INTRODUCTION

HOW TO USE THIS MANUAL

IN002–09

INDEX

An INDEX is provided on the first page of each section to guide you to the item to be repaired. To assist you in finding your way through the manual, the Section Title and major heading are given at the top of every page.

GENERAL DESCRIPTION

At the beginning of each section, a General Description is given that pertains to all repair operations contained in that section.
Read these precautions before starting any repair task.

TROUBLESHOOTING

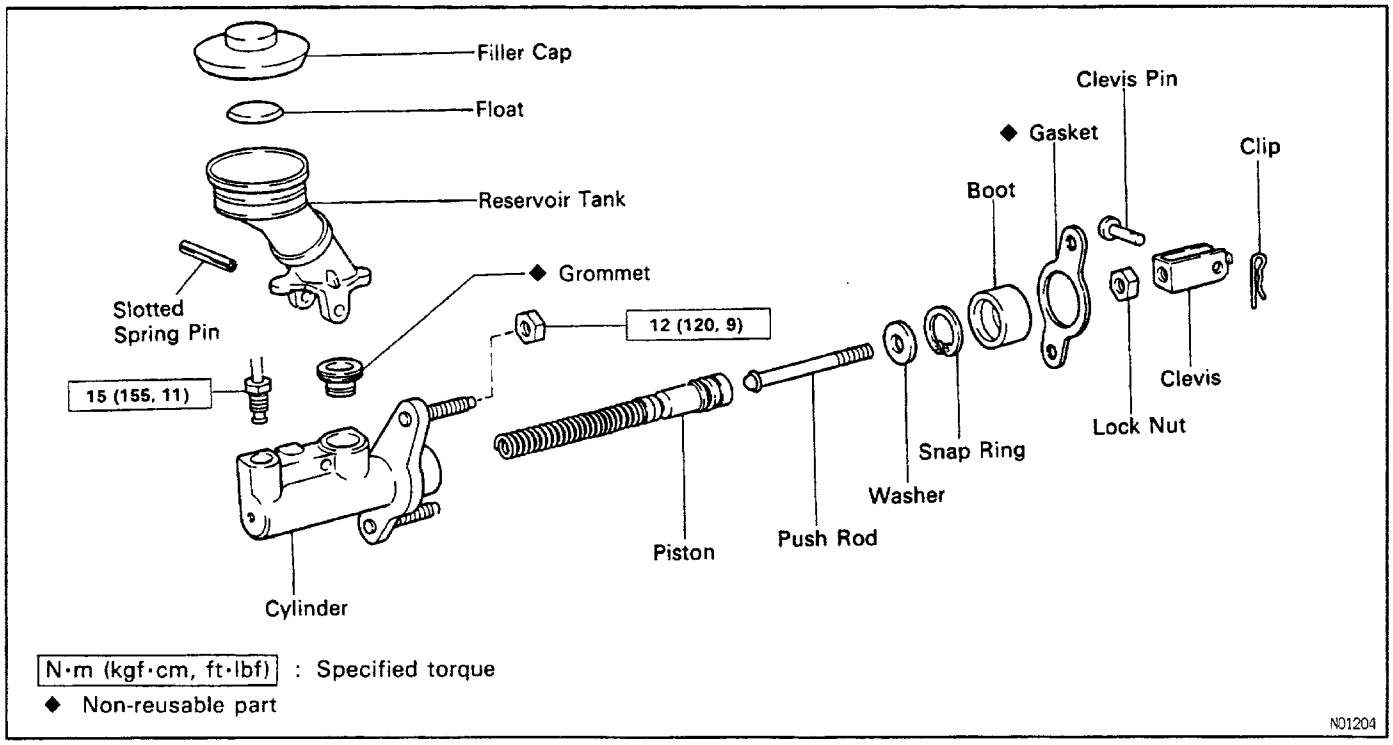
TROUBLESHOOTING tables are included for each system to help you diagnose the problem and find the cause.

PREPARATION

Preparation lists the SST (Special Service Tools), recommended tools, equipment, lubricant and SSM (Special Service Materials) which should be prepared before beginning the operation and explains the purpose of each one.

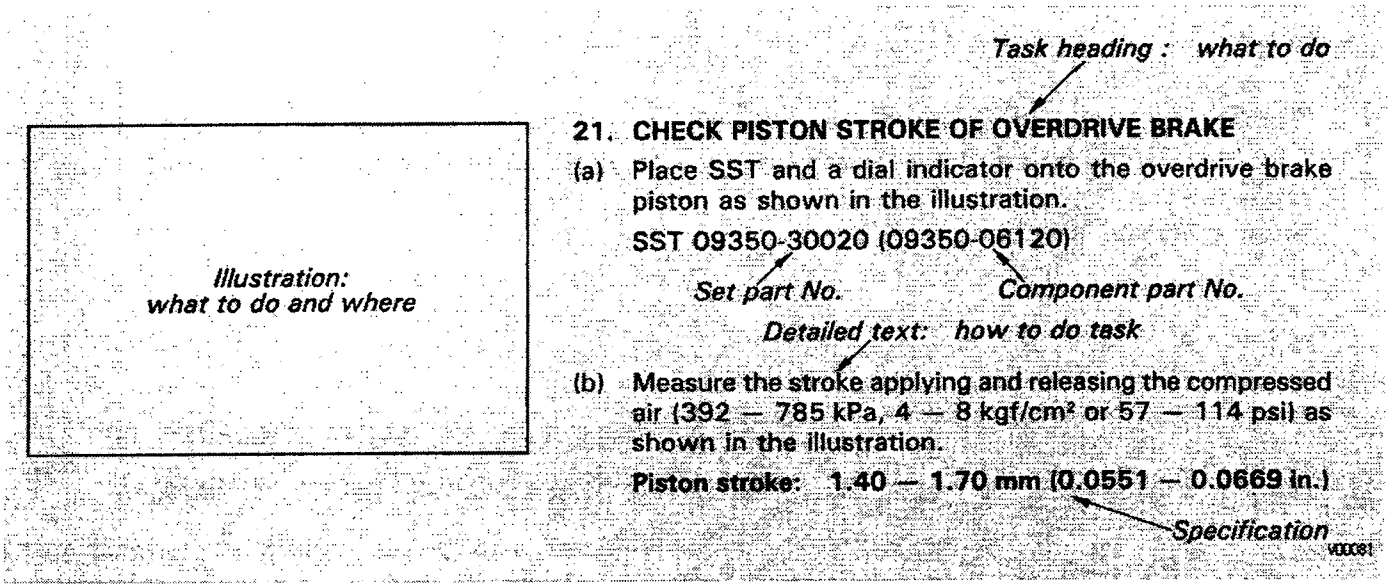
REPAIR PROCEDURES

Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together.
Example:



The procedures are presented in a step–by–step format:
Example:

- The illustration shows what to do and where to do it.
- The task heading tells what to do.
- The detailed text tells how to perform the task and gives other information such as specifications and warnings.



This format provides the experienced technician with a FAST TRACK to the information needed. The upper case task heading can be read at a glance when necessary, and the text below it provides detailed information. Important specifications and warnings always stand out in bold type.

REFERENCES

References have been kept to a minimum. However, when they are required you are given the page to refer to.

SPECIFICATIONS

Specifications are presented in bold type throughout the text where needed. You never have to leave the procedure to look up your specifications. They are also found at the end of each section, for quick reference.

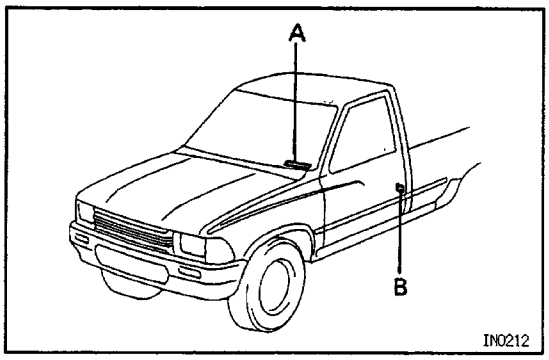
CAUTIONS, NOTICES, HINTS:

- CAUTIONS are presented in bold type, and indicate there is a possibility of injury to you or other people.
- NOTICES are also presented in bold type, and indicate the possibility of damage to the components being repaired.
- HINTS are separated from the text but do not appear in bold. They provide additional information to help you perform the repair efficiently.

SI UNIT

The UNITS given in this manual are primarily expressed according to the SI UNIT(Internationai System of Unit), and alternately expressed in the metric system and in the English System. Example:

Torque: 30 N–m (310 kgf–cm, 22 ft–lbf)

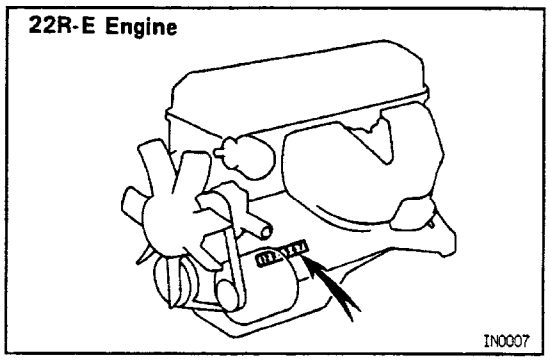


IDENTIFICATION INFORMATION
VEHICLE IDENTIFICATION NUMBER

IN003–01

The vehicle identification number is stamped on the vehicle identification number plate and certification label.

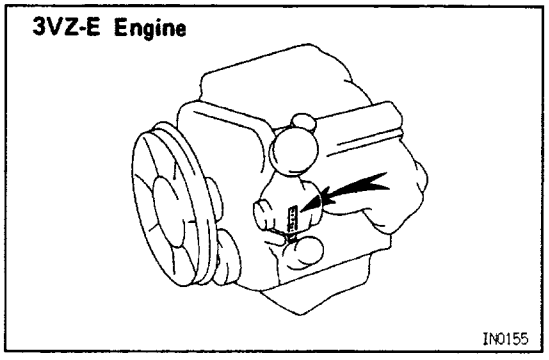
A. Vehicle Identification Number Plate
B. Certification Label



IN00A–01

ENGINE SERIAL NUMBER

The engine serial number is stamped on the engine block as shown.



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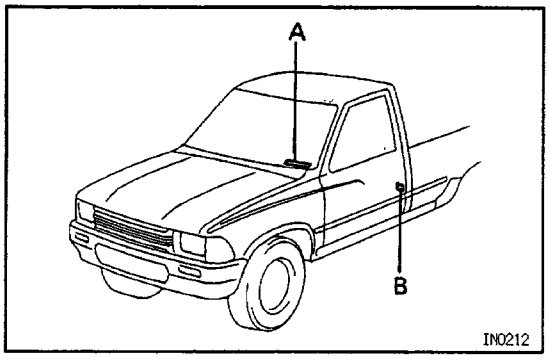
IDENTIFICATION INFORMATION

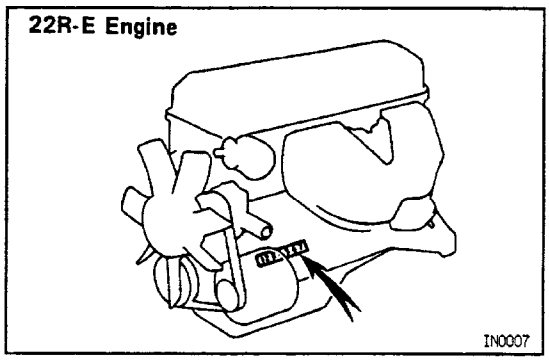
VEHICLE IDENTIFICATION NUMBER IN003–01



The vehicle identification number is stamped on the vehicle identification number plate and certification label.

A. Vehicle Identification Number Plate
B. Certification Label

ENGINE SERIAL NUMBER IN00A–01



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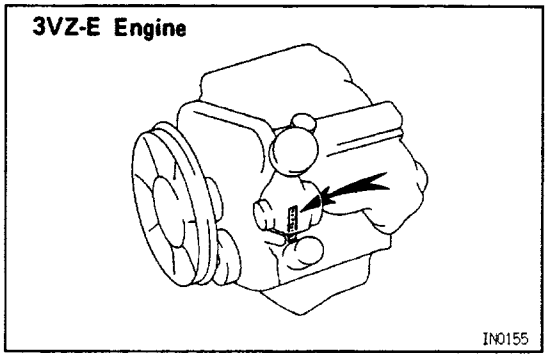
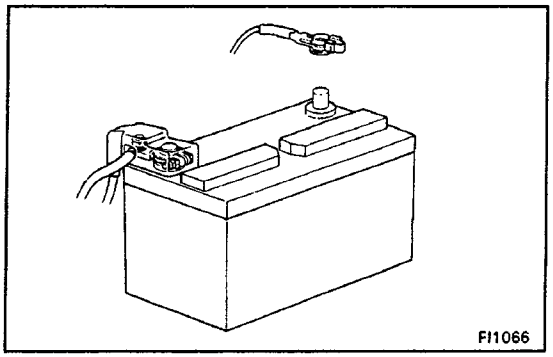
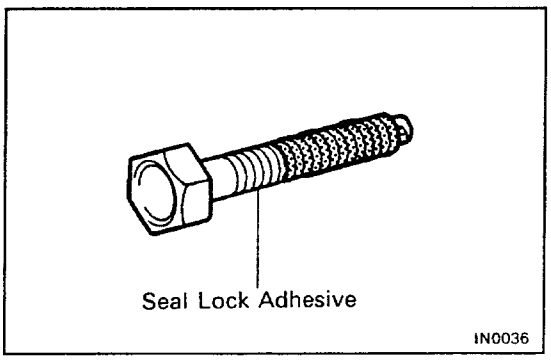



FI1066

GENERAL REPAIR INSTRUCTIONS

1. Use fender, seat and floor covers to keep the vehicle clean and prevent damage.
2. During disassembly, keep parts in the appropriate order to facilitate reassembly.
3. Observe the following:
   (a) Before performing electrical work, disconnect. the negative cable from the battery terminal.
   (b) If it is necessary to disconnect the battery for inspection or repair, always disconnect the cable from the negative (–) terminal which is grounded to the vehicle body.
   (c) To prevent damage to the battery terminal post, loosen the terminal nut and raise the cable str– aight up without twisting or prying it.
   (d) Cleah the battery terminal posts and cable ter– minals with a clean shop rag. Do not scrape them with a file or other abrasive objects.
   (e) Install the cable terminal to the battery post with the nut loose, and tighten the nut after installa– tion. Do not use a hammer to tap the terminal onto the post.
   (f) Be sure the cover for the positive (+) terminal is properly in place.
4. Check hose and wiring connectors to make sure that they are secure and correct.
5. Non–reusable parts
   (a) Always replace cotter pins, gaskets, 0– rings and oil seals etc. with new ones.
   (b) Non–reusable parts are indicated in the com– ponent illustrations by the“♦” symbol.



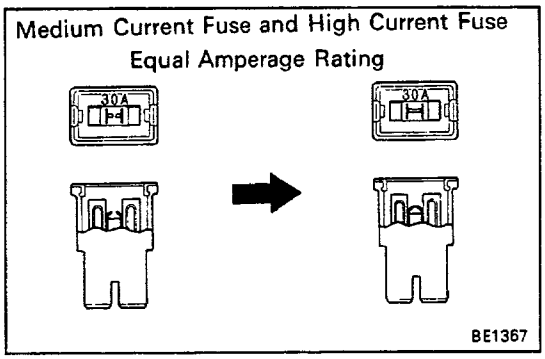
IN0036

6. Precoated parts
   Precoated parts are bolts and nuts, etc. that are coated with a seal lock adhesive at the factory.
   (a) If a precoated part is retightened, loosened or caused to move in any way, it must be recoated with the specified adhesive.

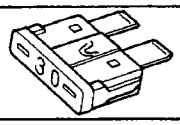
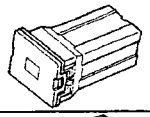
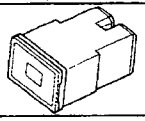
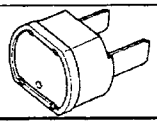
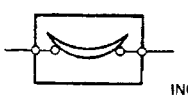
(b) When reusing precoated parts, clean off the old adhesive and dry with compressed air. Then apply the specified seal lock adhesive to the bolt, nut or threads.

(c) Precoated parts are indicated in the component illustrations by the "*" symbol.

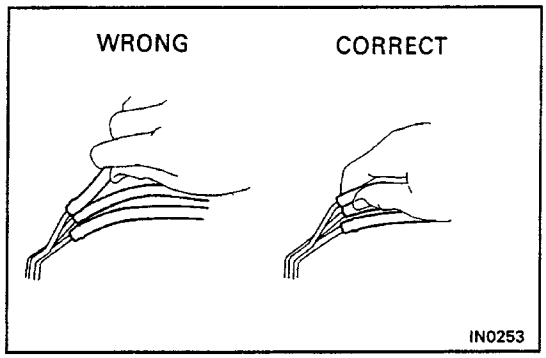
7. When necessary, use a sealer on gaskets to prevent leaks.
8. Carefully observe all specifications for bolt tightening torques. Always use a torque wrench.
9. Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work procedure. A list of SST and SSM can be found in the preparation part at the front of each section in this manual.



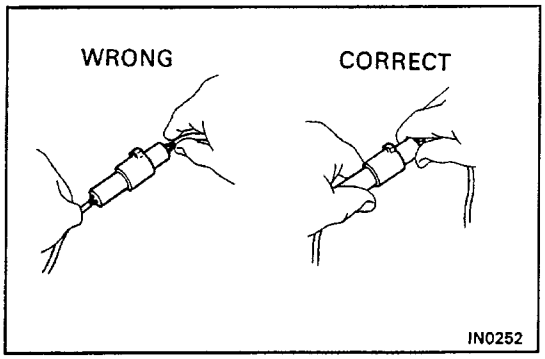
10. When replacing fuses, be sure the new fuse has the correct amperage rating. DO NOT exceed the rating or use one with a lower rating.

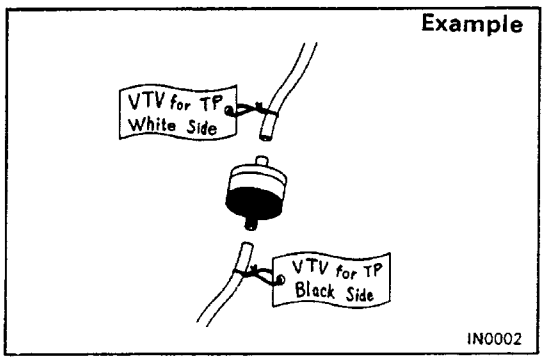
Illustration	Symbol	Part Name	Abbreviation
 BE5594	 IN0365	FUSE	FUSE
 BE5595	 IN0366	MEDIUM CURRENT FUSE	M–FUSE
 BE5596	 IN0367	HIGH CURRENT FUSE	H–FUSE
 BE5597	 IN0367	FUSIBLE L!1VK	FL
 BE5598	 IN0368	CIRCUIT BREAKER	CB

11. Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations (See page IN–9).
    (a) If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels at the opposite end in order to ensure safety.
    (6) After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on a vehicle raised on a jack alone, even for a small job that can be finished quickly.
12. Observe the following precautions to avoid damage to the parts:
    (a) Do not open the cover or case of the ECU, ECM, PCM or TCM unless absolutely necessary. (If the IC terminals are touched, the IC may be destr–oyed by static electricity.)



    (b) To disconnect vacuum hoses, pull on the end, not the middle of the hose.
    (c) To pull apart electrical connectors, pull on the connector itself, not the wires.
    (d) Be careful not to drop electrical components, such as sensors or relays. If they are dropped on a hard floor, they should be replaced and not reused.
    (e) When steam cleaning an engine, protect the distributor, air filter, and VCV from water.
    (f) Never use an impact wrench to remove or install temperature switches or temperature sensors.
    (g) When checking continuity at the wire connector, insert the tester probe carefully to prevent ter–minals from bending.
    (h) When using a vacuum gauge, never force the hose onto a connector that is too large. Use a step–down adapter instead. Once the hose has been stretched, it may leak.





13. Tag hoses before disconnecting them:
    (a) When disconnecting vacuum hoses, use tags to identify how they should be reconnected.
    (b) After completing a job, double check that the vacuum hoses are properly connected. A label under the hood shows the proper layout.

PRECAUTION

FOR VEHICLES EQUIPPED WITH A CATALYTIC CONVERTER

IN006–01

CAUTION: If large amounts of unburned gasoline flow into the converter, it may overheat and create a fire hazard. To prevent this, observe the following precautions and explain them to your customer.

1. Use only unleaded gasoline.

2. Avoid prolonged idling.

Avoid running the engine at idle speed for more than 20 minutes.

3. Avoid spark jump test.

(a) Perform spark jump test only when absolutely necessary. Perform this test as rapidly as possible.

(b) While testing, never race the engine.

4. Avoid prolonged engine compression measurement.

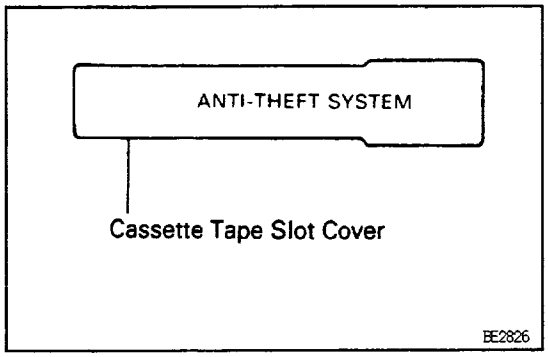
Engine compression tests must be done as rapidly as possible.

5. Do not run engine when fuel tank is nearly empty.

This may cause the engine to misfire and create an extra load on the converter.

6. Avoid coasting with ignition turned off and prolonged braking.

7. Do not dispose of used catalyst along with parts contaminated with gasoline or oil.



IN–01

FOR VEHICLES WITH AN AUDIO SYSTEM WITH BUILT–IN ANTI–THEFT SYSTEM

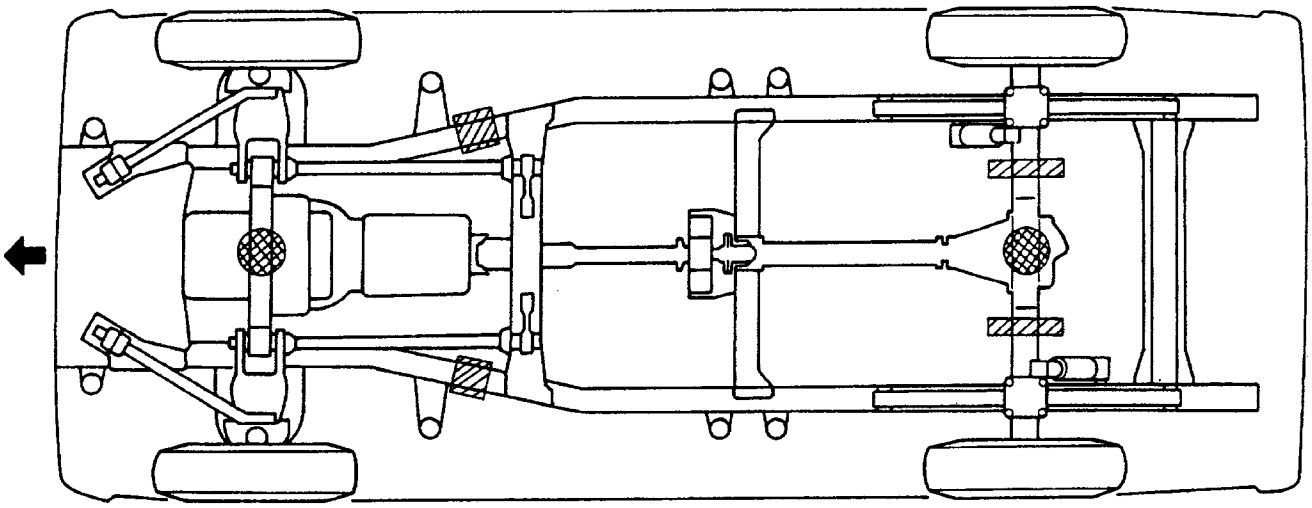
Audio System displaying the sign ”ANTI –THEFT SYSTEM” shown on the left has a built–in anti–theft system which makes the audio system soundless if stolen.

If the power source for the audio system is cut even once, the anti–theft system operates so that even if the power source is reconnected, the audio system will not produce any sound unless the ID number selected by the customer is input again. Accordingly, when performing repairs on vehicles equipped with this system, before disconnecting the battery terminals or removing the audio system the customer should be asked for the ID number so that the technician can input the ID number afterwards, or else a request made to the customer to input the ID number. For the method to input the ID number or cancel the anti–theft system, refer to the Owner’s Manual.

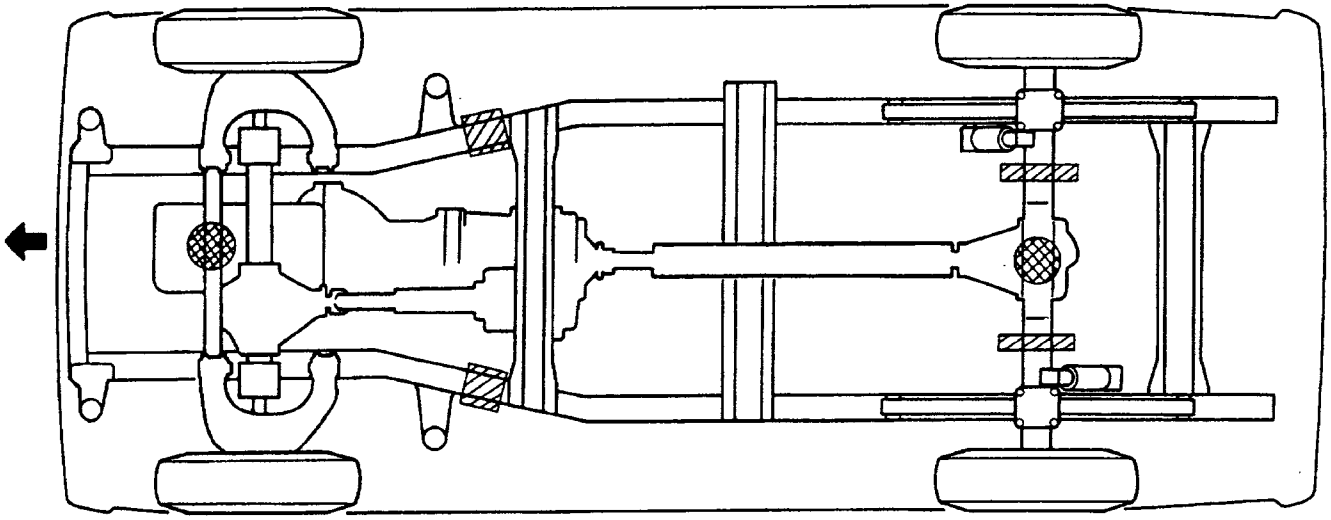
VEHICLE LIFT AND SUPPORT LOCATIONS

IN007–01

[2WD]



[4WD]



JACK POSITION .....

Front ..... Center of crossmember
Rear ..... Under the rear differential

SUPPORT POSITION

Safety stand .....

IN0012
IN0108

Z04590

ABBREVIATIONS USED IN THIS MANUAL

IN01D–06

ADD	Automatic Disconnecting Differential
ALR	Automatic Locking Retractor
A/T	Automatic Transmission
ATF	Automatic Transmission Fluid
BTDC	Before Top Dead Center
Calif.	California
CB	Circuit Breaker
C&C	Cab and Chassis
DP	Dash Pot
DRW	Double Rear Wheel
ECU	Electronic Control Unit
ELR	Emergency Locking Retractor
ESA	Electronic Spark Advance
EX	Exhaust (Manifold, Valve)
Ex.	Except
Fed.	Vehicles Sold in USA except California
FIPG	Formed in Place Gasket
FL	Fusible Link
Fr	Front
IG	Ignition
IN	Intake (Manifold, Valve)
J/6	Junction Block
LH	Left–Hand
LSPV	Load Sensing Proportioning Valve
LSP & BV	Load Sensing Proportioning and By–Pass Valve
Max.	Maximum
Min.	Minimum
MP	Multipurpose
M/T	Manual Transmission
0/D, OD	Overdrive
OHC	Over Head Camshaft
o/s	Oversize
PCV	Positive Crankcase Ventilation
PPS	Progressive Power Steering
PS	Power Steering
RH	Right–Hand
Rr	Rear
SRW	Single Rear Wheel
SSM	Special Service Materials
SST	Special Service Tools
STD	Standard
SW	Switch

TCCS	Toyota Computer Controlled System
TDC	Top Dead Center
TEMP.	Temperature
T/M	Transmission
U/S	Undersize
VCV	Vacuum Control Valve
VSV	Vacuum Switching Valve
VTV	Vacuum Transmitting Valve
w/	With
w/o	Without
2WD	Two Wheel Drive Vehicles (4 x 2)
4WD	Four Wheel Drive Vehicles (4 x 4)

GLOSSARY OF SAE AND TOYOTA TERMS

M076–03

This glossary lists all SAE–J 1930 terms and abbreviations used in this manual in compliance with SAE recommendations, as well as their Toyota equivalents.

SAE ABBRE–VIATIONS	SAE TERMS	TOYOTA TERMS ( )—ABBREVIATIONS
A/C	Air Conditioning	Air Conditioner
ACL	Air Cleaner	Air Cleaner
AIR	Secondary Air Injection	Air Injection (AD
AP	Accelerator Pedal	–
B+	Battery Positive Voltage	+ B, Battery Voltage
BARO	Barometric Pressure	–
CAC	Charge Air Cooler	Intercooler
CARB	Carburetor	Carburetor
CFI	Continuous Fuel Injection	–
CKP	Crankshaft Position	Crank Angle
CL	Closed Loop	Closed Loop
CMP	Camshaft Position	Cam Angle
CPP	Clutch Pedal Position	–
CTOX	Continuous Trap Oxidizer	–
CT P	Closed Throttle Position	–
D F!	Direct Fuel Injection (Diesel)	Direct Injection (DI)
DI	Distributor ignition	–
DLC1 DLC2 DLC3	Data Link Connector 1 Data Link Connector 2 Data Link Connector 3	1: Check Connector 2: Toyota Diagnosis Communication Link (TDCL) 3: OBDII Diagnostic Connector
DTC	Diagnostic Trouble Code	Diagnostic Code
DTM	Diagnostic Test Mode	–
ECL	Engine Control Level	–
ECM	Engine Control Module	Engine ECU (Electronic Control Unit)
ECT	Engine Coolant Temperature	Coolant Temperature, Water Temperature (THW)
EEPROM	Electrically Erasable Programmable Read Only Memory	Electrically Erasable Programmable Read Only Memory (EEPROM), Erasable Programmable Read Only Memory (EPROM)
EFE	Early Fuel Evaporation	Cold Mixture Heater (CMH), Heat Control Valve (HCV)
EGR	Exhaust Gas Recirculation	Exhaust Gas Recirculation (EGR)
EI	Electronic Ignition	Toyota Distributable Ignition (TDI)
EM	Engine Modification	Engine Modification (EM)
EPROM	Erasable Programmable Read Only Memory	Programmable Read Only Memory (PROM)
EVAP	Evaporative Emission	Evaporative Emission Control (EVAP)
FC	Fan Control	–
FEEPROM	Flash Electrically Erasable Programmable Read Only Memory	–
FEPROM	Flash Erasable Programmable Read Only Memory	–
FF	Flexible Fuel	–
FP	Fuel Pump	Fuel Pump
GEN	Generator	Alternator
GND	Ground	Ground (GND)
H02S	Heated Oxygen Sensor	Heated Oxygen Sensor (H02S)

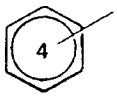
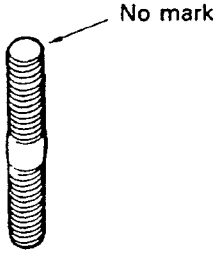
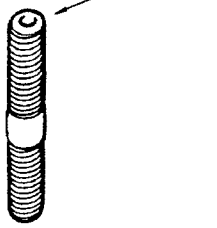
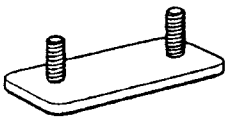
IAC	Idle Air Control	Idle Speed Control (ISC)
I AT	Intake Air Temperature	Intake or Inlet Air Temperature
ICM	Ignition Control Module	–
IFI	Indirect Fuel Injection	Indirect injection
IFS	Inertia Fuel–Shutoff	–
ISC	Idle Speed Control	–
KS	Knock Sensor	Knock Sensor
MAF	Mass Air Flow	Air Flow Meter
MAP	Manifold Absolute Pressure	Manifold Pressure Intake Vacuum
MC	Mixture Control	Electric Bleed Air Control Valve (EBCV) Mixture Control Valve (MCV) Electric Air Control Valve (EACV)
M DP	Manifold Differential Pressure	–
M Ft	Multiport Fuel Injection	Electronic Fuel Injection (EFI)
MIL	Malfunction Indicator Lamp	Check Engine Light
MST	Manifold Surface Temperature	–
MVZ	Manifold Vacuum Zone	–
NVRAM	Non–Volatile Random Access Memory	–
02S	Oxygen Sensor	Oxygen Sensor, O_2 Sensor (02S)
OBD	On–Board Diagnostic	On–Board Diagnostic (OBD)
OC	Oxidation Catalytic Converter	Oxidation Catalyst Converter (OC), CCo
OP	Open Loop	Open Loop
PAIR	Pulsed Secondary Air Injection	Air Suction (AS)
PCM	Powertrain Control Module	–
PNP	Park/Neutral Position	–
PROM	Programmable Read Only Memory	–
PSP	Power Steering Pressure	–
PTOX	Periodic Trap Oxidizer	Diesel Particulate Filter (DPF) Diesel Particulate Trap (DPT)
RAM	Random Access Memory	Random Access Memory (RAM)
RM	Relay Module	–
ROM	Read Only Memory	Read Only Memory (ROM)
RPM	Engine Speed	Engine Speed
SC	Supercharger	Supercharger
SCB	Supercharger Bypass	–
SFI	Sequential Multiport Fuel Injection	Electronic Fuel Injection (EFI), Sequential Injection
SPL	Smoke Puff Limiter	–
SRI	Service Reminder Indicator	–
S RT	System Readiness Test	–
ST	Scan Tool	–
TB	Throttle Body	Throttle Body
TBI	Throttle Body Fuel Injection	Single Point Injection Central Fuel Injection (Ci)
TC	Turbocharger	Turbocharger
TCC	Torque Converter Clutch	Torque Converter
TCM	Transmission Control Module	Transmission ECU (Electronic Control Unit)
TP	Throttle Position	Throttle Position
TR	Transmission Range	–

TVV	Thermal Vacuum Valve	Bimetal Vacuum Switching Valve (BVSV) Thermostatic Vacuum Switching Valve (TVSV)
twc	Three–Way Catalytic Converter	Three–Way Catalyst (TWC) CCRO
TWC+OC	Three–Way + Oxidation Catalytic Converter	CC_R + CCo
VAF	Volume Air Flow	Air Flow Meter
VR	Voltage Regulator	Voltage Regulator
VSS	Vehicle Speed Sensor	Vehicle Speed Sensor (Read Switch Type)
wot	Wide Open Throttle	Full Throttle
WU –OC	Warm Up Oxidation Catalytic Converter	–
WU–TWC	Warm Up Three–Way Catalytic Converter	Manifold Converter
3GR	Third Gear	–
4GR	Fourth Gear	–

STANDARD BOLT TORQUE SPECIFICATIONS

IN008–01

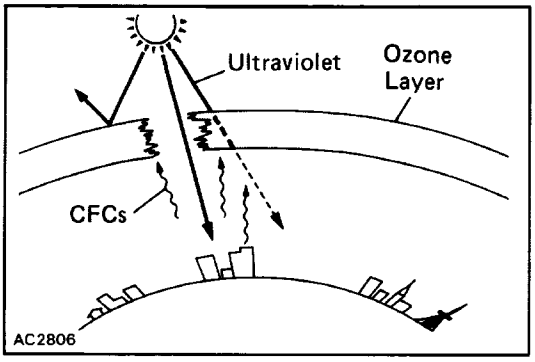
HOW TO DETERMINE BOLT STRENGTH

	Mark	Class		Mark	Class
Hexagon head bolt	 4– 5– 6– 8– 9– 10– 11–	4T 5T fiT 7T 8T 9T 10T 11T	Stud bolt		4T
	 No mark	4T			
Hexagon flange bolt w/ washer hexagon bolt	 No mark	4T			6T
Hexagon head bolt	 Two protruding lines	5T			
Hexagon flange bolt w/ washer hexagon bolt	 Two protruding lines	6T	Welded bolt		4T
Hexagon head bolt	 Three protruding lines	7T			
Hexagon head bolt	 Four protruding lines	8T			

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			N·m	kgf·cm	ft·lbf	N·m	kgf·cm	ft·lbf
4T	6	1	5	55	48 in.·lbf	6	60	52 in.·lbf
	8	1.25	12.5	130	9	14	145	10
	10	1.25	26	260	19	29	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	–	–	–
5T	6	1	6.5	65	56 in.·lbf	7.5	75	65 in.·lbf
	8	1.25	15.5	160	12	17.5	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1,050	76
	16	1.5	140	1,400	101	–	–	–
6T	6	1	8	80	69 in.·lbf	9	90	78 in.·lbf
	8	1.25	19	195	14	21	210	15
	10	1.25	39	400	29	44	440	32
	12	1.25	71	730	53	80	810	59
	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127	–	–	–
7T	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	105	1,050	76
	14	1.5	145	1,500	108	165	1,700	123
	16	1.5	230	2,300	166	–	–	–
8T	8	1.25	29	300	22	33	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	110	1,100	80	120	1,250	90
9T	8	1.25	34	340	25	37	380	27
	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
1 OT	8	1.25	38	390	28	42	430	31
	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
11T	8	1.25	42	430	31	47	480	35
	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

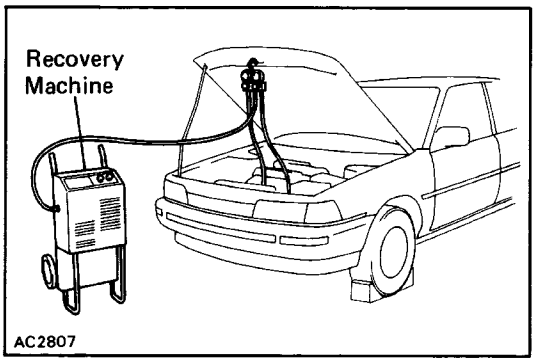
AIR CONDITIONING SYSTEM



GENERAL INFORMATION

REFRIGERATION SYSTEM

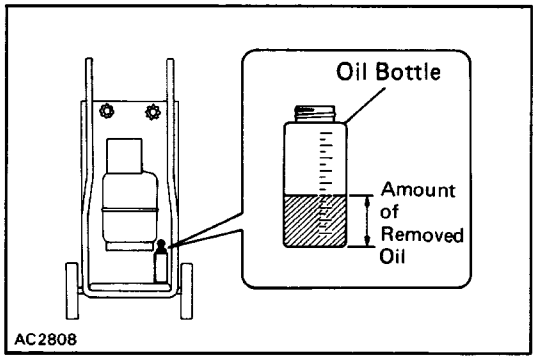
Prevention of Refrigerant Release and Excessive quantities Refrigerant (CFCs) for automobile air conditionings is be–lieved to cause harm by depleting the ozone layer which helps to protect us from the ultraviolet rays of the sun. Therefore, it is necessary to prevent release of refrigerant to the atmosphere and to use the minimum amount when servicing the air conditioning.



1. USE RECOVERY MACHINE TO RECOVER REFRIGERANT

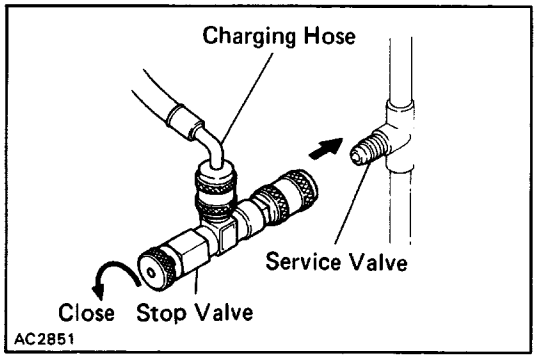
When discharging refrigerant from the system as follows, use a recovery machine to recover the refrigerant.

- Before replacing parts on the refrigerant line.
- When moisture or air gets in the refrigerant line.
- When excess refrigerant is charged.



NOTICE:

- **When handling the recovery machine, always follow the directions given in the instruction manual.**
- **After recovery, the amount of compressor oil removed must be measured and the same amount added to the system.**



2. USE CHARGING HOSES WITH STOP VALVE WHEN INSTALLING MANIFOLD GAUGE SET

To prevent release of refrigerant, using charging hoses with a stop valve when installing the manifold gauge set to the service valves on the refrigerant line.

3. TIGHTEN CONNECTING PARTS SECURELY

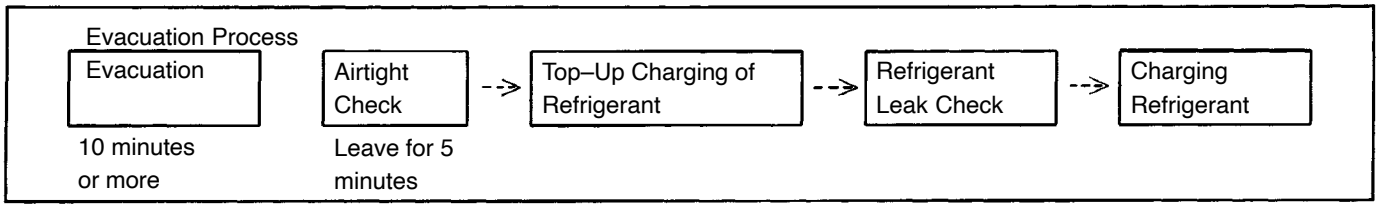
Follow the notices about tightening connecting parts in step 6 on page AC–4.

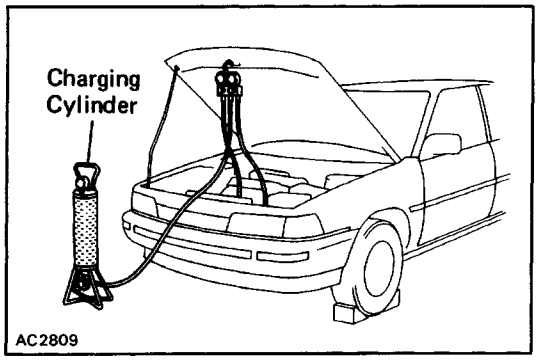
4. PROPERLY EVACUATE AIR FROM REFRIGERANT SYSTEM

To prevent release and wasteful use of refrigerant, evac–uate air with care from refrigeration system as follows;

- Do not evacuate before recovering refrigerant in system.

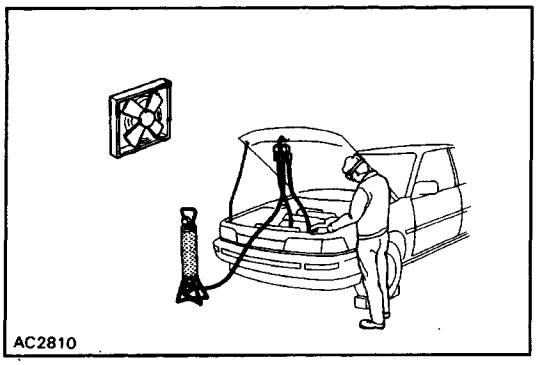
• Do not perform repeat evacuation of system.





6. USE CHARGING CYLINDER TO CHARGE PROPER AMOUNT OF REFRIGERANT

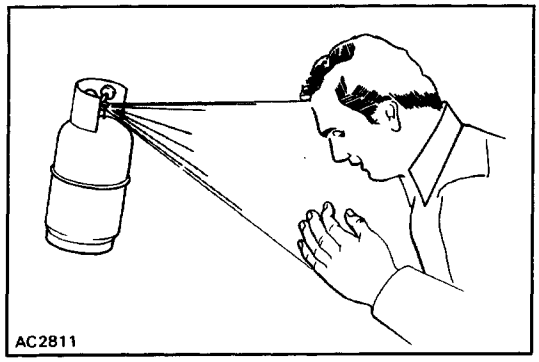
To prevent excessive use of refrigerant due to overcharg–ing, use a charging cylinder to charge the proper amount of refrigerant.



Handling Precautions for Refrigerant

1. DO NOT HANDLE REFRIGERANT IN AN ENCLOSED AREA OR NEAR AN OPEN FLAME

2. ALWAYS WEAR EYE PROTECTION



3. BE CAREFUL THAT LIQUID REFRIGERANT DOES NOT GET IN YOUR EYES OR ON YOUR SKIN

If liquid refrigerant gets in your eyes or on your skin;

(a) Wash the area with lots of cool water.

CAUTION: Do not rub your eyes or skin.

(b) Apply clean petroleum jelly to the skin.

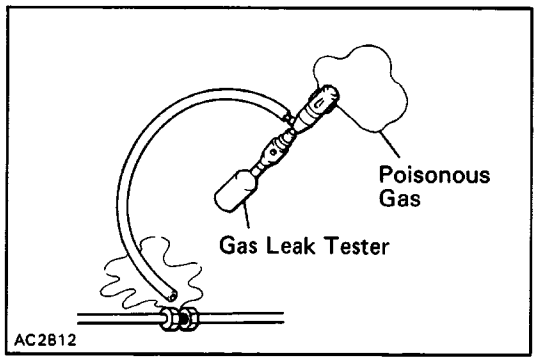
(c) Go immediately to a physician or hospital for profes–sional treatment.

CAUTION: Do not attempt to treat yourself.

Handling Precautions for Refrigerant Container

1. NEVER HEAT CONTAINER OR EXPOSE IT TO NAKED FLAME

2. BE CAREFUL NOT TO DROP CONTAINER AND NOT TO APPLY PHYSICAL SHOCKS TO IT

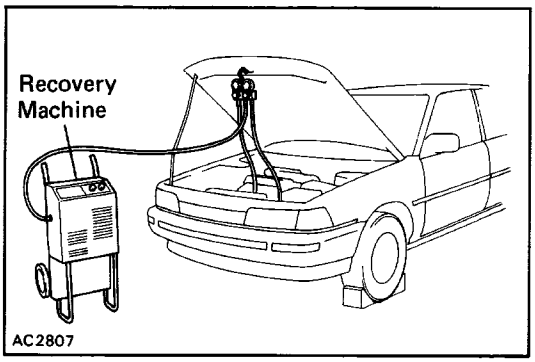


Handling Precautions for Gas–Cylinder Type Gas Leak Tester

1. BEFORE USING TESTER MAKE SURE THAT THERE ARE NO FLAMMABLE SUBSTANCES NEARBY

2. BE CAREFUL NOT TO INHALE POISONOUS GAS

If refrigerant gas comes in contact with flame, a poison–ous gas is produced. During leak tests, do not inhale any gas.

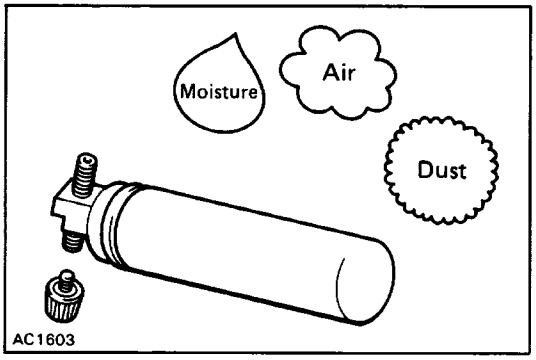


Precautions When Replacing Parts in Refrigerant line

1. RECOVER REFRIGERANT IN SYSTEM BEFORE REMOV–ING PARTS

Using a recovery machine, recover refrigerant in system before removing the parts.

NOTICE: Do not release refrigerant to atmosphere.



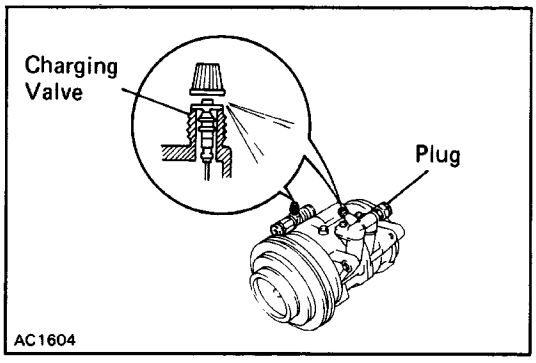
2. INSERT PLUG IMMEDIATELY IN DISCONNECTED PARTS

Insert a plug immediately in the disconnected parts to prevent the entry of moisture and dust.

3. DO NOT REMOVE PLUG FROM NEW PARTS UNTIL IM–MEDIATELY BEFORE INSTALLATION

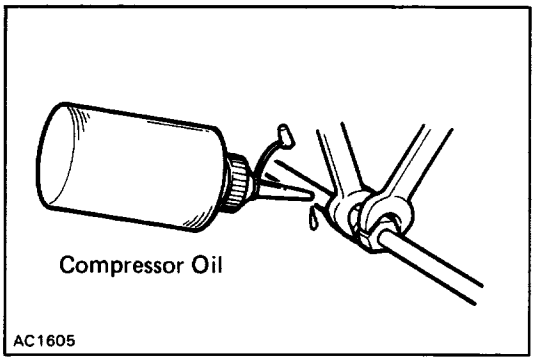
4. DO NOT USE BURNER FOR BENDING OR LENGTHENING OPERATIONS ON TUBE

If the tubes are heated with a burner, a layer of oxidation forms inside the tube, causing the same kind of trouble as an accumulation of dust.



5. DISCHARGE GAS IN NEW COMPRESSOR FROM CHARGING VALVE BEFORE INSTALLING IT

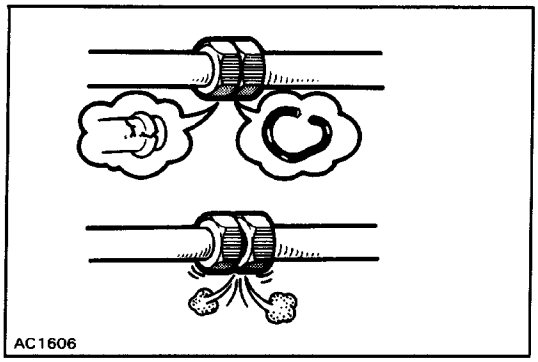
If the gas in new compressor is not discharged first, com–pressor oil will spray out with gas when the plug is re–moved.



6. TIGHTEN CONNECTING PARTS SECURELY

Securely tighten the connecting parts to prevent leaking of refrigerant gas.

- Apply a few drops of compressor oil to 0–ring fittings for easy tightening and to prevent leaking of refriger–ant gas.
- Tighten the nuts using two wrenches to avoid twisting the tube.

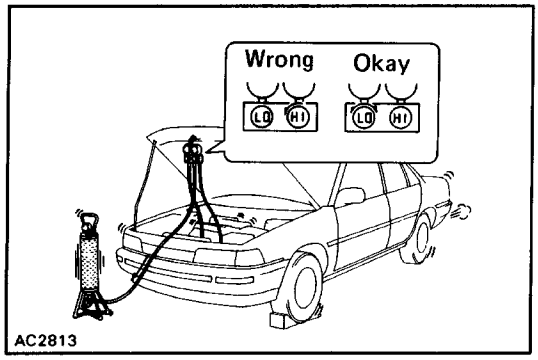


- Tighten the O–ring fittings or the bolted type fittings to the specified torque.

Precautions When Charging Refrigerant

1. DO NOT OPERATE COMPRESSOR WITHOUT ENOUGH REFRIGERANT IN REFRIGERANT CYCLE

If there is not enough refrigerant in the refrigerant cycle, oil lubrication will be insufficient and compressor burnout may occur, so take care to avoid this.



2. DO NOT OPEN HIGH PRESSURE VALVE OF MANIFOLD GAUGE WITH COMPRESSOR OPERATING

If the high pressure valve is opened, refrigerant flows in the reverse direction and could cause the charging cylin–der to rupture, so open and close the low pressure valve only.

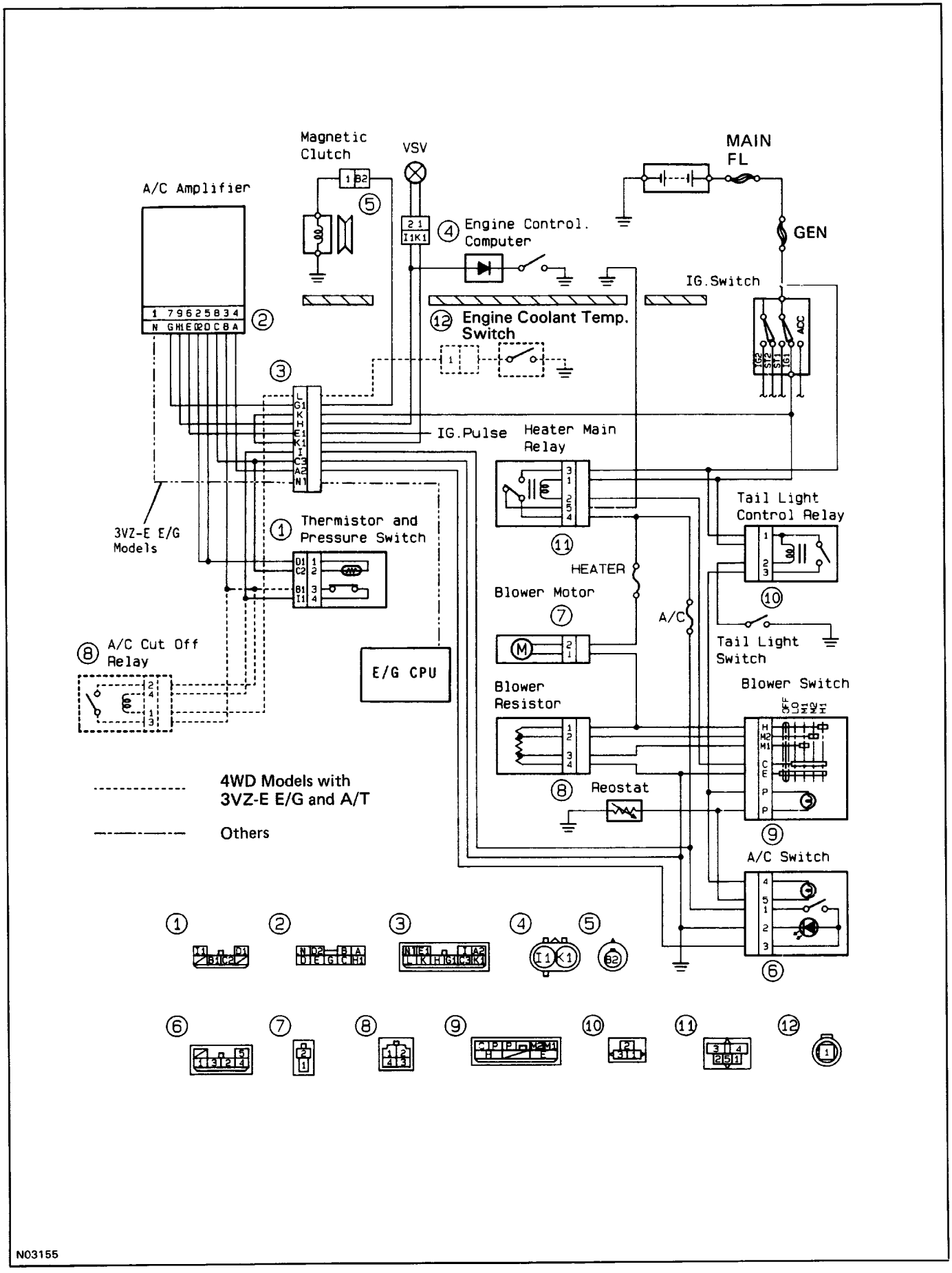
3. BE CAREFUL NOT TO OVERCHARGE WITH REFRIGER–ANT IN SYSTEM

If refrigerant is overcharged, it causes trouble such as in–sufficient cooling, poor fuel economy, engine overheating etc.

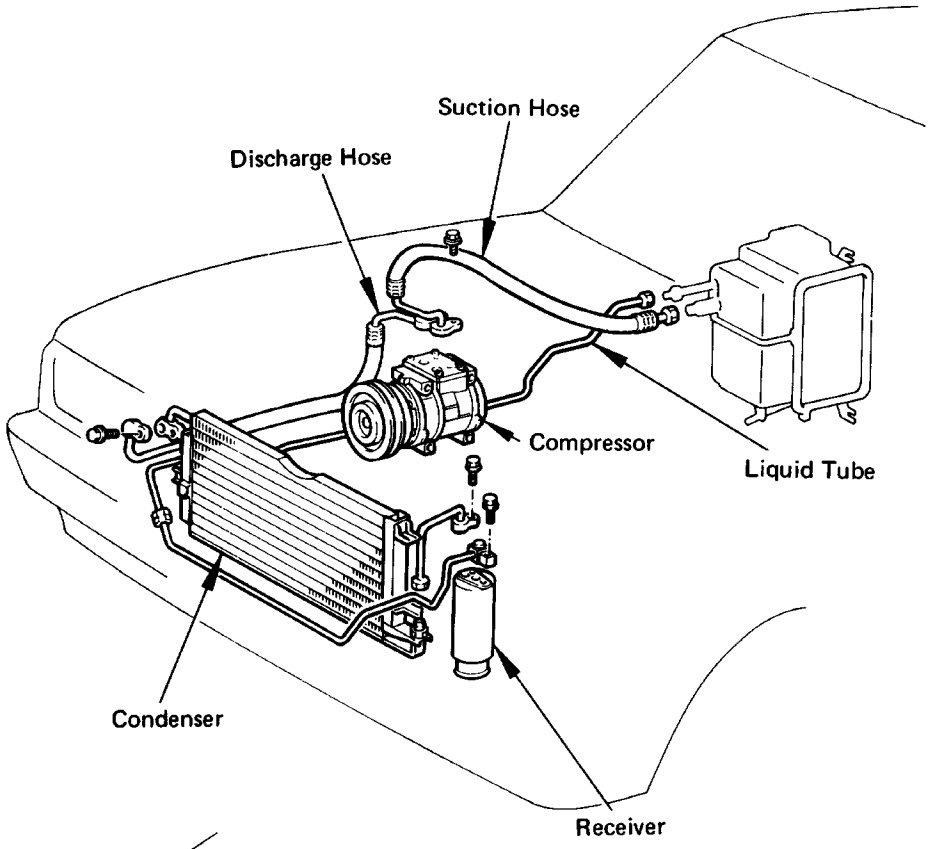
ELECTRICAL PARTS

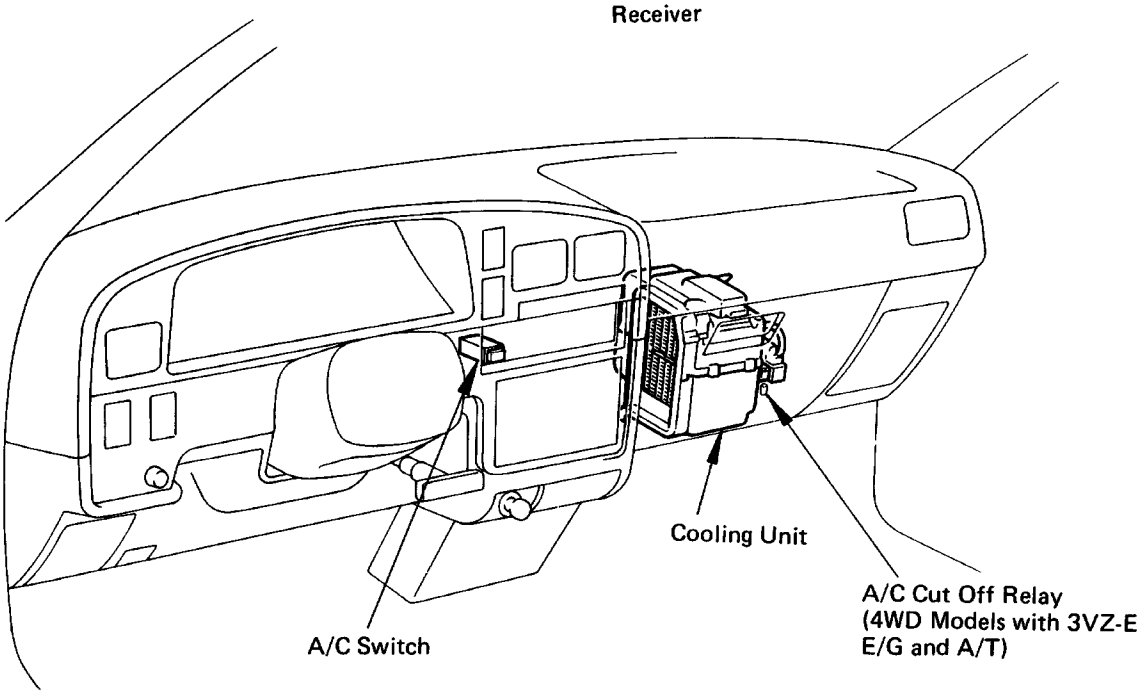
Before removing and inspecting the electrical parts, set the ignition switch to the LOCK position and disconnect the negative (–) terminal cable from the battery..

AIR CONDITIONING SYSTEM CIRCUIT



SYSTEM COMPONENTS

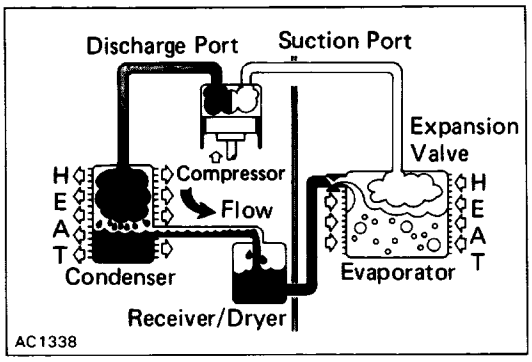




Specified Torque N·m (kgf·cm, ft·lbf)

0.31 in. Tube		14 (140, 10)
0.50 in. Tube		23 (230, 17)
0.62 in. Tube		32 (330, 24)
Bolted Type	For Compressor	25 (250, 18)
	For Condenser	13 (130, 9)
	For Receiver	5 (55, 48 in.·lbf)

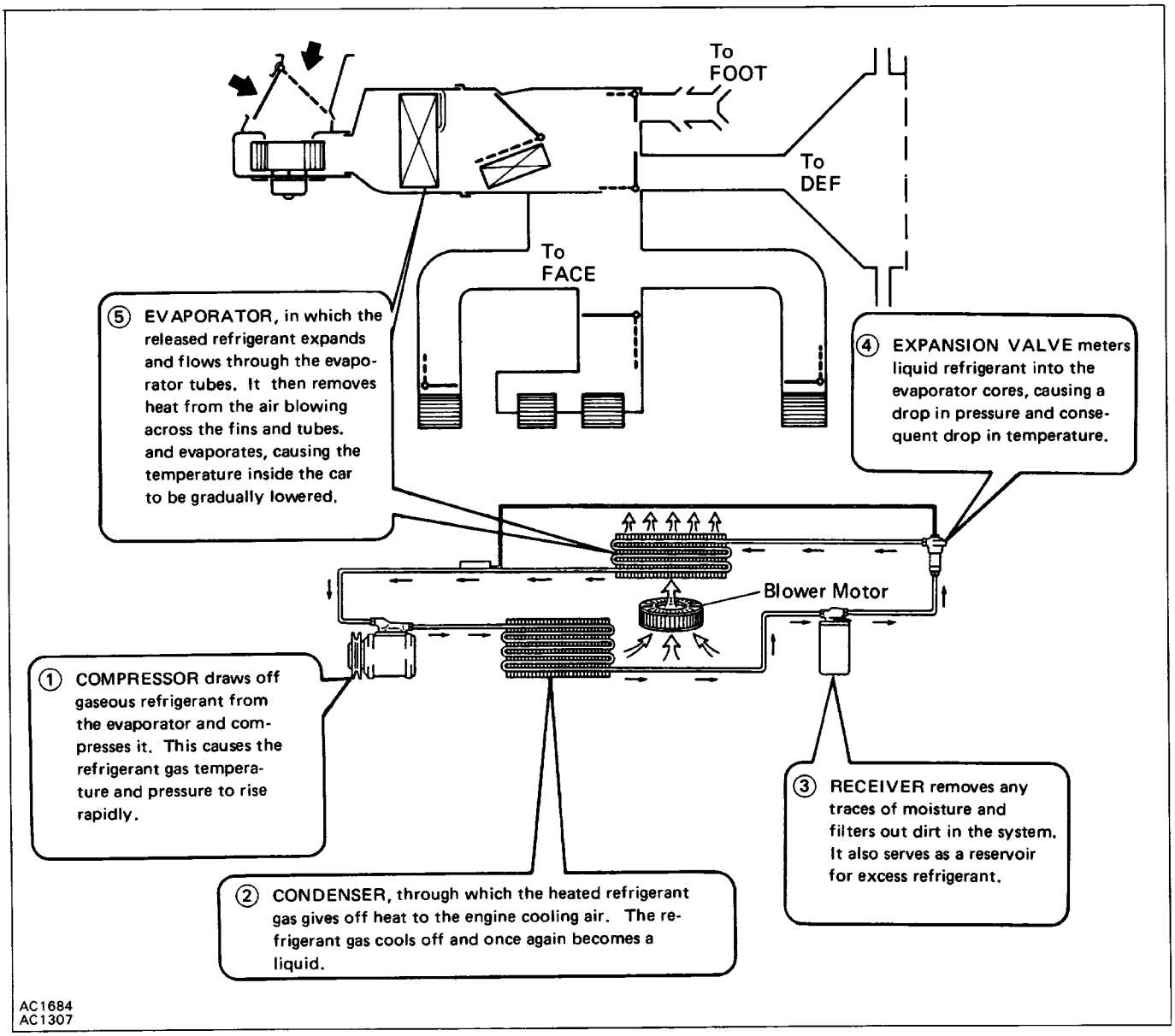
AC1852
AC2240



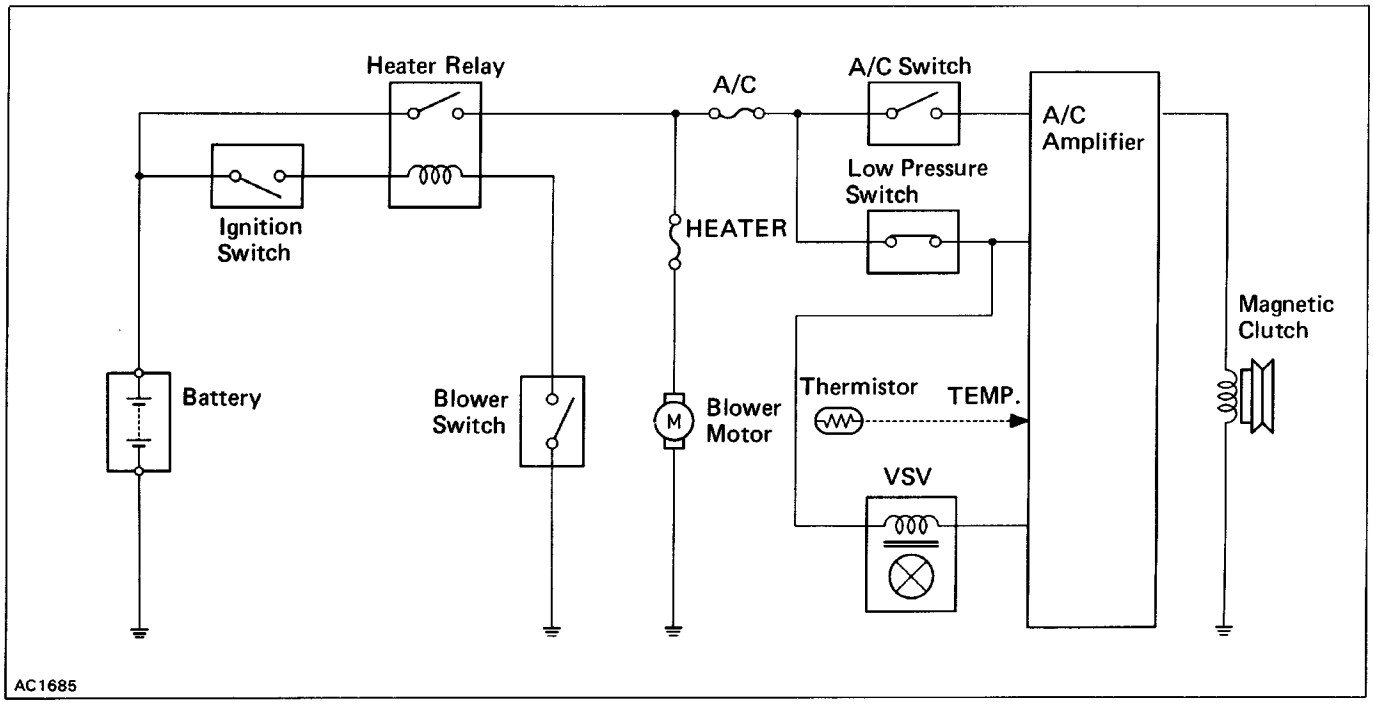
GENERAL DESCRIPTION

REFRIGERATION CYCLE

1. The compressor discharges high temperature and high pressure refrigerant containing the heat absorbed from the evaporator plus the heat created by the compressor in a discharge stroke.
2. This gaseous refrigerant flows into the condenser. In the condenser, the gaseous refrigerant condenses into liquid refrigerant.
3. This liquid refrigerant flows into the receiver which stores and filters the liquid refrigerant till the evaporator requires the refrigerant.
4. The liquid refrigerant is changed by the expansion valve into a low temperature, low pressure liquid and gaseous mixture.
5. This cold and foggy refrigerant flows to the evaporator. Vaporizing the liquid in the evaporator, the heat from the warm air stream passing through the evaporator core is transferred to the refrigerant. All the liquid is changed into the gaseous refrigerant in the evaporator and only heat–laden gaseous refrigerant is drawn into the compressor. Then the process is repeated again.



1. PRINCIPLE OF A/C ELECTRICAL CIRCUIT



2. HOW IS MAGNETIC CLUTCH ENERGIZED?

The general process until the magnetic clutch is energized as shown below.

① Ignition Switch "ON"

② Blower Switch "ON" → Heater Relay "ON" (Blower Motor "RUN")

③ A/C Switch "ON" → A/C Amplifier "ON" (A/C Amp. Main Power Supply)

④ Low Pressure Switch "ON":
Refrigerant Condition is more than 206 kPa (2.1 kgf/cm^2, 30 psi)

⑤ Thermistor supplies temperature signal of evaporator to A/C amplifier.

⑥ VSV "ON" → E/G Idle-up

⑦ Magnetic Clutch "ON"

SPECIAL TOOLS AND EQUIPMENT

Tool	SST No.	Use
Ohmmeter		To diagnosis electrical system
Voltage meter		To diagnosis electrical system
Air conditioning service tool set	07110–58011	To evacuate and charge system
Magnetic clutch remover	07112–66040	To remove pressure plate
Magnetic clutch stopper	07112–76060	To remove and install pressure plate
Snap ring pliers	07114–84020	To remove pressure plate

SSM (SPECIAL SERVICE MATERIALS)

Part Name	Part No.	Use etc.
ND OIL6, SUNISO No.5GS or equivalent	07117–68040	Compressor

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
No cooling or warm air	Magnetic clutch does not engage		
	(a) A/C fuse blown	Replace fuse and check for short	AC–6 AC–17
	(b) Magnetic clutch faulty	Check magnetic clutch	AC–29
	(c) A/C switch faulty	Check switch	AC–31
	(d) A/C amplifier faulty	Check amplifier	AC–6
	(e) Wiring or ground faulty	Repair as necessary	AC–16
	(f) Refrigerant empty	Check refrigerant volume	AC–37
	(g) Heater relay faulty	Check heater relay	AC–29
	(h) Pressure switch faulty	Check pressure switch	
	Compressor does not rotate properly		
	(a) Drive belt loose or broken	Adjust or replace drive belt	AC–15
	(b) Compressor faulty	Check compressor	AC–17
	Expansion valve faulty	Check expansion valve	AC–25
	Leak in system	Test system for leaks	
	Fusible plug on receiver blown or clogged screen	Check receiver	AC–23
	Blower does not operate		
	(a) HEATER fuse blown	Replace fuse and check for short	AC–6 AC–29
	(b) A/C switch faulty	Check switch	AC–37
	(c) Heater relay faulty	Check heater relay	AC–37
	(d) Blower motor faulty	Check blower motor	AC–6
	(e) Wiring or ground faulty	Repair as necessary	
Cool air comes out intermittently	Magnetic clutch slipping	Check magnetic clutch	AC–17
	Expansion valve faulty	Check expansion valve	AC–25
	Wiring connection faulty	Repair as necessary	AC–6
	Excessive moisture in system	Evacuate and charge system	
	A/C amplifier faulty	Check amplifier	AC–31

SPECIAL TOOLS AND EQUIPMENT

Tool	SST No.	Use
Ohmmeter		To diagnosis electrical system
Voltage meter		To diagnosis electrical system
Air conditioning service tool set	07110–58011	To evacuate and charge system
Magnetic clutch remover	07112–66040	To remove pressure plate
Magnetic clutch stopper	07112–76060	To remove and install pressure plate
Snap ring pliers	07114–84020	To remove pressure plate

SSM (SPECIAL SERVICE MATERIALS)

Part Name	Part No.	Use etc.
ND OIL6, SUNISO No.5GS or equivalent	07117–68040	Compressor

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
No cooling or warm air	Magnetic clutch does not engage		
	(a) A/C fuse blown	Replace fuse and check for short	AC–6 AC–17
	(b) Magnetic clutch faulty	Check magnetic clutch	AC–29
	(c) A/C switch faulty	Check switch	AC–31
	(d) A/C amplifier faulty	Check amplifier	AC–6
	(e) Wiring or ground faulty	Repair as necessary	AC–16
	(f) Refrigerant empty	Check refrigerant volume	AC–37
	(g) Heater relay faulty	Check heater relay	AC–29
	(h) Pressure switch faulty	Check pressure switch	
	Compressor does not rotate properly		
	(a) Drive belt loose or broken	Adjust or replace drive belt	AC–15
	(b) Compressor faulty	Check compressor	AC–17
	Expansion valve faulty	Check expansion valve	AC–25
	Leak in system	Test system for leaks	
	Fusible plug on receiver blown or clogged screen	Check receiver	AC–23
	Blower does not operate		
	(a) HEATER fuse blown	Replace fuse and check for short	AC–6 AC–29
	(b) A/C switch faulty	Check switch	AC–37
	(c) Heater relay faulty	Check heater relay	AC–37
	(d) Blower motor faulty	Check blower motor	AC–6
	(e) Wiring or ground faulty	Repair as necessary	
Cool air comes out intermittently	Magnetic clutch slipping	Check magnetic clutch	AC–17
	Expansion valve faulty	Check expansion valve	AC–25
	Wiring connection faulty	Repair as necessary	AC–6
	Excessive moisture in system	Evacuate and charge system	
	A/C amplifier faulty	Check amplifier	AC–31

SPECIAL TOOLS AND EQUIPMENT

Tool	SST No.	Use
Ohmmeter		To diagnosis electrical system
Voltage meter		To diagnosis electrical system
Air conditioning service tool set	07110–58011	To evacuate and charge system
Magnetic clutch remover	07112–66040	To remove pressure plate
Magnetic clutch stopper	07112–76060	To remove and install pressure plate
Snap ring pliers	07114–84020	To remove pressure plate

SSM (SPECIAL SERVICE MATERIALS)

Part Name	Part No.	Use etc.
ND OIL6, SUNISO No.5GS or equivalent	07117–68040	Compressor

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
No cooling or warm air	Magnetic clutch does not engage		
	(a) A/C fuse blown	Replace fuse and check for short	AC–6 AC–17
	(b) Magnetic clutch faulty	Check magnetic clutch	AC–29
	(c) A/C switch faulty	Check switch	AC–31
	(d) A/C amplifier faulty	Check amplifier	AC–6
	(e) Wiring or ground faulty	Repair as necessary	AC–16
	(f) Refrigerant empty	Check refrigerant volume	AC–37
	(g) Heater relay faulty	Check heater relay	AC–29
	(h) Pressure switch faulty	Check pressure switch	
	Compressor does not rotate properly		
	(a) Drive belt loose or broken	Adjust or replace drive belt	AC–15
	(b) Compressor faulty	Check compressor	AC–17
	Expansion valve faulty	Check expansion valve	AC–25
	Leak in system	Test system for leaks	
	Fusible plug on receiver blown or clogged screen	Check receiver	AC–23
	Blower does not operate		
	(a) HEATER fuse blown	Replace fuse and check for short	AC–6 AC–29
	(b) A/C switch faulty	Check switch	AC–37
	(c) Heater relay faulty	Check heater relay	AC–37
	(d) Blower motor faulty	Check blower motor	AC–6
	(e) Wiring or ground faulty	Repair as necessary	
Cool air comes out intermittently	Magnetic clutch slipping	Check magnetic clutch	AC–17
	Expansion valve faulty	Check expansion valve	AC–25
	Wiring connection faulty	Repair as necessary	AC–6
	Excessive moisture in system	Evacuate and charge system	
	A/C amplifier faulty	Check amplifier	AC–31

TROUBLESHOOTING (Cont'd)

Problem	Possible cause	Remedy	Page
Cool air comes out only at high speed	Condenser clogged	Check condenser	AC–24
	Drive belt slipping	Check or replace drive belt	AC–15
	Compressor faulty	Check compressor	AC–17
	Insufficient or too much refrigerant	Check refrigerant volume	AC–16
	Air in system	Evacuate and charge system	
Insufficient cooling	Condenser clogged	Check condenser	AC–24
	Drive belt slipping	Check or replace drive belt	AC–15
	Magnetic clutch faulty	Check magnetic clutch	AC–17
	Compressor faulty	Check compressor	AC–17
	Expansion valve faulty	Check expansion valve	AC–25
	Insufficient *or too much refrigerant	Check refrigerant volume	AC–16
	Air or excessive compressor oil in system	Evacuate and charge system	
	Receiver clogged	Check receiver	AC–23
	Water valve cable faulty	Reset water valve cable	AC–36
	A/C amplifier faulty	Check amplifier	AC–31
Insufficient velocity of cool air	Evaporator clogged or frosted	Clean evaporator fins or filters	AC–27
	Air leakage from cooling unit or air duct	Repair as necessary	
	Air inlet blocked	Repair as necessary	
	Blower motor faulty	Check blower motor	AC–37
	A/C amplifier faulty	Check amplifier	AC–31

Inspection of Refrigeration System with Manifold Gauge Set

This is a method in which the trouble is located by using a manifold gauge set. (See "Installation of Manifold Gauge Set" on page AC–16.) Read the manifold gauge pressure when the following conditions are established:

(b) Engine running at 2,000 rpm

(a) Temperature at the air inlet with the switch set at RECIRC is 30 – 35°C (86 – 95°F)

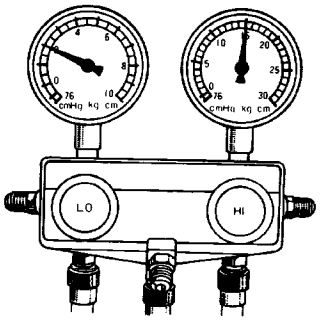
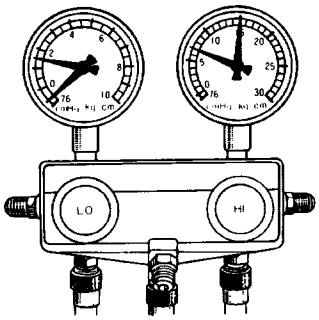
(c) Blower fan speed control switch set at high speed

(d) Temperature control switch set at max. cool side

HINT: It should be noted that the gauge indications may vary slightly due to ambient temperature conditions.

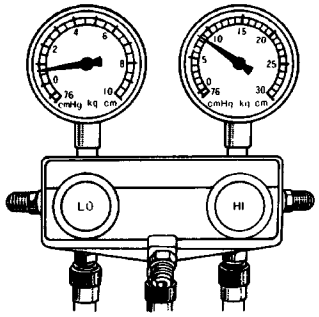
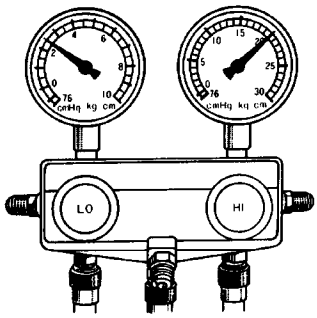
NOTICE:

- **Always recover refrigerant before removing the parts in the refrigerant line and evacuating air.**
- **Evacuate air and charge proper amount of purified refrigerant after installing the parts in the refrigerant line.**

No.	Gauge reading kPa (kgf/cm^2, psi)	Condition	Probable cause	Remedy
1	LO: 147 – 196 (1.5 – 2.0, 21 – 28) HI: 1,422 – 1,471 (14.5 – 15.0, 206 – 213)  AC0067	Normal cooling	Normally functioning system	
2	During operation, pressure at low pressure side sometimes becomes a vacuum and sometimes normal  AC0068	Periodically cools and then fails to cool	Moisture present in refrigeration system	(1) Replace receiver (2) Remove moisture in system through repeatedly evacuating air

NOTICE:

- **Always recover refrigerant before removing the parts in the refrigerant line and evacuating air.**
- **Evacuate air and charge proper amount of purified refrigerant after installing the parts in the refrigerant line.**

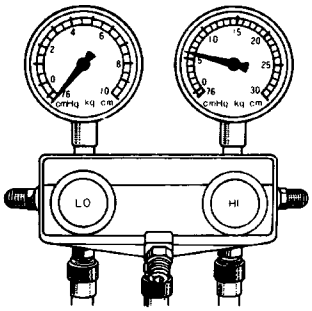
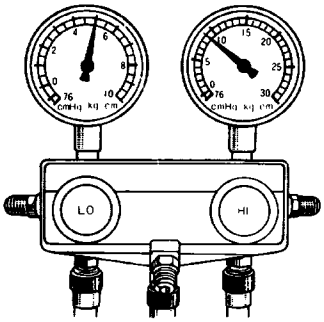
No.	Gauge reading kPa (kgf/cm^2, psi)	Condition	Probable cause	Remedy
3	Pressure low at both low and high pressure sides  AC0069	• Insufficient cooling • Bubbles seen in sight glass	Insufficient refrigerant	(1) Check for gas leakage with gas leak tester and repair if necessary (2) Add refrigerant until bubbles dis–appear
		• Insufficient cooling • Frost on tubes from receiver to unit	Refrigerant flow ob–structed by dirt in re ceiver	Replace receiver
4	Pressure too high at both low and high pressure sides  AC0070	Insufficient cooling	Insufficient cooling of condenser	(1) Clean condenser (2) Check fan motor operation
5			Refrigerant over–charged	(1) Check amount of refrigerant If refrigerant is over–charged (2) Recover refriger–ant (3) Evacuate air and charge proper amount of purified refrigerant
6			Air present in system	(1) Replace receiver (2) Check compressor oil to see if dirty (3) Remove air in sys–tem through re–peatedly evacuat–ing air
7		• Insufficient cooling • Frost or Large amount of dew on piping at low pres–sure side	Expansion valve im–properly mounted,heat sensing tube defective (Opens too wide)	(1) Check heat sens–ing tube installa–tion condition If (1) is normal (2) Check expansion valve and replace if defective

Hint at 6:

These gauge indications are for when the refrigeration system has been opened and the refrigerant charged without evacuating air.

NOTICE:

- **Always recover refrigerant before removing the parts in the refrigerant line and evacuating air.**
- **Evacuate air and charge proper amount of purified refrigerant after installing the parts in the refrigerant line.**

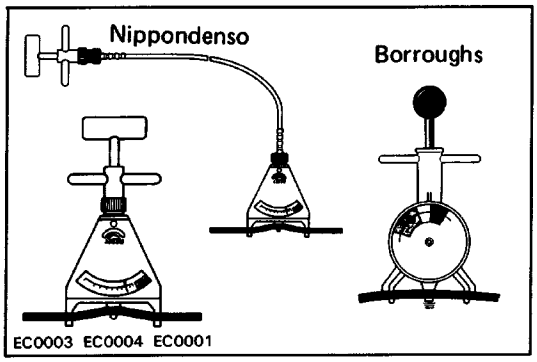
No.	Gauge reading kPa (kgf/cm^2, psi)	Condition	Probable cause	Remedy
8	Vacuum indicated at low pressure side, very low pressure indicated at high pressure  AC0156	• Does not cool (Cools from time to time in some cases) • Frost or dew seen on piping before and after receiver or expansion valve	Refrigerant does not circulate	(1) Check heat sens–ing tube for gas leakage and re–place expansion valve if defective If (1) is normal (2) Clean out dirt in expansion valve by blowing with air If not able to re–move dirt, replace expansion valve (3) Replace receiver
9	Pressure too high at low pressure side, pressure too low at high pres-sure side  AC0157	Does not cool	Insufficient compres–sion	Repair or replace com–pressor

ON–VEHICLE INSPECTION

7. CHECK CONDENSER FINS FOR BLOCKAGE OR DAMAGE

If the fins are clogged, clean them with pressurized wa–ter.

NOTICE: Be careful not to damage the fins.



2. CHECK DRIVE BELT TENSION

Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:

Nippondenso BTG–20 (95506–00020) or
Borroughs No. BT–33–73F

Drive belt tension:

	New belt (lbs)	Used belt (lbs)
3VZ	125 ± 25	80 ± 20
22R–E	125 ± 25	80 ± 20

HINT:

- ”New belt” refers to a belt which has been used less than 5 minutes on a running engine.
- ”Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.

3. START ENGINE

4. TURN ON A/C SWITCH

Check that the A/C operates at each position of the blower switch.

If blower does not operate, check heater fuse.

5. CHECK MAGNETIC CLUTCH OPERATION

6. CHECK THAT IDLE INCREASES

When the magnetic clutch engages, engine revolution should increase.

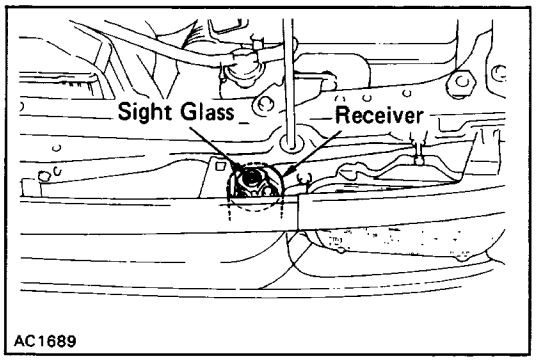
Standard idle–up rpm: 900 – 1,000 rpm

7. CHECK AMOUNT OF REFRIGERANT

If you can see bubbles in the sight glass, additional refrig–erant is needed. (See page AC–16)

8. IF NO COOLING OR IT IS INSUFFICIENT, INSPECT FOR LEAKAGE

Using a gas leak tester, inspect each component of the refrigeration system.



REFRIGERATION SYSTEM

Checking of Refrigerant Volume

1. RUN ENGINE AT APPROX. 1,500 RPM

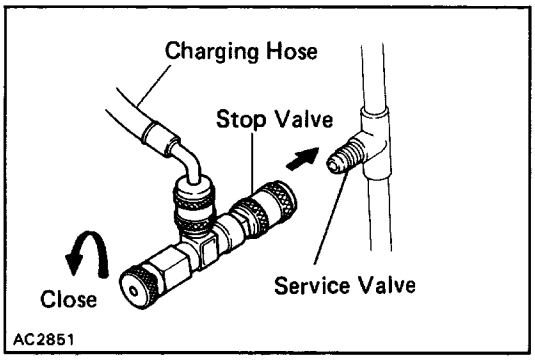
2. OPERATE AIR CONDITIONING AT MAXIMUM COOLING FOR A FEW MINUTES

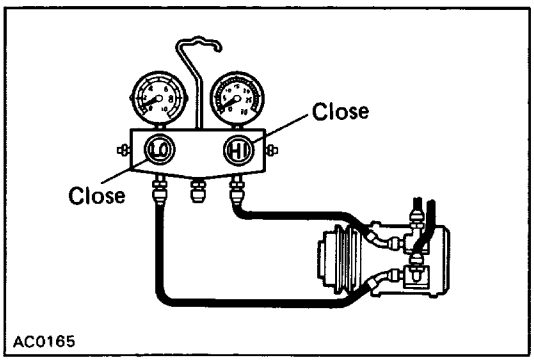
3. CHECK AMOUNT OF REFRIGERANT

Observe the sight glass on the receiver.

Item	Symptom	Amount of refrigerant	Remedy
1	Bubbles present in sight glass	Insufficient *	(1) Check for gas leakage with gas leak tester and repair if necessary (2) Add refrigerant until bubbles disappear
2	No bubbles present in sight glass	None, sufficient or too much	Refer to items 3 and 4
3	No temperature difference between compressor inlet and outlet	Empty or nearly empty	(1) Check for gas leakage with gas leak tester and repair if necessary (2) Add refrigerant until bubbles disappear
4	Temperature between compressor inlet and outlet is noticeably different	Proper or too much	Refer to items 5 and 6
5	Immediately after air conditioning is turned off, refrigerant in sight glass stays clear	Too much	(1) Recover refrigerant (2) Evacuate air and charge proper amount of purified refrigerant
6	When air conditioning is turned off, refrigerant foams and then stay clear	Proper	–

*: Bubbles in the sight glass with ambient temperatures higher can be considered normal if cooling is sufficient





Installation of Manifold Gauge Set

HINT: To prevent releasing refrigerant, use charging hoses with a stop valve when installing the manifold gauge set to service valves on the refrigerant line.
Part No. of charging hoses with a stop valve

1. CONNECT CHARGING HOSES WITH A STOP VALVE TO MANIFOLD GAUGE SET

Tighten the nuts by hand.

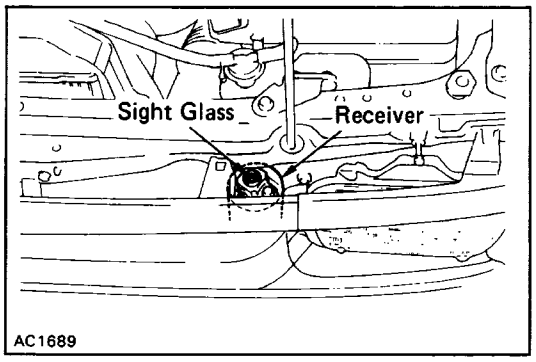
CAUTION:

- **Do not connect the wrong hoses to the high pressure and the low pressure sides.**
- **To prevent loosening the nuts, do not apply compressor oil to seat of the connection.**

2. CLOSE HAND VALVES OF BOTH STOP VALVES

3. CLOSE BOTH HAND VALVES OF GAUGE SET

4. REMOVE CAPS FROM SERVICE VALVES ON REFRIGERANT LINE



REFRIGERATION SYSTEM

Checking of Refrigerant Volume

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Observe the sight glass on the receiver.

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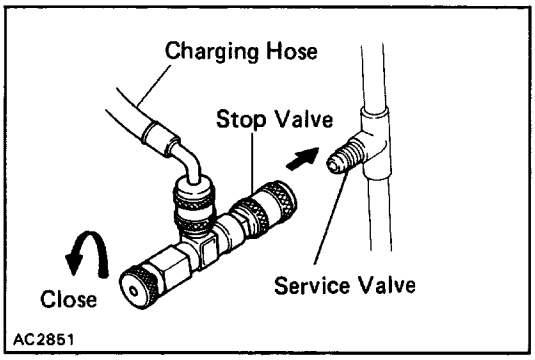
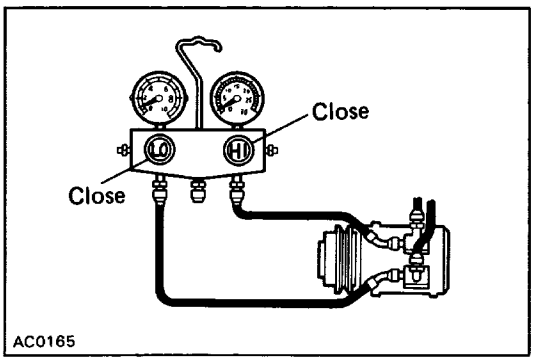
6	When air conditioning is turned off, refrigerant foams and then stay clear	Proper	–

*: Bubbles in the sight glass with ambient temperatures higher can be considered normal if cooling is sufficient





Installation of Manifold Gauge Set

HINT: To prevent releasing refrigerant, use charging hoses with a stop valve when installing the manifold gauge set to service valves on the refrigerant line.
Part No. of charging hoses with a stop valve

1. CONNECT CHARGING HOSES WITH A STOP VALVE TO MANIFOLD GAUGE SET

Tighten the nuts by hand.

CAUTION:

- **Do not connect the wrong hoses to the high pressure and the low pressure sides.**
- **To prevent loosening the nuts, do not apply compressor oil to seat of the connection.**

2. CLOSE HAND VALVES OF BOTH STOP VALVES

3. CLOSE BOTH HAND VALVES OF GAUGE SET

4. REMOVE CAPS FROM SERVICE VALVES ON REFRIGERANT LINE

5. CONNECT STOP VALVES TO SERVICE VALVES

Tighten the nuts by hand.

CAUTION:

- **Do not connect the wrong valves to the high pressure and the low pressure sides.**
- **To prevent loosening the nuts, do not apply compres–sor oil to seat of the connection.**

6. OPEN HAND VALVES OF BOTH STOP VALVES

REMOVAL OF MANIFOLD GAUGE SET

1. CLOSE BOTH HAND VALVES OF MANIFOLD GAUGE SET

2. CLOSE HAND VALVES OF BOTH STOP VALVES

3. DISCONNECT STOP VALVES FROM SERVICE VALVES ON REFRIGERANT LINE

4. INSTALL CAPS TO SERVICE VALVES

COMPRESSOR

ON–VEHICLE INSPECTION

1. INSTALL MANIFOLD GAUGE SET

(See page AC–16)

2. RUN ENGINE AT APPROX. 1,500 RPM

3. CHECK COMPRESSOR FOR FOLLOWING:

(a) High pressure gauge reading is not low and low pressure gauge reading is not higher than normal.

(b) Metallic sound

(e) Leakage from shaft seal

If defects are found, repair the compressor.

4. CHECK MAGNETIC CLUTCH

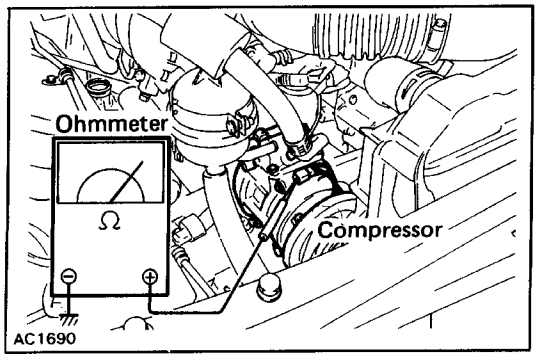
(a) Inspect the pressure plate and the rotor for signs of oil.

(b) Check the clutch bearings for noise and grease leakage.

(c) Using an ohmmeter, measure the resistance of the stator coil between the clutch lead wire and ground.

Standard resistance: 3.6 ± 0.2 Ω at 200C (680F)

If resistance value is not as specified, replace the coil.



5. CONNECT STOP VALVES TO SERVICE VALVES

Tighten the nuts by hand.

CAUTION:

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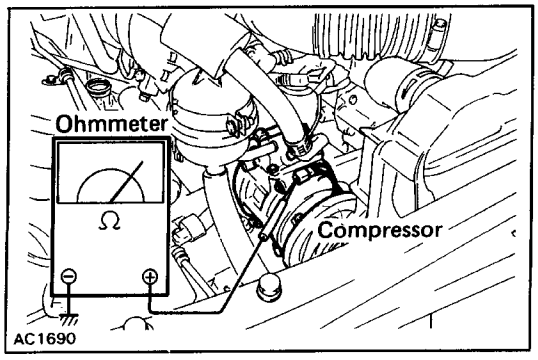
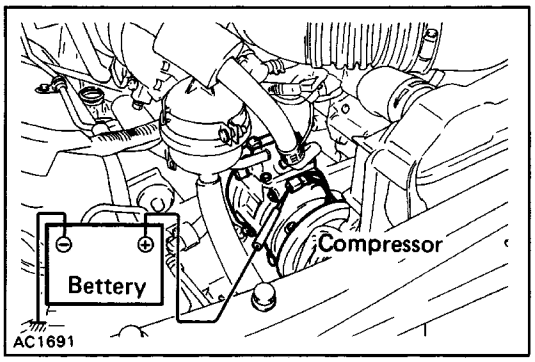
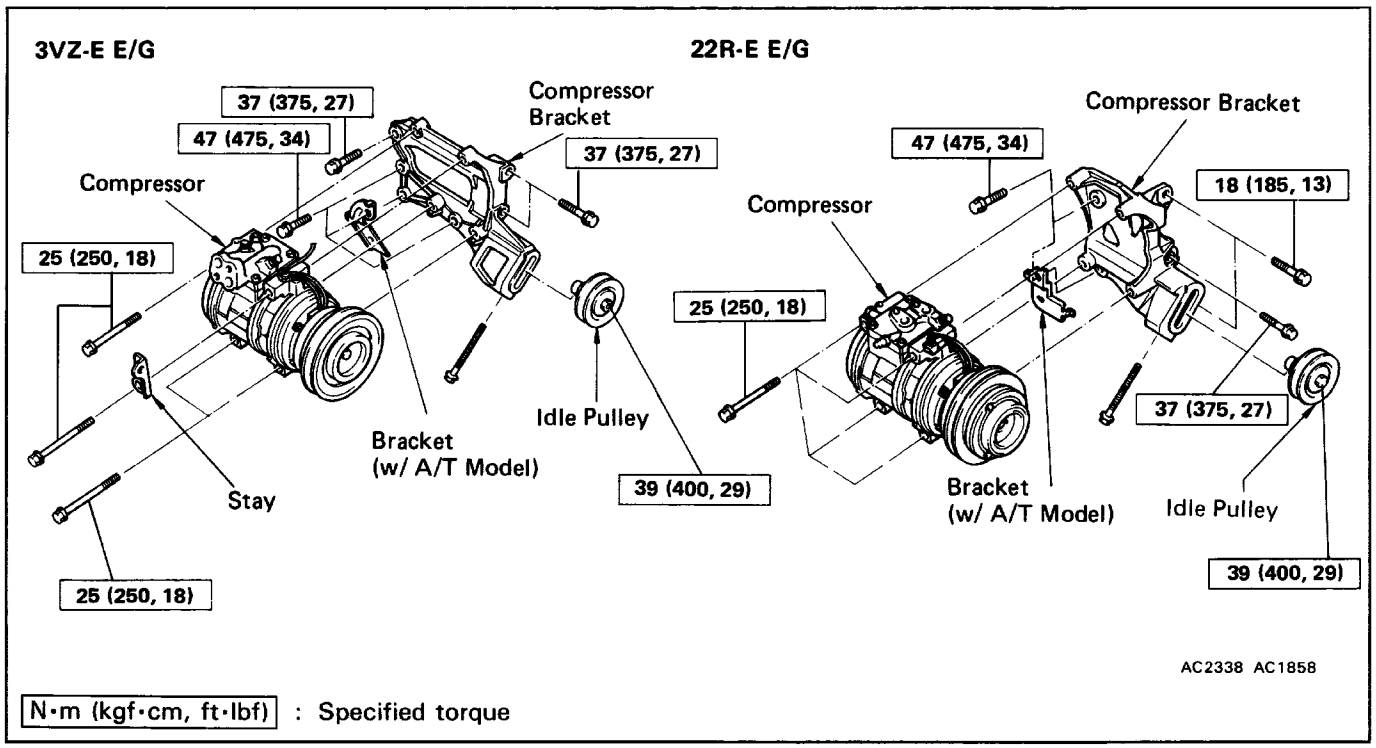




(d) Connect the positive (+) lead from the battery to terminal and the negative (–) lead to ground, check that the magnetic clutch is energized.

If magnetic clutch is not energized, replace the coil.

NOTICE: Do not short the positive (+) lead wire on the vehicle by applying battery positive voltage.



REMOVAL OF COMPRESSOR

1. RUN ENGINE AT IDLE SPEED FOR 10 MINUTES WITH AIR CONDITIONING ON

2. STOP ENGINE

3. DISCONNECT NEGATIVE CABLE FROM BATTERY

4. REMOVE POWER STEERING PUMP (3VZ EG ONLY)

5. DISCONNECT CLUTCH LEAD WIRE FROM WIRING HARNESS

6. RECOVER REFRIGERANT FROM REFRIGERATION SYS–TEM

7. DISCONNECT TWO HOSES FROM COMPRESSOR SERVICE VALVES

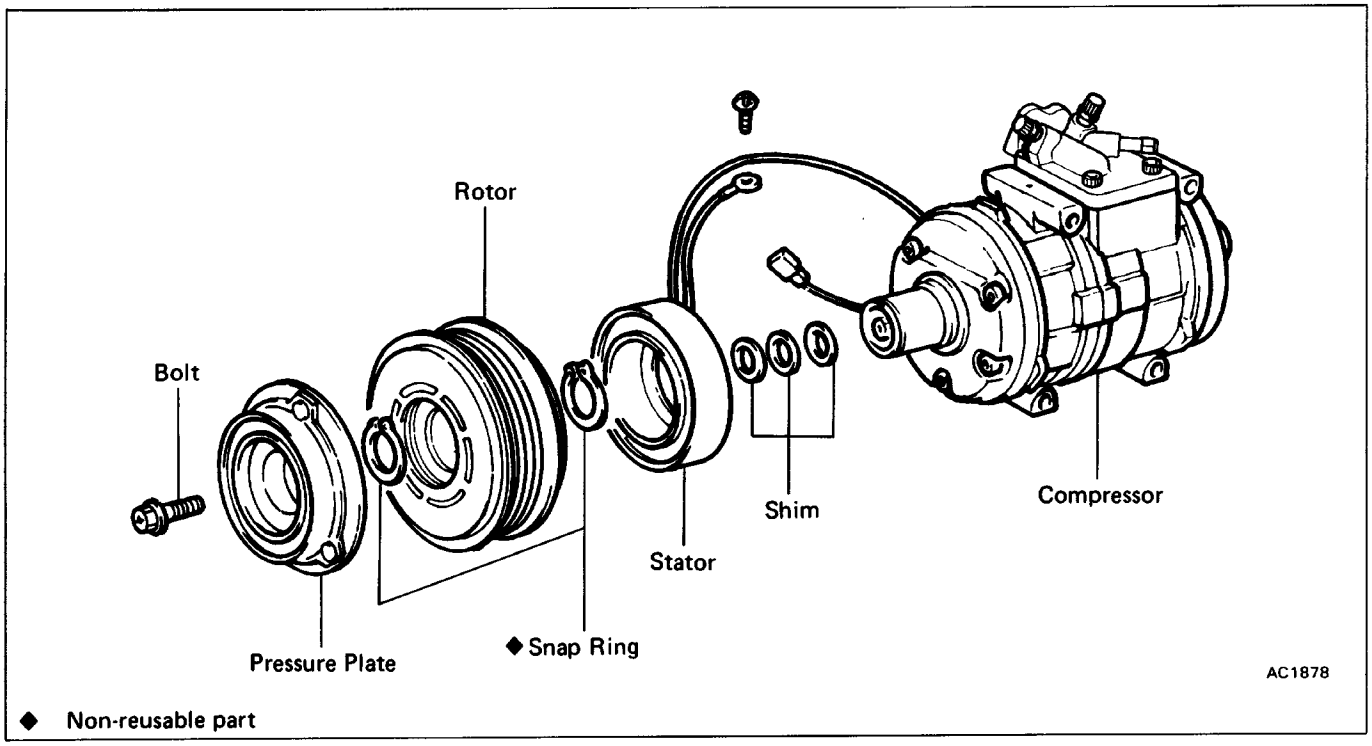
Cap the open fitting immediately to keep moisture out of the system.

8. REMOVE COMPRESSOR

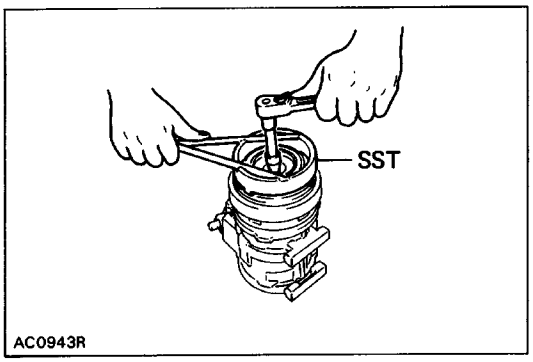
(a) Remove the fan shroud.

(b) Loosen the drive belt.

(c) Remove the compressor mounting bolts and the compressor.



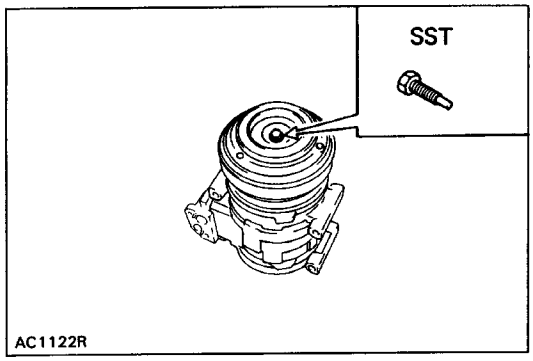
◆ Non-reusable part



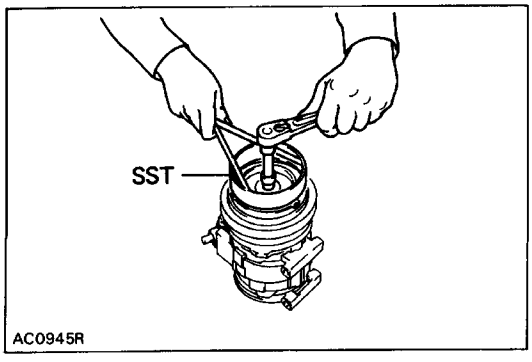
DISASSEMBLY OF MAGNETIC CLUTCH

1. REMOVE PRESSURE PLATE

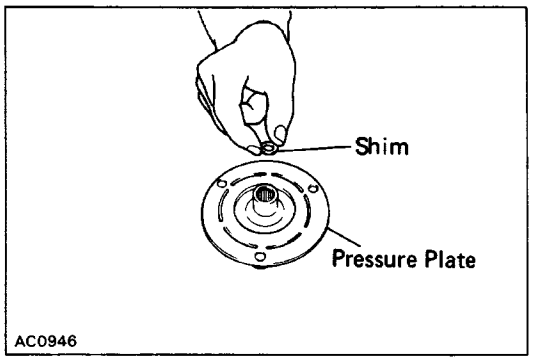
(a) Using SST and a socket, remove the shaft bolt.
SST 07112–76060



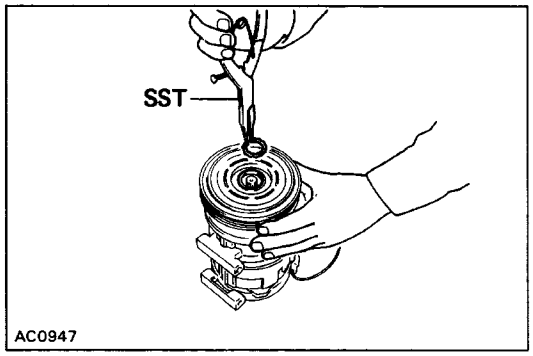
(b) Install SST to the pressure plate.
SST 07112–66040



(c) Using SST and a socket, remove the pressure plate. SST 07112–76060

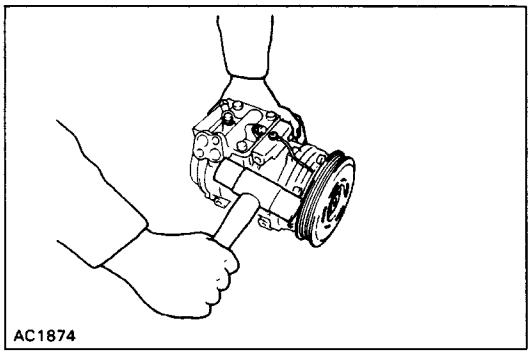


(d) Remove the shims from the pressure plate.



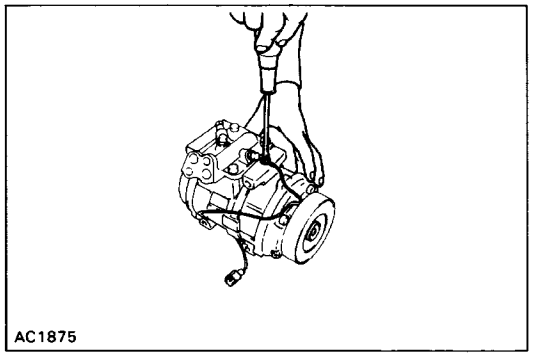
2. REMOVE ROTOR

(a) Using SST, remove the snap ring.
SST 07114–84020



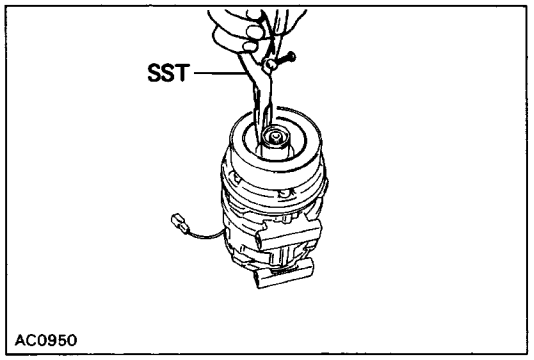
(b) Using a plastic hammer, tap the rotor off the shaft.

NOTICE: Be careful not to damage the pulley when tapping on the rotor.

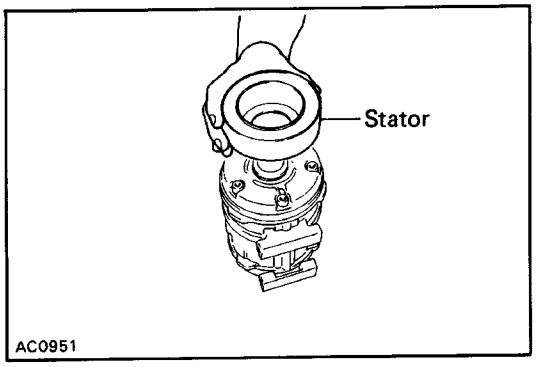


3. REMOVE STATOR

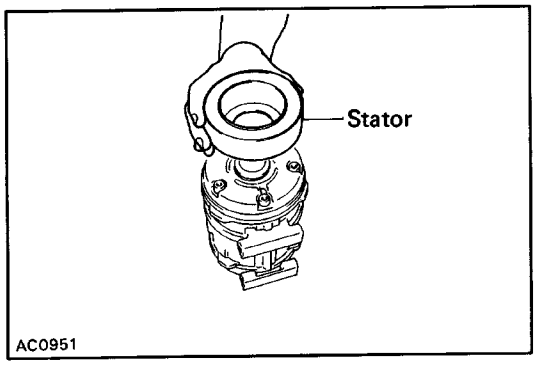
(a) Disconnect the stator lead wire from the compres–sor housing.



(b) Using SST, remove the snap ring.
SST 07114–84020



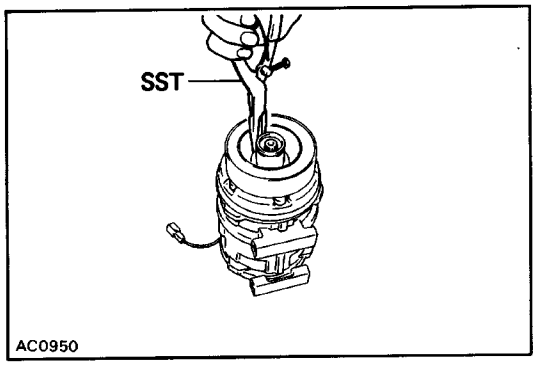
(c) Remove the stator.



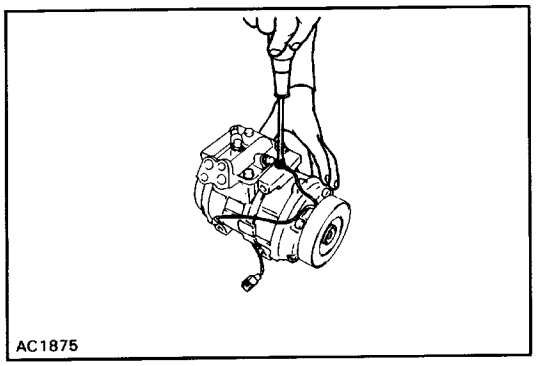
ASSEMBLY OF MAGNETIC CLUTCH

1. INSTALL STATOR

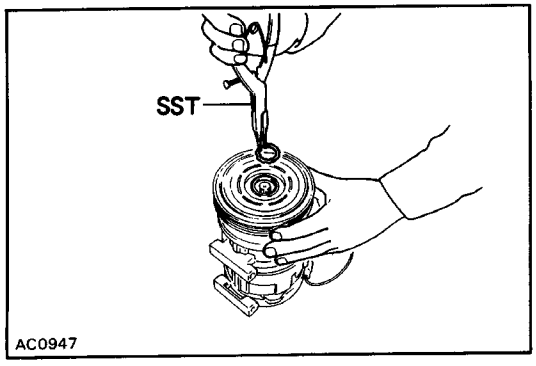
(a) Install the stator on the compressor.



(b) Using SST, install the new snap ring.
SST 07114–84020

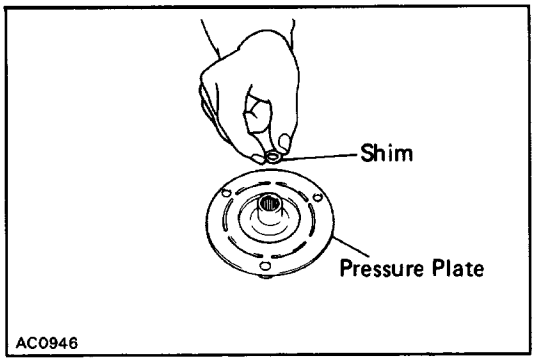


(c) Connect the stator lead wires to the compressor housing.



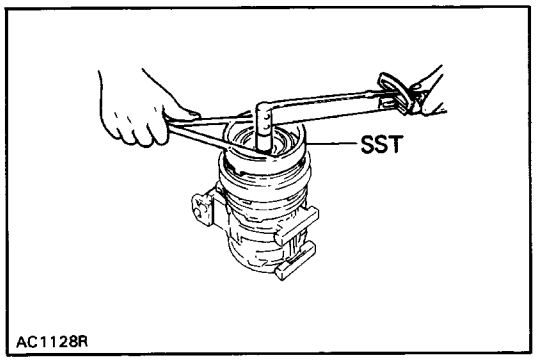
2. INSTALL ROTOR

(a) Install the rotor on the compressor shaft.
(b) Using SST, install the snap ring.
SST 07114–84020



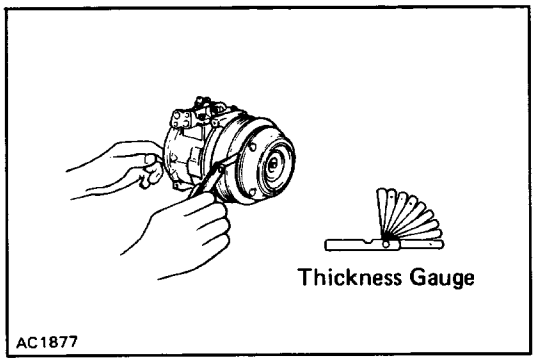
3. INSTALL PRESSURE PLATE

(a) Put the shims to the pressure plate.



(b) Using SST and torque wrench, install the shaft bolt. SST 07112–76060

Torque: 14 N–m (140 kgf · crm, 10 ft–lbf)



4. CHECK CLEARANCE OF MAGNETIC CLUTCH

Check the clearance between the pressure plate and rotor using thickness gauge.

Standard clearance:

0.5 ± 0.15 mm (0.020 i 0.0059 in.)

If the clearance is not within tolerance, change the number of shims to obtain the standard clearance.

INSTALLATION OF COMPRESSOR

(See page AC–17)

1. INSTALL COMPRESSOR WITH THREE MOUNTING

BOLTS

Torque: 27 N · m (280 kgf · cm, 20 ft · lbf)

2. INSTALL DRIVE BELT

(See step 2 and 3 and on page AC–14)

3. CONNECT TWO HOSES TO COMPRESSOR SERVICE

VALVES

Torque: Discharge line 25 N · m (250 kgf · cm, 18 ft · lbf)
Suction line 25 N · m (250 kgf · cm, 18 ft · lbf)

4. CONNECT CLUTCH LEAD WIRE TO WIRING HARNESS

5. CONNECT NEGATIVE CABLE TO BATTERY

6. EVACUATE AIR FROM AIR CONDITIONING SYSTEM

7. CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK FOR GAS LEAKAGE

Specified amount: 700 – 800 g (1.5 – 1.8 lb)

RECEIVER

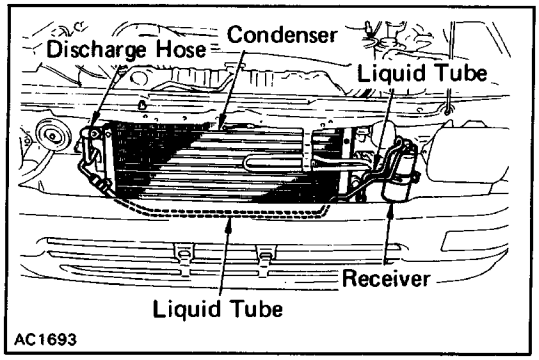
(See page AC–7)

ON–VEHICLE INSPECTION

CHECK SIGHT GLASS, FUSIBLE PLUG AND FITTINGS FOR LEAKAGE

Use a gas leak tester. Repair as necessary.

REMOVAL OF RECEIVER



1. RECOVER REFRIGERANT FROM REFRIGERATION SYSTEM

2. DISCONNECT TWO LIQUID TUBES FROM RECEIVER

HINT: Cap the open fittings immediately to keep moisture out of the system.

3. REMOVE RECEIVER FROM RECEIVER HOLDER

INSTALLATION OF RECEIVER

1. INSTALL RECEIVER IN RECEIVER HOLDER

HINT: Do not remove the caps until ready for connection.

2. CONNECT TWO LIQUID TUBES TO RECEIVER

Torque: 5.4 N·m (55 kgf·cm, 43 in.·lbf)

3. IF RECEIVER WAS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR

Add 20 cc (0.7 fl. oz.)

Compressor oil: ND OIL6,
SUNISO No.5GS or equivalent

4. EVACUATE AIR FROM AIR CONDITIONING SYSTEM

5. CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK FOR GAS LEAKAGE

Specified amount: 700 – 800 g (1.5 – 1.8 lb)

CONDENSER

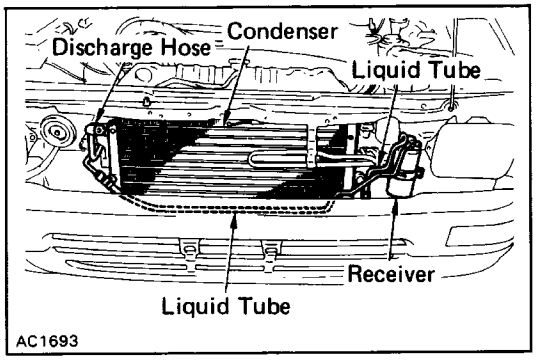
ON–VEHICLE INSPECTION

1. CHECK CONDENSER FINS FOR BLOCKAGE OR DAMAGE

If the fins are clogged, wash them with water and dry with compressed air.

NOTICE: Be careful not to damage the fins.

If the fins are bent, straighten them with a screwdriver or pliers.



2. CHECK CONDENSER FITTINGS FOR LEAKAGE

Repair as necessary.

REMOVAL OF CONDENSER

(SEE PAGE AC–7)

1. RECOVER REFRIGERANT FROM REFRIGERATION SYS–TEM

2. REMOVE FRONT GRILLE AND HOOD LOCK BRACE

3. DISCONNECT DISCHARGE HOSE FROM CONDENSER INLET FITTING

4. DISCONNECT LIQUID TUBE FROM RECEIVER OUTLET FITTING

HINT: Cap the open fittings immediately to keep mois–ture out of the system.

5. REMOVE CONDENSER

Remove the four bolts.

INSTALLATION OF CONDENSER

(SEE PAGE AC–7)

1. INSTALL CONDENSER

Install the four bolts making sure the rubber cushions fit on the mounting flanges correctly.

2. CONNECT LIQUID TUBE TO RECEIVER AND DISCHARGE HOSE TO CONDENSER

Torque:

Liquid tube 5.4 N·m (55 kgf·cm, 48 in.·lbf)
Discharge hose 18.5 N·m (185 kgf·cm, 14 ft·lbf)

3. INSTALL FRONT GRILLE AND HOOD LOCK BRACE

4. IF CONDENSER IS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR

Add 40 – 50 cc (1.4 – 1.7 fl.oz.)
Compressor oil: ND OIL6,
SUNISO No.5GS or equivalent

5. EVACUATE AIR FROM AIR CONDITIONING SYSTEM

6. CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK FOR GAS LEAKAGE

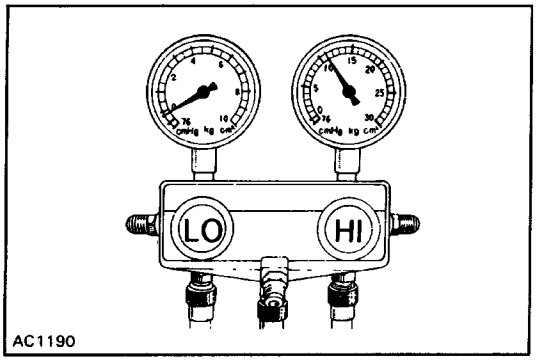
Specified amount: 700 – 800 g (1.5 – 1.8 lb)

COOLING UNIT

(SEE PAGE AC–7)

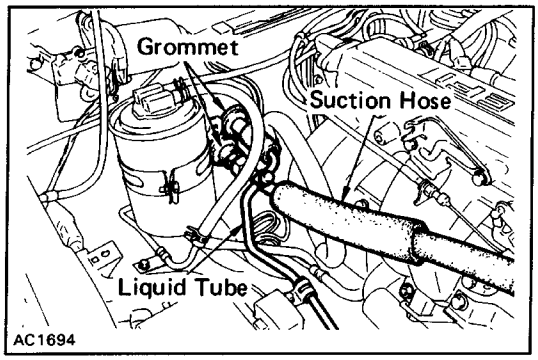
ON–VEHICLE INSPECTION OF EXPANSION VALVE

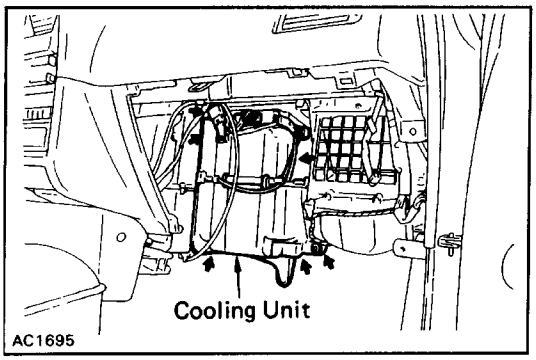
1. CHECK QUANTITY OF REFRIGERANT GAS DURING REFRIGERATION CYCLE
2. INSTALL MANIFOLD GAUGE SET
   (See page AC–16)
3. RUN ENGINE
   Run the engine at 2,000 rpm for at least 5 minutes.
4. CHECK EXPANSION VALVE
   If the expansion valve is clogged, the low pressure reading will drop to 0 kPa (0 kgf/cm2, 0 psi) otherwise it is OK.

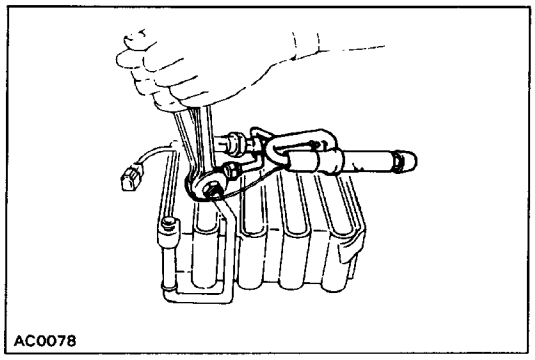


REMOVAL OF COOLING UNIT

1. DISCONNECT NEGATIVE CABLE FROM BATTERY
2. RECOVER REFREGERANT FROM REFRIGERATION SYSTEM
3. DISCONNECT SUCTION TUBE FROM COOLING UNIT OUTLET FITTING
4. DISCONNECT LIQUID TUBE FROM COOLING UNIT INLET FITTING
   HINT: Cap the open fittings immediately to keep moisture out of the system.
5. REMOVE GROMMETS FROM INLET AND OUTLET FITTINGS
6. REMOVE GLOVE BOX
7. DISCONNECT CONNECTOR
8. REMOVE COOLING UNIT
   Remove the five screws and a nut.







(c) Remove expansion valve.

Evaporator

INSPECTION OF EVAPORATOR

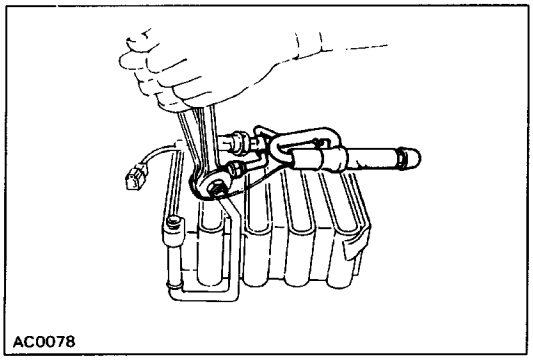
1. CHECK EVAPORATOR FINS FOR BLOCKAGE

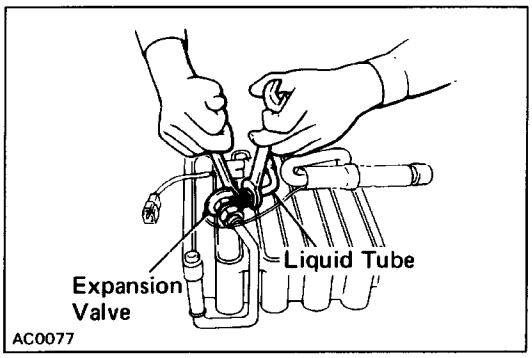
If the fins are clogged, clean them with compressed air.

NOTICE: Never use water to clean the evaporator.

2. CHECK FITTINGS FOR CRACKS OR SCRATCHES

Repair as necessary.





ASSEMBLY OF COOLING UNIT

INSTALL COMPONENTS ON EVAPORATOR

(a) Connect the expansion valve to the inlet fitting of the evaporator. Torque the nut.

Torque: 23 N·m (235 kgf·cm, 17 ft·lbf)

HINT: Be sure that the 0–rings are positioned on the tube fitting.

(b) Install the holder to the suction tube with heat sen–sitizing tube.

(c) Connect the liquid tube to the inlet fitting of the ex–pansion valve. Torque the nut.

Torque: 13 N·m (135 kgf·cm, 10 ft·lbf)

(d) Install lower unit case to the evaporator.

(e) Install thermistor to the evaporator.

(f) Install upper unit case

(g) Install four screws.

(h) Install four clips.

(i) Install A/C cut off relay.

(j) Connect connectors.

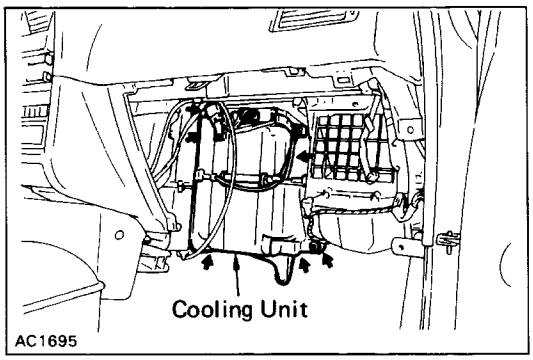
INSTALLATION OF COOLING UNIT

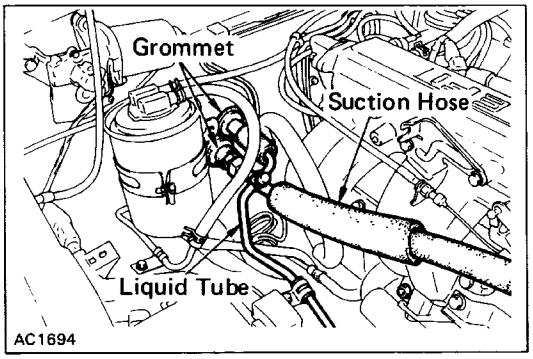
1. INSTALL COOLING UNIT

Install the cooling unit with four screws and a bolt.

2. CONNECT CONNECTOR

3. INSTALL GLOVE BOX AND REINFORCEMENT





4. INSTALL GROMMETS ON INLET AND OUTLET FITTINGS

5. CONNECT LIQUID TUBE TO COOLING UNIT INLET FITTING

Torque: 13 N·m (135 kgf·cm, 10 ft·lbf)

6. CONNECT SUCTION TUBE TO COOLING UNIT OUTLET FITTING

Torque: 32 N·m (325 kgf·cm, 24 ft·lbf)

7. IF EVAPORATOR WAS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR

Add 40 – 50 cc (1.4 – 1.7 fl.oz.)

Compressor oil: ND OIL6,
SUNISO No.5GS or equivalent

8. CONNECT NEGATIVE CABLE TO BATTERY

9. EVACUATE AIR FROM AIR CONDITIONING SYSTEM

10. CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK FOR GAS LEAKAGE

Specified amount: 700 – 800 g (1.5 – 1.8 lb)

REFRIGERANT LINES

ON–VEHICLE INSPECTION

1. INSPECT HOSES AND TUBES FOR LEAKAGE

Use a gas leak tester. Replace, if necessary.

2. CHECK THAT HOSE AND TUBE CLAMPS ARE NOT LOOSE

Tighten or replace, as necessary.

REPLACEMENT OF REFRIGERANT LINES

(SEE PAGE AC–7)

1. RECOVER REFRIGERANT FROM REFRIGERATION SYSTEM

2. REPLACE FAULTY TUBE OR HOSE

HINT: Cap the open fittings immediately to keep mois ture out of the system.

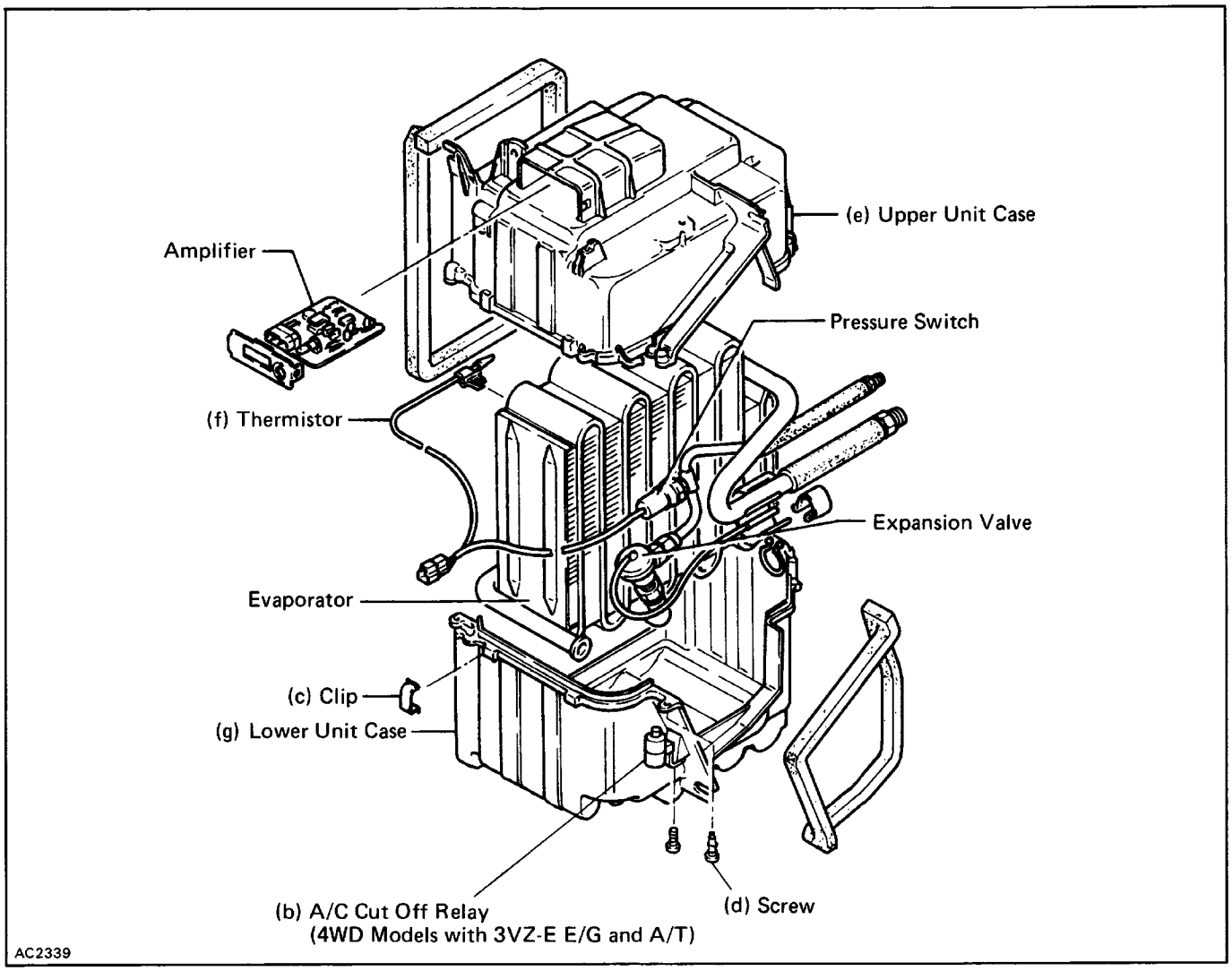
3. TIGHTENING TORQUE FOR O–RING FITTINGS AND BOLTED TYPE FITTINGS (See page AC–7)

4. EVACUATE AIR FROM AIR CONDITIONING SYSTEM

5. CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK FOR GAS LEAKAGE

Specified amount: 700 – 800 g (1.5 – 1.8 lb)

DISASSEMBLY OF COOLING UNIT

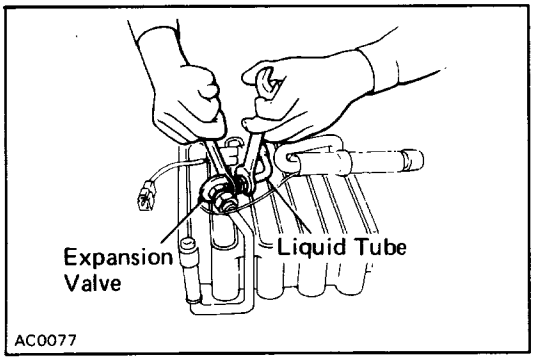


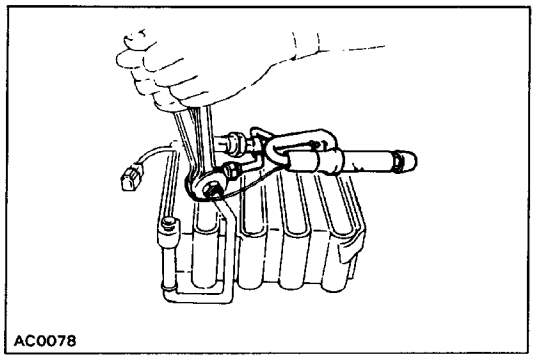
1. REMOVE LOWER AND UPPER UNIT CASES

(a) Disconnect connector.
(b) Remove A/C cut off relay (4WD with 3VZ–E E/G and A/T
(c) Remove four clips.
(d) Remove four screws.
(e) Remove upper unit case.
(f) Remove thermistor with thermistor holder.
(g) Remove lower unit case.

2. REMOVE EXPANSION VALVE

(a) Disconnect the liquid tube from the inlet fitting of the expansion valve.
(b) Remove the packing and heat sensing tube from suction tube of evaporator.





(c) Remove expansion valve.

Evaporator

INSPECTION OF EVAPORATOR

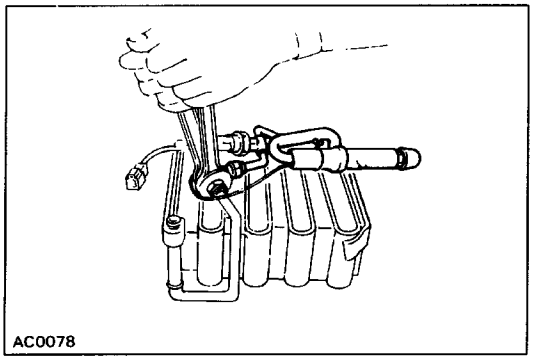
1. CHECK EVAPORATOR FINS FOR BLOCKAGE

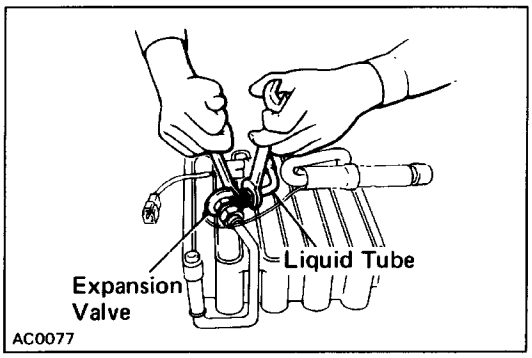
If the fins are clogged, clean them with compressed air.

NOTICE: Never use water to clean the evaporator.

2. CHECK FITTINGS FOR CRACKS OR SCRATCHES

Repair as necessary.





ASSEMBLY OF COOLING UNIT

INSTALL COMPONENTS ON EVAPORATOR

(a) Connect the expansion valve to the inlet fitting of the evaporator. Torque the nut.

Torque: 23 N·m (235 kgf·cm, 17 ft·lbf)

HINT: Be sure that the 0–rings are positioned on the tube fitting.

(b) Install the holder to the suction tube with heat sen–sitizing tube.

(c) Connect the liquid tube to the inlet fitting of the ex–pansion valve. Torque the nut.

Torque: 13 N·m (135 kgf·cm, 10 ft·lbf)

(d) Install lower unit case to the evaporator.

(e) Install thermistor to the evaporator.

(f) Install upper unit case

(g) Install four screws.

(h) Install four clips.

(i) Install A/C cut off relay.

(j) Connect connectors.

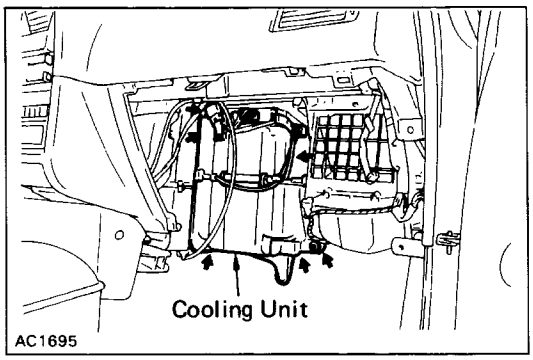
INSTALLATION OF COOLING UNIT

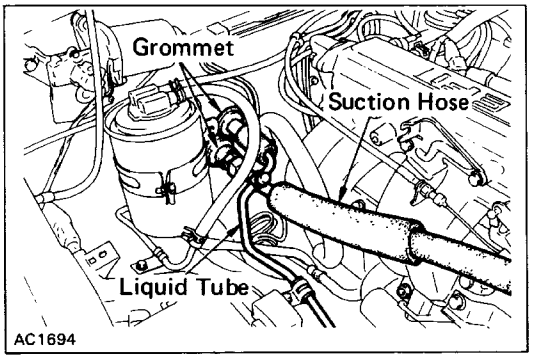
1. INSTALL COOLING UNIT

Install the cooling unit with four screws and a bolt.

2. CONNECT CONNECTOR

3. INSTALL GLOVE BOX AND REINFORCEMENT





4. INSTALL GROMMETS ON INLET AND OUTLET FITTINGS

5. CONNECT LIQUID TUBE TO COOLING UNIT INLET FITTING

Torque: 13 N·m (135 kgf·cm, 10 ft·lbf)

6. CONNECT SUCTION TUBE TO COOLING UNIT OUTLET FITTING

Torque: 32 N·m (325 kgf·cm, 24 ft·lbf)

7. IF EVAPORATOR WAS REPLACED, ADD COMPRESSOR OIL TO COMPRESSOR

Add 40 – 50 cc (1.4 – 1.7 fl.oz.)

Compressor oil: ND OIL6,
SUNISO No.5GS or equivalent

8. CONNECT NEGATIVE CABLE TO BATTERY

9. EVACUATE AIR FROM AIR CONDITIONING SYSTEM

10. CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK FOR GAS LEAKAGE

Specified amount: 700 – 800 g (1.5 – 1.8 lb)

REFRIGERANT LINES

ON–VEHICLE INSPECTION

1. INSPECT HOSES AND TUBES FOR LEAKAGE

Use a gas leak tester. Replace, if necessary.

2. CHECK THAT HOSE AND TUBE CLAMPS ARE NOT LOOSE

Tighten or replace, as necessary.

REPLACEMENT OF REFRIGERANT LINES

(SEE PAGE AC–7)

1. RECOVER REFRIGERANT FROM REFRIGERATION SYSTEM

2. REPLACE FAULTY TUBE OR HOSE

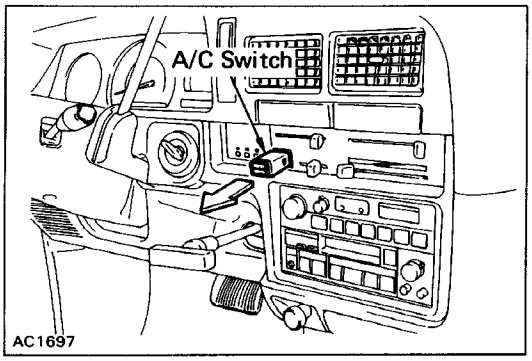
HINT: Cap the open fittings immediately to keep mois ture out of the system.

3. TIGHTENING TORQUE FOR O–RING FITTINGS AND BOLTED TYPE FITTINGS (See page AC–7)

4. EVACUATE AIR FROM AIR CONDITIONING SYSTEM

5. CHARGE AIR CONDITIONING SYSTEM WITH REFRIGERANT AND CHECK FOR GAS LEAKAGE

Specified amount: 700 – 800 g (1.5 – 1.8 lb)



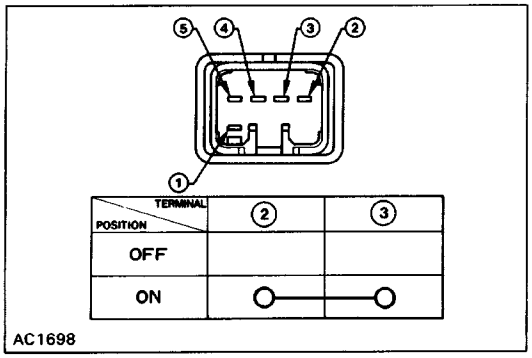
AC SWITCH

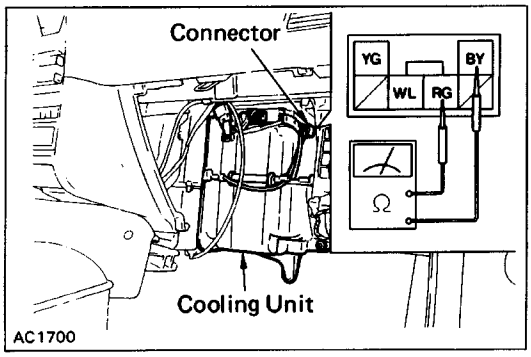
ON–VEHICLE INSPECTION

1. DISCONNECT NEGATIVE CABLE FROM BATTERY
2. REMOVE GLOVE BOX
3. REMOVE A/C SWITCH
4. CHECK A/C SWITCH FOR CONTINUITY

Using an ohmmeter, check for continuity between the terminals for each switch position shown in the table. If there is no continuity, replace the A/C switch.

5. INSTALL A/C SWITCH
6. INSTALL GLOVE BOX
7. CONNECT NEGATIVE CABLE TO BATTERY





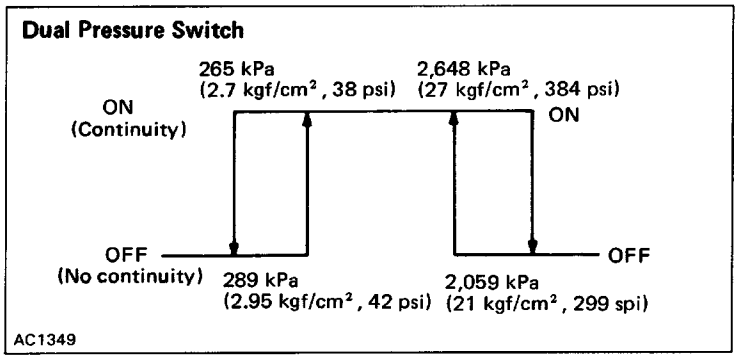
PRESSURE SWITCH

INSPECTION OF DUAL PRESSURE SWITCH

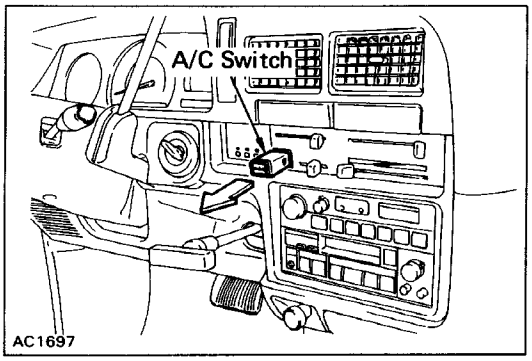
ON–VEHICLE INSPECTION

1. DISCONNECT NEGATIVE CABLE FROM BATTERY
2. REMOVE GLOVE BOX
3. INSPECT PRESSURE SWITCH

(a) Install the manifold gauge set.
(b) Observe the gauge reading.
(c) Check the continuity between the two terminals of the pressure switch shown in the below.



If defective, replace the pressure switch.

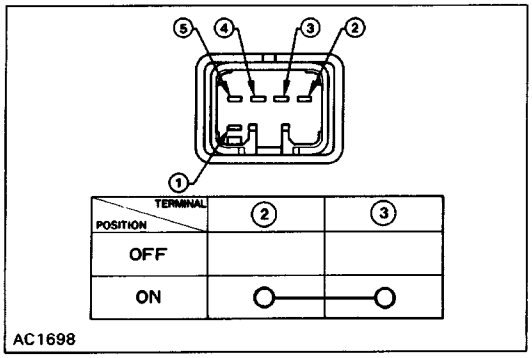


AC SWITCH

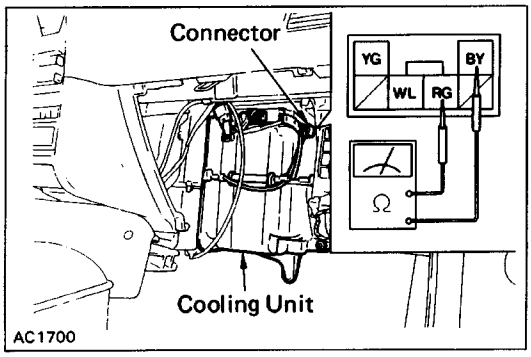
ON–VEHICLE INSPECTION

1. DISCONNECT NEGATIVE CABLE FROM BATTERY
2. REMOVE GLOVE BOX
3. REMOVE A/C SWITCH
4. CHECK A/C SWITCH FOR CONTINUITY

Using an ohmmeter, check for continuity between the terminals for each switch position shown in the table. If there is no continuity, replace the A/C switch.



5. INSTALL A/C SWITCH
6. INSTALL GLOVE BOX
7. CONNECT NEGATIVE CABLE TO BATTERY



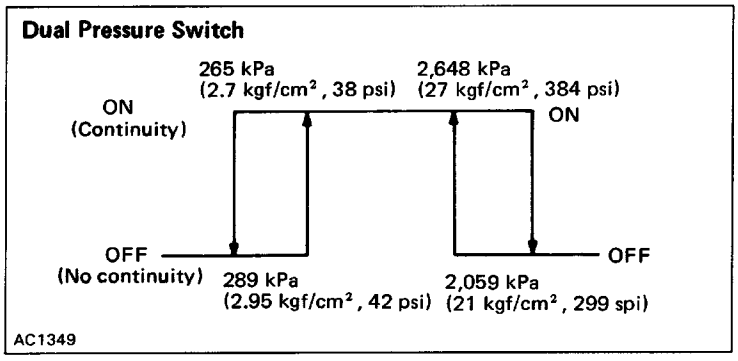
PRESSURE SWITCH

INSPECTION OF DUAL PRESSURE SWITCH

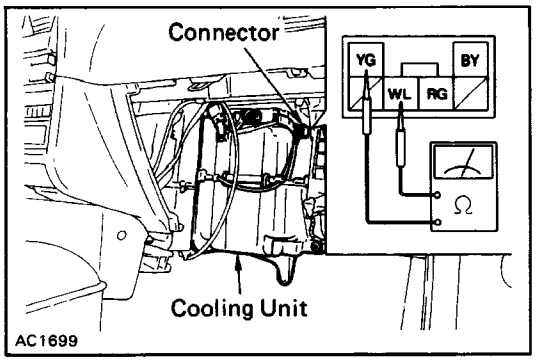
ON–VEHICLE INSPECTION

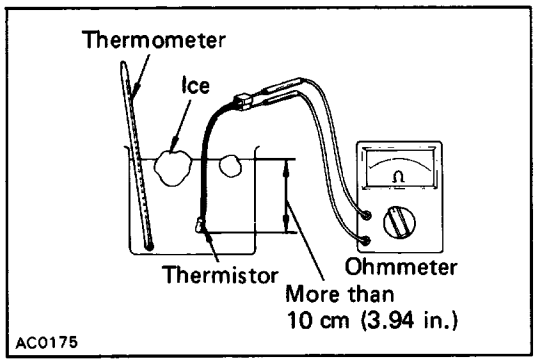
1. DISCONNECT NEGATIVE CABLE FROM BATTERY
2. REMOVE GLOVE BOX
3. INSPECT PRESSURE SWITCH

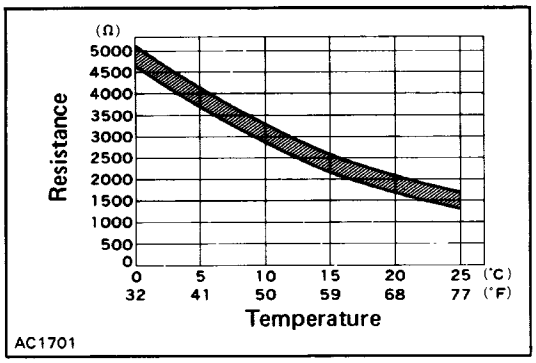
(a) Install the manifold gauge set.
(b) Observe the gauge reading.
(c) Check the continuity between the two terminals of the pressure switch shown in the below.



If defective, replace the pressure switch.







THERMISTOR

ON–VEHICLE INSPECTION

1. DISCONNECT NEGATIVE BATTERY CABLE
2. REMOVE GLOVE BOX
3. DISCONNECT CONNECTOR OF THERMISTOR
4. CHECK RESISTANCE OF THERMISTOR

Measure the resistance between terminals.
Standard resistance: 1,500 Ω at 25°C (77°F)
If resistance is not as specified, replace the thermistor.

REMOVAL AND INSPECTION OF THERMISTOR

1. REMOVE AND DISASSEMBLE COOLING UNIT (SEE PAGE AC–25)
2. REMOVE THERMISTOR FROM EVAPORATOR
3. CHECK THERMISTOR OPERATION

(a) Place the thermistor in cold water. While varying the temperature of the water, measure the resistance at the connector and at the same time; measure the temperature of the water with a thermometer.
(b) Compare the two readings on the chart.
If the intersection is not between the two lines, replace the thermistor.

INSTALLATION OF THERMISTOR

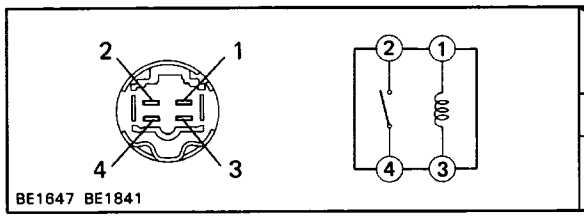
1. INSTALL THERMISTOR TO EVAPORATOR
2. ASSEMBLE AND INSTALL COOLING UNIT

RELAY

INSPECTION OF A/C CUT OFF RELAY

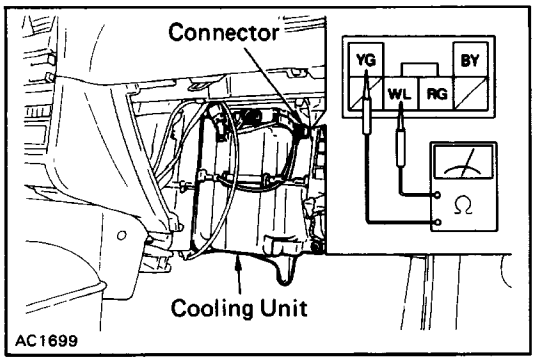
4WD Models with 3VZ–E E/G and AM

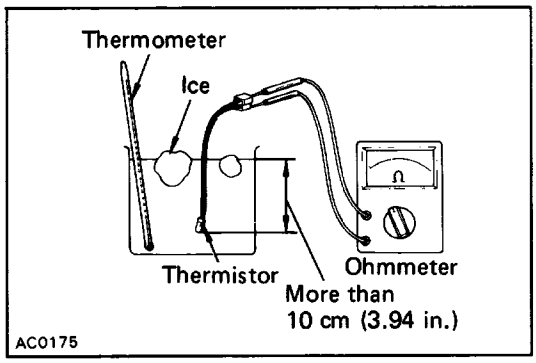
INSPECT A/C CUT OF RELAY CONTINUITY

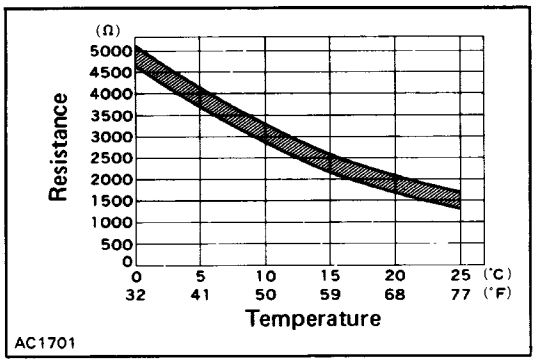


Terminal / Condition	1	2	3	4
Constant	○	∿∿∿	○	
Apply battery positive voltage to terminals 1 and 3.		○		○

If continuity is not as specified, replace the relay.







THERMISTOR

ON–VEHICLE INSPECTION

1. DISCONNECT NEGATIVE BATTERY CABLE
2. REMOVE GLOVE BOX
3. DISCONNECT CONNECTOR OF THERMISTOR
4. CHECK RESISTANCE OF THERMISTOR

Measure the resistance between terminals.
Standard resistance: 1,500 Ω at 25°C (77°F)
If resistance is not as specified, replace the thermistor.

REMOVAL AND INSPECTION OF THERMISTOR

1. REMOVE AND DISASSEMBLE COOLING UNIT (SEE PAGE AC–25)
2. REMOVE THERMISTOR FROM EVAPORATOR
3. CHECK THERMISTOR OPERATION

(a) Place the thermistor in cold water. While varying the temperature of the water, measure the resistance at the connector and at the same time; measure the temperature of the water with a thermometer.
(b) Compare the two readings on the chart.
If the intersection is not between the two lines, replace the thermistor.

INSTALLATION OF THERMISTOR

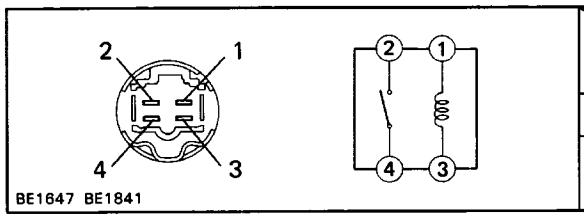
1. INSTALL THERMISTOR TO EVAPORATOR
2. ASSEMBLE AND INSTALL COOLING UNIT

RELAY

INSPECTION OF A/C CUT OFF RELAY

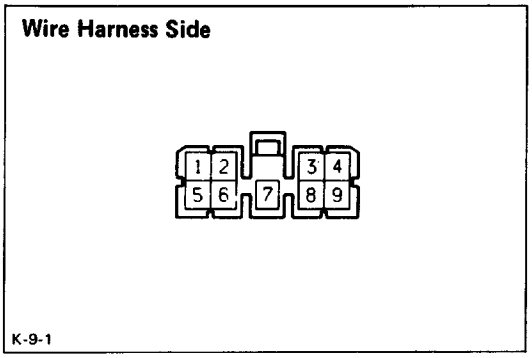
4WD Models with 3VZ–E E/G and AM

INSPECT A/C CUT OF RELAY CONTINUITY



Terminal / Condition	1	2	3	4
Constant	○	∿∿∿	○	
Apply battery positive voltage to terminals 1 and 3.		○		○

If continuity is not as specified, replace the relay.



AIR CONDITIONING AMPLIFIER

INSPECTION OF AMPLIFIER

INSPECT AMPLIFIER CIRCUIT

Disconnect the amplifier and inspect the connector on the wire harness side as shown in the chart below.

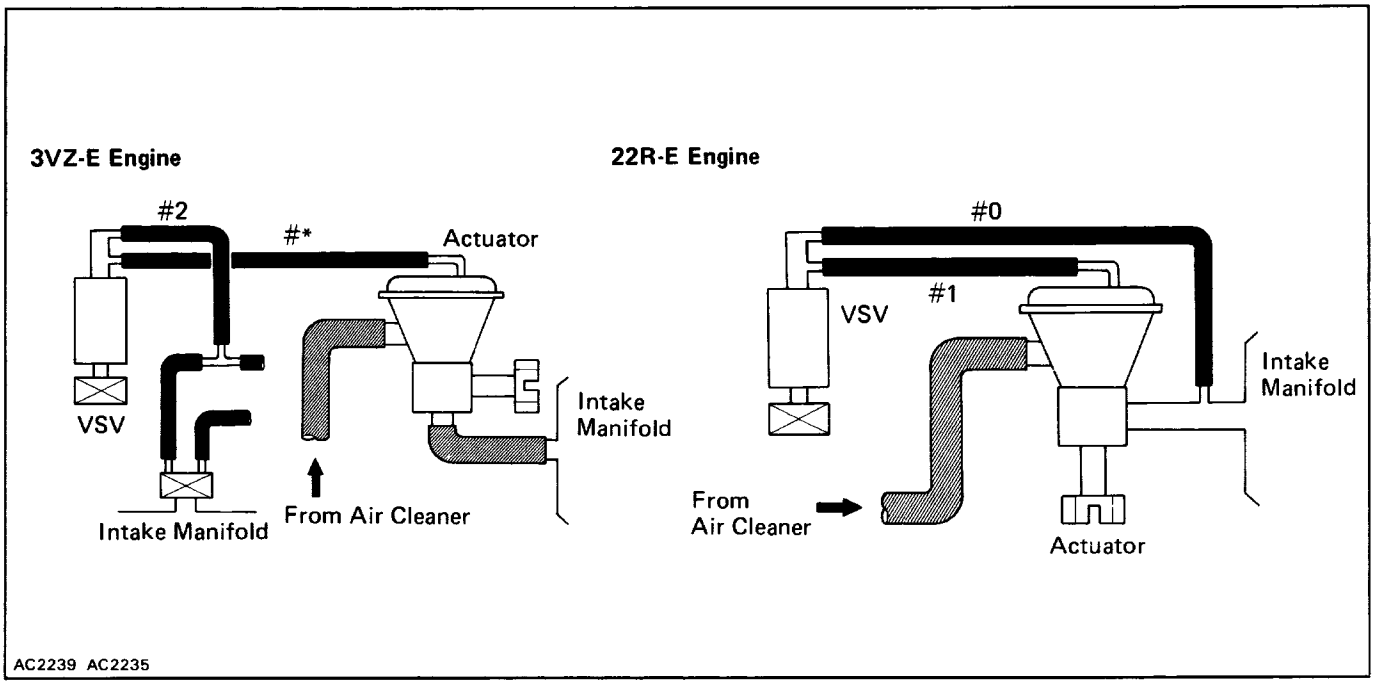
Test conditions:

(1) Ignition switch: ON
(2) Temperature control lever: MAX COOL
(3) Blower switch: HI

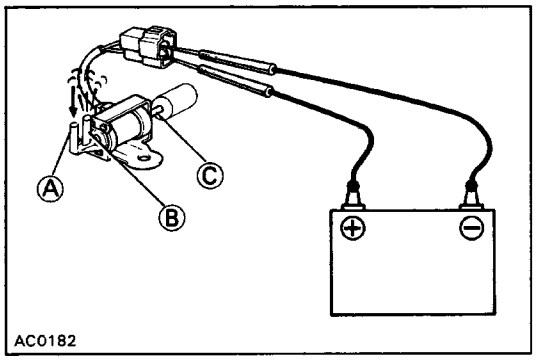
Check for	Tester connection	Condition	Specified value
Continuity	7 – 8	Constant	Continuity
	8 – Ground	Constant	Continuity
Voltage	3 – 8	Turn A/C switch on.	Battery positive voltage
		Turn A/C switch off.	Battery positive voltage
	4 – 8	Turn A/C switch on.	Battery positive voltage
		Turn A/C switch off.	No voltage
	6 – 8	Start the engine.	Approx. 10 to 14 V
		Stop the engine.	No voltage
	8 – 9	Turn A/C switch on.	Battery positive voltage
		Turn A/C switch off.	Battery positive voltage
Resistance	5 – 8	Constant	Approx. 1.5 kΩ at 25°C (77°F)
	2 – 5	MAX COOL	Approx. 0 0
		MIN COOL	Approx. 3 kΩ

If circuit is correct, replace the amplifier.

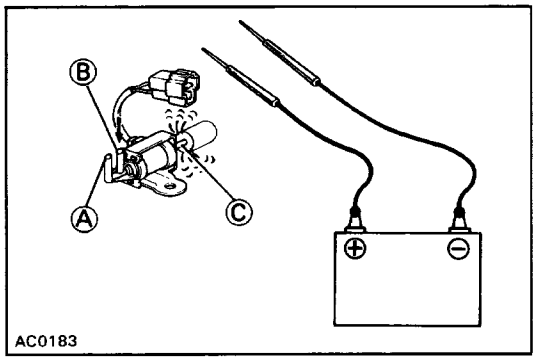
VACUUM HOSE CIRCUIT



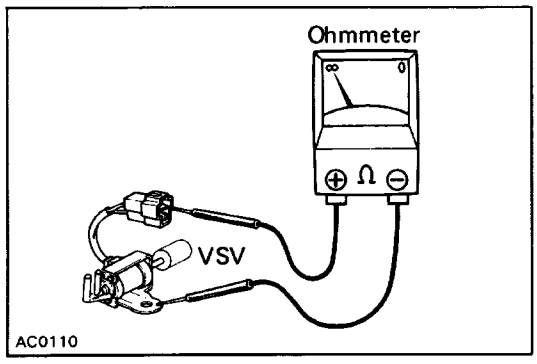
AC2239 AC2235



AC0182



AC0183



AC0110

VACUUM SWITCHING VALVE (VSV)

INSPECTION OF VSV

1. DISCONNECT VACUUM HOSES AND CONNECTOR FROM VSV

2. CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE

(a) Connect the VSV terminals to the battery terminals as shown.

(b) Blow into pipe (A) , and check that air comes out of pipe (B), but does not come out of filter (C).

(c) Disconnect the battery.

(d) Blow into pipe (B) and check that air comes out of filter (C), but does not come out of pipe (A) .

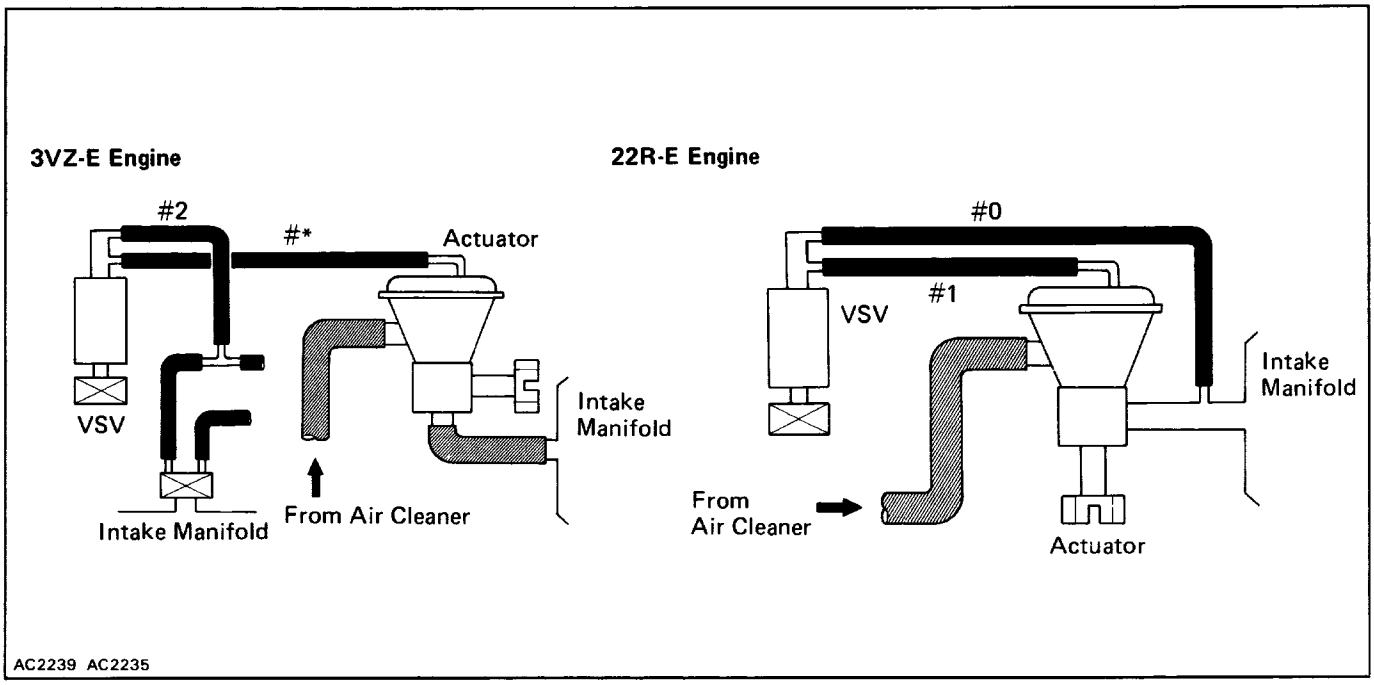
If a problem is found, replace the VSV.

3. CHECK FOR SHORT CIRCUIT

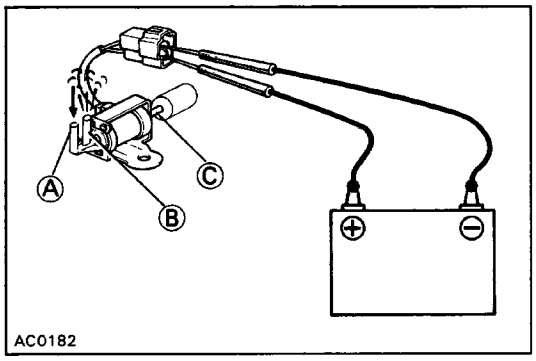
Using an ohmmeter, check that there is no continuity between each terminal and the VSV body.

If a short circuit is found, repair or replace the VSV.

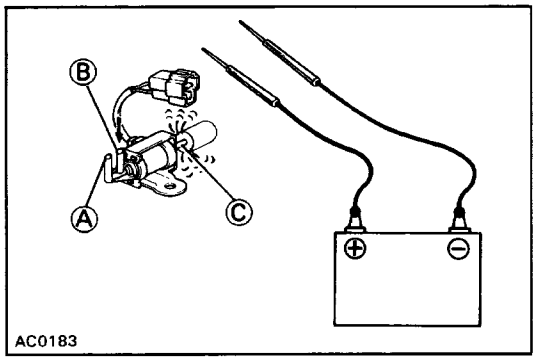
VACUUM HOSE CIRCUIT



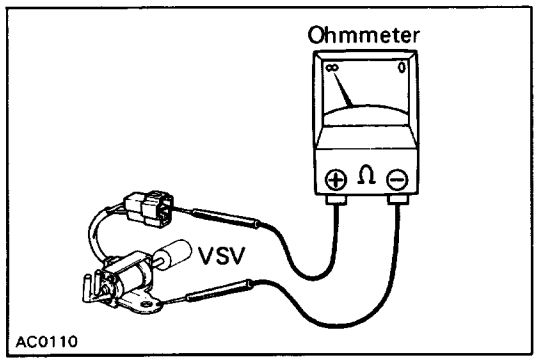
AC2239 AC2235



AC0182



AC0183



AC0110

VACUUM SWITCHING VALVE (VSV)

INSPECTION OF VSV

1. DISCONNECT VACUUM HOSES AND CONNECTOR FROM VSV

2. CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE

(a) Connect the VSV terminals to the battery terminals as shown.

(b) Blow into pipe (A) , and check that air comes out of pipe (B), but does not come out of filter (C).

(c) Disconnect the battery.

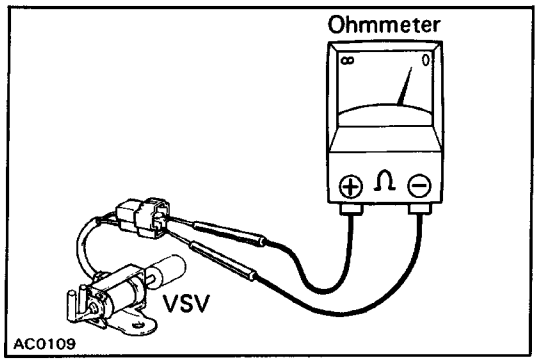
(d) Blow into pipe (B) and check that air comes out of filter (C), but does not come out of pipe (A) .

If a problem is found, replace the VSV.

3. CHECK FOR SHORT CIRCUIT

Using an ohmmeter, check that there is no continuity between each terminal and the VSV body.

If a short circuit is found, repair or replace the VSV.



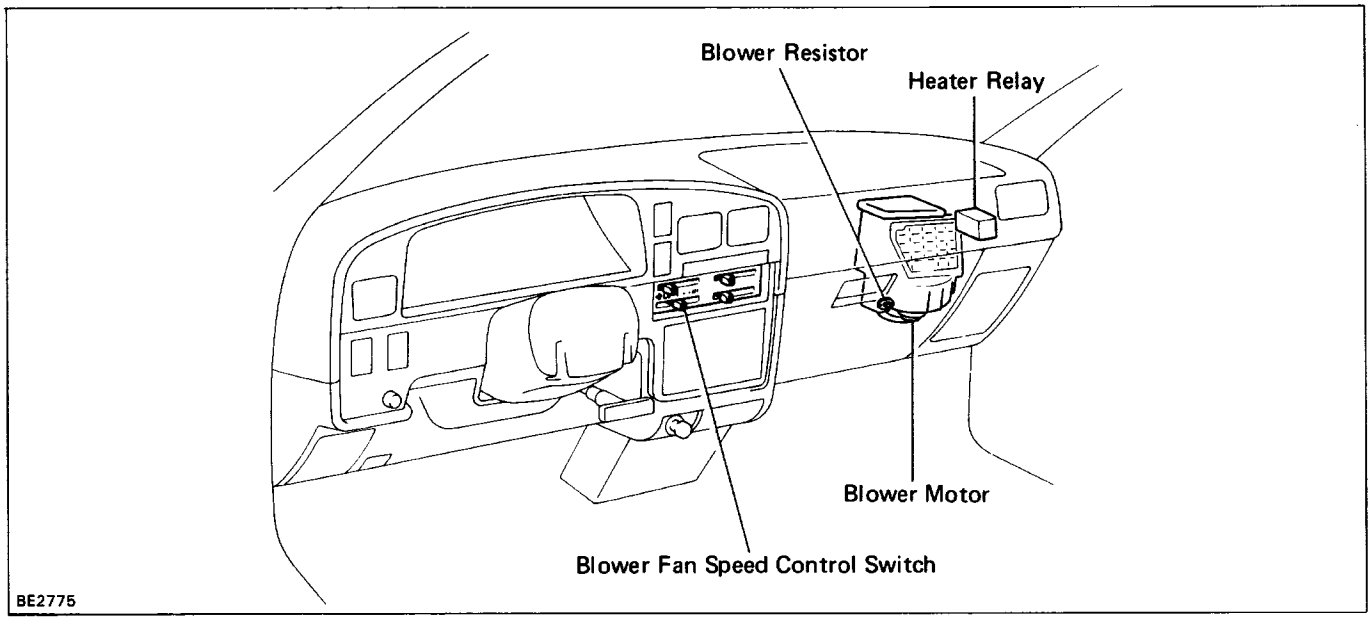
4. CHECK FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between two terminals of the VSV.

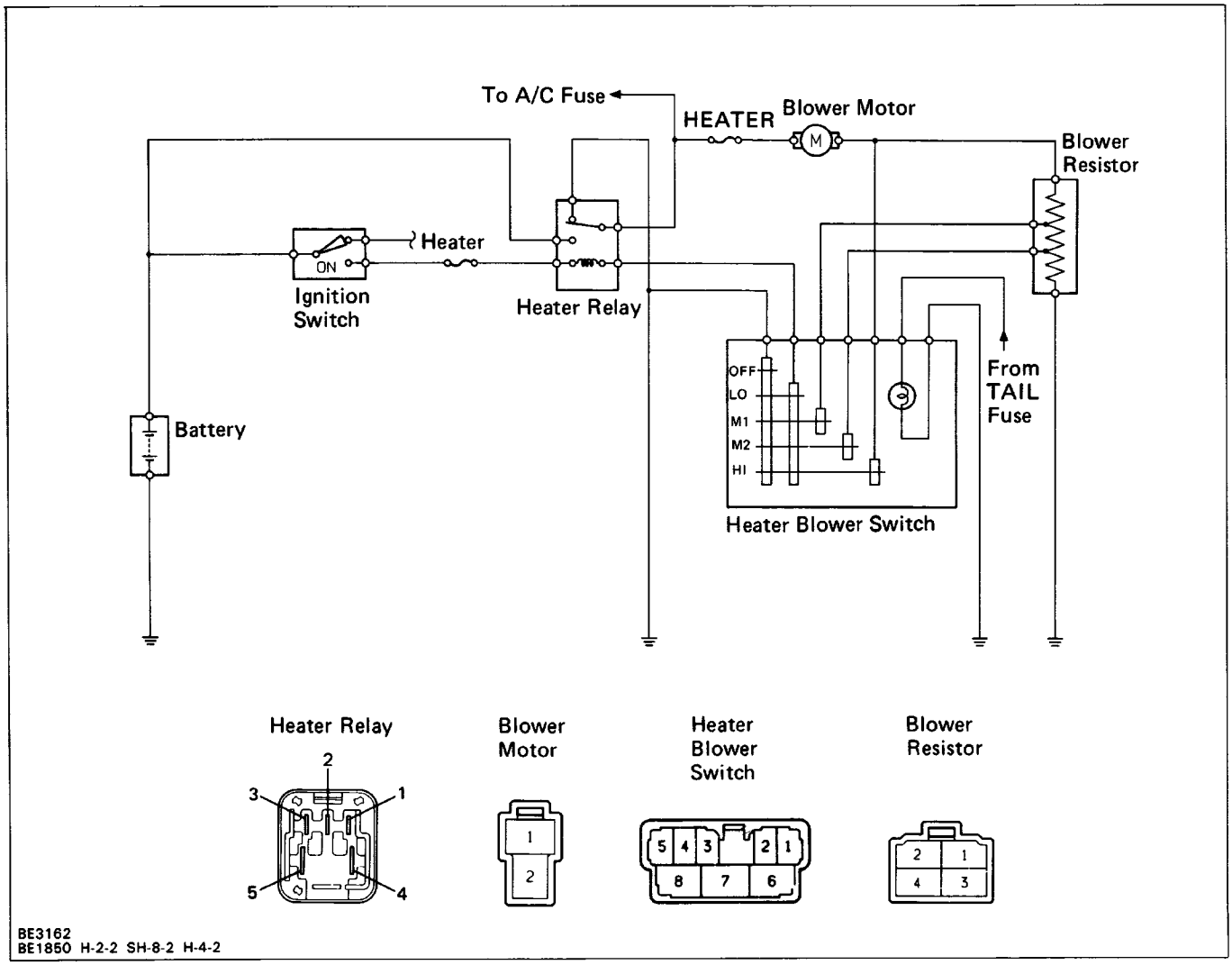
Specified resistance: 37 – 42 Ω at 200C (680F)

If resistance value is not as specified, replace the VSV.

HEATER
Parts Location



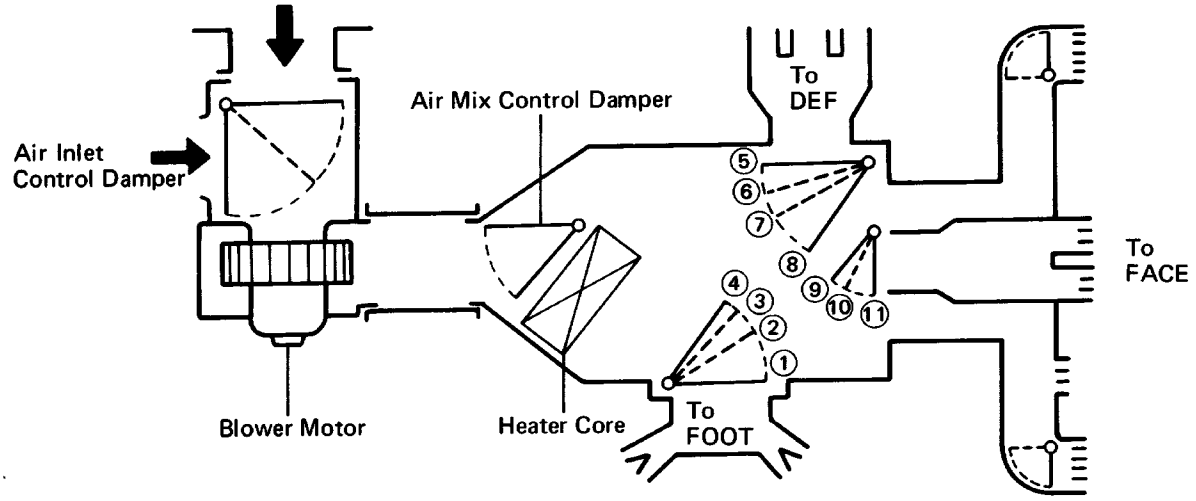
Wiring and Connector Diagrams



Troubleshooting

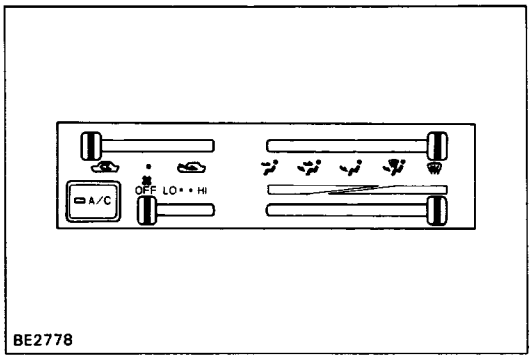
Problem	Possible cause	Remedy	Page
Blower does not work when fan switch is on	HEATER fuse blown	Replace fuse and check for short	
	Heater relay faulty	Check relay	AC–37
	Heater blower switch faulty	Check switch	AC–37
	Heater blower resistor faulty	Check resistor	AC–37
	Heater blower motor faulty	Check motor	AC–37
	Wiring or ground faulty	Repair as necessary	
Incorrect tempera–ture output	Control cables broken or adjustment faulty	Check cables	AC–36
	Heater hoses leaking or clogged	Replace hose	
	Water valve faulty	Replace valve	
	Air dampers broken	Repair dampers	

Damper Positions



Mode	Air Flow Mode Control Damper Positions	Air Flow Vents				
		Center	Side	Foot	Def.	Center of Driver's Seat
Face	① ⑤ ⑨	○	○			○
Bi-Level	② ⑤ ⑩	○	○	○		○
Foot	④ ⑥ ⑪		○	○	○	○
Foot/Def.	③ ⑦ ⑪		○	○	○	○
Def.	① ⑧ ⑪		○		○	○

BE2777 0001BE The size of circle (○) indicates the proportion of the air flow volume.

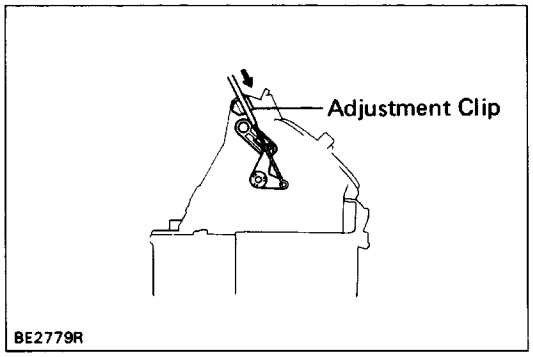


Inspection and Adjustment

1. INSPECT HEATER CONTROL PANEL

(Heater Control Cable Position)

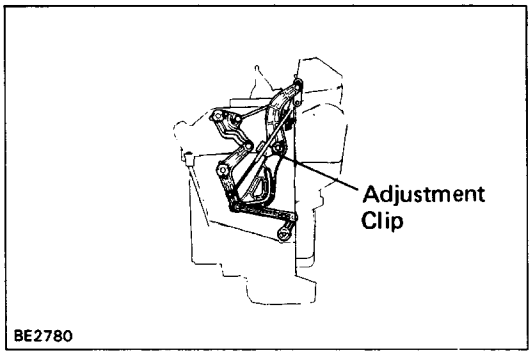
Move the control levers left and right and check for stiff–ness and binding through the full range of the levers.



2. ADJUST CONTROL DAMPER

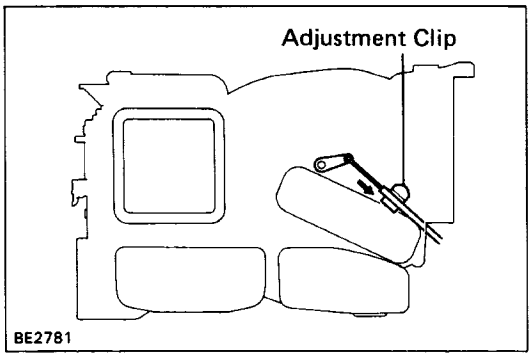
(Air Inlet Control Damper)

Set the air inlet control damper and lever to ”FRESH”.



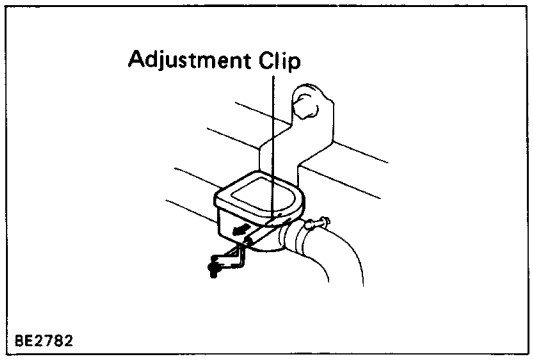
(Air Flow Control Damper)

Set the air flow control damper and lever to ”DEF”.



(Air Mix Control Damper)

Set the air mix control damper and lever to ”COOL”.



3. ADJUST WATER VALVE

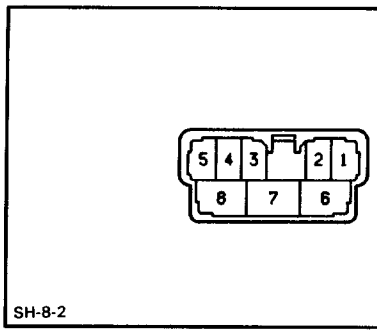
(Water Valve)

Set the water valve and control lever to ”COOL”.

HINT: Place the water valve lever on ”COOL” and while pushing the outer cable in the ”COOL” direction, clamp the outer cable to the water valve bracket.

Part Inspection

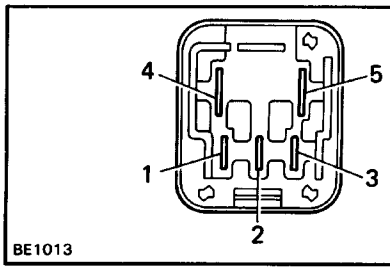
1. INSPECT HEATER BLOWER SWITCH
(Continuity)



Terminal / Switch position	1	2	5	6	8	Illumination 3	Illumination 4
OFF							
LO			○	○			
o (M 1)	○		○	○			
O (M 2)		○	○	○			
HI			○	○	○		

If continuity is not as specified, replace the switch.

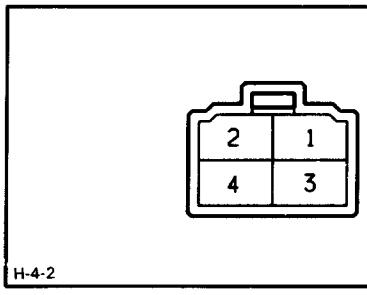
2. INSPECT HEATER RELAY
(Continuity)



Terminal / Condition	1	2	3	4	5
Constant	○	○	○		
		○		○	
Apply battery positive voltage to terminals 1 and 3.				○	○

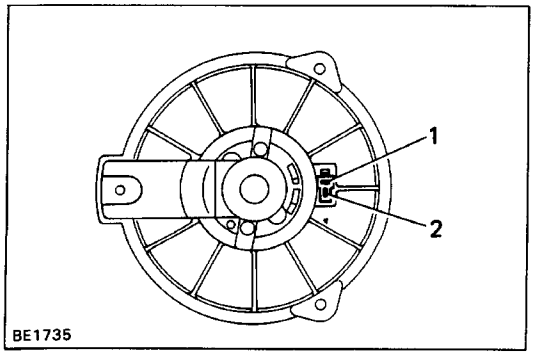
If continuity is not as specified, replace the relay.

3. INSPECT HEATER BLOWER RESISTOR
(Continuity)



Terminal / Condition	2	1	3	4
Constant	Hi ○			Lo ○

If continuity is not as specified, replace the resistor.



4. INSPECT HEATER BLOWER MOTOR
(Operation)

Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, check that the motor operation is smooth.

If operation is not as specified, replace the motor.

AUTOMATIC TRANSMISSION

MEMO

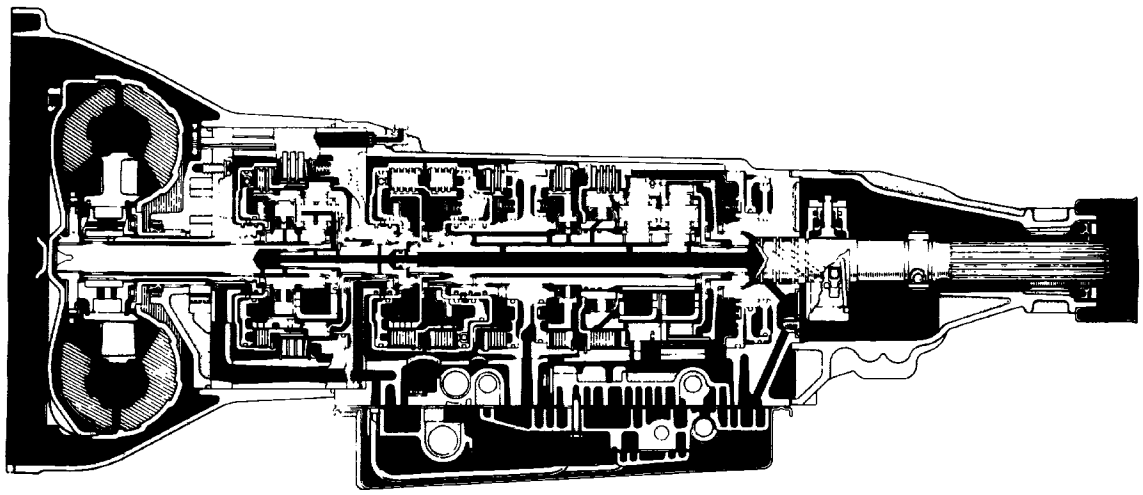
A43D Automatic Transmission

DESCRIPTION

General

The A43D is a 4–speed automatic transmission.
The A43D transmission is mainly composed of the torque converter clutch, the overdrive (hereafter called 0/D) planetary gear unit, 3–speed planetary gear unit, the hydraulic control system and the electronic con–trol system.

Sectional View



AT4220

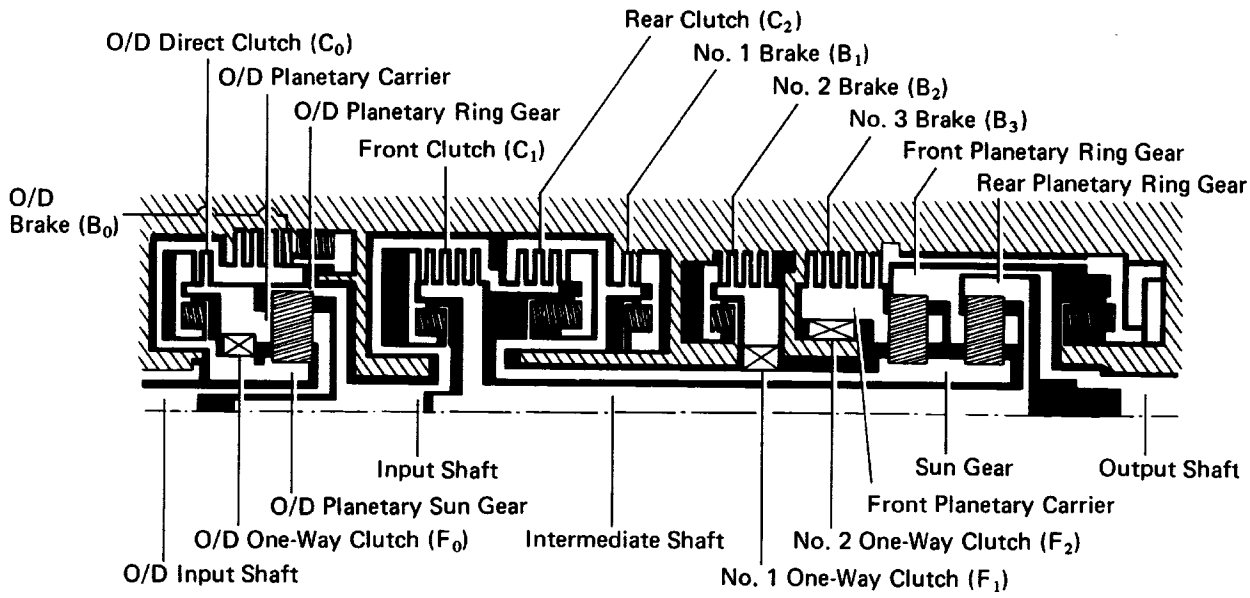
General Specifications

Type of Transmission				A43D
Type of Engine				22R-E
Torque Converter Clutch	Stall Torque Ratio			1.75 : 1
	Lock–Up Mechanism			Equipped
Gear Ratio	1 st Gear			2.452
	2nd Gear			1.452
	3rd Gear			1.000
	O/D Gear			0.688
	Reverse Gear			2.212
Plates (Disc/Plate)	C_0	O/D Direct Clutch		1/0
	C_1	Front Clutch		4/4
	C_2	Rear Clutch		3/3
	B_2	No.2 Brake		3/3
	B_3	No.3 Brake		5/4
	B_0	O/D Brake		3/3
	B_1	No. 1 Brake		1/1
ATF	Type			ATF DEXRON® II
	Capacity liter (US qts, Imp.qts)		Total	6.5 (6.9, 5.7)
			Drain and Ref ill	2.4 (2.5, 2.1)

OPERATION

Mechanical Operation

OPERATING CONDITIONS



AT3283

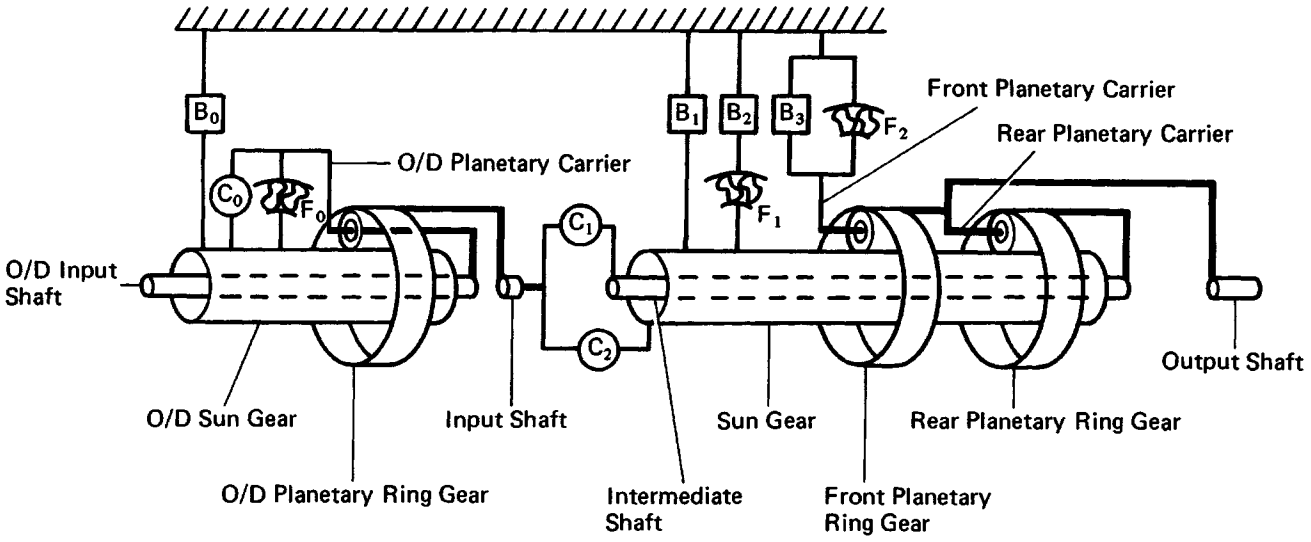
○ ..... Operating

Shift lever position	Gear position	C_0	C_1	C_2		B_0	B_1	B_2	B_3		F_0	F_1	F_2
				I.P.	O.P.				I.P.	O.P.			
P	Parking	○							○	○	○		
R	Reverse	○		○	○				○	○	○		
N	Neutral	○									○		
D	1 st	○	○								○		○
	2nd	○	○					○			○	○	
	3rd	○	○		○			○			○		
	O/D		○		○	○		○					
2	1st	○	○								○		○
	2nd	○	○				○	○			○	○	
L	1 st	○	○						○	○	○		○

I.P. ..... Inner Piston
O.P. ..... Outer Piston

FUNCTION OF COMPONENTS

NOMENCLATURE	OPERATION
O/D Direct Clutch (C_O)	Connects overdrive sun gear and overdrive carrier
O/D Brake (Bo)	Prevents overdrive sun gear from turning either clockwise or counterclockwise
O/D One–Way Clutch (Fo)	When transmission is being driven by engine, connects overdrive sun gear and overdrive carrier
Front Clutch (C_I)	Connects input shaft and intermediate shaft
Rear Clutch (C_2)	Connects input shaft and front & rear planetary sun gear
No. 1 Brake (B_1)	Prevents front & rear planetary sun gear from turning either clockwise or counterclockwise
No.2 Brake (B_2)	Prevents outer race of F_1 from turning either clockwise or counterclockwise, thus preventing front & rear planetary sun gear from turning counterclockwise
No.3 Brake (B3)	Prevents front planetary carrier from turning either clockwise or counterclockwise
No. 1 One–Way Clutch (F_1)	When B_2 is operating, prevents front & rear planetary sun gear from turning counterclockwise
No.2 One–Way Clutch (F_2)	Prevents front planetary carrier from turning counterclockwise

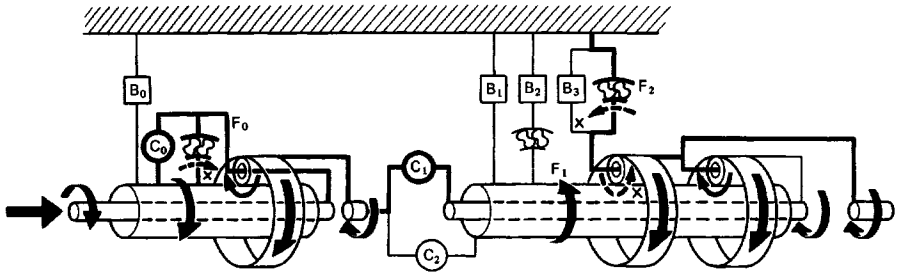


AT3282

FUNCTION OF COMPONENTS (Cont'd)

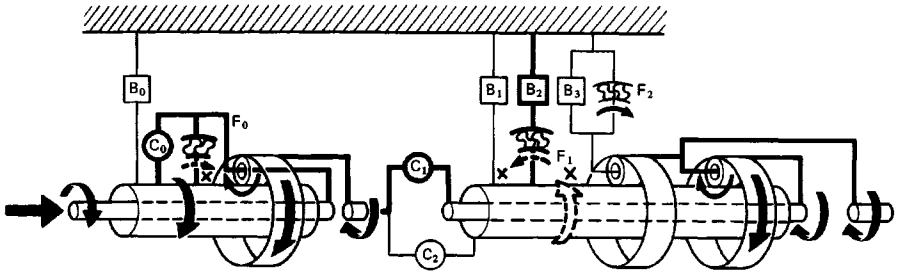
The conditions of operation for each gear position are shown in the following illustrations:

D or 2 Position 1st Gear



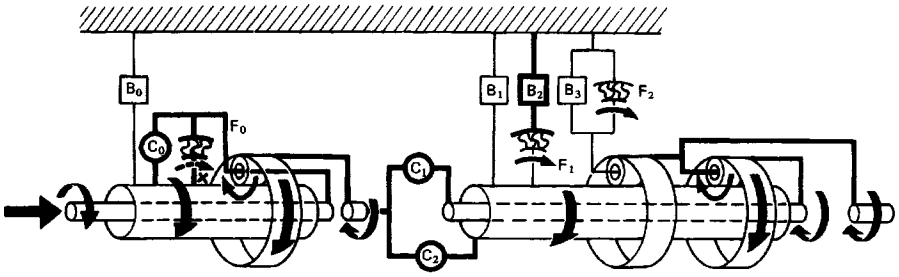
AT7802

D Position 2nd Gear



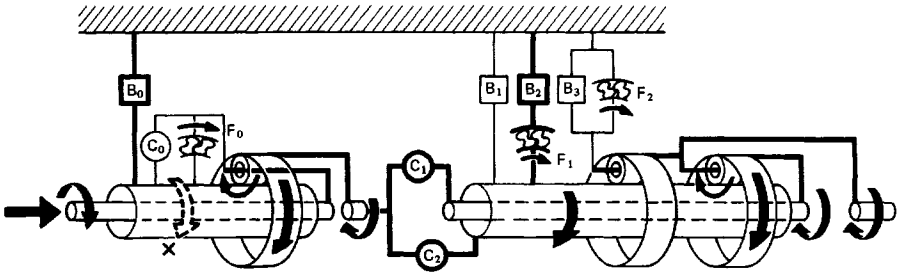
AT7803

D or 2 Position 3rd Gear



AT7804

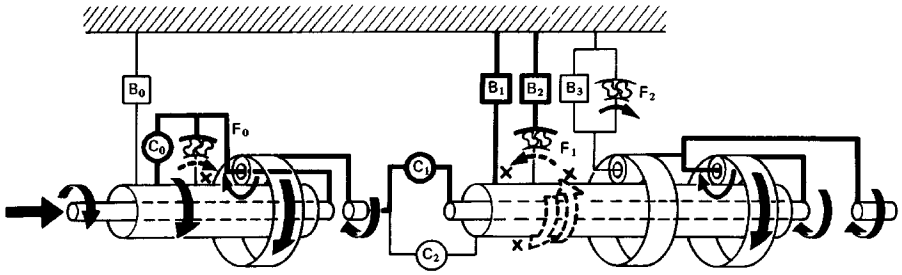
D Position O/D



AT7805

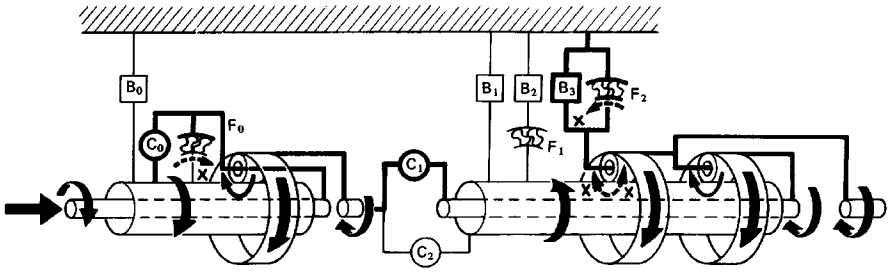
FUNCTION OF COMPONENTS (Cont'd)

2 or L Position 2nd Gear



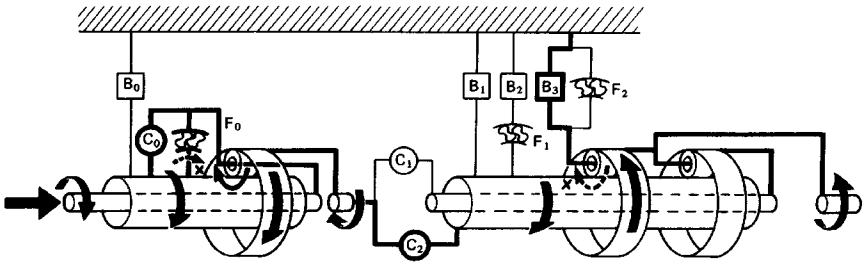
AT7806

L Position 1st Gear



AT7807

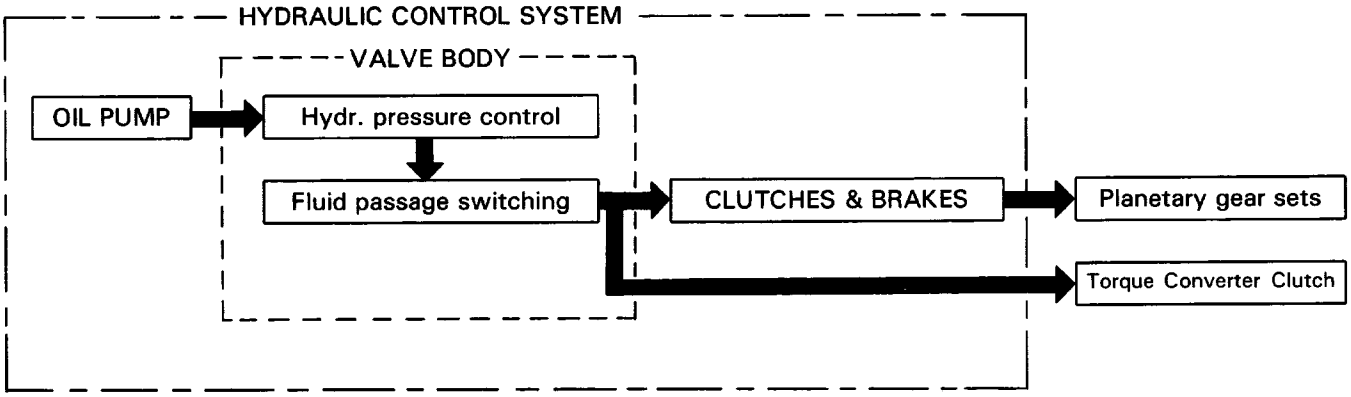
R Position Reverse Gear



AT7808

Hydraulic Control System

The hydraulic control system is composed of the oil pump, the valve body, the governor body, the accumu–lators, the clutches and brakes as well as the fluid passages which connect all of these components.
Based in the hydraulic pressure created by the oil pump, the hydraulic control system governs the hydraulic pressure acting on the torque converter clutch, clutches and brakes in accordance with the vehicle driving conditions.



TROUBLESHOOTING
Basic Troubleshooting

1. Troubleshooting occuring with the automatic transmission can be caused by either the engine, electrical control or the transmission itself. These three areas should be distinctly isolated before proceeding with troubleshooting.
2. Troubleshooting should begin with the simplest operation, working up in order or difficulty, but first determine whether the trouble lies within the engine, electrical control or transmission.
3. Proceed with the inspection as follows:

PRELIMINARY CHECK (See page AT–14)
(a) Check the tire inflation.
(b) Check the idle speed.
(c) Check the fluid level and fluid condition.
(d) Check the throttle cable mark.
(e) Check the shift linkage.
(f) Check the Park/Neutral Position Switch.

↓

STALL TEST (See page AT–20)
Check the engine and torque converter clutch.

↓

TIME LAG TEST (See page AT–21)
Check the automatic transmission (each clutch, brake and gear) for wear.

↓

HYDRAULIC TEST (See page AT–22)
Measure the line pressure and make basic check of fluid circuit.

↓

ROAD TEST (See page AT–24)
Confirm if trouble lies within automatic transmission. If noisy or vibrating, the possible cause could be with the engine, drive shaft, tires, etc.

(No up–shift to overdrive/No down–shift from overdrive)

OVERDRIVE CONTROL SYSTEM CHECK (See page AT–16)

General Troubleshooting

Problem	Possible cause	Remedy	Page
Fluid discolored or smells burnt	Fluid contaminated Torque converter clutch faulty Transmission faulty	Replace fluid Replace torque converter clutch Disassemble and inspect transmission	AT–14 AT–40
Vehicle does not move in any forward position or reverse	Manual linkage out of adjustment Valve body or primary regulator faulty Parking lock pawl faulty Torque converter clutch faulty Converter drive plate broken Oil pump intake screen blocked Transmission faulty	Adjust linkage Inspect valve body Inspect parking lock pawl Replace torque converter clutch Replace drive plate Clean screen Disassemble and inspect transmission	AT–15 AT–31 AT–40 AT–40
Shift lever position incorrect	Manual linkage out of adjustment Manual valve and lever faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–15
Harsh engagement into any drive position	Throttle cable out of adjustment Valve body or primary regulator faulty Accumulator pistons faulty Transmission faulty	Adjust throttle cable Inspect valve body Inspect accumulator pistons Disassemble and inspect transmission	AT–15
Delayed 1–2, 2–3 or 3–0/D up–shift, or down–shift from O/D–3 or 3–2 then shifts back to O/D or 3	Throttle cable out of adjustment Valve body faulty Governor body faulty	Adjust throttle cable Inspect valve body Inspect governor body	AT–15
Slips on 1–2, 2–3 or 3–0/D up–shift, or slips or shudders on acceleration	Manual linkage out of adjustment Throttle cable out of adjustment Valve body faulty Transmission faulty	Adjust linkage Adjust throttle cable Inspect valve body Disassemble and inspect transmission	AT–15 AT–15

Remark *: Refer to A43D Automatic Trans–mission Repair Manual.
(Pub. No. RM 272U)

General Troubleshooting (Cont'd)

Problem	Possible cause	Remedy	Page
Drag, binding or tie–up on 1–2, 2–3 or 3–O/D up–shift	Manual linkage out of adjustment Valve body faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–15
Harsh down–shift	Throttle cable out of adjustment Throttle cable and cam faulty Accumulator pistons faulty Valve body faulty Transmission faulty	Adjust throttle cable Inspect throttle cable and cam Inspect accumulator pistons Inspect valve body Disassemble and inspect transmission	AT–15 AT–15
No down–shift when coasting	Valve body faulty Governor body faulty	Inspect valve body Inspect governor body	★
Down–shift occurs too quickly or too late while coasting	Throttle cable faulty Valve body faulty Governor body faulty Transmission faulty	Inspect throttle cable Inspect valve body Inspect governor body Disassemble and inspect transmission	AT–15
No O/D–3, 3–2 or 2–1 kick–down	Throttle cable out of adjustment Governor body faulty Valve body faulty	Adjust throttle cable Inspect governor body Inspect valve body	AT–15
No engine braking in 2 or L position	Valve body faulty Transmission faulty	Inspect valve body Disassemble and inspect transmission	★
Vehicle does not hold in P	Manual linkage out of adjustment Parking lock pawl cam and spring faulty	Adjust linkage Inspect cam and spring	AT–15 AT–15

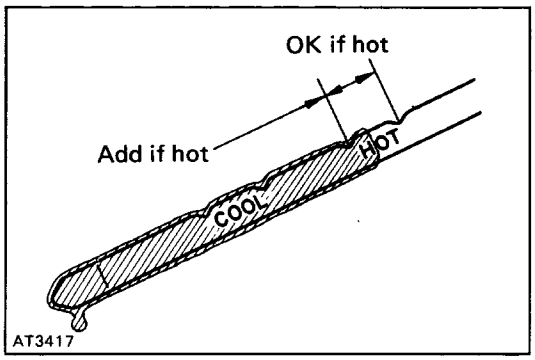
Remark * : Refer to A43D Automatic Transmission Repair Manual.
(Pub. No. RM272U)

Preliminary Check

1. CHECK FLUID LEVEL

HINT:

- The vehicle must have been driven so that the engine and transmission are at normal operating temperature. (Fluid temperature: 70–80°C or 158–176°F)
- Only use the COOL range on the dipstick as a rough reference when the fluid is replaced or the engine does not run.



(a) Park the vehicle on a level surface, set the parking brake.

(b) With the engine idling, shift the shift lever into all positions from P to L position and return to P position.

HINT: Depress brake pedal.

(c) Pull out the transmission dipstick and wipe it clean.

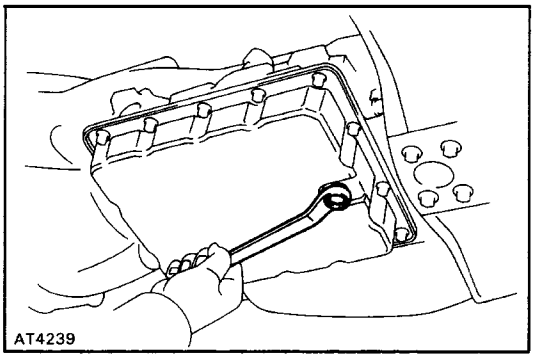
(d) Push it back fully into the tube.

(e) Pull it out and check that the fluid level is in the HOT range.

If the level is at the low side, add fluid.

Fluid type: ATF DEXRON® II

NOTICE: Do not overfill.



2. CHECK FLUID CONDITION

If the fluid smells burnt or is black, replace it as following procedures.

(a) Remove the drain plug and drain the fluid.

(b) Reinstall the drain plug securely.

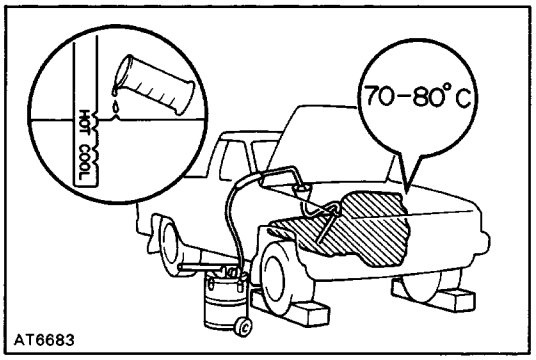
(c) With the engine OFF, add new fluid through the oil filler tube.

Fluid type ATF DEXRON® II

Capacity:

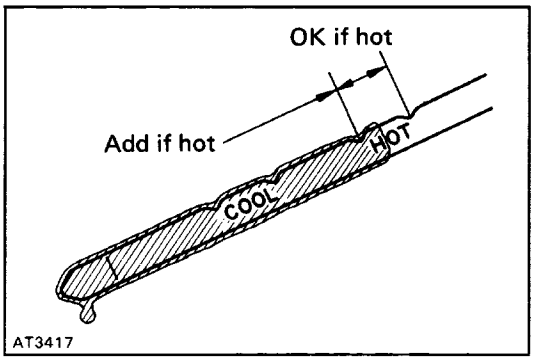
Total: 6.5 liters (6.9 US qts, 5.7 Imp qts)

Drain and refill: 2.4 liters (2.5 US qts, 2.1 Imp.qts)



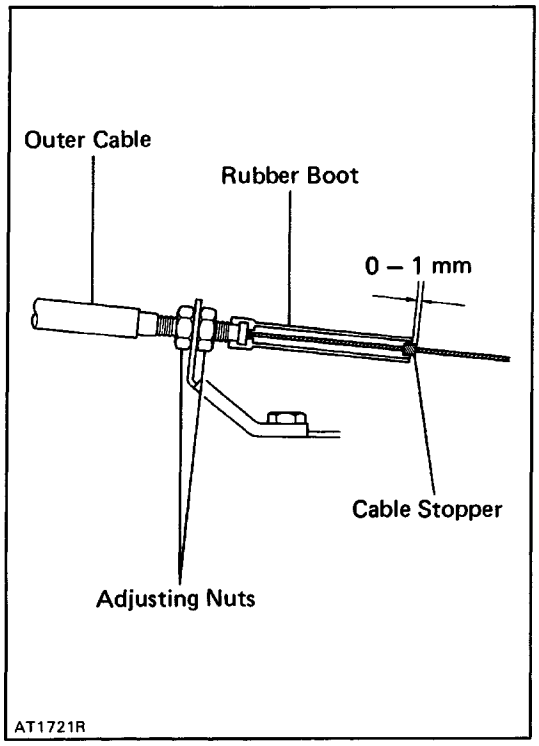
(d) Start the engine and shift the shift lever into all positions from P to L position and then shift into P position.

(e) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.



(f) Check the fluid level with the normal operating temperature (70–80°C or 158–176 °F) and add as necessary.

NOTICE: Do not overfill.



3. INSPECT THROTTLE CABLE

(a) Depress the accelerator pedal all the way and check that the throttle valve opens fully.

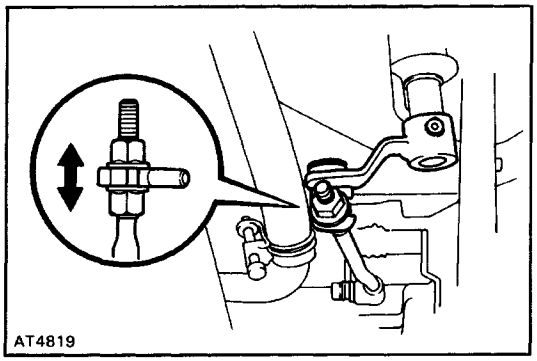
HINT: If the valve does not open fully, adjust the accelerator cable.

(b) Fully depress the accelerator pedal.

(c) Measure the distance between the end of the boot and stopper on the cable.

Standard distance: 0–1 mm (0–0.04 in.)

If the distance is not standard, adjust the cable by the adjusting nuts.



4. INSPECT SHIFT LEVER POSITION

When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator correctly indicates the position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

(a) Remove the nut on the cross shaft rod.

(b) Push the cross shaft rod fully downward.

(c) Return the cross shaft rod three notches to N position.

(d) Set the shift lever to N position.

(e) While holding the shift lever lightly toward the R position side, adjust the cross shaft rod nut.

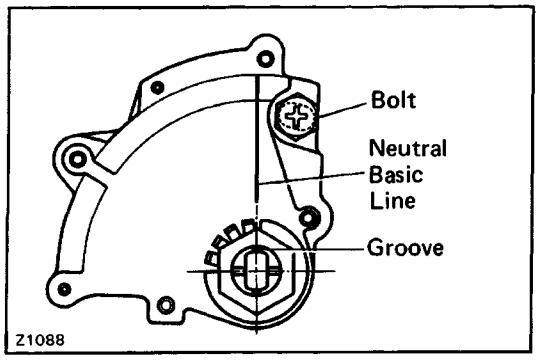
(f) Tighten the cross shaft rod nut.

(g) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverse when shifting it to the R position.

5. INSPECT PARK/ NEUTRAL POSITION SWITCH

Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.

If not as stated above, carry out the following adjustment procedures.



(a) Loosen the park/neutral position switch bolt and set the shift lever to the N position.

(b) Align the groove and neutral basic line.

(c) Hold in position and tighten the bolt.

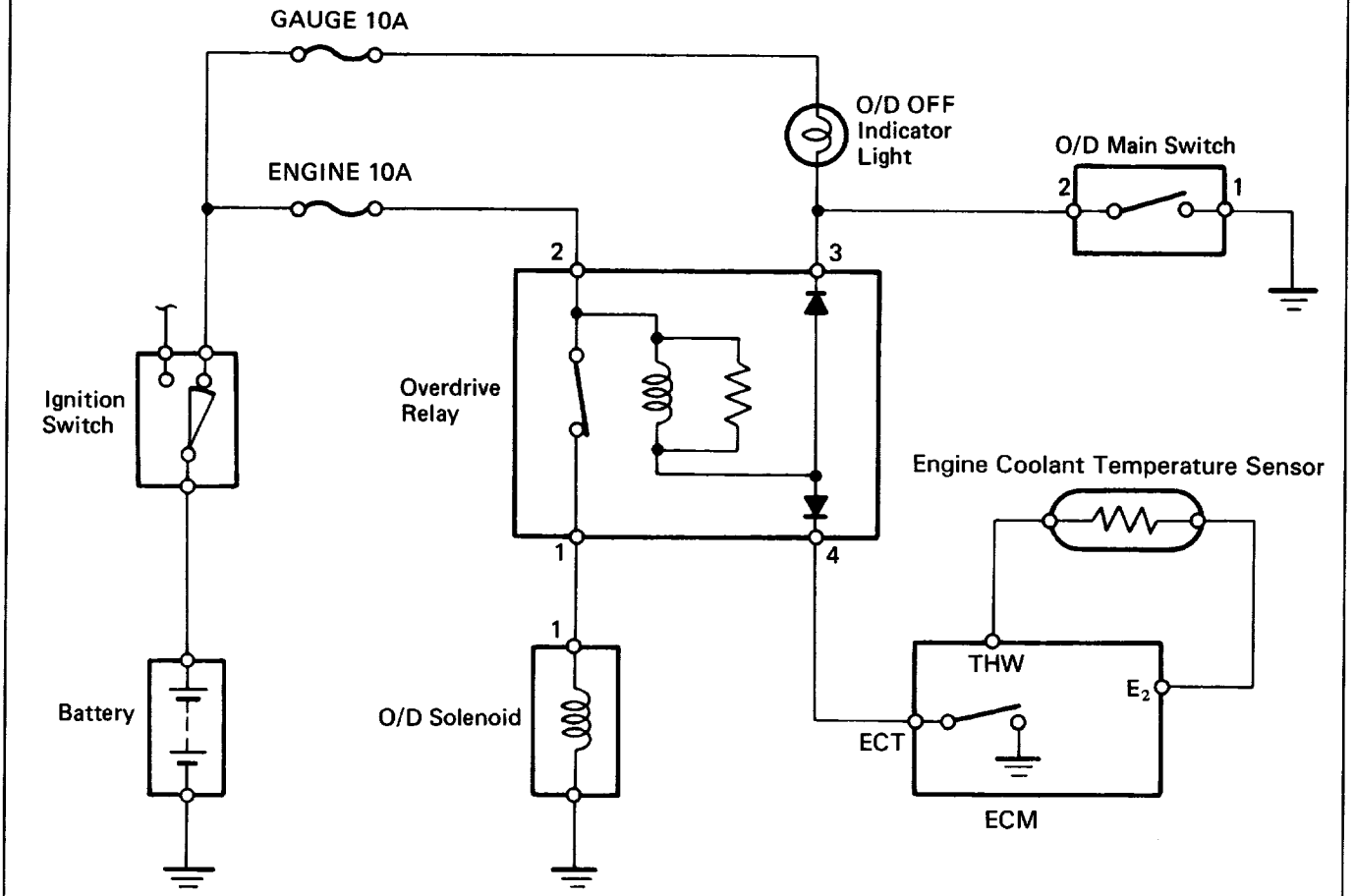
Torque: 5.4 N–m (55 kgf–cm, 48 in.lbf)

6. INSPECT IDLE SPEED (N POSITION)

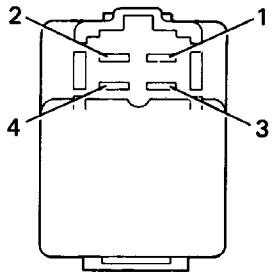
Idle speed: 750 RPM

Overdrive Control System

ELECTRIC CONTROL CIRCUIT



Overdrive Relay



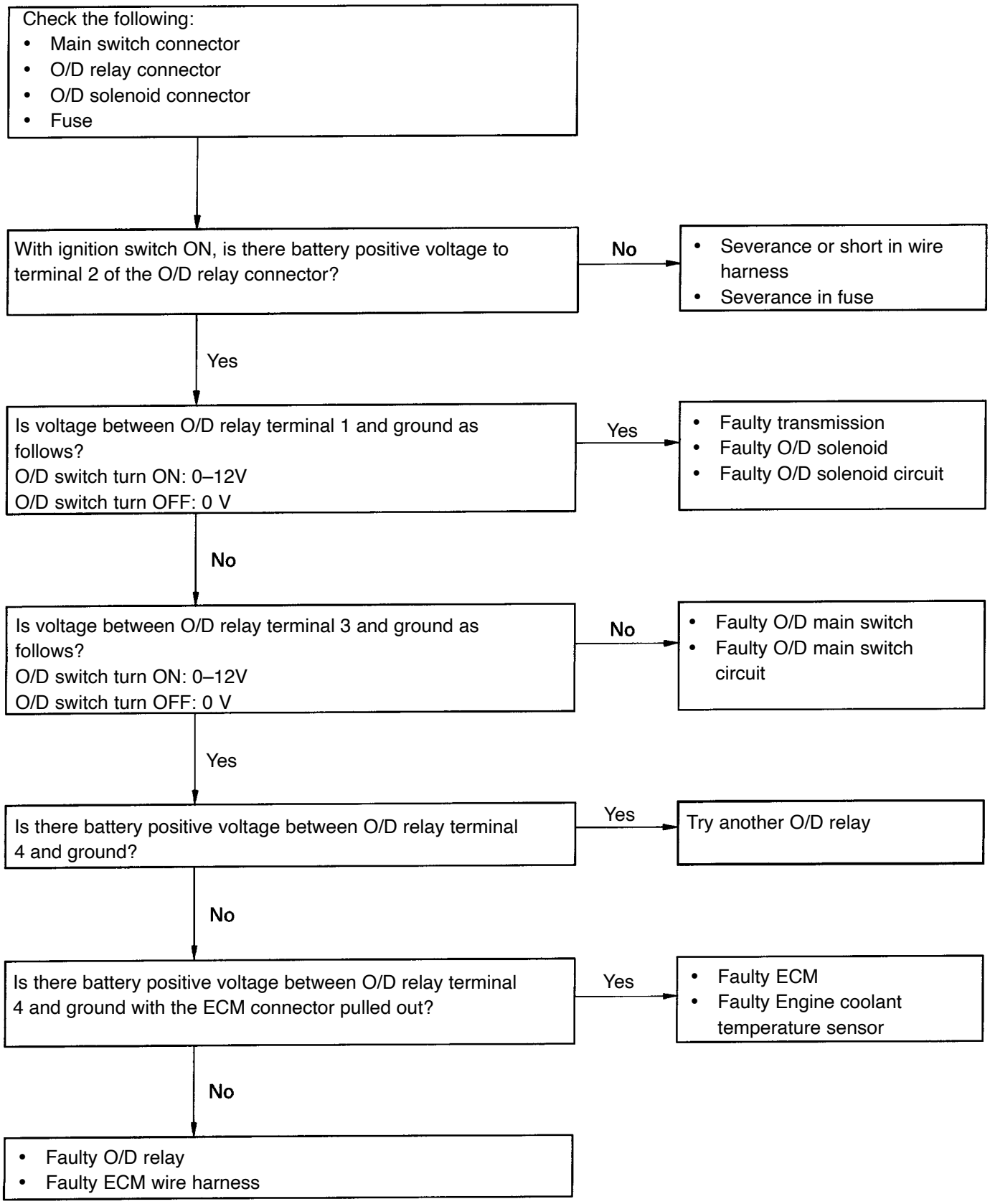
O/D Solenoid

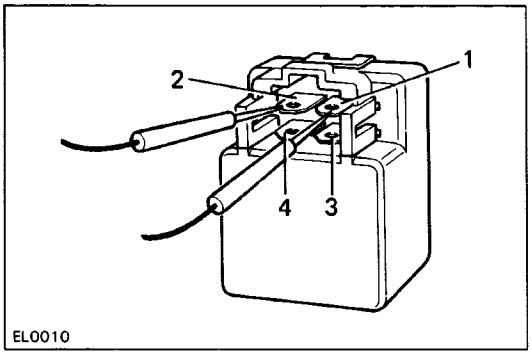
O/D Main Switch

AT4834
D9240 Ie-1-2-E H2-2-A

TROUBLESHOOTING FLOW–CHART

Trouble: No overdrive engagement with the main switch ON. (After warm–up)



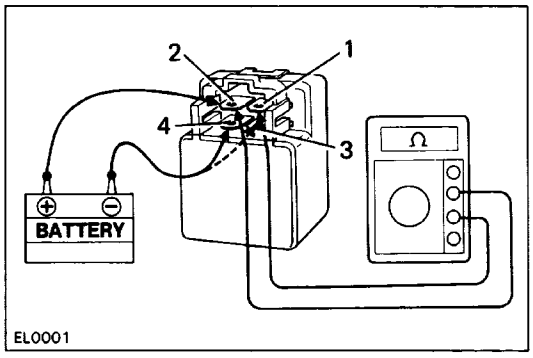


INSPECTION OF OVERDRIVE CONTROL COMPONENTS

1. INSPECT OVERDRIVE RELAY

(a) Remove the overdrive relay from the pedal bracket.

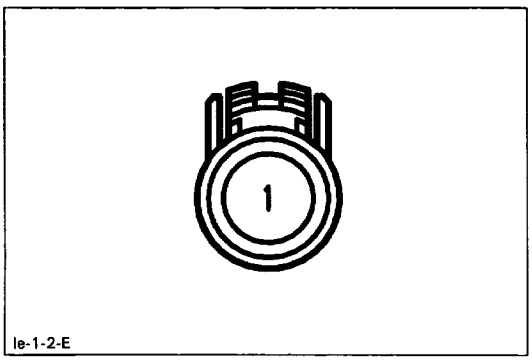
(b) Using an ohmmeter, check that there is continuity between terminals 1 and 2.



(c) Apply battery positive voltage to the relay terminals 2 and 3. Using an ohmmeter, check that there is no continuity between terminals 1 and 2.

(d) Apply battery positive voltage to the relay terminals 2 and 4. Using an ohmmeter, check that there is no continuity between terminals 1 and 2.

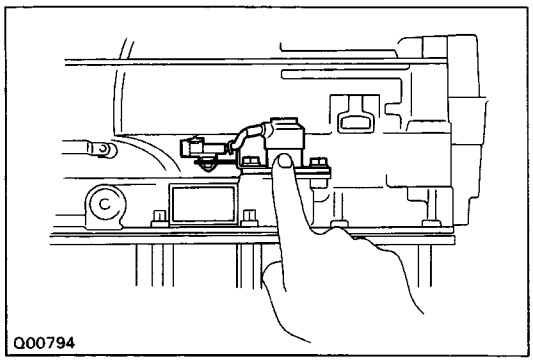
(e) Install the overdrive relay to the pedal bracket.



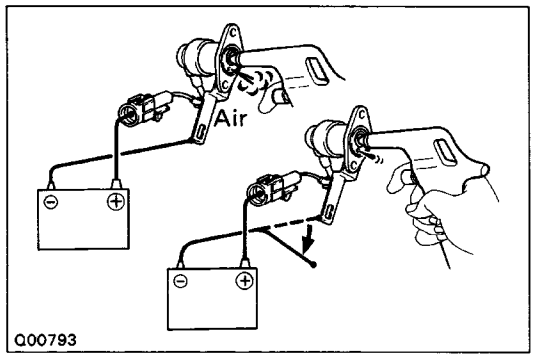
2. INSPECT OVERDRIVE SOLENOID

(a) Using an ohmmeter, measure the resistance between terminal 1 and body.

Resistance: 11–15 9



(b) Apply battery positive voltage to the solenoid. Check that the solenoid operation sound is heard.

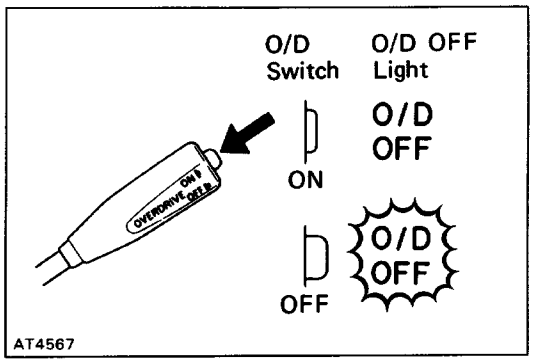


3. CHECK SOLENOID SEALS

If there is foreign material in the solenoid valve, there wil be no fluid control even with solenoid operation

(a) Check that the solenoid valve does not leak when low–pressure compressed air is applied.

(b) When supplying battery positive voltage to the solenoid, check that the solenoid valve opens.

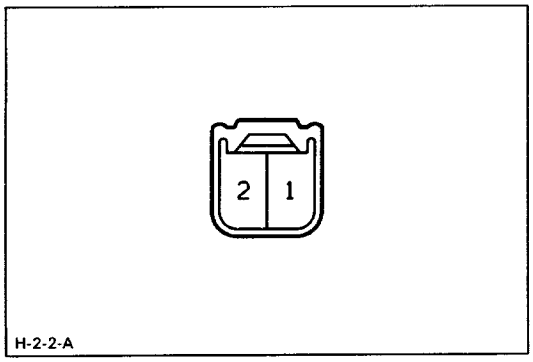


4. INSPECT–O/D OFF" INDICATOR

(a) Turn on the ignition switch.

(b) Check that the–O/D OFF" indicator does not light, when the O/D main switch is turned ON.

(c) Check that the–O/D OFF" indicator lights, when the O/D main switch is turned OFF.



5. INSPECT OVERDRIVE MAIN SWITCH

(a) Remove the steering column cover.

(b) Using an ohmmeter, check the continuity of the ter–minals for each switch position.

SW Position \ Terminal	1	2
ON		
OFF	O	O

6. INSPECT ENGINE COOLANT TEMPERATURE SENSOR
(See page FI–115)

Mechanical System Tests

STALL TEST

The objective of this test is to check the overall performance of the transmission and engine by measuring the maximum engine speeds in the D and R positions.

NOTICE:

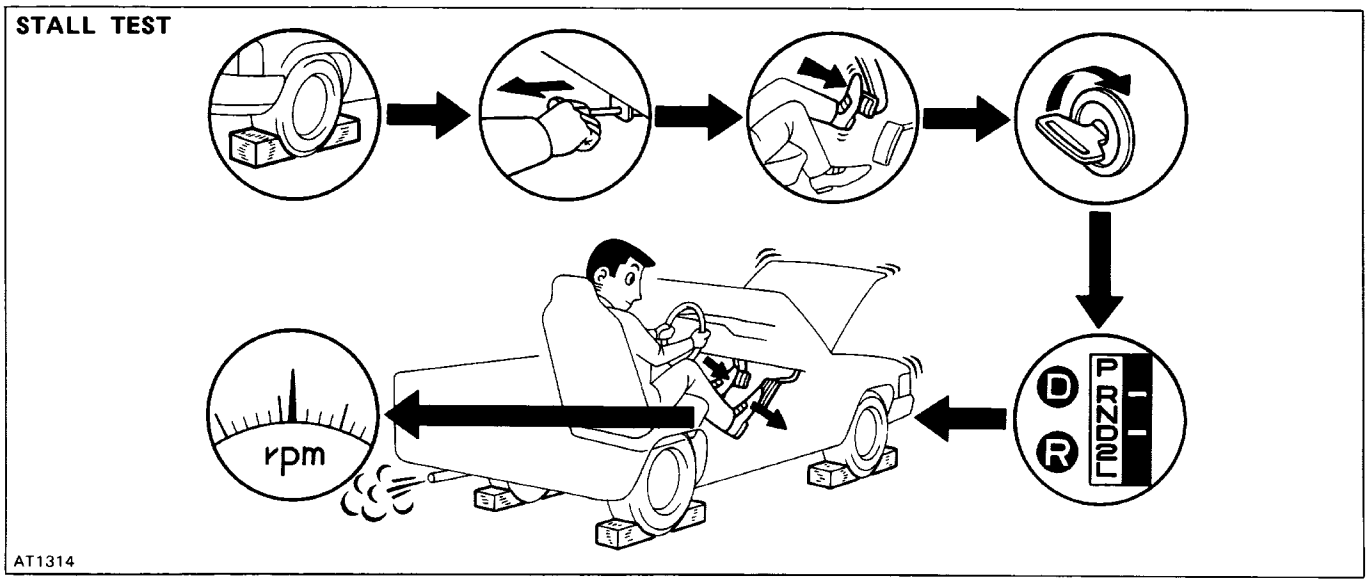
- **Perform the test at normal operating fluid temperature (50–80°C or 122–176°F).**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear, level area, which provides good traction.**

MEASURE STALL SPEED

(a) Check the four wheels and fully apply the parking brake.
(b) Mount an engine tachometer.
(c) Keep your left foot pressed firmly on the brake pedal, and start the engine.
(d) Shift into the D position. Step all the way down on the accelerator pedal with your right foot.
Quickly read the highest engine RPM at this time.
Stall speed: 1,900 ±150 RPM
(e) Perform the same test in the R position.

EVALUATION

(a) If the engine speed is the same for both positions but lower than specified value:
Engine output may be insufficient
Stator one–way clutch is not operating properly
HINT: If more than 600 RPM below the specified value, the torque converter clutch could be faulty.
(b) If the stall speed at the D position is higher than specified:
Line pressure too low
Front clutch slipping
No.2 one–way clutch not operating properly
O/D one–way clutch not operating properly
(c) If the stall speed at the R position is higher than specified:
Line pressure too low
Rear clutch slipping
No.3 brake slipping
O/D one–way clutch not operating properly
(d) If the stall speed in both R and D positions are higher than specified:
Line pressure too low
Improper fluid level
O/D one–way clutch not operating properly



TIME LAG TEST

When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the O/D direct clutch, front clutch, rear clutch and No.3 brake.

NOTICE:

- **Perform the test at normal operating fluid temperature (50–80°C or 122–176°F).**
- **Be sure to allow one minute interval between tests.**
- **Make three measurements and take the average value.**

MEASURE TIME LAG

(a) Fully apply the parking brake.

(b) Start the engine and check the idle speed.

Idle speed: 750 RPM

(N position)

(c) Shift the shift lever from N to D position. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

Time lag: Less than 1.2 seconds

(d) In same manner, measure the time lag for N–R.

Time lag: Less than 1.5 seconds

EVALUATION

(a) If N–) D time lag is longer than specified:

Line pressure too low

Front clutch worn

O/D one–way clutch not operating properly

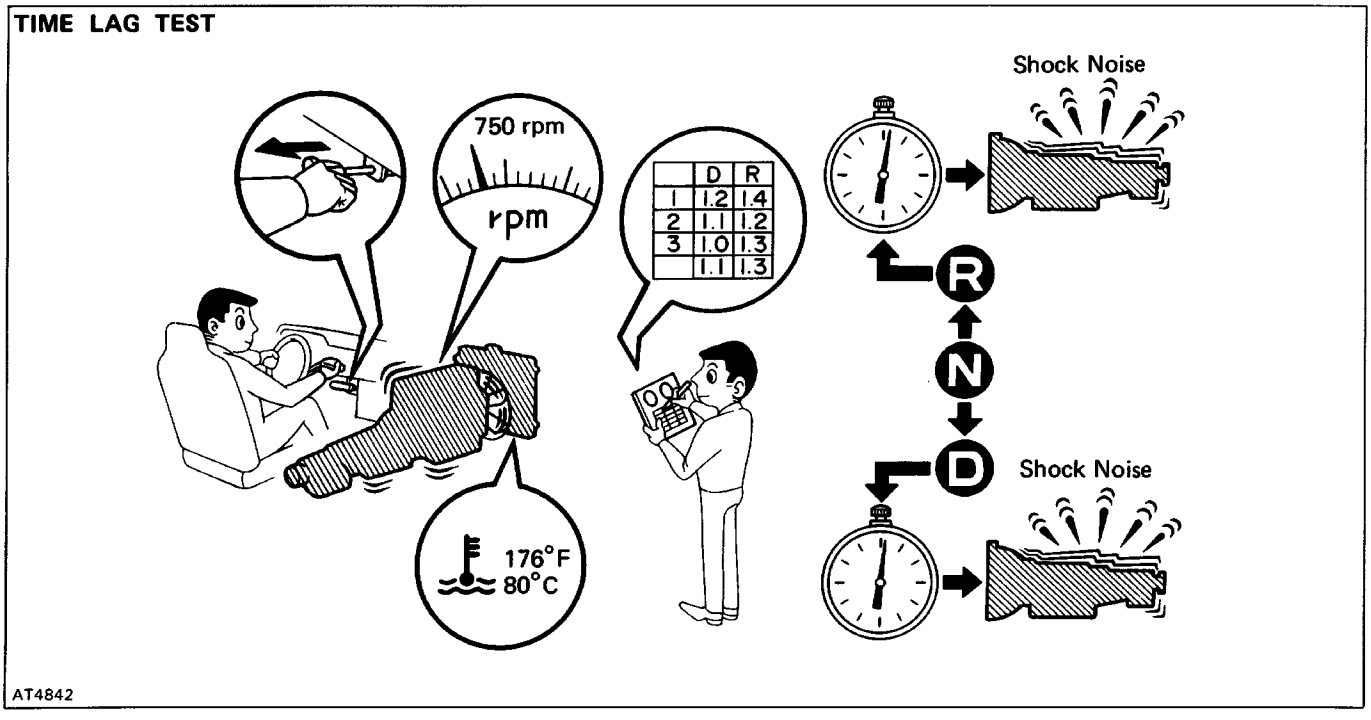
(b) If N–R time lag is longer than specified:

Line pressure too low

Rear clutch worn

No.3 brake worn

O/D one–way clutch not operating properly



HYDRAULIC TEST

1. PREPARATION

(a) Warm up the transmission fluid.

(b) Remove the transmission case test plug and connect the hydraulic pressure gauge.

SST 09992–00094 (Oil pressure gauge)

NOTICE: Perform the test at normal operating fluid temperature (50–80°C or 122–176°F).

2. MEASURE LINE PRESSURE

(a) Fully apply the parking brake and chock the four wheels.

(b) Start the engine and check the idle speed.

(c) Shift into the D position, keep your left foot pressed firmly on the brake pedal and while manipulating the accelerator pedal with the right foot, measure the line pressure at the engine speeds specified in the table.

(d) In the same manner, perform the test in the R position.

kPa (kgf/cm2,psi)

D position		R position	
Idling	Stall	Idling	Stall
441 – 500 (4.5 – 5.1, 64 – 73)	990 – 1,167 (10.1 – 11.9, 144 – 169)	667 – 745 (6.8 – 7.6, 97 – 108)	1,471 – 1,863 (15.0 – 19.0, 213 – 270)

If the measured pressures are not up to specified values, recheck the throttle cable adjustment and retest.

EVALUATION

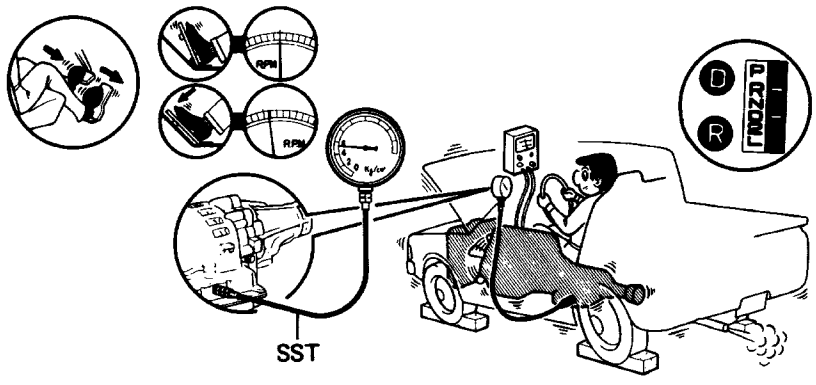
(a) If the measured values at all positions are higher than specified:
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective

(b) If the measured values at all positions are lower than specified:
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective
- Oil pump defective
- O/D direct clutch defective

(c) If pressure is low in the D position only:
- D position circuit fluid leakage
- Front clutch defective

(d) If pressure is low in the R position only:
- R position circuit fluid leakage
- No.3 brake defective
- Rear clutch defective

LINE PRESSURE TEST



AT4260

3. MEASURE GOVERNOR PRESSURE

(a) Check the parking brake to see that it is not applied.

(b) Start the engine.

(c) Shift into the D position and measure the governor pressure at the speeds specified in the table.

EVALUATION

If governor pressure is defective:

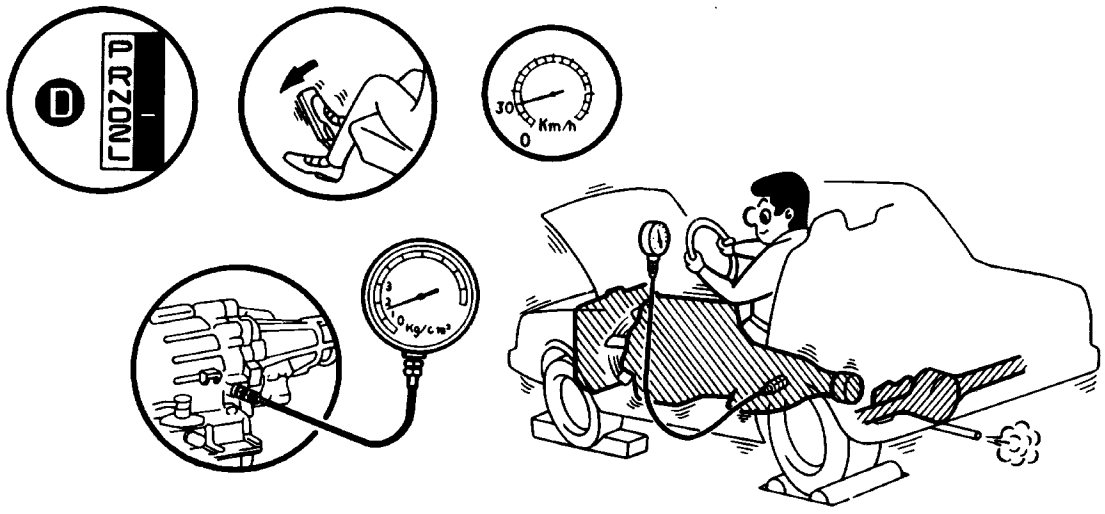
Line pressure defective

Fluid leakage in governor pressure circuit

Governor valve operation defective

Output shaft	Vehicle speed (Reference only)		Governor pressure
	P195175R14	P205/75R 14	
1,000 RPM	32 km/h (20 mph)	32 km/h (20 mph)	88 – 147 kPa (0.9 – 1.5 kgf/cm^2, 13 – 21 psi)
1,800 RPM	57 km/h (35 mph)	58 km/h (36 mph)	157 – 216 kPa (1.6 – 2.2 kgf/cm^2, 23 – 31 psi)
3,500 RPM	111 km/h (69 mph)	113 km/h (70 mph)	402 – 520 kPa (4.1 – 5.3 kgf/cm^2, 58 – 75 psi)

GOVERNOR PRESSURE TEST



AT4487

ROAD TEST

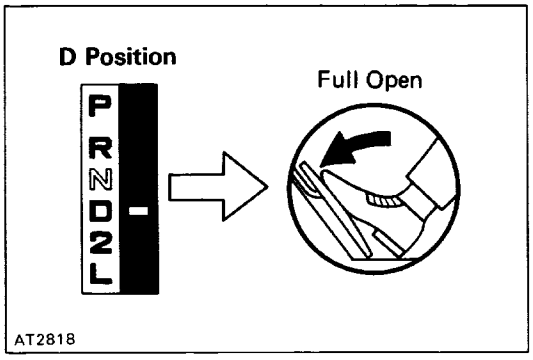
NOTICE: Perform this test at normal fluid temperature (50–80°C or 122–176°F).

1. D POSITION TEST

Shift into the D position and while driving with the accelerator pedal held constant at the throttle valve full open and the O/D switch ON, check on the following points:

(a) Check to see that the 1–2, 2–3 and 3–O/D up–shifts take place and also that the shift points conform to those shown in the automatic shift schedule.

HINT: 3–O/D up–shift does not take place with a throttle valve opening of more than 86% or engine coolant temperature below 50°C (122°F).



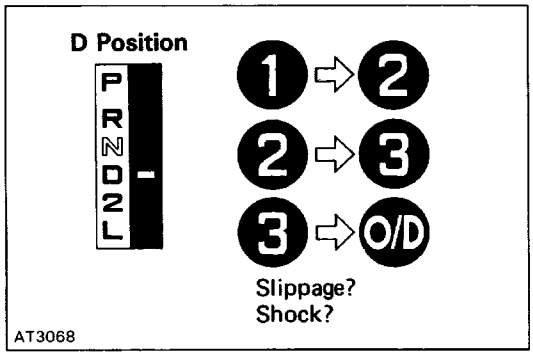
EVALUATION

(1) If there is no 1–2 up–shift:
- Governor valve is defective
- 1–2 shift valve is stuck

(2) If there is no 2–3 up–shift:
- 2–3 shift valve is stuck

(3) If there is no 3–O/D up–shift (throttle valve opening less than 86%):
- 3–4 shift valve is stuck
- Solenoid valve or circuit defective

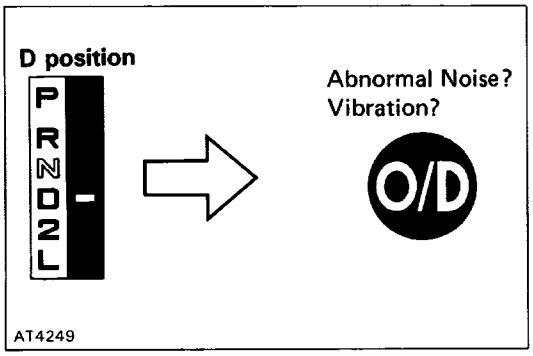
(4) If the shift point is defective:
- Throttle cable out of adjustment
- Throttle valve, 1–2 shift valve, 2–3 shift valve, 3–4 shift valve etc., are defective



(b) In the same manner, check the shock and slip at 1–2, 2–3 and 3–O/D up–shifts.

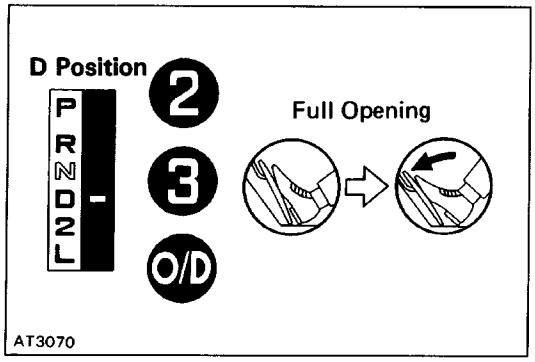
EVALUATION

If the shock is excessive:
- Line pressure is too high
- Accumulator is defective



(c) Run in the 3rd gear or O/D of D position and check for abnormal noise and vibration.

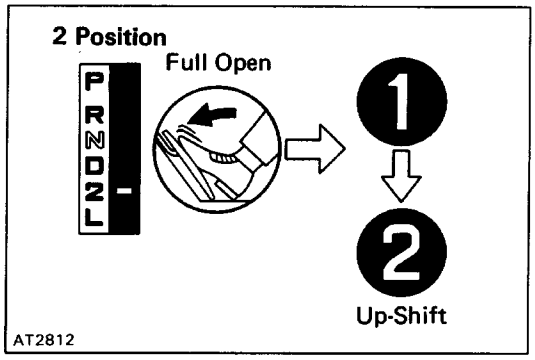
HINT: Check for cause of abnormal noise and vibration must be made with extreme care as they could also be due to unbalance in the propeller shaft, differential, tires, torque converter clutch, etc.



(d) While running in the D position, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2–1, 3–2 and O/D–3 kick–downs conform–to those indicated on the automatic shift schedule.

HINT: O/D–) 3 kick–down is always possible with a throttle valve opening of more than 86%.

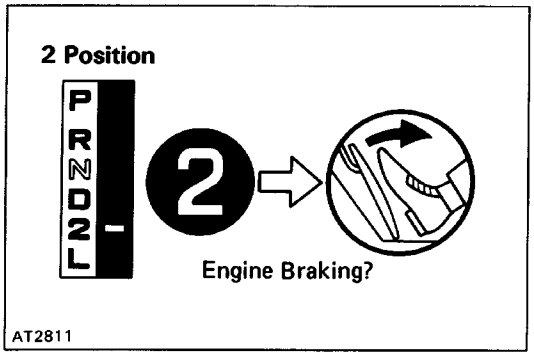
(e) Check for abnormal shock and slip at kick–down.



2. 2 POSITION TEST

Shift into the 2 position and, while driving with the accelerator pedal held constantly at the full throttle valve opening position, check on the following points:

(a) Check to see that the 1–2 up–shift takes place and that the shift point conforms to it shown on the automatic shift schedule.

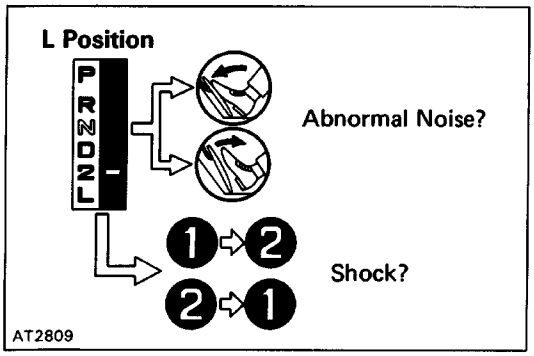


(b) While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.

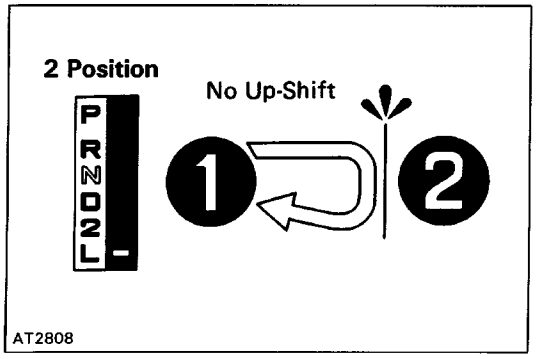
EVALUATION

If there is no engine braking effect:

- No. 1 brake is defective

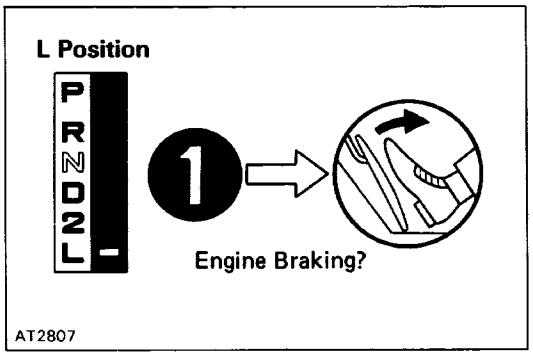


(c) Check for abnormal noise at acceleration and deceleration, and for shock at up–shift and down–shift.



3. L POSITION TEST

(a) While running in the L position, check to see that there is no up–shift to 2nd gear.

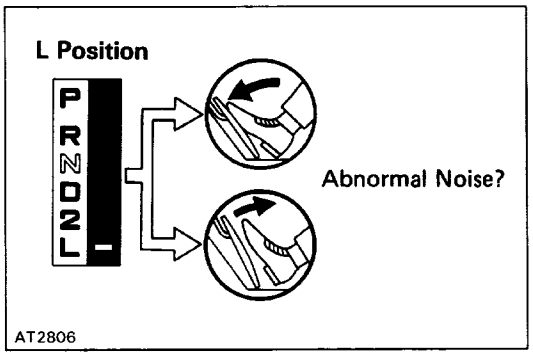


(b) While running in the L position, release the accelera–tor pedal and check the engine braking effect.

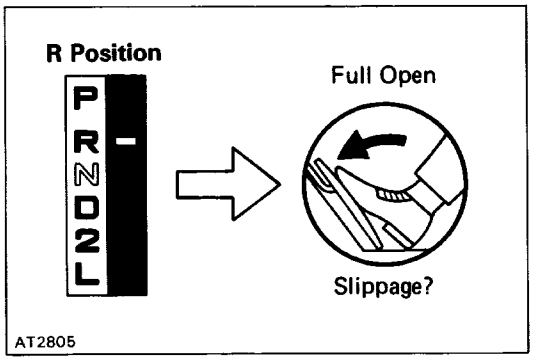
EVALUATION

If there is no engine braking effect:

- No–3 brake is defective

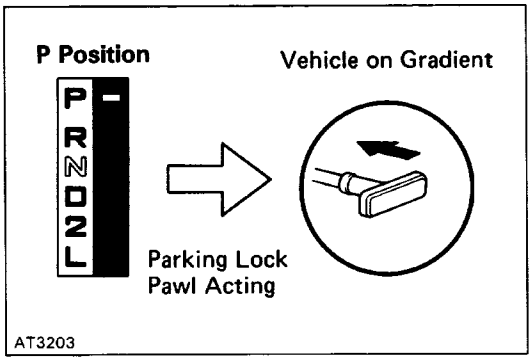


(c) Check for abnormal noise during acceleration and deceleration.



4. R POSITION TEST

Shift into the R position and, while starting at wide open throttle, check for slipping.



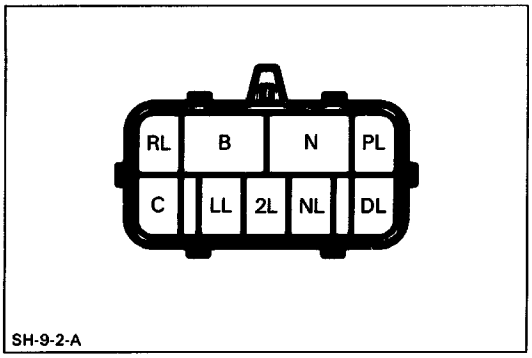
5. P POSITION TEST

Stop the vehicle on a gradient (more than 5°) and after shifting into the P position, release the parking brake. Then check to see that the parking lock pawl holds the vehicle in place.

Automatic Shift Schedule

Throttle valve fully open [ ] Fully closed						km/h (mph)
D position (2 position)						L position
1 → 2	2 → 3	[3 → O/D]	O/D → 3	3 → 2	2 → 1	2 → 1
57 – 73 (35 – 45)	106 – 124 (66 – 77)	38 – 52 (24 – 32)	*	95 – 112 (59 – 70)	36 – 49 (22 – 30)	46 – 62 (29 – 39)

* O/D–¿ 3 down–shift is possible up to maximum speed.



Park/Neutral Position Switch

INSPECTION OF PARK/NEUTRAL POSITION SWITCH

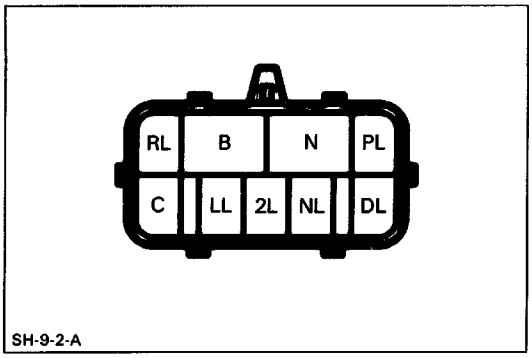
Inspect that there is continuity between each terminals.

Terminal / Shift Position	B	N	PL	RL	NL	DL	2L	LL	C
P	○—○		○						○
R				○					○
N	○—○				○				○
D						○			○
2							○		○
L								○	○

Automatic Shift Schedule

Throttle valve fully open [ ] Fully closed						km/h (mph)
D position (2 position)						L position
1 → 2	2 → 3	[3 → O/D]	O/D → 3	3 → 2	2 → 1	2 → 1
57 – 73 (35 – 45)	106 – 124 (66 – 77)	38 – 52 (24 – 32)	*	95 – 112 (59 – 70)	36 – 49 (22 – 30)	46 – 62 (29 – 39)

* O/D–¿ 3 down–shift is possible up to maximum speed.

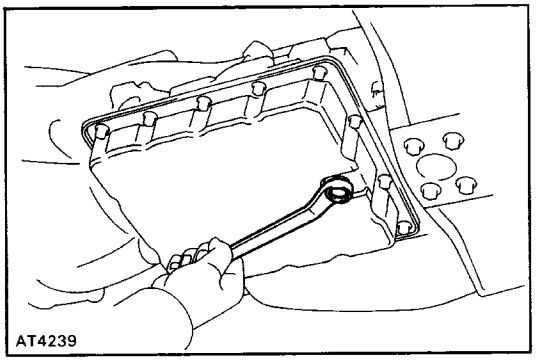


Park Neutral Position Switch

INSPECTION OF PARK/NEUTRAL POSITION SWITCH

Inspect that there is continuity between each terminals.

Shift Position \ Terminal	B	N	PL	RL	NL	DL	2L	LL	C
P	○—○		○						○
R				○					○
N	○—○				○				○
D						○			○
2							○		○
L								○	○


AT4239

ON–VEHICLE REPAIR

Valve Body

REMOVAL OF VALVE BODY

1. CLEAN TRANSMISSION EXTERIOR

To prevent contamination, clean the exterior of the trans–mission.

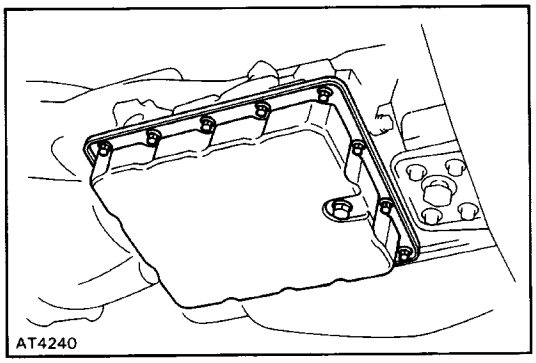
2. DRAIN TRANSMISSION FLUID

Remove the drain plug and the fluid into a suitable con–tainer.

3. REMOVE OIL PAN, FILLER TUBE AND GASKET

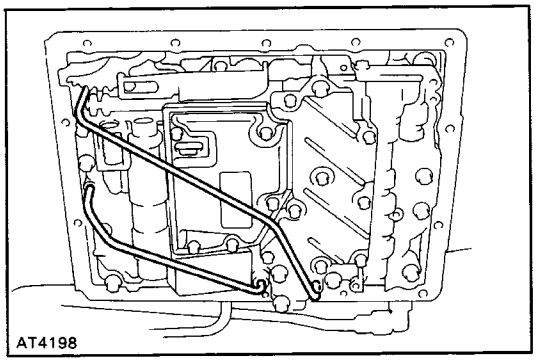
NOTICE: Some fluid will remain in the oil pan. Be careful not to damage the filler tube and O–ring.

Remove all pan bolts, and carefully remove the pan as–sembly. Discard the gasket.


AT4240

4. REMOVE OIL TUBES

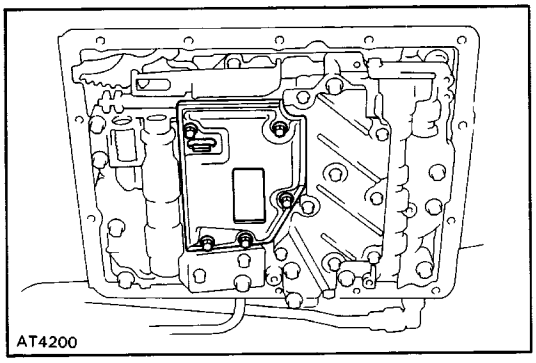
Pry up both tube ends with a large screwdriver and re–move the tubes.


AT4198

5. REMOVE OIL STRAINER

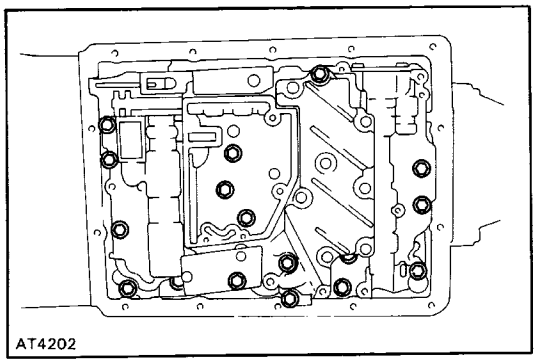
Remove the six bolts, and the oil strainer.

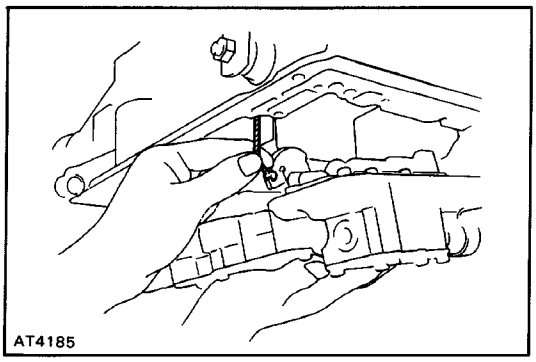
NOTICE: Be careful as some oil will come out with the filter.


AT4200

6. REMOVE VALVE BODY

(a) Remove the seventeen bolts.


AT4202

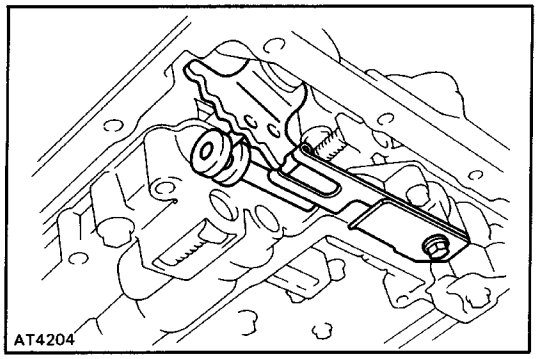


(b) Disconnect the throttle cable from the cam and remove the valve body.

INSTALLATION OF VALVE BODY

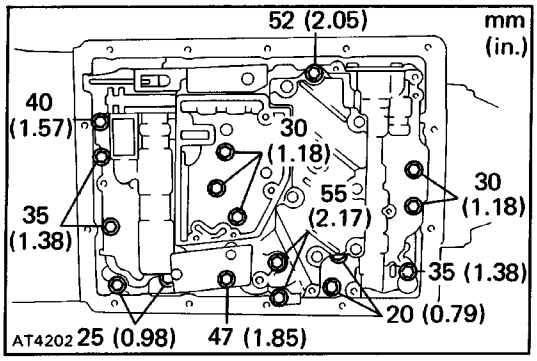
1. CONNECT THROTTLE CABLE TO CAM

Push the cable fitting into the cam.



2. INSTALL VALVE BODY

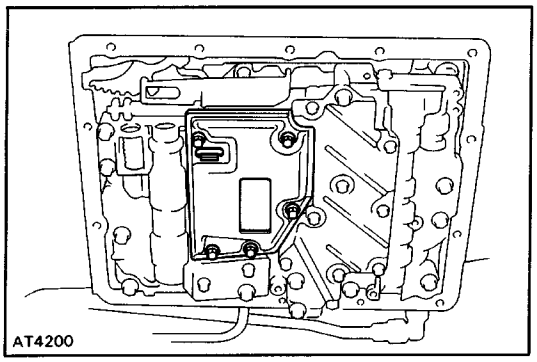
(a) Align the manual valve lever with the manual valve.



(b) Finger tighten the all bolts first. Then tighten the bolts evenly.

HINT: Each bolt length (mm, in.) is indicated in the figure.

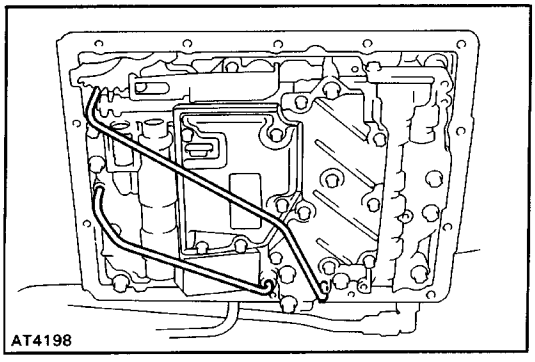
Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)



3. INSTALL OIL STRAINER

Be sure the screen is clean. Torque the bolts.

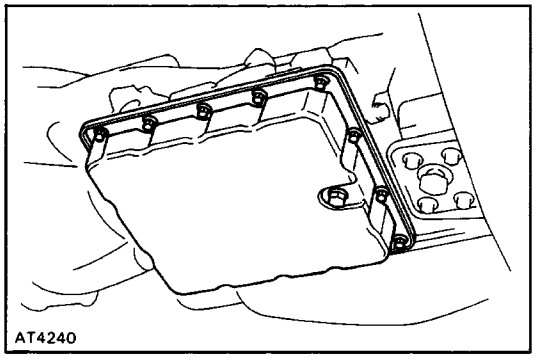
Torque: 5.4 N–m (55 kgf–cm, 48 in.¿lbf)



4. INSTALL OIL TUBES

Tap the tubes with a plastic hammer to install them into the positions in the figure.

NOTICE: Be careful not to bend or damage the tubes.



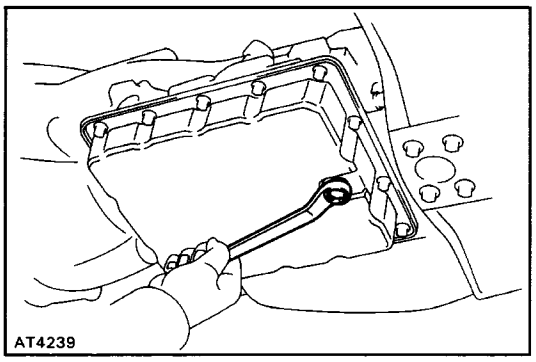
5. INSTALL PAN WITH NEW GASKET

Be sure the pan is clean and the two magnets are in place.

NOTICE: Do not use gasket sealer.

Tighten the bolts evenly.

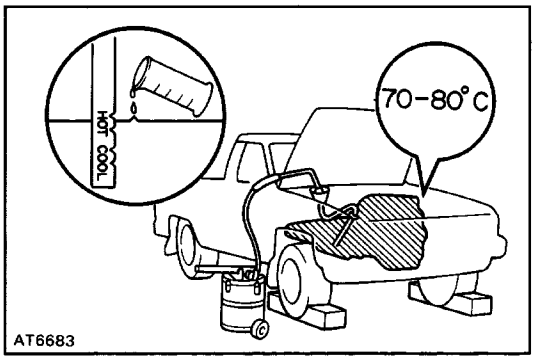
Torque: 5.4 N–m (55 kgf–cm, 48 in.¿lbf)



6. INSTALL DRAIN PLUG

Torque the drain plug.

Torque: 20 N–m (205 kgf–cm, 15 ft–lbf)

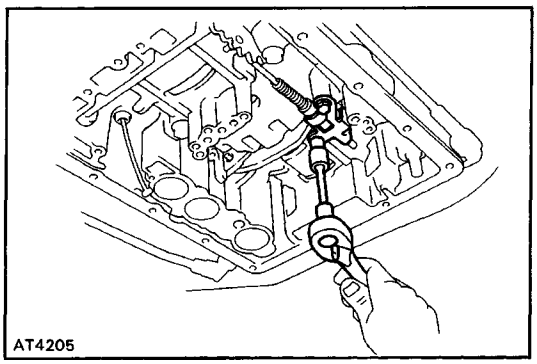


7. FILL TRANSMISSION WITH ATF

Add only about two liters of ATF. Start the engine and shift through all the positions. Check the fluid level and add as necessary.

NOTICE: Do not overfill.

Fluid type: ATF DEXRON□II



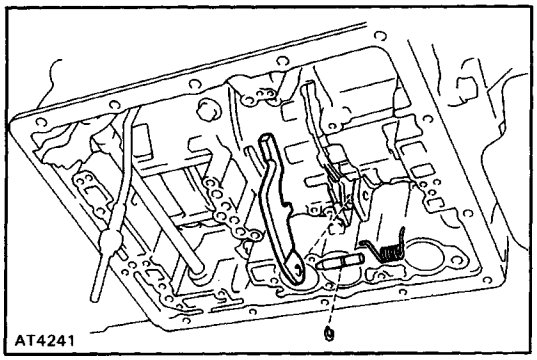
Parking Lock Pawl

REMOVAL OF PARKING LOCK PAWL

1. REMOVE VALVE BODY (See page AT–28)

2. REMOVE PARKING LOCK PAWL BRACKET

Remove the two bolts and the bracket.



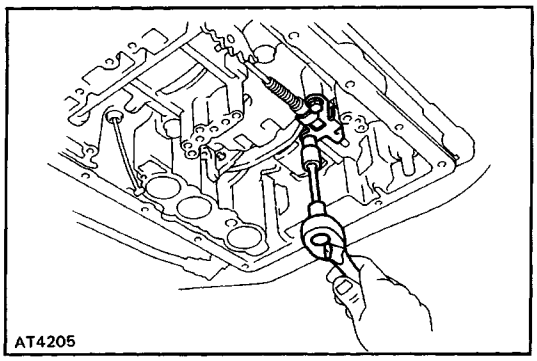
3. REMOVE SPRING FROM PARKING LOCK PAWL PIVOT PIN

4. REMOVE PIVOT PIN AND PARKING LOCK PAWL

INSTALLATION OF PARKING LOCK PAWL

1. INSTALL PARKING LOCK PAWL AND PIVOT PIN

2. INSTALL SPRING



3. INSTALL VALVE BODY (See page AT–29)

(a) Push lock rod fully toward.

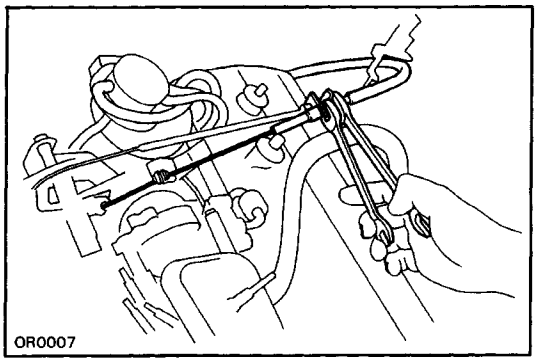
(b) Install the two bolts finger tight

(c) Check that the pawl operates smoothly.

(d) Torque the bolts.

Torque: 7.4 N.m (75 kgf.cm, 65 in.· lbf)

4. INSTALL VALVE BODY (See page AT–29)



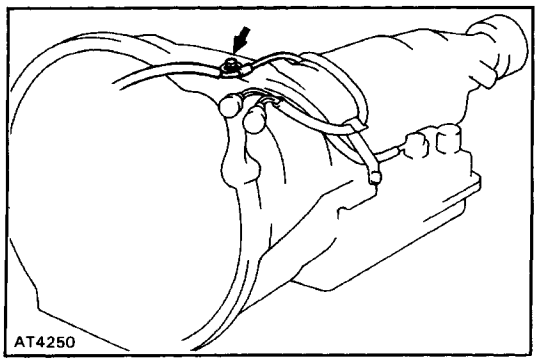
Throttle Cable

REMOVAL OF THROTTLE CABLE

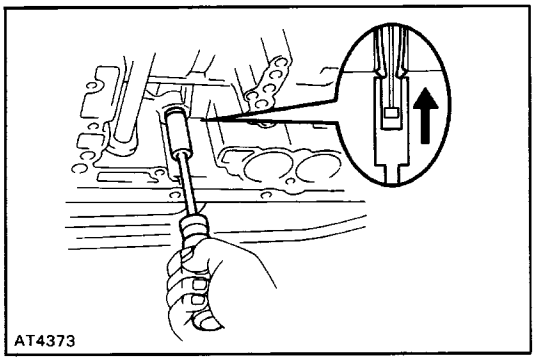
1. DISCONNECT THROTTLE CABLE

(a) Disconnect the cable housing from the bracket.

(b) Disconnect the cable from the throttle linkage.



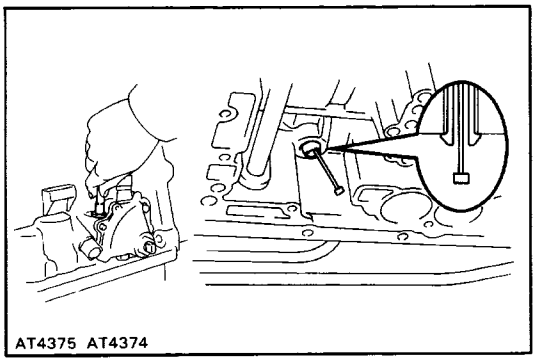
(c) Disconnect the cable from the torque converter clutch housing.



2. REMOVE VALVE BODY (See page AT–28)

3. PUSH THROTTLE CABLE OUT OF TRANSMISSION CASE

Using a 10–mm socket, push the throttle cable out.

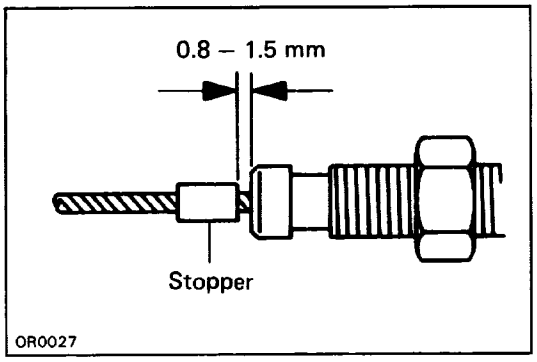


INSTALLATION OF THROTTLE CABLE

1. INSTALL CABLE IN TRANSMISSION CASE

Be sure to push it in all the way.

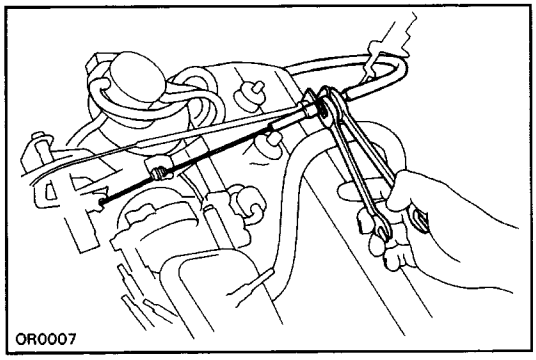
2. INSTALL VALVE BODY (See page AT–29)



3. IF THROTTLE CABLE IS NEW, STAKE STOPPER ON INNER CABLE

(a) Pull the inner cable lightly until a slight resistance is felt, and hold it.

(b) Stake the stopper as shown, 0.8–1.5 mm (0.031 –0.059 in.) in width.



4. CONNECT THROTTLE CABLE

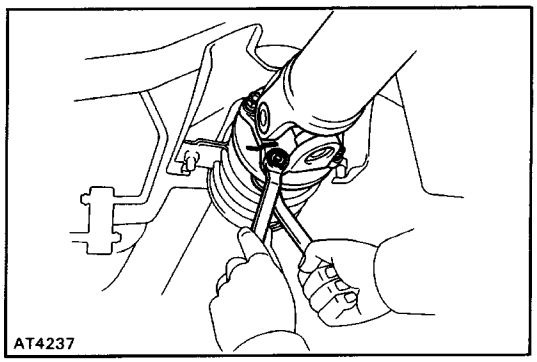
(a) Connect the cable to the throttle linkage.

(b) Connect the cable housing to the bracket.

(c) Connect the cable to the torque converter clutch housing.

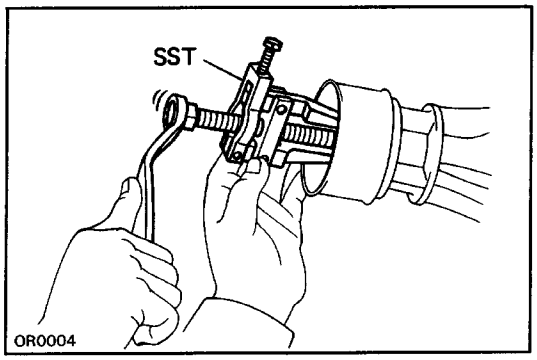
5. ADJUST THROTTLE CABLE (See page AT–15)

6. TEST DRIVE VEHICLE

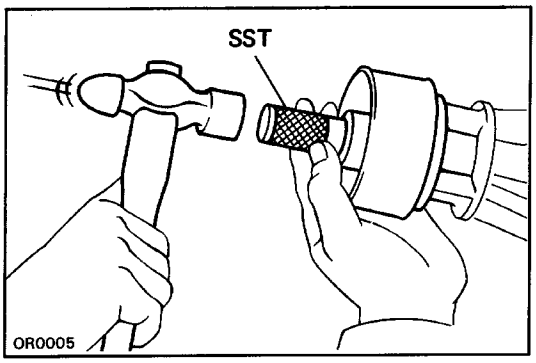


Extension Housing
REPLACEMENT OF OIL SEAL

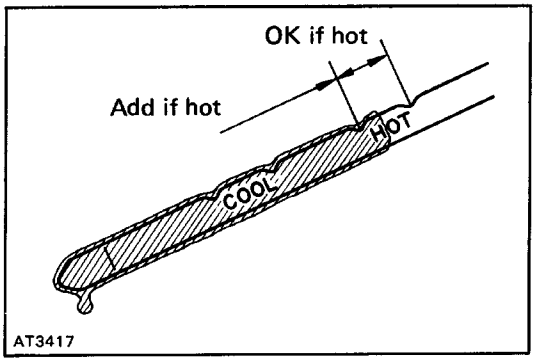
1. **RAISE VEHICLE, AND POSITION PAN TO CATCH ANY FLUID THAT MAY DRIP**
2. **REMOVE PROPELLER SHAFT**



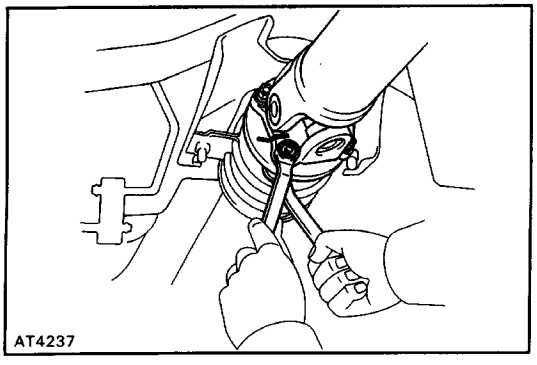
3. **REMOVE REAR OIL SEAL**
   NOTICE: Clean the rear extension housing before removing the seal.
   Using SST, remove the oil seal.
   SST 09308–10010



4. **INSTALL NEW OIL SEAL**
   Using SST, drive in a new oil seal as far as it will go.
   SST 0932 5–20010



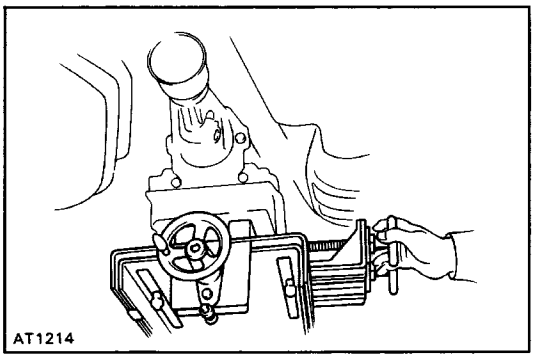
5. **INSTALL PROPELLER SHAFT**
6. **LOWER VEHICLE AND CHECK FLUID LEVEL**
   Start the engine, shift the shift lever into each position and, then check the fluid level with the transmission in P position.
   Add fluid as necessary.
   NOTICE: Do not overfill.
   Fluid type: ATF DEXRON¿II



REMOVAL OF EXTENSION HOUSING

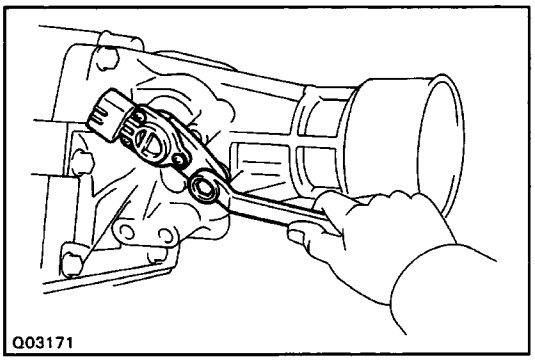
1. **RAISE VEHICLE AND POSITION PAN TO CATCH ANY FLUID THAT MAY DRIP**

2. **REMOVE PROPELLER SHAFT**



3. JACK UP TRANSMISSION SLIGHTLY

Securely support the transmission on a transmission jack. Lift the transmission slightly to remove weight from the rear support member.

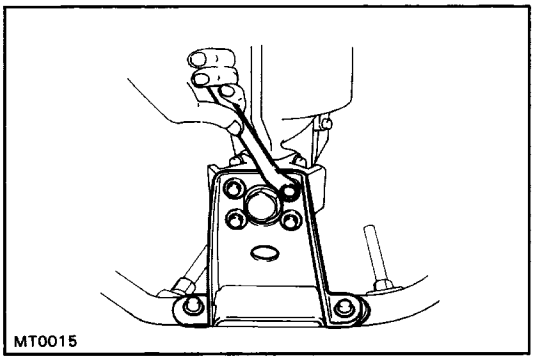


4. DISCONNECT CONNECTOR

5. REMOVE NO. 1 VEHICLE SPEED SENSOR

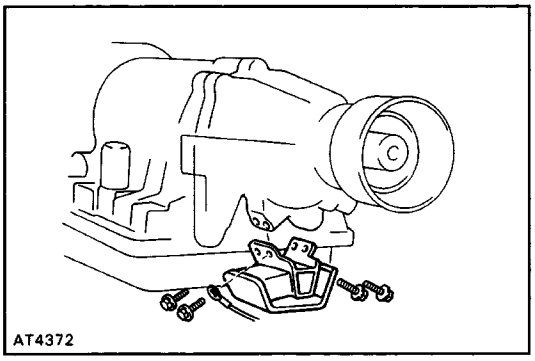
(a) Remove the bolt and the vehicle speed sensor.

(b) Remove the 0–ring from the sensor.



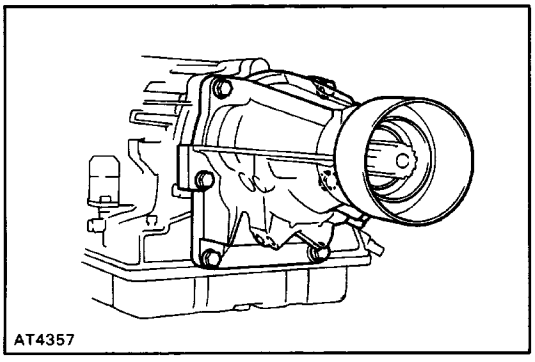
6. DISCONNECT ENGINE REAR MOUNTING FROM BRACKET

Remove four bolts from the bracket.



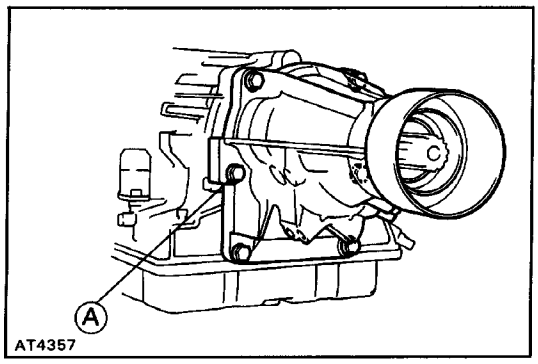
7. REMOVE ENGINE REAR MOUNTING FROM EXTENSION HOUSING

Remove four bolts and the engine rear mounting from the extension housing.



8. REMOVE EXTENSION HOUSING AND GASKET

Remove the six bolts. If necessary, tap the extension housing with a plastic hammer or wooden block to loosen it.



INSTALLATION OF EXTENSION HOUSING

1. INSTALL NEW GASKET AND EXTENSION HOUSING ON TRANSMISSION

(a) Clean the threads of the¿¿bolt and bolt hole.

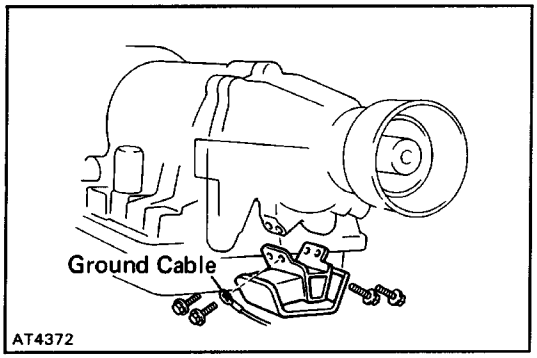
(b) Coat the threads of the¿¿bolt with sealant.

Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Install the extension housing over a new gasket with bolts, and then torque them.

HINT: The two lower bolts are shorter.

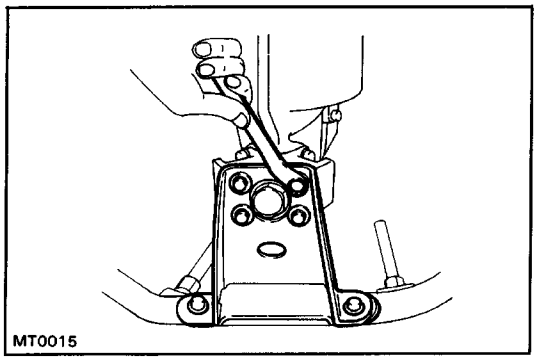
Torque: 34 N–m (345 kgf–cm, 25 ft–lbf)



2. INSTALL ENGINE REAR MOUNTING

(a) Install the engine rear mounting to the extension housing. Tighten the four bolts.

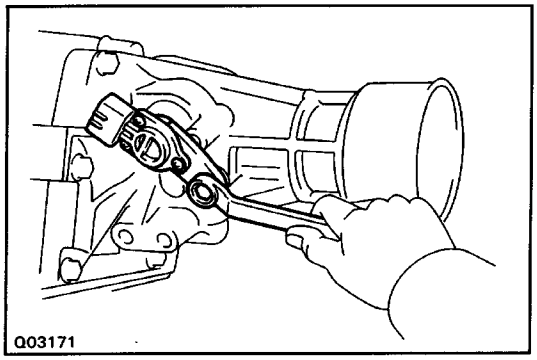
Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)



(b) Lower and rest the transmission on the mounting bracket.

(c) Connect the mounting to the bracket. Tighten the four bolts.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



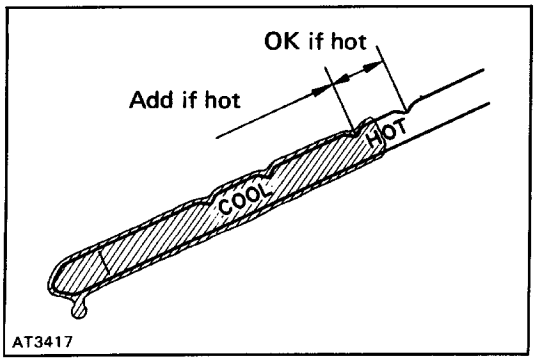
3. INSTALL PROPELLER SHAFT

4. INSTALL NO. 1 VEHICLE SPEED SENSOR

(a) Install a new O–ring on the sensor.

(b) Install the vehicle speed sensor with the bolt.

5. CONNECT CONNECTOR



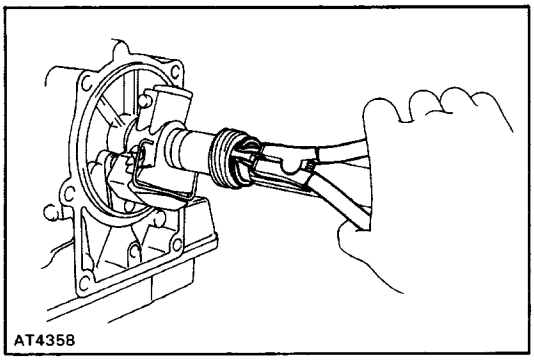
6. LOWER VEHICLE AND CHECK FLUID LEVEL

Start the engine, shift the shift lever into each position, and then check the fluid level with the transmission in P position.

Add fluid as necessary.

NOTICE: Do not overfill.

Fluid type: ATF DEXRON®II



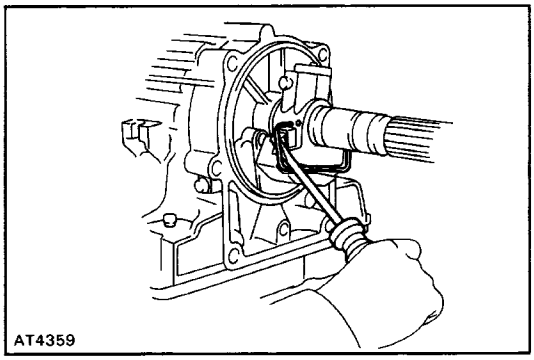
Governor Body

REMOVAL OF GOVERNOR BODY

1. REMOVE EXTENSION HOUSING (See page AT–33)

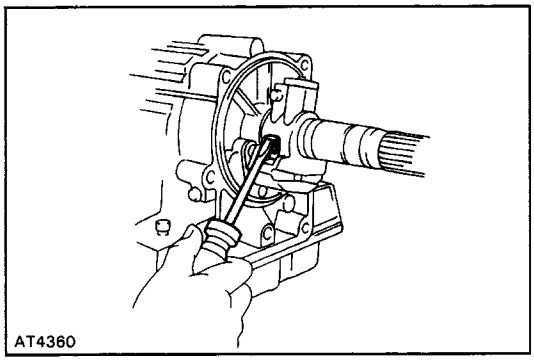
2. REMOVE SPEEDOMETER DRIVE GEAR

(a) Using snap ring pliers, remove the snap ring.
(b) Slide off the speedometer gear.
(e) Remove the lock ball and the outer snap ring.



3. REMOVE GOVERNOR FROM OUTPUT SHAFT

(a) Using a large screwdriver, remove the retaining clip.

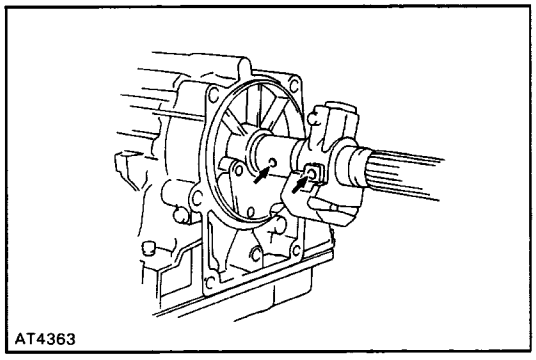


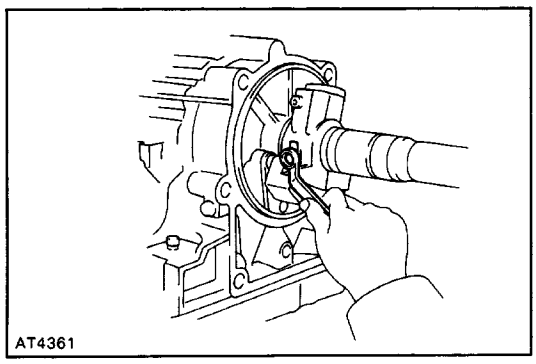
(b) Unstake the lock plate, remove the bolt and lock plate.
(c) Remove the governor body.

INSTALLATION OF GOVERNOR BODY

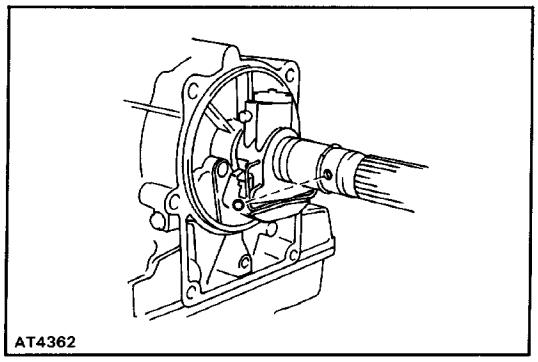
1. INSTALL GOVERNOR ON OUTPUT SHAFT

(a) Align the governor body and bolt hole on the output shaft.



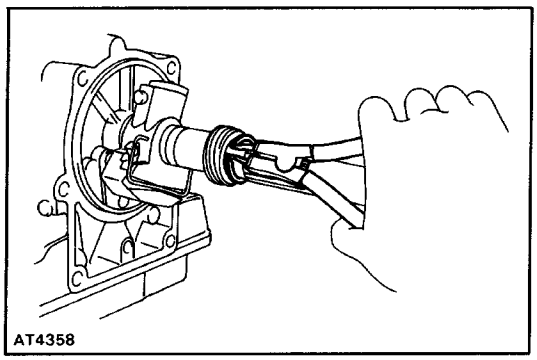


(b) Install the bolt and lock plate, stake the lock plate.
(c) Using a large screwdriver, install the retaining clip into the hole in the output shaft.
(d) Check that the governor assembly is secure.



2. INSTALL SPEEDOMETER DRIVE GEAR

(a) Install the snap ring and lock ball.



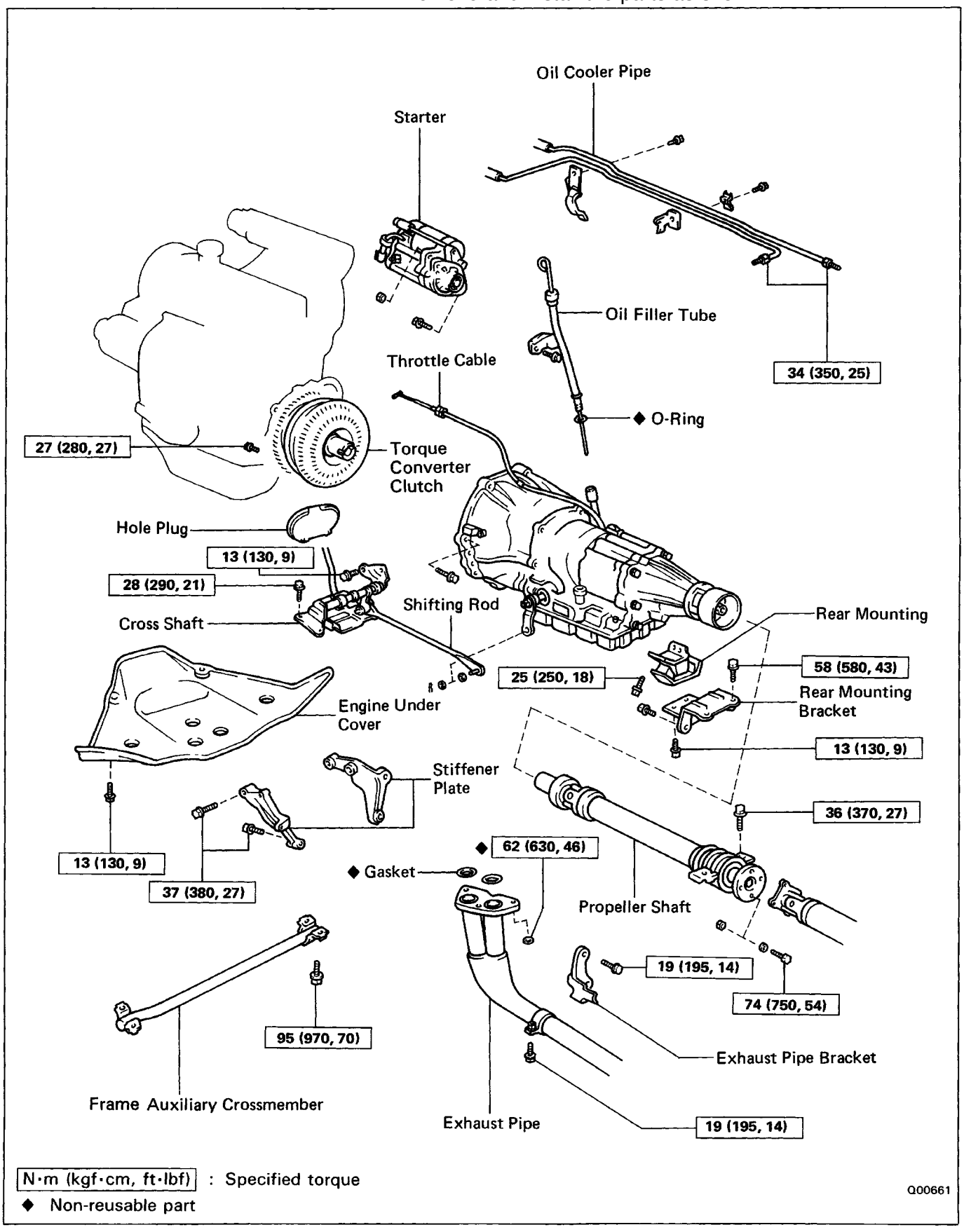
(b) Slide the speedometer drive gear on the shaft.

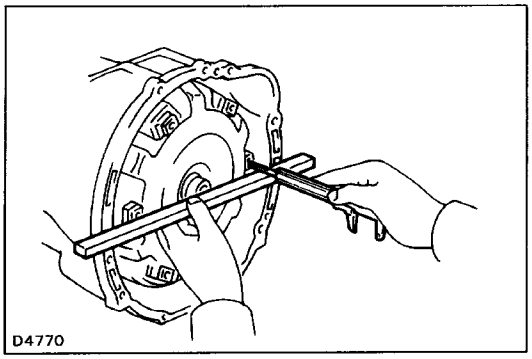
(c) Using snap ring pliers, install the outer snap ring.

3. INSTALL EXTENSION HOUSING (See page AT–34)

REMOVAL AND INSTALLATION OF TRANSMISSION

Remove and install the parts as shown.





(MAIN POINT OF INSTALLATION)

1. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

Using calipers and a straight edge, measure from the installed surface of the torque converter clutch to the front surface of the transmission housing.

Correct distance: 20.0 mm (0.787 in.)

If the distance is less than the standard, check for an improper installation.

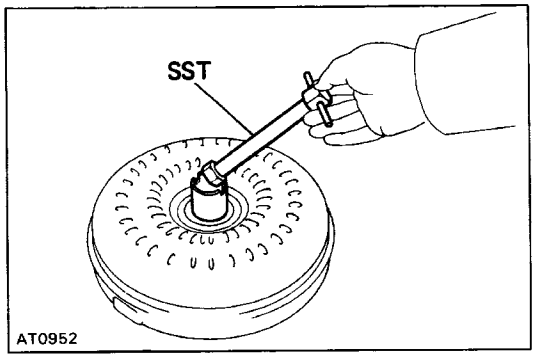
2. ADJUST TRANSMISSION THROTTLE CABLE

(See page AT–15)

3. FILL TRANSMISSION WITH ATF AND CHECK FLUID LEVEL

Fluid type: ATF DEXRON® II

NOTICE: Do not overfill.

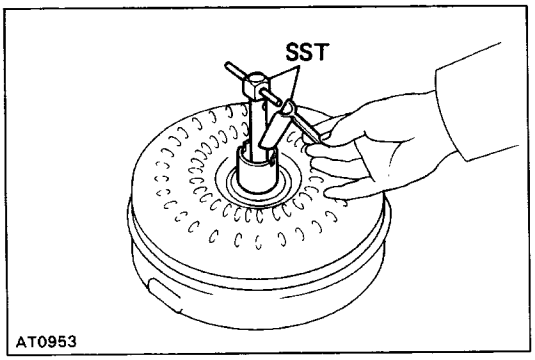


TORQUE CONVERTER CLUTCH AND DRIVE PLATE

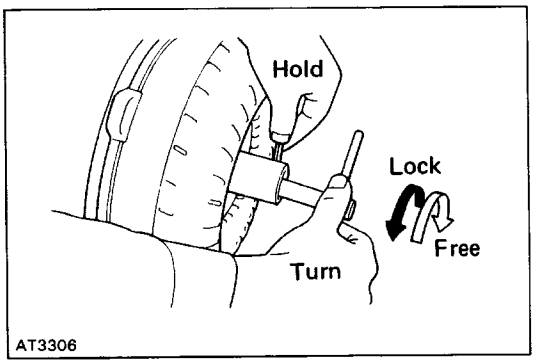
INSPECTION OF TORQUE CONVERTER CLUTCH AND DRIVE PLATE

1. INSPECT ONE–WAY CLUTCH

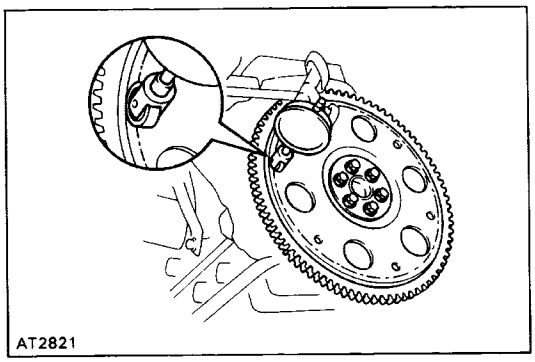
(a) Install SST into the inner race of the one–way clutch.
SST 09350–20015 (09397–22020)



(b) Install SST so that it fits in the notch of the converter hub and outer race of the one–way clutch.
SST 09350–20015 (09397–22020)



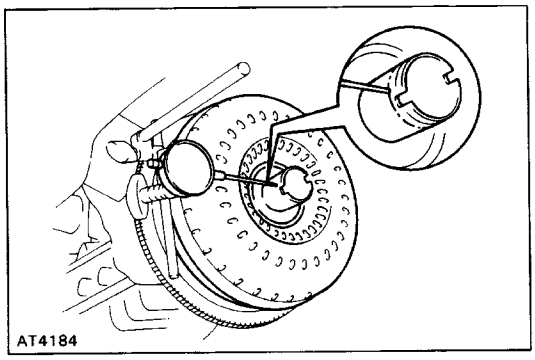
(c) With the torque converter clutch standing on its side, the clutch locks when turned counterclockwise, and rotates freely and smoothly clockwise.
If necessary, clean the converter and retest the clutch.
Replace the converter if the clutch still fails the test.



2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

Set up a dial indicator and measure the drive plate runout.
If runout exceeds 0.20 mm (0.0079 in.) or if the ring gear is damaged, replace the drive plate. If installing a new drive plate, note the orientation of spacers and tighten the bolts.

Torque: 83 N–m (850 kgf–cm, 61 ft–lbf)



3. MEASURE TORQUE CONVERTER CLUTCH SLEEVE RUNOUT

(a) Temporarily mount the torque converter clutch to the drive plate. Set up a dial indicator.
If runout exceeds 0.30 mm (0.0118 in.), try to correct by reorienting the installation of the converter. If excessive runout cannot be corrected, replace the torque converter clutch.
HINT: Mark the position of the converter to ensure cor rect installation.

(b) Remove the torque converter clutch.

A340E Automatic Transmission

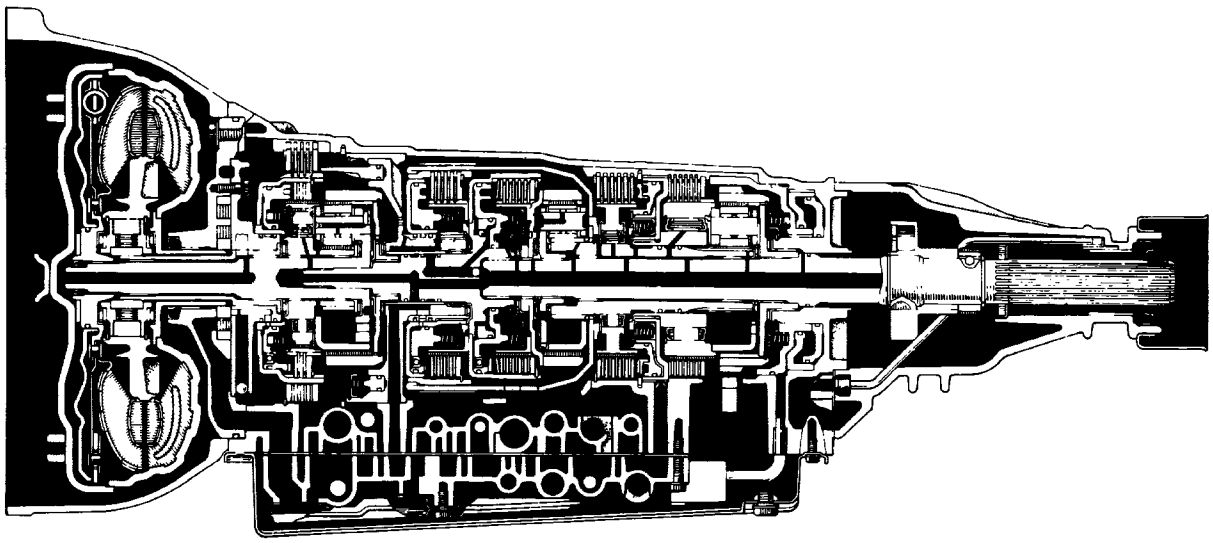
DESCRIPTION

General

The A340E is a 4–speed, Electronic Controlled Transmission developed for use with high–performance engine such as the 3VZ–E. A lock–up mechanism is built into the torque converter clutch.

The A340E automatic transmission is mainly composed of the torque converter clutch, the overdrive (hereafter called O/D) planetary gear unit, 3–speed planetary gear unit, the hydraulic control system and the electronic control system.

Sectional View



D1328

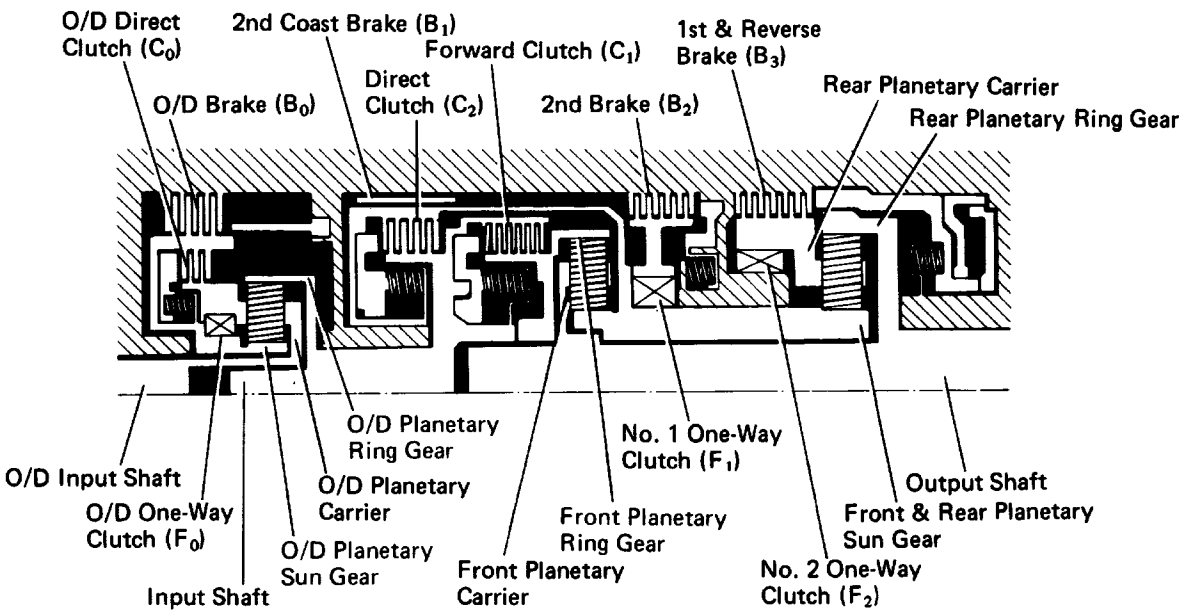
General Specifications

Type of Transmission				A340E
Type of Engine				3VZ-E
Torque Converter Clutch	Stall Torque Ratio			C&C 2.0 : 1 Others 2.1 : 1
	Lock–Up Mechanism			Equipped
Gear Ratio	1 st Gear			2.804
	2nd Gear			1.531
	3rd Gear			1.000
	O/D Gear			0.705
	Reverse Gear			2.393
Plates (Disc/Plate)	C_0	O/D Direct Clutch		2/2
	C_1	Forward Clutch		5/5
	C_2	Direct Clutch		4/4
	B_2	2nd Brake		5/5
	B_3	1 st & Reverse Brake		6/6
	B_0	O/D Brake		4/3
ATF	Type			ATF DEXRON® II
	Capacity liter (US qts, Imp.qts)		Total	7.2 (7.6, 6.3)
			Drain and Refill	1.6 (1.7, 1.4)

OPERATION

Mechanical Operation

OPERATING CONDITIONS



AT2157

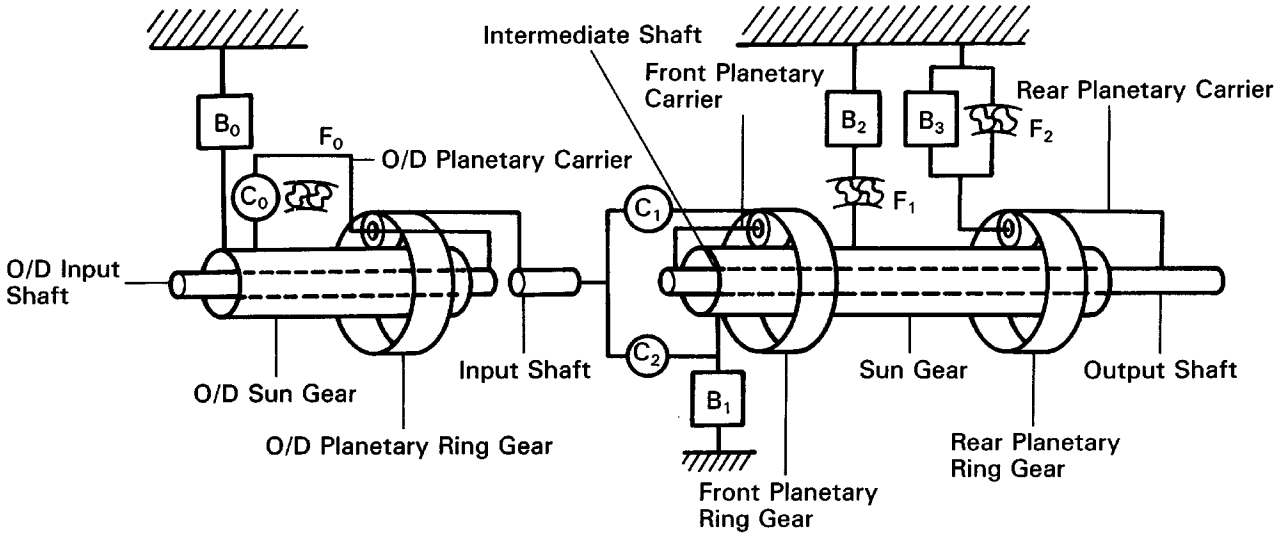
○ ..... Operating

Shift lever position	Gear position	C_0	C_1	C_2	B_0	B_1	B_2	B_3	F_0	F_1	F_2
P	Parking	○									
R	Reverse	○		○				○	○		
N	Neutral	○									
D	1 st	○	○						○		○
	2nd	○	○				○		○	○	
	3rd	○	○	○			○		○		
	O/D		○	○	○		○				
2	1 st	○	○						○		○
	2nd	○	○			○	○		○	○	
	3rd	○	○	○			○		○		
L	1 st	○	○					○	○		○
	* 2nd	○	○			○	○		○	○	

* Down–shift only in the L position and 2nd gear–no up–shift.

FUNCTION OF COMPONENTS

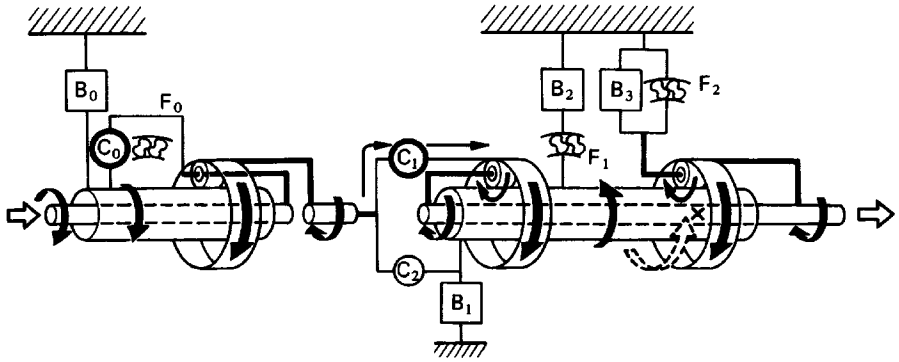
NOMENCLATURE	OPERATION
O/D Direct Clutch (C_o)	Connects overdrive sun gear and overdrive carrier
O/D Brake (BO)	Prevents overdrive sun gear from turning either clockwise or counterclockwise
O/D One–Way Clutch (Fo)	When transmission is being driven by engine, connects overdrive sun gear and overdrive carrier
Forward Clutch (Cl)	Connects input shaft and front planetary ring gear
Direct Clutch (C2)	Connects input shaft and front & rear planetary sun gear
2nd Coast Brake (Bl)	Prevents front & rear planetary sun gear from turning either clockwise or counterclockwise
2nd Brake (BZ)	Prevents outer race of F, from turning either clockwise or counterclockwise, thus preventing front & rear planetary sun gear from turning counterclockwise
1 st & Reverse Brake (B3)	Prevents rear planetary carrier from turning either clockwise or counterclockwise
No. 1 One–Way Clutch (Fl)	When B2 is operating, prevents front & rear planetary sun gear from turning counterclockwise
No.2 One–Way Clutch (F2)	Prevents rear planetary carrier from turning counterclockwise



FUNCTION OF COMPONENTS (Cont'd)

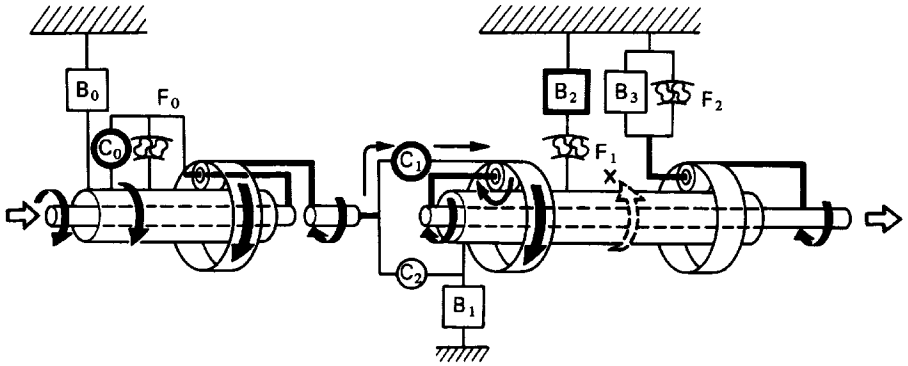
The conditions of operation for each gear position are shown in the following illustrations:

D or 2 Position 1st Gear



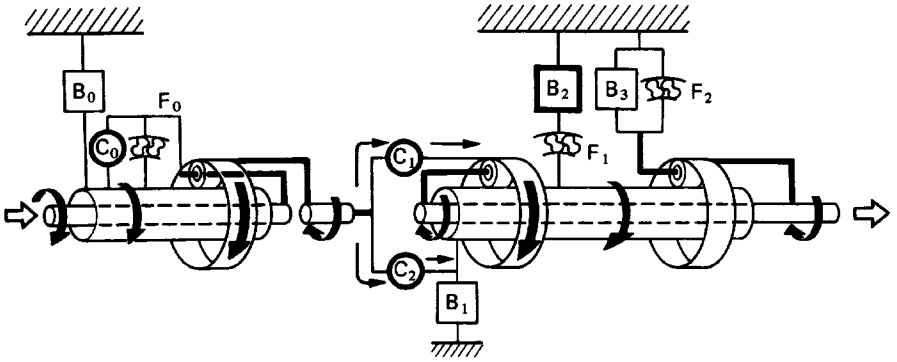
AT6675

D Position 2nd Gear



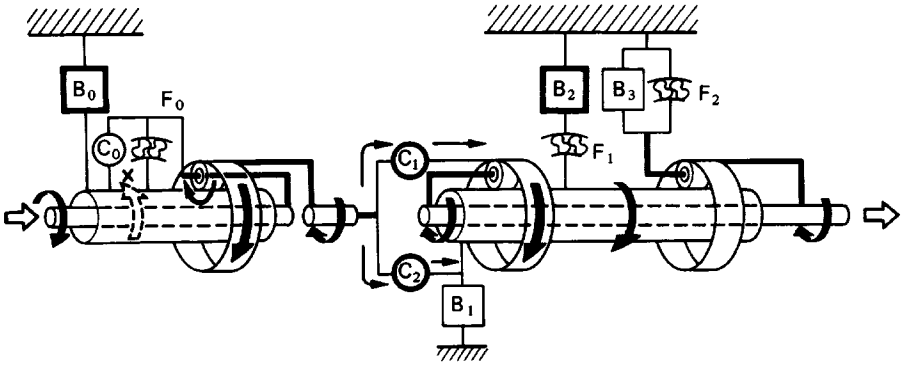
AT6676

D or 2 Position 3rd Gear



AT6677

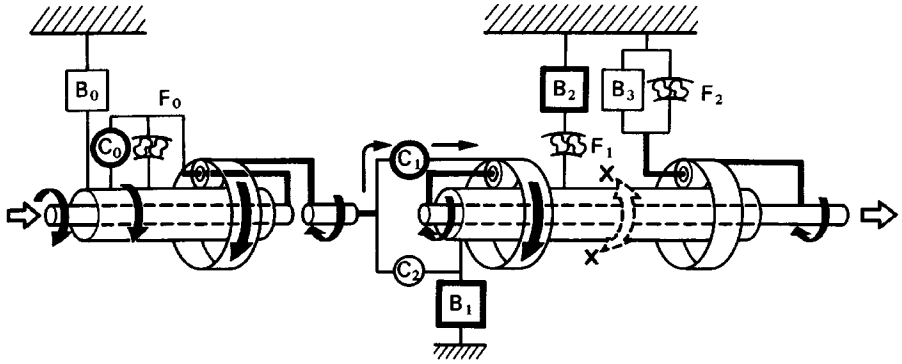
D Position O/D



AT6678

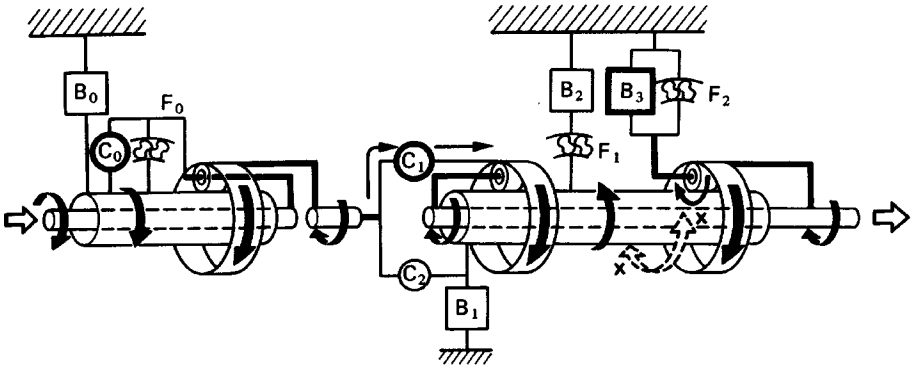
FUNCTION OF COMPONENTS (Cont'd)

2 or L Position 2nd Gear



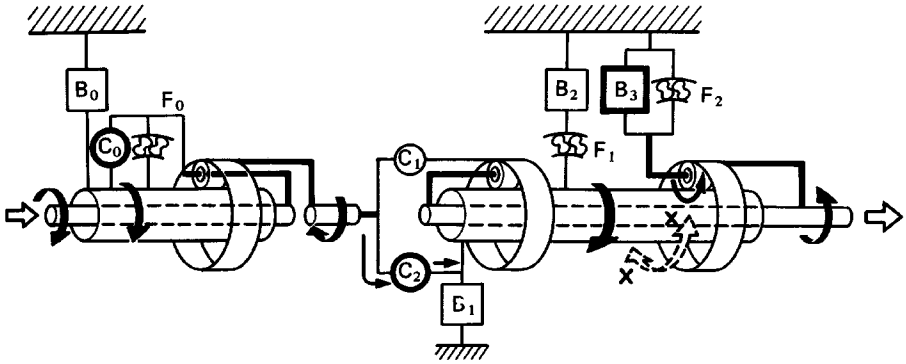
AT6679

L Position 1st Gear



AT6680

R Position Reverse Gear



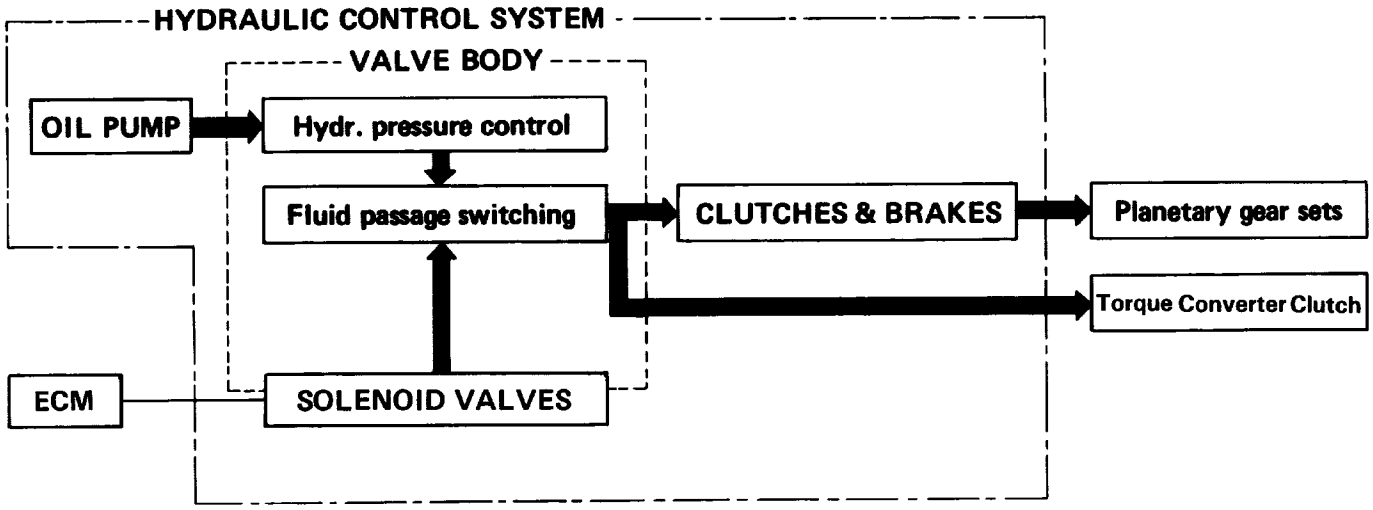
AT6681

HYDRAULIC CONTROL SYSTEM

The hydraulic control system is composed of the oil pump, the valve body, the solenoid valves, and the clutches and brakes, as well as the fluid passages which connect all of these components. Based on the hydraulic pressure created by the oil pump, the hydraulic control system governs the hydraulic pressure acting on the torque converter clutch, clutches and brakes in accordance with the vehicle driving condi–tions.

There are three solenoid valves on the valve body. These solenoid valves are turned on and off by signals from the ECM to operate the shift valves. These shift valves then switch the fluid passages so that fluid goes to the torque converter clutch and planetary gear units.

(Except for the solenoid valves, the hydraulic control system of the electronic controlled transmission is ba–sically the same as that of the fully hydraulic controlled automatic transmission.)



- **LINE PRESSURE**
  Line pressure is the most basic and important pressure used in the automatic transmission, because it is used to operate all of the clutches and brakes in the transmission.
  If the primary regulator valve does not operate correctly, line pressure will be either too high or too low. Line pressure that is too high will lead to shifting shock and consequent engine power loss due to the greater effort required of the oil pump; line pressure that is too low will cause slippage of clutches and brakes, which will, in extreme cases, prevent the vehicle from moving. Therefore, if either of these problems are noted, the line pressure should be measured to see if it is within stan–dard.
- **THROTTLE PRESSURE**
  Throttle pressure is always kept in accordance with the opening angle of the engine throttle valve. This throttle pressure acts on the primary regulator valve and, accordingly, line pressure is regulated in response to the throttle valve opening.
  In the fully hydraulic controlled automatic transmission, throttle pressure is used for regulating line
- Pressure and as signal pressure for up–shift and down–shift of the transmission. In the electronic
- controlled transmission, however, throttle pressure is used only for regulating line pressure. Conse quently, improper adjustment of the transmission throttle cable may result in a line pressure that is too high or too low. This, in turn, will lead to shifting shock or clutch and brake slippage.

ELECTRONIC CONTROL SYSTEM

The electronic control system, which controls the shift points and the operation of the lock–up clutch, is composed of the following three parts:

1. Sensors

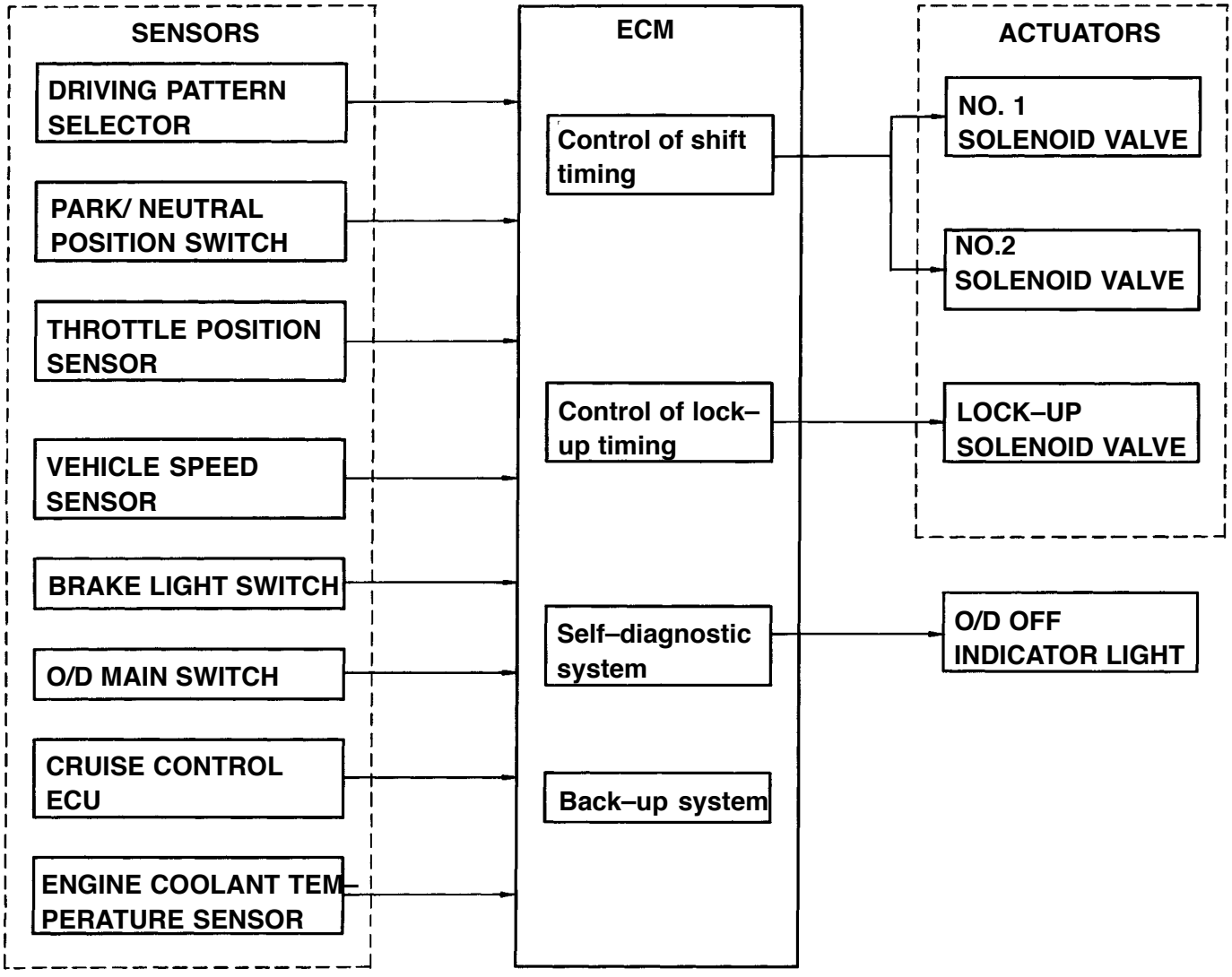
These sensors sense the vehicle speed, throttle opening and other conditions and send these data to the ECM in the form of electrical signals.

2. ECM

The ECM determines the shift and lock–up timing based upon the signals from sensors, and controls the solenoid valves of the hydraulic control unit accordingly.

3. Actuators

These are three solenoid valves that control hydraulic pressure acting on the hydraulic valves to control shifting and lock–up timing.



FUNCTION OF ECM

- **Control of Shift Timing**

  The ECM has programmed into its memory the optimum shift pattern for each shift lever position (D, 2, L position) and driving mode (Normal or Power).

  Based on the appropriate shift pattern, the ECM turns No. 1 and No.2 solenoid valves on or off in accordance with the vehicle speed signal from the vehicle speed sensor and the throttle opening signal from the throttle position sensor. In this manner, the ECM operates each shift valve, opening or closing the fluid passages to the clutches and brakes to permit up–shift or down–shift of the transmission.

  HINT: The electronic control system provides shift timing and lock–up control only while the vehicle is traveling forward. In REVERSE, PARK, and NEUTRAL, the transmission is mechanically, not electronically controlled.

- **Control of Overdrive**

  Driving in overdrive is possible if the O/D main switch is on and the shift lever is in the D position. However, when the vehicle is being driven using the cruise control system (CCS), if the actual vehicle speed drops to about 4 km/h (2 mph) below the set speed while the vehicle is running in overdrive, the CCS ECU sends a signal to the ECM to release the overdrive and prevent the transmission from shifting back into overdrive until the actual vehicle speed reaches the speed set in the CCS memory.

  On this model, if the engine coolant temperature falls below 70°C (158°F), preventing the transmission from up–shifting into overdrive.

- **Control of Lock–Up System**

  The ECM has programmed in its memory a lock–up clutch operation pattern for each driving mode (Normal or Power). Based on this lock–up pattern, the ECM turns lock–up solenoid valve on or off in accordance with the vehicle speed signals received from the vehicle speed sensor and the throttle opening signals from the throttle position sensor.

  Depending on whether lock–up solenoid valve is on or off, the lock–up relay valve performs changeover of the fluid passages for the converter pressure acting on the torque converter clutch to engage or disengage the lock–up clutch.

  (Mandatory Cancellation of Lock–Up System)

  If any of the following conditions exist, the ECM turns off lock–up solenoid valve to disengage the lock–up clutch.

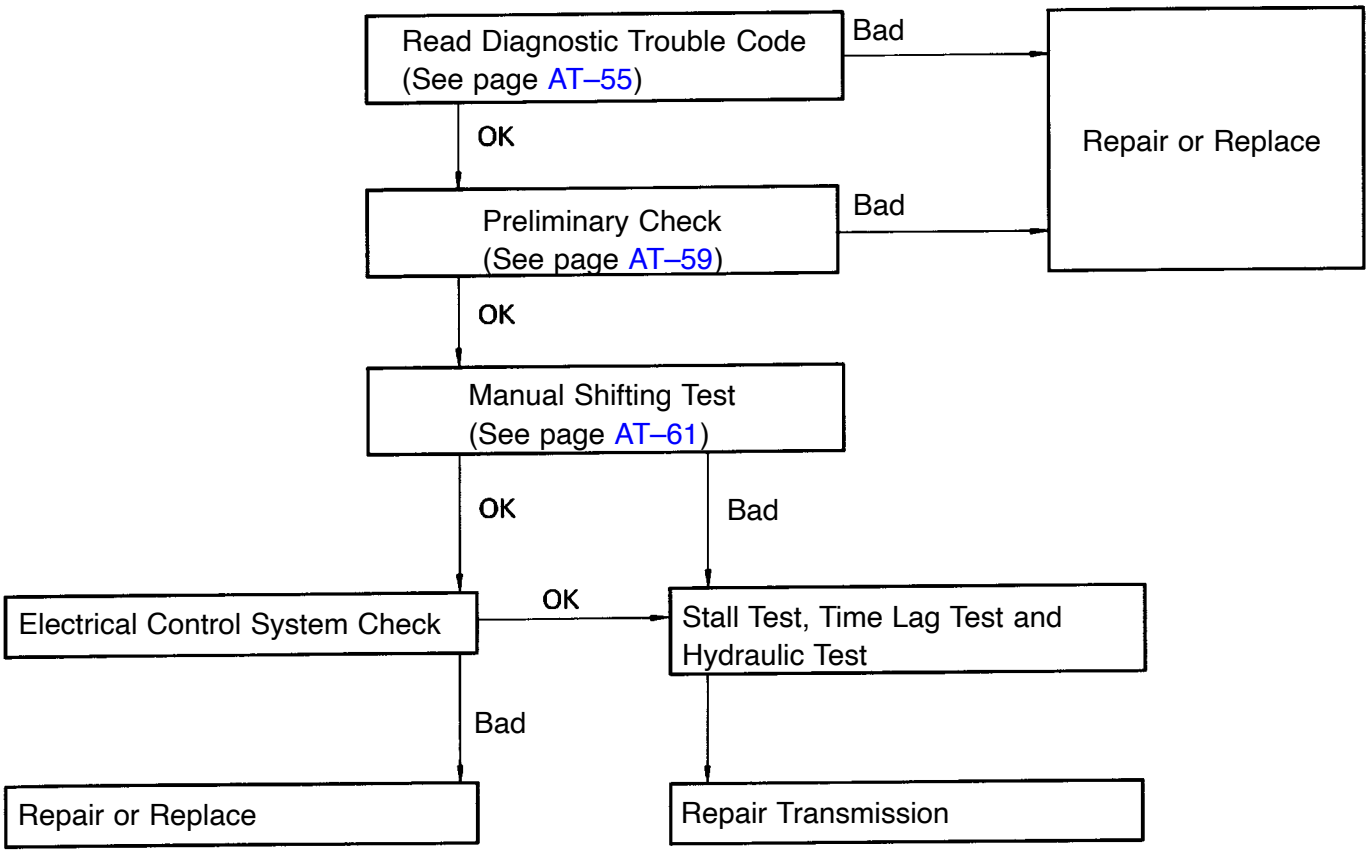
  1) The brake light switch comes on (during braking).
  2) The IDL points of the throttle position sensor close (throttle valve fully closed).
  3) The engine coolant temperature falls below 70°C (158°F).

  The purpose of 1) and 2) above is to prevent the engine from stalling if the rear wheels lock up. The purpose of 3) is to cause the torque converter clutch to operate to obtain torque multiplication. The purpose of 4) is both to improve general driveability, and to speed up transmission warm–up.

  Also, while the lock–up system is in operation, the ECM will temporarily turn it off during up–shift or down–shift in order to decrease shifting shock.

TROUBLESHOOTING
Basic Troubleshooting

Before troubleshooting an electronic controlled transmission, first determine whether the problem is electrical or mechanical. To do this, just refer to the basic troubleshooting flow–chart provided below.
If the cause is already known, using the basic troubleshooting chart below along with the general troubleshooting chart on the following pages should speed the procedure.



General Troubleshooting

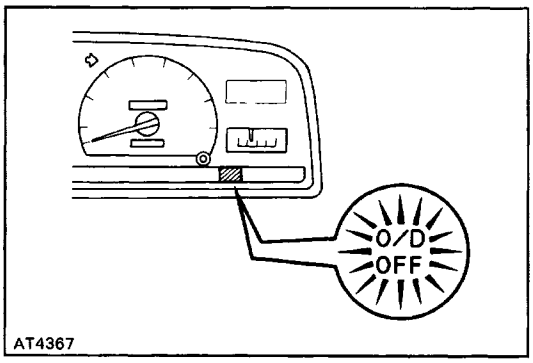
Problem	Possible cause	Remedy	Page
Fluid discolored or smells burnt	Fluid contaminated Torque converter clutch faulty Transmission faulty	Replace fluid Replace torque converter clutch Disassemble and inspect transmission	AT–59 AT–96
Vehicle does not move in any forward position or reverse	Manual linkage out of adjustment Valve body or primary regulator faulty Parking lock pawl faulty Torque converter clutch faulty Converter drive plate broken Oil pump intake screen blocked Transmission faulty	Adjust linkage Inspect valve body Inspect parking lock pawl Replace torque converter clutch Replace drive plate Clean screen Disassemble and inspect transmission	AT–60 AT–87 AT–96 AT–96
Shift lever position incorrect	Manual linkage out of adjustment Manual valve and lever faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–60
Harsh engagement into any drive position	Throttle cable out of adjustment Valve body or primary regulator faulty Accumulator pistons faulty Transmission faulty	Adjust throttle cable Inspect valve body Inspect accumulator pistons Disassemble and inspect transmission	AT–60
Delayed 1–2, 2–3 or 3–0/13 up–shift, or down–shift from O/D–3 or 3–2 and shifts back to O/D or 3	Electronic control faulty Valve body faulty Solenoid valve faulty	Inspect electronic control Inspect valve body Inspect solenoid valve	AT–63 AT–72
Slips on 1–2, 2–3 or 3–0/D up–shift, or slips or shudders on acceleration	Manual linkage out of adjustment Throttle cable out of adjustment Valve body faulty Solenoid valve faulty Transmission faulty	Adjust linkage Adjust throttle cable Inspect valve body Inspect solenoid valve Disassemble and inspect transmission	AT–60 AT–60 AT–72
Drag, binding or tie–up on 1–2, 2–3 or 3–O/D up–shift	Manual linkage out of adjustment Valve body faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–60

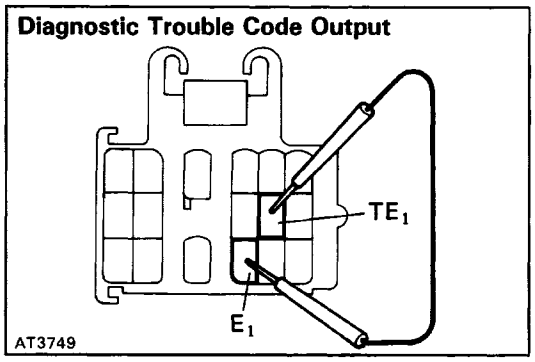
Remark ,k : Refer to A340E Automatic Transmission Repair Manual.
(Pub. No. RM271U)

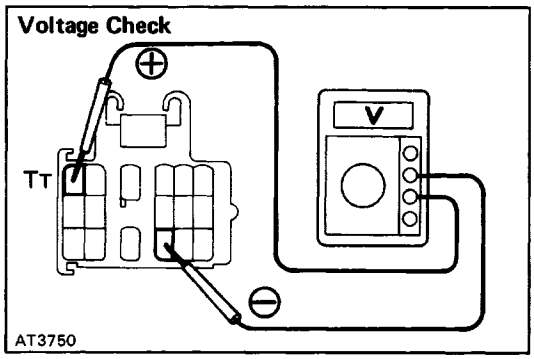
General Troubleshooting (Cont'd)

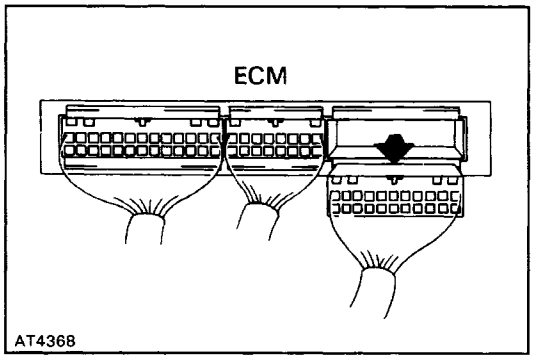
Problem	Possible cause	Remedy	Page
No lock–up in 2nd, 3rd or 01D	Electronic control faulty Valve body faulty Solenoid valve faulty Transmission faulty	Inspect electronic control Inspect valve body Inspect solenoid valve Disassemble and inspect transmission	AT–63 AT–72
Harsh down–shift	Throttle cable out of adjustment Throttle cable and cam faulty Accumulator pistons faulty Valve body faulty Transmission faulty	Adjust throttle cable Inspect throttle cable and cam Inspect accumulator pistons Inspect valve body Disassemble and inspect transmission	AT–60 AT–60
No down–shift when coasting	Valve body faulty Solenoid valve faulty Electronic control faulty	Inspect valve body Inspect solenoid valve Inspect electronic control	AT–72 AT–63
Down–shift occurs too quickly or too late while coasting	Throttle cable faulty Valve body faulty Transmission faulty Solenoid valve faulty Electronic control faulty	Inspect throttle cable Inspect valve body Disassemble and inspect transmission Inspect solenoid valve Inspect electronic control	AT–60 AT–72 AT–63
No O/D–3, 3–2 or 2–1 kick–down	Solenoid valve faulty Electronic control faulty Valve body faulty	Inspect solenoid valve Inspect electronic control Inspect valve body	AT–72 AT–63
No engine braking 2 or L position	Solenoid valve faulty Electronic control faulty Valve body faulty Transmission faulty	Inspect solenoid valve Inspect electronic control Inspect valve body Disassemble and inspect transmission	AT–72 AT–63
Vehicle does not hold in P	Manual linkage out of adjustment Parking lock pawl cam and spring faulty	Adjust linkage Inspect cam and spring	AT–60 AT–87

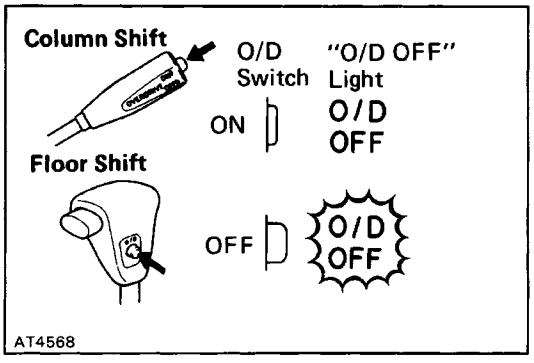
Remark *: Refer to A340E Automatic Transmission Repair Manual. (Pub. No. RM271U)











Diagnosis System

DESCRIPTION

1. A self–diagnosis function is built into the electrical control system. Warning is indicated by the overdrive OFF indicator light.

   HINT: Warning and diagnostic trouble codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light is lit continuously and will not blink.

   (a) If a malfunction occurs within the vehicle speed sensors (No. 1 or 2) or solenoids (No. 1 or 2), the overdrive OFF light will blink to warn the driver. However, there will be no warning of a malfunction with lock–up solenoid.

   (b) The diagnostic trouble code can be read by the number of blinks of the overdrive OFF indicator light when terminals TIE, and E I are connected. (See page AT–56)

   (c) The throttle position sensor or brake signal are not indicated, but inspection can be made by checking the voltage at terminal TT of the data link connector 1.

   (d) The signals to each gear can be checked by measuring the voltage at terminal TT of the data link connector 1 while driving.

2. The diagnostic trouble code is retained in memory by the ECM and due to back–up voltage, is not canceled out when the engine is turned off. Consequently, after repair, it is necessary to turn the ignition switch off and remove the MFI fuse (15A) or disconnect the EC M connector to cancel out the diagnostic trouble code. (See page AT–56)

   HINT:

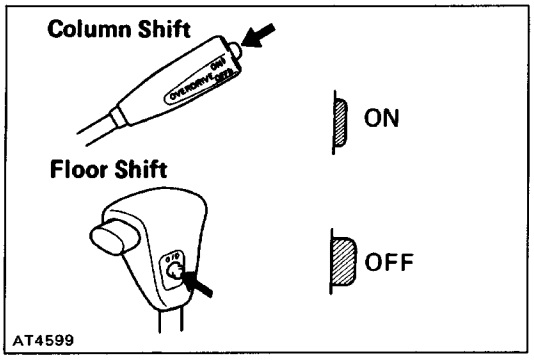
   Low battery positive voltage will cause faulty operation of the diagnosis system. Therefore, always check the battery first.

   Use a voltmeter and ohmmeter that have an impedance of at least 10 kΩ/v.

CHECK "O/D OFF" INDICATOR LIGHT

1. Turn the ignition switch ON.
2. The "O/D OFF" light will come on when the O/D switch is placed at OFF.
3. When the O/D switch is set to ON, the–O/D OFF" light should go out.

If the–O/D OFF" light flashes when the O/D switch is set to ON, the electronic control system is faulty.

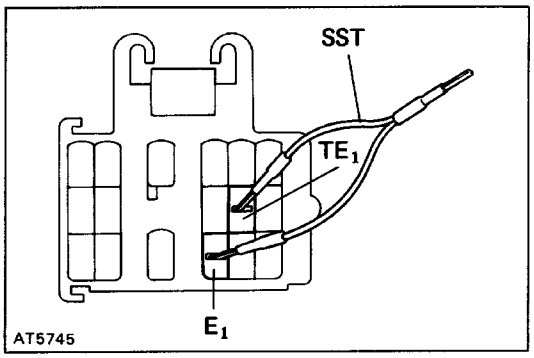


READ DIAGNOSTIC TROUBLE CODE

1. TURN IGNITION SWITCH AND O/D SWITCH TO ON

Do not start the engine.

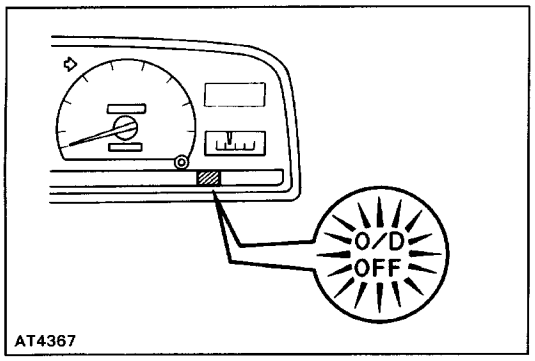
HINT: Warning and diagnostic trouble codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light will light continuously and will not blink.



2. CONNECT TE, AND E, TERMINALS OF DATA LINK CONNECTOR 1

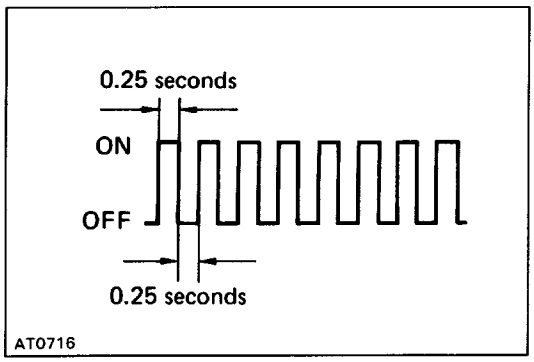
Using a SST, connect terminals TE, and E , of the data link connector 1.

SST 09843–18020



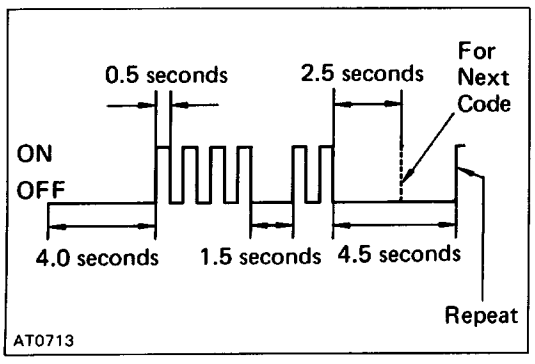
3. READ DIAGNOSTIC TROUBLE CODE

Read the diagnostic trouble code as indicated by the number of times the O/D OFF light flashes.



(Diagnostic Trouble Code Indication)

- If the system is operating normally, the light will flash 2 times per second.



- In the event of a malfunction, the light will flash 1 time per second. The number of blinks will equal the first number and, after 1.5 seconds pause, the second number of the two digit diagnostic trouble code. If there are two or more codes, there will be a 2.5 seconds pause between each.

HINT: In the event of several trouble codes occuring simultaneously, indication will begin from the smaller value and continue to the larger.

4. REMOVE SST

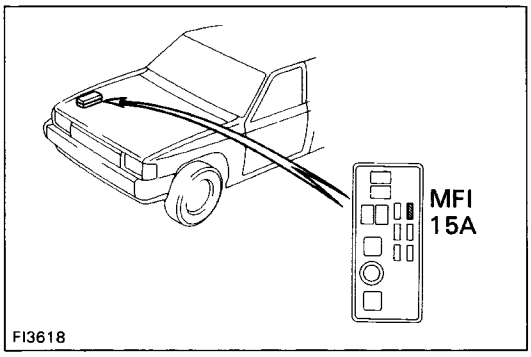
DIAGNOSTIC TROUBLE CODES

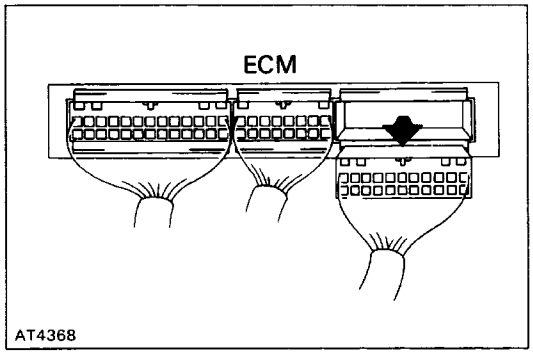
Code No.	Light Pattern	Diagnosis System
–		Normal
42		Defective No. 1 vehicle speed sensor (in ATM)– severed wire harness or short circuit
61		Defective No. 2 vehicle speed sensor (in ATM)– severed wire harness or short circuit
62		Severed No. 1 solenoid or short circuit– severed wire harness or short circuit
63		Severed No.2 solenoid or short circuit– severed wire harness or short circuit
64		Severed lock–up solenoid or short circuit– severed wire harness or short circuit

AT2020

HINT: If codes 62, 63 or 64 appear, there is an electri–cal malfunction in the solenoid.

Causes due to mechanical failure, such as a stuck valve, will not appear.





CANCEL OUT DIAGNOSTIC TROUBLE CODE

1. After repair of the trouble area, the diagnostic trouble code retained in memory by the ECM must be canceled by removing the MFI fuse (1 5A) for 10 seconds or more, depending on ambient temperature (the lower the tem–perature, the longer the fuse must be left out) with the ig–nition switch OFF.

   HINT:

   Cancellation can be also done by removing the battery negative (–) terminal, but in this case other memory systems will be also canceled out.

   The diagnostic trouble code can be also canceled out by disconnecting the EC M connector.

   If the diagnostic trouble code is not canceled out, it will be retained by the ECM and appear along with a new code in event of future trouble.

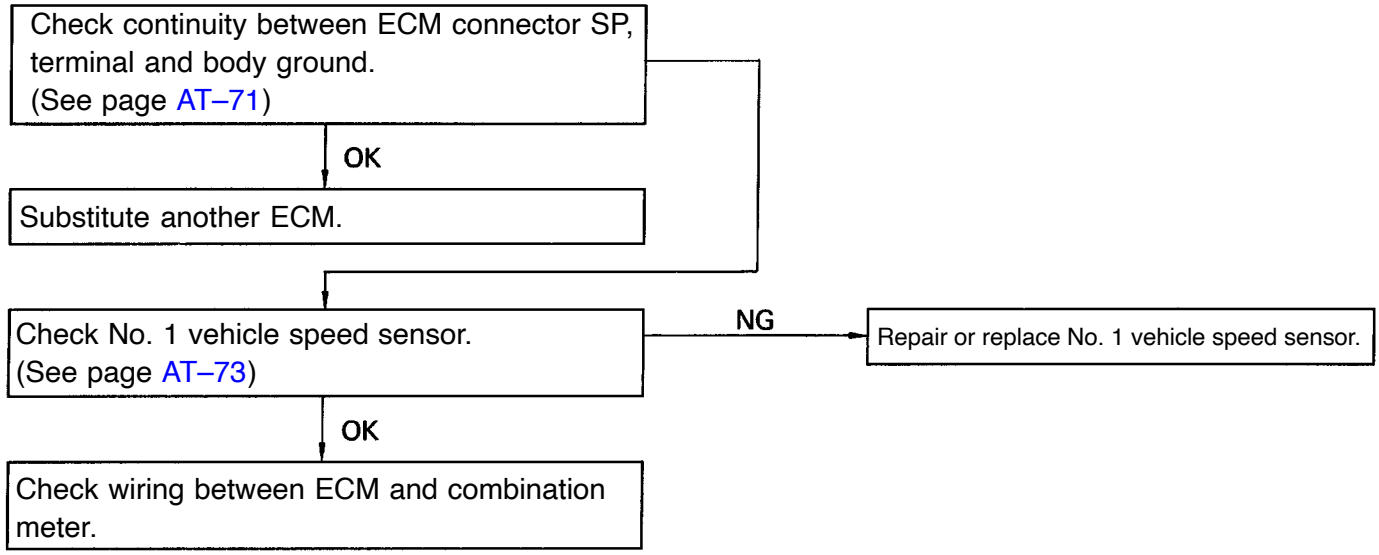
2. After cancellation, perform a road test to confirm that a ”normal code” is now read on the O/D OFF light.

TROUBLESHOOTING FLOW–CHART

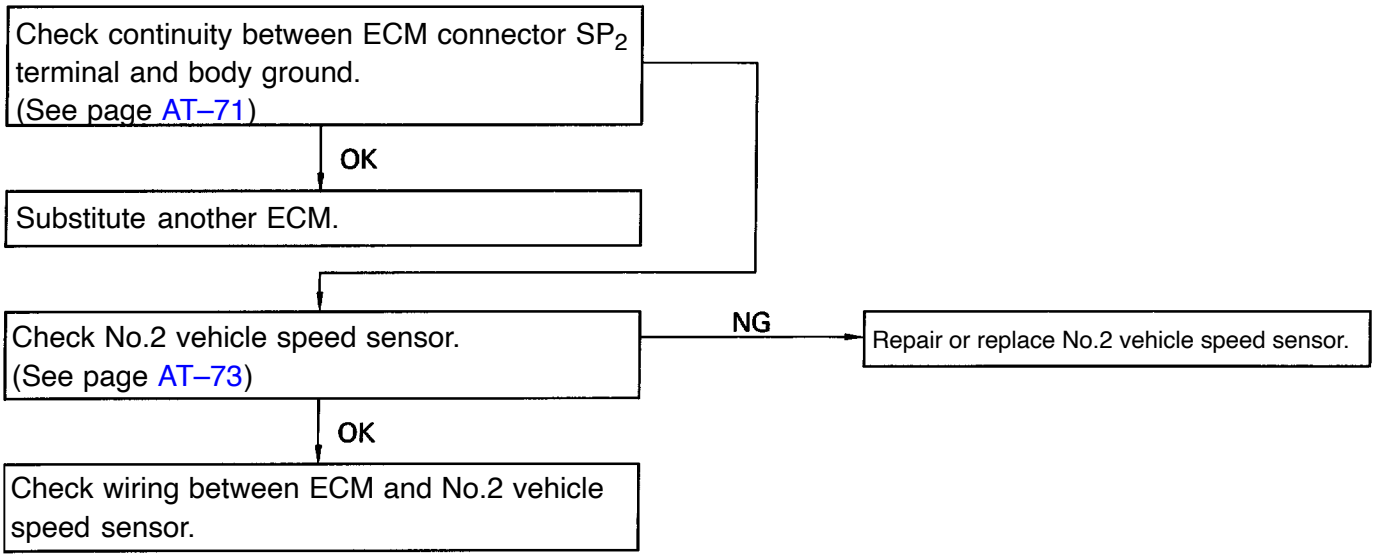
HINT:

- If diagnostic trouble code Nos. 42, 61, 62 or 63 are output, the overdrive OFF indicator light will begin to blink immediately to warn the driver. However, an impact or shock may cause the blinking to stop; but the code will still be retained in the ECM memory until canceled out.
- There is no warning for diagnostic trouble code No. 64.
- In the event of a simultaneous malfunction of both No. 1 and No. 2 vehicle speed sensors, no diagnostic trouble code will appear and the fail–safe system will not function. However, when driving in the D position, the transmission will not up–shift from first gear, regardless of the vehicle speed.

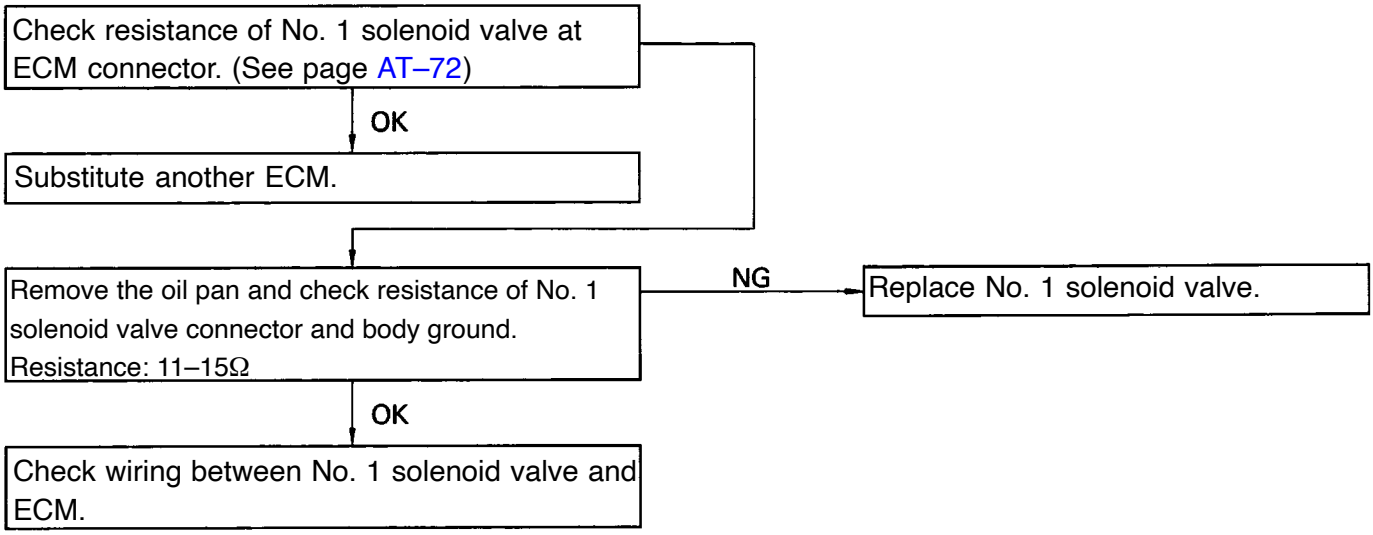
Diagnostic trouble code 42 (No. 1 vehicle speed sensor circuitry)



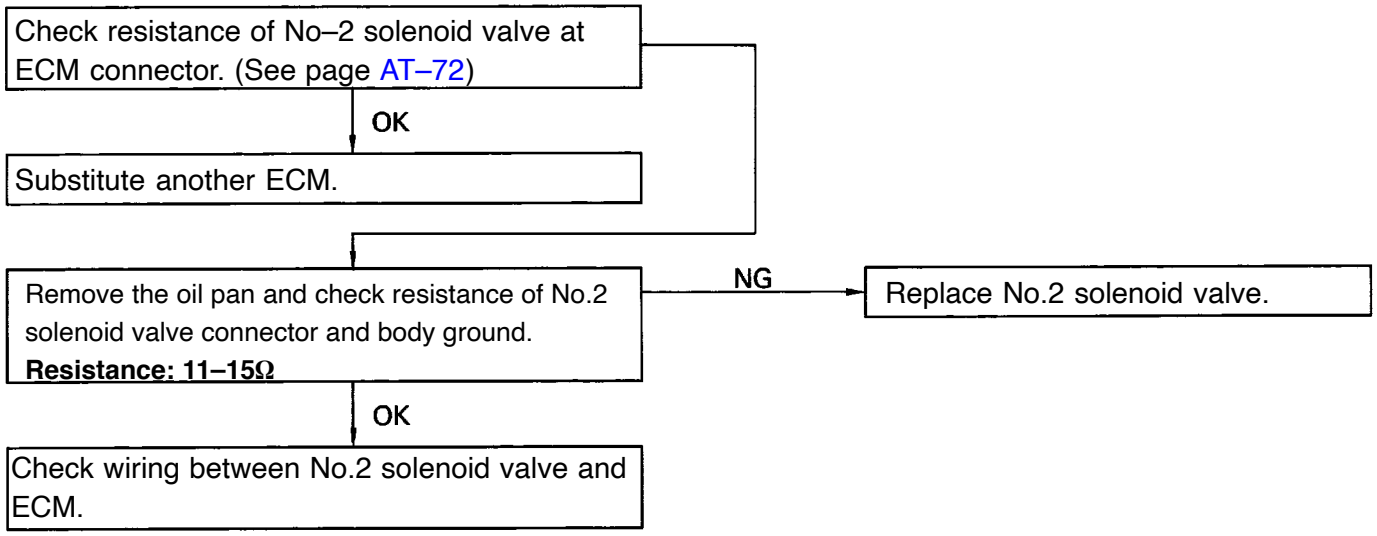
Diagnostic trouble code 61 (No.2 vehicle speed sensor circuitry)



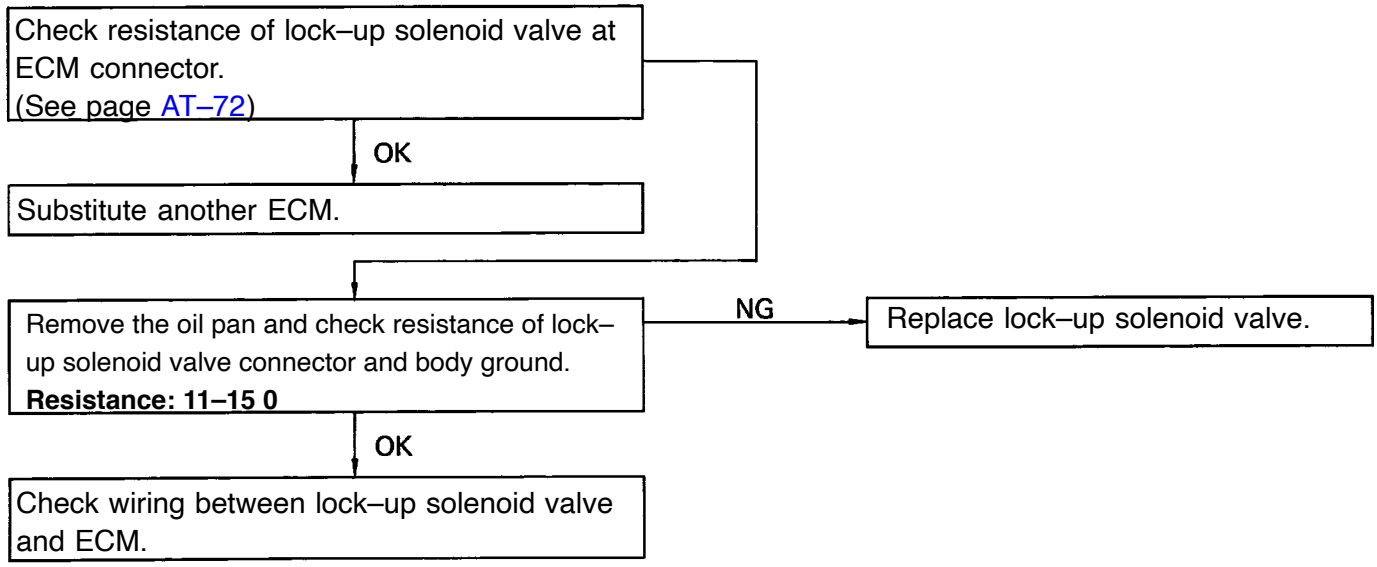
Diagnostic trouble code 62 (No. 1 solenoid valve circuitry)



Diagnostic trouble code 63 (No.2 solenoid valve circuitry)



Diagnostic trouble code 64 (Lock–up solenoid valve circuitry)



Preliminary Check

1. CHECK FLUID LEVEL

HINT:

The vehicle must have been driven so that the engine and transmission are at normal operating temperature. (Fluid temperature: 70–80 °C or 158–176 °F)

Only use the COOL range on the dipstick as a rough reference when the fluid is replaced or the engine does not run.

(a) Park the vehicle on a level surface, set the parking brake.

(b) With the engine idling, shift the shift lever into all positions from P to L position and return to P position.

HINT: Depress brake pedal.

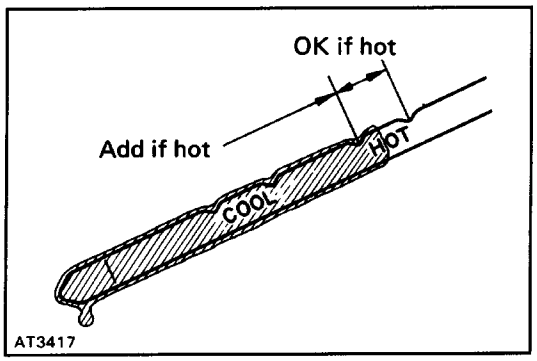
(c) Pull out the transmission dipstick and wipe it clean.

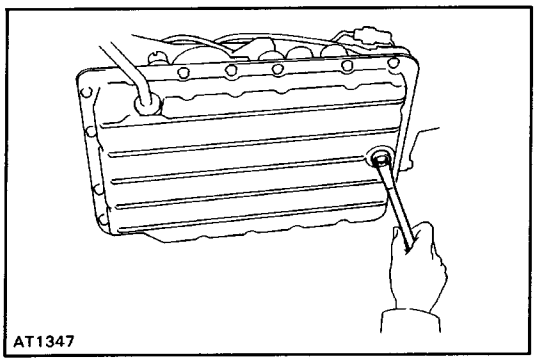
(d) Push it back fully into the tube.

(e) Pull it out and check that the fluid level is in the HOT range.

If the level is at the low side, add fluid.

Fluid type: ATF DEXRON®II





NOTICE: Do not overfill.

2. CHECK FLUID CONDITION

If the fluid smells burnt or is black, replace it as following procedures.

(a) Remove the drain plug and drain the fluid.

(b) Reinstall the drain plug securely.

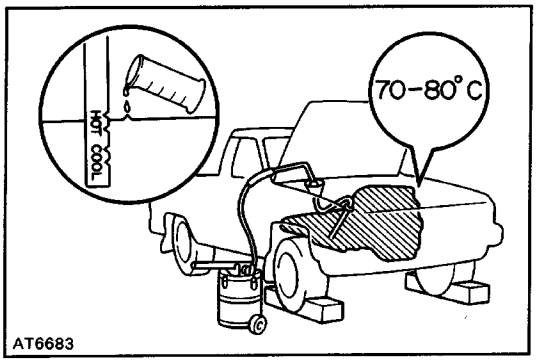
(c) With the engine OFF, add new fluid through the oil filler tube.

Fluid type ATF DEXRON®II

Capacity:

Total: 7.2 liters (7.6 US qts, 6.3 Imp qts)

Drain and refill: 1.6 liters (1.7 US qts, 1.4 Imp.qts)

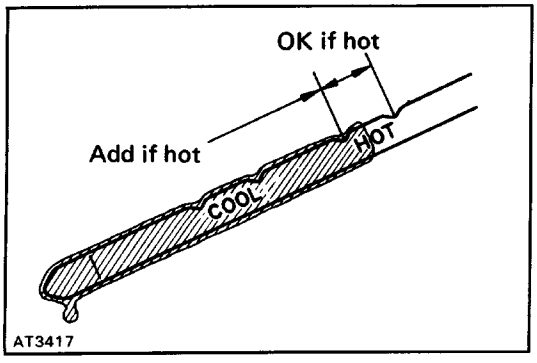


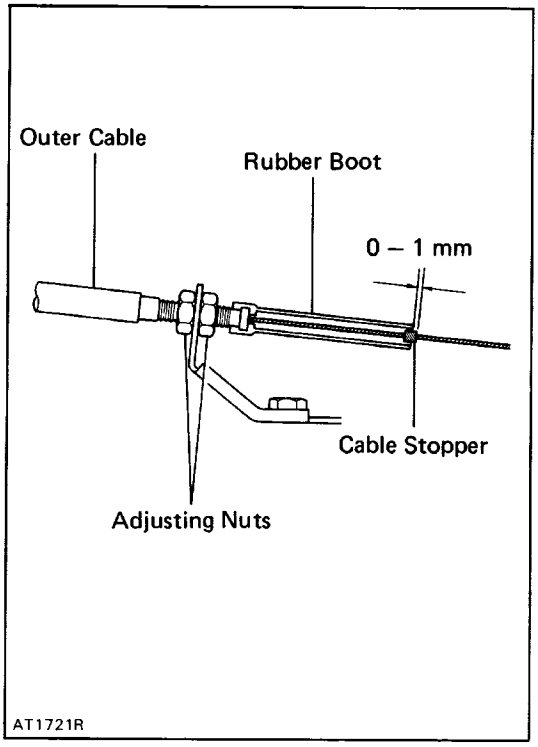
(d) Start the engine and shift the shift lever into all positions from P to L position and then shift into P position.

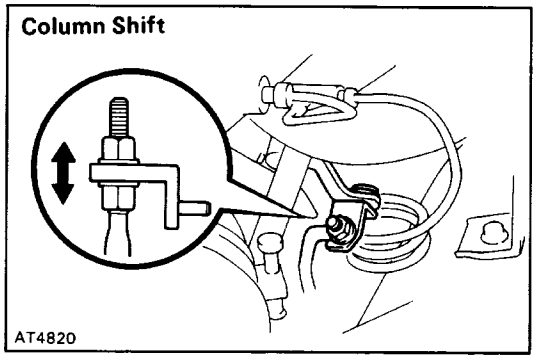
(e) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.

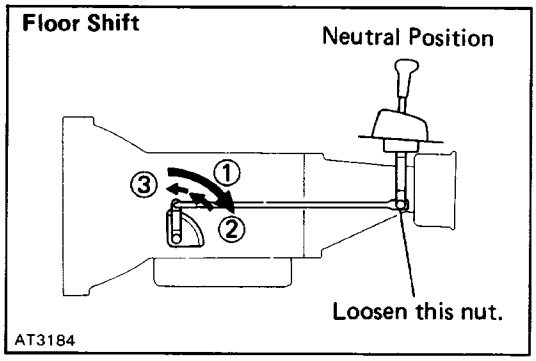
(f) Check the fluid level with the normal operating temperature (70–80 °C or 158–176 °F) and add as necessary.

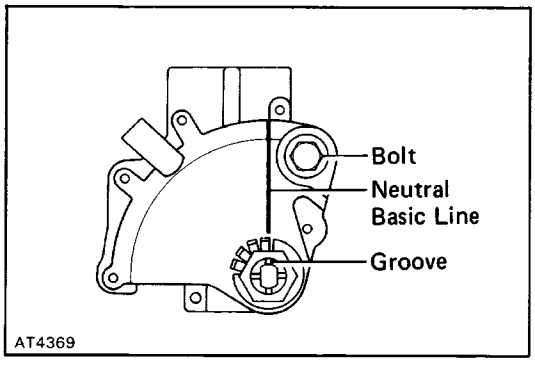
NOTICE: Do not overfill.











3. INSPECT THROTTLE CABLE

(a) Depress the accelerator pedal all the way and check that the throttle valve opens fully.

HINT: If the valve does not open fully, adjust the accelerator cable.

(b) Fully depress the accelerator pedal.

(c) Measure the distance between the end of the boot and stopper on the cable.

Standard distance: 0–1 mm (0–0.04 in.)

If the distance is not standard, adjust the cable by the adjusting nuts.

4. INSPECT SHIFT LEVER POSITION

When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator correctly indicates the position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

(Column shift)

(a) Remove the nut on the cross shaft rod.

(b) Push the cross shaft rod fully downward.

(c) Return the cross shaft rod two notches to N position.

(d) Set the shift lever to N position.

(e) While holding the shift lever lightly toward the R position side, adjust the cross shaft rod nut.

(f) Tighten the cross shaft rod nut.

(g) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverse when shifting it to the R position.

(Floor shift)

(a) Remove the nut on the cross shaft rod.

(b) Push the cross shaft rod fully downward.

(c) Return the cross shaft rod three notches to N position.

(d) Set the shift lever to N position.

(e) While holding the shift lever lightly toward the R position side, adjust the cross shaft rod nut.

(f) Tighten the cross shaft rod nut.

(g) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverse when shifting it to the R position.

5. INSPECT PARK/NEUTRAL POSITION SWITCH

Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.

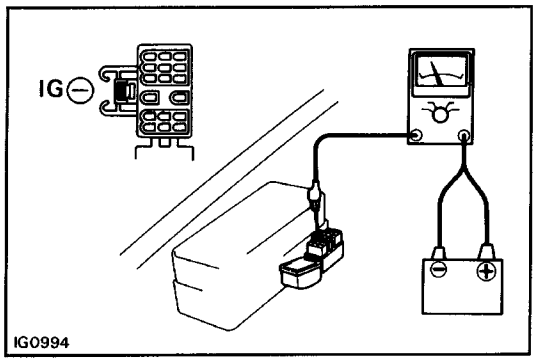
If not as stated above, carry out the following adjustment procedures.

(a) Loosen the park/neutral position switch bolt and set the shift lever to the N position.

(b) Align the groove and neutral basic line.

(c) Hold in position and tighten the bolt.

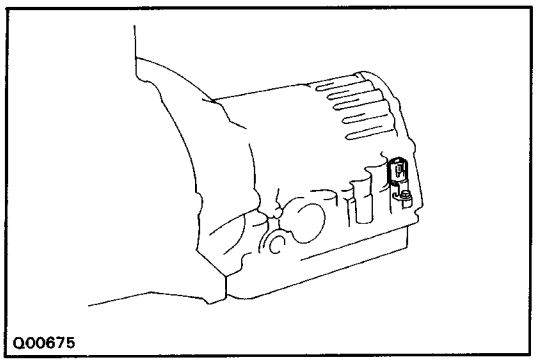
Torque: 13 N–m (130 kgf–cm, 9 in.¿lbf)



6. INSPECT IDLE SPEED (IN POSITION)

Connect a tachometer test probe to the data link connector 1 terminal IG ⊖, inspect the idle speed.

Idle speed: 800 RPM



Manual Shifting Test

HINT: With this test, it can be determined whether the trouble lies within the electrical circuit or is a mechanical problem in the transmission.

1. DISCONNECT SOLENOID WIRE

2. INSPECT MANUAL DRIVING OPERATION

Check that the shift and gear position correspond with the table below.

Shift position	D position	2 position	L position	R position	P position
Gear position	O/D	3rd	**1st**	Reverse	Pawl Lock

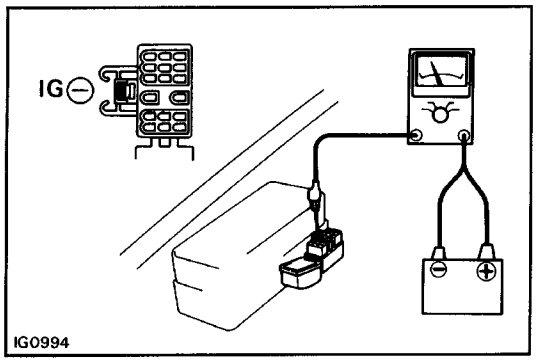
HINT: If the L, 2 and D position gear positions are difficult to distinguish, perform the following road test.

- While driving, shift through the L, 2 and D positions. Check that the gear change corresponds to the shift position.
  If any abnormality is found in the above test, the problem lies in transmission itself.

3. CONNECT SOLENOID WIRE

4. CANCEL OUT DIAGNOSTIC TROUBLE CODE

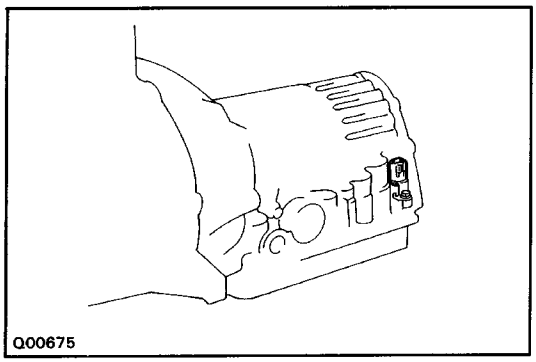
(See page AT–56)



6. INSPECT IDLE SPEED (IN POSITION)

Connect a tachometer test probe to the data link connector 1 terminal IG ⊖, inspect the idle speed.

Idle speed: 800 RPM



Manual Shifting Test

HINT: With this test, it can be determined whether the trouble lies within the electrical circuit or is a mechanical problem in the transmission.

1. DISCONNECT SOLENOID WIRE

2. INSPECT MANUAL DRIVING OPERATION

Check that the shift and gear position correspond with the table below.

Shift position	D position	2 position	L position	R position	P position
Gear position	O/D	3rd	**1st**	Reverse	Pawl Lock

HINT: If the L, 2 and D position gear positions are difficult to distinguish, perform the following road test.

- While driving, shift through the L, 2 and D positions. Check that the gear change corresponds to the shift position.
  If any abnormality is found in the above test, the problem lies in transmission itself.

3. CONNECT SOLENOID WIRE

4. CANCEL OUT DIAGNOSTIC TROUBLE CODE

(See page AT–56)

REFERENCE: Possible gear position in accordance with solenoid operating conditions.

Position	NORMAL			NO. 1 SOLENOID MALFUNCTIONING			NO.2 SOLENOID MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING		
	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position
	No. 1	No. 2		No. 1	No. 2		No. 1	No. 2		No. 1	No. 2	
D position	**ON**	OFF	1 st	×	ON (OFF)	3rd (O/D)	**ON**	×	1 st	×	×	O/D
	ON	**ON**	2nd	×	**ON**	3rd	OFF (ON)	×	O/D (1st)	×	×	O/D
	OFF	**ON**	3rd	×	**ON**	3rd	OFF	×	O/D	×	×	O/D
	OFF	OFF	O/D	×	OFF	O/D	OFF	×	O/D	×	×	O/D
2 position	**ON**	OFF	1 st	×	ON (OFF)	3rd (O/D)	**ON**	×	1 st	×	×	3rd
	ON	**ON**	2nd	×	**ON**	3rd	OFF (ON)	×	3rd (1st)	×	×	3rd
	OFF	**ON**	3rd	×	**ON**	3rd	OFF	×	3rd	×	×	3rd
L position	**ON**	OFF	1 st	×	OFF	**1st**	**ON**	×	1 st	×	×	**1st**
	ON	**ON**	2nd	×	**ON**	2nd	**ON**	×	1 st	×	×	1 st

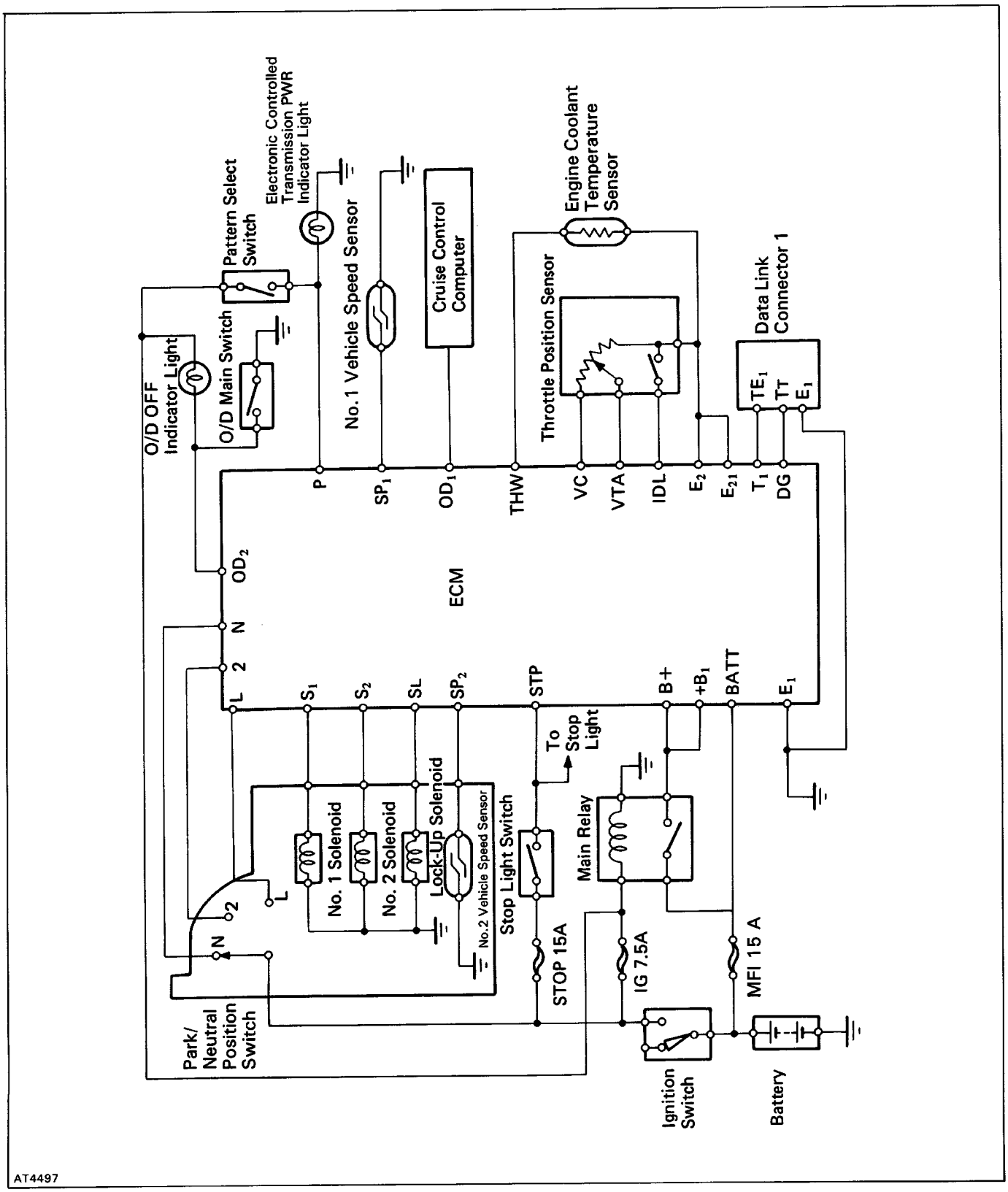
( ): No fail–safe function x : Malfunctions

Electronic Control System

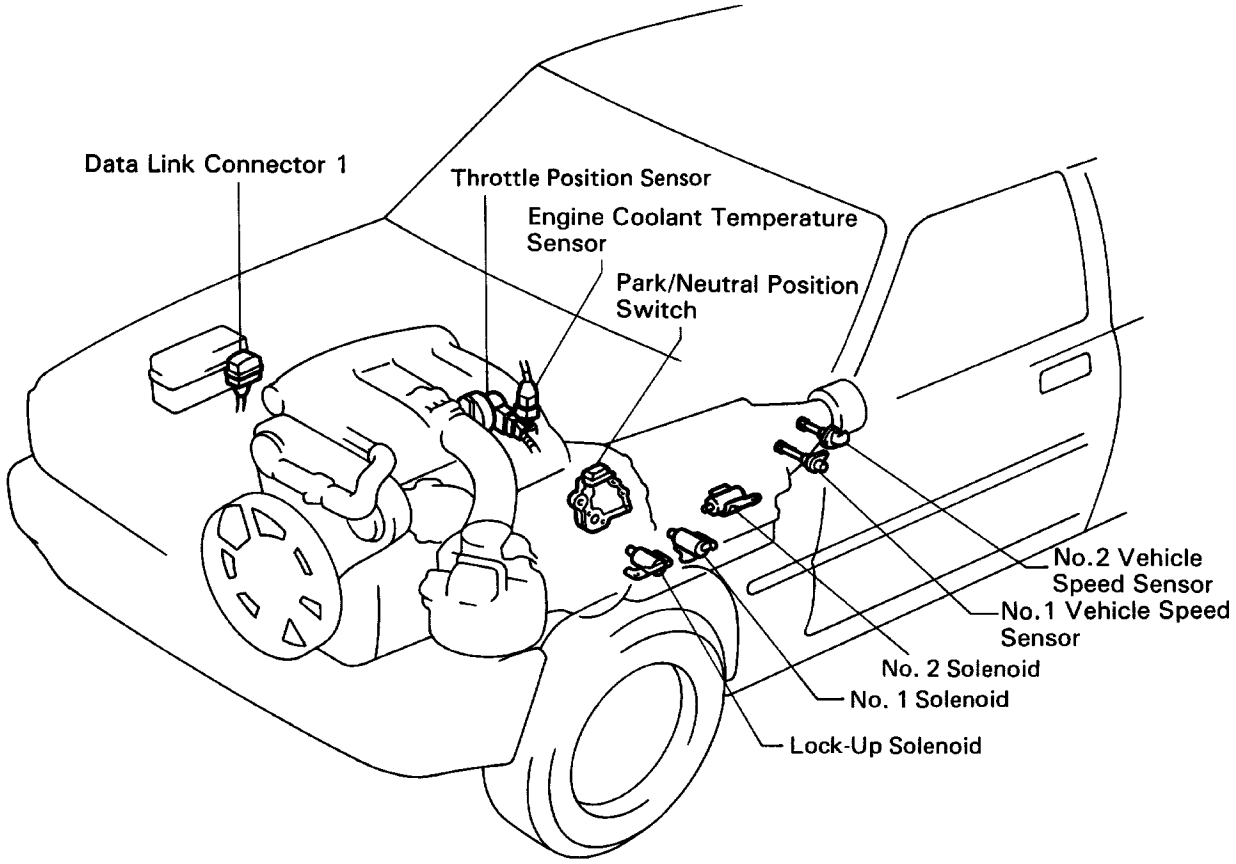
PRECAUTION

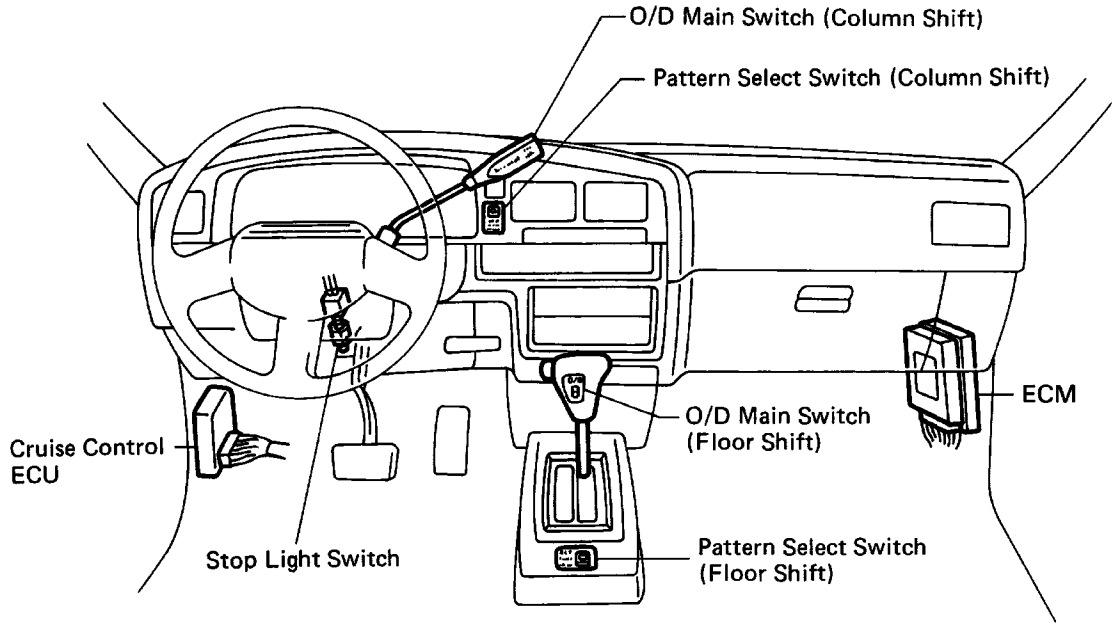
Do not open the cover or the case of the ECM and various computer unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)

ELECTRONIC CONTROL CIRCUIT



ELECTRONIC CONTROL COMPONENTS

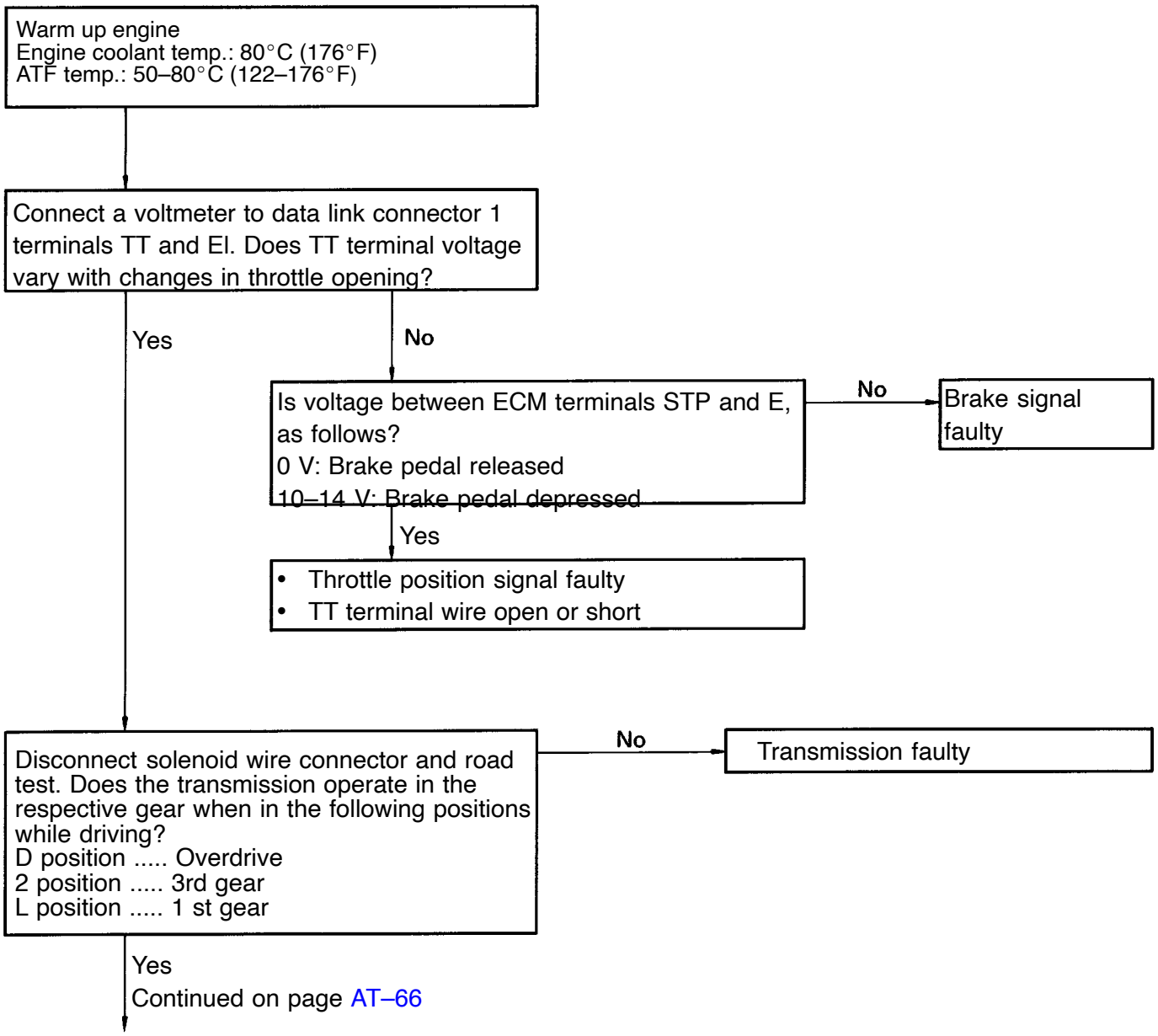


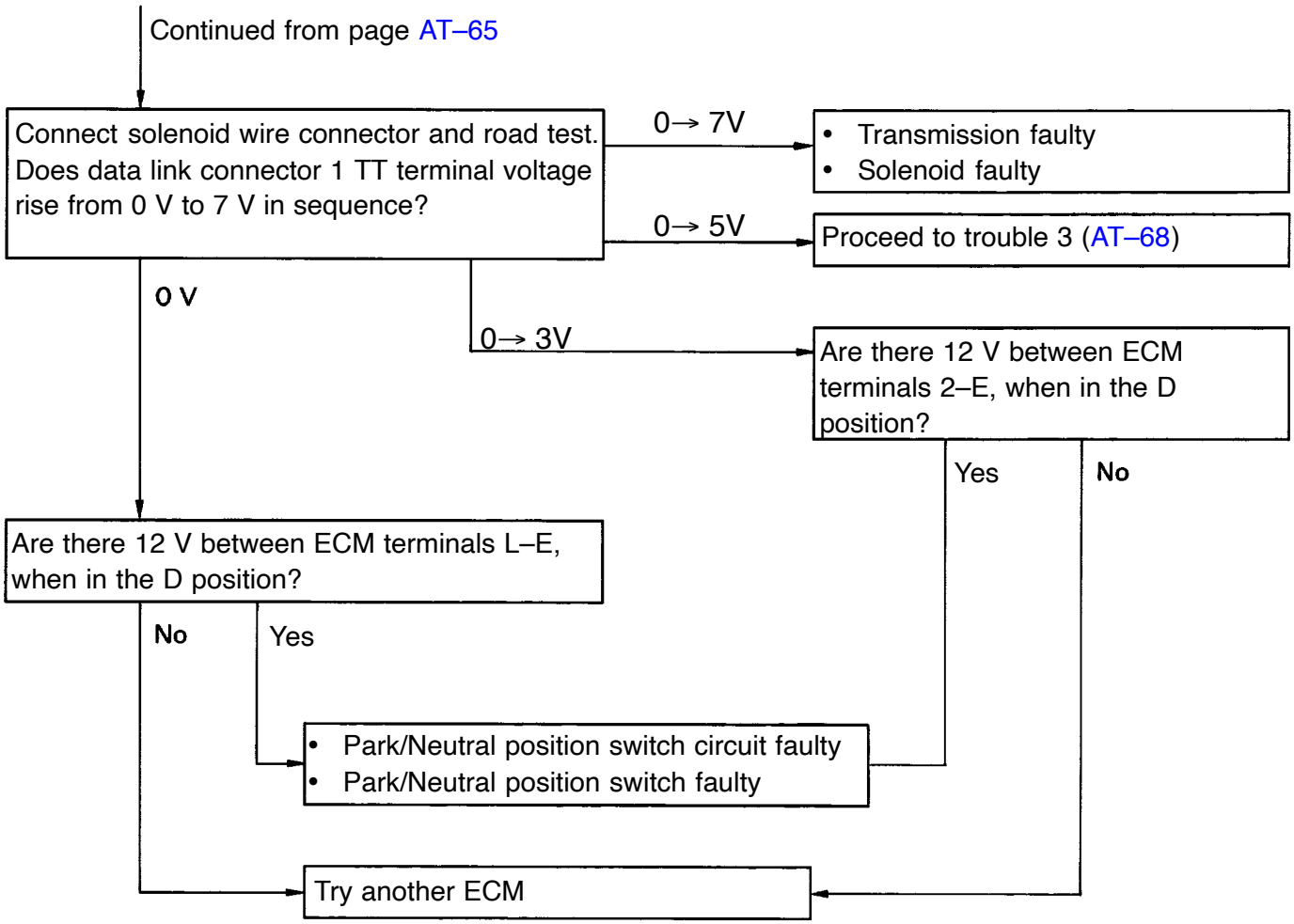


Q00559
Q00558

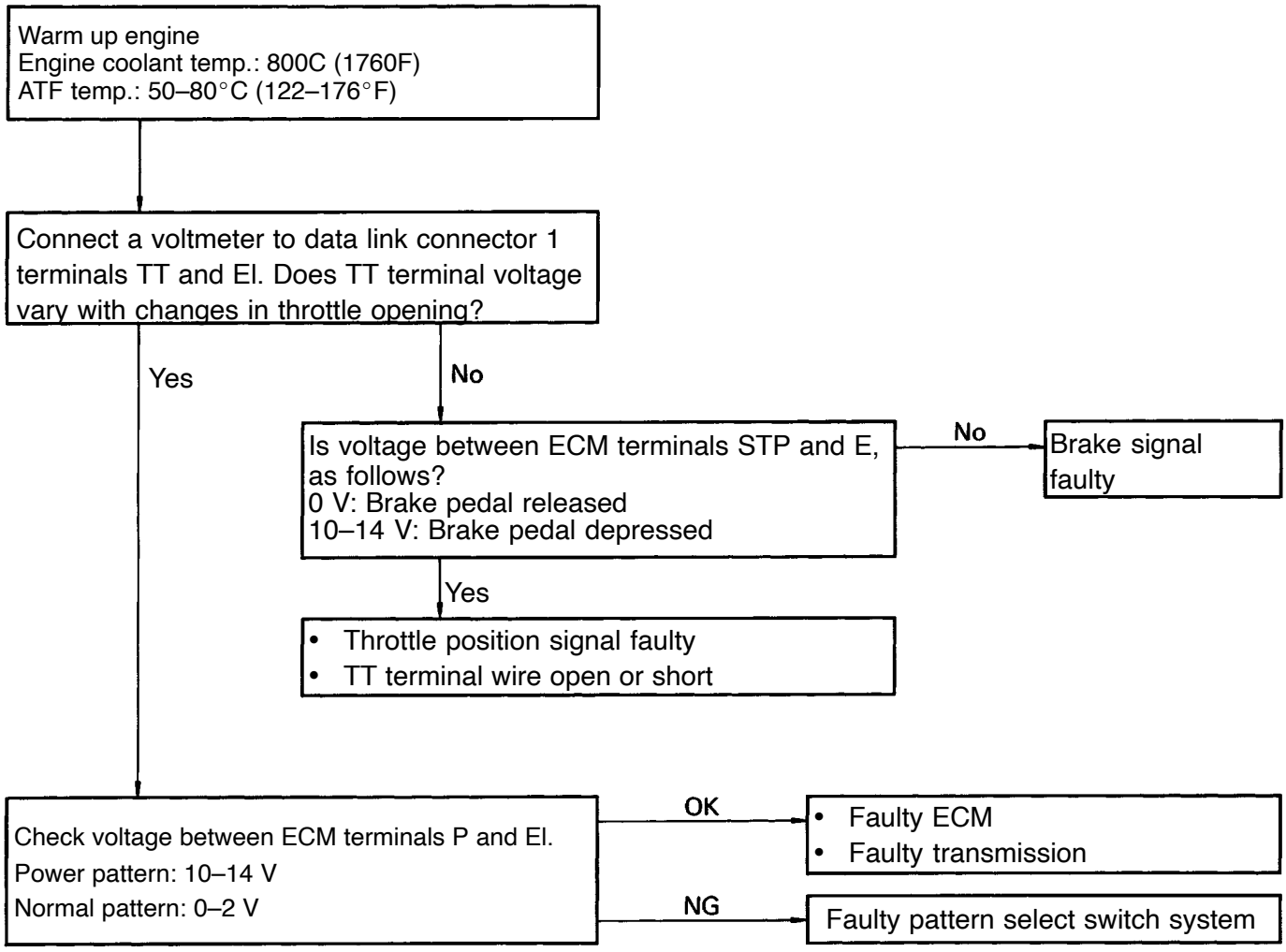
TROUBLESHOOTING FLOW–CHART

Trouble No. 1 No Shifting

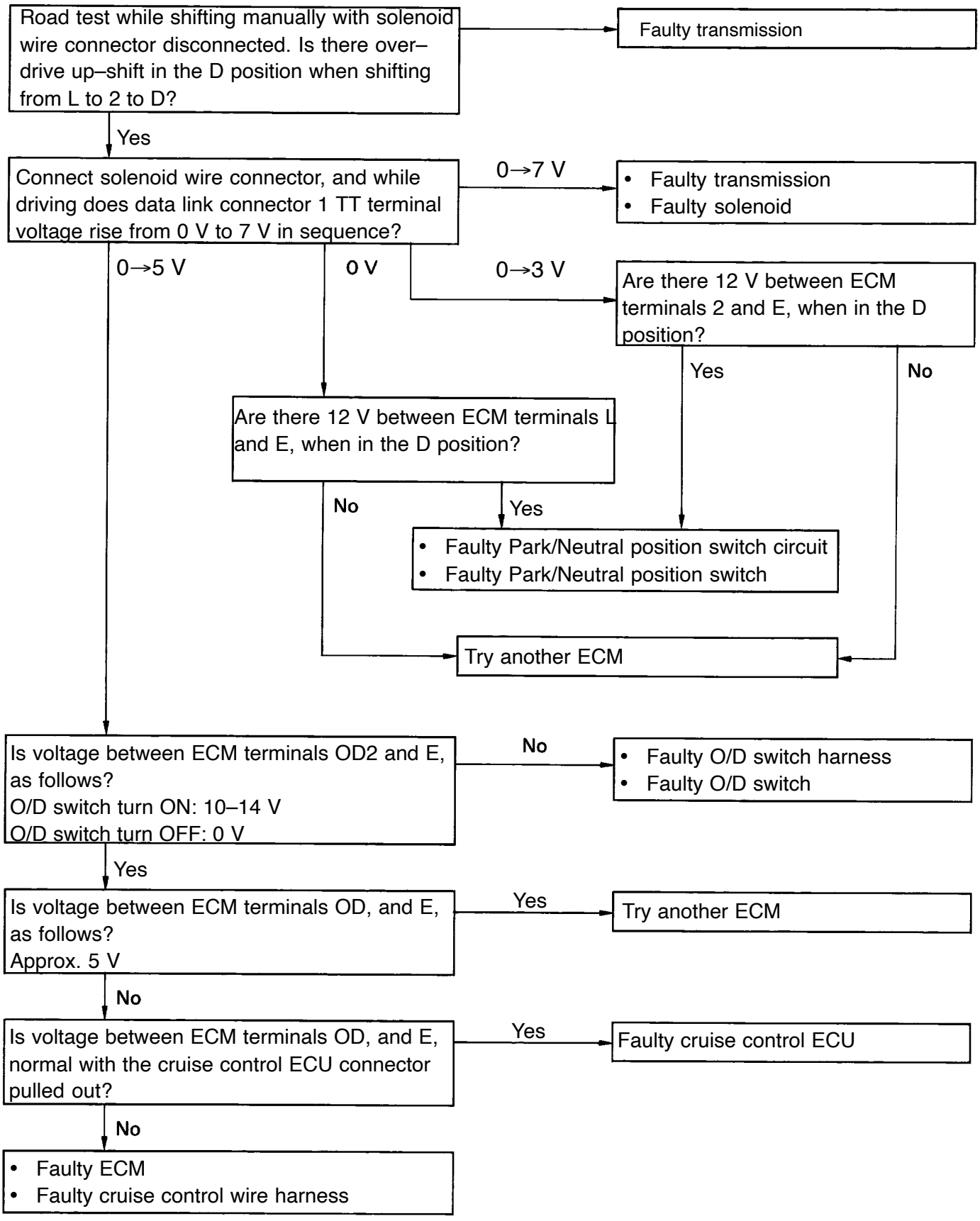



Continued from page AT–65
Connect solenoid wire connector and road test. Does data link connector 1 TT terminal voltage rise from 0 V to 7 V in sequence?
0→ 7V
• Transmission faulty
• Solenoid faulty
0→ 5V
Proceed to trouble 3 (AT–68)
0 V
0→ 3V
Are there 12 V between ECM terminals 2–E, when in the D position?
Yes
No
Are there 12 V between ECM terminals L–E, when in the D position?
No
Yes
• Park/Neutral position switch circuit faulty
• Park/Neutral position switch faulty
Try another ECM

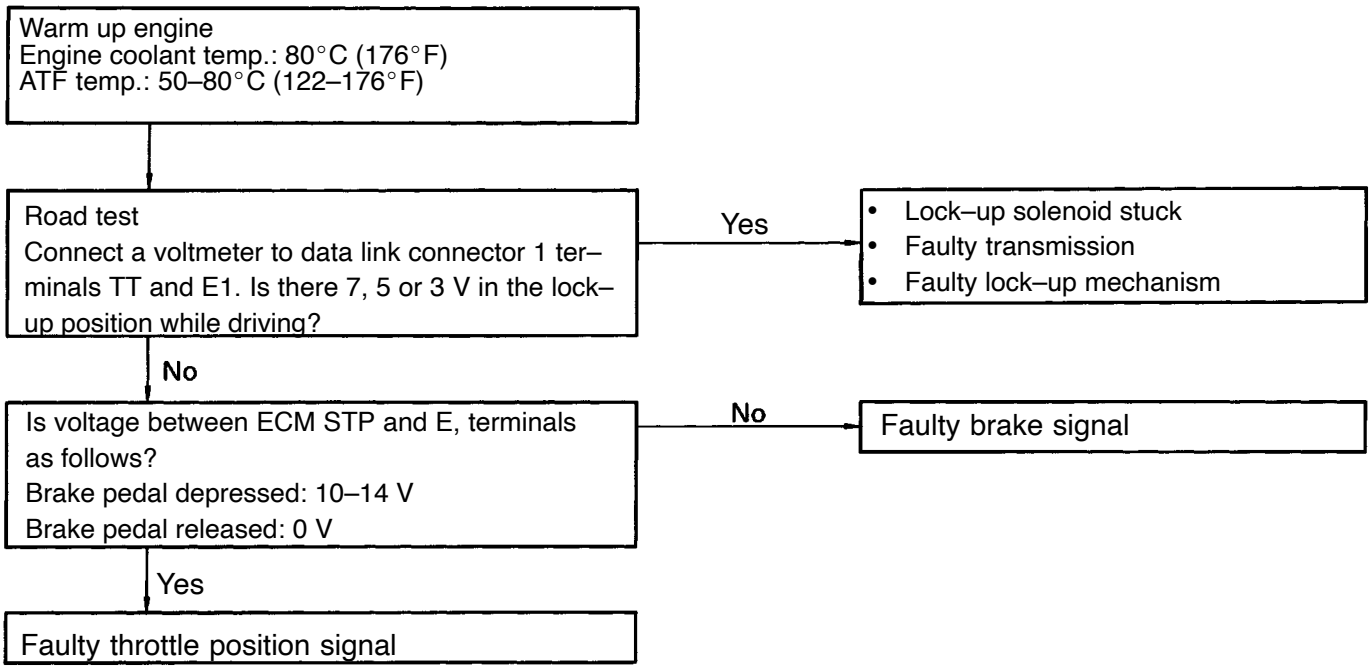
Trouble No.2 Shift point too high or too low

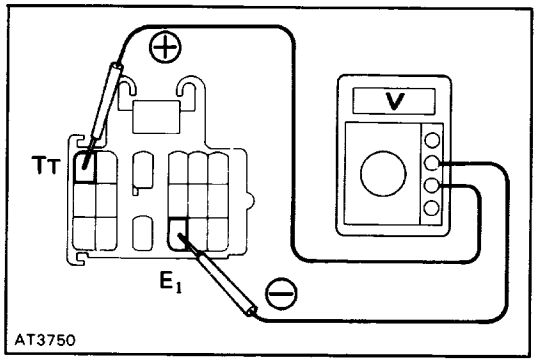


Trouble No.3 No up–shift to overdrive (After warm–up)



Trouble No.4 No lock–up (After warm–up)



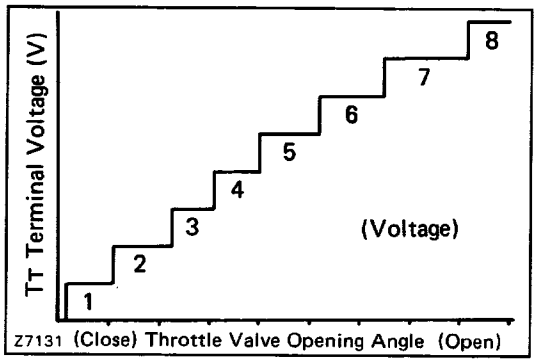


INSPECTION OF TT TERMINAL VOLTAGE

1. INSPECT THROTTLE POSITION SENSOR SIGNAL

(a) Turn the ignition switch to ON. Do not start the engine.

(b) Connect a voltmeter to data link connector 1 terminals TT and El.



(c) While slowly depressing the accelerator pedal, check that TT terminal voltage rises in sequence.

If the voltage does not change in proportion to the throttle opening angle, there is a malfunction in the throttle position sensor or circuit.

2. INSPECT BRAKE SIGNAL

(a) Depress the accelerator pedal until the TT terminal indicates 8V.

(b) Depress the brake pedal and check the voltage reading from the TT terminal.

Brake pedal depressed ..... 0 v

Brake pedal released ..... 8 V

If not as indicated, there is a malfunction in either the stop light switch or circuit.

3. INSPECT EACH UP–SHIFT POSITION

(a) Warm up the engine.

Engine coolant temperature: 80 ° C (176 ° F)

(b) Turn the O/D switch to "ON".

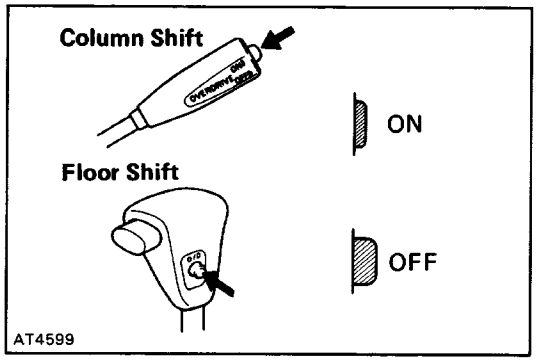
(c) Place the pattern select switch in "Normal" and the shift lever into the D position.

(d) During a road test (above 10 km/h or 6 mph) check that voltage at the TT terminal is as indicated below for each up–shift position.

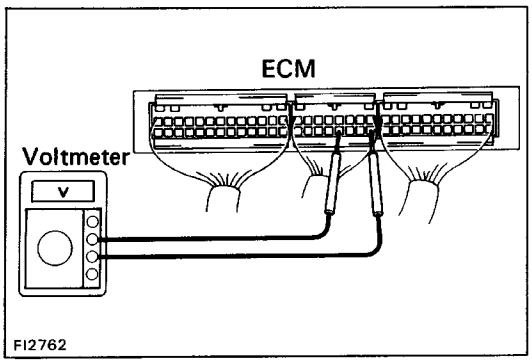
If the voltage rises from 0 v to 7 v in the sequence shown, the control system is okay.

The chart on the left shows the voltmeter reading and corresponding gears.

HINT: Determine the gear position by a light shock or change in engine RPM when shifting. The lock–up clutch will turn ON only infrequently during normal 2nd and 3rd gear operation. To trigger this action, press the accelerator pedal to 50% or more of its stroke. At less than 50%, the voltage may change in the sequence 2 V–4 v–6 v–7V.



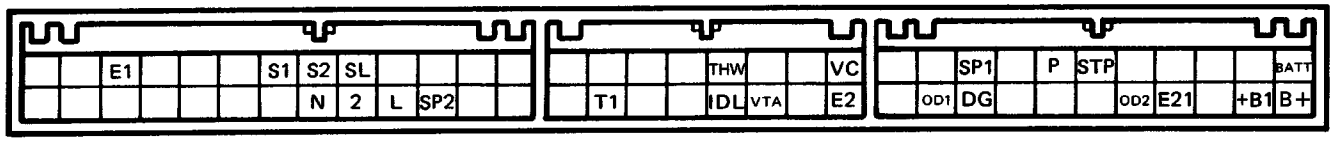
T_T Terminal (V)	Gear Position
0	1st
2	2nd
3	2nd Lock-up
4	3rd
5	3rd Lock-up
6	O/D
7	O/D Lock-up



INSPECTION OF ELECTRONIC CONTROL COMPONENTS

1. INSPECT VOLTAGE OF ECM CONNECTOR

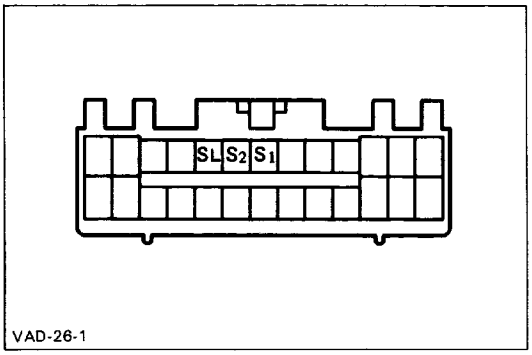
(a) Remove the cowl side trim of passenger side.
(b) Turn on the ignition switch.
(c) Measure the voltage at each terminal.



FI2796

Terminal	Measuring condition		Voltage (V)
$S_1 - E_1$	–		10 – 14
S_2, $S_L - E_1$	–		0
$P - E_1$	PWR pattern		10 – 14
	NORM pattern		0 – 2
$STP - E_1$	Brake pedal is depressed		10 – 14
	Brake pedal is released		0
$THW - E_2$ (E_{21})	Engine coolant temp. 80()C (1760F)		0.1 – 1.0
$IDL - E_2$ (E_{21})	Throttle valve fully closed		0
	Throttle valve open		10 – 14
$VTA - E_2$ (E_{21})	Throttle valve fully closed		0.1 – 1.0
	Throttle valve fully open		3 – 5
$VC - E_2$ (E_{21})	–		4 – 6
$OD_1 - E_1$	–		5
$OD_2 - E_1$	O/D main switch turned ON		10 – 14
	O/D main switch turned OFF		0
$SP_1 - E_1$	Cruise control main switch OFF	Standing still	0 or 5
		Vehicle moving	2 – 3
$SP_2 - E_1$	Standing still		0 or 5
	Vehicle moving		2 – 3

Terminal	Measuring condition	Voltage (V)
N – E_1	N position	10 – 14
	Except N position	0 – 2
2 – E_1	2 position	10 – 14
	Except 2 position	0 – 2
L – E_1	L position	10 – 14
	Except L position	0 – 2
B+ ($+B_1$) – E_1	–	10 – 14
BATT – E_1	–	10 – 14



2. INSPECT SOLENOID

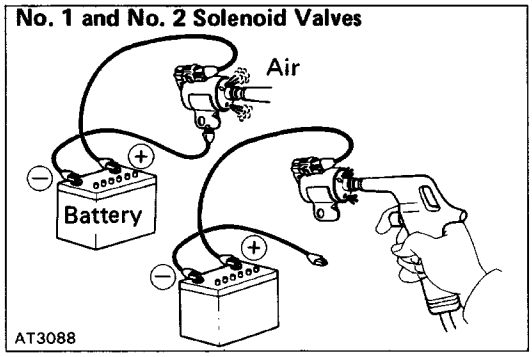
(a) Disconnect the connector from ECM.

(b) Measure the resistance between S, S2, SL and ground.

Resistance: 11–15Ω

(c) Apply battery positive voltage to each terminal.

Check that an operation noise can be heard from the solenoid.



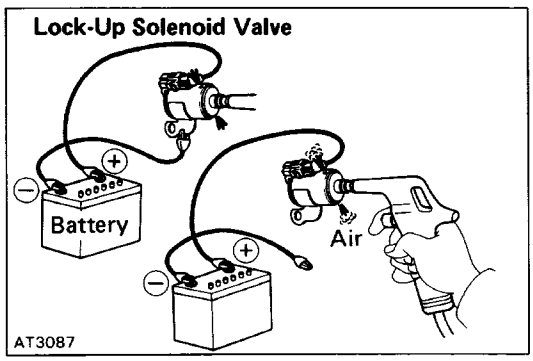
3. CHECK SOLENOID SEALS

If there is foreign material in the solenoid valve, there will be no fluid control even with solenoid operation.

(a) Check No.1 and No.2 solenoid valves.

Check that the solenoid valves do not leak when low–pressure compressed air is applied.

When supply battery positive voltage to the solenoids, check that the solenoid valves open.

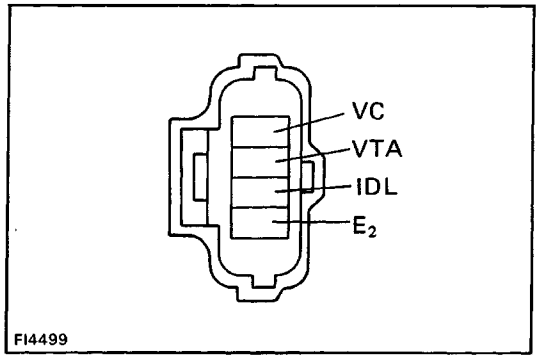


(b) Check the lock–up solenoid valve.

- Applying 490 kPa (5 kgf/cm2, 71 psi) of com–pressed air, check that the solenoid valve opens.
- When supply battery positive voltage to the solenoid, check that the solenoid valve does not leak the air.

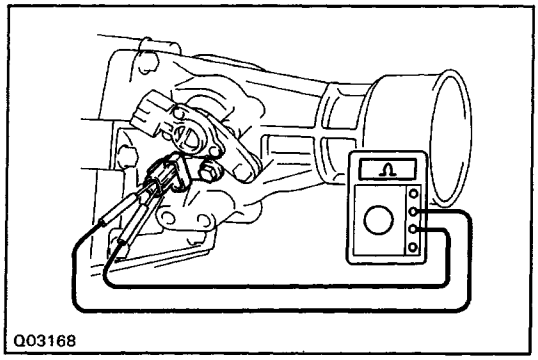
If a malfunction is found during voltage inspection (step 1.), inspect the components listed below.

4. INSPECT PARK/NEUTRAL POSITION SWITCH
(See page AT–83)



5. INSPECT THROTTLE POSITION SENSOR
Using an ohmmeter, check the resistance between each terminal.

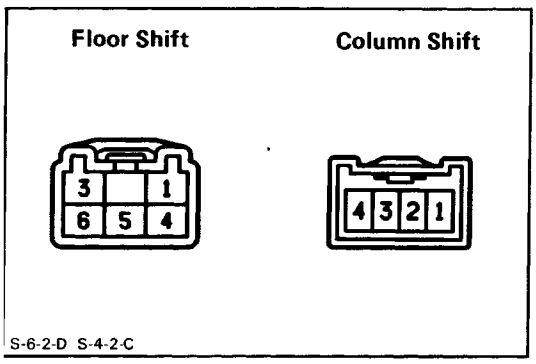
Terminal	Throttle valve condition	Resistance (kΩ)
IDL – E_2	Fully closed	Less than 2.3
	Open	Infinity
VC – E_2	–	3.9 – 9.0
VTA – E_2	Fully closed	0.47 – 6.1
	Fully open	3.1 – 12.1



6. INSPECT NO.2 VEHICLE SPEED SENSOR
(a) Jack up the rear wheel on one side.
(b) Connect an ohmmeter between the terminals.
(c) Spin the wheel and check that the meter needle de–f lects from 0Ω to ∞Ω.

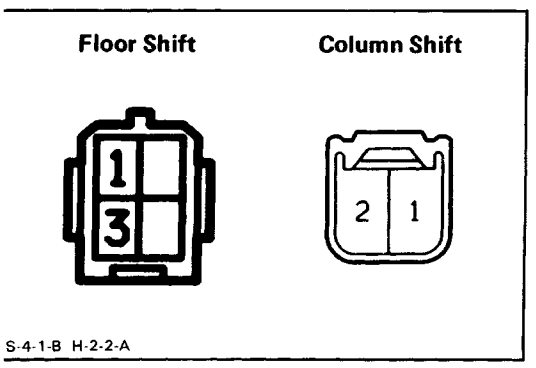
7. INSPECT NO.1 VEHICLE SPEED SENSOR
(See step 6. on page AT–73)

8. INSPECT PATTERN SELECT SWITCH
Using an ohmmeter, check the continuity of terminals for each switch position.
HINT: As there are diodes inside, be careful of the tester probe polarity.



Terminal / Pattern	Floor shift		Column shift	
	4	6	2	3
PW R	○—○		○—	—○
NORM				

9. INSPECT O/D SWITCH '
Using an ohmmeter, check the continuity of the terminals for each switch position.



SW position / Terminal	1	3(2)
ON		
OFF	○	—○

10. INSPECT ENGINE COOLANT TEMPERATURE SENSOR
(See page FI–200)

Mechanical System Tests

STALL TEST

The object of this test is to check the overall performance of the transmission and engine by measuring the stall speeds in the D and R positions.

NOTICE:

- **Perform the test at normal operating fluid temperature (50–80°C or 122–176°F).**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear, level area, which provides good traction.**
- **The stall test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.**

MEASURE STALL SPEED

(a) Chock the front and rear wheels.
(b) Connect a tachometer to the engine.
(c) Fully apply the parking brake.
(d) Keep your left foot pressed firmly on the brake pedal.
(e) Start the engine.
(f) Shift into the D position. Step all the way down on the accelerator pedal with your right foot. Quickly read the stall speed at this time.

NOTICE: Release the accelerator pedal and stop test if the rear wheels begin to rotate before the engine speed reaches specified stall speed.

Stall speed: C&C 2,200 ±150 RPM

Except: C&C 2,450 ± 150 RPM

(g) Perform the same test in R position.

EVALUATION

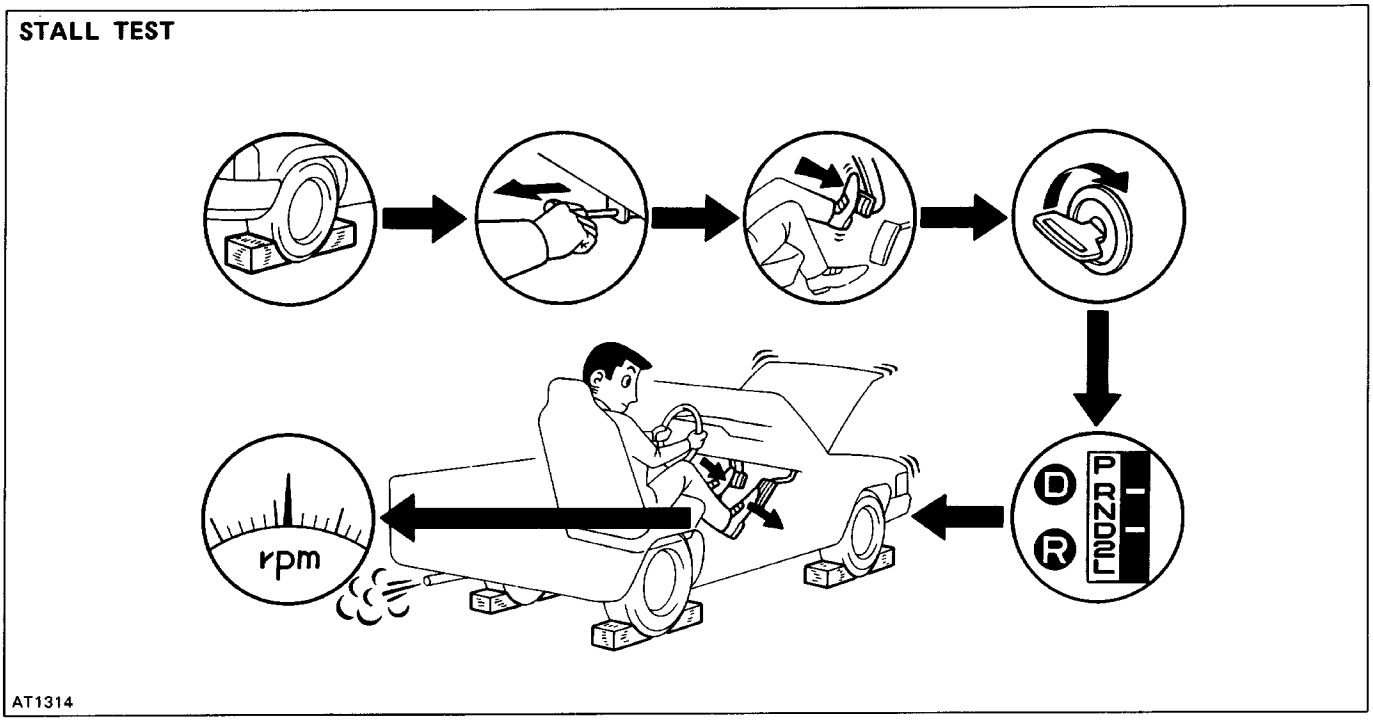
(a) If the stall speed is the same for both positions but lower than specified value:
- Engine output may be insufficient
- Stator one–way clutch is not operating properly

HINT: If more than 600 RPM below the specified value, the torque converter clutch could be faulty.

(b) If the stall speed in D position is higher than specified:
- Line pressure too low
- Forward clutch slipping
- No.2 one–way clutch not operating properly
- O/D one–way clutch not operating properly

(c) If the stall speed in R position is higher than specified:
- Line pressure too low
- Direct clutch slipping
- First and reverse brake slipping
- O/D one–way clutch not operating properly

(d) If the stall speed in both R and D positions are higher than specified:
- Line pressure too low
- Improper fluid level
- O/D one–way clutch not operating properly



TIME LAG TEST

When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the O/D direct clutch, forward clutch, direct clutch and first and reverse brake.

NOTICE:

- **Perform the test at normal operating fluid temperature (50–80°C or 122–176°F).**
- **Be sure to allow one minute interval between tests.**
- **Make three measurements and take the average value.**

MEASURE TIME LAG

(a) Fully apply the parking brake.

(b) Start the engine and check the idle speed.

Idle speed: 800 RPM

(N position)

(c) Shift the shift lever from N to D position. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

Time lag: Less than 1.2 seconds

(d) In same manner, measure the time lag for N–Y R.

Time lag: Less than 1.5 seconds

EVALUATION

(a) If N–D time lag is longer than specified:

Line pressure too low

Forward clutch worn

O/D one–way clutch not operating properly

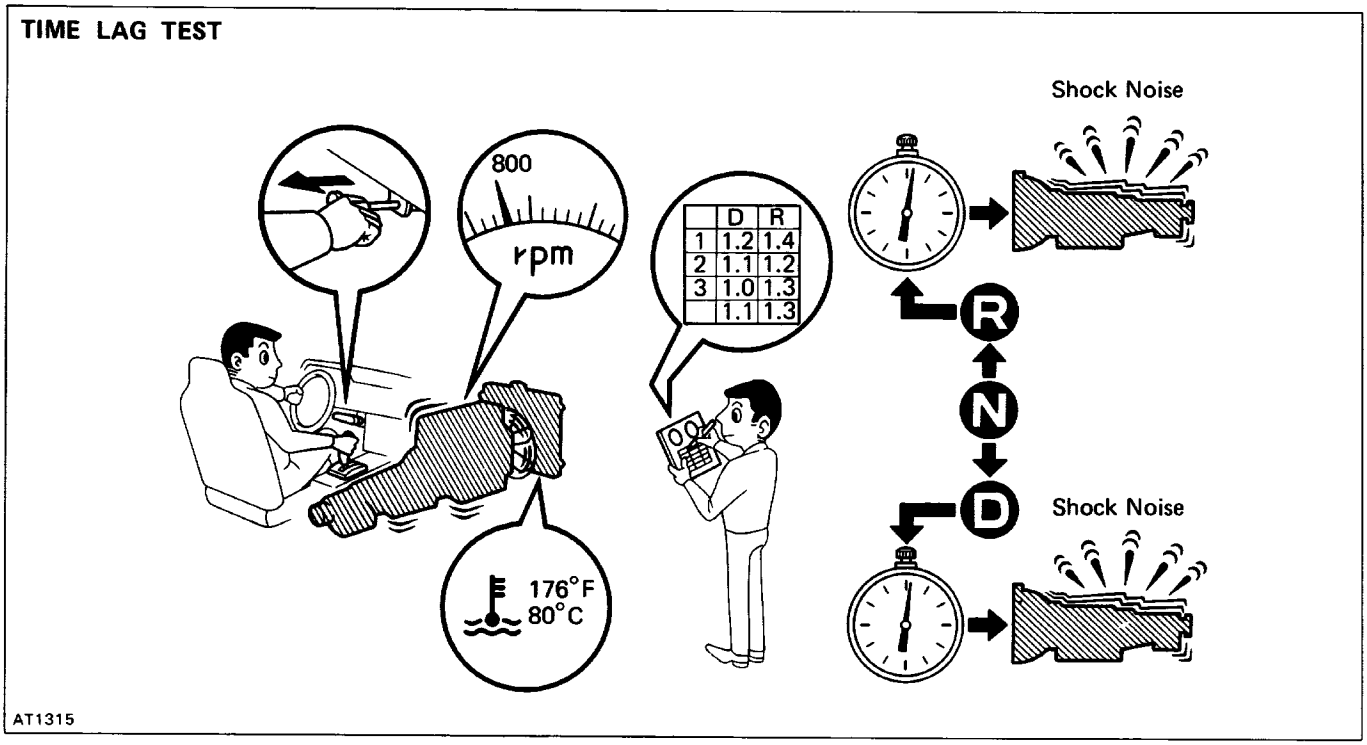
(b) If N–R time lag is longer than specified:

Line pressure too low

Direct clutch worn

First and reverse brake worn

O/D one–way clutch not operating properly



HYDRAULIC TEST

PREPARATION

(a) Warm up the transmission fluid.

(b) Remove the transmission case test plug and connect the hydraulic pressure gauge.
SST 09992–00094 (Oil pressure gauge)

NOTICE:

Perform the test at normal operating fluid temperature (50–80°C or 122–176°F).

The line pressure test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.

MEASURE LINE PRESSURE

(a) Fully apply the parking brake and chock the four wheels.

(b) Start the engine and check idling rpm.

(c) Keep your left foot pressed firmly on the brake pedal and shift into D position.

(d) Measure the line pressure when the engine is idling.

(e) Press the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.

NOTICE: Release the accelerator pedal and stop test if the rear wheels begin to rotate before the en–

gine speed reaches specified stall speed.

(f) In the same manner, perform the test in R position.

kPa (kgf/cm2,psi)

D position		R position	
Idling	Stall	Idling	Stall
363 – 422 (3.7 – 4.3, 53 – 61)	932 – 1,178 (9.5 – 12.0, 135 – 171)	490 – 588 (5.0 – 6.0, 71 – 85)	1,294 – 1,638 (13.2 – 16.7, 188 – 238)

If the measured pressures are not up to specified values, recheck the throttle cable adjustment and perform a retest.

EVALUATION

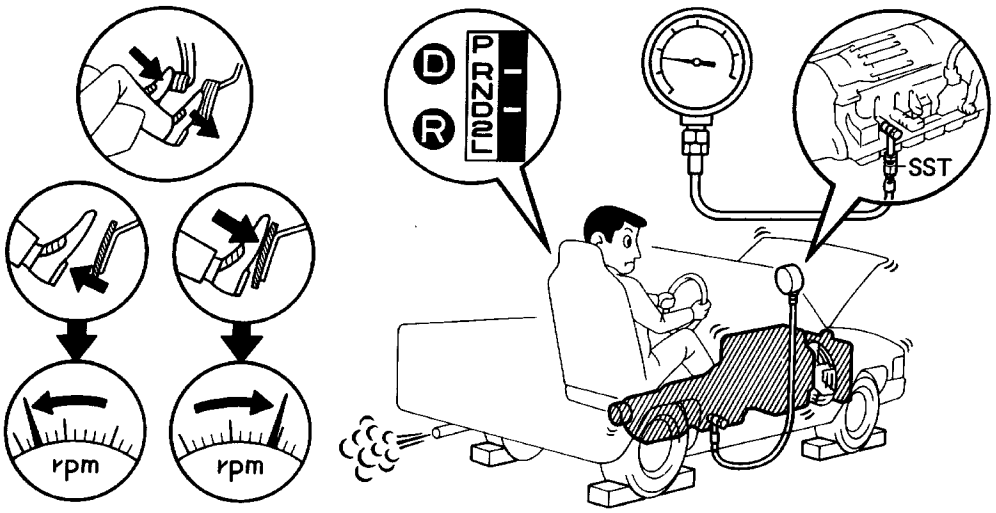
(a) If the measured values at all positions are higher than specified:
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective

(b) If the measured values at all positions are lower than specified:
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective
- Oil pump defective
- O/D direct clutch defective

(c) If pressure is low in the D position only:
- D position circuit fluid leakage
- Forward clutch defective

(d) If pressure is low in the R position only:
- R position circuit fluid leakage
- Direct clutch defective
- First and reverse brake defective

HYDRAULIC TEST



AT1316

ROAD TEST

NOTICE: Perform the test at normal operating fluid temperature (50–80°C or 122–176°F).

1. D POSITION TEST IN NORM AND PWR PATTERN RANGES

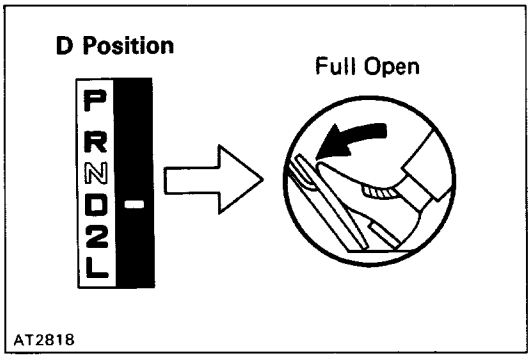
Shift into the D position and hold the accelerator pedal constant at the full throttle valve opening posiiton.

Check the following:

(a) 1–2, 2–3 and 3–OID up–shifts should take place, and shift points should conform to those shown in the automatic shift schedule.

Conduct a test under both Normal and Power patterns.

HINT: There is no O/D up–shift or lock–up when the engine coolant temp. is below 70°C (158°F).



EVALUATION

(1) If there is no 1–2 up–shift:

No.2 solenoid is stuck

1–2 shift valve is stuck

(2) If there is no 2–3 up–shift:

No.1 solenoid is stuck

2–3 shift valve is stuck

(3) If there is no 3–O/D up–shift:

3–4 shift valve is stuck

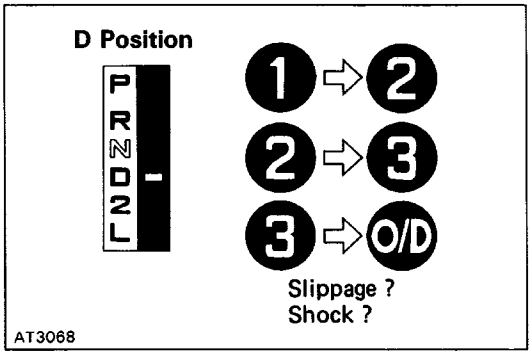
(4) If the shift point is defective:

Throttle valve, 1–2 shift valve, 2–3 shift valve, 3–4 shift valve etc., are defective

(5) If the lock–up is defective:

Lock–up solenoid is stuck

Lock–up relay valve is stuck



(b) In the same manner, check the shock and slip at the 1–2, 2–3, and 3–O/D up–shifts.

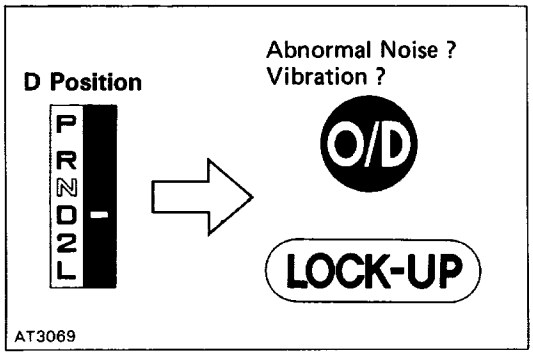
EVALUATION

If the shock is excessive:

Line pressure is too high

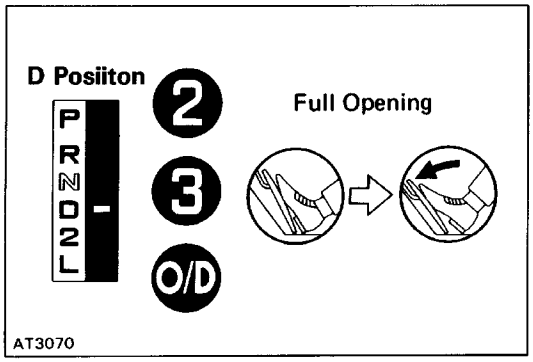
Accumulator is defective

Check ball is defective



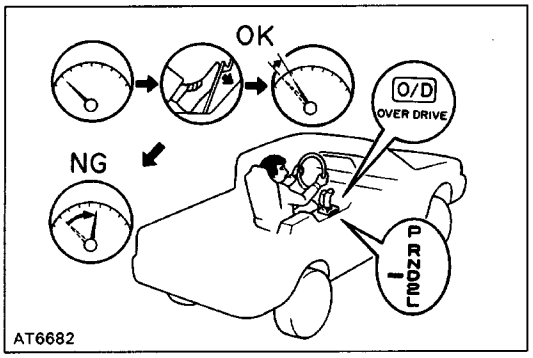
(c) Run at the D position lock–up or O/D gear and check for abnormal noise and vibration.

HINT: The check for the cause of abnormal noise and vibration must be made with extreme care as it could also be due to loss of balance in the propeller shaft, differen tial, torque converter clutch, etc.



(d) While running in the D position, 2nd, 3rd and O/D gears, check to see the possible kickdown vehicle speed limits for 2 → 1, 3 → 2 and O/D → 3 kickdowns conform to those indicated on the automatic shift schedule.

(e) Check for abnormal shock and slip at kick–down.

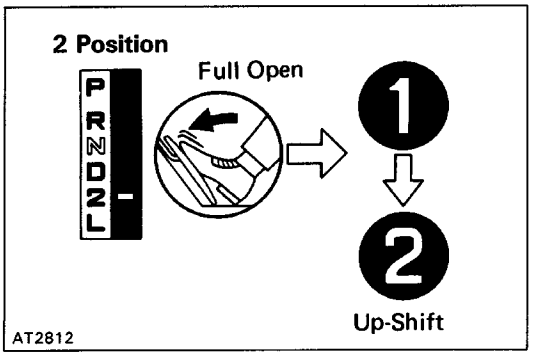


(f) Check for the lock–up mechanism.

(1) Drive in D position, O/D gear, at a steady speed (lock–up ON) of about 75 km/h¿47 mph).

(2) Lightly depress the accelerator pedal and check that the engine rpm does not change abruptly.

If there is a big jump in engine rpm, there is no lock–up.



2. 2 POSITION TEST

Shift into the 2 position and, while driving with the accelerator pedal held constantly at the full throttle valve opening position, push in one of the pattern selectors and check on the following points.

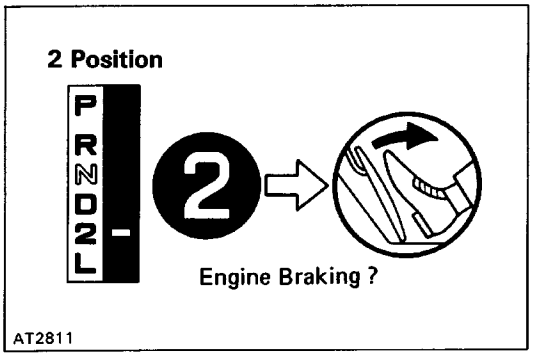
(a) Check to see that the 1–2 up–shift takes place and that the shift point conforms to it shown on the automatic shift schedule.

HINT:

There is no O/D up–shift and lock–up in the 2 position.

To prevent overrun, the transmission up–shifts into 3rd gear at around 100 km/h (62 mph) or more.

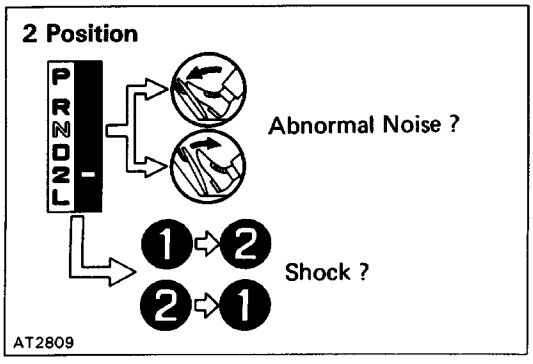
(b) While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.



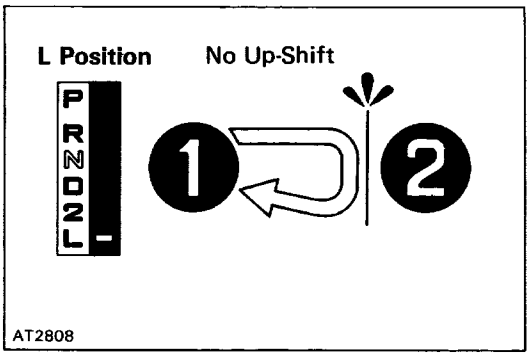
EVALUATION

If there is no engine braking effect:

Second coast brake is defective

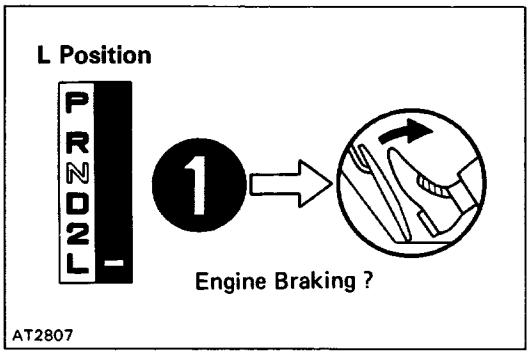


(c) Check for abnormal noise at acceleration and deceleration, and for shock at up–shift and down–shift.



3. L POSITION TEST

(a) While running in the L position , check to see that there is no up–shift to 2nd gear.

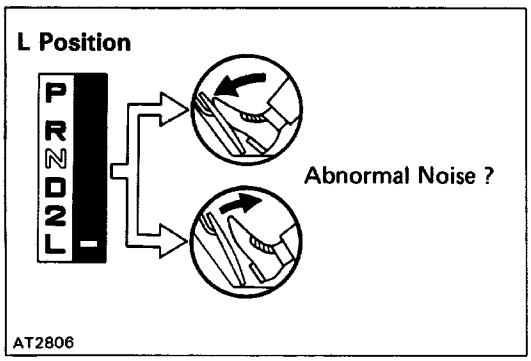


(b) While running in the L position, release the accelerator pedal and check the engine braking effect.

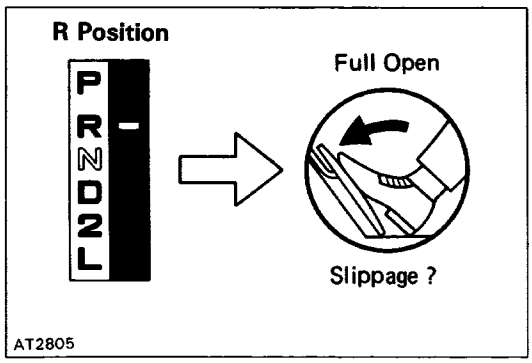
EVALUATION

If there is no engine braking effect:

First and reverse brake is defective

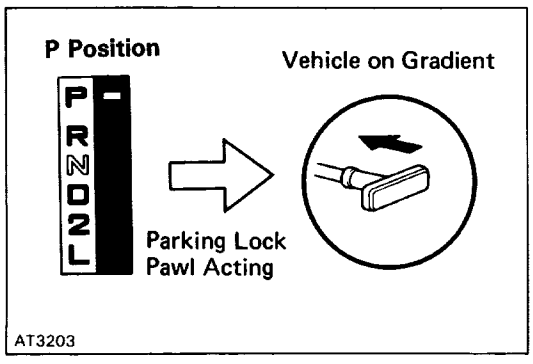


(c) Check for abnormal noise during acceleration and deceleration.



4. R POSITION TEST

Shift into the R position and, while starting at wide open throttle, check for slipping.



5. P POSITION TEST

Stop the vehicle on a gradient (more than 50) and after shifting into the P position, release the parking brake. Then check to see that the parking lock pawl holds the vehicle in place.

Automatic Shift Schedule

CBU: Tire size P205175R14, P215/65R15

(Differential gear ratio: 3.417)

		Throttle valve fully open [ ] Fully closed km/h (mph)							
		1→2	2→3	3→O/D	[3→O/D]	[O/D→3]	O/D→3	3→2	2→1
D position	NORM	61–66 (38–41)	108–117 (67–73)	143–152 (89–94)	43–48 (27–30)	26–30 (16–19)	136–145 (85–90)	100–105 (62–65)	44–49 (27–30)
	PW R	61–66 (38–41)	119–127 (74–79)	147–156 (91–97)	47–52 (29–32)	26–30 (16–19)	140–149 (87–93)	110–119 (68–74)	44–49 (27–30)
2 position	NORM PWR	53–57 (33–35)	126–135 (78–84)	–	–	–	–	119–128 (74–80)	47–52 (29–32)
L position	NORM PW R	–	–	–	–	–	–	101–110 (63–68)	57–62 (35–39)

		Throttle valve opening 5% km/h (mph)					
		Lock–up ON			Lock–up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D position	NORM	–	79 – 83 (49 – 52)	79 – 83 (49 – 52)	–	71 – 76 (44 – 47)	68 – 73 (42 – 45)
	PW R	–	61 – 66 (38 – 41)	79 – 83 (49 – 52)	–	68 – 73 (42 – 45)	68 – 76 (42 – 47)

* O/D switch OFF

CBU : Tire size 185R14–8

(Differential gear ratio: 3.9001

		Throttle valve fully open [ ] Fully closed km/h (mph)							
		1→2	2→3	3→O/D	[3→O/D]	[O/D→3]	O/D→3	3→2	2→1
D position	NORM	52–56 (32–35)	93–100 (45–62)	135–142 (84–88)	37–41 (23–25)	22–26 (14–16)	130–136 (81–85)	86–90 (53–56)	43–47 (27–29)
	PW R	52–56 (32–35)	102–109 (63–68)	148–154 (92–96)	40–44 (25–27)	22–26 (14–16)	141–148 (88–92)	95–102 (59–63)	43–47 (27–29)
2 position	NORM PW R	45–49 (28–30)	108–115 (67–71)	–	–	–	–	102–109 (63–68)	40–44 (25–27)
L position	NORM PW R	–	–	–	–	–	–	87–94 (54–58)	49–53 (30–33)

		Throttle valve opening 5% km/h (mph)					
		Lock–up ON			Lock–up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D position	NORM	–	67 – 71 (42 – 44)	68 – 71 (42 – 44)	–	61 – 65 (38 – 40)	58 – 62 (36 – 39)
	PW R	–	58 – 62 (36 – 39)	68 – 71 (42 – 44)	–	52 – 56 (32 – 35)	61 – 65 (38 – 40)

* : O/D switch OFF

C & C: Tire size 185R14–8, 185R14–6 (Double tire) **(Differential gear ratio: 4.100)**

		Throttle valve fully open [ ] Fully closed km/h (mph)							
		1→2	2→3	3→O/D	[3→O/D]	[O/D→3]	O/D→3	3→2	2→1
D position	NORM	43–47 (27–29)	84–91 (52–57)	129–135 (80–84)	73–77 (45–48)	21–25 (13–16)	123–130 (76–81)	77–81 (48–50)	38–42 (24–26)
	PWR	51–55 (32–34)	97–103 (60–64)	132–138 (82–86)	73–77 (45–48)	21–25 (13–16)	126–132 (78–82)	90–97 (56–60)	45–48 (28–30)
2 position	NORM PW R	43–47 (27–29)	103–110 (64–68)	–	–	–	–	97–104 (60–65)	38–42 (24–26)
L position	NORM PW R	–	–	–	–	–	–	83–89 (52–55)	47–51 (29–32)

		Throttle valve opening 5% km/h (mph)					
		Lock–up ON			Lock–up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D position	NORM	–	73 – 77 (45 – 48)	73 – 77 (45 – 48)	–	61 – 65 (38 – 40)	67 – 71 (42 – 44)
	PW R	–	73 – 77 (45 – 48)	73 – 77 (45 – 48)	–	67 – 71 (42 – 44)	67 – 71 (42 – 44)

* : O/D switch OFF

C & C: Tire size 185R14–6 (Double tire) **(Differential gear ratio: 4.300)**

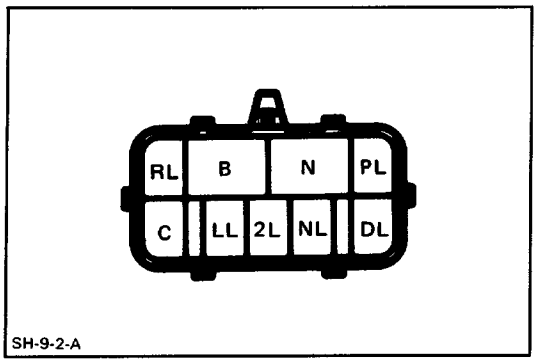
		Throttle valve fully open [ ] Fully closed km/h (mph)							
		1→2	2→3	3→O/D	[3→O/D]	[O/D→3]	O/D→3	3→2	2→1
D position	NORM	41–45 (25–28)	80–87 (50–54)	123–129 (76–80)	69 – 73 (43 – 45)	20–24 (12–15)	117–124 (73–77)	73–77 (45–48)	37–40 (23–25)
	PW R	49–53 (30–33)	92–99 (57–62)	126–132 (78–82)	69 – 73 (43 – 45)	20–24 (12–15)	120–126 (75–78)	86–92 (53–57)	42–46 (26–29)
2 position	NORM PWR	41–45 (25–28)	98–105 (61–65)	–	–	–	–	93–99 (58–62)	37–40 (23–25)
L position	NORM PW R	–	–	–	–	–	–	79–85 (49–53)	45–48 (28–30)

		Throttle valve opening 5% km/h (mph)					
		Lock–up ON			Lock–up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D position	NORM	–	69 – 73 (43 – 45)	69 – 73 (43 – 45)	–	58 – 62 (36 – 39)	64 – 68 (40 – 42)
	PW R	–	69 – 73 (43 – 45)	69 – 73 (43 – 45)	–	64 – 68 (40 – 42)	64 – 68 (40 – 42)

* : O/D switch OFF

HINT:

(1) Lock–up will not occur in 2nd gear unless the throttle valve opening is greater than 50%.
(2) There is no lock–up in the 2 and L positions.
(3) In the following cases, the lock–up will be released regardless of the lock–up pattern.
- When the throttle is completely closed.
- When the brake light switch is ON.



Park Neutral Position Switch

INSPECTION OF PARK/NEUTRAL POSIITON SWITCH

Inspect that there is continuity between each terminals.

Shift Position \ Terminal	B	N	PL	RL	NL	DL	2L	LL	C
P	○—○		○						○
R				○					○
N	○—○				○				○
D						○			○
2							○		○
L								○—○	

ON–VEHICLE REPAIR

Valve Body

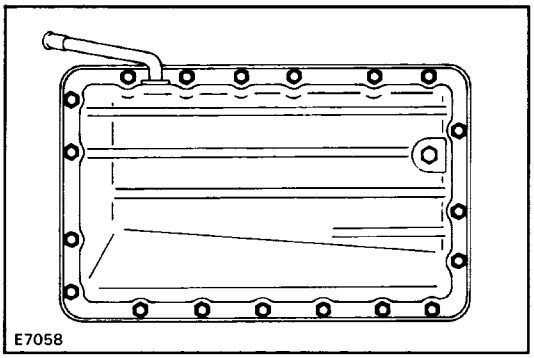
REMOVAL OF VALVE BODY

1. CLEAN TRANSMISSION EXTERIOR

To prevent contamination, clean the exterior of the transmission.

2. DRAIN TRANSMISSION FLUID

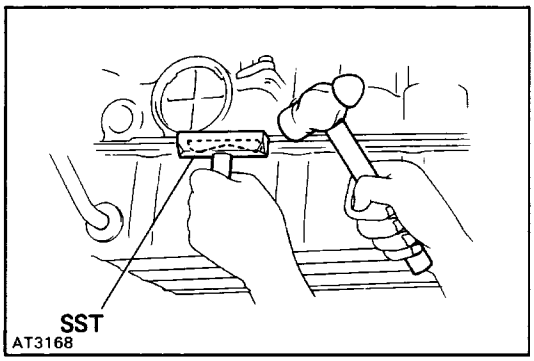
Remove the drain plug and the fluid into a suitable container.



3. REMOVE OIL PAN

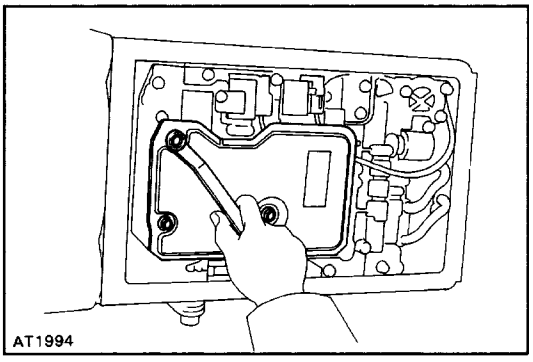
NOTICE: Some fluid will remain in the oil pan. Be careful not to damage the filler tube and O–ring.

(a) Remove the nineteen bolts.



(b) Install the blade of SST between the transmission case and oil pan, cut off applied sealer and then remove the oil pan.
SST 09032–00100

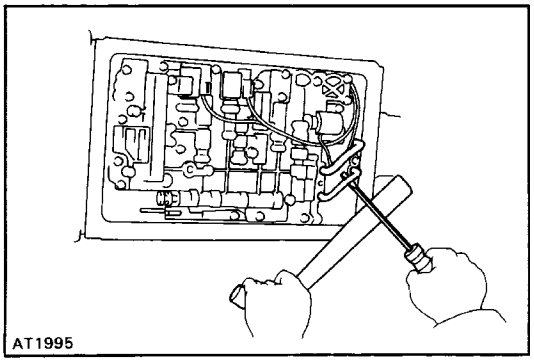
NOTICE: When removing the oil pan, be careful not to damage the oil pan flange.



4. REMOVE OIL STRAINER

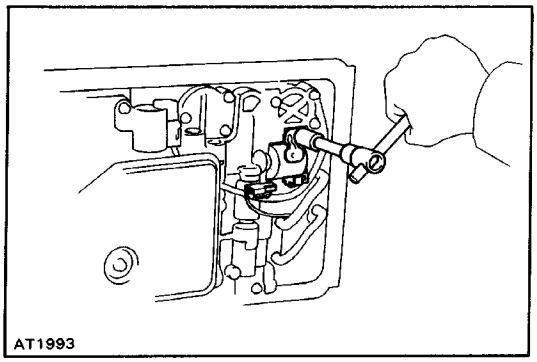
Remove the six bolts, and the oil strainer.

NOTICE: Be careful as some oil will come out with the filter



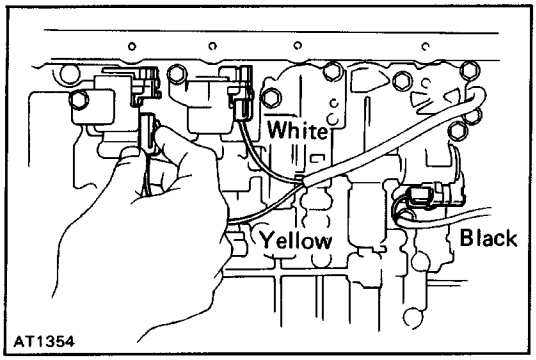
5. REMOVE OIL TUBES

Pry up both tube ends with a large screwdriver and remove the tubes.



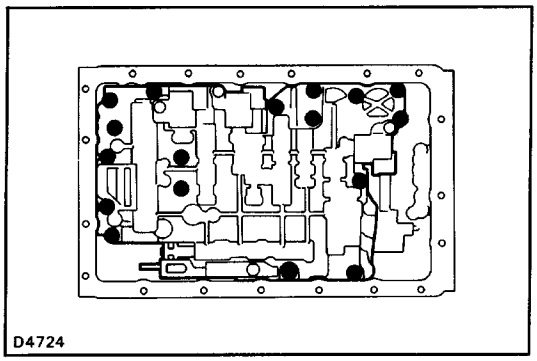
6. WHEN REPLACING SOLENOIDS

(a) Disconnect the connectors from the solenoids.
(b) Remove the solenoid mounting bolts.
(c) Remove the solenoids.



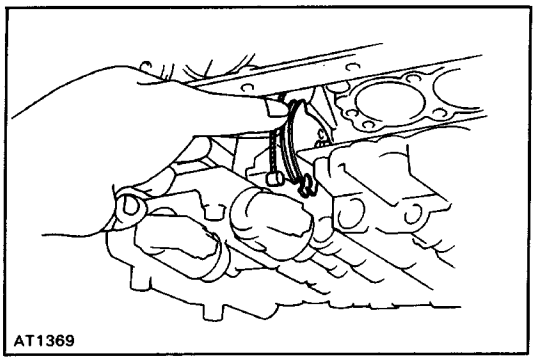
7. DISCONNECT SOLENOID CONNECTORS

Disconnect the three connectors from No.1, No.2 and lock–up solenoids.



8. REMOVE VALVE BODY

(a) Remove the seventeen bolts.

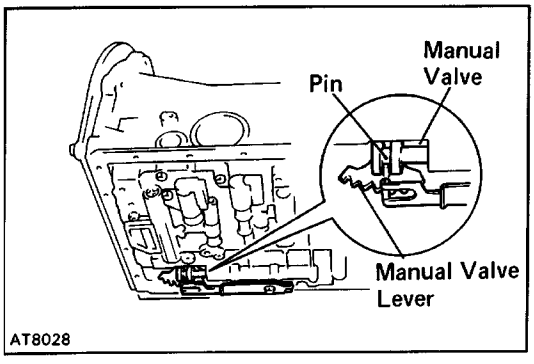


(b) Disconnect the throttle cable from the cam and remove the valve body.

INSTALLATION OF VALVE BODY

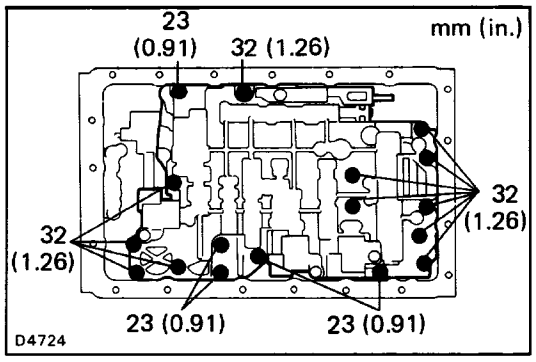
1. CONNECT THROTTLE CABLE TO CAM

Push the cable fitting into the cam.



2. INSTALL VALVE BODY

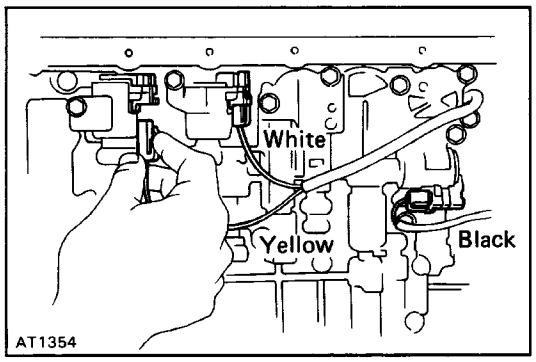
(a) Align the manual valve lever with the manual valve.



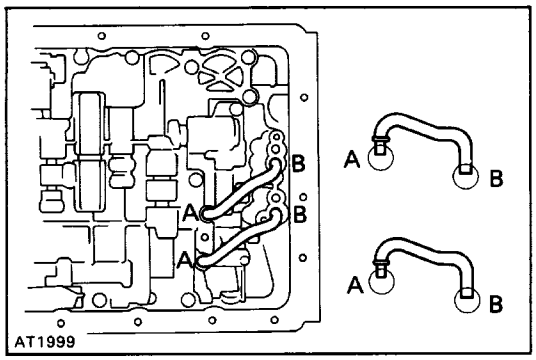
(b) Finger tighten the all bolts first. Then tighten the bolts evenly.

HINT: Each bolt length (mm, in.) is indicated in the figure.

Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)



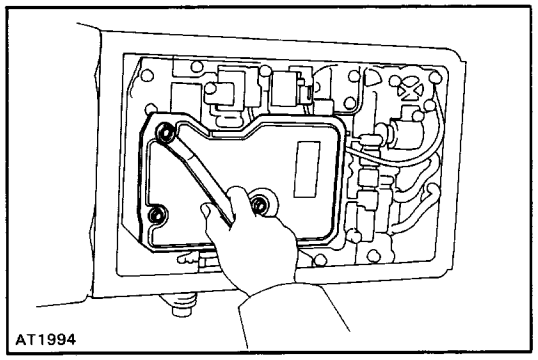
3. CONNECT SOLENOID WIRING



4. INSTALL OIL TUBES

Tap the tubes with a plastic hammer to install them into the positions in the figure.

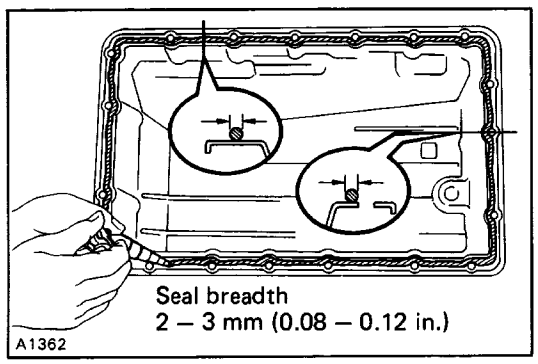
NOTICE: Be careful not to bend or damage the tubes.



5. INSTALL OIL STRAINER

Be sure the screen is clean. Torque the bolts.

Torque: 5.4 N–m (55 kgf–cm, 48 in.¿lbf)

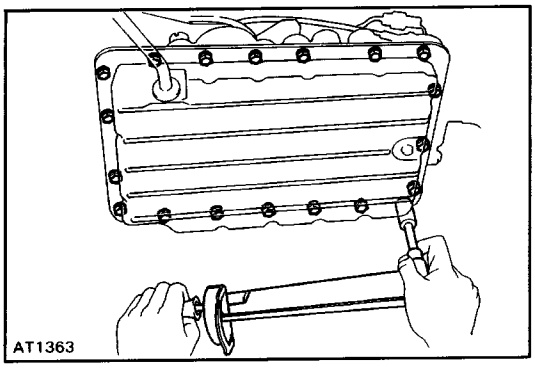


6. INSTALL OIL PAN

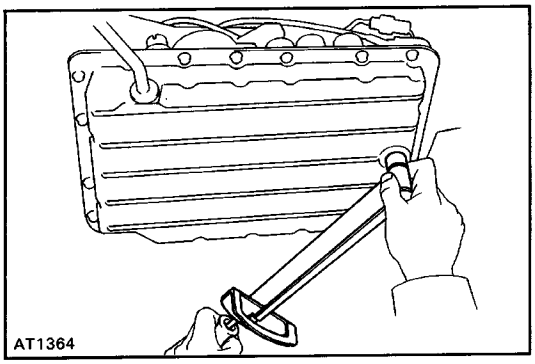
(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transrris–sion case and oil pan.

(b) Apply seal packing to the oil pan shown in the figure.

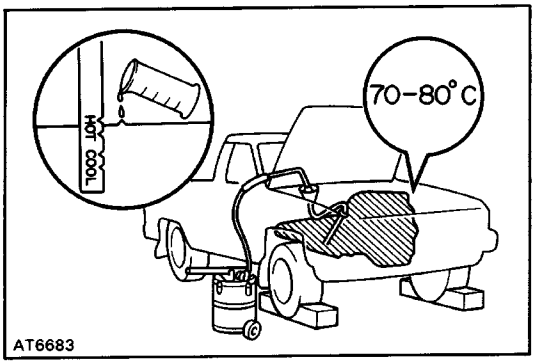
Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent



(c) Install and torque the nineteen bolts.
Torque:. 7.4 N–m (70 kgf–cm, 65 in.–lbf)



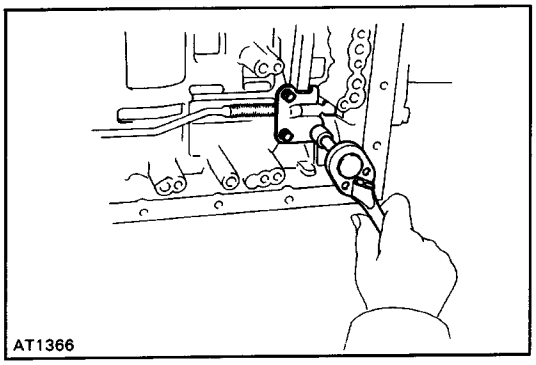
7. INSTALL DRAIN PLUG
Torque the drain plug.
Torque: 20 N–m (205 kgf–cm,15 ft–lbf)



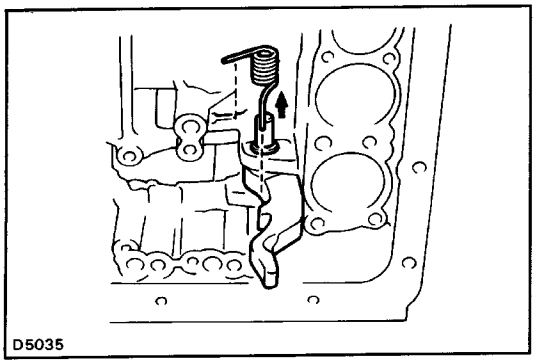
8. FILL TRANSMISSION WITH ATF
Add only about two liters of ATF. Start the engine and shift through all the positions. Check the fluid level and add as necessary.
NOTICE: Do not overfill.
Fluid type: ATF DEXRON® II

Parking Lock Pawl

REMOVAL OF PARKING LOCK PAWL



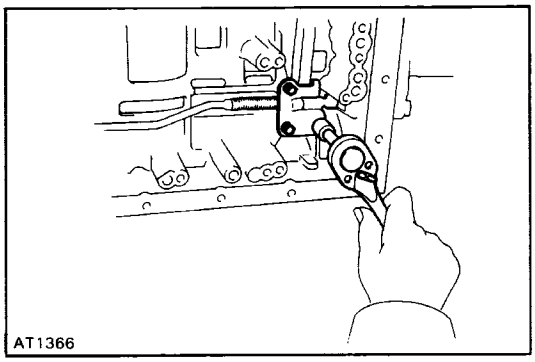
1. REMOVE VALVE BODY (See page AT–84)
2. REMOVE PARKING LOCK PAWL BRACKET
Remove the three bolts and the bracket.



3. REMOVE SPRING FROM PARKING LOCK PAWL PIVOT PIN
4. REMOVE PIVOT PIN AND PARKING LOCK PAWL

INSTALLATION OF PARKING LOCK PAWL

1. INSTALL PARKING LOCK PAWL AND PIVOT PIN
2. INSTALL SPRING

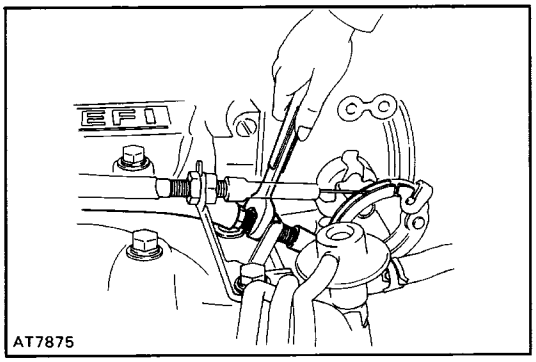


3. INSTALL PARKING LOCK PAWL BRACKET

(a) Push lock rod fully toward.
(b) Install the three bolts finger tight.
(c) Check that the pawl operates smoothly.
(d) Torque the bolts.

Torque: 7.4 N–m (70 kgf–cm,65 in.¿lbf)

4. INSTALL VALVE BODY (See page AT–85)

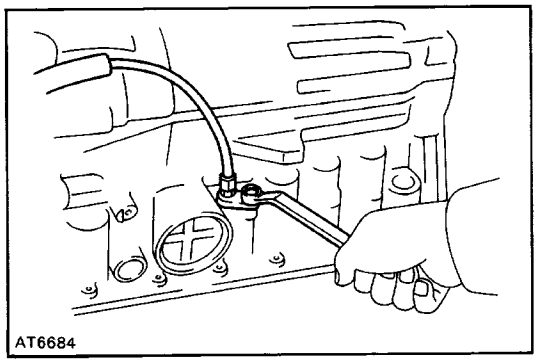


Throttle Cable

REMOVAL OF THROTTLE CABLE

1. DISCONNECT THROTTLE CABLE

(a) Disconnect the cable housing from the bracket.
(b) Disconnect the cable from the throttle linkage.



2. REMOVE VALVE BODY (See page AT–84)

3. PUSH THROTTLE CABLE OUT OF TRANSMISSION CASE

Remove the retaining bolt and pull out the throttle cable.

INSTALLATION OF THROTTLE CABLE

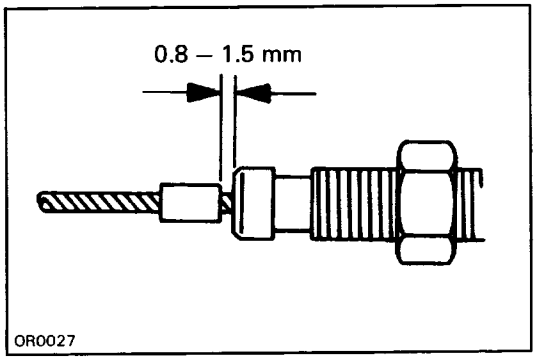
1. INSTALL CABLE IN TRANSMISSION CASE

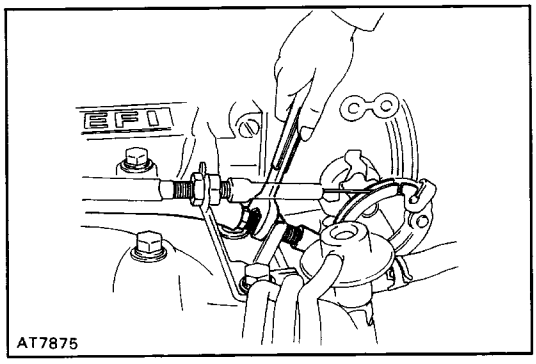
Install the retaining bolt and push in the throttle cable.

2. INSTALL VALVE BODY (See page AT–85)

3. IF THROTTLE CABLE IS NEW, STAKE STOPPER ON INNER CABLE

(a) Pull the inner cable lightly until a slight resistance is felt, and hold it.
(b) Stake the stopper as shown, 0.8–1.5 mm (0.031 –0.059 in.) in width.





4. CONNECT THROTTLE CABLE

(a) Connect the cable to the throttle linkage.
(b) Connect the cable housing to the bracket.

5. ADJUST THROTTLE CABLE (See page AT–60)

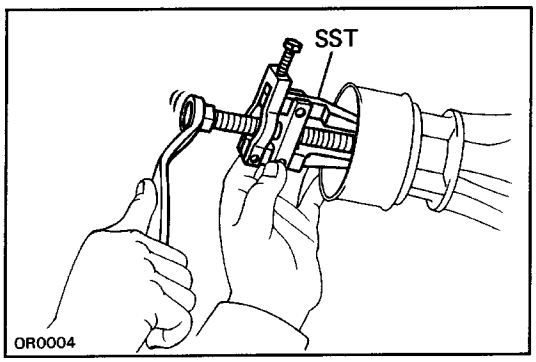
6. TEST DRIVE VEHICLE

Extension Housing
REPLACEMENT OF OIL SEAL

1. RAISE VEHICLE, AND POSITION PAN TO CATCH ANY FLUID THAT MAY DRIP

2. REMOVE PROPELLER SHAFT

(See page PR–3)

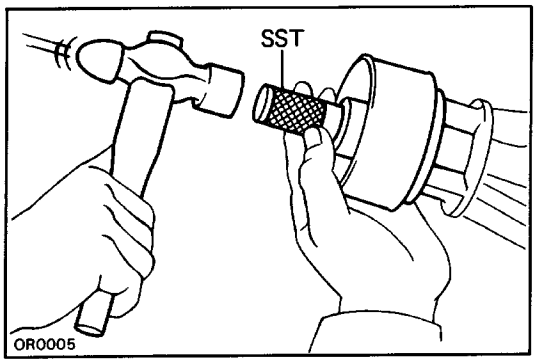


3. REMOVE REAR OIL SEAL

NOTICE: Clean the rear extension housing before removing the seal.

Using SST, remove the oil seal.

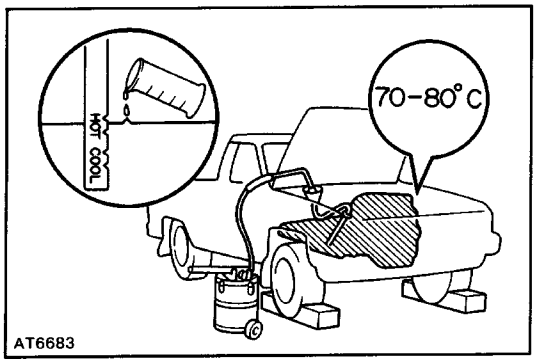
SST 09308–10010



4. INSTALL NEW OIL SEAL

Using SST, drive in a new oil seal as far as it will go.

SST 0932 5–20010



5. INSTALL PROPELLER SHAFT

(See page PR–3)

6. LOWER VEHICLE AND CHECK FLUID LEVEL

Start the engine, shift the shift lever into each position and, then check the fluid level with the transmission in P position.

Add fluid as necessary.

NOTICE: Do not overfill.

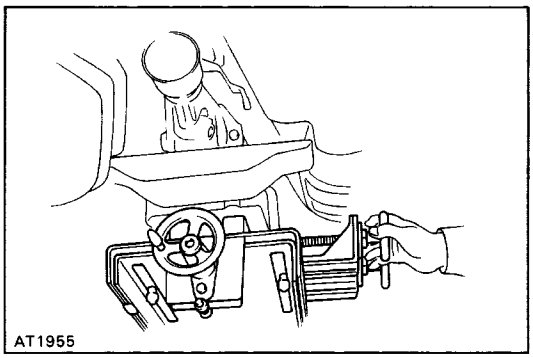
Fluid type: ATF DEXRON□II

REMOVAL OF EXTENSION HOUSING

1. RAISE VEHICLE AND POSITION PAN TO CATCH ANY FLUID THAT MAY DRIP

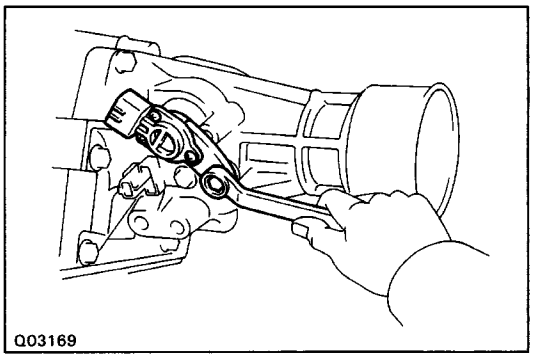
2. REMOVE PROPELLER SHAFT

(See page PR–3)



3. JACK UP TRANSMISSION SLIGHTLY

Securely support the transmission on a transmission jack. Lift the transmission slightly to remove weight from the rear support member.

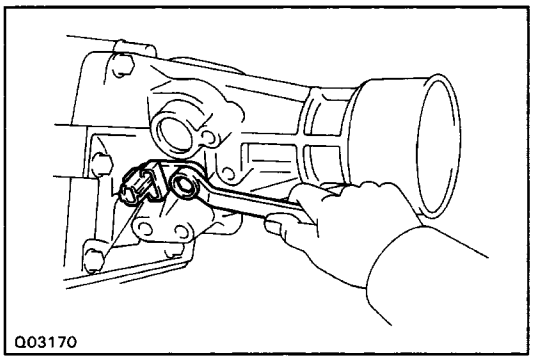


4. REMOVE NO. 1 VEHICLE SPEED SENSOR

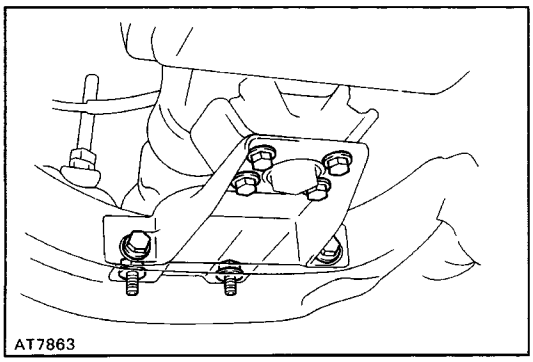
(a) Disconnect the connector.

(b) Remove the bolt and pry out the No. 1 vehicle speed sensor with a screwdriver.

(c) Remove the 0–ring from the sensor.

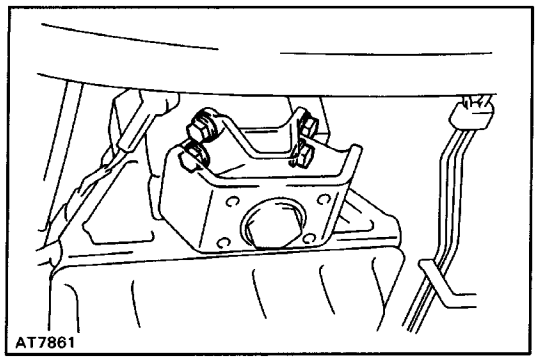


5. REMOVE NO.2 VEHICLE SPEED SENSOR



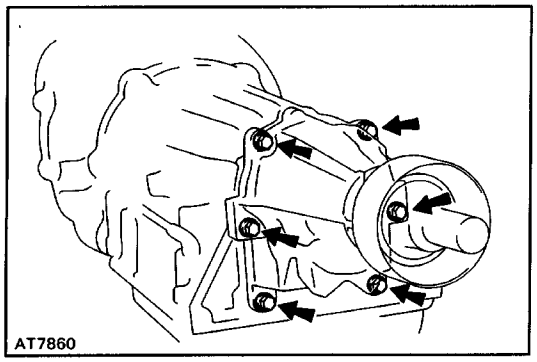
6. REMOVE ENGINE REAR MOUNTING FROM BRACKET

Remove eight bolts from the bracket.



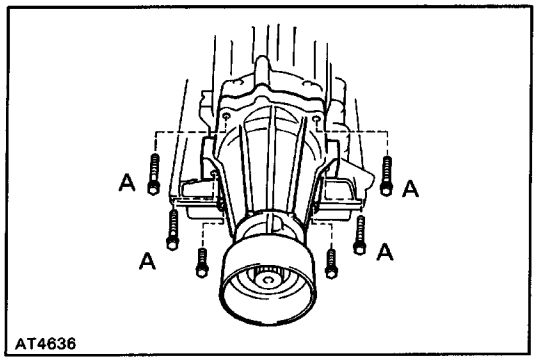
7. REMOVE ENGINE REAR MOUNTING FROM EXTENSION HOUSING

Remove four bolts and the engine rear mounting from the extension housing.



8. REMOVE EXTENSION HOUSING AND GASKET

Remove the six bolts. If necessary, tap the extension housing with a plastic hammer or wooden block to loosen it.



INSTALLATION OF EXTENSION HOUSING

1. INSTALL NEW GASKET AND EXTENSION HOUSING ON TRANSMISSION

(a) Clean the threads of the A bolt and bolt hole.

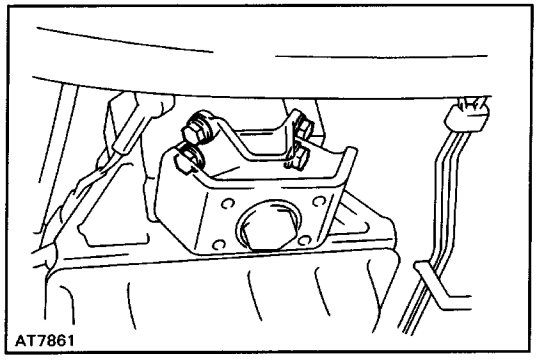
(b) Coat the threads of the A bolt with sealant.

Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Install the extension housing over a new gasket with bolts, and then torque them.

HINT: The two lower bolts are shorter.

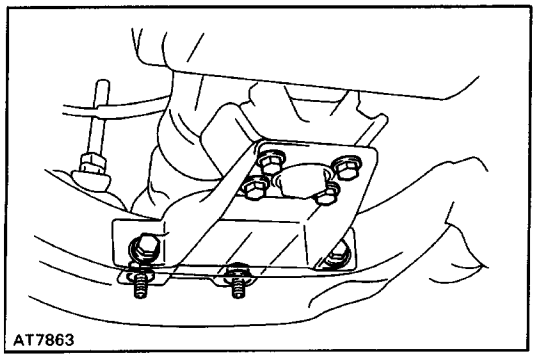
Torque: 34 N–m (345 kgf–cm, 25 ft–lbf)



2. INSTALL ENGINE REAR MOUNTING

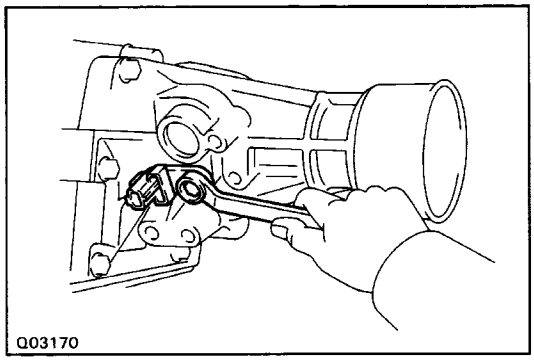
(a) Install the engine rear mounting to the extension housing. Tighten the four bolts.

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)

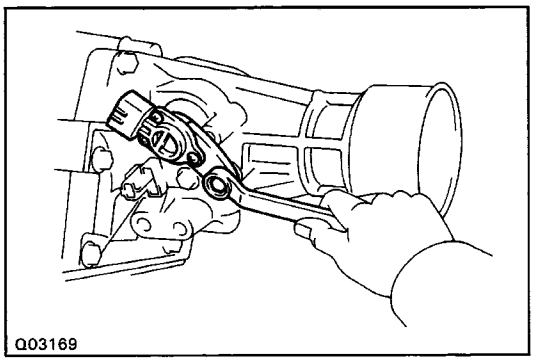


(b) Connect the bracket to the rear mounting and tighten the four bolts.

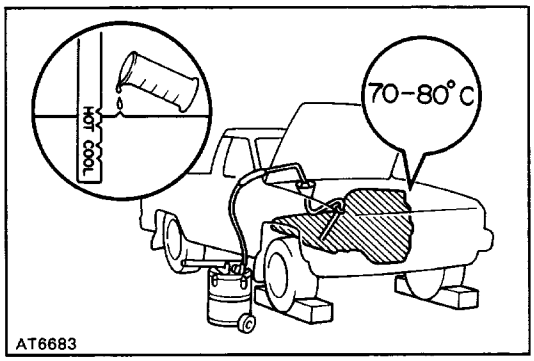
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



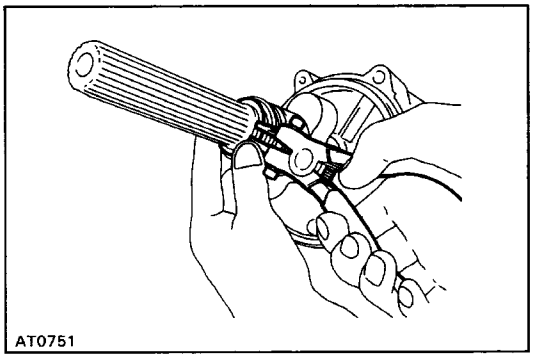
3. INSTALL NO.2 VEHICLE SPEED SENSOR



4. INSTALL PROPELLER SHAFT
(See page PR–3)
5. INSTALL NO. 1 VEHICLE SPEED SENSOR
(a) Install a new O–ring on the sensor.
(b) Install the No. 1 vehicle speed sensor.
6. CONNECT CONNECTOR



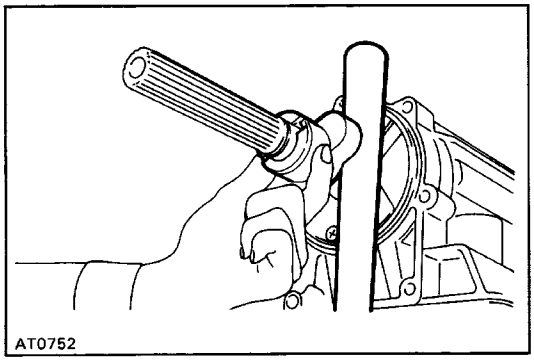
7. LOWER VEHICLE AND CHECK FLUID LEVEL
Start the engine, shift the shift lever into each position, and then check the fluid level with the transmission in P position.
Add fluid as necessary.
NOTICE: Do not overfill.
Fluid type: ATF DEXRON® 11

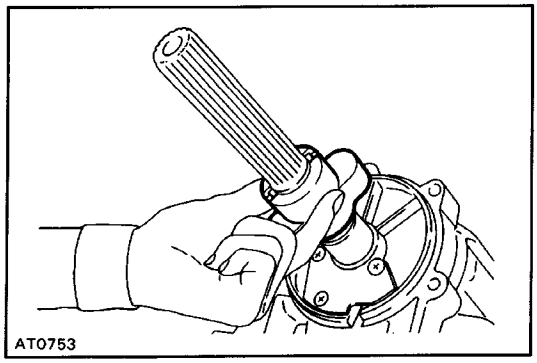


Sensor Rotor

REMOVAL OF SENSOR ROTOR

1. REMOVE EXTENSION HOUSING
(See page AT–90)
2. REMOVE SPEEDOMETER DRIVE GEAR
(a) Using snap ring pliers, remove the snap ring.
(b) Slide off the speedometer drive gear.
(e) Remove the lock ball.
3. REMOVE SENSOR ROTOR FROM OUTPUT SHAFT



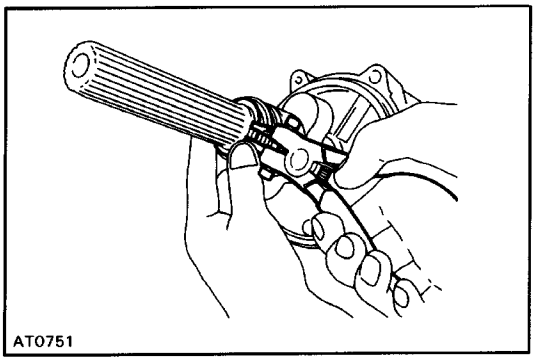


INSTALLATION OF SENSOR ROTOR

1. INSTALL SENSOR ROTOR ON OUTPUT SHAFT

(a) Make sure that the key is installed in the groove.

(b) Install the sensor rotor on the shaft.



2. INSTALL SPEEDOMETER DRIVE GEAR

(a) Slide the lock ball and the speedometer drive gear on the output shaft.

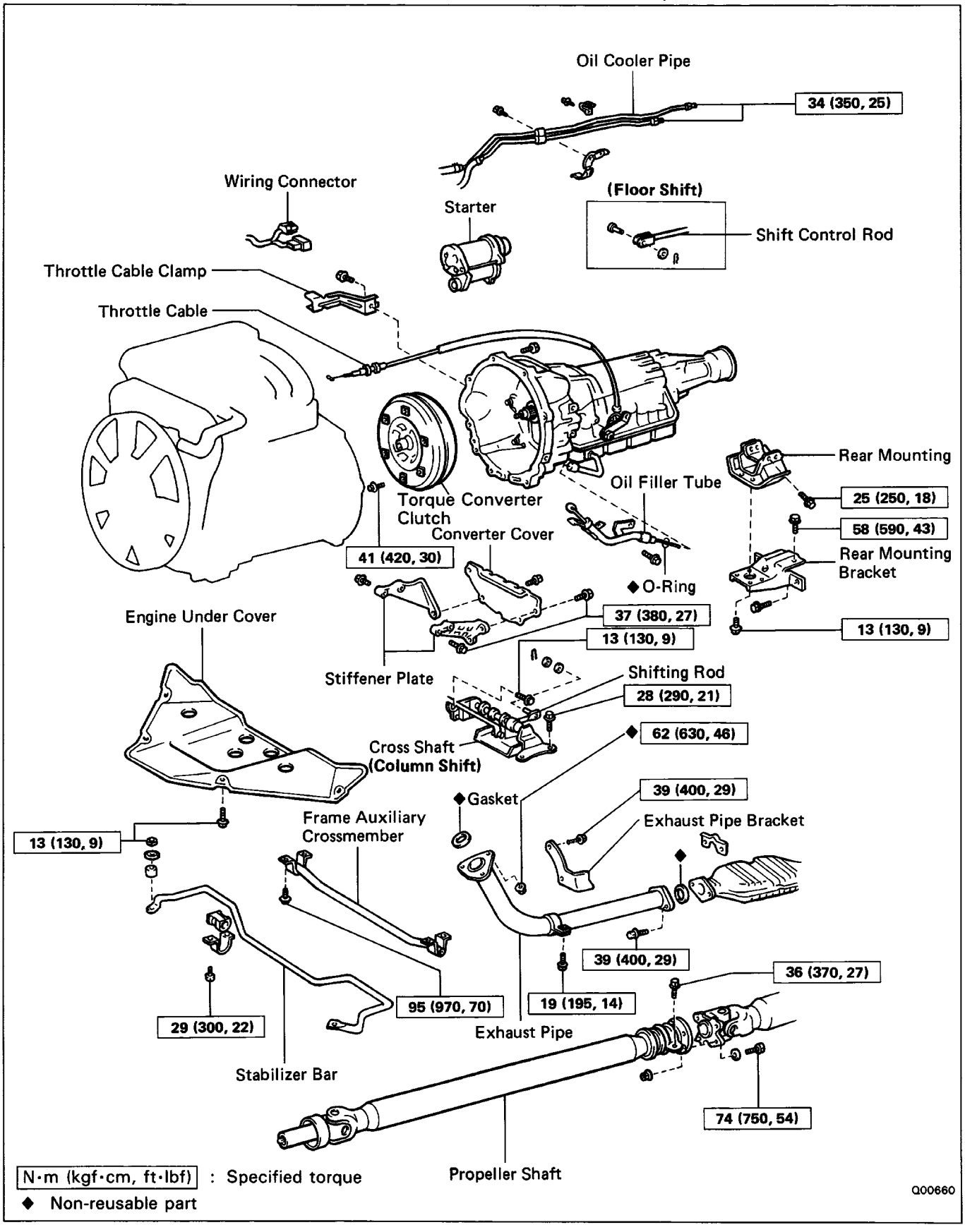
(b) Using snap ring pliers, install the snap ring.

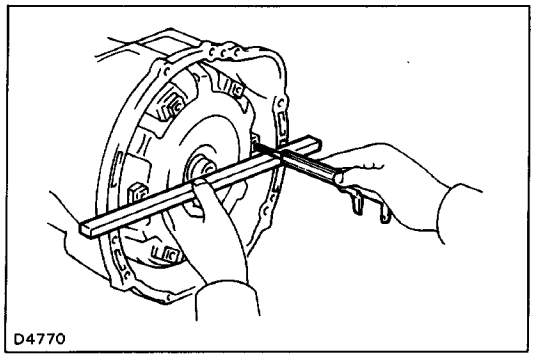
3. INSTALL EXTENSION HOUSING

(See page AT–91)

REMOVAL AND INSTALLATION OF TRANSMISSION

Remove and install the parts as shown.





(MAIN POINT OF INSTALLATION)

1. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

Using calipers and a straight edge, measure from the installed surface of the torque converter clutch to the front surface of the transmission housing.

Correct distance: 18.0 mm (0.709 in.)

If the distance is less than the standard, check for an improper installation.

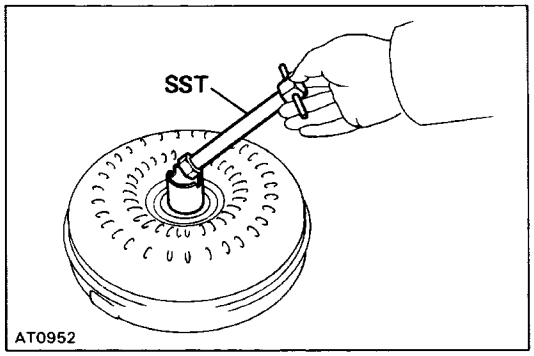
2. ADJUST TRANSMISSION THROTTLE CABLE

(See page AT–60)

3. FILL TRANSMISSION WITH ATF AND CHECK FLUID LEVEL

Fluid type: ATF DEXRON® II

NOTICE: Do not overfill.

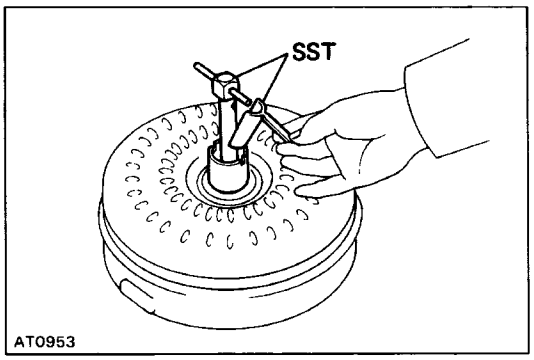


TORQUE CONVERTER CLUTCH AND DRIVE PLATE

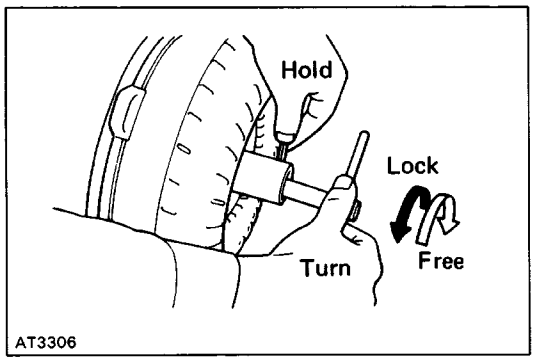
INSPECTION OF TORQUE CONVERTER CLUTCH AND DRIVE PLATE

1. INSPECT ONE–WAY CLUTCH

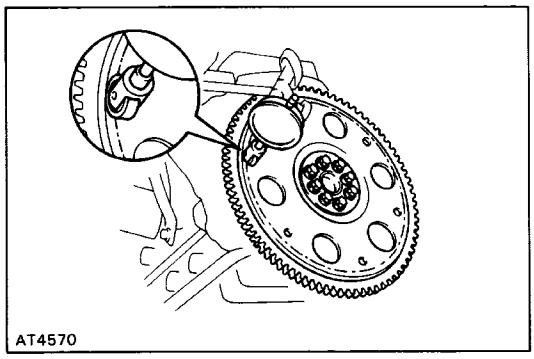
(a) Install SST into the inner race of the one–way clutch.
SST 09350–30020 (09351–32010)



(b) Install SST so that it fits in the notch of the converter hub and outer race of the one–way clutch.
SST 09350–30020 (09351–32020)



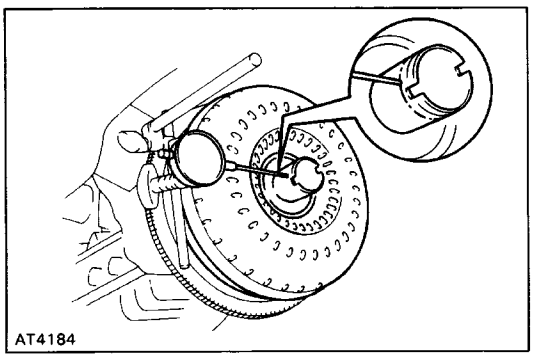
(c) With the torque converter clutch standing on its side, the clutch locks when turned counterclockwise, and rotates freely and smoothly clockwise.
If necessary, clean the converter and retest the clutch.
Replace the converter if the clutch still fails the test.



2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

Set up a dial indicator and measure the drive plate runout.
If runout exceeds 0.20 mm (0.0079 in.) or if the ring gear is damaged, replace the drive plate. If installing a new drive plate, note the orientation of spacers and tighten the bolts.

Torque: 83 N–m (850 kgf–cm, 61 ft–lbf)



3. MEASURE TORQUE CONVERTER CLUTCH SLEEVE RUNOUT

(a) Temporarily mount the torque converter clutch to the drive plate. Set up a dial indicator.
If runout exceeds 0.30 mm (0.0118 in.), try to correct by reorienting the installation of the converter. If excessive runout cannot be corrected, replace the torque converter clutch.
HINT: Mark the position of the converter to ensure cor rect installation.
(b) Remove the torque converter clutch.

A340F Automatic Transmission

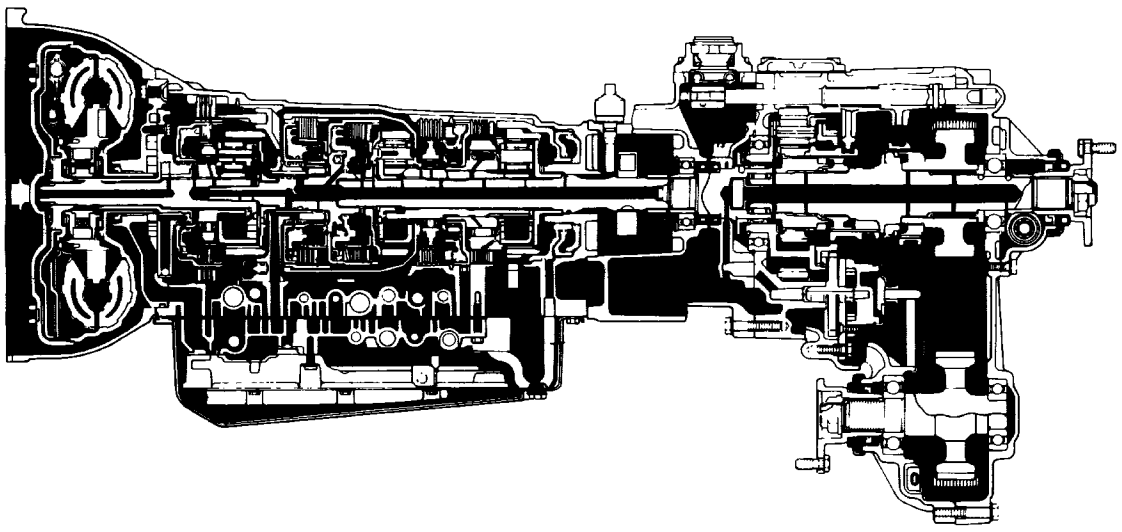
DESCRIPTION

GENERAL

The A340F automatic transmission is a four–speed automatic transmission with mechanically controlled 4WD transfer, developed with the aim of producing an easy–driving 4WD vehicle. The transmission section has fundamentally the same construction as the A340E automatic transmission mounted in the TRUCK 2WD. The operation of these is fully controlled by the ECM.

The A340F transmission is mainly composed of the torque converter clutch, the overdrive (hereafter called O/D) planetary gear unit, 3–speed planetary gear unit, the hydraulic control system and the electronic con–trol system.

Sectional View



AT5774

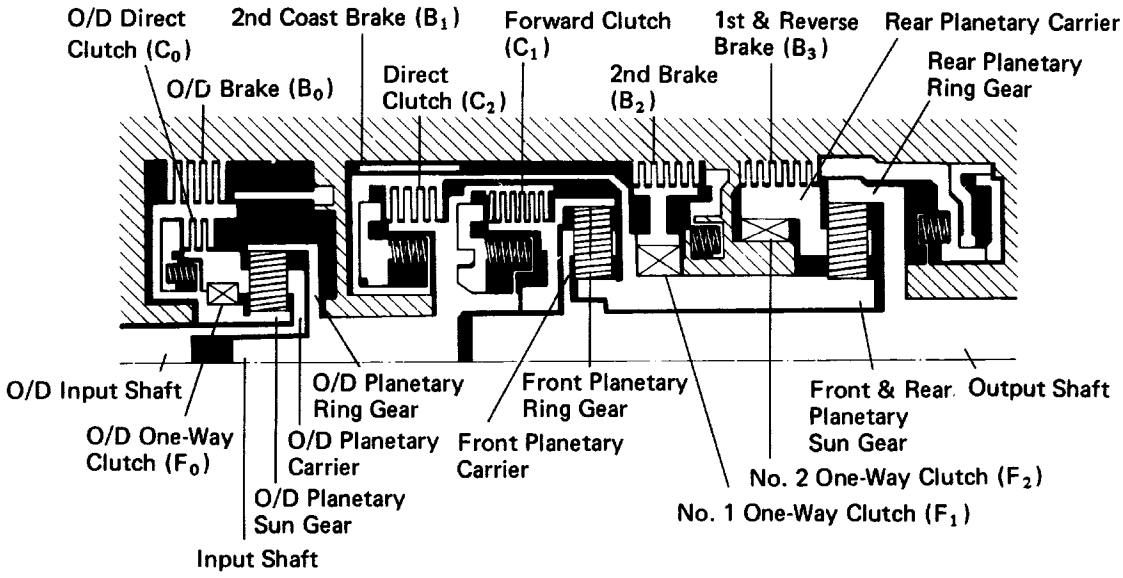
General Specifications

Type of Transmission				A340F
Type of Engine				22R-E
Torque Converter Clutch	Stall Torque Ratio			2.3 : 1
	Lock–Up Mechanism			Equipped
Gear Ratio	1 st Gear			2.804
	2nd Gear			1.531
	3rd Gear			1.000
	O/D Gear			0.705
	Reverse Gear			2.393
Plates (Disc/Plate)	C_0	O/D Direct Clutch		1/1
	C_1	Forward Clutch		4/4
	C_2	Direct Clutch		3/3
	B_2	2nd Brake		4/4
	B_3	1 st & Reverse Brake		5/5
	B_0	O/D Brake		3/2
ATF	Type			ATF DEXRON® II
	Capacity litter (US qts, Imp. qts)		Total	7.6 (8.0, 6.7)
			Drain and Refill	2.0 (2.1, 1.8)

OPERATION

Mechanical Operation

OPERATING CONDITIONS



AT2157

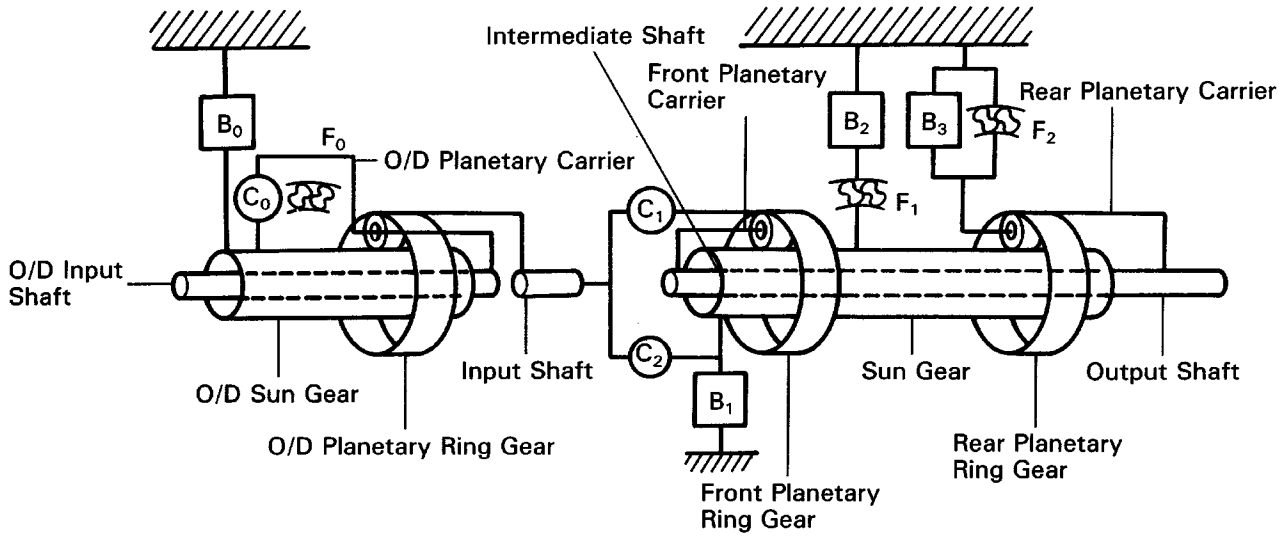
○ ..... Operating

Shift lever position	Gear position	C_0	C_1	C_2	B_0	B_1	B_2	B_3	F_0	F_1	F_2
P	Parking	○									
R	Reverse	○		○				○	○		
N	Neutral	○									
D	1st	○	○						○		○
	2nd	○	○				○		○	○	
	3rd	○	○	○			○		○		
	O/D		○	○	○		○				
2	1st	○	○						○		○
	2nd	○	○			○	○		○	○	
	3rd	○	○	○			○		○		
L	1st	○	○					○	○		○
	* 2nd	○	○			○	○		○	○	

* Down–shift only in the L position and 2nd gear–no up–shift.

FUNCTION OF COMPONENTS

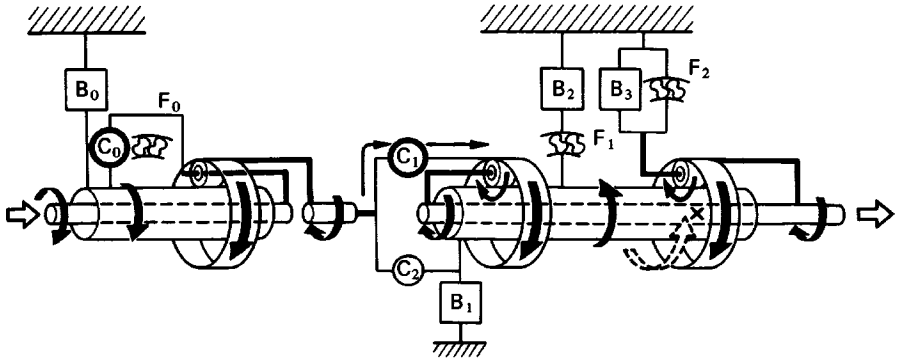
NOMENCLATURE	OPERATION
O/D Direct Clutch (Co)	Connects overdrive sun gear and overdrive carrier
O/D Brake (Bo)	Prevents overdrive sun gear from turning either clockwise or counterclockwise
O/D One–Way Clutch (Fo)	When transmission is being driven by engine, connects overdrive sun gear and overdrive carrier
Forward Clutch (Cl)	Connects input shaft and front planetary ring gear
Direct Clutch (C2)	Connects input shaft and front & rear planetary sun gear
2nd Coast Brake (Bl)	Prevents front & rear planetary sun gear from turning either clockwise or counterclockwise
2nd Brake (B2)	Prevents outer race of F, from turning either clockwise or counterclockwise, thus preventing front & rear planetary sun gear from turning counterclockwise
1 st & Reverse Brake (B3)	Prevents rear planetary carrier from turning either clockwise or counterclockwise
No. 1 One–Way Clutch (Fl)	When B2 is operating, prevents front & rear planetary sun gear from turning counterclockwise
No.2 One–Way Clutch 1F21	Prevents rear planetary carrier from turning counterclockwise



FUNCTION OF COMPONENTS (Cont'd)

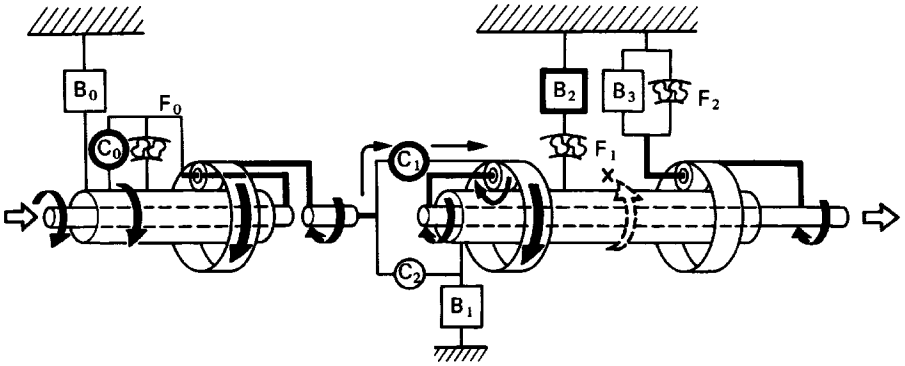
The conditions of operation for each gear position are shown in the following illustrations:

D or 2 Position 1st Gear



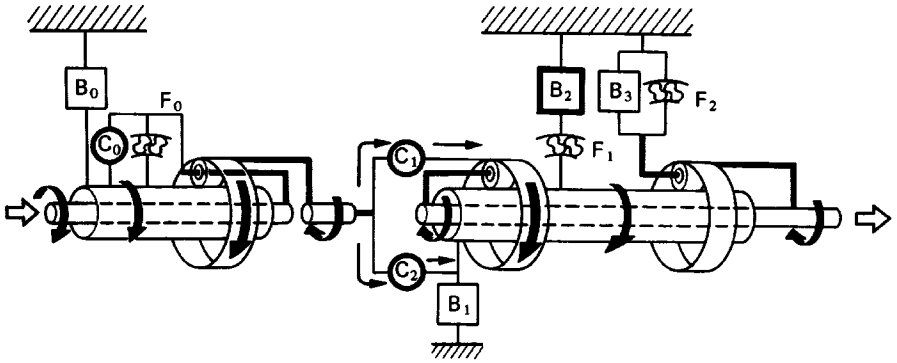
AT6675

D Position 2nd Gear



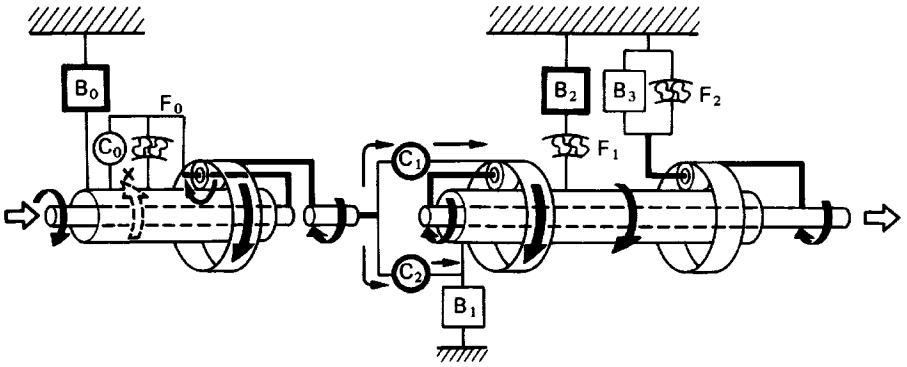
AT6676

D or 2 Position 3rd Gear



AT6677

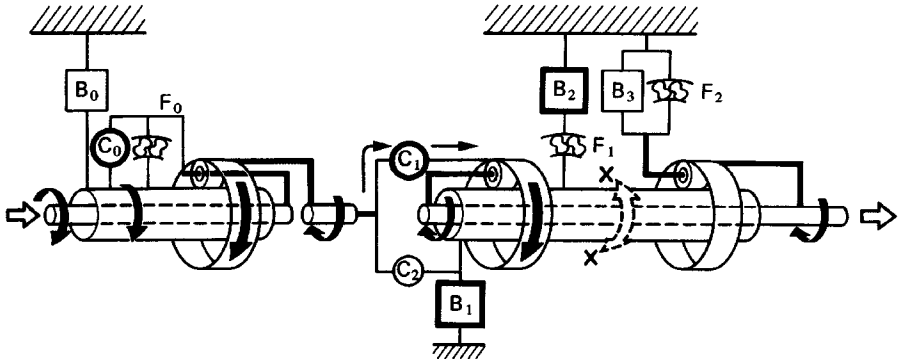
D Position O/D



AT6678

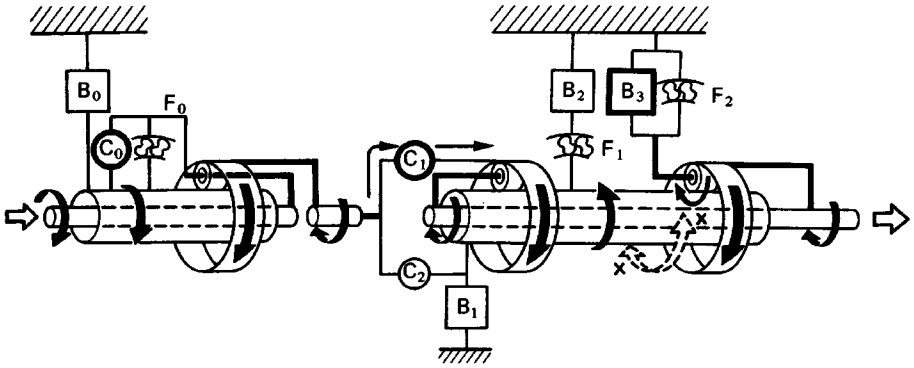
FUNCTION OF COMPONENTS (Cont'd)

2 or L Position Gear



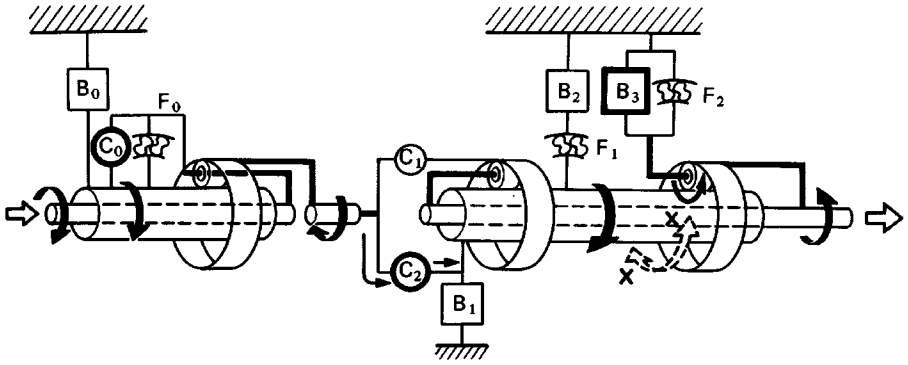
AT6679

L Position 1st Gear



AT6680

R Position Reverse Gear



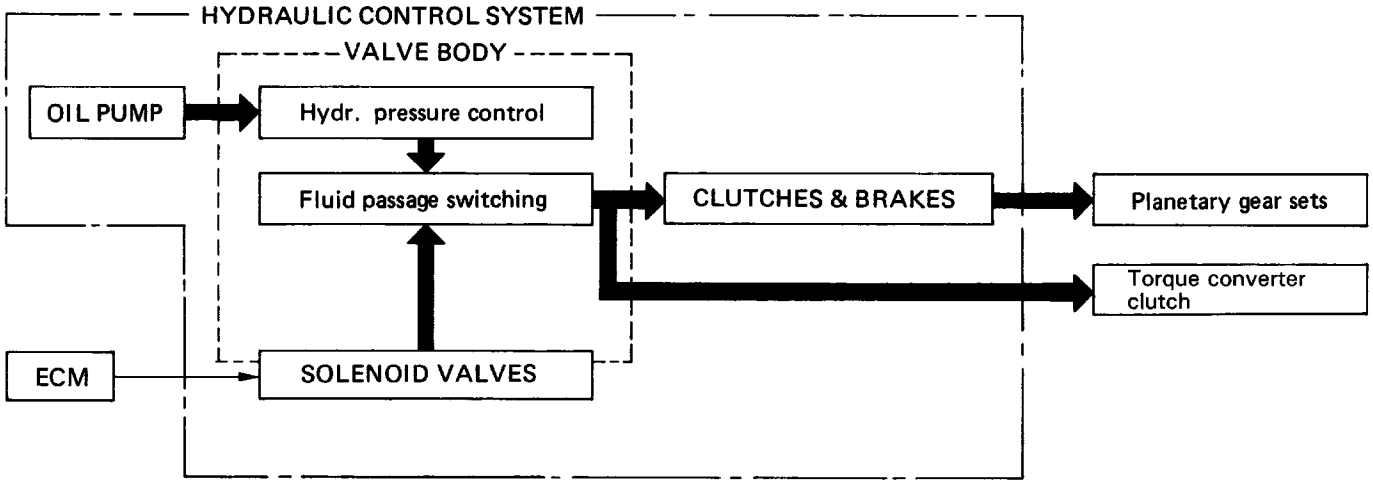
AT6681

HYDRAULIC CONTROL SYSTEM

The hydraulic control system is composed of the oil pump, the valve body, the solenoid valves, and the clutches and brakes, as well as the fluid passages which connect all of these components. Based on the hydraulic pressure created by the oil pump, the hydraulic control system governs the hydraulic pressure acting on the torque converter clutch, clutches and brakes in accordance with the vehicle driving condi–tions.

There are three solenoid valves on the valve body. These solenoid valves are turned on the off by signals from the ECM to operate the shift valves. These shift valves then switch the fluid passages so that fluid goes to the torque converter clutch and planetary gear units.

(Except for the solenoid valves, the hydraulic control system of the electronic controlled transmission is ba–
sically the same as that of the fully hydraulic controlled automatic transmission.)



- **LINE PRESSURE**

  Line pressure is the most basic and important pressure used in the automatic transmission, because it is used to operate all of the clutches and brakes in the transmission.

  If the primary regulator valve does not operate correctly, line pressure will be either too high or too low. Line pressure that is too high will lead to shifting shock and consequent engine power loss due to the greater effort required of the oil pump; line pressure that is too low will cause slippage of clutches and brakes, which will, in extreme cases, prevent the vehicle from moving. Therefore, if either of these problems are noted, the line pressure should be measured to see if it is within stan–dard.

- **THROTTLE PRESSURE**

  Throttle pressure is always kept in accordance with the opening angle of the engine throttle valve. This throttle pressure acts on the primary regulator valve and, accordingly, line pressure is regulated in response to the throttle valve opening.

  In the fully hydraulic controlled automatic transmission, throttle pressure is used for regulating line pressure and as signal pressure for up–shift and down–shift of the transmission. In the electronic controlled transmission, however, throttle pressure is used only for regulating line pressure. Conse–quently, improper adjustment of the transmission throttle cable may result in a line pressure that is too high or too low. This, in turn, will lead to shifting shock or clutch and brake slippage.

ELECTRONIC CONTROL SYSTEM

The electronic control system, which controls the shift points and the operation of the lock–up clutch, is composed of the following three parts:

1. Sensors

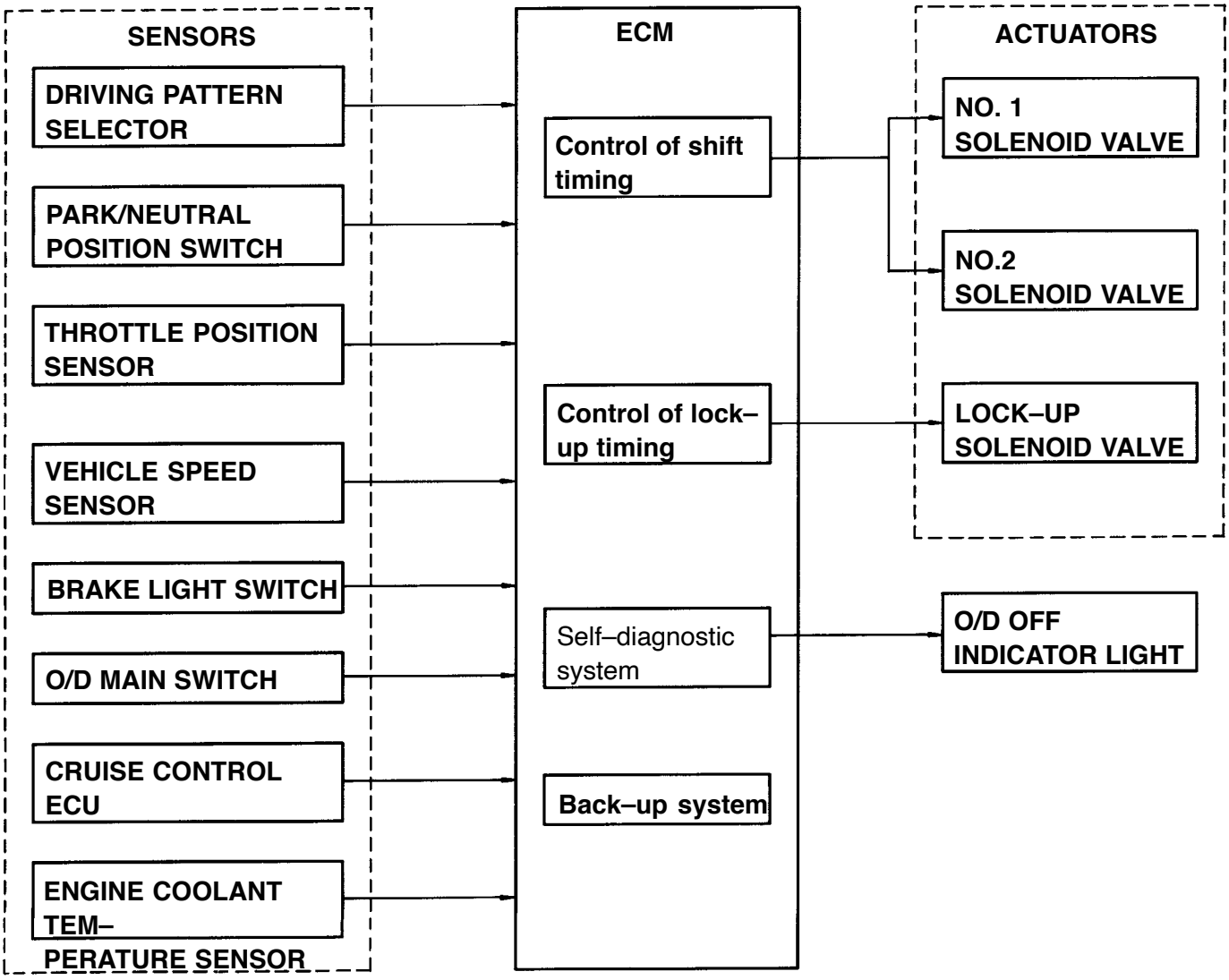
These sensors sense the vehicle speed, throttle opening and other conditions and send these data to the ECM in the form of electrical signals.

2. ECM

The ECM determines the shift and lock–up timing based upon the signals from sensors, and controls the solenoid valves of the hydraulic control unit accordingly.

3. Actuators

These are three solenoid valves that control hydraulic pressure acting on the hydraulic valves to control shifting and lock–up timing.



FUNCTION OF ECM

- **Control of Shift Timing**
  The ECM has programmed into its memory the optimum shift pattern for each shift lever position (D, 2, L position) and driving mode (Normal or Power).
  Based on the appropriate shift pattern, the ECM turns No. 1 and No.2 solenoid valves on or off in accordance with the vehicle speed signal from the vehicle speed sensor and the throttle opening signal from the throttle position sensor. In this manner, the ECM operates each shift valve, opening or closing the fluid passages to the clutches and brakes to permit up–shift or down–shift of the transmission.

HINT: The electronic control system provides shift timing and lock–up control only while the vehicle is traveling forward. In REVERSE, PARK, and NEUTRAL, the transmission is mechanically, not electronically controlled.

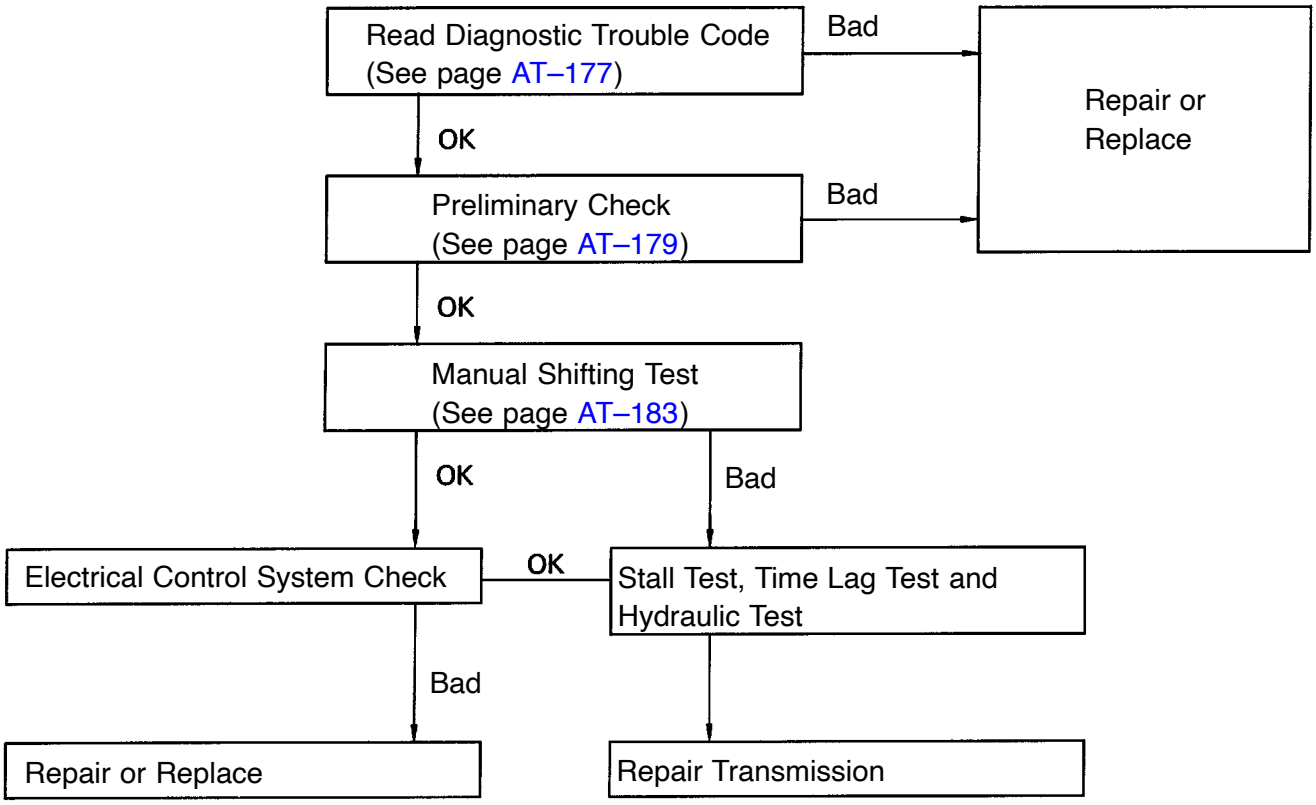
- **Control of Overdrive**
  Driving in overdrive is possible if the O/D main switch is on and the shift lever is in the D position. However, when the vehicle is being driven using the cruise control system (CCS), if the actual vehicle speed drops to about 4 km/h (2 mph) below the set speed while the vehicle is running in overdrive, the CCS ECU sends a signal to the ECM to release the overdrive and prevent the transmission from shifting back into overdrive until the actual vehicle speed reaches the speed set in the CCS memory.
  On this model, if the engine coolant temperature falls below 70°C (158°F), preventing the transmission from up–shifting into overdrive.
- **Control of Lock–Up System**
  The ECM has programmed in its memory a look–up clutch operation pattern for each driving mode (Normal or Power). Based on this lock–up pattern, the ECM turns lock–up solenoid valve on or off in accordance with the vehicle speed signals received from the vehicle speed sensor and the throttle opening signals from the throttle position sensor.
  Depending on whether lock–up solenoid valve is on or off, the lock–up relay valve performs changeover of
  the fluid passages for the converter pressure acting on the torque converter clutch to engage or disengage the lock–up clutch.
  (Mandatory Cancellation of Lock–Up System)
  If any of the following conditions exist, the ECM turns off lock–up solenoid valve to disengage the lock–up clutch.
  1) The brake light switch comes on (during braking).
  2) The IDL points of the throttle position sensor close (throttle valve fully closed).
  3) The vehicle speed drops 4 km/h (2 mph) or more below the set speed while the cruise control system is operating.
  4) The engine coolant temperature falls below 70°C (158°F).

  The purpose of 1) and 2) above is to prevent the engine from stalling if the rear wheels lock up. The purpose of 3) is to cause the torque converter clutch to operate to obtain torque multiplication. The purpose of 4) is both to improve general driveability, and to speed up transmission warm–up.
  Also, while the lock–up system is in operation, the ECM will temporarily turn it off during up–shift or down–shift in order to decrease shifting shock.

TROUBLESHOOTING

Basic Troubleshooting

Before troubleshooting an electronic controlled transmission, first determine whether the problem is electrical or mechanical. To do this, just refer to the basic troubleshooting flow–chart provided below.
If the cause is already known, using the basic troubleshooting chart below along with the general troubleshooting chart on the following pages should speed the procedure.



General Troubleshooting

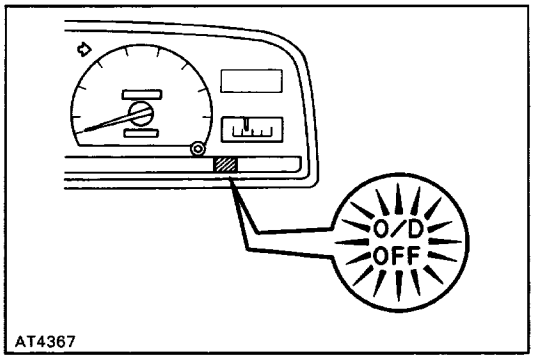
Problem	Possible cause	Remedy	Page
Fluid discolored or smells burnt	Fluid contaminated Torque converter clutch faulty Transmission faulty	Replace fluid Replace torque converter clutch Disassemble and inspect transmission	AT–181 AT–212 ★
Vehicle does not move in any forward position or reverse	Manual linkage out of adjustment Valve body or primary regulator faulty Parking lock pawl faulty Torque converter clutch faulty Converter drive plate broken Oil pump intake screen blocked Transmission faulty	Adjust linkage Inspect valve body Inspect parking lock pawl Replace torque converter clutch Replace drive plate Clean screen Disassemble and inspect transmission	AT–182 AT–208 AT–212 AT–212 ★ ★
Shift lever position incorrect	Manual linkage out of adjustment Manual valve and lever faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–182 ★
Harsh engagement into any drive position	Throttle cable out of adjustment Valve body or primary regulator faulty Accumulator pistons faulty Transmission faulty	Adjust throttle cable Inspect valve body Inspect accumulator pistons Disassemble and inspect transmission	AT–182 ★ ★ ★
Delayed 1–2, 2–3 or 3–0/D up–shift, or down–shifts from O/D–3 or 3–2 and shifts back to O/D or 3	Electronic control faulty Valve body faulty Solenoid valve faulty	Inspect electronic control Inspect valve body Inspect solenoid valve	AT–184 AT–193
Slips on 1–2, 2–3 or 3–0/D up–shift, or slips or shudders on acceleration	Manual linkage out of adjustment Throttle cable out of adjustment Valve body faulty Solenoid valve faulty Transmission faulty	Adjust linkage Adjust throttle cable Inspect valve body Inspect solenoid valve Disassemble and inspect transmission	AT–182 AT–182 ★ AT–193 ★
Drag, binding or tie–up on 1–2, 2–3 or 3–OID up–shift	Manual linkage out of adjustment Valve body faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–182 ★ ★

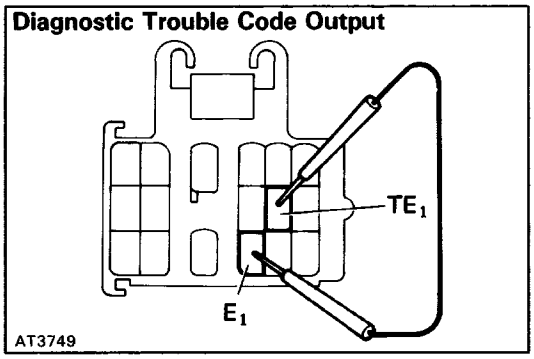
Remark ★: Refer to A340F Automatic Transmission Repair Manual. (Pub. No. RM271U)

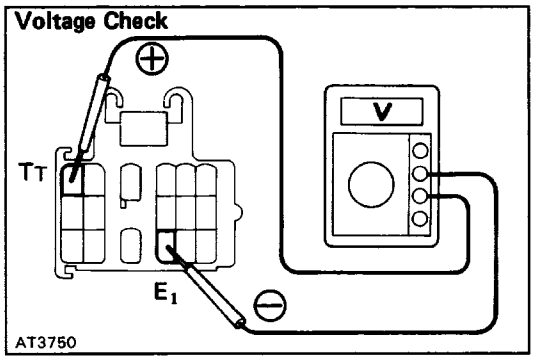
General Troubleshooting (Cont'd)

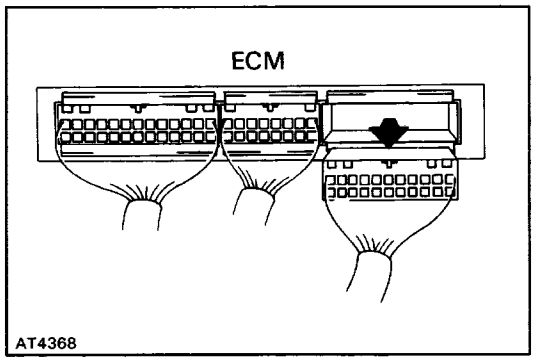
Problem	Possible cause	Remedy	Page
No lock–up in 2nd, 3rd or O/D	Electronic control faulty Valve body faulty Solenoid valve faulty Transmission faulty	Inspect electronic control Inspect valve body Inspect solenoid valve Disassemble and inspect transmission	AT–184 ★ AT–193 ★
Harsh down–shift	Throttle cable out of adjustment Throttle cable and cam faulty Accumulator pistons faulty Valve body faulty Transmission faulty	Adjust throttle cable Inspect throttle cable and cam Inspect accumulator pistons Inspect valve body Disassemble and inspect transmission	AT–182 AT–182 ★ ★ ★
No down–shift when coasting	Valve body faulty Solenoid valve faulty Electronic control faulty	Inspect valve body Inspect solenoid valve Inspect electronic control	★ AT–193 AT–184
Down–shift occurs too quickly or too late while coasting	Throttle cable faulty Valve body faulty Transmission faulty Solenoid valve faulty Electronic control faulty	Inspect throttle cable Inspect valve body Disassemble and inspect transmission Inspect solenoid valve Inspect electronic control	AT–1 82 ★ ★ AT–193 AT–184
No O/D–3, 3–2 or 2–1 kick–down	Solenoid valve faulty Electronic control faulty Valve body faulty	Inspect solenoid valve Inspect electronic control Inspect valve body	AT–193 AT–184
No engine braking in 2 or L position	Solenoid valve faulty Electronic control faulty Valve body faulty Transmission faulty	Inspect solenoid valve Inspect electronic control Inspect valve body Disassemble and inspect transmission	AT–193 AT–184 ★ ★
Vehicle does not hold in P	Manual linkage out of adjustment Parking lock pawl cam and spring faulty	Adjust linkage Inspect cam and spring	AT–188 AT–208
No H2–H4, H4–L4, L4–H4 or H4–H2 change gear position of transfer	Transfer linkage out of adjustment Transfer faulty	Adjust linkage Disassemble and inspect transfer	AT–182 ★

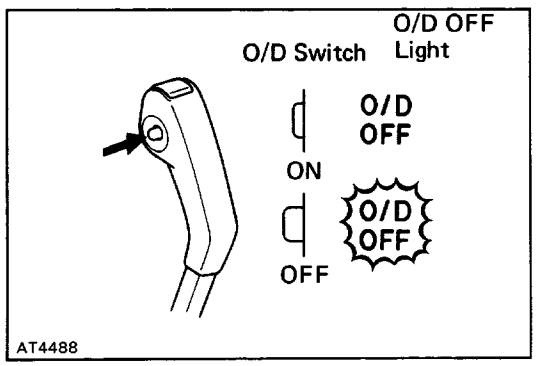
Remark ★: Refer to A340F Automatic Transmission Repair Manual. (Pub. No. RM271 U)











Diagnosis System

DESCRIPTION

1. A self–diagnosis function is built into the electrical control system. Warning is indicated by the overdrive OFF indica–tor light.

HINT: Warning and diagnostic trouble codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light is lit continuously and will not blink.

(a) If a malfunction occurs within the vehicle speed sen–sors (No. 1 or 2) or solenoids (No. 1, 2), the overdrive OFF light will blink to warn the driver.
However, there will be no warning of a malfunction with lock–up solenoid.

(b) The diagnostic trouble code can be read by the num–ber of blinks of the overdrive OFF indicator light when terminals TE, and El are connected.
(See page AT–1 78)

(c) The throttle position sensor or brake signal are not indicated, but inspection can be made by checking the voltage at terminal TT of the data link connector 1.

(d) The signals to each gear can be checked by measur–ing the voltage at terminal TT while driving.

2. The diagnostic trouble code is retained in memory by the ECM and due to back–up voltage, is not canceled out when the engine is turned off. Consequently, after repair, it is necessary to turn the ignition switch off and remove the MF I fuse
(1 5A) or disconnect the ECM connector to cancel out the diagnostic trouble code. (See page AT–178)

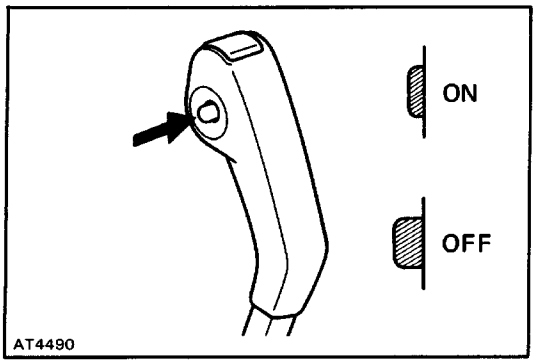
HINT:

Low battery positive voltage will cause faulty opera–tion of the diagnosis system. Therefore, always check the battery first.

Use a voltmeter and ohmmeter that have an imped–ance of at least 10 k0/V.

CHECK ”O/D OFF” INDICATOR LIGHT

1. Turn the ignition switch ON.
2. The–O/D OFF” light will come on when the O/D switch is placed at OFF.
3. When the O/D switch is set to ON, the ”O/D OFF” light should go out.
If the–O/D OFF” light flashes when the O/D switch is set to ON, the electronic control system is faulty.

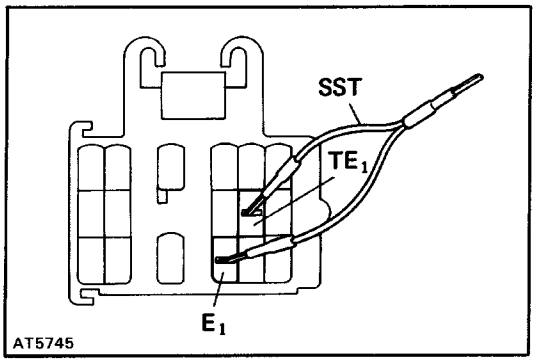


READ DIAGNOSTIC TROUBLE CODE

1. TURN IGNITION SWITCH AND O/D SWITCH TO ON

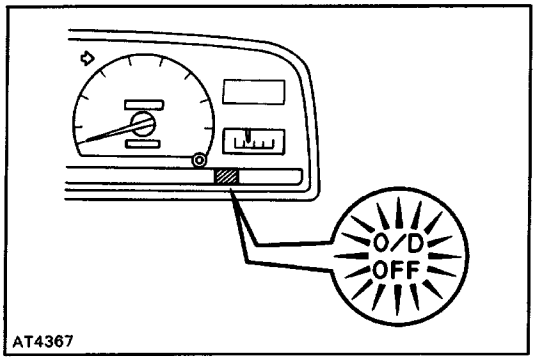
Do not start the engine.

HINT: Warning and diagnostic trouble codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light will light continuously and will not blink.



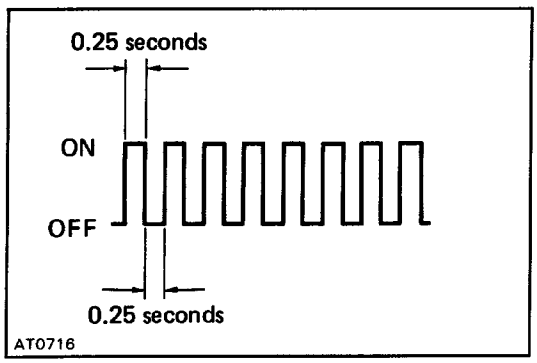
2. CONNECT TE, AND E, TERMINALS OF DATA LINK CONNECTOR 1

Using SST, connect terminals TE, and El.
SST 09843–18020



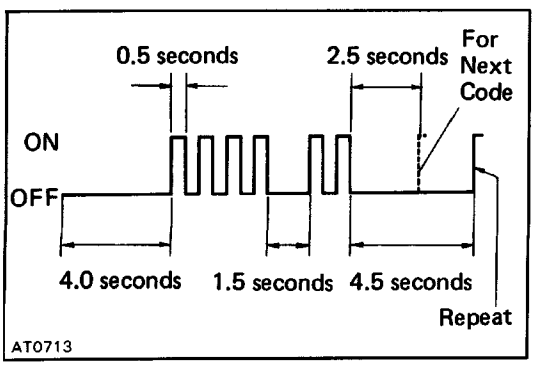
3. READ DIAGNOSTIC TROUBLE CODE

Read the diagnostic trouble code as indicated by the number of times the O/D OFF light flashes.



(Diagnostic Trouble Code Indication)

- If the system is operating normally, the light will flash 2 times per second.



- In the even of a malfunction, the light will flash 1 time per second. The number of blinks will equal the first number and, after 1.5 seconds pause, the second number of the two digit diagnostic trouble code. If there are two or more codes, there will be a 2.5 sec–onds pause between each.

HINT: In the event of several trouble codes occuring si–multaneously, indication will begin from the smaller value and continue to the larger.

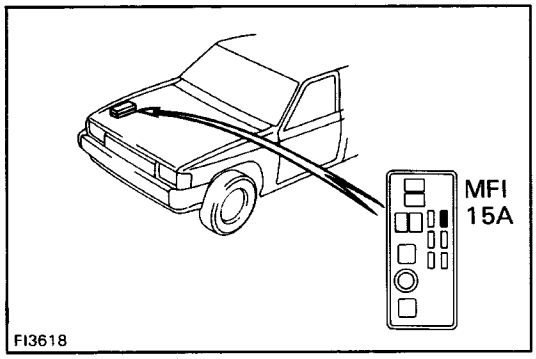
4. REMOVE SST

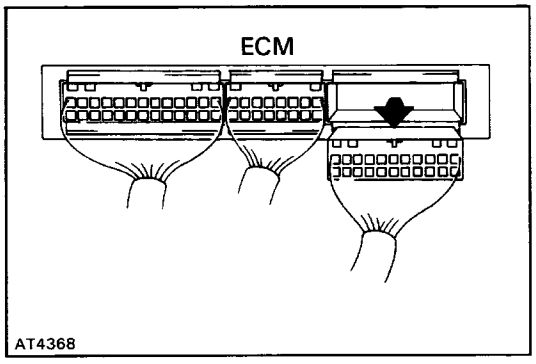
DIAGNOSTIC TROUBLE CODES

Code No.	Light Pattern	Diagnosis System
–		Normal
42		Defective No. 1 vehicle speed sensor (in combination meter)– severed wire harness or short circuit
61		Defective No.2 vehicle speed sensor (in ATM)– severed wire harness or short circuit
62		Severed No. 1 solenoid or short circuit– severed wire harness or short circuit
63		Severed No.2 solenoid or short circuit– severed wire harness or short circuit
64		Severed lock–up solenoid or short circuit– severed wire harness or short circuit

AT2020

HINT: If codes 62, 63 or 64 appear, there is an electrical malfunction in the solenoid.
Causes due to mechanical failure, such as a stuck valve, will not appear.





CANCEL OUT DIAGNOSTIC TROUBLE CODE

1. After repair of the trouble area, the diagnostic trouble code retained in memory by the ECM must be canceled by removing the MFI fuse (1 5A) for 10 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch OFF.

HINT:

- Cancellation can be also done by removing the battery negative (–) terminal, but in this case other memory systems will be also canceled out.
- The diagnostic trouble code can be also canceled out by disconnecting the ECM connector.
- If the diagnostic trouble code is not canceled out, it will be retained by the ECM and appear along with a new code in event of future trouble.

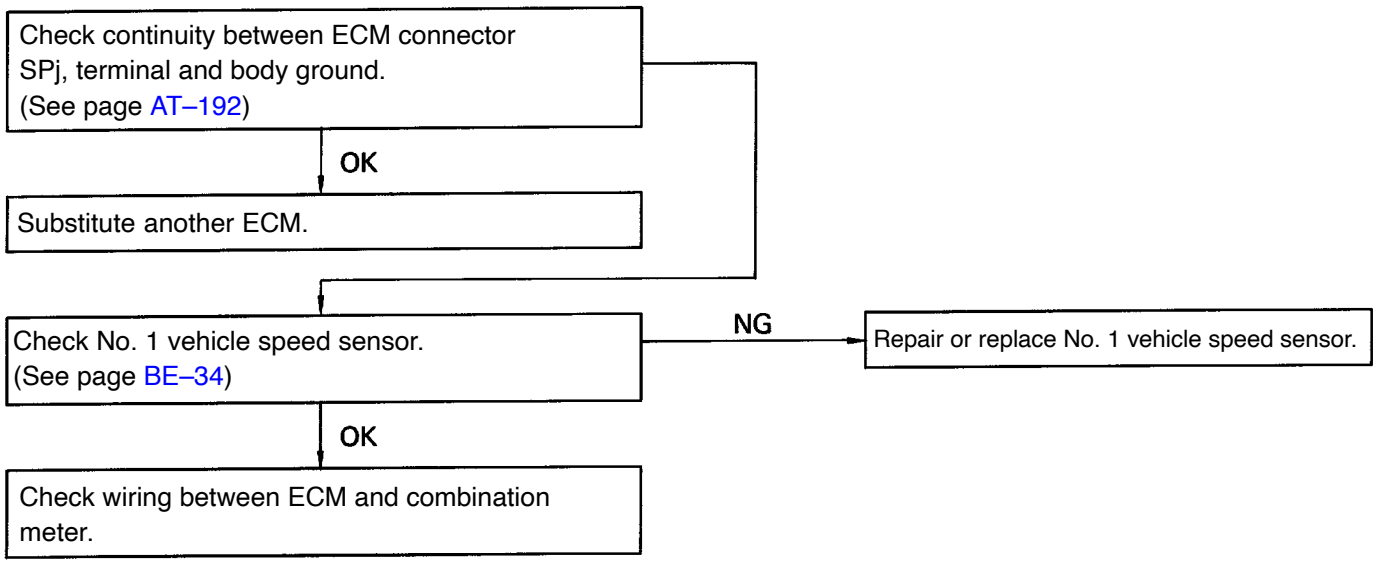
2. After cancellation, perform a road test to confirm that a ”normal code” is now read on the O/D OFF light.

TROUBLESHOOTING FLOW–CHART

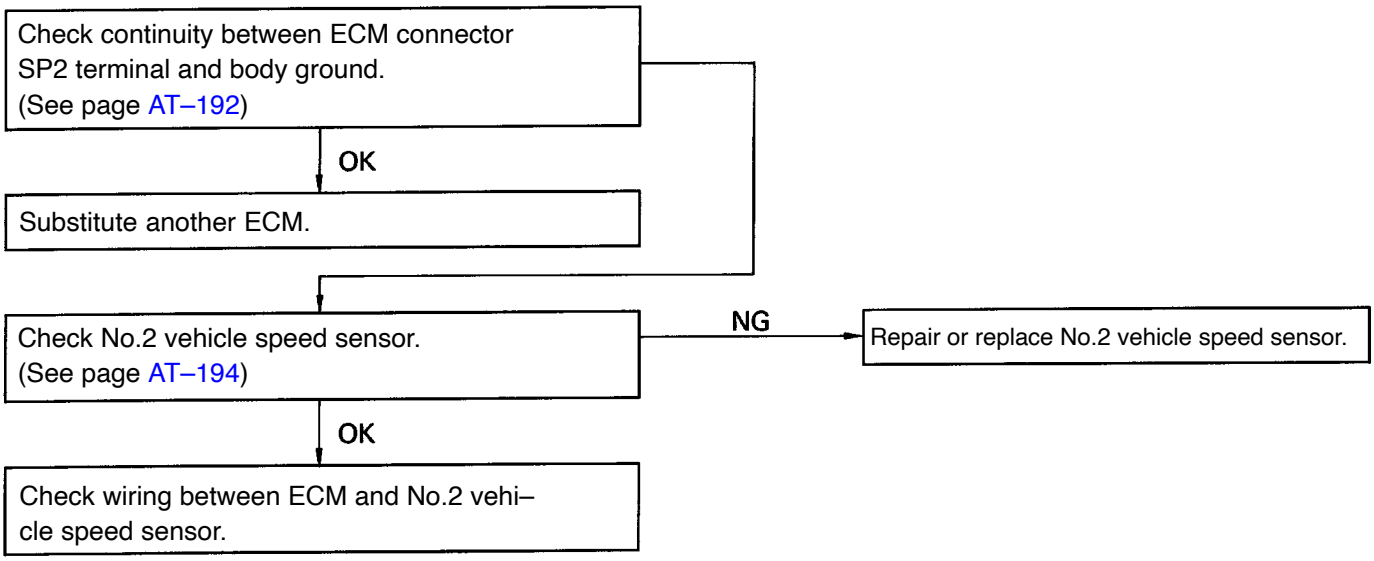
HINT:

- If diagnostic trouble code Nos. 42, 61, 62 or 63 are output, the overdrive OFF indicator light will begin to blink immediately to warn the driver. However, an impact or shock may cause the blinking to stop; but the code will still be retained in the ECM memory until canceled out.
- There is no warning for diagnostic trouble code No.64.
- In the event of a simultaneous malfunction of both No.1 and No.2 vehicle speed sensors, no diag–nostic trouble code will appear and the fail–safe system will not function. However, when driving in the D position, the transmission will not up–shift from first gear, regardless of the vehicle speed.

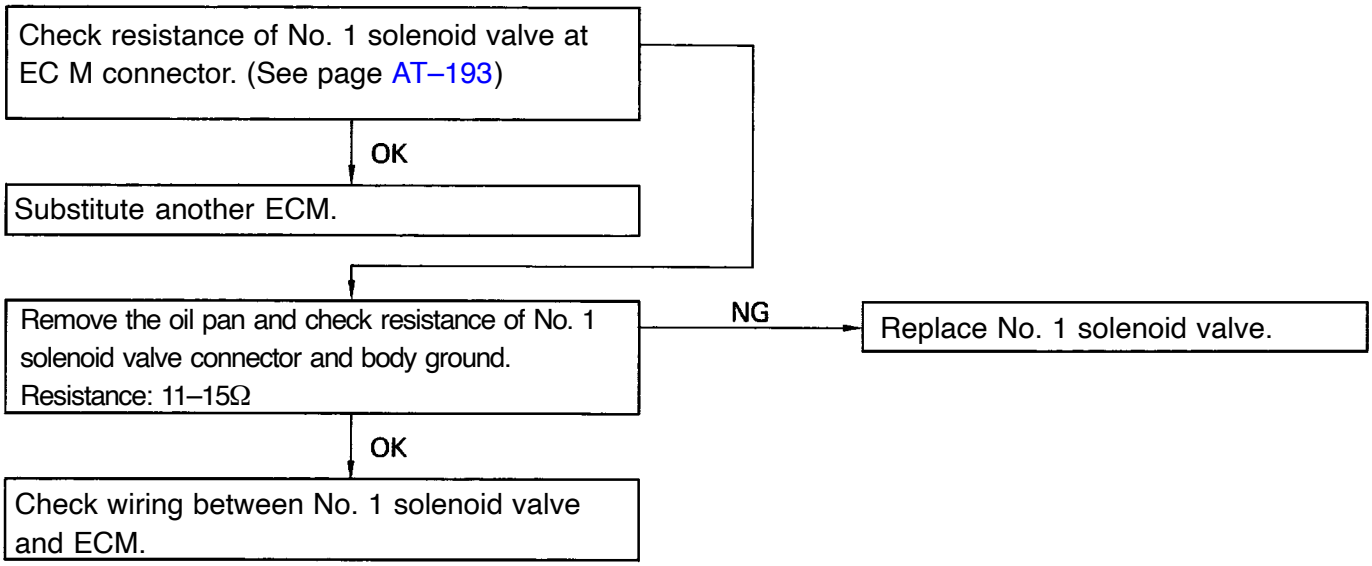
Diagnostic trouble code 42 (No.1 vehicle speed sensor circuitry)



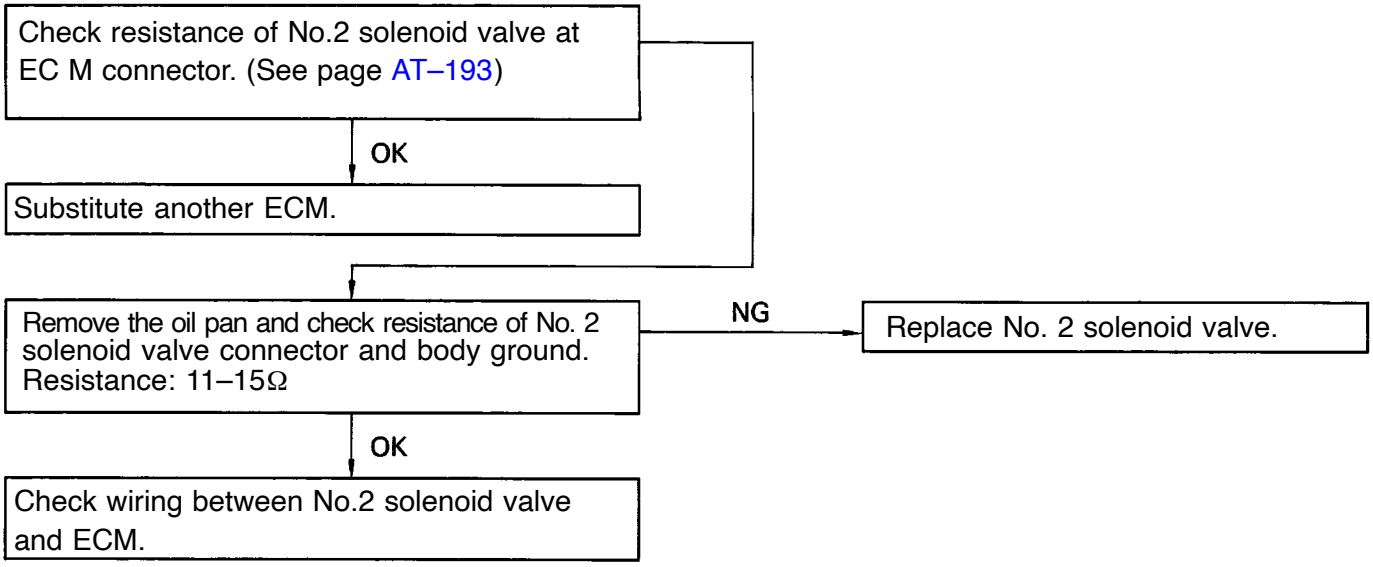
Diagnostic trouble code 61 (No–2 vehicle speed sensor circuitry)



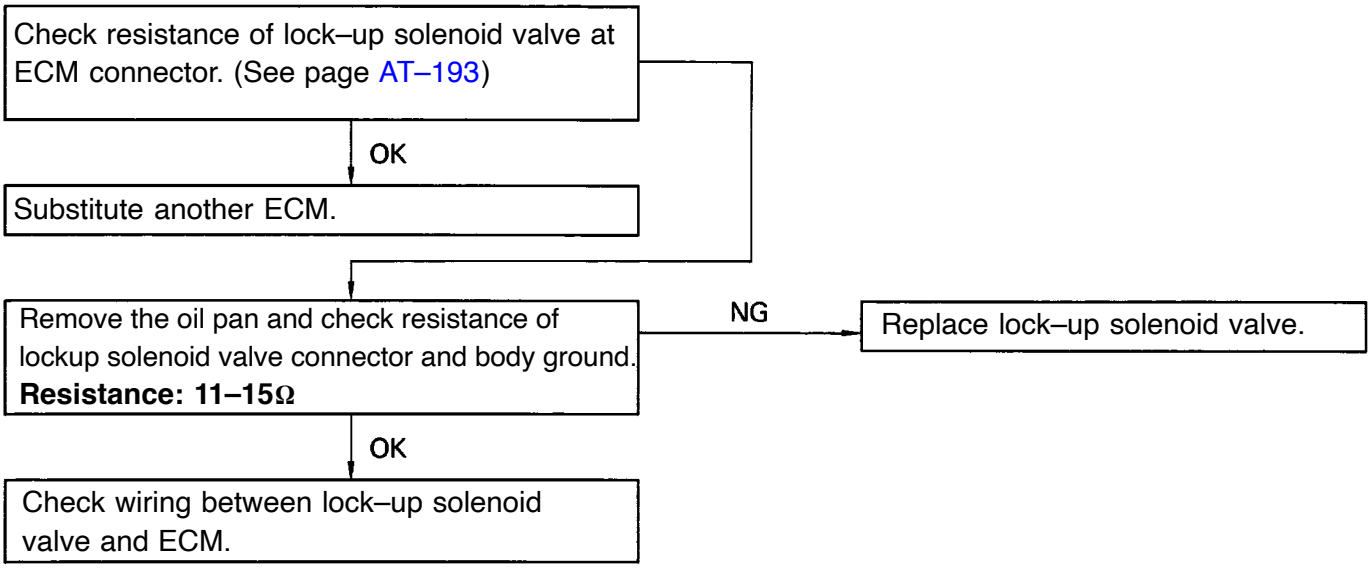
Diagnostic trouble code 62 (No. 1 solenoid valve circuitry)



Diagnostic trouble code 63 (No.2 solenoid valve circuitry)



Diagnostic trouble code 64 (Lock–up solenoid valve circuitry)



Preliminary Check

1. CHECK FLUID LEVEL

HINT:

- The vehicle must have been driven so that the engine and transmission are at normal operating temperature. (Fluid temperature: 70–80°C or 158–176°F)
- Only use the COOL range on the dipstick as a rough reference when the fluid is replaced or the engine does not run.

(a) Park the vehicle on a level surface, set the parking brake.

(b) With the engine idling, shift the shift lever into all positions from P to L position and return to P position.

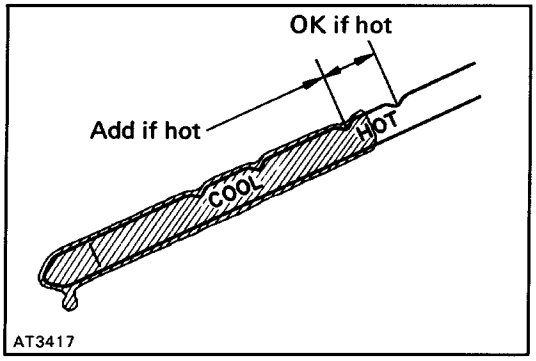
(c) Pull out the transmission dipstick and wipe it clean.

(d) Push it back fully into the tube.

(e) Pull it out and check that the fluid level is in the HOT range.

If the level is at the low side, add fluid.

Fluid type: ATF DEXRON®II



NOTICE: Do not overfill.

2. CHECK FLUID CONDITION

If the fluid smells burnt or is black, replace it as following procedures.

(a) Remove the drain plug and drain the fluid.

(b) Reinstall the drain plug securely.

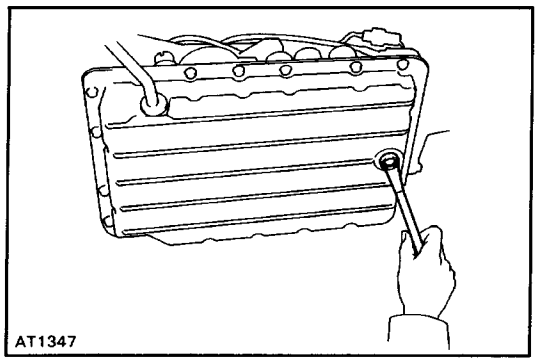
(e) With the engine OFF, add new fluid through the oil filler tube.

Fluid type: ATF DEXRON® II

Capacity:

Total: 7.6 liters (8.0 US qts, 6.7 Imp. qts)

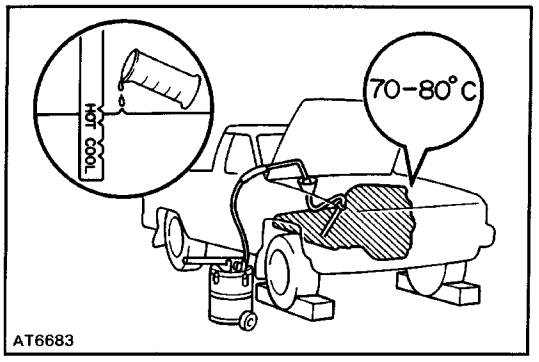
Drain and refill: 1.6 liters (1.7 US qts, 1.4 Imp. qts)



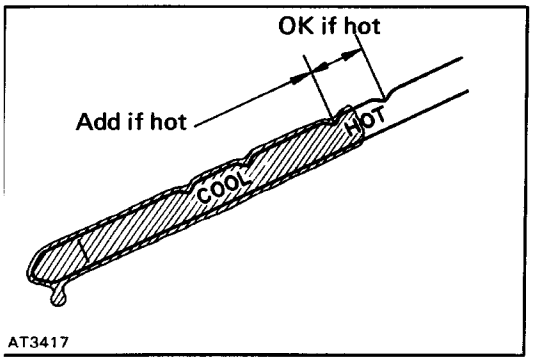
(d) Start the engine and shift the shift lever into all positions from P to L position and then shift into P position.

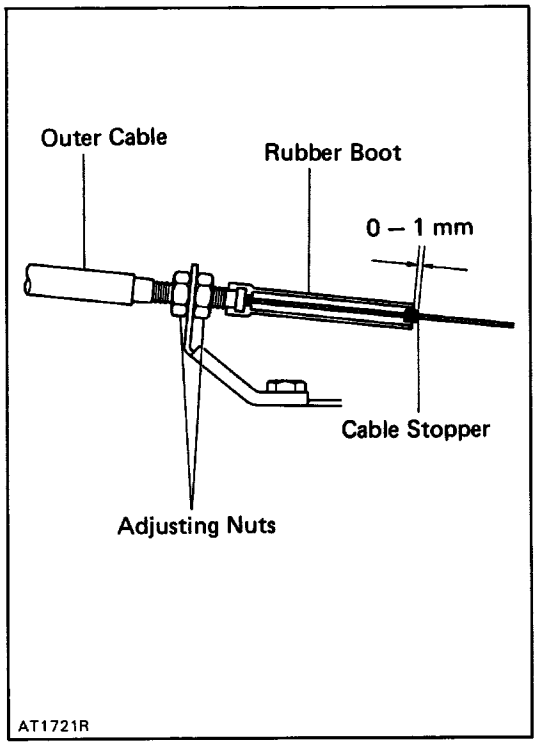
(e) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.

(f) Check the fluid level with the normal operating temperature (70–80°C or 158–176°F) and add as necessary.



NOTICE: Do not overfill.





3. INSPECT THROTTLE CABLE

(a) Depress the accelerator pedal all the way and check that the throttle valve opens fully.

HINT: If the valve does not open fully, adjust the accel–erator cable.

(b) Fully depress the accelerator pedal.

(c) Measure the distance between the end of the boot and stopper on the cable.

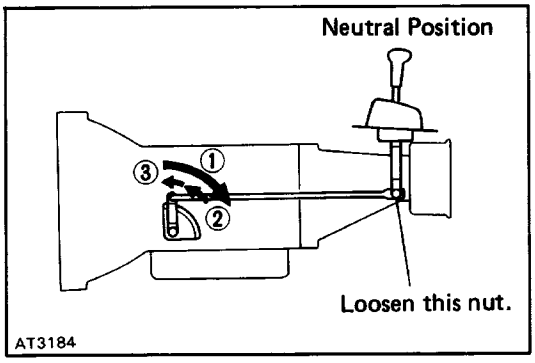
Standard distance: 0–1 mm (0–0.04 in.)

If the distance is not standard, adjust the cable by the adjusting nuts.

4. INSPECT TRANSMISSION SHIFT LEVER POSITION

When shifting the shift lever from the N position to other position, check that the lever can be shifted smoothly and accurately indicates the position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.



(a) Loosen the nut on the shift lever.

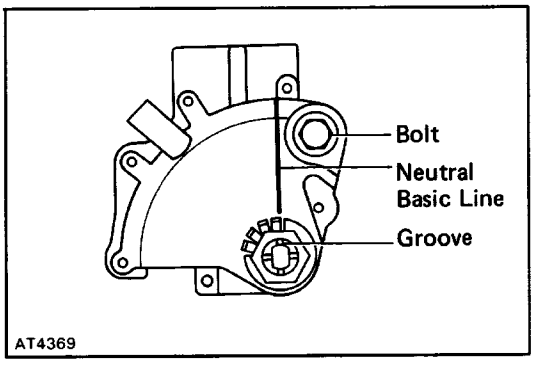
(b) Push the control shaft lever fully rearward.

(c) Return the control shaft lever two notches to N pos–tion.

(d) Set the shift lever to N position.

(e) While holding the shift lever lightly toward the R po–sition side, tighten the shift lever nut.

(f) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverse when shifting it to the R po–sition.



5. INSPECT PARK/NEUTRAL POSITION SWITCH

Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.

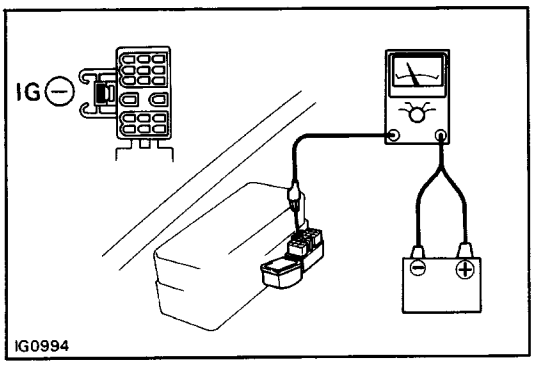
If not as started above, carry out the following adjust–ment procedures.

(a) Loosen the park/neutral position switch bolt and set the shift lever to the N position.

(b) Align the groove and neutral basic line.

(c) Hold in position and tighten the bolt.

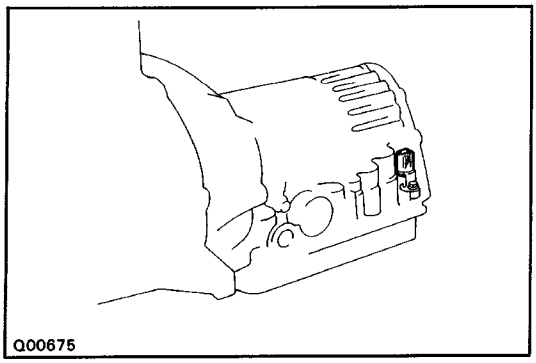
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



6. INSPECT IDLE SPEED (N POSITION)

Connect a tachometer test probe, to the data link con–nectar 1 terminal IG (–), inspect the idle speed.

Idle speed: 850 RPM



Manual Shifting Test

HINT: With this test, it can be determined whether the trouble lies within the electrical circuit or is a mechanical problem in the transmission.

1. DISCONNECT SOLENOID WIRE

2. INSPECT MANUAL DRIVING OPERATION

Check that the shift and gear positions correspond with the table below.

Shift Position	D position	2 position	L position	R position	P position
Gear Position	O/D	3rd	1 st	Reverse	Pawl Lock

HINT: If the 1, 2 and D position gear positions are diffi–cult to distinguish, perform the following road test.

- While driving, shift through the L, 2 and D positions. Check that the gear change corresponds to the shift position.
  If any abnormality is found in the above test, the prob-lem lies in transmission itself.

3. CONNECT SOLENOID WIRE

4. CANCEL OUT DIAGNOSTIC TROUBLE CODE

(See page AT–178)

REFERENCE: Possible gear positions in accordance with solenoid operating conditions.

Position	NORMAL			NO. 1 SOLENOID MALFUNCTIONING			NO.2 SOLENOID MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING		
	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position
	No. 1	No.2		No. 1	No. 2		No. 1	No. 2		No. 1	No. 2	
D position	**ON**	OFF	**1st**	×	ON (OFF)	3rd (O/D)	**ON**	×	**1st**	×	×	O/D
	ON	**ON**	2nd	×	**ON**	3rd	OFF (ON)	×	O/D (1 SO	×	×	O/D
	OFF	**ON**	3rd	×	**ON**	3rd	OFF	×	O/D	×	×	O/D
	OFF	OFF	O/D	×	OFF	O/D	OFF	×	O/D	×	×	O/D
2 position	**ON**	OFF	**1st**	×	ON (OFF)	3rd (O/D)	**ON**	×	**1st**	×	×	3rd
	ON	**ON**	2nd	×	**ON**	3rd	OFF (ON)	×	3rd (1st)	×	×	3rd
	OFF	**ON**	3rd	×	**ON**	3rd	OFF	×	3rd	×	×	3rd
L position	**ON**	OFF	**1st**	×	OFF	**1st**	**ON**	×	**1st**	×	×	**1st**
	ON	**ON**	2nd	×	**ON**	2nd	**ON**	×	**1st**	×	×	**1st**

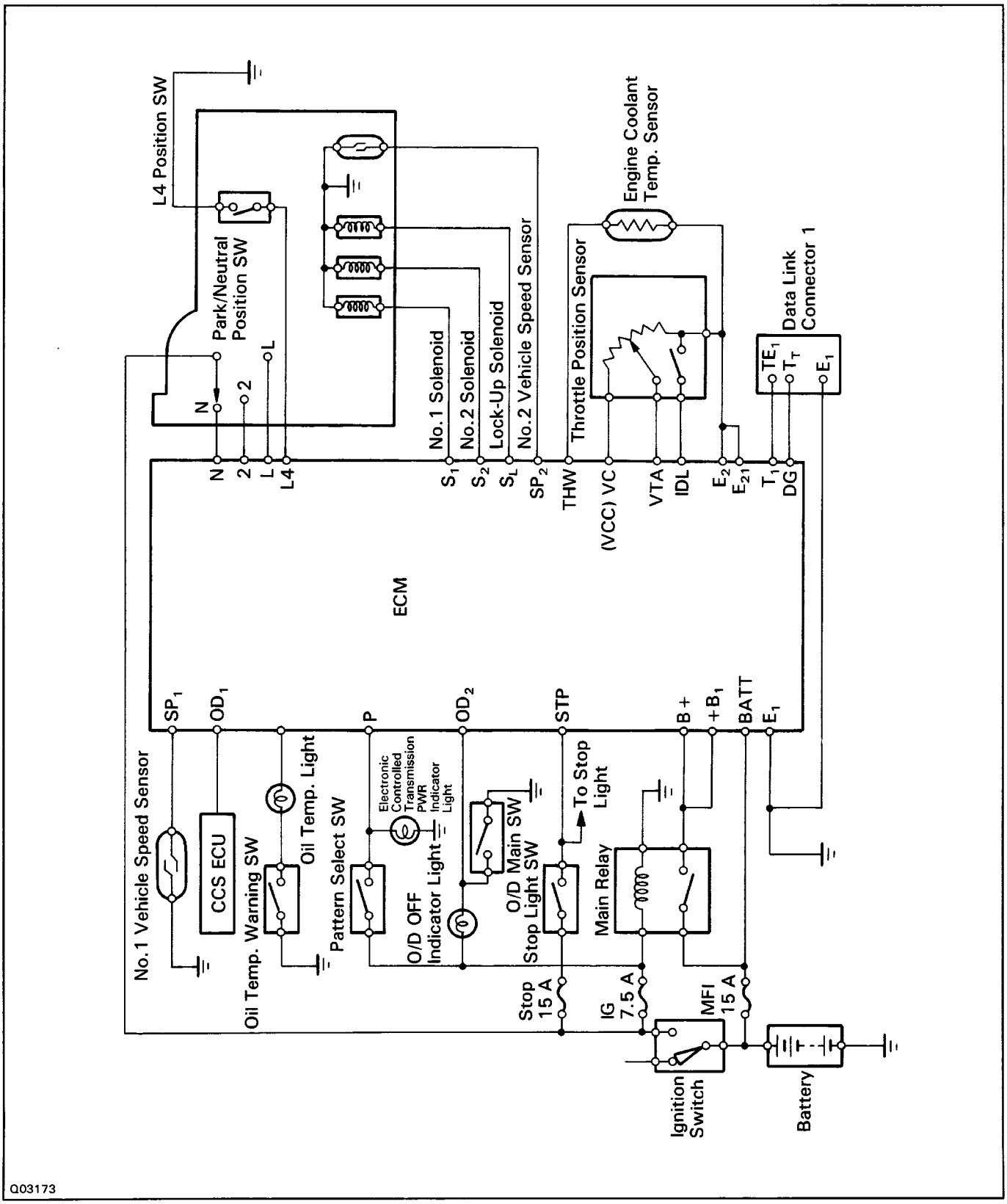
( ) : No fail–safe function x : Malfunctions

Electronic Control System

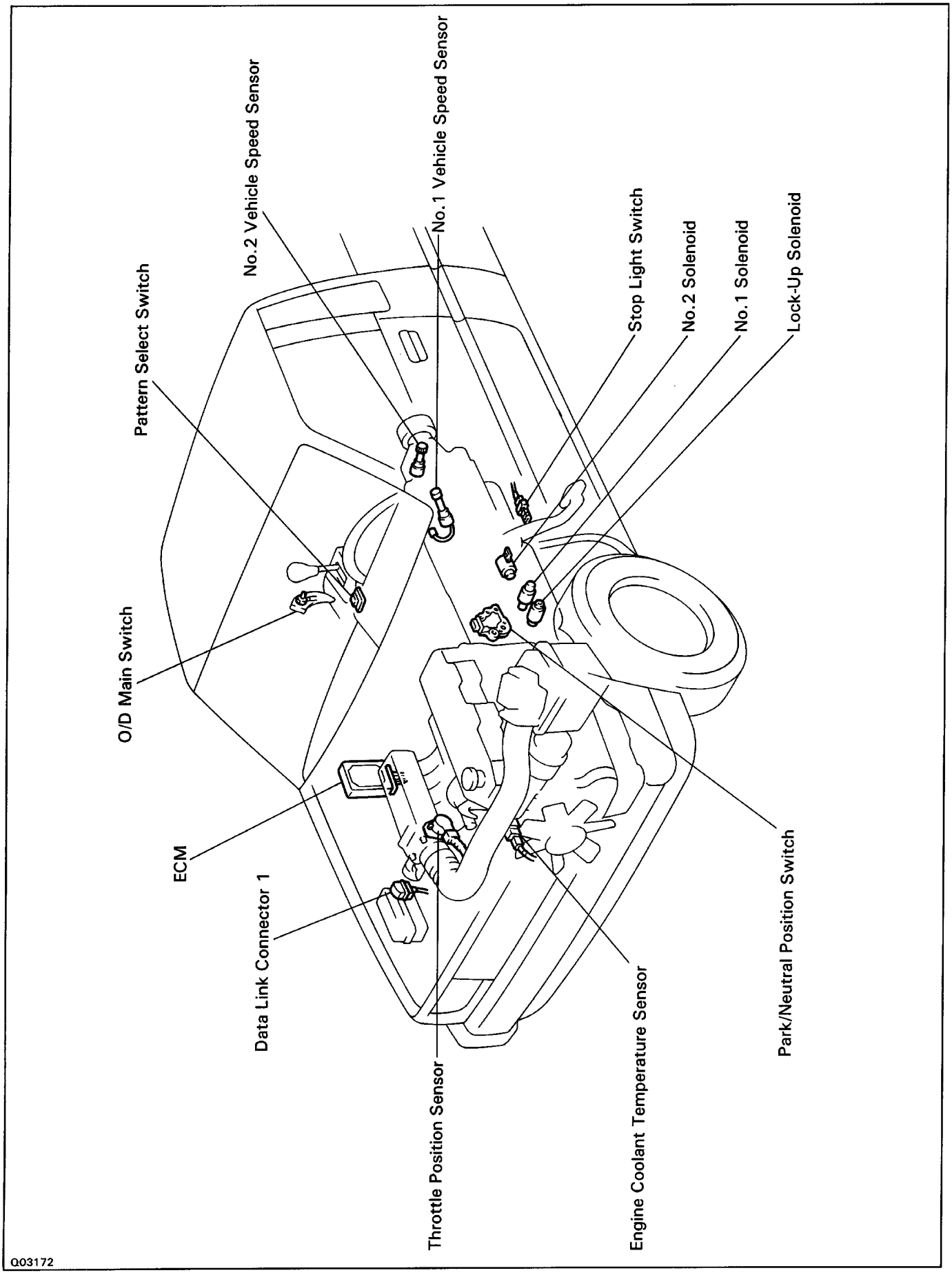
PRECAUTION

Do not open the cover or the case of the ECM and various computer unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)

ELECTRONIC CONTROL CIRCUIT

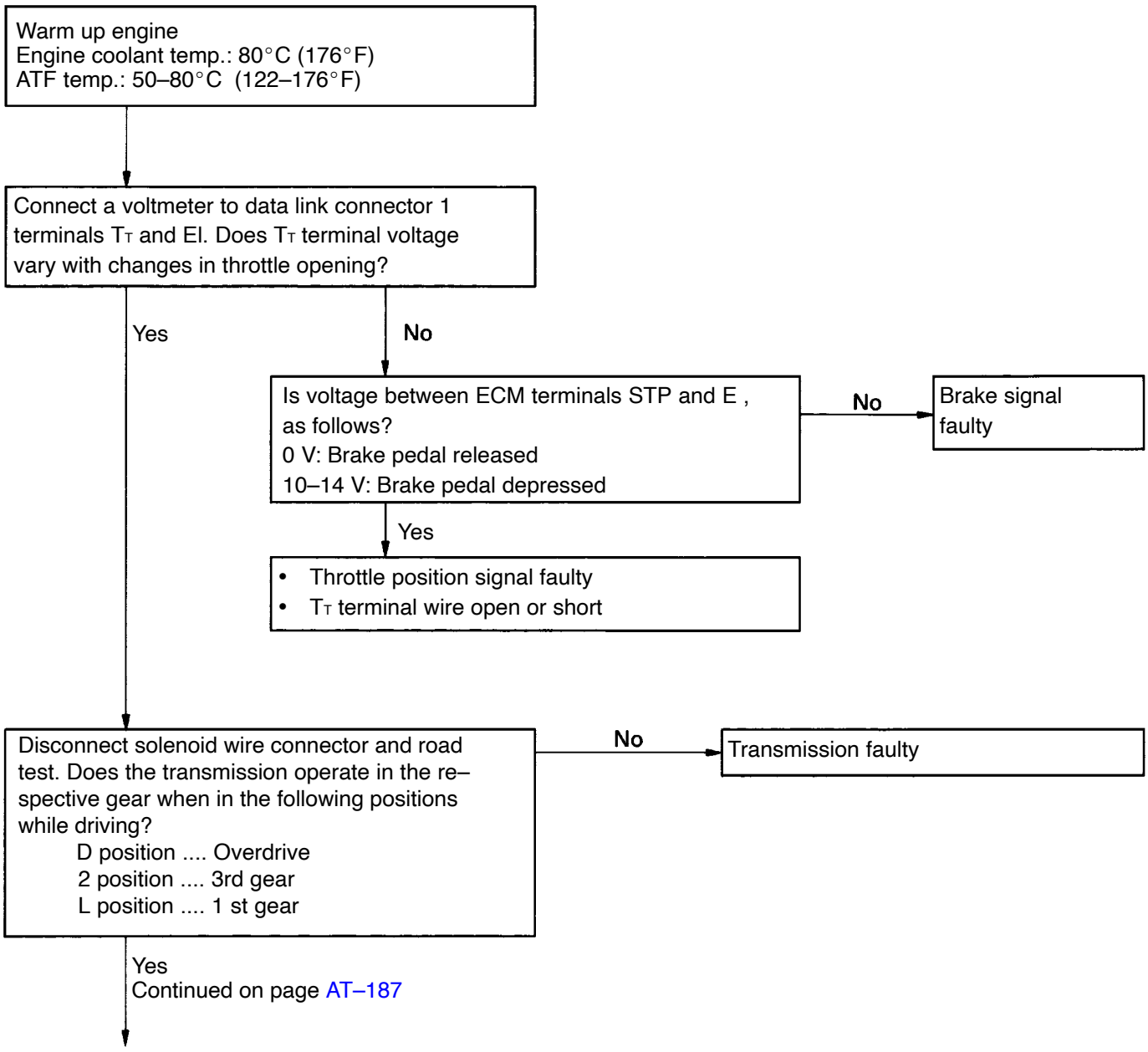


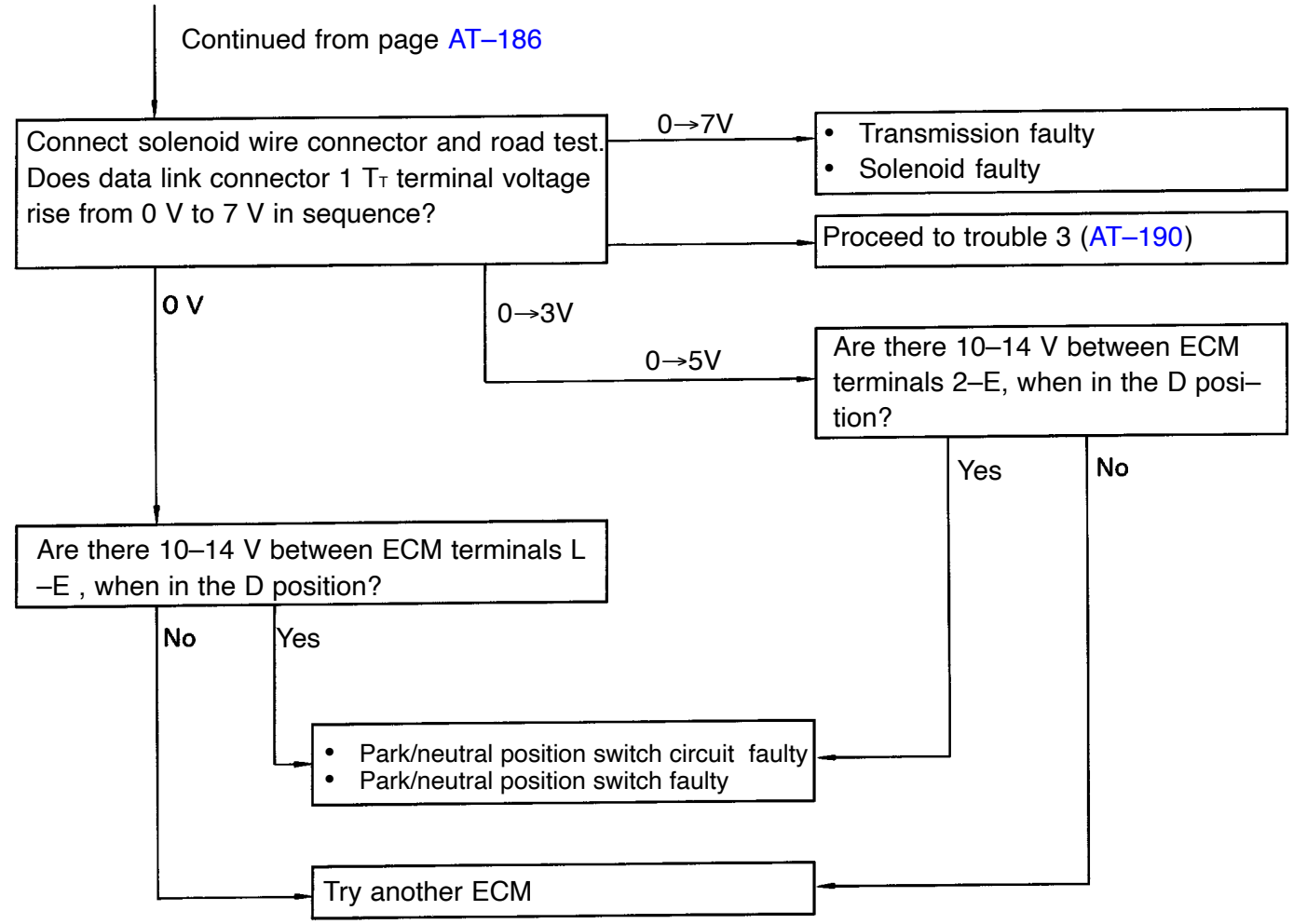
ELECTRONIC CONTROL COMPONENTS



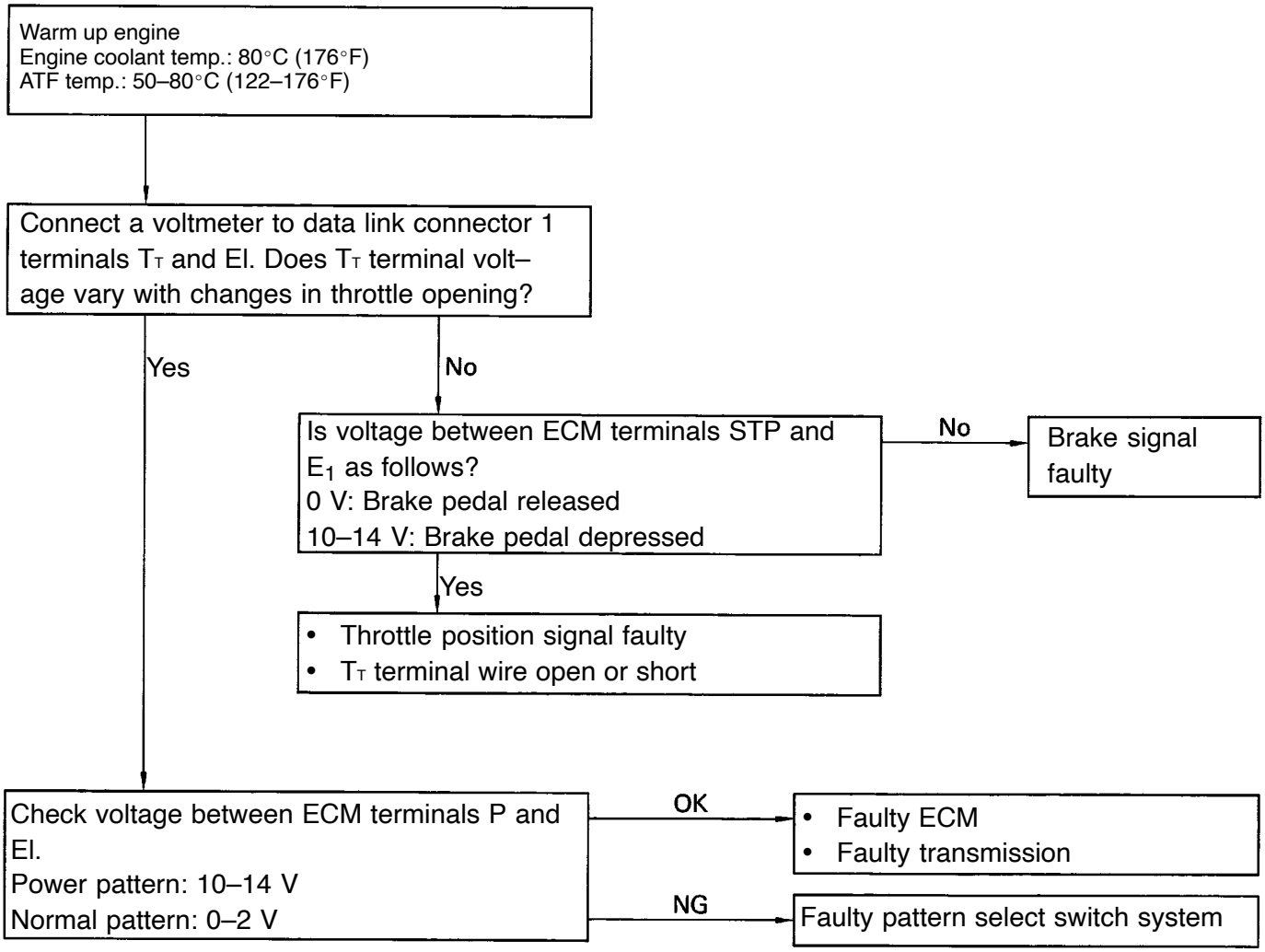
TROUBLESHOOTING FLOW–CHART

Trouble No. 1 No Shifting

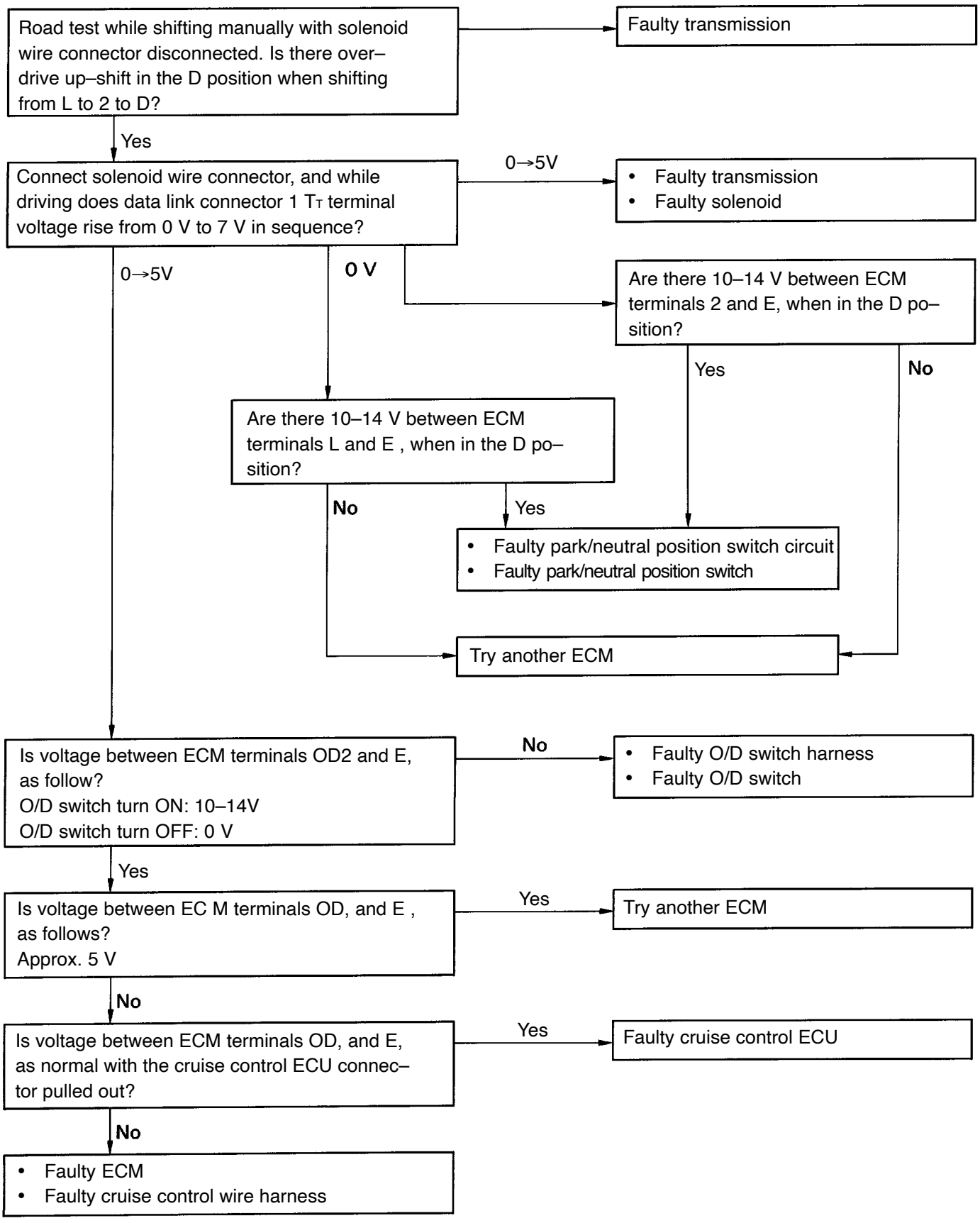



Continued from page AT–186
Connect solenoid wire connector and road test. Does data link connector 1 TT terminal voltage rise from 0 V to 7 V in sequence?
0→7V
• Transmission faulty
• Solenoid faulty
Proceed to trouble 3 (AT–190)
0 V
0→3V
0→5V
Are there 10–14 V between ECM terminals 2–E, when in the D position?
Yes
No
Are there 10–14 V between ECM terminals L –E , when in the D position?
No
Yes
• Park/neutral position switch circuit faulty
• Park/neutral position switch faulty
Try another ECM

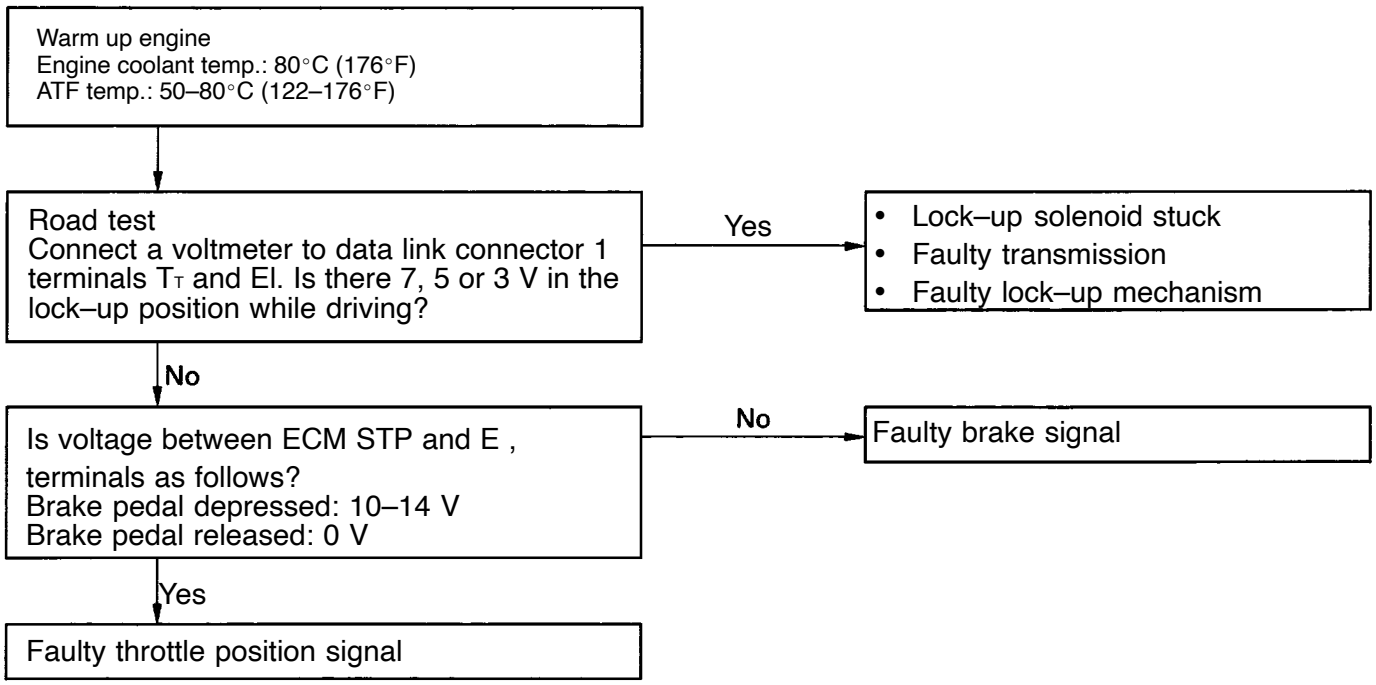
Trouble No.2 Shift point too high or too low



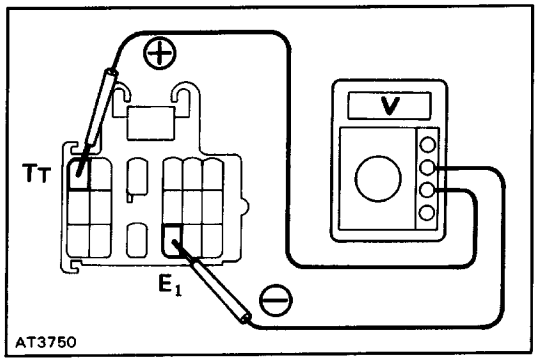
Trouble No–3 No up–shift to overdrive (After warm–up)



Trouble No.4 No lock–up (After warm–up)



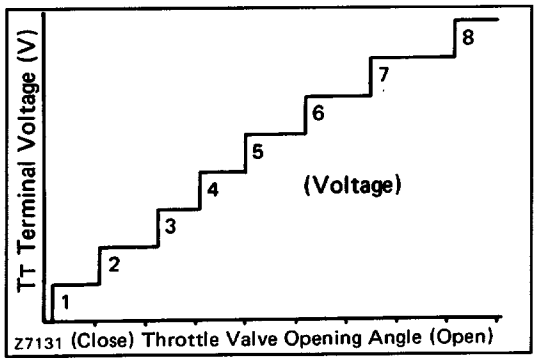
INSPECTION OF T_T TERMINAL VOLTAGE



1. INSPECT THROTTLE POSITION SENSOR SIGNAL

(a) Turn the ignition switch to ON. Do not start the engine.

(b) Connect a voltmeter to data link connector 1 terminals T_T and El.



(c) While slowly depressing the accelerator pedal, check that T_T terminal voltage rises in sequence.
If the voltage does not change in proportion to the throttle opening angle, there is a malfunction in the throttle position sensor or circuit.

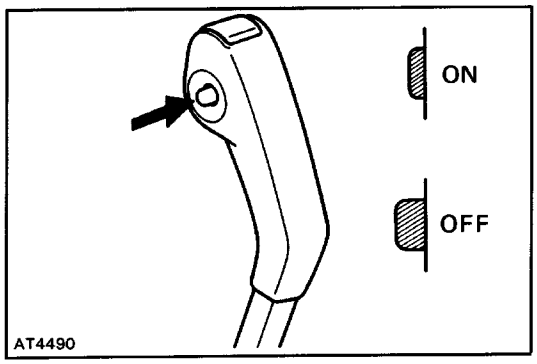
2. INSPECT BRAKE SIGNAL

(a) Depress the accelerator pedal until the T_T terminal indicates 8 V.

(b) Depress the brake pedal and check the voltage reading from the T_T terminal.

Brake pedal depressed ..... 0 V
Brake pedal released ..... 8 V

If not as indicated, there is a malfunction in either the stop light switch or circuit.



3. INSPECT EACH UP–SHIFT POSITION

(a) Warm up the engine.
Engine coolant temperature: 80 ° C (176 ° F)

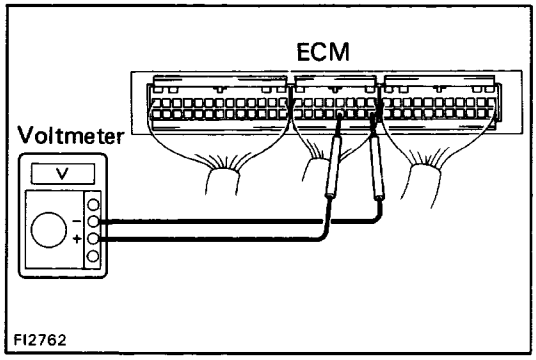
(b) Turn the O/D switch to "ON".

(e) Place the pattern select switch in "Normal" and the shift lever into the D position.

(d) During a road test (above 10 km/h or 6 mph)check that voltage at the T_T terminal is as indicated below for each up–shift position.
If the voltage rises from 0 V to 7 v in the sequence shown, the control system is okay.
The chart on the left shows the voltmeter reading and corresponding gears.

T_T Terminal (V)	Gear Position
0	1st
2	2nd
3	2nd Lock-up
4	3rd
5	3rd Lock-up
6	O/D
7	O/D Lock-up

HINT: Determine the gear position by a light shock or change in engine RPM when shifting. The lock–up clutch will turn ON only infrequently during normal 2nd and 3rd gear operation. To trigger this action, press the accelerator pedal to 50% or more of its stroke. At less than 50%, the voltage may change in the sequence 2 V–4 V–6 V–7V.



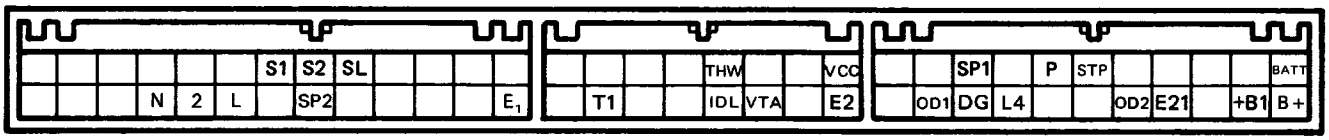
INSPECTION OF ELECTRONIC CONTROL COMPONENTS

1. INSPECT VOLTAGE OF ECM CONNECTOR

(a) Remove the cowl side trim of passenger side.

(b) Turn on the ignition switch.

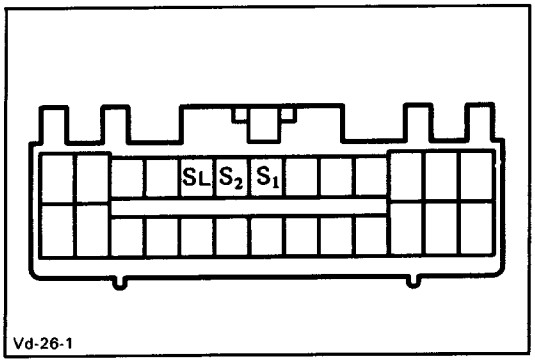
(c) Measure the voltage at each terminal.



FI2796

Terminal	Measuring condition		Voltage (V)
$S_1 - E_1$	–		10 – 14
$S_2, S_L - E_1$	–		0
$P - E_1$	PWR pattern		10 – 14
	NORM pattern		0 – 2
$STP - E_1$	Brake pedal is depressed		10 – 14
	Brake pedal is released		0
$THW - E_2 (E_{21})$	Engine coolant temp. 80°C (1 760F)		0.1 – 1.0
$IDL - E_2 (E_{21})$	Throttle valve fully closed		0
	Throttle valve open		10 – 14
$VTA - E_2(E_{21})$	Throttle valve fully closed		0.1 – 1.0
	Throttle valve fully open		3 – 5
$VC (VCC) - E_2 (E_{21})$	–		4 – 6
$OD_1 - E_1$	–		5
$OD_2 - E_1$	O/D main switch turned ON		10 – 14
	O/D main switch turned OFF		0
$SP_1 - E_1$	Cruise control main switch OFF	Standing still	0 or 5
		Vehicle moving	2 – 3
$SP_2 - E_1$	Standing still		0 or 5
	Vehicle moving		2 – 3

Terminal	Measuring condition	Voltage (V)
$N - E_1$	N position	10 – 14
	Except N position	0 – 2
$2 - E_1$	2 position	10 – 14
	Except 2 position	0 – 2
$L - E_1$	L position	10 – 14
	Except L position	0 – 2
$L_4 - E_1$	Transfer shift position H2 or H4	10 – 14
	Transfer shift position L4	0
$B+ (+B_1) - E_1$	–	10 – 14
$BATT - E_1$	–	10 – 14

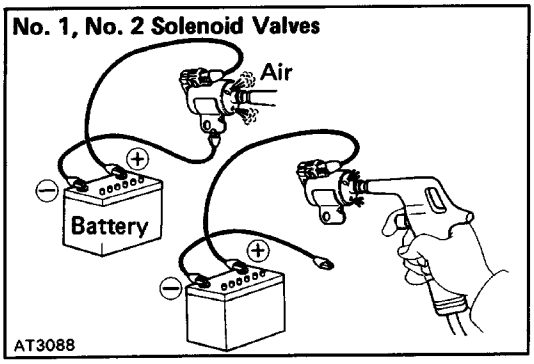


2. INSPECT SOLENOID

(a) Disconnect the connector from the ECM.

(b) Measure the resistance between S,, S2, SL and ground.
Resistance: 11–15Ω

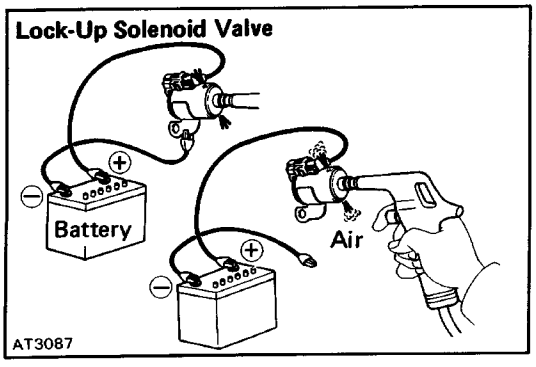
(c) Apply battery voltage to each terminal. Check that an operation noise can be heard from the solenoid.



3. CHECK SOLENOID SEALS

If there is foreign material in the solenoid valve, there will be no fluid control even with solenoid operation.

(a) Check No. 1, No. 2 solenoid valves.
Check that the solenoid valves do not leak when low–pressure compressed air is applied.
When supply battery positive voltage to the sole–noids, check that the solenoid valves open.

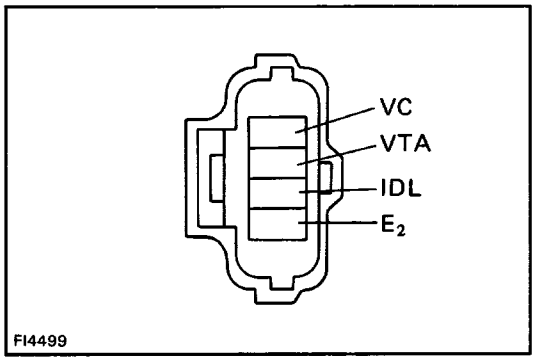


(b) Check the lock–up solenoid valve.
Applying 490 kPa (5 kgf/cm^2, 71 psi) of com–pressed air, check that the solenoid valve opens.
When supply battery positive voltage to the sole–noid, check that the solenoid valve does not leak the air.

If a malfunction is found during voltage inspection (step 1.), inspect the components listed below.

4. INSPECT PARK/NEUTRAL POSITION SWITCH

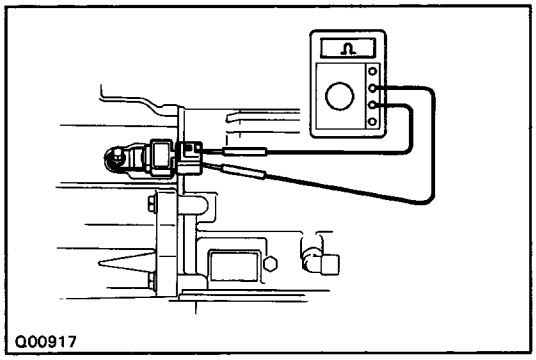
(See page AT–203)



5. INSPECT THROTTLE POSITION SENSOR

Using an ohmmeter, check the resistance between each terminal.

Terminal	Throttle valve condition	Resistance (kΩ)
IDL–E2	Fully closed	Less than 2.3
	Open	Infinity
VC–E2	–	3.9 – 9.0
VTA–E2	Fully closed	0.47 – 6.1
	Fully open	3.1 – 12.1



6. INSPECT NO.2 VEHICLE SPEED SENSOR

(a) Jack up the rear wheel on one side.

(b) Connect an ohmmeter between the terminals.

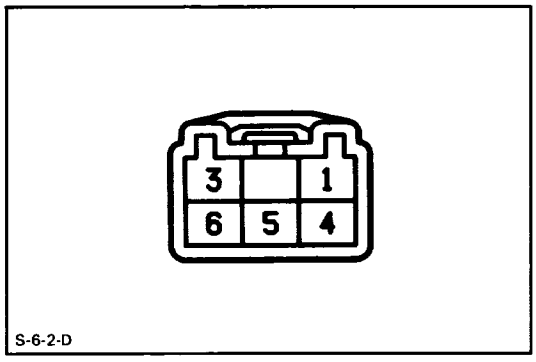
(e) Spin the wheel and check that the meter needle de–flects from OΩ to aoΩ.

7. INSPECT NO. 1 VEHICLE SPEED SENSOR

(See step 6. on page AT–194)

8. INSPECT PATTERN SELECT SWITCH

Using an ohmmeter, check the continuity of the terminals for each switch position.

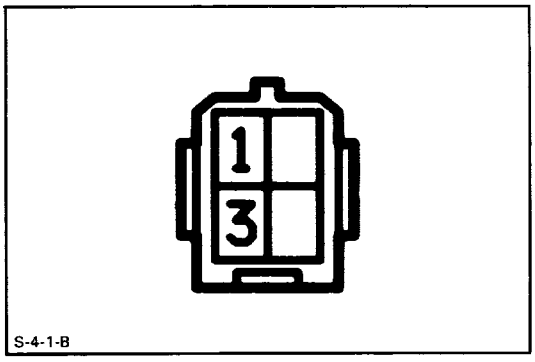


HINT: As there are diodes inside, be careful of the tester probe polarity.

Terminal / Pattern	4	6
PWR	○	○
NORM		

9. INSPECT O/D SWITCH

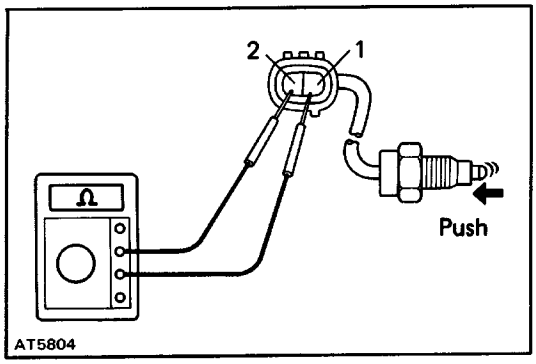
Using an ohmmeter, check the continuity of the terminals for each switch position.



Terminal / SW position	1	3
ON		
OFF	○	○

10. INSPECT ENGINE COOLANT TEMPERATURE SEN-SOR

(See page FI–115)

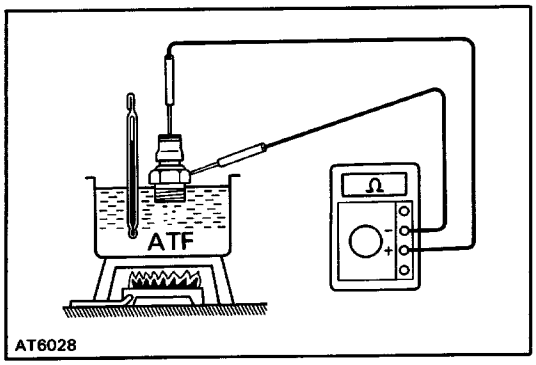


11. INSPECT TRANSFER POSITION SWITCH

Check that there is continuity between each terminal as shown.

Switch Position	Specified
Push	Continuity
Free	No continuity

If operation is not as specified, replace the switch.



12. INSPECT TRANSMISSION FLUID TEMPERATURE SWITCH

Check that there is continuity at the temperature of 145°C–155°C (325°F–343°F).

If continuity is not as specified, replace the switch.

Mechanical System Tests

STALL TEST

The object of this test is to check the overall performance of the transmission and engine by measuring the stall speeds in the D and R positions.

NOTICE:

- **Perform the test at normal operating fluid temperature (50–80°C or 122–176°F).**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear, level area, which provides good traction.**
- **The stall test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.**

MEASURE STALL SPEED

(a) Check the front and rear wheels.

(b) Connect a tachometer to the engine.

(c) Fully apply the parking brake.

(d) Keep your left foot pressed firmly on the brake pedal.

(e) Start the engine.

(f) Shift into the D position. Step all the way down on the accelerator pedal with your right foot.
Quickly read the stall speed at this time.

NOTICE: Release the accelerator pedal and stop test if the rear wheels begin to rotate before the engine speed reaches specified stall speed.

Stall speed: 2,200 f 150 RPM

(g) Perform the same test in R position.

EVALUATION

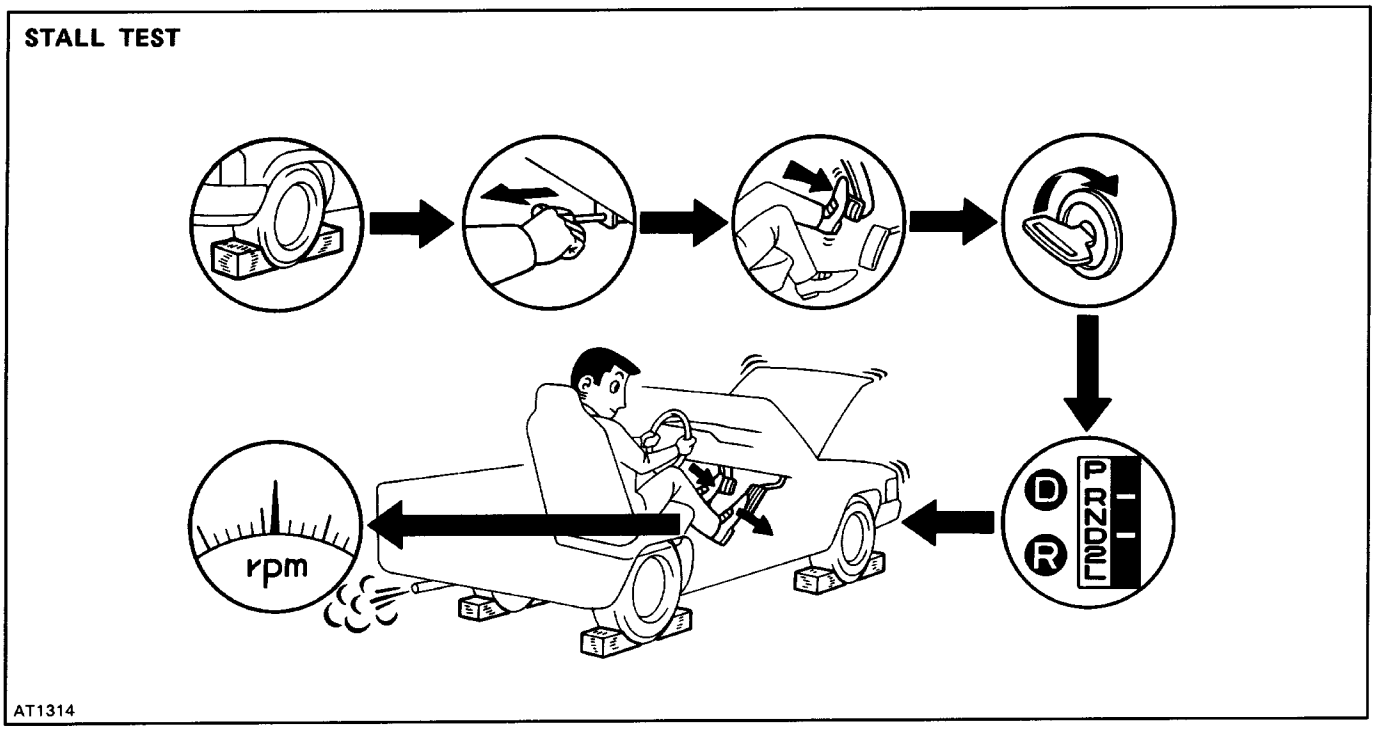
(a) If the stall speed is the same for both positions but lower than specified value:
Engine output may be insufficient
Stator one–way clutch is not operating properly

HINT: If more than 600 RPM below the specified value, the torque converter clutch could be faulty.

(b) If the stall speed in D position is higher than specified:
Line pressure too low
Forward clutch slipping
No.2 one–way clutch not operating properly
O/D one–way clutch not operating properly

(c) If the stall speed in R position is higher than specified:
Line pressure too low
Direct clutch slipping
First and reverse brake slipping
O/D one–way clutch not operating properly

(d) If the stall speed in both R and D positions are higher than specified:
Line pressure too low
Improper fluid level
O/D one–way clutch not operating properly



TIME LAG TEST

When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the 0!D direct clutch, forward clutch, direct clutch and first and reverse brake.

NOTICE:

- **Perform the test at normal operating fluid temperature (50–80°C or 122–176°F).**
- **Be sure to allow one minute interval between tests.**
- **Make three measurements and take the average value.**

MEASURE TIME LAG

(a) Fully apply the parking brake.

(b) Start the engine and check the idle speed.
Idle speed: 850 RPM
(N position)

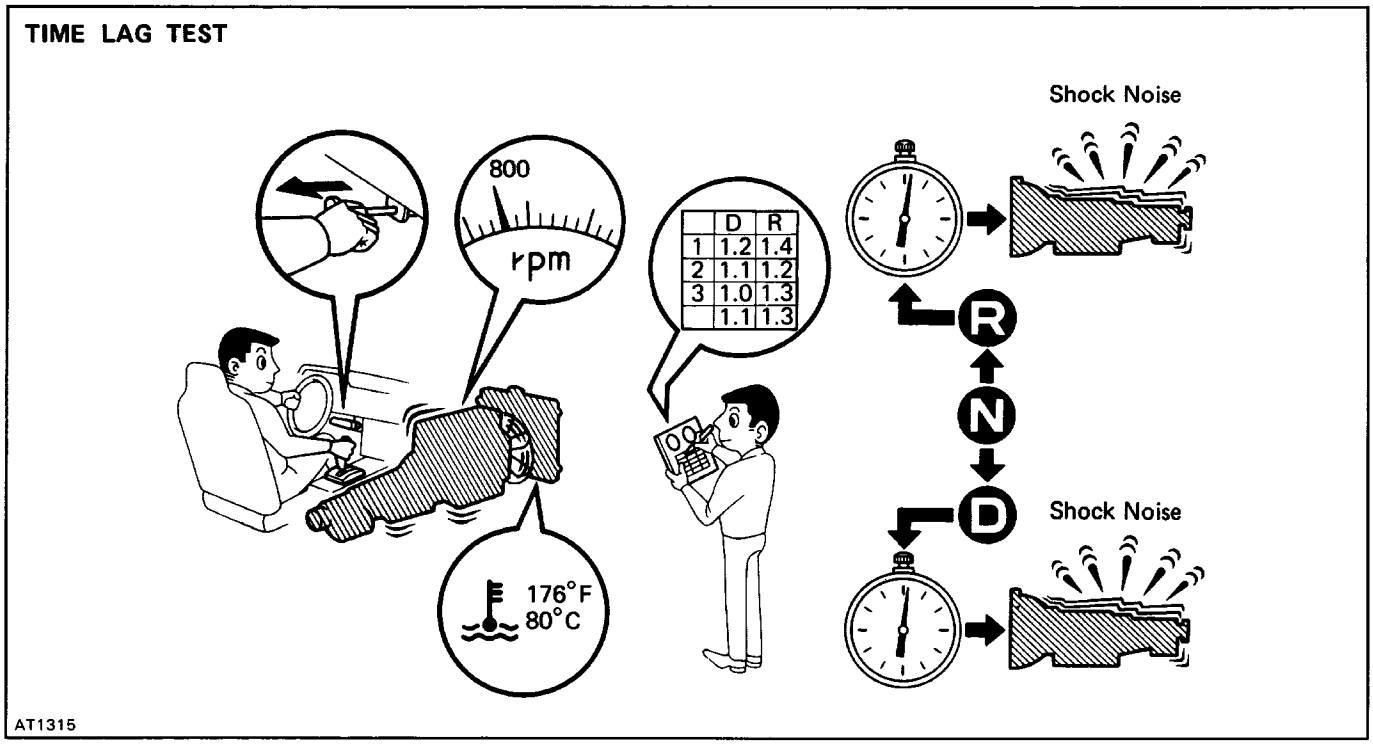
(c) Shift the shift lever from N to D position. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.
Time lag: Less than 1.2 seconds

(d) In same manner, measure the time lag for N–R.
Time lag: Less than 1.5 seconds

EVALUATION

(a) If N–i D time lag is longer than specified:
Line pressure too low
Forward clutch worn
O/D one–way clutch not operating properly

(b) If N–R time lag is longer than specified:
Line pressure too low
Direct clutch worn
First and reverse brake worn
O/D one–way clutch not operating properly



HYDRAULIC TEST

PREPARATION

(a) Warm up the transmission fluid.

(b) Remove the transmission case test plug and connect the hydraulic pressure gauge.
SST 09992–00094 (Oil pressure gauge)

NOTICE:

- **Perform the test at normal operating fluid temperature (50–80°C or 122–176°F).**
- **The line pressure test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.**

MEASURE LINE PRESSURE

(a) Fully apply the parking brake and check the four wheels.

(b) Start the engine and check idling RPM.

(c) Keep your left foot pressed firmly on the brake pedal and shift into D position.

(d) Measure the line pressure when the engine is idling.

(e) Press the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.

NOTICE: Release the accelerator pedal and stop test if the rear wheels begin to rotate before the en–
gine speed reaches specified stall speed.

(f) In the same manner, perform the test in R position.

kPa (kgf/cm^2, psi)

D position		R position	
Idling	Stall	Idling	Stall
363 – 422 (3.7 – 4.3, 53 – 61)	932 – 1,177 (9.5 – 12.0, 135 – 171)	490 – 588 (5.0 – 6.0, 71 – 85)	1,294 – 1,638 (13.2 – 16.7, 188 – 238)

If the measured pressures are not up to specified values, recheck the throttle cable adjustment and perform a retest.

EVALUATION

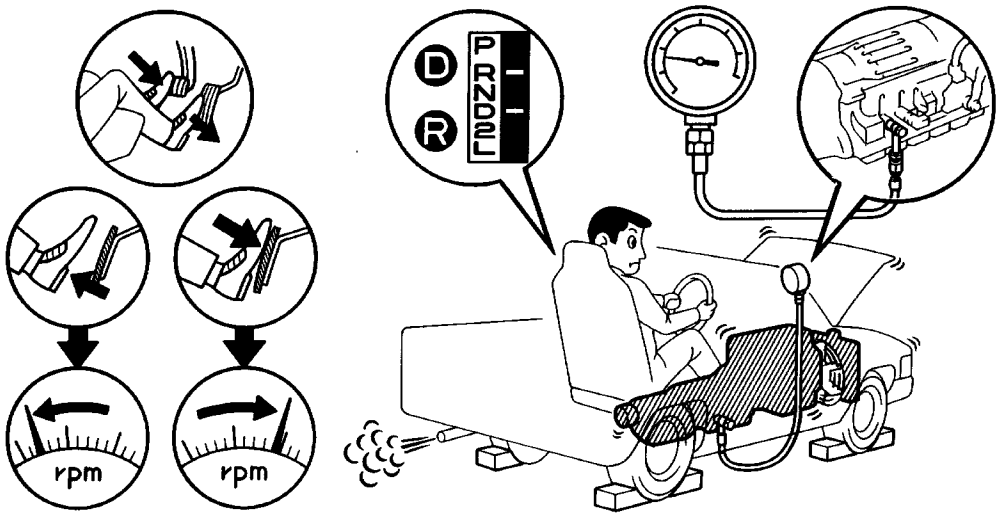
(a) If the measured values at all positions are higher than specified:
Throttle cable out of adjustment
Throttle valve defective
Regulator valve defective

(b) If the measured values at all positions are lower than specified:
Throttle cable out of adjustment
Throttle valve defective
Regulator valve defective
Oil pump defective
O/D direct clutch defective

(c) If pressure is low in the D position only:
D position circuit fluid leakage
Forward clutch defective

(d) If pressure is low in the R position only:
R position circuit fluid leakage
Direct clutch defective
First and reverse brake defective

HYDRAULIC TEST



AT1316

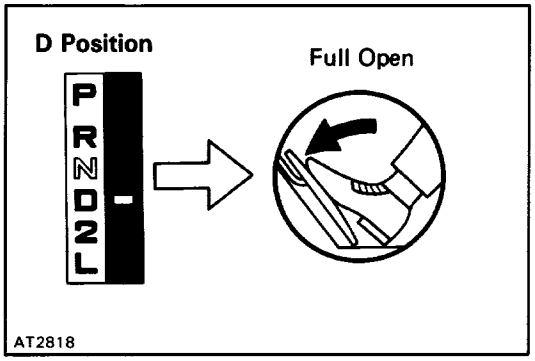
ROAD TEST

NOTICE: Perform the test at normal operating fluid temperature (50–800C or 122–1760F).

1. D POSITION TEST IN NORM AND PWR PATTERN POSITIONS

Shift into the D position and hold the accelerator pedal constant at the full throttle valve opening position.

(a) 1–2, 2–3 and 3–OID up–shifts should take place, and shift points should conform to those shown in the automatic shift schedule.
Conduct a test under both Normal and Power patterns.



HINT: There is no O/D up–shift or lock–up when the engine coolant temp. is below 70°C (158°F).

EVALUATION

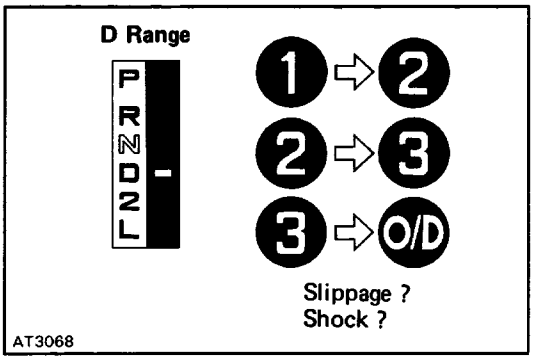
(1) If there is no 1 → 2 up–shift:
No.2 solenoid is stuck
1–2 shift valve is stuck

(2) If there is no 2 → 3 up–shift:
No.1 solenoid is stuck
2–3 shift valve is stuck

(3) If there is no 3 → O/D up–shift:
3–4 shift valve is stuck

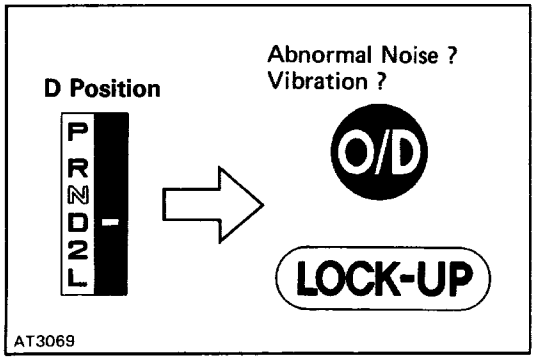
(4) If the shift point is defective:
Throttle valve, 1–2 shift valve, 2–3 shift valve, 3–4 shift valve etc., are defective

(5) If the lock–up is defective:
Lock–up solenoid is stuck
Lock–up relay valve is stuck



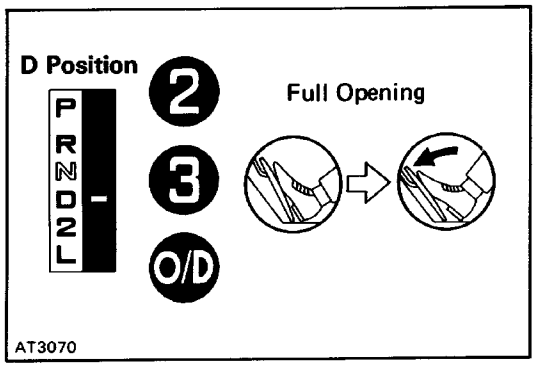
(b) In the same manner, check the shock and slip at the 1 → 2, 2 → 3, and 3 → O/D up–shifts.
EVALUATION

If the shock is excessive:
- Line pressure is too high
- Accumulator is defective
- Check ball is defective



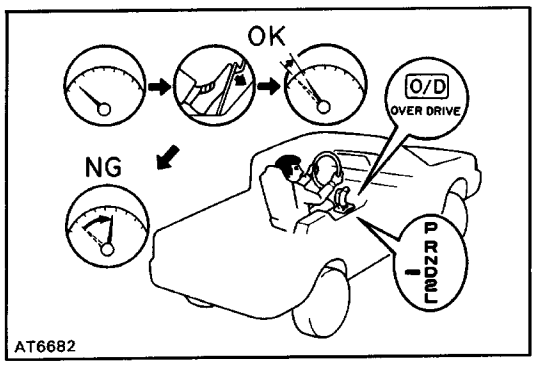
(c) Run at the D position lock–up or O/D gear and check for abnormal noise and vibration.

HINT: The check for the cause of abnormal noise and vibration must be made with extreme care as it could also be due to loss of balance in the propeller shaft, differential, torque converter clutch, etc.



(d) While running in the D position, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2→1, 3→2 and O/D→ 3 kick–downs conform to those indicated on the automatic shift schedule.

(e) Check for abnormal shock and slip at kick–down.

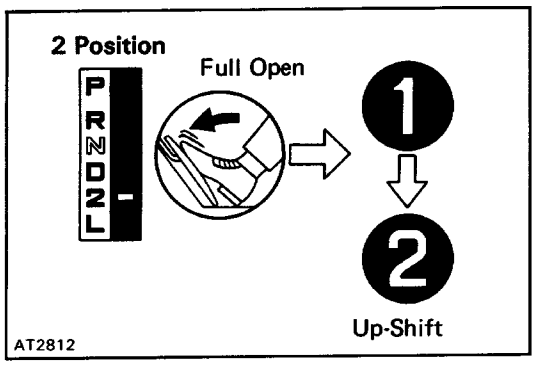


(f) Check for the lock–up mechanism.

(1) Drive in D position, O/D gear, at a steady speed (lock–up ON) of about 75kmlh (47mph).

(2) Lightly depress the accelerator pedal and check that the engine RPM does not change abruptly.

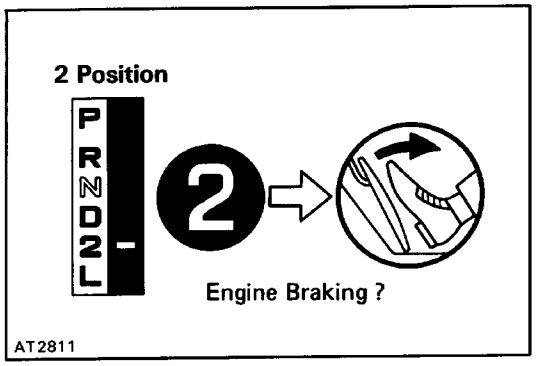
If there is a big jump in engine rpm, there is no lock–up.



2. 2 POSITION TEST

Shift into the 2 position and, while driving with the accel–erator pedal held constantly at the full throttle valve opening position, push in one of the pattern selectors and check on the following points.

(a) Check to see that the 1 → 2 up–shift takes place and that the shift point conforms to it shown on the au–tomatic shift schedule.



HINT:

There is no O/D up–shift and lock–up in the 2 position.

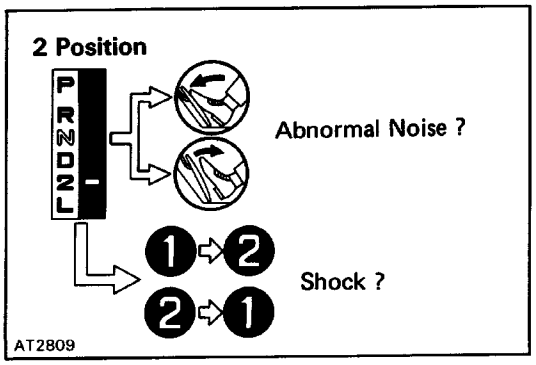
To prevent overrun, the transmission up–shifts into 3rd gear at around 100 km/h (62 mph) or more.

(b) While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.

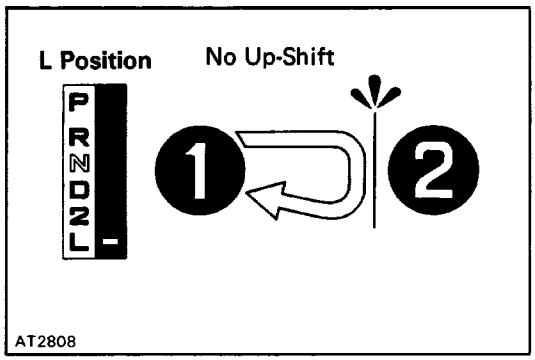
EVALUATION

If there is no engine braking effect:

Second coast brake is defective

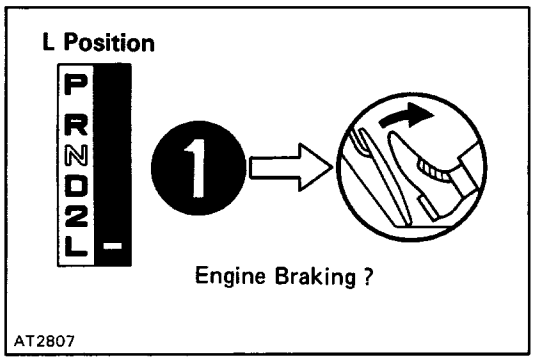


(c) Check for abnormal noise at acceleration and deceleration, and for shock at up–shift and down–shift.



3. L POSITION TEST

(a) While running in the L position, check to see that there is no up–shift to 2nd gear.

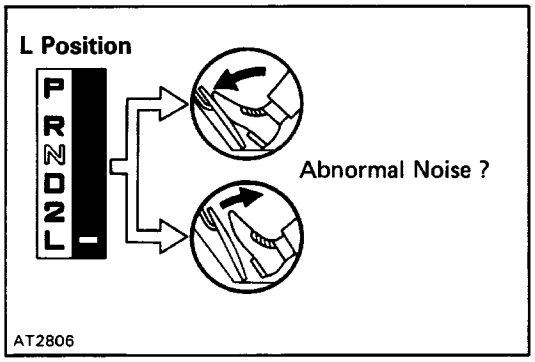


(b) While running in the L position, release the accelerator pedal and check the engine braking effect.

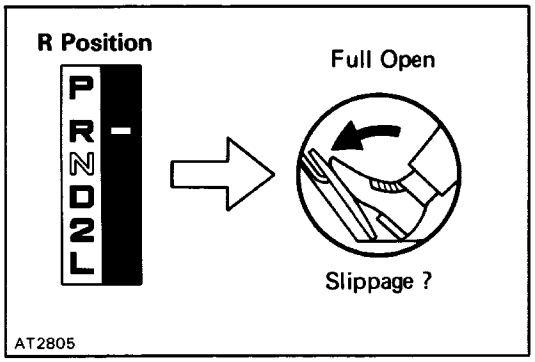
EVALUATION

If there is no engine braking effect:

- First and reverse brake is defective

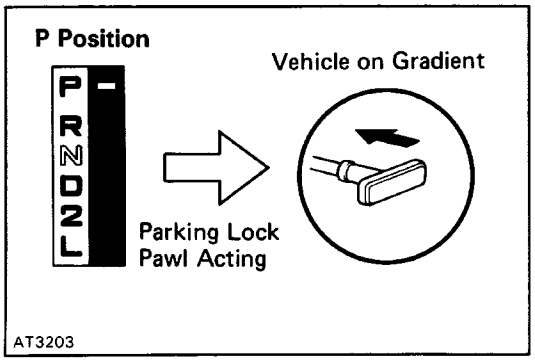


(c) Check for abnormal noise during acceleration and deceleration.



4. R POSITION TEST

Shift into the R position and, while starting at wide open throttle, check for slipping.



5. P POSITION TEST

Stop the vehicle on a gradient (more than 50) and after shifting into the P position, release the parking brake. Then check to see that the parking lock pawl holds the vehicle in place.

Automatic Shift Schedule

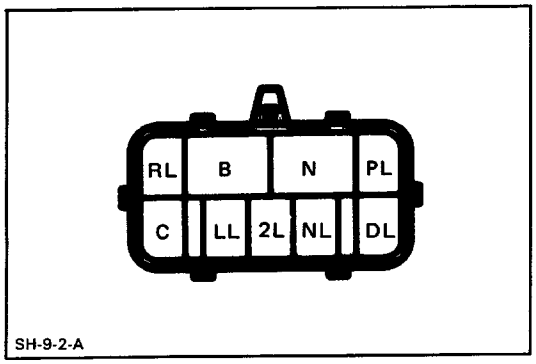
		Throttle valve fully open			[ ] Fully closed			km/h (mph)	
		1→2	2→3	3→O/D	[3→O/D]	[O/D→3]	O/D→3	3→2	2→1
D position	NORM	44–48 (27–30)	93–99 (58–61)	134–141 (83–87)	35–39 (22–24)	21–25 (13–16)	128–135 (79–84)	87–94 (54–58)	40–43 (25–27)
	PW R	47–51 (29–32)	93–99 (58–61)	148–155 (92–96)	50–53 (31–33)	21–25 (13–16)	143–149 (89–92)	87–94 (54–58)	41–45 (25–28)
2 position	NORM PW R	43–46 (27–29)	103–109 (64–68)	–	–	–	–	97–103 (60–64)	38–42 (24–26)
L position	NORM PW R	–	–	–	–	–	–	82–89 (51–55)	47–51 (29–32)

		Throttle valve opening 5%					km/h (mph)
		Lock–up ON			Lock–up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D position	NORM	–	41 – 45 (25 – 28)	59 – 63 (37 – 39)	–	38 – 42 (24 – 26)	55 – 59 (34 – 37)
	PWR	–	55 – 59 (34 – 37)	75 – 79 (47 – 49)	–	50 – 53 (31 – 33)	70 – 73 (43 – 45)

* : O/D switch OFF

HINT:

(1) Lock–up will not occur in 2nd gear unless the throttle valve opening is greater than 50%.
(2) There is no lock–up in the 2 and L positions.
(3) In the following cases, the lock–up will be released regardless of the lock–up pattern.
When the throttle is completely closed.
When the brake light switch is ON.



Park/Neutral Position Switch

INSPECTION OF PARK/NEUTRAL POSITION SWITCH

Inspect that there is continuity between each terminals.

Terminal / Shift Position	B	N	PL	RL	NL	DL	2L	LL	C
P	○	○	○						○
R				○					○
N	○	○			○				○
D						○			○
2							○		○
L								○	○

Automatic Shift Schedule

Throttle valve fully open [ ] Fully closed km/h (mph)

		1→2	2→3	3→O/D	[3→O/D]	[O/D→3]	O/D→3	3→2	2→1
D position	NORM	44–48 (27–30)	93–99 (58–61)	134–141 (83–87)	35–39 (22–24)	21–25 (13–16)	128–135 (79–84)	87–94 (54–58)	40–43 (25–27)
	PW R	47–51 (29–32)	93–99 (58–61)	148–155 (92–96)	50–53 (31–33)	21–25 (13–16)	143–149 (89–92)	87–94 (54–58)	41–45 (25–28)
2 position	NORM PW R	43–46 (27–29)	103–109 (64–68)	–	–	–	–	97–103 (60–64)	38–42 (24–26)
L position	NORM PW R	–	–	–	–	–	–	82–89 (51–55)	47–51 (29–32)

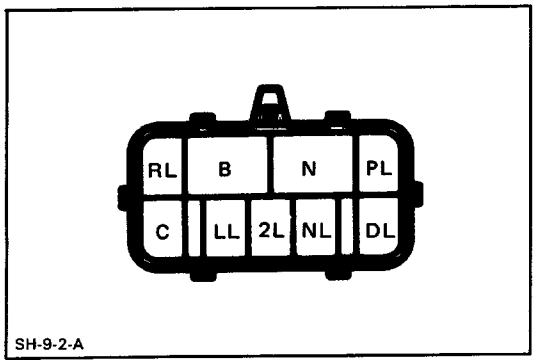
Throttle valve opening 5% km/h (mph)

		Lock–up ON			Lock–up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D position	NORM	–	41 – 45 (25 – 28)	59 – 63 (37 – 39)	–	38 – 42 (24 – 26)	55 – 59 (34 – 37)
	PWR	–	55 – 59 (34 – 37)	75 – 79 (47 – 49)	–	50 – 53 (31 – 33)	70 – 73 (43 – 45)

* : O/D switch OFF

HINT:

(1) Lock–up will not occur in 2nd gear unless the throttle valve opening is greater than 50%.
(2) There is no lock–up in the 2 and L positions.
(3) In the following cases, the lock–up will be released regardless of the lock–up pattern.
When the throttle is completely closed.
When the brake light switch is ON.



Park Neutral Position Switch

INSPECTION OF PARK/NEUTRAL POSITION SWITCH

Inspect that there is continuity between each terminals.

Shift Position \ Terminal	B	N	PL	RL	NL	DL	2L	LL	C
P	○—○		○						○
R				○					○
N	○—○				○				○
D						○			○
2							○		○
L								○	○

ON–VEHICLE REPAIR
Valve Body
REMOVAL OF VALVE BODY

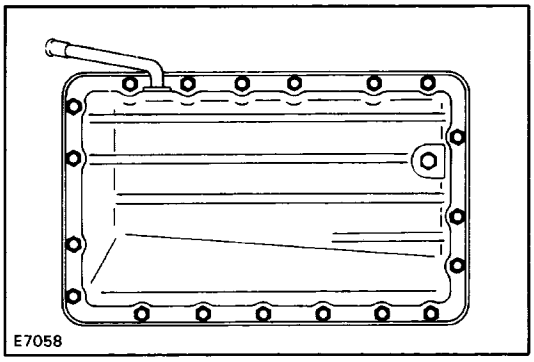
1. CLEAN TRANSMISSION EXTERIOR

To prevent contamination, clean the exterior of the trans–mission.

2. DRAIN TRANSMISSION FLUID

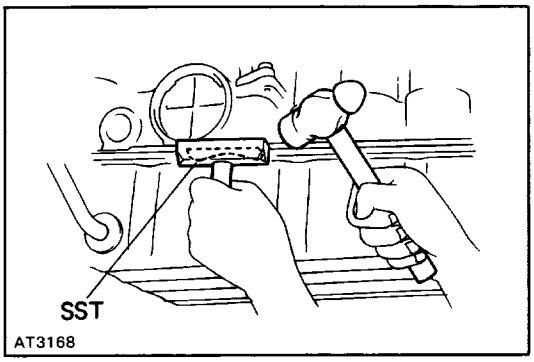
Remove the drain plug and the fluid into a suitable con–tainer.

3. REMOVE OIL PAN



NOTICE: Some fluid will remain in the oil pan . Be careful not to damage the filler tube and O–ring.

(a) Remove the nineteen bolts.

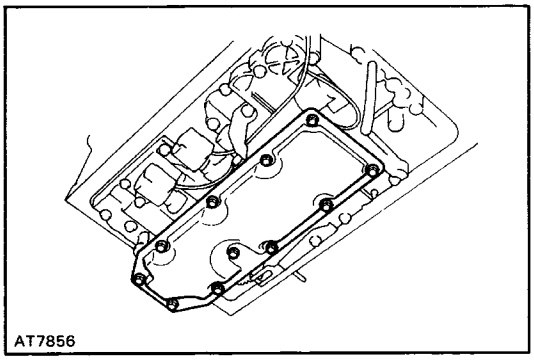


(b) Install the blade of SST between the transmission case and oil pan, cut off applied sealer and then re–move the oil pan.

SST 09032–00 100

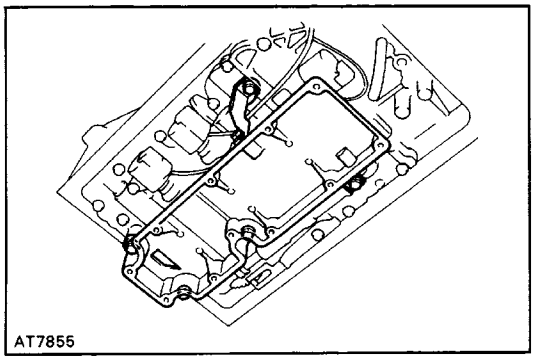
NOTICE: When removing the oil pan, be careful not to damage the oil pan flange.

4. REMOVE OIL STRAINER AND GASKETS



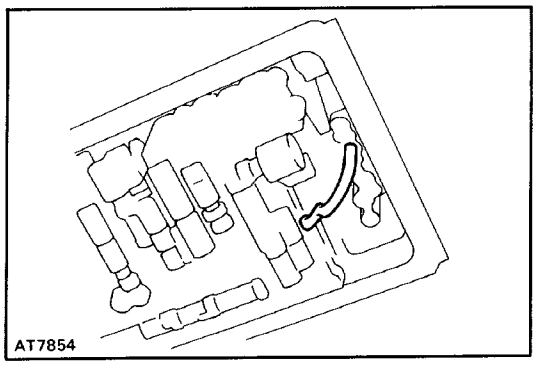
(a) Remove the eleven bolts holding the oil strainer to the oil strainer case.

(b) Remove the oil strainer and gasket.



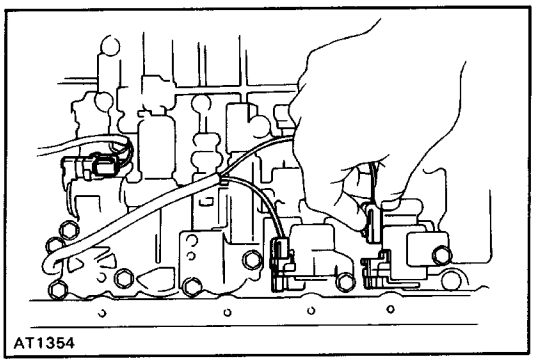
(c) Remove the five bolts and oil strainer case.

(d) Remove the two gaskets from the case.



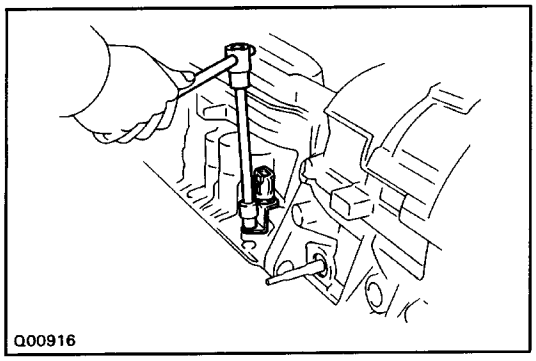
5. REMOVE OIL TUBE

Pry up both tube ends with a large screwdriver and remove the tube.



6. REMOVE SOLENOID WIRING

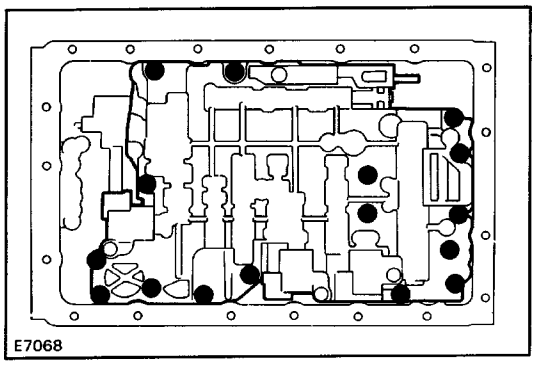
(a) Disconnect the three connectors from No.1, No.2 and lock–up solenoids.



(b) Remove the stopper plate from the case.

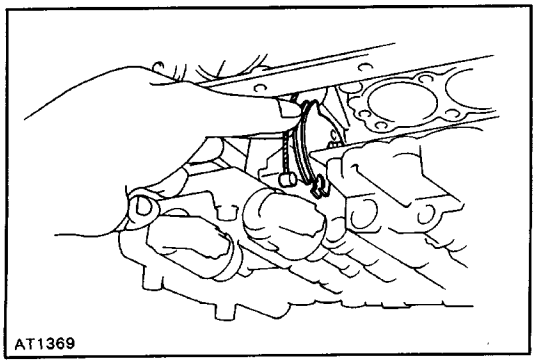
(c) Pull out the solenoid wiring from the transmission case.

(d) Remove the O–ring from the grommet.



7. REMOVE VALVE BODY

(a) Remove the sixteen bolts.

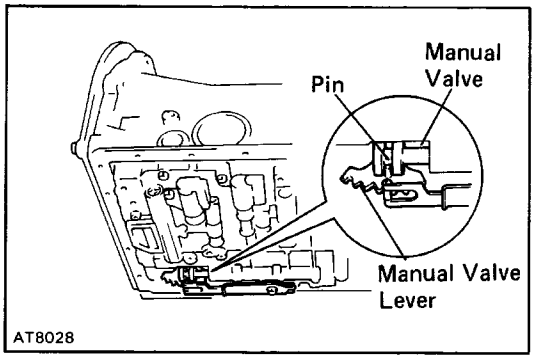


(b) Disconnect the throttle cable from the cam and remove the valve body.

INSTALLATION OF VALVE BODY

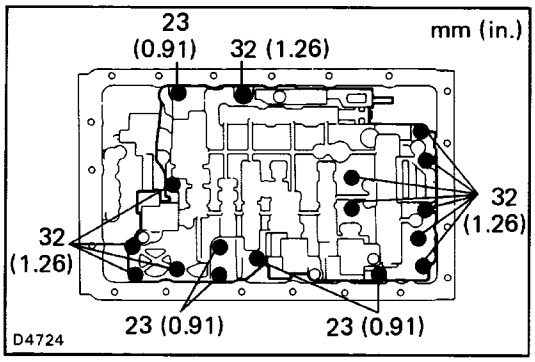
1. CONNECT THROTTLE CABLE TO CAM

Push the cable fitting into the cam.



2. INSTALL VALVE BODY

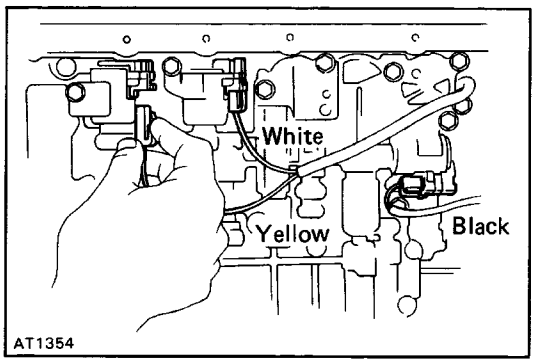
(a) Align the manual valve lever with the manual valve.



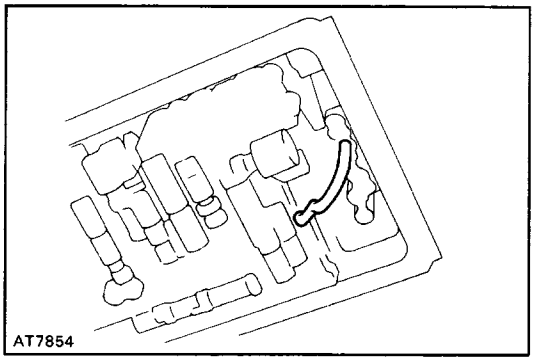
(b) Finger tighten the all bolts first. Then tighten the bolts evenly.

HINT: Each bolt length (mm, in.) is indicated in the figure.

Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)



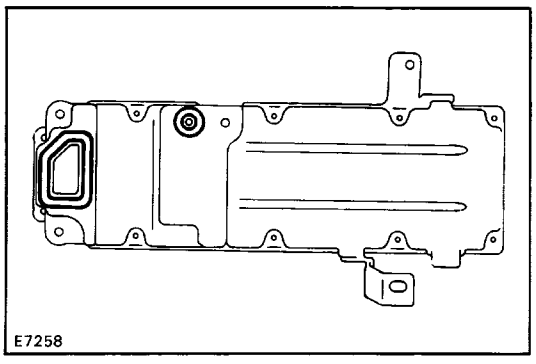
3. CONNECT SOLENOID WIRING



4. INSTALL OIL TUBE

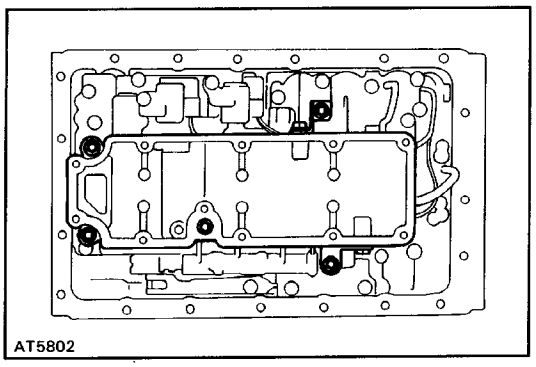
Tap the tubes with a plastic hammer to install the tube into the position shown in the figure.

NOTICE: Be careful not to bend or damage the tube.

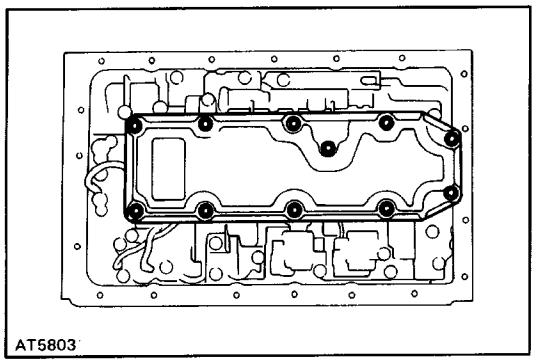


5. INSTALL OIL STRAINER AND GASKETS

(a) Install two new gaskets to the oil strainer case.

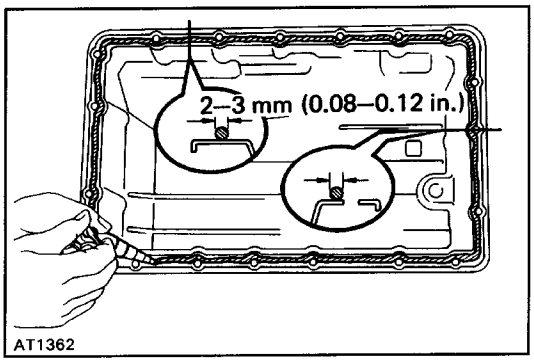


(b) Install the oil strainer case and torque the five bolts.
Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)



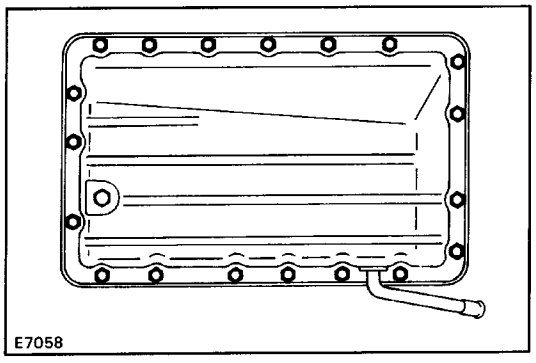
(c) Install a new gasket to the oil strainer case.
(d) Install the oil strainer and torque the eleven bolts.

Torque: 6.9 IV –m (70 kgf –cm, 61 in. –lbf)



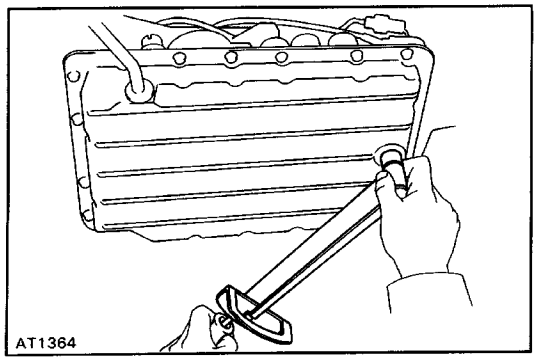
6. INSTALL OIL PAN

(a) Remove any packing material and be careful not to drop oil on the contacting surfaces of the transmis–sion case and oil pan.
(b) Apply seal packing to the oil pan shown in the fig–ure.
Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent



(c) Install and torque the nineteen bolts.

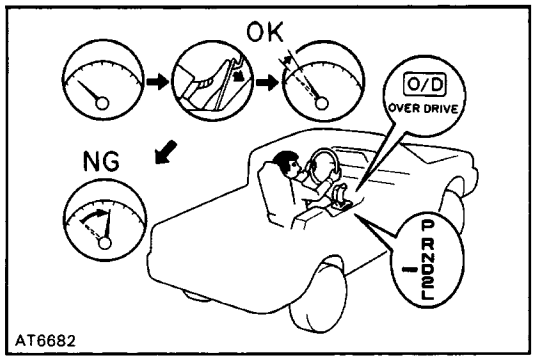
Torque: 7.4 N–m (75 kgf–cm, 65 in.–lbf)



7. INSTALL DRAIN PLUG

Torque the drain plug.

Torque: 20 N–m (205 kgf–cm, 15 ft–lbf)

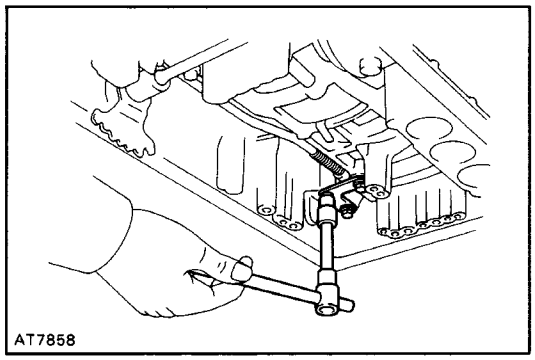


8. FILL TRANSMISSION WITH ATF

Add only about two liters of ATF. Start the engine and shift through all the positions. Check the fluid level and add as necessary.

NOTICE: Do not overfill.

Fluid type: ATF DEXRON°II



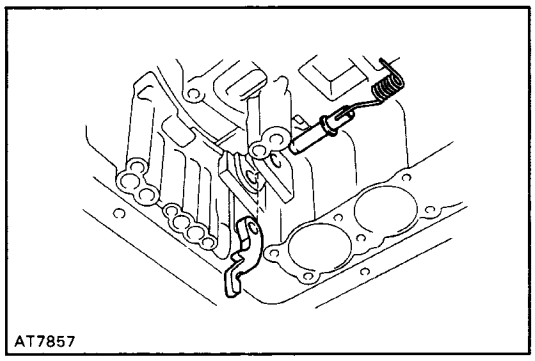
Parking Lock Pawl

REMOVAL OF PARKING LOCK PAWL

1. REMOVE VALVE BODY (See page AT–204)

2. REMOVE PARKING LOCK PAWL BRACKET

Remove the three bolts and the bracket.



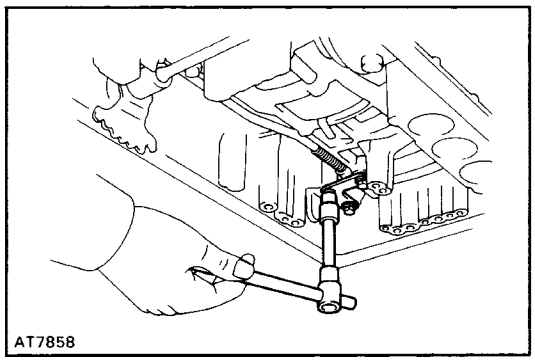
3. REMOVE SPRING FROM PARKING LOCK PAWL PIVOT PIN

4. REMOVE PIVOT PIN AND PARKING LOCK PAWL

INSTALLATION OF PARKING LOCK PAWL

1. INSTALL PARKING LOCK PAWL AND PIVOT PIN

2. INSTALL SPRING



3. INSTALL PARKING LOCK PAWL BRACKET

(a) Push lock rod fully toward.

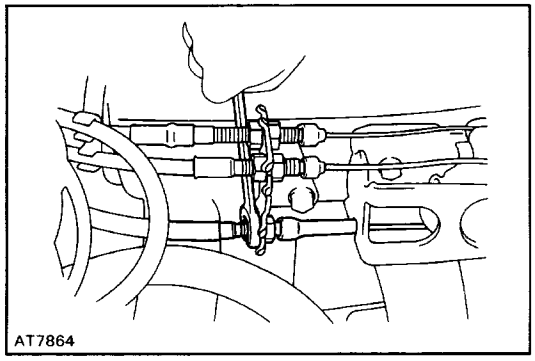
(b) Install the three bolts finger tight.

(c) Check that the pawl operates smoothly.

(d) Torque the bolts.

Torque: 7.4 N–m (75 kgf–cm, 65, in.–lbf)

4. INSTALL VALVE BODY (See page AT–204)

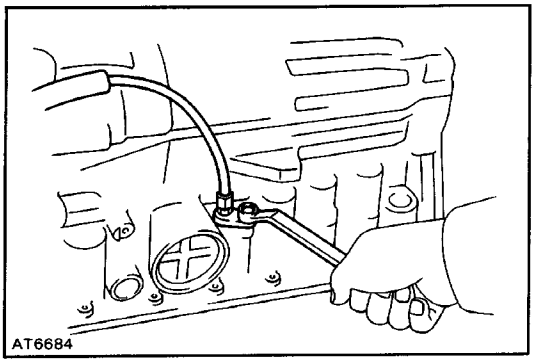


Throttle Cable

REMOVAL OF THROTTLE CABLE

1. DISCONNECT THROTTLE CABLE

Disconnect the cable from the throttle linkage.



2. REMOVE VALVE BODY (See page AT–204)

3. PUSH THROTTLE CABLE OUT OF TRANSMISSION CASE

Remove the retaining bolt and pull out the throttle cable.

INSTALLATION OF THROTTLE CABLE

1. INSTALL CABLE IN TRANSMISSION CASE

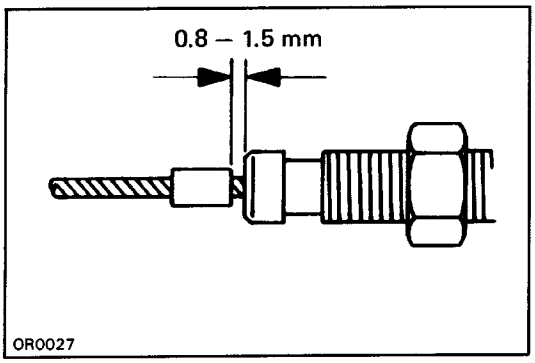
Install the retaining bolt and push in the throttle cable.

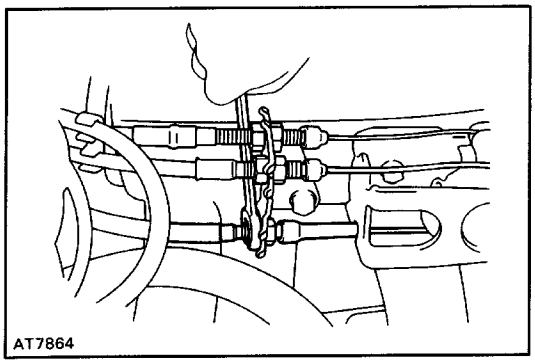
2. INSTALL VALVE BODY (See page AT–205)

3. IF THROTTLE CABLE IS NEW, STAKE STOPPER ON INNER CABLE

(a) Pull the inner cable lightly until a slight resistance is felt, and hold it.

(b) Stake the stopper as shown, 0.8 – 1.5 mm (0.031 – 0.059 in.) in width.





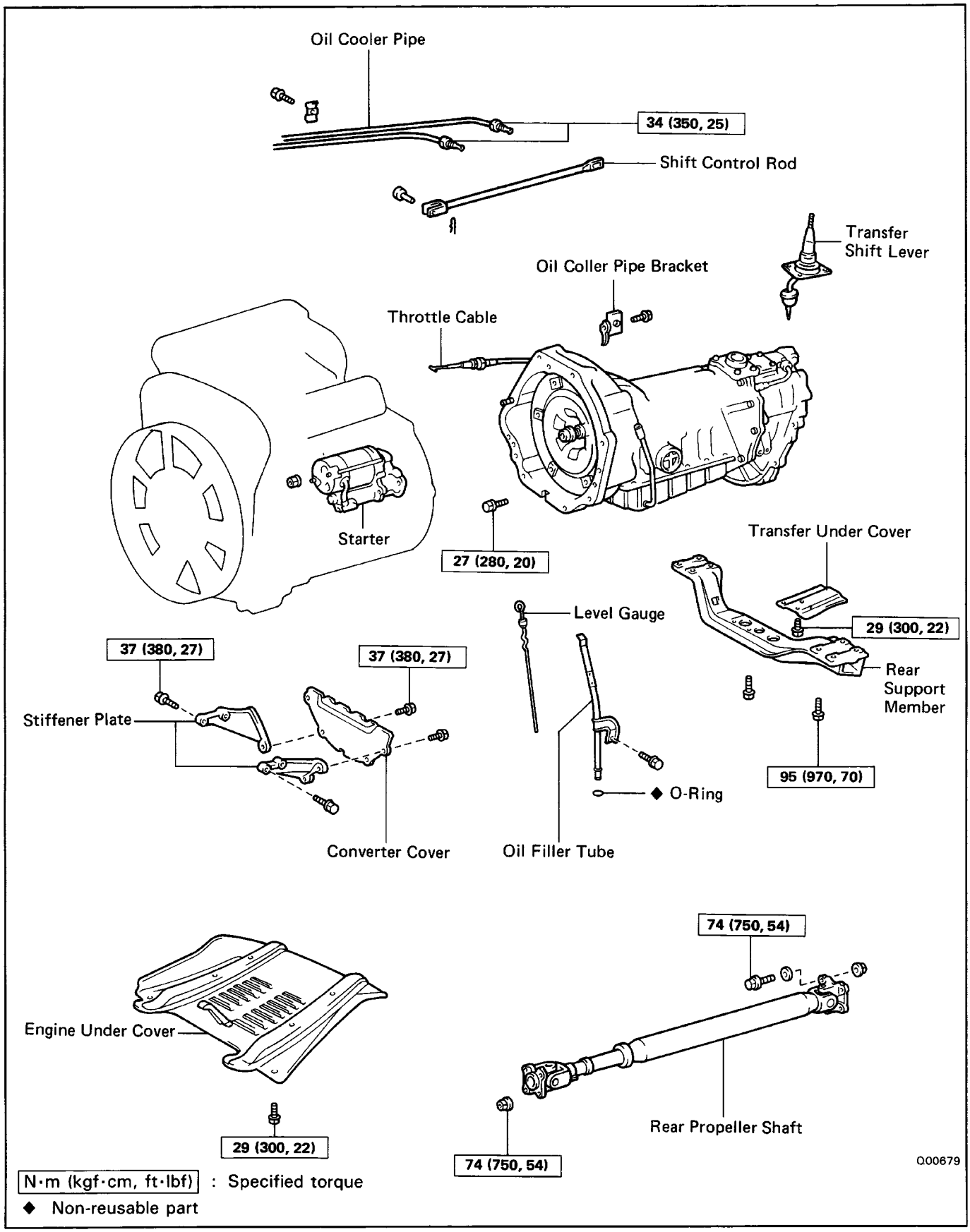
4. CONNECT THROTTLE CABLE

5. ADJUST THROTTLE CABLE (See page AT–182)

6. TEST DRIVE VEHICLE

REMOVAL AND INSTALLATION OF TRANSMISSION

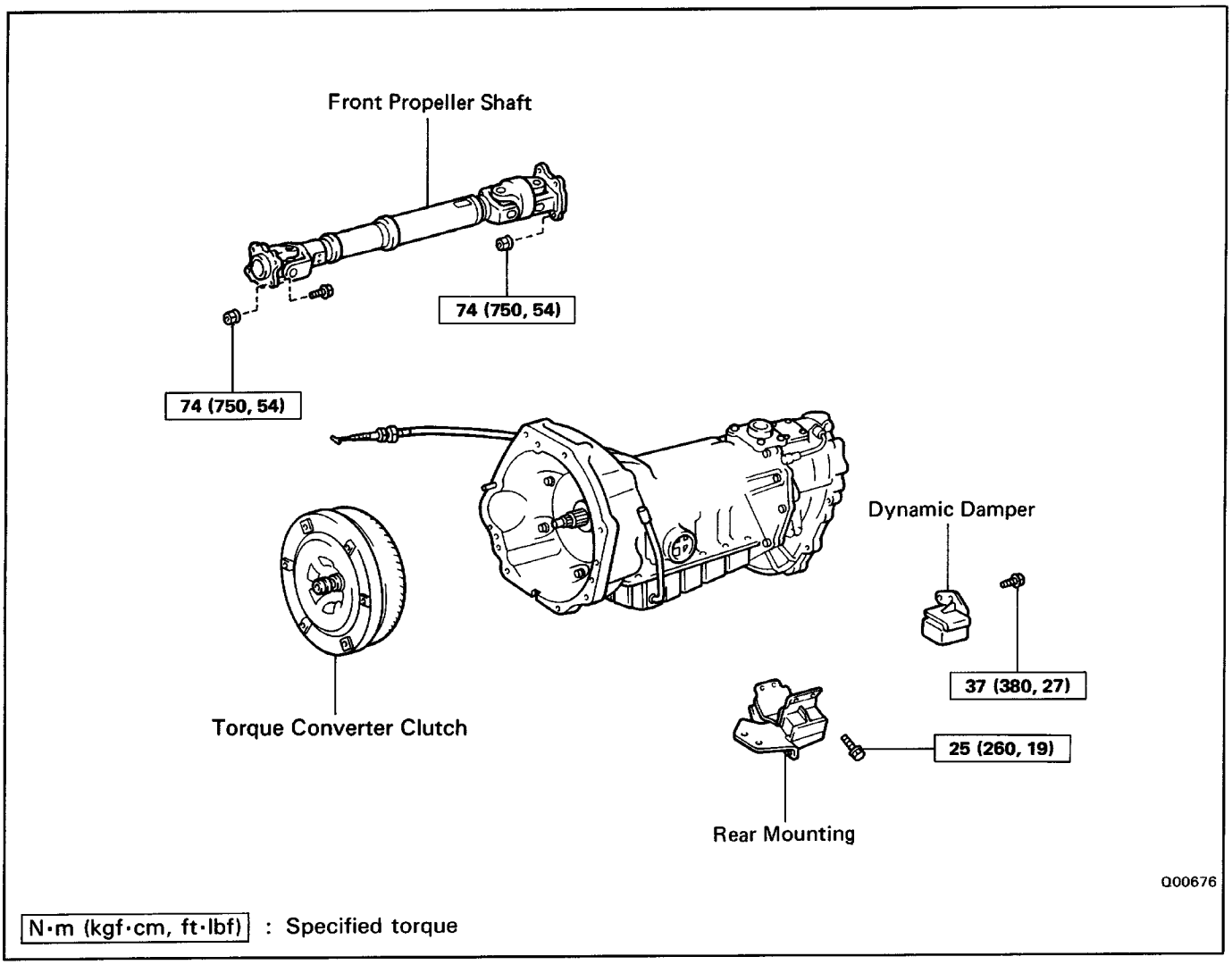
Remove and Install the parts as shown.



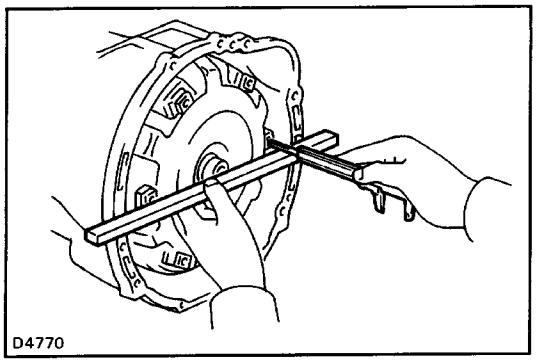
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

(Cont'd)



N·m (kgf·cm, ft·lbf) : Specified torque



(MAIN POINT OF INSTALLATION)

1. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

Using calipers and a straight edge, measure from the installed surface of the torque converter clutch to the front surface of the transmission housing.

Correct distance: 20.0 mm (0.787 in.)

If the distance is less than the standard, check for an improper installation.

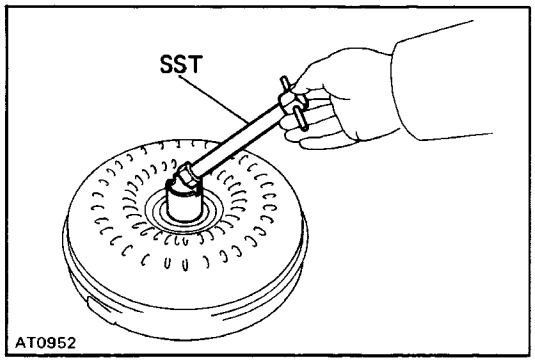
2. ADJUST TRANSMISSION THROTTLE CABLE

(See page AT–182)

3. FILL TRANSMISSION WITH ATF AND CHECK FLUID LEVEL

Fluid type: ATF DEXRON® II

NOTICE: Do not overfill.

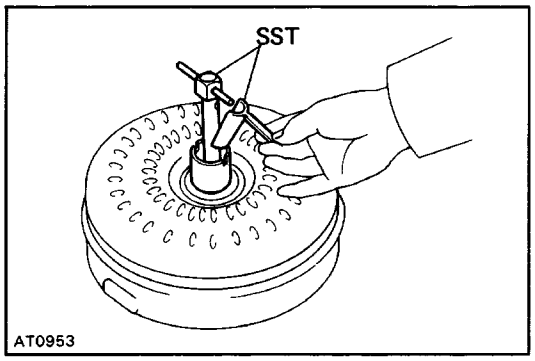


TORQUE CONVERTER CLUTCH AND DRIVE PLATE

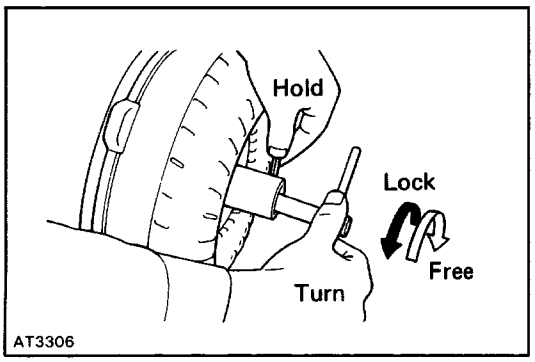
INSPECTION OF TORQUE CONVERTER CLUTCH AND DRIVE PLATE

1. INSPECT ONE–WAY CLUTCH

(a) Install SST into the inner race of the one–way clutch.
SST 09350–30020 (09351–32010)

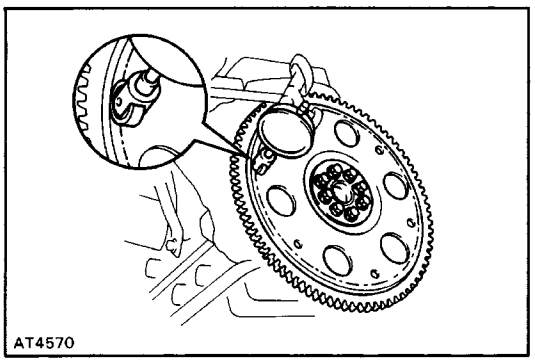


(b) Install SST so that it fits in the notch of the converter hub and outer race of the one–way clutch.
SST 09350–30020 (09351–32020)



(c) With the torque converter clutch standing on its side, the clutch locks when turned counterclockwise, and rotates freely and smoothly clockwise.
If necessary, clean the converter and retest the clutch.
Replace the converter if the clutch still fails the test.

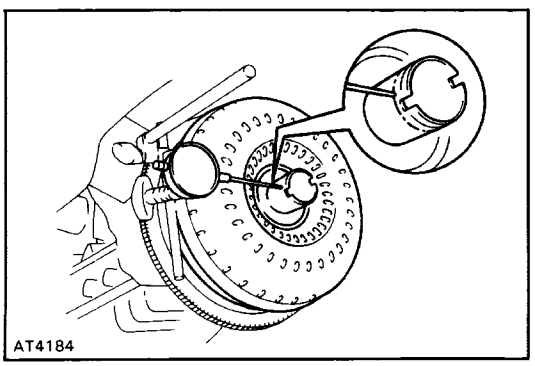
2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR



Set up a dial indicator and measure the drive plate runout.
If runout exceeds 0.20 mm (0.0079 in.) or if the ring gear is damaged, replace the drive plate. If installing a new drive plate, note the orientation of spacers and tighten the bolts.

Torque: 83 N–m (850 kgf–cm, 61 ft–lbf)

3. MEASURE TORQUE CONVERTER CLUTCH SLEEVE RUNOUT



(a) Temporarily mount the torque converter clutch to the drive plate. Set up a dial indicator.
If runout exceeds 0.30 mm (0.0118 in.), try to correct by reorienting the installation of the converter. If excessive runout cannot be corrected, replace the torque converter
clutch.

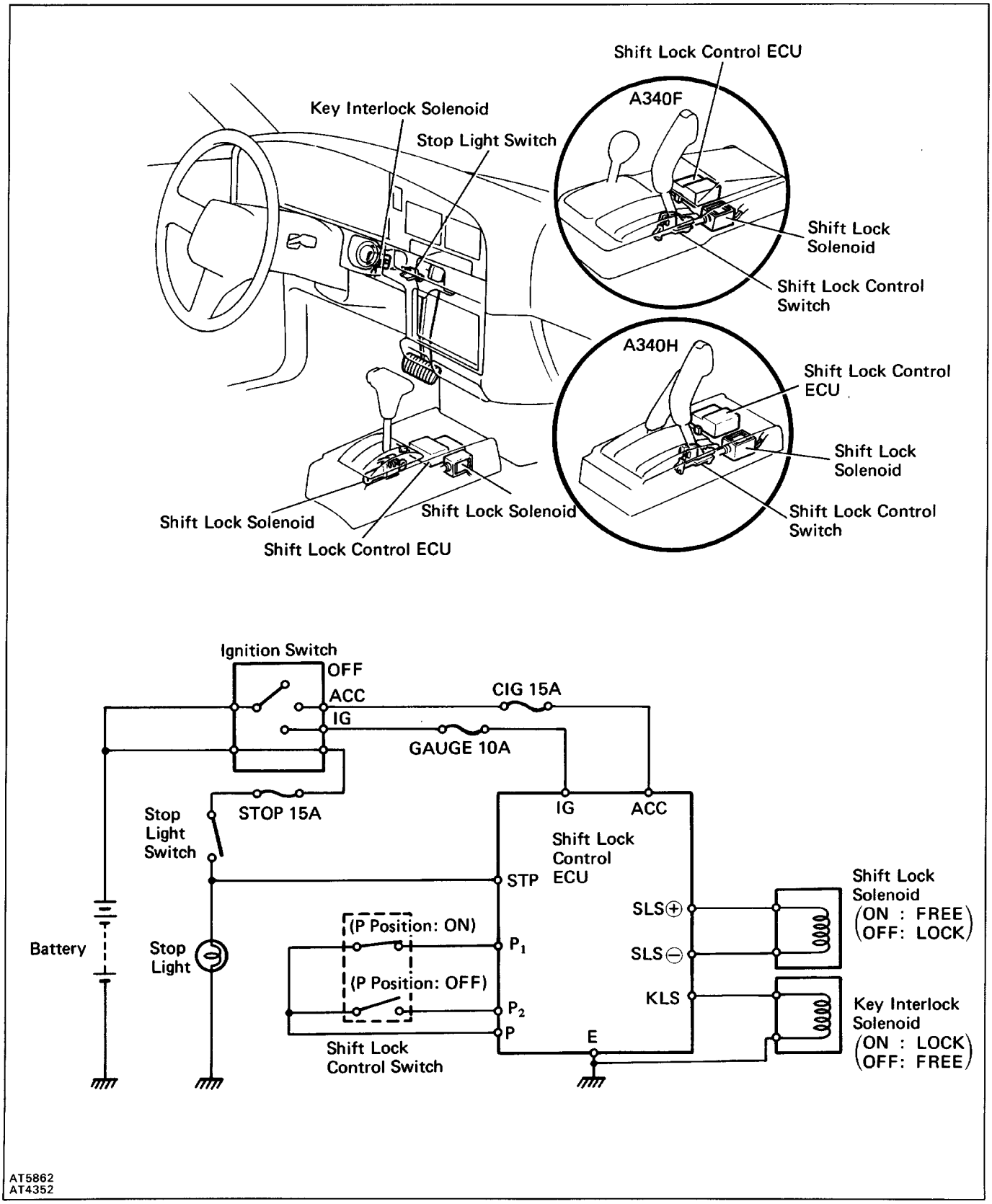
HINT: Mark the position of the converter to ensure correct installation.

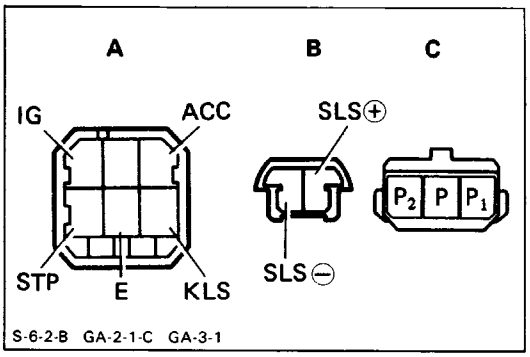
(b) Remove the torque converter clutch.

SHIFT LOCK SYSTEM

(Electrically Controlled Shift Lock System)

COMPONENTS AND CIRCUIT



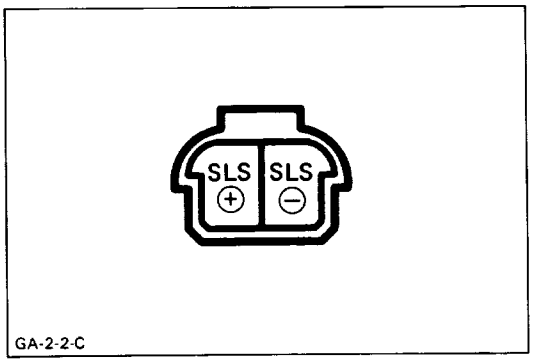


INSPECTION OF ELECTRIC CONTROL COMPONENTS

1. INSPECT SHIFT LOCK CONTROL COMPUTER

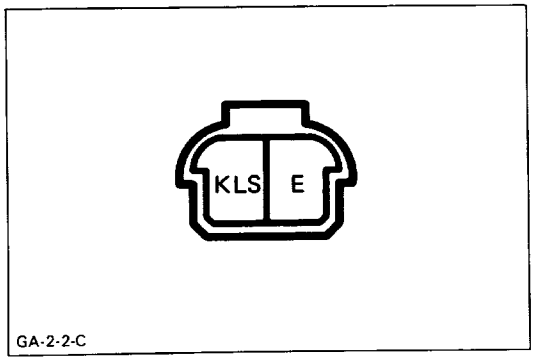
Using a voltmeter, measure the voltage at each terminals.

Connector	Terminal	Measuring condition		Voltage (V)
A	ACC – E	IG SW ACC position		10 – 14
	IG – E	• G SW ON position		10 – 14
	STP – E	Depress brake pedal		10 – 14
	KLS – E	①	IG SW ACC position and P position	0
		②	P –i R, N, D, 2, L position	10 – 14
		③	↑ (Approx. after one second)	6 – 9
B	SLS ⊕ – SLS ⊖	①	IG SW ON position and P position	0
		②	Depress brake pedal	10 – 14
		③	P¿ R, N, D, 2, L positions or release brake pedal	0
C	P_1 – P	①	IG SW ON, P position and depress brake pedal	0
		②	R, N, D, 2, L positions	10 – 14
	P_2 – P	①	IG SW ACC position and P position	10 – 14
		②	R, N, D, 2, L positions	0



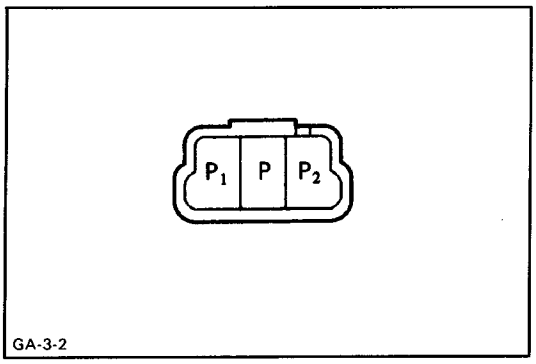
2. INSPECT SHIFT LOCK SOLENOID

(a) Disconnect the solenoid connector.
(b) Using an ohmmeter, measure the resistance between terminals.
Standard resistance: 29 – 36Ω
(c) Apply the battery positive voltage between terminals. At this time, confirm that a solenoid operation



3. INSPECT KEY INTERLOCK SOLENOID

(a) Disconnect the solenoid connector.
(b) Using an ohmmeter, measure the resistance between terminals.
Standard resistance: 12 – 17Ω
(c) Apply the battery positive voltage between terminals. At this time, confirm that a solenoid operation



4. INSPECT SHIFT LOCK CONTROL SWITCH

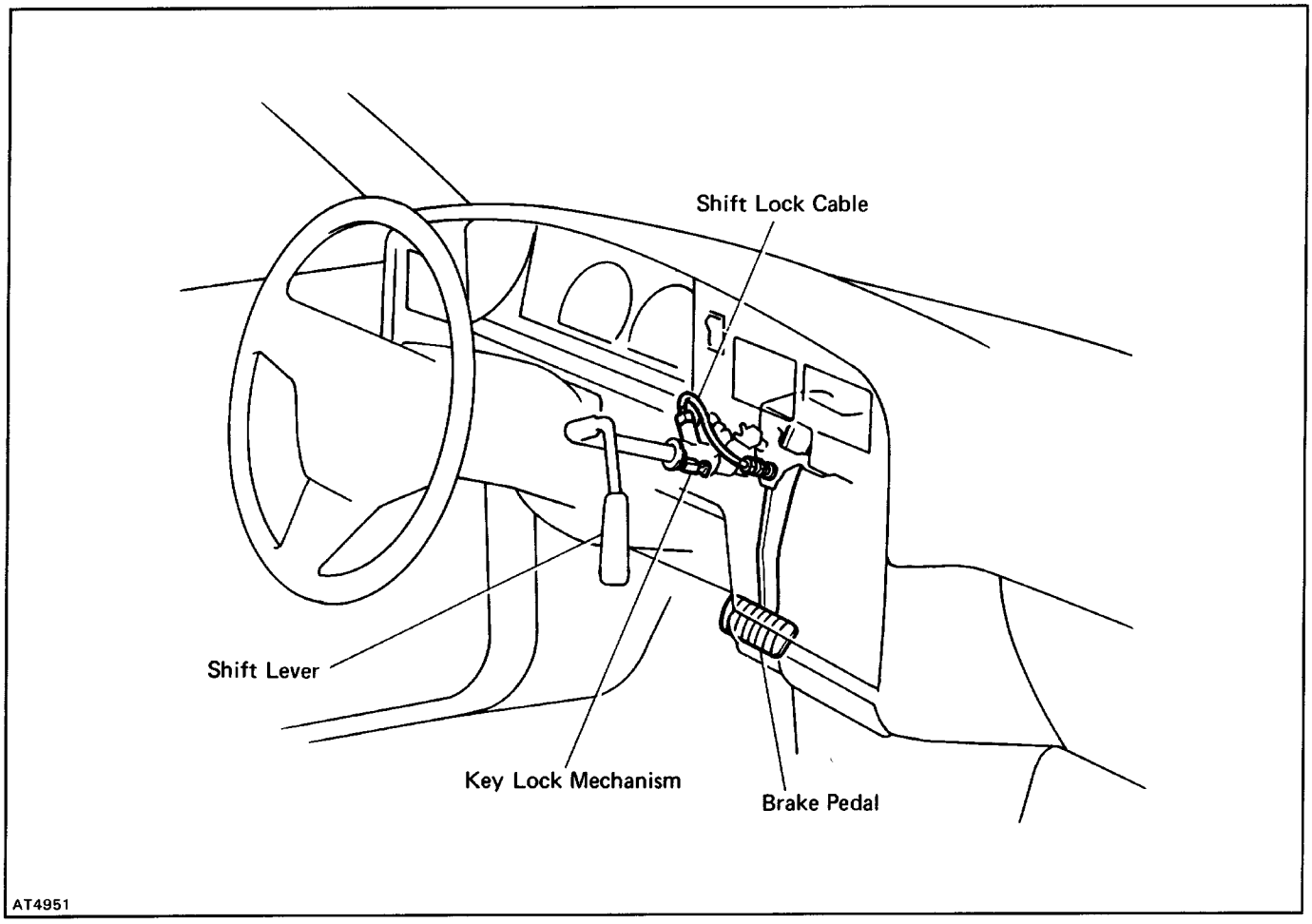
Inspect that there is continuity between each terminals.

: Continuity

Shift Position \ Terminal	P	P_1	P_2
P position (Release button is not pushed)	○—○		
R, N, D, 2, L positions	○—○	○—○	

(Mechanically Controlled Shift Lock System)

COMPONENTS



HINT: Do the following steps, after replacing the shift–lever, ignition switch, shift lock cable and brake pedal.

(a) Check that the stop lights turn on whlile depressing the brake pedal.

(b) Check that the stop lights turn off when releasing the brake pedal.

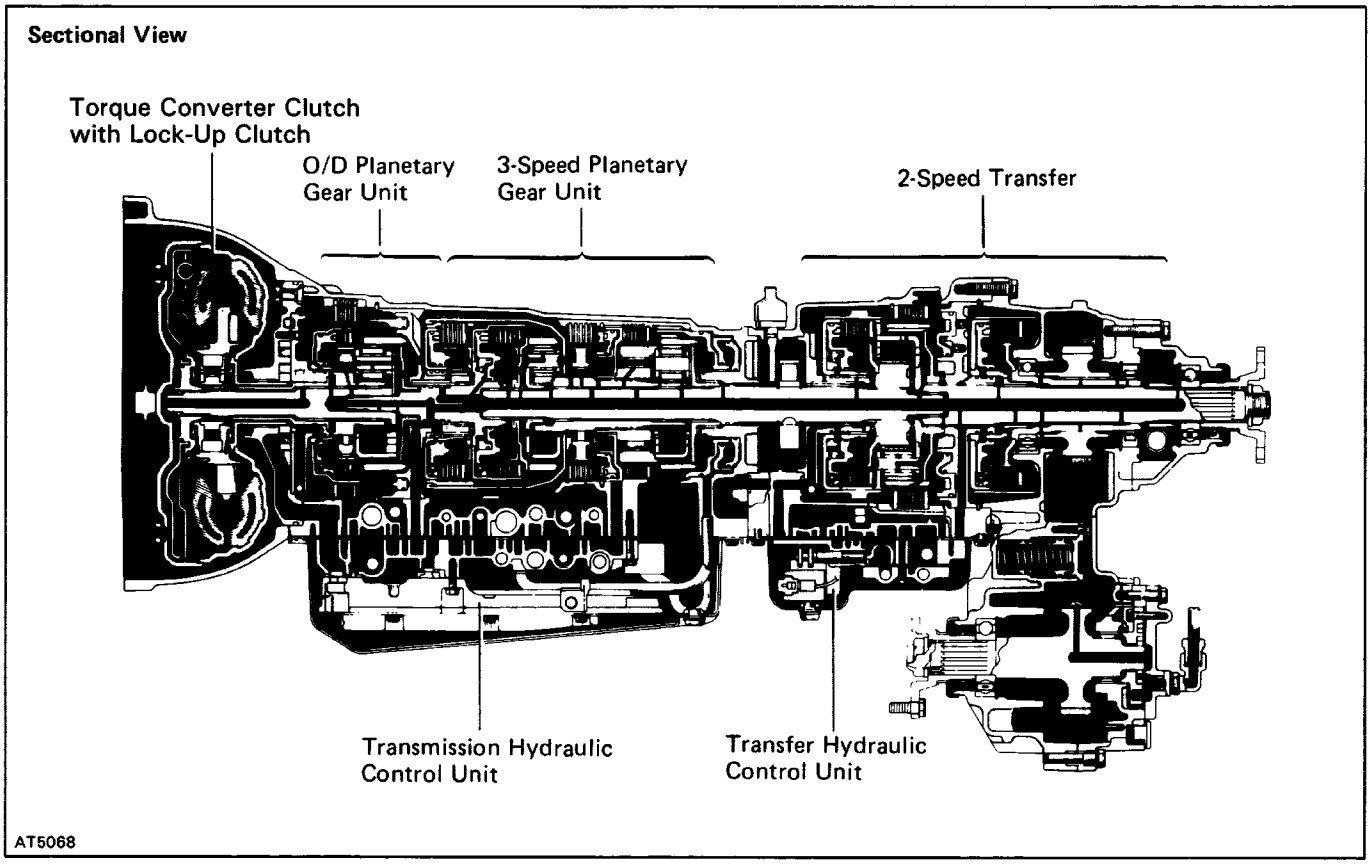
If stop light operation is not as specified, adjust the stop light switch position.

A340H Automatic Transmission

DESCRIPTION

General

The A340H automatic transmission is a four–speed, Electronic Controlled Transmission with electronically controlled 4WD transfer, developed with the aim of producing an easy–driving 4WD vehicle.
The transfer section consists of planetary gears, hydraulic clutches and hydraulic brake. The operation of these is fully controlled by the ECM.
The A340H transmission is mainly composed of the torque converter clutch, the overdrive (hereafter called O/D) planetary gear unit, 3–speed planetary gear unit, 2–speed transfer, the hydraulic control system and the electronic control system.



General Specifications

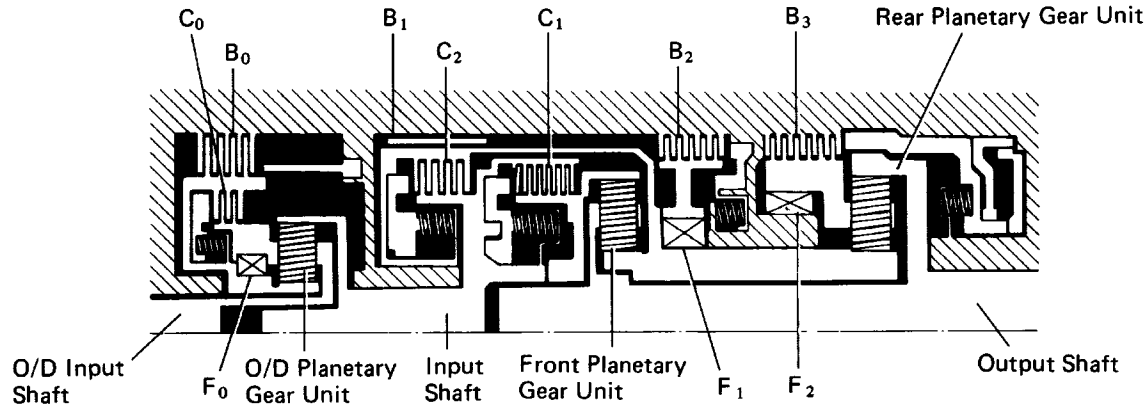
Type of Transmission				A340H
Type of Engine				3VZ-E
Torque Converter Clutch		Stall Torque Ratio		2.1 : 1
		Lock–Up Mechanism		Equipped
Gear Ratio	Transmission	1 st Gear		2.804
		2nd Gear		1.531
		3rd Gear		1.000
		O/D Gear		0.705
		Reverse Gear		2.393
	Transfer	High (H2, H4)		1.000
		Low (L4)		2.659
Number of Discs and Plates (Disc /Plate)	Transmission	C_1	Forward Clutch	5/5
		C_2	Direct Clutch	4/4
		C_0	O/D Direct Clutch	2/2
		B_2	2nd Brake	5/5
		B_3	1 st & Reverse Brake	6/6
		B_0	O/D Brake	4/3
	Transfer	C_3	Transfer Direct Clutch	6/6
		C_4	Front Drive Clutch	6/6
		B_4	Low Speed Brake	7/6
ATF		Type		ATF DEXRON® II
		Capacity liter (US qts, Imp. qts)	Total	Transmission: 10.3 (10.9, 9.1), Transfer: 1.1 (1.2, 1.0)
			Drain & Refill	Transmission: 4.5 (4.8, 4.0), Transfer: 0.8 (0.8, 0.7)

OPERATION

Mechanical Operation

OPERATING CONDITIONS

1. Transmission

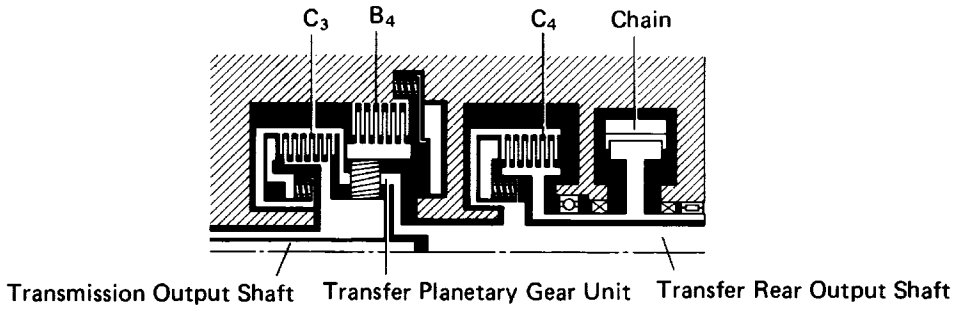


Shift Lever Position	Gear	No. 1 Solenoid Valve	No. 2 Solenoid Valve	C_0	C_1	C_2	B_0	B_1	B_2	B_3 I.P.	B_3 O.P.	F_0	F_1	F_2
P	Parking	ON	OFF	●										
R	Reverse	ON	OFF	●		●				●	●	●		
N	Neutral	ON	OFF	●										
D	1st	ON	OFF	●	●							●		●
	2nd	ON	ON	●	●				●			●	●	
	3rd	OFF	ON	●	●	●			●			●		
	O/D	OFF	OFF		●	●	●		●					
2	1st	ON	OFF	●	●							●		●
	2nd	ON	ON	●	●			●	●			●	●	
	3rd	OFF	ON	●	●	●			●			●		
L	1st	ON	OFF	●	●					●	●	●		●
	* 2nd	ON	ON	●	●			●	●			●	●	

* Down–shift only in the L position and 2nd gear–no up–shift.

I.P. ..... Inner Piston
O.P. ..... Outer Piston

2. Transfer

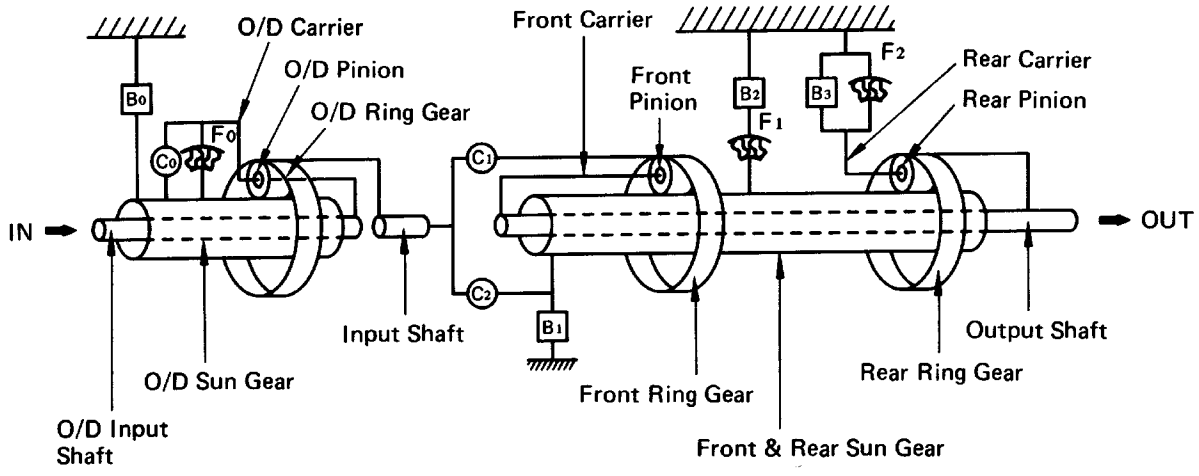


Transfer gear position	No.4 solenoid valve	C_3	C_4	B_4
H2	OFF	●		
H4	OFF	●	●	
L4	ON		●	●

FUNCTION OF COMPONENTS

1. Transmission

Component		Function
C_1	Forward Clutch	Connects input shaft and front planetary ring gear.
C_2	Direct Clutch	Connects input shaft and front & rear planetary sun gear.
C_0	O/D Direct Clutch	Connects overdrive sun gear and overdrive planetary carrier.
B_1	2nd Coast Brake	Prevents front & rear planetary sun gear from turning either clockwise or counterclockwise.
B_2	2nd Brake	Prevents outer race of F, from turning either clockwise or counterclockwise thus preventing the front & rear planetary sun gear from turning counterclock–wise.
B_3	1 st & Reverse Brake	Prevents rear planetary carrier from turning either clockwise or counterclock–wise.
B_0	O/D Brake	Prevents overdrive sun gear from turning either clockwise or counterclock–wise.
F_1	No. 1 One–Way Clutch	When B_2 is operating, this clutch prevents the front & rear planetary sun gear from turning counterclockwise.
F_2	No.2 One–Way Clutch	Prevents rear planetary carrier from turning counterclockwise.
F_0	O/D One–Way Clutch	When the transmission is being driven by the engine, this clutch connects the overdrive sun gear and overdrive planetary carrier.
Planetary Gears		These gears change the route through which driving force is transmitted in accordance with the operation of each clutch and brake in order to increase or reduce the input and output speed.

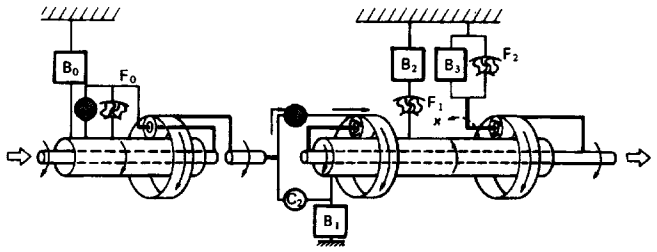


AT5440

FUNCTION OF COMPONENTS (Cont'd)

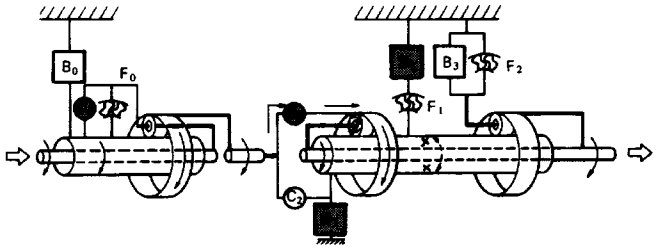
The conditions of operation for each gear position are shown in the following illustrations:

D or 2 Position 1st Gear



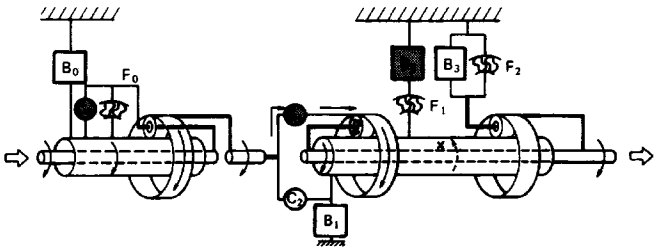
AT5854

2 or L Position 2nd Gear



AT5854

D Position 2nd Gear



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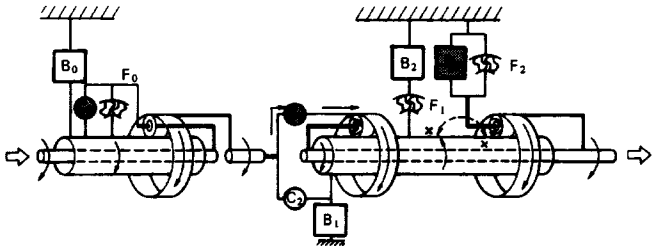
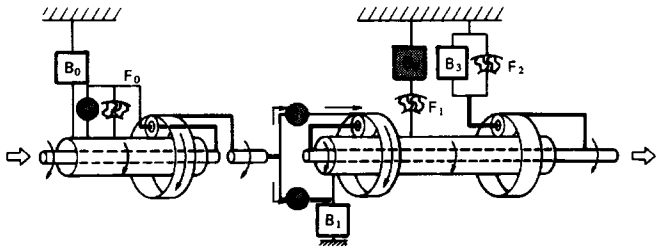
L Position 1st Gear



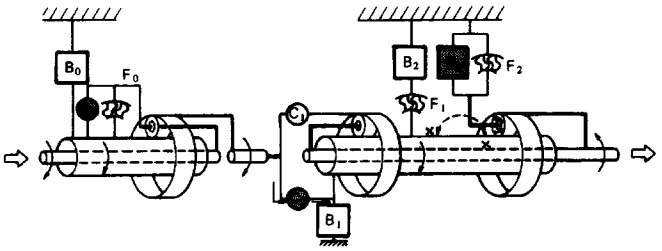
AT5854

D or 2 Position 3rd Gear



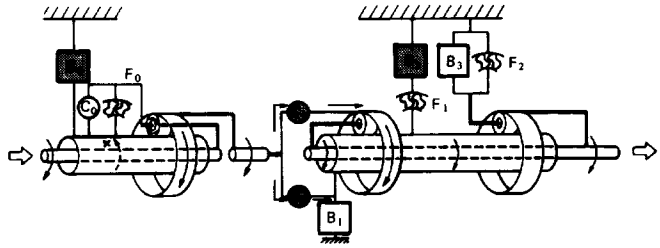
AT5854

R Position Reverse Gear



AT5854

D Position O/D

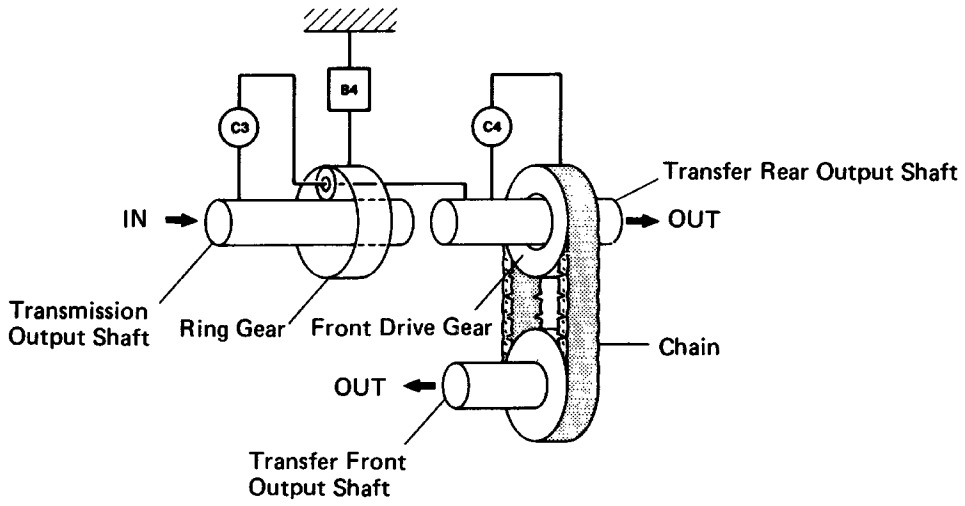


AT5854

FUNCTION OF COMPONENTS (Cont'd)

2. Transfer

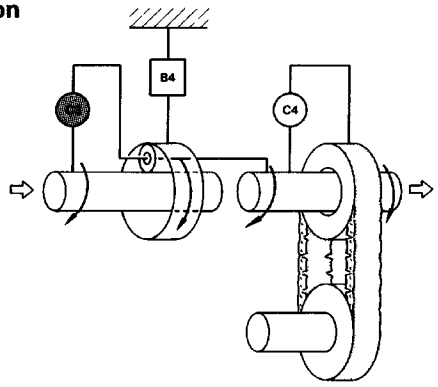
Component		Function
C_3	Forward Clutch	Connects transmission output shaft and transfer pinion gear.
C_4	Direct Clutch	Connects transfer rear output shaft and front drive gear.
B_4	O/D Direct Clutch	Prevents transfer ring gear from turning either clockwise or counterclockwise.



ND0047

The conditions of operation for each gear position are shown in the following illustrations:

H2 Position



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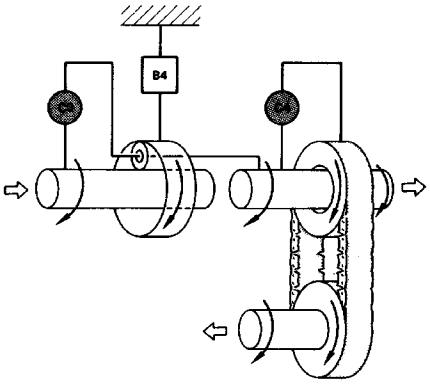
H4 Position



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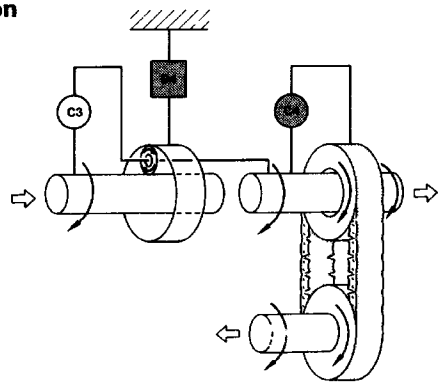
L4 Position

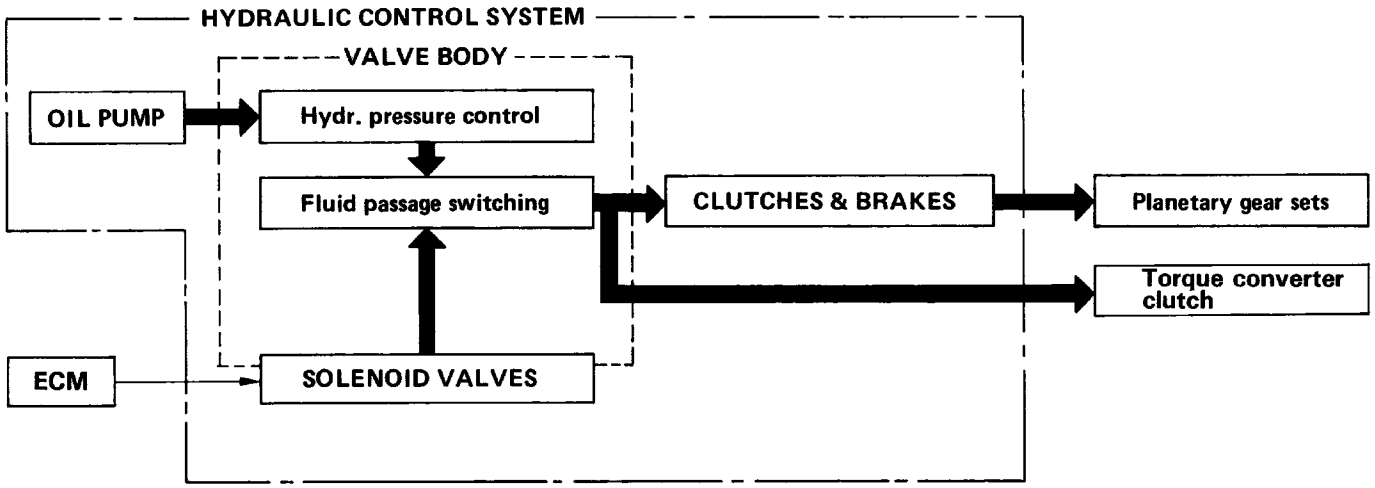


ND00047

Hydraulic Control System

1. Transmission

The hydraulic control system is composed of the oil pump, the valve body, the solenoid valves, and the clut–ches and brakes, as well as the fluid passages which connect all of these components. Based on the hydraulic pressure created by the oil pump, the hydraulic control system governs the hydraulic pressure ac–ting on the torque converter clutch, clutches and brakes in accordance with the vehicle driving conditions. There are three solenoid valves on the valve body. These solenoid valves are turned on and off by signals from the ECM to operate the shift valves. These shift valves then switch the fluid passages so that fluid goes to the torque converter clutch and planetary gear units.



2 Transfer

The hydraulic control system consists of a valve body, No.4 solenoid valve, a brake (B_4) and two clutches (C3, C4) and passages that connect these elements. It hydraulically controls the planetary gear unit either manually, or automatically by the ECM.

Electronic Control System

The electronic control system, which controls the transmission and transfer shift timing and the operation of the lock–up clutch, is composed of the following three parts:

1. Sensors

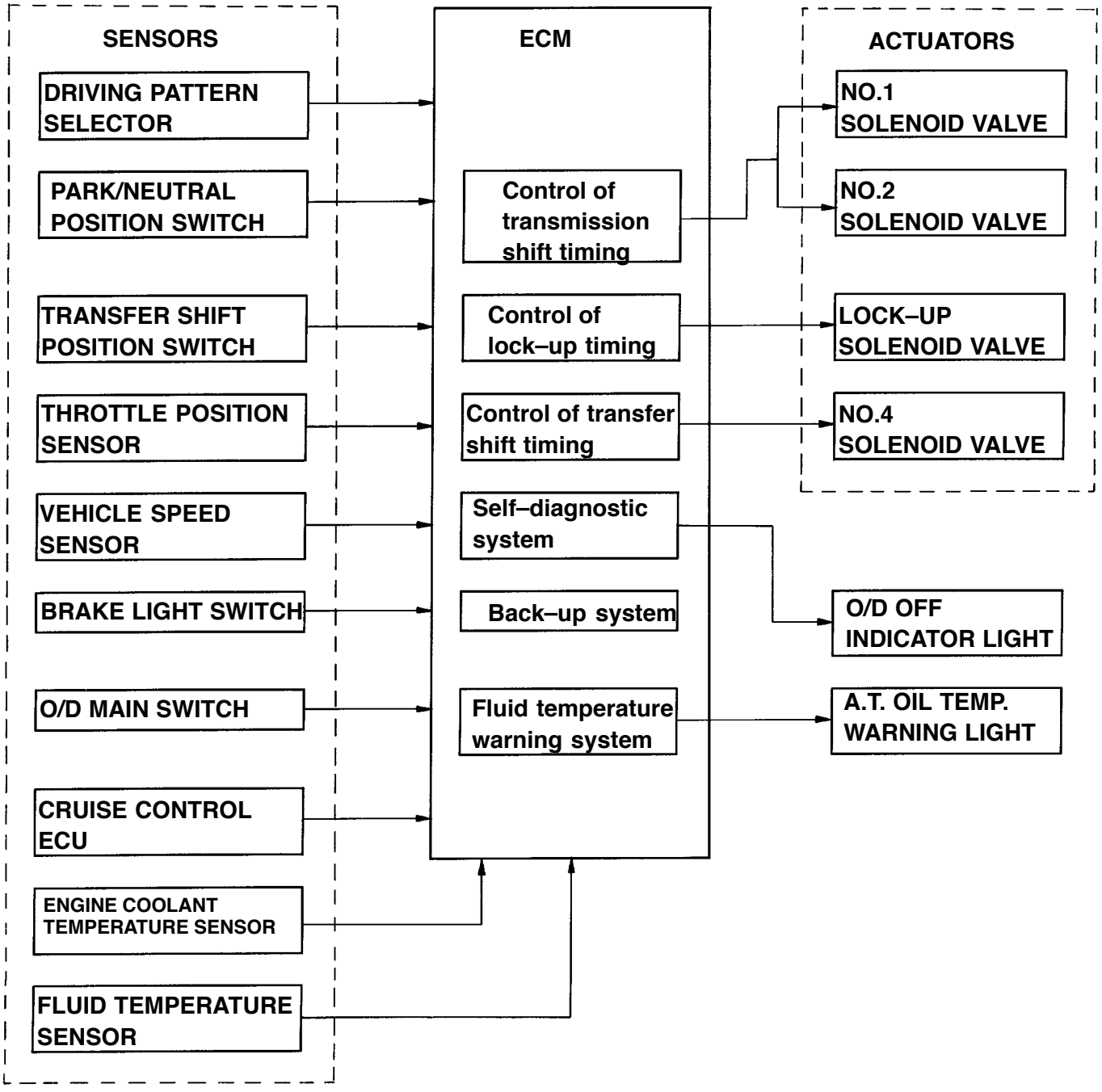
These sensors sense the vehicle speed, throttle opening and other conditions and send these data to the ECM in the form of electrical signals.

2. ECM

The ECM determines the transmission and transfer shift timing and lock–up timing based upon the signals from sensors, and controls the solenoid valves of the hydraulic control unit accordingly.

3. Actuators

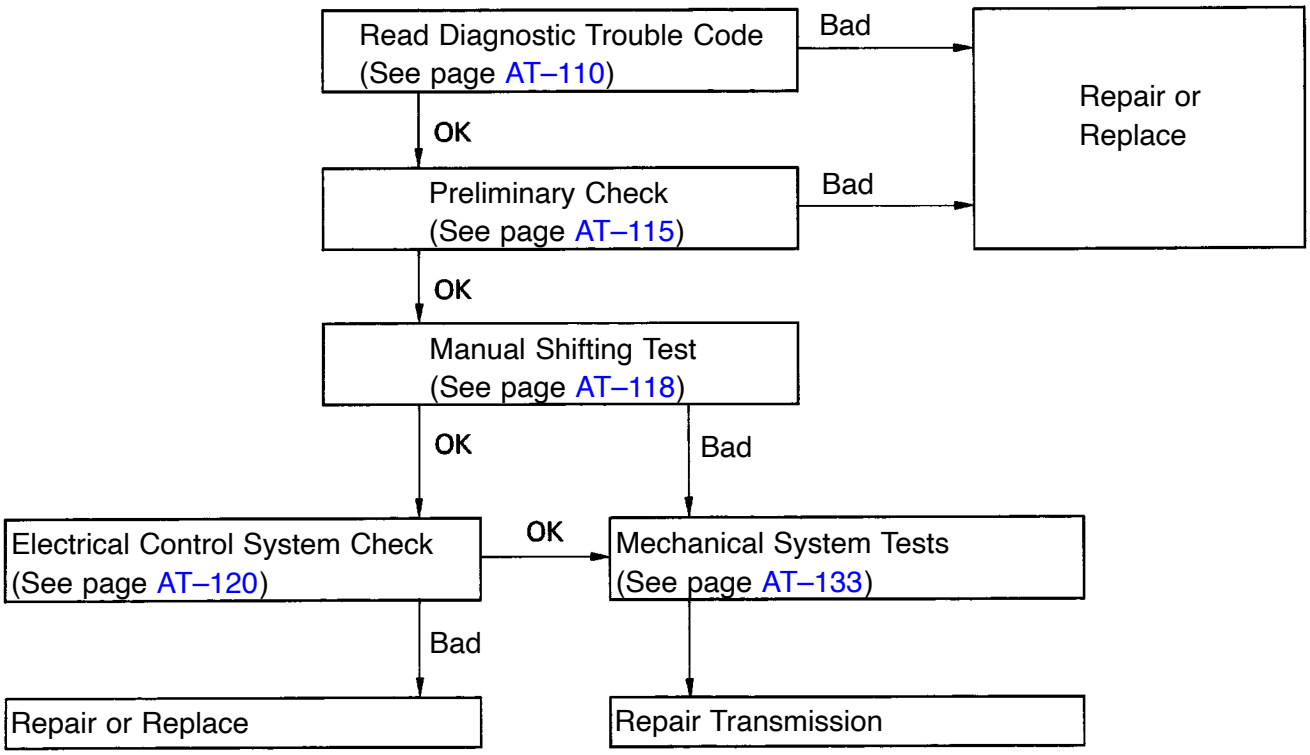
These are four solenoid valves that control hydraulic pressure acting on the hydraulic valves to control shifting and lock–up timing.



TROUBLESHOOTING

Basic Troubleshooting

Before troubleshooting an electronic controlled transmission first determine whether the problem is electri–cal or mechanical. To do this, just refer to the basic troubleshooting flow–chart provide below.
If the cause is already known, using the basic troubleshooting chart below along with the general trouble–shooting chart on the following pages should speed the procedure.



General Troubleshooting

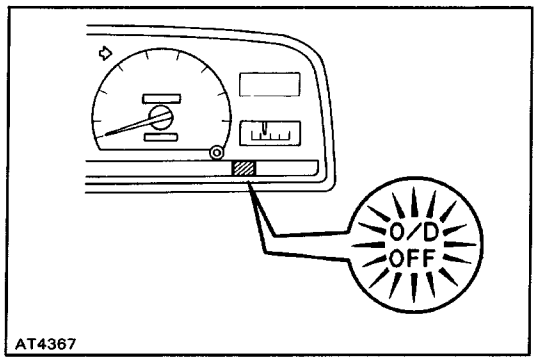
Problem	Possible cause	Remedy	Page
Fluid discolored or smells burnt	Fluid contaminated Torque converter clutch faulty Transmission faulty	Replace fluid Replace torque converter clutch Disassemble and inspect transmission	AT–115 AT–162 ★
Vehicle does not move in any forward position or reverse	Manual linkage out of adjustment Valve body or primary regulator faulty Parking lock pawl faulty Torque converter clutch faulty Converter drive plate broken Oil pump intake screen blocked Transmission faulty	Adjust linkage Inspect valve body Inspect parking lock pawl Replace torque converter clutch Replace drive plate Clean screen Disassemble and inspect transmission	AT–116 ★ AT–158 AT–162 AT–162 ★ ★
Shift lever position incorrect	Manual linkage out of adjustment Manual valve and lever faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–116 ★ ★
Harsh engagement into any drive position	Throttle cable out of adjustment Valve body or primary regulator faulty Accumulator pistons faulty Transmission faulty	Adjust throttle cable Inspect valve body Inspect accumulator pistons Disassemble and inspect transmission	AT–116 ★ ★ ★
Delayed 1–2, 2–3 or 3–0/1) up–shift, or down–shifts from O/D–3 or 3–2 and shifts back to O/D or 3	Electronic control faulty Valve body faulty Solenoid valve faulty	Inspect electronic control Inspect valve body Inspect solenoid valve	AT–120 ★ ★
Slips on 1–2, 2–3 or 3–0/D up–shift, or slips or shudders on acceleration	Manual linkage out of adjustment Throttle cable out of adjustment Valve body faulty Solenoid valve faulty Transmission faulty	Adjust linkage Adjust throttle cable Inspect valve body Inspect solenoid valve Disassemble and inspect transmission	AT–116 AT–116 ★ ★ ★
Drag, binding or tie–up on 1–2, 2–3 or 3–OID up–shift	Manual linkage out of adjustment Valve body faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–116 ★ ★

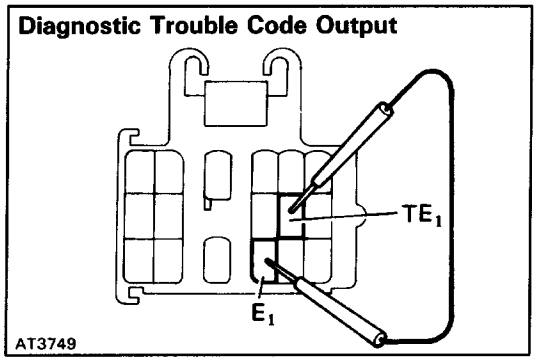
Remark *: Refer to A340H Automatic Transmission Repair Manual. (Pub. No. RM271U)

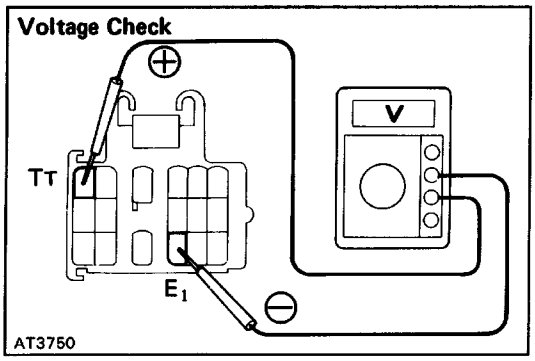
General Troubleshooting (Cont'd)

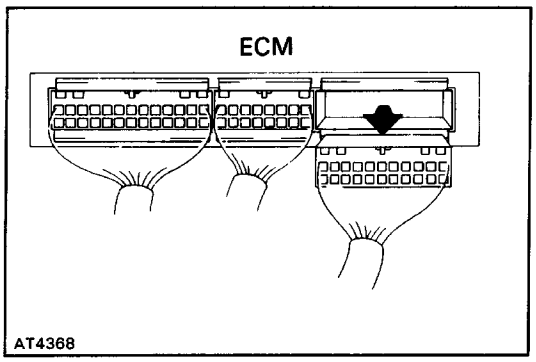
Problem	Possible cause	Remedy	Page
No lock–up in 2nd, 3rd or O/D	Electronic control faulty Valve body faulty Solenoid valve faulty Transmission faulty	Inspect electronic control Inspect valve body Inspect solenoid valve Disassemble and inspect transmission	AT–120 ★ ★ ★
Harsh down–shift	Throttle cable out of adjustment Throttle cable and cam faulty Accumulator pistons faulty Valve body faulty Transmission faulty	Adjust throttle cable Inspect throttle cable and cam Inspect accumulator pistons Inspect valve body Disassemble and inspect transmission	AT–116 AT–116 ★ ★ ★
No down–shift when coasting	Valve body faulty Solenoid valve faulty Electronic control faulty	Inspect valve body Inspect solenoid valve Inspect electronic control	★ ★ AT–120
Down–shift occurs too quickly or too late while coasting	Throttle cable faulty Valve body faulty Transmission faulty Solenoid valve faulty Electronic control faulty	Inspect throttle cable Inspect valve body Disassemble and inspect transmission Inspect solenoid valve Inspect electronic control	AT–116 ★ ★ ★ AT–120
No O/D–3, 3–2 or 2–1 kick–down	Solenoid valve faulty Electronic control faulty Valve body faulty	Inspect solenoid valve Inspect electronic control Inspect valve body	★ AT–120 ★
No engine braking in 2 or L position	Solenoid valve faulty Electronic control faulty Valve body faulty Transmission faulty	Inspect solenoid valve Inspect electronic control Inspect valve body Disassemble and inspect transmission	★ AT–120 ★ ★
Vehicle does not hold in P	Manual linkage out of adjustment Parking lock pawl cam and spring faulty	Adjust linkage Inspect cam and spring	AT–116 AT–158
No H2–H4, H4–L4, L4–H4 or H4–H2 change gear position of transfer	Transfer linkage out of adjustment Electronic control faulty Transfer valve body faulty Transfer faulty	Adjust linkage Inspect electronic control Inspect valve body Disassemble and inspect transfer	AT–116 AT–120 ★ ★

Remark *: Refer to A340H Automatic Transmission Repair Manual. (Pub. No. RM271 U)









Diagnosis System

DESCRIPTION

1. A self–diagnosis function is built into the electrical control system. Warning is indicated by the overdrive OFF indicator light.

   HINT: Warning and diagnostic trouble codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light is lit continuously and will not blink.

   (a) If a malfunction occurs within the vehicle speed sensors (No. 1 or 2) or solenoids (No. 1, 2, or 4), the overdrive OFF light will blink to warn the driver. However, there will be no warning of a malfunction with lock–up solenoid.

   (b) The diagnostic trouble code can be read by the number of blinks of the overdrive OFF indicator light when terminals TE, and EI are connected.
   (See page AT–111)

   (c) The throttle position sensor or brake signal are not indicated, but inspection can be made by checking the voltage at terminal TT of the data link connector 1.

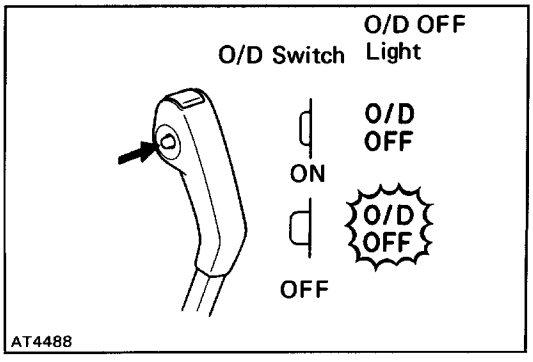
   (d) The signals to each gear can be checked by measuring the voltage at terminal TT while driving.

2. The diagnostic trouble code is retained memory by the ECM and due to back–up voltage, is not canceled out when the engine is turned off. Consequently, after repair, it is necessary to turn the ignition switch off and remove the MFI fuse (1 5A) or disconnect the ECM connector to cancel out the diagnostic trouble code.
   (See page AT–119)

   HINT:

   Low battery positive voltage will cause faulty operation of the diagnosis system. Therefore, always check the battery first.

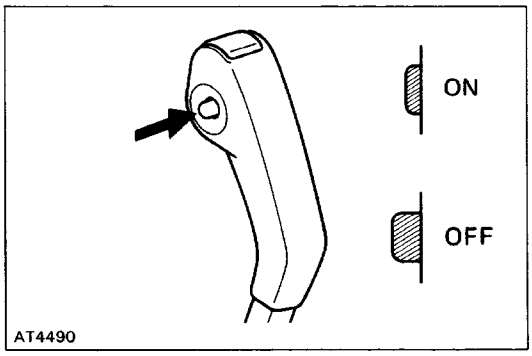
   Use a voltmeter and ohmmeter that have an impedance of at least 10 kΩ/v.



CHECK "O/D OFF" INDICATOR LIGHT

1. Turn the ignition switch ON.
2. The "O/D OFF" light will come on when the O/D switch is placed at OFF.
3. When the O/D switch is set to ON, the–O/D OFF" light should go out.

If the "'O/D OFF" light flashes when the O/D switch is set to ON, the electronic control system is faulty.

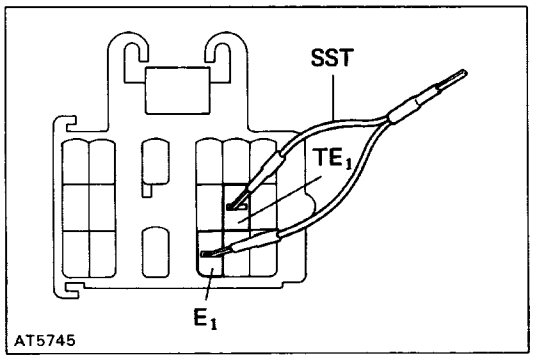


READ DIAGNOSTIC TROUBLE CODE

1. TURN IGNITION SWITCH AND O/D SWITCH TO ON

Do not strat the engine.

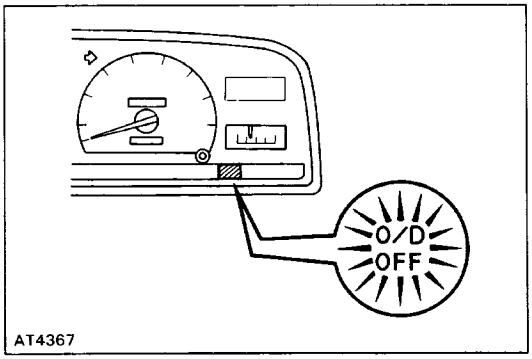
HINT: Warning and diagnostic trouble codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light will light continuously and will not blink.



2. CONNECT TE, AND E, TERMINALS OF DATA LINK CONNECTOR 1

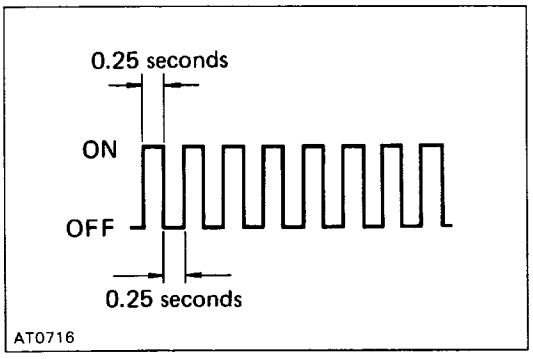
Using SST, connect terminals TE, and.El.

SST 09843–18020



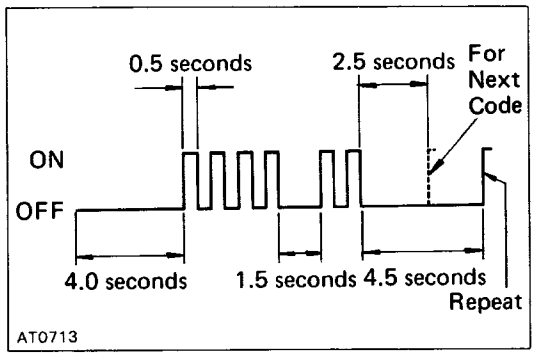
3. READ DIAGNOSTIC TROUBLE CODE

Read the diagnostic trouble code as indicated by the number of times the O/D OFF light flashes.



(Diagnostic Trouble Code Indication)

- If the system is operating normally, the light will flash 2 times per second.



- In the event of a malfunction, the light will flash 1 time per second. The number of blinks will equal the first number and, after 1.5 seconds pause, the second number of the two digit diagnostic trouble code. If there are two or more codes, there will be a 2.5 seconds pause between each.

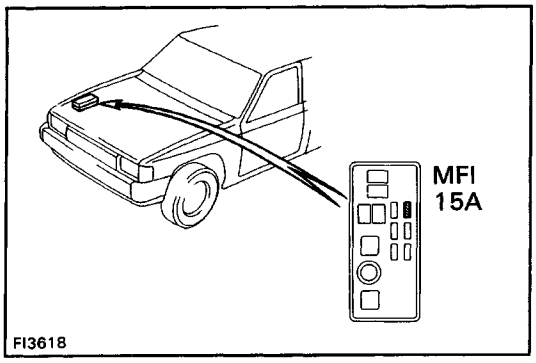
HINT: In the event of several trouble codes occuring si–multaneously, indication will begin from the smaller value and continue to the larger.

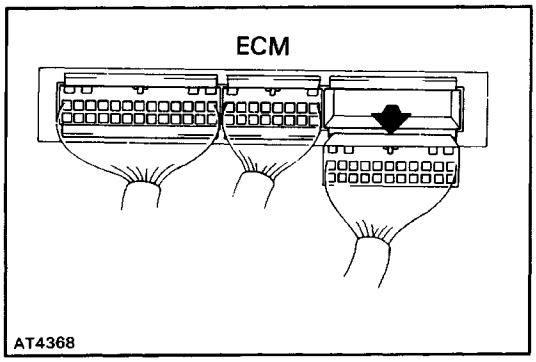
4. REMOVE SST

DIAGNOSTIC TROUBLE CODES

Code No.	Light Pattern	Diagnosis System
–		Normal
42		Defective No. 1 vehicle speed sensor (in ATM)– severed wire harness or short circuit
61		Defective No.2 vehicle speed sensor (in ATM)– severed wire harness or short circuit
62		Severed No. 1 solenoid or short circuit– severed wire harness or short circuit
63		Severed No.2 solenoid or short circuit– severed wire harness or short circuit
64		Severed lock–up solenoid or short circuit– severed wire harness or short circuit
65		Severed No.4 solenoid or short circuit– severed wire harness or short circuit

HINT: If codes 62, 63, 64 or 65 appear, there is an electrical malfunction in the solenoid.
Causes due to mechanical failure, such as a stuck valve, will not appear.





CANCEL OUT DIAGNOSTIC TROUBLE CODE

1. After repair of the trouble area, the diagnostic trouble code retained in memory by the ECM must be canceled by removing the MFI fuse (1 5A) for 10 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch OFF.

HINT:

- Cancellation can be also done by removing the battery negative (–) terminal, but in this case other memory systems will be also canceled out.
- The diagnostic trouble code can be also canceled out by disconnecting the ECM connector.
- If the diagnostic trouble code is not canceled out, it will be retained by the ECM and appear along with a new code in event of future trouble.

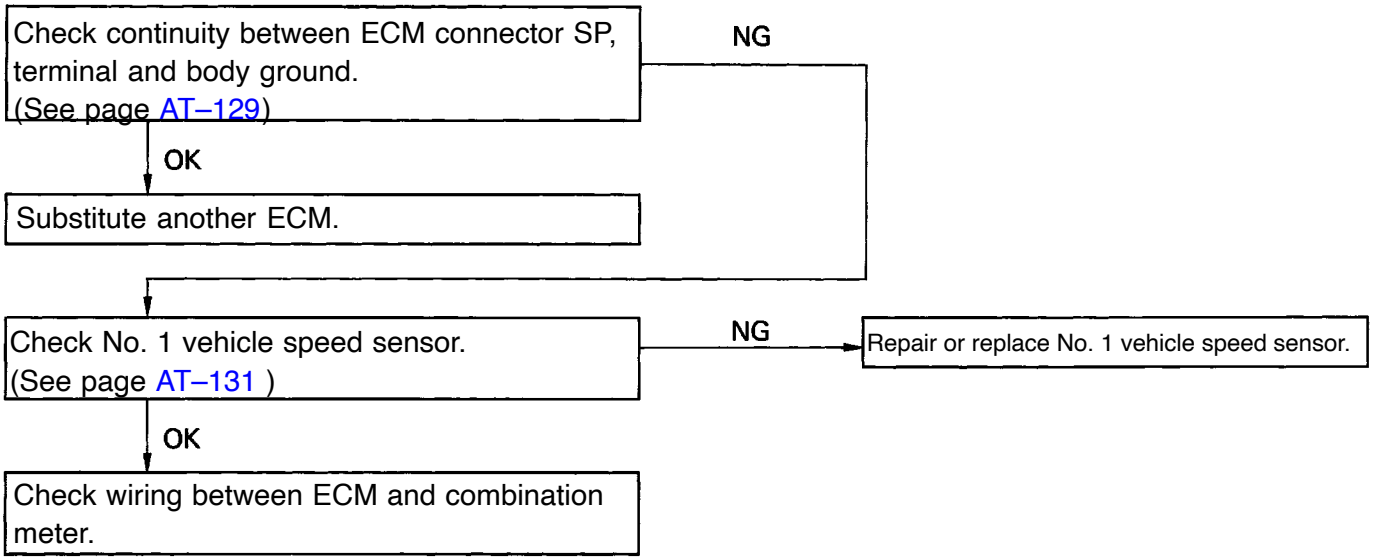
2. After cancellation, perform a road test to confirm that a ”normal code” is now read on the O/D OFF light.

TROUBLESHOOTING FLOW–CHART

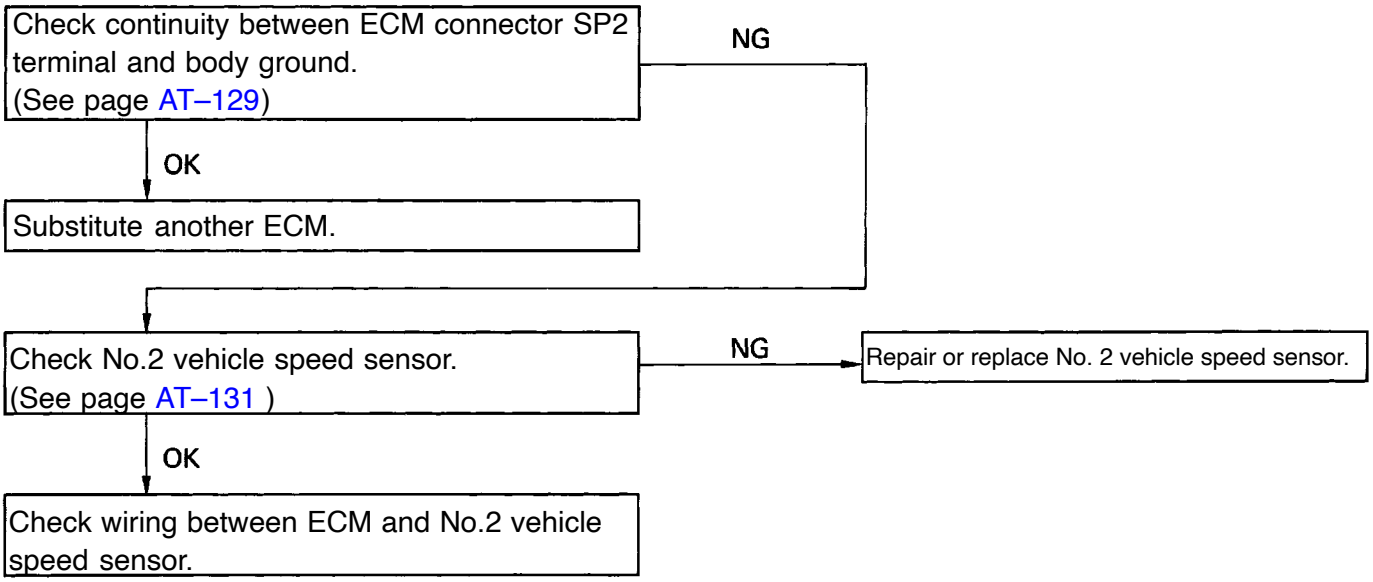
HINT:

- If diagnostic trouble code Nos. 42, 61, 62, 63 or 65 are output, the overdrive OFF indicator light will begin to blink immediately to warn the driver. However, an impact or shock may cause the blinking to stop; but the code will still be retained in the ECM memory unit canceled out.
- There is no warning for diagnostic trouble code No. 64.
- In the event of a simultaneous malfunction of both No. 1 and No. 2 vehicle speed sensors, no diagnostic trouble code will appear and the fail–safe system will not function. However, when driving in the D position, the transmission will not up–shift from first gear, regardless of the vehicle speed.

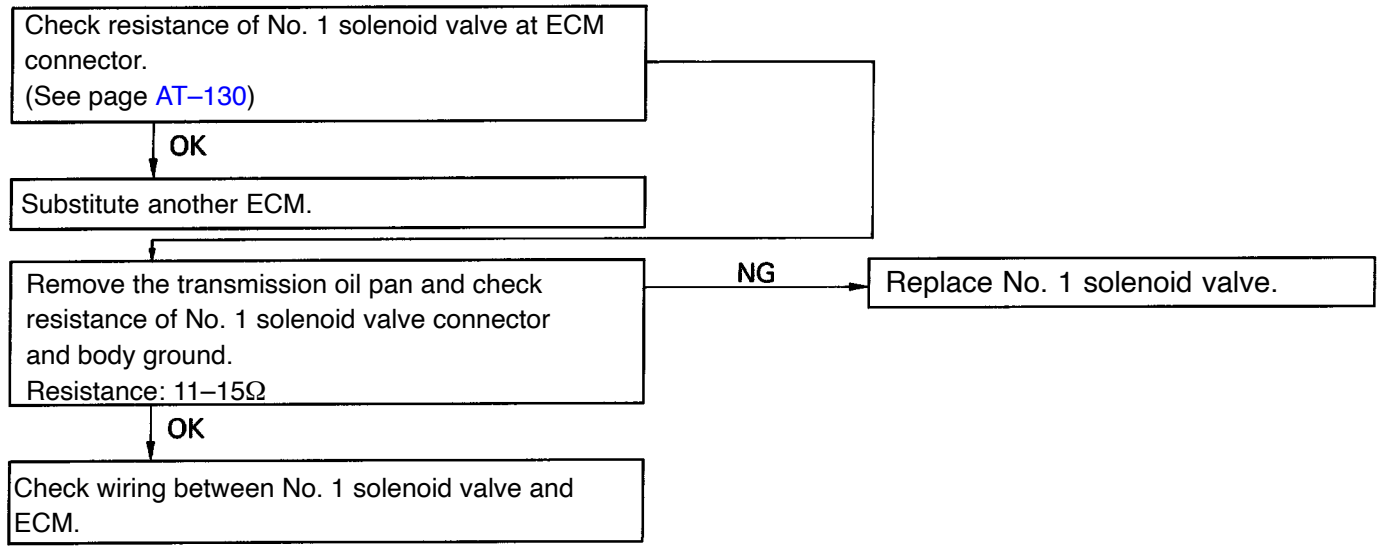
Diagnostic trouble code 42 (No. 1 vehicle speed sensor circuitry)



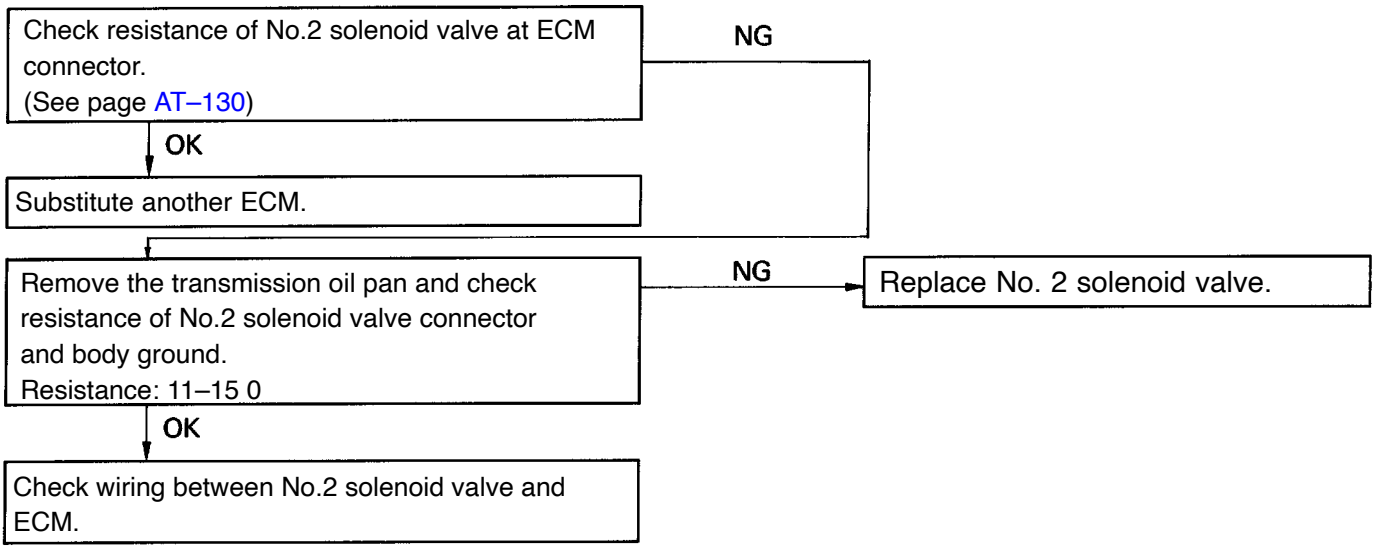
Diagnostic trouble code 61 (No.2 vehicle speed sensor circuitry)



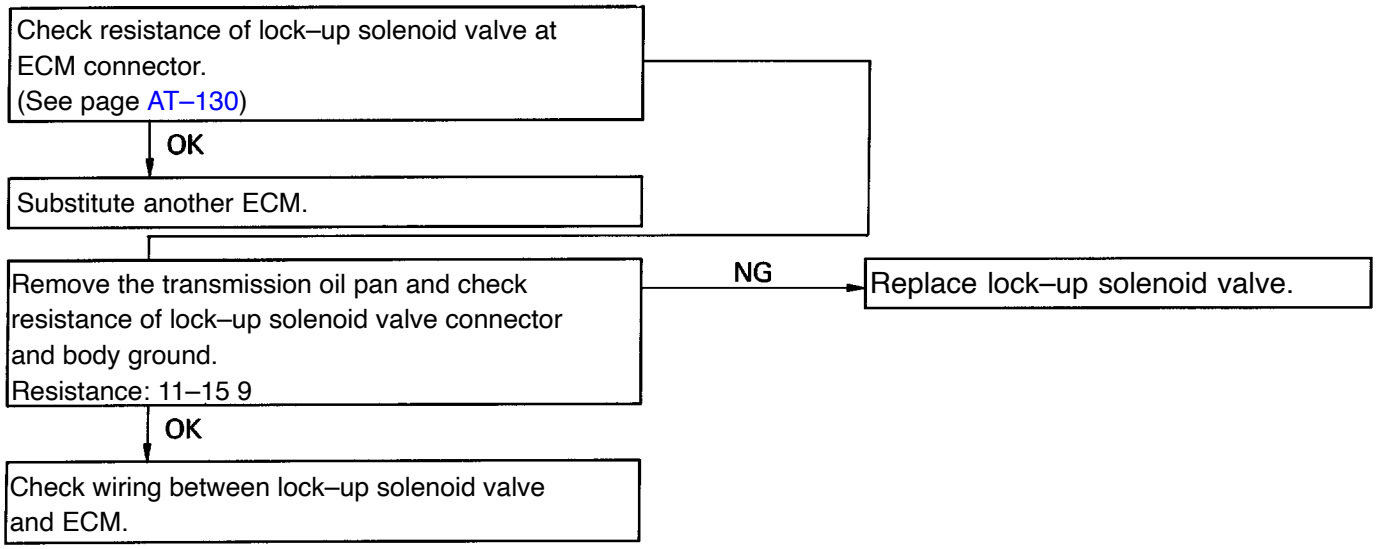
Diagnostic trouble code 62 (No. 1 solenoid valve circuitry)



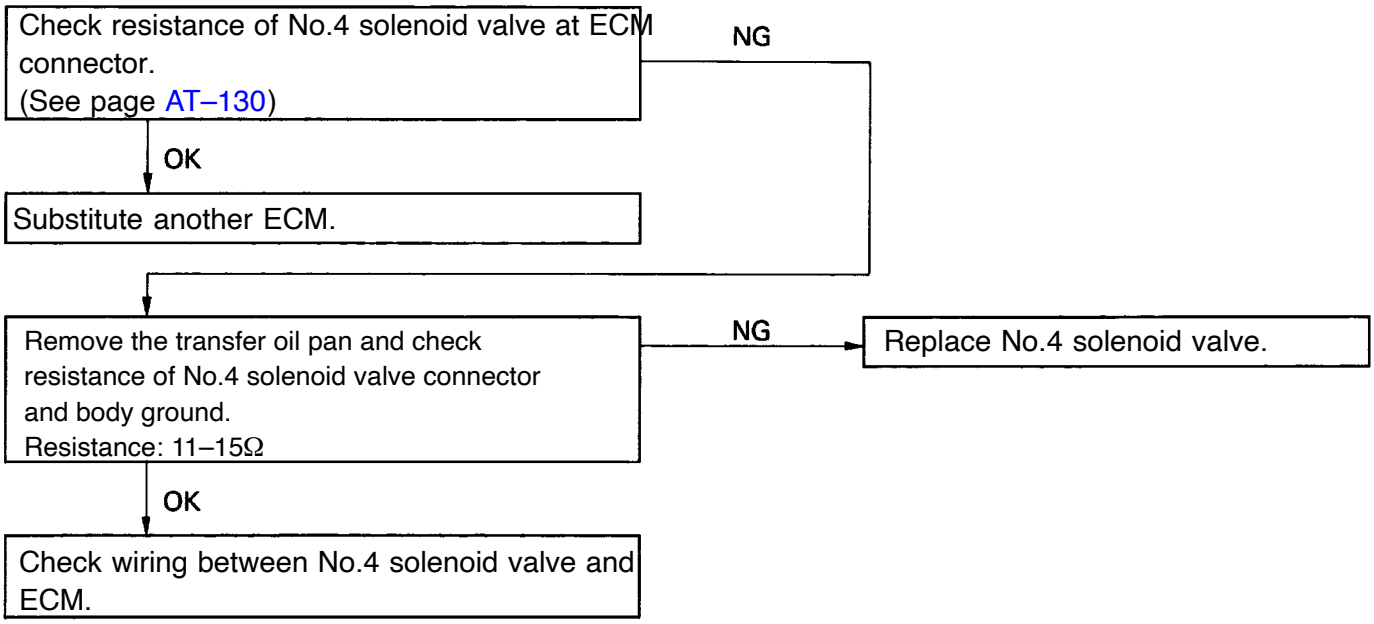
Diagnostic trouble code 63 (No.2 solenoid valve circuitry)



Diagnostic trouble code 64 (Lock–up solenoid valve circuitry)



Diagnostic trouble code 65 (No.4 solenoid valve circuitry)



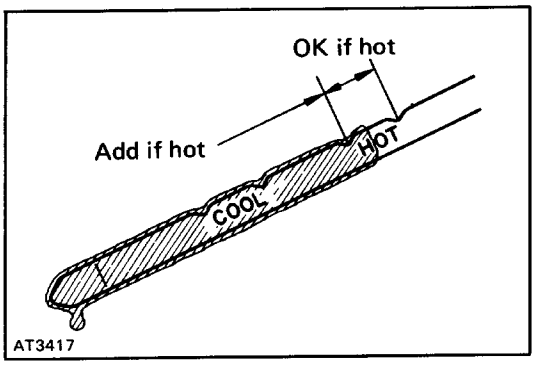
Preliminary Check

1. CHECK FLUID LEVEL

(Transmission and transfer case)

HINT:

- The vehicle must have been driven so that the engine and transmission are at normal operating temperature. (Fluid temperature: 70–80°C or 158–176°F)
- Only use the COOL range on the dipstick as a rough re–ferance when the fluid is replaced or the engine does not run.



(a) Park the vehicle on a level surface, set the parking brake.

(b) With the engine idling, shift the shift lever into all positions from P to L position and return to P posi–tion.

(c) Pull out the transmission dipstick and wipe it clean.

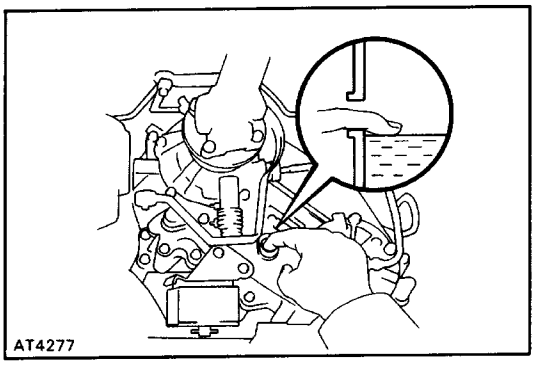
(d) Push it back fully into the tube.

(e) Pull it out and check that the fluid level is in the HOT range.

If the level is at the low side, add fluid.

Fluid type: ATF DEXRON® II

NOTICE: Do not overfill.

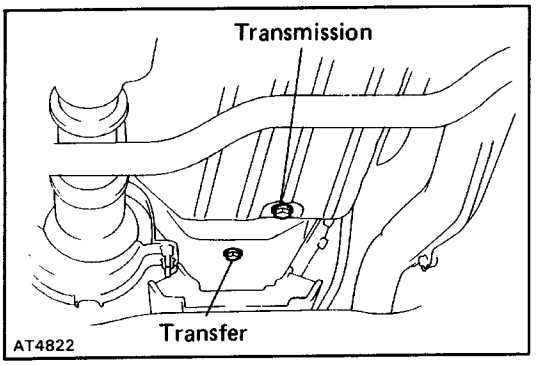


(Transfer chain case)

Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 10 mm (0.39 in.) of the bottom edge of the hole.

If the level is low, add fluid until it begins to run out of the filler hole.

Fluid type: ATF DEXRON® II



2. CHECK FLUID CONDITION

If the fluid smells burnt or is black, replace it as following procedures.

(Transmission and transfer case)

(a) Remove the drain plugs and drain the fluid.

(b) Reinstall the drain plugs securely.

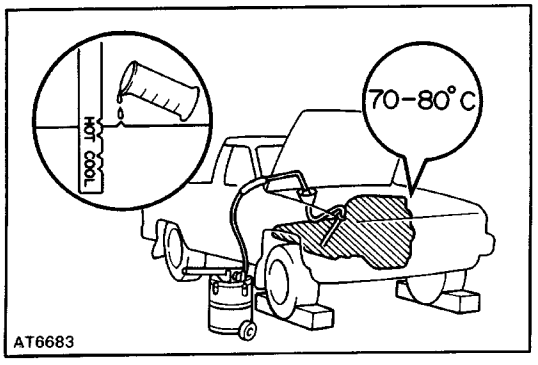
(c) With the engine OFF, add new fluid through the oil filler tube.

Fluid type: ATF DEXRON® II

Capacity: liter (US qts, Imp. qts)

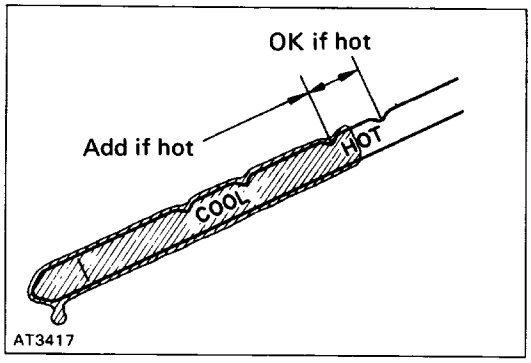
	Transmission	Transfer
Drain and refill	4.5 (4.8, 4.0)	
	*3.8 (4.0, 3.	*1.2 (1.3, 1.1)
Total	10.3 (10.9, 9.1)	

*: Reference capacity when replacing transmission or transfer valve body.



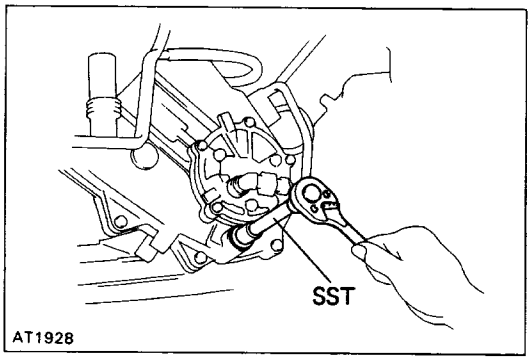
(d) Start the engine and shift the shift lever into all po–sitions from P to L position and then shift into P po–sition.

(e) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.



(f) Check the fluid level with the normal operating temperature (70–80˚C or 158–176˚F) and add as necessary.

NOTICE: Do not overfill.

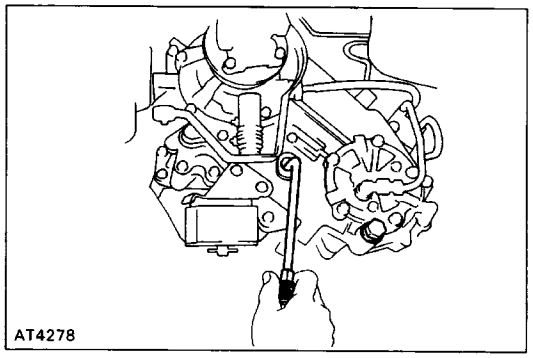


(Transfer chain case)

(a) Remove the transfer under cover.
(b) Remove the drain plug with SST and drain the fluid.
SST 09043–38 100
(c) Reinstall the drain plug securely with SST.
(d) With the engine OFF, add new fluid through the filler hole.

Fluid type: ATF DEXRON® II
Capacity:
Total 1.1 liters (1.2 US qts, 1.0 Imp. qts)
Drain and refill 0.8 liters (0.8 US qts, 0.7 Imp. qts)

(e) Check the fluid level.
(f) Install the transfer under cover.



3. INSPECT THROTTLE CABLE

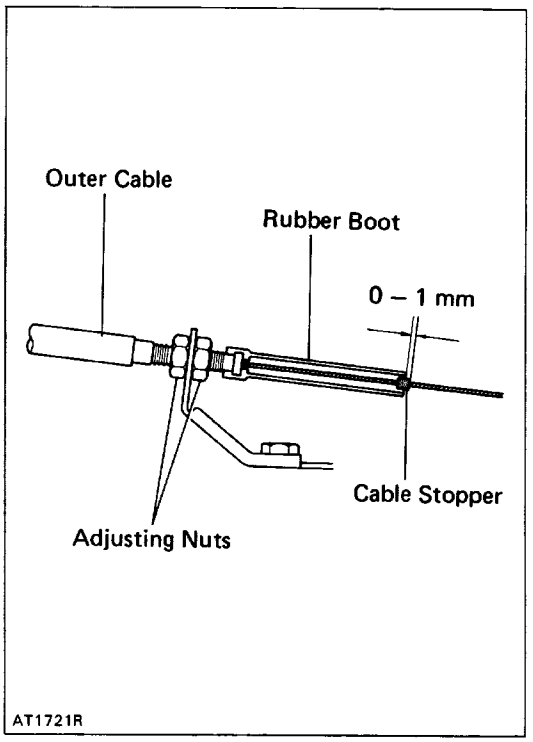
(a) Depress the accelerator pedal all the way and check that the throttle valve opens fully.

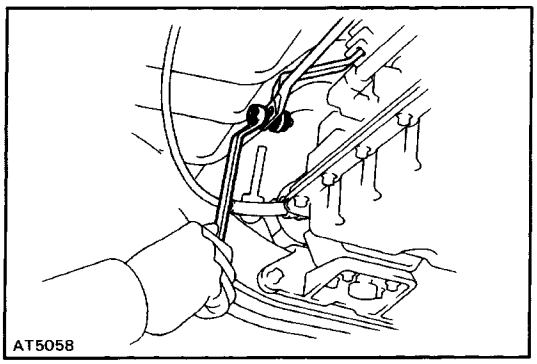
HINT: If the valve does not open fully, adjust the accelerator cable.

(b) Fully depress the accelerator pedal.
(c) Measure the distance between the end of the boot and stopper on the cable.

Standard distance: 0–1 mm (0–0.04 in.)

If the distance is not standard, adjust the cable by the adjusting nuts.



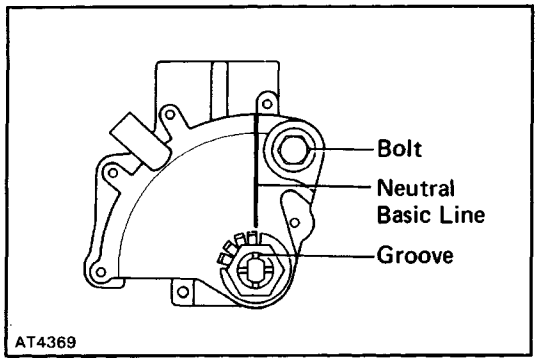


4. INSPECT TRANSMISSION SHIFT LEVER POSITION

When shifting the shift lever from the IV position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator correctly indicates the position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

(a) Loosen the nut on the transmission control rod.
(b) Push the control shaft lever fully rearward.
(e) Return the control shaft lever two notches to N position.
(d) Set the shift lever to N position.
(e) While holding the shift lever lightly toward the R position side, tighten the nut.
(f) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverse when shifting it to the R position.



5. INSPECT PARK/ NEUTRAL POSITION SWITCH

Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.

If not as stated above, carry out the following adjustment procedures.

(a) Loosen the park/neutral position switch bolt and set the shift lever to the N position.
(b) Align the groove and neutral basic line.
(c) Hold in position and tighten the bolt.

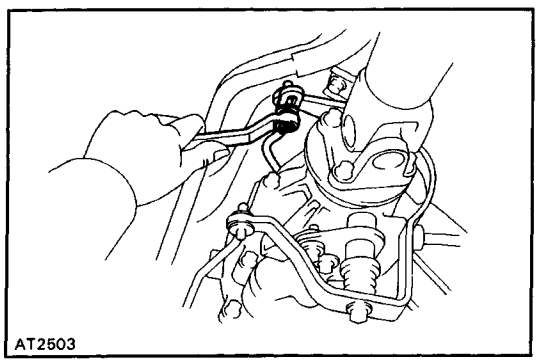
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

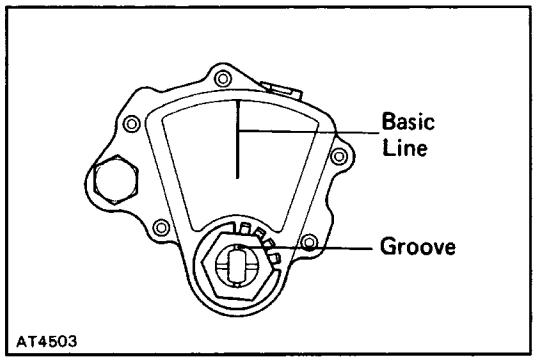
6. INSPECT TRANSFER SHIFT LEVER POSITION

When shifting the shift lever from H2 position to H4 and L4 positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator correctly indicates the position.

If the indicator is not aligned with the correct position, carry out the following adjustment procedures.

(a) Loosen the nut on the cross shaft.
(b) Push the control shaft lever fully forward.
(c) Return the control shaft lever one notch to H4 position.
(d) Set the shift lever H4 position.
(e) While holding the shift lever lightly toward the L4 position side, tighten the nut.





7. INSPECT TRANSFER POSITION SWITCH

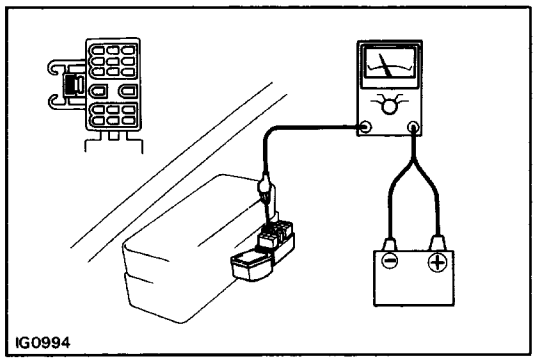
If necessary, carry out the following adjustment procedures.

(a) Loosen the transfer position switch bolt and set the transfer shift lever to the H4 position.

(b) Align the groove and H4 basic line.

(c) Hold in position and tighten the bolt.

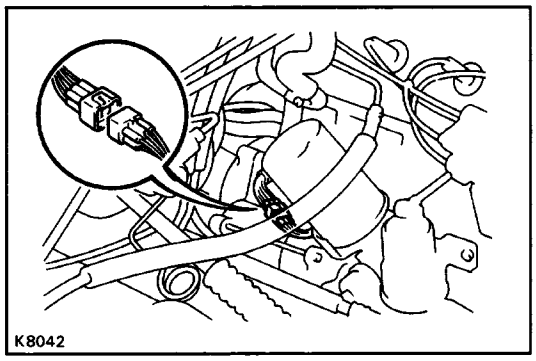
Torque: 13 N. m (130 kgf.cm, 9 ft. lbf)



8. INSPECT IDLE SPEED (N POSITION)

Connect a tachometer test probe to the data link connector 1 terminal IG (3, inspect the idle speed.

Idle speed: 800 RPM



Manual Shifting Test

HINT: With this test, it can be determined whether the trouble lies within the electrical circuit or is a mechanical problem in the transmission.

1. DISCONNECT SOLENOID WIRE

2. INSPECT MANUAL DRIVING OPERATION

Check that the shift and gear positions correspond with the table below.

Transmission						Transfer (Reference)		
Shift position	D position	2 position	L position	R position	P position	H2 position	H4 position	L4 position
Gear position	O/D	3rd	1 st	Reverse	Pawl Lock	High Gear 2W D	High Gear 4WD	High Gear 4WD

HINT: If the L, 2 and D position gear positions are difficult to distinguish, perform the following road test.

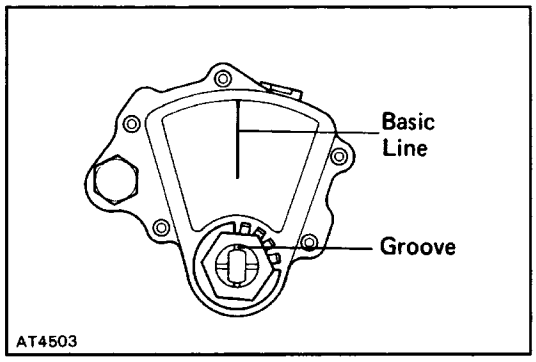
- While driving, shift through the L, 2 and D positions. Check that the gear change corresponds to the shift position.

  If any abnormality is found in the above test, the problem lies in transmission itself.

3. CONNECT SOLENOID WIRE

4. CANCEL OUT DIAGNOSTIC TROUBLE CODE

(See page AT–111)



7. INSPECT TRANSFER POSITION SWITCH

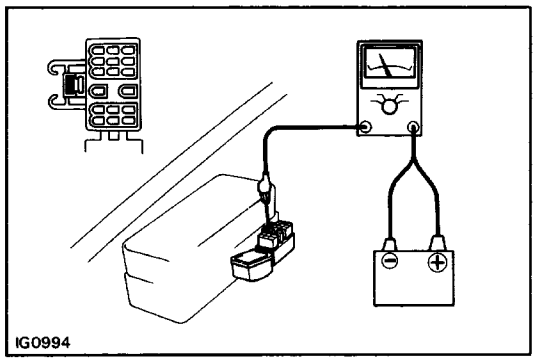
If necessary, carry out the following adjustment procedures.

(a) Loosen the transfer position switch bolt and set the transfer shift lever to the H4 position.

(b) Align the groove and H4 basic line.

(c) Hold in position and tighten the bolt.

Torque: 13 N. m (130 kgf.cm, 9 ft. lbf)



8. INSPECT IDLE SPEED (N POSITION)

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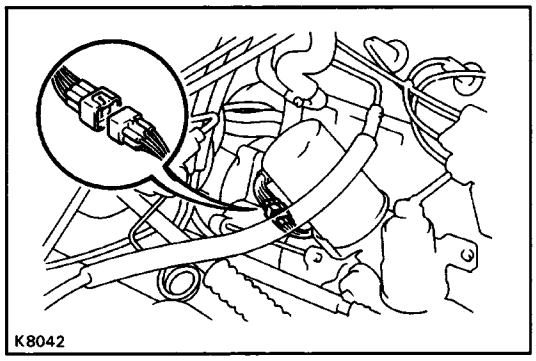


Manual Shifting Test

HINT: With this test, it can be determined whether the trouble lies within the electrical circuit or is a mechanical problem in the transmission.

1. DISCONNECT SOLENOID WIRE

2. INSPECT MANUAL DRIVING OPERATION

Check that the shift and gear positions correspond with the table below.

Transmission						Transfer (Reference)		
Shift position	D position	2 position	L position	R position	P position	H2 position	H4 position	L4 position
Gear position	O/D	3rd	1 st	Reverse	Pawl Lock	High Gear 2W D	High Gear 4WD	High Gear 4WD

HINT: If the L, 2 and D position gear positions are difficult to distinguish, perform the following road test.

- While driving, shift through the L, 2 and D positions. Check that the gear change corresponds to the shift position.

  If any abnormality is found in the above test, the problem lies in transmission itself.

3. CONNECT SOLENOID WIRE

4. CANCEL OUT DIAGNOSTIC TROUBLE CODE

(See page AT–111)

REFERENCE: Possible gear positions in accordance with solenoid operating conditions.

Position	NORMAL			NO. 1 SOLENOID MALFUNCTIONING			NO.2 SOLENOID MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING		
	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position
	No. 1	No. 2		No. 1	No. 2		No. 1	No. 2		No. 1	No.2	
D position	**ON**	OFF	1 st	**X**	**ON**	3rd	**ON**	**X**	**1st**	**X**	**X**	O/D
	ON	**ON**	2nd	**X**	**ON**	3rd	OFF	**X**	O/D	**X**	**X**	O/D
	OFF	**ON**	3rd	**X**	**ON**	3rd	OFF	**X**	O/D	**X**	**X**	O/D
	OFF	OFF	O/D	**X**	OFF	O/D	OFF	**X**	O/D	**X**	**X**	O/D
2 position	**ON**	OFF	1 st	**X**	**ON**	3rd	**ON**	**X**	**1st**	**X**	**X**	3rd
	ON	**ON**	2nd	**X**	**ON**	3rd	OFF	**X**	3rd	**X**	**X**	3rd
	OFF	**ON**	3rd	**X**	**ON**	3rd	OFF	**X**	3rd	**X**	**X**	3rd
L position	**ON**	OFF	**1st**	**X**	OFF	**1st**	**ON**	**X**	1 st	**X**	**X**	**1st**
	ON	**ON**	2nd	**X**	**ON**	2nd	**ON**	**X**	1 st	**X**	**X**	**1st**

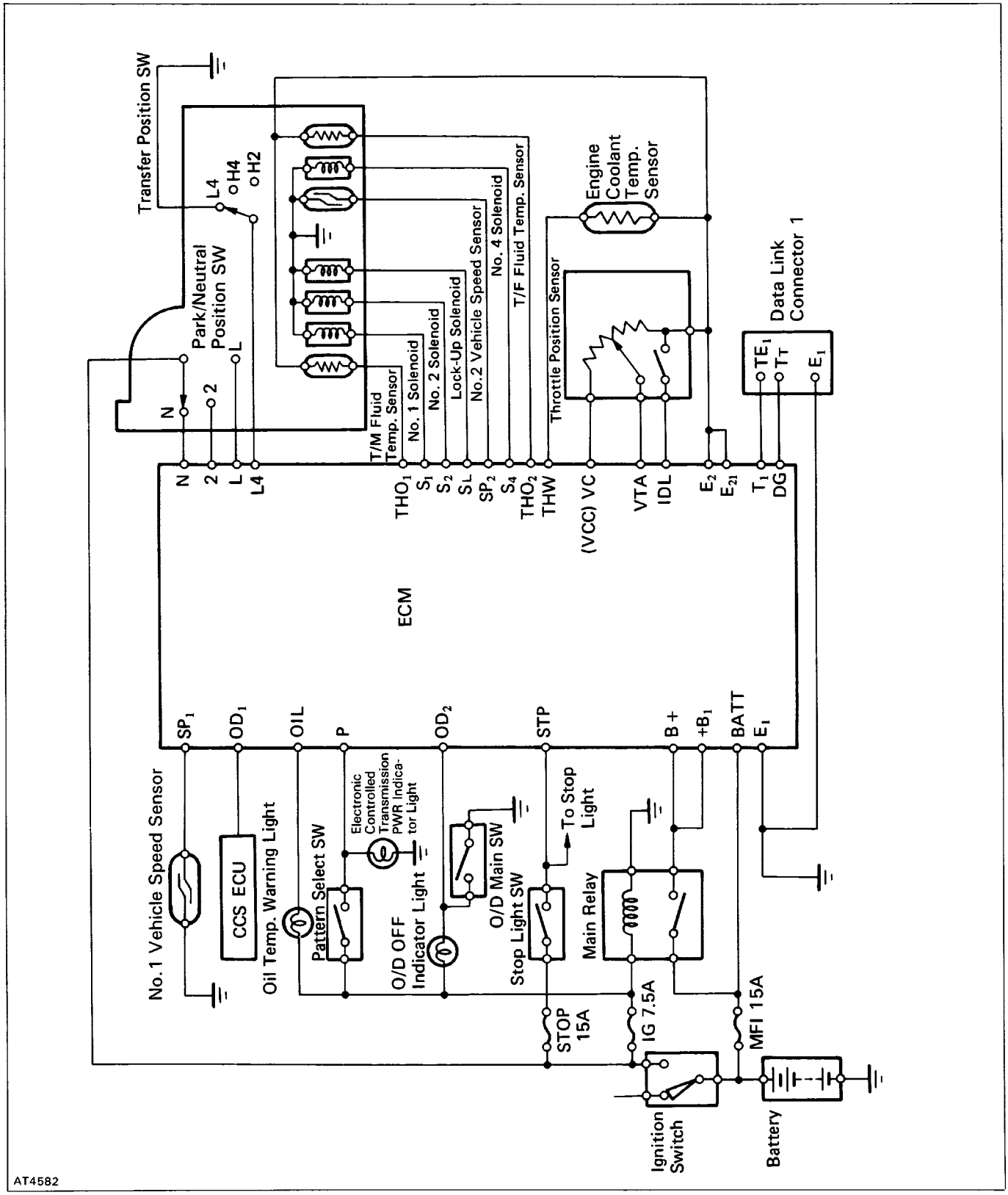
X: Malfunctions

Electronic Control System

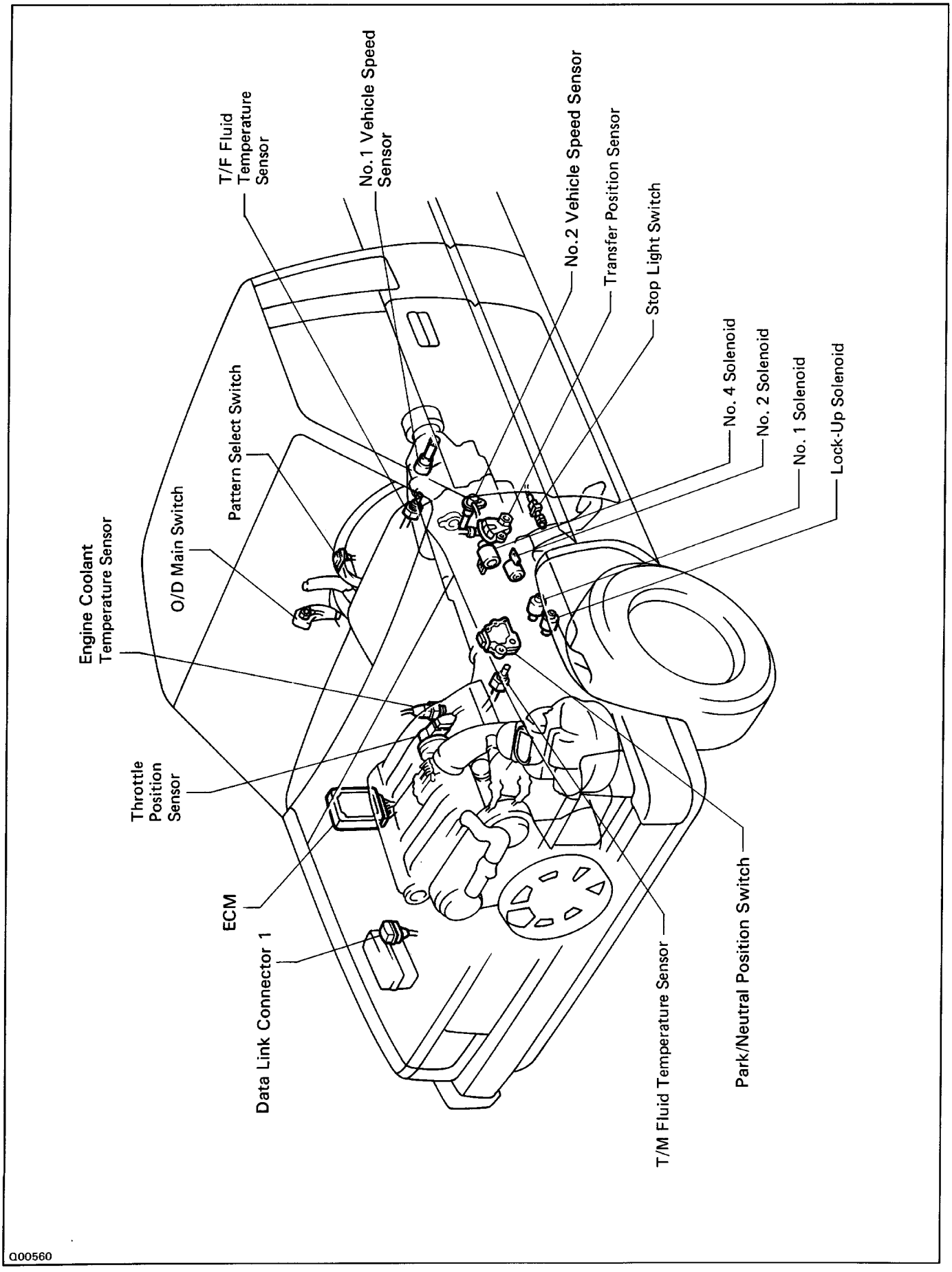
PRECAUTION

Do not open the cover or the case of the ECM and various computer unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)

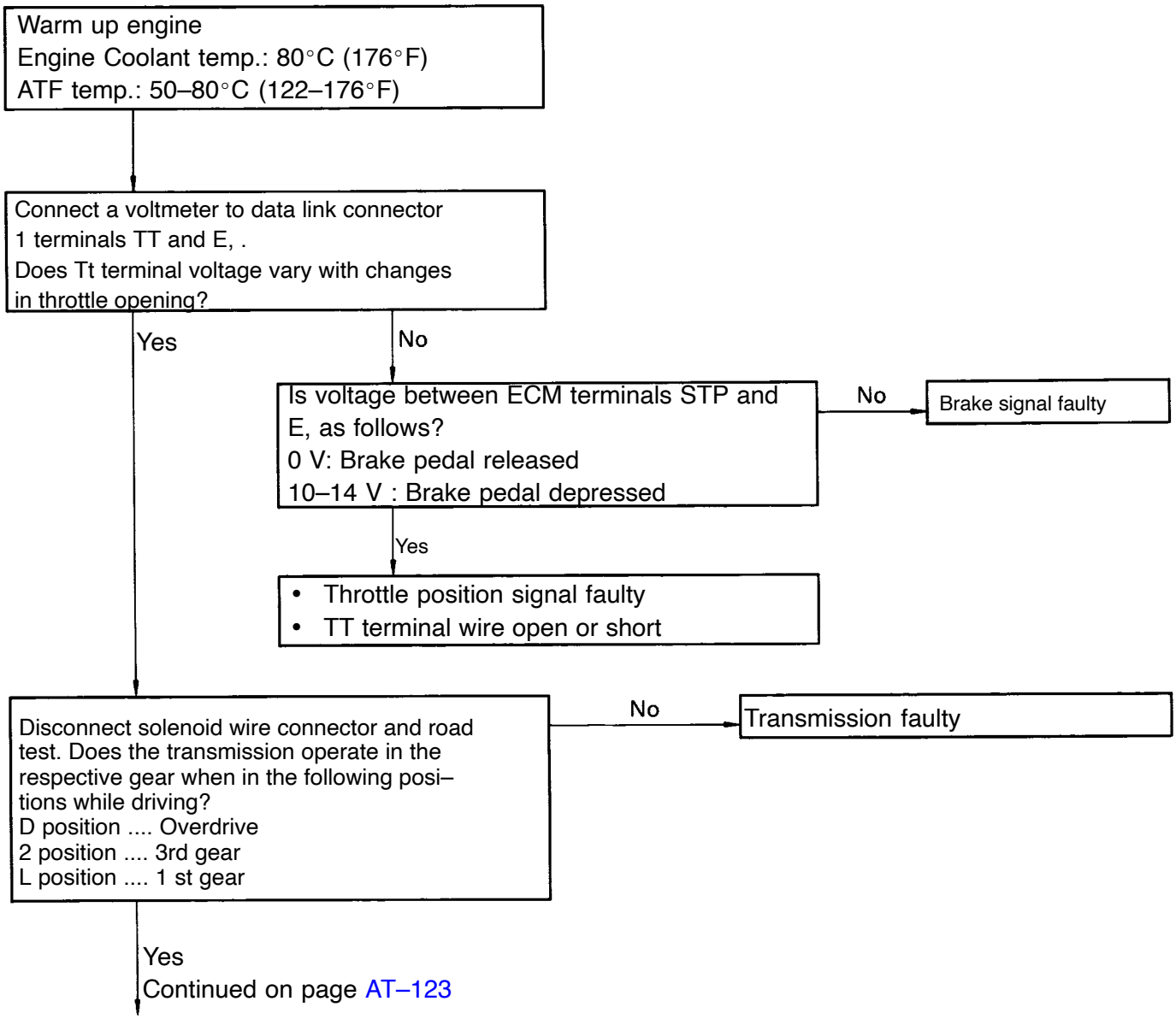
ELECTRONIC CONTROL CIRCUIT

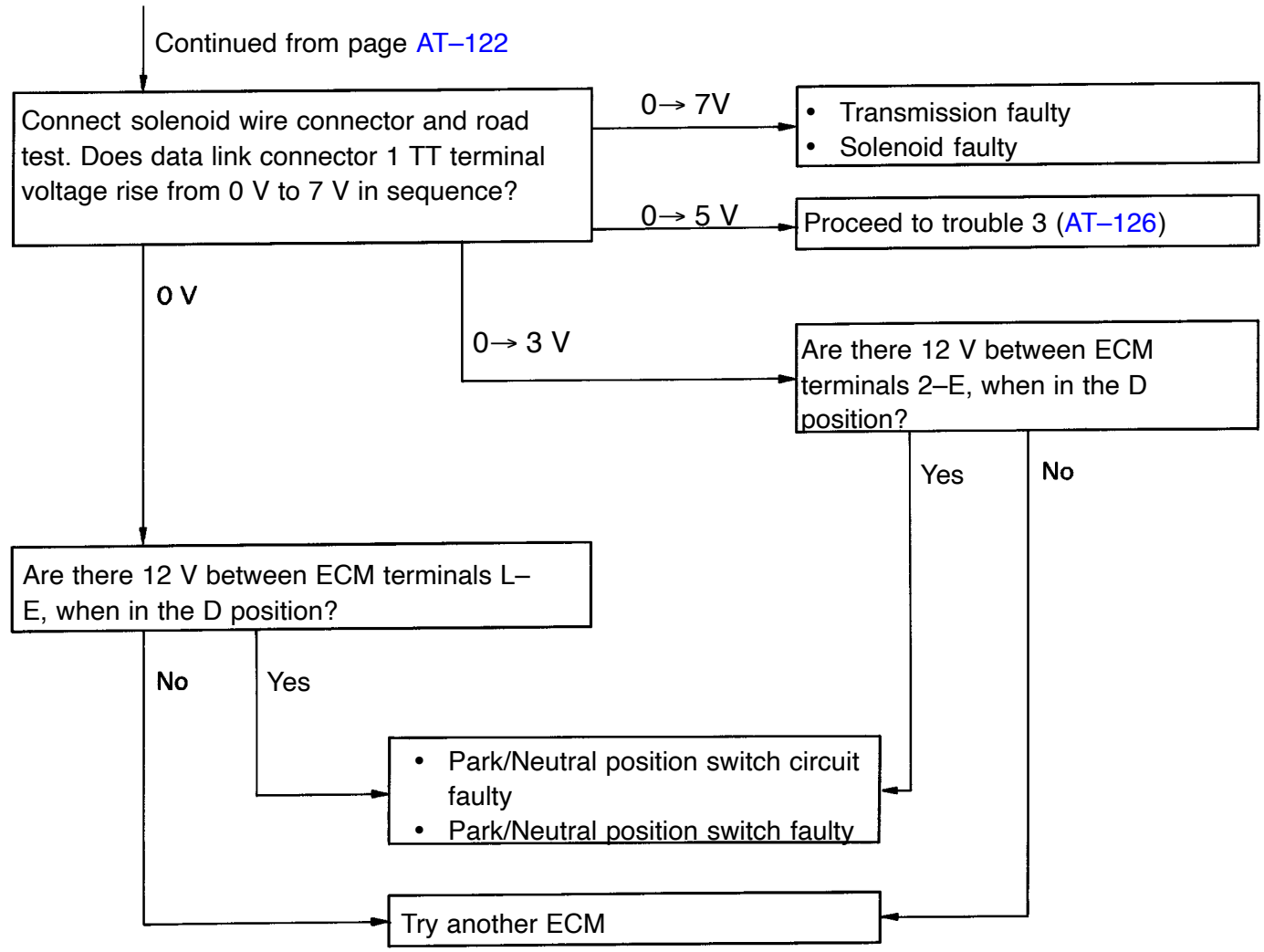


ELECTRONIC CONTROL COMPONENTS

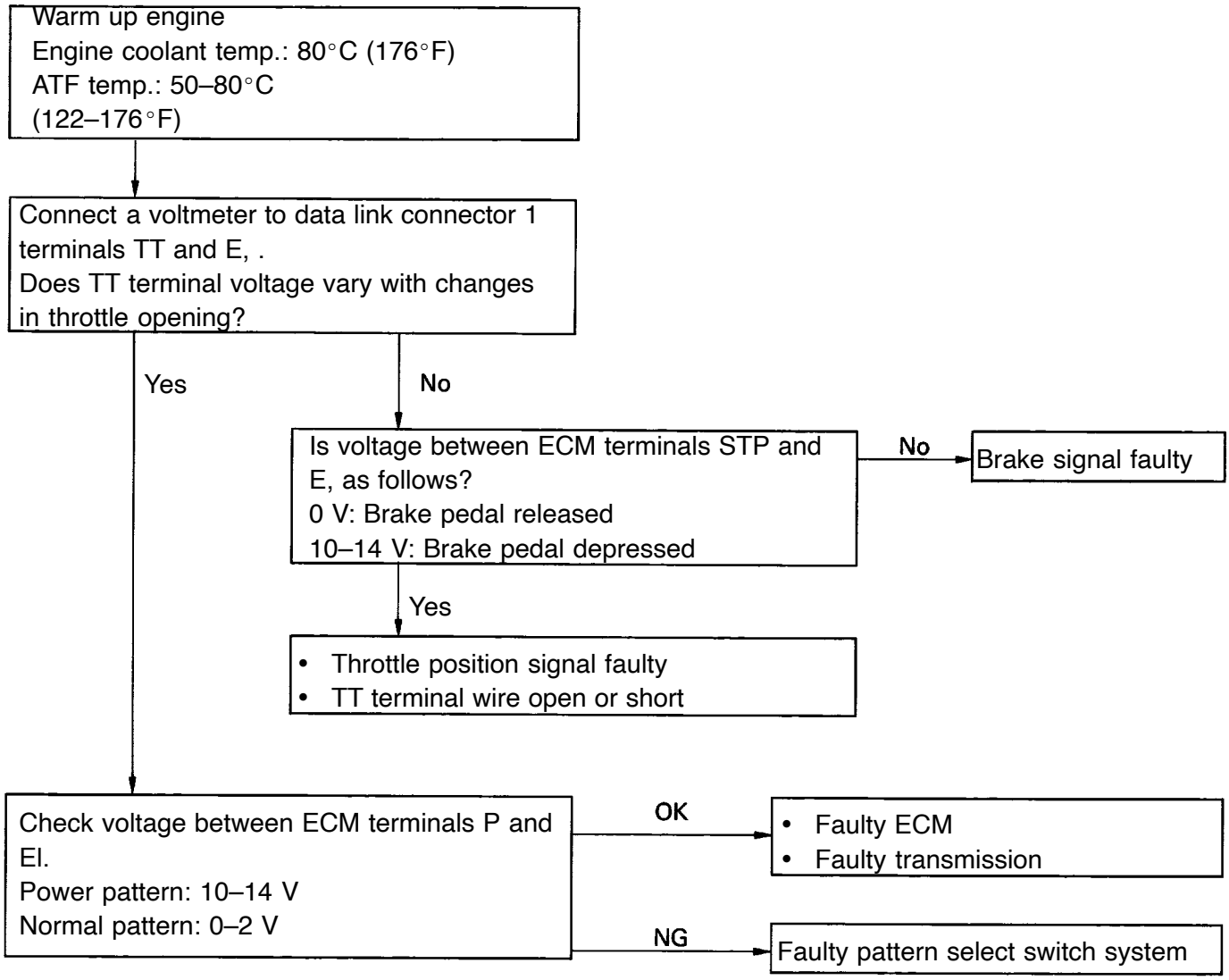


TROUBLESHOOTING FLOW–CHART
Trouble No. 1 No Shifting

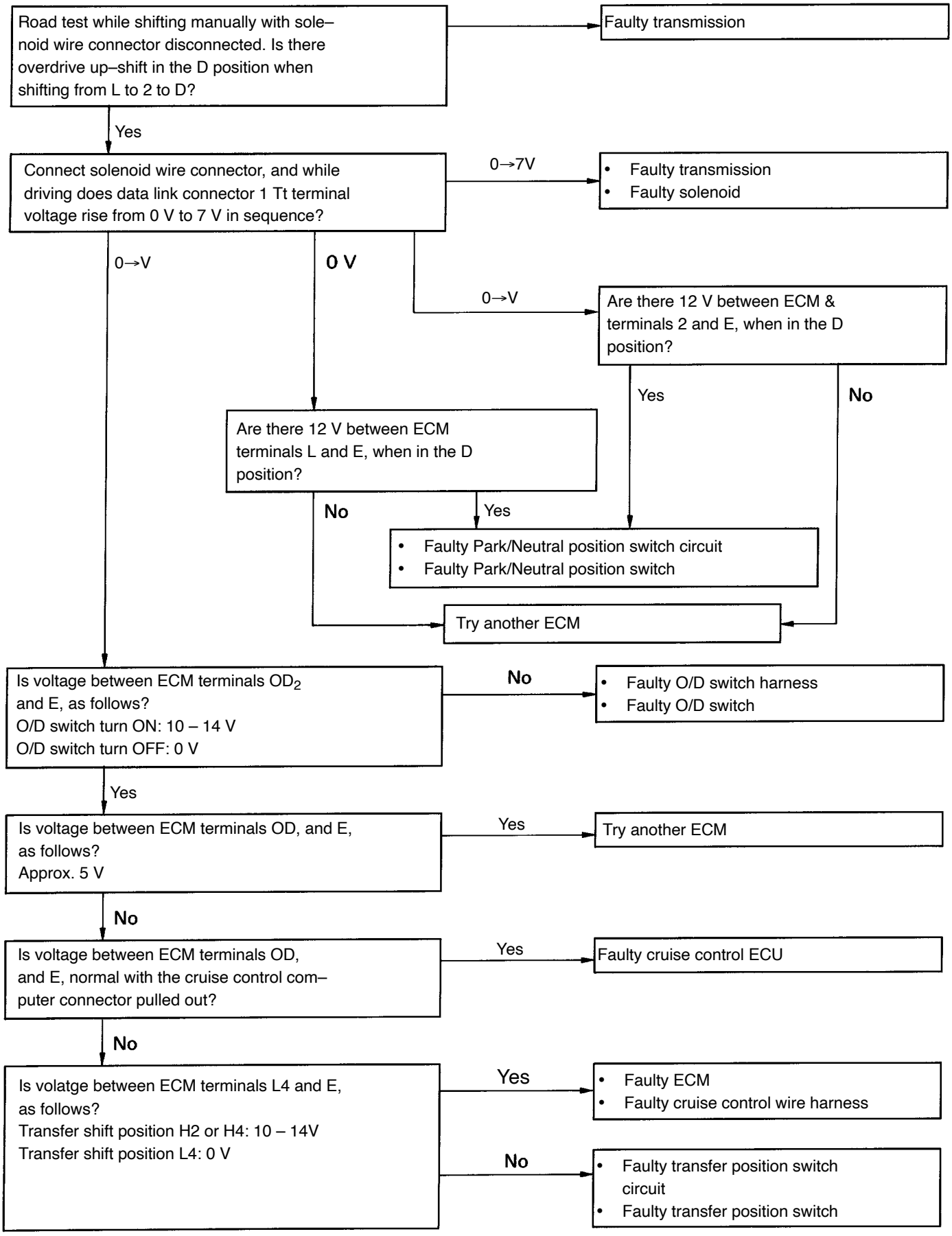



Continued from page AT–122
Connect solenoid wire connector and road test. Does data link connector 1 TT terminal voltage rise from 0 V to 7 V in sequence?
0→ 7V
• Transmission faulty
• Solenoid faulty
0→ 5 V
Proceed to trouble 3 (AT–126)
0 V
0→ 3 V
Are there 12 V between ECM terminals 2–E, when in the D position?
Yes
No
Are there 12 V between ECM terminals L–E, when in the D position?
No
Yes
• Park/Neutral position switch circuit faulty
• Park/Neutral position switch faulty
Try another ECM

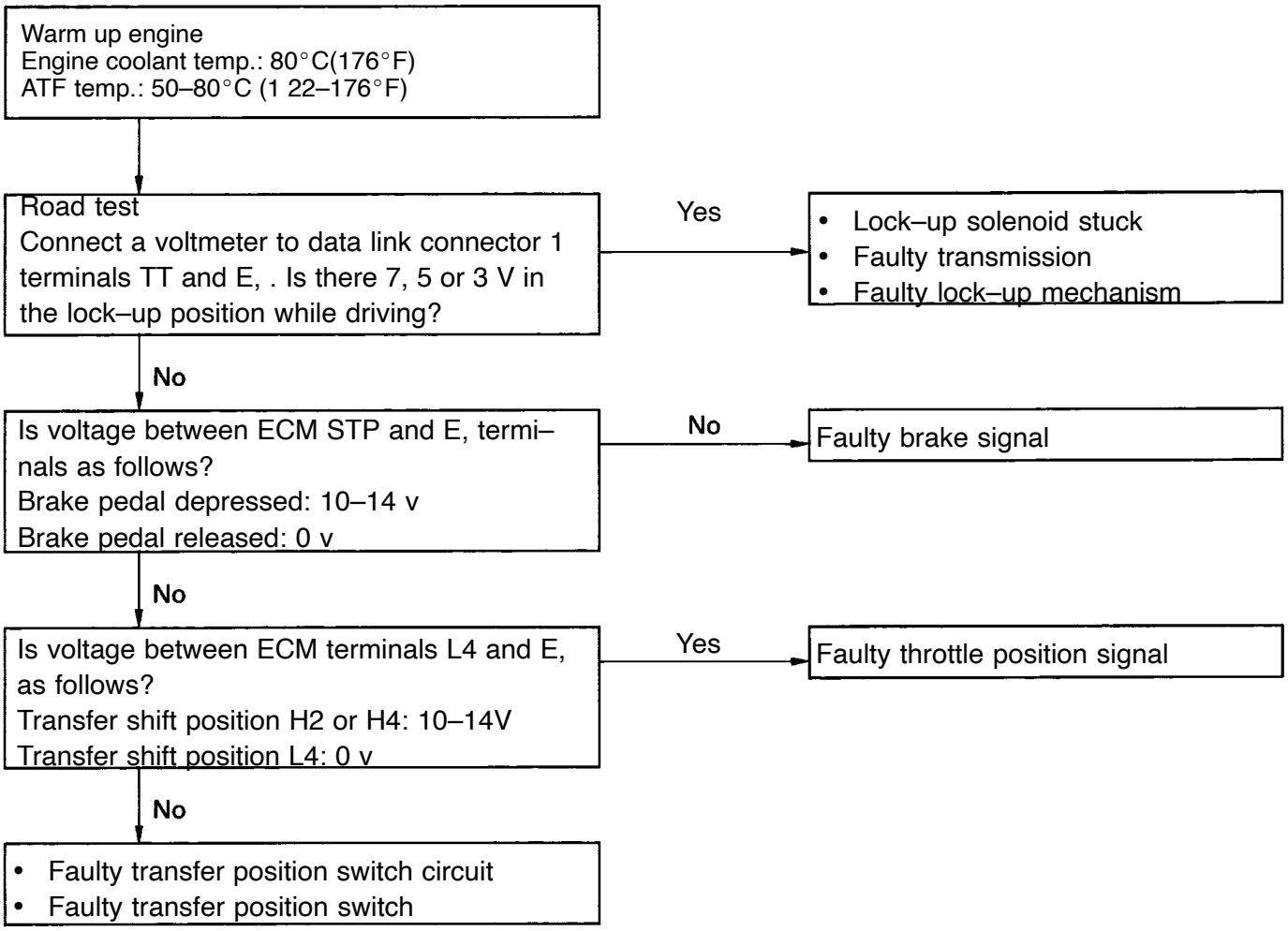
Trouble No.2 Shift point too high or too low



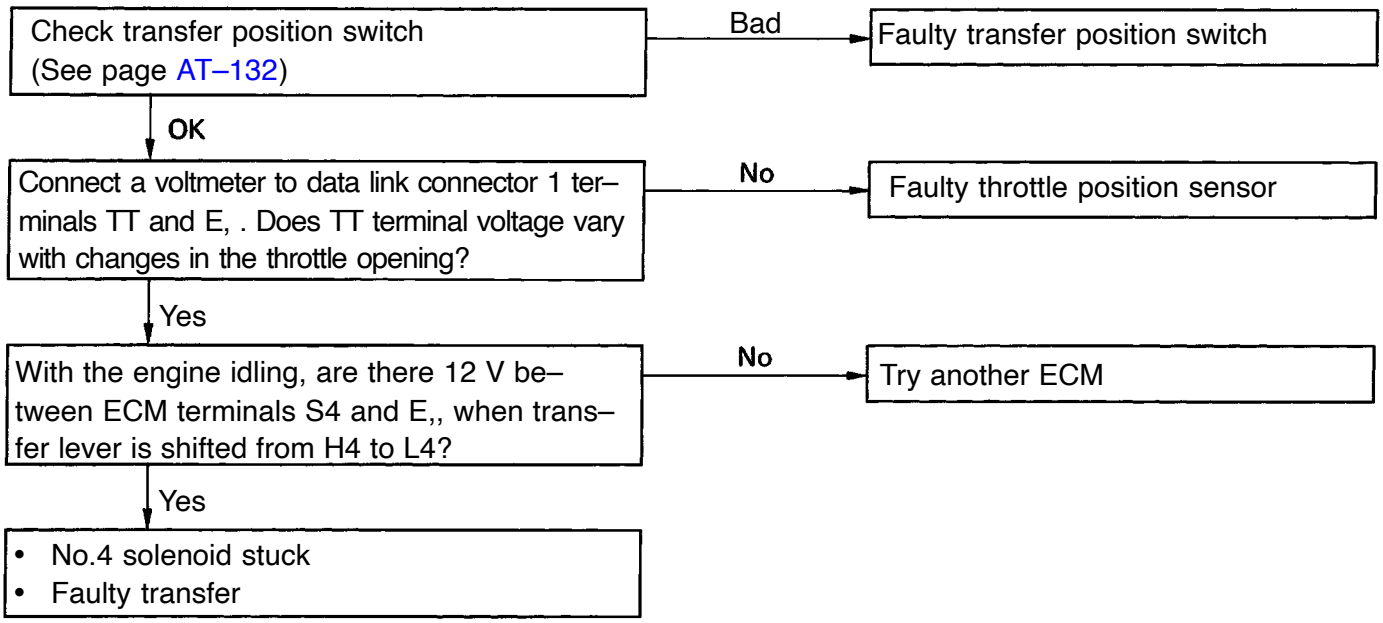
Trouble No.3 No up–shift to overdrive (After warm–up)

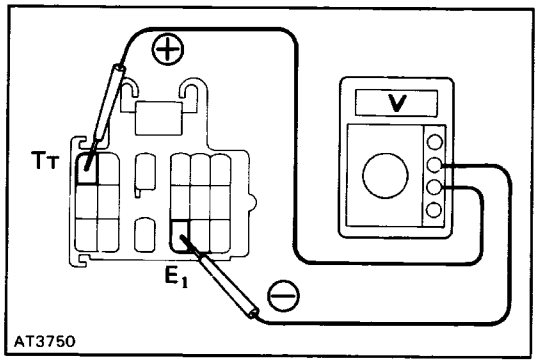


Trouble No. 4 No lock–up (After warm–up)



Trouble No.5 Transfer gear no change L4 from H4



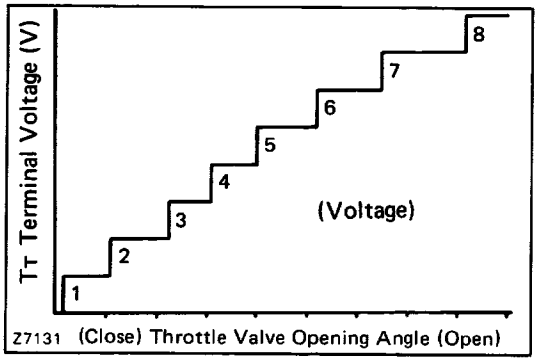


INSPECTION OF TT TERMINAL VOLTAGE

1. INSPECT THROTTLE POSITION SENSOR SIGNAL

(a) Turn the ignition switch to ON. Do not start the engine.

(b) Connect a voltmeter to data link connector 1 terminals Tt and E,.



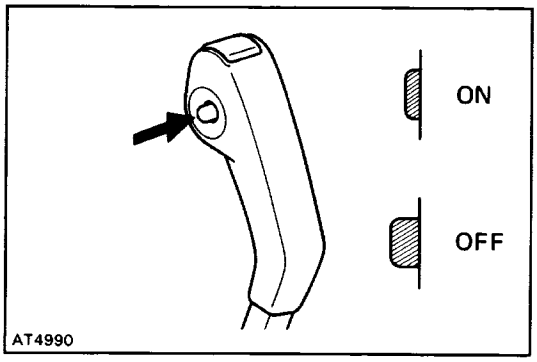
(c) While slowly depressing the accelerator pedal, check that TT terminal voltage rises in sequence.
If the voltage does not change in proportion to the throttle opening angle, there is a malfunction in the throttle position sensor or circuit.

2. INSPECT BRAKE SIGNAL

(a) Depress the accelerator pedal until the TT terminal indicates 8 V.

(b) Depress the brake pedal and check the voltage reading from the TT terminal.
Brake pedal depressed ..... 0 V
Brake pedal released ..... 8 V

If not as indicated, there is a malfunction in either the stop light switch or circuit.



T_T Terminal (V)	Gear Position
0	1st
2	2nd
3	2nd Lock-up
4	3rd
5	3rd Lock-up
6	O/D
7	O/D Lock-up

3. INSPECT EACH UP–SHIFT POSITION

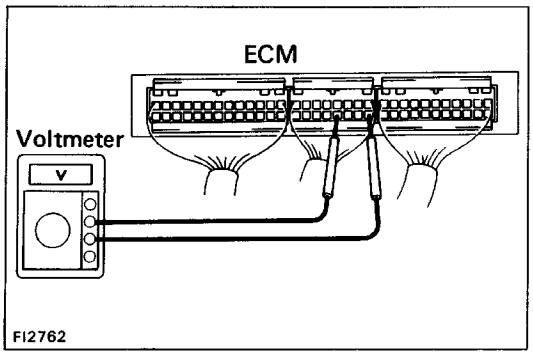
(a) Warm up the engine.
Engine Coolant temperature: 800C (1760F)

(b) Turn the O/D switch to ”ON”.

(c) Place the pattern select switch in ”Normal” and the shift lever into the D position.

(d) During a road test (above 10 km/h or 6 mph)check that voltage at the TT terminal is as indicated below for each up–shift position.

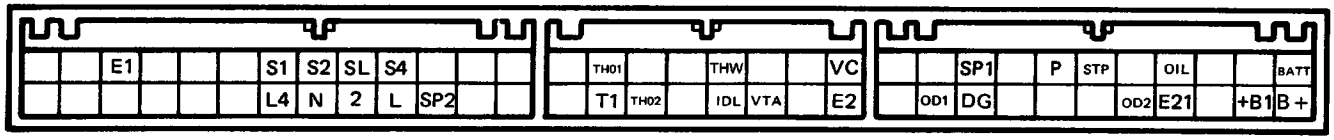
If the voltage rises from 0 V to 7 V in the sequence shown, the control system is okay.
The chart on the left shows the voltmeter reading and corresponding gears.
HINT: Determine the gear position by a light shock or change in engine rpm when shifting. The lock–up clutch will turn ON only infrequently during normal 2nd and 3rd gear operation. To trigger this action, press the accelerator pedal to 50% or more of its stroke. At less than 50%, the voltage may change in the sequence 2 V–4 V–6 V–7V.



INSPECTION OF ELECTRONIC CONTROL COMPONENTS

1. INSPECT VOLTAGE OF ECM CONNECTOR

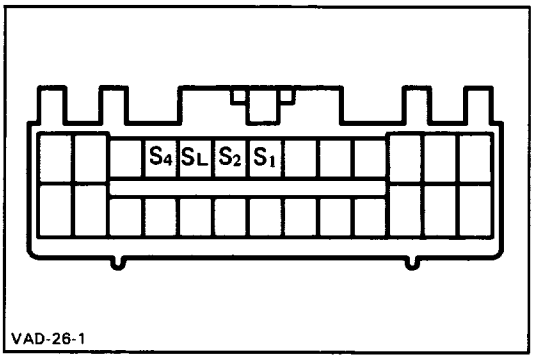
(a) Remove the cowl side trim of passenger side.
(b) Turn on the ignition switch.
(c) Measure the voltage at each terminal.



FI2796

Terminal	Measuring condition		Voltage i V j
$S_1 - E_1$	–		10 – 14
S_2, $S_L - E_1$	–		0
$S_4 - E_1$	Transfer shift position H2 or H4		0
	Transfer shift position L4		10 – 14
$P - E_1$	PWR pattern		10 – 14
	NORM pattern		0 – 2
$STP - E_1$	Brake pedal is depressed		10 – 14
	Brake pedal is released		0
$THW - E_2 (E_{21})$	Engine Coolant temp. 80°C (176°F)		0.1 – 1.0
$IDL - E_2 (E_{21})$	Throttle valve fully closed		0
	Throttle valve open		10 – 14
$VTA - E_2(E_{21})$	Throttle valve fully closed		0.1 – 1.0
	Throttle valve fully open		3 – 5
$VC (VCC) - E_2 (E_{21})$	–		4 – 6
$OD_1 - E_1$	–		5
$OD_2 - E_1$	O/D main switch turned ON		10 – 14
	O/D main switch turned OFF		0
$SP_1 - E_1$	Cruise control main switch OFF	Standing still	0 or 5
		Vehicle moving	2 – 3
$SP_2 - E_1$	Standing still		0 or 5
	Vehicle moving		2 – 3

Terminal	Measuring condition	Voltage (V)
N – E_1	N position	10 – 14
	Except N position	0 – 2
2 – E_1	2 position	10 – 14
	Except 2 position	0 – 2
L – E_1	L position	10 – 14
	Except L position	0 – 2
L_4 – E_1	Transfer shift position H2 or H4	10 – 14
	Transfer shift position L4	0
OIL – E_1	–	10 – 14
THO_1, THO_2 – E_2 THO (E_{21})	Fluid temp. 20°C (68°F)	4 – 5
B+ (+B_1) – E_1	–	10 – 14
BATT – E_1	–	10 – 14



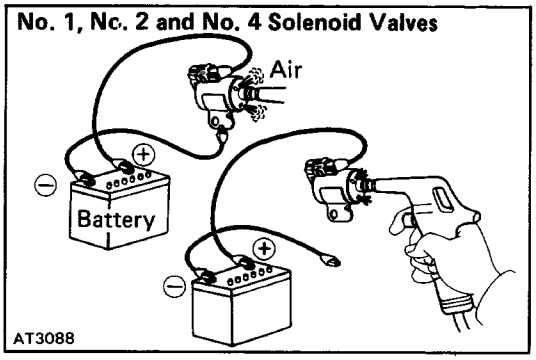
2. INSPECT SOLENOID

(a) Disconnect the connector from ther ECM.

(b) Measure the resistance between S,, S2, SL, S4 and ground.

Resistance: 11–15Ω

(c) Apply battery positive voltage to each terminal. Check that an operation noise can be heard from the solenoid.



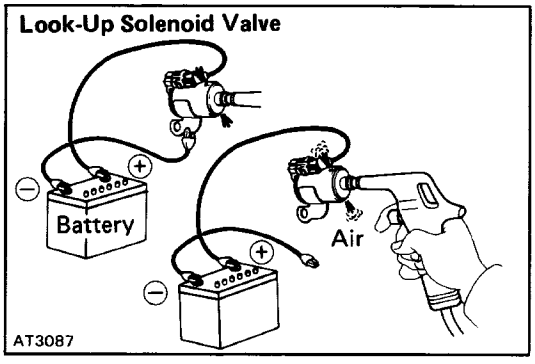
3. CHECK SOLENOID SEALS

If there is foreign material in the solenoid valve, there will be no fluid control even with solenoid operation.

(a) Check No. 1, No.2 and No.4 solenoid valves.

Check that the solenoid valves do not leak when low–pressure compressed air is applied.

When supply battery positive voltage to the solenoids, check that the solenoid valves open.



(b) Check the lock–up solenoid valve.

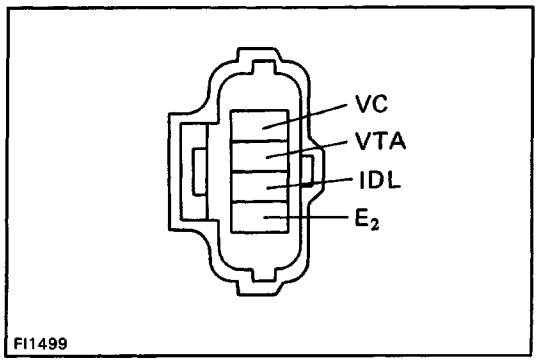
Applying 490 kPa (5 kgf/cm2, 71 psi) of com–pressed air, check that the solenoid valve opens.

When supply battery positive voltage to the solenoid, check that the solenoid valve does not leak the air.

If a malfunction is found during voltage inspection (step 1.), inspect the components listed below.

4. INSPECT PARK/ NEUTRAL POSITION SWITCH

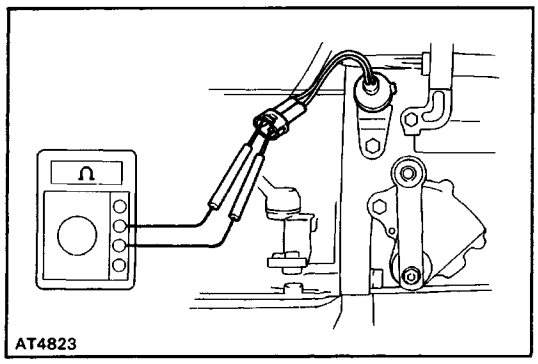
(See page AT–144)



5. INSPECT THROTTLE POSITION SENSOR

Using an ohmmeter, check the resistance between each terminal.

Terminal	Throttle valve condition	Resistance (kΩ)
IDL–E2	Fully closed	Less than 2.3
	Open	Infinity
VC–E2	–	3.9–9.0
VTA–E2	Fully closed	0.47–6.1
	Fully open	3.1–12.1



6. INSPECT NO.2 VEHICLE SPEED SENSOR

(a) Jack up the rear wheel on one side.

(b) Connect an ohmmeter between the terminals.

(c) Spin the wheel and check that the meter needle deflects from 0Ω to ∞Ω.

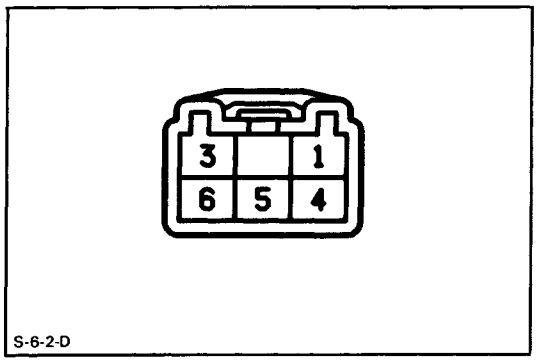
7. INSPECT NO.1 VEHICLE SPEED SENSOR

(See step 6. on page AT–131)

8. INSPECT PATTERN SELECT SWITCH

Using an ohmmeter, check the continuity of the terminals for each switch position.

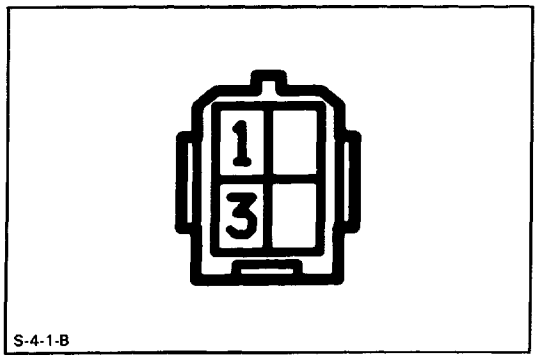
HINT: As there are diodes inside, be careful of the tester probe polarity.



Terminal / Pattern	4	6
PWR	○	○
NORM		

9. INSPECT O/D SWITCH

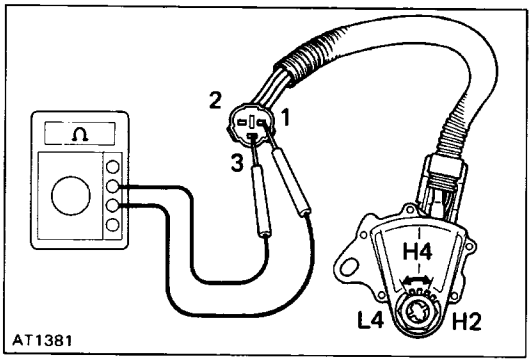
Using an ohmmeter, check the continuity of the terminals for each switch position.



Terminal / SW position	1	3
ON		
OFF	○	○

10. INSPECT ENGINE COOLANT TEMPERATURE SENSOR

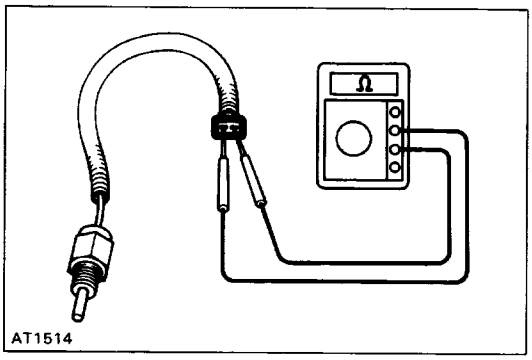
(See page FI–201)



11. INSPECT TRANSFER POSITION SWITCH

Check that there is continuity between each terminal.

Shift position \ Terminal	1	2	3
H4	○		○
L4	○	○	○
H2			



12. INSPECT TRANSMISSION AND TRANSFER FLUID TEMPERATURE SENSOR

Measure the resistance between terminals.

Oil Temperature	Resistance (Ω)
20°C (68°F)	5k – 20k
120°C (248°F)	540 – 690
150°C (302°F)	300 – 340

Mechanical System Tests

STALL TEST

The object of this test is to check the overall performance of the transmission and engine by measuring the stall speeds in the D and R positions.

NOTICE:

- **Perform the test at normal operating fluid temperature (50–80°C or 122–176°F).**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear, level area, which provides good traction.**
- **The stall test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.**

MEASURE STALL SPEED

(a) Chock the front and rear wheels.
(b) Connect a tachometer to the engine.
(c) Fully apply the parking brake.
(d) Keep your left foot pressed firmly on the brake pedal.
(e) Shift the transfer lever to the H2 position.
(f) Start the engine.
(g) Shift into the D position. Step all the way down on the accelerator pedal with your right foot.
Quickly read the stall speed at this time.

NOTICE: Release the accelerator pedal and stop test if the rear wheels begin to rotate before the engine speed reaches specified stall speed.

Stall speed: 2,850 f 150 RPM

(h) Perform the same test in R position.

EVALUATION

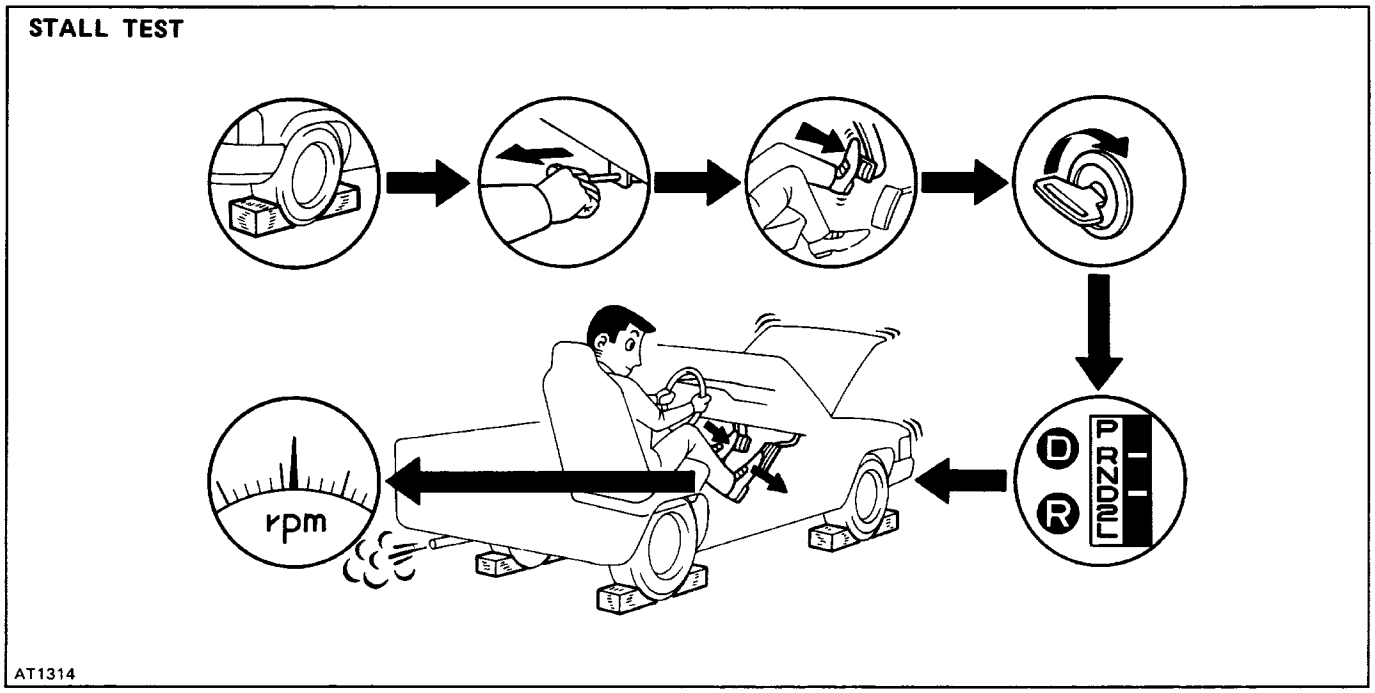
(a) If the stall speed is the same for both positions but lower than specified value:
Engine output may be insufficient
Stator one–way clutch is not operating properly

HINT: If more than 600 RPM below the specified value, the torque converter clutch could be faulty.

(b) If the stall speed in D position is higher than specified:
Line pressure too low
Forward clutch slipping
No.2 one–way clutch not operating properly
O/D one–way clutch not operating properly
Transfer direct clutch slipping

(c) If the stall speed in R position is higher than specified:
Line pressure too low
Direct clutch slipping
First and reverse brake slipping
O/D one–way clutch not operating properly
Transfer direct clutch slipping

(d) If the stall speed in both R and D positions are higher than specified:
Line pressure too low
Improper fluid level
O/D one–way clutch not operating properly
Transfer direct clutch slipping



TIME LAG TEST

When the shift lever is shifted while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the O/D direct clutch, forward clutch, direct clutch and first and reverse brake.

NOTICE:

Perform the test at normal operating fluid temperature (50–80°C or 122–176°F).

Be sure to allow one minute interval between tests.

Make three measurements and take the average value.

MEASURE TIME LAG

(a) Fully apply the parking brake.

(b) Shift the transfer shift lever to the H2 position.

(c) Start the engine and check the idle speed.

Idle speed: 850 RPM
(N position)

(d) Shift the shift lever from N to D position. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

Time lag: Less than 1.2 seconds

(e) In same manner, measure the time lag for N–R.

Time lag: Less than 1.5 seconds

EVALUATION

(a) If N–D time lag is longer than specified:

Line pressure too low

Forward clutch worn

O/D one–way clutch not operating properly

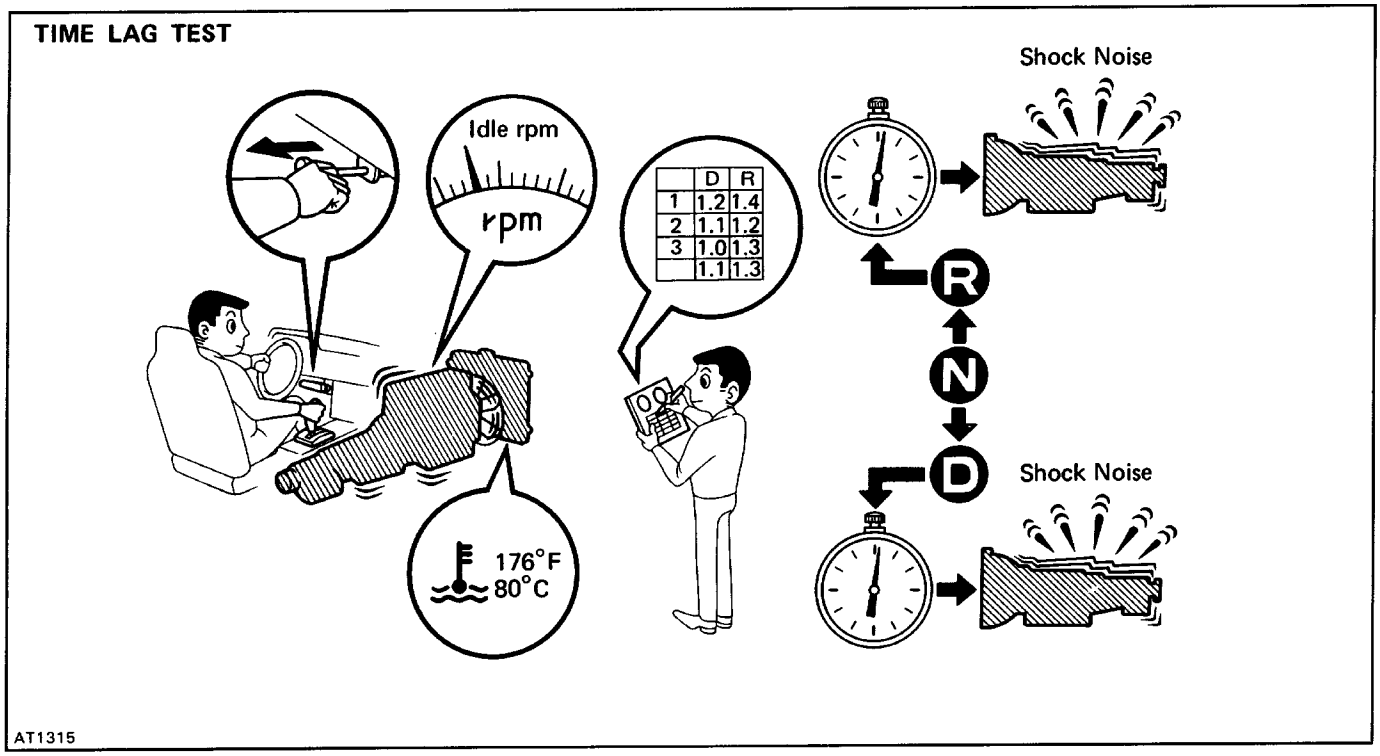
(b) If N–) R time lag is longer than specified:

Line pressure too low

Direct clutch worn

First and reverse brake worn

O/D one–way clutch not operating properly



HYDRAULIC TEST PREPARATION

(a) Warm up the transmission fluid.

(b) Remove the transmission case test plug and connect the hydraulic pressure gauge.
SST 09992–00094 (Oil pressure gauge)

NOTICE:

Perform the test at normal operating fluid temperature (50–80°C or 122–176°F).

The line pressure test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.

MEASURE LINE PRESSURE

(a) Fully apply the parking brake and check the four wheels.

(b) Start the engine and check idling RPM.

(c) Keep your left foot pressed firmly on the brake pedal and shift into D position.

(d) Measure the line pressure when the engine is idling.

(e) Press the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.

NOTICE: Release the accelerator pedal and stop test if the rear wheels begin to rotate before the en–

gine speed reaches specified stall speed.

(f) In the same manner, perform the test in R position.

kPa (kgf/cm2,psi)

D position		R position	
Idling	Stall	Idling	Stall
427 – 481 (4.3 – 4.9, 61 – 70)	1,118 – 1,363 (11.4 – 13.9, 162 – 198)	510 – 608 (5.2 – 6.2, 74 – 88)	1,373 – 1,716 (14.0 – 17.5, 199 – 249)

If the measured pressures are not up to specified values, recheck the throttle cable adjustment and perform a retest.

EVALUATION

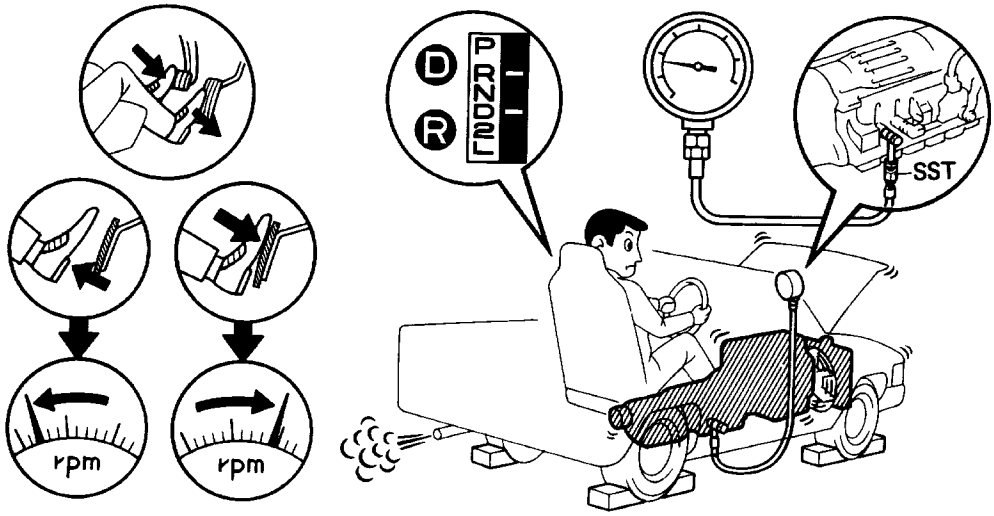
(a) If the measured values at all positions are higher than specified:
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective

(b) If the measured values at all positions are lower than specified:
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective
- Oil pump defective
- O/D direct clutch defective
- Transfer direct clutch defective (H2, H4)
- Transfer front drive clutch defective (H4, L4)
- Transfer low speed brake defective (L4)

(c) If pressure is low in the D position only:
- D position circuit fluid leakage
- Forward clutch defective

(d) If pressure is low in the R position only:
- R position circuit fluid leakage
- Direct clutch defective
- First and reverse brake defective

HYDRAULIC TEST



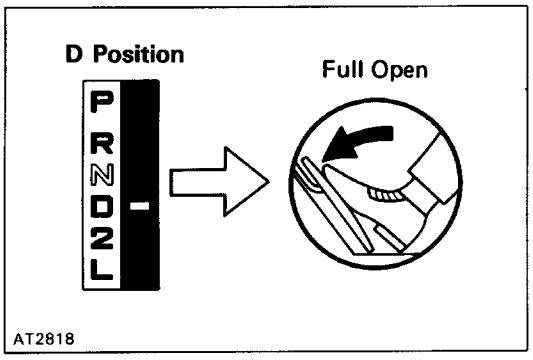
AT1316

ROAD TEST

NOTICE: Perform the test at normal operating fluid temperature (50–80°C or 122–176°F).

HINT: The transmission shift points for the H2, H4 and L4 transfer positions are different. Also, the O/D gear and lock–up are cancelled when L4 is engaged.

1. D POSITION TEST IN NORM AND PWR PATTERN POSITIONS



Shift into the D position and hold the accelerator pedal constant at the full throttle valve opening position.

Check the following:

(a) 1–2, 2–3 and 3–O/D up–shifts should take place, and shift points should conform to those shown in the automatic shift schedule.

Conduct a test under both Normal and Power patterns.

HINT: There is no O/D up–shift or lock–up when the engine coolant temp. is below 70°C (158°F).

EVALUATION

(1) If there is no 1–2 up–shift:

No. 2 solenoid is stuck

1–2 shift valve is stuck

(2) If there is no 2–3 up–shift:

No. 1 solenoid is stuck

2–3 shift valve is stuck

(3) If there is no 3–i O/D up–shift:

3–4 shift valve is stuck

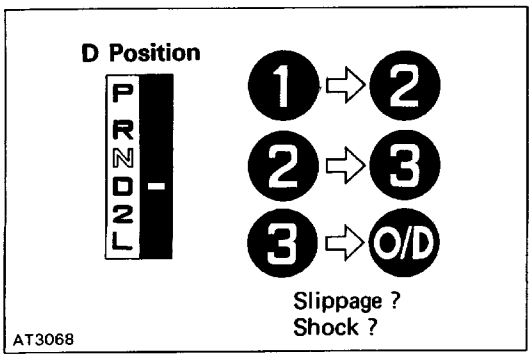
(4) If the shift point is defective:

Throttle valve, 1–2 shift valve, 2–3 shift valve, 3–4 shift valve etc., are defective

(5) If the lock–up is defective:

Lock–up solenoid is stuck

Lock–up relay valve is stuck



(b) In the same manner, check the shock and slip at the 1–) 2, 2–i 3, and 3–O/D up–shifts

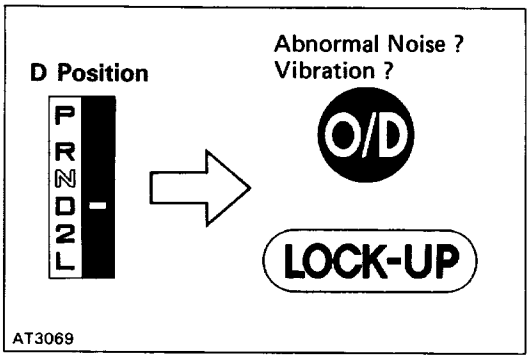
EVALUATION

If the shock is excessive:

Line pressure–is too high

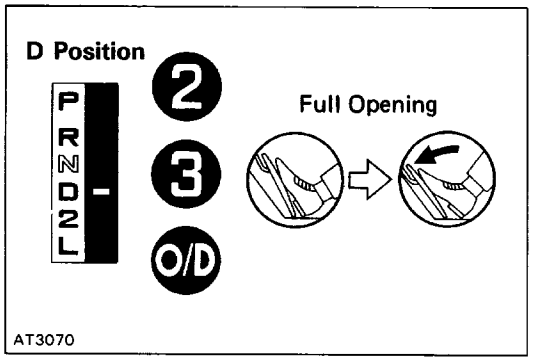
Accumulator is defective

Check ball is defective



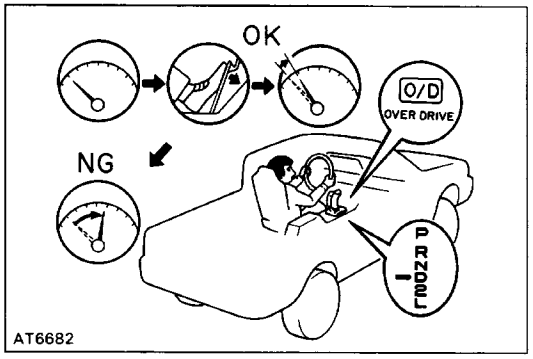
(c) Run at the D position lock–up or O/D gear and check for abnormal noise and vibration.

HINT: The check for the cause of abnormal noise and vibration must be made with extreme care as it could also
be due to loss of balance in the propeller shaft, differen–
tial, torque converter clutch, etc.



(d) While running in the D position, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2–1, 3–) 2 and O/D–3 kick–downs conform to those indicated on the automatic shift schedule.

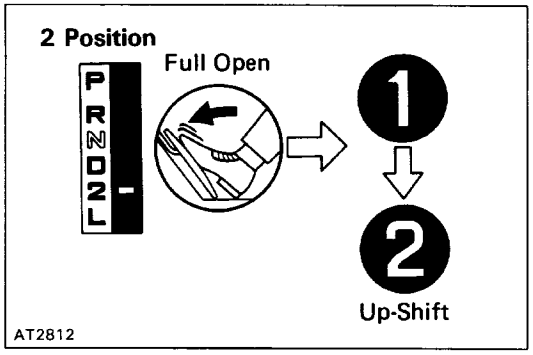
(e) Check for abnormal shock and slip at kick–down.



(f) Check for the lock–up mechanism.

(1) Drive in D position, O/D gear, at a steady speed (lock–up ON) of about 75 km/h (47 mph).

(2) Lightly depress the accelerator pedal and check that the engine RPM does not change abruptly. If there is a big jump in engine RPM, there is no lock–up.



2. 2 POSITION TEST

Shift into the 2 position and, while driving with the accelerator pedal held constantly at the full throttle valve opening position, push in one of the pattern selectors and check on the following points.

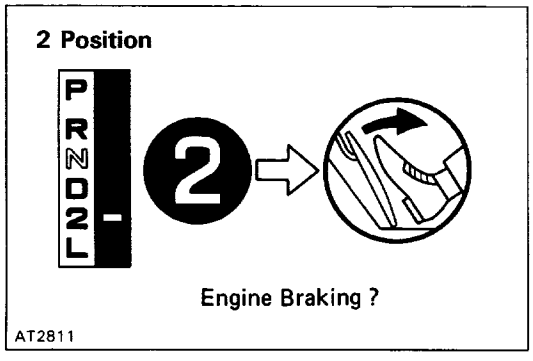
(a) Check to see that the 1–2 up–shift takes place and that the shift point conforms to it shown on the automatic shift schedule.

HINT:

There is no O/D up–shift and lock–up in the 2 position.

To prevent overrun, the transmission up–shifts into 3rd gear at around 100 km/h (62 mph) or more.

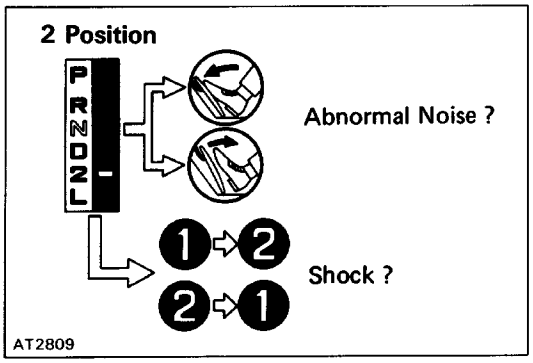
(b) While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.



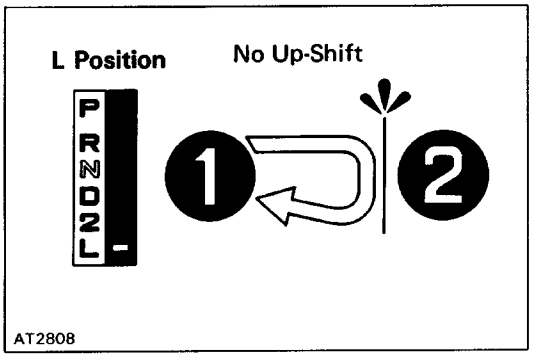
EVALUATION

If there is no engine braking effect:

Second coast brake is defective

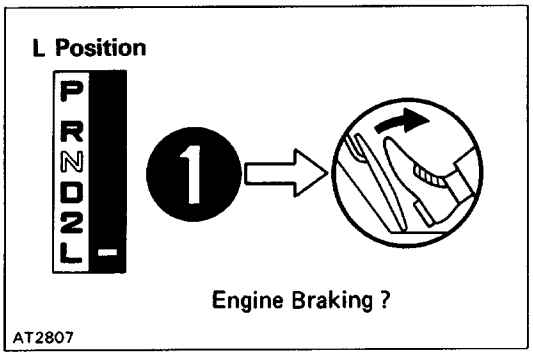


(c) Check for abnormal noise at acceleration and deceleration, and for shock at up–shift and down–shift.



3. L POSITION TEST

(a) While running in the L position, check to see that there is no up–shift to 2nd gear.

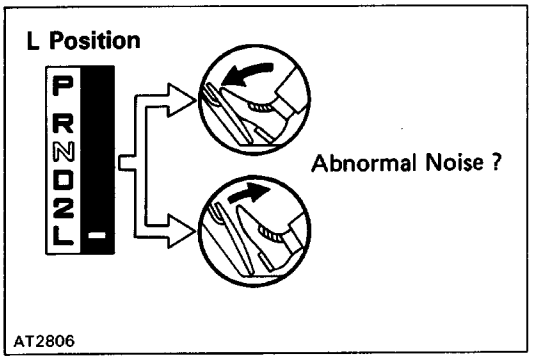


(b) While running in the L position, release the accelerator pedal and check the engine braking effect.

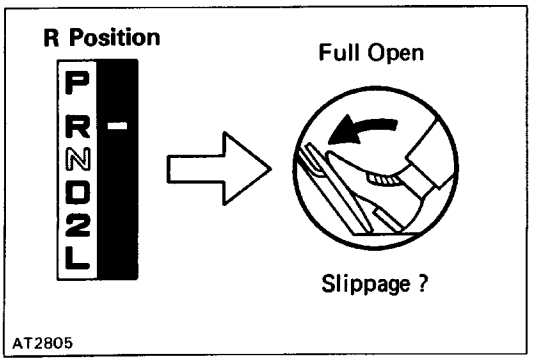
EVALUATION

If there is no engine braking effect:

- First and reverse brake is defective

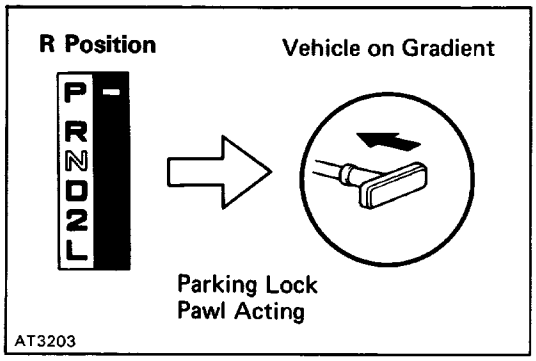


(c) Check for abnormal noise during acceleration and deceleration.



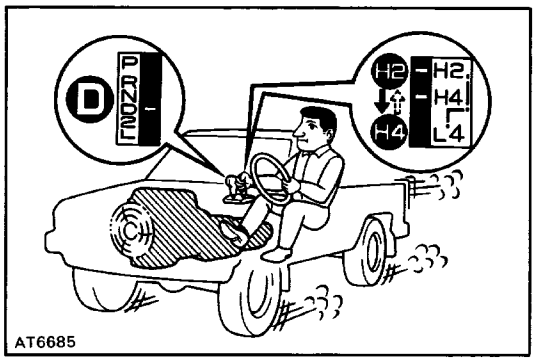
4. R POSITION TEST

Shift into the R position and, while starting at wide open throttle, check for slipping.



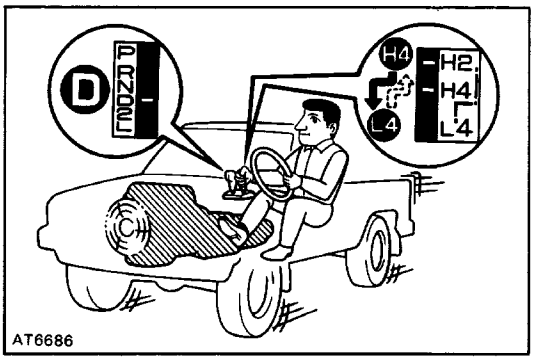
5. P POSITION TEST

Stop the vehicle on a gradient (more than 5°) and after shifting into the P position, release the parking brake. Then check to see that the parking lock pawl holds the vehicle in place.



6. TRANSFER TEST

(a) When the shift lever is shifted from the H2 to H4, confirm that the vehicle changes from 2 to 4 wheel drive. If it does not, the transfer is faulty.



(b) When the transfer lever is shifted from H4 to L4, confirm that the gear changes according to the shifted diagram (See page **AT–141**). If it does not, the No.4 solenoid, ECM or transfer faulty.

Automatic Shift Schedule

Transfer shift position "H2" or.."H4"		Throttle valve fully open ( ] Fully closed							km/h (mph)
		1→2	2→3	3→O/D	[3→O/D]	[O/D→3]	O/D→3	3→2	2→1
D position	NORM	50–53 (31–33)	90–96 (56–60)	131–138 (81–86)	35–39 (22–24)	21–25 (13–16)	125–132 (78–82)	84–91 (52–57)	40–44 (25–27)
	PW R	50–53 (31–33)	90–96 (56–60)	131–138 (81–86)	38–42 (24–26)	21–25 (13–16)	125–132 (78–82)	84–91 (52–57)	40–44 (25–27)
2 position	NORM PWR	43–46 (27–29)	103–109 (64–68)	–	–	–	–	97–103 (60–64)	38–42 (24–42)
L position	NORM PWR	–	–	–	–	–	–	82–89 (51–55)	47–51 (29–32)

Transfer shift position "H2" or "H4"		Throttle valve opening 5%					km/h (mph)
		Lock–up ON			Lock–up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D position	NORM	–	52 – 56 (32 – 35)	64 – 68 (40 – 42)	–	50 – 53 (31 – 33)	55 – 59 (34 – 37)
	PW R	–	52 – 56 (32 – 35)	64 – 68 (40 – 42)	–	50 – 53 (31 – 33)	55 – 59 (34 – 37)

* : O/D switch OFF

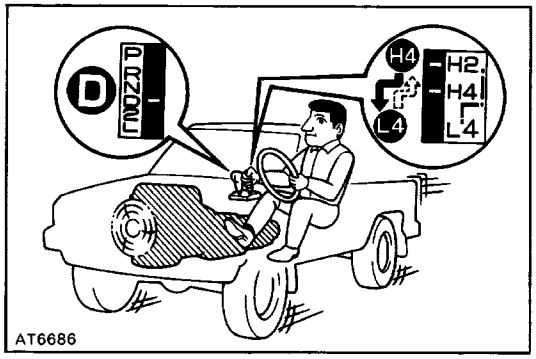
HINT:

(1) Lock–up will not occur–in 2nd gear unless the throttle valve opening is greater than 50%.

(2) There is no lock–up in the 2 and L positions.

(3) In the following cases, the lock–up will be released regardless of the lock–up pattern.

- When the throttle is completely closed.
- When the brake light switch is ON.



TRANSFER HIGH–LOW SHIFT RANGE

The A340H transfer differs from previous manual transfer in that high–low shifting is possible while the vehicle is in motion, though it is not possible at all vehicle speeds or throttle opening angles. The shifting possibility ranges for high–low shifting have been adopted with the idea of improving shifting performance and transfer conditions, and preventing engine overrun.

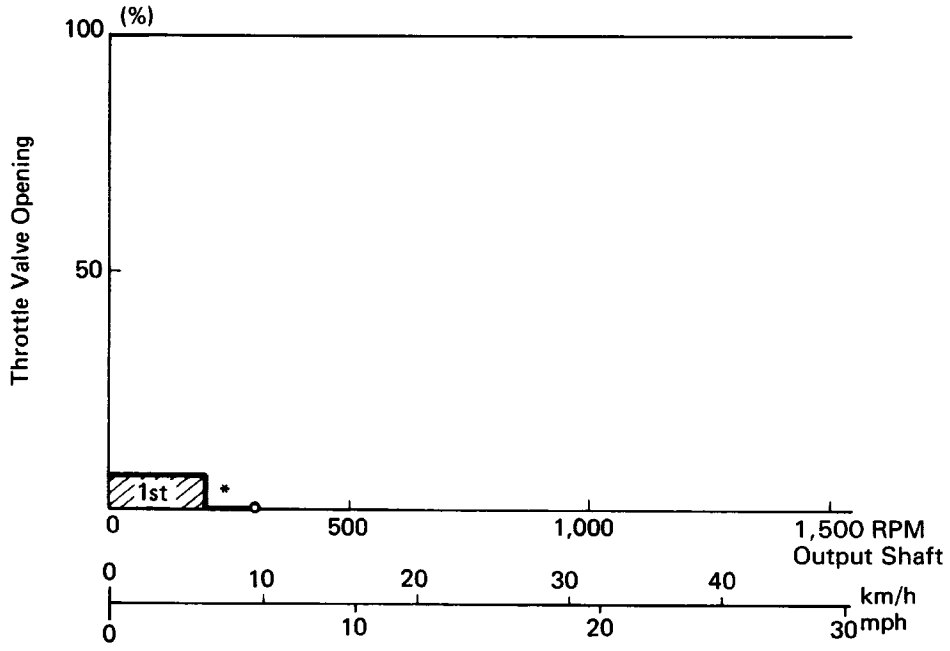
The shifting possibility ranges are controlled by ECM and when a high–low shift change is made within these ranges the ECM operates the No.4 solenoid which carries out the high–low transfer shift. However, if a transfer is attempted outside the shifting possibility range, the high–low shift will not take place until the vehicle speed and throttle opening angle come within the appropriate range. The high–low shifting possibility ranges are shown in the diagrams below.

There are three shifting possibility ranges for when the transmission gear is in first, second or third gear, which combine with the respective transmission shift positions (L, 2, D).

Although the high–) low shift takes place in the 1st gear, 2nd gear and 3rd gear shifting positions with the gears in 1st gear, 2nd gear and 3rd gear respectively, when a high–low shift change is made in 1st gear while in the 2nd gear shifting possibility range only after the transmission has shifted up into second gear does the high–low shift take place. In the 2 position and D position high–low shifting possibility ranges where the 1st and 2nd positions overlap, the high–low shift will take place in first gear if the transmission is in first gear, or in second gear if the transmission is in second gear.

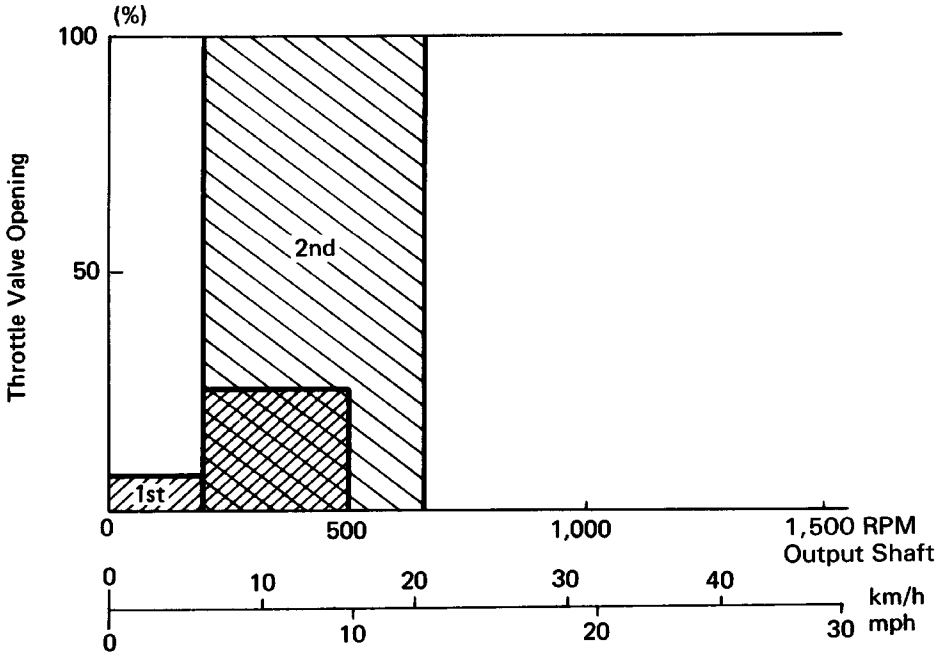
L Position: High–Low Shift Possibility Range

* : This transfer shift is only possible when the I D L contact points of the throttle position sensor are ON.



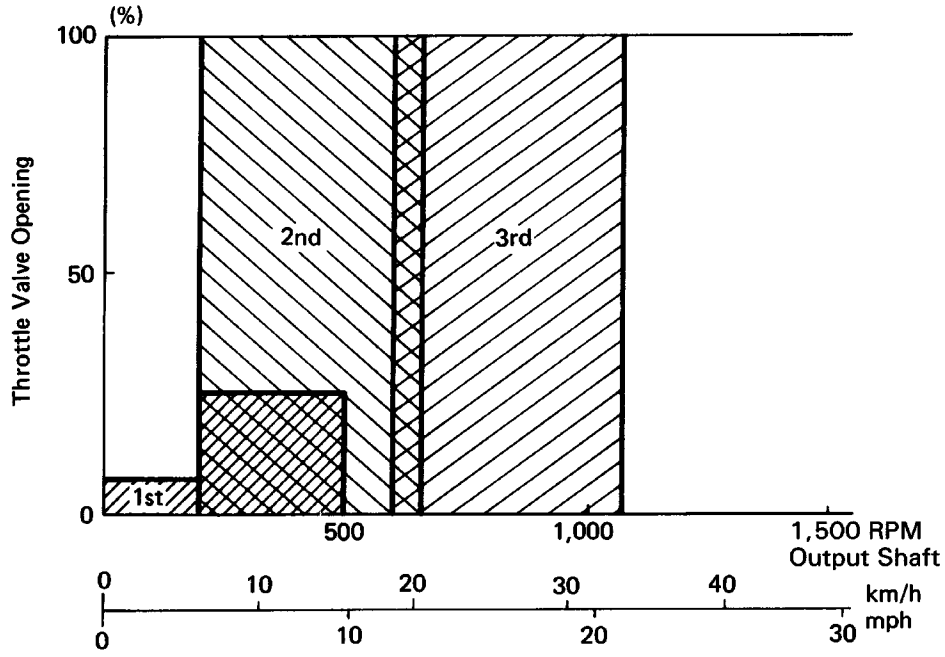
AT4662

2 Position: High–Low Shift Possibility Range



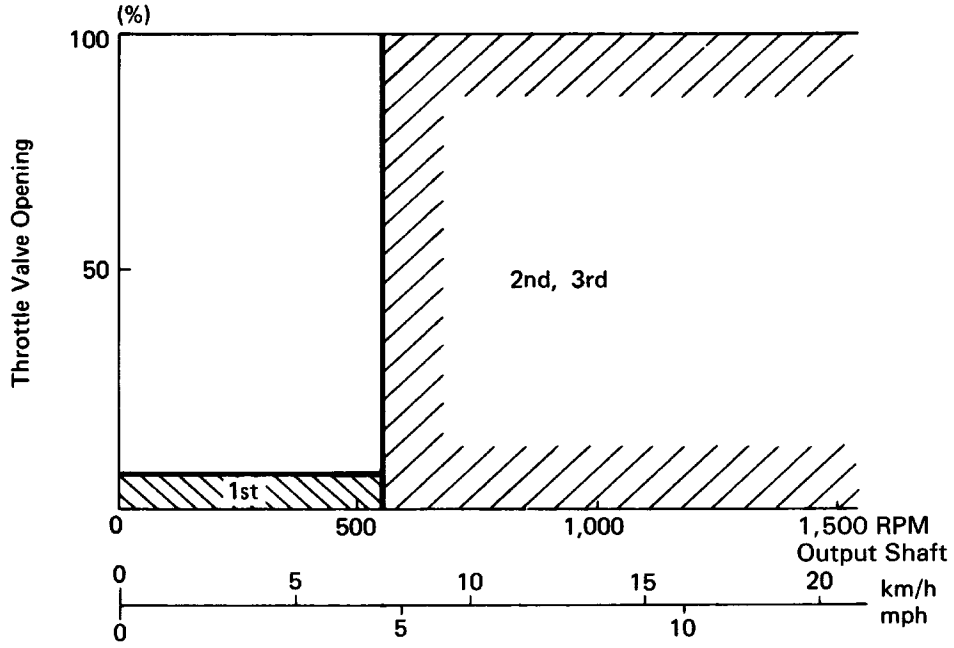
AT4663

D Position: High–Low Shift Possibility Range

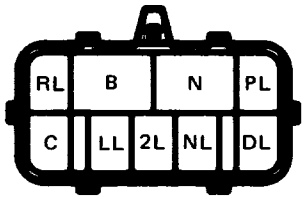


AT4664

Low–High Shift Possibility Range (L, 2, D Position)



AT4665



SH-9-2-A

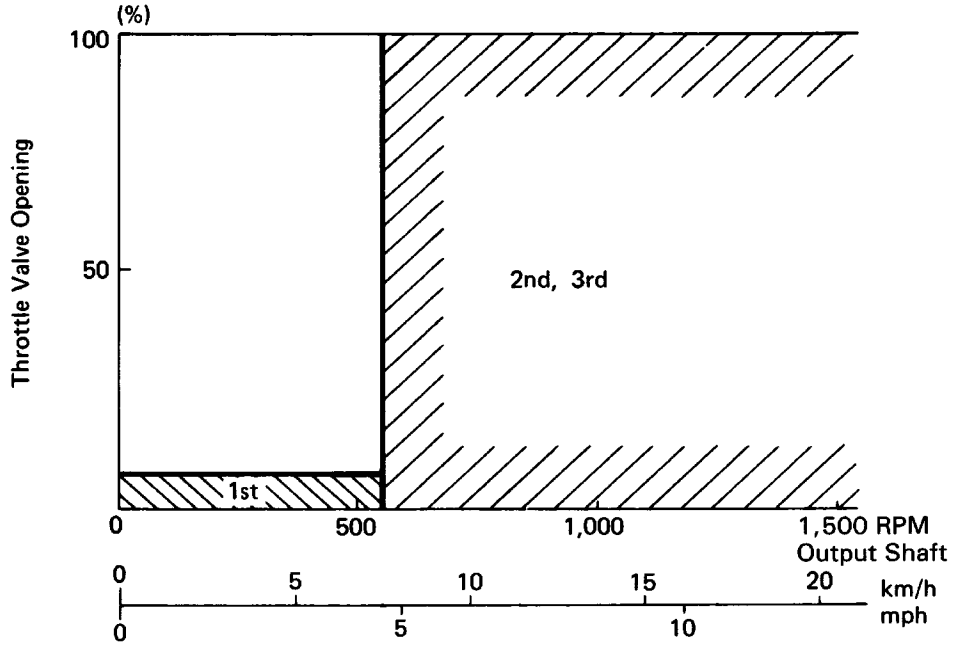
Park/Neutral Position Switch

INSPECTION OF PARK/NEUTRAL POSITION SWITCH

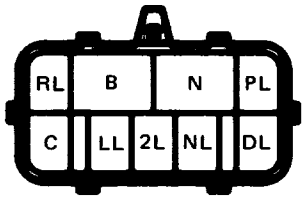
Inspect that there is continuity between each terminals.

Shift Position \ Terminal	B	N	PL	RL	NL	DL	2L	LL	C
P	○—○		○						○
R				○					○
N	○—○				○				○
D						○			○
2							○		○
L								○	○

Low–High Shift Possibility Range (L, 2, D Position)



AT4665



SH-9-2-A

Park Neutral Position Switch

INSPECTION OF PARK/NEUTRAL POSITION SWITCH

Inspect that there is continuity between each terminals.

Shift Position \ Terminal	B	N	PL	RL	NL	DL	2L	LL	C
P	○—○		○						○
R				○					○
N	○—○				○				○
D						○			○
2							○		○
L								○	○

ON–VEHICLE REPAIR

Transmission Valve Body

REMOVAL OF VALVE BODY AND/OR SOLENOID VALVE

1. CLEAN TRANSMISSION EXTERIOR

To prevent contamination, clean the exterior of the transmission.

2. DRAIN TRANSMISSION FLUID

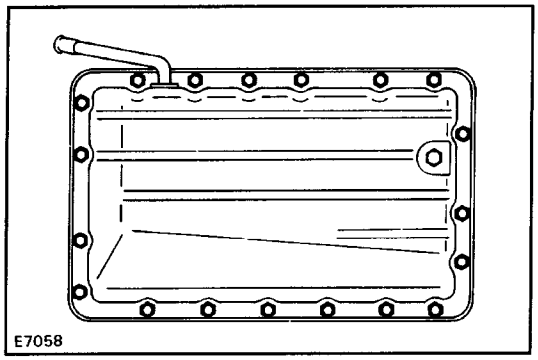
Remove the drain plug and drain the fluid into a suitable container.

3. REMOVE FRONT STABILIZER BAR

(See page SA–123)

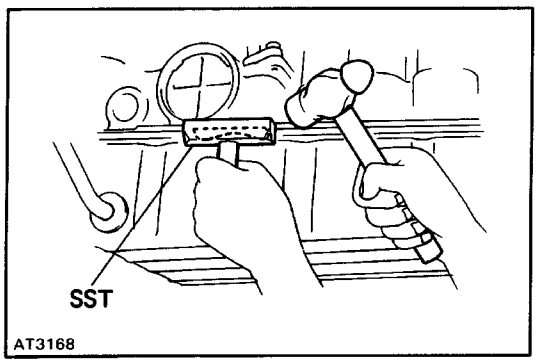
4. REMOVE FRONT PROPELLER SHAFT

(See page PR–4)



5. REMOVE TRANSMISSION OIL PAN

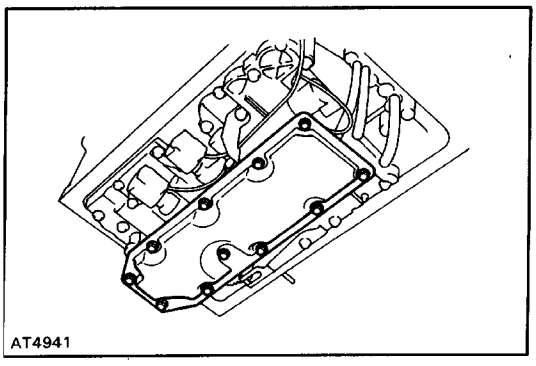
(a) Remove the nineteen bolts.



(b) Install the blade of SST between the transmission case and oil pan, cut off applied sealer.
SST 09032–00100

NOTICE: Be careful not to damage the oil pan flange.

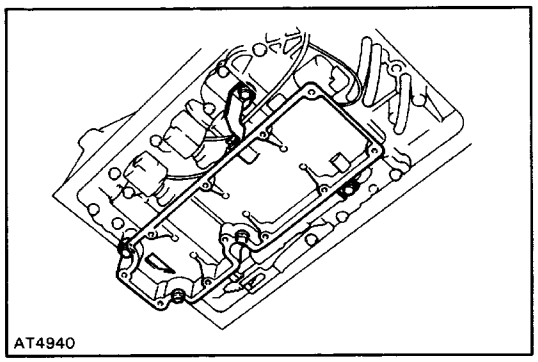
(c) Remove pan by lifting the transmission case.



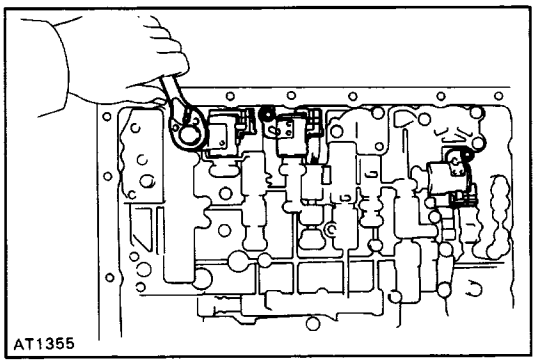
6. REMOVE OIL STRAINER AND GASKETS

(a) Remove the eleven bolts holding the oil strainer to the oil strainer case.

(b) Remove the oil strainer and gasket.

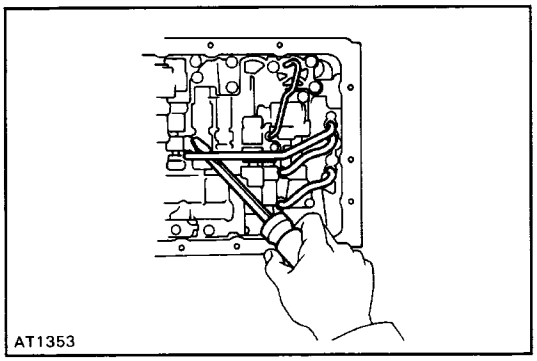


(c) Remove the five bolts and oil strainer case.
(d) Remove the two gaskets from the case.



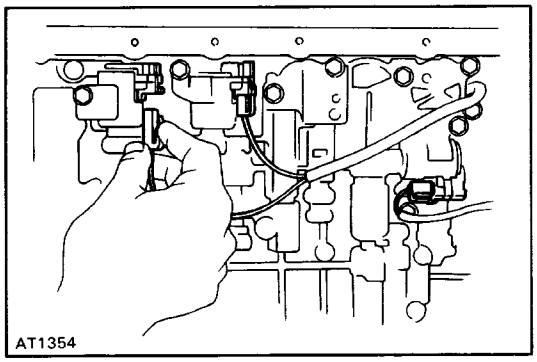
7. WHEN REPLACING SOLENOIDS

(a) Disconnect the connectors from the solenoids.
(b) Remove the solenoid mounting bolts.
(c) Remove the solenoids.



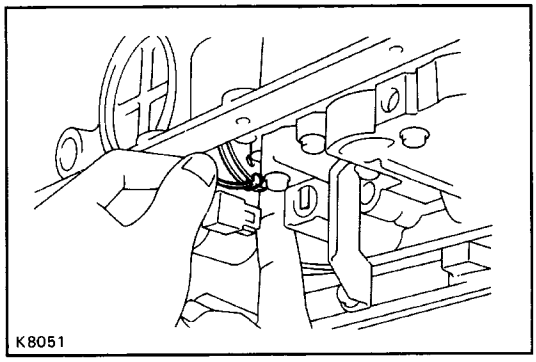
8. REMOVE OIL TUBES

Pry up both tube ends with a large screwdriver and remove the three tubes.



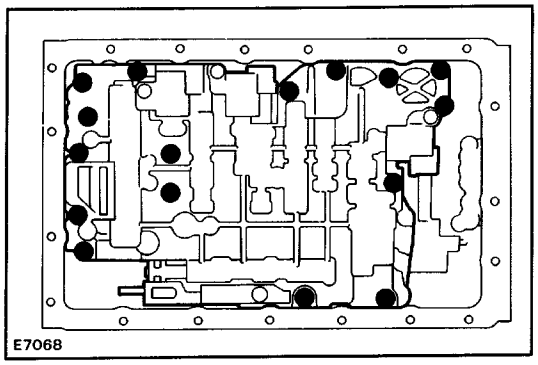
9. DISCONNECT SOLENOID CONNECTORS

Disconnect the three connectors from No.1, No. 2 and lock–up solenoids.

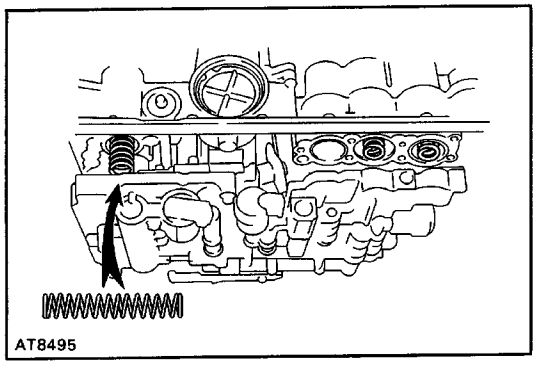


10. REMOVE VALVE BODY

(a) Disconnect the throttle cable from the cam.

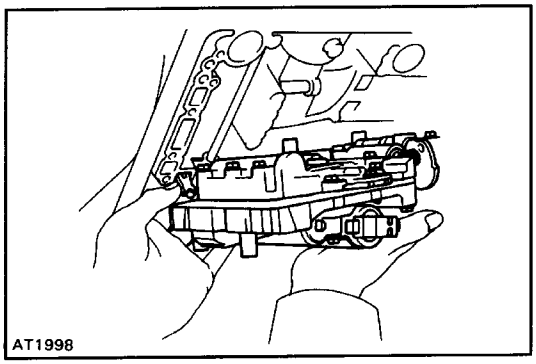

E7068

(b) Remove the sixteen bolts.


AT8495

(c) Remove the two Co accumulator piston springs.
(d) Remove the valve body.

HINT: Be careful not to drop the check ball body and spring.

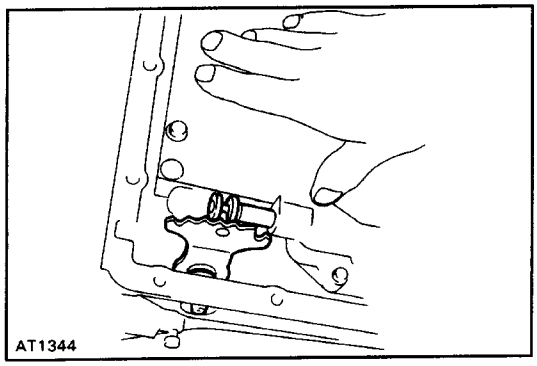

AT1998

INSTALLATION OF VALVE BODY AND/OR SOLENOID VALVE

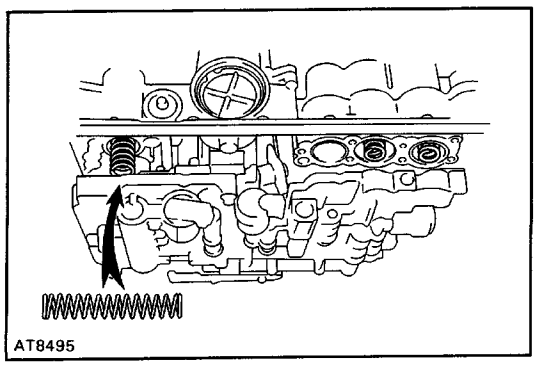
1. INSTALL VALVE BODY

(a) Install the valve body together the check ball body and spring.

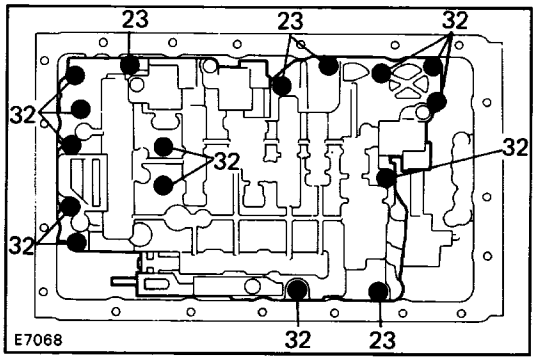
HINT: Align the groove of the manual valve to the pin of the lever.


AT1344

(b) Align the groove of the manual valve to the pin of the lever.


AT8495

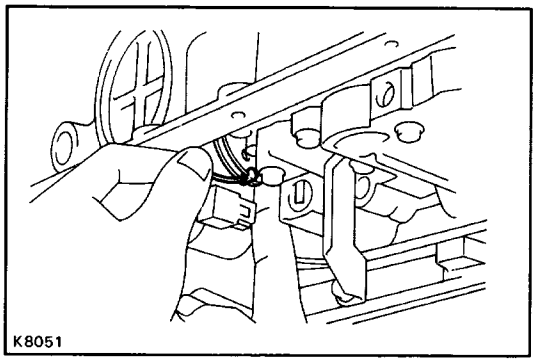
(c) Install the two Co accumulator piston springs.



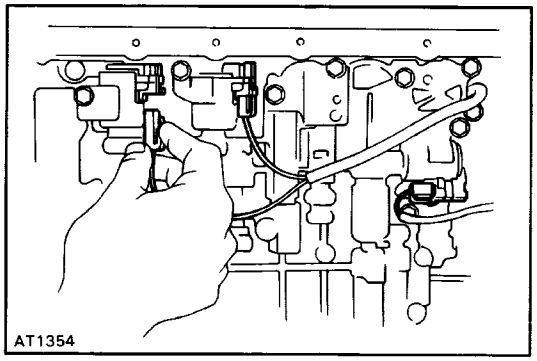
(d) Install the sixteen bolts.

HINT: Each bolt length (mm) is indicated in the figure.

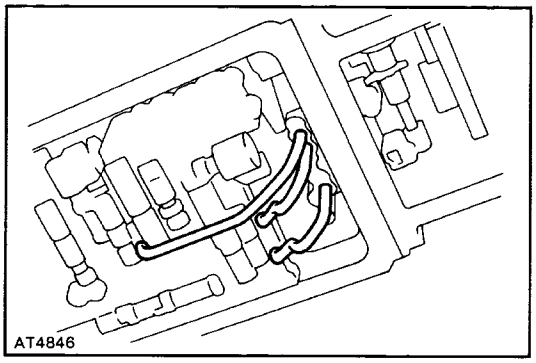
Torque: 10 N–m 0 00 kgf–cm, 7 ft–lbf)



(e) Connect the throttle cable to the cam.



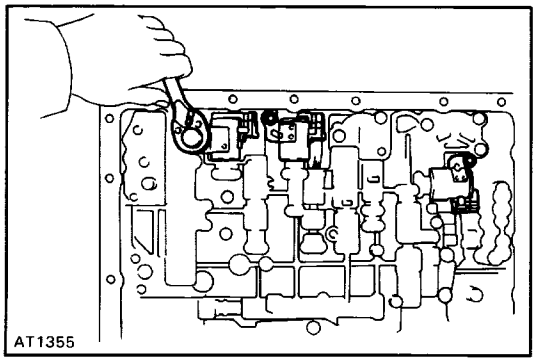
2. CONNECT CONNECTORS TO EACH SOLENOID



3. INSTALL OIL TUBES

Using a plastic hammer, install the three tubes into posi–tion shown in the figure.

NOTICE: Be careful not to bend or damage the tubes.

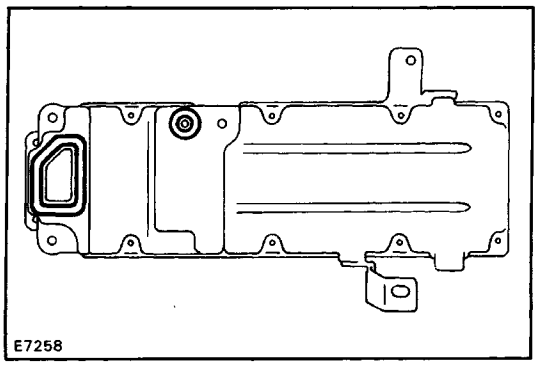


4. WHEN REPLACING SOLENOID

(a) Install a new 0–ring to the solenoid.
(b) Install the solenoid and torque the bolt.

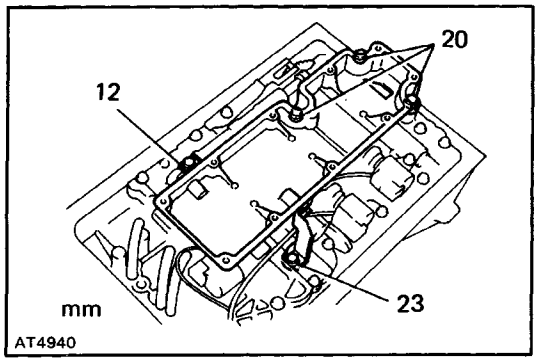
Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)

(c) Connect the connector to the solenoid.
(d) Clamp the solenoid wire.



5. INSTALL OIL STRAINER AND GASKETS

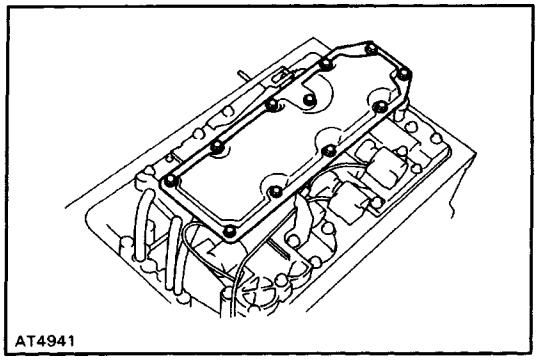
(a) Install two new gaskets to the oil strainer case.



(b) Install the oil strainer case and torque the five bolts.

Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)

HINT: Each bolt length (mm) is indicated in the figure.



(c) Install a new gasket to the oil strainer case.

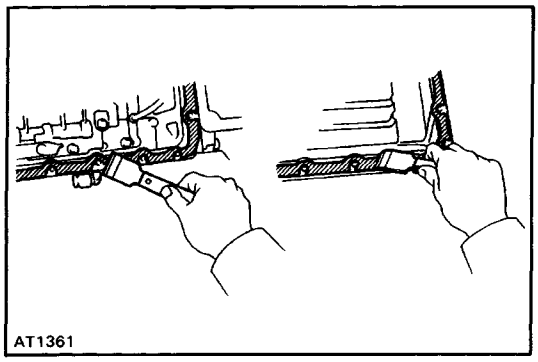
(d) Install the oil strainer and torque the eleven bolts.

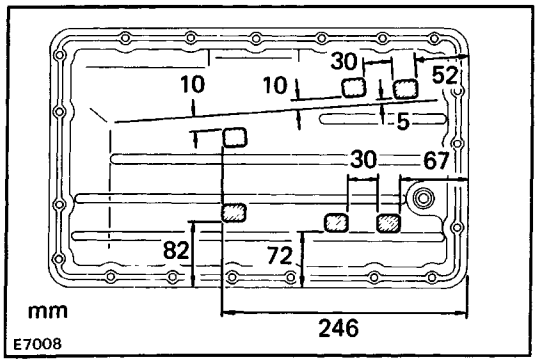
Torque: 6.9 N–m (70 kgf–cm, 61 in.–lbf)

6. INSTALL OIL PAN

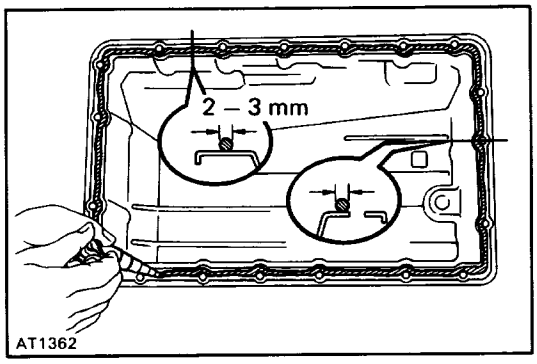
(a) Remove any packing material and be careful not to drop the oil on the contacting surfaces of the oil pan and transmission case.

(b) Clean contacting surfaces of any residual packing material using gasoline or alcohol.

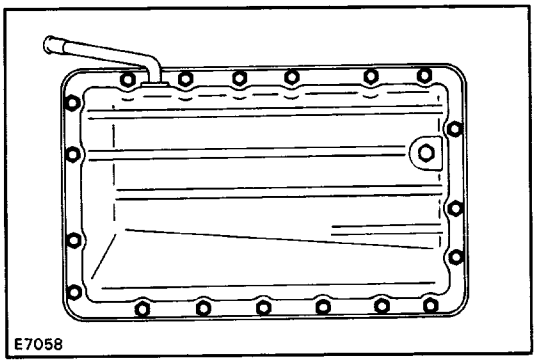




(c) Install the six magnets as shown in the figure.



(d) Apply seal packing to the oil pan as shown in the figure.
Seal packing: Part No. 08826–00090, THREE BOND
1281 or equivalent



(e) Install and torque the nineteen bolts.

Torque: 7.4 N–m (75 kgf–cm, 61 in.¿lbf)

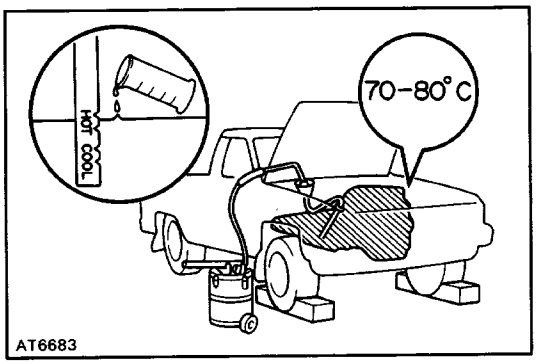
7. INSTALL OIL PAN DRAIN PLUG

Torque the drain plug.

Torque: 20 N–m (205 kgf–cm, 15 ft–lbf)

8. INSTALL FRONT PROPELLER SHAFT
(See page PR–4)

9. INSTALL FRONT STABILIZER BAR
(See page SA–123)

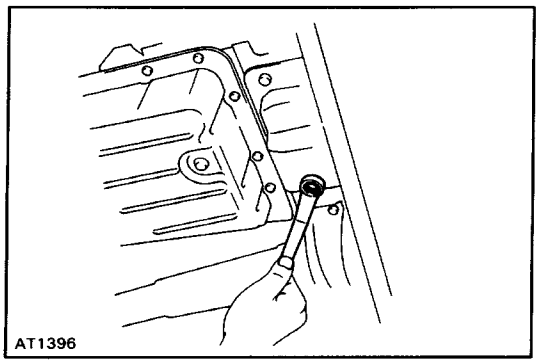


10. FILL TRANSMISSION WITH ATF
(See page AT–1 14)

NOTICE: Do not overfill.

Fluid type: ATF DEXRONO® II

11. CHECK FLUID LEVEL



Transfer Valve Body
REMOVAL OF VALVE BODY AND/OR SOLENOID

VALVE

1. CLEAN TRANSFER EXTERIOR

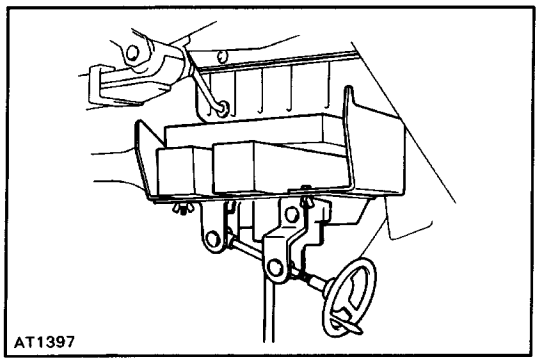
To prevent contamination, clean the exterior of the transfer.

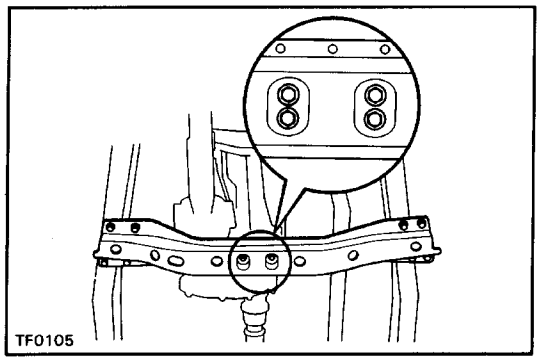
2. DRAIN TRANSFER CASE FLUID

Remove the drain plug and drain fluid into a suitable container.

3. SUPPORT TRANSMISSION

Using a transmission jack, support the transmission.



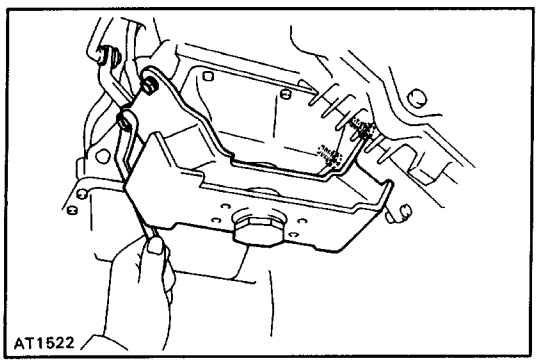


4. REMOVE REAR SUPPORT MEMBER FROM SIDE FRAME

(a) Remove the four bolts from the engine rear mounting.

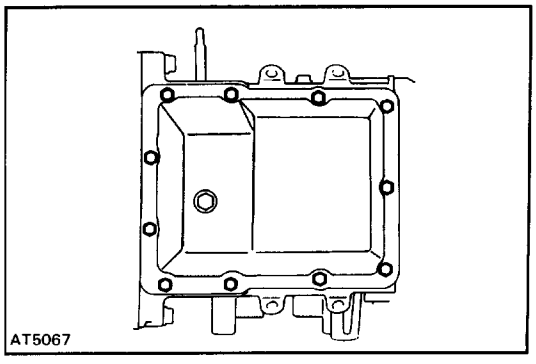
(b) Raise the transmission slightly with a jack.

(c) Remove the eight bolts from the side frame and remove the rear support member.



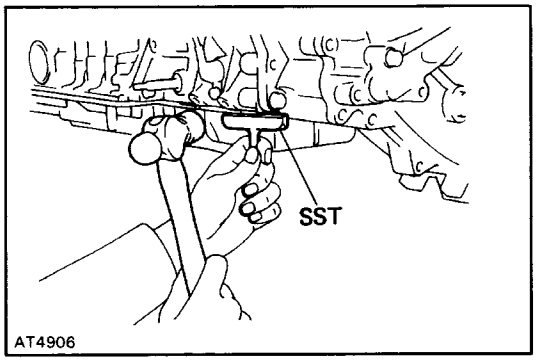
5. REMOVE MEMBER BRACKET FROM TRANSFER

Remove the four bolts and member bracket from the transfer.



6. REMOVE TRANSFER OIL PAN

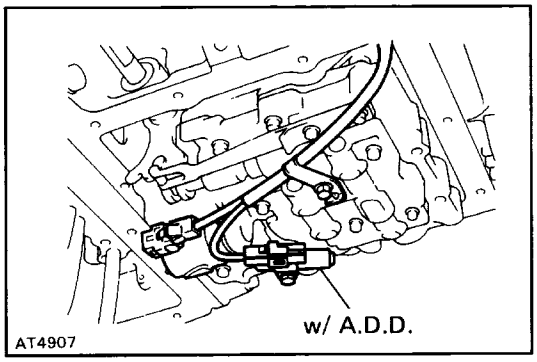
(a) Remove the eleven bolts.



(b) Install the blade of SST between the transfer case and oil pan, cut off applied sealer.
SST 09032–00100

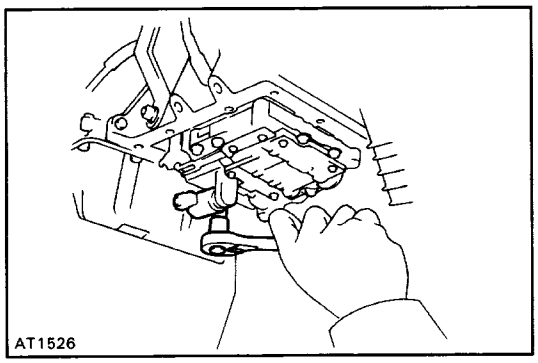
NOTICE: Be careful not to damage the oil pan flange.

(c) Remove the transfer oil pan.



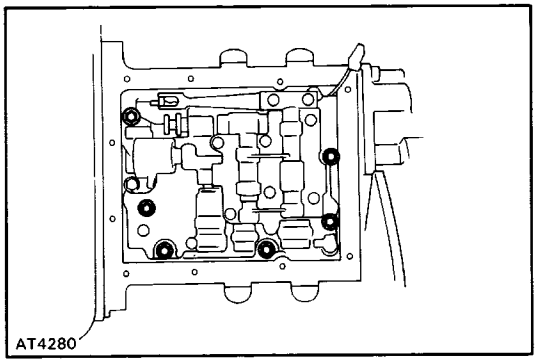
7. DISCONNECT SOLENOID CONNECTOR

Disconnect the connectors from No.4 solenoid and transfer pressure switch.



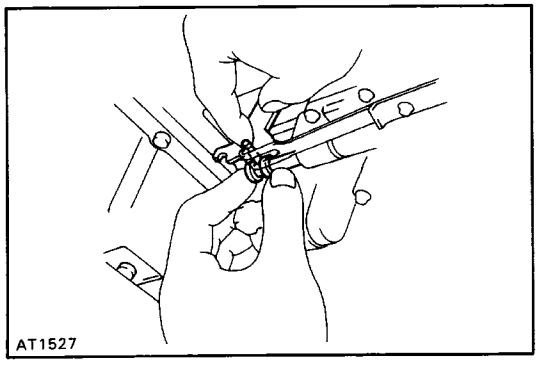
8. WHEN REPLACING SOLENOID

(a) Remove the solenoid mounting bolt.
(b) Remove the solenoid.



9. REMOVE VALVE BODY

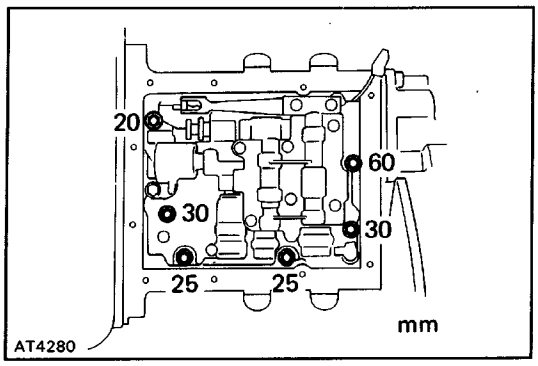
Remove the six bolts and valve body.



INSTALLATION OF VALVE BODY AND/OR SOLENOID VALVE

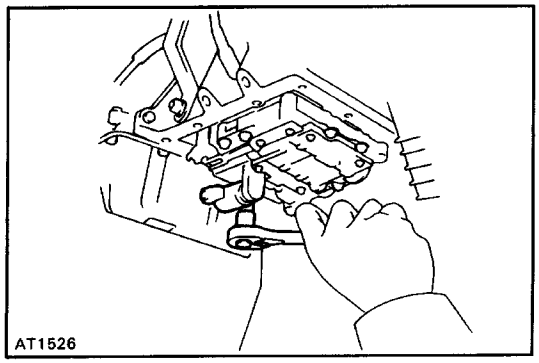
1. INSTALL VALVE BODY

(a) Align the manual valve lever with the manual valve.



(b) Install the bolts as shown. Torque the bolts evenly.

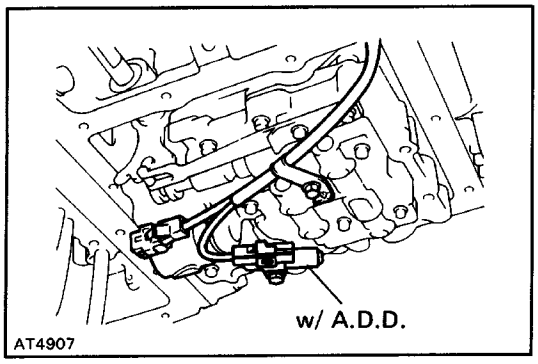
Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)



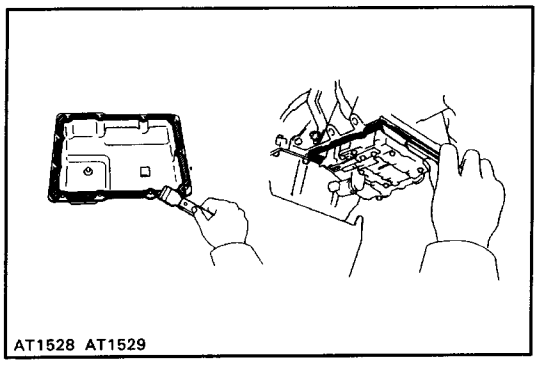
2. WHEN REPLACING SOLENOID

Install the solenoid and torque the bolt.

Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)



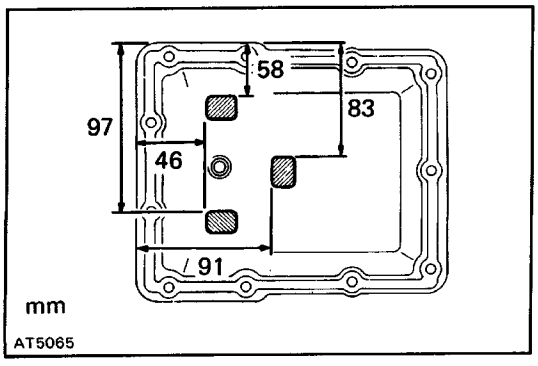
3. CONNECT CONNECTOR TO SOLENOID



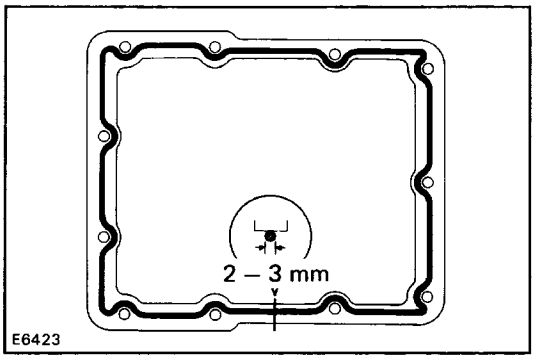
4. INSTALL TRANSFER OIL PAN

(a) Remove any packing material and be careful not to drop the oil on the contacting surfaces of the oil pan and transfer case.

(b) Clean contacting surfaces of any residual packing material, using gasoline or alcohol.

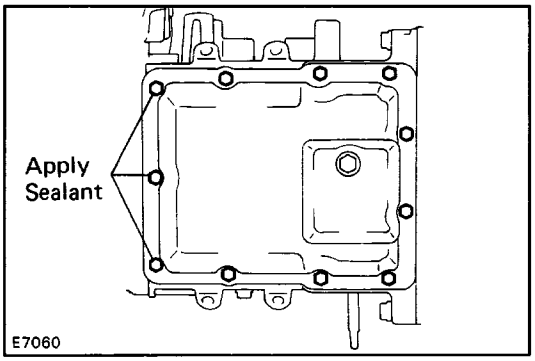


(c) Install the three magnets as shown in the figure.



(d) Apply seal packing to the oil pan as shown in the figure.

Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent



(e) Apply sealant to the threads of the three bolts.

Sealant: Part No. 08833–00070, THREE BOND 1324 or equivalent

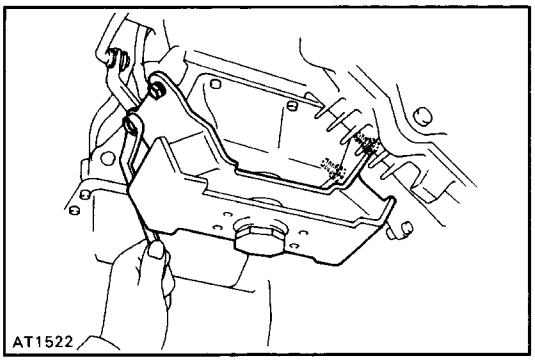
(f) Install the oil pan and torque the eleven bolts.

Torque: 7.4 N–m (75 kgf–cm, 65 in.–lbf)

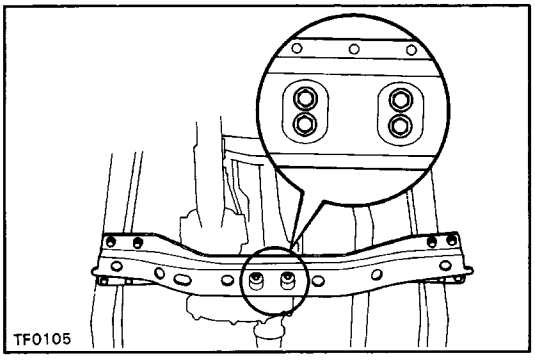
5. INSTALL DRAIN PLUG

Torque the drain plug

Torque: 20 N–m (205 kgf–cm, 15 ft–lbf)



6. INSTALL MEMBER BRACKET TO TRANSFER



7. INSTALL REAR SUPPORT MEMBER

(a) Raise the transmission slightly with a jack.

(b) Install the rear support member to the side frame with the bolts. Torque the bolts.

Torque: 95 N–m (970 kgf–cm, 70 ft–lbf)

(c) Lower the transmission and transfer.

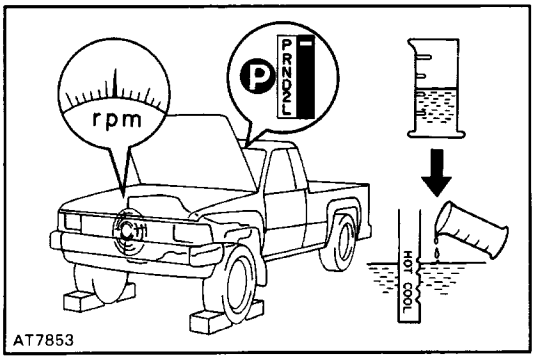
(d) Install the four mounting bolts to the engine rear mounting. Torque the bolts.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

8. REMOVE TRANSMISSION JACK

9. FILL TRANSMISSION WITH ATF

(See page AT–115**)**



NOTICE: Do not overfill.

Fluid type: ATF DEXRON®II

10. CHECK FLUID LEVEL

Throttle Cable

REMOVAL OF THROTTLE CABLE

1. DISCONNECT THROTTLE CABLE FROM THROTTLE LINKAGE

2. DRAIN TRANSMISSION FLUID

Remove the drain plug and drain the fluid into a suitable container.

3. REMOVE FRONT STABILIZER BAR

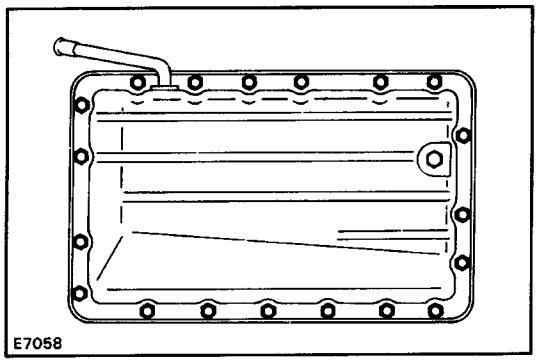
(See page SA–123)

4. REMOVE FRONT PROPELLER SHAFT

(See page PR–4)

5. REMOVE TRANSMISSION OIL PAN

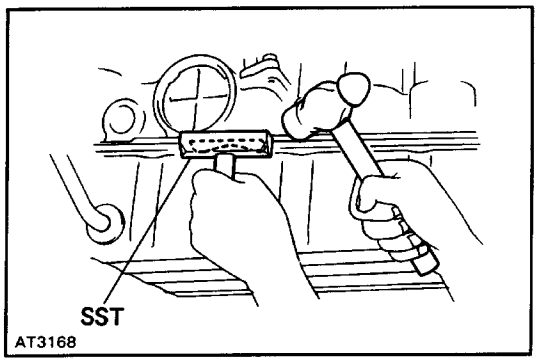
(a) Remove the nineteen bolts.



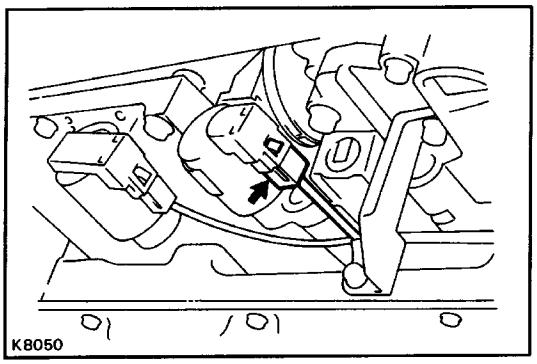
1bf Insert the blade of SST between the transmission case and oil pan, cut off applied sealer.
SST 09032–00100

NOTICE: Be careful not to damage the oil pan flange.

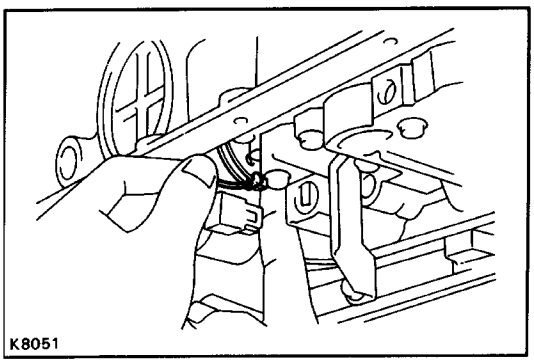
(c) Remove pan by lifting the transmission case.

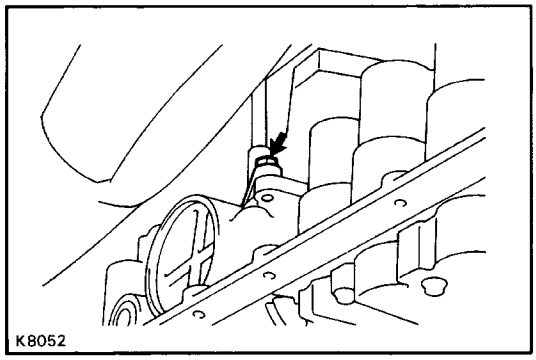


6. DISCONNECT SOLENOID CONNECTOR



7. DISCONNECT THROTTLE CABLE FROM VALVE BODY

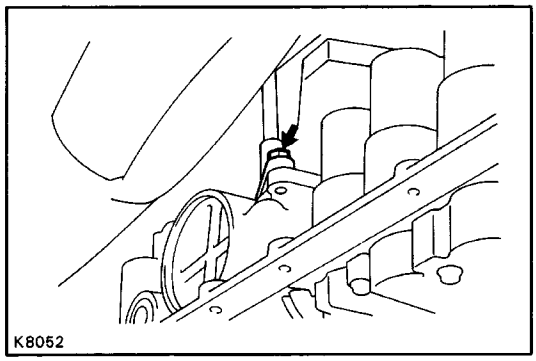




8. REMOVE THROTTLE CABLE

Remove the bolt and pull out the cable from the transmis–sion case.

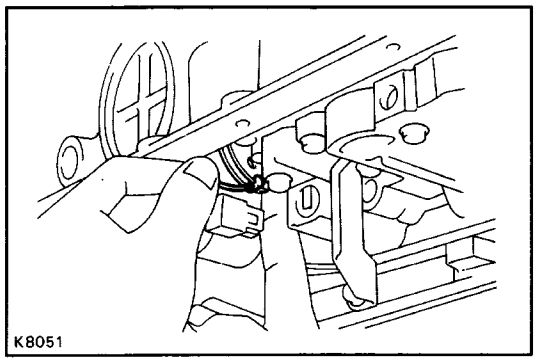
INSTALLATION OF THROTTLE CABLE



1. INSTALL CABLE INTO TRANSMISSION CASE

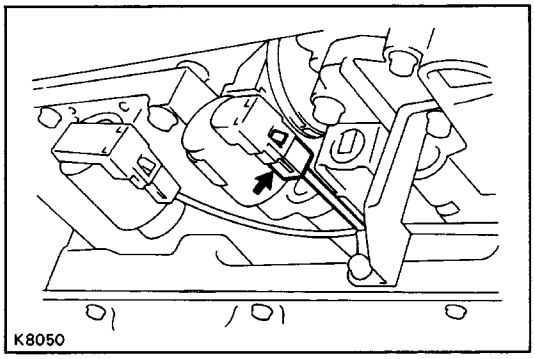
(a) Be sure to push it in all the way.

(b) Install the bolt.



2. CONNECT THROTTLE CABLE TO VALVE BODY

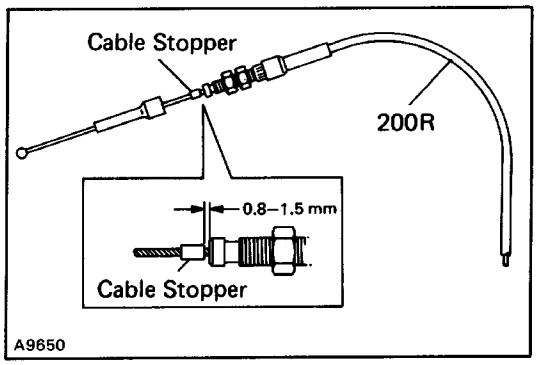
Connect throttle cable to the cam.



3. CONNECT SOLENOID CONNECTOR

4. INSTALL OIL PAN AND OIL PAN DRAIN PLUG

(See pages AT–150 and AT–151)



5. IF THROTTLE CABLE IS NEW, STAKE STOPPER ON INNER CABLE

HINT: New cable do not have a cable stopper staked.

(a) Bend the cable so there is a radius of about 200 mm (7.87 in.).

(b) Pull the inner cable lightly until a slight resistance is felt, and hold it.

(c) Stake the stopper, 0.8–1.5 mm (0.031–0.059 in.) from the end of outer cable.

6. INSTALL FRONT PROPELLER SHAFT
(See page PR–4**)**

7. INSTALL FRONT STABILIZER BAR
(See page SA–123**)**

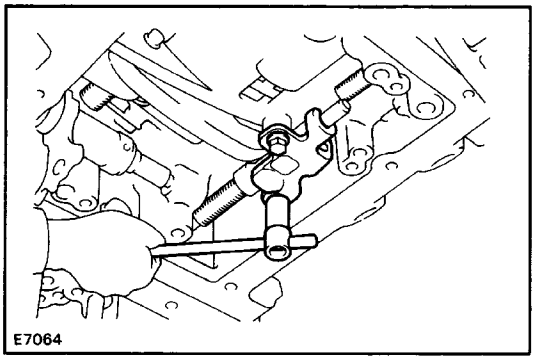
8. CONNECT THROTTLE CABLE TO THROTTLE LINKAGE

9. ADJUST THROTTLE CABLE
(See page AT–116**)**

10. FILL TRANSMISSION WITH ATF
(See page AT–115**)**

NOTICE: Do not overfill.
Fluid type: ATF DEXRON® II

11. CHECK FLUID LEVEL



Parking Lock Pawl

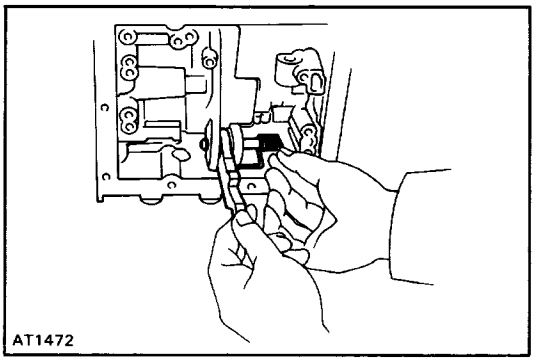
REMOVAL OF PARKING LOCK PAWL

1. REMOVE TRANSFER VALVE BODY

(See page AT–151)

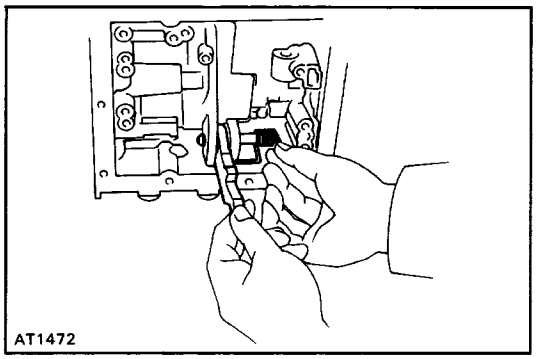
2. REMOVE PARKING LOCK PAWL BRACKET

Remove the two bolts and bracket.



3. REMOVE SPRING, SHAFT AND PARKING LOCK PAWL

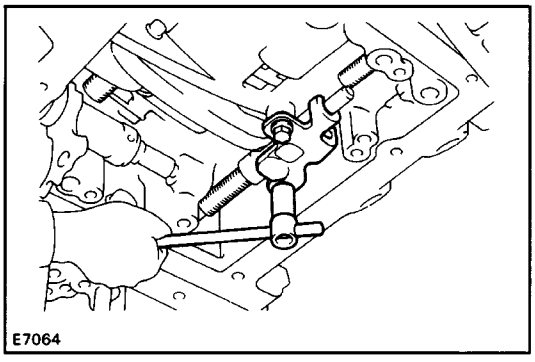
Remove the spring, shaft and parking lock pawl.



INSTALLATION OF PARKING LOCK PAWL

1. INSTALL PARKING LOCK PAWL, SHAFT AND SPRING

Install the parking lock pawl, shaft and spring.



2. INSTALL PARKING LOCK PAWL BRACKET

(a) Install two bolts finger tight.

(b) Check that the parking lock pawl operates smoothly.

(c) Torque the bolts.

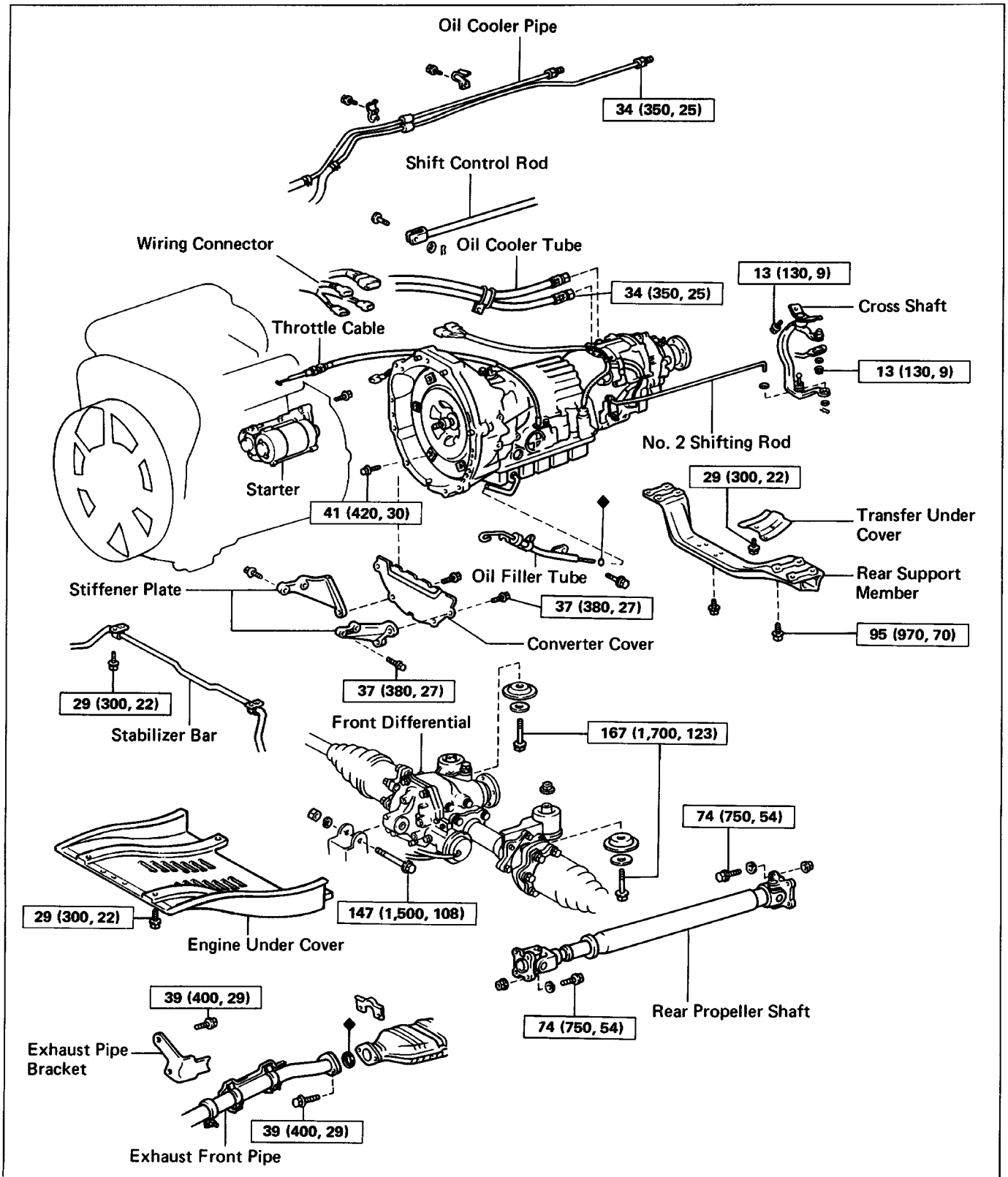
Torque: 6.9 N–m (70 kgf–cm, 61 in.¿lbf)

3. INSTALL TRANSFER VALVE BODY

(See page AT–152)

REMOVAL AND INSTALLATION OF TRANSMISSION

Remove and install the parts as shown.

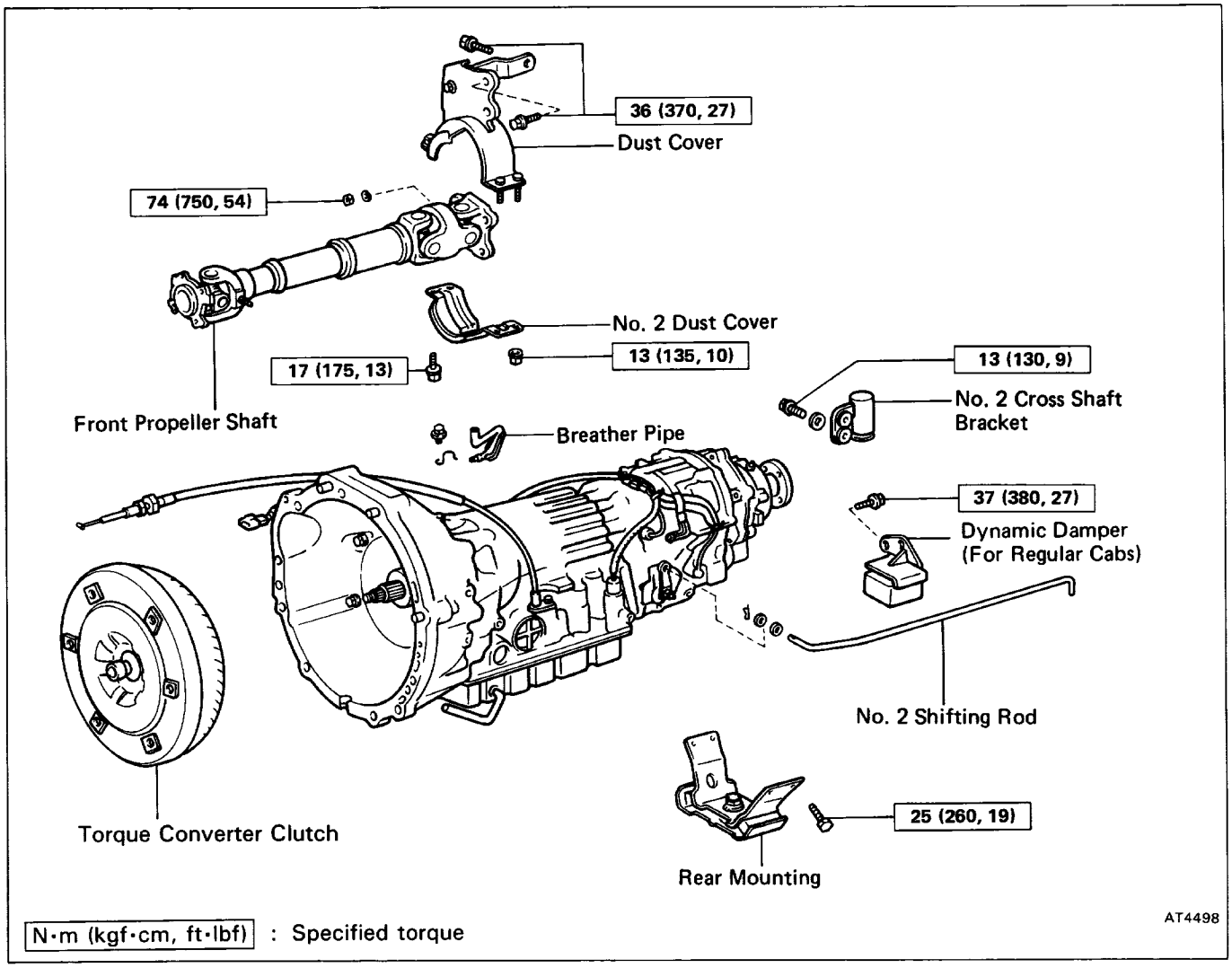


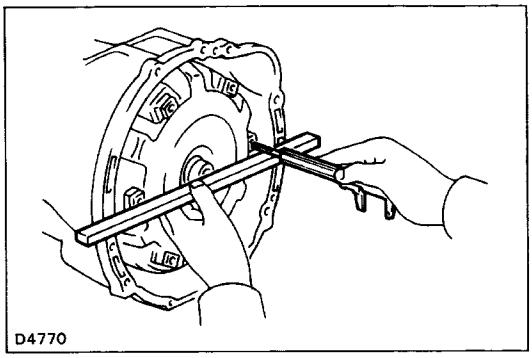
N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

AT4583

(Cont'd)





(MAIN POINT OF INSTALLATION)

1. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

Using calipers and a straight edge, measure from the installed surface of the torque converter clutch to the front surface of the transmission housing.

Correct distance: 18.0 mm (0.709 in.)

If the distance is less than the standard, check for an improper installation.

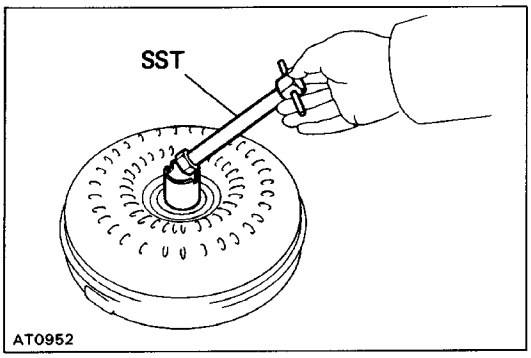
2. ADJUST TRANSMISSION THROTTLE CABLE

(See page AT–116)

3. FILL TRANSMISSION WITH ATF AND CHECK FLUID LEVEL

Fluid type: ATF DEXRON® II

NOTICE: Do not overfill.



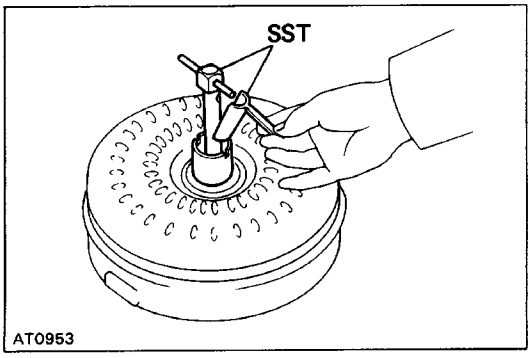
TORQUE CONVERTER CLUTCH AND DRIVE PLATE

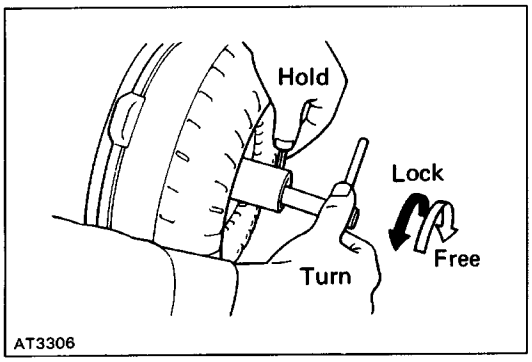
INSPECTION OF TORQUE CONVERTER CLUTCH AND DRIVE PLATE

1. INSPECT ONE–WAY CLUTCH

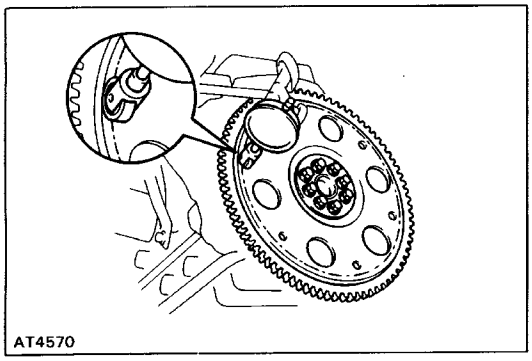
(a) Install SST into the inner race of the one–way clutch.
SST 09350–30020 (09351–32010)

(b) Install SST so that it fits in the notch of the converter hub and outer race of the one–way clutch.
SST 09350–30020 (09351–32020)





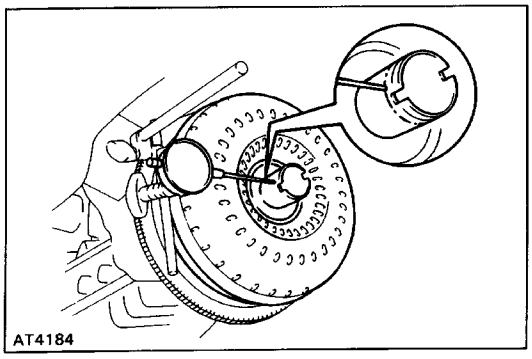
(c) With the torque converter clutch standing on its side, the clutch locks when turned counterclockwise, and
rotates freely and smoothly clockwise.
If necessary, clean the converter and retest the clutch.
Replace the converter if the clutch still fails the test.



2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

Set up a dial indicator and measure the drive plate runout.
If runout exceeds 0.20 mm (0.0079 in.) or if the ring gear is damaged, replace the drive plate. If installing a new drive plate, note the orientation of spacers and tighten the bolts.

Torque: 83 N–m (850 kgf–cm, 61 ft–lbf)



3. MEASURE TORQUE CONVERTER CLUTCH SLEEVE RUNOUT

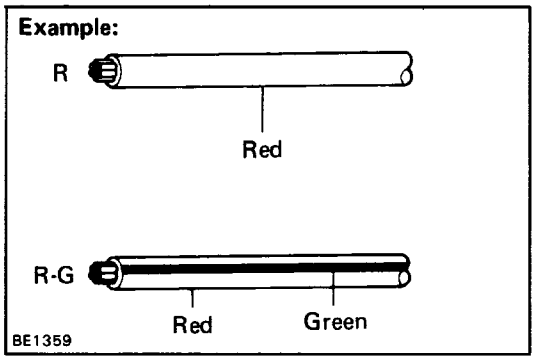
(a) Temporarily mount the torque converter clutch to the drive plate. Set up a dial indicator.
If runout exceeds 0.30 mm (0.0118 in.), try to correct by reorienting the installation of the converter. If excessive runout cannot be corrected, replace the torque converter clutch.

HINT: Mark the position of the converter to ensure correct installation.

(b) Remove the torque converter clutch.

MEMO

BODY ELECTRICAL SYSTEM



GENERAL INFORMATION

Wiring color code

Wire colors are indicated by an alphabetical code.

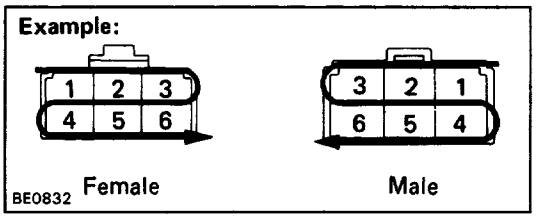
B = Black L = Blue R = Red

BR = Brown LG = Light Green V = Violet

G = Green O = Orange W = White

GR = Gray P = Pink * =Yellow

The first letter indicates the basic wire color and the sec–ond letter indicates the color of the stripe.



Connector

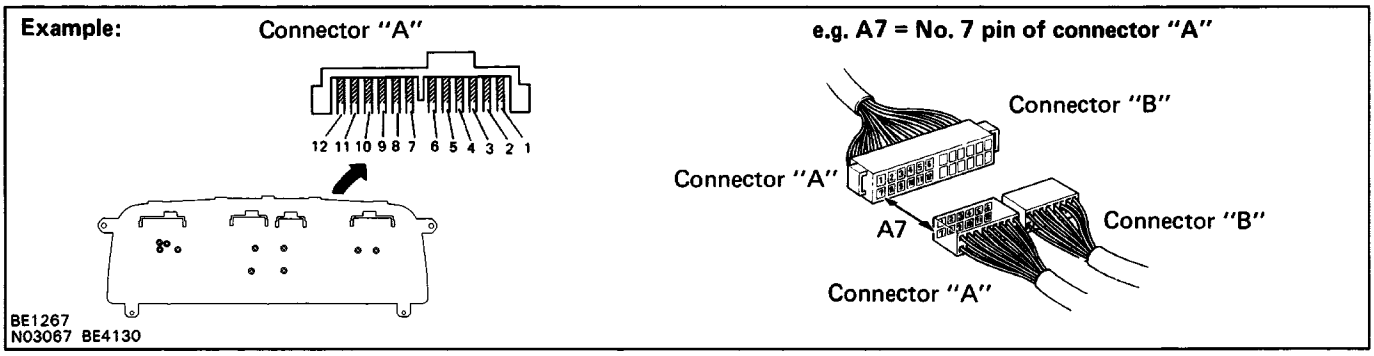
1. PIN NUMBER OF FEMALE CONNECTOR

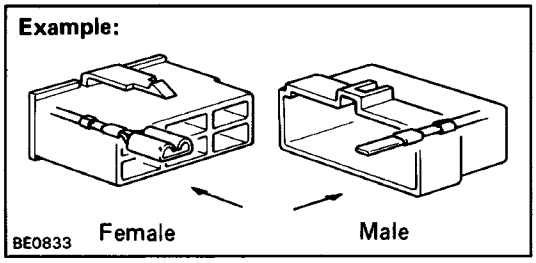
Numbered in order from upper left to lower right.

2. PIN NUMBER OF MALE CONNECTOR

Numbered in order from upper right to lower left.

HINT: When connectors with different or the same number of terminals are used with the same parts, each connector name (letter of the alphabet) and pin number is specified.





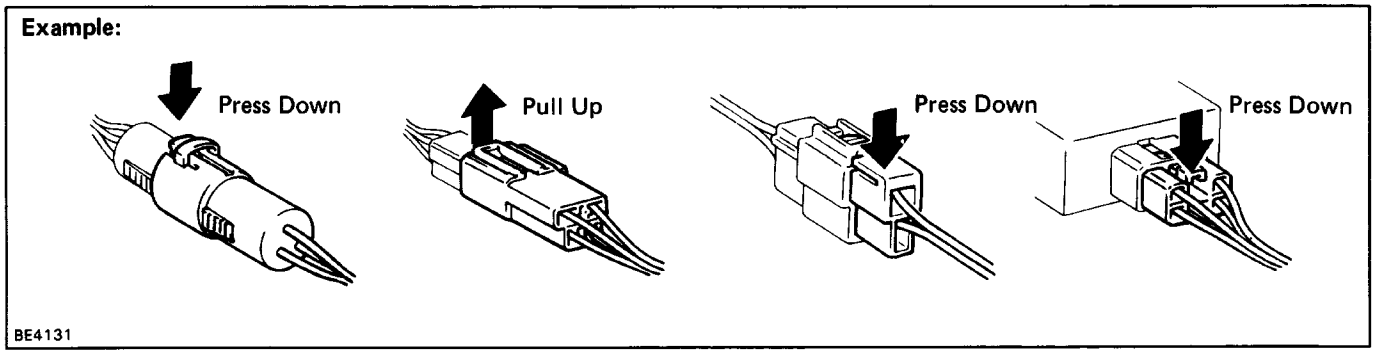
3. DISTINCTION OF MALE AND FEMALE CONNECTORS

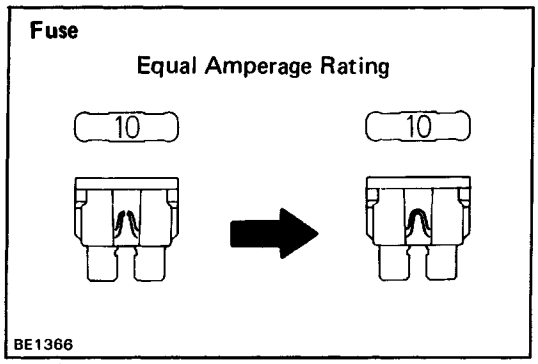
Male and female connectors are distinguished by shape of their internal pins.

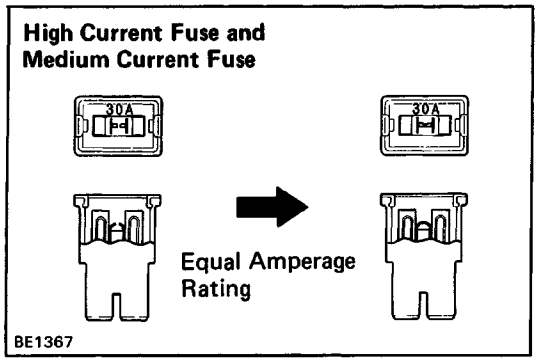
(a) All connectors are shown from the open end, and the lock is on top.

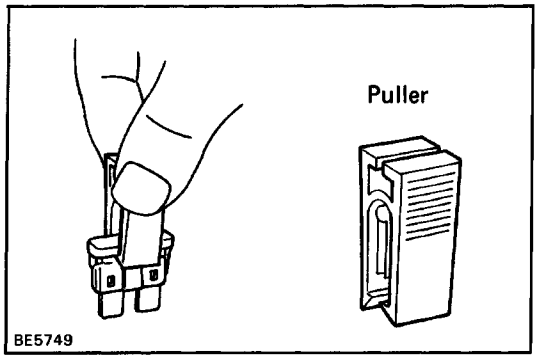
(b) To pull apart the connectors, pull on the connector itself, not the wires.

HINT: Check to see what kind of connector you are dis–connecting before pulling apart.









Replacement of High Current Fuse, Medium Current Fuse and Fuse

HINT: If replacing the fuse be sure to replace it with a fuse of fusible link with and equal amperege rating.

NOTICE:

1. **Turn off all electrical components and the ignition switch before replacing a fuse or fusible link. Do not exceed the fuse or fusible link amperage rating.**
2. **Always use a fuse puller for removing and inserting a fuse. Remove and insert straight in and out without twisting. Twisting could force open the terminals too much, resulting in a bad connection.**

If a fuse or fusible link continues to blow, a short circuit is indicated. The system must be checked by a qualified technician.

How to Inspect for System Inspection

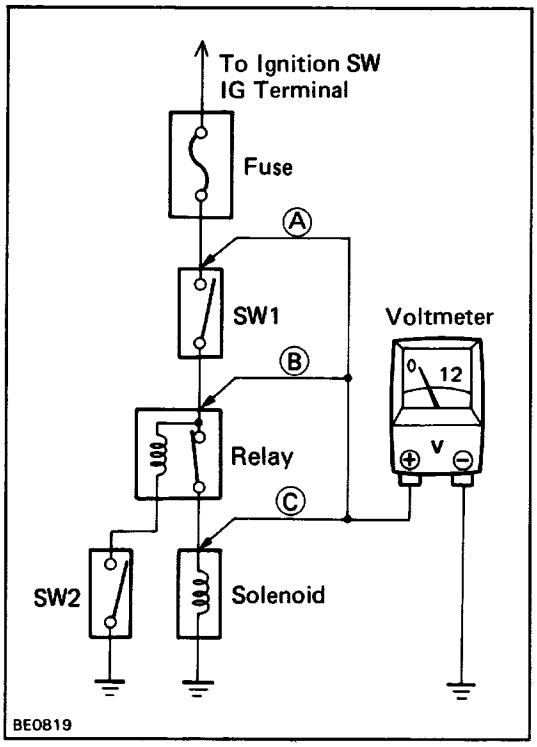
This inspection procedure is a simple troubleshooting which should be carried out on the vehicle during system operation and was prepared on the assumption of system component troubles (except for the wires and connectors, etc.).

Always inspect the trouble taking the following items into consideration.

- Ground point fault
- Open or short circuit of the wire harness
- Connector or terminal connection fault
- Fuse or fusible link fault

NOTICE:

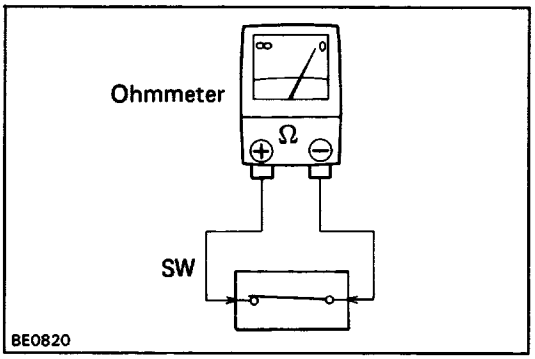
1. This is an on–vehicle inspection during system operations. Therefore, inspect the trouble with due regard for security.
2. In case of connecting the battery directly, be careful not to short circuit, and select the applicable voltage.



Check for Voltage

(a) Establish conditions in which voltage is present at the check point.
Example:
(A) Ignition switch on
(B) Ignition switch and switch 1 (SW 1) on.
(C) Ignition switch, switch 1 (SW 1) and relay on (switch 2 (SW2) off).

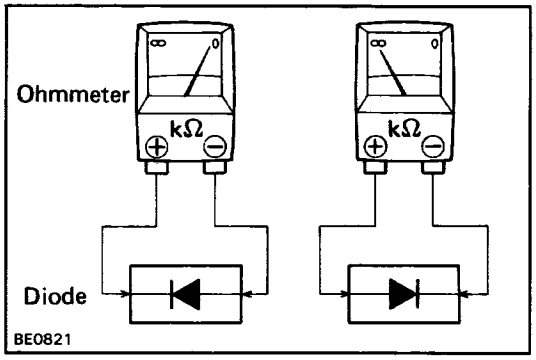
(b) Using a voltmeter, connect the negative (–) lead to a good ground point or negative (–) battery terminal and the positive (+) lead to the connector or component terminal. This check can be done with a test bulb instead of a voltmeter.



Check for Continuity and Resistance

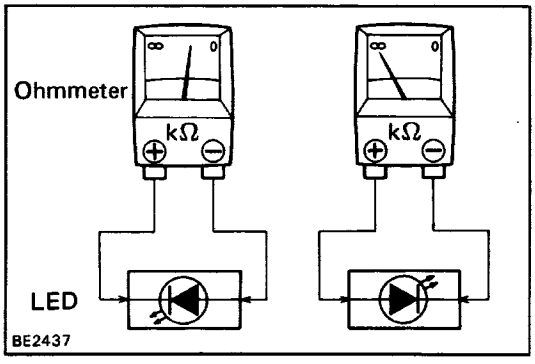
(a) Disconnect the battery terminal or wire so there is no voltage between the check points.

(b) Contact the two leads of an ohmmeter to each of the check points.



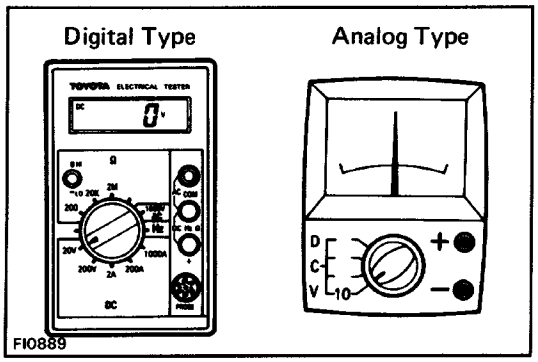
If the circuit has diodes, reverse the two leads and check again.
When contacting the negative (–) lead to the diode positive (+) side and the positive (+) lead to the negative (–) side, there should be continuity. When contacting the two leads in reverse, there should be no continuity.

HINT: Specifications may vary depending on the type of tester, so refer to the tester's instruction manual before performing the inspection.

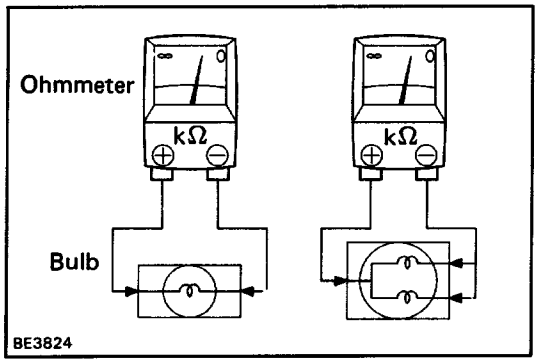


Check LED (Light Emitting Diode) in the same manner as that for diodes.

- Use a tester with a power source of 3 V or greater to overcome the circuit resistance.
- If a suitable tester is not available, apply battery positive voltage and check that the LED lights up.

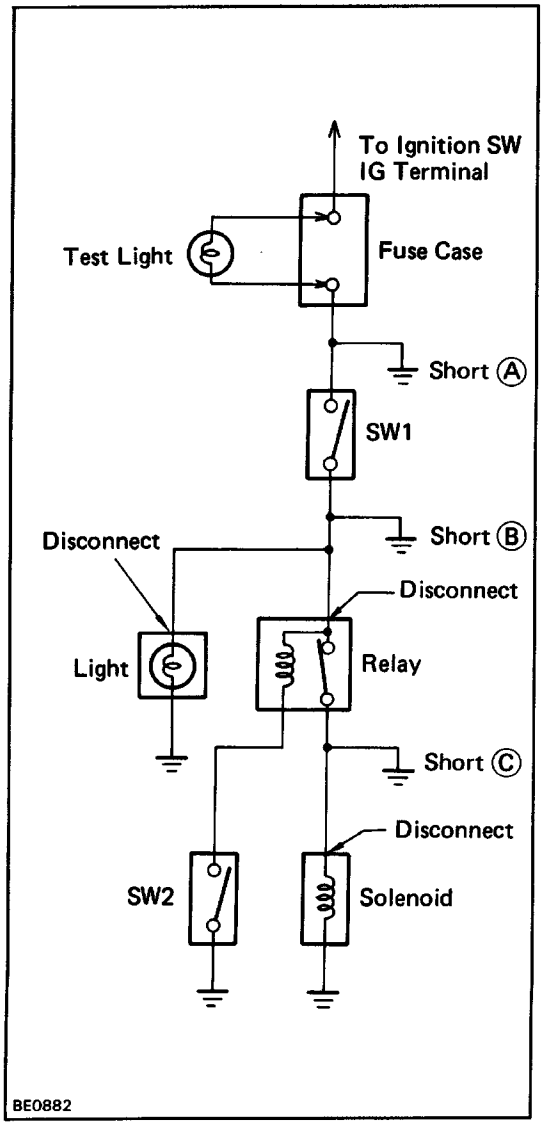


(c) Use a volt/ohmmeter with high impedance (10 k/V minimum) for troubleshooting of the electrical circuit.



Check the Bulb

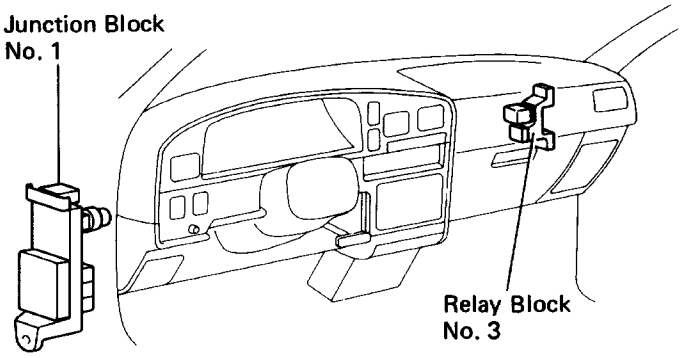
(a) Remove the bulb.
(b) There should be continuity between the respective terminals of the bulb together with a certain amount of resistance.
(c) Apply the two leads of the ohmmeter to each of the terminals.
(d) Apply battery positive voltage and check that the bulb light up.

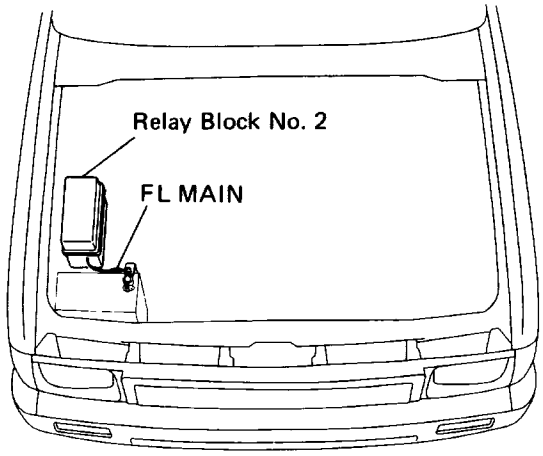


Check for Short Circuit

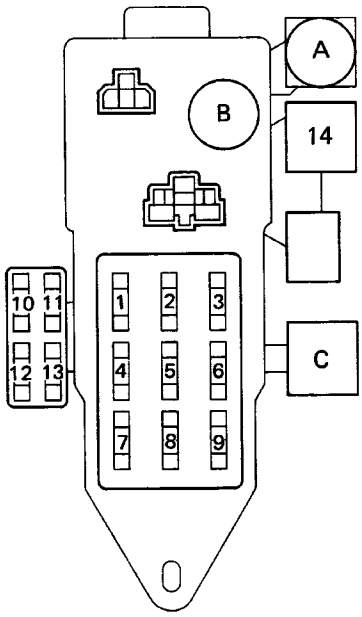
(a) Remove the blown fuse and eliminate all loads from the fuse.
(b) Connect a test bulb in place of the fuse.
(e) Establish conditions in which the test bulb comes on.
Example:
(A) Ignition switch on.
(B) Ignition switch and switch 1 (SW 1) on.
(C) Ignition switch, switch 1 (SW 1) and relay on (connect the relay) and switch 2 (SW2) off (or disconnect switch 2 (SW2)).
(d) Disconnect and reconnect the connectors while watching the test bulb.
The short lies between the connector where the test bulb stays lit and the connector where the bulb goes out.
(e) Find the exact location of the short by lightly shaking the problem wire along the body.

POWER SOURCE
Parts Location





Junction Block No. 1

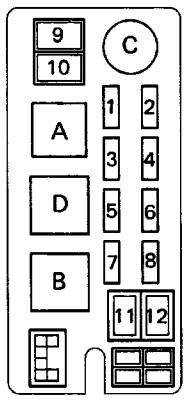


Fuses

1.	ENGINE	10A
2.	IGN	7.5A
3.	TAIL	15A
4.	WIPER	20A
5.	GAUGE	10A
6.	STOP	15A
7.	RADIO	7.5A
8.	CIG	15A
9.	TURN	10A
10.	REAR ANTILOCK	15A
11.	–	–
12.	ECM-IG	20A
13.	–	–
14.	POWER (w/ Power Door Lock and Power Window)	30A

Relays
A. Back Up Relay (USA)
DRL Relay No. 4 (Canada)
B. Taillight Control Relay
C. Horn Relay
14. Back Up Relay
(CANADA with column A/T)

Relay Block No. 2



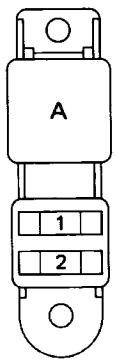
Fuses

1.	CHARGE	7.5A
2.	MFI	15A
3.	HAZ-HORN	15A
4.	DOME	15A
5.	(USA) HEAD (RH)	10A
6.	(USA) HEAD (LH)	10A
7.	–	–
8.	–	–
9.	GEN (H-fuse)	80A
10.	–	–
11.	AM1 (H-fuse)	40A or 60A
12.	AM2 (H-fuse) (CANADA)	30A

1.	DRL	7.5A
5.	HEAD LO (RH)	10A
6.	HEAD LO (LH)	10A
7.	HEAD HI (RH)	10A
8.	HEAD HI (LH)	10A

Relays
A. Headlight Dimmer Relay (CANADA)
B. Headlight Control Relay
C. MFI Relay
D. Starter Relay

Relay Block No. 3



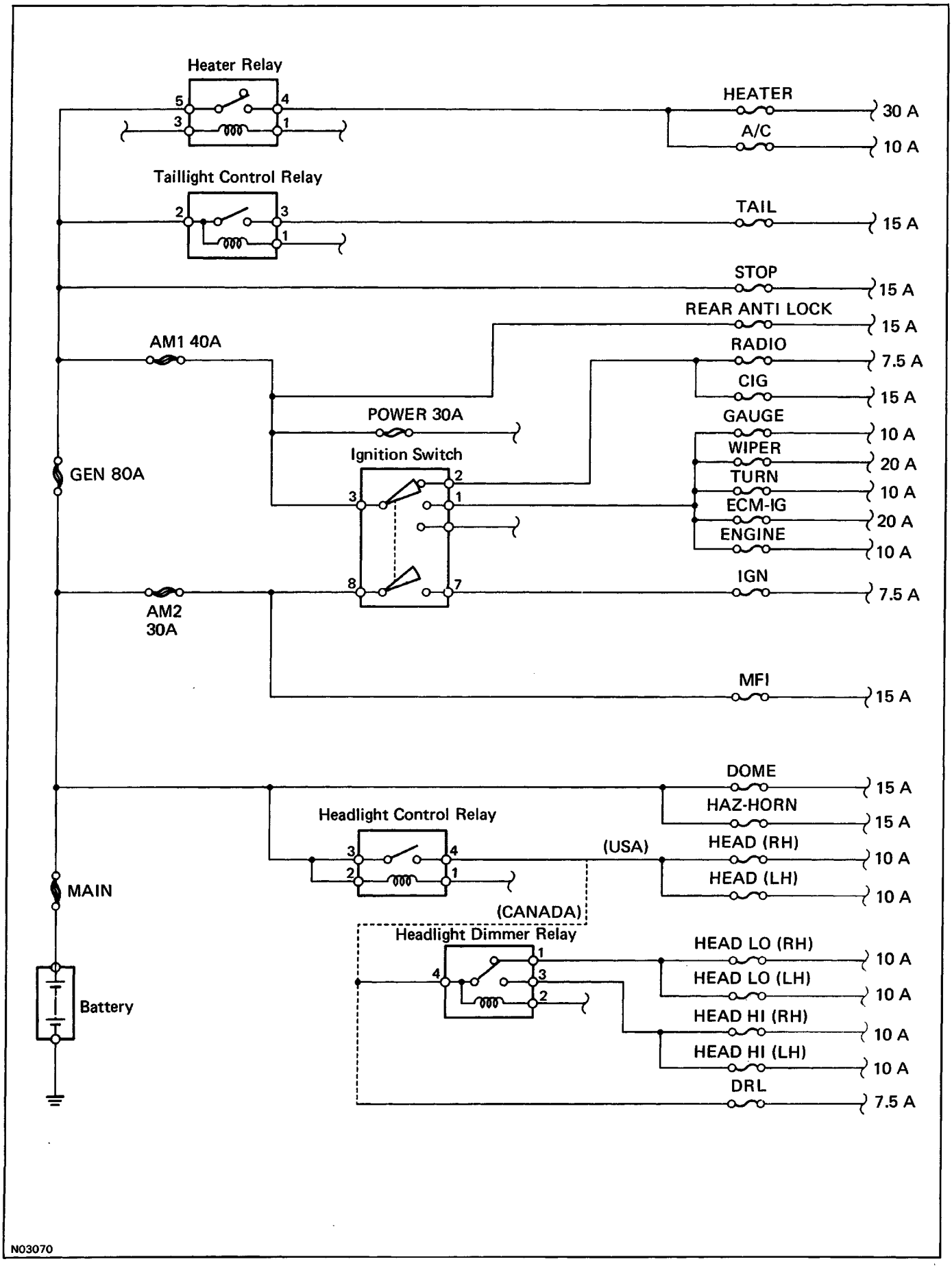
Fuses

1.	A/C	10A
2.	HEATER	30A

Relay
A. Heater Relay

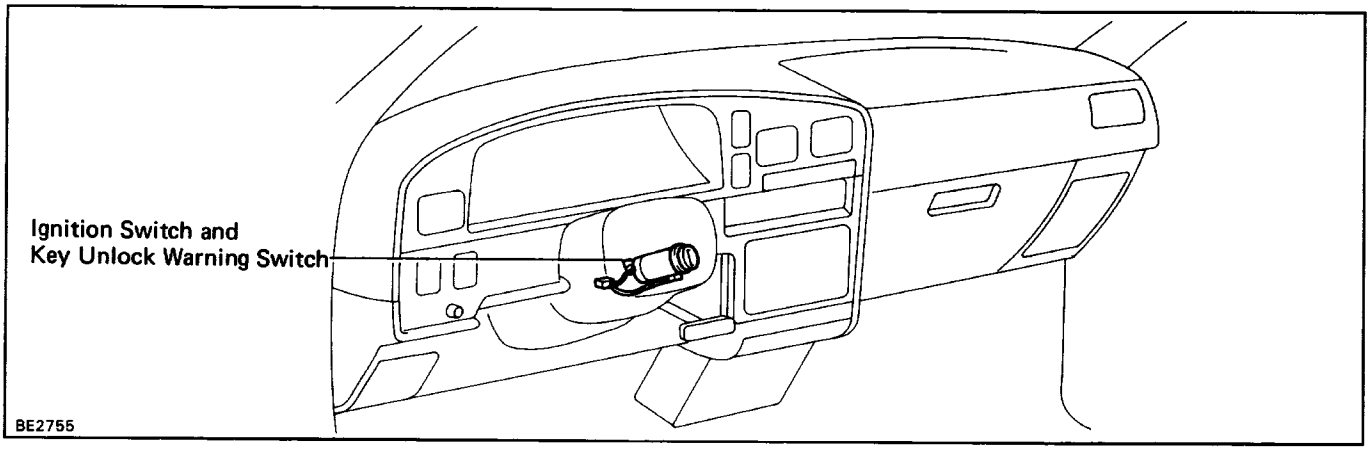
BE2946 BE2947
N02967 N02966
BE2950

Wiring Diagram

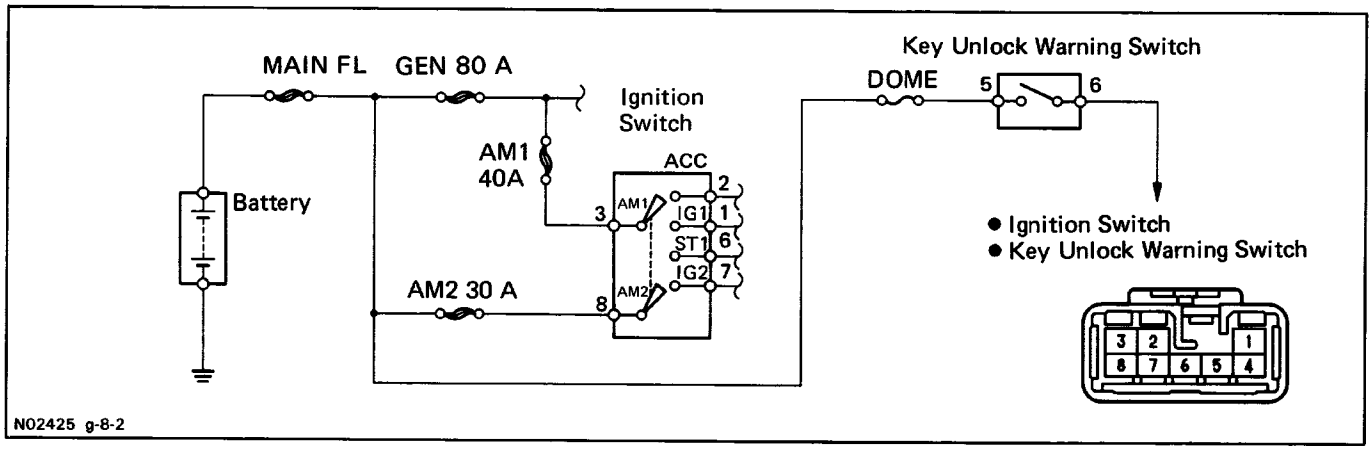


IGNITION SWITCH

Parts Location



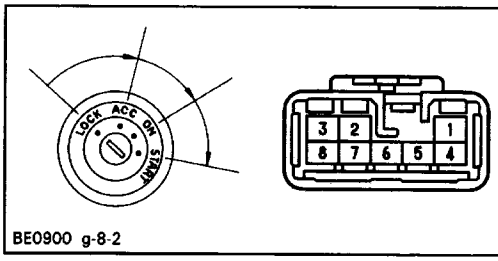
Wiring and Connector Diagrams



Parts Inspection

Ignition System

INSPECT SWITCH
(ignition Switch /Continuity)

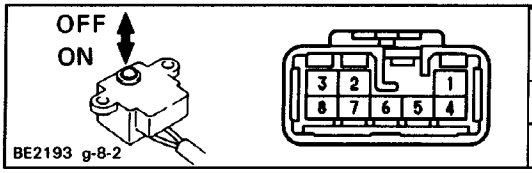


Terminal / Switch position	1	2	3	6	7	8
LOCK						
ACC		○—○	○—○			
ON	○—○	○—○	○—○		○—○	
START	○—○		○—○	○—○	○—○	

If continuity is not as specified, replace the switch.

Key Confine Prevention System

1. INSPECT SWITCH
(Key Unlock Warning Switch/Continuity)

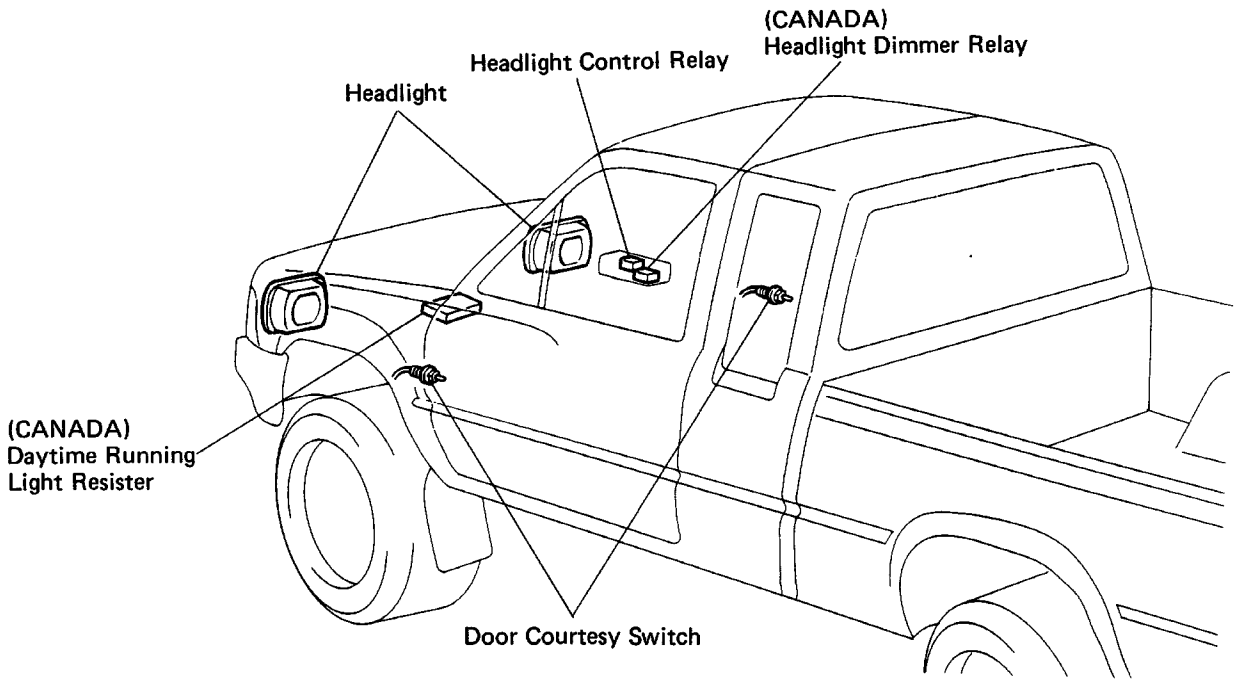


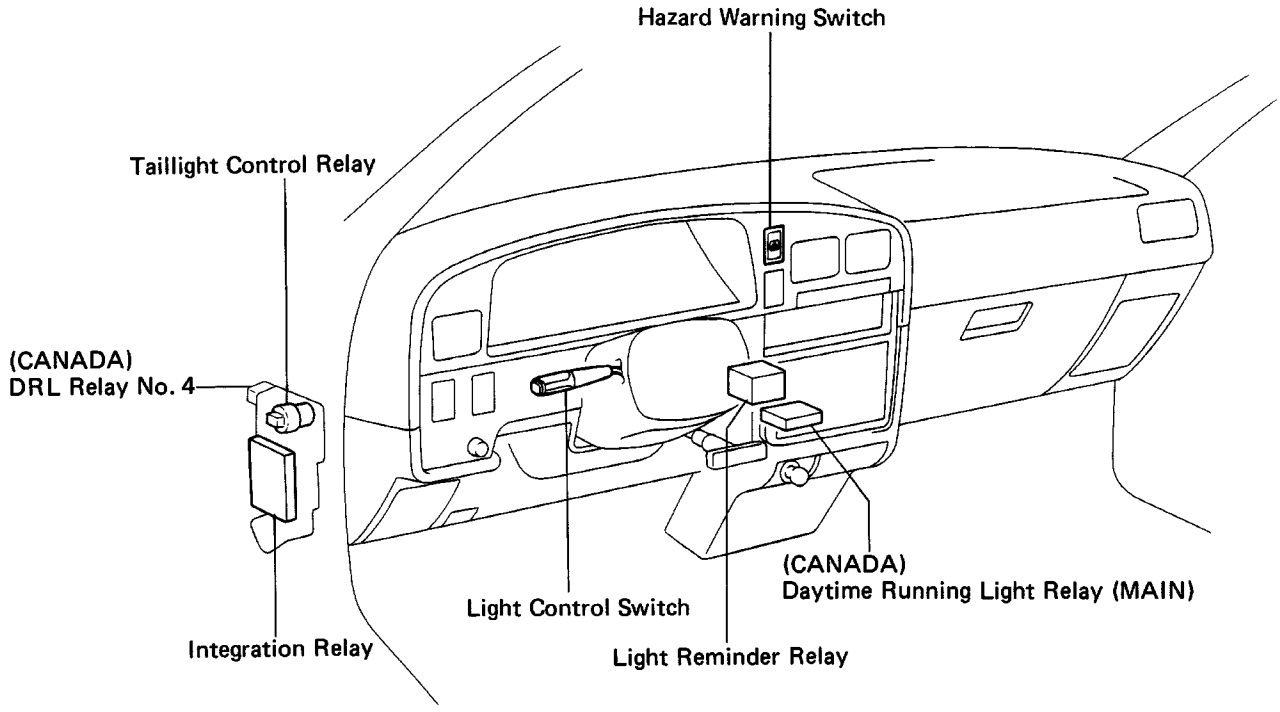
Terminal / Switch position	3	4
OFF (Key removed)		
ON (Key set)	○	○

(Door Courtesy Switch/Continuity)
See step 2 on page BE–42.
If continuity is not as specified, replace the switch.

2. INSPECT RELAY
See step 3 of Integration Relay on page BE–42.

LIGHTING SYSTEM
Parts Location

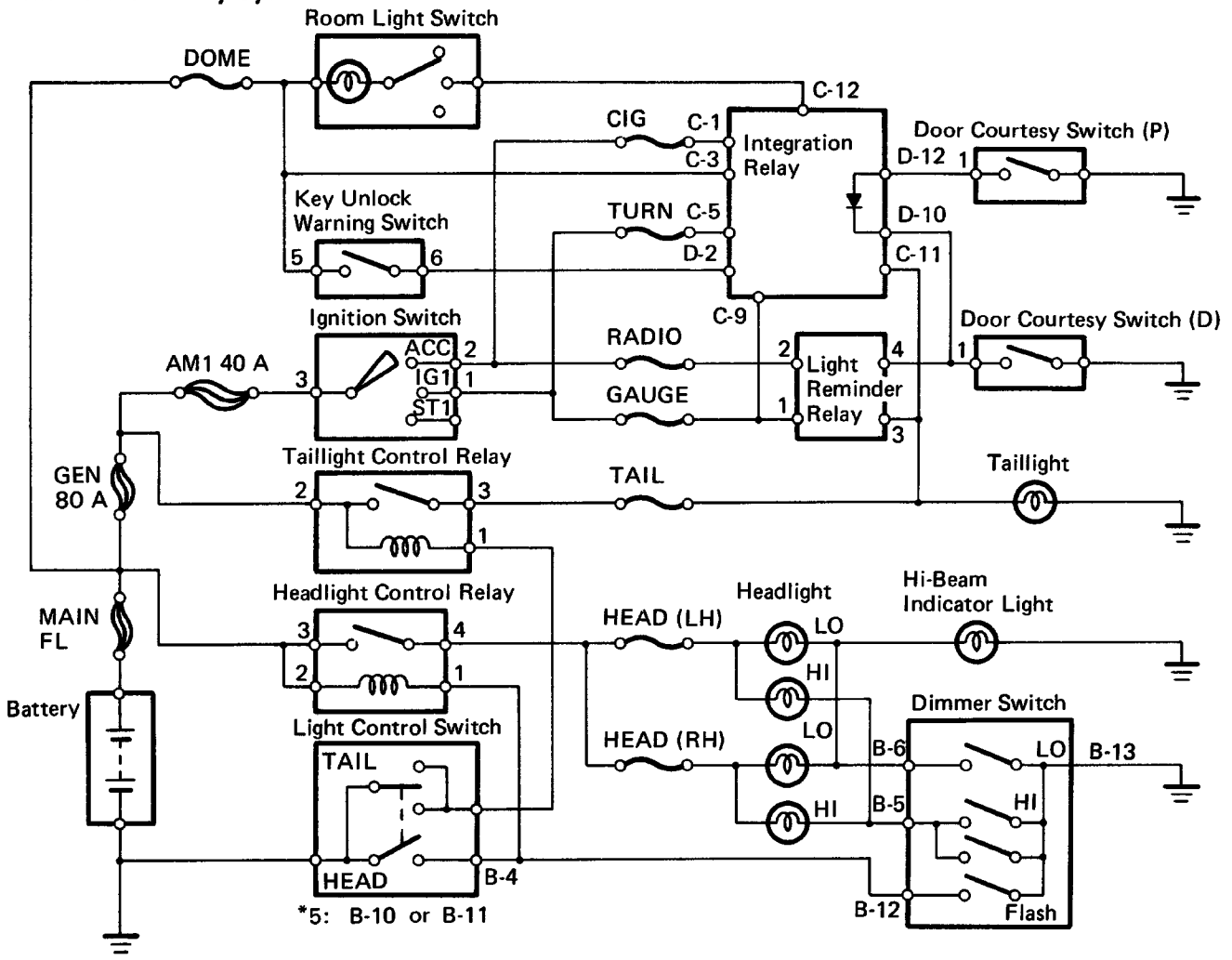




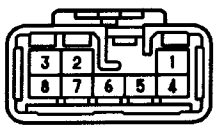
N03072
N03160

Wiring and Connector Diagrams

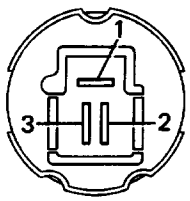
- **Headlight System (USA)**
- **Taillight System (USA)**
- **Lights-On Warning System**
- **Illuminated Entry System**



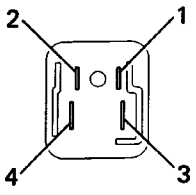
- Ignition Switch
- Key Unlock Warning Switch



Taillight Control Relay

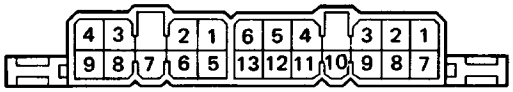


Headlight Control Relay

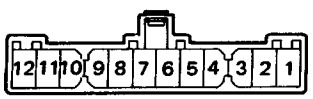


- Light Control Switch
- Dimmer Switch

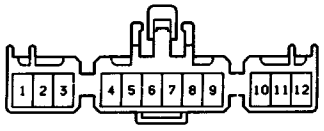
Connector "A" Connector "B"



Integration Relay
J/B Side: Connector "C"



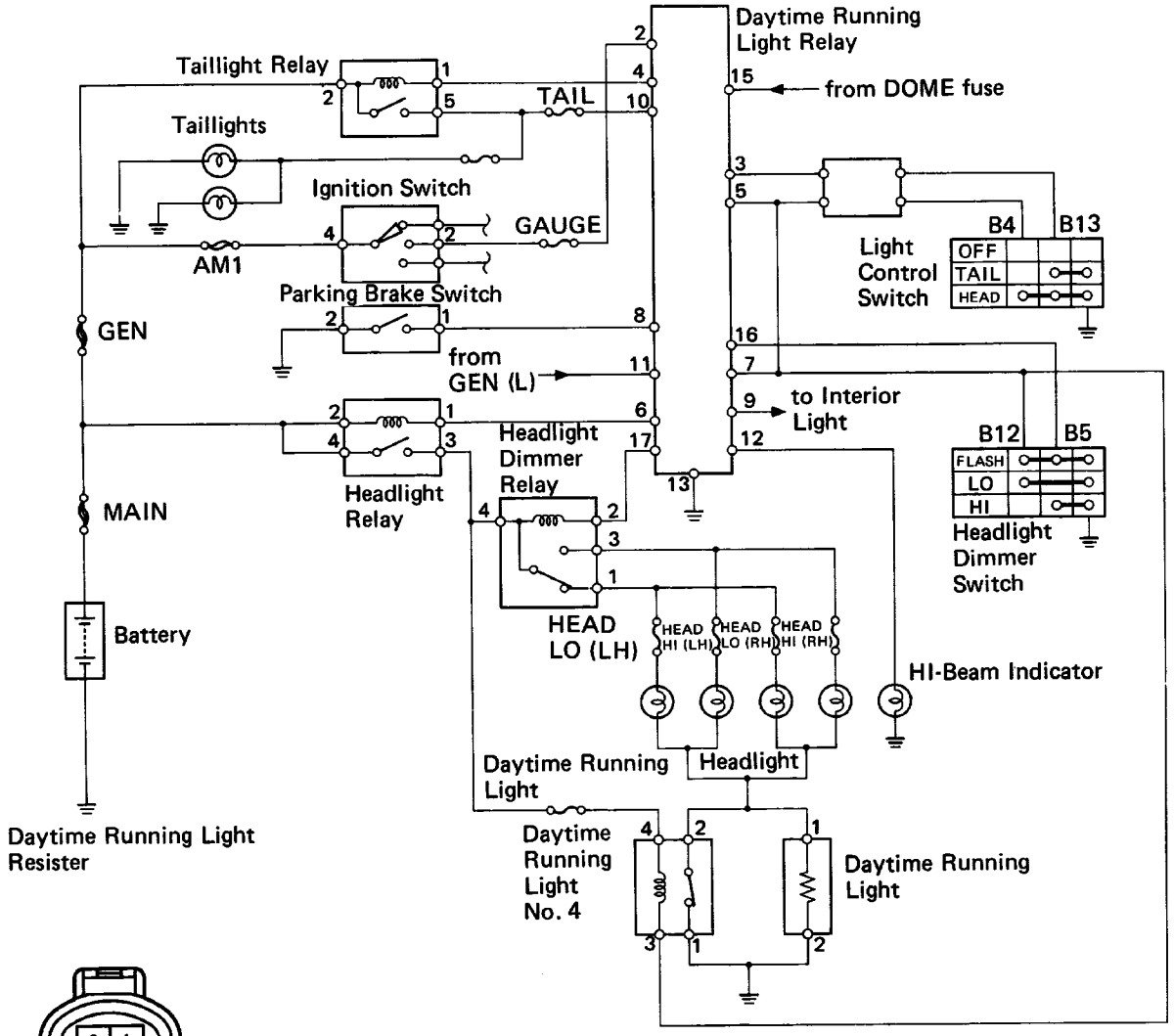
Wire Harness Side: Connector "D"

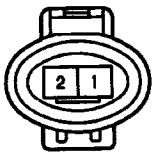


Light Reminder Relay

BE5627
g-8-2 BE2763 BE1838 BE0111
BE1851 S-12-1-B H-4-2

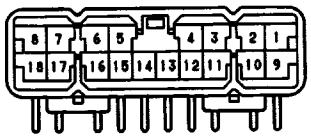
• Daytime Running Light System (CANADA)



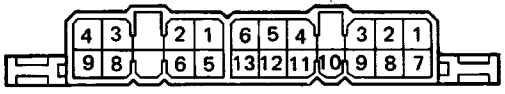


Daytime Running Light Relay

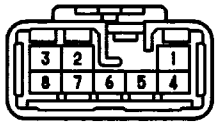
• Light Control Switch
• Headlight Dimmer Switch



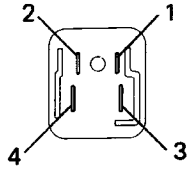
Connector "A" Connector "B"



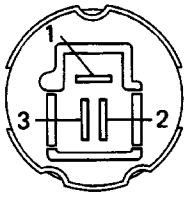
Ignition Switch



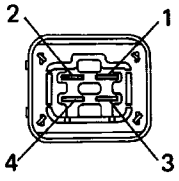
Daytime Running Light Relay and Headlight Control Relay



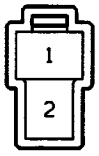
Taillight Control Relay



Headlight Dimmer Relay

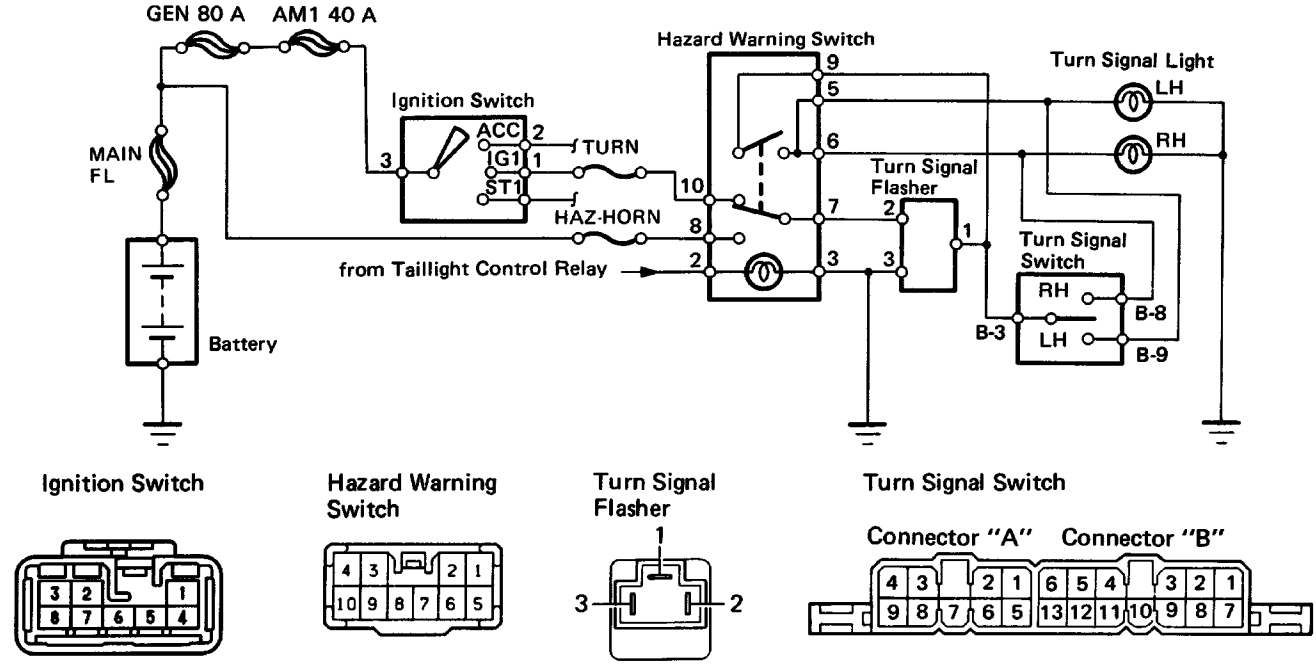


Parking Brake Switch



N02871
lg-2-2
e-18-2-A BE0111 g-8-2
BE1838 BE2763 BE1839 H-2-2

• Turn Signal and Hazard Warning System



Ignition Switch

Hazard Warning Switch

Turn Signal Flasher

Turn Signal Switch

Connector "A" Connector "B"

BE5629
g-8-2 S-10-2 BE2896 BE0111

Troubleshooting

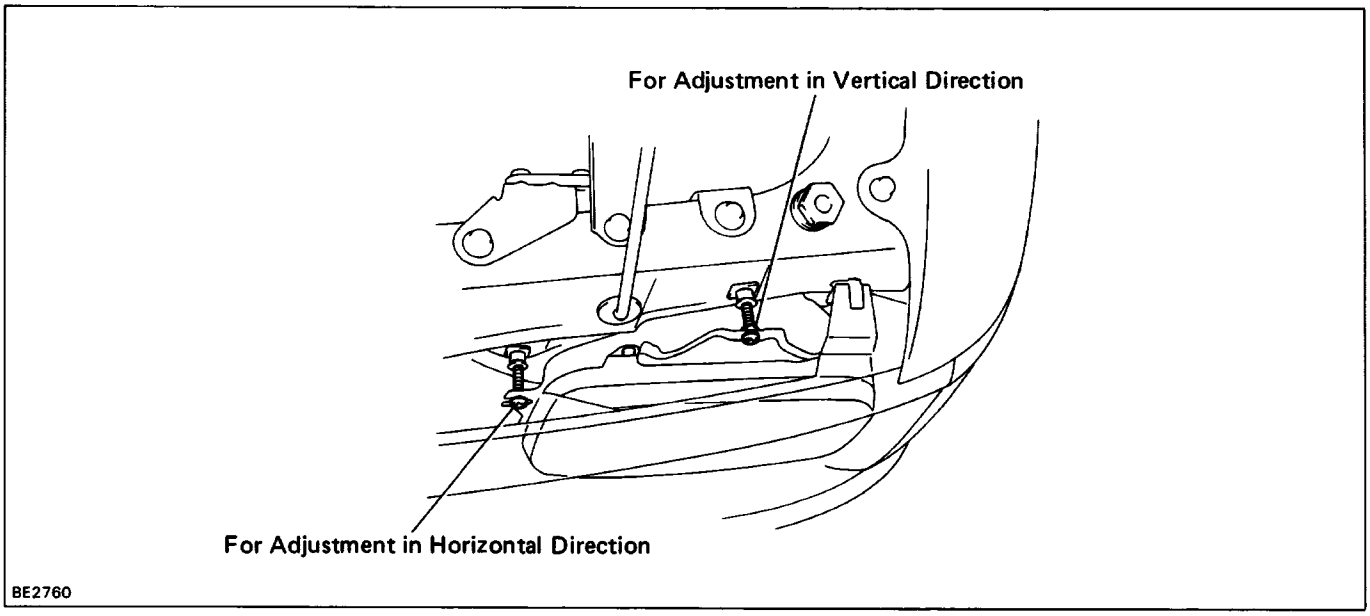
Problem	Possible cause	Remedy	Page
Only one light does not light up	Light bulb burned out Socket, wire or ground faulty	Replace sealed beam headlight Repair as necessary	
Headlights do not light up	Fusible link blown Headlight control relay faulty Light control/dimmer switch faulty Daytime running light relay faulty Wiring and ground faulty	Replace fusible link Check relay Check switch Check relay circuit Repair as necessary	BE–1 9 BE–1 9 BE–20
High beam headlights or headlight flashers do not operate	Light control/dimmer switch faulty Daytime running light really faulty Wiring or ground faulty	Check switch Check relay Repair as necessary	BE–1 9 BE–20
Tail, parking and license light do not light up	TAIL fuse blown Fusible link blown Taillight control relay faulty Light control relay faulty Daytime running light relay faulty Wiring or ground faulty	Replace fuse and check for short Replace fusible link Check relay Check switch Check relay Repair as necessary	BE–3 BE–19 BE–1 9 BE–20
Stop lights do not light up	STOP fuse blown Stop light switch faulty Wiring or ground faulty	Replace fuse and check for short Adjust or replace switch Repair as necessary	BE–3
Stop lights stay on	Stop light switch faulty	Adjust or replace switch	
Instrument lights do not light up (taillight light up)	Wiring or ground faulty	Repair as necessary	
Turn signal does not flash on one side	Turn signal switch faulty Wiring or ground faulty	Check switch Repair as necessary	BE–1 9

Troubleshooting (Cont'd)

Problem	Possible cause	Remedy	Page
Turn signal do not operate	HAZ–HORN fuse blown	Replace fuse and check for short	BE–3
	Turn signal flasher faulty	Check flasher	
	Turn signal/hazard switch faulty	Check switch	BE–23
	Wiring or ground faulty	Repair as necessary	BE–23
Hazard warning lights do not operate	HAZ–HORN fuse blown	Replace fuse and check for short	BE–3
	Turn signal flasher faulty	Check flasher	
	Turn signal/hazard switch faulty	Check switch	BE–23
	Wiring or ground faulty	Repair as necessary	BE–23
Daytime running light system does not operate	DOME fuse blown	Replace fuse and check for short	BE–3
	GAUGE fuse blown		
	IG N fuse blown		
	HEAD fuse blown		
	TAIL fuse blown		
	Headlight control relay faulty		
	Taillight control relay faulty		
	Dimmer relay faulty	Check relay	BE–1 9
	Ignition switch faulty	Check relay	BE–19
	Light control/dimmer switch faulty	Check relay	BE–20
	Wiring or ground faulty	Check switch	BE–8
		Check switch	BE–1 9
		Repair as necessary	

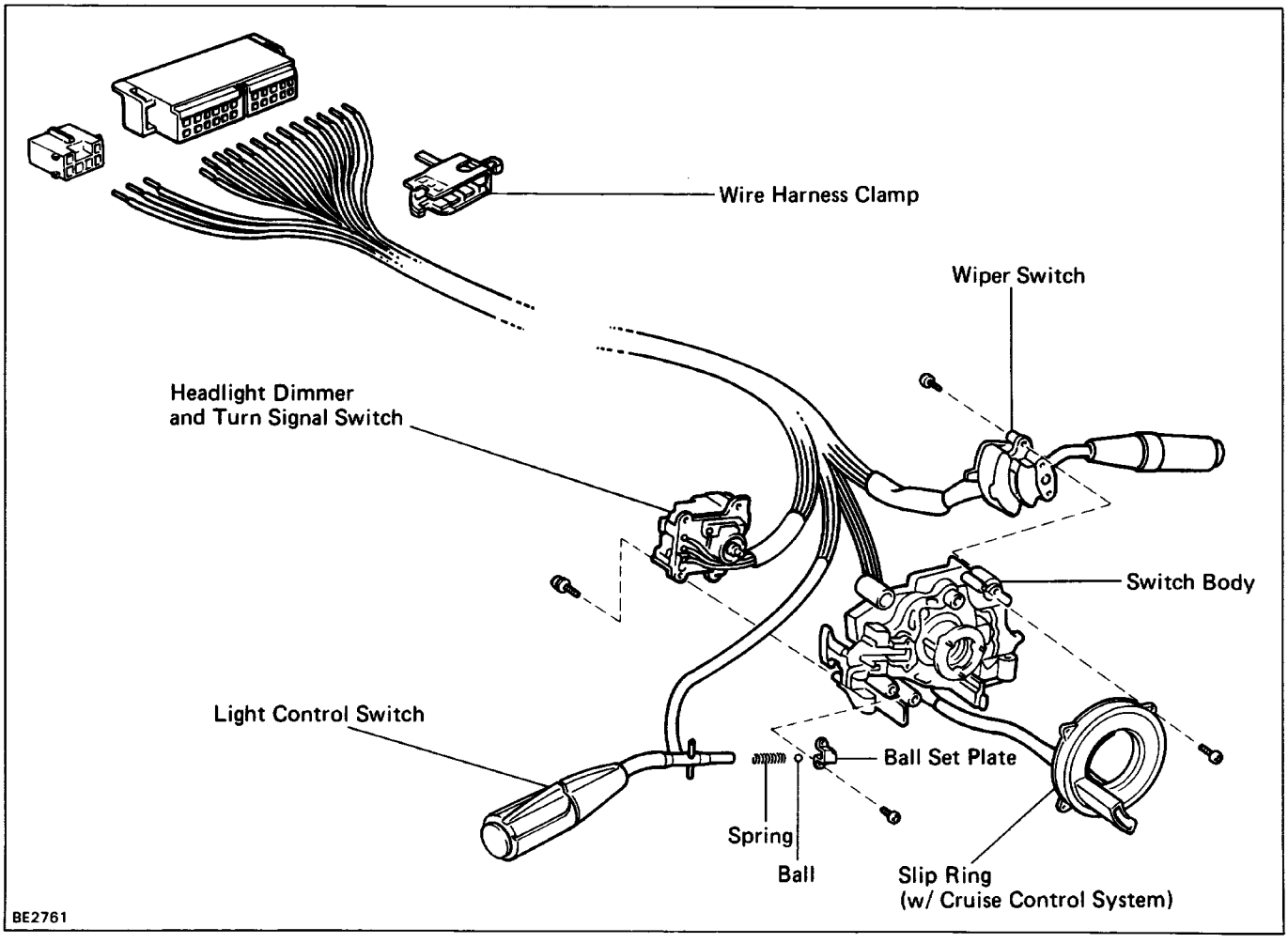
Parts Adjustment

Adjustment of Light Aiming



Parts Replacement

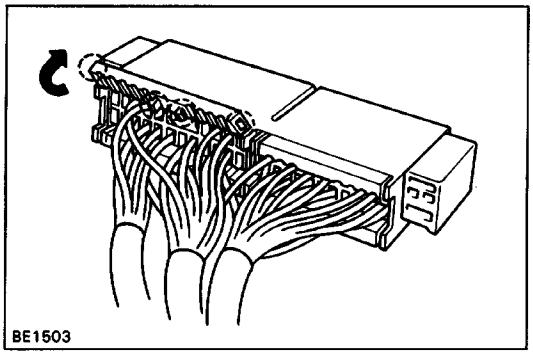
Components



Disassembly of Combination Switch

NOTICE: w/ Cruise Control System
To prevent damage to the slip ring when removing the steering wheel, be careful of the following points.

- **Keep the steering wheel in the "straight–ahead" steering position.**
- **Do not let the steering wheel strongly interfere with the connector part of the slip ring.**

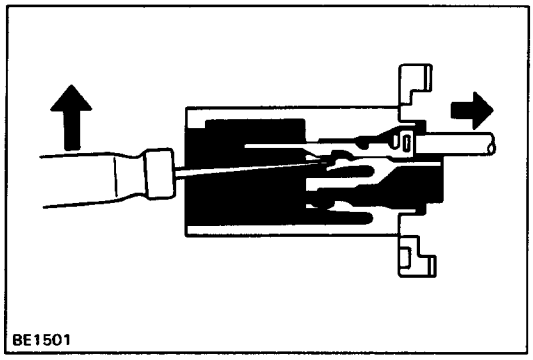

BE1503

1. REMOVE WIRE HARNESS CLAMP FROM WIRE HARNESS

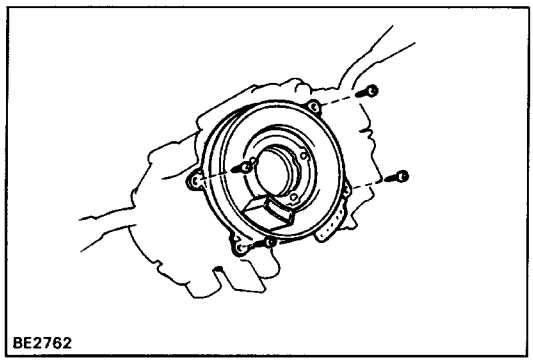
Pry loose– the two locking lugs and remove the clamp from the wire harness.

2. REMOVE TERMINALS FROM CONNECTOR

(a) Release four tabs and open the terminal cover.

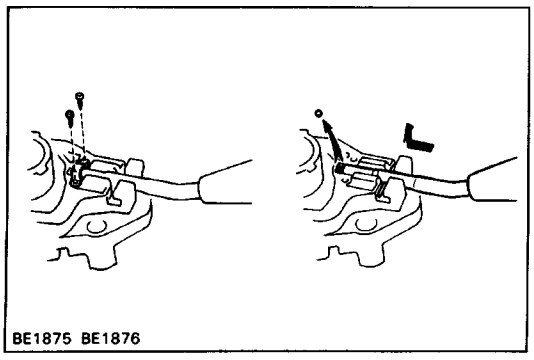

BE1501

(b) From the open end, insert a miniature screwdriver between the locking lug and terminal.
(c) Pry down the locking lug with the screwdriver and pull the terminal out from the rear.


BE2762

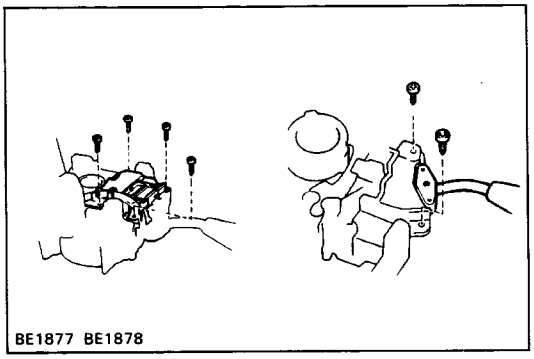
3. (w! Cruise Control System) REMOVE SLIP RING

Remove four screws and the slip ring from the switch body.


BE1875 BE1876

4. REMOVE LIGHT CONTROL SWITCH

(a) Remove two screws and the ball set plate from the switch body.
(b) Remove the ball and slide out the switch from the switch body with the spring.

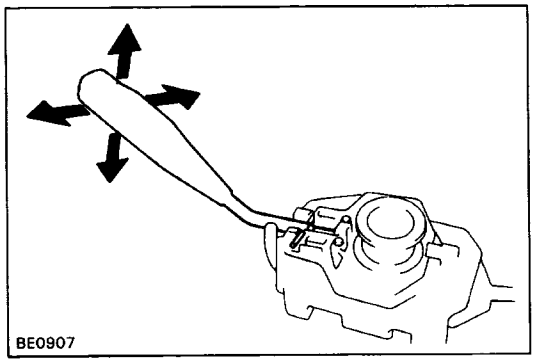


5. REMOVE HEADLIGHT DIMMER AND TURN SIGNAL SWITCH

Remove four screws and the switch from the switch body.

6. REMOVE WIPER AND WASHER SWITCH

Remove two screws and the switch from the switch body.

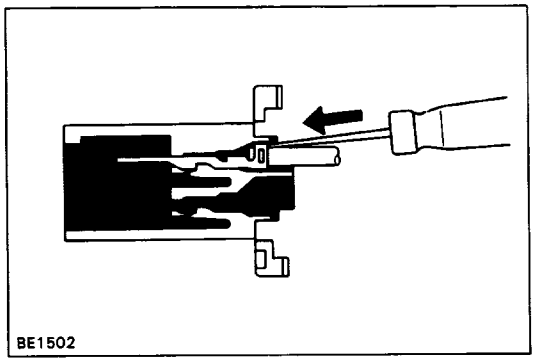


Assembly of Combination Switch

INSTALL PARTS OF COMBINATION SWITCH IN REVERSE SEQUENCE OF REMOVAL

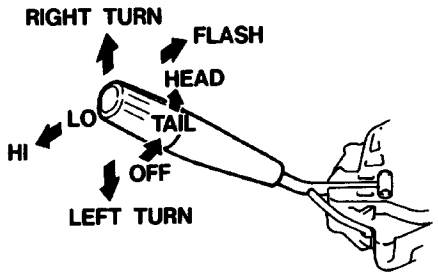
HINT:

- After installing the light control switch to the switch body, insure that the switch operates smoothly.

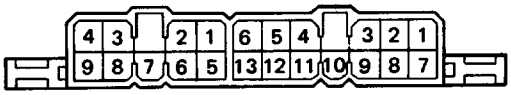


- Push in the terminal until it is securely locked in the connector lug.

Reference:



Connector "A" Connector "B"



BE2414
BE0111

Parts Inspection

Headlight, Taillight and Daytime Running Light System

1. INSPECT COMBINATION SWITCH

(Light Control Switch /Continuity)

Terminal (Color) / Switch position	B-10 (W)	B-11 (W)	B-4 (R)
OFF			
TAIL	○—○		
HEAD	○—○	○—○	

(Headlight Dimmer and Turn Signal Switch/Continuity)

Headlight Dimmer Switch

Terminal (Color) / Switch position	B-5 (R-Y)	B-6 (R-G)	B-12 (R-W)	B-13 (W-B)
Flash	○		○	○
Low beam		○		○
High beam	○			○

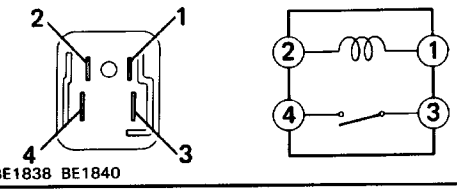
Turn Signal Switch

Terminal (Color) / Switch position	B-3 (G-W)	B-8 (G-Y)	B-9 (G-B)
Left turn	○		○
Neutral			
Right turn	○	○	

If continuity is not as specified, replace the switch.

2. INSPECT RELAY

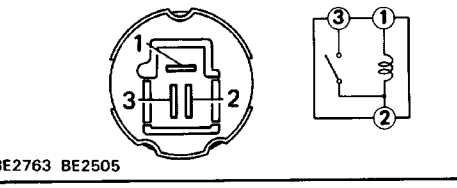
(Headlight Control Relay/Continuity)



BE1838 BE1840

Terminal / Condition	1	2	3	4
Constant	○	○		
Apply battery positive voltage to terminals 1 and 2.			○	○

(Taillight Control Relay/Continuity)

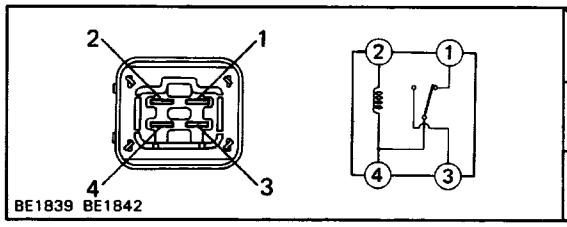


BE2763 BE2505

Terminal / Condition	1	2	3
Constant	○	○	
Apply battery positive voltage to terminals 1 and 2.		○	○

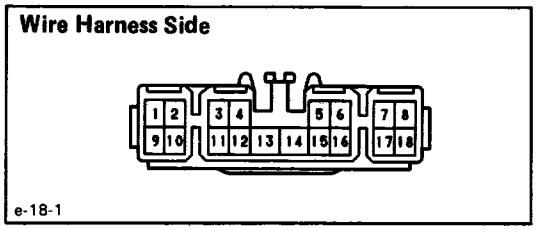
If continuity is not as specified, replace the relay.

(Headlight Dimmer Relay/Continuity)



Terminal / Condition	1	2	3	4
Constant	○			○
		○	∿	○
Apply battery positive voltage to terminals 2 and 4.			○	○

If continuity is not as specified, replace the relay.

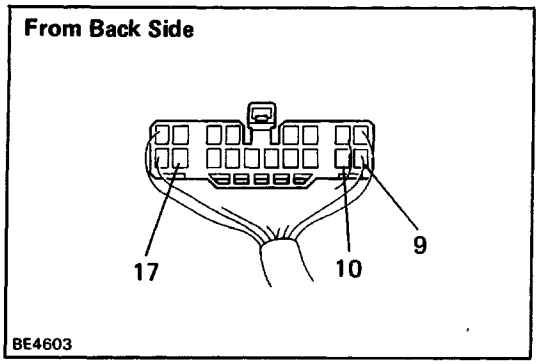


1. INSPECT DAYTIME RUNNING LIGHT RELAY

(Relay Circuit)

Disconnect the connector from the relay and inspect the connector on the wire harness side as shown in the chart.

Check for	Tester connection	Condition		Specified value
Continuity	3 — Ground	Light control switch position	OFF	No continuity
			TAIL or HEAD	Continuity
	5 — Ground	Light control switch position	OFF or TAIL	No continuity
			HEAD	Continuity
	7 — Ground	Headlight dimmer switch position	Low beam or High beam	No continuity
			Flash	Continuity
	8 — Ground	Parking brake switch position	OFF (Parking brake lever released)	No continuity
			ON (Parking brake lever pulled up)	Continuity
	13 — Ground	Constant		Continuity
	16 — Ground	Headlight dimmer switch position	Low beam	No continuity
			High beam or Flash	Continuity
Voltage	2 — Ground 18 — Ground	Ignition switch position	LOCK or ACC	No voltage
			ON or START	Battery positive voltage
	4 — Ground 6 — Ground 15 — Ground	Constant		Battery positive voltage
	11 — Ground	Engine	Stop	No voltage
			Running	Battery positive voltage



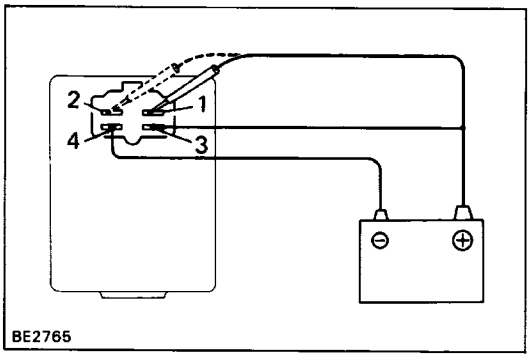
(Relay Circuit/Connector connected)
Connect the wire harness side connector to the relay and inspect wire harness side connector from the back side as shown.

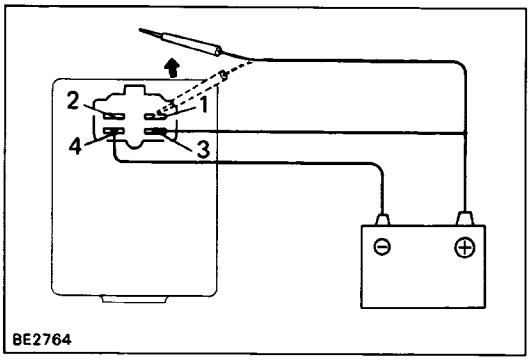
Check for	Tester connection	Condition		Specified value
Voltage	9 — Ground	Light control switch position	OFF	No voltage
			TAIL or HEAD	Battery positive voltage
	10 — Ground	Light control switch position	OFF	No voltage
			TAIL or HEAD	Battery positive voltage
	17 — Ground	Headlight dimmer switch position	Low beam or High beam	No voltage
			Flash	Battery positive voltage

If circuit is as specified, replace the relay.

4. INSPECT PARKING BRAKE SWITCH

(See page BE–39)





Lights–On Warning System

1. INSPECT DOOR COURTESY SWITCH

See combination meter on page BE–39.

2. INSPECT LIGHT REMAINDER RELAY

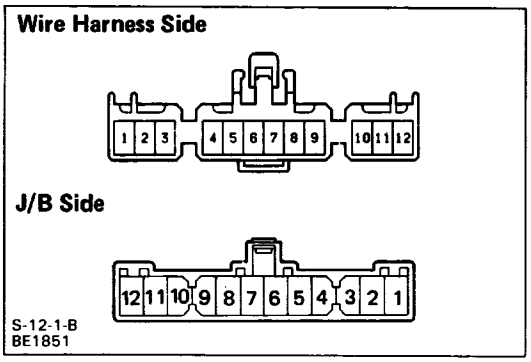
(Relay Circuit/Operation)

(a) Connect the positive (+) lead from the battery to terminal 3 and the negative (–) lead to terminal 4.

(b) Check that the buzzer does not sound when connected terminal 1 or 2 to the positive (+) lead.

(c) Check that the buzzer sounds when disconnecting terminal 1 or 2 from the positive (+) lead.

If operation is not as specified, replace the relay.



Illuminated Entry System

1. INSPECT DRIVER'S DOOR COURTESY SWITCH

See combination meter on page BE–40.

2. INSPECT INTEGRATION RELAY

(Relay Circuit)

Disconnect the connectors from the relay and inspect the connectors on the wire harness side and JIB side as shown in the chart.

(Wire Harness Side)

Check for	Tester connection	Condition		Specified value
Continuity	4 — Ground	Constant		Continuity
	7 — Ground	Constant		Continuity
	10 — Ground	Driver's door position	Closed (Courtesy switch OFF)	No continuity
			Opened (Courtesy switch ON)	Continuity

(JIB Side)

Check for	Tester connection	Condition	Specified value
Continuity	7 — Ground	Constant	Continuity
Voltage	3 — Ground	Constant	Battery positive voltage
	12 — Ground	Constant	Battery positive voltage

If the circuit is as specified, replace the relay.

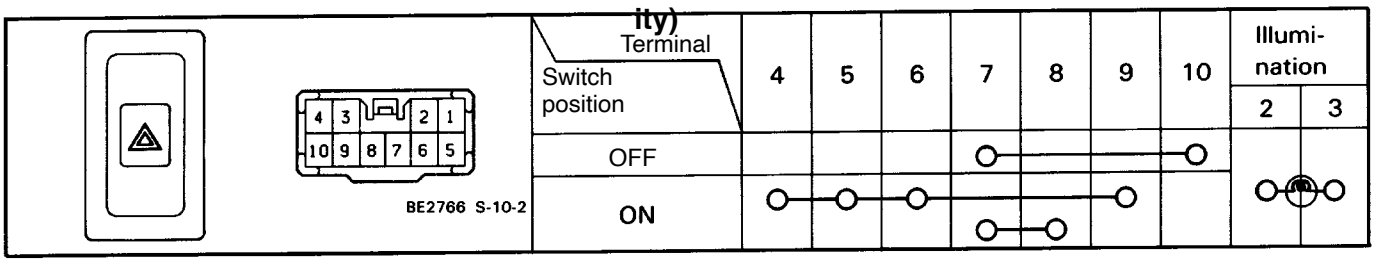
Turn Signal and Hazard Warning System

1. INSPECT SWITCHES

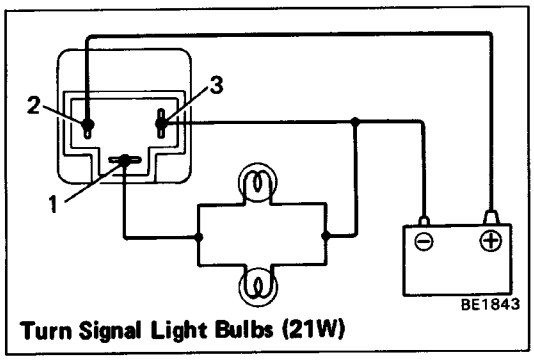
(Turn Signal Switch /Continuity)

See Headlight Dimmer and Turn Signal Switch on page BE–1 9.

(Hazard Warning Switch/Continuity)



If continuity is not as specified, replace the switch.



2. INSPECT TURN SIGNAL FLASHER

(Operation)

(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 3.

(b) Connect the two turn signal light bulbs parallel to each other to terminals 1 and 3, check that the bulbs flash.

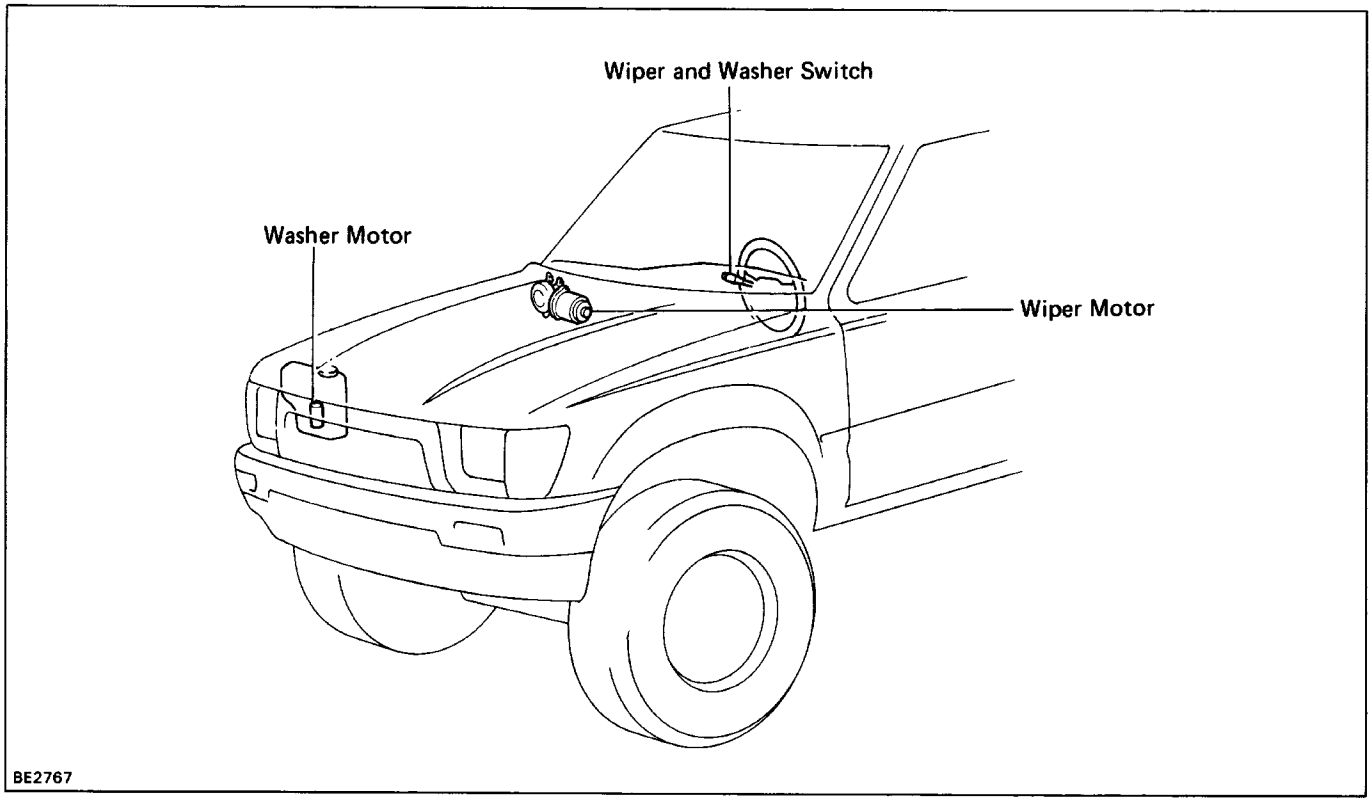
HINT: The turn signal lights should flash 60 to 120 times per minute.

If one of the front or rear turn signal lights has an open circuit, the number of flashers will be more than 140 per minute.

If operation is not as specified, replace the flasher.

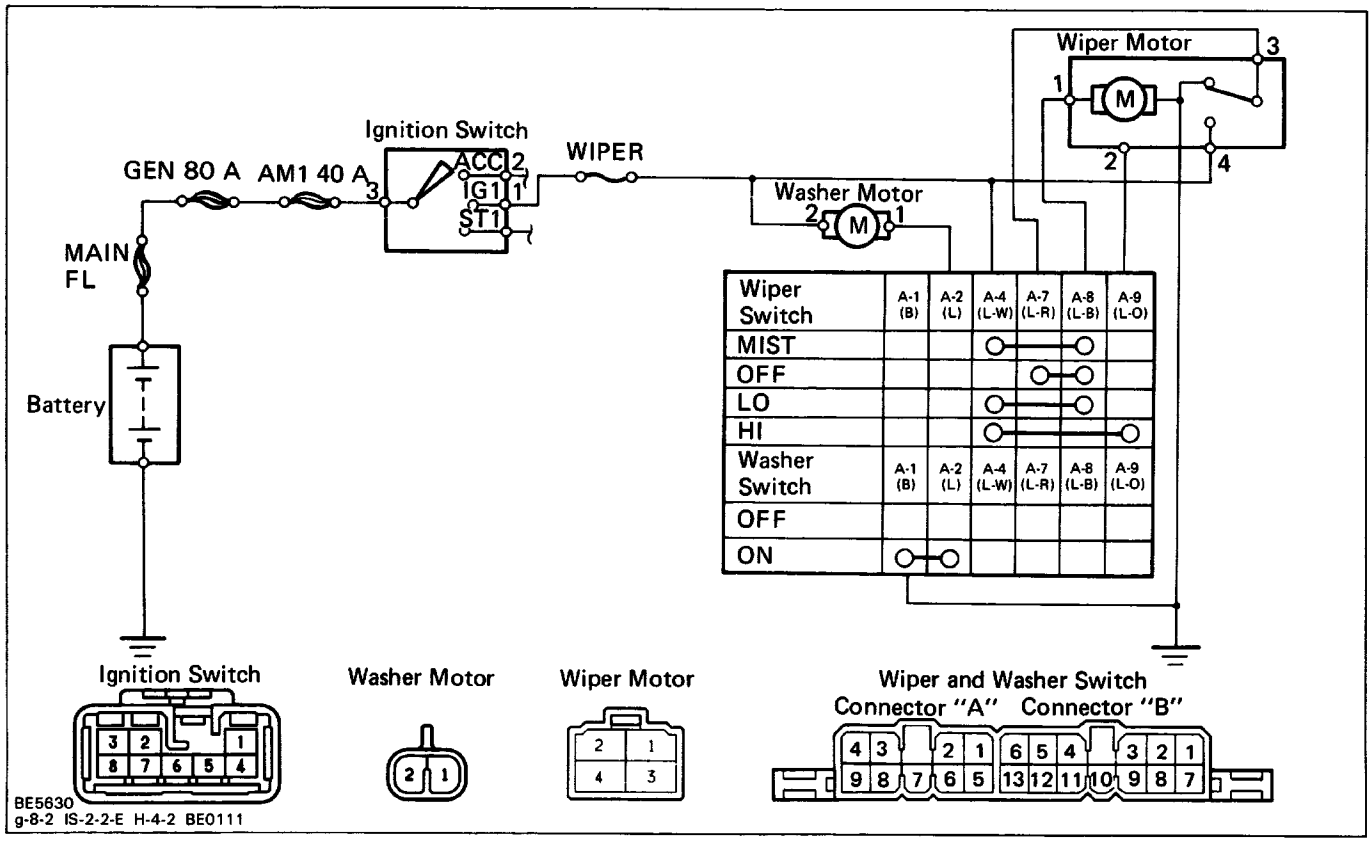
WIPER AND WASHER SYSTEM

Parts Location

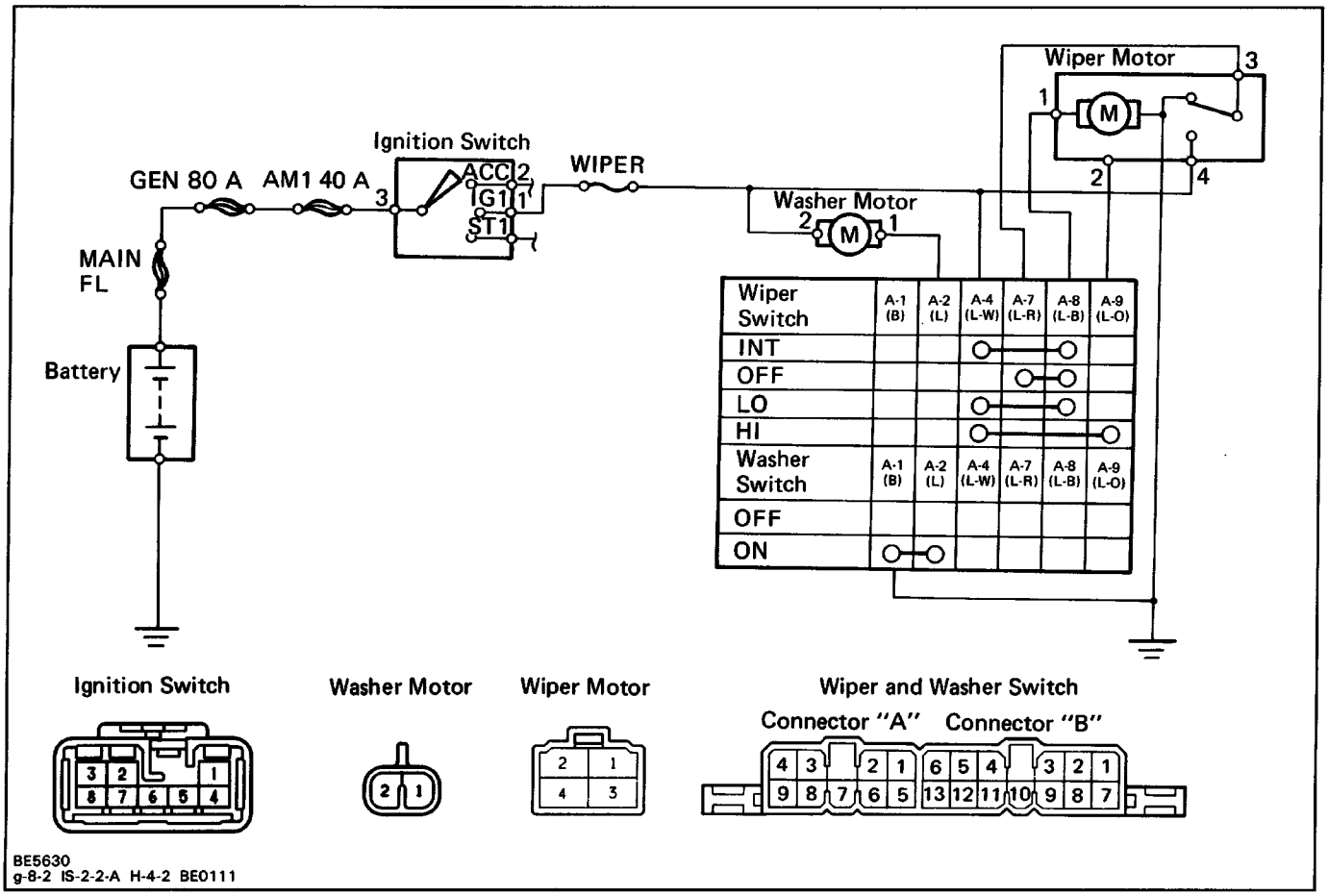


Wiring and Connector Diagrams

(w/ MIST Wiper)



(w/ Intermittent Wiper)

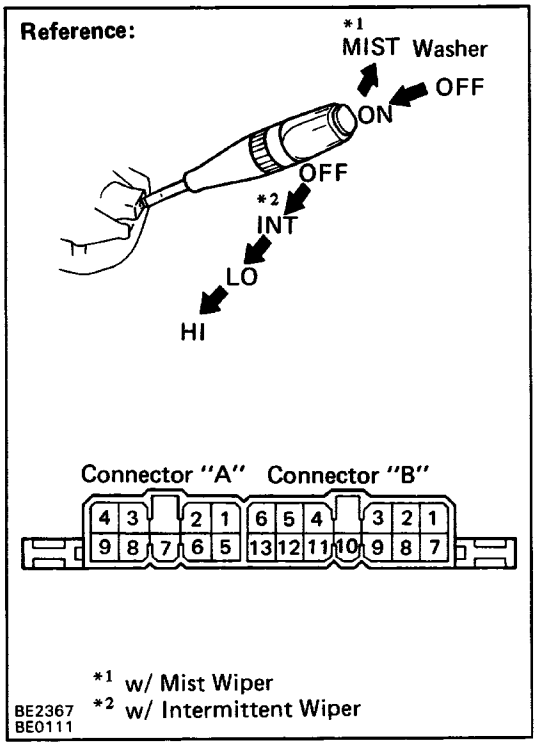


Troubleshooting

Problem	Possible cause	Remedy	Page
Wipers do not operate or return to off position	WIPER fuse blown	Replace fuse and check for short	BE–3
	Wiper motor faulty	Check motor	
	Wiper switch faulty	Check switch	BE–27
	Wiper or ground faulty	Repair as necessary	BE–26
Wipers do not operate in INT position	Wiper switch faulty	Check switch	BE–26
	Wiper motor faulty	Check motor	BE–27
	Wiring or ground faulty	Repair as necessary	
Washers do not operate	Washer hose or nozzle clogged	Repair as necessary	
	Washer motor faulty	Check motor	BE–28
	Washer switch faulty	Check switch	BE–28
	Wiring faulty	Repair as necessary	

Parts Replacement

See replacement of combination switch on pages BE–1 6 to 18.



Parts Inspection

Wiper System

1. INSPECT SWITCHES

(Wiper and Washer Switch/Continuity)

w/ Mist Wiper

Terminal (Color) / Switch position		A-1 (B)	A-2 (L)	A-4 (L-W)	A-7 (L-R)	A-8 (L-B)	A-9 (L-O)
Wiper	MIST			○		○	
	OFF				○	○	
	LO			○		○	
	HI			○			○
Washer	OFF						
	ON	○	○				

wI Intermittent Wiper

Terminal (Color) / Switch position		A-1 (B)	A-2 (L)	A-4 (L-W)	A-7 (L-R)	A-8 (L-B)	A-9 (L-O)
Wiper	MIST				○	○	
	INT			○		○	
	LO			○		○	
	HI			○			○
Washer	OFF						
	ON	○	○				

If continuity is not as specified, replace the switch.

(Wiper and Washer Switch /intermittent Wiper Operation)

(a) Turn the wiper switch to INT position.

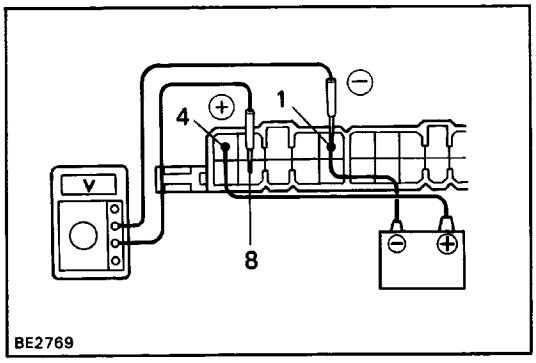
(b) (Variable Type)
Turn the intermittent time control switch to FAST position.

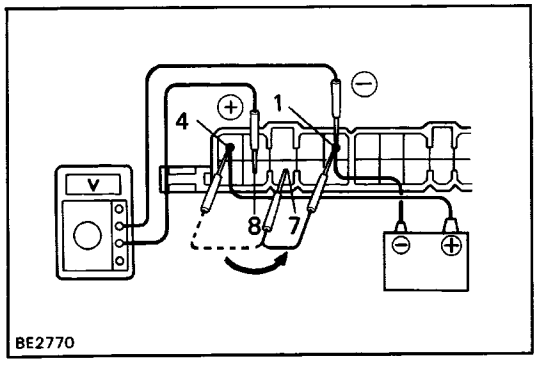
(c) Connect the positive (+) lead from the battery to terminal 4!9 and the negative (–) lead to terminal 1/9.

(d) Connect the positive (+) lead from the voltmeter to terminal 8I9 and the negative (–) lead to terminal 1/9, check that the meter needle indicates battery positive voltage.

(e) After connecting terminal 7I9 to terminal 419, con–nect to terminal 1/9.

Then, check that the voltage rises from 0 volts to battery positive voltage within the times as shown in the table.





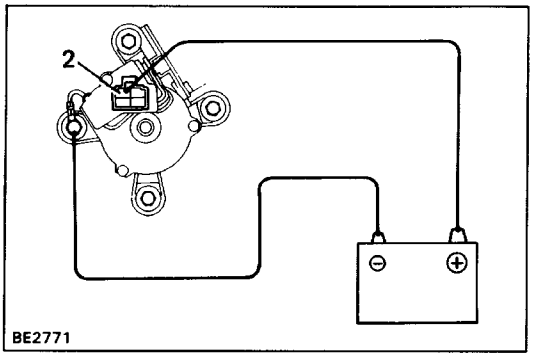
Non Variable Type

Switch position	Specified valve
INT	3.3 ± 1 sec. Battery positive voltage 0 volts

Variable Type

Switch position		Specified valve
INT	FAST	1.6 ± 1 sec. Battery positive voltage 0 volts
	LOW	10.7 ± 5 sec. Battery positive voltage 0 volts

If operation is not as specified, replace the switch.

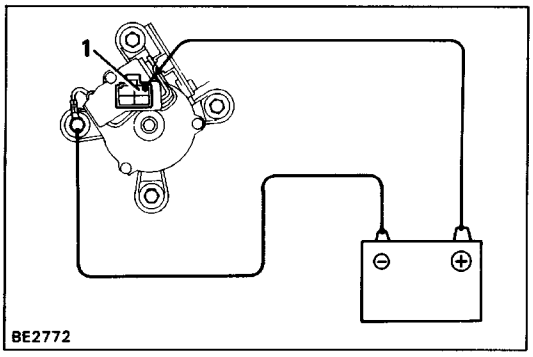


2. INSPECT MOTOR

(Operation at Low Speed)

Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to the motor body, check that the motor operates at low speed.

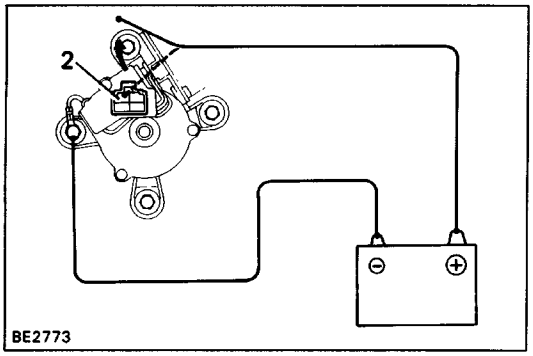
If operation is not as specified, replace the motor.



(Operation at High Speed)

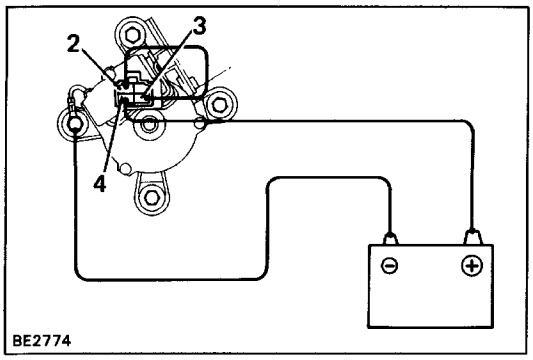
Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to the motor body, check that the motor operates at high speed.

If operation is not as specified, replace the motor.



(Operation, Stopping at Stop Position)

(a) Operate the motor at low speed and stop the motor operation anywhere except at the stop position by disconnecting positive (+) lead from terminal 2.



(b) Connect terminals 2 and 3.

(c) Connect the positive (+) lead from the battery to terminal 4 and the negative (–) lead to the motor body, check that the motor stops running at the stop position after the motor operates again.

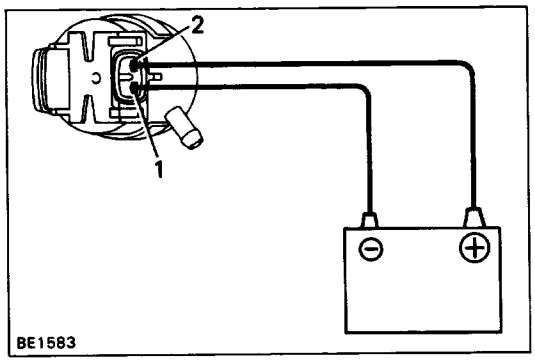
If operation is not as specified, replace the motor.

Washer System

1. INSPECT WASHER SWITCH

(Front Windshield Washer Switch)

See Wiper and Washer Switch on page BE–27.



2. INSPECT WASHER MOTOR

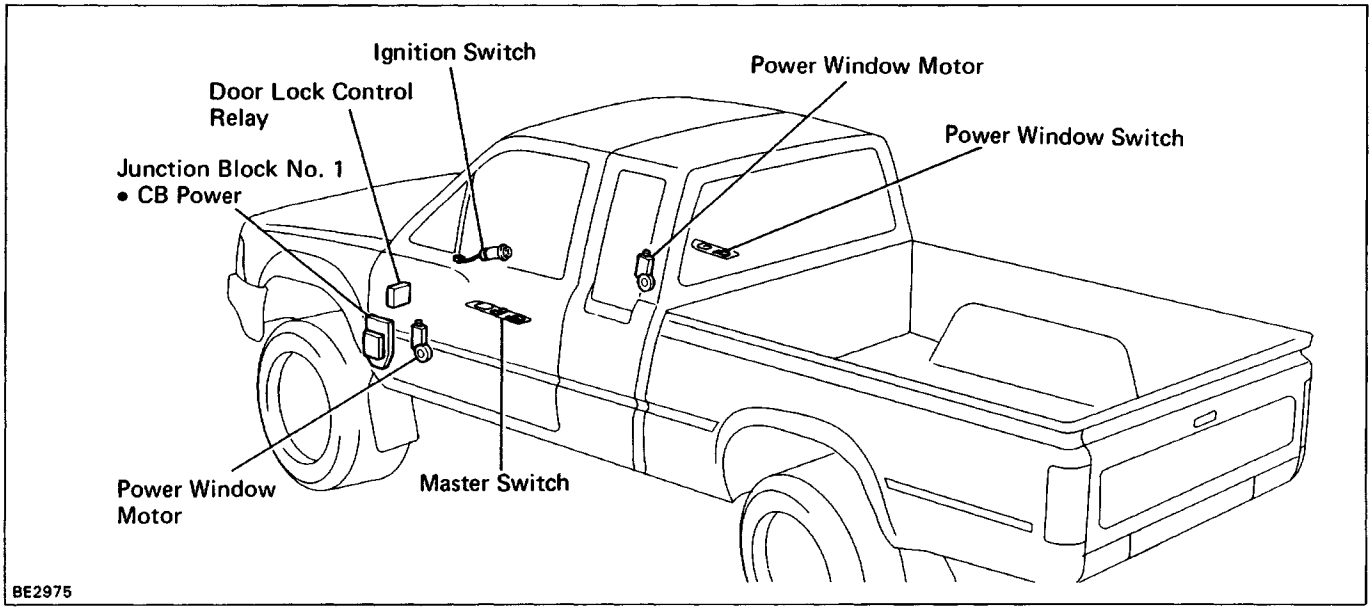
Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1, check that the motor operates.

NOTICE: These tests must be performed quickly (Within 20 seconds) to prevent the coil from burning out.

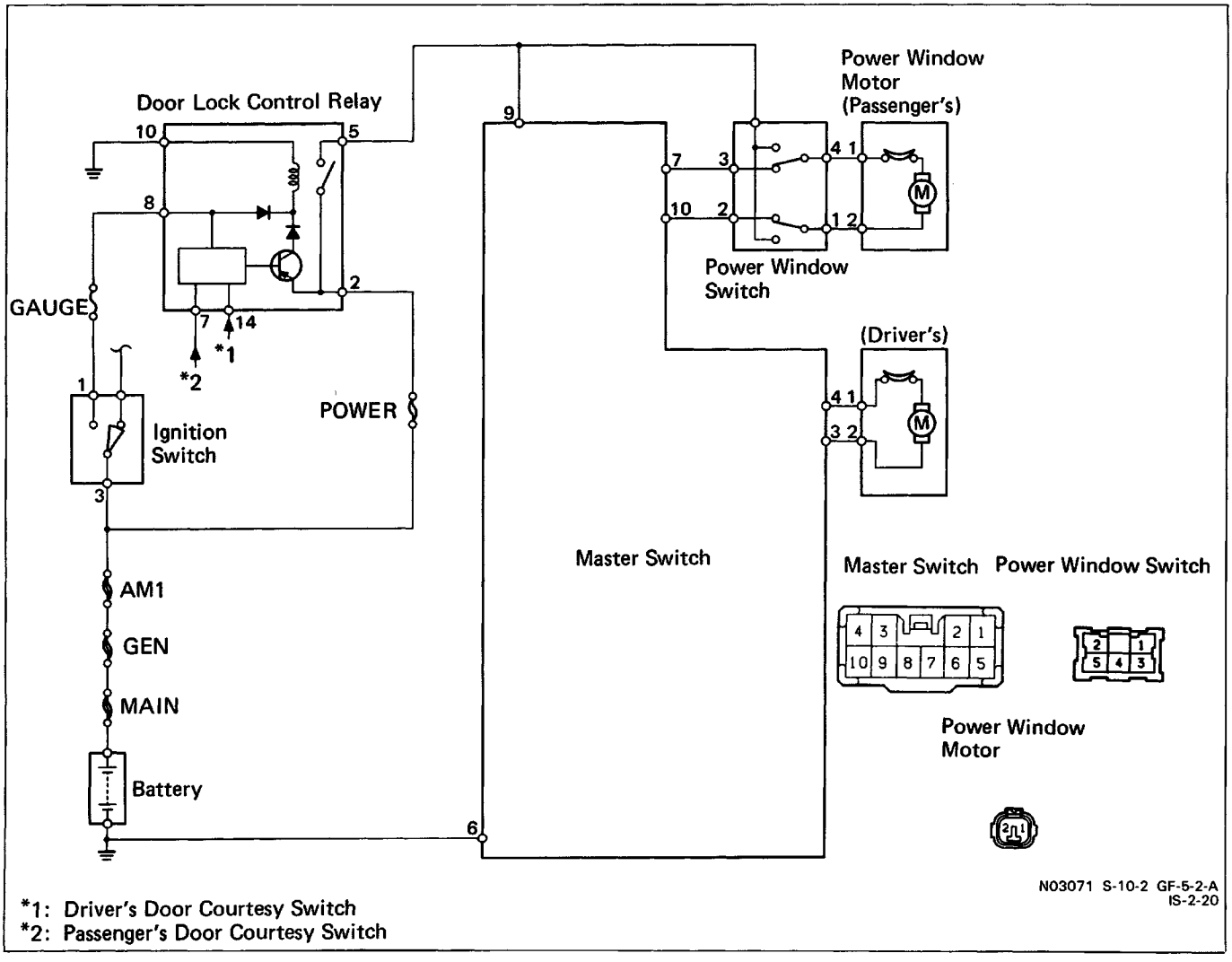
If operation is not as specified, replace the motor.

POWER WINDOW CONTROL SYSTEM

Parts Location



Wiring and Connector Diagrams



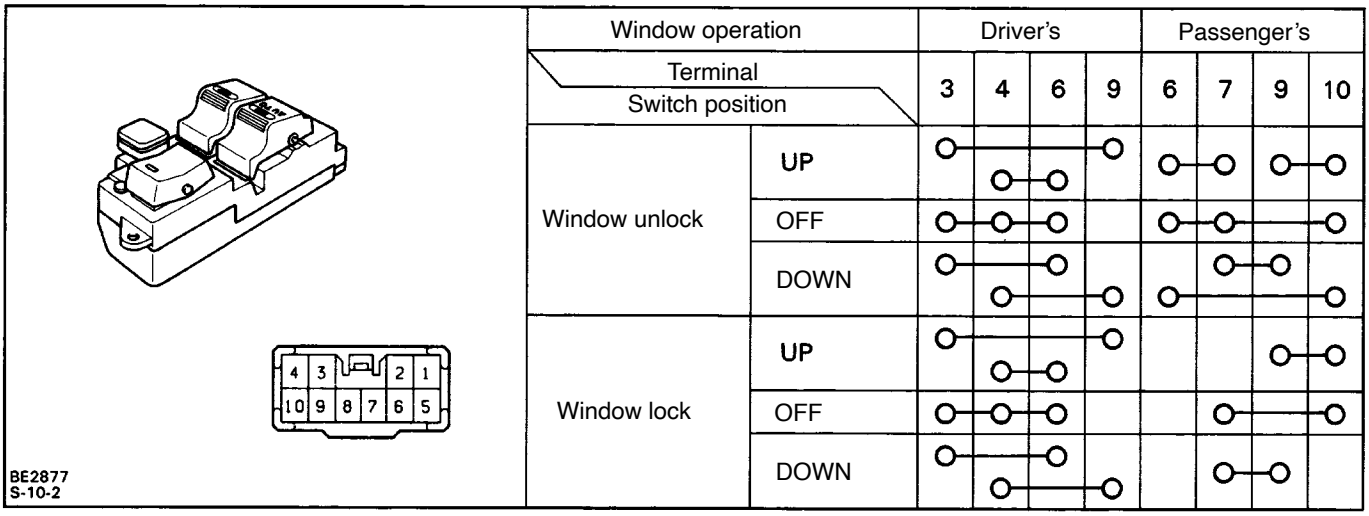
Troubleshooting

Problem	Possible cause	Remedy	Page
Power window does not operate at all	GAUGE fuse blown	Replace fuse and check for short	BE–3
	Door lock control relay faulty	Check relay	
	Wiring or ground faulty	Repair as necessary	BE–51
One touch power window does not operate	Power window master switch faulty	Check switch	BE–44
Only one window does not operate	Power window switch faulty	Check switch	BE–46
	Power window motor faulty	Check motor	BE–46
	Wiring or ground faulty	Repair as necessary	

Parts Inspection

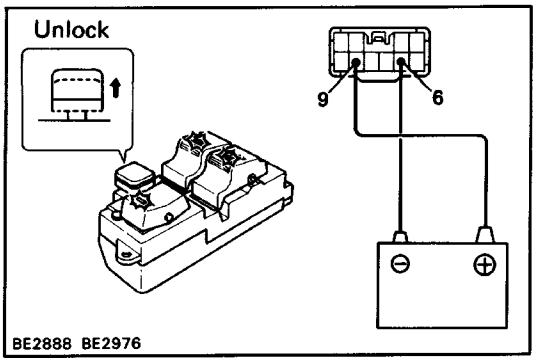
1. INSPECT SWITCHES

(Master Switch/Continuity)



Window operation		Driver's				Passenger's			
Terminal / Switch position		3	4	6	9	6	7	9	10
Window unlock	UP	○			○	○	○	○	○
			○	○					
	OFF	○	○	○		○	○		○
	DOWN	○		○		○		○	
			○		○	○	○		○
Window lock	UP	○			○			○	○
			○	○					
	OFF	○	○	○			○		○
	DOWN	○		○					
			○		○		○	○	

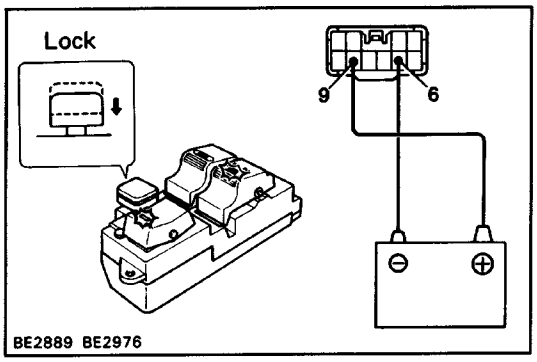
If continuity is not as specified, replace the switch.



(Master Switch: Illumination)

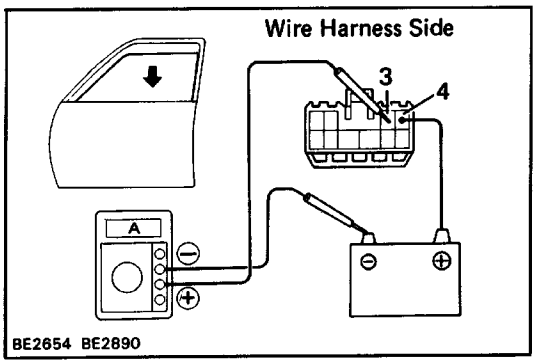
(a) Set the window lock switch to the unlock position.

(b) Connect the positive (+) lead from the battery to terminal 9 and negative (–) lead to terminal6, check that all the illuminations light up.



(c) Set the window lock switch to the lock position, check that the passenger's power window switch illumination goes out.

If operation is not as specified, replace the master switch.



(Master Switch: One Touch Power Window System)

Inspection using an ammeter:

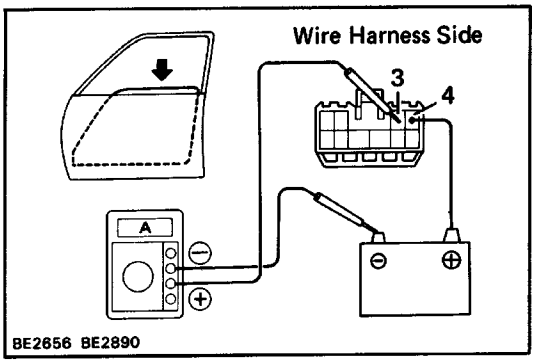
(a) Disconnect the connector from the master switch.

(b) Connect the positive (+) lead from the ammeter to terminal 3 on the wire harness side connector and the negative (–) lead to negative terminal of the battery.

(c) Connect the positive (+) lead from the battery to terminal 4 on the wire harness side connector.

(d) As the window goes down, check that the current flows approximately 7 A.

(e) Check that the current increases approximately 14.5 A or more when the window stops going down.



HINT: The circuit breaker opens some 4–40 seconds after the window stops going down, so the check must be made before the circuit breaker operates.

If operation is not as specified, replace the master switch.

Inspection using an ammeter with a current–measuring probe:

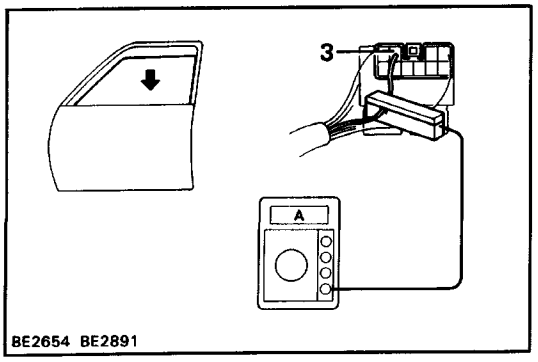
(a) Remove the master switch with connector con–nected.

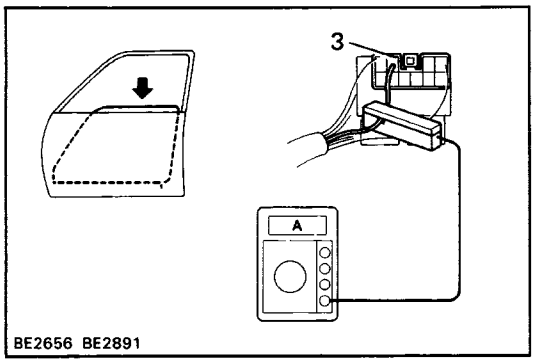
(b) Attach a current–measuring probe to terminal 3 of the wire harness.

i Turn the ignition switch ON and set the power win–

dow switch in the down position.

(d) As the window goes down, check that the current flows approximately 7 A.

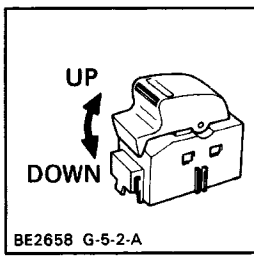




(e) Check that the current increases approximately 14.5 A or more when the window stops going down.

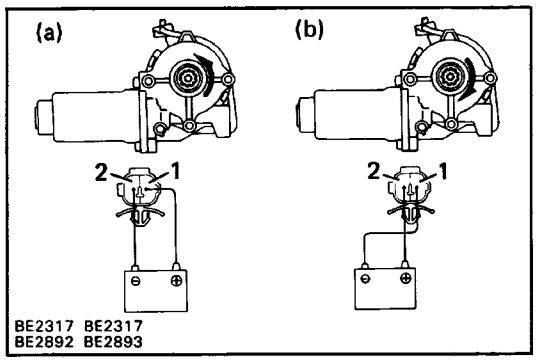
HINT: The circuit breaker opens some 4–40 seconds after the window stops going down, so that check must be made before the circuit breaker operates.
If operation is not as specified, replace the master switch.

(Power Window Switch/ Continuity)



Switch position \ Terminal	1	2	3	4	5
UP	○			○	○
OFF	○	○	○	○	
DOWN	○	○		○	○

If continuity is not as specified, replace the switch.



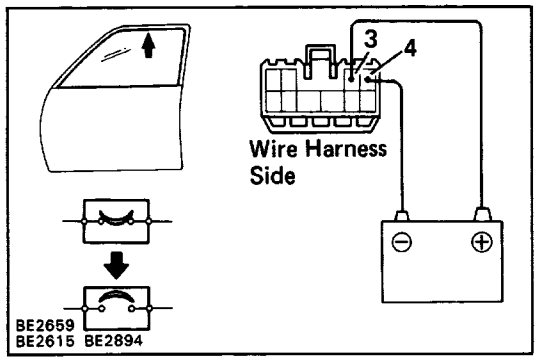
2. INSPECT POWER WINDOW MOTOR

(Left Side Door Motor/ Motor Operation)

(a) Connect the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 2, check that the motor turns counterclockwise.

(b) Reverse the polarity, check that the motor turns clockwise.

If operation is not as specified, replace the motor.



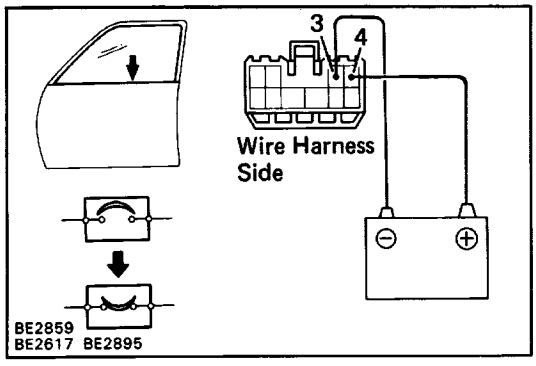
(Left Side Door Motor/ Circuit Breaker Operation)

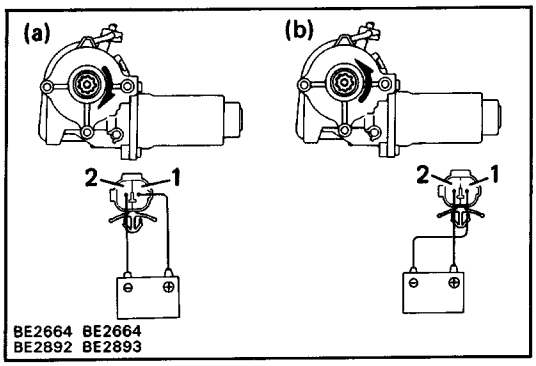
(a) Disconnect the connector from the master switch.

(b) Connect the positive (+) lead from the battery to terminal 3 and negative (–) lead to terminal 4 on the wire harness side connector, and raise the window to full closed position.

(c) Continue to apply voltage, check that there is a circuit breaker operation noise within approximately 4 to 40 seconds.

(d) Reverse the polarity, check that the window begins to descend within approximately 60 seconds.
If operation is not as specified, replace the motor.



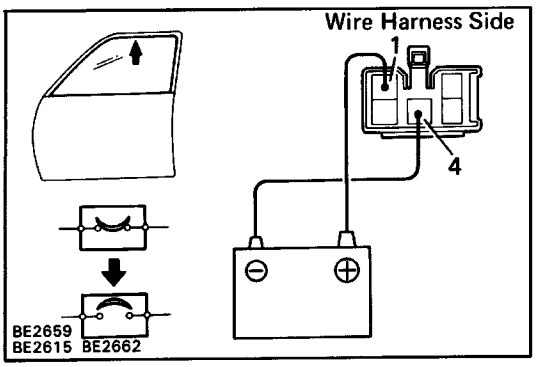


(Right Side Door Motor/ Motor Operation)

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2, check that the motor turns clockwise.

(b) Reverse the polarity, check that the motor turns counterclockwise.

If operation is not as specified, replace the motor.



(Right Side Door Motor/ Circuit Breaker Operation)

(a) Disconnect the connector from the power window switch.

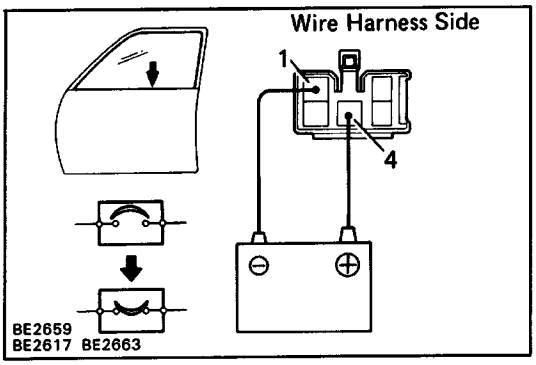
(b) Connect the positive (+) lead from the battery to terminal 1 and negative (–) lead to terminal 4 on the

wire harness side connector, and raise the window to full closed position.

(c) Continue to apply voltage, check that there is a cir–cuit breaker operation noise within approximately 4 to 40 seconds.

(d) Reverse the polarity, check that the window begins to descend within approximately 60 seconds.

If operation is not as specified, replace the motor.

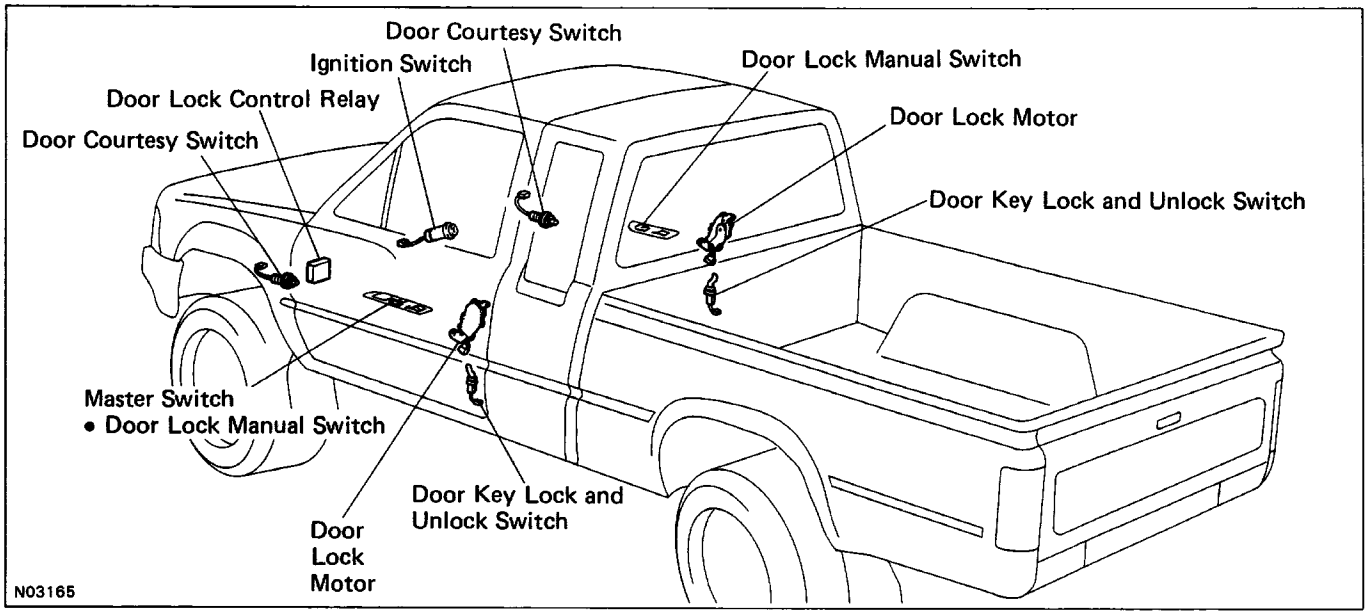


3. INSPECT DOOR LOCK CONTROL RELAY

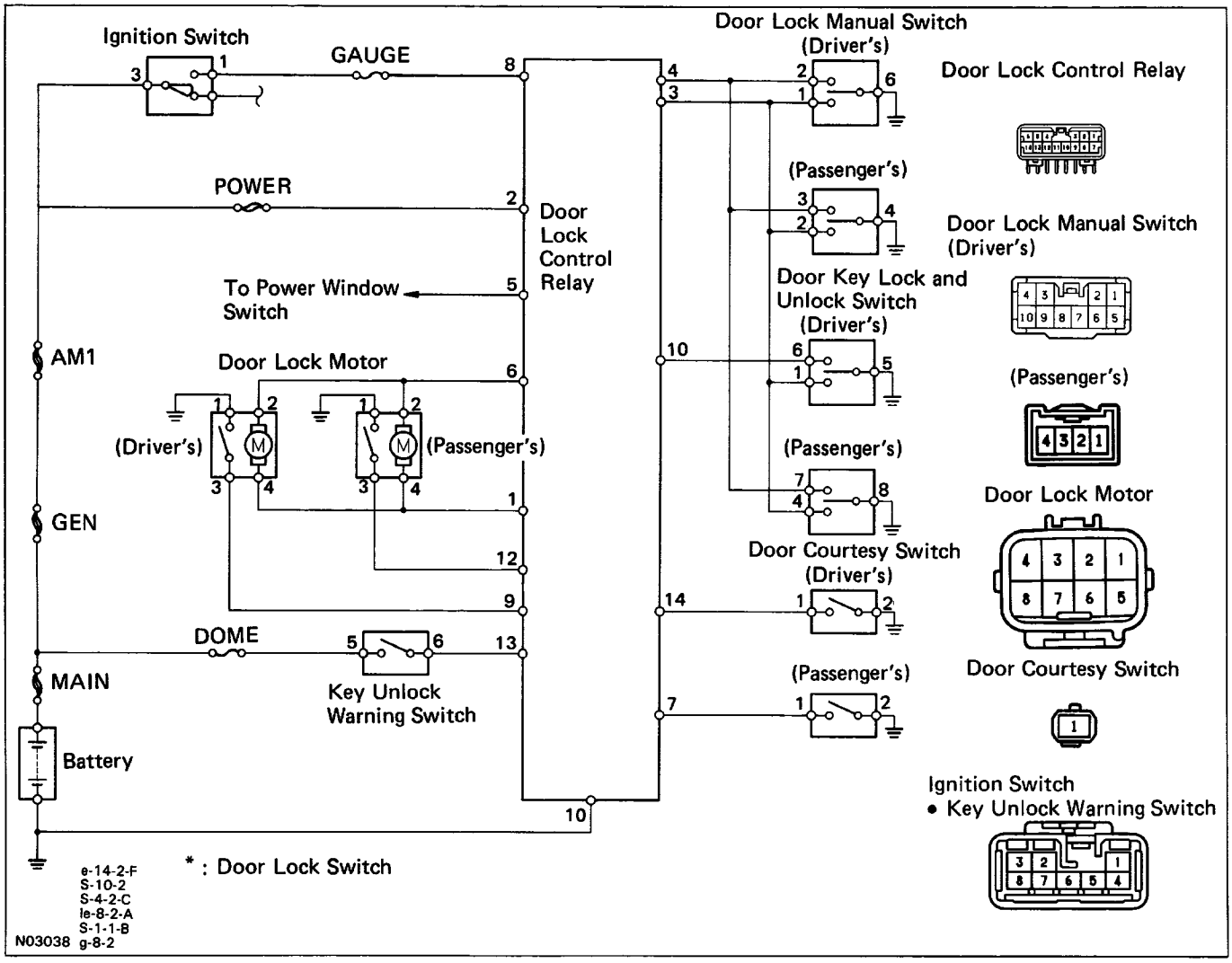
See step 3 of Power Door Lock Control System on page BE–52.

POWER DOOR LOCK CONTROL SYSTEM

Parts Location



Wiring and Connector Diagrams



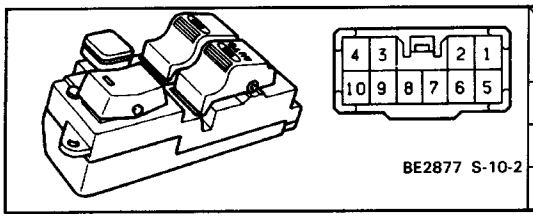
Troubleshooting

Problem	Possible cause	Remedy	Page
Door lock system does not operate at all	GAUGE fuse blown Door lock solenoid faulty Door lock control relay faulty Wiring or ground faulty	Replace fuse and check for short Check solenoid Check relay Repair as necessary	BE–3 BE–50 BE–51
Door lock system does not operate by manual switch	Door lock manual switch faulty Door lock control relay faulty Wiring or ground faulty	Check switch Check relay Repair as necessary	BE–49 BE–51
Door lock system does not operate by door key	Door key lock and unlock switch faulty Door lock control relay faulty Wiring or ground faulty	Check switch Check relay Repair as necessary	BE–49 BE–51

Parts Inspection

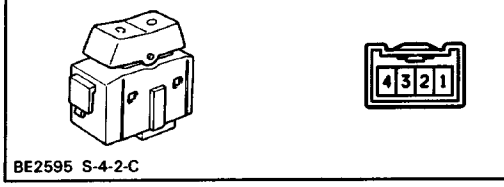
1. INSPECT SWITCHES

(Driver's Door Lock Manual Switch: in Master Switch/ Continuity)



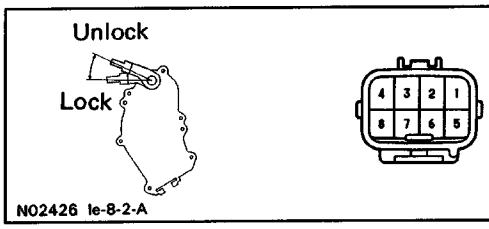
Terminal / Switch position	1	2	6
LOCK		○	○
OFF			
UNLOCK	○		○

(Passenger's Door Lock Manual Switch/ Continuity)



Terminal / Switch position	2	3	4
LOCK		○	○
OFF			
UNLOCK	○		○

(Door Key Lock and Unlock Switch/ Continuity)



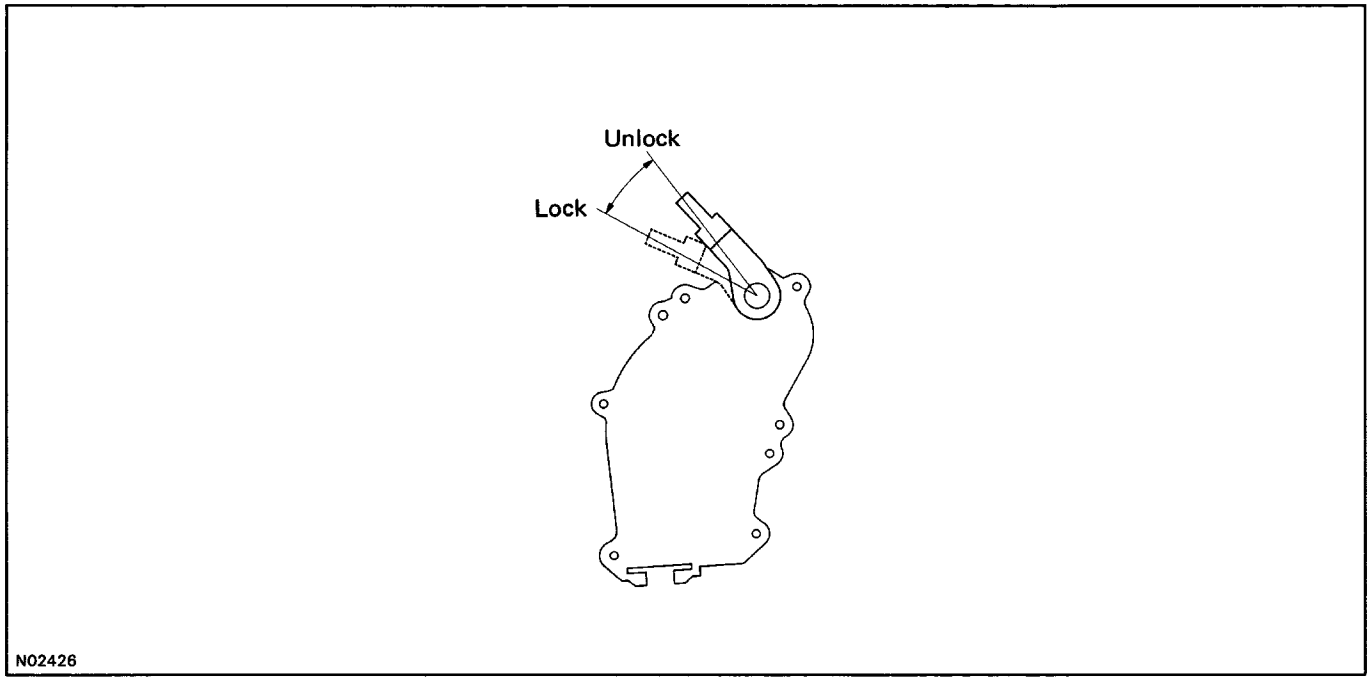
Terminal / Switch position	RH 4 LH 1	8 5	7 6
LOCK		○	○
OFF			
UNLOCK	○	○	

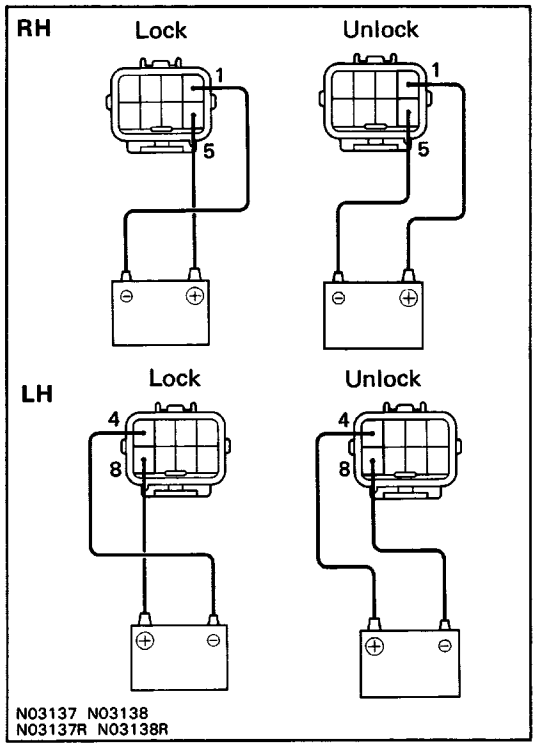
If continuity is not as specified, replace the switch.

(Key Unlock Warning Switch/ Continuity)
See Step I of Key Confine Prevention System on page BE–9.
(Door Courtesy Switch/ Continuity)
See Step of Open Door Warning System on page BE–41.

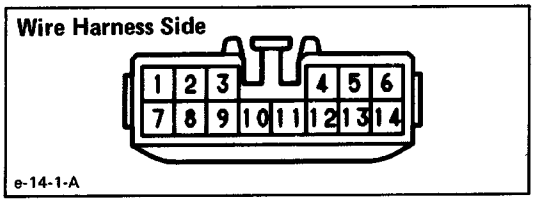
HINT: Door key lock and unlock switch is built into the front door lock assembly.

2. INSPECT DOOR LOCK MOTOR
(Motor Operation)





(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 5, check that the door lock link moves to UNLOCK position.
(b) Remove the polarity, check that the door lock link move to LOCK position.
If operation is not as specified, replace the door lock assembly.
(c) Connect the positive (+) lead from the battery to terminal 4 and the negative (–) lead to terminal 8, check that the door lock link moves to UNLOCK position.
(d) Remove the polarity, check that the door lock link move to lock position.
If operation is not as specified, replace the door lock assembly.

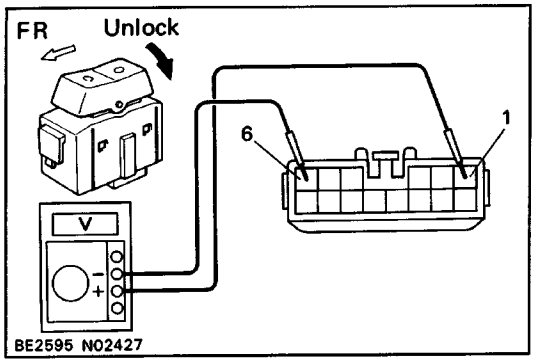


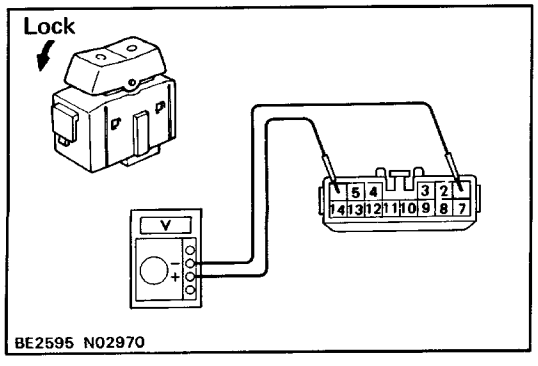
3. INSPECT DOOR LOCK CONTROL RELAY (Relay Circuit)

Disconnect the connector from the relay and inspect the connector on the wire harness side as shown in the chart.

Check for	Tester connection	Condition		Specified value
Continuity	3 — Ground	Door lock manual switch or door key lock and unlock switch position	OFF or LOCK	No continuity
			Unlock	Continuity
	4 — Ground	Door lock manual switch or door key lock and unlock switch position	OFF or Unlock	No continuity
			Lock	Continuity
	7 — Ground	Passenger's door courtesy switch position	OFF (Door closed)	No continuity
			ON (Door opened)	Continuity
	9 — Ground	Driver's door lock switch position	Unlock	Continuity
			Lock	No continuity
	11 — Ground	Constant		Continuity
	12 — Ground	Passenger's door lock switch po–sition	Unlock	Continuity
			Lock	No continuity
	14 — Ground	Driver's door courtesy switch position	OFF (Door–closed)	No continuity
			ON (Door opened)	Continuity
Voltage	2 — Ground	Constant		Battery positive voltage
	8 — Ground	Ignition switch position	LOCK or ACC	No voltage
			ON	Battery positive voltage
	13 — Ground	Key unlock warning switch posi–tion	OFF (Ignition key removed)	No voltage
			ON (Ignition key set)	Battery positive voltage

If circuit is as specified, inspect the door lock signal and key–off power window signal.



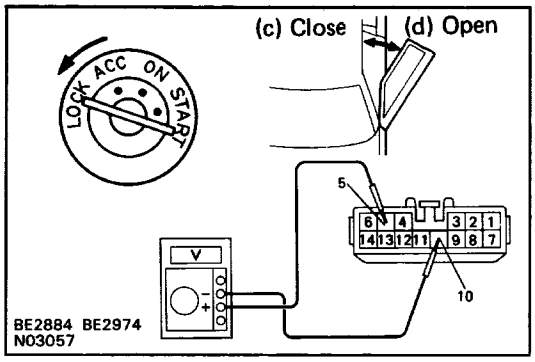


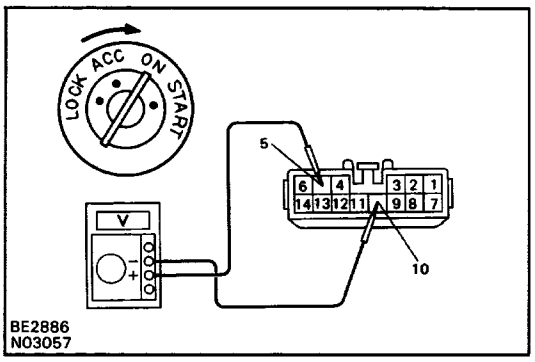
(Door Lock Signal)

HINT: When the relay circuit is as specified, inspect the door lock signal.

(a) Connect the connector to the relay.
(b) Connect the positive (+) lead from the voltmeter to terminal 1 and negative (–) lead to terminal 6.
(c) Set the door lock manual switch to UNLOCK, check that the voltage rises from 0 V to battery positive voltage for approximately 0.2 seconds.
(d) Reverse the polarity of the voltmeter leads.
(e) Set the door–lock manual switch to LOCK, check that the voltage rises from 0 V to battery positive voltage for approximately 0.2 seconds.

If operation is not as specified, replace the relay.





(Key–Off Power Window Signal)

HINT: When the relay circuit is as specified, inspect the key–off power window signal.

(a) Connect the connector to the relay.

(b) Connect the positive (+) lead from the voltmeter to terminal 5 and negative (–) lead to terminal 10.

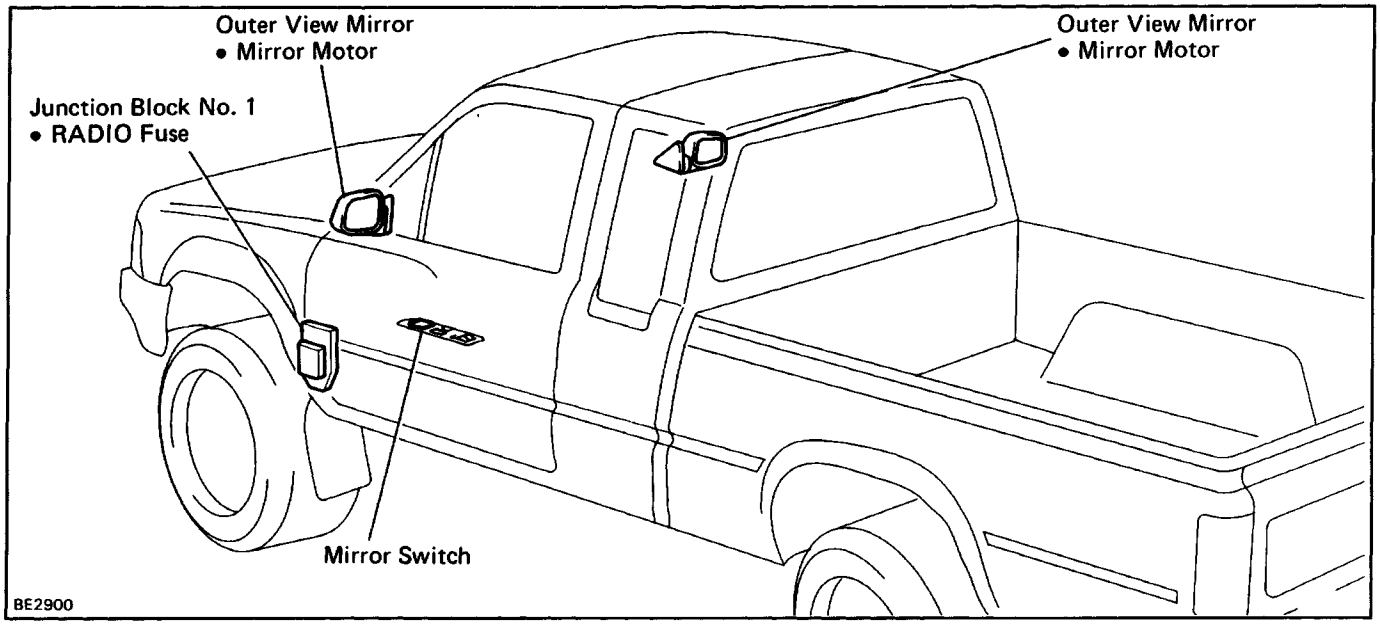
(c) Close the door with ignition switch turned to LOCK or ACC, check that the meter needle indicates battery positive voltage.

(d) Open the door, check that the meter needle indicates 0 V.

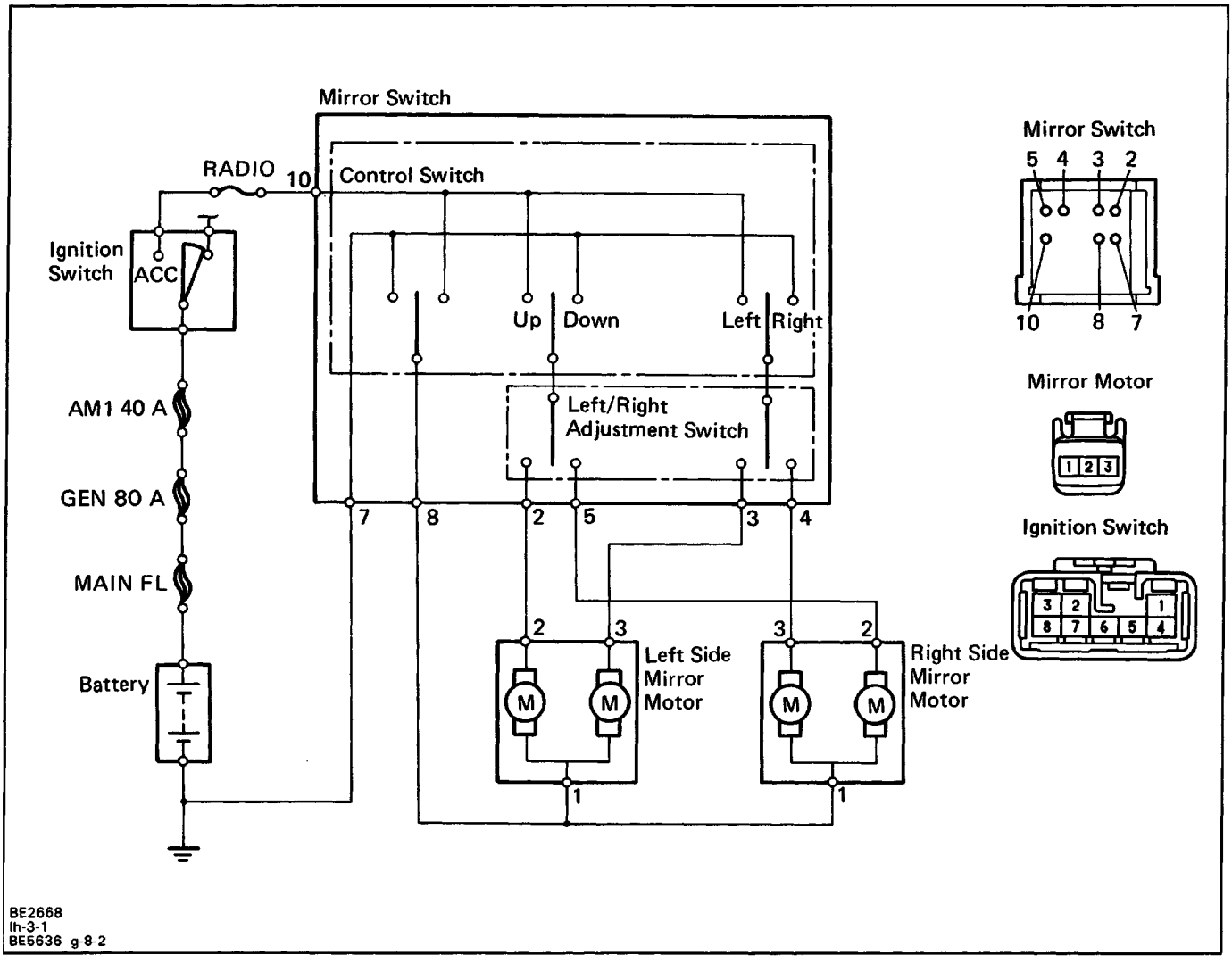
(e) Turn the ignition switch ON, check that the meter needle indicates battery positive voltage again.
If operation is not as specified, replace the relay.

POWER MIRROR CONTROL SYSTEM

Parts Location



Wiring and Connector Diagrams

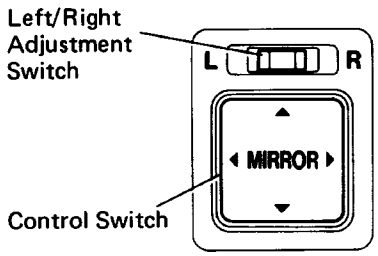


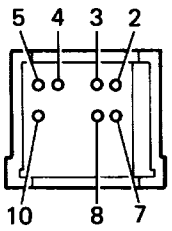
Troubleshooting

Problem	Possible cause	Remedy	Page
Remote control mir–ror system does not operate	RADIO fuse blown	Replace fuse and check for short	BE–3
	Mirror switch faulty	Check switch	
	Mirror motor faulty	Check motor	BE–54
	Wiring or ground faulty	Repair as necessary	BE–55

Parts Inspection

1. INSPECT MIRROR SWITCH (CONTINUITY)

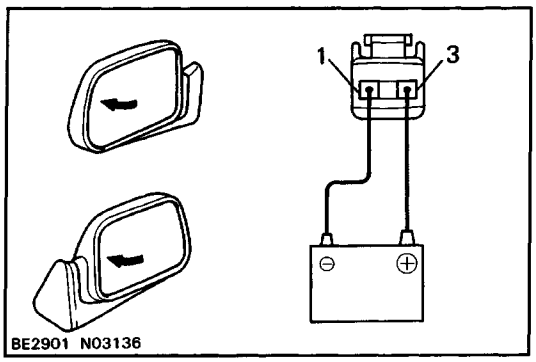




BE2357 BE2989

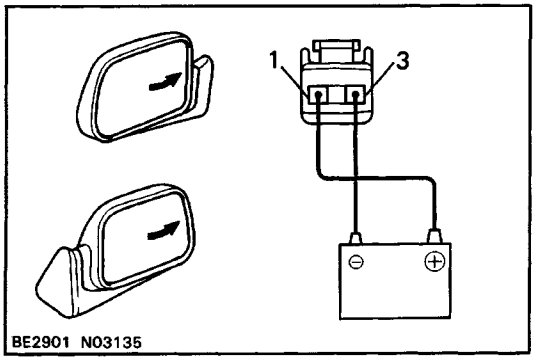
Left/Right adjustment switch position	LEFT SIDE					OFF			RIGHT SIDE				
Terminal / Control switch position	2	3	7	8	10	7	8	10	4	5	7	8	10
OFF													
UP	○		○	○	○	○	○			○	○	○	○
DOWN	○		○	○	○		○	○		○	○	○	○
LEFT		○	○	○	○	○	○		○		○	○	○
RIGHT		○	○	○	○		○	○	○		○	○	○

If continuity is not as specified, replace the switch.

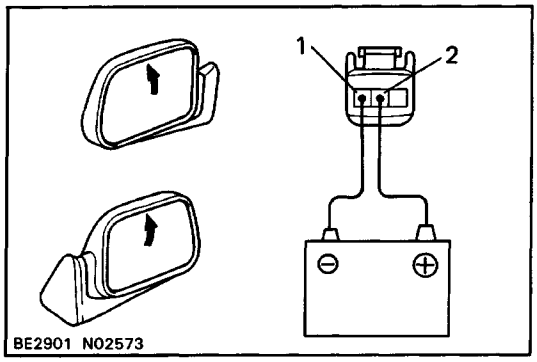


2. INSPECT MIRROR MOTOR

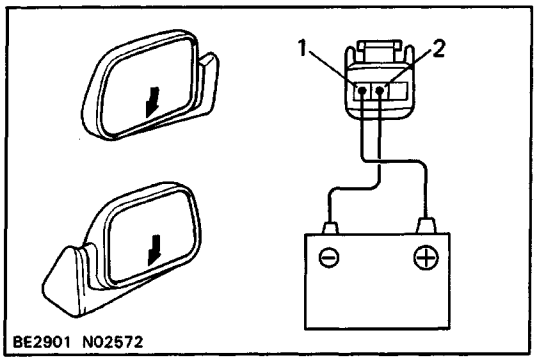
(a) Connect the positive (+) lead from the battery to terminal 3 and negative (–) lead to terminal 1, check that the mirror turns to left side.



(b) Reverse the polarity, check that the mirror turns to right side.



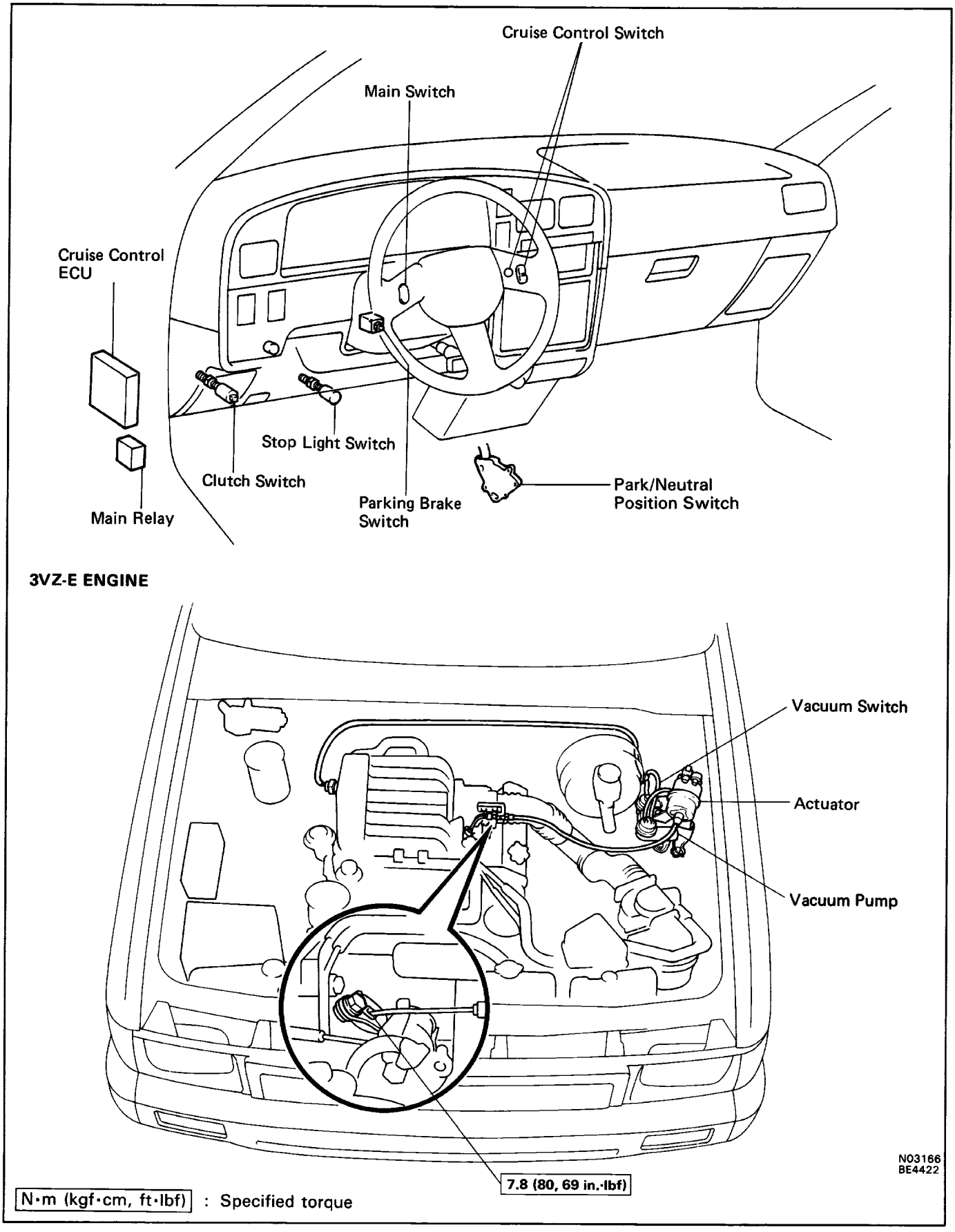
(c) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminal 1, check that the mirror turns upward.



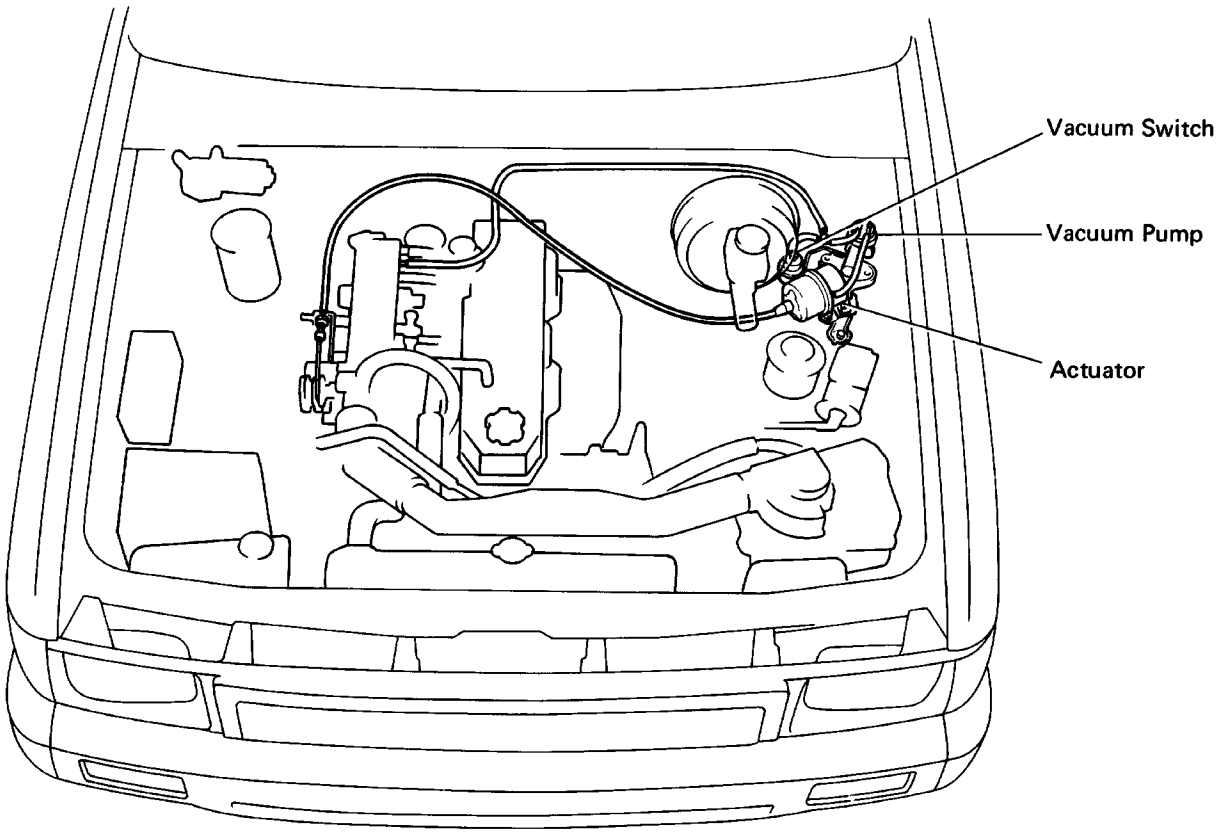
(d) Reverse the polarity, check that the mirror turns downward.

If operation is not as specified, replace the mirror assembly.

CRUISE CONTROL SYSTEM
Parts Location

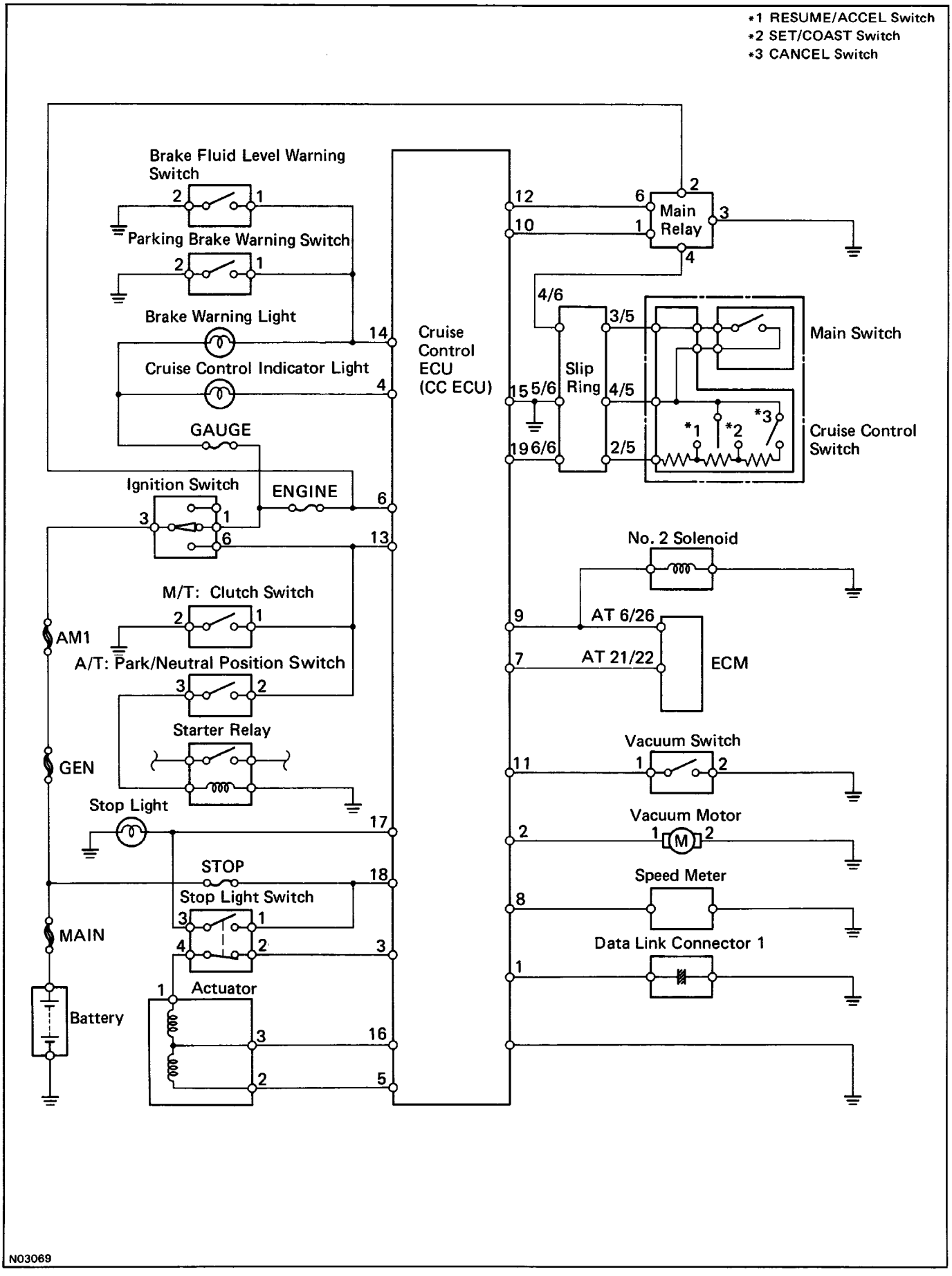


22R-E ENGINE



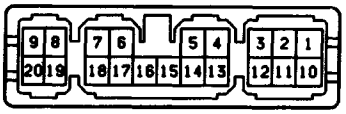
BE3035

Wiring Diagram



Connector Diagrams

Cruise Control ECU

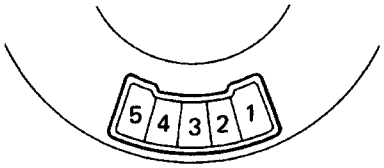


Main Relay

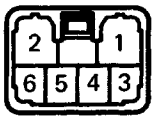
Main Switch

Cruise Control Switch

Slip Ring Speed
(Control Switch Side)



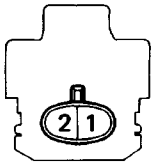
(Wire Harness Side)



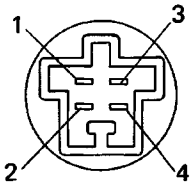
Actuator

Vacuum Pump

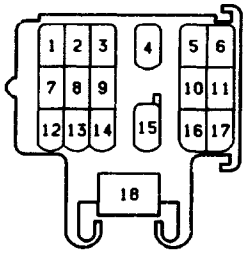
Vacuum Switch



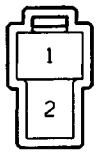
Stop Light Switch



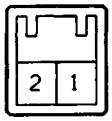
Data Link Connector 1



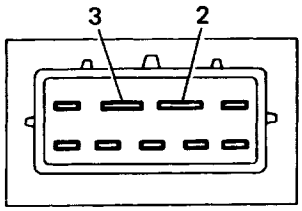
Parking Brake Switch



Clutch Switch



Park/Neutral Position Switch



S-20-2 S-6-2 IS-2-2-C S-5-1-B GA-2-1-C
BE1930 S-6-2 IS-3-2-A
IS-2-2-0 BE5756 SH18-1
H-2-2 G-2-2 BE1485

System Description

Standby Operation

- When the ignition switch is turned ON (IG), current flows from the battery to terminal 6 of the Cruise Control ECU (hereafter called ECU).
- When the ignition switch is turned ON (IG), current flows from the battery to terminal 2 of the Main Relay.

Operation

1. MAIN SWITCH OPERATION

When the main switch is pushed ON, current flows from terminal 2 of the main relay → terminal 4 →terminal 4!6 of the slip ring–i terminal 3I5–terminal 3/5 → of the cruise control switch (hereafter called SCS)–i terminal 1/2 → terminal 1 of the main switch–terminal 2 →/terminal 2I2 of the SCS → ter–minal 4I5 → terminal 4/5 of the slip ring → terminal 5/6 → ground.
As a result, the main relay turned ON → current flows to terminal 12 of ECU.
After that, current flows through the ”CRUISE” indicator light to terminal 4 of the ECU.
Therefore, the main switch remains on and continues to supply current to terminal 12 of the ECU.

2. SPEED CONTROL SWITCH OPERATION

The cruise control switch controls the SET, COAST, RESUME, ACCEL and CANCEL functions.
When the each speed control switch is pushed ON, sends a signal (each voltage) from terminal 2I5 of the SCS → terminal 2I5 of the slip ring → terminal 6/6 → terminal 19 of the ECU.
Then, the vehicle speed at the moment the switch (SET position) is released is registered in memory.

3. SPEED CONTROL OPERATION

When the vehicle speed is set by the cruise control switch, the ECU send a signal from terminal 3 of the ECU terminal 2 of the stop light switch → terminal 4 → terminal 1 of the actuator (release valve side).
At the same time, the ECU sends a signal from terminal 5 of the ECU → terminal 2 of the actuator (control valve side).
Then, the actuator increases or decreases the throttle valve opening angle in accordance with the sig–nal from the ECU.

4. CANCEL OPERATION

The Cruise Control System is provided with several types of the cancel, such as the cruise control switch (CANCEL), the stop light switch, the parking brake switch and the park/neutral position switch (AM or clutch switch (M/T).

(a) Cruise Control Switch (CANCEL)

When the cruise control switch (CANCEL) is pushed ON, sends a cancellation signal from terminal 2/5 of the SCS → terminal 2I5 of the slip ring → terminal 6/6 → terminal 9 of the ECU.

(b) Parking Brake Switch

When the parking brake lever is pulled, the parking brake switch turned ON → Sends a cancella–tion signal (ground voltage) to terminal 14 of the ECU.

(c) Park/Neutral Position Switch (A/T)

When the shift lever is set to the ”N” or ”P” position, the park/neutral position switch turned ON → sends a cancellation signal (ground voltage) to terminal 14 of the ECU.

(d) Clutch Switch (M/T)

When the clutch pedal is depressed, the clutch switch is turned ON → sends a cancellation signal (ground voltage) to terminal 13 of the ECU.

(e) Stop Light Switch

When the brake pedal is depressed, the SW B of stop light switch is turned OFF → the release valve (in actuator) is opened, and the SW A of stop light switch is turned ON → sends a cancel–lation signal to terminal 17 of the ECU.

Therefore, the operation of the cruise control system is canceled and the actuator is shut off due to the operation of these switches.

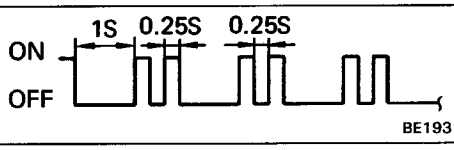
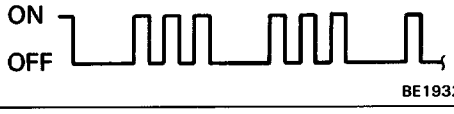
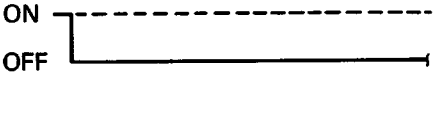
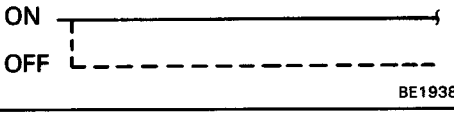
Diagnosis System

Output of Diagnostic Trouble Code

READ DIAGNOSTIC TROUBLE CODE

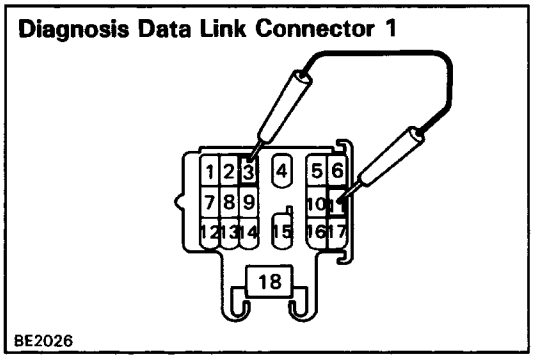
(Type A)

(a) Turn the ignition switch on.
(b) Push the SET/COAST switch on, and keep it on.
(c) Push the main switch on.
(d) Check that the indicator light ”CRUISE” light–on in the combination meter and after 3 seconds check that the indicator light ”CRUISE” blinks.
(e) Turn the SET/COAST switch off.
(f) Meet the conditions listed below.
(g) Read the diagnostic trouble code on the indicator light ”CRUISE”.

No.	Conditions	Indication code	Diagnosis
1	Push the cruise control switch SET/COAST on.		SET/COAST circuit is normal.
2	Push the cruise control switch RESUMEIACCEL on.		RESUMEIACCEL circuit is normal.
3	Vacuum switch is turned ON.		Vacuum switch circuit is normal.
4	Each cancel switch turned ON. • Cruise control switch (to CANCEL) • Stop light switch • Park/Neutral Position switch (to N or P Position) • Clutch switch • Parking brake switch		Each cancel switch is normal.
5	Drive approx. 40 km/h (25 mph) or over.		Speed sensor circuit is normal.
6	Drive approx. 40 km/h (25 mph) or below.		Speed sensor circuit is normal.

HINT:

- Indication codes appear in order from No. 1.
- If there is no indication code, perform diagnosis and inspection. (See page BE–64)
- Indication is stopped, when the MAIN switch is re–pushed.

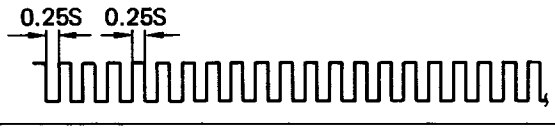
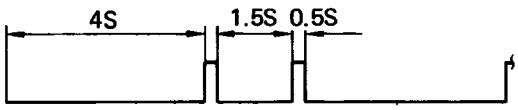
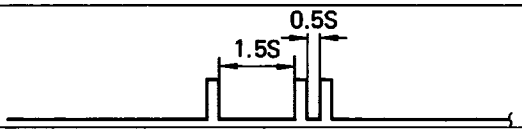
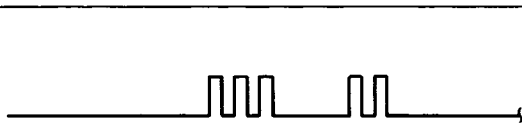


(Type6)

(a) If while driving with the cruise control on, the system is canceled by a malfunction in either the actuator, speed sensor or cruise control switch circuit, the cruise control indicator light "CRUISE" will blink 5 times.

(b) While stopping, connect terminals 3 and 1 1 of the data link connector 1.
HINT: Should the ignition switch turned off, the diagnostic trouble code will be erased from the computer memory.

(c) Read the diagnostic trouble code on the indicator light "CRUISE".

Indication code		Diagnosis
		Normal.
11		Control valve circuit of actuator is abnormal.
12		Release valve circuit of actuator is abnormal.
21		Speed sensor circuit is abnormal.
23		*Vehicle speed has decreased by 16 km/h (10 mph) or more from the set speed.
32		SET/COAST switch signal and RESUMEIACCEL switch signal stay on simultaneously.
34		Control switch does not turn off before switching.
* If the set speed can be maintained when the speed control switch is again set at SET/COAST, there is no malfunction .		

When 41 code is indicated, replace the cruise control ECU.

41	

HINT:

¿

- Indication codes appear in order from No. 11
- If there is no indication code, perform diagnosis and inspection. (See page BE–84)

Troubleshooting

You will find the troubles easier using the table well shown below. In this table, each number shows the priority of causes in troubles. Check each part in order.

Chart No.					C	A	B	E	G, H	F	I	I	D		
Inspection Item / Diagnosis Code / Problem	Type B	Type A		ECU	Actuator	Main Switch	Control Switch	Stop Light Switch	Clutch Switch or Park/ Neutral Position Switch	Parking Brake Switch	Vacuum Switch	Vacuum Pump	Speed Sensor' or Speedometer Cable	Speedometer Cable Function	Others
• "CRUISE" indicator light blinks 5 time. • Cruise control system does not set. • Cruise control system does not operate.	11			2	1										
	12			3	1			2							
	21			2									1		
	23			6	2						5	4	3	1	*2
	32			2			1								
	Normal	5	OK	8	7	1	2	3	4	5				6	*3
			NG	2									1		
Setting speed deviated on high or low side.		3	OK	6	5						4	3	2	1	
			NG								1				
Vehicle speed fluctuates when speed con–trol switch turned to SET.				4	3								1	2	
Setting speed does not cancel when brake pedal depressed.		4	OK	3	1			2							
			NG	2				1							
Setting speed does not cancel when park–ing brake lever pulled.		4	OK	2	1										
			NG	2						1					
Setting speed does not cancel when shifted to "N" position. (A/T)		4	OK	2	1										
			NG	2					1						
Setting speed does not cancel when clutch pedal depressed. (M/T)		4	OK	2	1										
			NG	2					1						
Vehicle speed does not decrease when cruise control switch turned to COAST.		1	OK	3	1									2	
			NG	2			1								
Vehicle speed does not accelerate when cruise control switch turned to ACCEL.		2	OK	3	1									2	
			NG	2			1								
Vehicle speed does not return to memo–rized speed when control switch turned on RESUME.		2	OK	3	1									2	
			NG	2			1								
Setting speed does not cancel when cruise control switch turned to CANCEL.		4	OK	2	1										
			NG	2			1								
Speed can be set below about 40 km/h (25 mph).		5	OK	2	1										
			NG	2									1		
Cruise control will not disengage even at about 40 km/h (25 mph).		5	OK	2	1										
			NG	3									1	2	
Acceleration response is sluggish when cruise control switch turned to "ACCEL" or "RESUME".		3	OK	4	3							2		1	*2
			NG								1	2			

" : in the Speedometer Vacuum Hose *3: Vacuum Hose & Brake Fluid

Inspection Chart

A **INSPECTION OF POWER SOURCE CIRCUIT**

Turn ignition switch on

Is ENGINE fuse normal?

No → Replace fuse. Is operation normal?

No → • Short circuit in wire harness between ENGINE fuse and terminal 2 of main relay.
• Inspect main relay. (See page BE–82)

Yes

Yes → Fuse faulty.

MAIN RELAY

INSPECT GROUND CONNECTION
Disconnect connector from main relay.
Is there continuity between terminal 3 of main relay and ground?

No → • Open circuit in wire harness between terminal 3 of main relay and ground.
• Ground faulty.

Yes

INSPECT POWER SOURCE
Is there battery positive voltage between terminal 2 of main relay and ground with ignition switch turned on?

No → Open circuit in wire harness between ENGINE fuse and terminal 2 of main relay.

Yes

INSPECT MAIN RELAY OPERATION
Is main relay operation normal? (See page BE–81)

No → Main relay faulty.
Replace main relay. Then recheck system.

Yes

Is there continuity between terminal 6 on wire harness side connector and ground?

Yes → Short circuit in wire harness between terminals6 of main relay and 12 of CC ECU.

No

Is there continuity between terminal 1 on wire harness side connector and ground?

Yes → Short circuit in wire harness between terminals 1 of main relay and 10 of CC ECU.

No

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Disconnect combination switch connector.

Is there continuity between terminal 4 of main relay connector on wire harness side and ground?

Yes → Short circuit in wire harness between terminals 4 of main relay and 4I6 of slip ring.

No

Connect connector to main relay.

SLIP RING

Disconnect connectors from slip ring.

INSPECT POWER SOURCE
Is there battery positive voltage between terminal 4I6 on wire harness side connector and ground with ignition switch turned on?

No → Open circuit in wire harness between terminals 4 of wire harness side connector and 4I6 of slip ring.

Yes

INSPECT GROUND CONNECTION
Is there continuity between terminal 5I6 on wire harness side connector and ground?

No → Open circuit in wire harness side between terminal 5I6 of slip ring and ground.

Yes

INSPECT SLIP RING CONTINUITY
Is slip ring continuity normal?
(See page BE–81)

No → Slip ring faulty.
Replace slip ring. Then recheck system.

Yes

MAIN SWITCH

Disconnect connector from main switch.

Is there continuity between terminals 1I2 and 3I5 of speed control switch?

No → Open circuit in speed control switch between terminals 1/2 and 3I5.

Yes

INSPECT MAIN SWITCH CONTINUITY
Is main switch continuity normal?
(See page BE–80)

No → Main switch faulty.
Replace main switch. Then recheck system.

Yes

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Is there continuity between terminals 2I2 and 4I5 of speed control switch?
No → Open circuit in cruise control switch between terminals 2I2 and 4I5.

Yes

Connect connectors to slip ring.

INSPECT POWER SOURCE
Is there battery positive voltage between terminal 1/2 of cruise control switch and ground with ignition switch turned on?
No → Short circuit in wire harness between terminals 1/2 and 3/5 of cruise control switch.

Yes

Connect connector to main switch.

ECU

Disconnect connector from CC ECU and inspect connector on wire harness side as follows.

INSPECT GROUND CONNECTION
Is there continuity between terminal 15 and ground?
No →
- Open circuit in wire harness between terminal 15 and ground.
- Ground faulty.

Yes

INSPECT POWER SOURCE
Is there battery positive voltage between terminal 12 and ground with ignition switch and main switch is turned on?
No → Open circuit in wire harness between terminals 12 of CC ECU and 6 of main relay.

Yes

Disconnect connector from main relay.

Is there continuity between terminals 10 of CC ECU and 1 of main relay wire harness side connector?
No → Open circuit in wire harness between terminals 10 of CC ECU and 1 of main relay.

Yes

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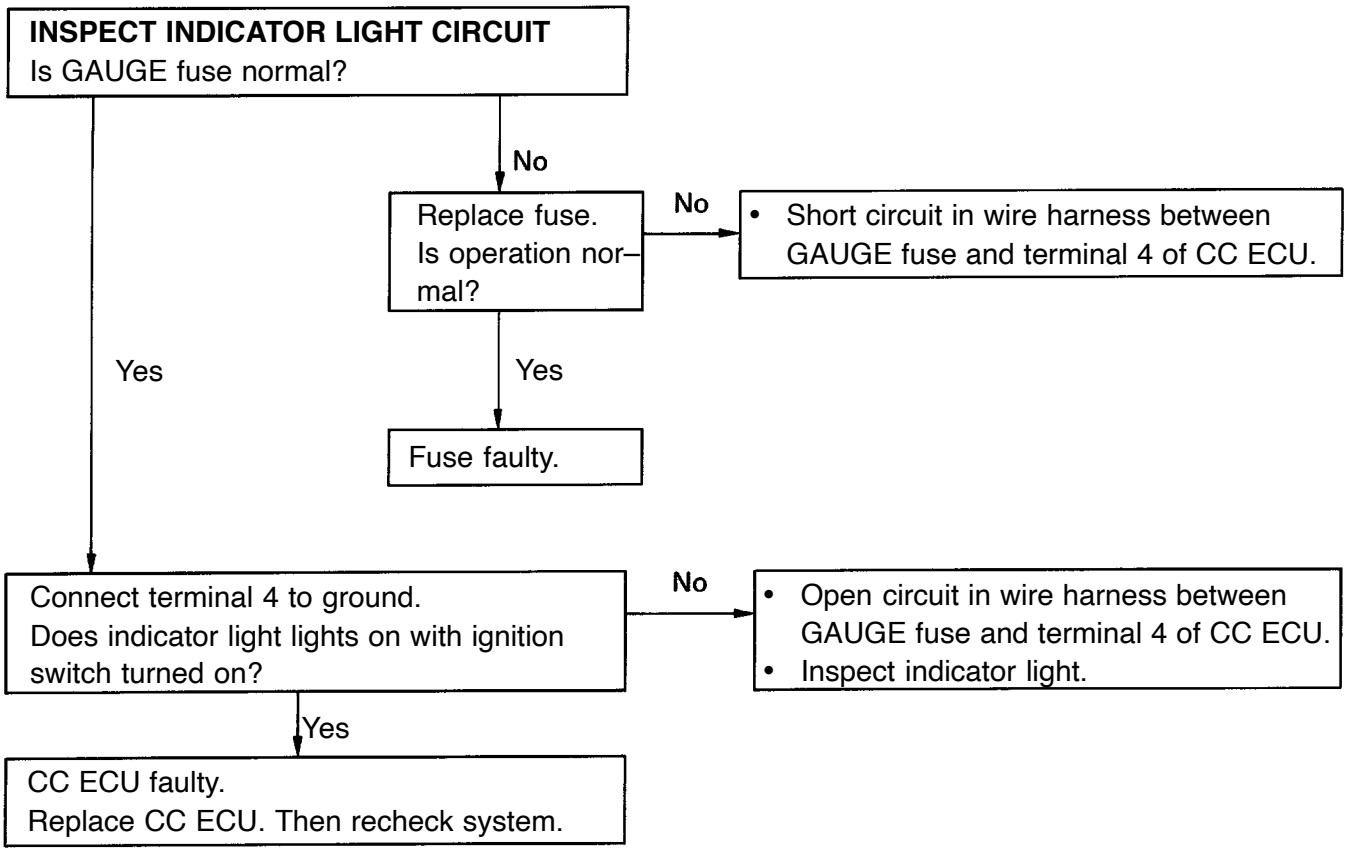

B INSPECTION OF CRUISE CONTROL SWITCH CIRCUIT

Turn ignition switch off.

CRUISE CONTROL SWITCH

Disconnect connector from control switch.

INSPECT CONTROL SWITCH
Is control switch operation normal?
(See page BE–81)

No → Speed control switch faulty.
Replace cruise control switch. Then re–check system.

Yes

SLIP RING

Disconnect connector from slip ring.

INSPECT GROUND CONNECTION
Is there continuity between terminal 5I6 on wire harness side connector and ground?

No →
- Open circuit in wire harness between terminal 5I6 of slip ring and ground.
- Ground faulty.

Yes

INSPECT SLIP RING CONTINUITY
Is slip ring continuity normal?
(See page BE–82)

No → Slip ring faulty.
Replace slip ring. Then recheck system.

Yes

ECU

Connect connectors to slip ring.
Disconnect connector from CC ECU and in–spect connector on wire harness side as fol–lows.

INSPECT GROUND CONNECTION
Is there continuity between terminal 15 and ground?

No →
- Open circuit in wire harness between terminal 15 of CC ECU and ground.
- Ground faulty.

Yes

INSPECT CRUISE CONTROL SWITCH CIRCUIT
Is there no continuity between terminals 19 and 15 with control switch is off?

No → Short circuit in wire harness between ter–minal 19 of CC ECU and terminal 6I6 of slip ring.

Yes

Is there approx. 68Ω between terminals 19 and 15 with control switch RESUME/ACCEL is pushed on?

No → Open circuit in wire harness between ter–minal 19 of CC ECU and terminal 6I6 of slip ring.

Yes

CC ECU faulty.
Replace CC ECU. Then recheck system.

C INSPECTION OF ACTUATOR CIRCUIT

Turn ignition switch off.

VACUUM HOSE

Are there cracks or other damage on the vacuum hose?
- Yes → Vacuum hose faulty. Replace vacuum hose. Then recheck system.
- No

ACTUATOR

INSPECT CABLE FREEPLAY
Is control cable freeplay less than 10 mm (0.39 in.)?
- No → Adjust control cable freeplay.
- Yes

INSPECT ACTUATOR OPERATION
Disconnect connector from actuator.
Is actuator operation normal?
(See page BE–82)
- No → Actuator faulty. Replace actuator. Then recheck system.
- Yes

Is there continuity between terminal 3 on wire harness side connector and ground?
- No → Open circuit in wire harness between terminal 3 of actuator and terminal 16 of ECU.
- Yes

STOP LIGHT SWITCH

INSPECT STOP LIGHT SWITCH CIRCUIT
Disconnect connector from stop light switch.
Is there continuity between terminal 4 of wire harness side connector and ground?
- Yes → Short circuit in wire harness between terminal 1 of actuator and terminal 4 of stop light switch.
- No

Connect the connector to actuator.
Is there continuity between terminal 4 of wire harness side connector and ground?
- No → Open circuit in wire harness between terminal 1 of actuator and terminal 4 of stop light switch. .
- Yes (There is resistance approx. 71Ω)

INSPECT STOP LIGHT SWITCH CONTINUITY
Is stop light switch continuity normal?
(See page BE–80)
- → Replace stop light switch. Then recheck system.
- Yes

Connect connector to stop light switch.

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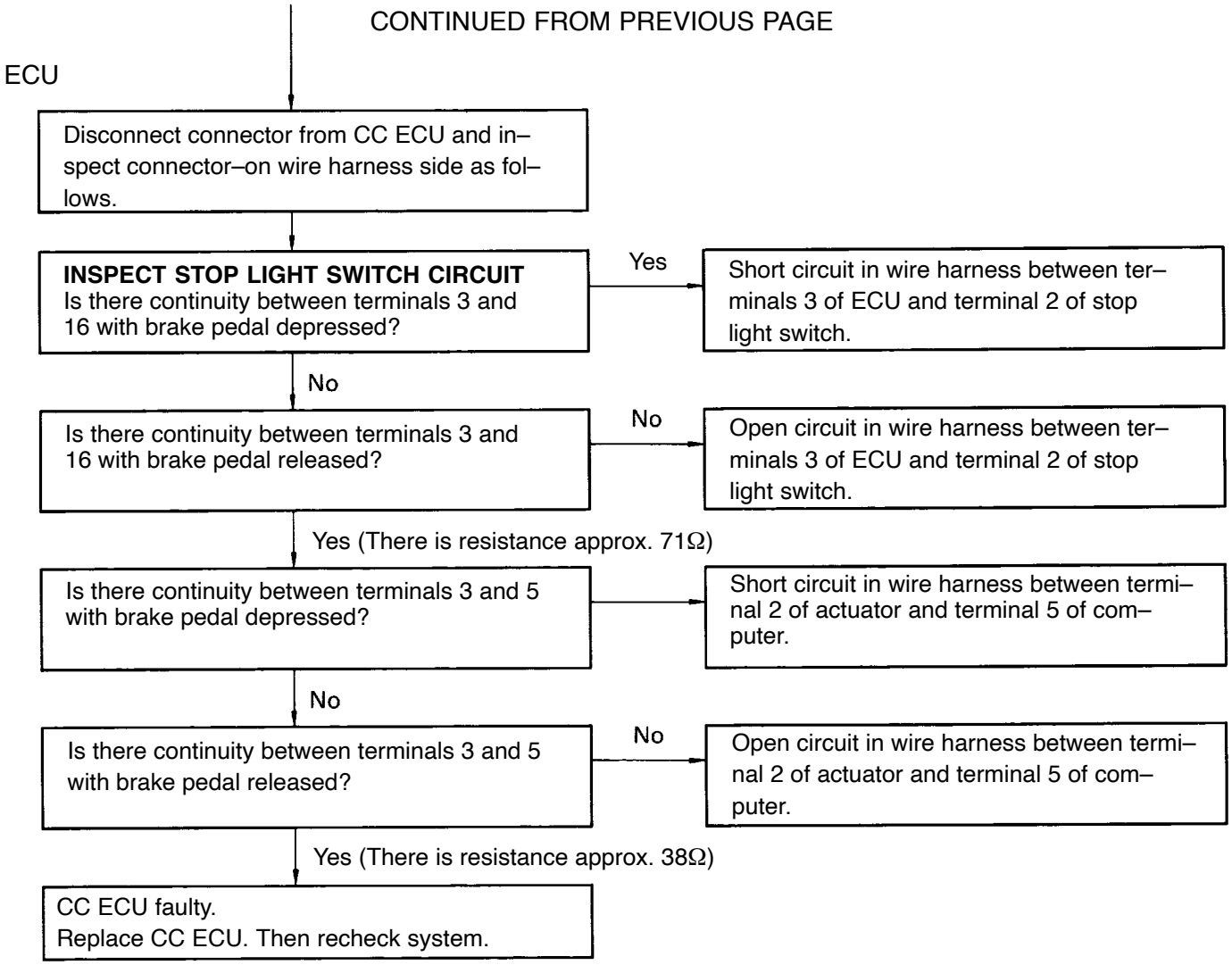
CONTINUED FROM PREVIOUS PAGE
ECU
Disconnect connector from CC ECU and inspect connector–on wire harness side as follows.
INSPECT STOP LIGHT SWITCH CIRCUIT
Is there continuity between terminals 3 and 16 with brake pedal depressed?
Yes
Short circuit in wire harness between terminals 3 of ECU and terminal 2 of stop light switch.
No
Is there continuity between terminals 3 and 16 with brake pedal released?
No
Open circuit in wire harness between terminals 3 of ECU and terminal 2 of stop light switch.
Yes (There is resistance approx. 71Ω)
Is there continuity between terminals 3 and 5 with brake pedal depressed?
Short circuit in wire harness between terminal 2 of actuator and terminal 5 of computer.
No
Is there continuity between terminals 3 and 5 with brake pedal released?
No
Open circuit in wire harness between terminal 2 of actuator and terminal 5 of computer.
Yes (There is resistance approx. 38Ω)
CC ECU faulty.
Replace CC ECU. Then recheck system.

D INSPECTION OF SPEED SENSOR CIRCUIT

SPEED METER CABLE

INSPECT SPEED METER CABLE
Does not meter fluctuate when driving at a steady speed?

Yes → Meter cable faulty.
Replace meter cable. Then recheck system.

No

Turn ignition switch off.

SPEED SENSOR

Disconnect connector from combination meter.

INSPECT GROUND CONNECTION
Is there continuity between terminal6 of wire harness side connector and ground?

No →
- Open circuit in wire harness between terminal B of combination meter and ground.
- Ground faulty.

Yes

INSPECT SPEED SENSOR OPERATION
Is there sensor operation normal? (See page BE–33).

No → Speed sensor faulty.
Replace speed sensor. Then recheck system.

Yes

Connect connectors to combination meter.

ECU

Disconnect connector from CC ECU and inspect connector on wire harness side as follows.
Turn ignition switch on.

INSPECT SPEED SENSOR CIRCUIT
Does the voltage between terminal 8 and ground change repeatedly from OV to approx. 5V or more when speedometer shaft is turned?

No → Open or short circuit in wire harness between terminal 8 of CC ECU and terminal A of combination meter.

Yes

CC ECU faulty.
Replace CC ECU. Then recheck system.

E INSPECTION OF STOP LIGHT SWITCH CIRCUIT

Turn ignition switch off.

Is STOP fuse normal?

No → Replace fuse. Is operation normal?

No → Short circuit in wire harness between terminal 18 of CC ECU or terminal 1 of stop light switch and fuse.

Yes → Fuse faulty.

STOP LIGHT SWITCH

INSPECT GROUND CONNECTION
Disconnect connector from stop light switch.
Is there continuity between terminal 3 of wire harness side connector and ground?

No →
- Open circuit in wire harness between terminal 3 and ground.
- Bulb burned out.
- Ground faulty.

Yes

INSPECT STOP LIGHT SWITCH CONTINUITY
Is stop light switch continuity normal?
(See page BE–80).

No → Stop light faulty.
Replace stop light switch. Then recheck system.

Yes → Connect connector to stop light switch.

ECU

Disconnect connector from CC ECU and inspect connector on wire harness side as follows.

INSPECT STOP FUSE CIRCUIT
Is there battery positive voltage between terminal 17 and ground with brake pedal released?

Yes → Short circuit in wire harness between terminal 17 of CC ECU and STOP fuse.

No

Is there battery positive voltage between terminal 17 and ground with brake pedal depressed?

No → Open circuit in wire harness between terminal 17 of CC ECU and STOP fuse.

Yes → CC ECU faulty.
Replace CC ECU. Then recheck system.

F INSPECTION OF PARKING BRAKE SWITCH CIRCUIT

Turn ignition switch off.

BRAKE FLUID LEVEL WARNING SWITCH

INSPECT GROUND CONNECTION
Disconnect connector from brake fluid level warning switch.
Is there continuity between terminal 2 of wire harness side connector and ground?

No →
- Open circuit in wire harness between terminal 2 of brake fluid level warning switch.
- Ground faulty.

Yes ↓

INSPECT BRAKE WARNING SWITCH
Is brake fluid level warning switch operation normal?
(See page BE–38)

No → Brake warning switch faulty.
Replace brake warning switch.

Yes ↓

Connect the connector to brake warning switch.

PARKING BRAKE SWITCH

INSPECT GROUND CONNECTION
Disconnect connector from parking brake switch.
Is there continuity between terminal 2 of wire harness side connector and ground?

No →
- Open circuit in wire harness between terminal 2 of parking brake switch.
- Ground faulty.

Yes ↓

INSPECT PARKING BRAKE SWITCH OPERATION
Is parking brake switch operation normal?
(See page BE–40)

No → Replace parking brake switch.

Yes ↓

Connect connector to parking brake switch.

ECU

Disconnect connector from CC ECU and inspect connector on wire harness side as follows.

↓

Ignition switch turned on.

↓

Is there no voltage between terminal 14 and ground with parking brake lever pulled up?

No → Open circuit in wire harness between terminal 14 of ECU and terminal 1 of parking brake switch or brake warning light.

Yes ↓

Is there battery positive voltage between terminal 14 and body ground with parking brake released?

No → Short circuit in wire harness between terminal 14 of ECU and terminal 1 of parking brake switch, terminal 1 of brake fluid level warning switch or brake warning light.

Yes ↓

CC ECU faulty.
Replace CC ECU. Then recheck system.

G INSPECTION OF CLUTCH SWITCH CIRCUIT

Turn ignition switch off.

CLUTCH SWITCH

INSPECT GROUND CONNECTION
Disconnect connector from clutch switch.
Is there continuity between terminal 2 of wire harness side connector and ground?

No → Open circuit in wire harness between terminal 2 of the clutch switch and ground.

Yes

INSPECT CLUTCH SWITCH CONTINUITY
Is clutch switch continuity normal?
(See page BE–81)

No → Replace clutch switch.

Yes

Connect connector to clutch switch.

ECU

Disconnect connector from CC ECU and inspect connector on wire harness side as follows.

INSPECT CLUTCH SWITCH CIRCUIT
Is there continuity between terminal 13 and ground when clutch pedal is depressed?

No → Open circuit in wire harness between terminal 13 of ECU and terminal 1 of clutch switch.

Yes

CC ECU faulty.
Replace CC ECU. Then recheck system.

H INSPECTION OF PARK/NEUTRAL POSITION SWITCH CIRCUIT

Turn ignition switch off.

PARK/NEUTRAL POSITION SWITCH

INSPECT GROUND CONNECTION
Disconnect connector from park/neutral position switch.
Is there continuity between terminal 3 of wire harness side connector and ground?

No → Open circuit in wire harness between terminal 3 of park/neutral position switch and ground.

Yes

INSPECT PARK/NEUTRAL POSITION SWITCH OPERATION
Is park/neutral position switch operation normal?
(See page AT–26, 79, 137 or 196)

No → Replace park/neutral position switch.

Yes

Connect connector to park/neutral position switch.

ECU

Disconnect connector from CC ECU and inspect connector on wire harness side as follows.

INSPECT PARK/NEUTRAL POSITION SWITCH CIRCUIT
Is there continuity between terminal 13 and ground when shifted to "N" and "P" position?

No → Open circuit in wire harness between terminal 13 of ECU and terminal 2 of park /neutral position switch.

Yes

CC ECU faulty.
Replace CC ECU. Then recheck system.

INSPECTION OF VACUUM CIRCUIT

Turn ignition switch off.

VACUUM HOSE

Are there cracks or other damage on the vacuum hose?

Yes → Replace vacuum hose.

No

VACUUM SWITCH

INSPECT VACUUM SWITCH CIRCUIT
Disconnect connector from vacuum switch.
Is there continuity terminal 2 of vacuum switch and ground?

No →
- Open circuit in wire harness between terminal 2 of vacuum switch and ground.
- Ground faulty.

Yes

INSPECT VACUUM SWITCH OPERATION
Is vacuum switch normal?
(See page BE–82)

No → Replace vacuum switch.

Yes

VACUUM PUMP

INSPECT GROUND CONNECTION
Disconnect connector from vacuum pump.
Is there continuity between terminal 2 of wire harness side connector and ground?

No →
- Open circuit in wire harness between terminal 2 of vacuum pump and ground.
- Ground faulty.

Yes

INSPECT VACUUM PUMP OPERATION
Is vacuum pump operation normal?
(See page BE–82)

No → Replace vacuum pump.

Yes

Connect connector to vacuum switch and pump.

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ECU

Disconnect connector from CC ECU and inspect connector on wire harness side as follows.

INSPECT VACUUM SWITCH CIRCUIT
Is there continuity between terminal 1 1 and ground?

No → Open circuit in wire harness between terminal 1 1 of CC ECU and terminal 1 of vacuum switch.

Yes

Start engine (idling).

Is there continuity between terminal 1 1 and ground?

Yes → Short circuit in wire harness between terminal 1 1 of CC ECU and terminal 1 of vacuum switch.

No

Stop the engine.

INSPECT VACUUM PUMP CIRCUIT
Is there continuity between terminal 2 and ground?

No → Open circuit in wire harness between terminal 2 of CC ECU and terminal 1 of vacuum switch.

Yes

Is there continuity between terminal 2 and ground when disconnect connector from vacuum pump?

Yes → Short circuit in wire harness between terminal 2 of 'CC ECU and terminal 1 of vacuum pump.

No

CC ECU faulty.
Replace CC ECU. Then recheck system.

J INSPECTION OF ECM SOLENOID CIRCUIT

Start engine (idling).

ECM

Is there battery positive voltage between terminal 6126 of ECM and ground?

No → Short or open circuit in wire harness between terminal 6/26 of ECM and terminal 9 of CC ECU.

Yes

Is there voltage approx. 5V between terminal 7 of CC ECU and ground?

No → Short or open circuit in wire harness between terminal 7 of CC ECU and terminal of EC M .

Yes

Stop engine.

ECU

Disconnect connector from CC ECU and inspect connector on wire harness side as follows.

INSPECT ECM SOLENOID CIRCUIT
Is there continuity between terminal 9 and terminal 6126 of ECM?

No → Open circuit in wire harness between terminal 9 of CC ECU and terminal 6I26 of ECM.

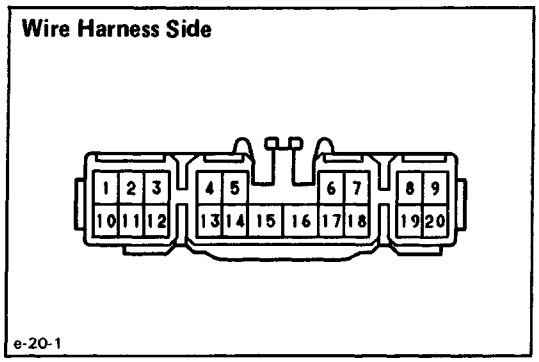
Yes

Is resistance value about 11–15Ω between terminal 9 and ground?

No → Open or short circuit in wire harness between terminal 9 of CC ECU and terminal of ECM or No. 2 solenoid.

Yes

CC ECU faulty.
Replace CC ECU. Then recheck system.



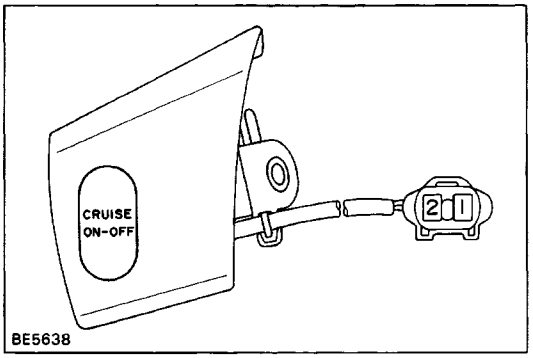
Cruise Control ECU Circuit Inspection of ECU Circuit

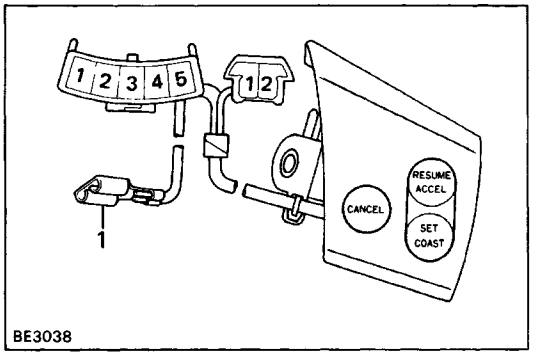
Disconnect the connector from the ECU and inspect the connector on the wire harness side as shown below.

Connection or Measure item	Check for	Tester Connection	Condition		Specified valve
Data Link Connector 2	Continuity	1 – Ground	Short terminals between "Te" and "El"		Continuity
			Released		No continuity
Vacuum pump		2 – Ground	Constant		Continuity *1
Speed sensor (in combination meter)		8 – Ground	Vehicle moving slowly		1 pulse each 40 cm approx. (15.75 in.)
Vacuum switch		11 – Ground	Vacuum	No vacuum	Continuity
				More than 70 + 30 mmHg 6.69 f 1.18 in. Hg 22.66 + 4.0 kPa	No continuity
Park/Neutral Position switch (A/T)		13 – Ground	Shift position	"N" or "P" position	Continuity
				⍰, ,.2⍰, ⍰p⍰ or "R" position	No continuity
Clutch switch (M/T)		13 – Ground	Clutch pedal position	Depressed	Continuity
				Released	No continuity
Parking brake switch		14 – Ground	Parking brake lever position	Pulled	Continuity
				Released	No continuity
Body ground		15 – Ground	Constant		Continuity
Stop light switch		17 – 18	Brake pedal position	Depressed	Continuity *1
				Released	No continuity
CANCEL switch	Resistance	19 – Ground	Cruise control switch position	CANCEL switch is pushed	Approx. 4180
				Released	No continuity
RESUMEIACCEL switch		19 – Ground		RESUME/ACCEL switch is pushed	Approx. 68Ω
				Released	No continuity
SET/COAST switch		19 – Ground		SET/COAST switch is pushed	Approx. 1980
				Released	No continuity
Stop light switch and actuator (release valve)		3 – 16	Brake pedal position	Depressed	No continuity
				Released	Approx. 71Ω
Actuator (control valve)		5 – 16	Constant		Approx. 380
No. 2 solenoid valve		9 – Ground	Constant		less than 1511
GAUGE fuse and indicator light	Voltage	4 – Ground	Ignition switch position	ON	Battery positive voltage
				LOCK, ACC	No voltage
ENGINE fuse		6 – Ground	Ignition switch position	ON	Battery positive voltage
				LOCK, ACC	No voltage
O/D circuit		7 – Ground	Ignition SW position	ON	Approx. 5V or more
				LOCK or ACC	No voltage
ENGINE fuse, main switch and main relay		10 – Ground	Ignition switch ON and MAIN switch position	ON	less than 0.3 V
				OFF	No voltage
		12 – Ground	Ignition switch ON –and MAIN switch position	ON	Battery positive voltage
				OFF	No voltage

* 1 There is resistance in the circuit.

If circuit is as specified, replace the ECU.





Parts Inspection

1. INSPECT SWITCHES
(Main Switch/Continuity)

Terminal / Switch position	1	2
OFF		
ON	○	○

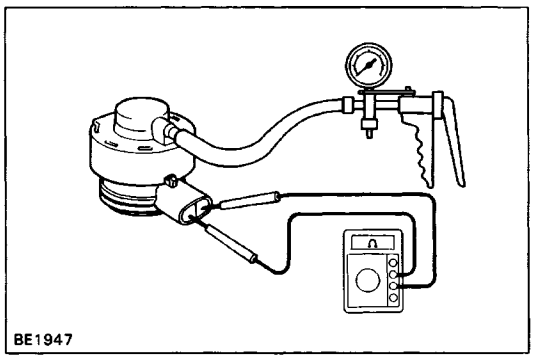
If continuity is not as specified, replace the switch.
(Cruise Control Switch /Continuity)

Terminal / Condition	1/2	2/2	3/5	4/5
Constant	○		○	
		○		○

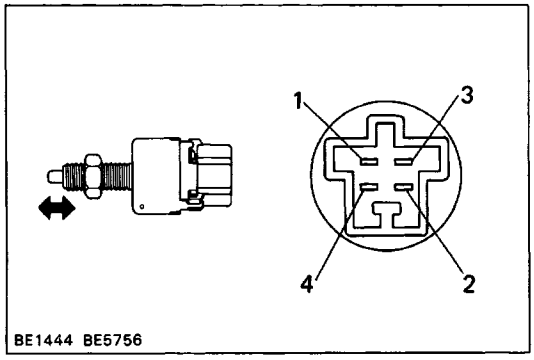
If continuity is not as specified, replace the switch.
(Cruise Control Switch/Resistance)
Measure the resistance value between terminals 2/5 and 4l5 or 2l2.

Switch position	RESISTANCE (Ω)
OFF	No continuity
RESUME/ACCEL	Approx. 68
SET/COAST	Approx. 198
CANCEL	Approx. 418

If resistance value is not as specified, replace the switch.



(Vacuum Switch /Operation)
(a) Check that there is continuity between terminals with no vacuum.
(b) Check that there is no continuity between terminals with a vacuum of 170 ± 30mmHg (6.69 ± 1.18 in. Hg, 22.66 ± 4. 00 kPa) or above.
If operation is not as specified, replace the switch.

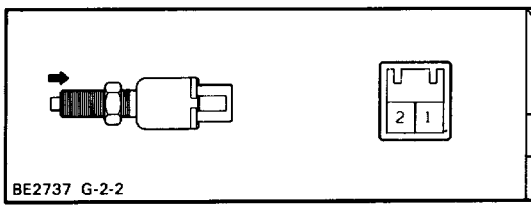


(Stop Light Switch /Continuity)
Inspect the switch continuity between terminals.

Terminals / Switch position	1	2	3	4
Switch pin free (Brake pedal depressed)	○		○	
Switch pin pushed in (Brake pedal released)		○		○

If continuity is not as specified, replace the switch.

(Clutch Switch /Continuity)
Inspect the switch continuity between terminals.



Condition \ Terminal	1	2
Switch pin free (Clutch pedal depressed)	○	○
Switch pin pushed in (Clutch pedal released)		

If continuity is not as specified, replace the switch.

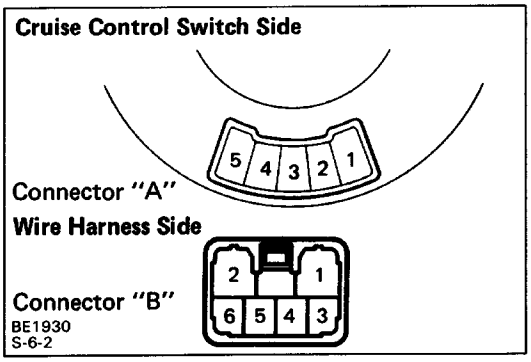
(Brake Fluid Level Warning Switch/Operation)
See step 2 on page BE–39.

(Parking Brake Switch/Operation)
See step 2 on page BE–40.

(Park/Neutral Position Switch /Operation)
See pages AT–26, 79, 137 or 196.

2. INSPECT SPEED SENSOR
See step 2 on page BE–34.

3. INSPECT SLIP RING
(Continuity)
Inspect the continuity between terminals.



Condition \ Terminal	A-2	A-3	A-4	B-4	B-5	B-6
Constant	○					○
		○		○		
			○		○	

If continuity is not as specified, replace the slip ring.

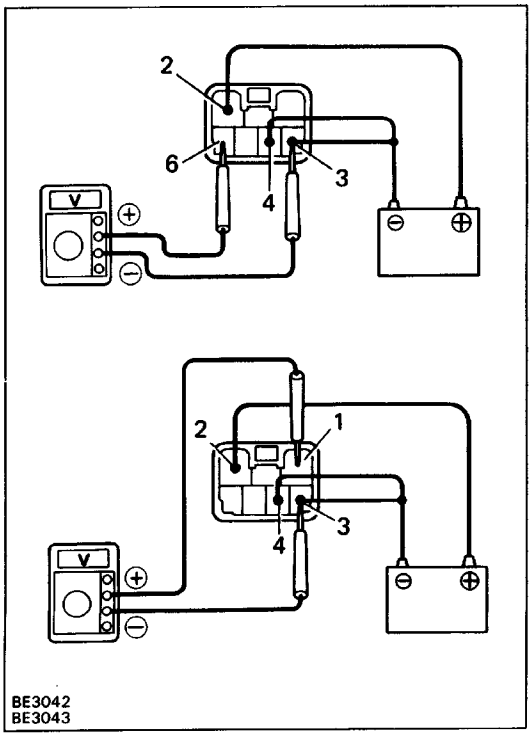
4. INSPECT MAIN RELAY
(Operation)

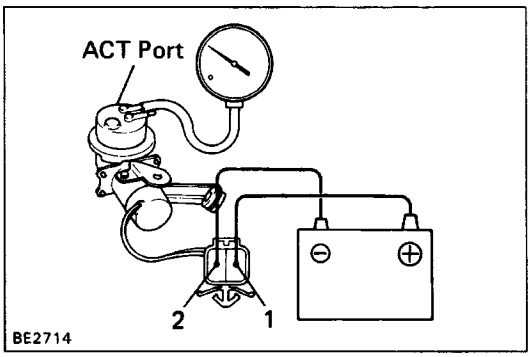
(a) Connect the positive (+) lead from the battery to terminal 2 and the negative (–) lead to terminals 3 and 4.

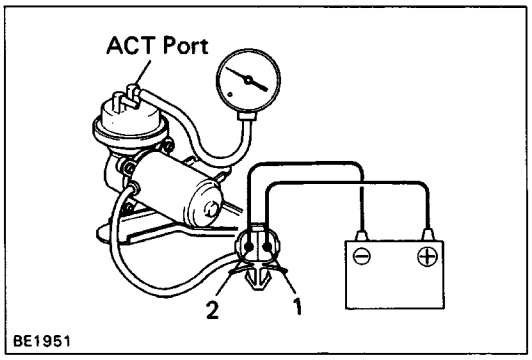
(b) Connect the positive (+) lead from the voltmeter to terminal 6 and the negative (–) lead to terminal 3, check that there is battery positive voltage.

(c) Change the positive (+) lead to terminal 1, check that there is voltage less than 0.3V.

If operation is not as specified, replace the relay.







5. INSPECT VACUUM PUMP

(3VZ–E Engine)

(a) Connect a vacuum gauge to the ACT side of the pump.

(b) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2.

(c) Check that there is a vacuum of 200 mmHg (7.87 in. Hg, 26.7 kPa) or above.

If operation is not as specified, replace the pump.

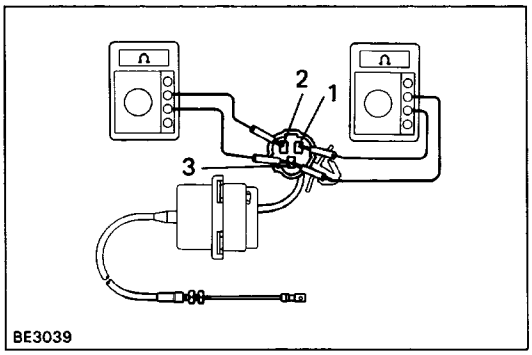
(22R–E Engine)

(a) Connect a vacuum gauge to the ACT side of the pump.

(b) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2.

(c) Check that there is a vacuum of 200 mm Hg (7.87 in.Hg, 26.7 kPa) or above.

If operation is not as specified, replace the pump.



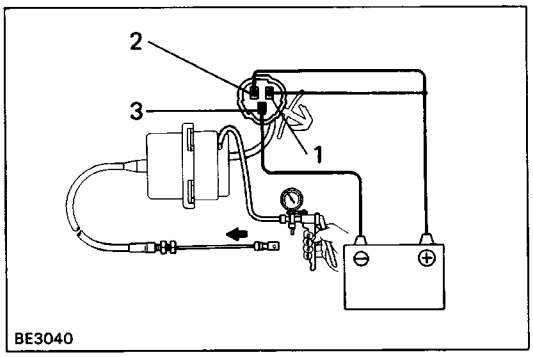
6. INSPECT ACTUATOR

(Resistance)

Measure the resistance value between terminals as follows.

Resistance: 1–3 Approx. 71Ω
2–3 Approx. 38Ω

If the resistance value is not as specified, replace the actuator.



(Operation)

(a) Connect the positive (+) lead from the battery to terminals 1 and 2, and the negative (–) lead to terminal 3.

(b) Slowly apply vacuum from 0 to 300 mmHg (0 to 11.81 in.Hg, 0 to 40.0 kPa), check that the control cable can be pulled smoothly.

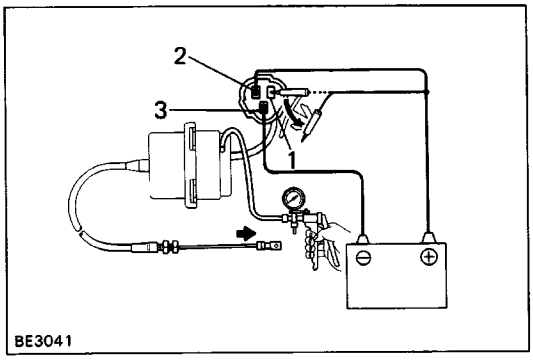
Cable stroke: Approx. 36 mm (1.42 in.)

(c) With the vacuum stabilized, check that the control cable does not return.

HINT: As you apply and hold the vacuum with the vacuum pump, the drawn in diaphragm will in some cases return. This does not indicate a malfunction. Actuator leakage is allowable.

(d) Disconnect terminal 1 or 2 and check that the control cable returns to its original position and the vacuum returns to 0 mmHg (0 in. Hg, 0 kPa).

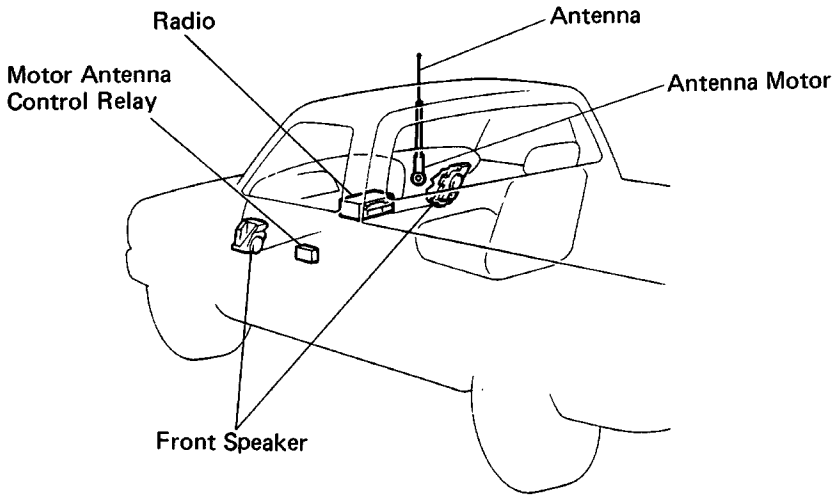
If operation is not as specified, replace the actuator.



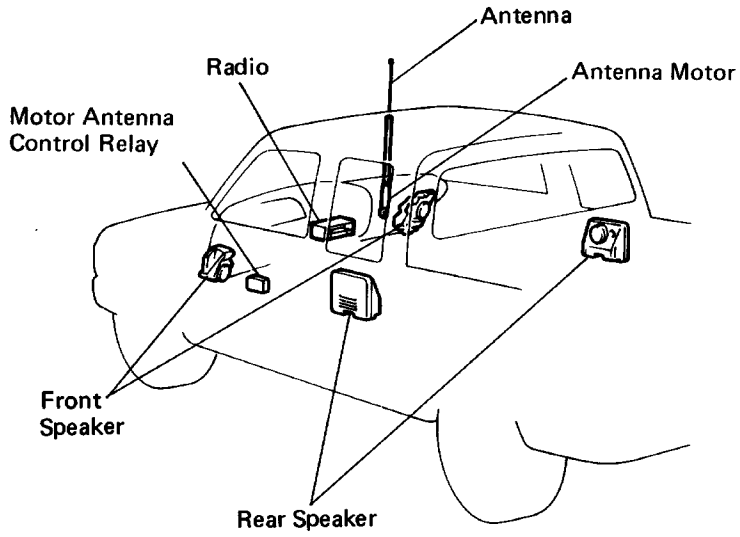
AUDIO SYSTEM

Parts Location

2-Speaker Type



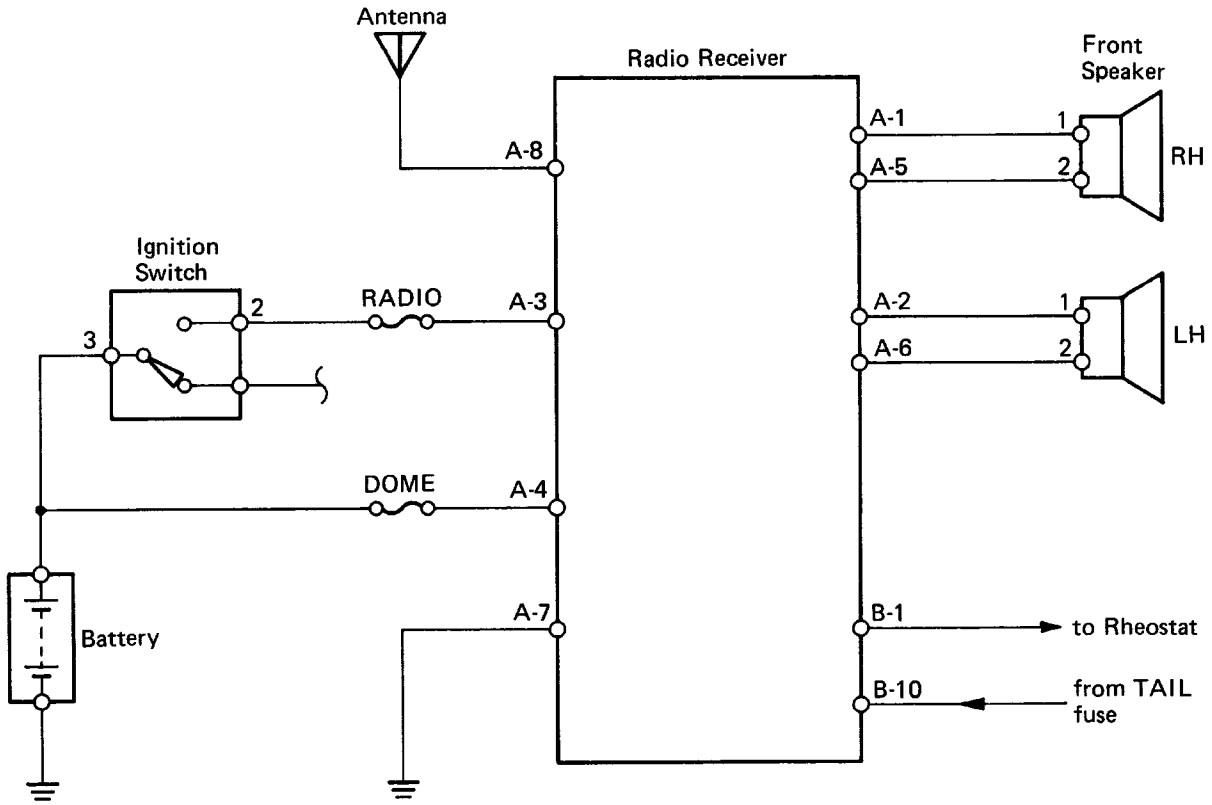
4-Speaker Type



N03063
BE2942

Wiring and Connector Diagrams

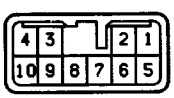
Radio: Simbol R



The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE-8.

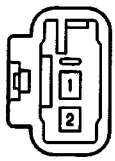
Radio Receiver

Connector "A"



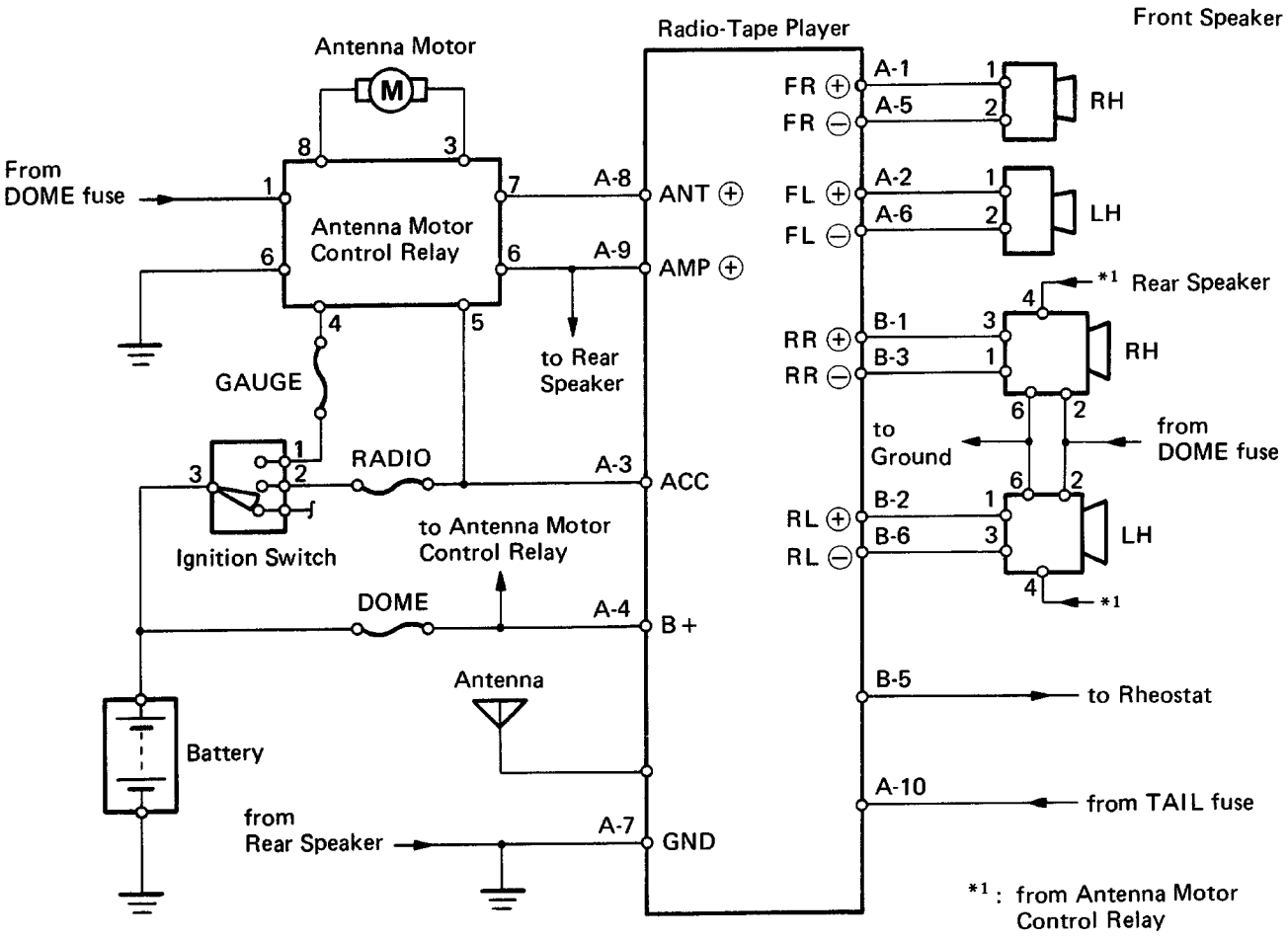
Connector "B"

Front Speaker



N02964
S-10-2-A e-1-2 e-2-2-E

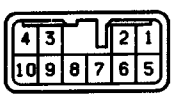
Radio-Tape Player Unit: Simbol U



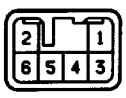
The POWER SOURCE CIRCUIT has been simplified. For full datils, see page BE-8.

Radio-Tape Player

Connector "A"

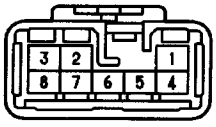


Connector "B"

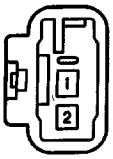


Antenna Motor Control Relay

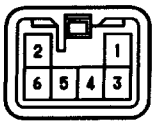
Ignition Switch



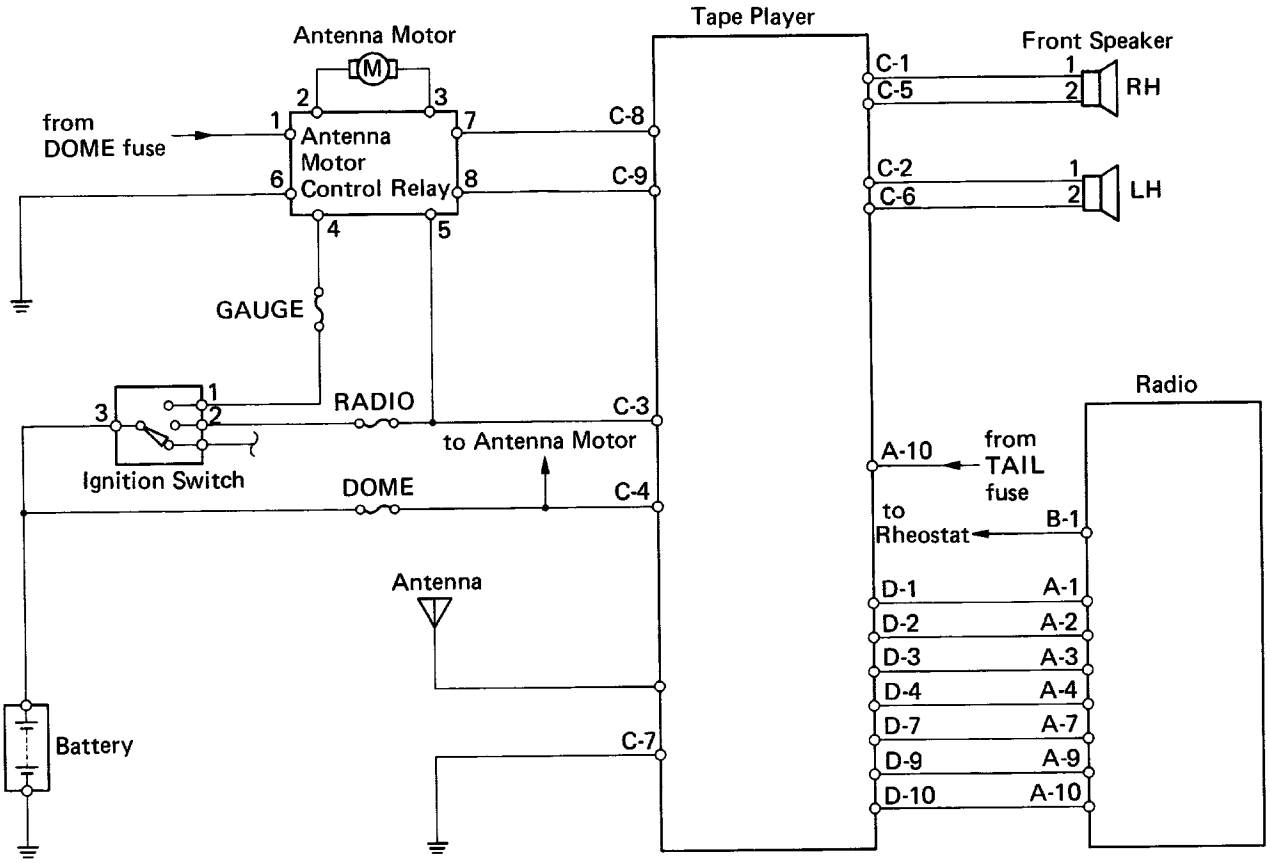
Front Speaker



Rear Speaker



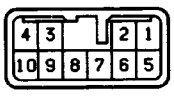
Radio-Tape Player (Separate): Simbol S



The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE-8.

Radio

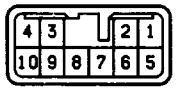
Connector "A"



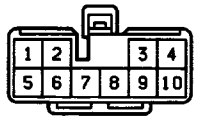
Connector "B"

Tape Player

Connector "C"

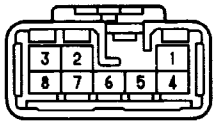


Connector "D"

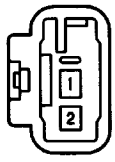


Antenna Motor Control Relay

Ignition Switch

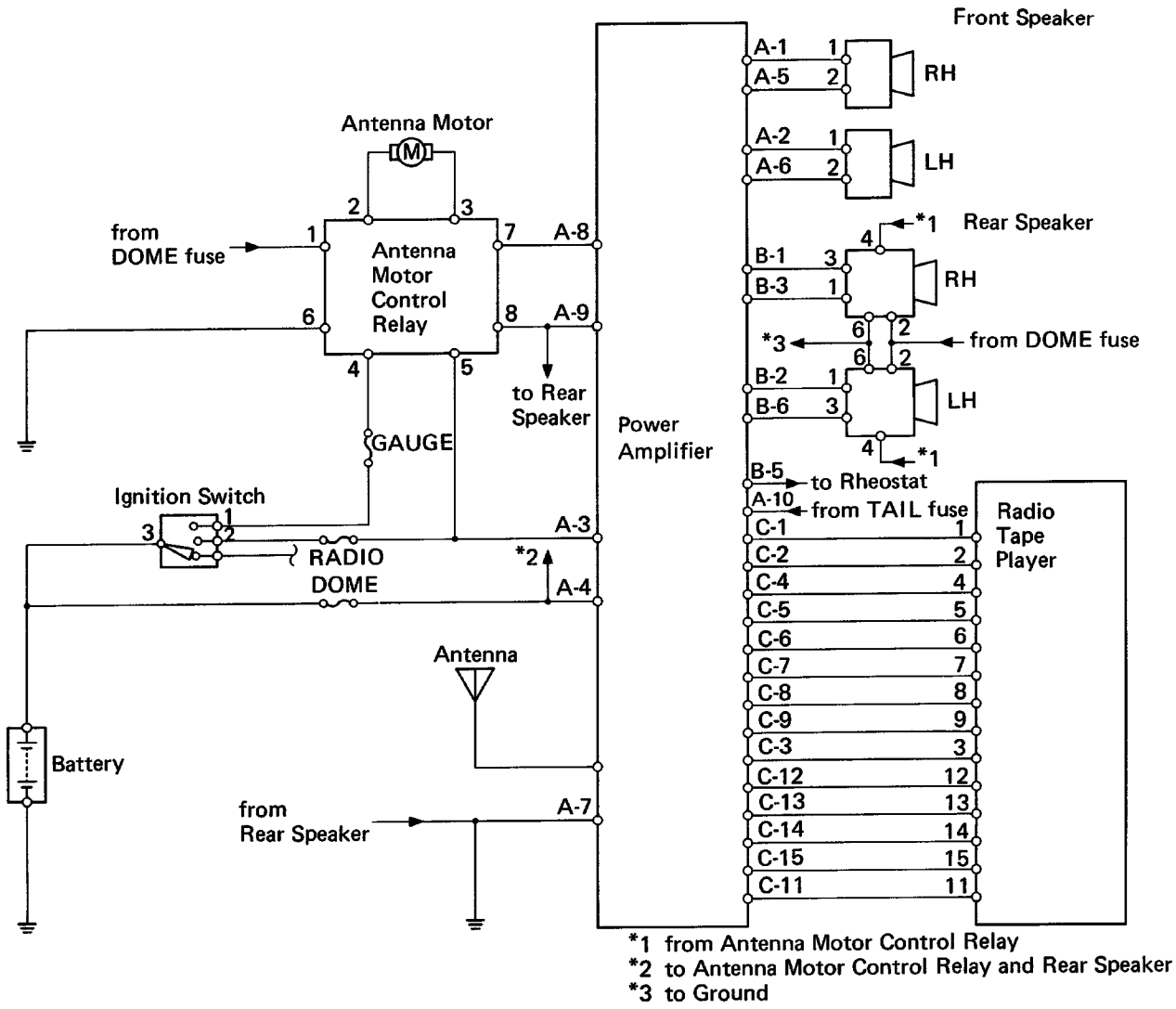


Front Speaker



N02968
S-10-2-A e-1-2 S-10-2-A S-10-1-A
G-9-2 e-8-2 g-8-2 e-2-2-E

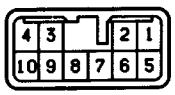
Radio-Tape Player Unit (Separate Power Amplifier): Simbol P



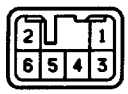
The POWER SOURCE CIRCUIT has been simplified. For full details, see page BE-8.

Power Amplifier

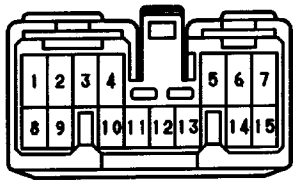
Connector "A"



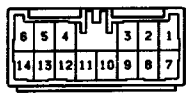
Connector "B"



Connector "C"

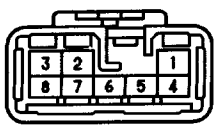


Radio-Tape Player

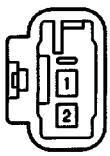


Antenna Motor Control Relay

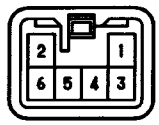
Ignition Switch



Front Speaker



Rear Speaker



N03036
S-10-2-A S-6-2-E h-15-1-A Y-14-2
e-8-2 g-8-2 e-2-2-E le-6-2-A

System Description

RADIO WAVE BAND

The radio wave bands used in radio broadcasting are as follows:

Frequency	30kHz	300kHz	3MHz	30MHz	300MHz
Designation	LF	MF	HF	VHF	
Radio wave	LM	AM (MW)	SW	FM (UKW)	
Modulation method	Amplitude modulation			Frequency modulation	

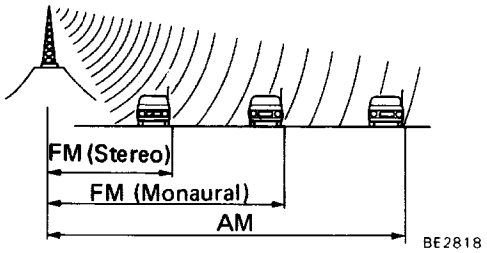
LF: Low Frequency MF: Medium Frequency HF: High Frequency VHF: Very High Frequency

HINT: In this section, the term "'AM" includes LW, MW and SW, and the term "FM" includes UKW.

SERVICE AREA

There is great difference in the size of the service area for AM, FM monaural, and FM stereo broadcasting. Thus it may happen that FM broadcast cannot be received even though AM comes in very clearly.

Not only does FM stereo have the smallest service area, but it also picks up static and other types of interference ("noise") the most easily.

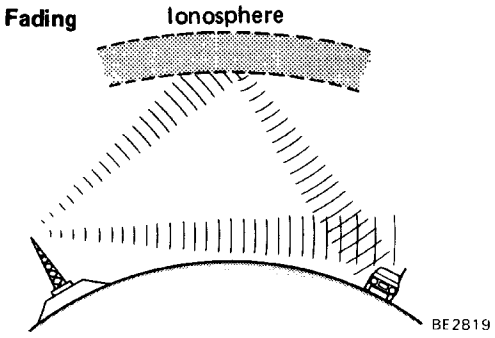


RECEPTION PROBLEMS

Besides the problem of static, there are also the problems called "fading", "multipath", and "fade out". These problems are caused not by electrical noise but by the na–ture of the radio waves themselves.

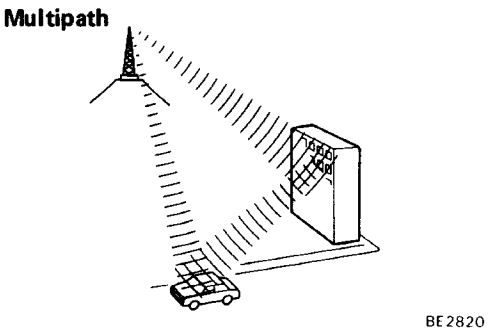
Fading

Besides electrical interference, AM broadcasts are also susceptible to other types of interference, especially at night. This is because AM radio waves bounce off the ionosphere at night. These radio waves then interfere with the signals from the same transmitter that reach the vehicle's antenna directly. This type of interference is called "fading".



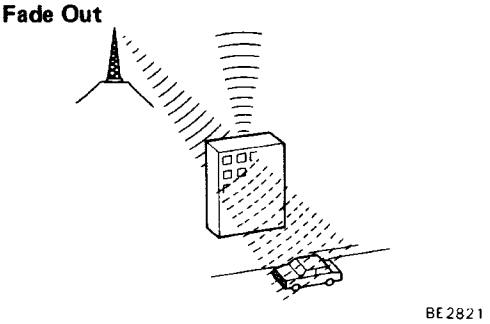
Multipath

One type of interference caused by the bouncing of radio waves off of obstructions is called "multipath". Mul–tipath occurs when a signal from the broadcast transmit–ter antenna bounces off of buildings and mountains and interferes with the signal that is received directly.



Fade Out

Because FM radio waves are of higher frequencies than AM radio waves, they bounce off of buildings, moun–tains, and other obstructions. For this reason, FM signals often seem to gradually disappear or fade away as the vehicle goes behind a building or other obstruction. This is called "fade out".



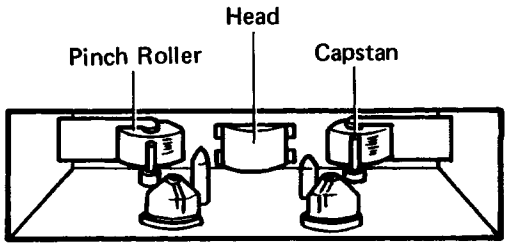
MAINTENANCE OF TAPE PLAYER

Head Cleaning

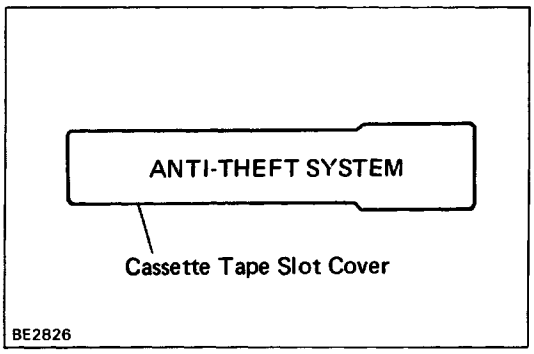
(a) Raise the cassette door with your finger. Next using a pencil or like object, push in the guide.

(b) Using a cleaning pen or cotton applicator soaked in cleaner, clean the head surface, pinch rollers and capstans.

Example:



C0192



Anti–Theft System

The anti–theft system is only provided for audio systems equipped with an Acoustic Flavor function.

HINT: The words ”ANTI–THEFT SYSTEM” are displayed on the cassette tape slot cover.
For operation instructions for the anti–theft system, please consult the audio system section in the Owner’s Manual (hereafter called O/M).

1. SETTING SYSTEM

The system is in operation once the customer has pushed the required buttons and entered the customer–selected 3–digit ID number.
(Refer to the O/M section, ”SETTING THE ANTI–THEFT SYSTEM”).

HINT:

- When the audio system is shipped the ID number has not been input, so the anti–theft system is not in operation.
- If the ID number has not been input, the audio system remains the same as a normal audio system.

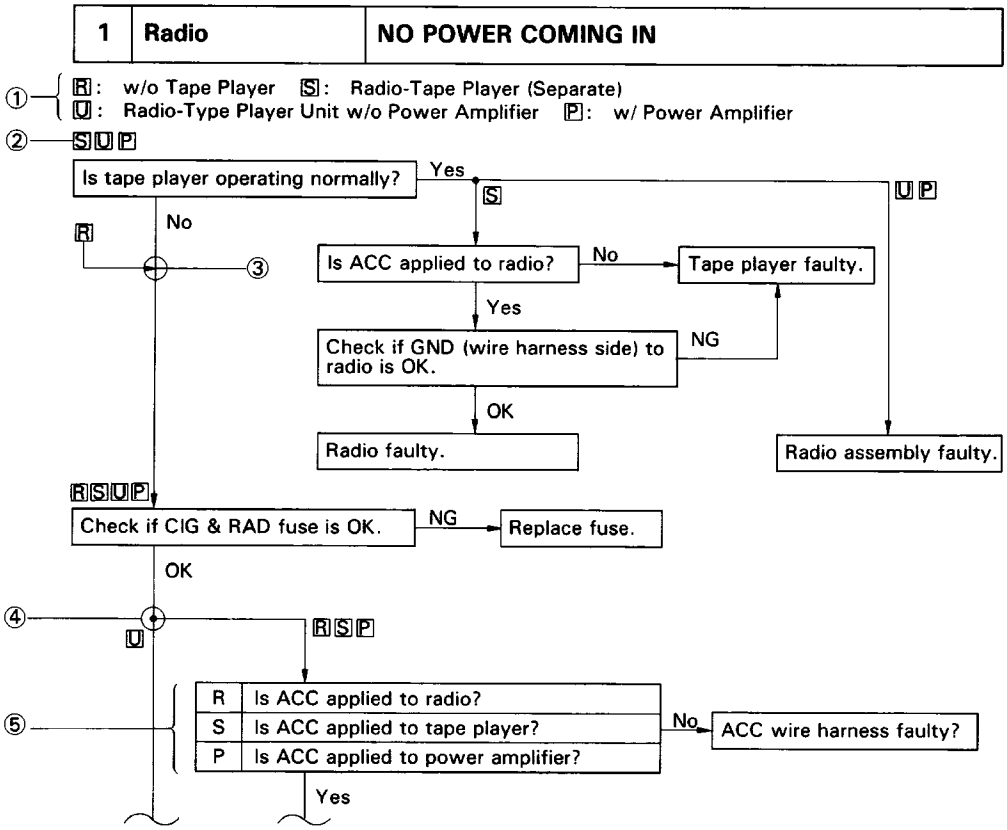
2. ANTI–THEFT SYSTEM OPERATION

If the normal electrical power source (connector or battery terminal) is cut off, the audio system becomes inoperable, even if the power supply resumes.

3. CANCELLING SYSTEM

The ID number chosen by the customer is input to cancel the anti–theft system.
(Refer to the O/M section, ”IF THE SYSTEM IS ACTIVATED”)
HINT: To change or cancel the ID number, please refer to the O/M section, ”CANCELLING THE SYSTEM”.

HOW TO USE DIAGNOSTIC CHART



① Audio system type and symbol used.
HINT: Confirm the applicable type of audio system.

② Symbol for type of audio system the question applies to.

HINT: If the audio system type is not applicable, proceed to next question below.

③ Junction without black circle.

HINT: Proceed to next question below.

④ Junction with black circle.
HINT: Proceed to question for applicable audio system type.

⑤ HINT: Select question for applicable audio system type.

Troubleshooting

NOTICE: when replacing the internal mechanism (computer part) of the audio system, be careful that no part of your body or clothing comes in contact with the terminals of the leads from the IC, etc. of the re–placement part (spare part).

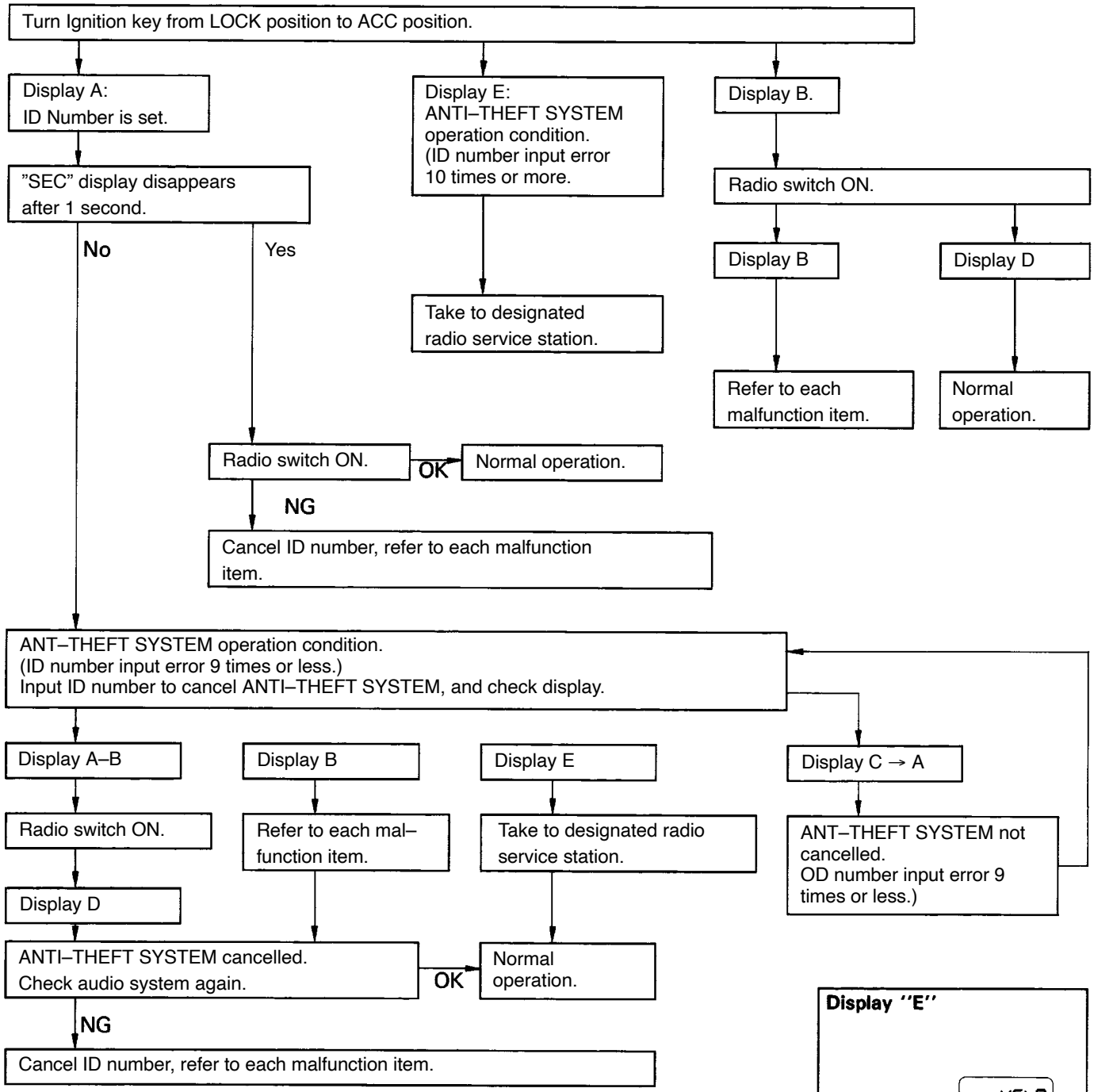
HINT: This inspection procedure is a simple troubleshooting which should be carried out on the vehicle during system operation and was prepared on the assumption of system component troubles (except for the wires and connectors, etc.).

Always inspect the trouble taking the following items into consideration.

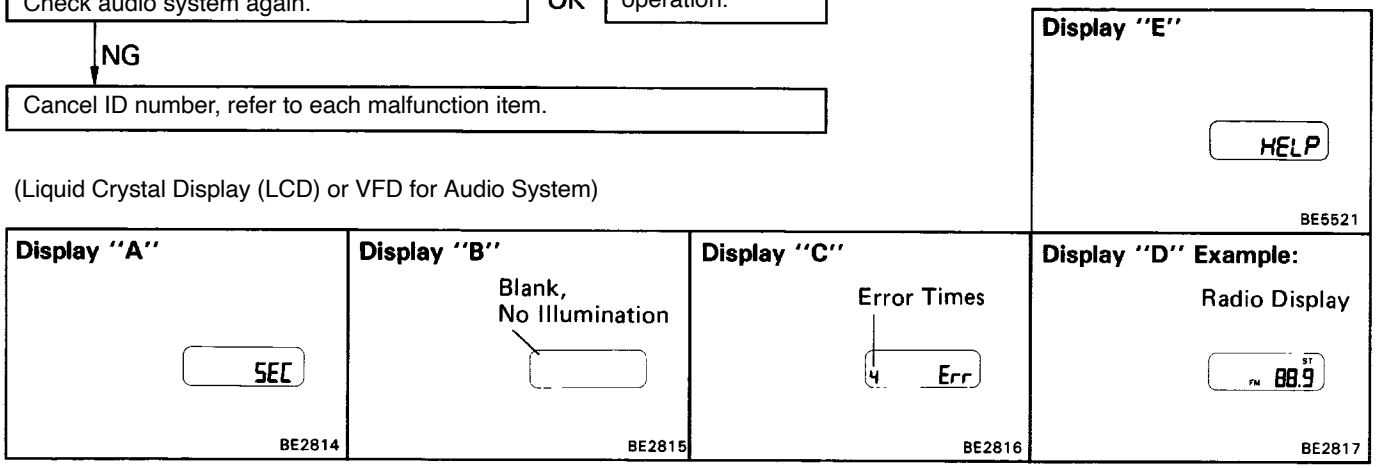
- Open or short circuit of the wire harness
- Connector or terminal connection fault
- For audio systems with anti–theft system, troubleshooting items marked (*) indicate that ”Trouble–shooting for ANTI–THEFT SYSTEM” should be carried out first.

Problem		No.
Radio	No power coming in.	*1
	Power coming in, but radio not operating.	*2
	Noise present, but AM–FM not operating.	3
	Either speaker does not work.	4
	Either AM or FM does not work.	5
	Reception poor (Volume faint).	5
	Few preset tuning bands.	5
	Sound quality poor.	6
	Cannot set station select button.	7
	Preset memory disappears.	7
Tape Player	Cassette tape cannot be inserted.	8
	Cassette tape inserts, but no power.	*9
	Power coming in, but tape player not operating.	10
	Either speaker does not work.	11
	Sound quality poor (Volume faint).	12
	Tape jammed, malfunction with tape speed or auto–reverse.	13
	APS, SKIP, RPT buttons not operating.	14
	Cassette tape will not eject.	* 15
Antenna	Antenna–related.	16
Noise	Noise produced by vibration or shock while driving.	17
	Noise produced when engine starts.	18

Troubleshooting for ANTI–THEFT SYSTEM



(Liquid Crystal Display (LCD) or VFD for Audio System)

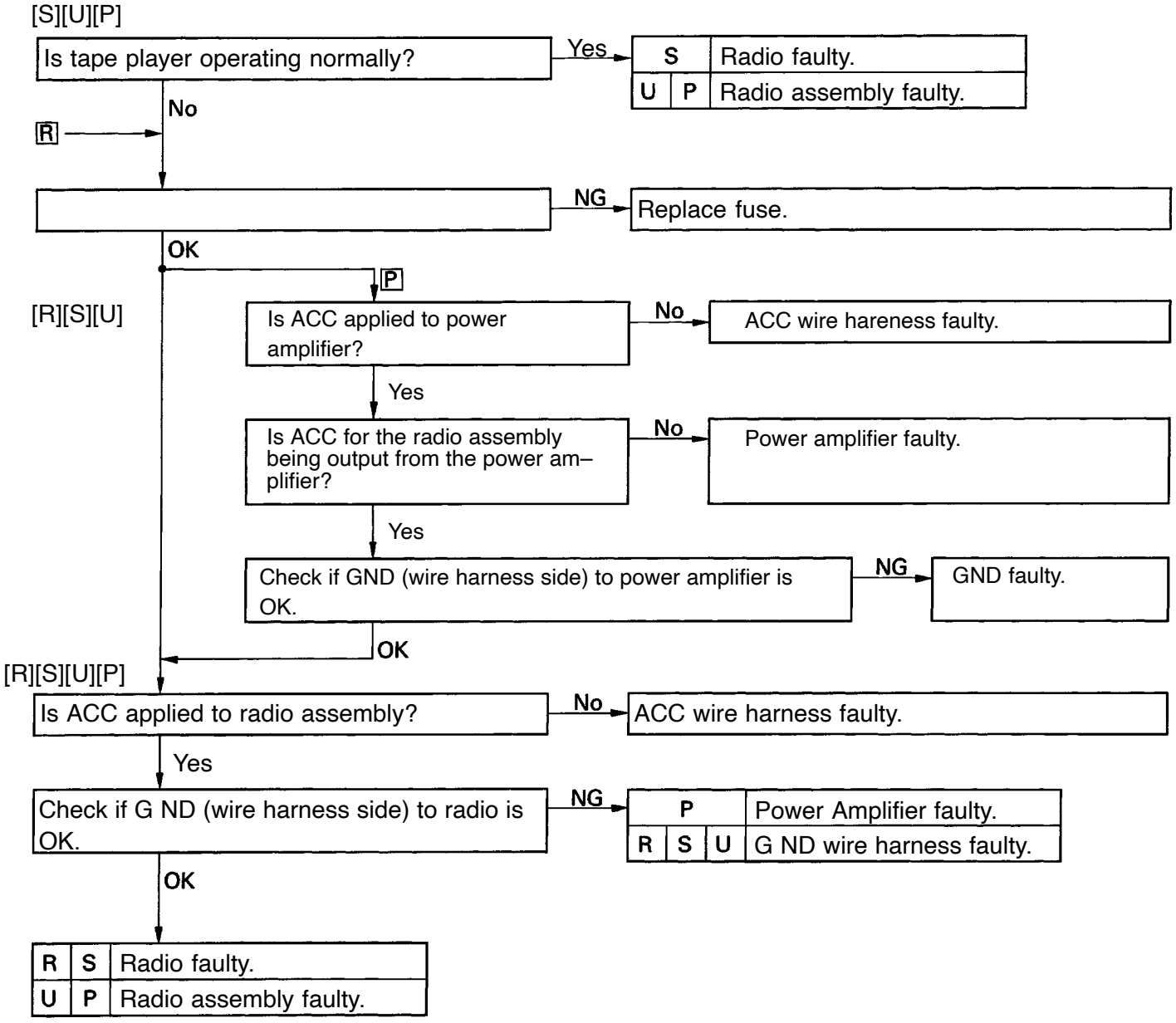


HINT:

- Refer to Owner's Manual for operation details of ANTI–THEFT SYSTEM.
- When the ID number has been cancelled, reset the same number after completing the operation, or in–form the customer that it has been cancelled.

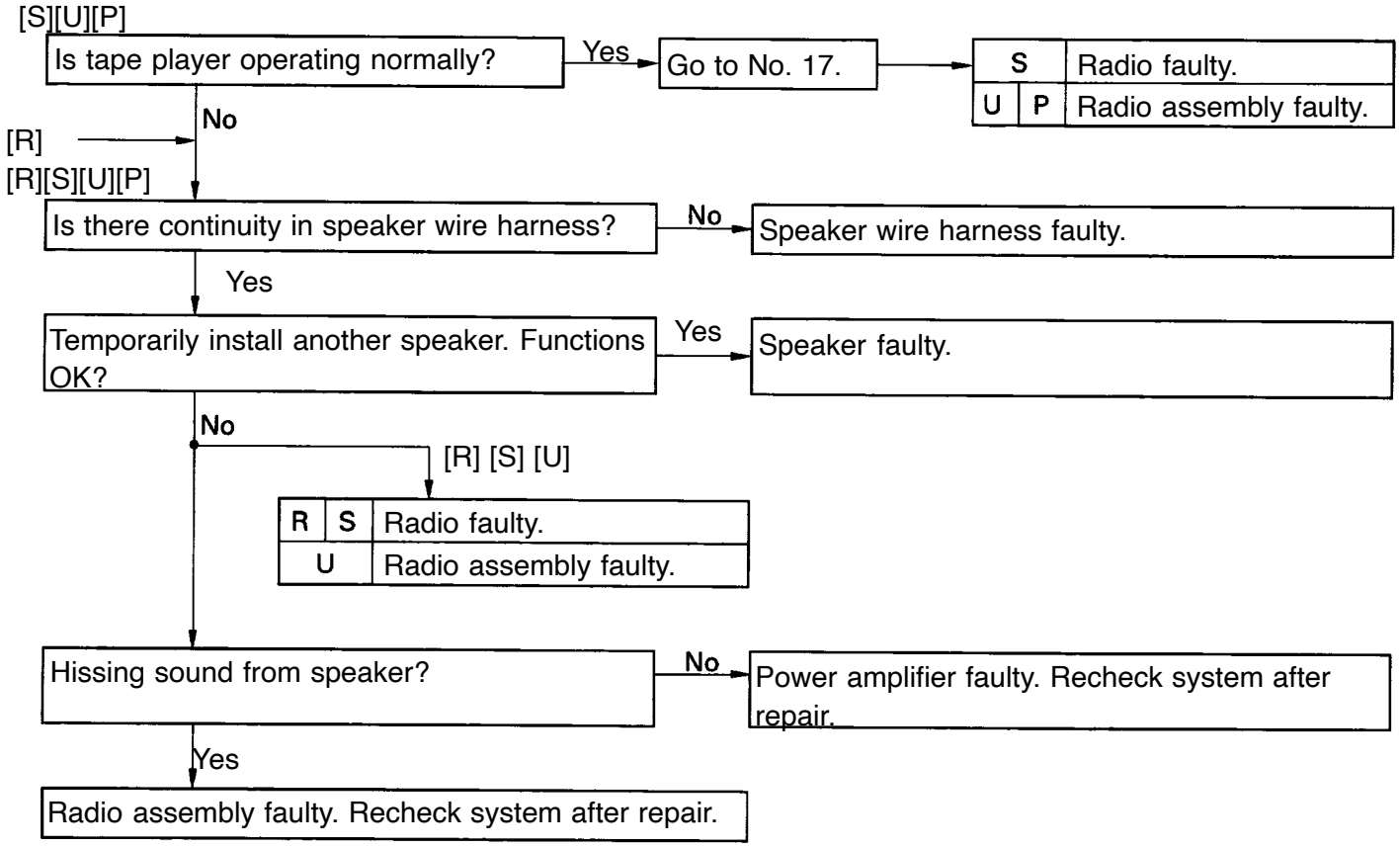
1 Radio — NO POWER COMING IN

[R] Radio [S]: Radio + Tape Player [U]: Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)



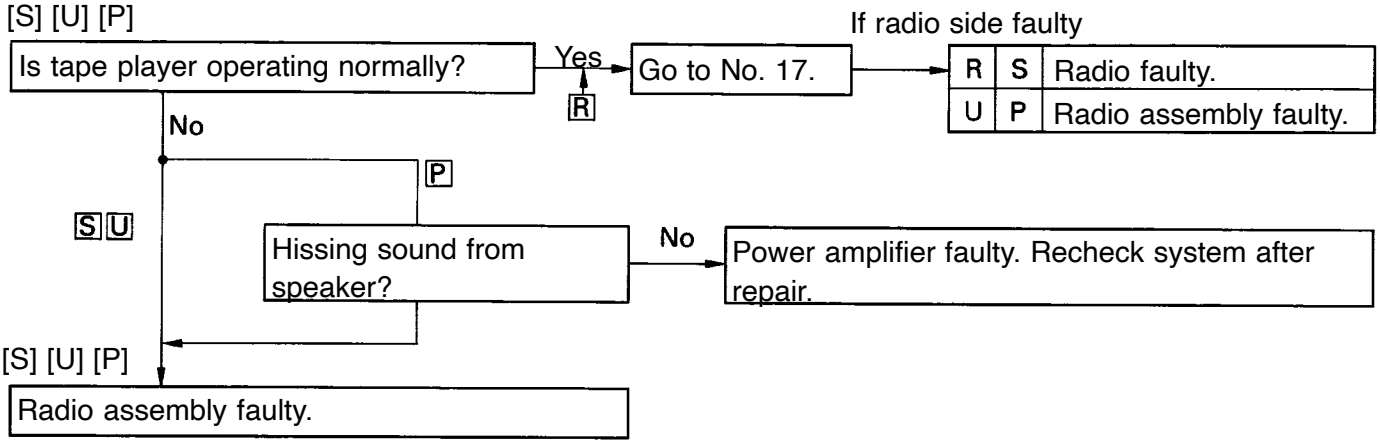
2 Radio — POWER COMING IN, BUT RADIO NOT OPERATING

[R] Radio [S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)



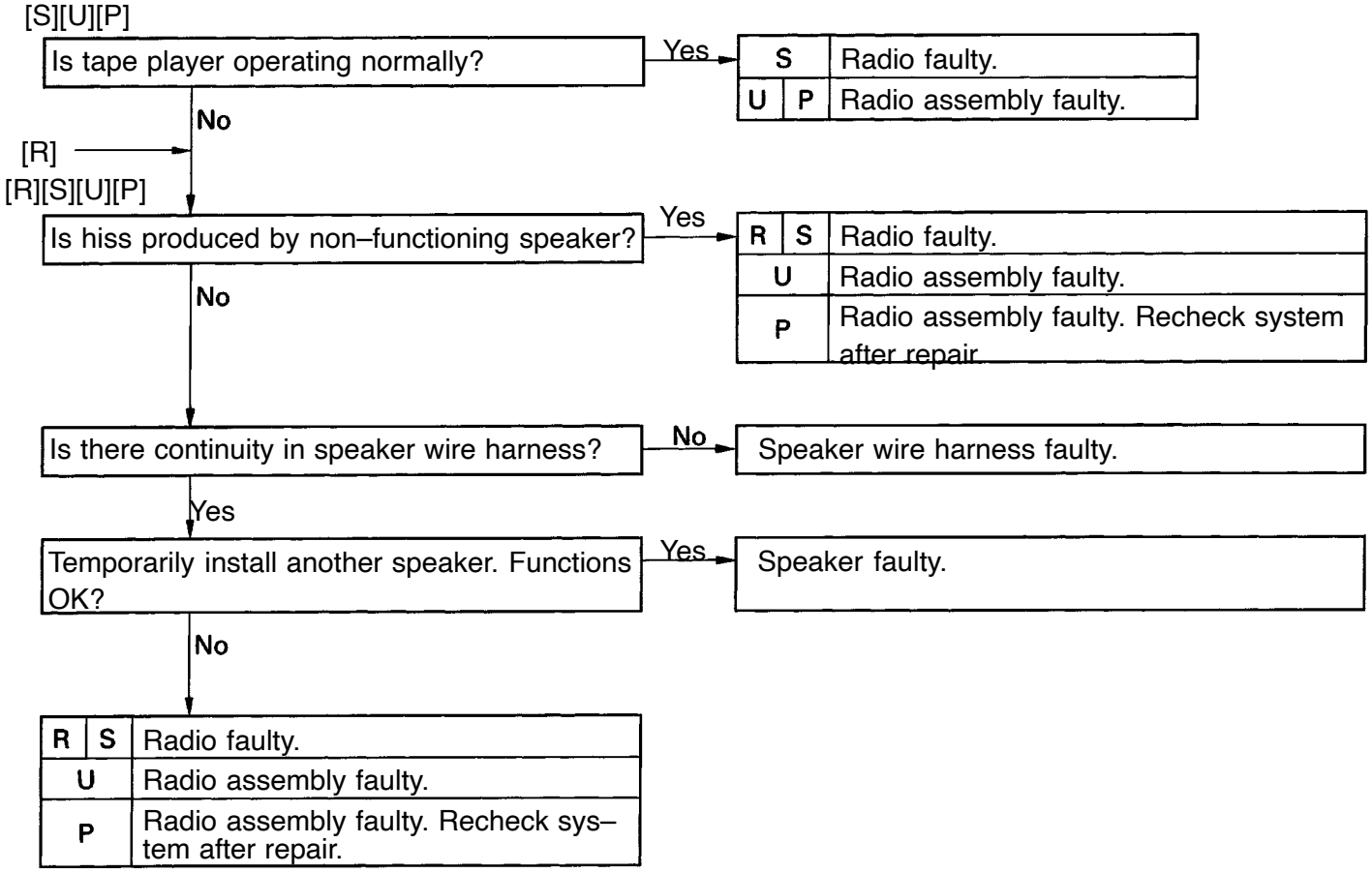
3 Radio — NOISE PRESENT, BUT AM–FM NOT OPERATING

[R] Radio [S]: Radio + Tape Player [U]: Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Type Player (Separate Power Amplifier)



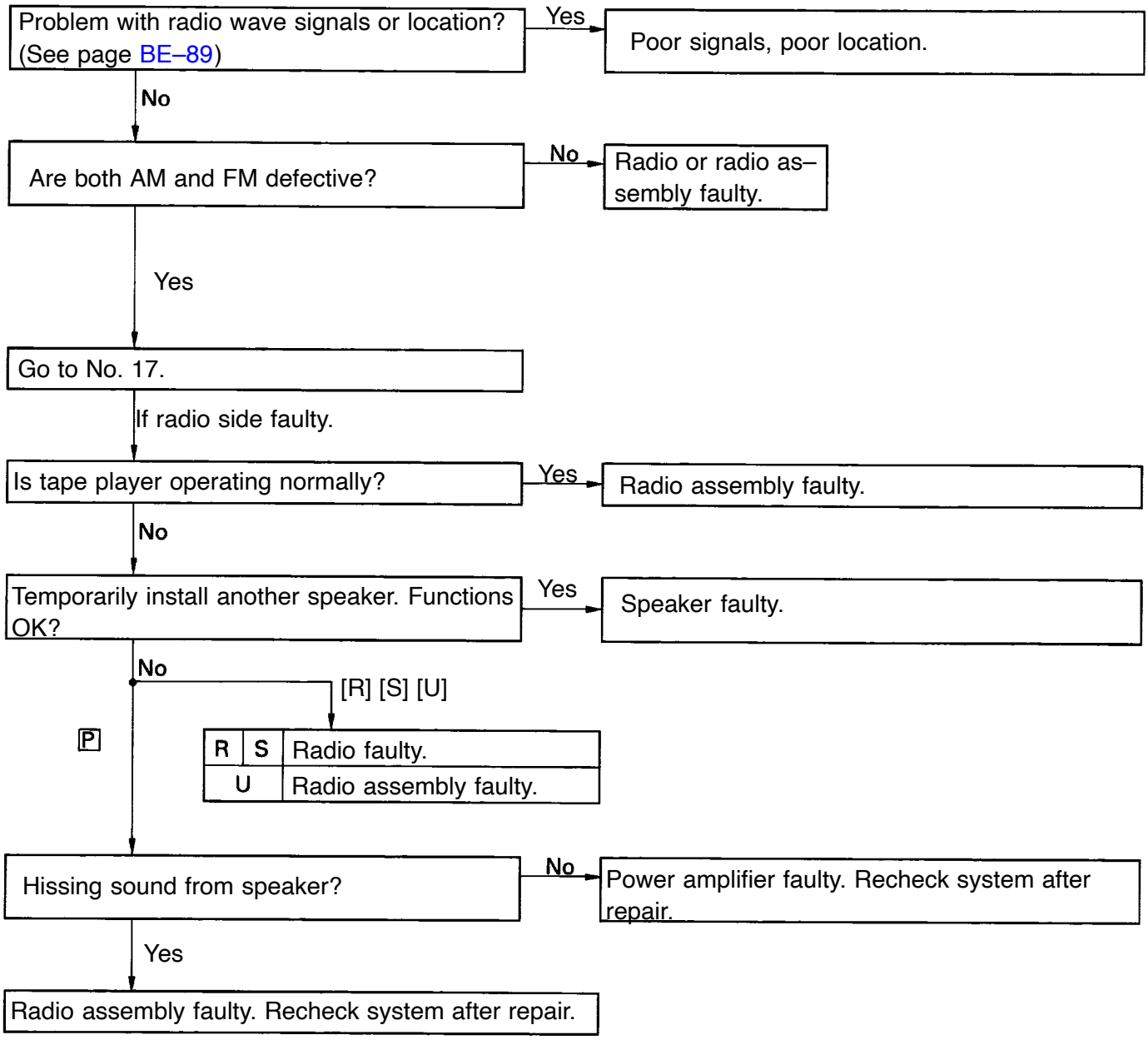
4	Radio	EITHER SPEAKER DOES NOT WORK

[R] Radio [S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)



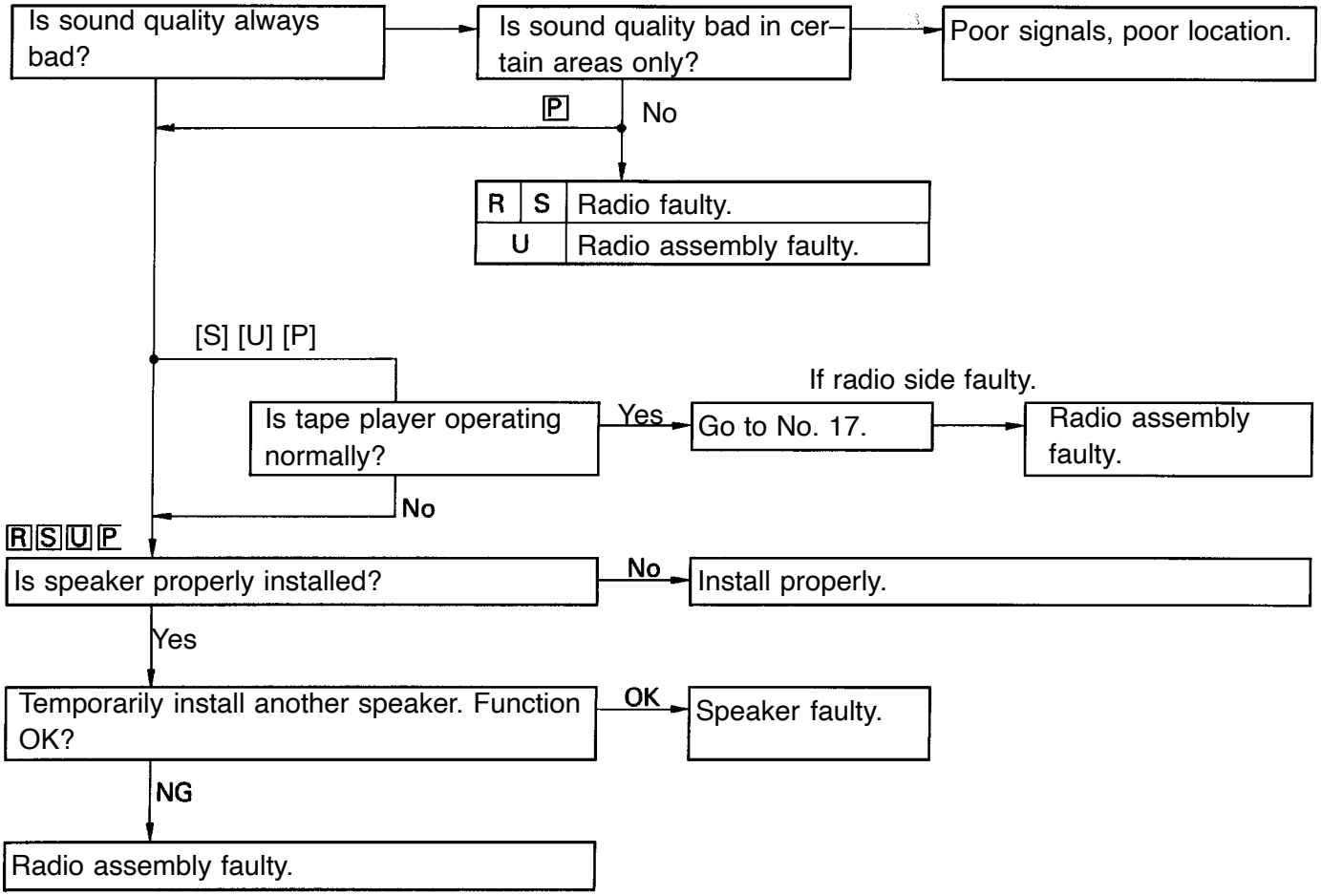
5	Radio	EITHER AM OR FM DOES NOT WORK, RECEPTION POOR (VOLUME FAINT), FEW PRESET TUNING BANDS

[R] Radio [S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)



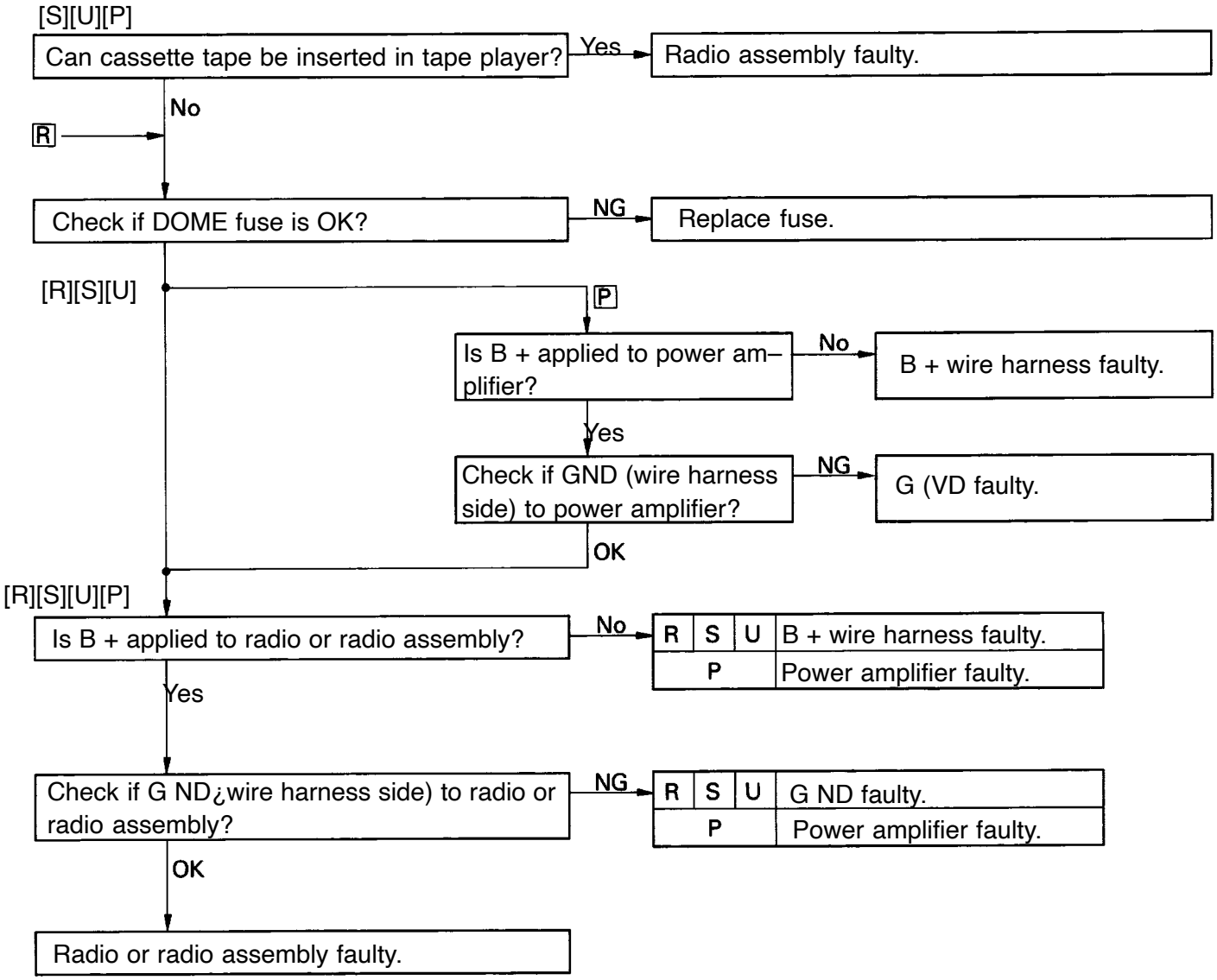
6 Radio — SOUND QUALITY POOR

[E] Radio [S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)



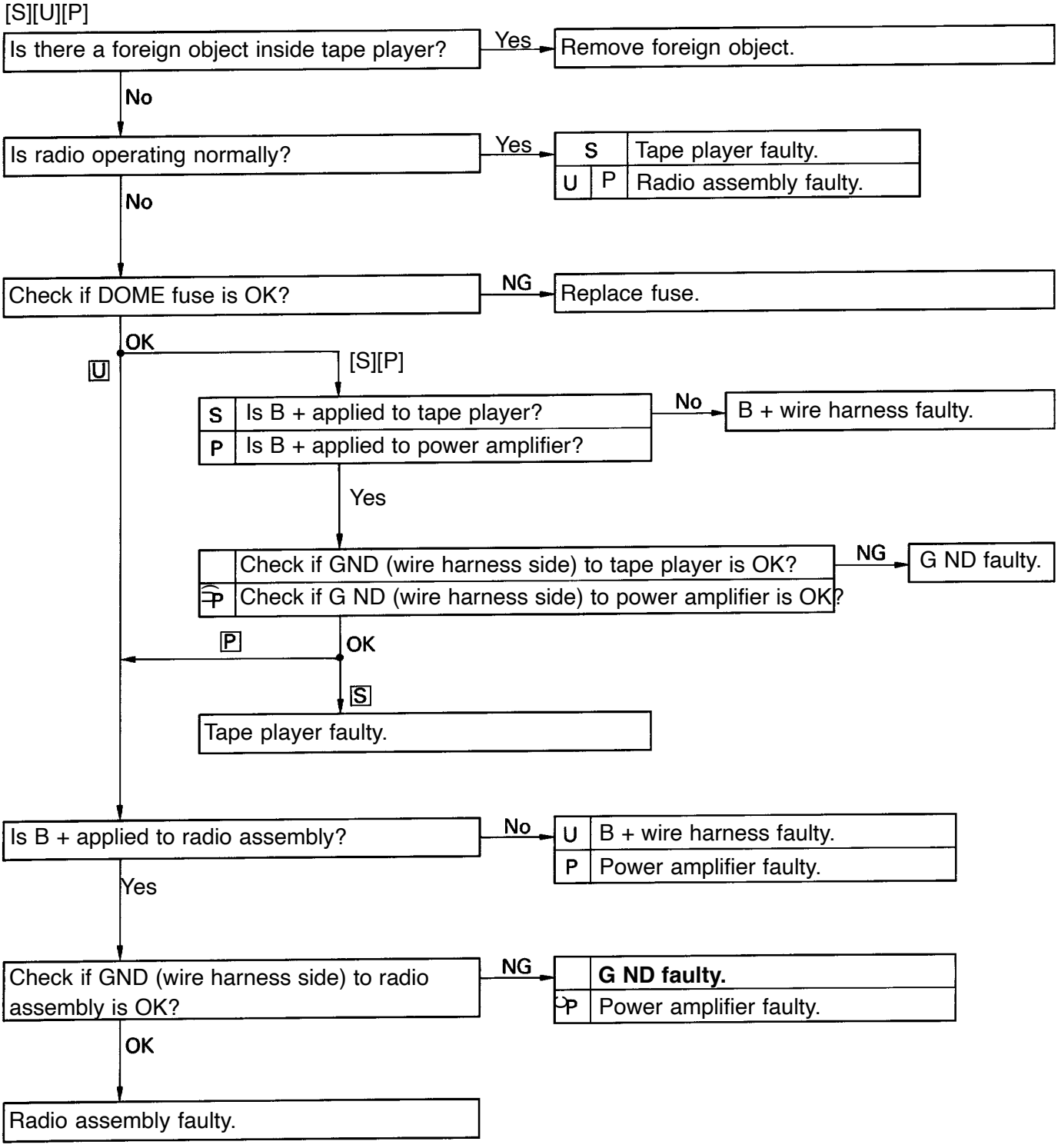
7	Radio	CANNOT SET STATION SELECT BUTTON, PRESET MEMORY DISAPPEARS

[R] Radio [S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)



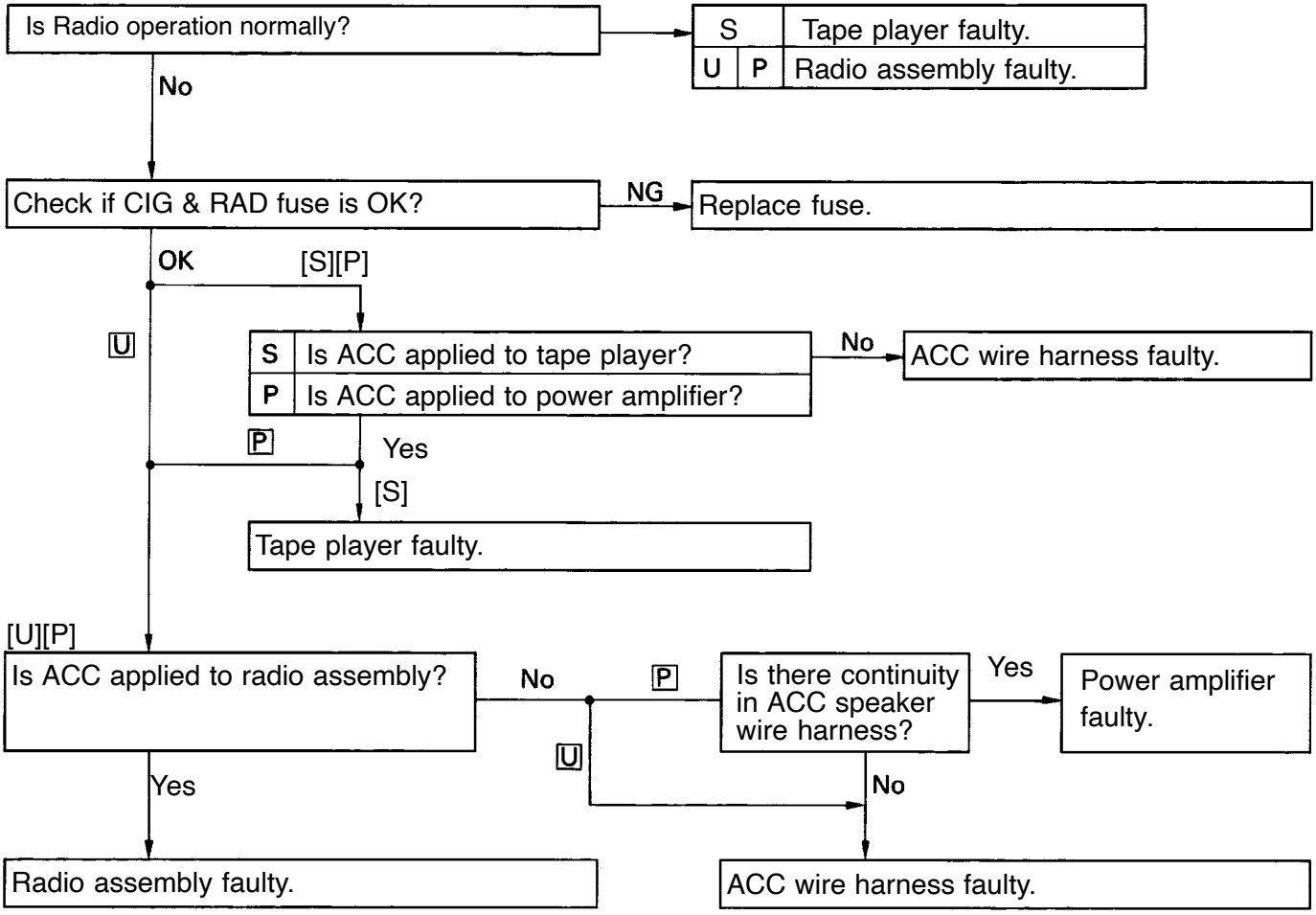
8 Tape Player — CASSETTE TAPE CANNOT BE INSERTED

[S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)



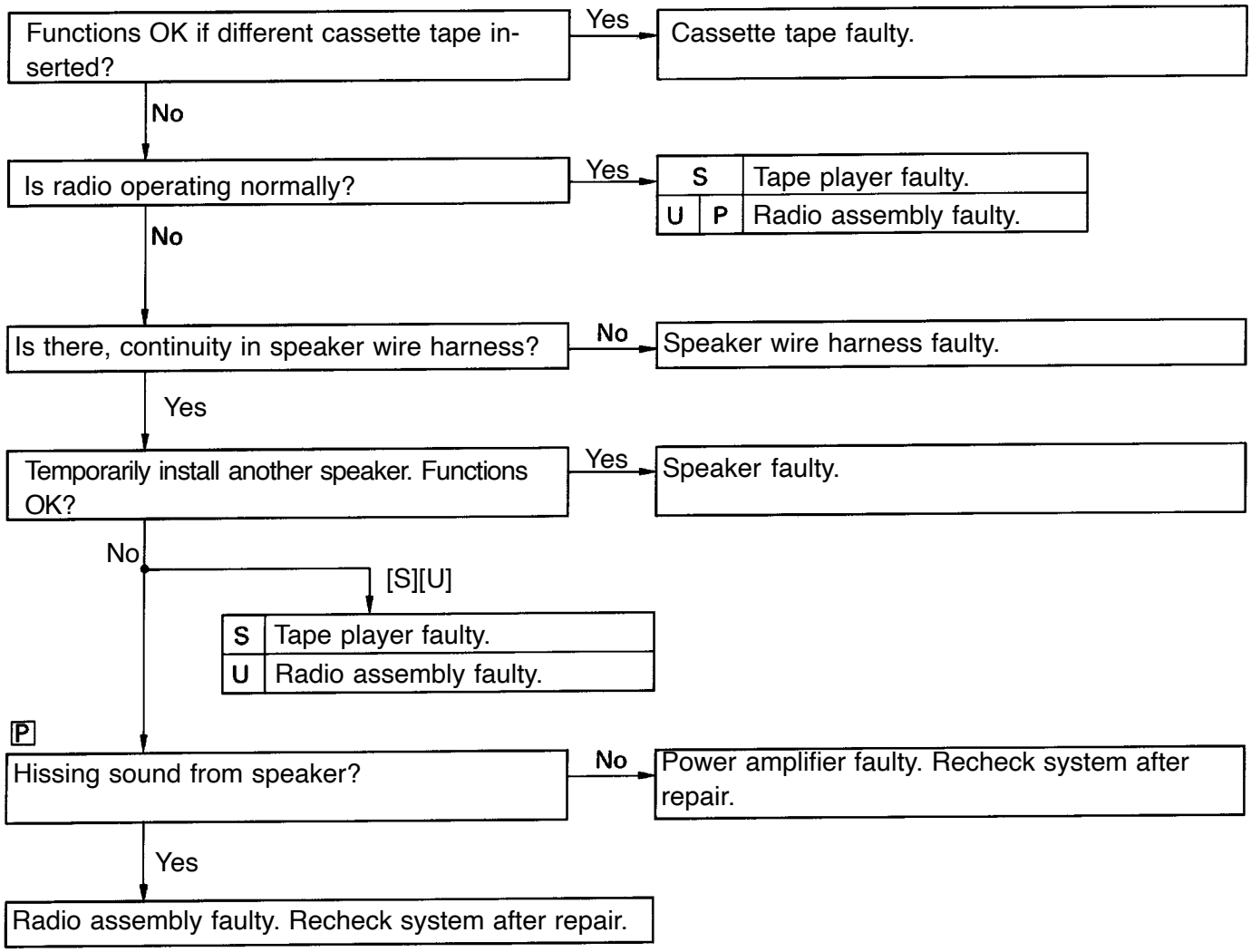
9	Tape Player	CASSETTE TAPE INSERTS, BUT NO POWER

[S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)



10	Tape Player	POWER COMING IN, BUT TAPE PLAYER NOT OPERATING

[S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)



11	Tape Player	EITHER SPEAKER DOES NOT WORK

[S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)

Is radio operating normally?

Yes →

S		Tape player faulty.
U	P	Radio assembly faulty.

No ↓

Is hiss produced by non–functioning speaker?

Yes →

S	Tape player faulty.
U	Radio assembly faulty.
P	Radio assembly faulty. Recheck system after repair.

No ↓

Is there continuity in speaker wire harness?

No → Speaker wire harness faulty.

Yes ↓

Temporarily install another speaker. Functions OK?

OK → Speaker faulty.

NG ↓

S	Tape player faulty.
U	Radio assembly faulty.
P	Radio assembly faulty. Recheck system after repair.

12 Tape Player — SOUND QUALITY POOR (VOLUME FAINT)

[S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)

- Functions OK if different cassette tape inserted? — Yes → Cassette tape faulty.
- No → Operates normally after cleaning the heads? (See page BE–90) — Yes → Head dirty.
- No → Is radio operating normally? — Yes → Radio assembly faulty.
- No → Is speaker properly installed? — No → Install properly.
- Yes → Temporarily install another speaker. Functions OK? — Yes → Speaker faulty.
- No →

S	Tape player faulty.
U	Radio assembly faulty.
P	Radio assembly faulty. Recheck system after repair.

13 Tape Player — TAPE JAMMED, MALFUNCTION WITH TAPE SPEED OR AUTO–REVERSE

[S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)

- Functions OK if different tape (less than 120 mins.) is inserted? — Yes → Cassette tape faulty.
- No → Is there a foreign object inside tape player? — Yes → Remove foreign object.
- No → Operates normally after cleaning the heads? (See page BE–90) — Yes → Head dirty.
- No →

S		Tape player faulty.
U	P	Radio assembly faulty.

14	Tape Player	APS, SKIP, RPT BUTTONS NOT OPERATING

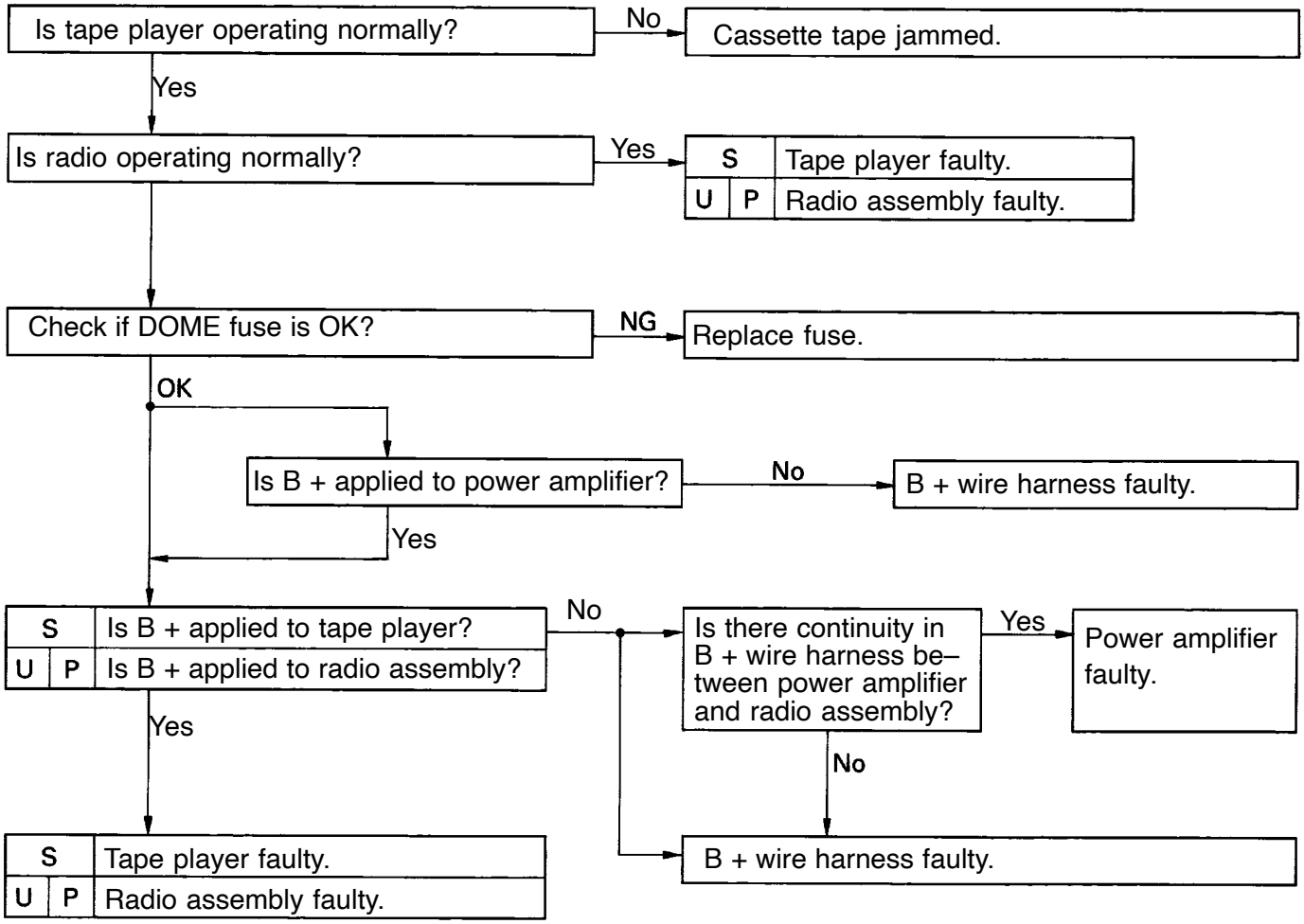
[S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)

Functions OK if different cassette tape inserted? — No → Radio assembly faulty.

Yes → Cassette tape faulty. (Less than 3 secs. of silence between songs (APS, RPT). Less than 15 secs. of silence (SKIP).)

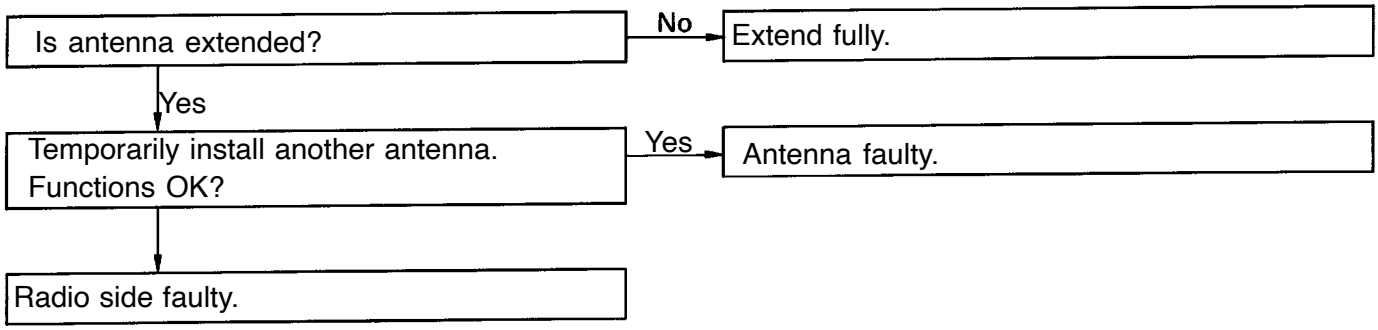
15	Tape Player	CASSETTE TAPE WILL NOT EJECT

[S] Radio + Tape Player [U] Radio–Tape Player (Built–in Power Amplifier)
[P] Radio–Tape Player (Separate Power Amplifier)



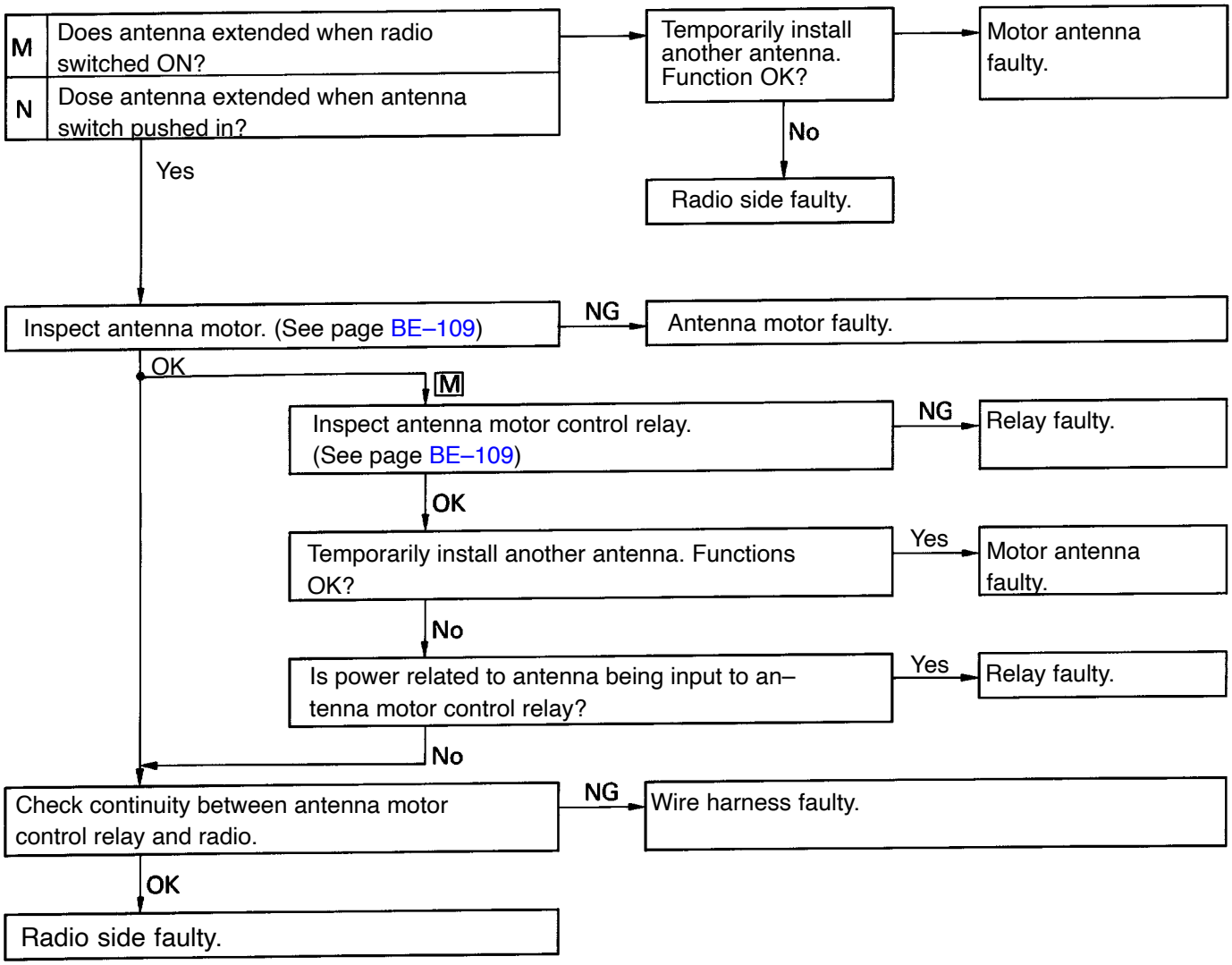
16	Antenna	ANTENNA–RELATED

24–a: Pole Antenna

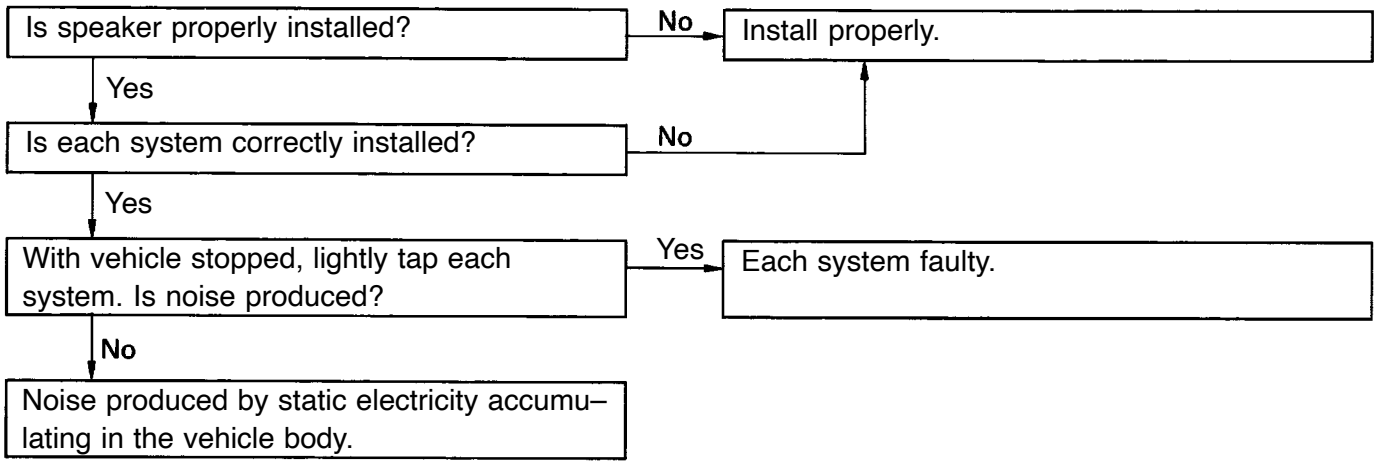


24–b: Motor Antenna

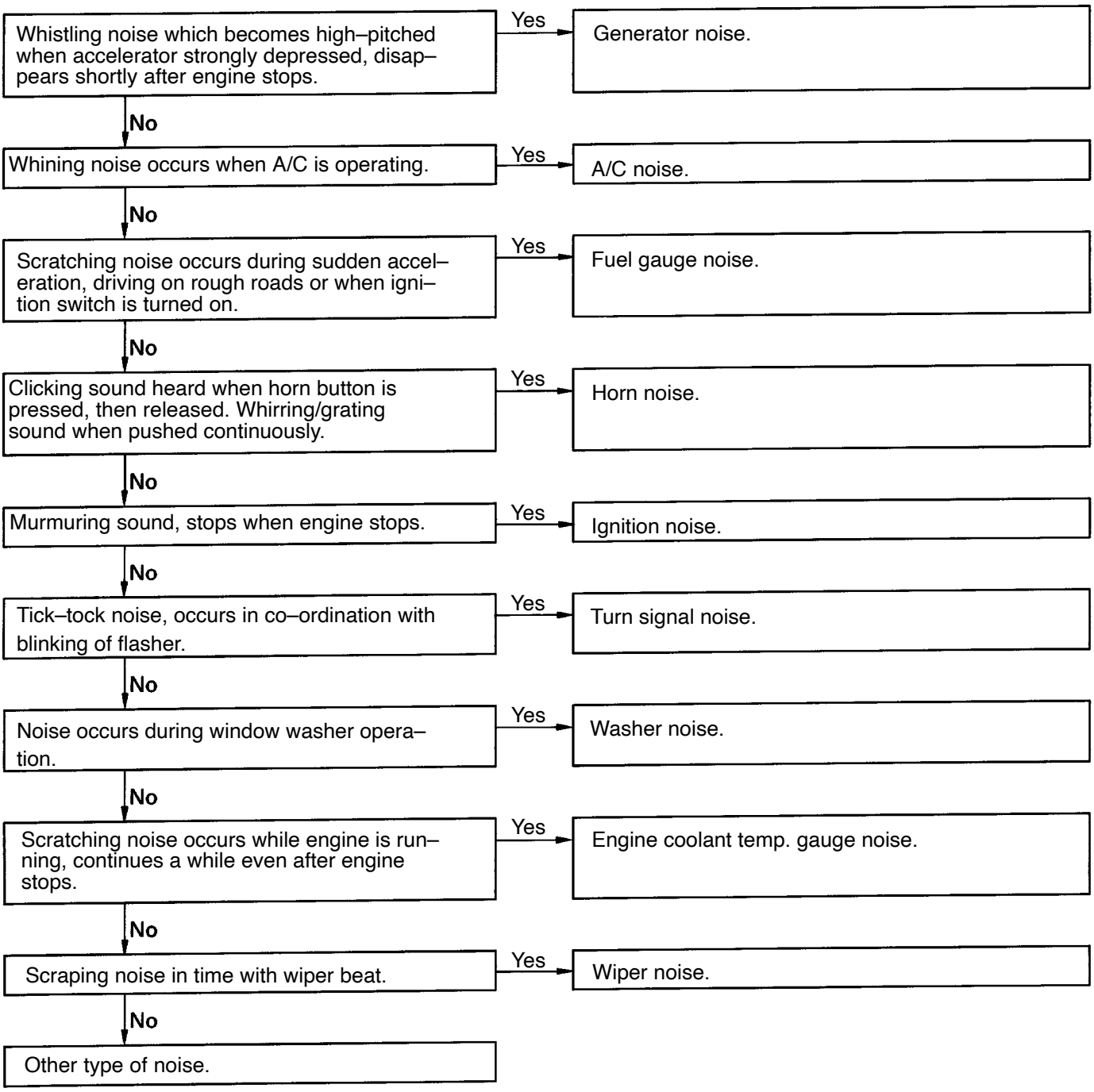
[M] : Motor Antenna (Radio Linked Type) 0 : Motor Antenna (Except Radio–Linked Type)

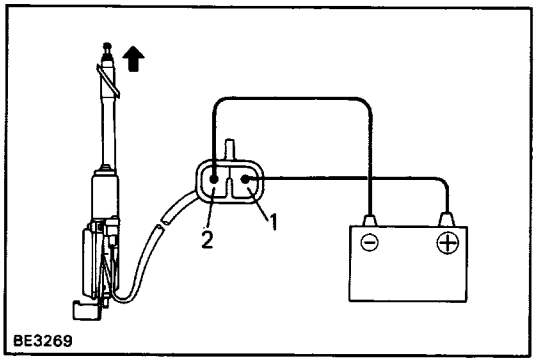


17	Noise	NOISE PRODUCED BY VIBRATION OR SHOCK WHILE DRIVING



18	Noise	NOISE PRODUCED WHEN ENGINE STARTS





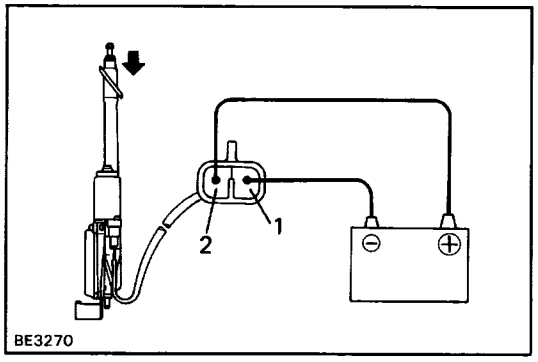
Parts Inspection

1. INSPECT ANTENNA MOTOR

(a) Connect the positive (+) lead from the battery to terminal 1 and the negative (–) lead to terminal 2.

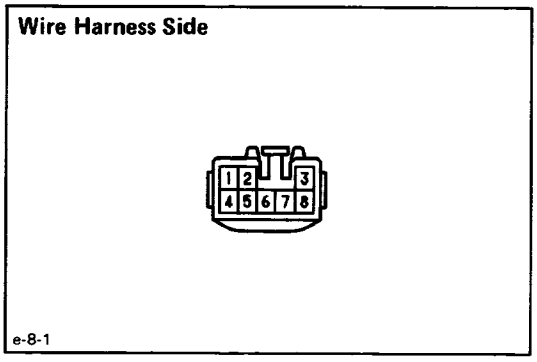
(b) Check that the motor turns (moves upward).

NOTICE: These tests must be performed quickly (within 3–5 seconds) to prevent the coil from burning out.



(c) Then, reverse the polarity, check that the motor turns the opposite way (moves downward).

NOTICE: These tests must be performed quickly (within 3–5 seconds) to prevent the coil from burning out.



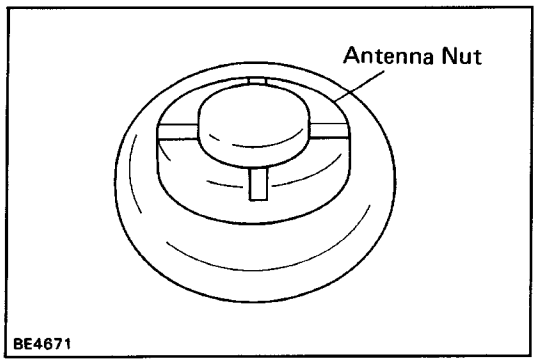
2. INSPECT ANTENNA MOTOR CONTROL RELAY

(Relay Circuit)

Disconnect the connector from the relay and inspect the connector on wire harness side as shown in the chart.

Check for	Tester connection	Condition			Specified value
Continuity	1 – 4	Constant			Continuity
	2 – Ground	Constant			Continuity
Voltage	3 – Ground	Constant			Battery positive voltage
	5 – Ground	Ignition switch position	LOCK		No voltage
			ACC or ON		Battery positive voltage
	6 – Ground	Ignition swtich position	LOCK		No voltage
			ACC or ON	Radio switch and cassette OFF	No voltage
				Radio switch or cassette ON	Battery positive voltage
	8 – Ground	Ignition switch position	LOCK		No voltage
			ACC or ON	Radio switch OFF or cassette ON	No voltage
				Radio switch ON and cassette OFF	Battery positive voltage
	9 – Ground	Ignition switch position	LOCK or ACC		No voltage
			ON		Battery positive voltage

If circuit is as specified, replace the relay.



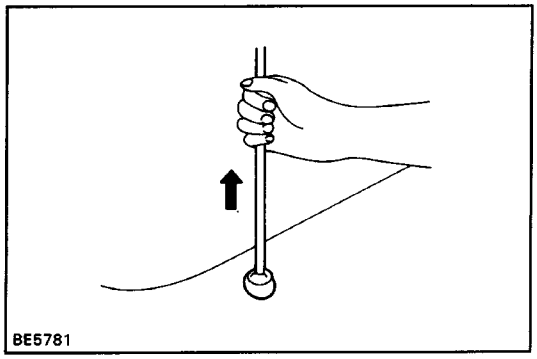
REMOVAL AND INSTALLATION OF ANTENNA ROD

1. REMOVE ANTENNA ROD

HINT: Perform this operation with the battery negative (–) cable connected to the battery terminal.

(a) Turn the ignition switch to "LOCK" position.

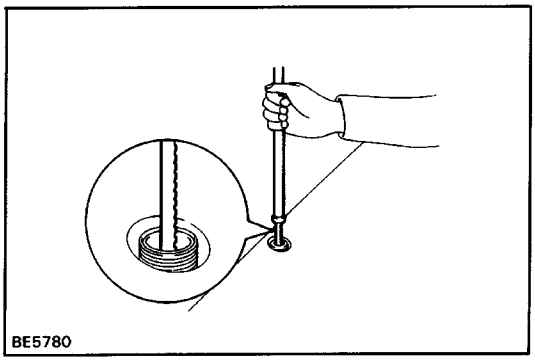
(b) Remove the antenna nut.



(c) Press the "AM" button on the radio receiver, and simultaneously turn the ignition switch to "ACC" position.

HINT:

- The rod will extend fully and be released from the motor antenna.
- After removing the antenna rod, leave the ignition switch at "ACC".

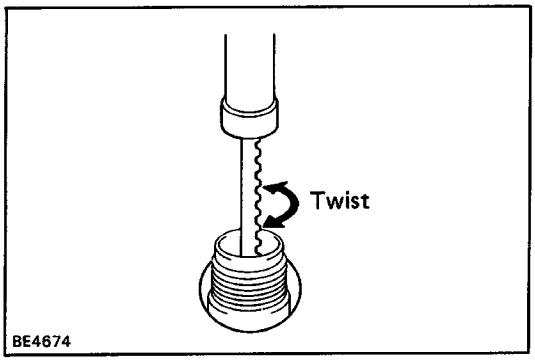


2. INSTALL ANTENNA ROD

(a) Insert the cable of the rod until it reaches the bottom.

HINT:

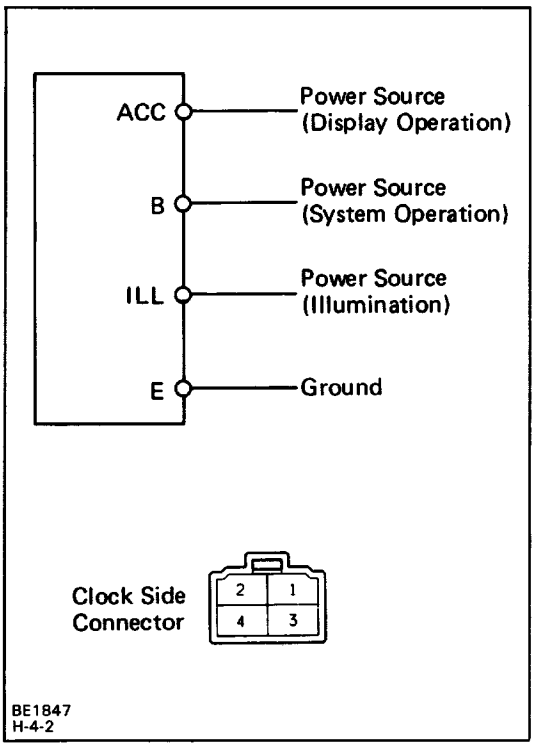
- When inserting the cable, the teeth on the cable must face toward the rear of the vehicle.
- Insert the antenna approx. 300 mm (11.8 in.)



(b) Wind the cable to retract the rod by turning the ignition switch to "LOCK" position.

HINT:

- If the ignition switch is already in "LOCK" position, perform step 1
  (c) first, then turn the ignition switch to "ACC" position.
- In case the cable is not wound, twist it as shown in the illustration.
- Even if the rod has not retracted fully, install the antenna nut and inspect the antenna rod operation. It will finally retract fully.
  (c) Inspect the antenna rod operation by pushing the radio wave band select buttons.



CLOCK

Troubleshooting

As shown in the illustration, those are clock circuit and connector diagrams. Inspect each terminal for applicable trouble.

Terminals		Condition	Specified value
1	E	Constant	Continuity
2	ILL	Turn light control switch ON	Battery positive voltage
3	B	Constant	
4	ACC	Turn ignition switch ACC	

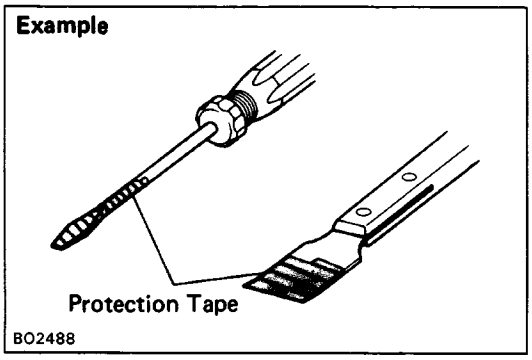
Allowable error: ± 1.5 seconds/day

BODY

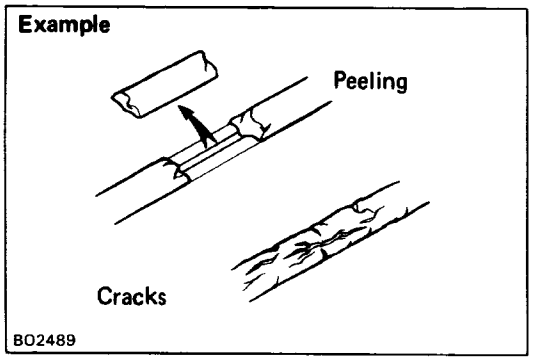
GENERAL INFORMATION

If there is a possibility the body and/or parts may be damaged, first remove the danger before performing repair operations.
Example:

1. Apply protection tape to the body adjacent to the body parts when removing and installing.

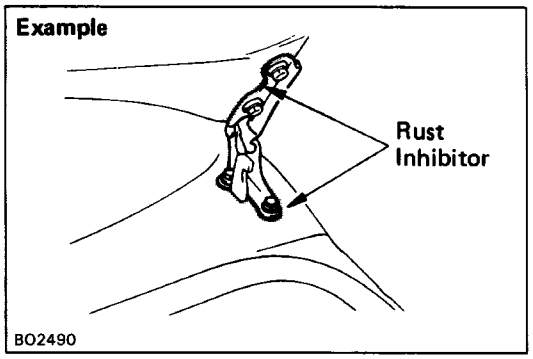


2. When prying off the body parts with a screwdriver or scraper etc., be sure to apply protection tape to the tip or blade to prevent damage to the paint film or body part.

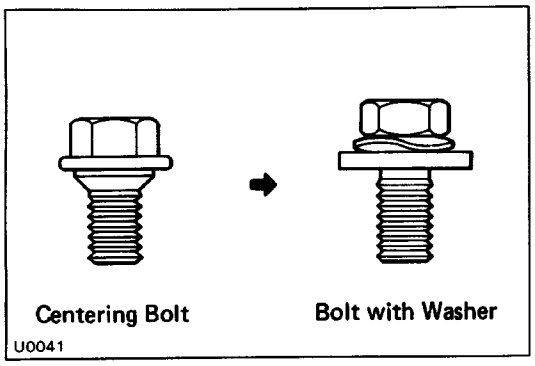


If anti–rust agents are damaged while repairing other parts, be sure to repair the anti–rust agent.
Example:

1. If body sealant, paint film or undercoat are damaged by peeling, cracks, etc., be sure to repair each with an anti–rust agent.



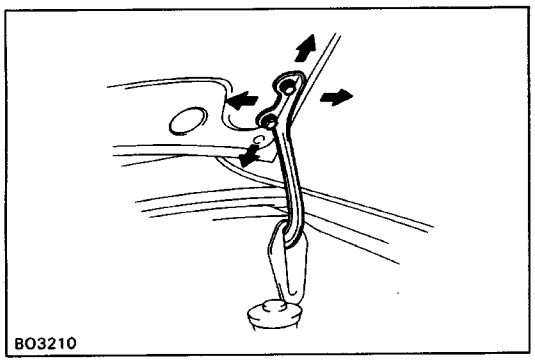
2. If a hinge or exterior body panel is loosened or removed, be sure apply rust inhibitor after repairs.



HOOD

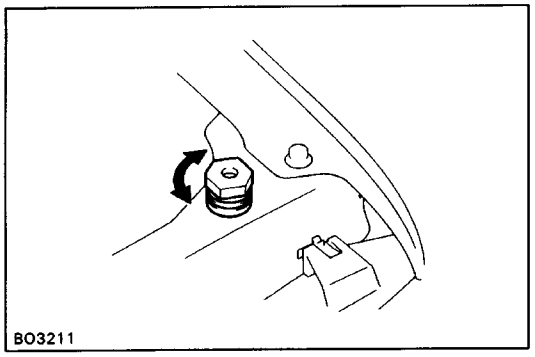
ADJUSTMENT OF HOOD

HINT: Since the centering bolt is used as the hood hinge set bolt, the hood cannot be adjusted with it on. Substitute the bolt with the washer for the centering bolt.



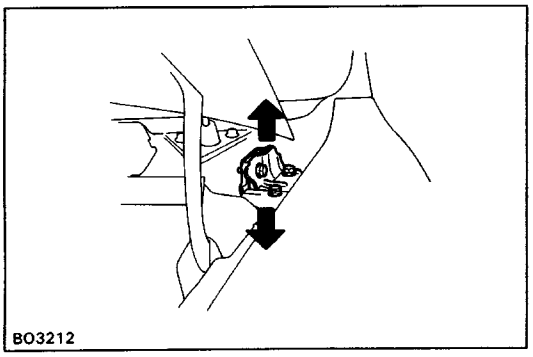
1. ADJUST HOOD IN FORWARD /REARWARD AND LEFT/RIGHT DIRECTIONS

Adjust the hood by loosening the hood side hinge bolts.



2. ADJUST FRONT EDGE OF HOOD IN VERTICAL DIRECTION

Adjust the hood by turning the cushions.



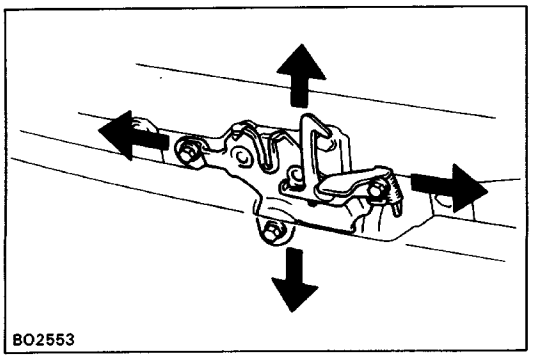
3. REMOVE WIPER ARMS

4. REMOVE COWL PANEL

Remove two clips, three screws and the cowl panel.

5. ADJUST REAR EDGE OF HOOD IN VERTICAL DIRECTION

Adjust the hood by loosening the hood hinge bolts.

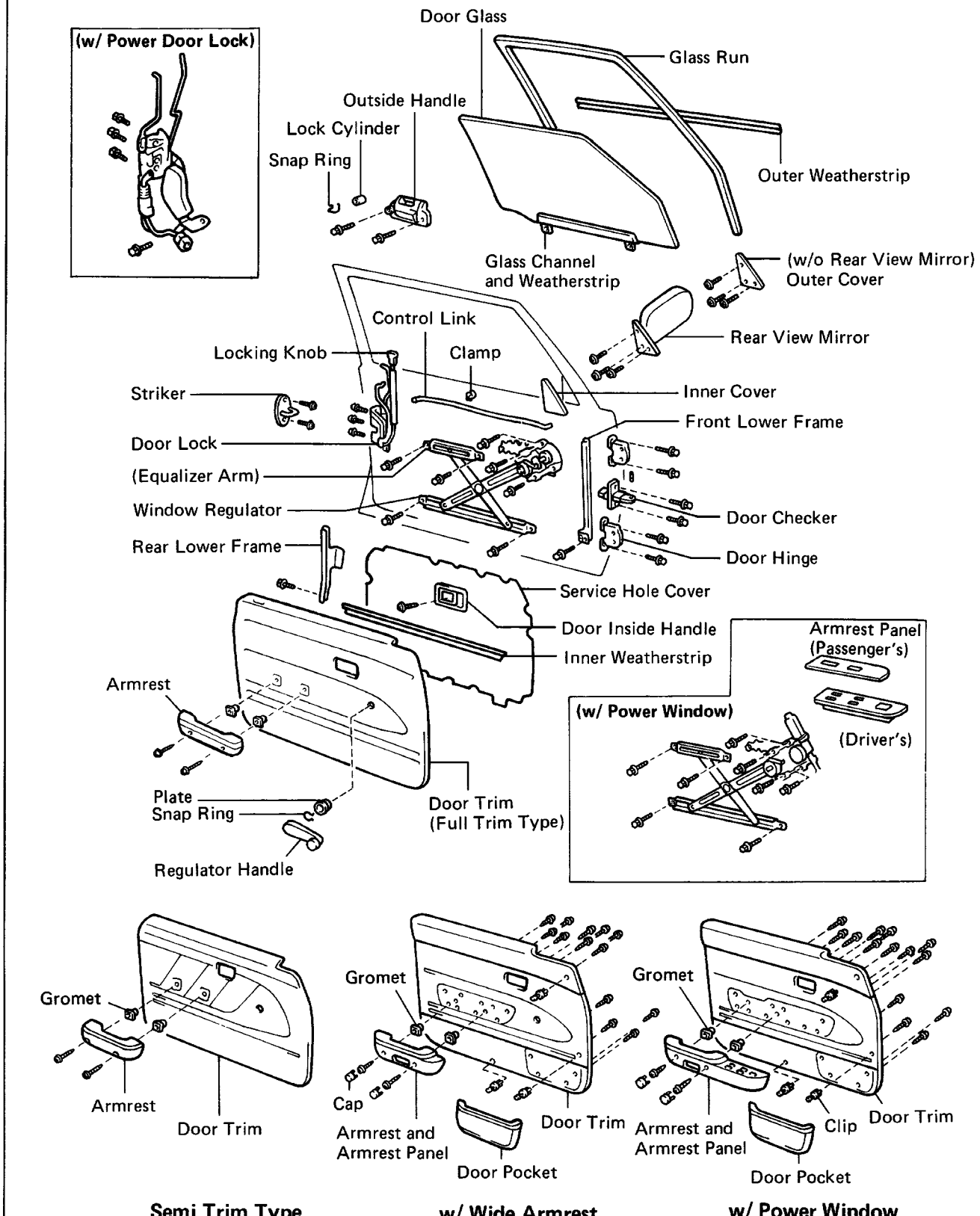


6. ADJUST HOOD LOCK

Adjust the lock by loosening the bolts.

FRONT DOOR
COMPONENTS

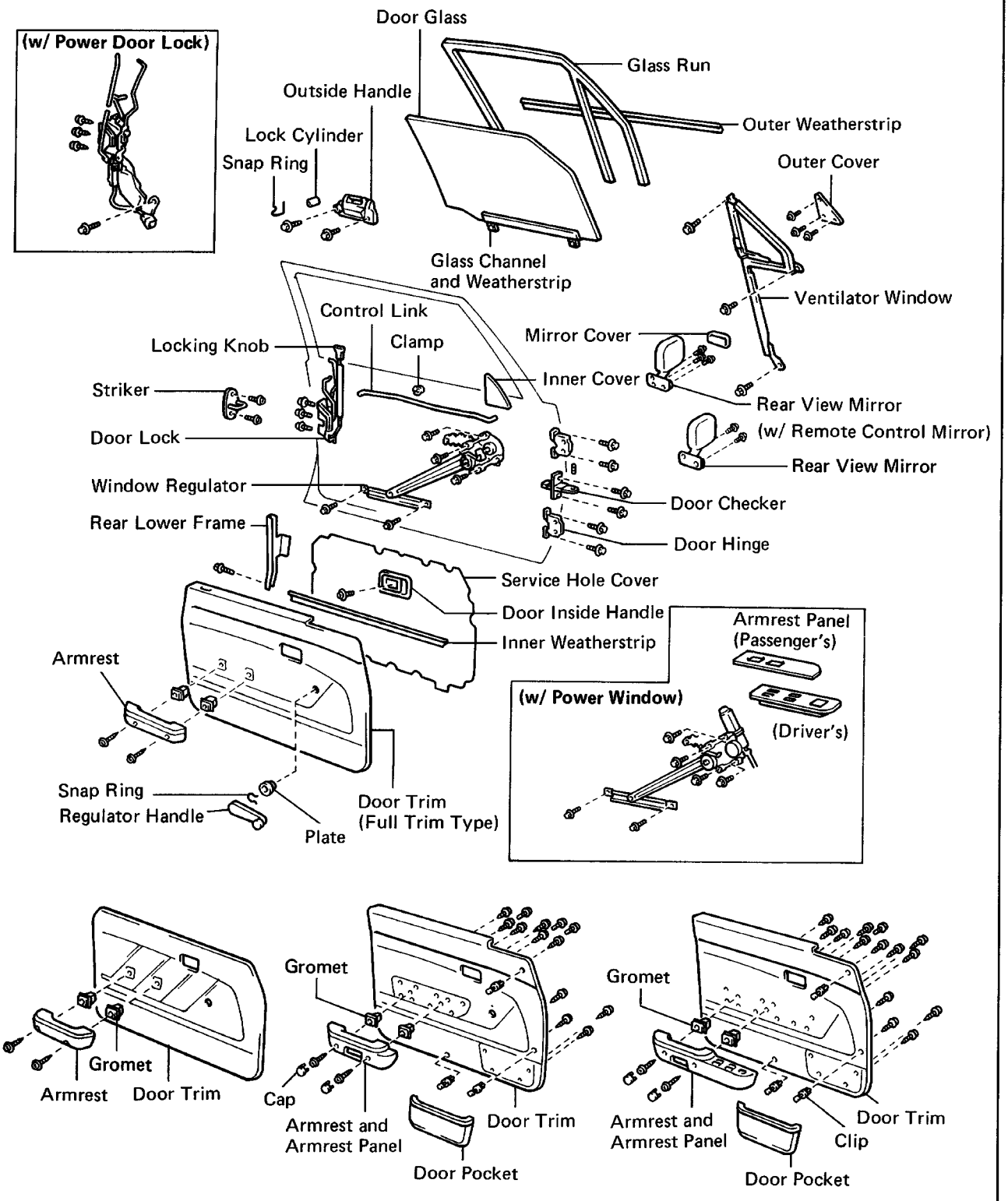
w/o Ventilator Window Type



N03022

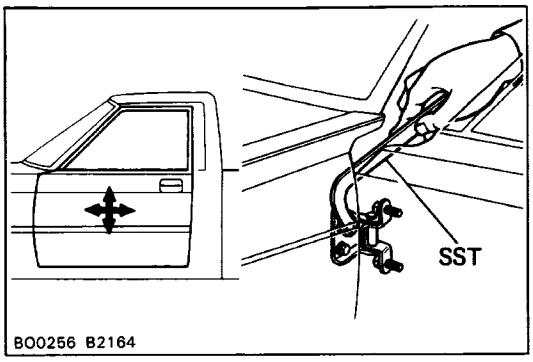
COMPONENTS (Cont'd)

w/ Ventilator Window Type



Semi Trim Type **w/ Wide Armrest** **w/ Power Window**

N03023

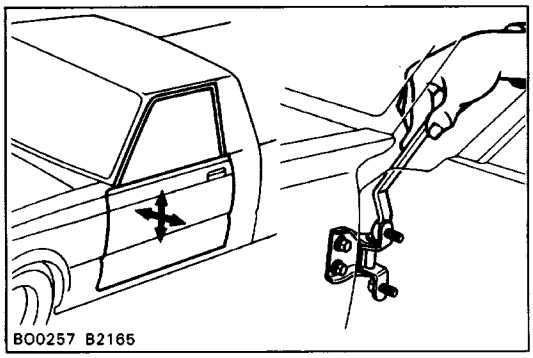


ADJUSTMENT OF FRONT DOOR

1. ADJUST DOOR IN FORWARD/REARWARD AND VERTICAL DIRECTIONS

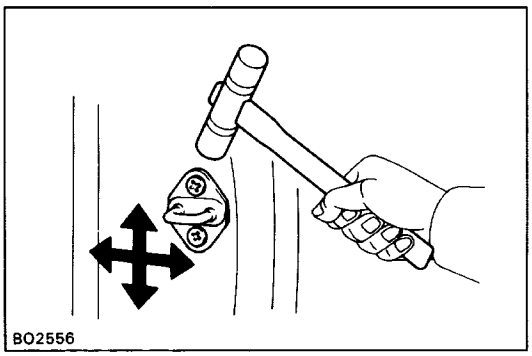
Using SST, adjust the door by loosening the body side hinge bolts.

SST 09812–00010



2. ADJUST DOOR IN LEFT/RIGHT AND VERTICAL DIRECTIONS

Loosen the door side hinge bolts to adjust.

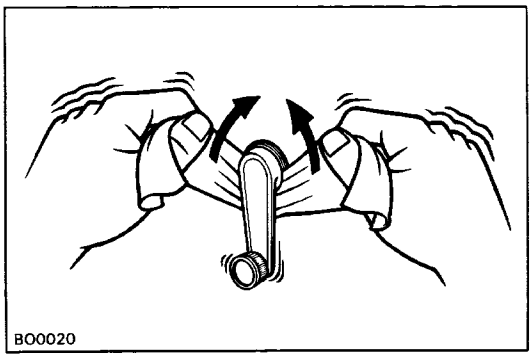


3. ADJUST DOOR LOCK STRIKER

(a) Check that the door fit and door lock linkages are adjusted correctly.

(b) Adjust the striker position by slightly loosening the striker mounting screws, and hitting the striker with a hammer.

(c) Tighten the striker mounting screws again.

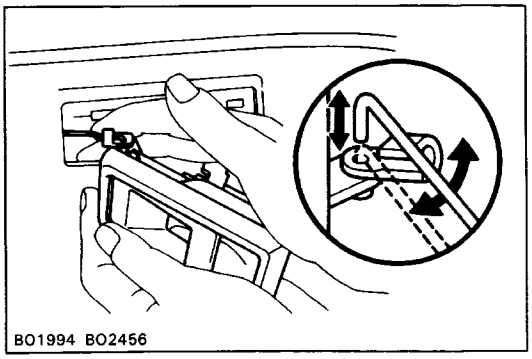


DISASSEMBLY OF FRONT DOOR

(See pages BO–4 and 5)

1. (w/o Power Window)
REMOVE REGULATOR HANDLE

Pull off the snap ring with a cloth and remove the regulator handle and plate.



2. REMOVE DOOR INSIDE HANDLE

(a) Remove the screw and slide the handle forward.

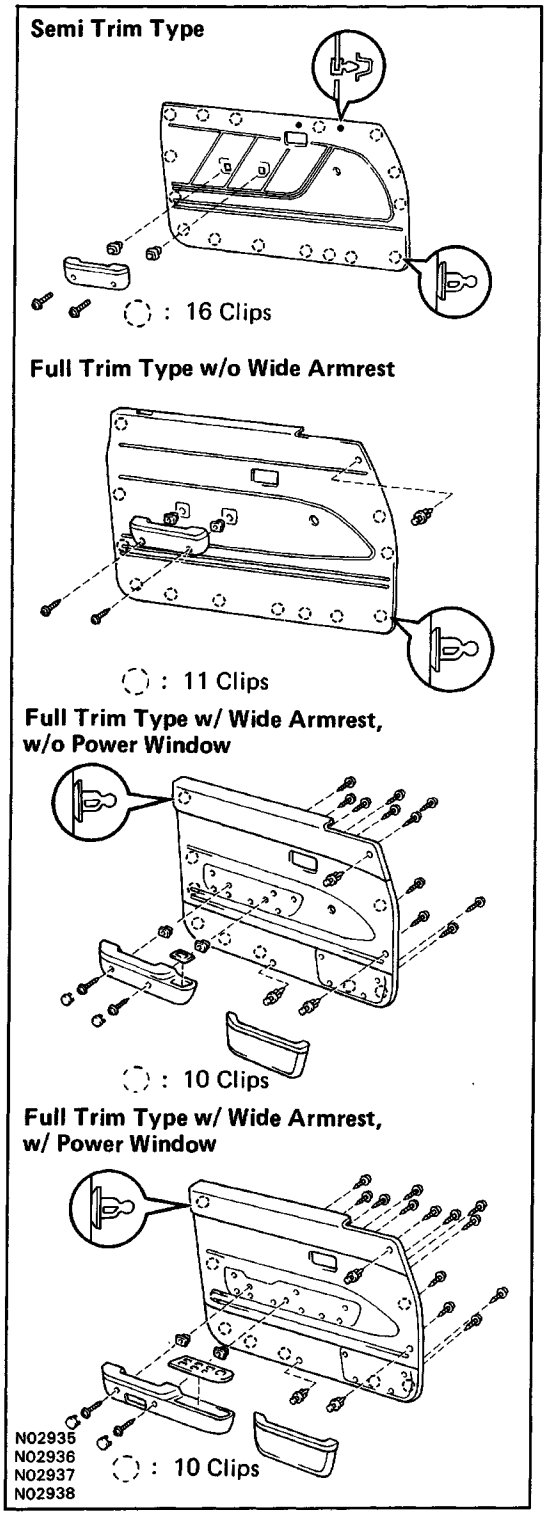
(b) Disconnect the handle from the control link and remove the handle.

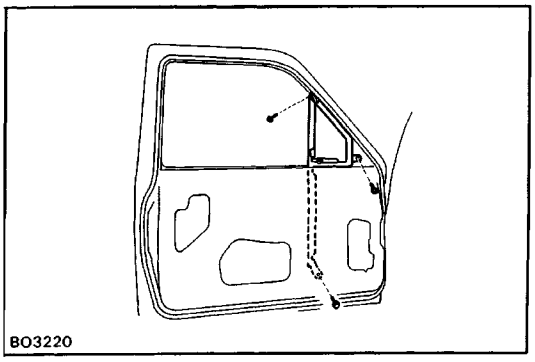
3. REMOVE INNER AND OUTER COVERS

(a) Using a screwdriver, pry loose a clip and remove the inner cover.

HINT: Tape the screwdriver tip before use.

(b) (w/ Ventilator Window or w/o Rear View Mirror) Remove three screws and the outer cover.





4. REMOVE REAR VIEW MIRROR

(w/o Ventilator Window)

(a) (w/Remote Control Mirror)
Disconnect the connector.

(b) Remove three screws and the mirror.

(wl Ventilator Window)

(a) (w/ Remote Control Mirror)
Disconnect the connector.

(b) (w/o Remote Control Mirror)
Remove the mirror cover, two screws and the mirror.
(w/ Remote Control Mirror)
Remove the mirror cover, three screws and the mirror.

5. REMOVE DOOR TRIM

(a) (w/ Wide Armrest)
Remove two caps from the armrest.

(b) (w/ Wide Armrest)
Remove two screws from the armrest.
(Semi Trim Type and Full Trim Type, wI Wide Armrest)
Remove two screws and the armrest.

(c) (w/ Power Window)
Remove the armrest panel by pulling upward, then disconnect the connectors.

(d) (w/ Wide Armrest)
Remove three clips.
(Full Trim Type, w/o Wide Armrest)
Remove the clip.

(e) Install the screwdriver between the retainers and door trim to pry it loose.

HINT: Tape the screwdriver tip before use.

(f) Remove the door trim.

(g) (w/ Power Window)
Remove nine screws and the armrest.
(wI Wide armrest, w/o Power Window)
Remove seven screws and the armrest.

(h) (w/ Wide Armrest)
Remove four screws and the door pocket.

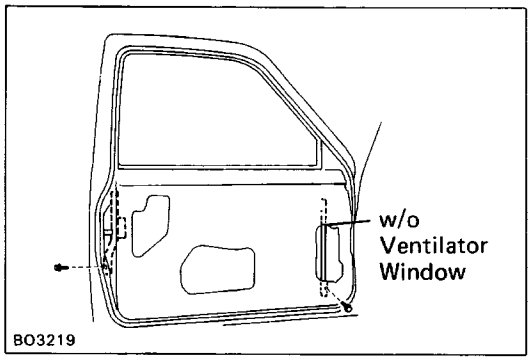
(i) (Full Trim Type)
Remove the inner weatherstrip from the door trim.

6. REMOVE SERVICE HOLE COVER

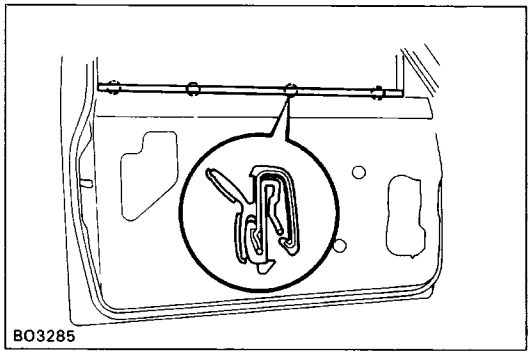
7–1. (wl Ventilator Window)
REMOVE VENTILATOR WINDOW

(a) Remove the bolt and two screws.

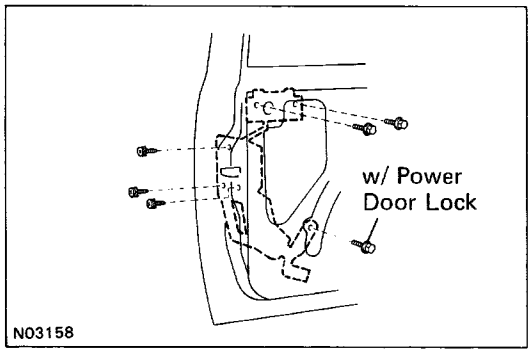
(b) Remove the ventilator window by pulling it upward.



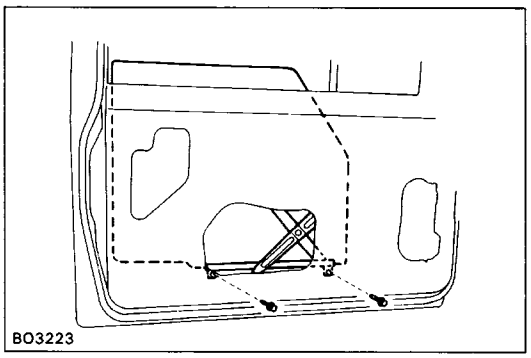
7–2. (w/o Ventilator Window)
REMOVE FRONT LOWER FRAME
Remove the bolt and the frame.
8. REMOVE REAR LOWER FRAME
Remove the bolt and the frame.

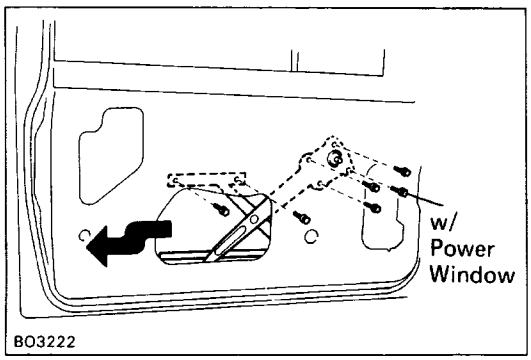


9–1. (Semi Trim type)
REMOVE INNER AND OUTER WEATHERSTRIP
Pry loose the clips from the edge of the panel and remove the weatherstrip.
9–2. (Full Trim type)
REMOVE OUTER WEATHERSTRIP
In the same manner, remove the outer weatherstrip.
10. REMOVE GLASS RUN

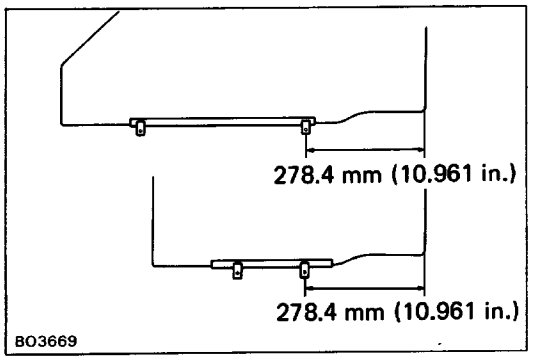


11. REMOVE INSIDE LOCKING KNOB
Disconnect the link and remove the inside locking knob.
12. REMOVE OUTSIDE HANDLE WITH LOCK CYLINDER AND DOOR LOCK
(a) Disconnect the links from the outside handle with the lock cylinder.
(b) (w/Power Door Lock)
Disconnect the connectors, remove three screws, the bolt and the door lock with the motor.
(w/o Power Door Lock)
Remove three screws and the door lock.
(c) Remove two bolts and the outside handle with lock cylinder.
(d) Remove the snap ring and the lock cylinder.
13. REMOVE DOOR GLASS AND WINDOW REGULATOR
(a) Remove two glass channel mounting bolts.
(b) Place the glass in the door cavity.





(c) (w/o Ventilator Window)
Remove two equalizer arm bracket mounting bolts.
(d) (wI Power Window)
Disconnect the connectors, then remove four regu–lator mounting bolts.
(wIo Power Window)
Remove three regulator mounting bolts.
(e) Remove the regulator through the service hole.
(f) Remove the glass by pulling it upward.



REPLACEMENT OF GLASS

1. REMOVE GLASS CHANNEL WITH SCREWDRIVER OR LIKE OBJECT

2. APPLY SOAPY WATER TO INSIDE OF WEATHER–STRIP

3. INSTALL CHANNEL BY TAPPING IT WITH PLASTIC HAMMER

ASSEMBLY OF FRONT DOOR

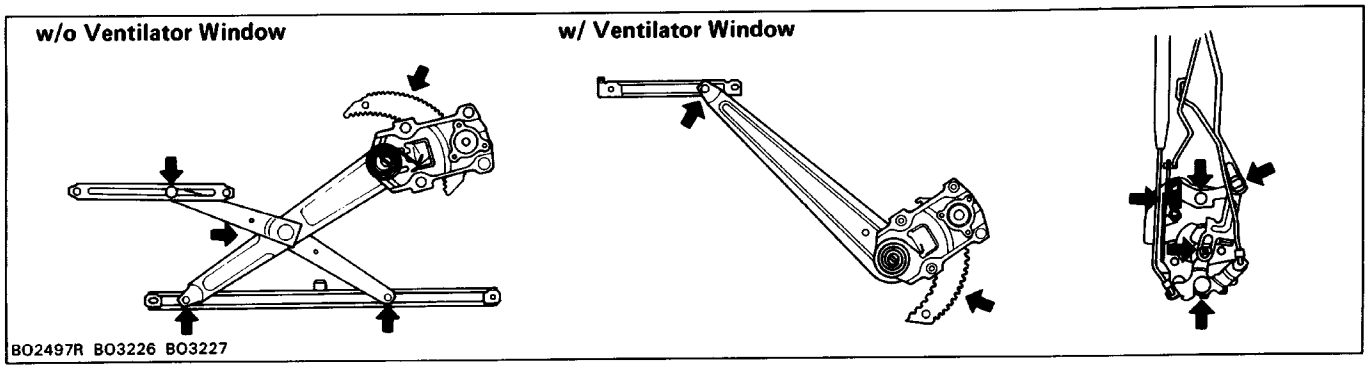
(See pages BO–4 and 5)

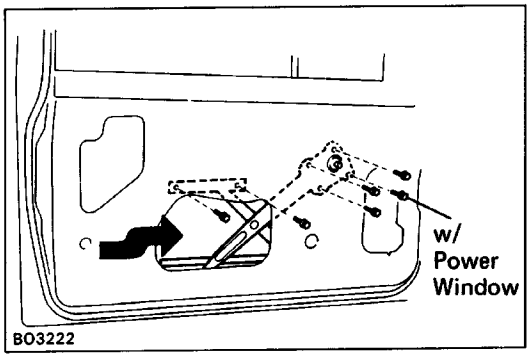
1. BEFORE INSTALLING PARTS, COAT THEM WITH MP GREASE

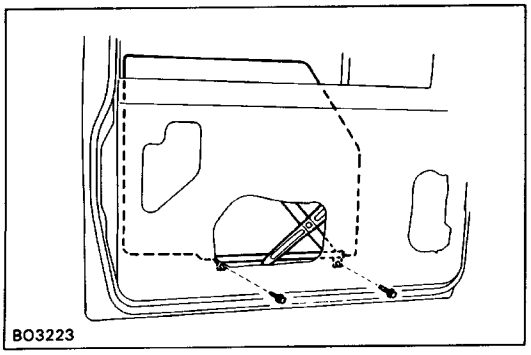
(a) Apply MP grease to the sliding surface and the gears of the window regulator.

NOTICE: Do not apply MP grease to the spring of the window regulator.

(b) Apply MP grease to the sliding surface of the door lock.







2. INSTALL WINDOW REGULATOR AND DOOR GLASS

(a) Place the glass in the door cavity.

(b) Place the regulator through the service hole.

(c) (wI Power Window)

Install the four regulator mounting bolts, then con–nect the connector.

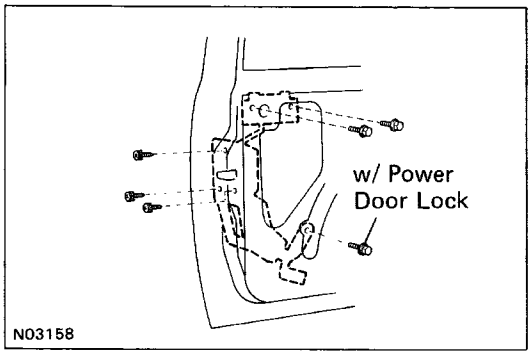
(w/o Power Window)

Install the three regulator mounting bolts.

(d) (w/o Ventilator Window)

Install the equalizer arm and temporarily tighten two equalizer arm mounting bolts.

(e) Attach the glass to the window regulator with two bolts.



3. INSTALL OUTSIDE HANDLE WITH LOCK CYLINDER AND DOOR LOCK

(a) Install the lock cylinder with the snap ring to the outside handle.

(b) Install the outside handle and lock cylinder with two bolts.

(c) (w/Power Door Lock)

Install the door lock and motor with three screws and the bolt, then connect the connector.

(w/o Power Door Lock)

Install the door lock with three screws.

(d) Connect the links to the outside handle.

4. INSTALL INSIDE LOCKING KNOB

Install the locking knob and connect the control links.

5. INSTALL GLASS RUN

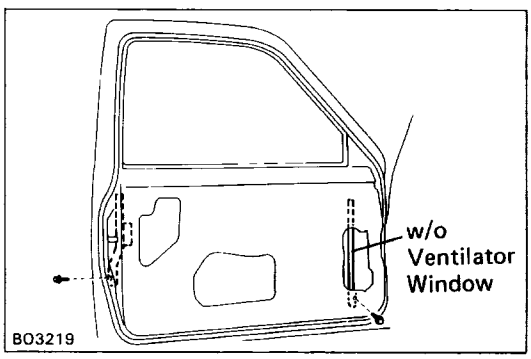
6. INSTALL REAR LOWER FRAME

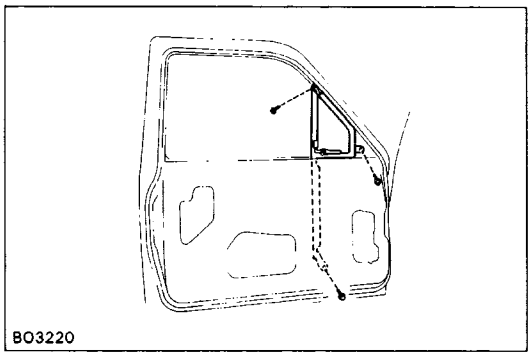
7–1. (w/o Ventilator Window)
INSTALL FRONT LOWER FRAME

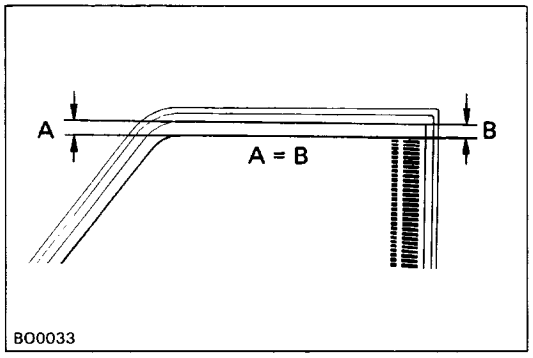
7–2. (w/Ventilator Window)
INSTALL VENTILATOR WINDOW

(a) Install the ventilator window.

(b) Install the bolt and two screws.





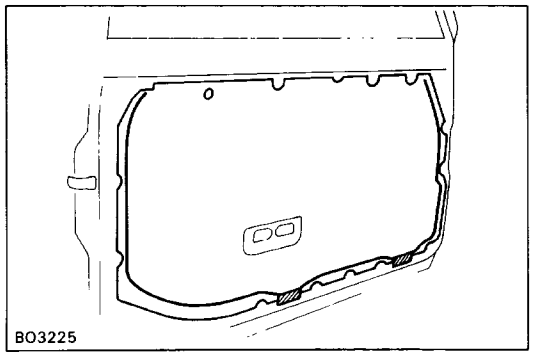


8. (w/o Ventilator Window)
ADJUST DOOR GLASS

Adjust the equalizer arm up or down and tighten if where–dimensions A and B, as shown are equal.

9. INSTALL REAR VIEW MIRROR

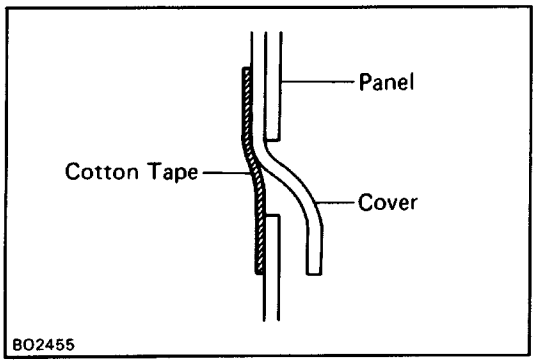
10. INSTALL INNER AND OUTER COVERS

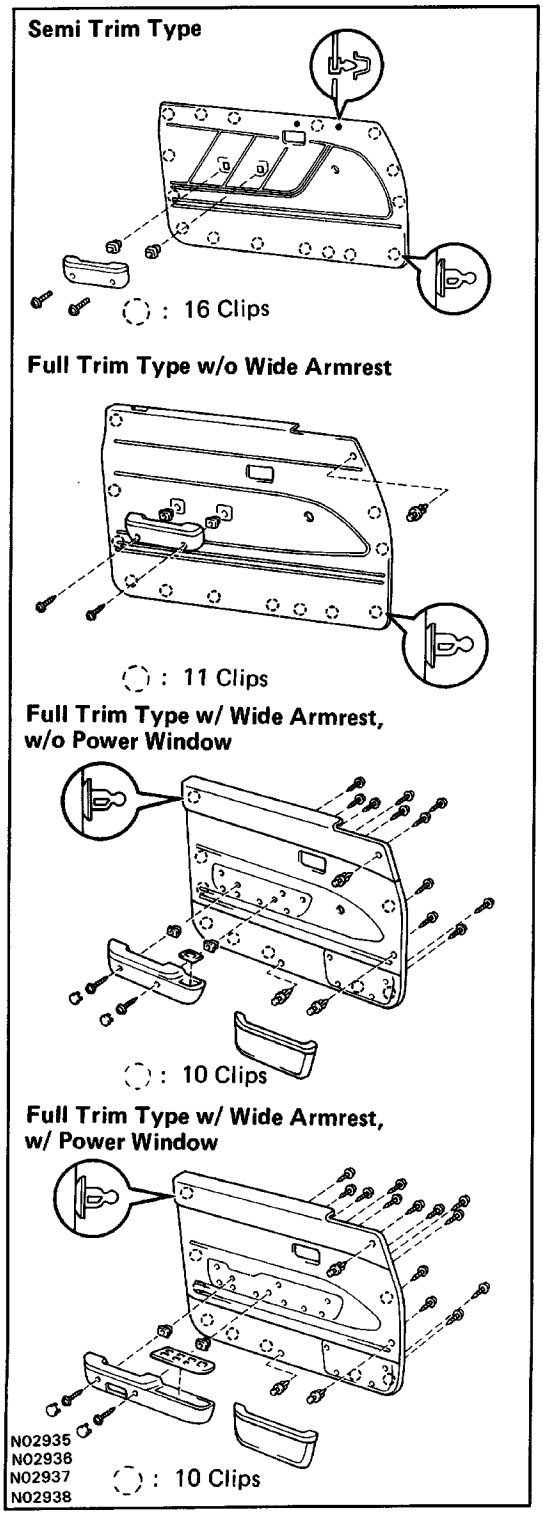


11. INSTALL SERVICE HOLE COVER

(a) Seal the service hole cover with adhesive.

(b) Install the lower edge of the service hole cover into the panel slit.





(c) Seal the panel slit with the cotton tape.

NOTICE: Do not block the trim clip seating with the tape.

12–1.(Semi Trim type)

INSTALL OUTER AND INNER WEATHERSTRIP

Install the claw of the clips into the upper panel slit and push the weatherstrip onto the panel.

12–2.(Full Trim type)

INSTALL OUTER WEATHERSTRIP

In the same manner, install the outer weatherstrip.

13. INSTALL THE DOOR TRIM

(a) (Full Trim Type)

Install the inner weatherstrip to the door trim.

(b) (wI Wide Armrest)

Install the door pocket with four screws to the door trim.

(c) (w/Power Window)

Install the armrest with nine screws to the door trim.

(wI Wide Armrest, w/o Power Window)

Install the armrest with seven screws to the door trim.

(d) Install the door trim with retainers to the inside panel by tapping.

(e) (wI Power Window)

Connect the connectors and install the armrest panel.

(f) (w/ Wide Armrest)

Install three crips.

(Full Trim Type, w/o Wide Armrest)

Install the clip.

(g) (w/ Wide Armrest)

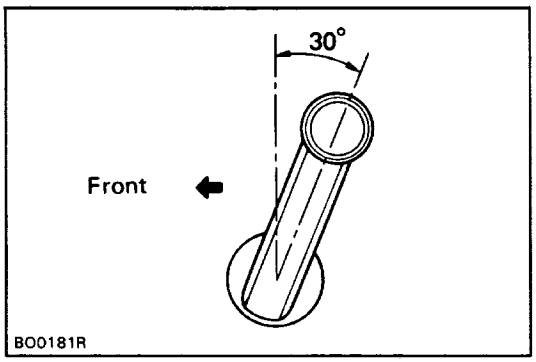
Install two screws to the armrest.

(Semi Trim Type and Full Trim Type, wI Wide Arm–rest)

Install the armrest with two screws.

(h) (w/ Wide Armrest)

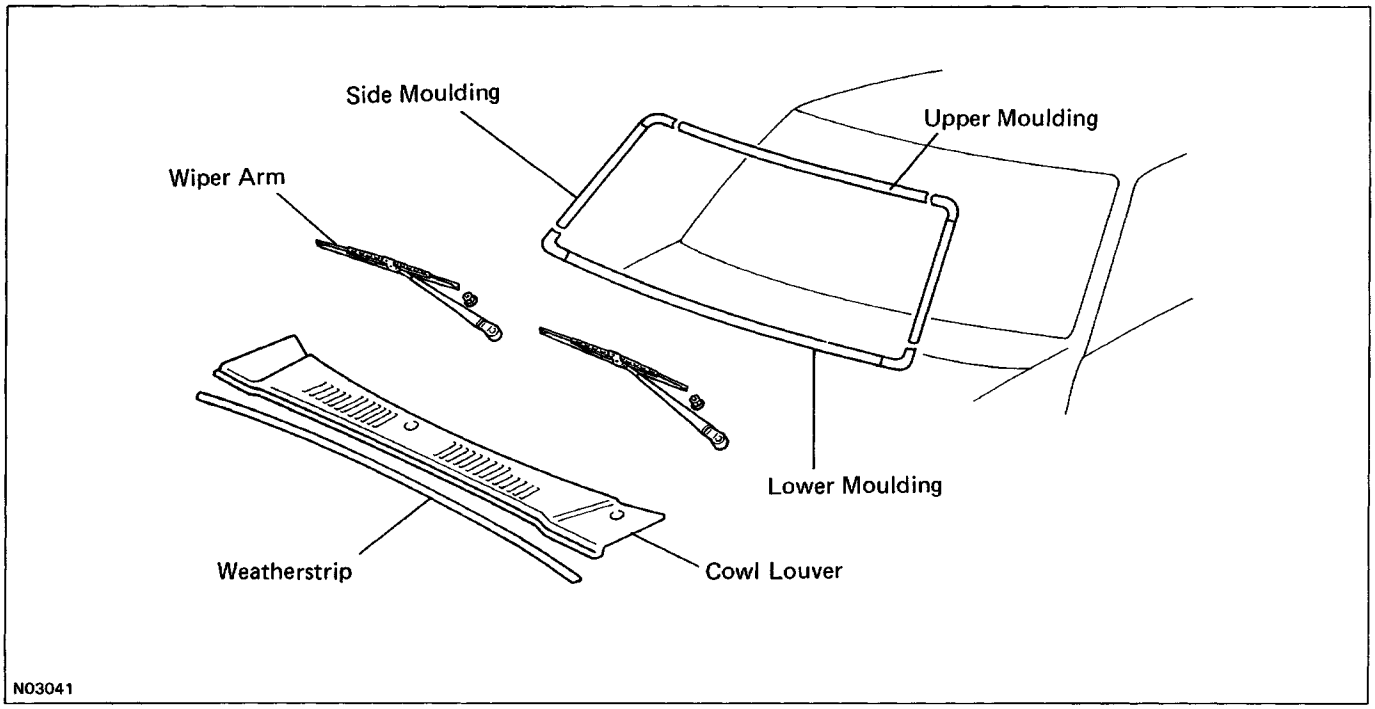
Install two caps to the armrest.

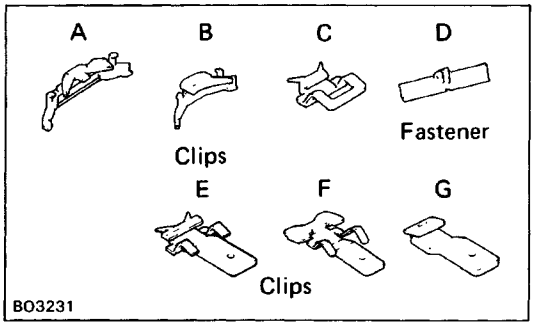


14. INSTALL DOOR INSIDE HANDLE
(See step 2 on page BO–6)
(a) Connect the handle to the control links.
(b) Push the inside handle in the door panel and slide it rearward.
(c) Install the screw.

15. (w/o Power Window)
INSTALL REGULATOR HANDLE
With door window fully closed, install the plate and the regulator handle with the snap ring as shown.

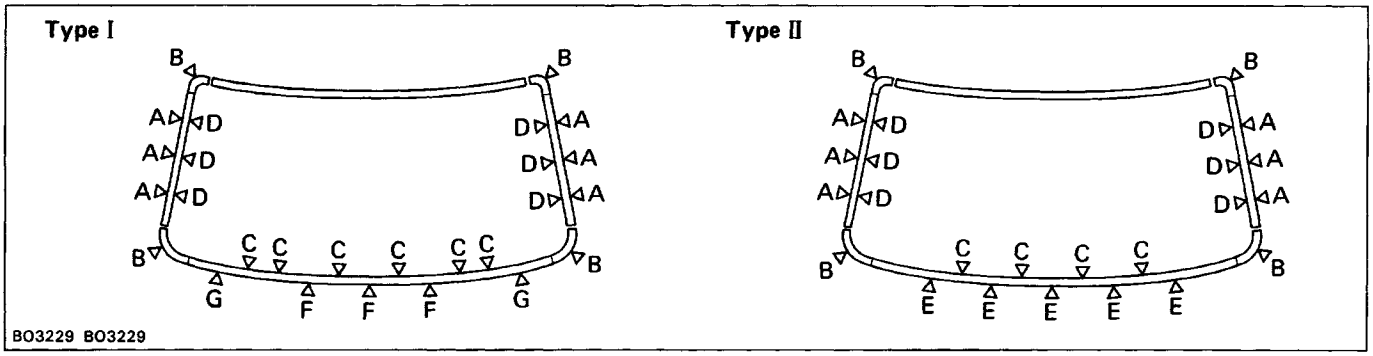
MOULDING
Windshield Moulding
COMPONENTS





REMOVAL OF WINDSHIELD MOULDING
LOCATION OF CLIPS AND FASTENER

- For vehicles in the table below which have black moul–ding, refer to diagram type 1.
- For other vehicles which have black or metallic mould–ing, refer to diagram Type 11.
- However, if all clips and fasteners are replaced, either diagram Type I or Type 11 may be referred to.



Type I Applicable Models

Frame No.	Vehicle Code	Frame No.	Vehicle Code
0000001 ~ 1999999	VZN 100, VZN 105	0000001 ~ 6999999	RN101, RN106
0000001 ~ 4999999	RN80, RN85, RN90 VZN80, VZN85, VZN90, VZN 110	0000001 ~ 9999999	VZN95
		6000000 ~ 9999999	VZN100,VZN105
0000001 ~ 5999999	RN110	–	–

1. REMOVE WIPER ARMS

2. REMOVE COWL LOUVER AND WEATHERSTRIP

3. REMOVE LOWER MOULDING WITH LOWER JOINT COVERS

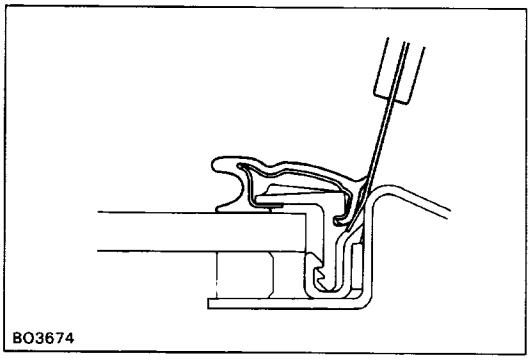
(a) Remove five screws from the clips.

(b) Pry up a scraper to loosen the clips from the body.

HINT: Tape the scraper tip before use.

(c) Remove the moulding with lower joint covers and clips.

4. REMOVE SIDE MOULDING WITH UPPER JOINT COVERS



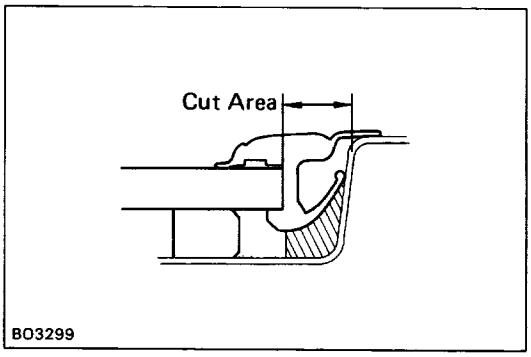
(a) Install the tip of a scraper between the body and moulding.

HINT: Tape the scraper tip before use.

(b) Pry up the scraper to loosen the moulding from the claws of the clips and fasteners.

(c) Remove the moulding with upper joint covers.

5. REMOVE UPPER MOULDING



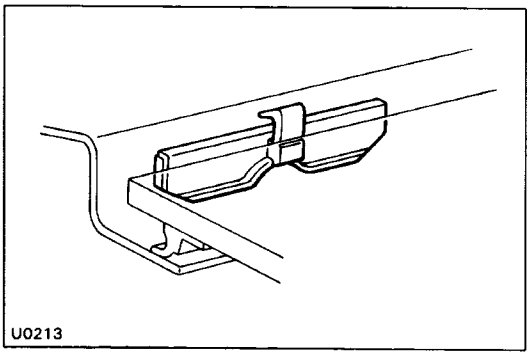
(a) Using a knife, cut off the upper moulding as shown.

(b) Cut off the old adhesive around the upper moulding installation area.

NOTICE: Do not damage the body and glass.

REPLACEMENT OF FASTENER

REPLACE FASTENER



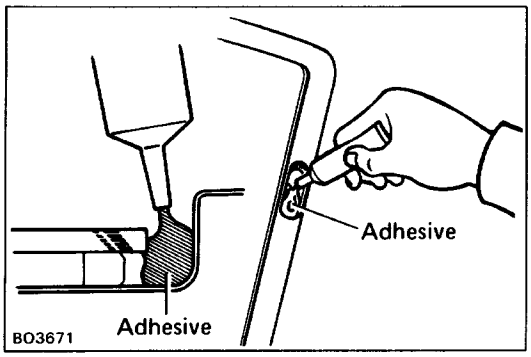
(a) Remove the damaged fastener.

(b) Cut off the old adhesive around the fastener instal–lation area.

NOTICE: Be carefully not to damage the body.

(c) Clean the installation area.

(d) Install new fastener onto the body.



INSTALLATION OF WINDSHIELD MOULDING

1. INSTALL CLIP INTO MOULDING

(See page BO–13)

Install the clip to the appropriate place on the moulding.

2. APPLY ADHESIVE AT CLIP INSTALLATION AREA

(a) Cut out the old adhesive around the clip installation area.

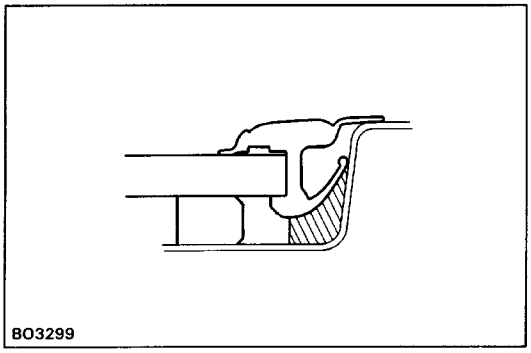
NOTICE: Do not damage the body and fastener.

(b) Apply adhesive at the clip installation area so water does not collect there.

3. APPLY ADHESIVE AT UPPER MOULDING INSTALLATION AREA

4. INSTALL NEW UPPER MOULDING

Place the moulding onto the body and tap it by hand.

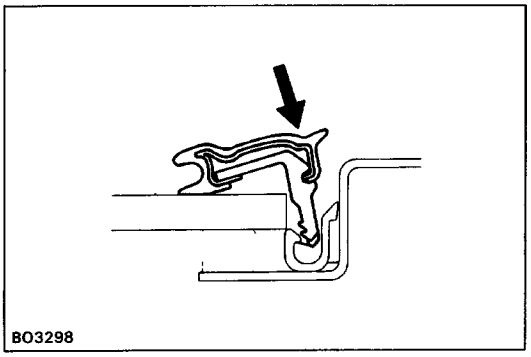


5. INSTALL SIDE MOULDING WITH UPPER JOINT COVERS

(a) Place the moulding with upper joint covers onto the body.

(b) Tap the moulding by hand to install it.

(c) Pry up the clips on the body side, and install them to the moulding.



6. INSTALL LOWER MOULDING WITH LOWER JOINT COVERS

(a) Place the moulding with lower joint covers onto the body.

(b) Align the clips of the moulding with the body holes, and push the moulding on the body.

7. INSTALL COWL LOUVER AND WEATHERSTRIP

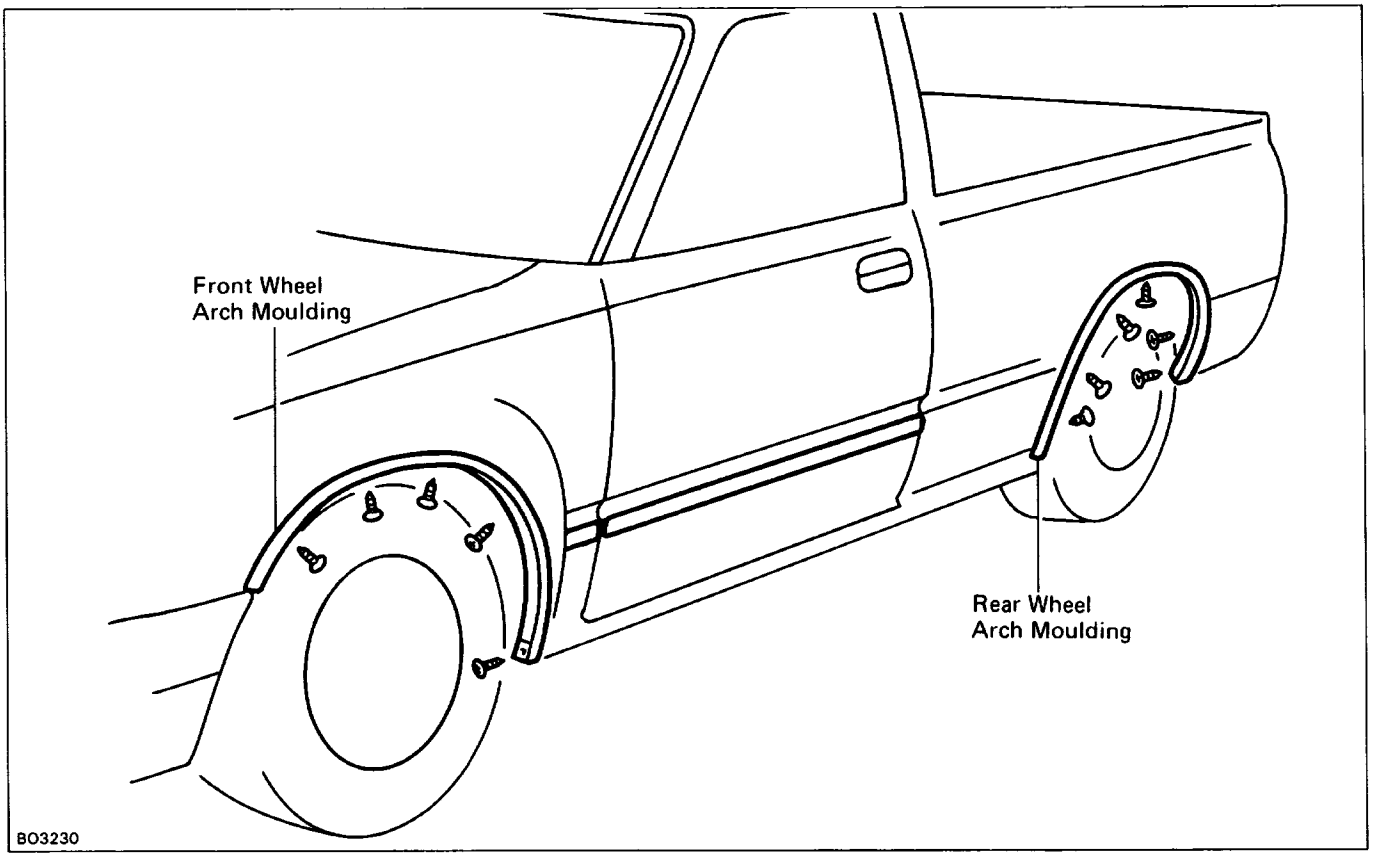
(See page BO–13)

8. INSTALL WIPER ARMS

(See page BO–13)

Wheel Arch Moulding

COMPONENTS



REPLACEMENT OF FRONT WHEEL ARCH MOULDING

1. REMOVE FRONT WHEEL ARCH MOULDING

(a) Remove five screws.

(b) Using a screwdriver, pry up the wheel arch mould–
ing, and remove it.

HINT: Tape the screwdriver tip before use.

2. INSTALL FRONT WHEEL ARCH MOULDING

(a) Tap the wheel arch moulding by hand to install it.

(b) Install five screws.

REPLACEMENT OF REAR WHEEL ARCH MOULDING

1. REMOVE REAR WHEEL ARCH MOULDING

(a) Remove six screws.

(b) Using a screwdriver, pry up the wheel arch mould
ing, and remove it.

HINT: Tape the screwdriver tip before use.

2. INSTALL REAR WHEEL ARCH MOULDING

(a) Tap the wheel arch moulding by hand to install it.

(b) Install six screws.

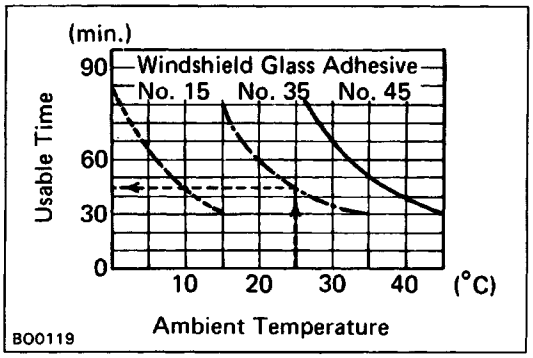
WINDSHIELD
(Adhesive Type)
PREPARE ITEMS LISTED

Part name and No.	Contents of set	Quantity
Adhesive set 08850–00070 (0 – 150C or 32 – 59'F) 08850–00080 (15 – 351C or 59 – 951F) 08850–00090 (35 – 450C or 95 – 1131F)	Main agent 500g (17.64 oz.) hardening agent 75g (2.65 oz.) Primer G (for glass) 20g (0. 71 oz.) Primer M (for body) 20g (0.71 oz.) Sponge (for applying primer) Piano wire 0.6 mm dia. x 1 m (0.024 x 39.37 in.) Cartridge	1 1 1 1 2 1 1
Dam kit 04562–30040	Dam Double–stick tape (for sticking on dam)	
	Sealant gun (for applying adhesive Glass or steel sheet (for mixing adhesive) Putty spatula (for mixing adhesive and correcting adhered parts) Cleaner (for cleaning adhering surface)	

Ambient temperature	Part No.	Part name
0 – 15°C (32 – 59°F)	08850-00070	Windshield glass adhesive set No. 15
15 – 35°C (59 – 95°F)	08850-00080	Windshield glass adhesive set No. 35
35 – 45°C (95 – 113°F)	08850-00090	Windshield glass adhesive set No. 45

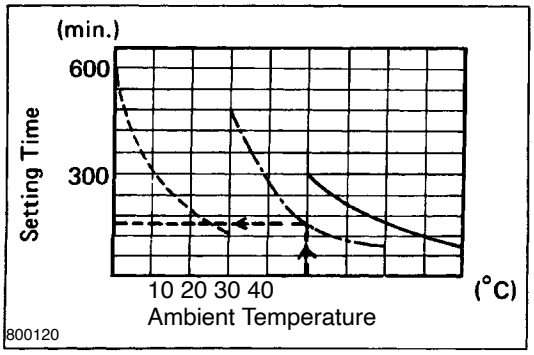
1. CHOOSE SUITABLE ADHESIVE SET

Use an adhesive set suitable for the ambient tempera–ture.



2. CHECK ADHESIVE USABLE TIME

After mixing the main and hardening agents, finish glass installation within the specified time as shown.
Example: For glass installation in ambient temperature of 25°C (77°F), apply adhesive set No.35 within 45 min–utes.

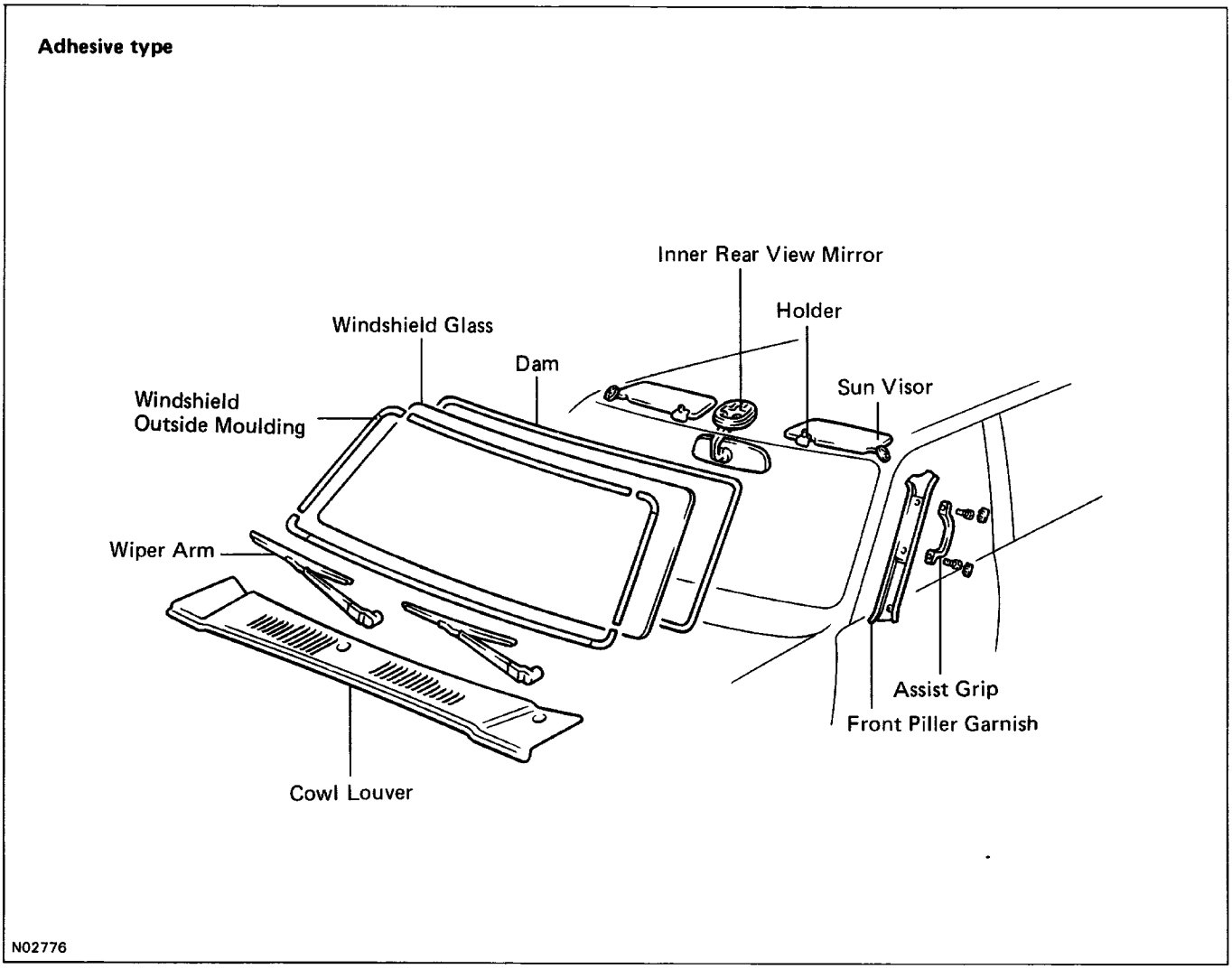


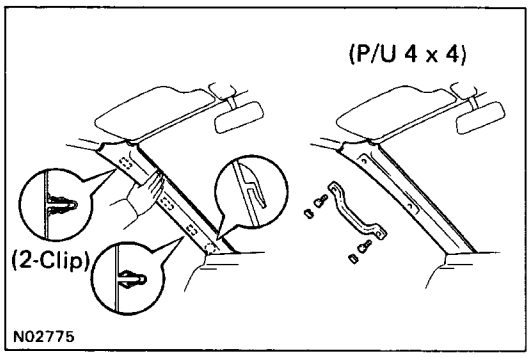
3. CHECK ADHESIVE SETTING TIME

First, mix the main and hardening agents. Then, perform a leak test only after the setting time has elapsed.
Example: The setting time for adhesive set No.35 with an ambient temperature of 25°C (77°F) is 2.5 hours.

NOTICE: Do not drive the vehicle until at least double the setting time has elapsed.

COMPONENTS

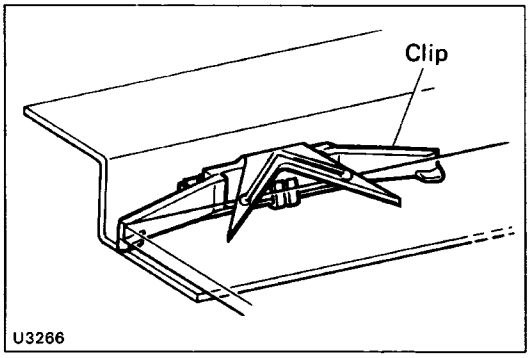




REMOVAL OF WINDSHIELD

1. REMOVE FOLLOWING PARTS:

- Inner rear view mirror
- Sun visors and holders
- Wiper arms
- Cowl louver
- Front pillar garnishes
- Assist grip

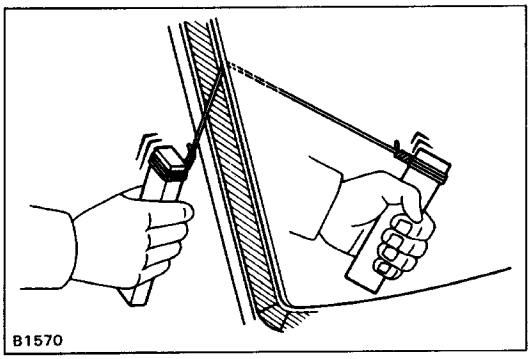


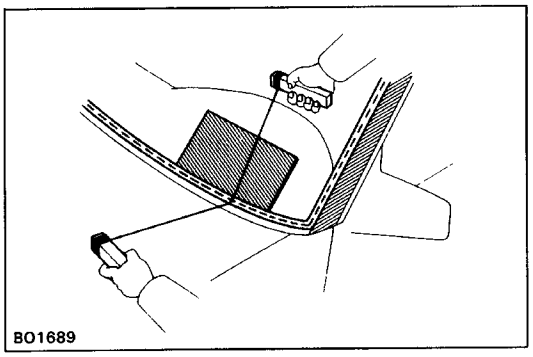
2. REMOVE WINDSHIELD MOULDING
(See page BO–13)

3. REMOVE CLIPS

Be careful not to damage the side moulding clips, when removing them from around the glass.

HINT: It is not necessary to remove the fasteners but any damaged fasteners should be replaced.





4. REMOVE WINDSHIELD GLASS

(a) Push piano wire through from the interior.

(b) Tie both wire ends to the wooden blocks or like objects.

HINT: Apply adhesive tape to the outer surface to keep the surface from being scratched.

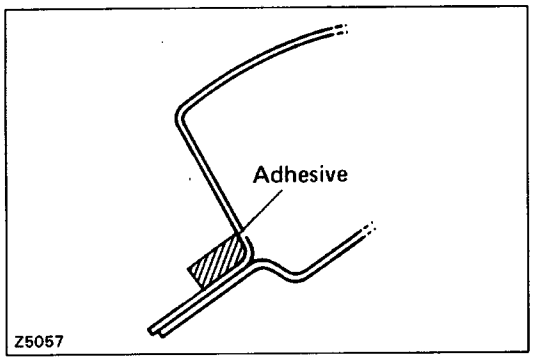
NOTICE: When separating, take care not to damage the paint and interior and exterior ornaments.

To prevent scratching the safety pad when removing the windshield, place a plastic sheet between the piano wire and safety pad.

Cut the adhesive by pulling the piano wire around it.

(d) Remove the glass.

NOTICE: Leave as much of the adhesive layer on the body as possible when cutting off the glass.



PREPARATION FOR INSTALLATION

1. CLEAN AND SHAPE CONTACT SURFACE OF BODY

(a) Remove any dam remaining on the body.

(b) Cut away any rough areas with a knife.

HINT: Leave as much of the adhesive layer on the body as possible.

(c) Clean the cutting surface of the adhesive with a piece of cloth saturated in cleaner.

HINT: Even if all the adhesive has been removed, clean the body.

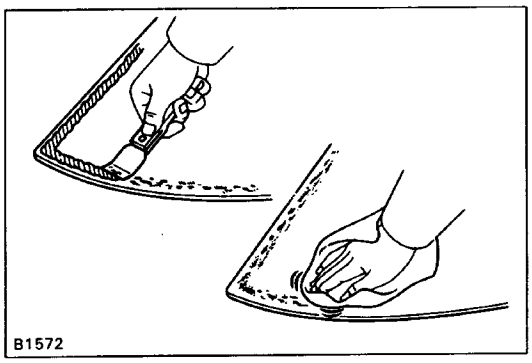
2. IF NECESSARY, REPLACE FASTENERS

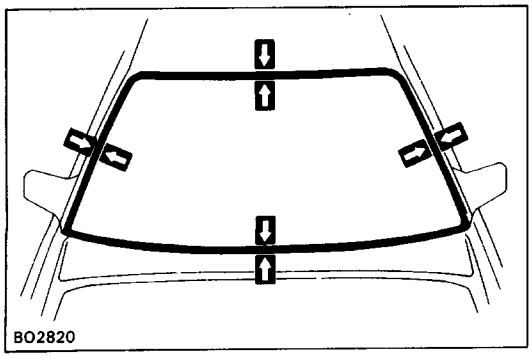
(See page BO–14)

3. CLEAN REMOVED GLASS BEFORE INSTALLATION

(a) Using a scraper, remove the adhesive sticking to the glass.

(b) Using the cleaner, clean the glass.





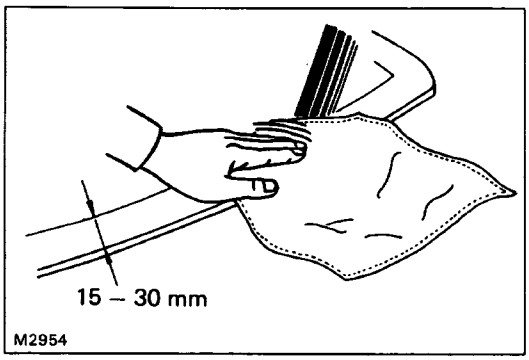
4. POSITION GLASS

(a) Place the glass in correct position.

(b) Check that all contacting parts of the glass rim are perfectly even, and do not make contact with the fasteners.

(c) Mark reference marks between the glass and body.

(d) Remove the glass.

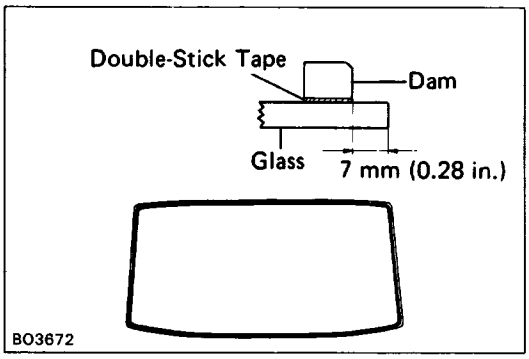


INSTALLATION OF WINDSHIELD

(See pages BO–13 and 18)

1. CLEAN CONTACT SURFACE OF GLASS

Using cleaner, clean the contact surface 15 – 30 mm (0.59 – 1.18) wide around the entire glass rim.



2. INSTALL DAM

(a) Apply double–stick tape at a point as shown.

(b) Place the dam on the double–stick tape.

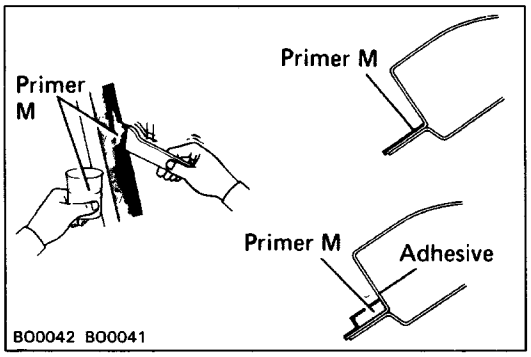
NOTICE: Do not touch the glass face after cleaning it.

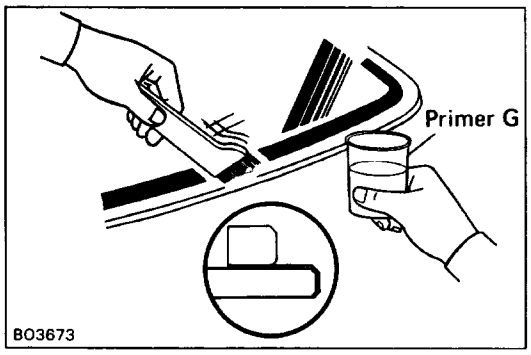
3. COAT CONTACT SURFACE OF BODY WITH PRIMER "M"

Using a brush, coat the contact surface on the body with Primer M.

NOTICE:

- **Let the Primer coating dry for 10 minutes or more. Make sure that the installation of the glass is finished within 2 hours.**
- **Use care not to leave any part of the contact surface uncoated or excessively coated, as Primer M and G serve to boost the adhesive power of the adhesive to the glass or body.**
- **Do not keep any of the opened Primer M and G for later use.**





4. COAT CONTACT SURFACE OF GLASS WITH PRIMER "G"

(a) Using a brush or sponge, coat the edge of the glass and the contact surface with Primer G.

(b) Before the Primer dries, wipe it off with a clean cloth to avoid too thick a coat.

NOTICE: Be sure that installation of the glass is finished within 70 minutes.

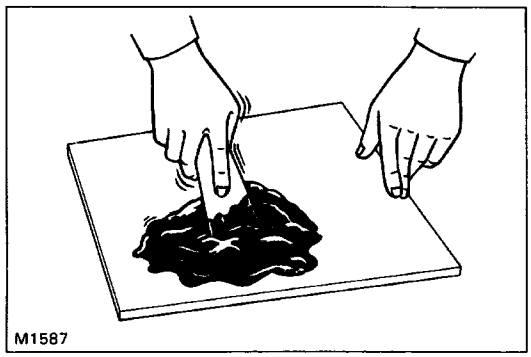
5. MIX ADHESIVE COATING

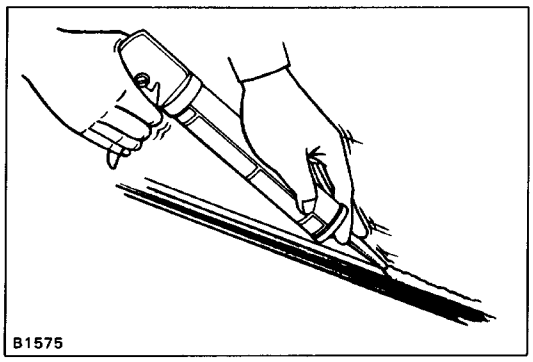
NOTICE:

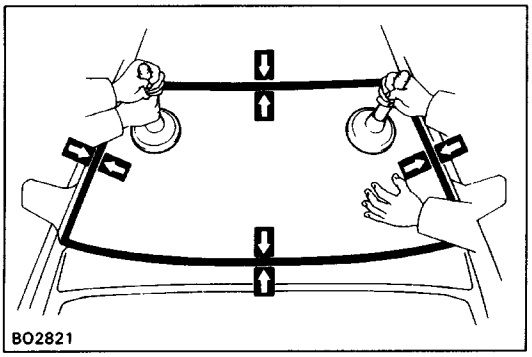
- **Be sure that installation of the glass is finished within usable time. (See step 2 on page BO–17)**
- **The mixture should be made in 5 minutes or less.**

(a) Thoroughly clean the glass plate and putty spatula with cleaner.

(b) Thoroughly mix 500 g (17.64 oz.) of the main agent and 75 g (2.65 oz.) of the hardening agent on a glass plate or like object with a putty spatula.







6. APPLY ADHESIVE

(a) Cut off the tip of the cartridge nozzle to make a hole 5 mm (0.20 in.) in diameter. Fill the cartridge with adhesive.

(b) Load the cartridge into the sealer gun.

(c) Coat the glass with adhesive on all contact surfaces along the ridge.

Adhesive height:

If adhesive remains on the body

3.5 – 5.0 mm (0.138 – 0.197 in.)

If no adhesive remains on the body

8 – 10 mm (0.31 – 0.39 in.)

7. INSTALL GLASS

(a) Position the glass so that the reference marks are lined up, and press in gently along the rim.

(b) Using a spatula, apply adhesive on the glass rim.

(c) Use a spatula to remove any excess or protruding adhesive.

(d) Fasten glass securely until the adhesive sets.

8. INSPECT FOR LEAKS AND REPAIR

(a) Perform a leak test after the hardening time has elapsed.

(b) Seal any leaks with auto glass sealer.

Part No. 08833–00030 or equivalent

9. INSTALL CLIPS AND WINDSHIELD MOULDING

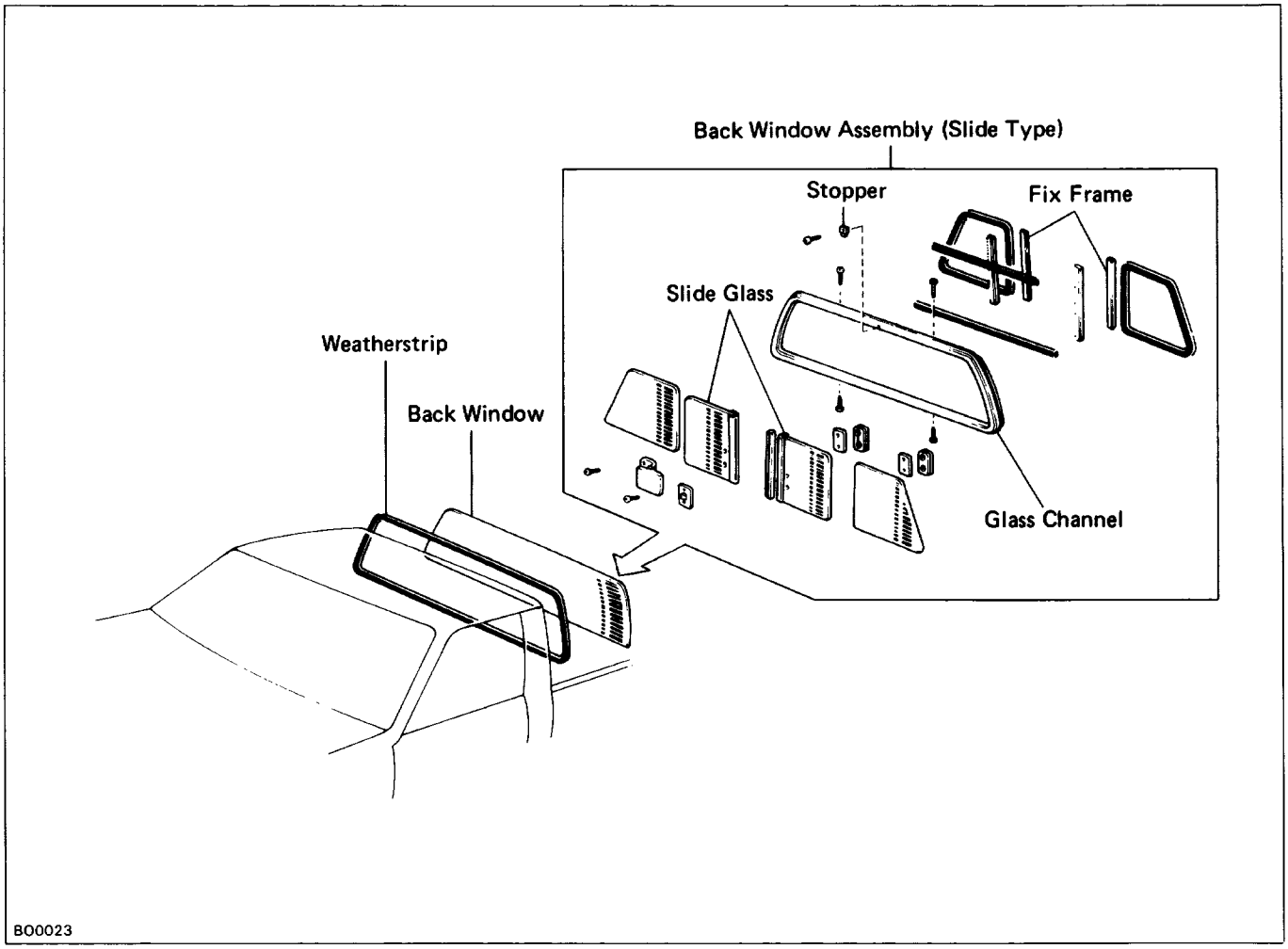
(See page BO–13)

10. INSTALL FOLLOWING PARTS:

(See page BO–18)

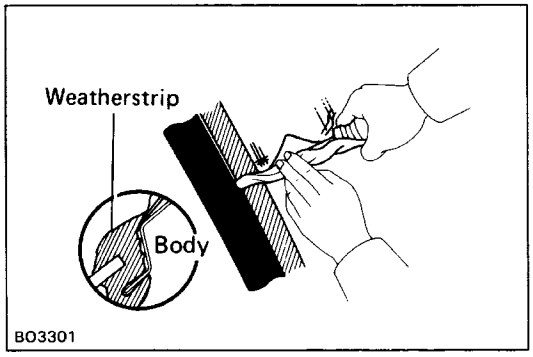
- Inner rear view mirror
- Sun visors and holders
- Front pillar garnishes
- Cowl louver
- Wiper arms

BACK WINDOW
COMPONENTS



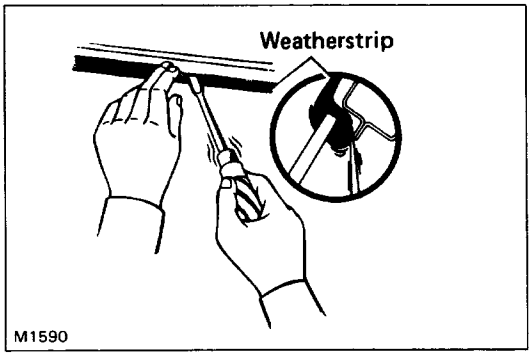
REMOVAL OF BACK WINDOW

REMOVE BACK WINDOW



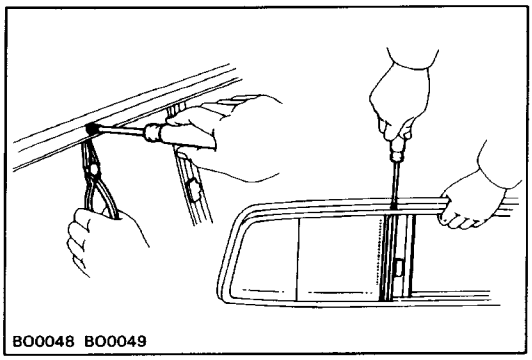
(a) Using a screwdriver, loosen the weatherstrip from the body.

NOTICE: Be careful not to damage the body paint.



(b) Pry the lip of the weatherstrip outward from the interior part of the body flange.

(c) Pull the glass outwards, and remove it with the weatherstrip.

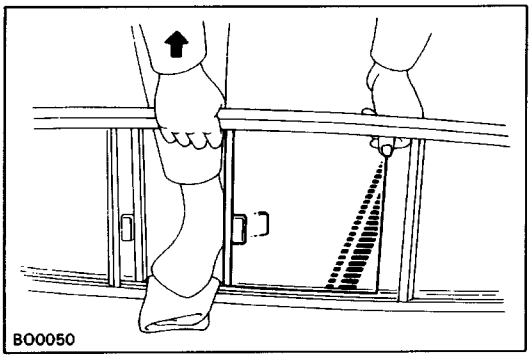

BO0048 BO0049

DISASSEMBLY OF BACK WINDOW ASSEMBLY

(Slide Glass type)

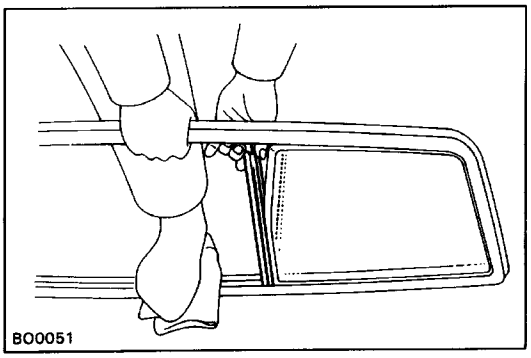
1. REMOVE FOLLOWING PARTS:

- Back window slide glass stoppers
- Four screws holding two fix frames


BO0050

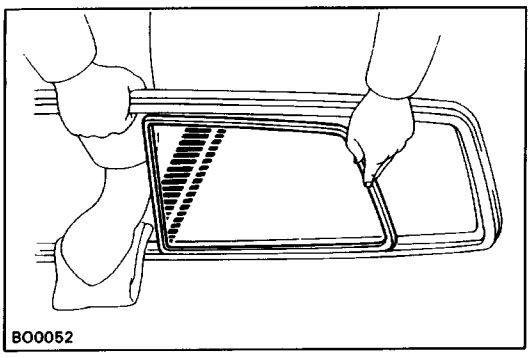
2. REMOVE SLIDE GLASS

Pull apart the channels and remove two slide glass panes at the center area of the glass channel.


BO0051

3. REMOVE NON–SLIDE GLASS

(a) Pull apart the channels and remove two fix frames as shown.


BO0052

(b) Pull apart the channels and remove two non–slide glass panes as shown.

ASSEMBLY OF BACK WINDOW ASSEMBLY

1. INSTALL NON–SLIDE GLASS

(a) Apply soapy water to the contact surface of the weatherstrip and glass channel flange.

(b) Install two non–slide glass panes.

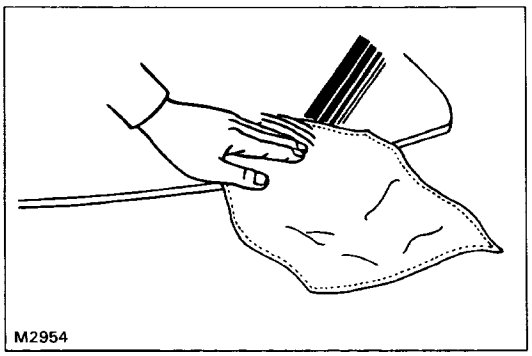
(c) Install two fix frames.

2. INSTALL SLIDE GLASS

Install two slide glass panes at the center area of the glass channel.

3. INSTALL FOLLOWING PARTS:

- Four screws holding two fix frames
- Back window slide glass channel stoppers



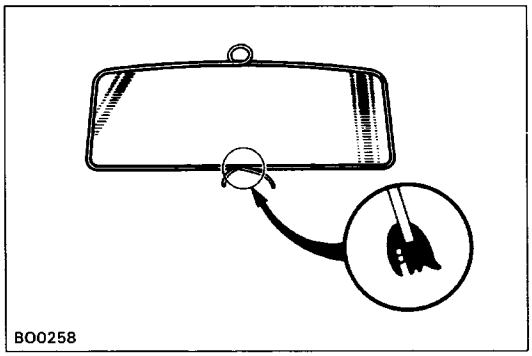
INSTALLATION OF BACK WINDOW

1. CLEAN BODY AND GLASS

Using cleaner, wipe off the contact surface of the body and the glass.

2. CLEAN WEATHERSTRIP

Using cleaner, clean the weatherstrip surface.

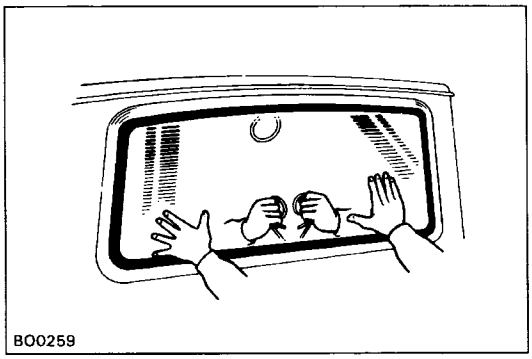


3. INSTALL WEATHERSTRIP ON BACK WINDOW

(a) Attach the weatherstrip to the back window.

NOTICE: If the weatherstrip has become hard, it may develop water leaks. Use a new one if possible.

(b) Apply a working cord along the weatherstrip groove as shown.

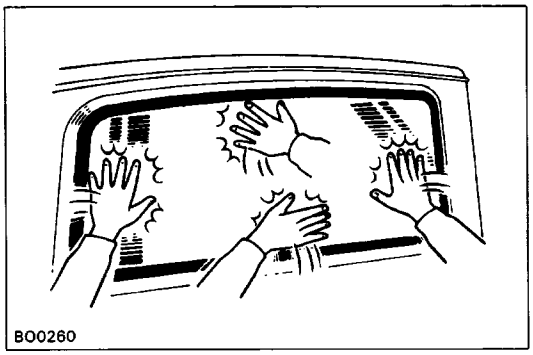


4. INSTALL BACK WINDOW

HINT: Begin installation in the middle of the lower part of the glass.

(a) Hold the back window in position on the body.

(b) Install the back window by pulling the cord from the interior, while pushing the outside of the glass with your open hand.



(c) To snug the back window in place, tap from the out–side with your open hand.

5. INSPECT FOR LEAKS AND REPAIR

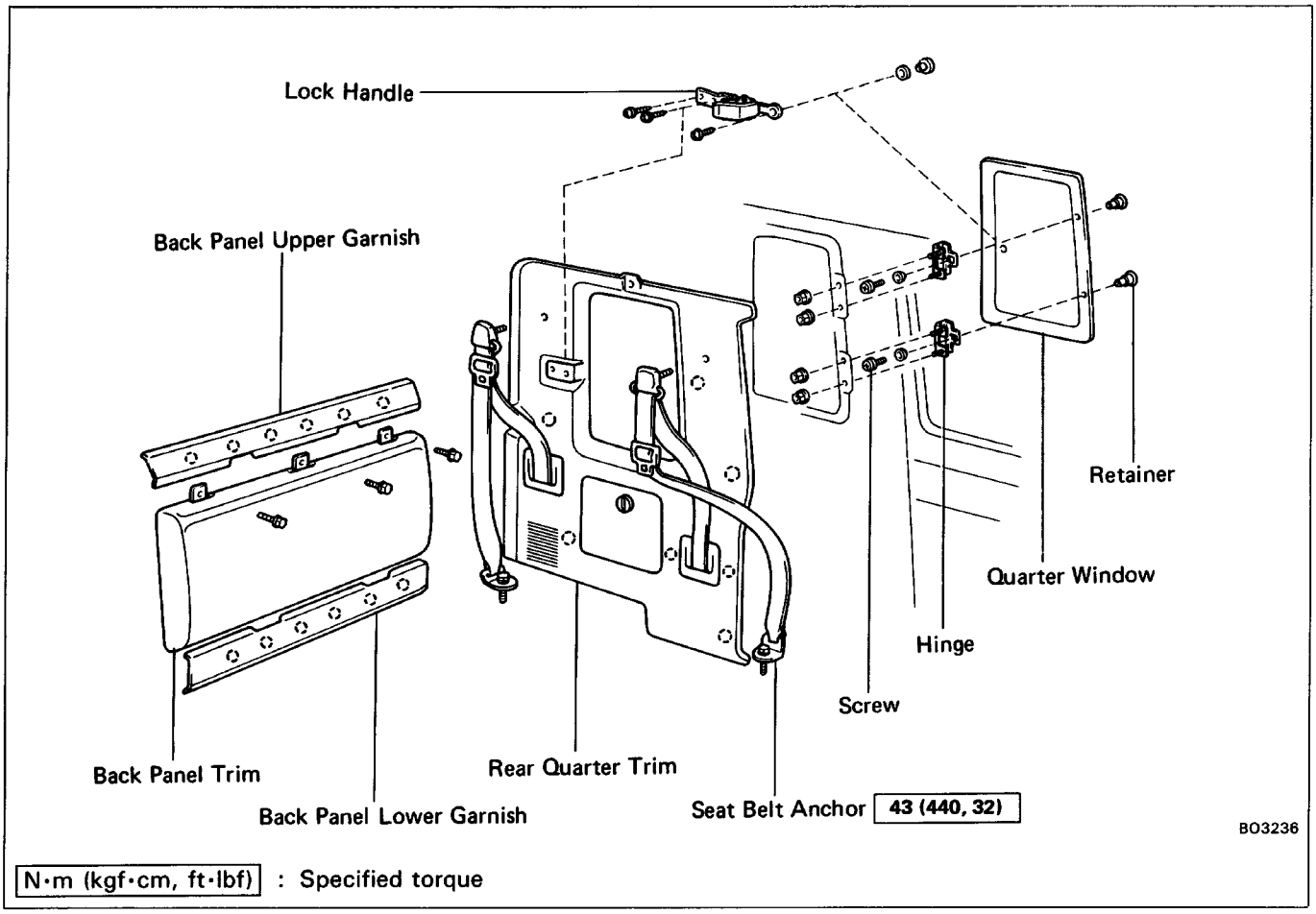
(a) Perform a leak test.

(b) Seal any leak with auto glass sealer.

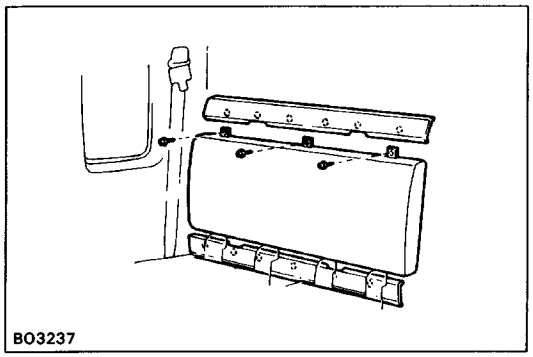
Part No. 08830–00030 or equivalent

QUARTER WINDOW (Xtra Cab)

COMPONENTS



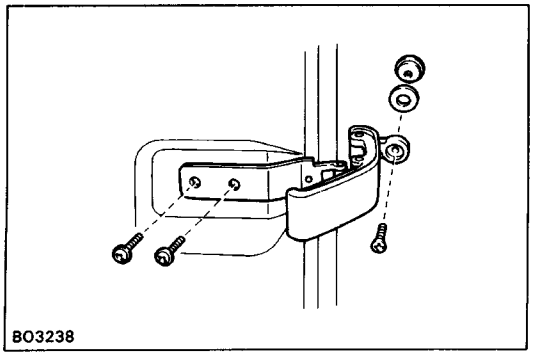
N·m (kgf·cm, ft·lbf) : Specified torque



REMOVAL OF QUARTER WINDOW

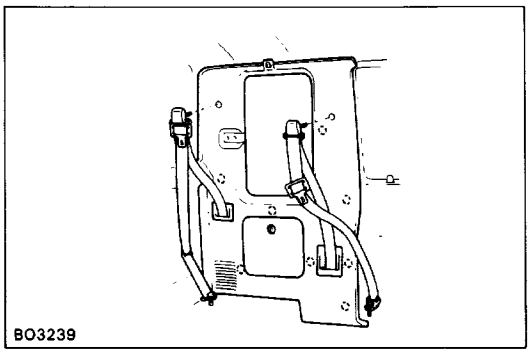
1. REMOVE BACK PANEL GARNISHES AND BACK PANEL TRIM

(a) Remove the back panel lower garnish.
(b) Remove the back panel upper garnish.
(c) Remove three bolts and the back panel trim.



2. REMOVE LOCK HANDLE

Remove three screws and the lock handle.



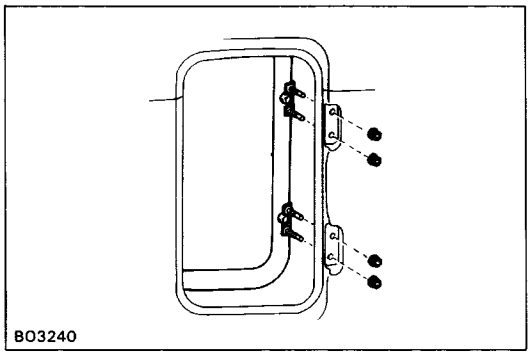
3. REMOVE REAR QUARTER TRIM

(a) Remove four bolts, the seat belt anchors and the belt guide.

(See pages BO–46 and 47)

(b) Remove the screw and the hook.

c) Remove the rear quarter trim.

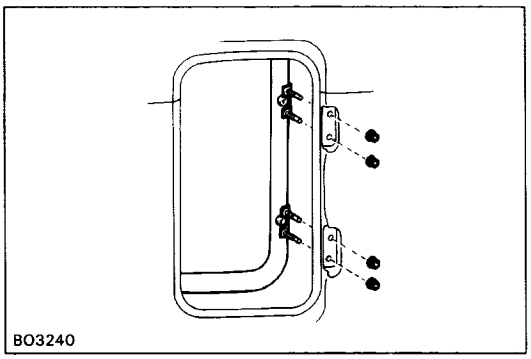


4. REMOVE QUARTER WINDOW

Remove four nuts and the quarter window.

5. REMOVE HINGES FROM WINDOW GLASS

Remove two screws and the hinges.



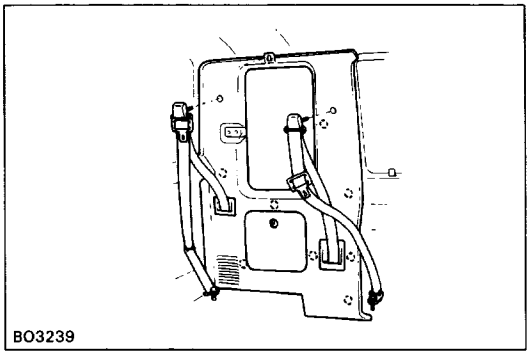
INSTALLATION OF QUARTER WINDOW

1. INSTALL HINGES TO WINDOW GLASS

Install the two hinges with the screws.

2. INSTALL QUARTER WINDOW

Install the quarter window with four nuts.



3. INSTALL REAR QUARTER TRIM

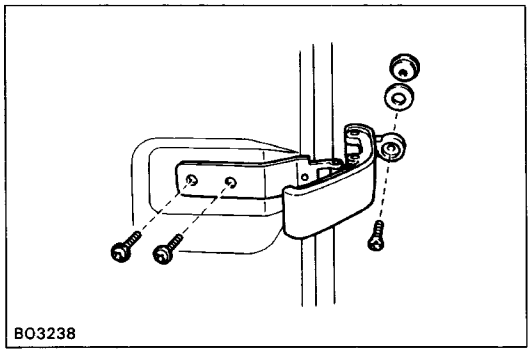
(a) Install the rear quarter trim.

(b) Install the hook with the screw.

(c) Install the seat belt anchor with four bolts.

(See pages BO–46 and 47)

Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)



4. INSTALL LOCK HANDLE

Install the lock handle with three screws.

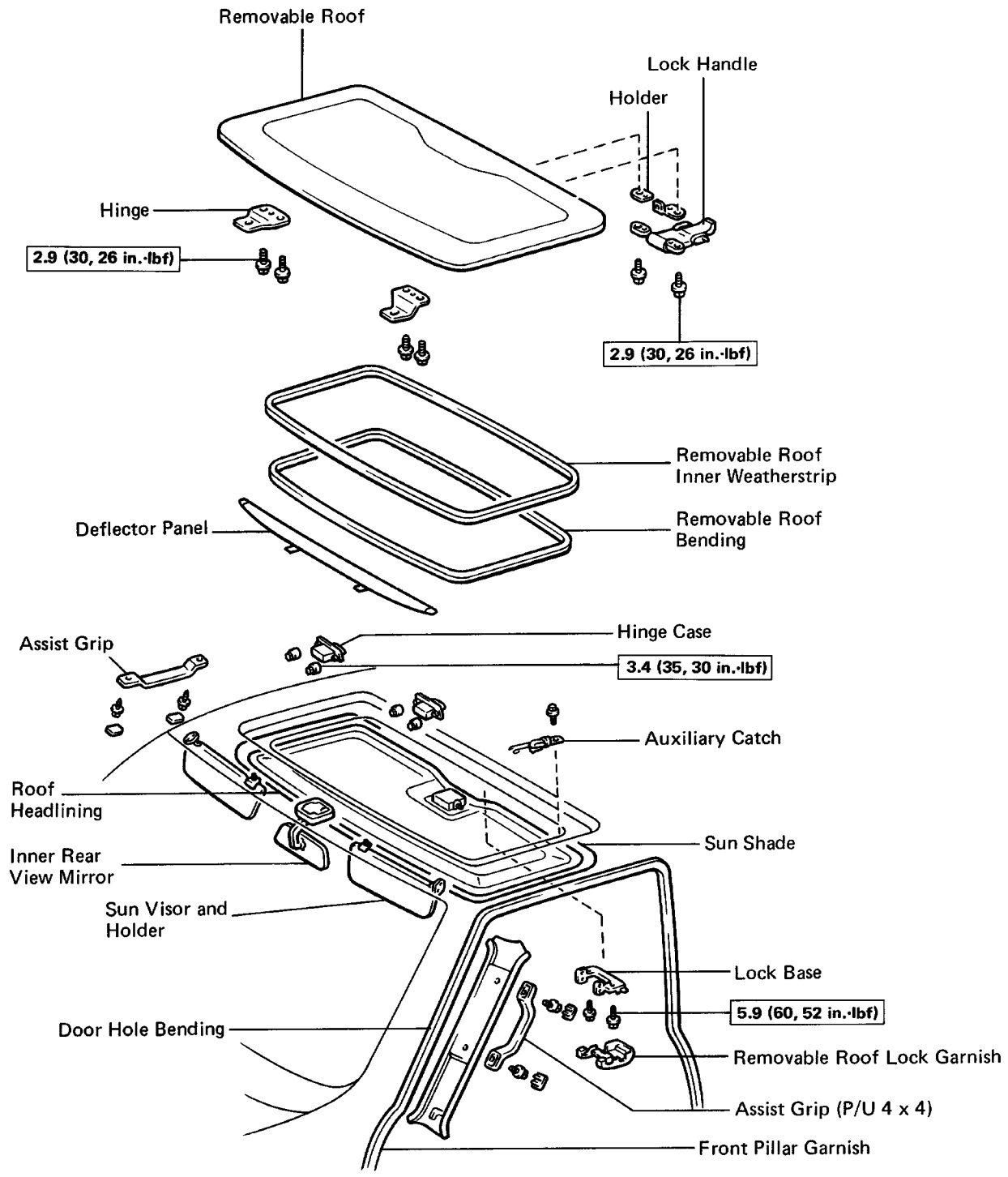
5. INSTALL BACK PANEL TRIM AND BACK PANEL GARNISHES

(a) Install the back panel trim with three bolts.

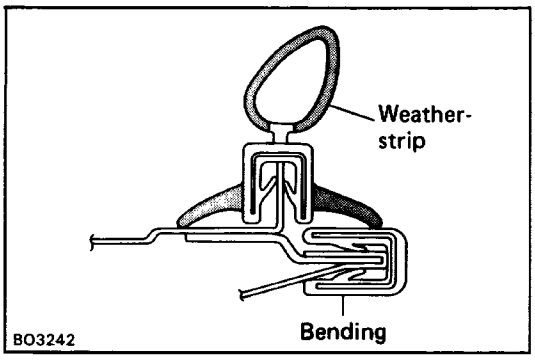
(b) Install the back panel upper garnish by tapping.

(c) Install the back panel lower garnish.

MOON ROOF
COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque



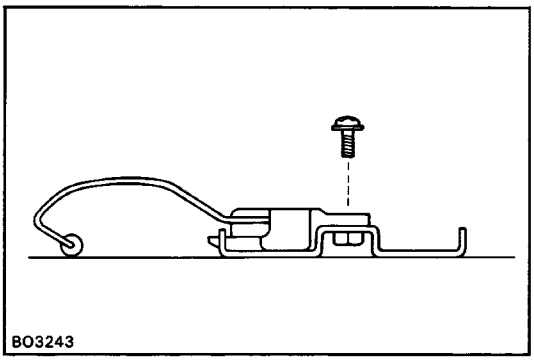
REMOVAL OF MOON ROOF

(See page BO–31)

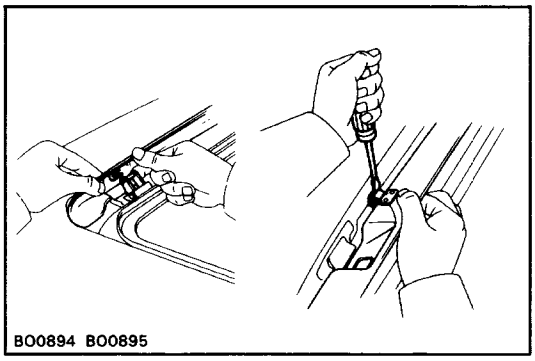
1. REMOVE REMOVABLE ROOF WITH SUN SHADE

2. REMOVE REMOVABLE ROOF INNER WEATHERSTRIP

3. REMOVE REMOVABLE ROOF BENDING



4. REMOVE REMOVABLE ROOF AUXILIARY CATCH



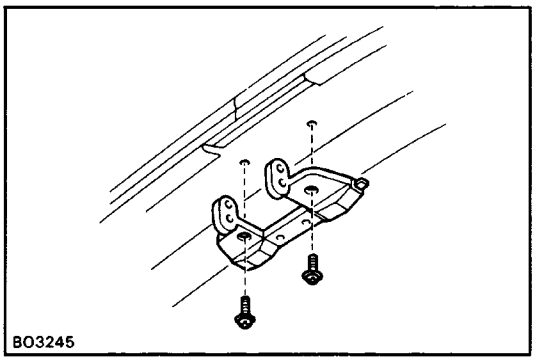
5. REMOVE WIND DEFLECTOR PANEL

(a) Remove two outside deflector clips on the left and right sides.

(b) Remove two inside deflector clips on the left and right sides, while prying it with a screwdriver.

HINT: Tape the screwdriver tip before use.

6. REMOVE REMOVABLE ROOF LOCK GARNISH



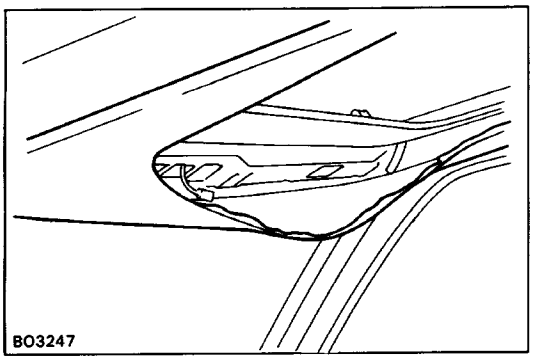
7. REMOVE REMOVABLE ROOF LOCK BASE

Remove two screws and the lock base.

8. REMOVE FOLLOWING PARTS:

(See page BO–31)

- Inner rear view mirror
- Sun visors and holders
- Assist grip
- Front pillar garnishes
- Door hole bendings

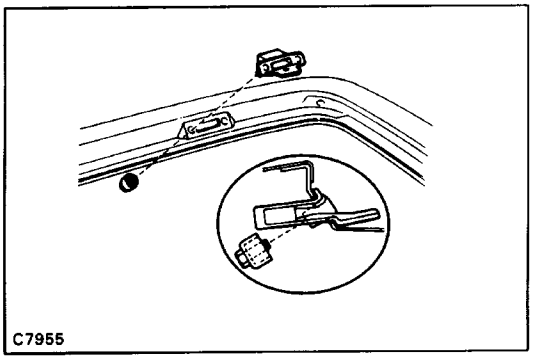


9. REMOVE ROOF HEADLINING

(a) Remove the roof headlining as shown, and leave it hanging.

(b) Remove any double–stick tape remaining on the body.

NOTICE: Do not damage the roof headlining.



10. REMOVE REMOVABLE ROOF HINGE CASE

Remove two bolts and the hinge case.

INSTALLATION OF MOON ROOF

(See page BO–31)

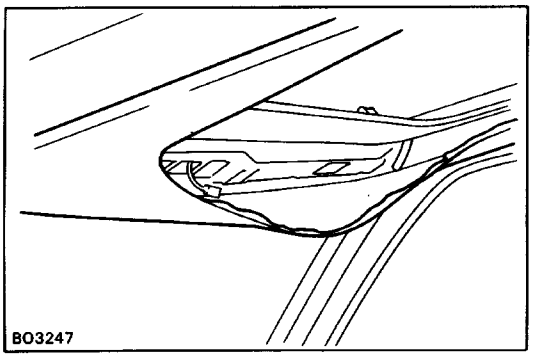
1. INSTALL REMOVABLE ROOF HINGE CASE

Install the hinge case with the bolts.

Torque: 3.4 N–m (35 kgf–cm, 30 in.–lbf)

HINT:

- Make sure the seal is properly torqued.
- If any part of the seal is damaged, replace the seal and case.



2. INSTALL REMOVABLE ROOF HEADLINING

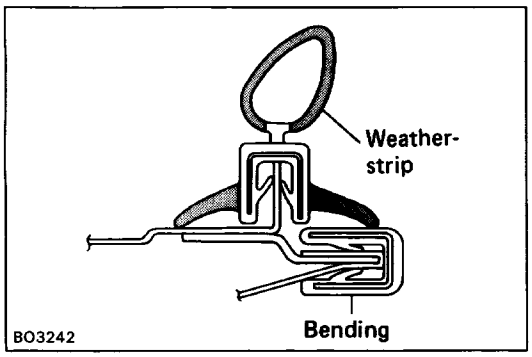
(a) Apply double–stick tape to the edge of the roof panel.

(b) Install the roof headlining to the double–stick tape on the body.

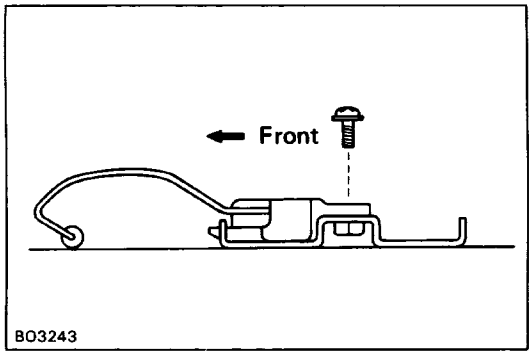
3. INSTALL FOLLOWING PARTS:

(See page BO–31)

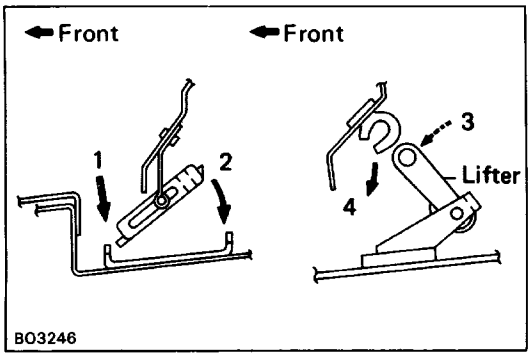
- Door hole bendings
- Front pillar garnishes
- Assist grip
- Sun visors and holders
- Inner rear view mirror



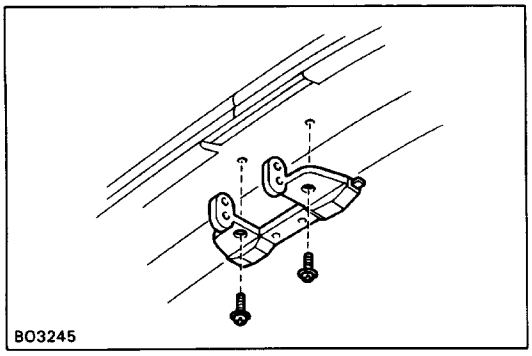
4. INSTALL REMOVABLE ROOF BENDING
5. INSTALL REMOVABLE ROOF INNER WEATHERSTRIP



6. INSTALL REMOVABLE ROOF AUXILIARY CATCH
Install the auxiliary catch with the bolt.



7. INSTALL WIND DEFLECTOR PANEL
Install the deflector clips as shown in the illustration.



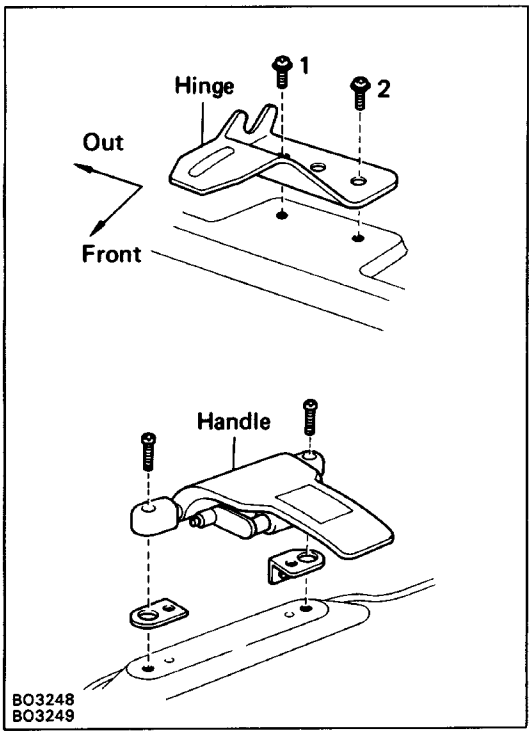
8. INSTALL REMOVABLE ROOF LOCK BASE
Install the lock base, and lightly tighten the bolts.

9. INSTALL REMOVABLE ROOF WITH SUN SHADE
10. TORQUE REMOVABLE ROOF LOCK BASE BOLTS
Torque: 5.9 N–m (60 kgf–cm, 52 in.–lbf)
11. INSTALL REMOVABLE ROOF LOCK GARNISH

DISASSEMBLY OF REMOVABLE ROOF

(See page BO–31)

1. REMOVE HANDLE WITH HOLDER
2. REMOVE LEFT/RIGHT HINGE



ASSEMBLY OF REMOVABLE ROOF

1. INSTALL LEFT/RIGHT HINGE

(a) Install the hinge with two screws.

(b) Torque the outside screw.

Torque: 2.9 N–m (30 kgf–cm, 26 in.–lbf)

(c) Torque the inside screw.

Torque: 2.9 N–m (30 kgf–cm, 26 in.–lbf)

2. INSTALL HOLDER AND HANDLE

(a) Install the holder and handle with two bolts.

(b) Torque the bolts.

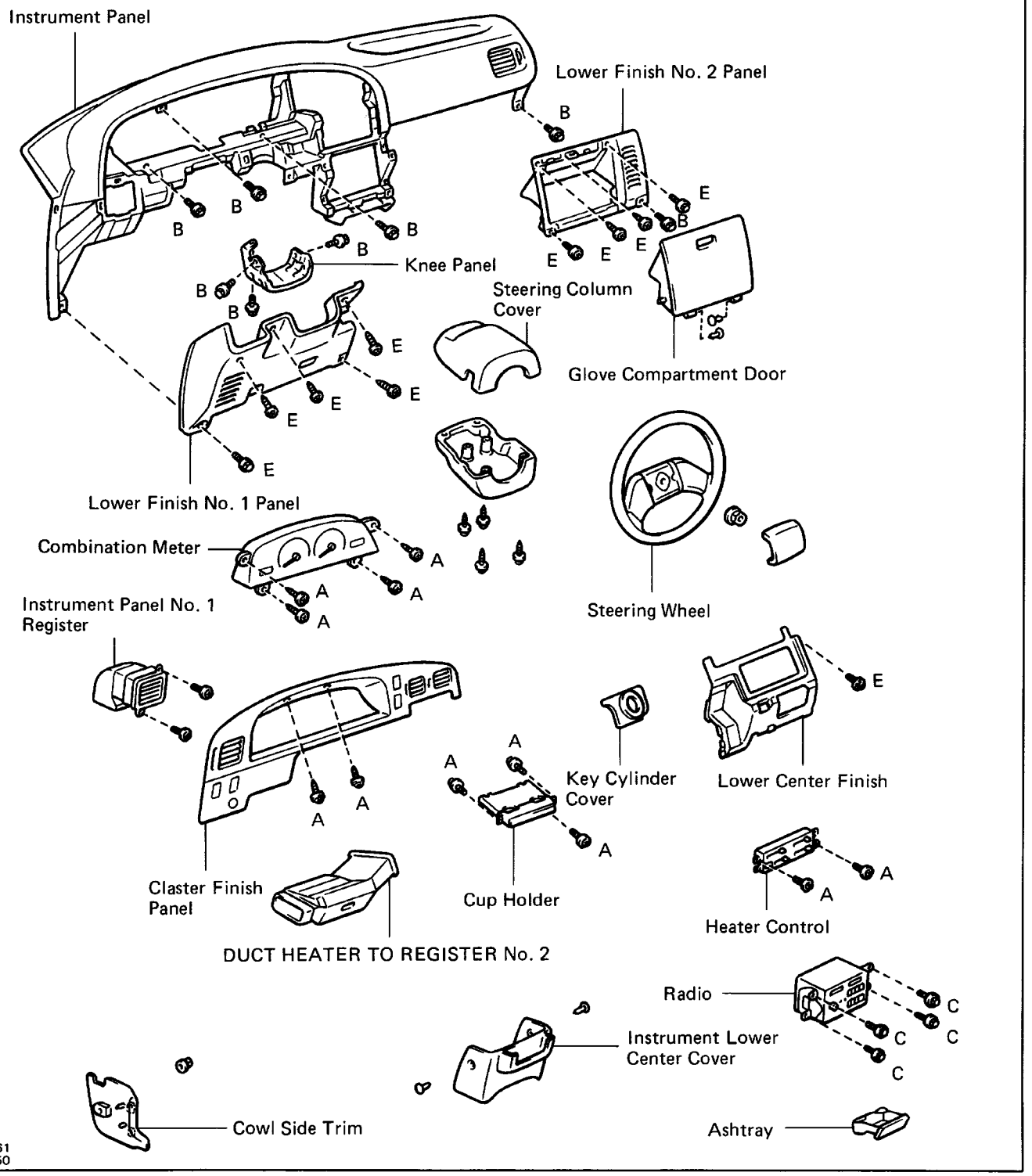
Torque: 2.9 N–m (30 kgf–cm, 26 in.–lbf)

INSTRUMENT PANEL

COMPONENTS

Models Ex. 4-Speed M/T

Code	Shape	Size	Code	Shape	Size	Code	Shape	Size
A		ϕ=5 (0.20) L=14 (0.55)	B		ϕ=6 (0.24) L=22 (0.87)	C		ϕ=5 (0.20) L=18 (0.71)
D		ϕ=5 (0.20) L=16 (0.63)	E		ϕ=5 (0.20) L=16 (0.63)			

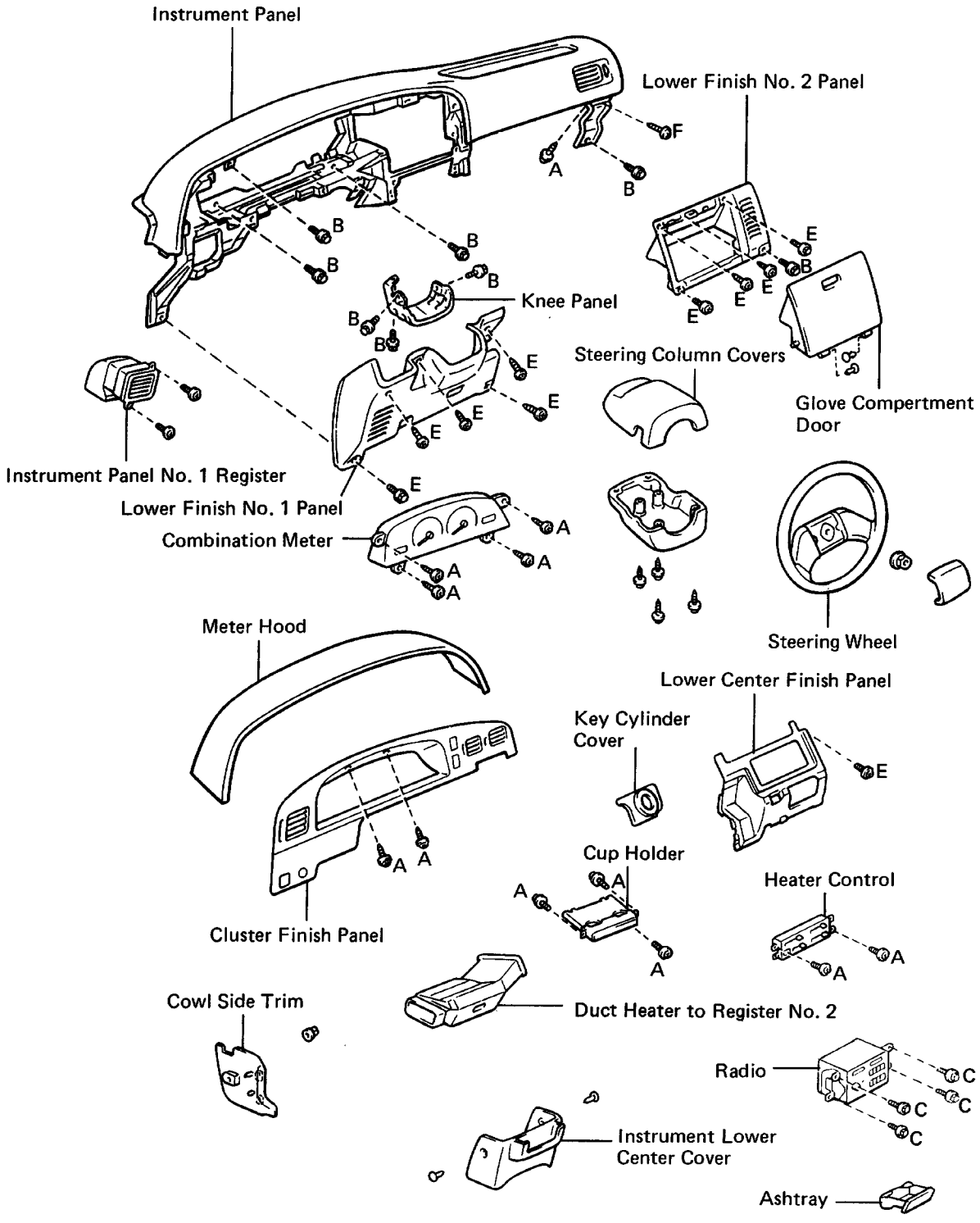


BO4461
N02850

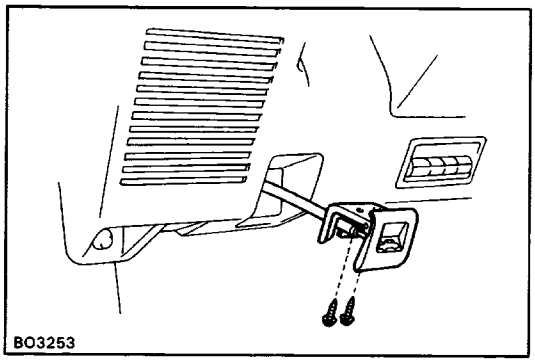
COMPONENTS (Cont'd)

4-Speed M/T Models

Code	Shape	Size	Code	Shape	Size	Code	Shape	Size
A		ϕ = 5 (0.20) L = 14 (0.55)	B		ϕ = 6 (0.24) L = 22 (0.87)	C		ϕ = 5 (0.20) L = 18 (0.71)
D		ϕ = 5 (0.20) L = 16 (0.63)	E		ϕ = 5 (0.20) L = 16 (0.63)	F		ϕ = 5 (0.20) L = 14 (0.55)



N03040
N02849


BO3253

REMOVAL OF INSTRUMENT PANEL

(See pages BO–36 and 37)

1. DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL

2. REMOVE STEERING WHEEL

(See page SR–4)

3. REMOVE STEERING COLUMN COVERS

(See page SR–4)

4. REMOVE ENGINE HOOD RELEASE LEVER

Remove two screws and the engine hood release lever.

5. REMOVE COWL SIDE TRIM

Remove the nut and the cowl side trim.

6. REMOVE INSTRUMENT LOWER CENTER COVER

Remove two clips and the cover.

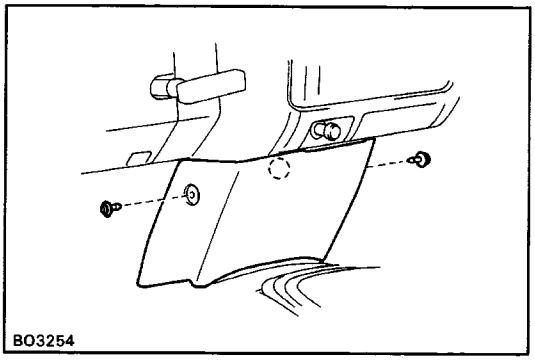
7. REMOVE KEY CYLINDER COVER

Pry out the key cylinder cover.

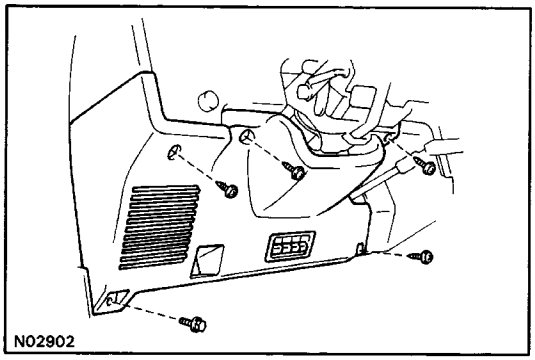
8. REMOVE LOWER FINISH NO.1 PANEL

(a) Remove four screws, one bolt and the panel.

(b) Disconnect the connector.

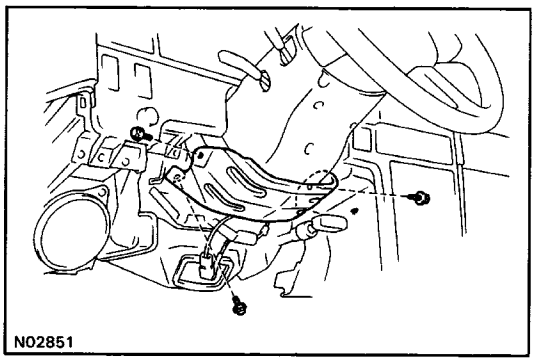

BO3254

9. REMOVE DUCT HEATER TO REGISTER NO.2


N02902

10. REMOVE KNEEPANEL

Remove the three bolts and knee panel.


N02851

11. REMOVE HEATER CONTROL PLATE

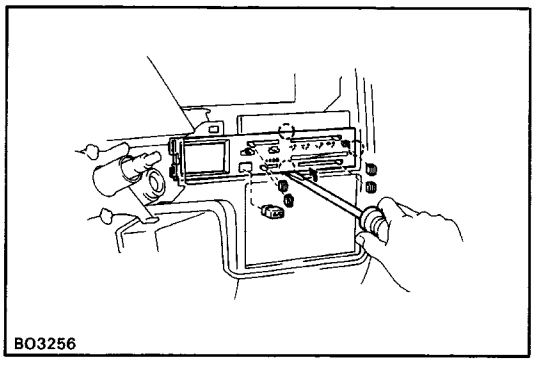
(a) Pull off the heater control knobs.

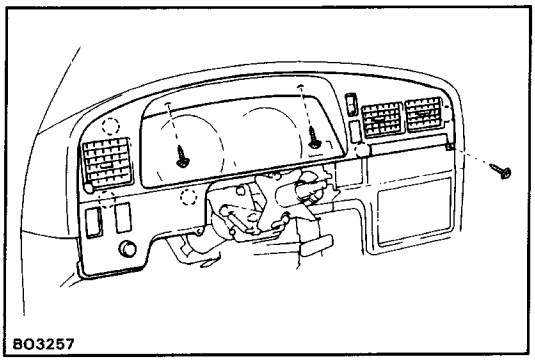
(b) (w/ A/C)

Pry off the A/C switch.

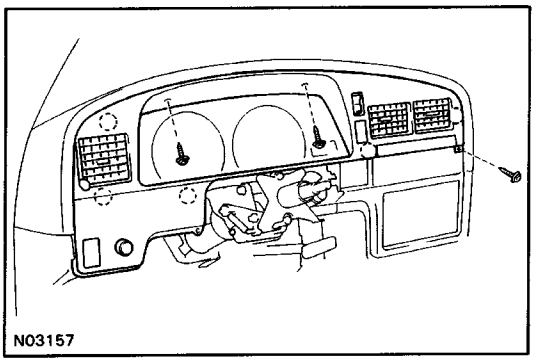
(c) Using a screwdriver, pry out the heater control plate as shown in the illustration, and remove it.

HINT: Tape the screwdriver tip before use.

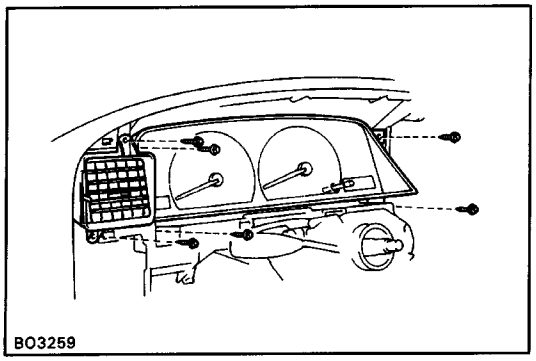

BO3256



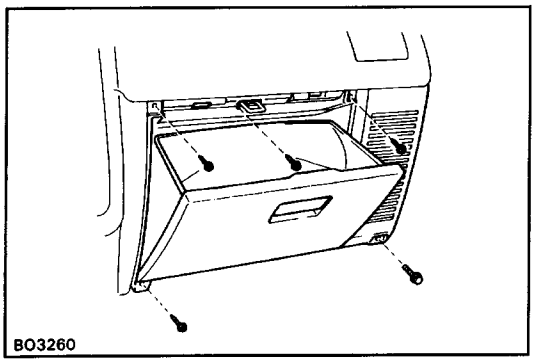
12–1.(Models Ex. 4–Speed M/T)
REMOVE CLUSTER FINISH PANEL
(a) Remove three screws and pull out the cluster finish panel.
(b) Disconnect the connectors.
(c) Remove two screws and the cup holder from the cluster finish panel.



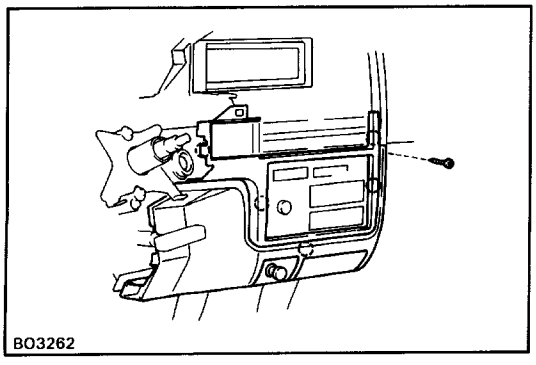
12–2.(4–Speed M/T Models)
REMOVE CLUSTER FINISH PANEL WITH METER HOOD
(a) Remove two screws and pull out the cluster finish panel with meter hood.
(b) Disconnect the connectors.
(c) Pull off the meter hood.
(d) Remove two screws and the cup holder from the cluster finish panel.



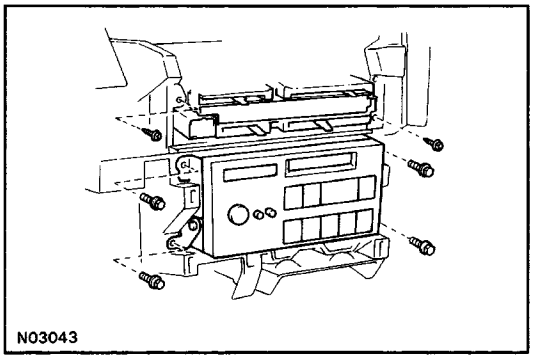
13. REMOVE INSTRUMENT PANEL NO. 1 REGISTER
Remove two screws and the register.
14. REMOVE COMBINATION METER
(a) Remove four screws.
(b) Disconnect the connectors.
(c) Remove the combination meter.

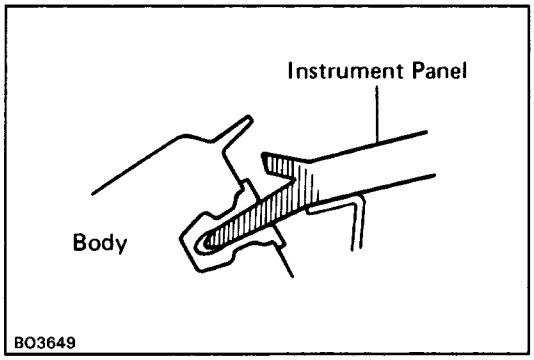


15. REMOVE LOWER FINISH NO.2 PANEL WITH GLOVE COMPARTMENT DOOR
(a) Remove four screws, one bolt and the lower finish No.2 panel with glove compartment door.
(b) Disconnect the connector.



16. REMOVE LOWER CENTER FINISH PANEL
(a) Remove a screw and pull out the panel.
(b) Disconnect the connectors.


N03043



BO3649

17. REMOVE HEATER CONTROL

Remove two screws and hang the heater control.

18. REMOVE RADIO

(a) Remove four bolts

(b) Disconnect the antenna cable and connectors.

(c) Remove the radio with bracket.

19. REMOVE INSTRUMENT PANEL

(a) Remove four bolts and the instrument panel.

(b) Disconnect the connectors.

HINT: The instrument panel has a boss onto the clip on the body side. Therefore when removing, pull upward at an angle.

20. REMOVE FOLLOWING PARTS FROM INSTRUMENT PANEL

(Models Ex. 4–Speed M/T)

(a) Safety pad

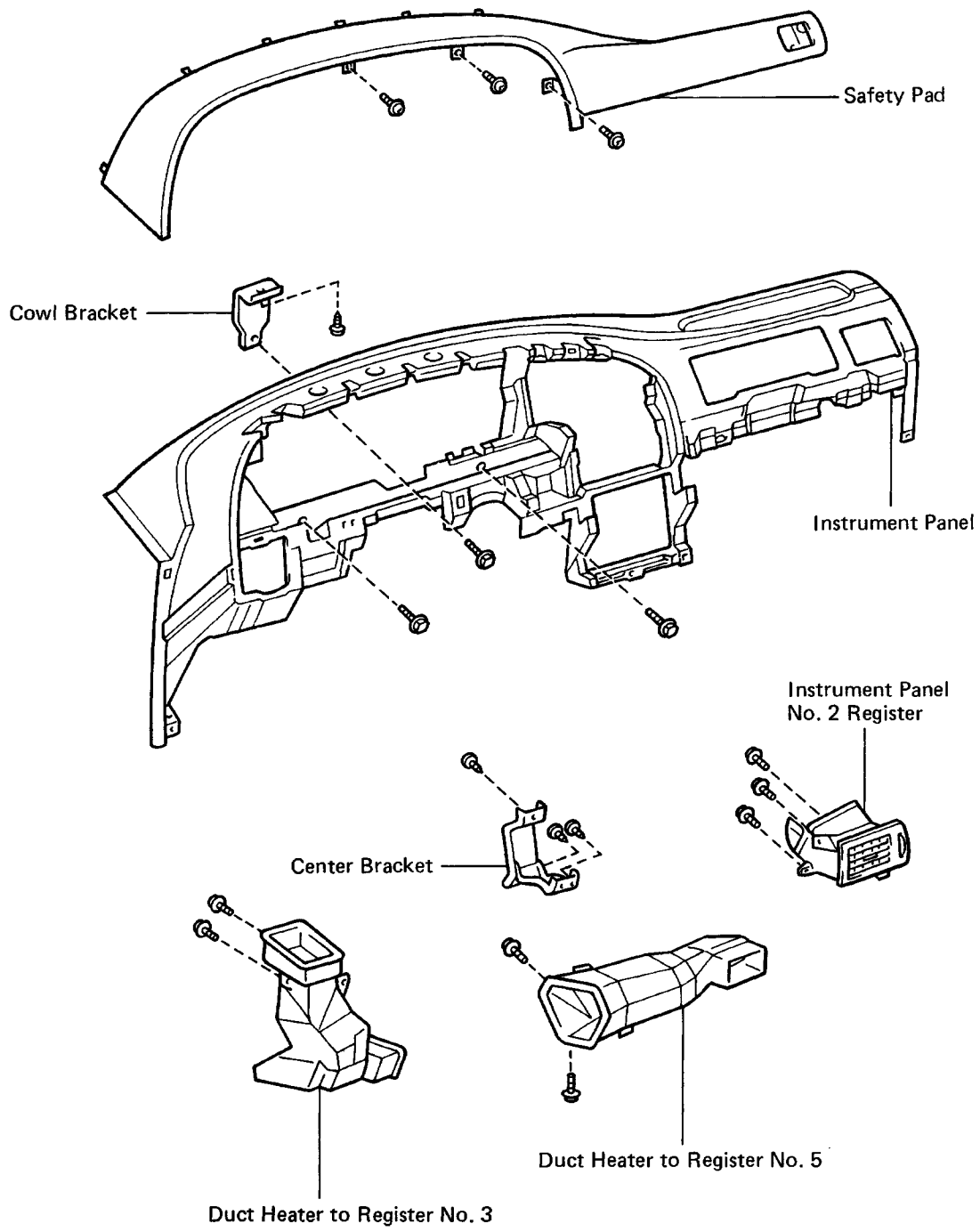
(b) No. 3, No. 5 heater to register ducts

(c) Instrument panel No.2 register

(d) Center bracket

(e) Cowl bracket

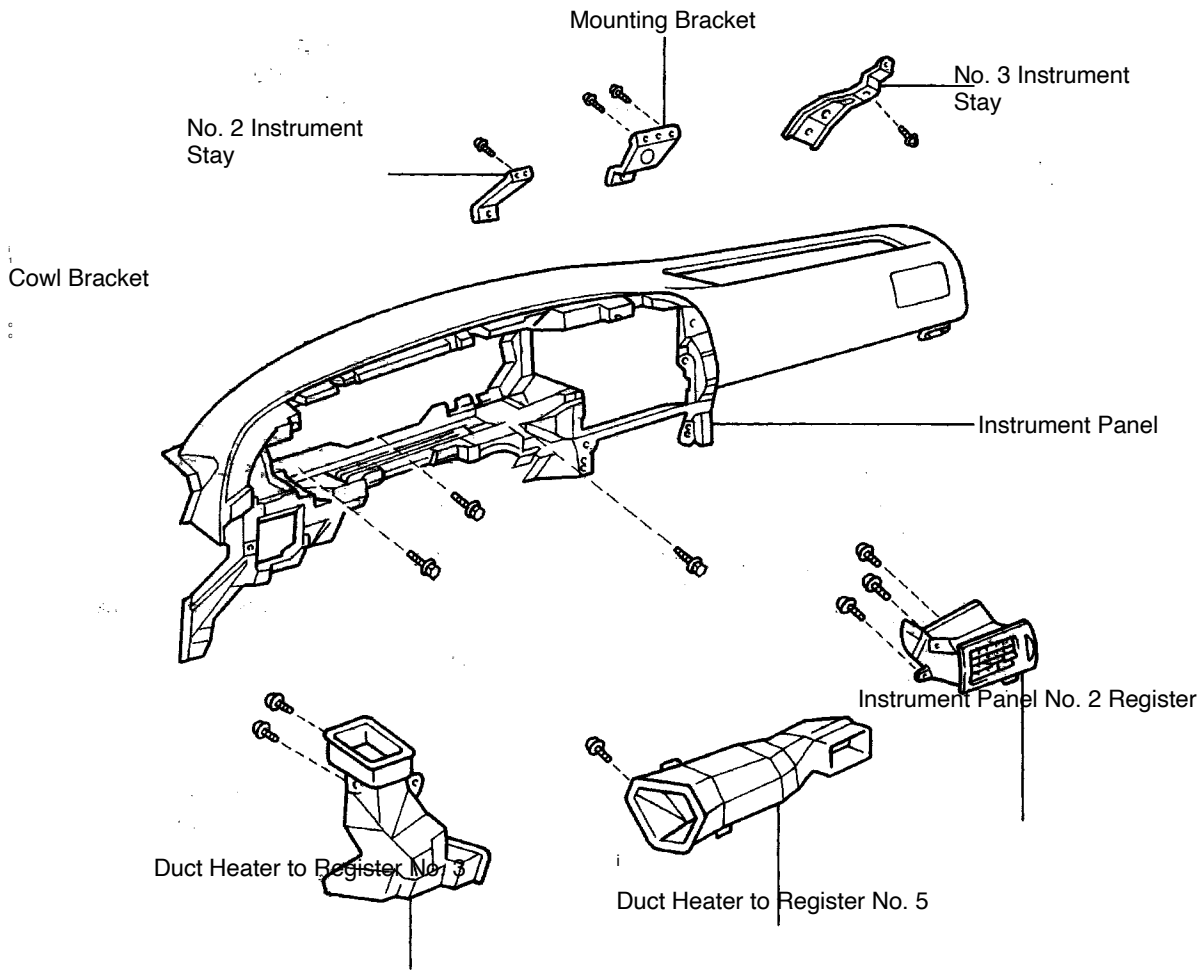
Models Ex. 4-speed M/T



(4–Speed M/T Models)

(a) No.3, No.5 heater to register duct
(b) Instrument panel No.2 register
(c) No.2, No.3 Instrument stay
(d) Mounting bracket
(e) Cowl bracket

4–Speed M/T Models



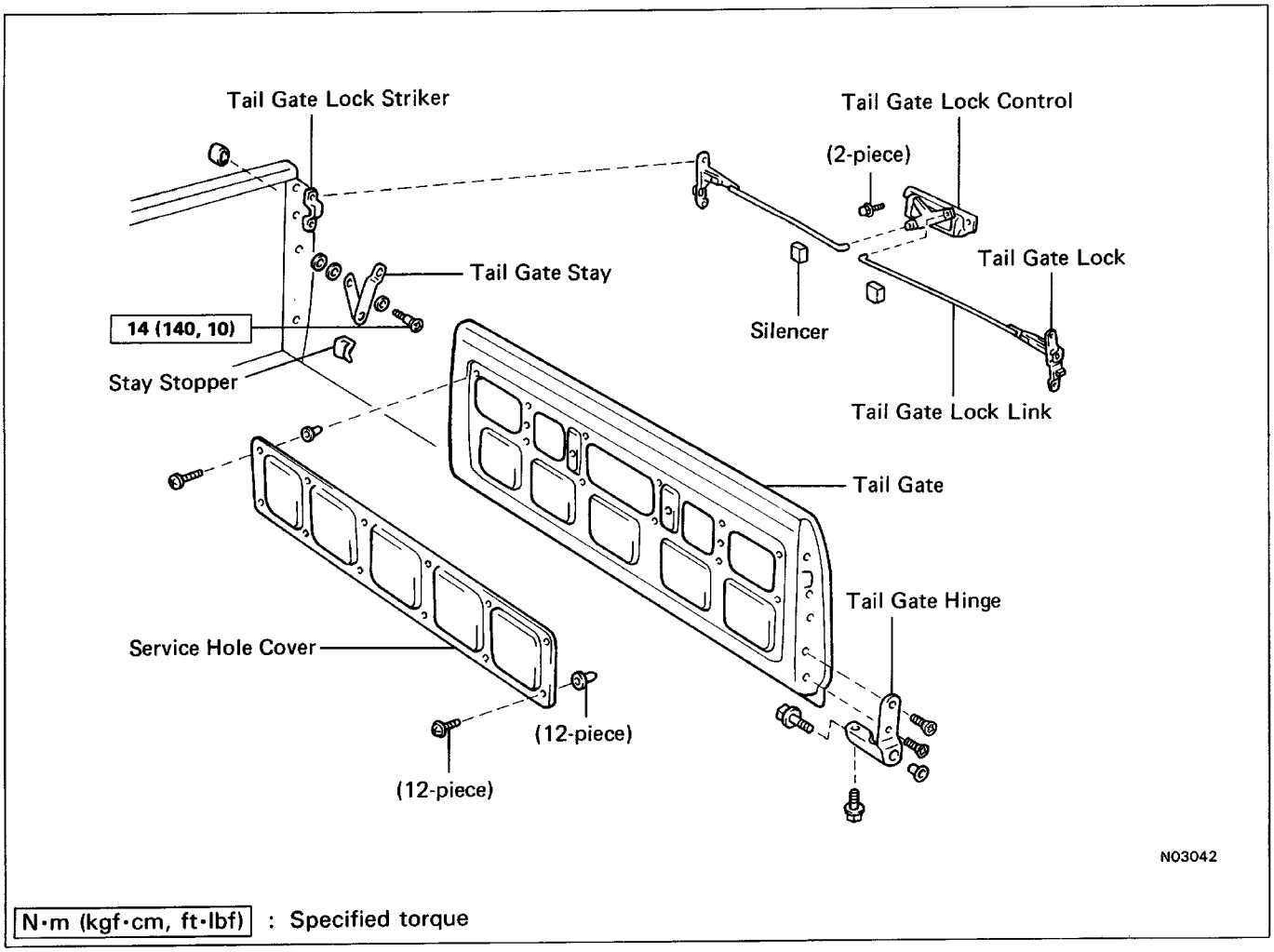
INSTALLATION OF INSTRUMENT PANEL

(See pages BO–36 and 37)

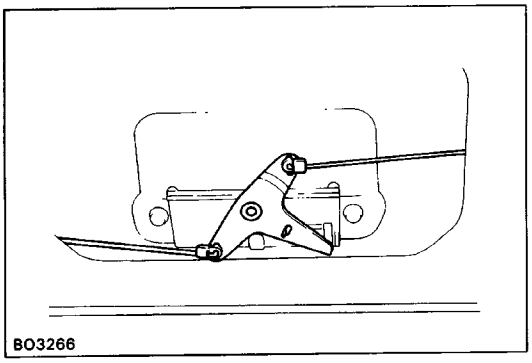
INSTALL INSTRUMENT PANEL PARTS FOLLOWING REMOVAL SEQUENCE IN REVERSE

ONE–TOUCH TAIL GATE

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

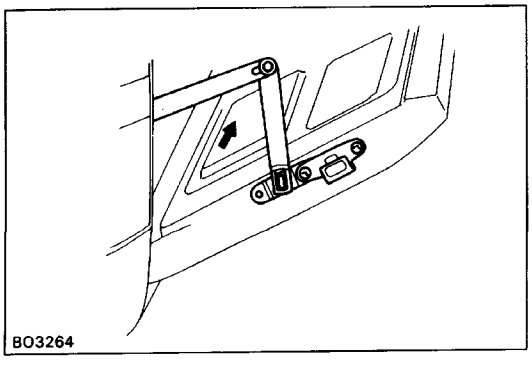


REMOVAL OF TAIL GATE LOCK

1. REMOVE SERVICE HOLE COVER

Remove twelve screws and the service hole cover.

2. DISCONNECT TAIL GATE LOCK LINK FROM TAIL GATE LOCK CONTROL



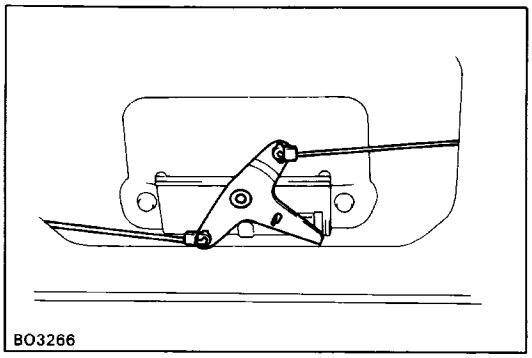
3. REMOVE TAIL GATE STAY

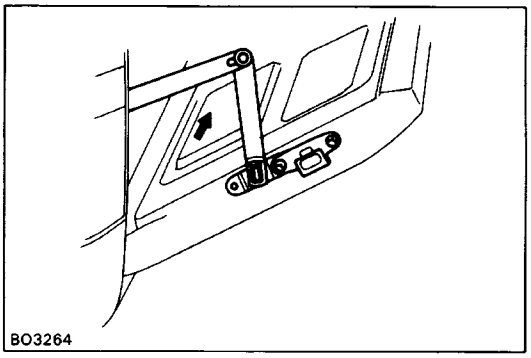
(a) Disconnect the tail gate stay from the tail gate.

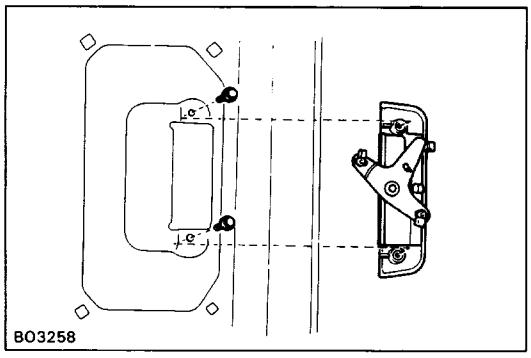
(b) Remove the bolt and the tail gate stay from the body.

4. REMOVE TAIL GATE LOCK FROM TAIL GATE

Remove two screws and the tail gate lock.


BO3266


BO3264


BO3258

INSTALLATION OF TAIL GATE LOCK

1. INSTALL TAIL GATE LOCK TO TAIL GATE

Install the tail gate lock with the two screws.

2. INSTALL TAIL GATE STAY

(a) Install the tail gate stay and the bolt.

Torque: 14 N–m (140 kgf–cm, 10 ft–lbf)

(b) Connect the tail gate stay to the tail gate.

3. CONNECT TAIL GATE STAY TO TAIL GATE

4. INSTALL SERVICE HOLE COVER

Install service hole cover with twelve screws.

REMOVAL OF TAIL GATE LOCK CONTROL

1. REMOVE SERVICE HOLE COVER

2. DISCONNECT TWO TAIL GATE LOCK LINKS

3. REMOVE TAIL GATE LOCK CONTROL

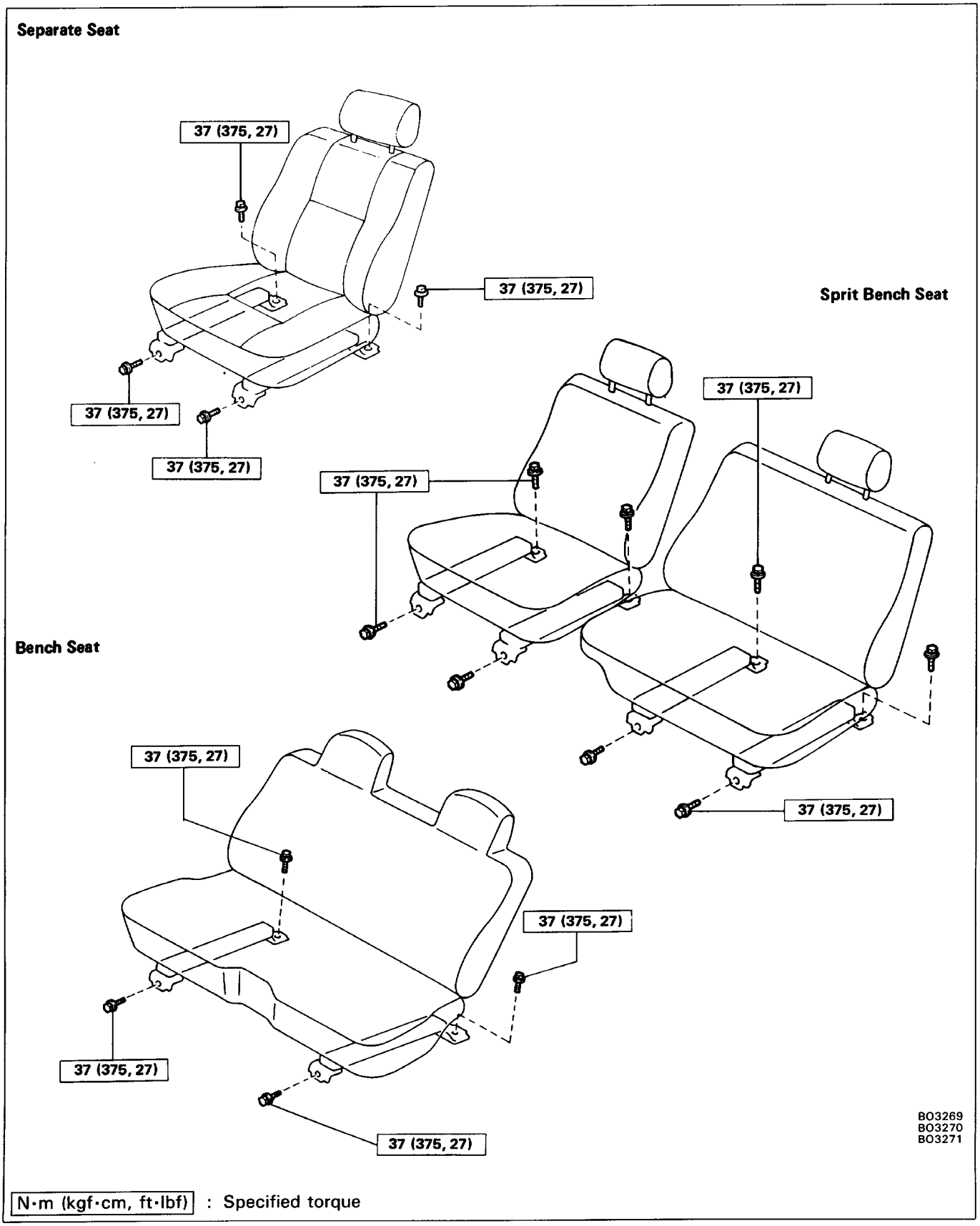
INSTALLATION OF TAIL GATE LOCK CONTROL

INSTALL TAIL GATE LOCK CONTROL IN REVERSE ORDER OF REMOVAL

SEAT

Front Seat

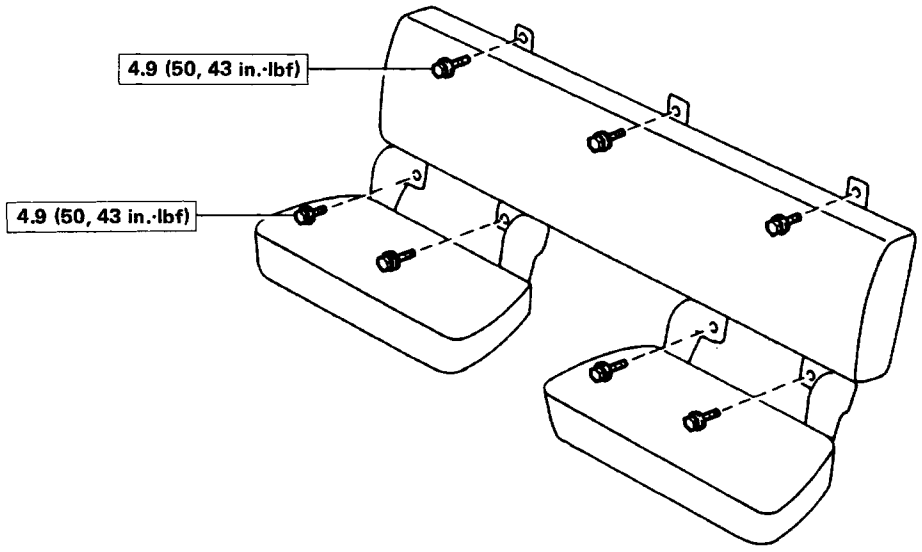
COMPONENTS



Rear Jump Seat

COMPONENTS (Cont'd)

Xtra Cab



BO3272

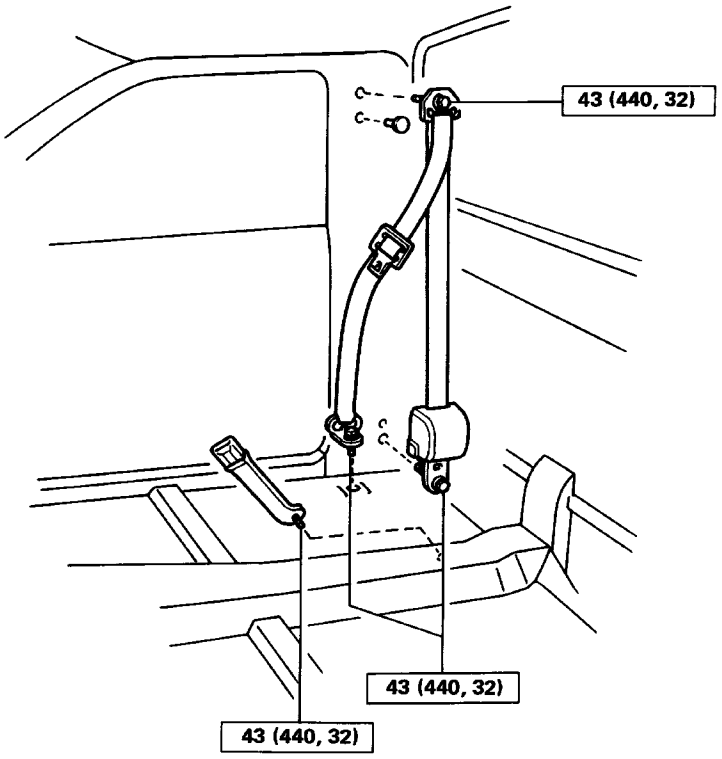
N·m (kgf·cm, ft·lbf) : Specified torque

SEAT BELT

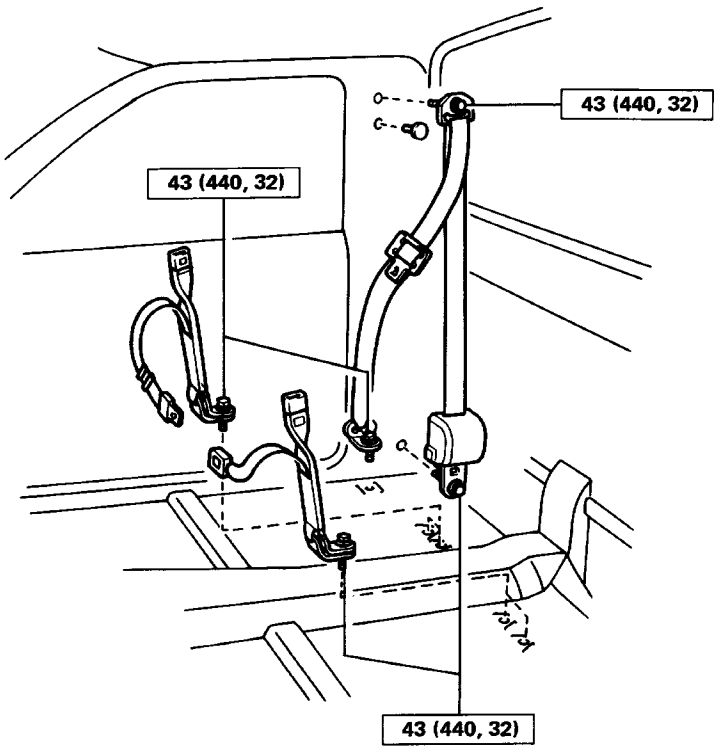
Front Seat Belt

COMPONENTS

Separate Seat



Sprit Bench Seat and Bench Seat



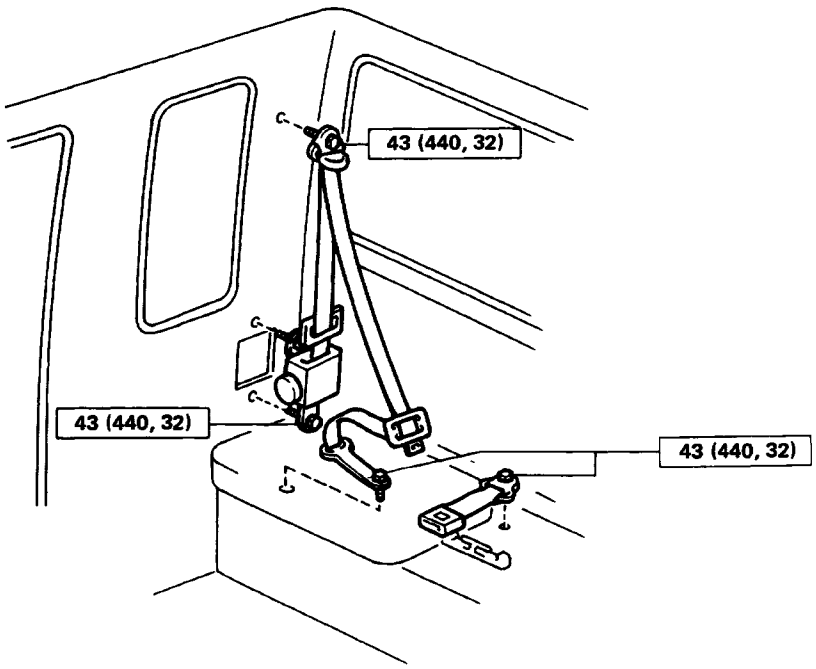
BO3275
BO3274

N·m (kgf·cm, ft·lbf) : Specified torque

Rear Jump Seat Belt

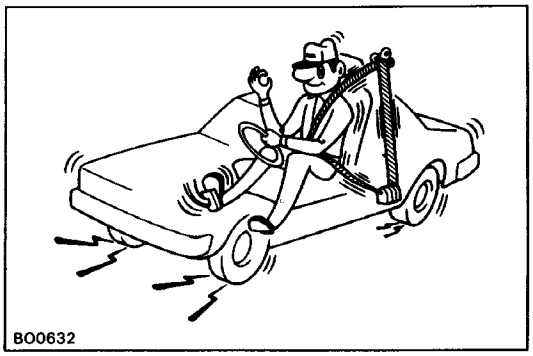
COMPONENTS (Cont'd)

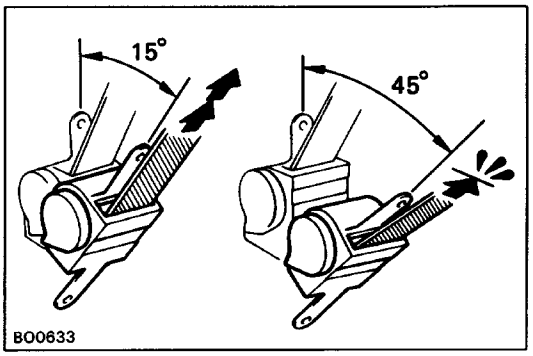
Xtra Cab



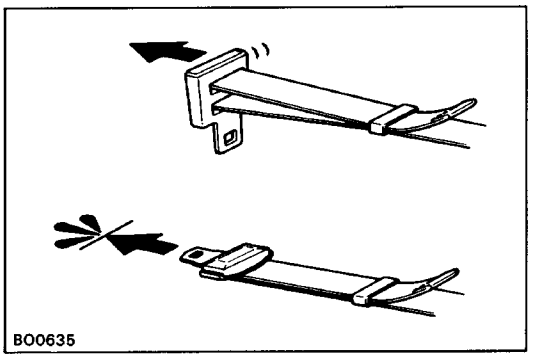
BO3277

N·m (kgf·cm, ft·lbf) : Specified torque


BO0632



BO0633


BO0635

SEAT BELT

[Emergency Locking Retractor (ELR) Type]

1. RUNNING TEST (IN SAFETY AREA)

(a) Fasten the seat belt.
(b) Drive the car at 10 mph116 km/h) and make a very hard stop.
(c) Check that the seat belt is locked and cannot be extended at this time.

HINT: Conduct this test in safe area. If the belt does not lock, remove the belt mechanism assembly and conduct the following static check. Also, whenever installing a new belt assembly, verify the proper operation before installation.

2. STATIC TEST

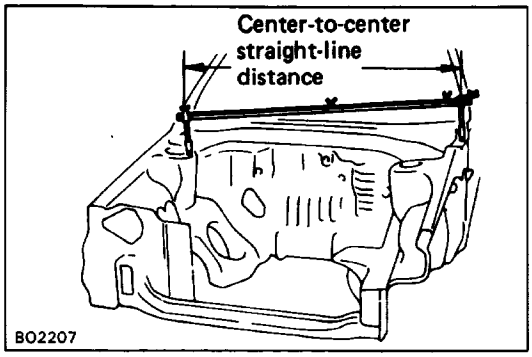
(a) Remove the locking retractor assembly.
(b) Tilt the retractor slowly.
(e) Verify that the belt can be pulled out at a tilt of 15 degrees or less, and cannot be pulled out at over 45 degrees of tilt.
If a problem is found, replace the assembly.

CENTER SEAT BELT

(Manual Type)

TESTING

(a) Adjust the belt to the proper length.
(b) Apply a firm load to the belt.
(c) Verify that the belt does not extend.



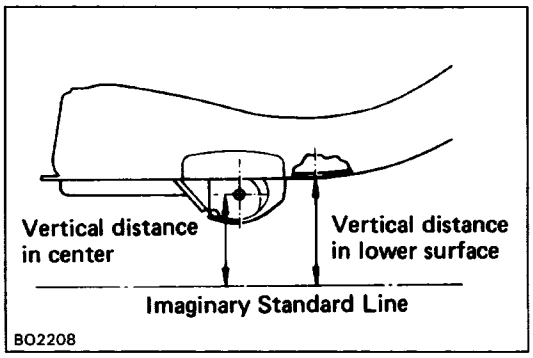
BODY DIMENSIONS

General Information

1. BASIC DIMENSIONS

(a) There are two types of dimensions in the diagram.
(Three–dimensional distance)

- Straight–line distance between the centers of two measuring points.



(Two–dimensional distance)

- Horizontal distance in forward/rearward between the centers of two measuring points.
- The height from an imaginary standard line.

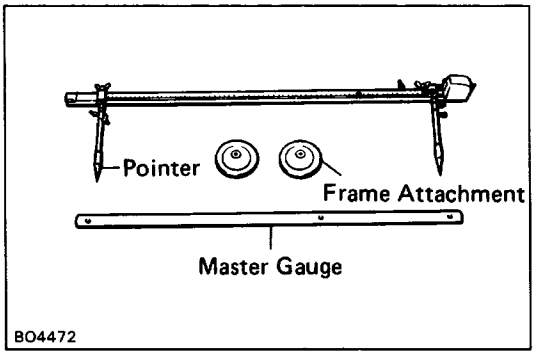
(b) Incases in which only one dimension is given, left and right are symmetrical.

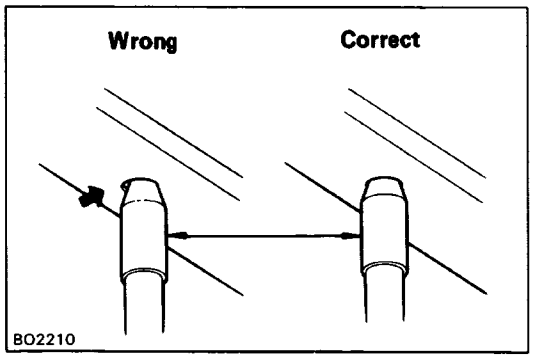
(c) The dimensions in the following drawing indicate actual distance. Therefore, please use the dimensions as a reference.

2. MEASURING

(a) Basically, all measurements are to be done tracking gauge. For portions where it is not possible to use a tracking gauge, a tape measure should be used.

(b) Use only tracking gauge that has no looseness in the body, measuring plate, or pointers.





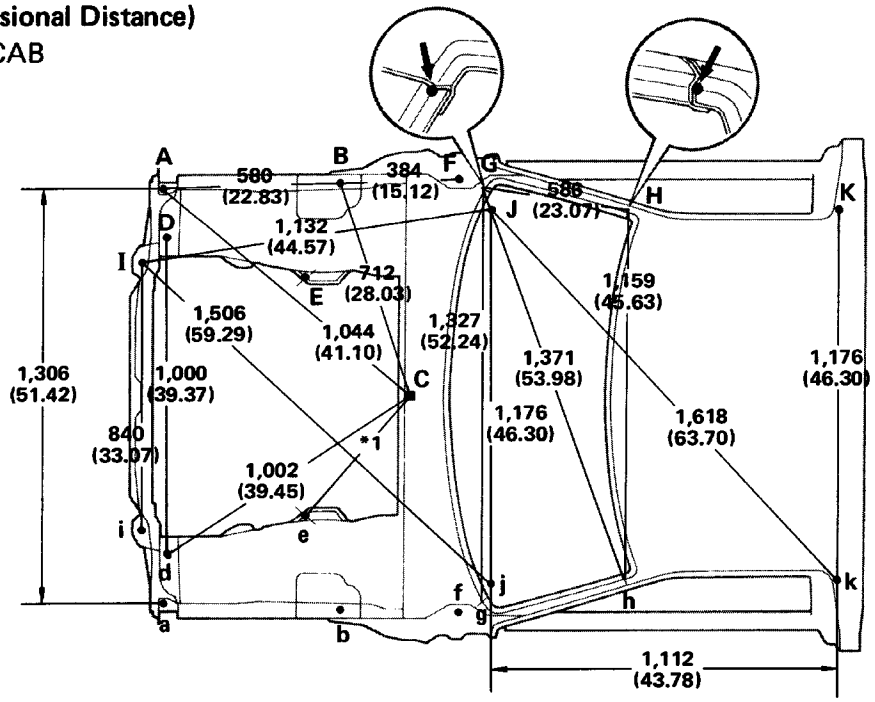
HINT:

1. The height of the left and right pointers must be equal.
2. Always calibrate the tracking gauge before measuring or after adjusting the pointer height.
3. Take care not to drop the tracking gauge or otherwise shock it.
4. Confirm that the pointers are securely in the holes.

(c) When using a tape measure, avoid twists and bends in the tape.

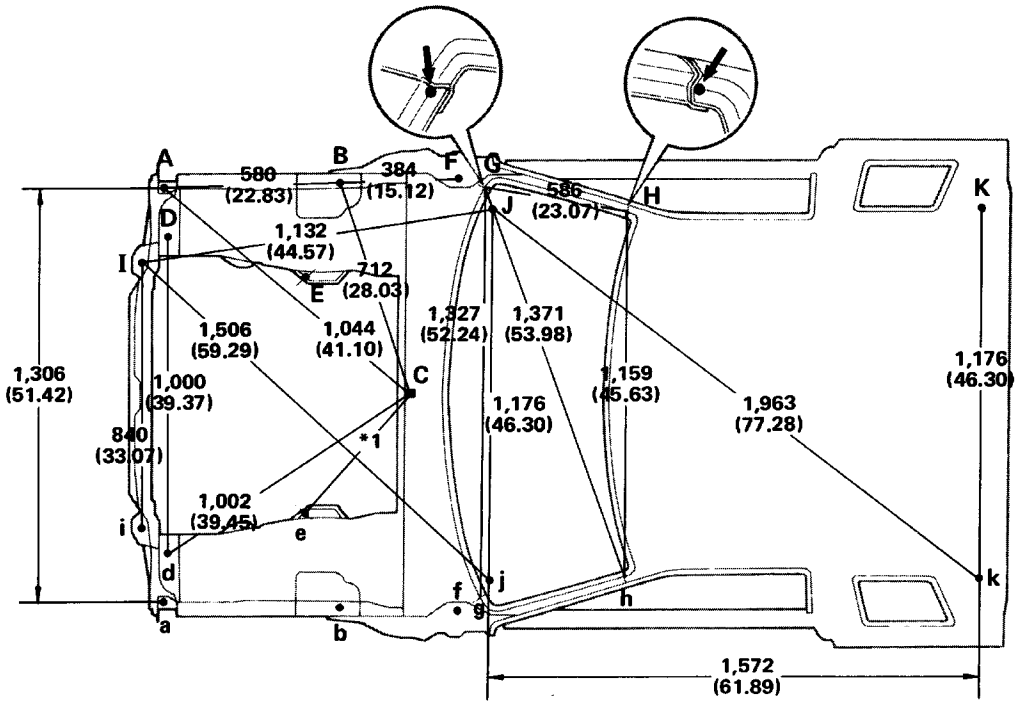
Body Dimensions

OVERHEAD VIEW
(Three-Dimensional Distance)
REGULAR CAB



*1: 2WD 655 (25.79)
4WD 688 (27.09)

XTRA CAB



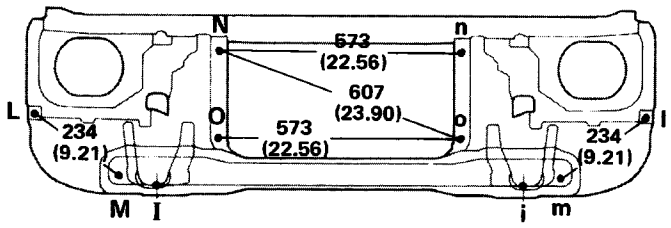
BO3601
BO3602

mm (in.)

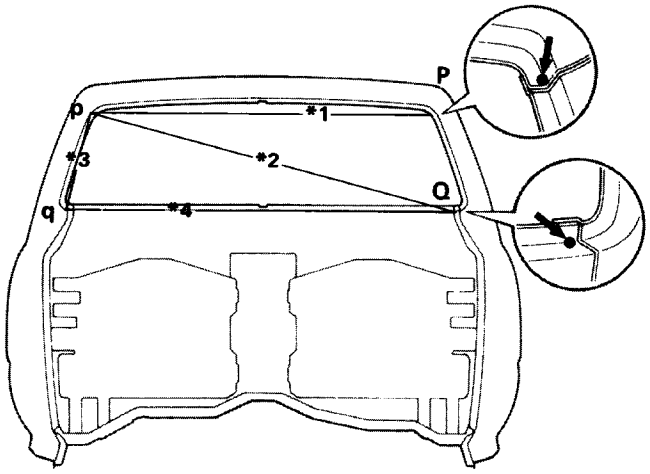
Symbol	Name	Hole dia.
A,a	Front fender installation nut	8 (0.31)
B,b	Front fender installation nut	8 (0.31)
C	Cowl ventilation louver installation nut	7.5 x 7.5 (0.295 x 0.295)
D,d	Fender apron standard hole	25 (0.98)
E,e	Fender apron seal installation hole	8 (0.31)
F,f	Cowl top panel standard hole	10 (0.39)
—	—	—

Symbol	Name	Hole dia.
G,g	Front body pillar/Cowl panel adjoining portion	—
H,h	Roof panel/Front body pillar adjoining portion	—
I,i	Cab mounting hole	RH 11 (0.43) LH 15 x 12 (0.59 x 0.47)
J,j	Cab mounting hole	22 (0.87)
K,k	Cab mounting hole	RH 22 (0.87) LH 23 x 12 (0.91 x 0.47)

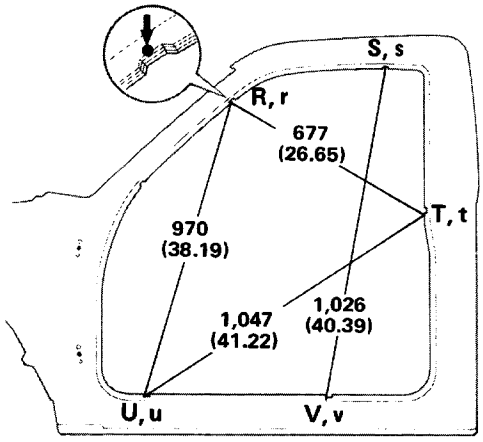
FRONT VIEW
(Three-Dimensional Distance)
ALL MODELS



REAR VIEW
(Three-Dimensional Distance)
ALL MODELS



SIDE VIEW
(Three-Dimensional Distance)
ALL MODELS



*1: Regular Cab 1,110 (43.70)
Xtra Cab 1,104 (43.46)

*2: Regular Cab 1,216 (47.87)
Xtra Cab 1,231 (48.46)

*3: Regular Cab 305 (12.01)
Xtra Cab 346 (13.62)

*4: Regular Cab 1,248 (49.13)
Xtra Cab 1,264 (49.76)

NOTE: For symbol, capital letters indicate right side of vehicle, small letters indicate left side of vehicle.

BO3603
BO3604 BO3605

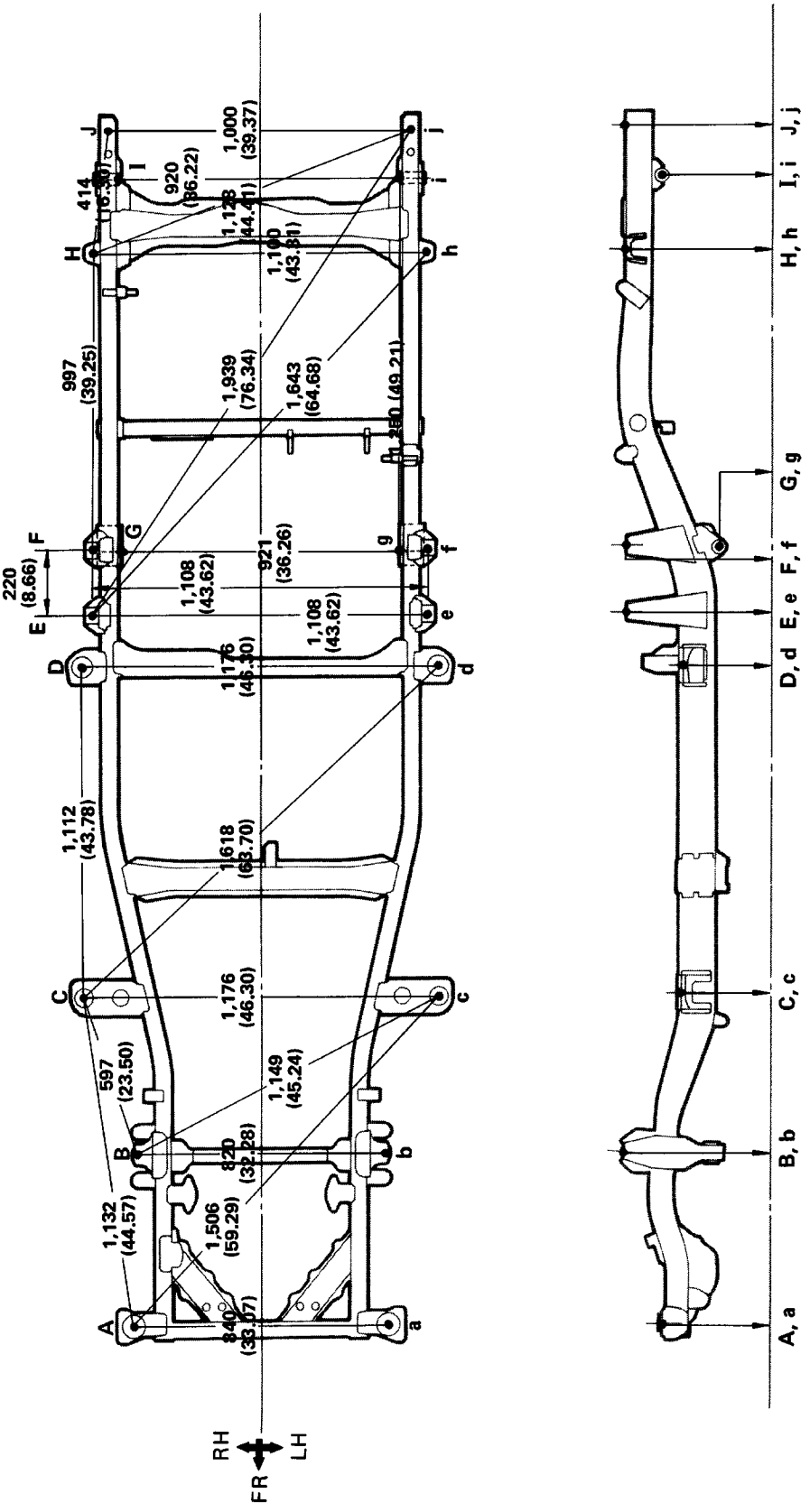
mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
I,i	Cab mounting hole — RH 11 (0.43) LH 15 x 12 (0.59 x 0.47)		Q,q	Back panel/Quarter panel adjoining portion	—
L,l	Front fender installation nut	7 (0.28)	R,r	Front body pillar assembly mark	—
M,m	Front crossmember standard hole	13 (0.51)	S,s	Roof side rail assenbly mark	—
N,n	Radiator installation nut	9 (0.35)	T,t	Quarter panel assembly mark	—
O,o	Radiator installation nut	9 (0.35)	U,u	Rocker panel assembly mark	—
P,p	Roof panel/Quarter panel adjoining portion	—	V,v	Rocker panel assembly mark	—
			—	—	—

Frame Dimensions

2WD Regular Cab: Short Wheel Base Models

(Three-Dimensional Distance)



mm (in.)

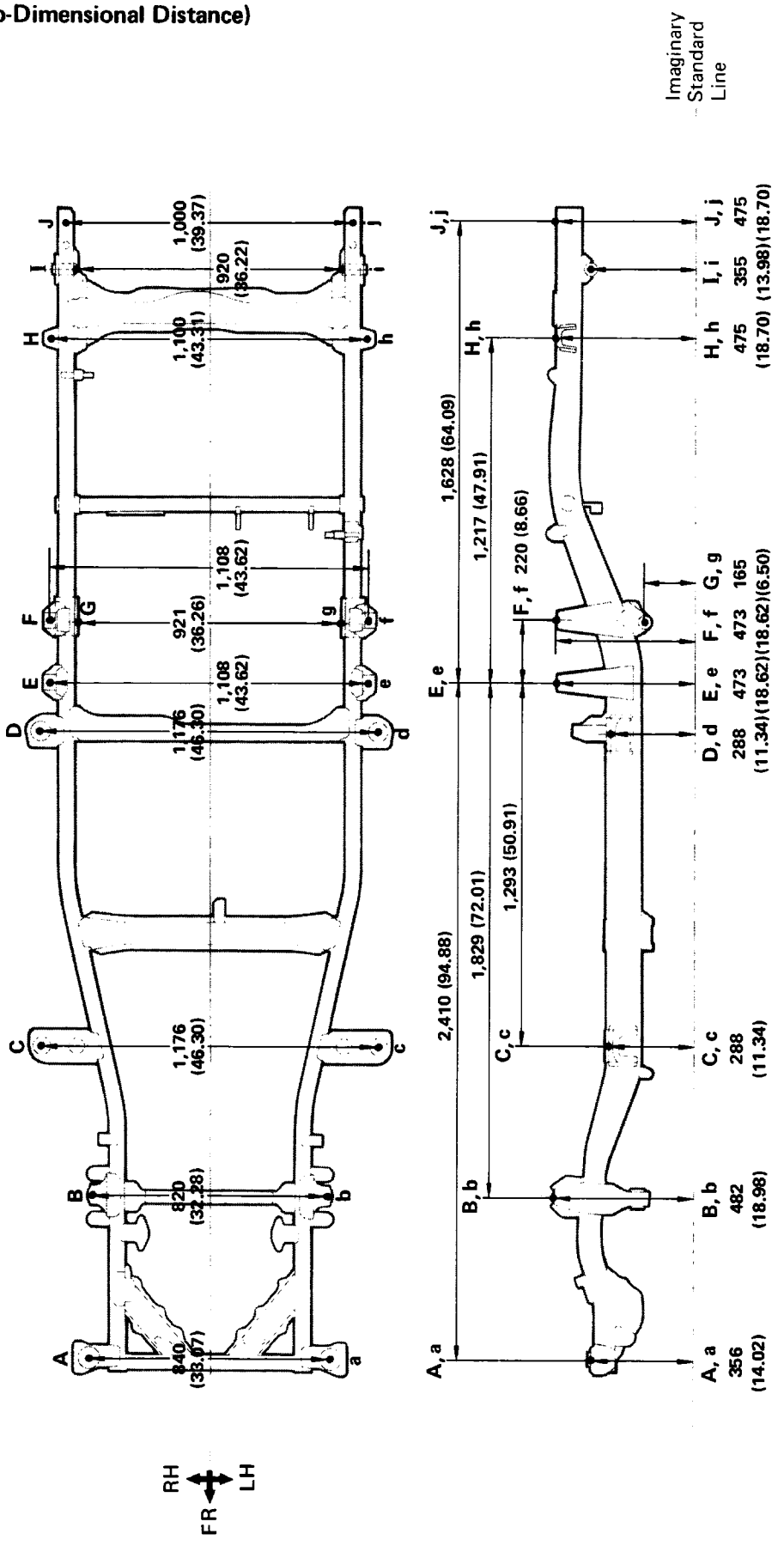
Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)

Symbol	Name	Hole dia.
F,f	Rear body mounting hole	17 (0.67)
G,g	Rear spring front hanger hole – inner	14.5 (0.571)
H,h	Rear body mounting hole	17 (0.67)
I,i	Rear spring rear hanger hole – inner	30.35 (1.1949)
J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)

BO3586

2WD Regular Cab: Short Wheel Base Models

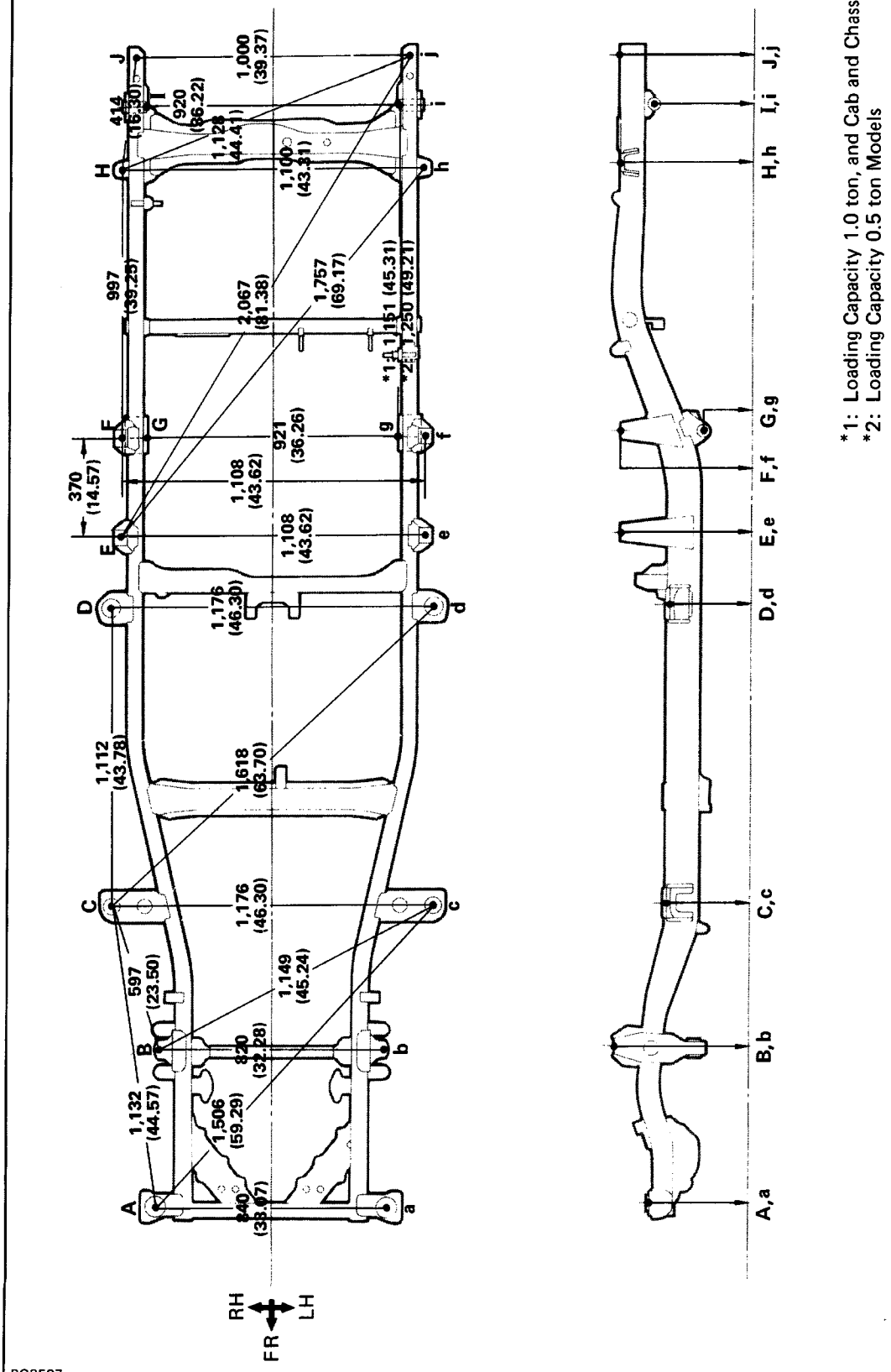
(Two-Dimensional Distance)



Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)	F,f	Rear body mounting hole	17 (0.67)
B,b	Shock absorber installation hole	16 (0.63)	G,g	Rear spring front hanger hole – inner	14.5 (0.571)
C,c	Cab mounting hole	60 (2.36)	H,h	Rear body mounting hole	17 (0.67)
D,d	Cab mounting hole	70 (2.76)	I,i	Rear spring rear hanger hole – inner	30.35 (1.1949)
E,e	Rear body mounting hole	17 (0.67)	J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)

2WD Regular Cab: Long Wheel Base Models

(Three-Dimensional Distance)



*1: Loading Capacity 1.0 ton, and Cab and Chassis Models
*2: Loading Capacity 0.5 ton Models

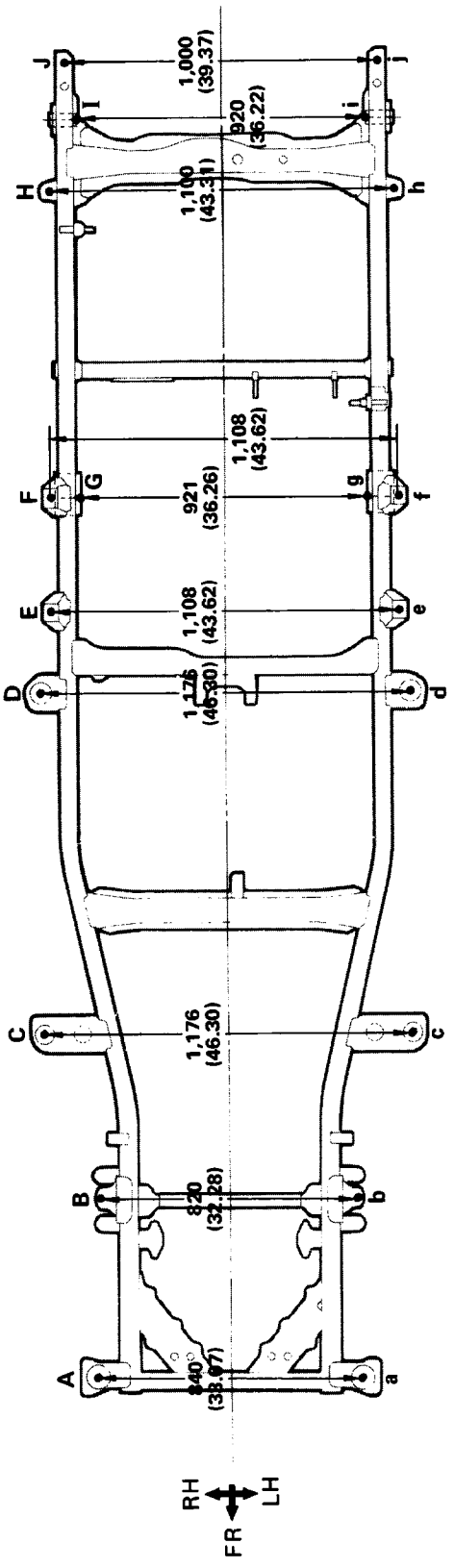
mm (in.)

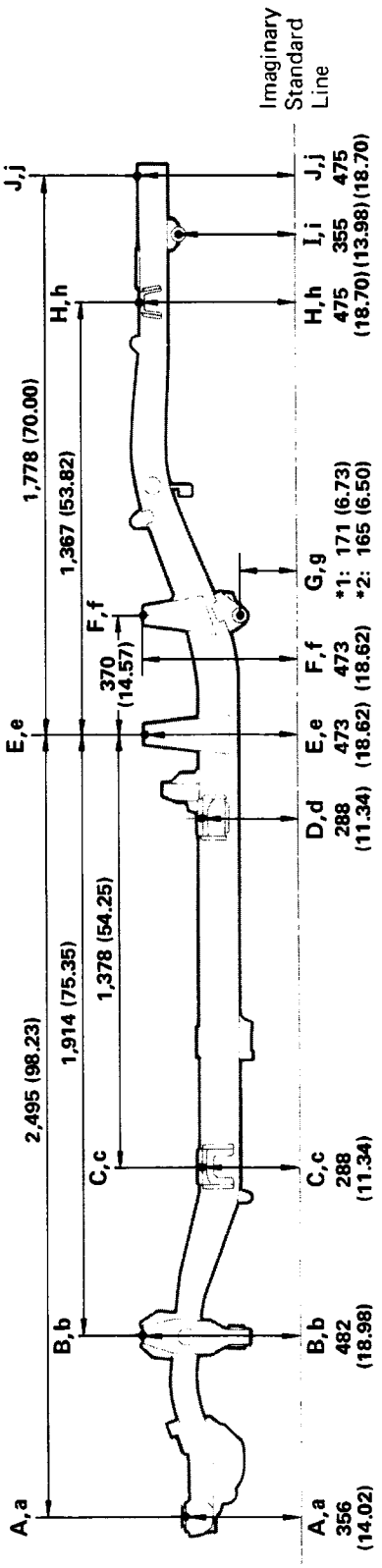
Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)
F,f	Rear body mounting hole	17 (0.67)

Symbol	Name	Hole dia.
G,g	Rear spring front hanger hole – inner	14.5 (0.571)
H,h	Rear body mounting hole	17 (0.67)
I,i	Rear spring rear hanger hole – inner	30.35 (1.1949)
J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)
–	–	–

2WD Regular Cab: Long Wheel Base Models

(Two-Dimensional Distance)





*1: Loading Capacity: 1.0 ton, and Cab and Chassis Models
*2: Loading Capacity: 0.5 ton Models

Wheel Base: 2,850 (112.20)

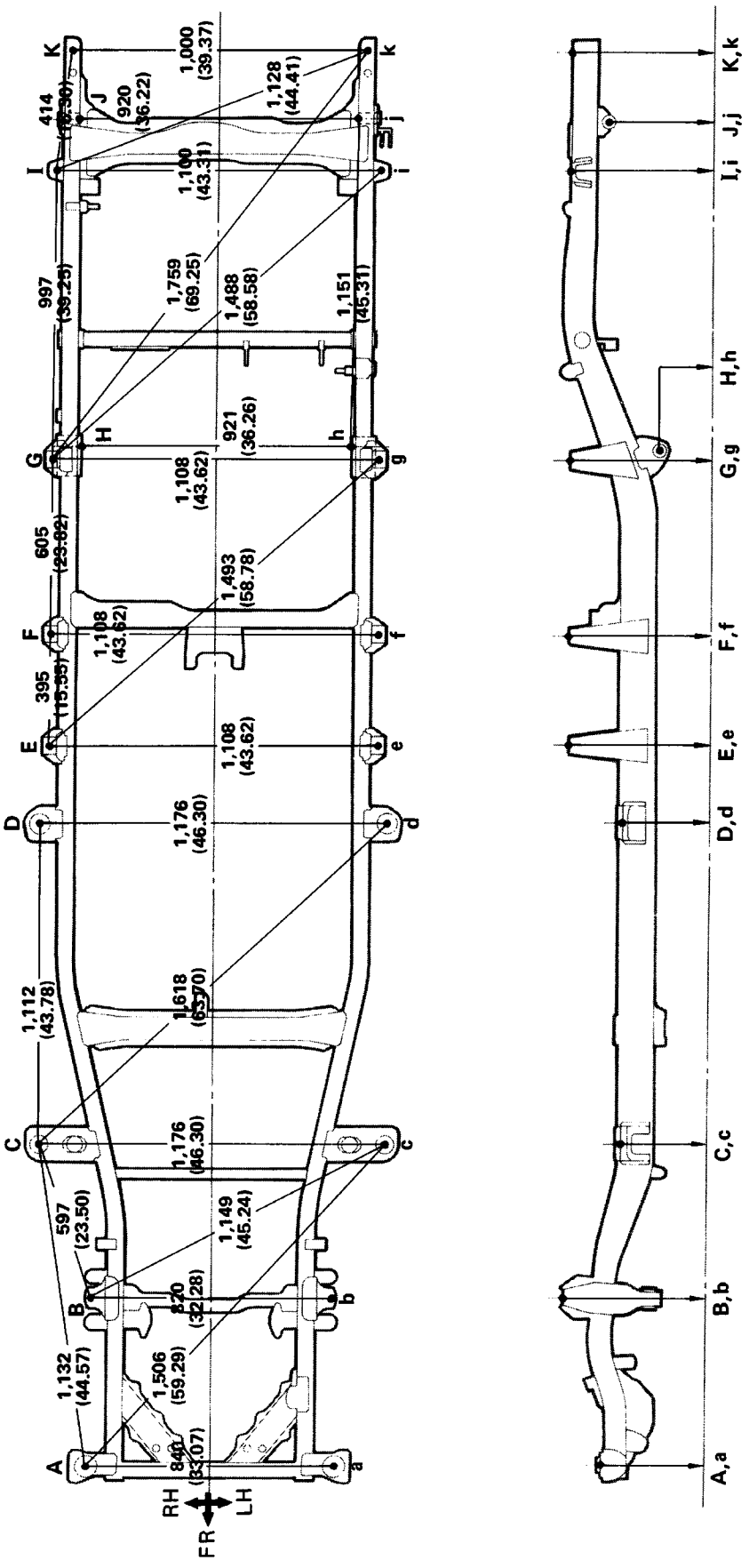
mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)	G,g	Rear spring front hanger hole – inner	*1 14.6 (0.575) *2 14.5 (0.571)
B,b	Shock absorber installation hole	16 (0.63)			
C,c	Cab mounting hole	60 (2.36)	H,h	Rear body mounting hole	17 (0.67)
D,d	Cab mounting hole	70 (2.76)	I,i	Rear spring rear hanger hole – inner	30.35 (1.1949)
E,e	Rear body mounting hole	17 (0.67)	J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)
F,f	Rear body mounting hole	17 (0.67)			

BO3587

2WD Regular Cab: Super Long Wheel Base Models

(Three-Dimensional Distance)



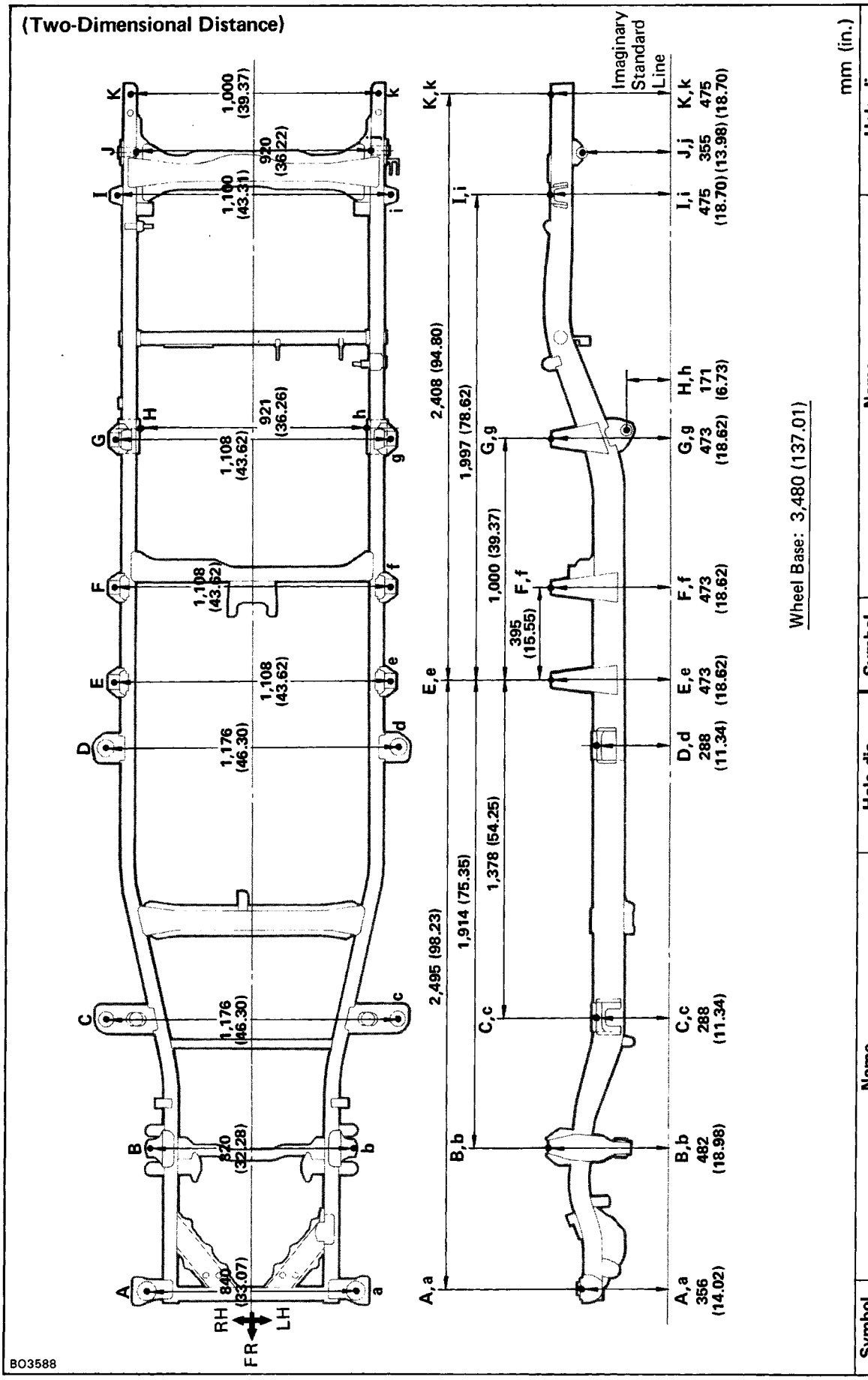
BO3588

mm (in.)

Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)
F,f	Rear body mounting hole	17 (0.67)

Symbol	Name	Hole dia.
G,g	Rear body mounting hole	17 (0.67)
H,h	Rear spring front hanger hole – inner	14.6 (0.575)
I,i	Rear body mounting hole	17 (0.67)
J,j	Rear spring rear hanger hole – inner	30.35 (1.1949)
K,k	Rear body mounting hole	18 x 21 (0.71 x 0.83)

2WD Regular Cab: Super Long Wheel Base Models

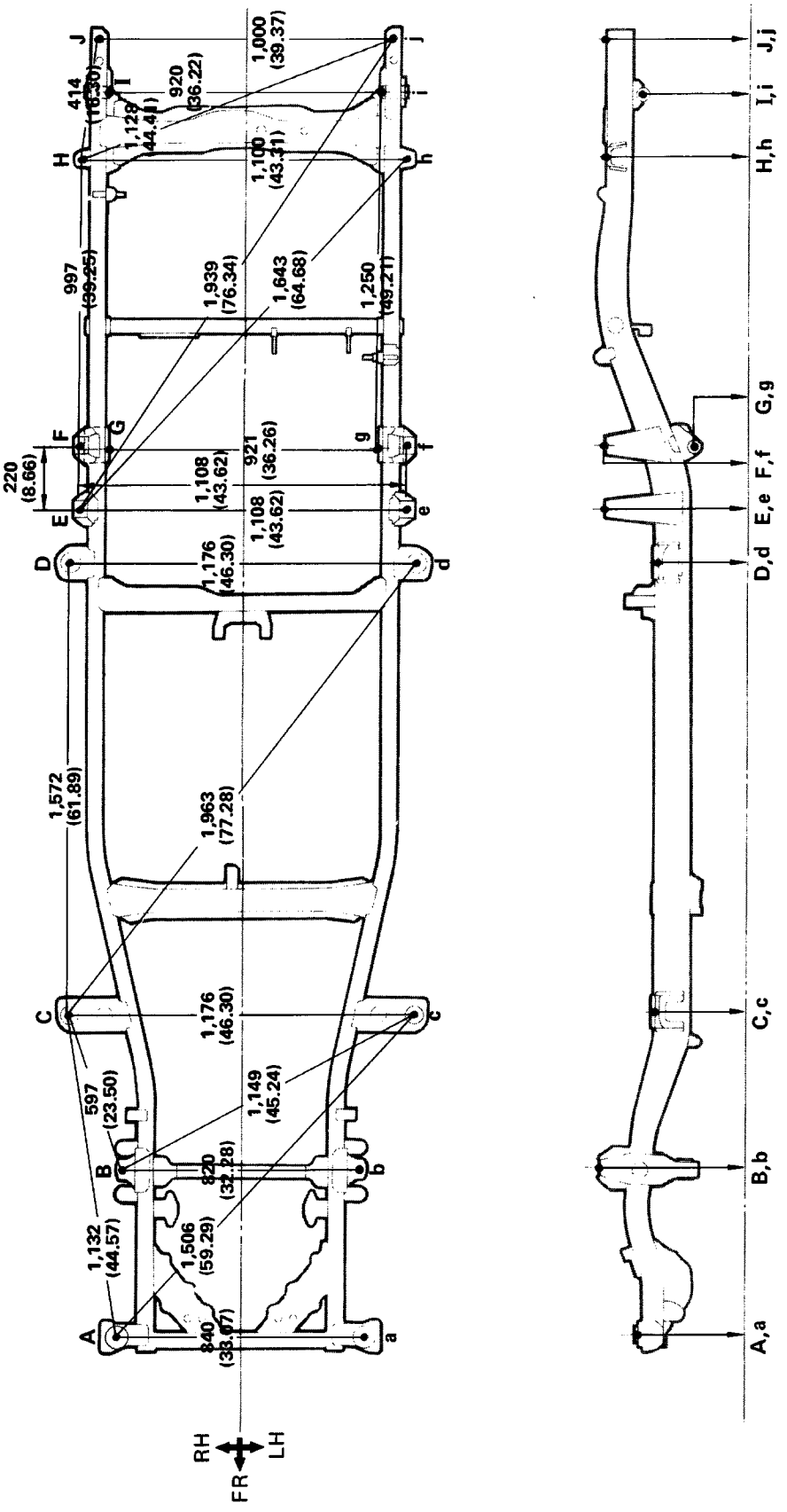


Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)
F,f	Rear body mounting hole	17 (0.67)

Symbol	Name	Hole dia.
G,g	Rear body mounting hole	17 (0.67)
H,h	Rear spring front hanger hole – inner	14.6 (0.575)
I,i	Rear body mounting hole	17 (0.67)
J,j	Rear spring rear hanger hole – inner	30.35 (1.1949)
K,k	Rear body mounting hole	18 x 21 (0.71 x 0.83)

2WD Xtra Cab Models

(Three-Dimensional Distance)



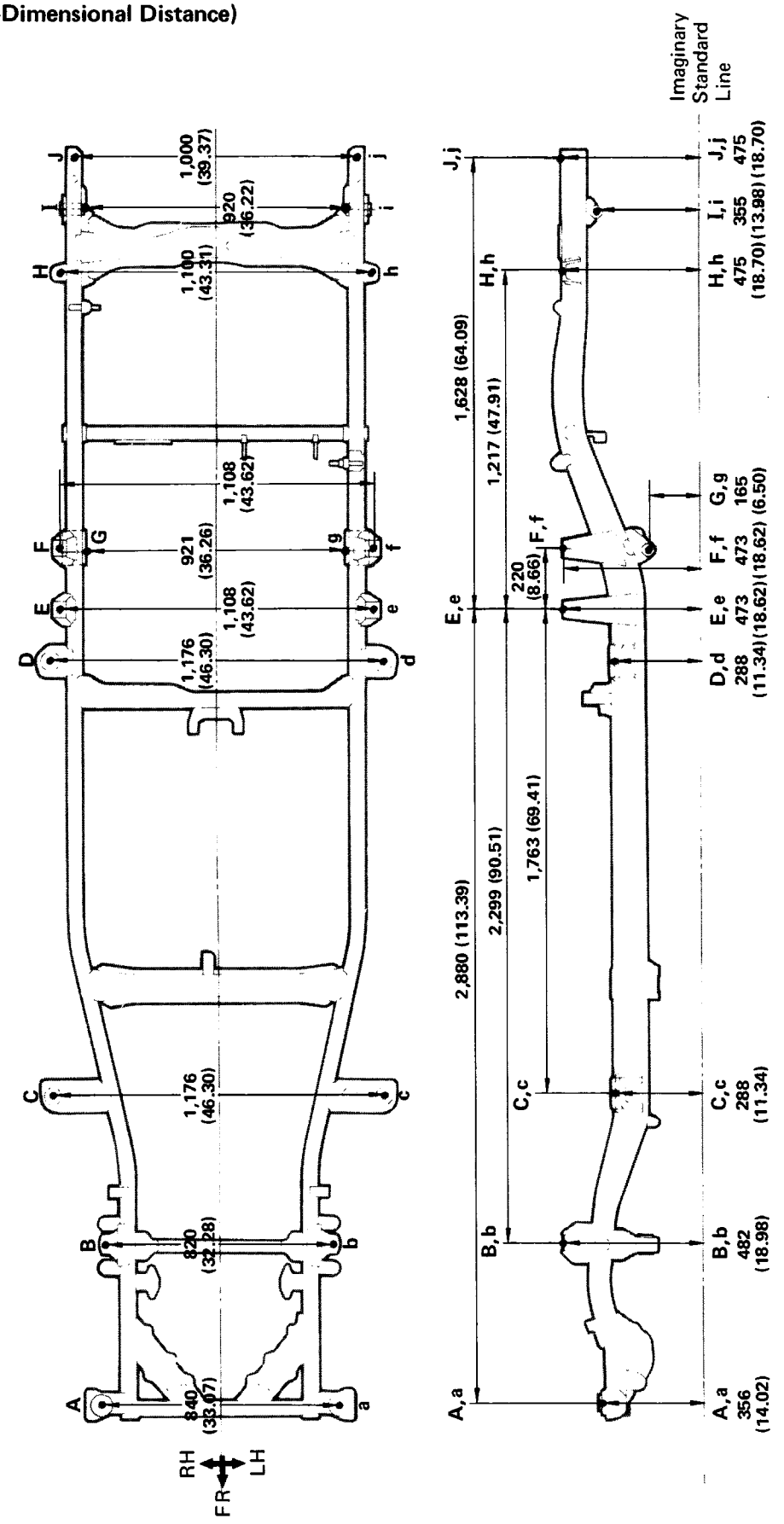
mm (in.)

Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)
F,f	Rear body mounting hole	17 (0.67)

Symbol	Name	Hole dia.
G,g	Rear spring front hanger hole – inner	14.5 (0.571)
H,h	Rear body mounting hole	17 (0.67)
I,i	Rear spring rear hanger hole – inner	30.35 (1.1949)
J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)
–	–	–

2WD Xtra Cab Models

(Two-Dimensional Distance)



Wheel Base: 3,085 (121.46)

mm (in.)

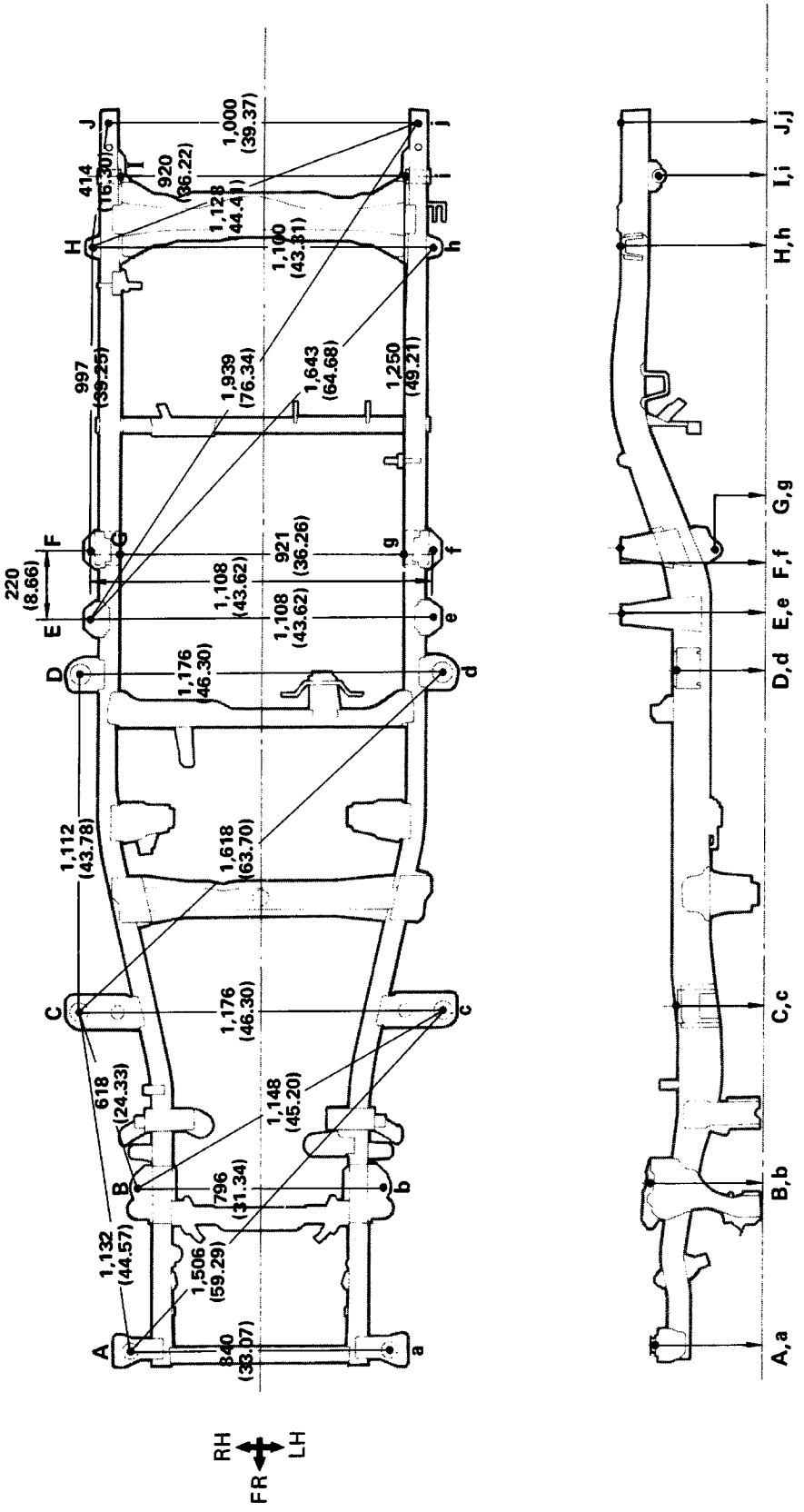
Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)
F,f	Rear body mounting hole	17 (0.67)

Symbol	Name	Hole dia.
G,g	Rear spring front hanger hole – inner	14.5 (0.571)
H,h	Rear body mounting hole	17 (0.67)
I,i	Rear spring rear hanger hole – inner	30.35 (1.1949)
J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)
—	—	—

BO3589

4WD Regular Cab: Short Wheel Base Models

(Three-Dimensional Distance)



mm (in.)

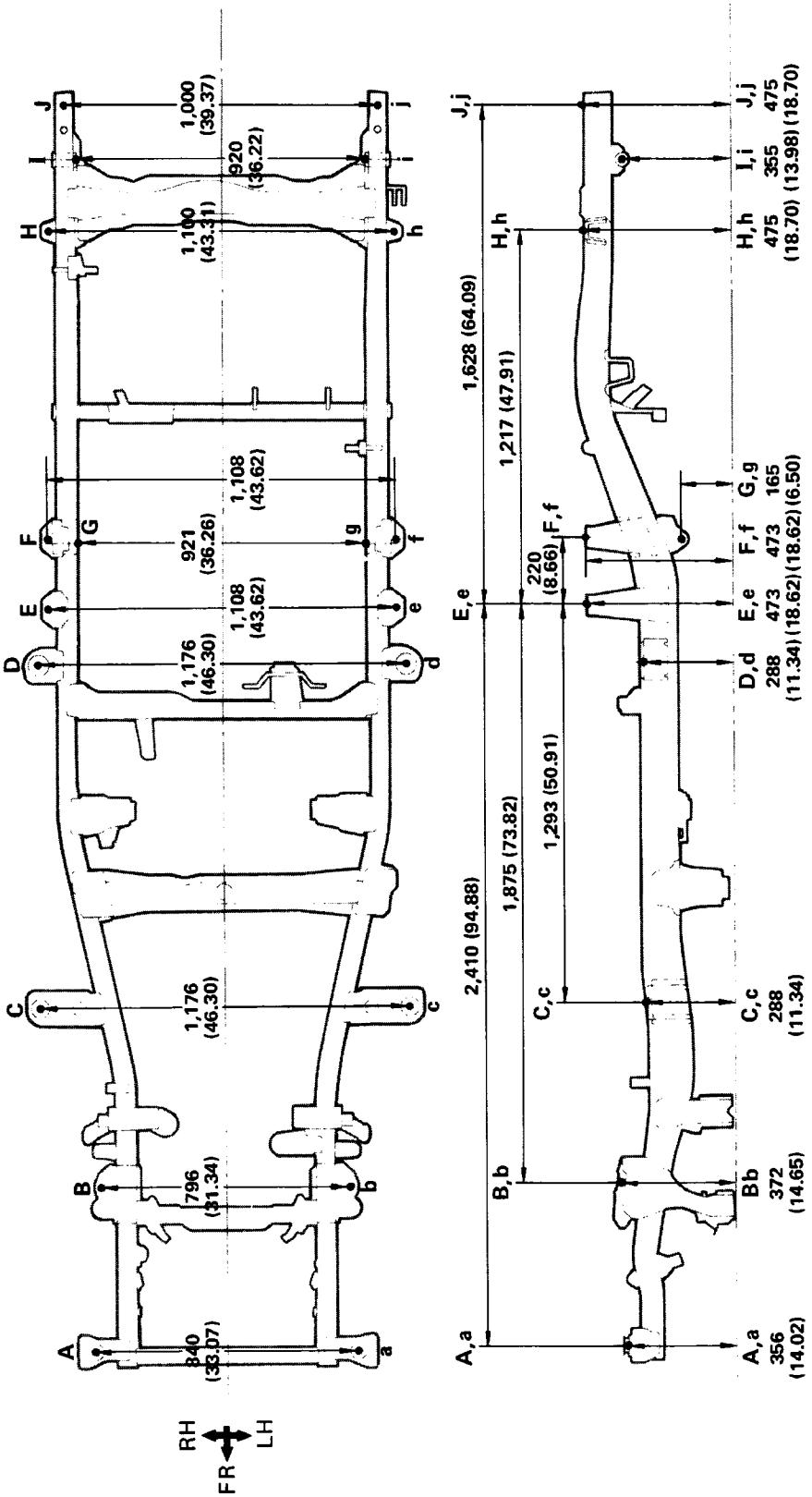
Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)
F,f	Rear body mounting hole	17 (0.67)

Symbol	Name	Hole dia.
G,g	Rear spring front hanger hole — inner	14.5 (0.571)
H,h	Rear body mounting hole	17 (0.67)
I,i	Rear spring rear hanger hole — inner	30.35 (1.1949)
J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)
—	—	—

BO3590

4WD Regular Cab: Short Wheel Base Models

(Two-Dimensional Distance)



Wheel Base: 2,625 (103.35)

mm (in.)

Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)
F,f	Rear body mounting hole	17 (0.67)

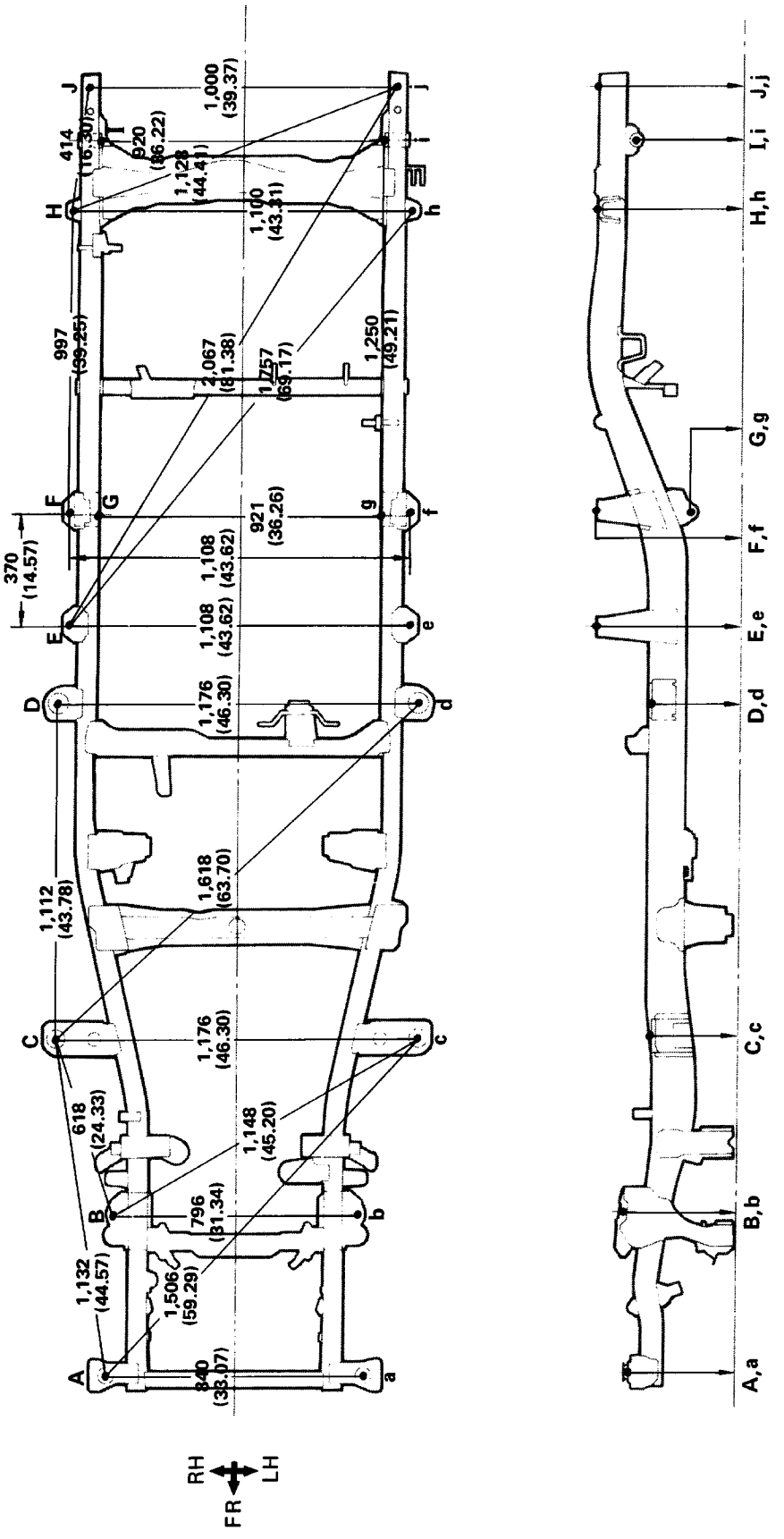
Symbol	Name	Hole dia.
G,g	Rear spring front hanger hole – inner	14.5 (0.571)
H,h	Rear body mounting hole	17 (0.67)
I,i	Rear spring rear hanger hole – inner	30.35 (1.1949)
J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)
–	–	–

BO3590

BO3590

4WD Regular Cab: Long Wheel Base Models

(Three-Dimensional Distance)



mm (in.)

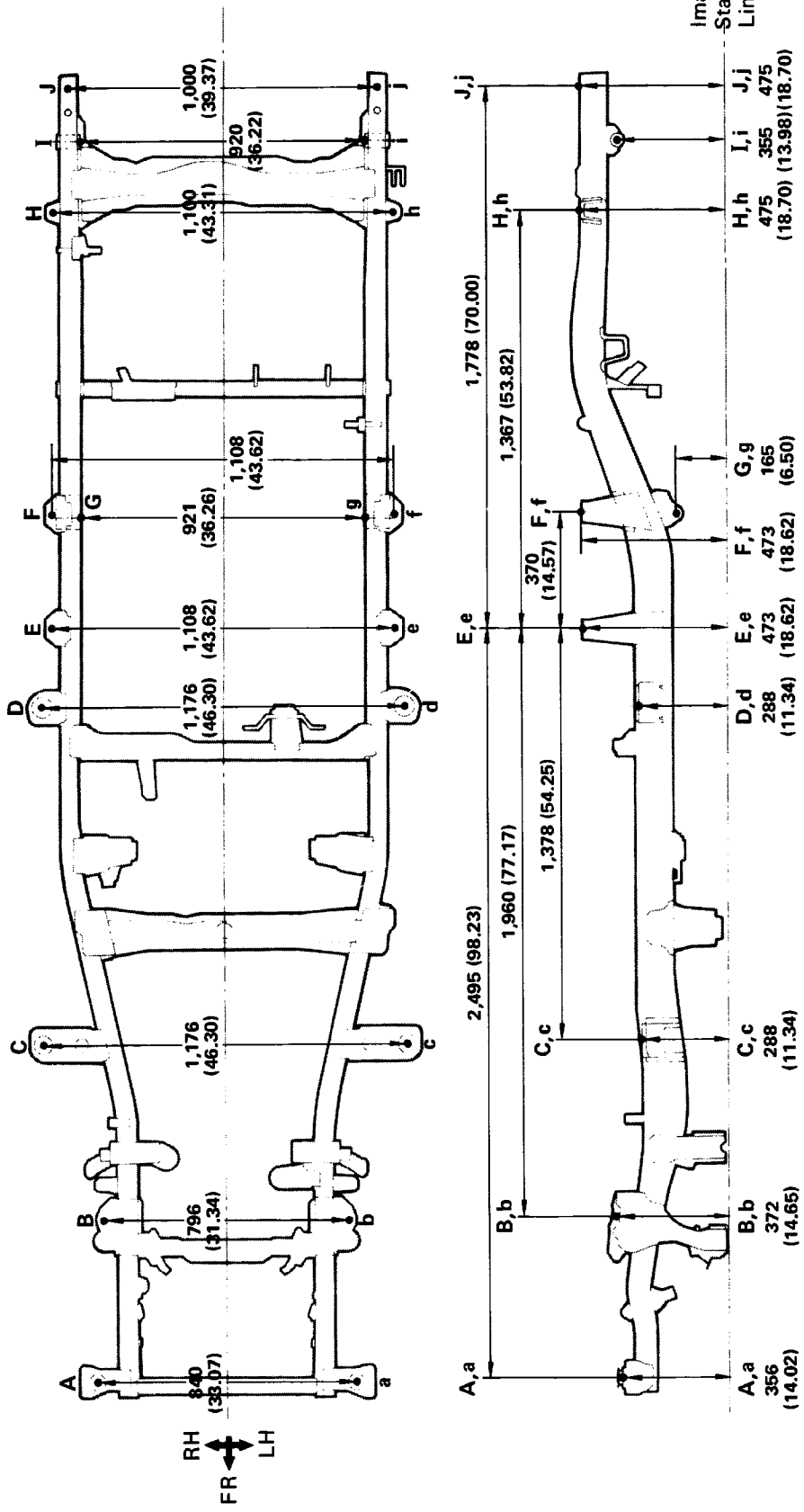
Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)
F,f	Rear body mounting hole	17 (0.67)

Symbol	Name	Hole dia.
G,g	Rear spring front hanger hole — inner	14.5 (0.571)
H,h	Rear body mounting hole	17 (0.67)
I,i	Rear spring rear hanger hole — inner	30.35 (1.1949)
J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)
—	—	—

BO3591

4WD Regular Cab: Long Wheel Base Models

(Two-Dimensional Distance)



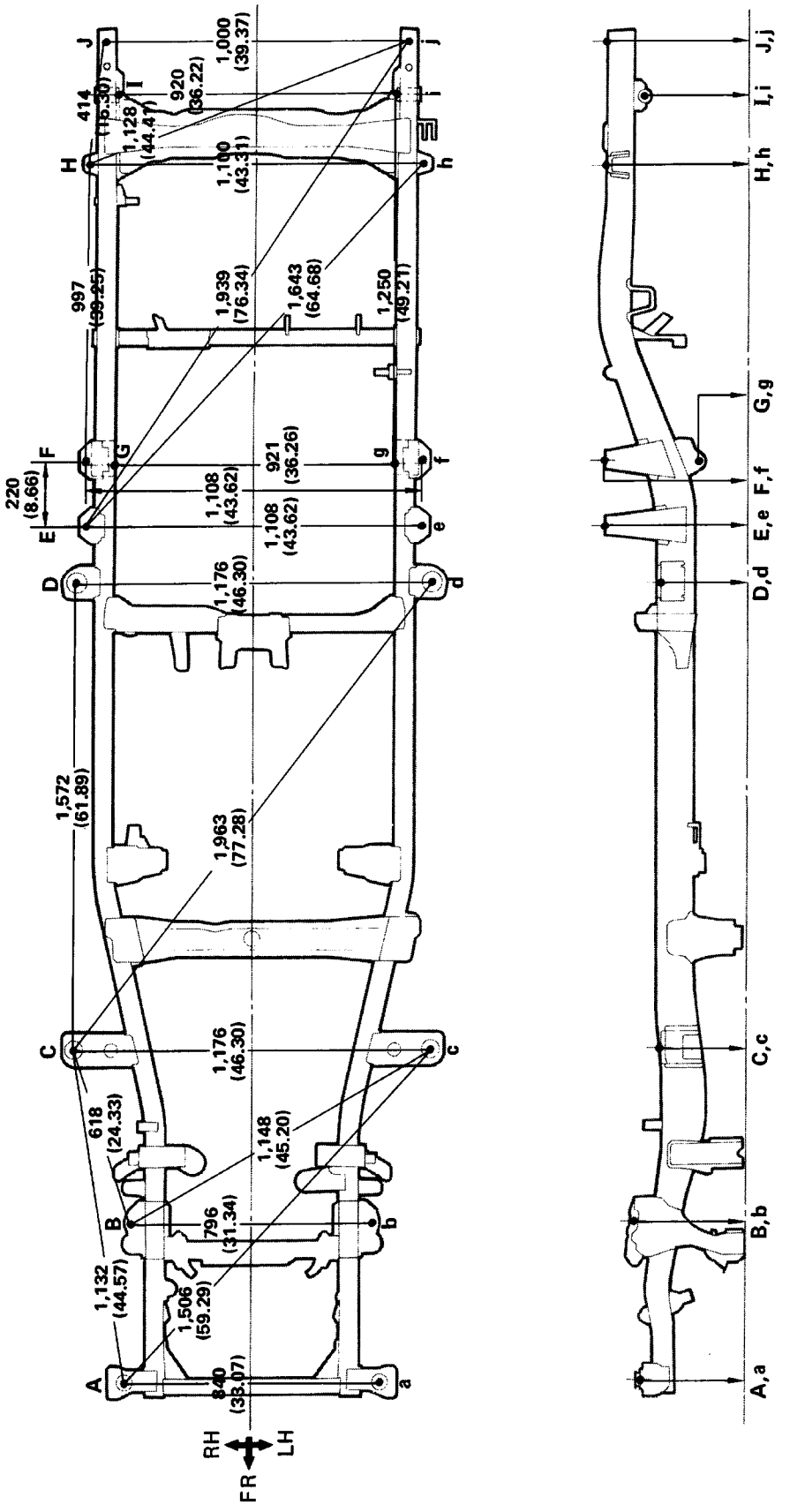
mm (in.)

Symbol	Name	Hole dia.	Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)	G,g	Rear spring front hanger hole – inner	14.5 (0.571)
B,b	Shock absorber installation hole	16 (0.63)	H,h	Rear body mounting hole	17 (0.67)
C,c	Cab mounting hole	60 (2.36)	I,i	Rear spring rear hanger hole – inner	30.35 (1.1949)
D,d	Cab mounting hole	70 (2.76)	J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)
E,e	Rear body mounting hole	17 (0.67)			
F,f	Rear body mounting hole	17 (0.67)	–	–	–

BO3591

4WD Xtra Cab Models

(Three-Dimensional Distance)



mm (in.)

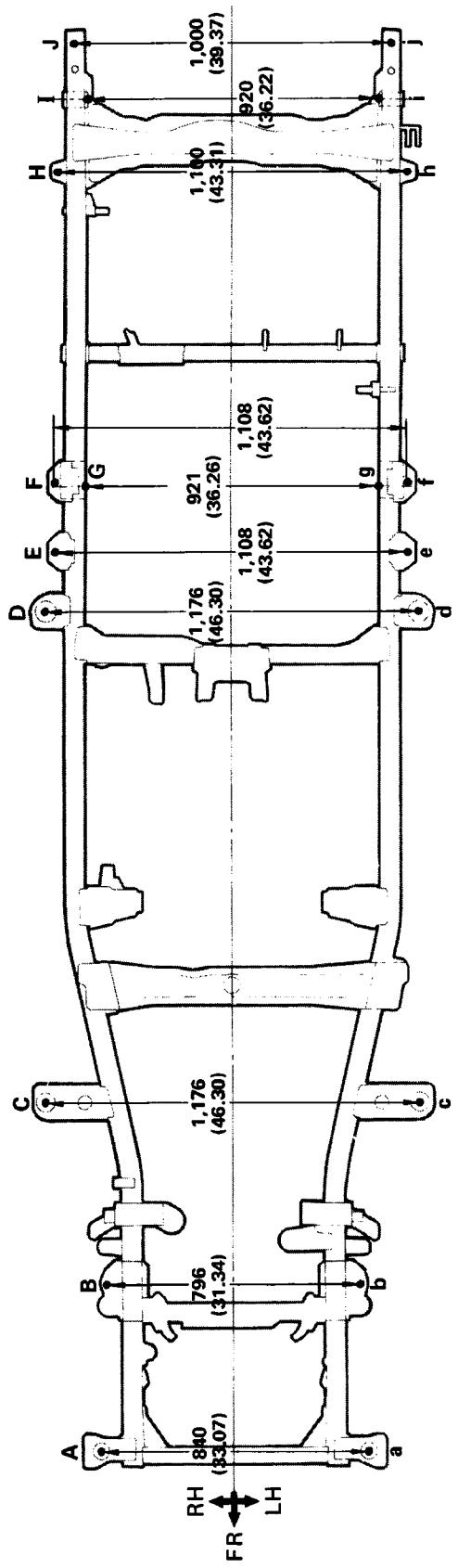
Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)
F,f	Rear body mounting hole	17 (0.67)

Symbol	Name	Hole dia.
G,g	Rear spring front hanger hole — inner	14.5 (0.571)
H,h	Rear body mounting hole	17 (0.67)
I,i	Rear spring rear hanger hole — inner	30.35 (1.1949)
J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)
—	—	—

BO3592

4WD Xtra Cab Models

(Two-Dimensional Distance)



Wheel Base: 3,095 (121.85)

mm (in.)

Symbol	Name	Hole dia.
A,a	Cab mounting hole	24 (0.94)
B,b	Shock absorber installation hole	16 (0.63)
C,c	Cab mounting hole	60 (2.36)
D,d	Cab mounting hole	70 (2.76)
E,e	Rear body mounting hole	17 (0.67)
F,f	Rear body mounting hole	17 (0.67)

Symbol	Name	Hole dia.
G,g	Rear spring front hanger hole – inner	14.5 (0.571)
H,h	Rear body mounting hole	17 (0.67)
I,i	Rear spring rear hanger hole – inner	30.35 (1.1949)
J,j	Rear body mounting hole	18 x 21 (0.71 x 0.83)
–	–	–

BO3592

BRAKE SYSTEM

PRECAUTIONS

1. Care must be taken to replace each part properly as it could affect the performance of the brake system and result in a driving hazard. Replace the parts with parts of the same part number or equivalent.

2. It is very important to keep parts and the area clean when repairing the brake system.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Low or spongy pedal	Linings worn	Replace brake shoes	BR–40, 47 55
	Brake pads worn	Replace pads	
	Leak in brake system	Repair leak	BR–18, 26 33
	Master cylinder faulty	Repair or replace master cylinder	BR–10
	Air in brake system	Bleed brake system	BR–8
	Wheel cylinder faulty	Repair wheel cylinder	BR–40, 47 55
	Brake cylinder faulty	Repair cylinder	
	Piston seals worn or damaged	Repair brake cylinder	BR–18, 26 33
	Rear brake automatic adjuster faulty	Repair or replace adjuster	BR–18, 26 33
			BR–40, 47 55
Brakes drag	Parking brake out of adjustment	Adjust parking brake	BR–9
	Binding parking brake wire	Repair as necessary	BR–17
	Booster push rod out of adjustment	Adjust push rod	BR–40, 47 55
	Tension or return spring faulty	Replace spring	
	Brake line restricted	Repair as necessary	BR–40, 47 55
	Lining cracked or distorted	Replace shoe	
	Pad cracked or distorted	Replace pad	BR–18, 26 33
	Wheel cylinder or caliper piston sticking	Repair as necessary	
	Adjuster broken	Replace adjuster	BR–18, 26 33
	Master cylinder faulty	Repair or replace master cylinder	BR–10
Brakes pull	Tires improperly inflated	Inflate tires to proper pressure	
	Oil or grease on shoes or pads	Check for cause. Replace shoes or pads	
	Brake shoes distorted, linings worn or glazed	Replace brake shoes	BR–40, 47 55
	Brake pads distorted, worn or glazed	Replace pads	
	Drum or disc out of round	Replace drum or disc	BR–18, 26 33
			BR–18, 26 33,40 47, 55
	Tension or return spring faulty	Replace spring	BR–40, 47 55
	Wheel cylinder faulty	Repair wheel cylinder	
	Brake cylinder faulty	Repair cylinder	BR–18, 26 33
	Piston frozen in brake cylinder	Repair cylinder	
	Brake pad sticking	Replace pads	BR–18, 26 33
			BR–18, 26 33

PRECAUTIONS

1. Care must be taken to replace each part properly as it could affect the performance of the brake system and result in a driving hazard. Replace the parts with parts of the same part number or equivalent.

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TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
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	Brake pads worn	Replace pads	
	Leak in brake system	Repair leak	BR–18, 26 33
	Master cylinder faulty	Repair or replace master cylinder	BR–10
	Air in brake system	Bleed brake system	BR–8
	Wheel cylinder faulty	Repair wheel cylinder	BR–40, 47 55
	Brake cylinder faulty	Repair cylinder	
	Piston seals worn or damaged	Repair brake cylinder	BR–18, 26 33
	Rear brake automatic adjuster faulty	Repair or replace adjuster	BR–18, 26 33
			BR–40, 47 55
Brakes drag	Parking brake out of adjustment	Adjust parking brake	BR–9
	Binding parking brake wire	Repair as necessary	BR–17
	Booster push rod out of adjustment	Adjust push rod	BR–40, 47 55
	Tension or return spring faulty	Replace spring	
	Brake line restricted	Repair as necessary	BR–40, 47 55
	Lining cracked or distorted	Replace shoe	
	Pad cracked or distorted	Replace pad	BR–18, 26 33
	Wheel cylinder or caliper piston sticking	Repair as necessary	
	Adjuster broken	Replace adjuster	BR–18, 26 33
	Master cylinder faulty	Repair or replace master cylinder	BR–10
Brakes pull	Tires improperly inflated	Inflate tires to proper pressure	
	Oil or grease on shoes or pads	Check for cause. Replace shoes or pads	
	Brake shoes distorted, linings worn or glazed	Replace brake shoes	BR–40, 47 55
	Brake pads distorted, worn or glazed	Replace pads	
	Drum or disc out of round	Replace drum or disc	BR–18, 26 33
			BR–18, 26 33,40 47, 55
	Tension or return spring faulty	Replace spring	BR–40, 47 55
	Wheel cylinder faulty	Repair wheel cylinder	
	Brake cylinder faulty	Repair cylinder	BR–18, 26 33
	Piston frozen in brake cylinder	Repair cylinder	
	Brake pad sticking	Replace pads	BR–18, 26 33
			BR–18, 26 33

TROUBLESHOOTING (Cont'd)

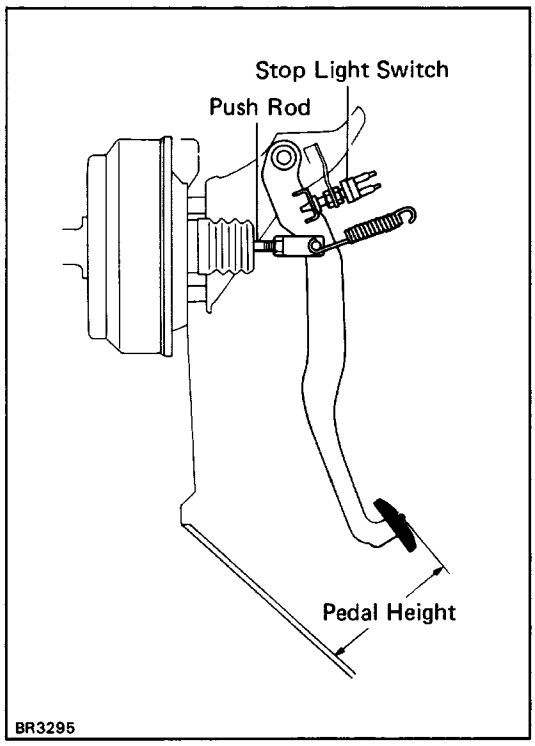
Problem	Possible cause	Remedy	Page
Hard pedal but brakes inefficient	Oil or grease on shoes or pads	Check for cause. Replace shoes or pads	
	Brake shoes distorted, linings worn or glazed, drums worn	Replace brake shoes	BR–40, 47 55
	Brake pads distorted, worn or glazed	Replace pads	BR–18, 26 33
	Piston frozen in brake cylinder	Repair cylinder	BR–18, 26 33
	Brake booster faulty	Repair booster	BR–16
	Vacuum leaks	Repair as necessary	
	Brake line restricted	Repair as necessary	
Snapping or clicking noise when brakes are applied	(Drum brake)		
	Brake shoes binding at backing plate ledges	Lubricate	BR–40, 47 55
	Backing plate ledges worn	Replace and lubricate ledges	BR–40, 47 55
	Loose or missing shoe hold–down spring	Replace shoe hold–down spring	BR–40, 47 55
	Loose set bolt at backing plate	Tighten	BR–40, 47 55
	(Disc brake)		
	Loose or missing pad support plate	Replace pad support plate	BR–18, 26 33
	Loose installation bolt	Tighten	BR–18, 26 33
Scraping or grinding noise when brakes are applied	Worn brake linings or pads	Replace or refinish drums or rotors if heavily scored	BR–18, 26 33,40 47, 55
	Caliper to wheel or rotor interference	Replace as required	BR–18, 26 33
	Dust cover to rotor or backing plate to drum interference	Correct or replace	BR–18, 26 33,40 47, 55
	Other brake system components faulty	Repair or replace as necessary	
	Tires rubbing against chassis and/or body	Repair as necessary	

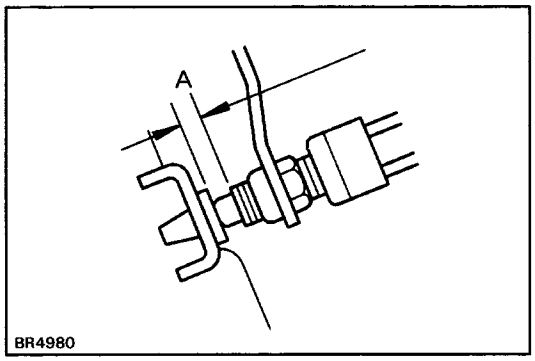
TROUBLESHOOTING (Cont'd)

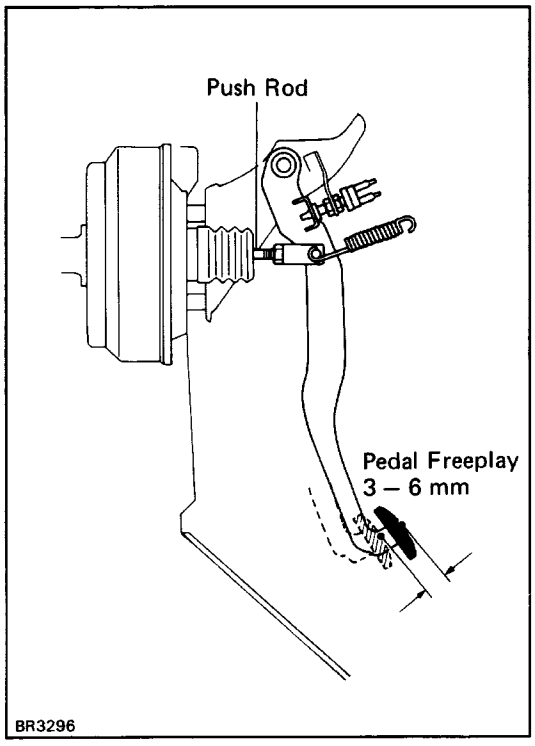
Problem	Possible cause	Remedy	Page
Squeaking, squealing groaning or chattering noise when brakes are applied HINT: Brake friction materials inherently generate noise and heat in order to dissipate energy. As a result, occasional squeal is normal and is aggravated by severe environmental conditions such as cold, heat, wetness, snow, salt, mud, etc. This occasional squeal is not a functional problem and does not indicate any loss of brake effectiveness	Brake drums and linings, rotors and pads worn or scored Dirty, greased, contaminated or glazed linings or pads Improper linings or pads using Maladjustment of brake pedal or booster push rod (Disc brake) Missing or damaged brake pad anti–squeal shim Pad wear and pad wear indicator making contact with the rotor Burred or rusted calipers (Drum brake) Weak damaged or incorrect shoe hold–down springs, loose or damaged shoe hold–down spring pins and springs and grooved backing plate ledges	Inspect, repair or replace Clean or replace Inspect for correct usage or replace Inspect and adjust Replace Replace Clean or deburr Inspect, repair or replace	BR–18, 26 33,40 47, 55 BR–18, 26 33,40 47, 55 BR–6, 17 BR–1 8, 26 33 BR–18, 26 33 BR–18, 26 33 BR–40, 47 55
Squealing and squeaking noise when brakes are not applied	Mal–adjustment of brake pedal or booster push rod Poor return of brake booster or master cylinder or brake cylinder (Disc brake) Rusted or stuck piston Improper positioning of pad in caliper Rotor rubbing against caliper housing Improper installation of disc brake pad support plate Pad wear and pad wear indicator making contact with the rotor (Drum brake) Weak, damaged or incorrect shoe hold–down springs Grooved backing plate ledges Bent or warped backing plate causing interference with drum Improper machining of drum causing interference with backing plate or shoe Other brake system components: Loose or extra parts in brakes Rear drum adjustment too tight causing lining to glaze Worn, damaged or insufficiently lubricated wheel bearings	Inspect and adjust Inspect, repair or replace Inspect and lubricate as necessary Reinstall correctly Inspect and replace Reinstall correctly Replace Replace Repair or replace Repair or replace Replace drum Inspect, repair or replace as necessary	BR–6, 17 BR–10, 16 18,26 33,40 47, 55 BR–18, 26 33 BR–18, 2 33 BR–18, 26 33 BR–40, 47 55 BR–40, 47 55 BR–40, 47 55 BR–40, 47 55 BR–40, 47 55

TROUBLESHOOTING (Cont'd)

Problem	Possible cause	Remedy	Page
Groaning, clicking or rattling noise when brakes are not applied	Stones or foreign material trapped inside wheel covers	Remove foreign material	
	Loose wheel nuts	Tighten to correct torque Replace if stud holes are elongated	
	Mal–adjustment of brake pedal or booster push rod	Inspect and adjust	BR–6, 17
	Worn, damaged or dry wheel bearings	Inspect and lubricate or replace	
	(Disc brake) Loose or missing anti–rattle spring or pad support plate or crimping on outer pad		
	Failure of shim	Inspect, repair or replace	BR–18, 26 33
		Inspect, replace if necessary	BR–18, 26 33
	Wear on slide bushing	Inspect, replace if necessary	BR–18, 26 33
	Loose installation bolt	Inspect, tighten if necessary	BR–18, 26 33
	Poor return of piston	Inspect, repair or replace	BR–18, 26 33
	(Drum brake) Loose or extra parts	Inspect and repair	BR–40, 47 55







CHECKS AND ADJUSTMENTS

CHECK AND ADJUSTMENT OF BRAKE PEDAL

1. CHECK THAT PEDAL HEIGHT IS CORRECT, AS SHOWN

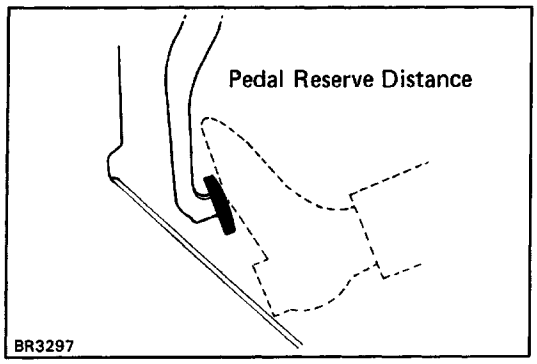
PEDAL HEIGHT FROM ASPHALT SHEET:
2WD 148 MM (5.83 IN.)
4WD 145 MM (5.71 IN.)

2. IF NECESSARY, ADJUST PEDAL HEIGHT

(a) Disconnect the connector from the stop light switch.
(b) Loosen the stop light switch lock nut and remove the stop light switch.
(c) Loosen the push rod lock nut.
(d) Adjust the pedal height by turning the pedal push rod.
(e) Tighten the push rod lock nut.
Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)
(f) Install the stop light switch and turn it until it lightly contacts the pedal stopper.
(g) Return the stop light switch one turn.
(f) Check the clearance
(A) between stop light switch and pedal.
Clearance: 0.5 – 2.4mm (0.02 – 0.09 in.)
(i) Tighten the stop light switch lock nut.
(j) Check that the stop light come on when the brake pedal is depressed, and go off when the brake pedal is released.
(k) After adjusting the pedal height, check the pedal free play.
HINT: If clearance
(A) between the stop light switch and the pedal stopper has been adjusted correctly, the pedal freeplay will meet the specifications.

3. CHECK THAT PEDAL FREEPLAY IS CORRECT, AS SHOWN

(a) Stop the engine and depress the brake pedal several times until there is no more vacuum left in the booster.
(b) (Single booster)
Push in the pedal until the beginning of resistance is felt. Measure the distance, as shown.
(Tandem booster)
Push in the pedal by hand until the beginning of the second resistance is felt, measure the distance, as shown.
Pedal freeplay: 3 – 6mm (0.12 – 0.24 in.)
(Tandem booster)
HINT: The freeplay to the first resistance is due to the play between the clevis and pin. And it is 1 – 3mm (0.04 – 0.12 in.) on the pedal.



4. CHECK THAT PEDAL RESERVE DISTANCE IS CORRECT, AS SHOWN

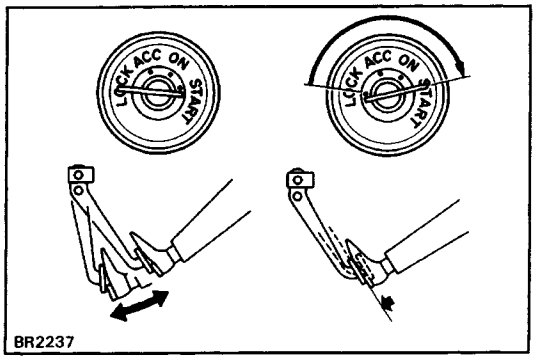
Release the parking brake.

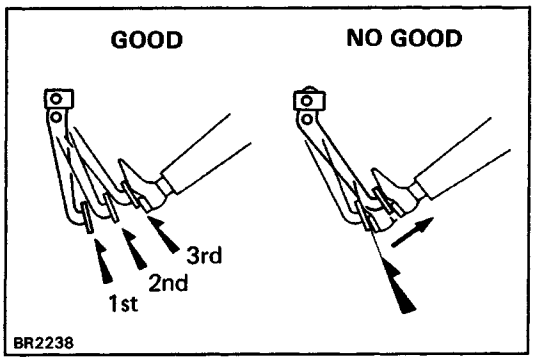
With engine running, depress the pedal and measure the pedal reserve distance, as shown.

Pedal reserve distance from asphalt sheet at 490 N (50 kgf, 110.2 lbf):

(2WD)	
22R–E Engine	**More than 70 mm (2.76 in.)**
3VZ–E Engine	
1 ton	**More than 75 mm (2.95 in.)**
1/2 ton	**More than 65 mm (2.56 in.)**
C&C	
SRW	**More than 75 mm (2.95 in.)**
DRW	**More than 55 mm (2.17 in.)**
(4WD)	**More than 65 mm (2.56 in.)**

If incorrect, troubleshoot the brake system.





OPERATIONAL TEST OF BRAKE BOOSTER

HINT: If available, use a brake booster tester to check the booster operating condition.

1. OPERATING CHECK

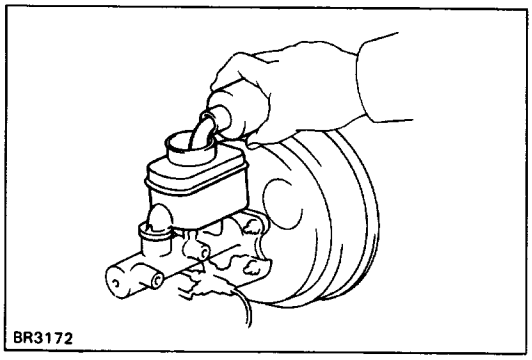
(a) Depress the brake pedal several times with the engine off, and check that there is no change in the pedal reserve distance.

(b) Depress the brake pedal and start engine. If the pedal goes down slightly, operation is normal.

2. AIR TIGHTNESS CHECK

(a) Start the engine and stop it after one or two minutes. Depress the brake pedal several times slowly. If the pedal goes down deepest the first time, but gradually rises after the second or third time, the booster is air tight.

(b) Depress the brake pedal while the engine is running, and stop it with the pedal depressed . If there is no change in pedal reserve travel after holding' the pedal for thirty seconds, the booster is air tight.



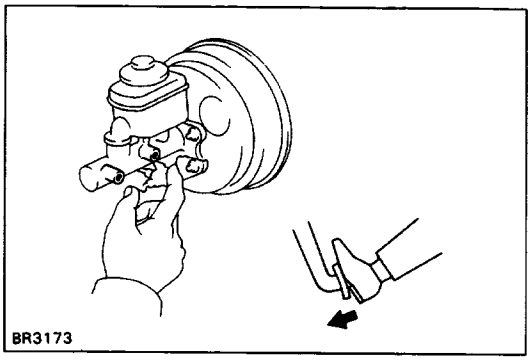
BLEEDING OF BRAKE SYSTEM

HINT: If any work is done on the brake system or if air is suspected in the brake lines, bleed the system of air.

NOTICE: Do not let brake fluid remain on a painted surface. Wash it off immediately.

1. FILL BRAKE RESERVOIR WITH BRAKE FLUID

Check the fluid level in the reservoir after bleeding each wheel. Add fluid, if necessary.

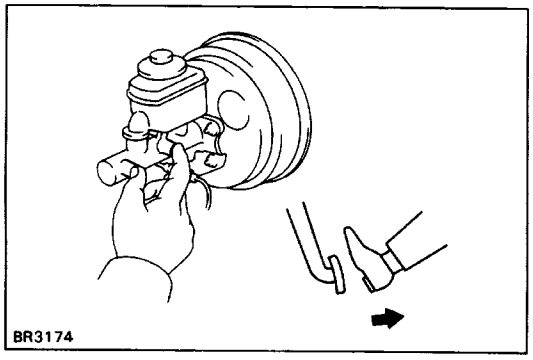


2. BLEED MASTER CYLINDER

HINT: If the master cylinder was disassembled or if the reservoir tank becomes empty, bleed the air from the master cylinder.

(a) Disconnect the brake tubes from the master cylinder.

(b) Slowly depress the brake pedal and hold it.

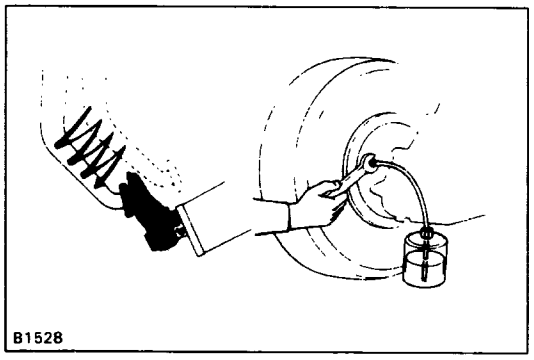


(c) Block off the outlet plug with your finger, and release the brake pedal.

(d) Repeat

(b) and

(c) three or four times.



3. CONNECT VINYL TUBE TO WHEEL CYLINDER BLEEDER PLUG

Insert other end of the tube in a half–full container of brake fluid.

HINT: Begin air bleeding from the wheel cylinder with the longest hydraulic line.

4. BLEED BRAKE LINE

(a) Slowly depress the brake pedal several times.

(b) While an assistant depresses the pedal, loosen the bleeder plug until fluid starts to run out. Then close the bleeder plug.

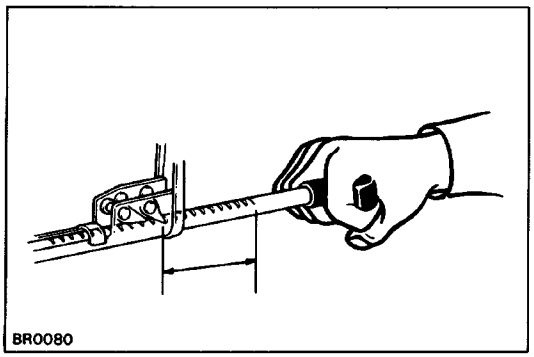
(c) Repeat this procedure until there are no more air bubbles in the fluid.

Bleeder plug tightening torque:

11 N–m (110 kgf–cm, 8 ft–lbf)

5. REPEAT PROCEDURE FOR EACH WHEEL

6. BLEED LSP & BV



CHECK AND ADJUSTMENT OF PARKING BRAKE

1. CHECK THAT PARKING BRAKE LEVER TRAVEL IS CORRECT

Pull the parking brake lever all the way up, and count the number of clicks.

Parking brake lever travel at 196 N (20 kgf, 44.1 lbf)

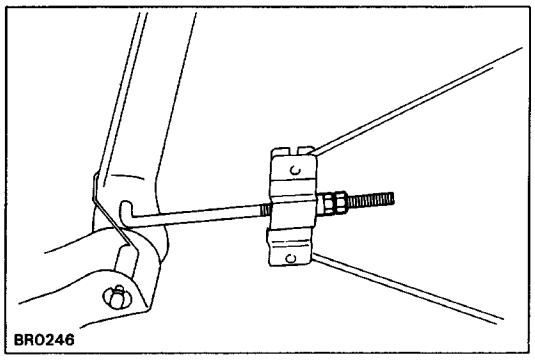
2WD 1/2 ton 12 – 18 clicks

1 ton 11 – 17 clicks

4WD 11 – 17 clicks

2. IF NECESSARY, ADJUST PARKING BRAKE

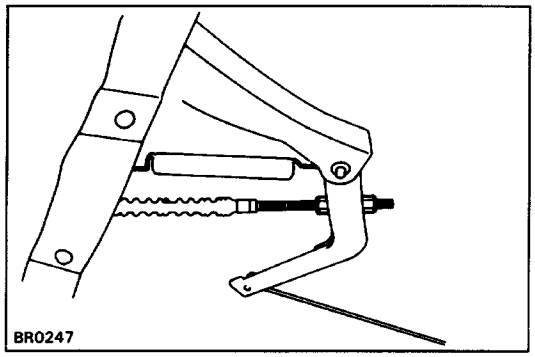
HINT: Before adjusting the parking brake, make sure that the rear brake shoe clearance has been adjusted.



(2WD)

(a) Tighten the adjusting nut until the travel is correct. Then tighten the lock nut.

(b) After adjusting the parking brake, confirm that the rear brakes are not dragging.



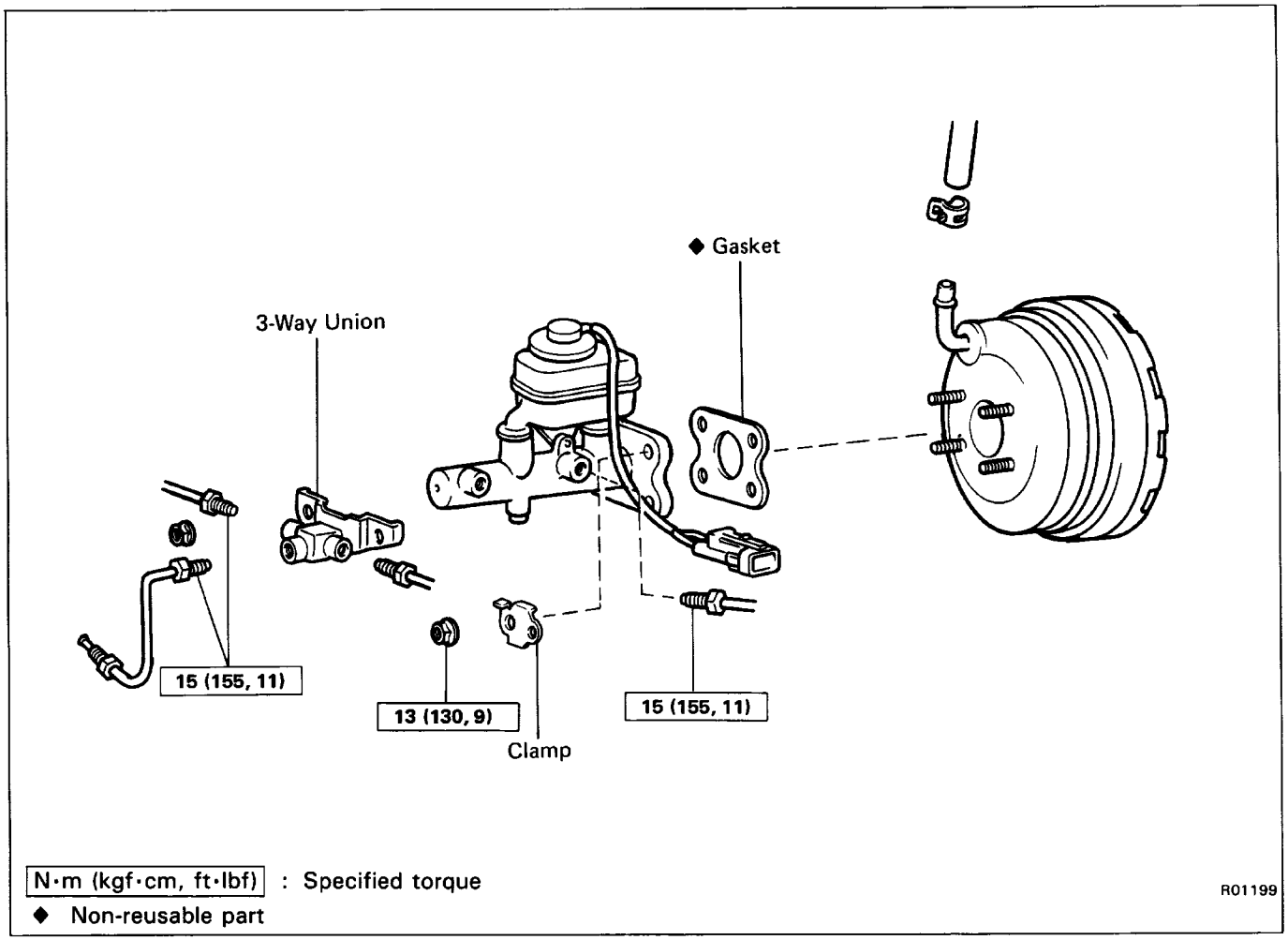
(4WD)

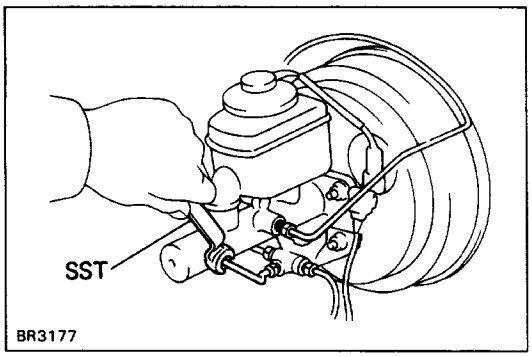
(a) Tighten one of the adjusting nuts of the intermediate lever while loosening the other one until the travel is correct. Tighten the two adjusting nuts.

(b) After adjusting the parking brake, confirm that the bellcrank stopper screw comes in contact with the backing plate.

MASTER CYLINDER

REMOVAL OF MASTER CYLINDER





1. DISCONNECT LEVEL WARNING SWITCH CONNECTOR

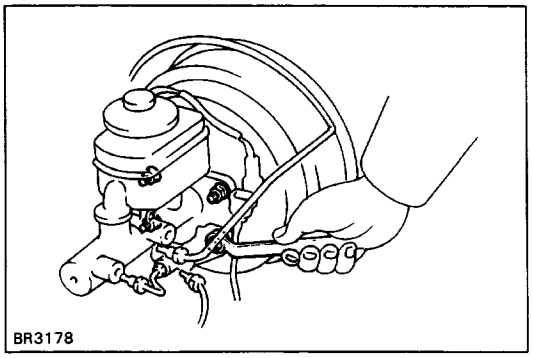
2. DRAW OUT FLUID WITH SYRINGE

NOTICE: Do not let brake fluid remain on a painted surface. Wash it off immediately.

3. DISCONNECT BRAKE TUBES

Using SST, disconnect the brake tubes from the master cylinder.

SST 09751–36011



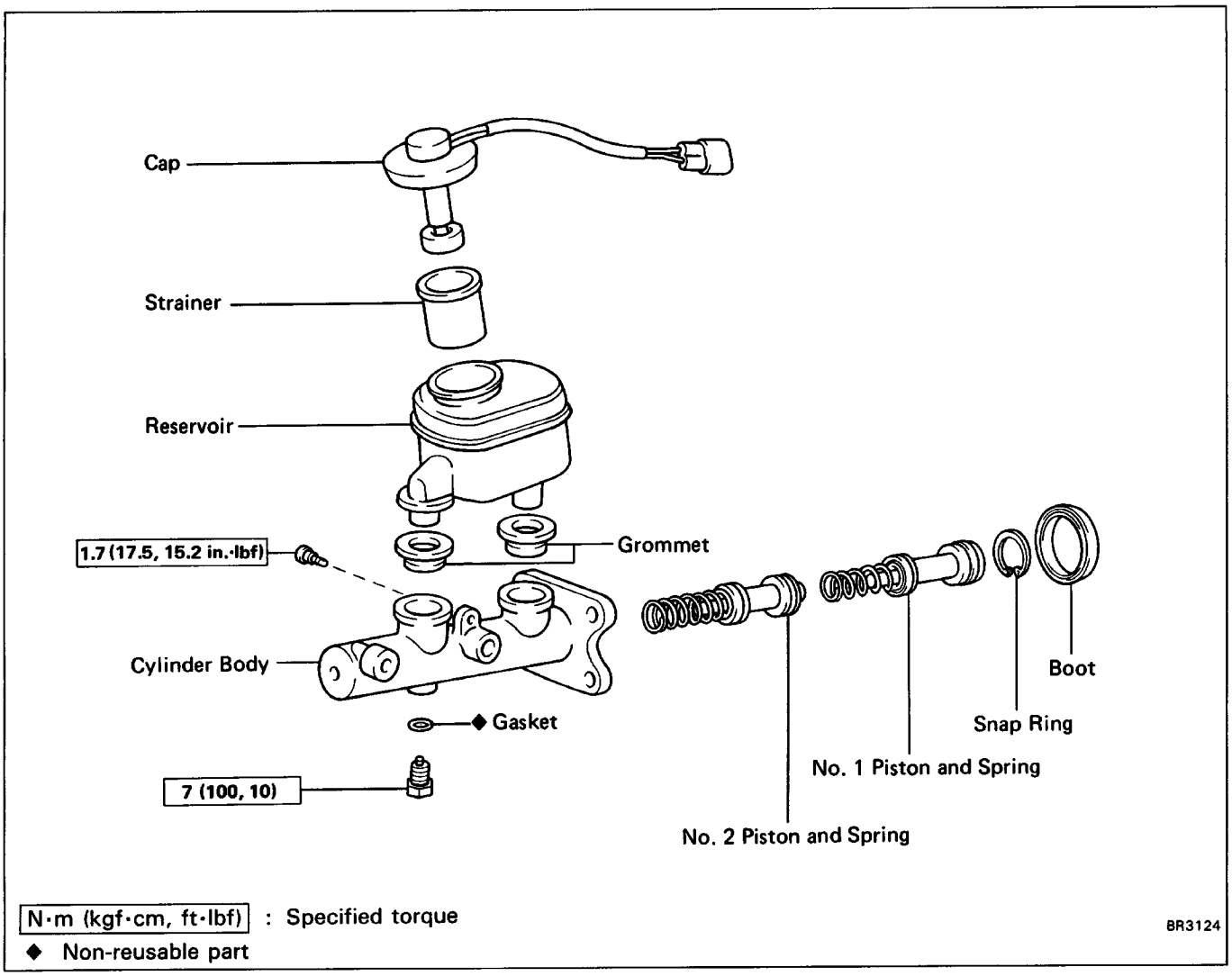
4. REMOVE MASTER CYLINDER

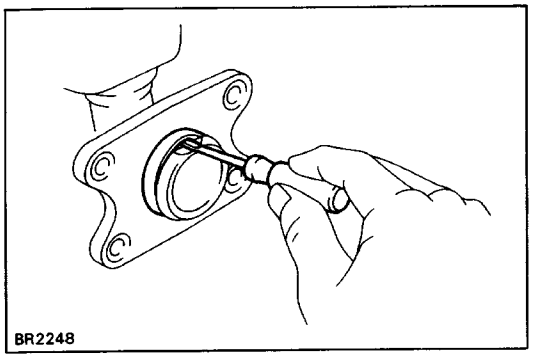
(a) Remove the four nuts and 3–way union.

(b) Remove the clamp.

(c) Remove the master cylinder and gasket from the brake booster.

COMPONENTS

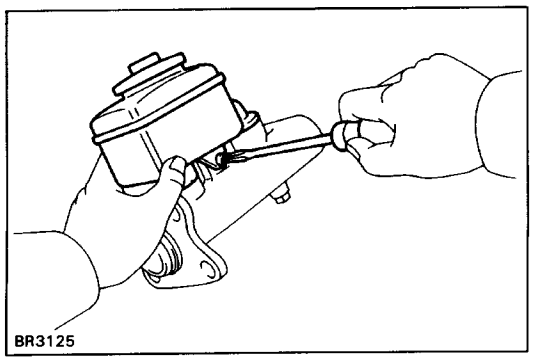




DISASSEMBLY OF MASTER CYLINDER

1. REMOVE MASTER CYLINDER BOOT

Using a screwdriver, remove the master cylinder boot.

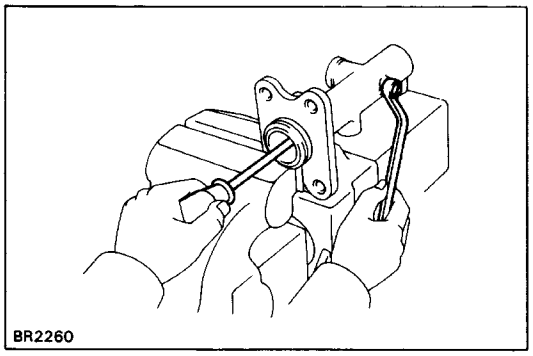


2. REMOVE RESERVOIR

(a) Remove the set screw and pull out the reservoir.
(b) Remove the cap and strainer from the reservoir.

3. REMOVE TWO GROMMETS

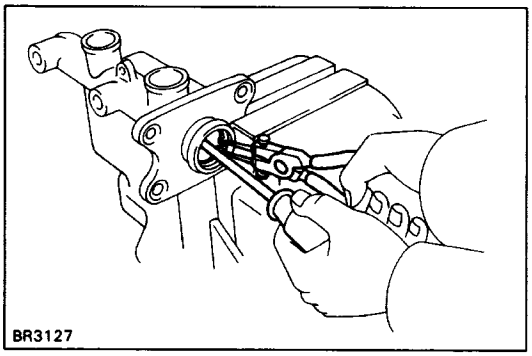
4. PLACE CYLINDER IN VISE


BR2260

5. REMOVE PISTON STOPPER BOLT

Using a screwdriver, push the pistons in all the way and remove the piston stopper bolt and gasket.

HINT: Tape the screwdriver tip before use.

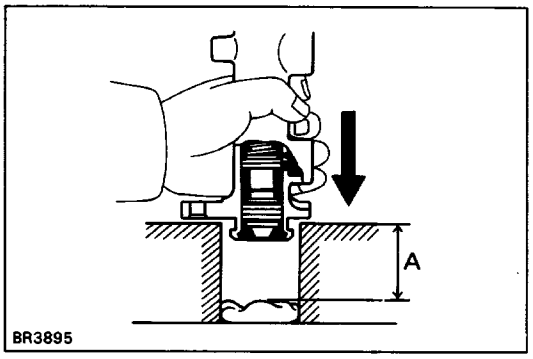

BR3127

6. REMOVE TWO PISTONS AND SPRINGS

(a) Push in the piston with a screwdriver and remove the snap ring with snap ring pliers.

(b) Remove the No. 1 piston and spring by hand, pulling straight out, not at an angle.

NOTICE: If pulled out at an angle, there is possibility of damaging the cylinder bore.



BR3895

(c) Place a rag and two wooden blocks on the work table, and lightly tap the cylinder flange against the block edges until the No.2 piston drops out of cylinder.

HINT: Make sure the distance

(A) from the rag to the top of the blocks is at least 100 mm (3.94 in.).

INSPECTION OF MASTER CYLINDER COMPONENTS

HINT: Clean the disassembled parts with compressed air.

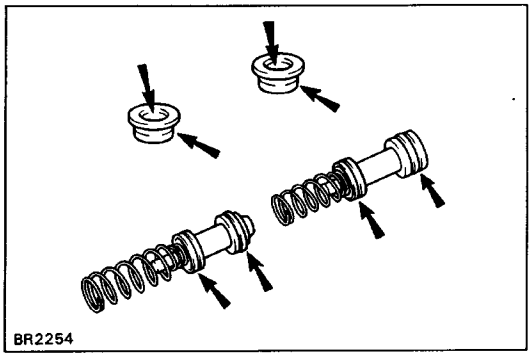
1. INSPECT CYLINDER BORE FOR RUST OR SCORING

2. INSPECT CYLINDER FOR WEAR OR DAMAGE

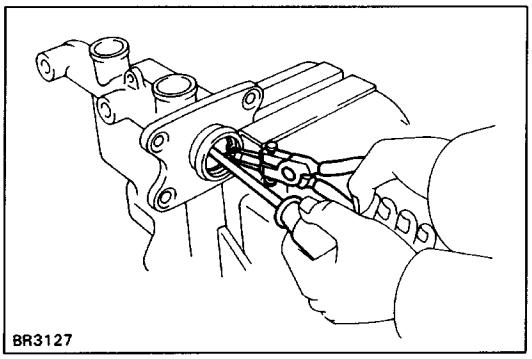
If necessary, clean or replace the cylinder.

ASSEMBLY OF MASTER CYLINDER

(See page BR–11)



1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO RUBBER PARTS INDICATED BY ARROWS



2. INSTALL TWO SPRINGS AND PISTONS

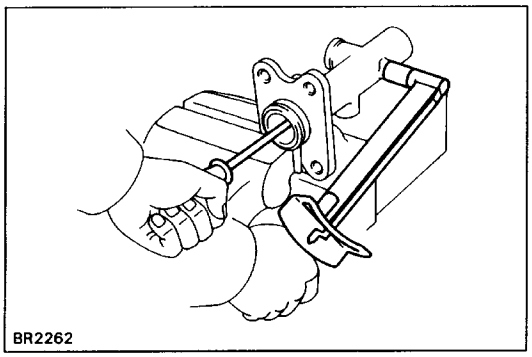
NOTICE: Be careful not to damage the rubber lips on the pistons.

(a) Insert the two springs and pistons straight in, not at an angle.

NOTICE: If inserted at an angle, there is a possibility of damaging the cylinder bore.

(b) Push in the piston with a screwdriver and install the snap ring with snap ring pliers.

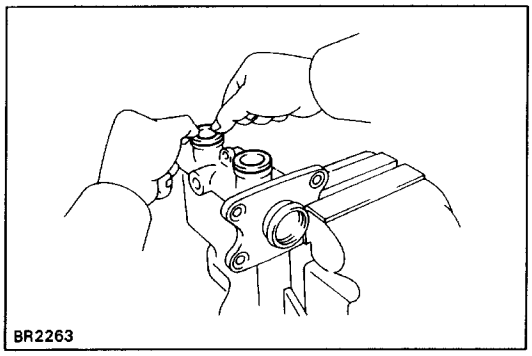
HINT: Tape the screwdriver tip before use.



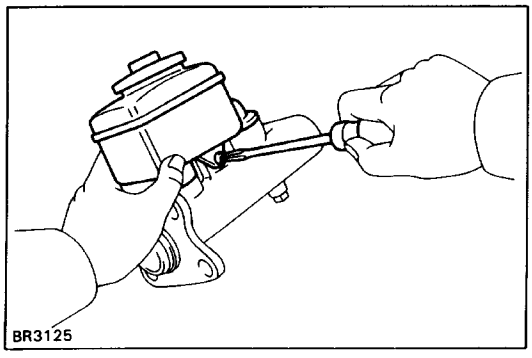
3. INSTALL PISTON STOPPER BOLT

Using a screwdriver, push the piston in all the way and install the piston stopper bolt over the gasket. Torque the bolt.

Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)



4. INSTALL TWO GROMMETS



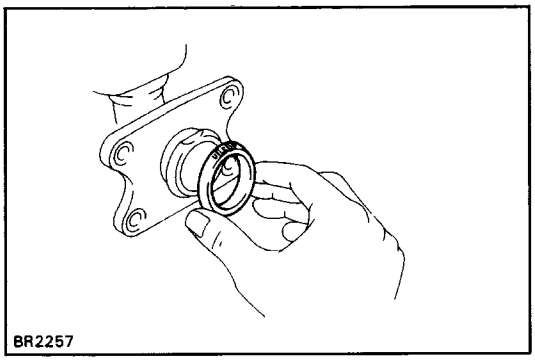
5. INSTALL RESERVOIR

(a) Install the cap and strainer to the reservoir.

(b) Push the reservoir onto the cylinder.

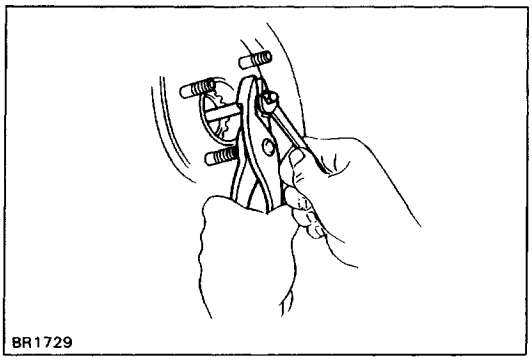
(c) Install the set screw while pushing on the reservoir.

Torque: 1.7 N–m (17.5 kgf–cm, 15.2 in. –lbf)



6. INSTALL MASTER CYLINDER BOOT

Facing the up mark on the master cylinder boot upwards, install the cylinder boot to the master cylinder.

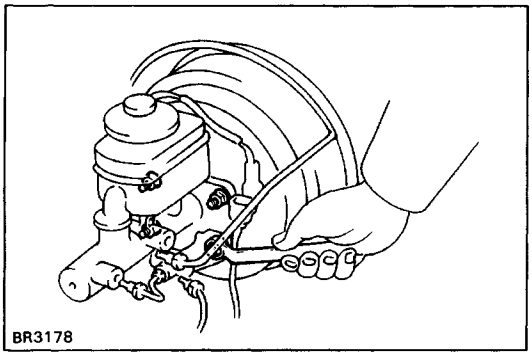


INSTALLATION OF MASTER CYLINDER

(See page BR–10)

1. ADJUST LENGTH OF BRAKE BOOSTER PUSH ROD BEFORE INSTALLING MASTER CYLINDER

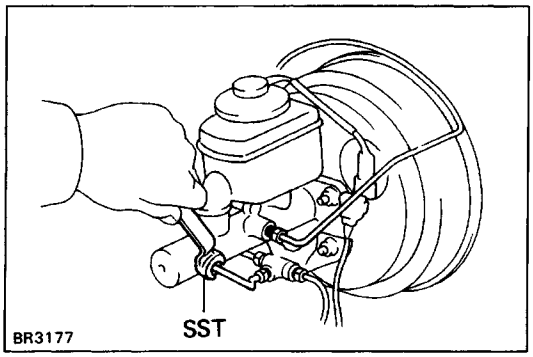
(See page BR–17)



2. INSTALL MASTER CYLINDER

Install the master cylinder and gasket on the brake booster with four nuts.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



3. CONNECT TWO BRAKE TUBES

Using SST, connect the brake tubes to the master cylin–der. Torque the union nuts.

SST 09751–36011

Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)

4. CONNECT LEVEL WARNING SWITCH CONNECTOR

5. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

(See page BR–8)

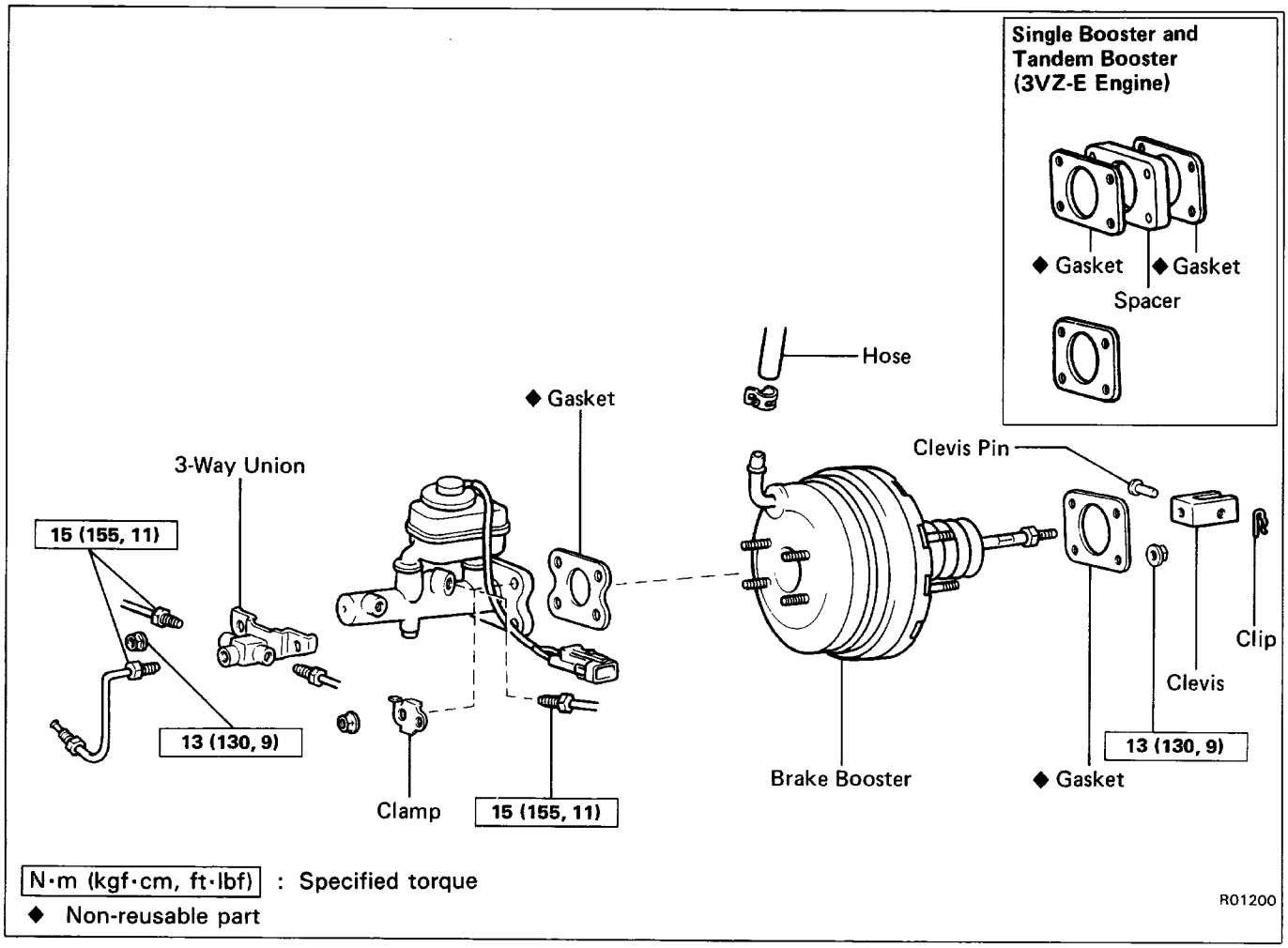
6. CHECK FOR FLUID LEAKAGE

7. CHECK AND ADJUST BRAKE PEDAL

(See page BR–6)

BRAKE BOOSTER

REMOVAL OF BRAKE BOOSTER

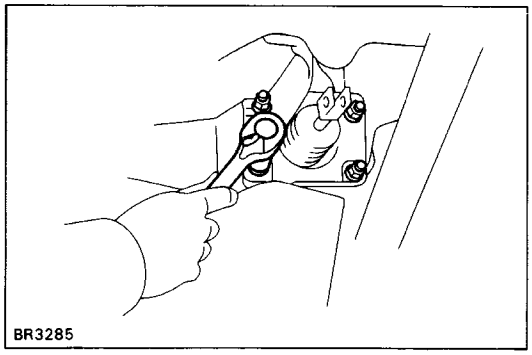


1. REMOVE MASTER CYLINDER
   (See page BR–10)

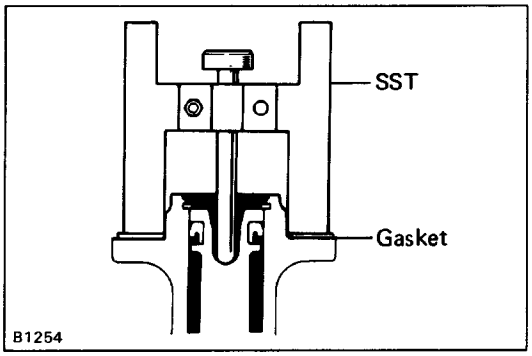
2. DISCONNECT VACUUM HOSE FROM BRAKE BOOSTER

3. REMOVE PEDAL RETURN SPRING

4. REMOVE CLIP AND CLEVIS PIN



5. REMOVE BRAKE BOOSTER, GASKET AND CLEVIS



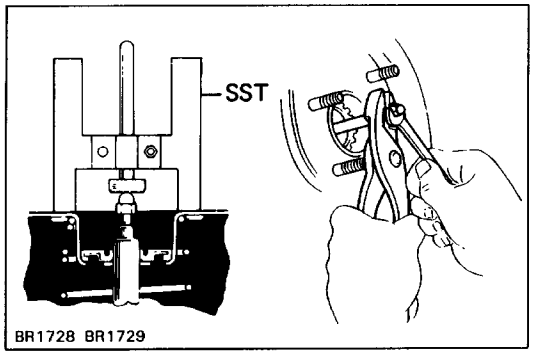
INSTALLATION OF BRAKE BOOSTER

(See page BR–16)

1. ADJUST LENGTH OF BOOSTER PUSH ROD

(a) Install the gasket on the master cylinder.

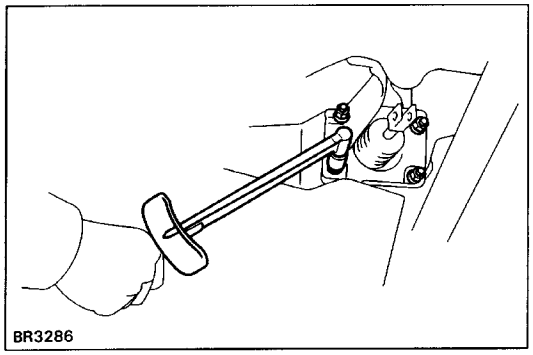
(b) Set the SST on the gasket, and lower the pin until its tip slightly touches the piston.
SST 09737–00010



(c) Turn the SST upside down, and set it on the booster.
SST 09737–00010

(d) Measure the clearance between the booster push rod and pin head (SST).
Clearance: 0 mm (0 in.)

(e) Adjust the booster push rod length until the push rod lightly touches the pin head.



2. INSTALL BRAKE BOOSTER, GASKET AND CLEVIS

(a) Install the booster and gasket.

(b) Install the clevis.

(c) Install and torque the booster mounting nuts.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

3. CONNECT CLEVIS TO BRAKE PEDAL

Insert the clevis pin into the clevis and brake pedal and install the clip to the clevis pin.

4. INSTALL PEDAL RETURN SPRING

5. INSTALL MASTER CYLINDER

(See page BR–15)

6. CONNECT HOSE TO BRAKE BOOSTER

7. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

(See page BR–8)

8. CHECK FOR FLUID LEAKAGE

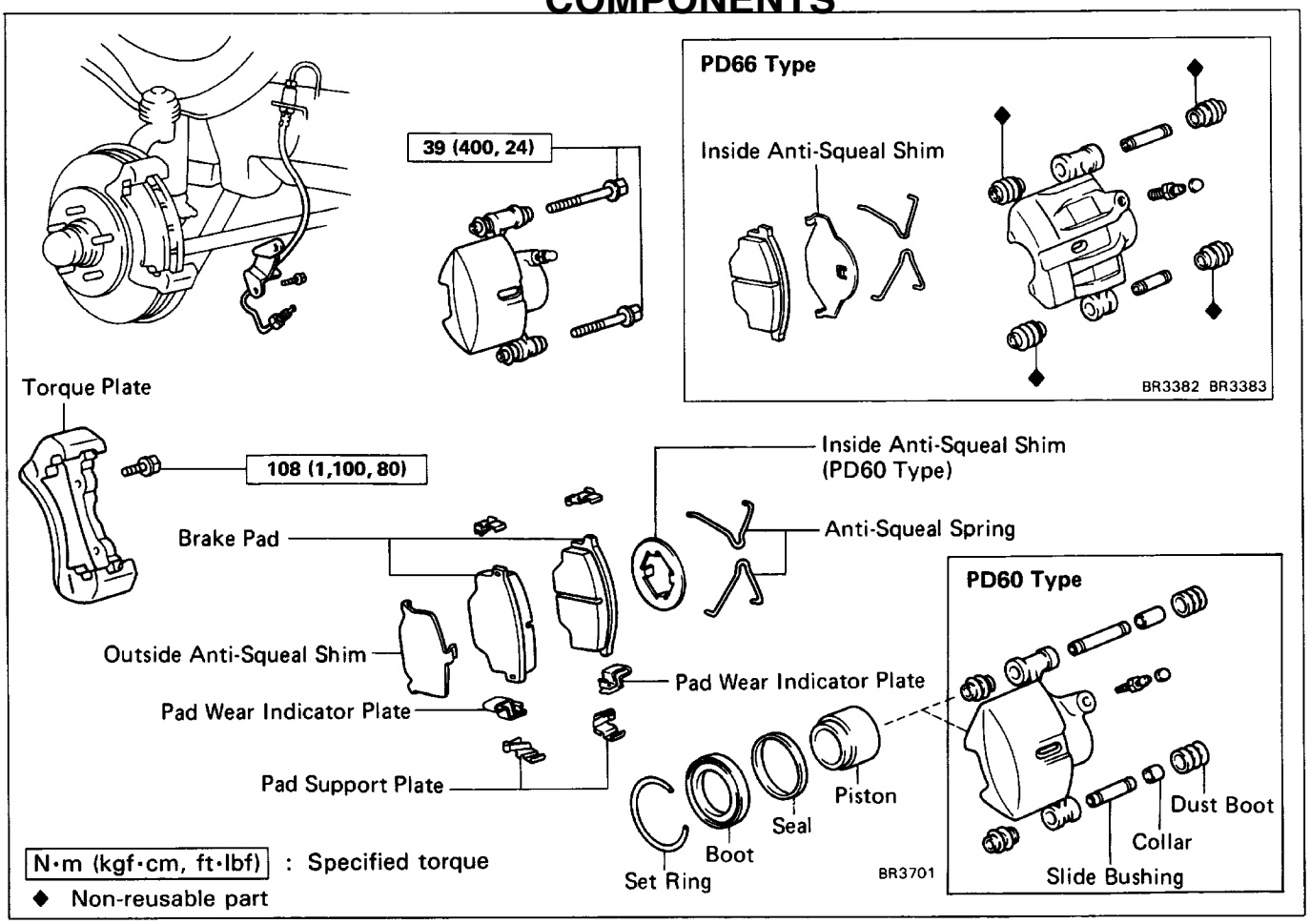
9. CHECK AND ADJUST BRAKE PEDAL

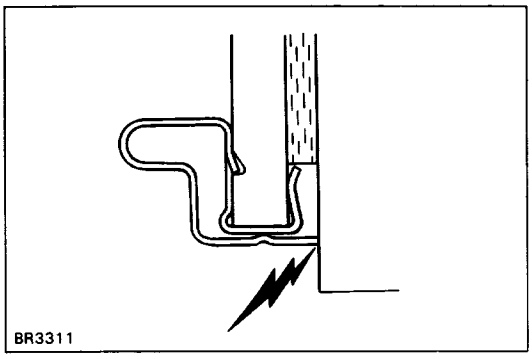
(See page BR–6)

10. PERFORM OPERATIONAL CHECK

(See page BR–7)

FRONT BRAKE
2WD (PD60 66 Type Disc)
COMPONENTS

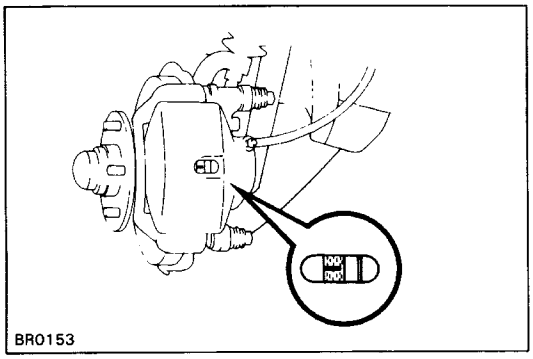




REPLACEMENT OF BRAKE PADS

HINT: If a squealing noise occurs from the front brakes while driving, check the pad wear indicator. If there are traces of the indicator contacting the rotor disc, the brake pad should be replaced.

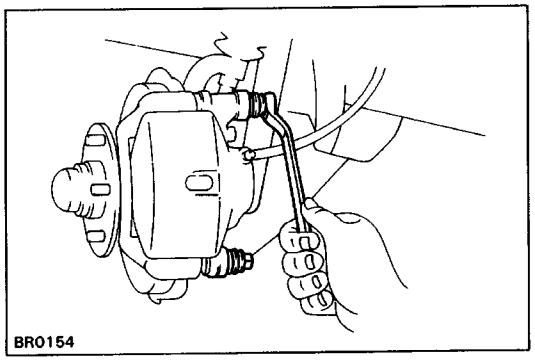
1. REMOVE FRONT WHEEL



2. INSPECT PAD LINING THICKNESS

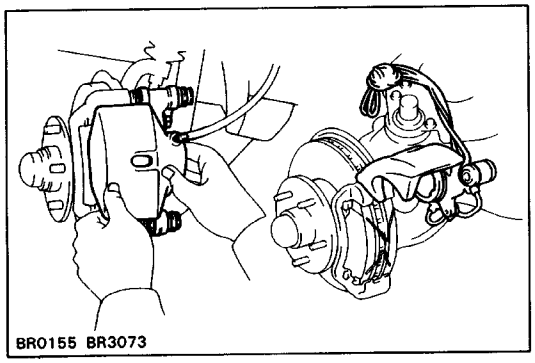
Check the pad thickness through the cylinder inspection hole and replace pads if not within specification.

Minimum thickness: 1.0 mm (0.039 in.)

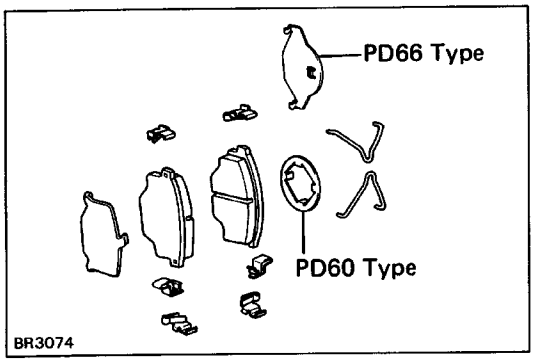

BR0154

3. LIFT UP CYLINDER

(a) Remove the installation bolt from the torque plate.


BR0155 BR3073

(b) Lift up the brake cylinder and suspend it so the hose is not stretched.
HINT: Do not disconnect the brake hose.



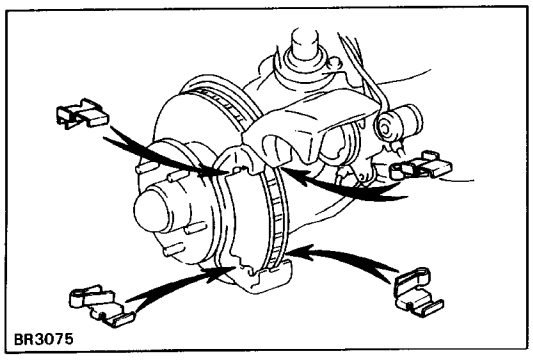
BR3074

4. REMOVE FOLLOWING PARTS:

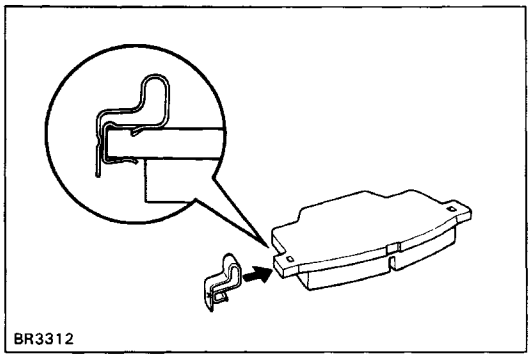
(a) Two anti–squeal springs
(b) Two brake pads
(c) Two anti–squeal shims
(d) Two pad wear indicator plates
(e) Four pad support plates

5. CHECK ROTOR DISC THICKNESS
(See step 2 on page BR–23)

6. CHECK ROTOR DISC RUNOUT
(See step 3 on page BR–23)


BR3075

7. INSTALL PAD SUPPORT PLATES


BR3312

8. INSTALL NEW PADS

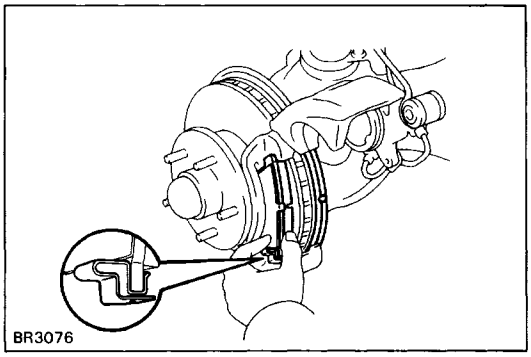
(a) Install a pad wear indicator plate to the pad.

(b) (PD60 Type)

Install the outside anti–squeal shim to the outside pad.

(PD66 Type)

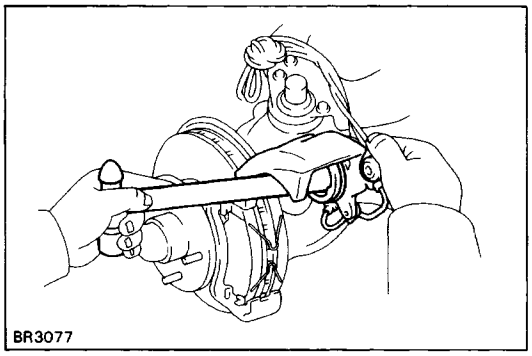
Install the two anti–squeal shims to the each pad.


BR3076

(c) Install the two pads so the wear indicator plate is facing underneath.

NOTICE: Do not allow oil or grease to get on the rubbing face.

(d) Install the anti–squeal springs in position.

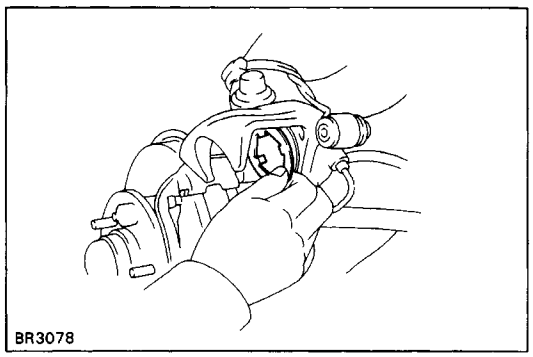

BR3077

9. INSTALL CYLINDER

(a) Draw out a small amount of brake fluid from the reservoir.

(b) Press in piston with a hammer handle or an equivalent.

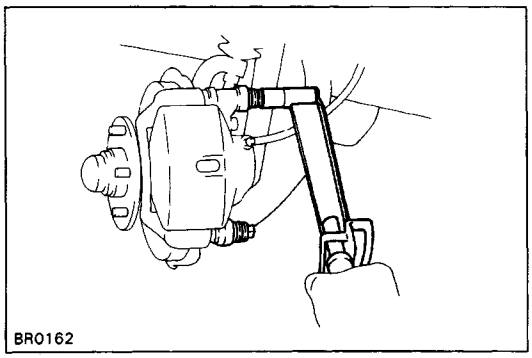
HINT: Always change the pad on one wheel at a time as there is a possibility of the opposite piston flying out.


BR3078

(c) (PD60 Type)

Install the inside anti–squeal shim to the piston.

(d) Insert the brake cylinder carefully so the boot is not wedged.

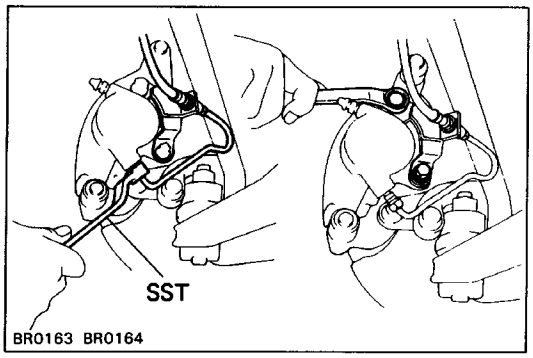

BR0162

(e) Install and torque the installation bolts.

Torque: 39 N–m (400 kgf–cm, 29 ft –lbf)

10. INSTALL FRONT WHEEL

11. CHECK THAT FLUID LEVEL IS MAX LINE



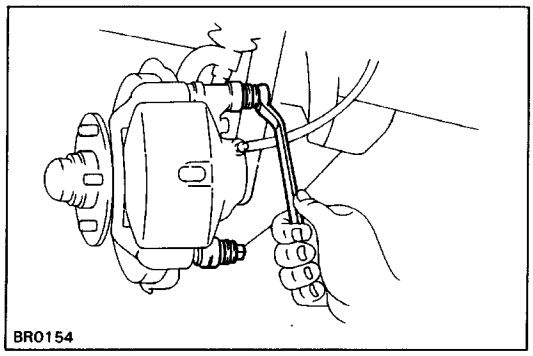
REMOVAL OF CYLINDER

(See page BR–18)

1. DISCONNECT BRAKE TUBE

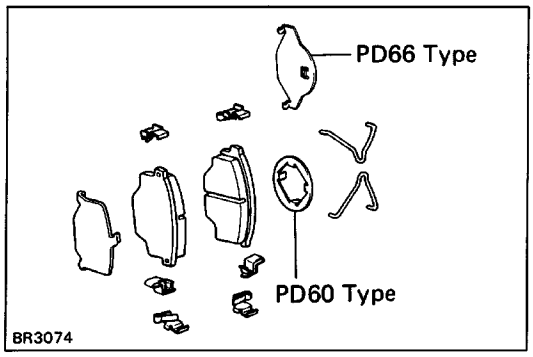
(a) Using SST, disconnect the brake tube. Use a container to catch the brake fluid.
SST 09751–36011

(b) Remove the bracket from the cylinder.



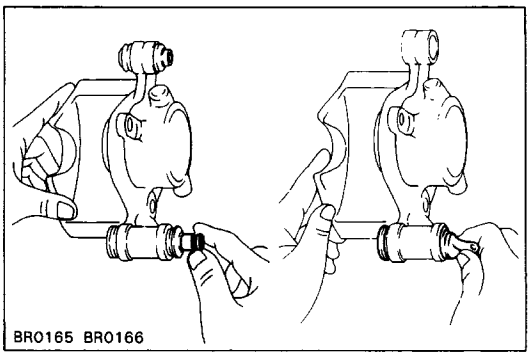
2. REMOVE CYLINDER FROM TORQUE PLATE

Remove the two installation bolts and cylinder.

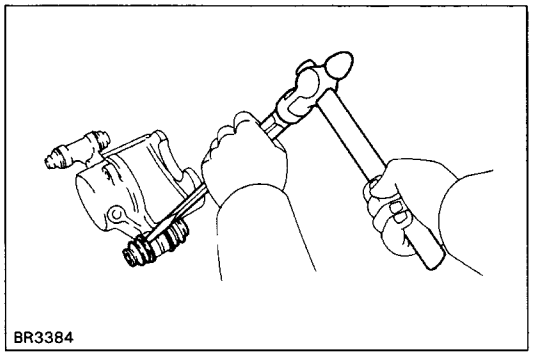


3. REMOVE PADS

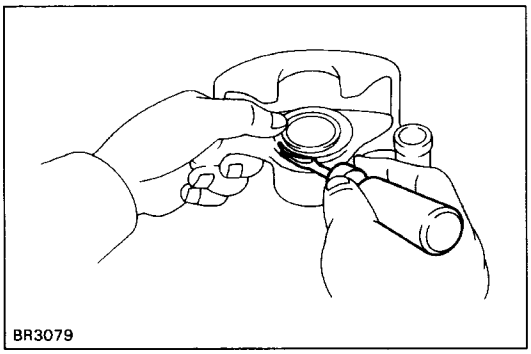
(See step 4 on page BR–19)



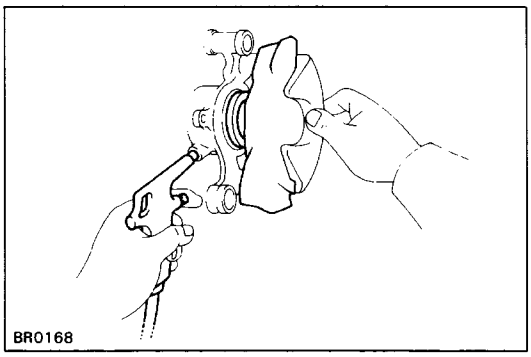
DISASSEMBLY OF CYLINDER
(See page BR–18)
1. (PD60 TYPE)
REMOVE CYLINDER SLIDING BUSHINGS, DUST BOOTS AND COLLARS



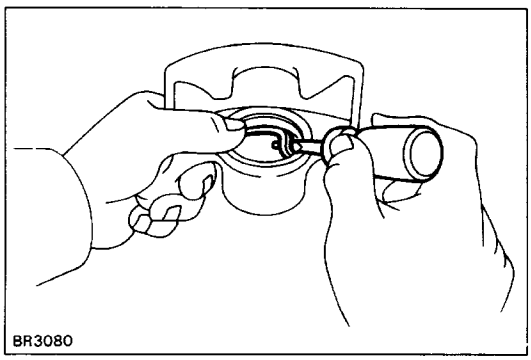
(PD66 TYPE)
REMOVE CYLINDER SLIDING BUSHINGS AND DUST BOOTS
(a) Remove the sliding bushings.
(b) Using a chisel and a hammer, remove the dust boots.



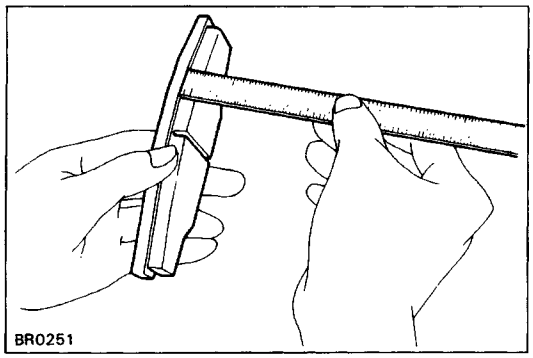
2. REMOVE CYLINDER BOOT SET RING AND CYLINDER BOOT
Using a screwdriver, remove the cylinder boot set ring and cylinder boot.



3. REMOVE PISTON FROM CYLINDER
(a) Put a piece of cloth or an equivalent between the piston and cylinder.
(b) Use compressed air to remove the piston from the cylinder.
NOTICE: Do not place your fingers in front of the piston when using compressed air.



4. REMOVE PISTON SEAL FROM BRAKE CYLINDER
Using a screwdriver, remove the piston seal.



INSPECTION OF FRONT BRAKE COMPONENTS

1. MEASURE PAD LINING THICKNESS

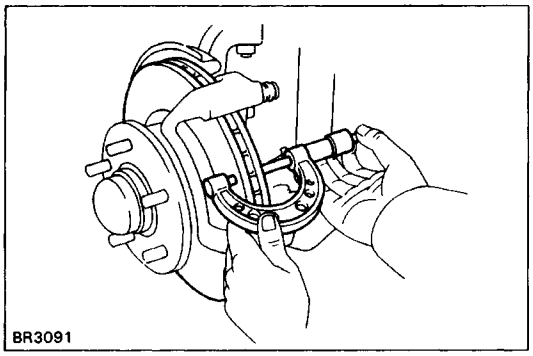
Standard thickness:

PD60 Type 9.5 mm (0.374 in.)

PD66 Type 9.7 mm (0.382 in.)

Minimum thickness: 1.0 mm (0.039 in.)

Replace the pad if the thickness is less than the minimum (the 1.0 mm slite is no longer visible), or if it shows sign of uneven wear.



2. MEASURE ROTOR DISC THICKNESS

Standard thickness:

PD60 Type 25.0 mm (0.984 in.)

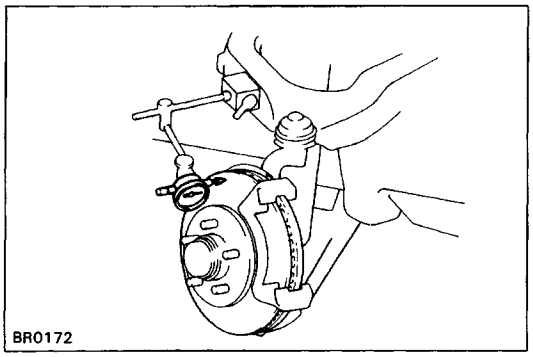
PD66 Type 30.0 mm (1.181 in.)

Minimum thickness:

PD60 Type 23.0 mm (0.906 in.)

PD66 Type 28.0 mm (1.102 in.)

If the disc is scored or worn, or if thickness is less than minimum, repair or replace the disc.



3. MEASURE ROTOR DISC RUNOUT

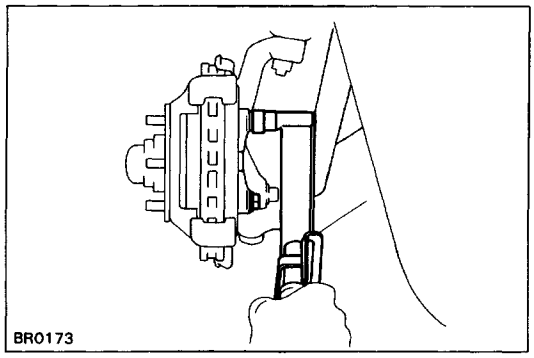
HINT: Before measuring the runout, confirm that the front hub bearing play is within specification.

Measure the rotor disc runout at 10 mm (0.39 in.) from the outer edge of the rotor disc.

Maximum disc runout:

PD60 Type 0.09 mm (0.0035 in.)

PD66 Type 0.12 mm (0.0047 in.)



4. IF NECESSARY, REPLACE ROTOR DISC

(a) Remove the torque plate from the knuckle.

(b) Remove the axle hub. (See page SA–15)

(c) Remove the disc from the axle hub.

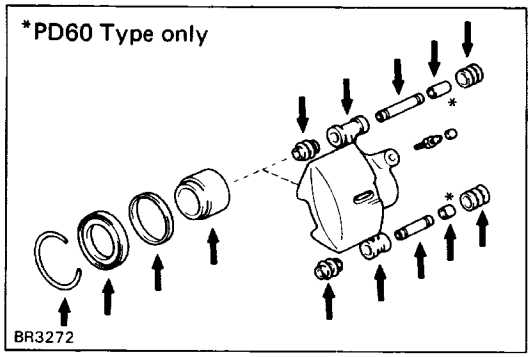
(d) Install a new rotor disc. Torque the bolts.

Torque: 64 N–m (650 kgf–cm, 47 ft–lbf)

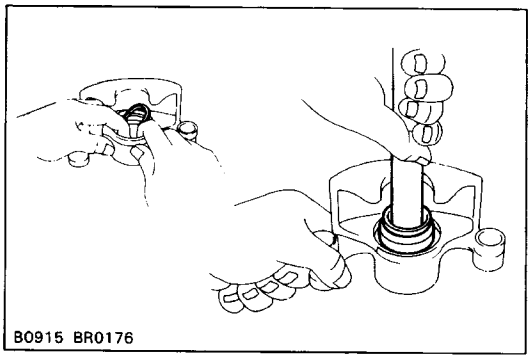
(e) Install the axle hub and adjust the front bearing preload. (See page SA–16)

(f) Install the torque plate onto the knuckle.

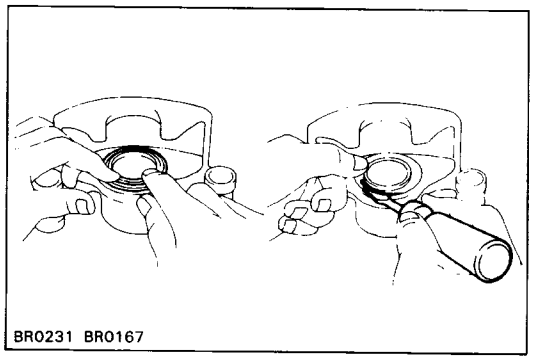
Torque: 108 N–m (1,100 kgf–cm, 80 ft–lbf)



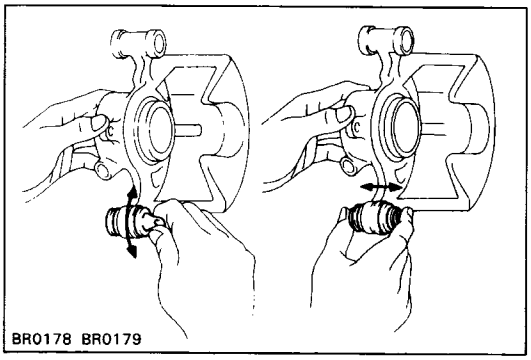
ASSEMBLY OF CYLINDER
(See page BR–18)
1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO PARTS INDICATED WITH ARROWS



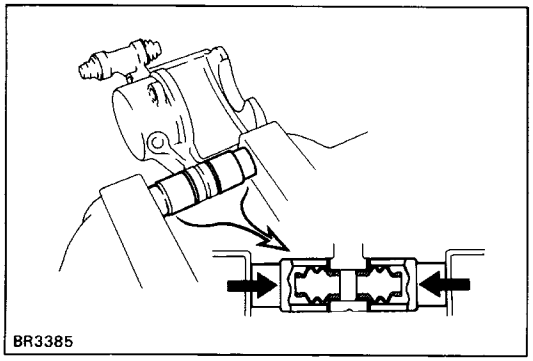
2. INSTALL PISTON SEAL AND PISTON IN CYLINDER



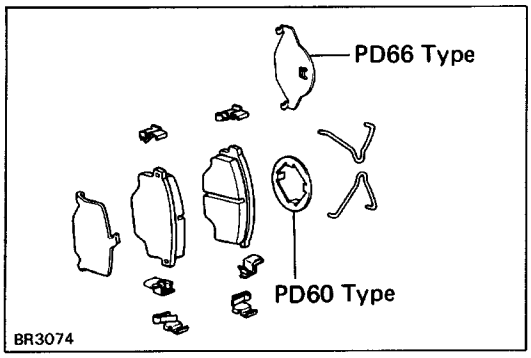
3. INSTALL CYLINDER BOOT AND SET RING IN CYLINDER



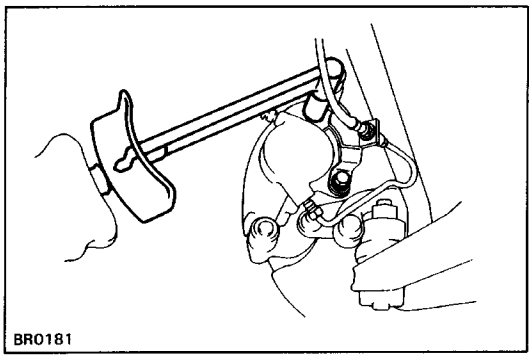
4. (PD60 TYPE)
INSTALL COLLAR, DUST BOOTS AND CYLINDER SLIDING BUSHINGS
(a) Install the collar and dust boots into the brake cylinder.
(b) Insure that the boots is secured firmly to the brake cylinder grooves.
(e) Install the bushing into the boots.
(d) Insure that the boots is secured firmly to the bush–ing grooves.



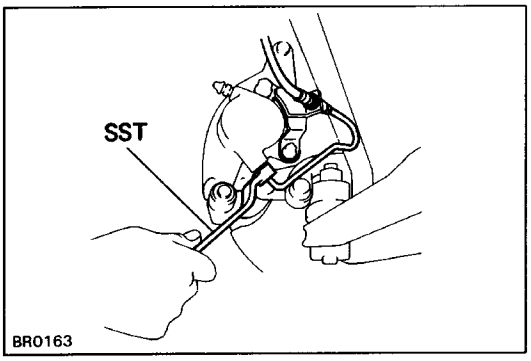
(PD66 TYPE)
INSTALL DUST BOOTS AND CYLINDER SLIDING BUSHINGS
(a) Using two socket wrenches and a vise, press in new dust boots.
(b) Install the bushing into the boots.
(c) Insure that the boots is secured firmly to the bush–ing grooves.



INSTALLATION OF CYLINDER
(See page BR–18)
1. INSTALL PADS
(See steps 7 to 8 on pages BR–19 and 20)



2. INSTALL CYLINDER
(a) Insert the brake cylinder.
(b) Install and torque the two installation bolts.
Torque: 39 N–m (400 kgf –cm, 29 ft–lbf)

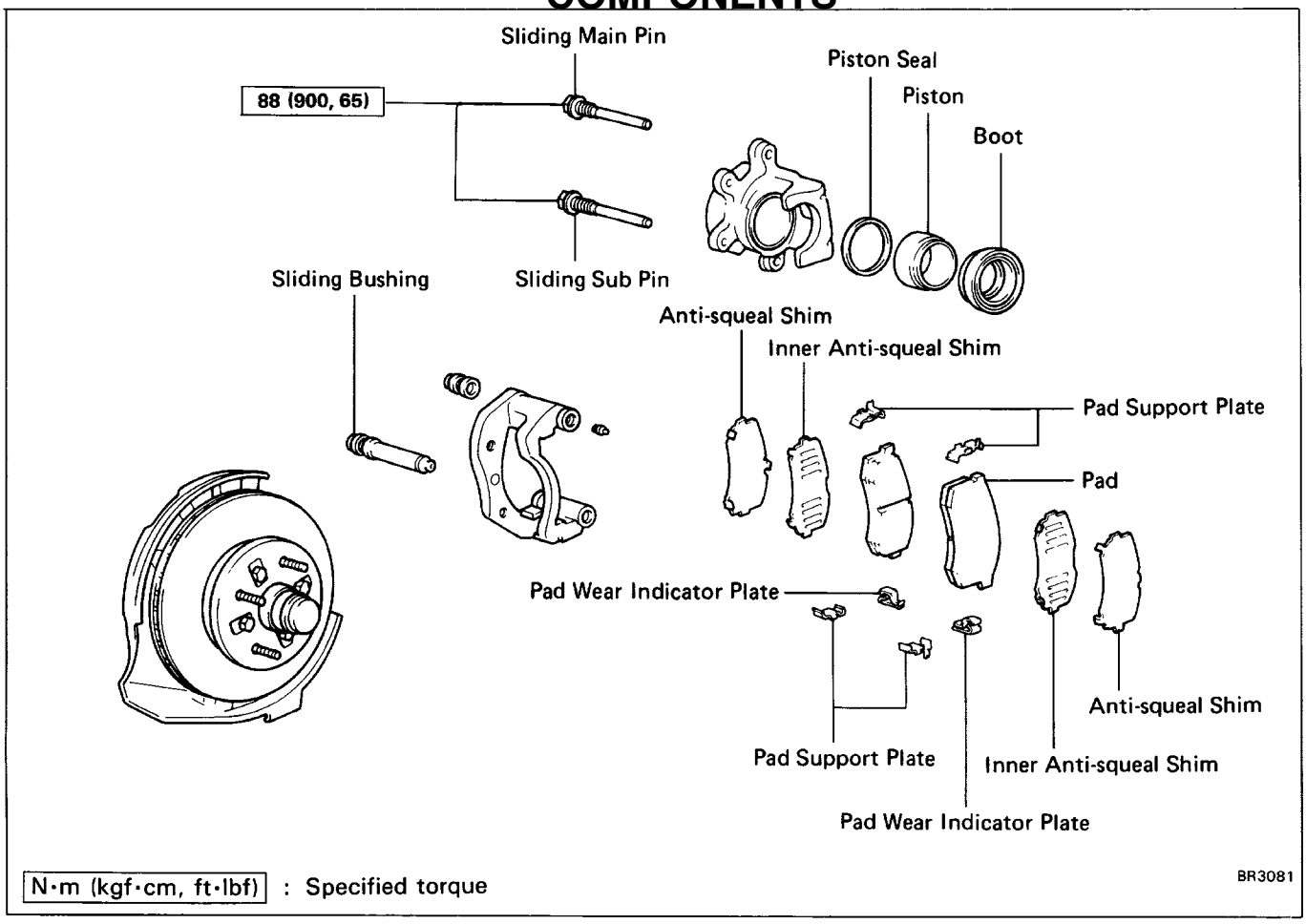


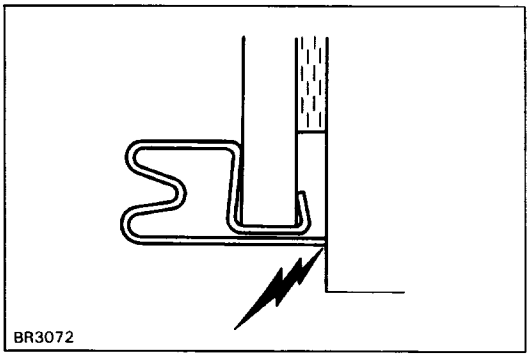
3. INSTALL BRAKE TUBE TO BRAKE CYLINDER
(a) Install the bracket to the cylinder.
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)
(b) Using SST, connect the brake tube to the cylinder.
SST 09751–36011
Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)

4. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM
(See page BR–8)

5. CHECK FOR FLUID LEAKAGE

FRONT BRAKE
2WD (FS17 18 Type Disc)
COMPONENTS

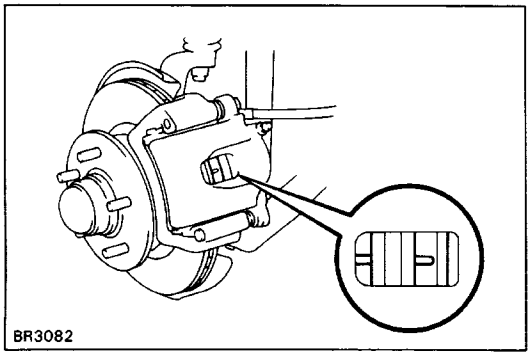




REPLACEMENT OF BRAKE PADS

HINT: If a squealing noise occurs from the front brakes while driving, check the pad wear indicator. If there are traces of the indicator contacting the rotor disc, the brake pad should be replaced.

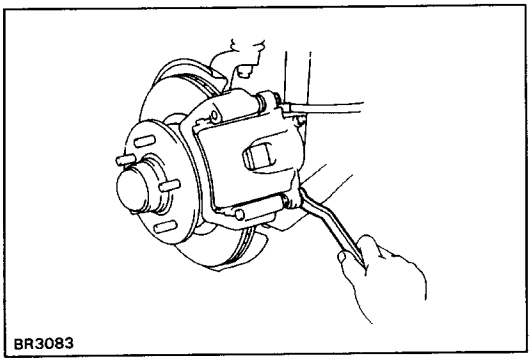
1. REMOVE FRONT WHEEL



2. INSPECT PAD LINING THICKNESS

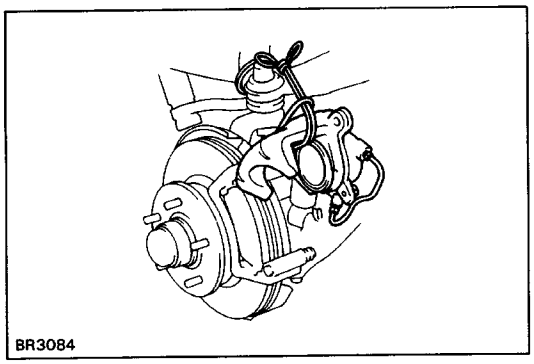
Check the pad thickness through the cylinder inspection hole and replace pads if not within specification.

Minimum thickness: 1.0 mm (0.039 in.)

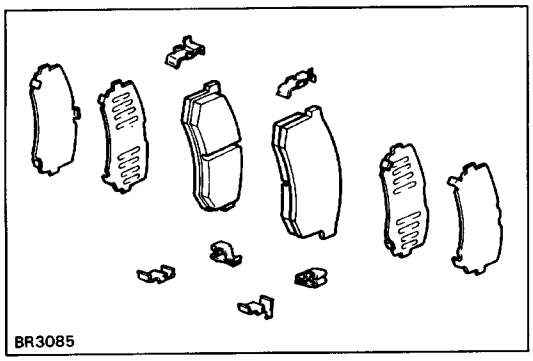


3. LIFT UP CYLINDER

(a) Remove the sliding sub pin from the torque plate.



(b) Lift up the brake cylinder and suspend it so the hose is not stretched.
HINT: Do not disconnect the brake hose.



4. REMOVE FOLLOWING PARTS:

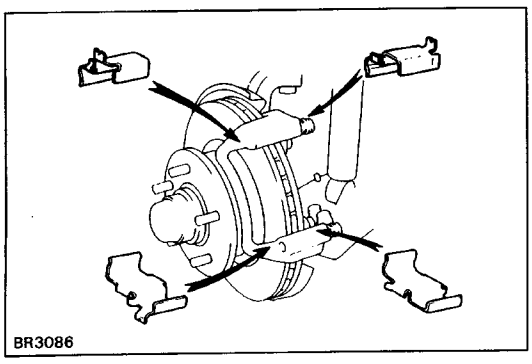
(a) Two brake pads
(b) Four anti–squeal shims
(c) Two pad wear indicator plates
(d) Four pad support plates

5. CHECK ROTOR DISC THICKNESS

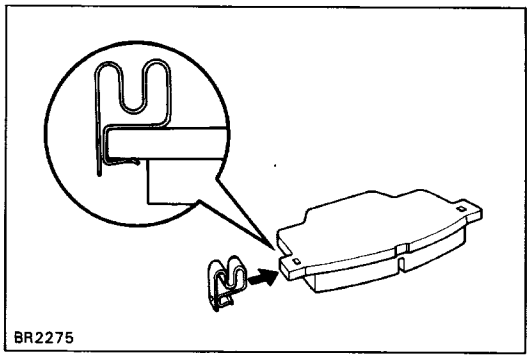
(See step 2 on page BR–30)

6. CHECK ROTOR DISC RUNOUT

(See step 3 on page BR–30)



7. INSTALL PAD SUPPORT PLATES

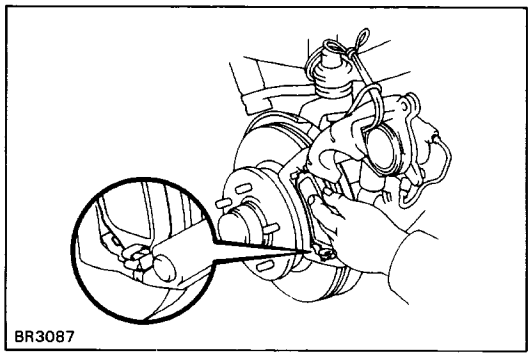


8. INSTALL NEW PADS

(a) Install a pad wear indicator plate to the pad.

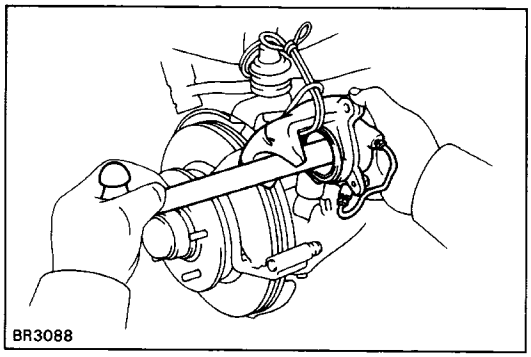
(b) Install the two anti–squeal shims to the each pad.

HINT: Apply disc brake grease to both side of the inner anti–squeal shim.



(C) Install the two pads so the wear indicator plate is facing underneath.

NOTICE: Do not allow oil or grease to get on the rubbing face.



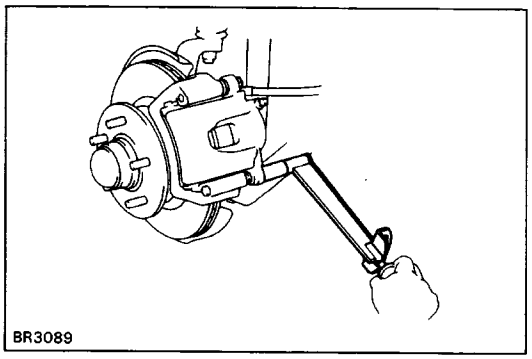
9. INSTALL CYLINDER

(a) Draw out a small amount of brake fluid from the reservoir.

(b) Press in piston with a hammer handle or an equivalent.

HINT: Always change the pad on one wheel at a time as there is a possibility of the opposite piston flying out.

(c) Insert the brake cylinder carefully so the boot is not wedged.

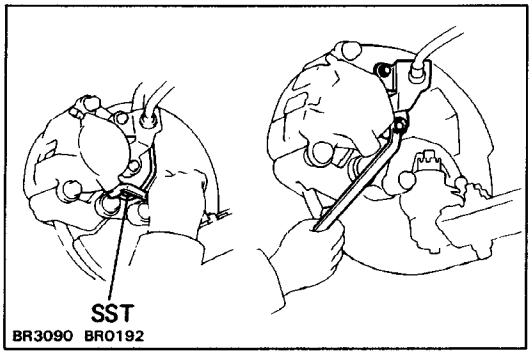


(d) Install and torque the sliding sub pin.

Torque: 88 N–m (900 kgf–cm, 65 ft–lbf)

10. INSTALL FRONT WHEEL

11. CHECK THAT FLUID LEVEL IS MAX LINE



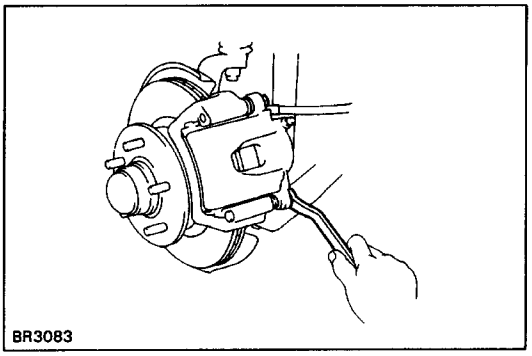
REMOVAL OF CYLINDER

(See page BR–26)

1. DISCONNECT BRAKE TUBE

(a) Using SST, disconnect the brake tube. Use a container to catch the brake fluid.
SST 09751–36011

(b) Remove the bracket from the cylinder.



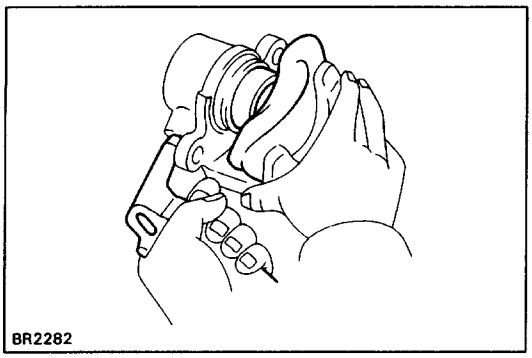
2. REMOVE CYLINDER FROM TORQUE PLATE

(a) Remove the sliding main pin and sliding sub pin.

(b) Remove the cylinder.

3. REMOVE PADS

(See step 4 on page BR–27)



DISASSEMBLY OF CYLINDER

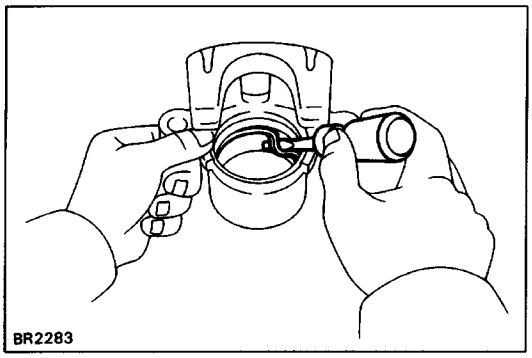
(See page BR–26)

1. REMOVE PISTON FROM CYLINDER

(a) Put a piece of cloth or an equivalent between the piston and cylinder.

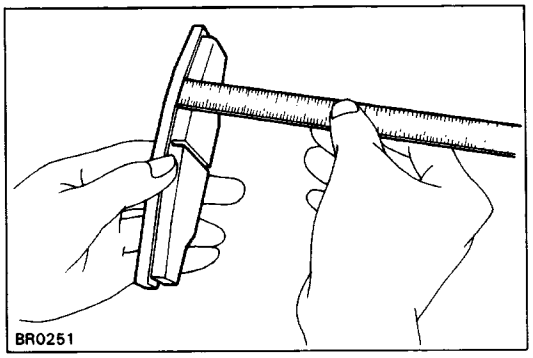
(b) Use compressed air to remove the piston and cylinder boot from the cylinder.

CAUTION: Do not place your fingers in front of the piston when using compressed air.



2. REMOVE PISTON SEAL FROM BRAKE CYLINDER

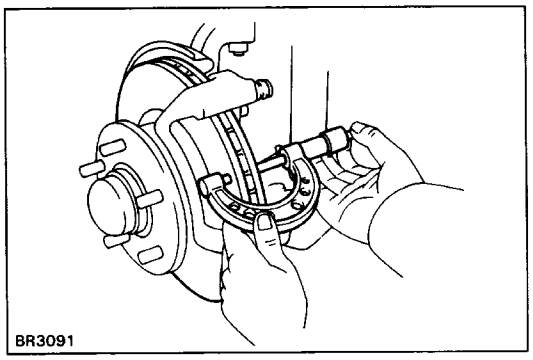
Using a screwdriver, remove the piston seal.



INSPECTION OF FRONT BRAKE COMPONENTS

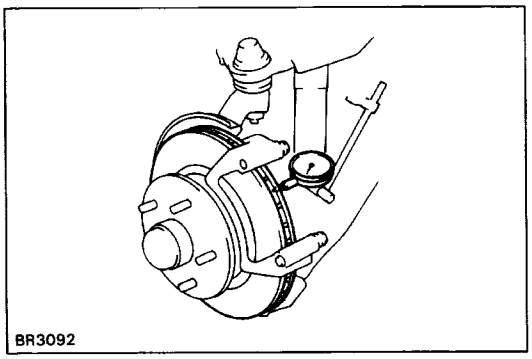
1. MEASURE PAD LINING THICKNESS

Standard thickness:
FS 17 Type 9.5 mm (0.374 in.)
FS18 Type 10.0 mm (0.394 in.)
Minimum thickness: 1.0 mm (0.039 in.)
Replace the pad if the thickness is less than the minimum (the 1.0 mm slit is no longer visible), or if it shows sign of uneven wear.



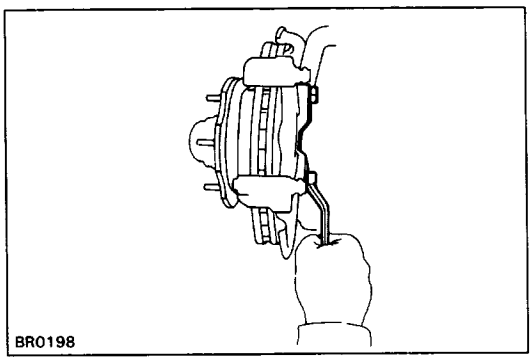
2. MEASURE ROTOR DISC THICKNESS

Standard thickness: 22.0 mm (0.866 in.)
Minimum thickness: 20.0 mm (0.787 in.)
If the disc is scored or worn, or if thickness is less than minimum, repair or replace the disc.



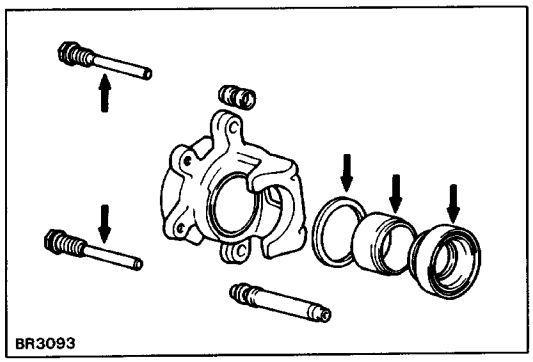
3. MEASURE ROTOR DISC RUNOUT

HINT: Before measuring the runout, confirm that the front hub bearing play is within specification.
Measure the rotor disc runout at 10 mm (0.39 in.) from the outer edge of the rotor disc.
Maximum disc runout: 0.09 mm (0.0035 in.)



4. IF NECESSARY, REPLACE ROTOR DISC

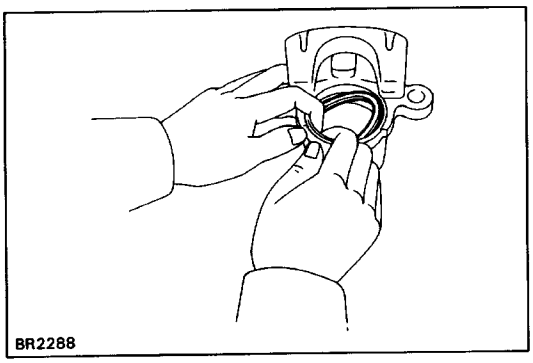
(a) Remove the torque plate from the knuckle.
(b) Remove the axle hub. (See page SA–15)
(c) Remove the disc from the axle hub.
(d) Install a new rotor disc. Torque the bolts.
Torque: 64 N–m (650 kgf–cm, 47 ft–lbf)
(e) Install the axle hub and adjust the front bearing pre. load. (See page SA–16)
(f) Install the torque plate onto the knuckle.
Torque: 108 N*m (1,100 kgf –cm, 80 ft–lbf)



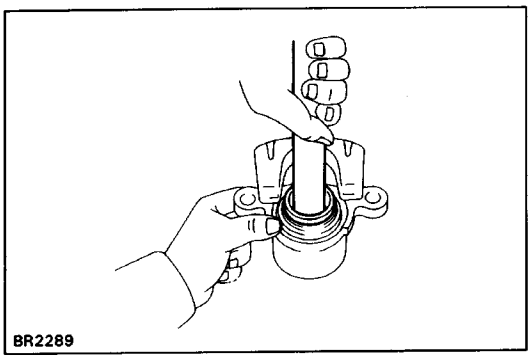
ASSEMBLY OF CYLINDER

(See page BR–26)

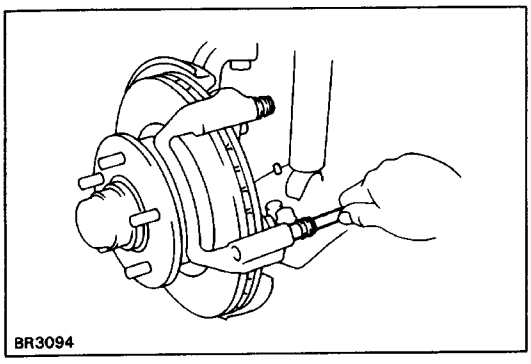
1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO PARTS INDICATED WITH ARROWS



2. INSTALL PISTON SEAL IN CYLINDER



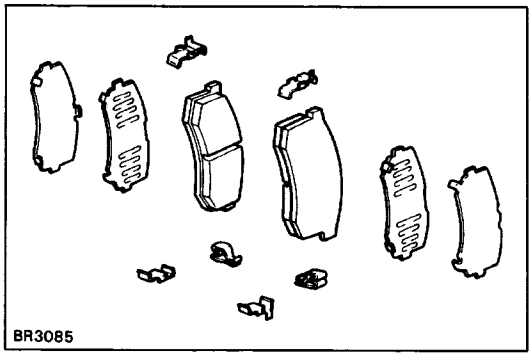
3. INSTALL PISTON AND CYLINDER BOOT IN CYLINDER



4. INSTALL PIN BOOT AND CYLINDER SLIDING BUSHING

(a) Install the pin boot into the sliding sub pin side.

(b) Using a plastic bar, install the cylinder sliding bushing into the sliding sub pin side.

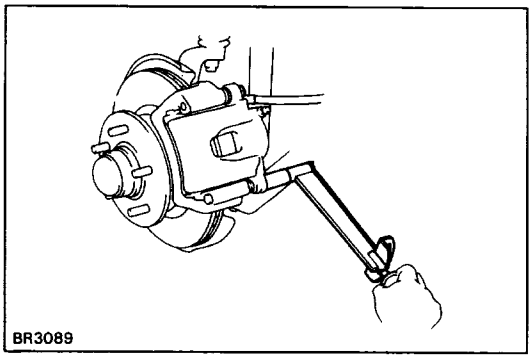

BR3085

INSTALLATION OF CYLINDER

(See page BR–26)

1. INSTALL PADS

(See steps 7 to 8 on pages BR–27 and 28)

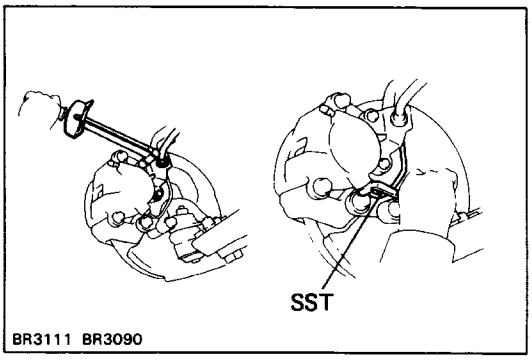

BR3089

2. INSTALL CYLINDER

(a) Insert the brake cylinder.

(b) Install and torque the two sliding pins.

Torque: 88 N–m (900 kgf–cm, 65 ft–lbf)



BR3111 BR3090

3. CONNECT BRAKE TUBE

(a) Install the bracket to the cylinder.

Torque: 18 N–m (185 kgf –cm, 13 ft–lbf)

(b) Using SST, connect the brake tube to the cylinder.

SST 09751–36011

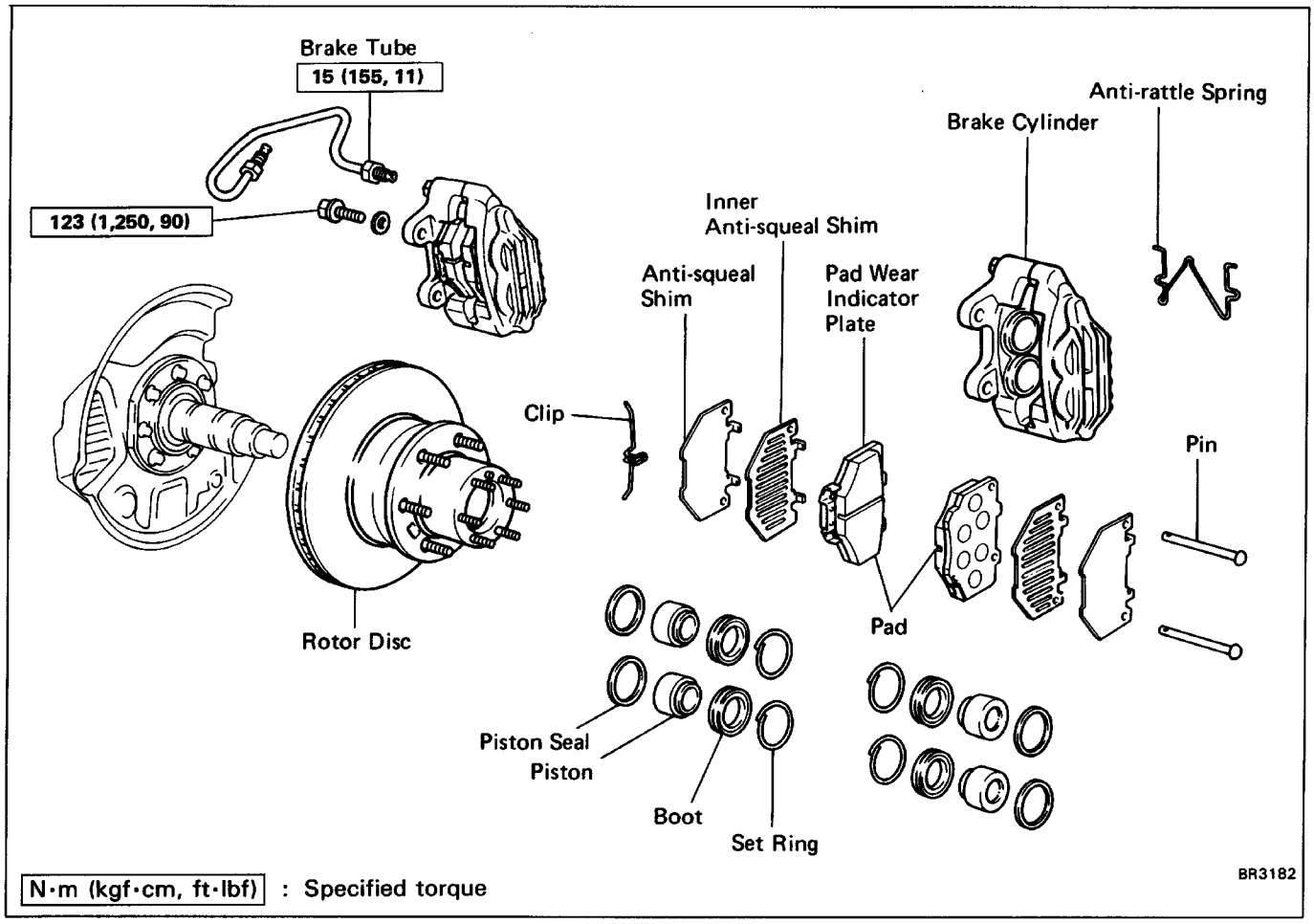
Torque: 15 N–m (155 kgf –cm, 11 ft–lbf)

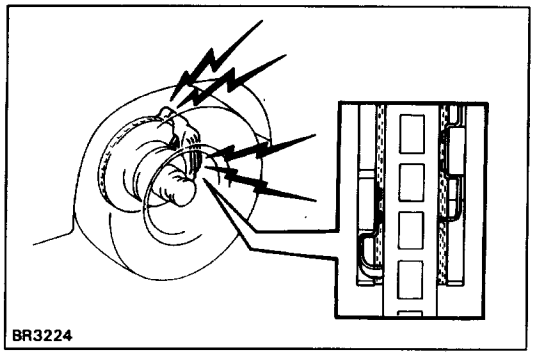
4. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

(See page BR–8)

5. CHECK FOR FLUID LEAKAGE

FRONT BRAKE
4WD (S12 + 12 Type Disc)
COMPONENTS

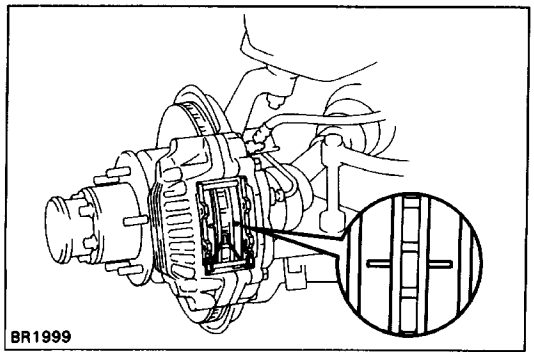




REPLACEMENT OF BRAKE PADS

HINT: If a squealing noise occurs from the brakes while driving, check the pad wear indicator plate. If the pad wear indicator plate contacts the rotor disc, the brake pads should be replaced.

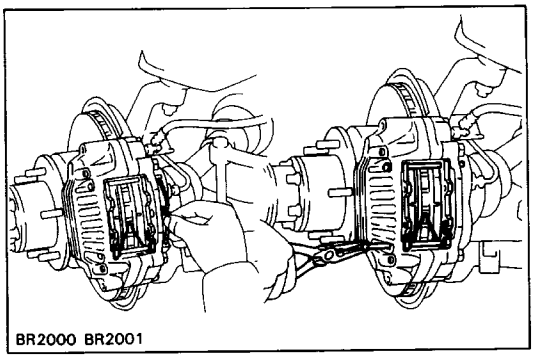
1. REMOVE FRONT WHEEL



2. INSPECT PAD LINING THICKNESS

Check the pad thickness and replace pads if not within specification.

Minimum thickness: 1.0 mm (0.039 in.)



3. REMOVE FOLLOWING PARTS

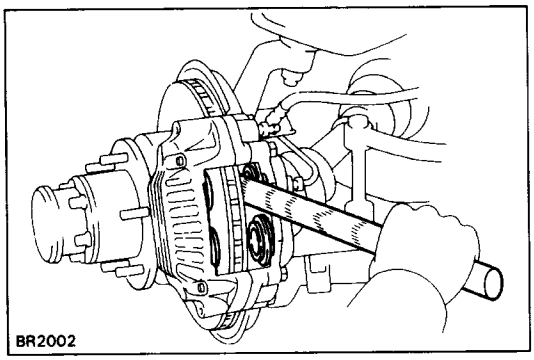
(a) Clip
(b) Two pins
(c) Anti–rattle spring
(d) Two pads
(e) Four anti–squeal shims

4. CHECK ROTOR DISC THICKNESS

(See step 2 on page BR–37)

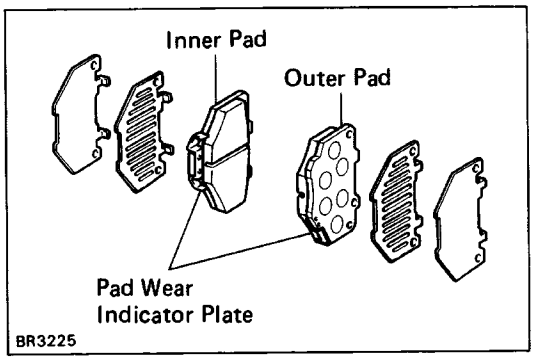
5. CHECK ROTOR DISC RUNOUT

(See step 3 on page BR–37)

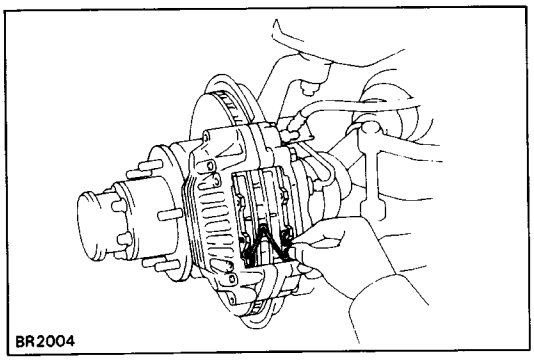


6. INSTALL NEW PADS

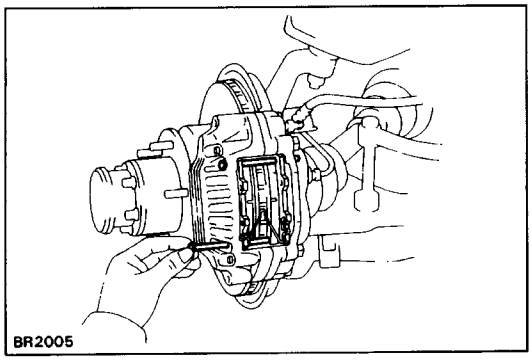
(a) Draw out a small amount of brake fluid from the res–ervoir.
(b) Press in the pistons with a hammer handle or ar equivalent.
HINT: Always change the pads on one wheel at a time as there is possibility of the opposite piston flying out.



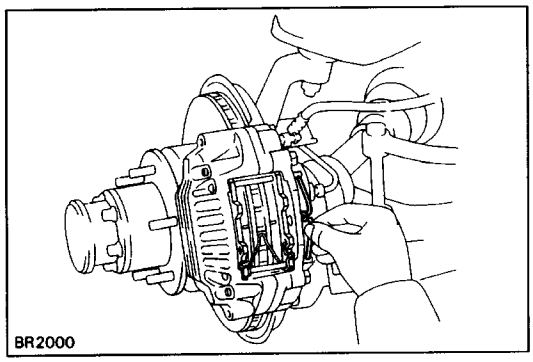
(c) Install the four anti–squeal shims to new pads a: shown.
HINT: Apply disc brake grease to both sides of the inner anti–squeal shims.
(d) Install the two pads as shown in the illustration.
NOTICE: Do not allow oil or grease to get on the rub bing face.



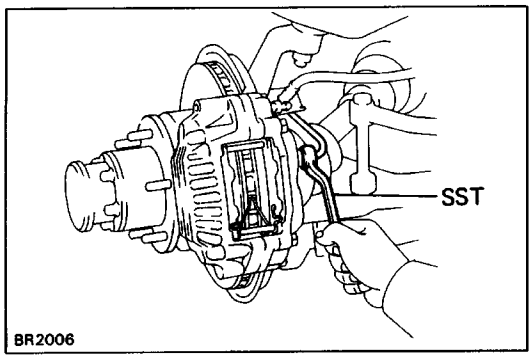
7. INSTALL ANTI–RATTLE SPRING



8. INSTALL TWO PINS



9. INSTALL CLIP



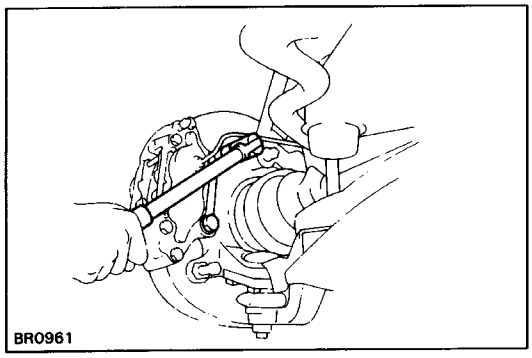
REMOVAL OF CYLINDER

(See page BR–33)

1. REMOVE FRONT WHEEL

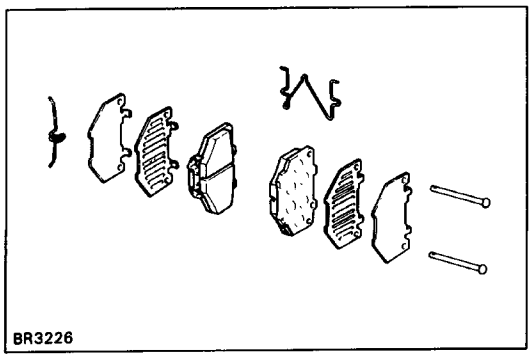
2. DISCONNECT BRAKE TUBE

Using SST, disconnect the brake tube.
Use a container to catch the brake fluid.
SST 09751–36011



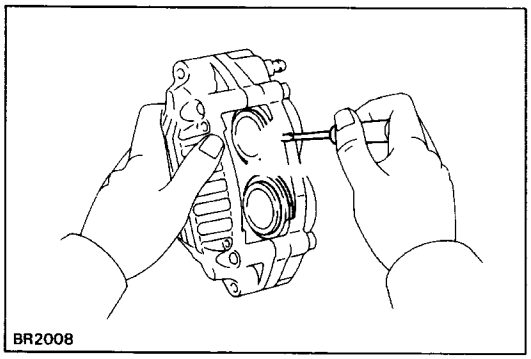
3. REMOVE CYLINDER

Remove the two mounting bolts and remove the cylinder.



4. REMOVE FOLLOWING PARTS:

(a) Clip
(b) Two pins
(c) Anti–rattle spring
(d) Two pads
(e) Four anti–squeal shims

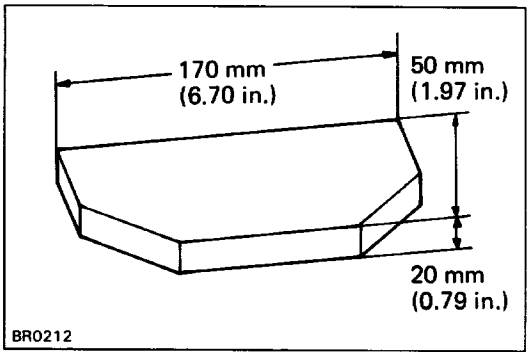

BR2008

DISASSEMBLY OF CYLINDER

(See page BR–33)

1. REMOVE CYLINDER BOOT SET RINGS AND BOOTS

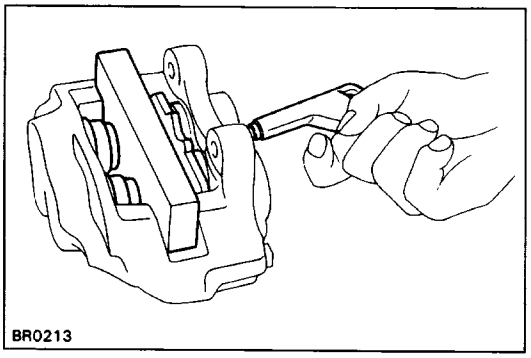
Using a screwdriver, remove the four cylinder boot set rings and four boots.



BR0212

2. REMOVE PISTONS FROM CYLINDER

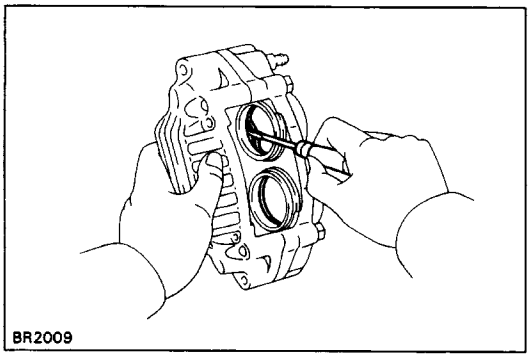
(a) Prepare the wooden plate as shown in the illustration to hold the pistons.


BR0213

(b) Place the plate between the pistons and insert a pad at one side.

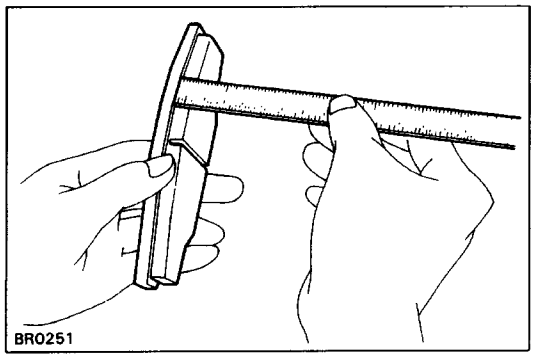
(c) Use compressed air to remove the pistons alternately from the cylinder.

NOTICE: Do not place your fingers in front of the pistons when using compressed air.


BR2009

3. REMOVE PISTON SEALS

Using a screwdriver, remove the four seals from the cylinder.



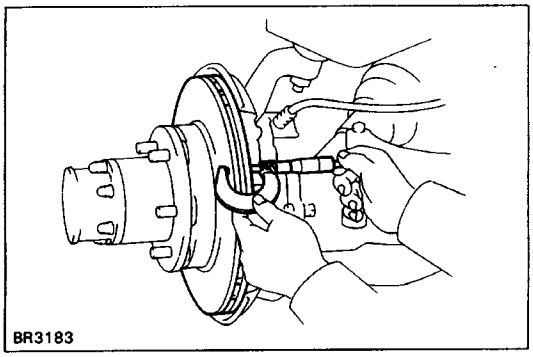
INSPECTION AND REPAIR OF FRONT BRAKE COMPONENTS

1. MEASURE PAD LINING THICKNESS

Standard thickness: 9.5 mm (0. 374 in.)

Minimum thickness: 1.5 mm (0.059 in.)

Replace the pads if the thickness is less than the mini–mum (the 1.5 mm slit is no longer visible) or if it shows sign of uneven wear.

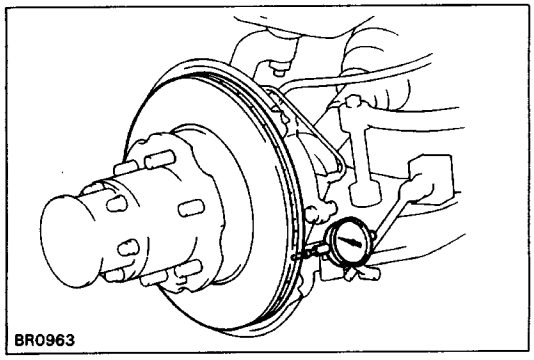


2. MEASURE ROTOR DISC THICKNESS

Standard thickness: 20.0 mm (0.787 in.)

Minimum thickness: 18.0 mm (0.709 in.)

If the disc is scored or worn, or if thickness is less than minimum, repair or replace the disc.



3. MEASURE ROTOR DISC RUNOUT

Measure the rotor disc runout at 10 mm (0.39 in.) from the outer edge of the rotor disc.

Maximum disc runout: 0.09 mm (0.0035 in.)

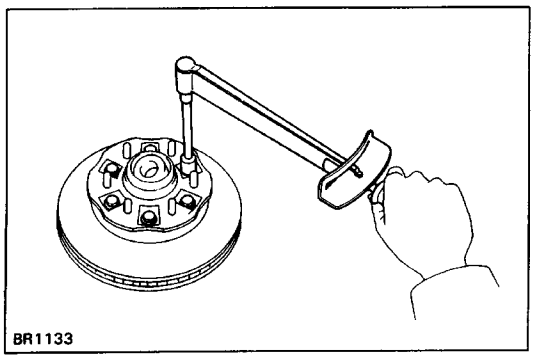
If the runout is greater than maximum, replace the rotor disc.

HINT: Before measuring the runout, confirm that the front bearing play is within specification.

4. IF NECESSARY, REPLACE ROTOR DISC

(a) Remove the front axle hub.

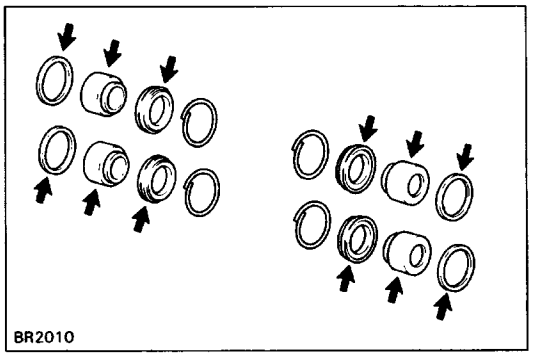
(b) Remove the disc from the axle hub.



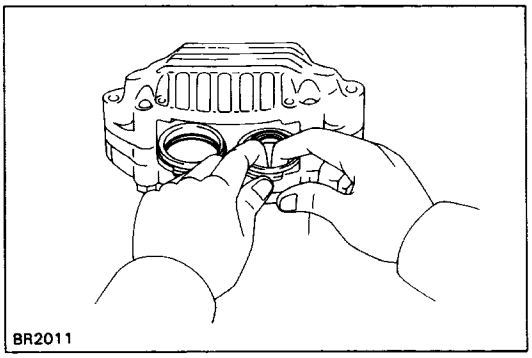
(c) Install a new rotor disc and torque the bolts.

Torque: 64 N–m (650 kgf–cm, 47 ft–lbf)

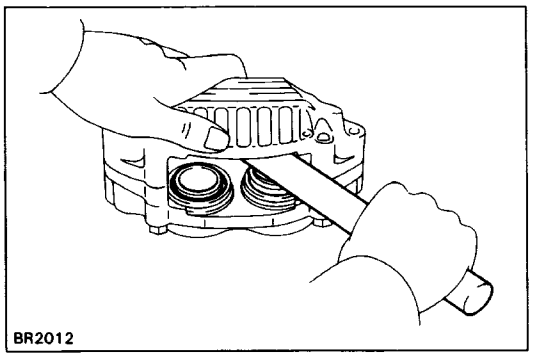
(d) Install the axle hub and adjust the front bearing pre–load.



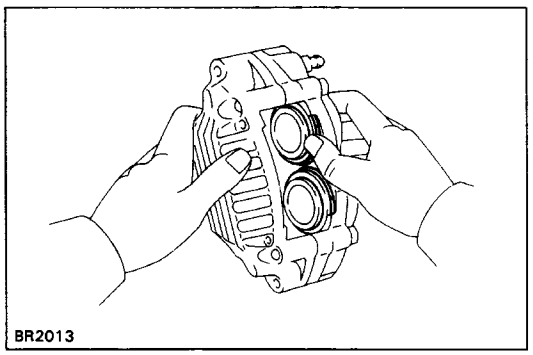
ASSEMBLY OF CYLINDER
(See page BR–33)
1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO PARTS INDICATED BY ARROWS



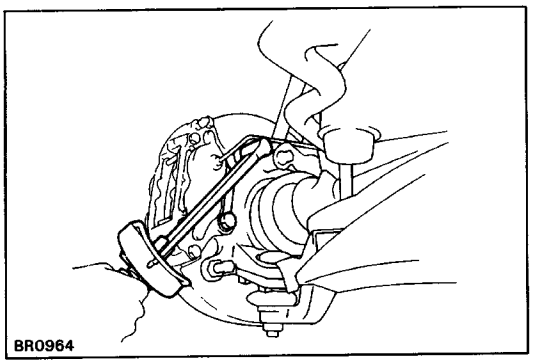
2. INSTALL PISTON SEALS INTO CYLINDER



3. INSTALL PISTONS INTO CYLINDER



4. INSTALL CYLINDER BOOTS AND SET RINGS INTO CYLINDER



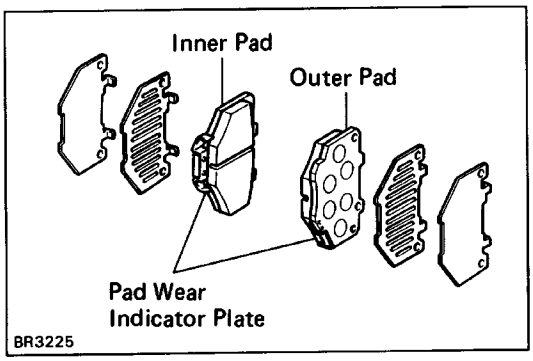
INSTALLATION OF CYLINDER

(See page BR–33)

1. INSTALL CYLINDER

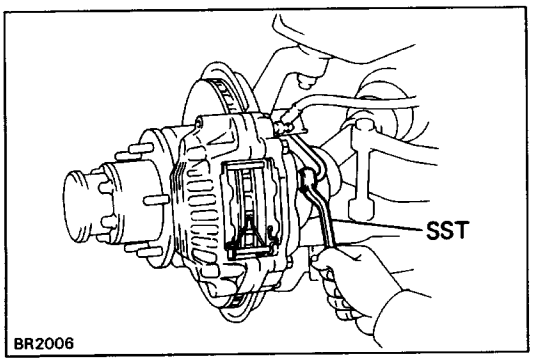
Install the brake cylinder, and torque the two mounting bolts.

Torque: 123 N–m (1,250 kgf–cm, 90 ft–lbf)



2. INSTALL PADS

(See steps 6 to 9 on pages BR–34 and 35)



3. CONNECT BRAKE TUBE

Using SST, connect the brake tube.

SST 09751–36011

Torque: 15 N–m (155 kgf –cm, 11 ft–lbf)

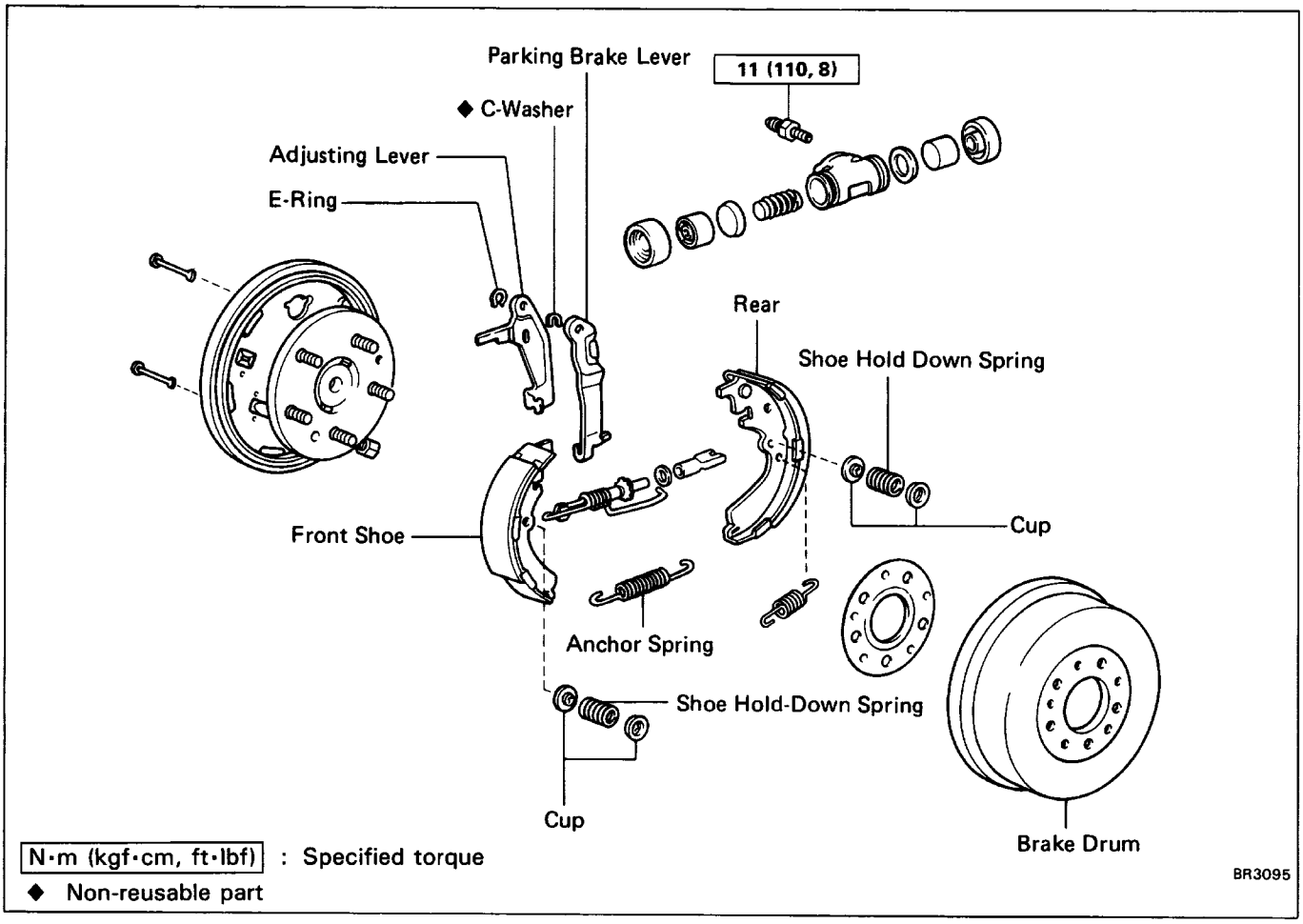
4. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

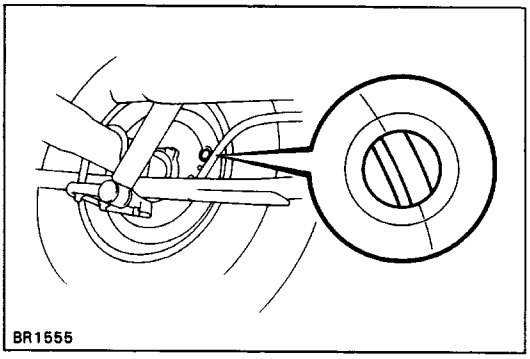
(See page BR–8)

5. CHECK FOR FLUID LEAKAGE

6. INSTALL FRONT WHEEL

REAR BRAKE
2WD (Leading–Trailing Type)
COMPONENTS





REMOVAL OF REAR BRAKE

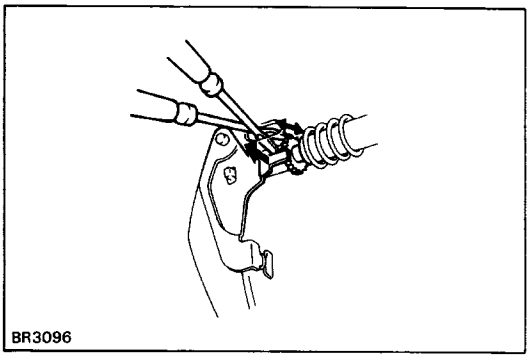
1. INSPECT SHOE LINING THICKNESS

Remove the inspection hole plug, and check the shoe lining thickness through the hole.

If less than minimum, replace the shoes.

Minimum thickness: 1.0 mm (0.039 in.)

2. REMOVE REAR WHEEL

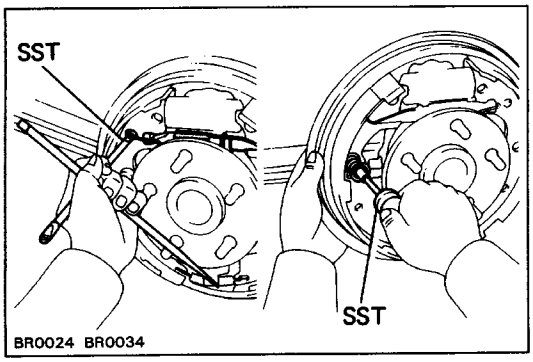


3. REMOVE BRAKE DRUM

HINT: If the brake drum cannot be easily removed, perform the following steps.

(a) Insert a screwdriver through the hole in the backing plate, and hold the automatic adjusting lever away from the adjusting bolt.

(b) Using another screwdriver, reduce the brake shoe adjustment by turning the adjusting bolt.



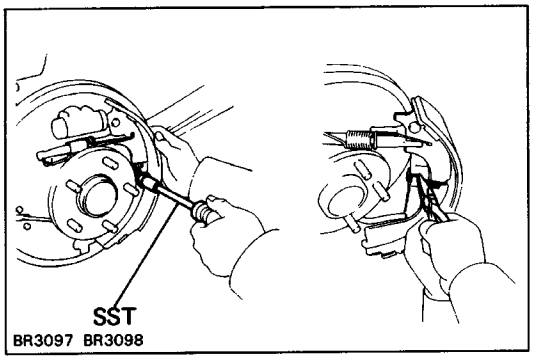
4. REMOVE FRONT SHOE

(a) Using SST, disconnect the return spring.
SST 09703–30010

(b) Using SST, remove the shoe hold–down spring, cups and pin.
SST 09718–00010

(c) Disconnect the anchor spring from the front shoe and remove the front shoe.

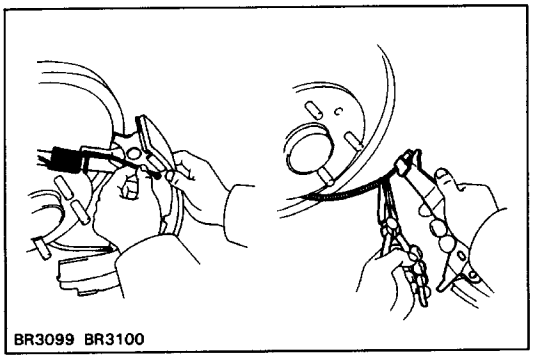
(d) Remove the anchor spring from the rear shoe.



5. REMOVE ADJUSTER AND REAR SHOE

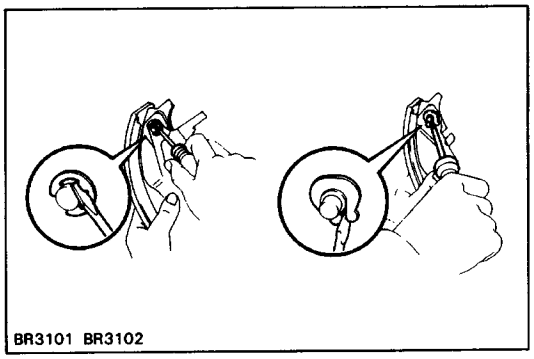
(a) Using SST, remove the shoe hold–down spring, cups and pin.
SST 09718–00010

(b) Remove the adjusting lever spring.



(c) Remove the adjuster together with the return spring.

(d) Using pliers, disconnect the parking brake cable from the lever and remove the rear shoe.



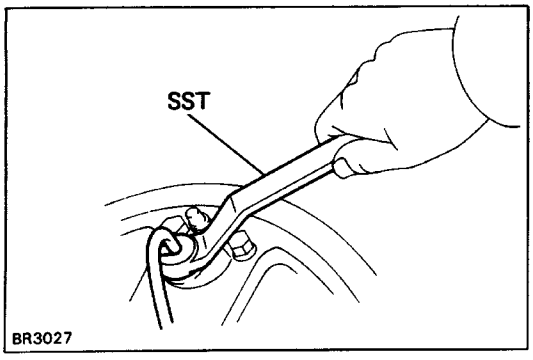
6. REMOVE AUTOMATIC ADJUSTING LEVER AND PARKING BRAKE LEVER

(a) Remove the E–ring.

(b) Remove the automatic adjusting lever.

(c) Remove the C–washer.

(d) Remove the parking brake lever.

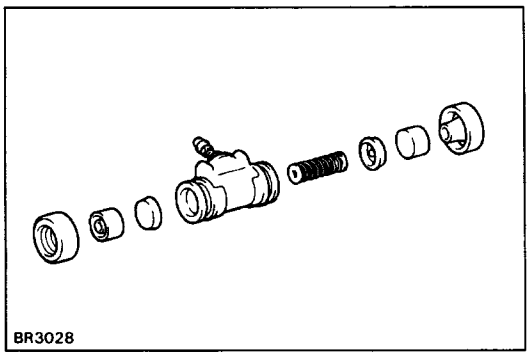


7. DISCONNECT BRAKE TUBE FROM WHEEL CYLINDER

Using SST, disconnect the brake tube. Use a container to catch the brake fluid.
SST 09751–36011

8. REMOVE WHEEL CYLINDER

Remove the two bolts and wheel cylinder.



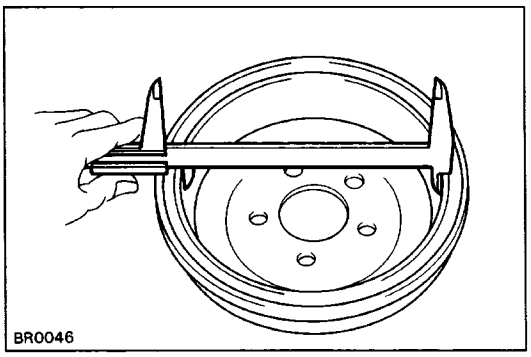
9. REMOVE FOLLOWING PARTS FROM WHEEL CYLINDER

(a) Two boots
(b) Two pistons
(c) Two piston cups
(d) Spring

INSPECTION AND REPAIR OF REAR BRAKE COMPONENTS

1. INSPECT DISASSEMBLED PARTS

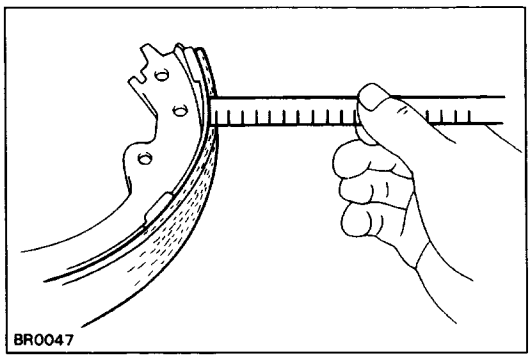
Inspect the disassembled parts for wear, rust or damage.



2. INSPECT BRAKE DRUM INSIDE DIAMETER

Standard inside diameter: 254.0 mm (10.00 in.)
Maximum inside diameter: 256.0 mm (10.08 in.)

If the drum is scored or worn, the brake drum may be lathed to the maximum inside diameter.

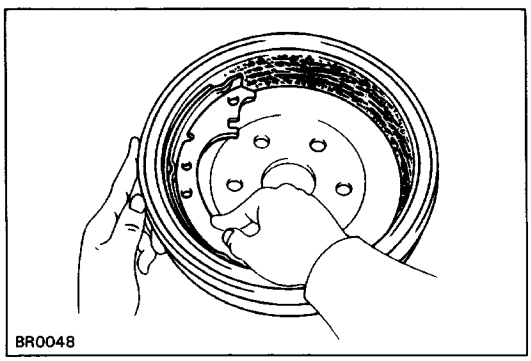


3. INSPECT BRAKE SHOE LINING THICKNESS

Standard thickness: 5.0 mm (0.197 in.)
Minimum thickness: 1.0 mm (0.039 in.)

If the shoe lining is less than minimum or shows signs of uneven wear, replace the brake shoes.

HINT: If any of the brake shoes have to be replaced, replace all of the rear brake shoes in order to maintain even braking.



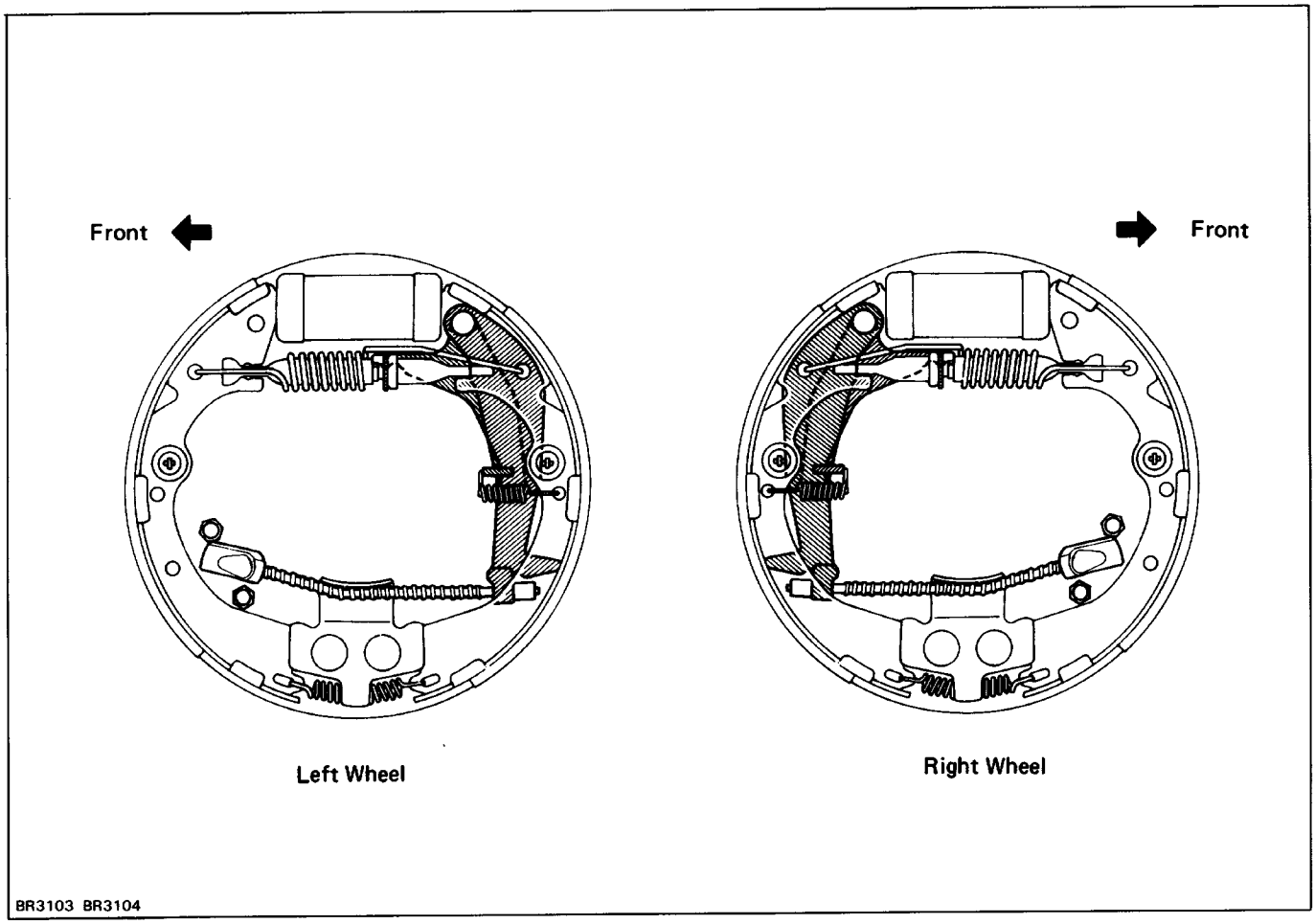
4. INSPECT BRAKE LINING AND DRUM FOR PROPER CONTACT

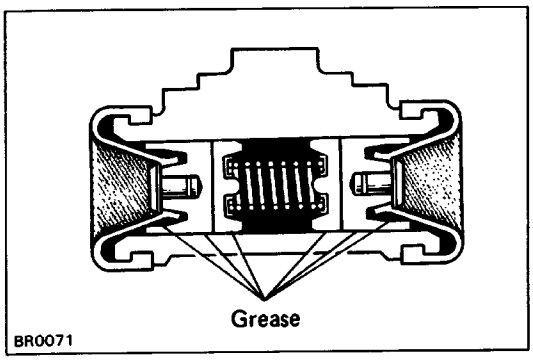
If the contact between the brake lining and drum is improper, repair the lining with a brake shoe grinder, or replace the brake shoe assembly.

INSTALLATION OF REAR BRAKE

(See page BR–40)

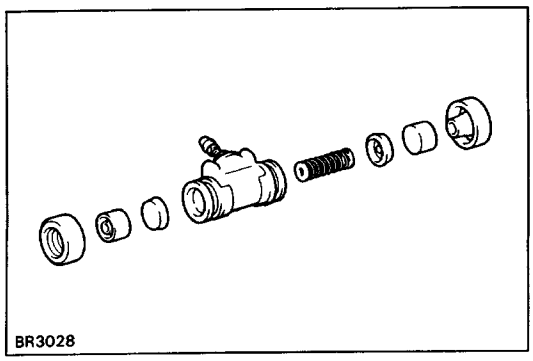
HINT: Assemble the parts in the correct direction as shown.





1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO FOLLOWING PARTS:

(a) Two piston cups
(b) Two pistons
(c) Two boots



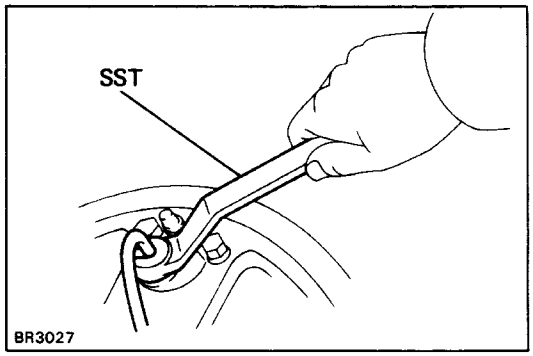
2. ASSEMBLE WHEEL CYLINDER

(a) Install the spring and two piston cups into the wheel cylinder. Check that the flanges of the piston cups are pointed inward.
(b) Install the two pistons.
(c) Install the two boots.

3. INSTALL WHEEL CYLINDER

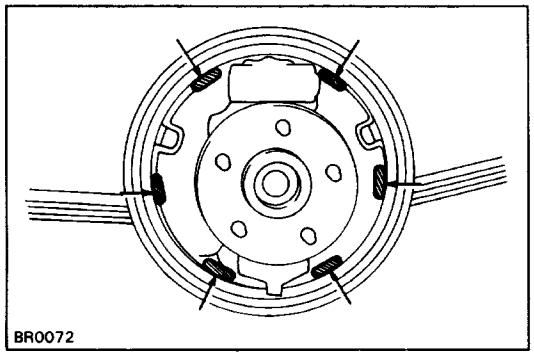
Install the wheel cylinder on the backing plate with the two bolts.

Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)



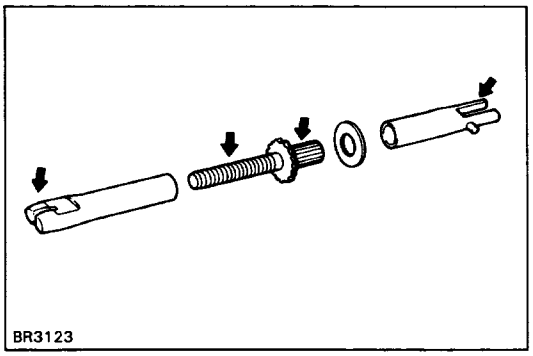
4. CONNECT BRAKE TUBE TO WHEEL CYLINDER

Using SST, connect the brake tube.
SST 09751–36011
Torque: 15 N–m (155 kgf –cm, 11 ft–lbf)

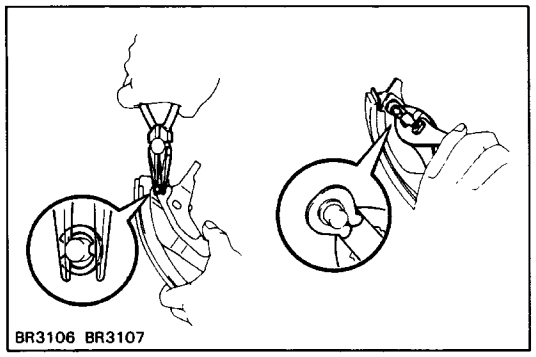


5. APPLY HIGH TEMPERATURE GREASE TO FOLLOWING PARTS:

(a) Backing plate and brake shoe contact points
(b) Anchor plate and brake shoe contact points

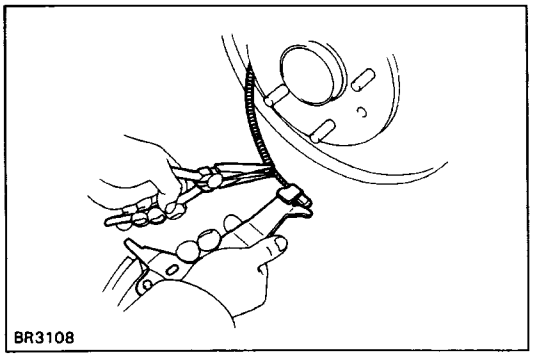


(c) Adjusting bolt
(d) Adjuster and brake shoe contact points



6. INSTALL PARKING BRAKE LEVER AND AUTOMATIC ADJUSTING LEVER

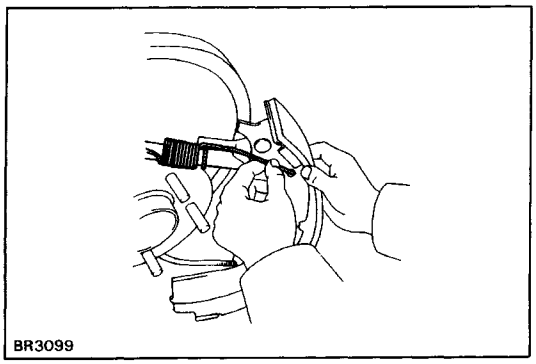
(a) Install the parking brake lever with a new C–washer.
(b) Install the automatic adjusting lever with the E–ring.



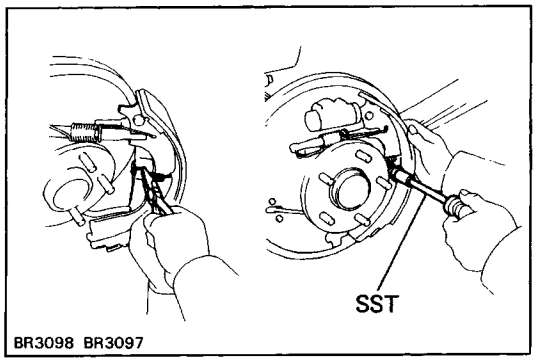
7. INSTALL ADJUSTER AND REAR SHOE

NOTICE: Do not allow oil or grease to get on the rubbing face.

(a) Using pliers, connect the parking brake cable to the lever.

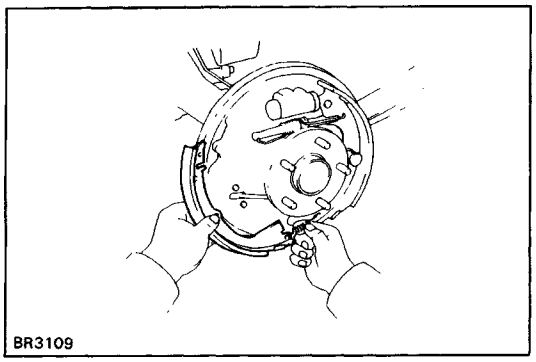

BR3099

(b) Set the adjuster and return spring.



BR3098 BR3097

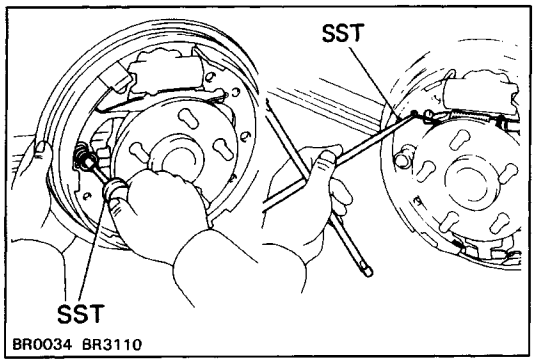
(c) Install the adjusting lever spring.
(d) Set the rear shoe in place with the end of the shoe inserted in the wheel cylinder and the other end in the anchor plate.
(e) Using SST, install the shoe hold–down spring, cups and pin.
SST 09718–00010


BR3109

8. INSTALL FRONT SHOE

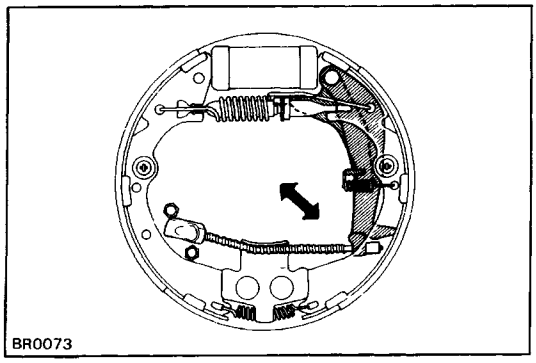
NOTICE: Do not allow oil or grease to get on the rubbing face.

(a) Install the anchor spring between the front and rear shoes.
(b) Set the front shoe in place with the end of the shoe inserted in the wheel cylinder and the adjuster in place.



BR0034 BR3110

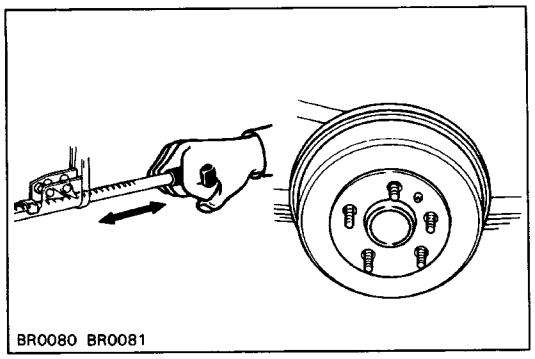
(c) Using SST, install the shoe hold–down spring, cups and pin.
SST 09718–00010
(d) Using SST, connect the return spring.
SST 09703–30010


BR0073

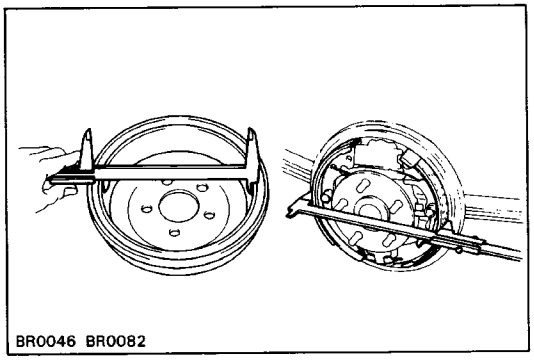
9. CHECK OPERATION OF AUTOMATIC ADJUSTER MECHANISM

(a) Move the parking brake lever of the rear shoe back and forth, as shown. Check that the adjusting bolt turns.

If the adjuster does not turn, check for incorrect installation of the rear brakes.


BR0080 BR0081

(b) Adjust the adjuster length to the shortest possible amount.
(c) Install the drum.
(d) Pull the parking brake lever all the way up until a clicking sound can no longer be heard.


BR0046 BR0082

10. CHECK CLEARANCE BETWEEN BRAKE SHOES AND DRUM

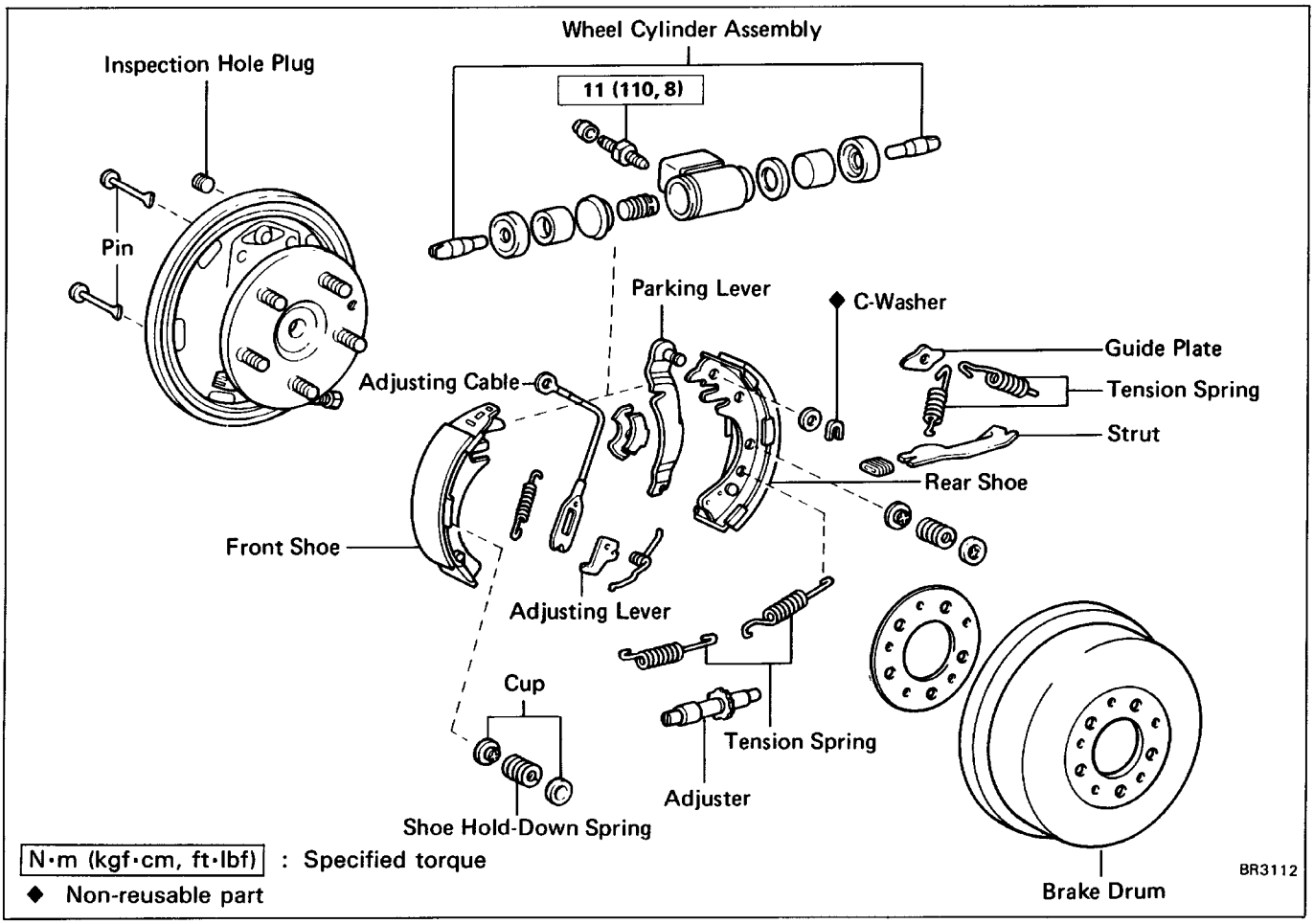
(a) Remove the drum.
(b) Measure the brake drum inside diameter and diameter of the brake shoes. Check that the difference between the diameters is the correct shoe clearance.
Shoe clearance: 0.6 mm (0.024 in.)
If incorrect, check the parking brake system.

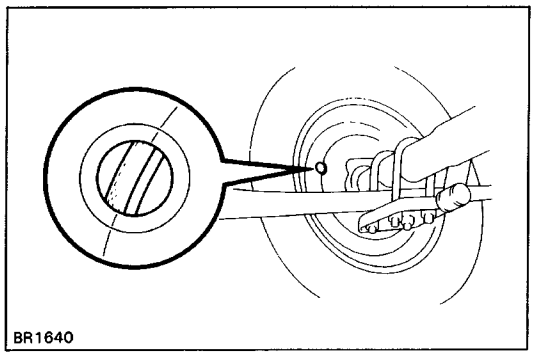
11. INSTALL BRAKE DRUM AND REAR WHEEL

12. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM
(See page BR–8)

13. CHECK FOR FLUID LEAKAGE

REAR BRAKE
2WD (Duo–Servo Type)
COMPONENTS





REMOVAL OF REAR DRUM BRAKE

1. INSPECT SHOE LINING THICKNESS

Remove the inspection hole plug, and check the shoe lining thickness through the hole.

If less than minimum, replace the shoes.

Minimum thickness: 1.0 mm (0.039 in.)

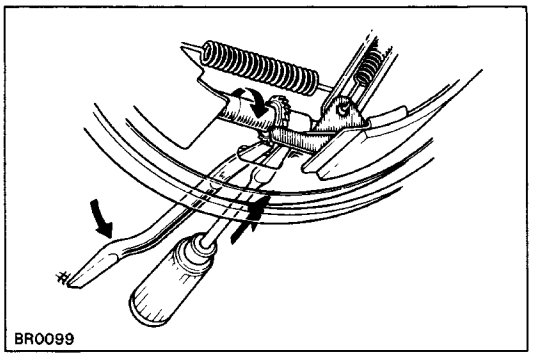
2. REMOVE BRAKE DRUM

(Single tire)

Remove the brake drum.

(Double tire)

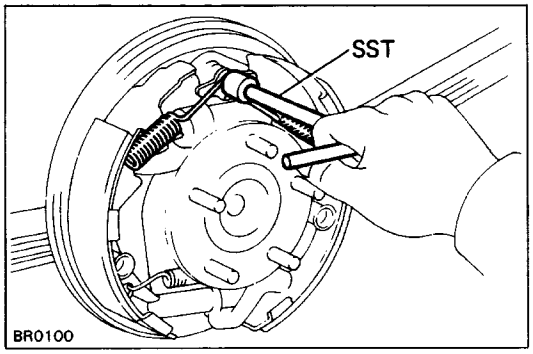
Remove the rear axle shaft and remove the drum with the axle hub.



HINT: If the brake drum cannot be removed easily, perform the following steps.

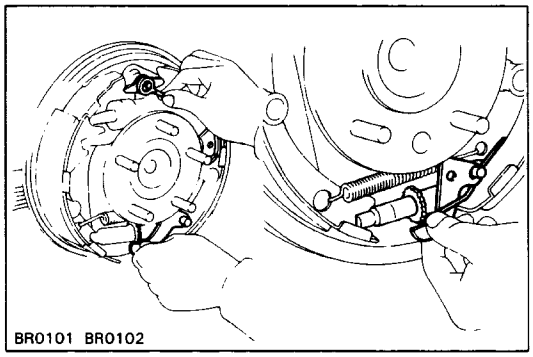
(a) Insert a screwdriver through the hole in the backing plate, and hold the automatic adjusting lever away from the adjusting bolt.

(b) Using another screwdriver, reduce the brake shoe adjustment by turning the adjusting bolt.



3. REMOVE TWO SHOE RETURN SPRINGS

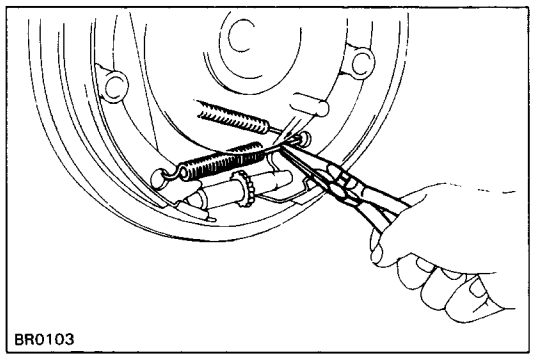
Using SST, remove the two return springs.
SST 09717–20010



4. REMOVE ADJUSTING CABLE, SHOE GUIDE PLATE, CABLE GUIDE AND ADJUSTING LEVER

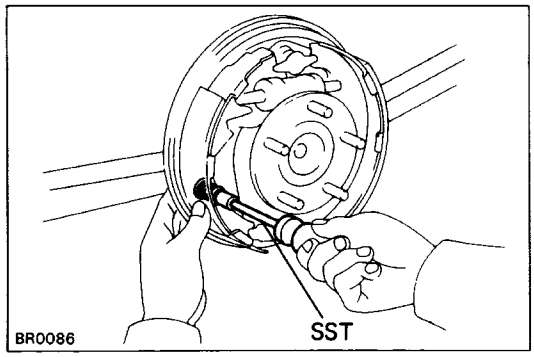
(a) Push up the lever and remove the cable, shoe guide plate and cable guide.

(b) Take off the spring from the lever and remove the le–ver and spring.



5. REMOVE TWO TENSION SPRINGS

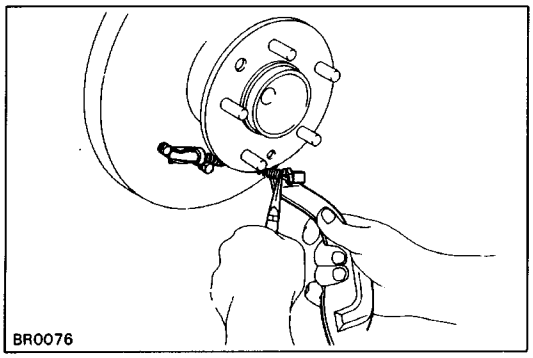
Using pliers, remove the two tension springs.



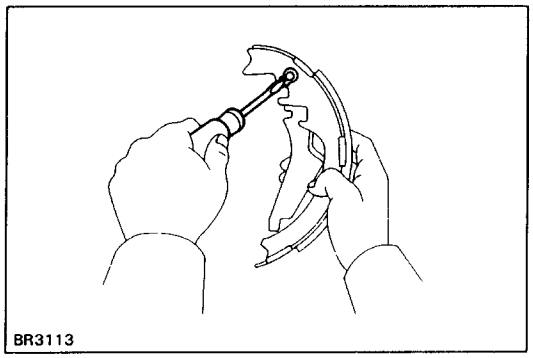
6. REMOVE SHOES, ADJUSTER AND STRUT

(a) Using SST, remove the shoe hold down springs, cups and pins.
SST 09718–00010

(b) Remove the shoes, adjuster and strut.

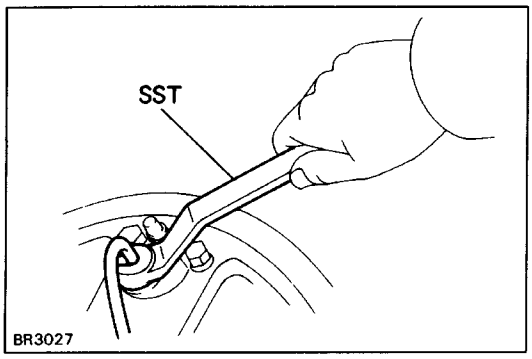


(c) Disconnect the parking brake cable from the parking brake lever



7. REMOVE PARKING BRAKE LEVER

Using a screwdriver, remove the parking brake lever.



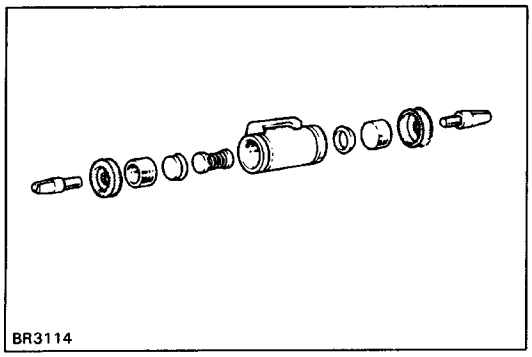
8. DISCONNECT BRAKE TUBE FROM WHEEL CYLINDER

Using SST, disconnect the brake tube. Use a container to catch the brake fluid.

SST 09751–36011

9. REMOVE WHEEL CYLINDER

Remove the two bolts and wheel cylinder.



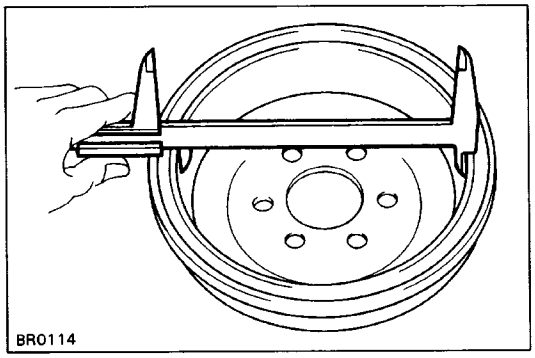
10. REMOVE FOLLOWING PARTS FROM WHEEL CYLINDER

(a) Two piston rods
(b) Two boots
(c) Two pistons
(d) Two piston cups
(e) Spring

INSPECTION AND REPAIR OF REAR BRAKE COMPONENTS

1. INSPECT DISASSEMBLED PARTS

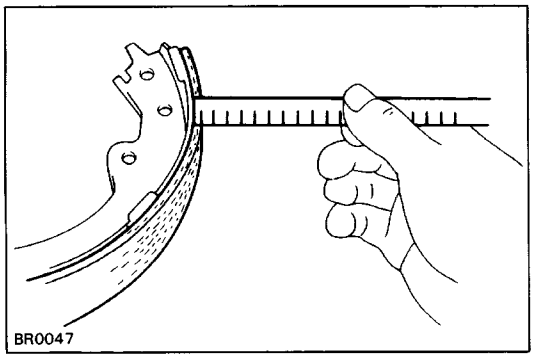
Inspect the disassembled parts for wear, rust or damage.



2. INSPECT BRAKE DRUM INSIDE DIAMETER

Standard inside diameter: 254.0 mm (10.00 in.)
Maximum inside diameter: 256.0 mm (10.08 in.)

If the drum is scored or worn, the brake drum may be lathed to the maximum inside diameter.

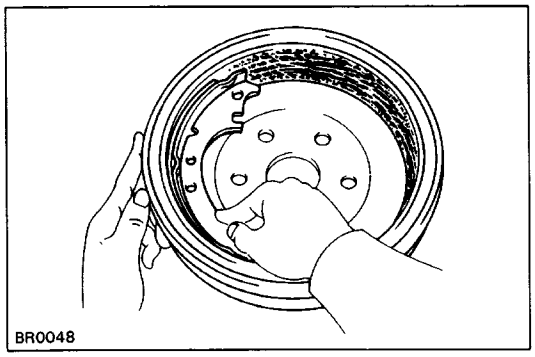


3. INSPECT BRAKE SHOE LINING THICKNESS

Standard thickness: 5.0 mm (0.197 in.)
Minimum thickness: 1.0 mm (0.039 in.)

If the shoe lining is less than minimum or shows signs of uneven wear, replace the brake shoes.

HINT: If any of the brake shoes have to be replaced, replace all of the rear brake shoes in order to maintain even braking.



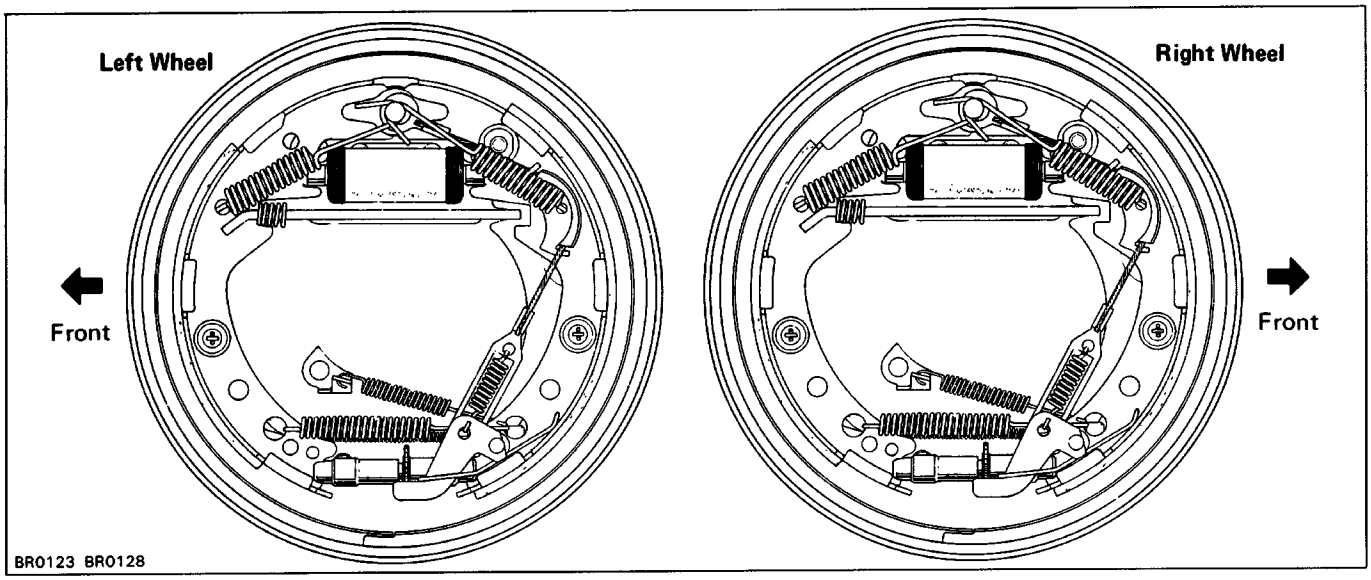
4. INSPECT BRAKE LINING AND DRUM FOR PROPER CONTACT

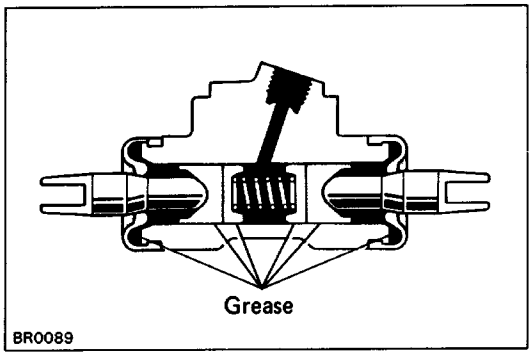
If the contact between the brake lining and drum is improper, repair the lining with a brake shoe grinder, or replace the brake shoe assembly.

INSTALLATION OF REAR BRAKE

(See page BR–47)

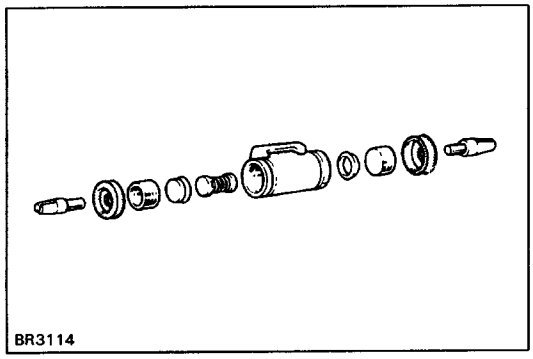
HINT: Assemble the parts in the correct direction as shown.





1. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO FOLLOWING PARTS

(a) Two piston cups
(b) Two pistons



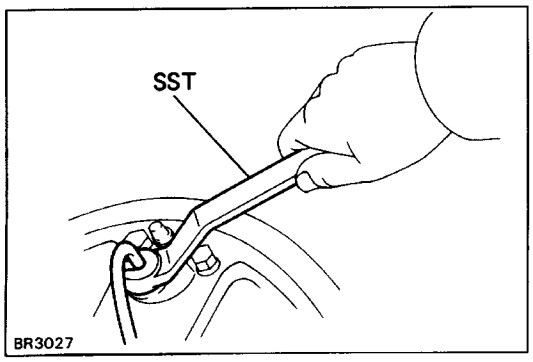
2. ASSEMBLE WHEEL CYLINDER

(a) Install the spring and two piston cups into the wheel cylinder. Check that the flanges of the piston cups are pointed inward.
(b) Install the two pistons.
(c) Install the boots and rods.

3. INSTALL WHEEL CYLINDER

Install the wheel cylinder on the backing plate with the two bolts.

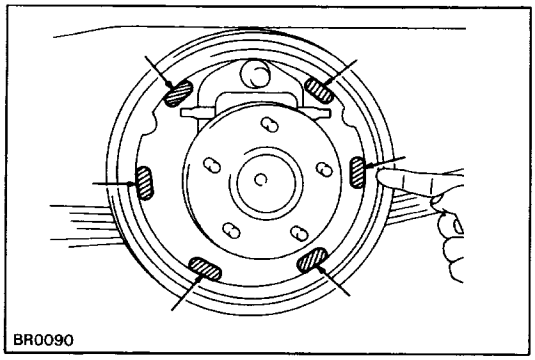
Torque: 14 N–m (145 kgf–cm, 10 ft–lbf)



4. CONNECT BRAKE TUBE TO WHEEL CYLINDER

Using SST, connect tube.
SST 09751–36011

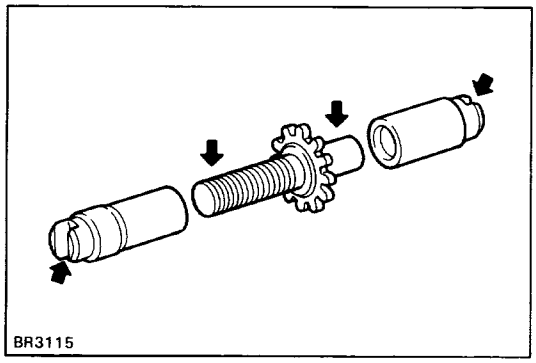
Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)



5. APPLY HIGH TEMPERATURE GREASE TO FOLLOWING PARTS:

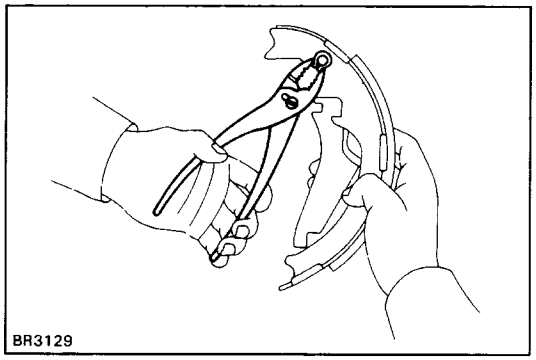
(a) Backing plate and brake shoe contact points

(b) Piston rod and brake shoe contact points



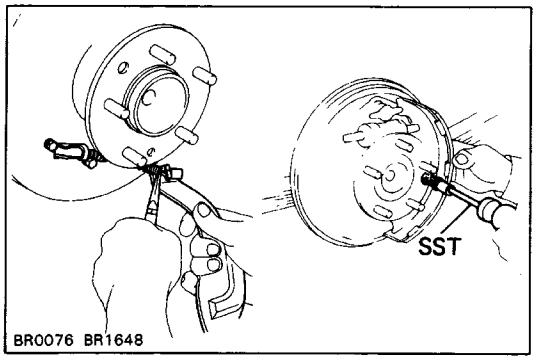
(c) Adjusting bolt

(d) Adjuster and brake shoe contact point



6. INSTALL PARKING BRAKE LEVER

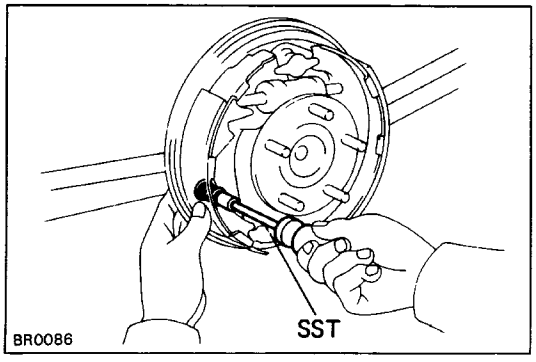
Using pliers, install the parking brake lever with a new C–washer.



7. INSTALL REAR SHOE

(a) Install the parking brake cable to the parking brake lever.

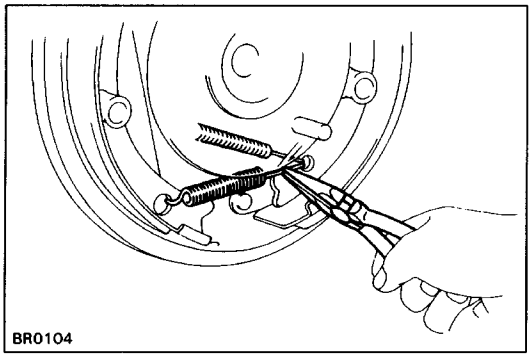
(b) Set the rear brake shoe in place with the end of the shoe inserted in the piston rod. Using SST, install the shoe hold–down spring and pin.
SST 09718–00010



8. INSTALL STRUT AND FRONT SHOE

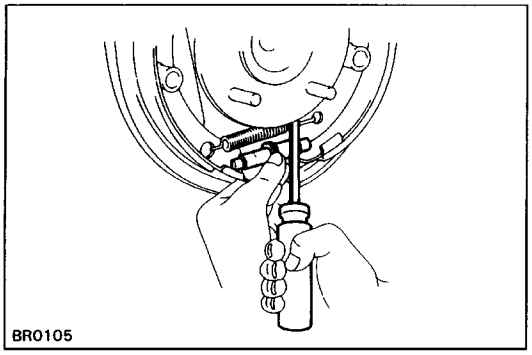
(a) Install the strut with the spring.

(b) Set the front brake shoe in place with the end of the shoe inserted in the piston rod and the strut in place. Using SST, install the shoe hold–down spring and pin.
SST 09718–00010



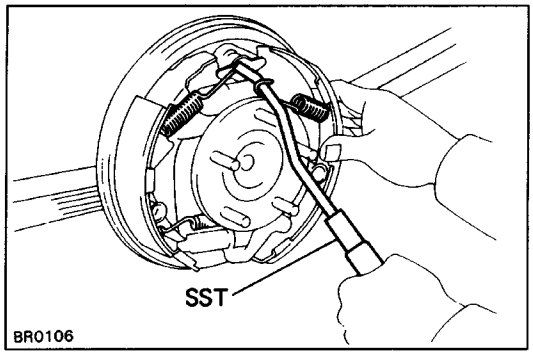
9. INSTALL TWO TENSION SPRINGS

Using pliers, install the two tension springs.



10. INSTALL ADJUSTER

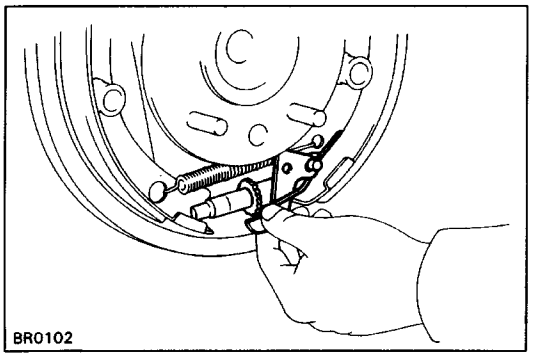
Using a screwdriver, open the shoes and install the adjuster.



11. INSTALL SHOE GUIDE PLATE, CABLE GUIDE, ADJUSTING CABLE AND RETURN SPRINGS

(a) Install the shoe guide plate, cable guide and adjusting cable.

(b) Using SST, install the front return spring and then install the rear return spring.
SST 09718–20010

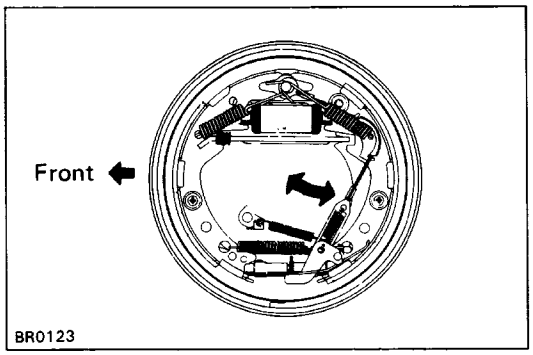


12. INSTALL ADJUSTING LEVER

(a) Install the tension spring to the rear shoe.

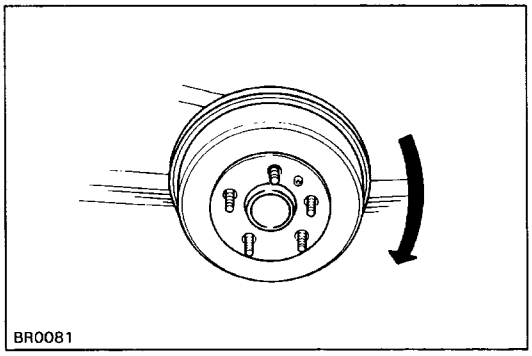
(b) Hook the adjusting lever with the cable and install the lever.

(c) Hook the adjusting lever with the tension spring.

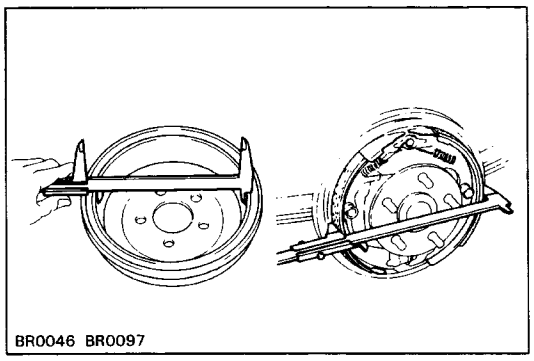


13. CHECK OPERATION OF AUTOMATIC ADJUSTER MECHANISM

(a) Pull the adjusting cable backward as shown, and release. Check that the adjusting bolt turns.
If the bolt does not turn, check for incorrect installation of the rear brakes.



(b) Adjust the adjuster to the shortest possible length.
(c) Install the drum.
(d) Turn the brake drum in reverse direction and depress the brake pedal. Repeat this procedure until a clicking sound can no longer be heard.



14. CHECK CLEARANCE BETWEEN BRAKE SHOES AND DRUM

(a) Remove the drum.
(b) Measure the brake drum inside diameter and diameter of the brake shoes. Check that the difference between the diameters is the correct shoe clearance.
Shoe clearance: 0.6 mm (0.024 in.)
If incorrect, check the parking brake system.

15. INSTALL BRAKE DRUM

(Single tire)
Install the brake drum.
(Double tire)
Install the brake drum with axle hub and install the rear axle shaft. (See page SA–128)

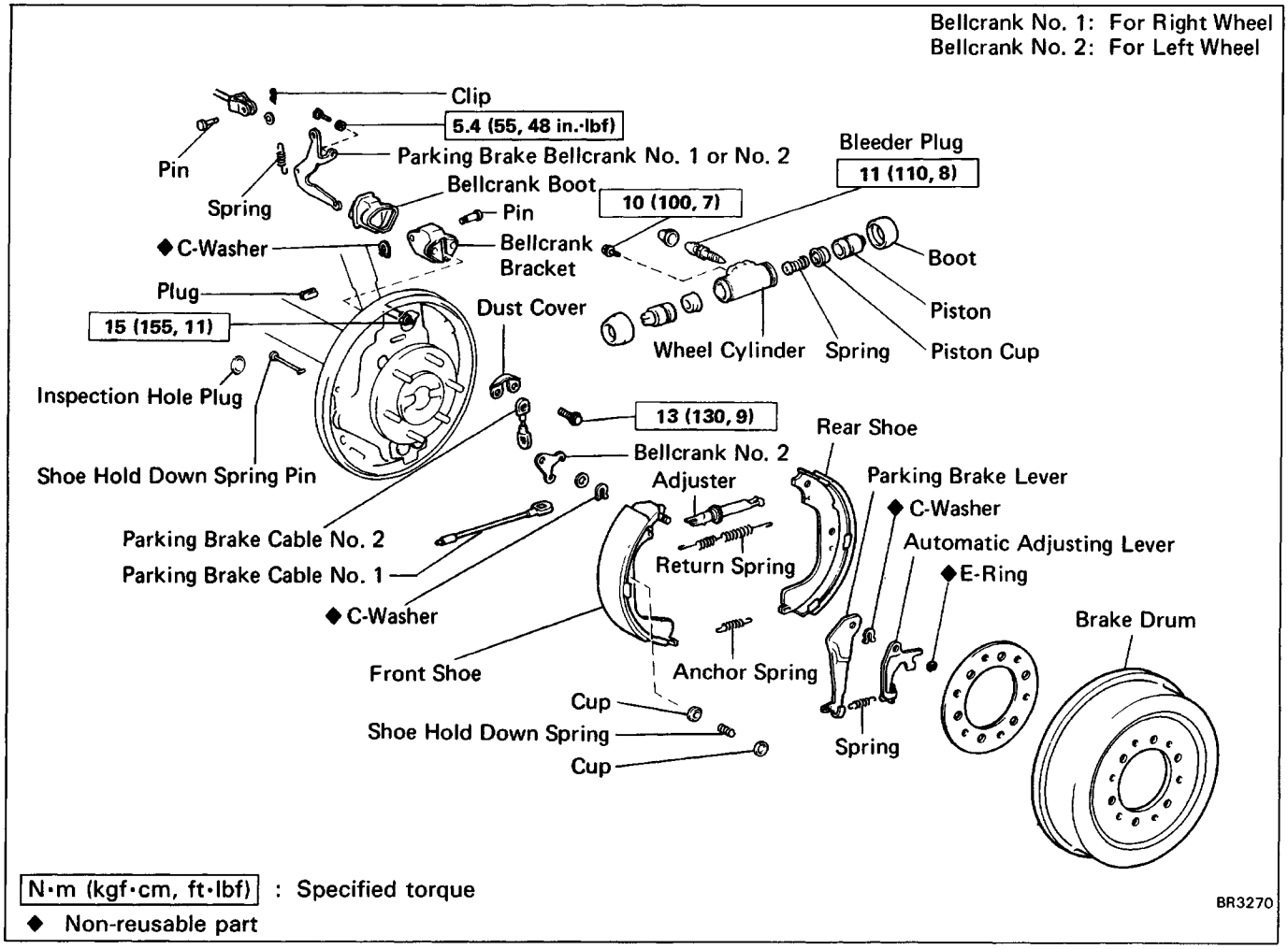
16. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM

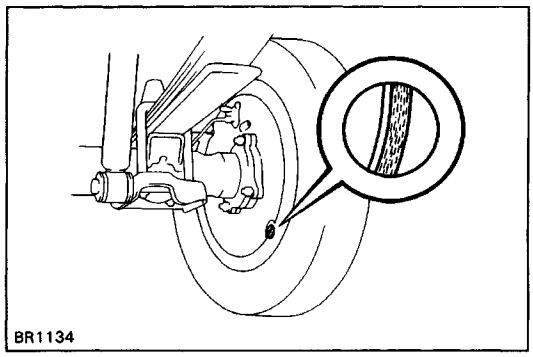
(See page BR–8)

17. CHECK FOR FLUID LEAKAGE

REAR BRAKE 4WD

COMPONENTS





REMOVAL OF REAR DRUM BRAKE

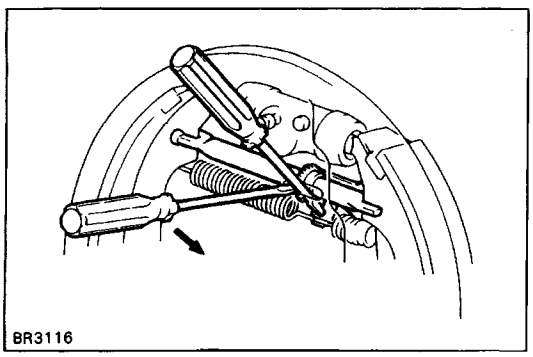
1. INSPECT SHOE LINING THICKNESS

Remove the inspection hole plug, and check the shoe lining thickness through the hole.

If less than minimum, replace the shoes.

Minimum thickness: 1.0 mm (0.039 in.)

2. REMOVE REAR WHEEL

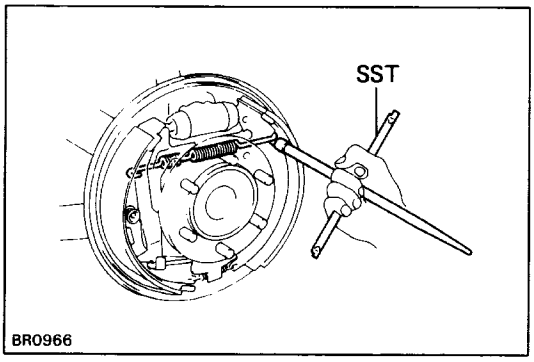


3. REMOVE BRAKE DRUM

HINT: If the brake drum cannot be removed easily, perform the following.

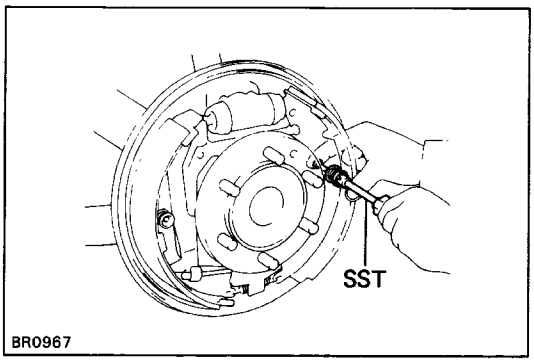
(a) Insert a screwdriver through the hole in the backing plate, and hold the automatic adjusting lever away from the adjusting bolt.

(b) Using another screwdriver, reduce the brake shoe adjustment by turning the adjusting bolt clockwise.

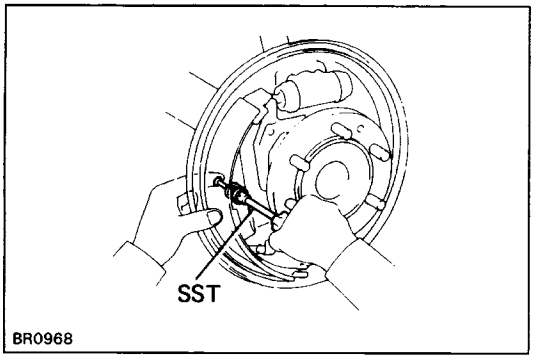


4. REMOVE REAR SHOE

(a) Using SST, disconnect the return spring.
SST 09703–30010

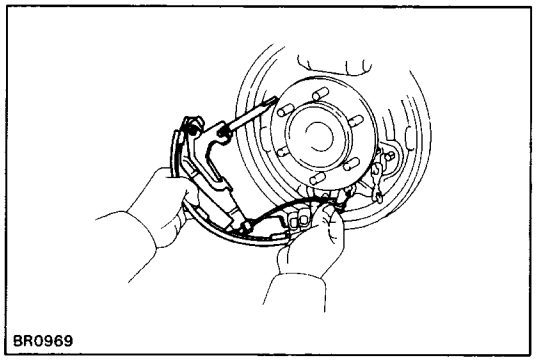


(b) Using SST, remove the shoe hold–down spring, cups and pin.
SST 09718–00010
(c) Disconnect the anchor spring from the rear shoe and remove the rear shoe.
(d) Remove the anchor spring from the. front shoe.

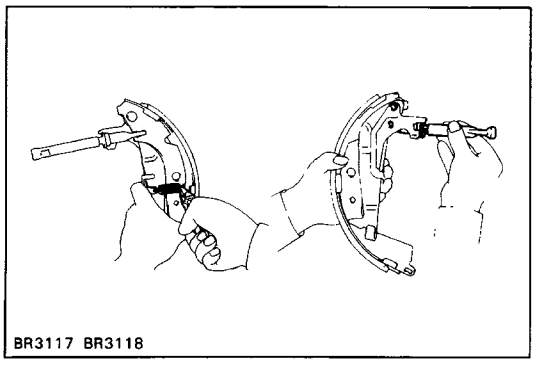


5. REMOVE FRONT SHOE

(a) Using SST, remove the shoe hold–down spring, cups and pin.
SST 09718–00010
(b) Remove the return spring from the front shoe.

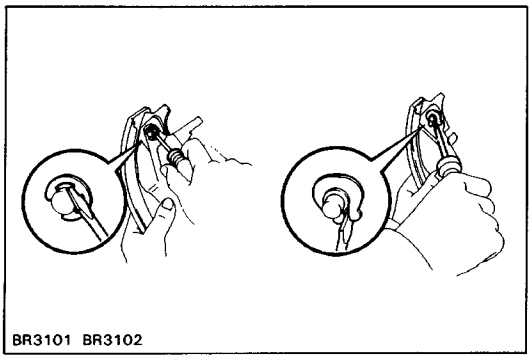


(c) Disconnect the parking brake cable No. 1 from the parking brake bellcrank No.3.
(d) Remove the front shoe with adjuster.
(e) Disconnect the parking brake cable from the front shoe.



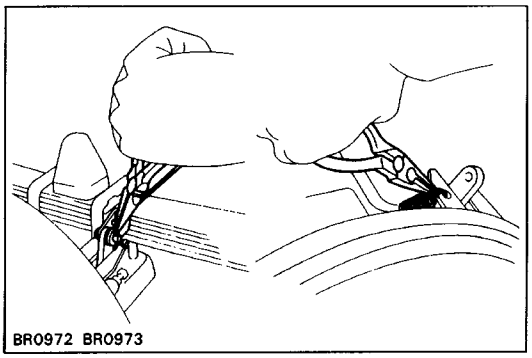
6. REMOVE ADJUSTER FROM FRONT SHOE

(a) Remove the adjusting lever spring.
(b) Remove the adjuster.


BR3101 BR3102

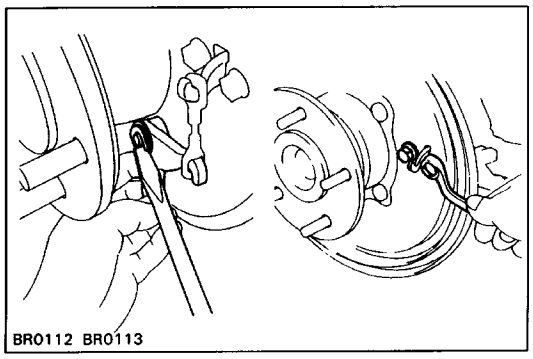
7. REMOVE AUTOMATIC ADJUSTING LEVER AND PARKING BRAKE LEVER

(a) Remove the E–ring.
(b) Remove the automatic adjusting lever.
(c) Remove the C–washer.
(d) Remove the parking brake lever.

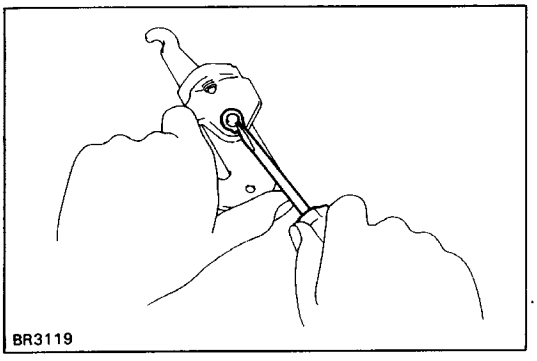

BR0972 BR0973

8. REMOVE AND DISASSEMBLE PARKING BRAKE BELLCRANK

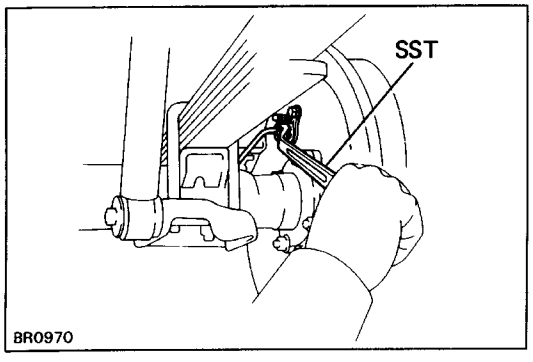
(a) Remove the clip and disconnect the parking brake cable.
(b) Remove the tension spring.


BR0112 BR0113

(c) Using a screwdriver, remove the bellcrank No.3 from the backing plate with parking brake cable No. 2.
(d) Remove the parking brake bellcrank No. 1 or No. 2 and dust cover with the two bolts.
(e) Remove the bellcrank boot from the bellcrank bracket.


BR3119

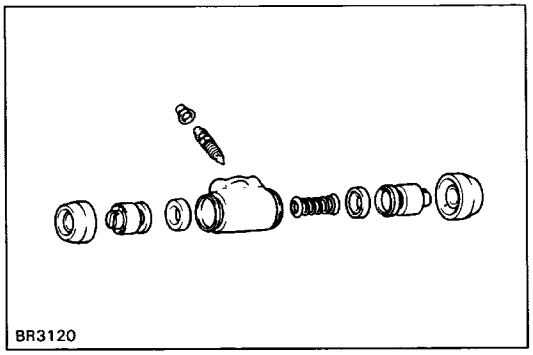
(f) Remove the C–washer and pin.
(g) Remove the par–king brake bellcrank from the bell–crank bracket.



BR0970

9. REMOVE WHEEL CYLINDER

(a) Using SST, disconnect the brake tube. Use a con–tainer to catch the brake fluid.
SST 09751–36011
(b) Remove the two bolts and the wheel cylinder.



10. DISASSEMBLE WHEEL CYLINDER

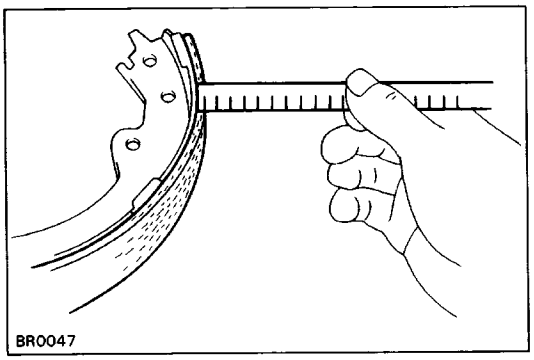
Remove the following parts from the wheel cylinder:

- Two boots
- Two pistons
- Two piston cups
- Spring

INSPECTION AND REPAIR OF REAR BRAKE COMPONENTS

1. INSPECT DISASSEMBLED PARTS

Inspect the disassembled parts for wear, rust or damage.



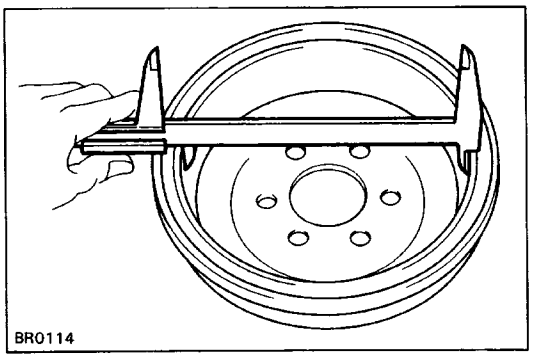
2. MEASURE BRAKE SHOE LINING THICKNESS

Standard thickness: 6.0 mm (0.236 in.)

Minimum thickness: 1.0 mm (0.039 in.)

If the shoe lining is less than minimum or shows signs of uneven wear, replace the brake shoes.

HINT: If any of the brake shoes have to be replaced, re–place all of the rear shoes in order to maintain even brak-ing.

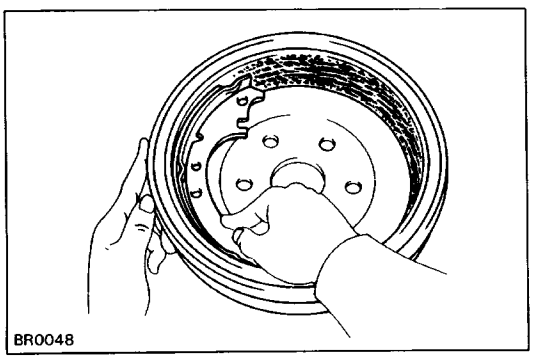


3. MEASURE BRAKE DRUM INSIDE DIAMETER

Standard inside diameter: 295.0 mm (11.61 in.)

Maximum inside diameter: 297.0 mm (11.69 in.)

If the drum is scored or worn, the brake drum may be lathed to the maximum inside diameter.



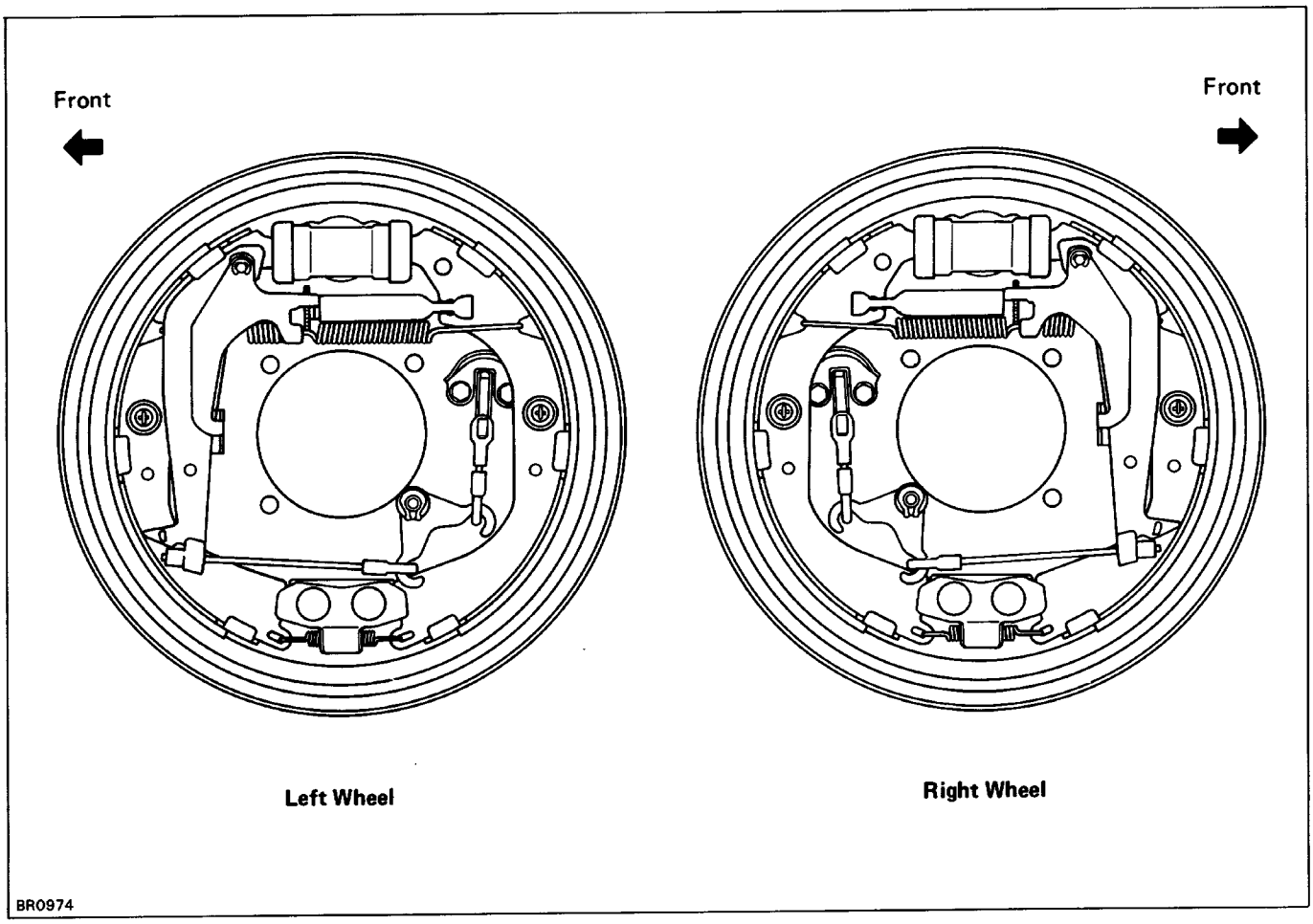
4. INSPECT REAR BRAKE LINING AND DRUM FOR PROP-ER CONTACT

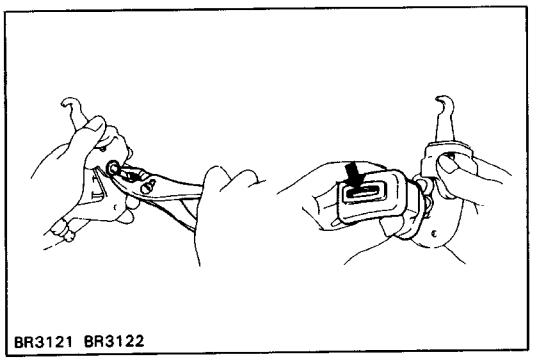
If the contact between the brake lining and drum is im proper, repair the lining with a brake shoe grinder, or re place the brake shoe assembly.

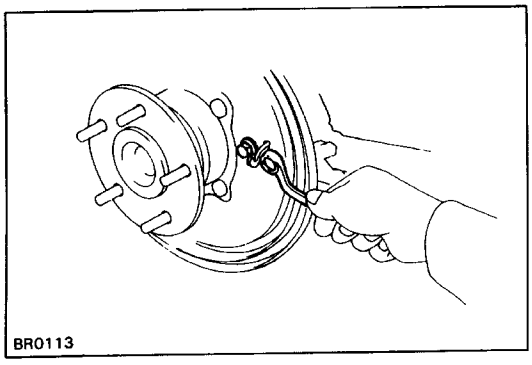
ASSEMBLY OF REAR BRAKES

(See page BR–55)

HINT: Assemble the parts in the correct direction as shown.

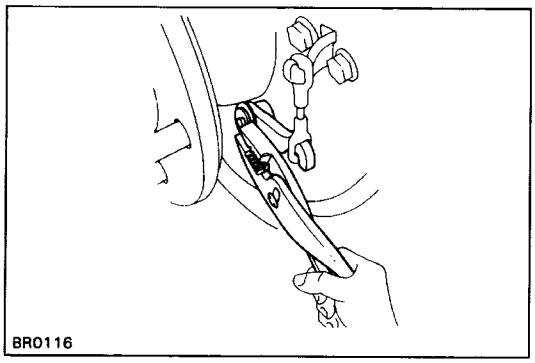




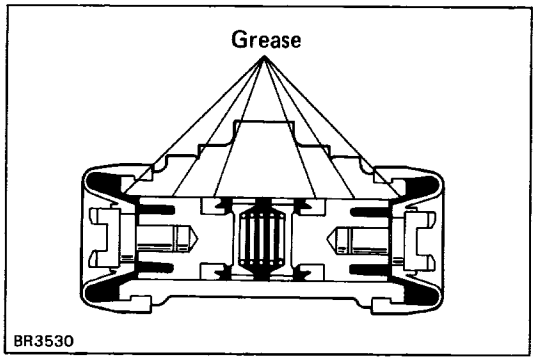


1. ASSEMBLE AND INSTALL PARKING BRAKE BELLCRANK

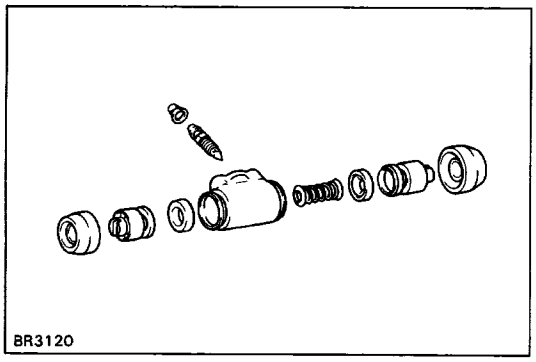
(a) Apply high temperature grease to the rotating parts of the bellcrank.
(b) Apply lithium soap base glycol grease to the bell–crank boot and insert it to the parking brake bell–crank.
(c) Install the parking brake bellcrank to the bellcrank bracket.
(d) Install the pin with a new C–washer.
(e) Install the bellcrank boot to the parking brake bell–crank bracket.
(f) Install the parking brake bellcrank and dust cover on the backing plate.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



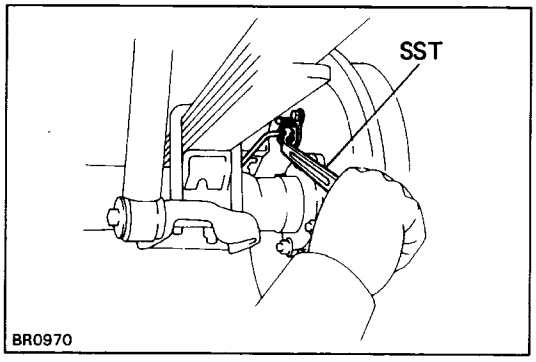
(g) Install the parking brake cable No.2 to the parking brake bellcrank No. 1 or No. 2.
(h) Hook the bellcrank No. 3 to the cable No. 2, and then install the bellcrank No.3 with a new C–washer.



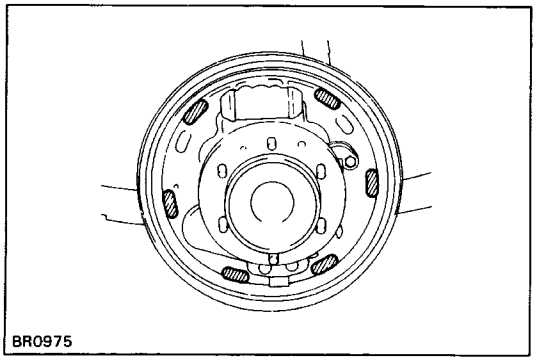
2. APPLY LITHIUM SOAP BASE GLYCOL GREASE TO FOLLOWING PARTS:
(a) Two piston cups
(b) Two pistons



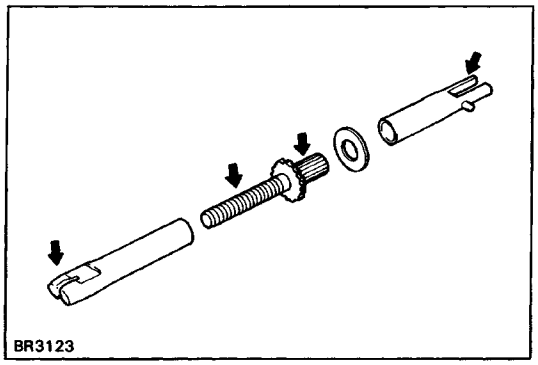
3. ASSEMBLE WHEEL CYLINDER
(a) Install the cup to the each piston.
(b) Install the spring and two pistons into the wheel cylinder. Make sure flanges of the cups are pointed inward.
(c) Install the two boots.



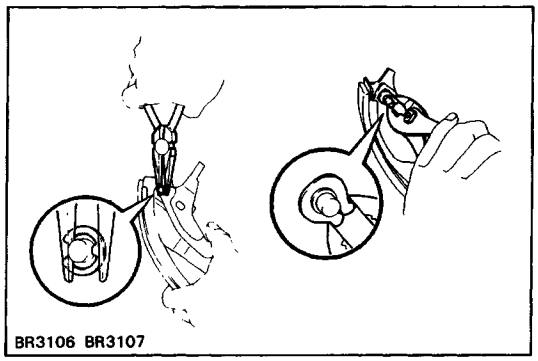
4. INSTALL WHEEL CYLINDER
(a) Install the wheel cylinder on the backing plate with two bolts.
Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)
(b) Using SST, connect the brake tube.
SST 09751–36011
Torque: 15 N–m (155 kgf –cm, 11 ft–lbf)



5. APPLY HIGH TEMPERATURE GREASE TO BACKING PLATE AND ADJUSTER
(a) Apply high temperature grease to the brake shoe contact surfaces as shown.

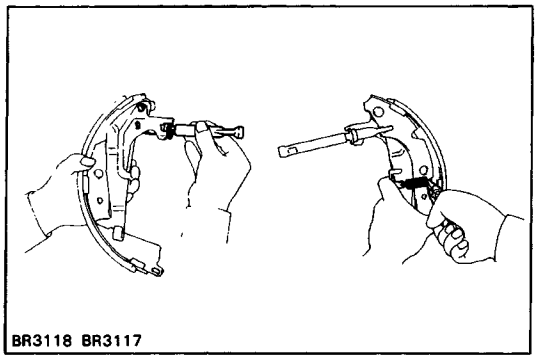

BR3123

(b) Apply high temperature grease to the adjuster bolt threads and ends.


BR3106 BR3107

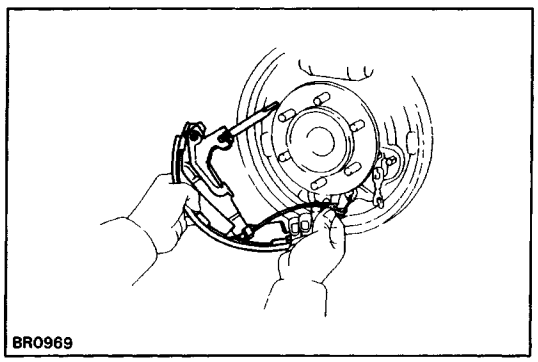
6. INSTALL PARKING BRAKE LEVER AND AUTOMATIC ADJUSTING LEVER

(a) Install the parking brake lever with a new C–washer.
(b) Install the automatic adjusting lever with the E–ring.


BR3118 BR3117

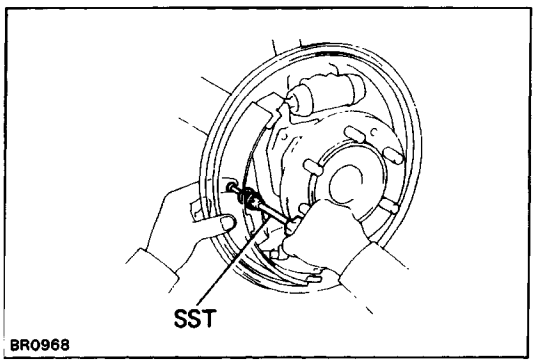
7. INSTALL ADJUSTER TO FRONT SHOE

(a) Install the adjuster to the adjust lever.
(b) Install the adjust lever spring.


BR0969

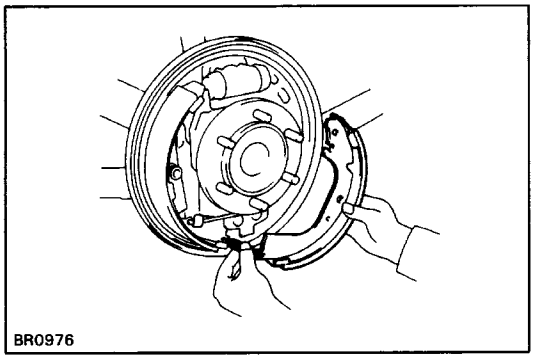
8. INSTALL FRONT SHOE

(a) Install the parking brake cable No. 1 to the parking brake shoe lever.
(b) Hook the another side of the cable No. 1 to the bellcrank No.3.
(c) Install the return spring to the front shoe.



BR0968

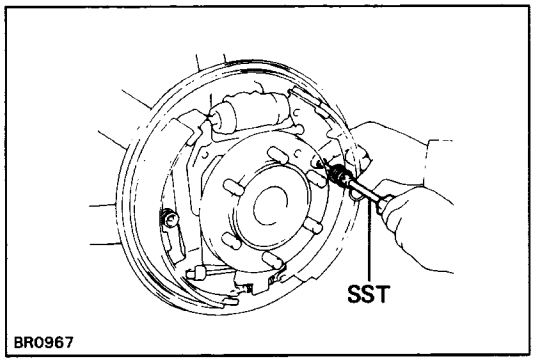
(d) Set the front shoe in place with the end of the shoe inserted in the piston.
(e) Using SST, install the shoe hold–down spring, cups and pin.
SST 09718–00010
NOTICE: Do not allow oil or grease to get on the rubbing face.



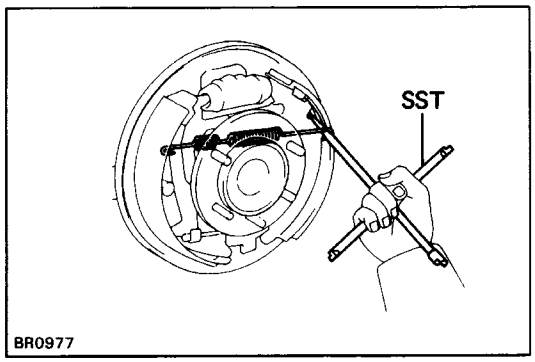
9. INSTALL REAR SHOE

(a) Install the anchor spring between the front and rear shoes.

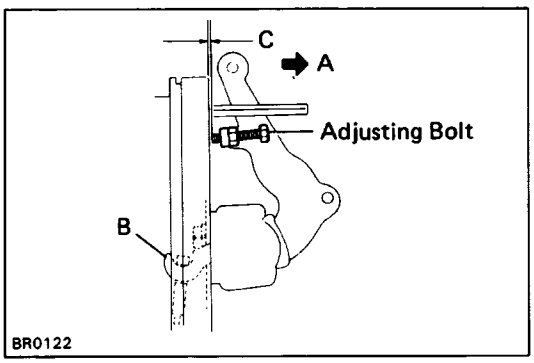
(b) Set the rear shoe in place with the end of the shoe inserted in the wheel cylinder and the adjuster in place.



(c) Using SST, install the shoe hold down spring, cups and pin.
SST 09718–00010
NOTICE: Do not allow oil or grease to get on the rubbing face.



(d) Using SST, connect the return spring.
SST 09718–00010

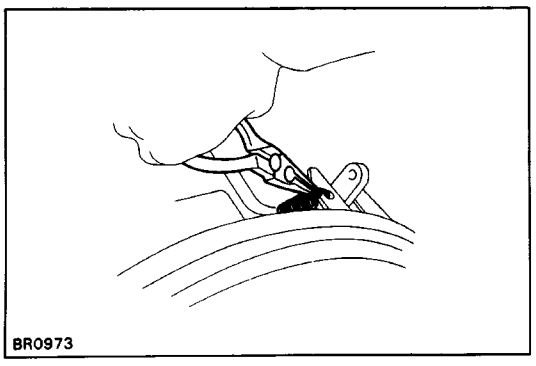


10. ADJUST BELLCRANK

(a) Lightly pull the bellcrank in direction A until there is no slack at part B.

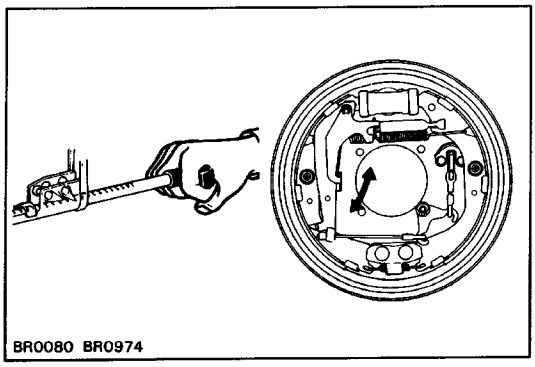
(b) In this condition, turn the adjusting bolt so that dimension C will be 0.4 – 0.8 mm (0.016 – 0.031 in.).

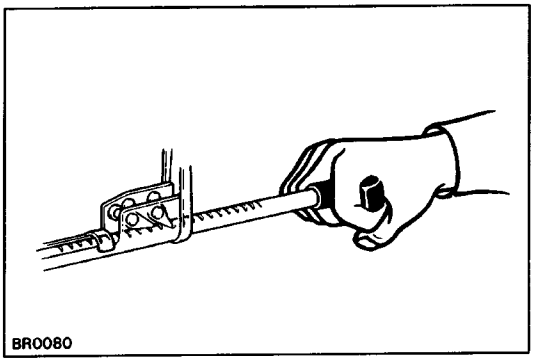
(c) Lock the adjust bolt with the lock nut.

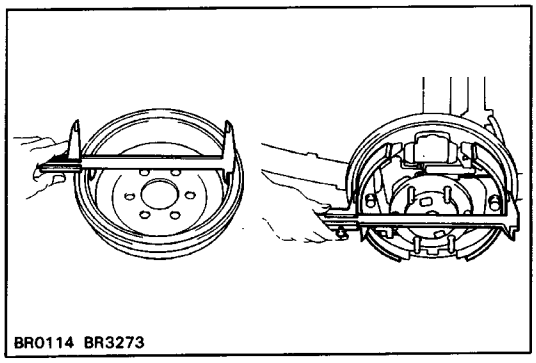


(d) Connect the parking brake cable to the parking brake bellcrank and install the clip.

(e) Install the tension spring.


BR0080 BR0974


BR0080


BR0114 BR3273

11. CHECK OPERATION OF AUTOMATIC ADJUSTING MECHANISM

(a) Move the parking brake lever of the front shoe back and forth, as shown. Check that the adjuster turns.
If the adjuster does not turn, check for incorrect instal–lation of the rear brakes.

(b) Adjust the adjuster length to the shortest possible amount.

(c) Install the brake drum.

(d) Pull the parking brake lever all the way up until a clicking sound can no longer be heard.

12. CHECK CLEARANCE BETWEEN BRAKE SHOES AND DRUM

(a) Remove the brake drum.

(b) Measure the brake drum inside diameter and di–ameter of the brake shoes. Check that the differ–ence between the diameters is the correct shoe clearance.
Shoe clearance: 0.6 mm (0.024 in.)
If incorrect, check the parking brake system.

13. INSTALL BRAKE DRUM

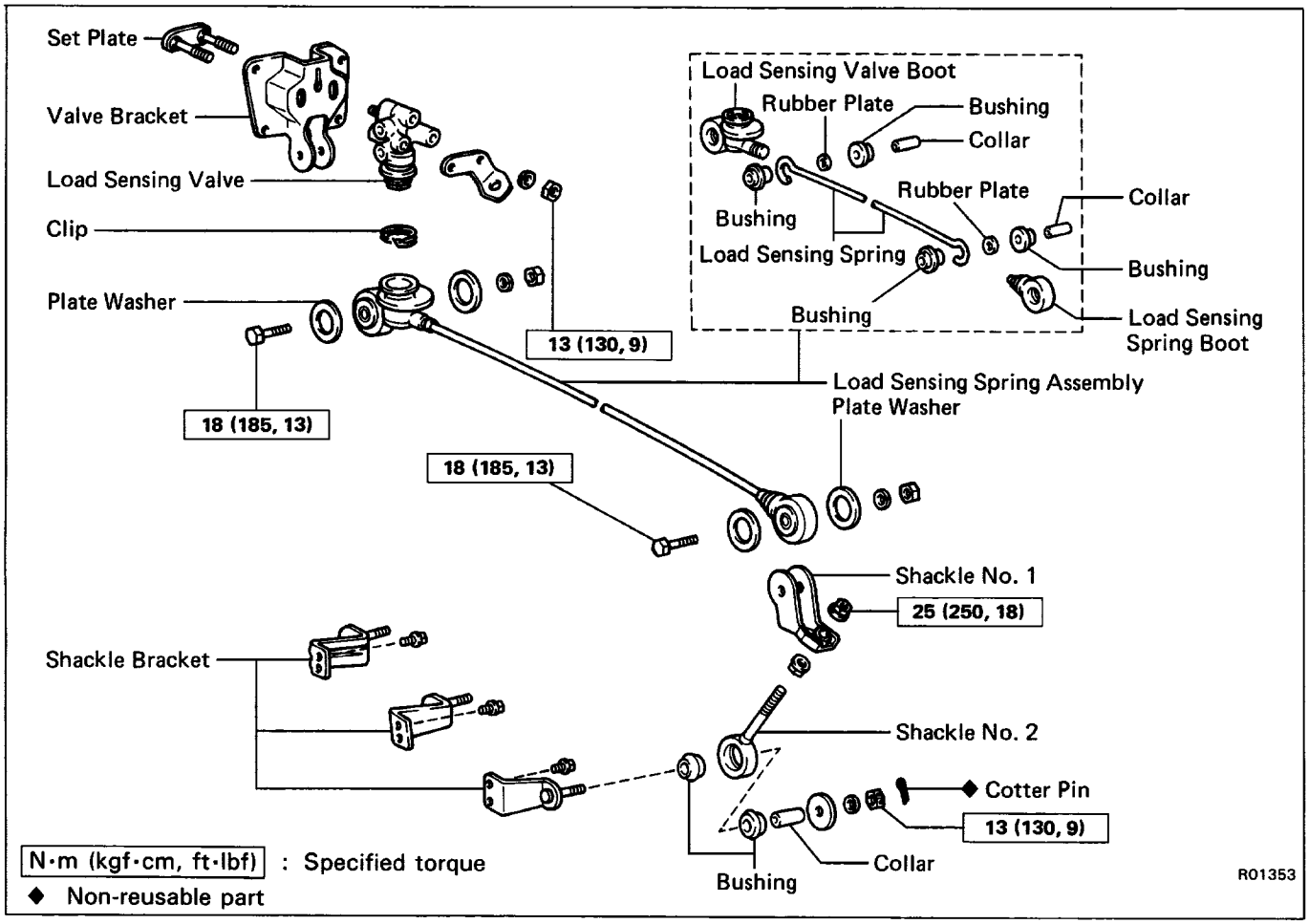
14. INSTALL REAR WHEEL

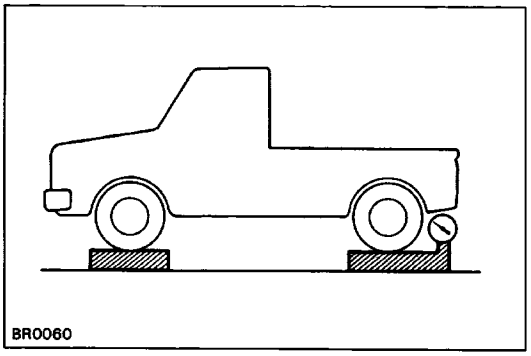
15. FILL BRAKE RESERVOIR WITH BRAKE FLUID AND BLEED BRAKE SYSTEM
(See page BR–8)

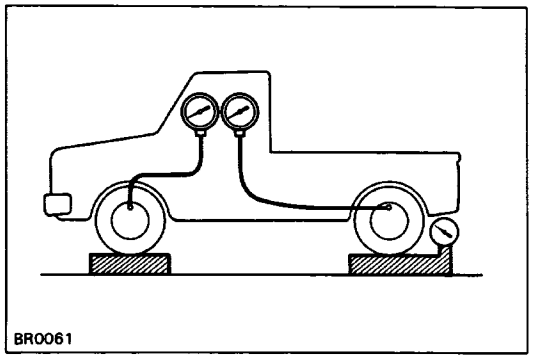
16. CHECK FOR FLUID LEAKAGE

LOAD SENSING PROPORTIONING AND BY–PASS VALVE (LSP & BV)

COMPONENTS







CHECK AND ADJUSTMENT OF FLUID PRESSURE

1. SET REAR AXLE LOAD

Rear axle load (includes vehicle weight):

2WD 1 ton, C & C (SRW)	**900 kg (1,984 lb)**
1/2 ton	**700 kg (1,543 lb)**
C & C (DRW)	**1,150 kg (2,535 lb)**
4WD	**800 kg (1,764 lb)**

HINT: (For C & C)

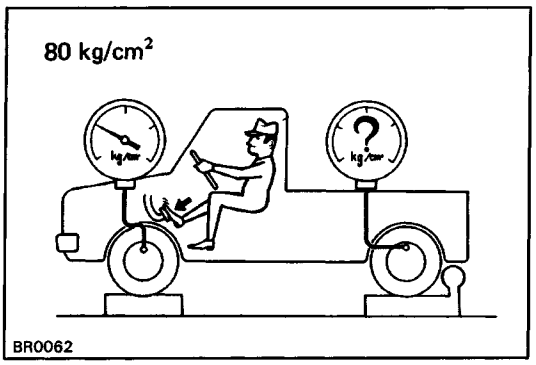
If the vehicle unladen weight exceeds the specification above, set the rear axle load to the specification shown below. (See step 4 on page BR–65)

Rear axle load (includes vehicle weight):

SRW	**1,678 kg (3,699 lb)**
DRW	**1,996 kg (4,400 lb)**

2. INSTALL LSPV GAUGE (SST) AND BLEED AIR

SST 09709–29017



3. RAISE FRONT BRAKE PRESSURE TO 7,845 kPa (80 kgf/cm², 1,138 psi) AND CHECK REAR BRAKE PRESSURE

Rear brake pressure:

2WD 1 ton, C & C (SRW) 4,413±490 kPa (45±5kgf/cm², 640±71 psi)

1/2 ton 4,315 t 490 kPa (44±5 kgf/cm², 626 ± 71 psi)

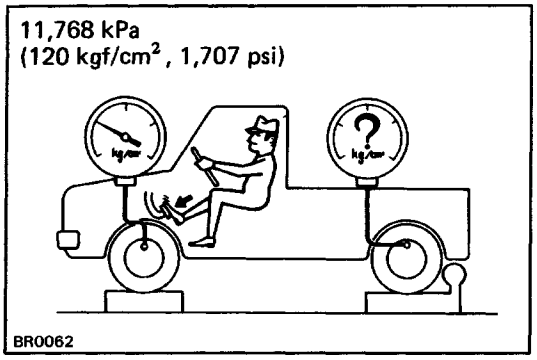
C & C (DRS) 4,707 ± 490 kPa (48±5 kgf/cm², 683 ± 71 psi)

4WD Regular cab 3,923±490 kPa (40±5 kgf/cm², 569±71 psi)

Extra cab 4,315±490 kPa (43±5 kgf/cm², 626±71 psi)

HINT: The brake pedal should not be depressed twice and/or returned while setting to the specified pressure. Read the value of rear brake pressure two seconds after adjusting the specified fluid pressure.

If the brake pressure is incorrect, adjust the fluid pressure.



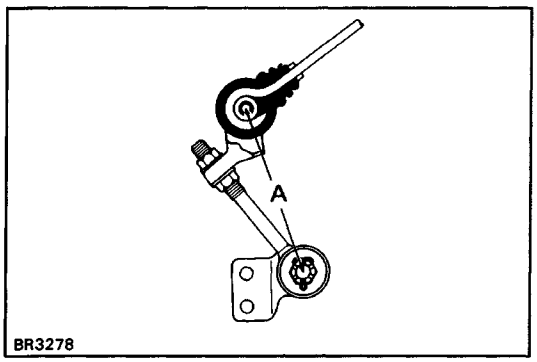
4. (C&C)

RAISE FRONT BRAKE PRESSURE TO 11,768 kPa (120 kgf/cm², 1,707 psi) AND CHECK REAR BRAKE PRESSURE

Rear brake pressure:

SRW 9,709 ± 588 kPa (99 ± 6 kgf/cm², 1,408 ± 85 psi)

DRW 8,336 ± 588 kPa (85 ± 6 kgf/cm², 1,209 ± 85 psi)



5. IF NECESSARY, ADJUST FLUID PRESSURE

(a) Adjust the length of the No.2 shackle.

Low pressure Lengthen A

High pressure Shorten A

Initial set:

2WD 78 mm (3.07 in.)

4WD 120 mm (4.72 in.)

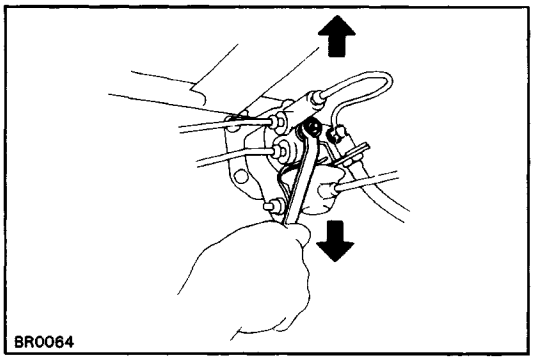
Adjusting range:

2WD 72 – 84 mm (2.83 – 3.31 in.)

4WD 114 – 126 mm (4.49 – 4.96 in.)

HINT: One turn of the nut changes the fluid pressure as shown in the table below.

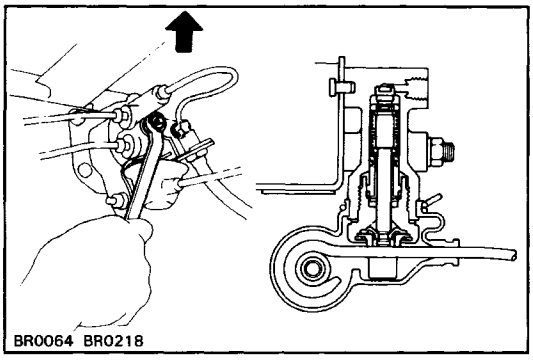
		Rear brake pressure
2WD	1/2 ton, C & C (SRW)	74 kPa (0.75 kgf/cm², 11 psi)
	1 ton, C & C (DRW)	98 kPa (1.0 kgf/cm², 14 psi)
4WD		59 kPa (0.6 kgf/cm², 8.5 psi)


BR0064

(b) In event the pressure cannot be adjusted by the No. 1 shackle, raise or lower the valve body.
Low pressure – Lower
High pressure – Raise

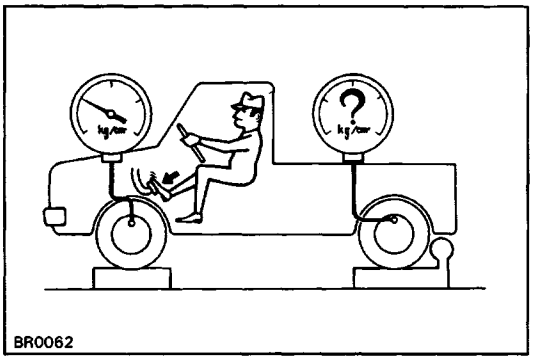
(c) Torque the nuts.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

(d) Adjust the length of the No. 1 shackle again.
If it cannot be adjusted, inspect the valve housing.


BR0064 BR0218

6. IF NECESSARY, CHECK VALVE BODY

(a) Assemble the valve body in the uppermost position.
HINT: When the brakes are applied, the piston will move down about 1 mm (0.04 in.). Even at this time, the piston should not make contact with or move the load sensing spring.


BR0062

(b) In this position, check the rear brake pressure.
2WD (SRW)

kPa (kgf/cm², psi)

Front brake pressure	Rear brake pressure
490 (5, 71)	490 (5, 71)
2,452 (25, 356)	883 – 1,275 (9 – 13, 128 – 185)
5,884 (60, 853)	1,765 – 2,452 (18 – 25, 256 – 356)

4WD (DRW)

kPa (kgf/cm², psi)

Front brake pressure	Rear brake pressure
490 (5, 71)	490 (5, 71)
2,452 (25, 356)	1,020 – 1,412 (10.4 – 14.4, 148 – 205)
5,884 (60, 853)	2,148 – 2,834 (21.9 – 28.9, 311 – 411)

4WD (Regular cab)

kPa (kgf/cm², psi)

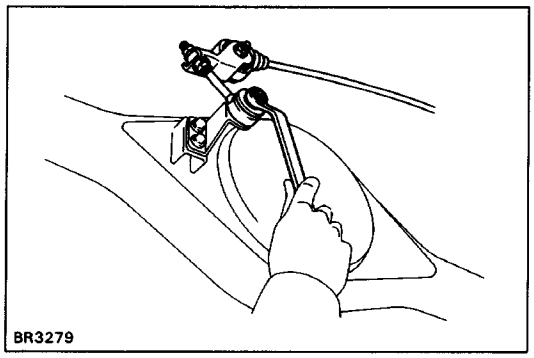
Front brake pressure	Rear brake pressure
981 (10, 142)	981 (10, 142)
2,452 (25, 356)	1,079 – 1,471 (11 – 15, 156 – 213)
5,884 (60, 853)	1,618 – 2,305 (16.5 – 23.5, 235 – 334)

4WD (Extra cab)

kPa (kgf/cm², psi)

Front brake pressure	Rear brake pressure
981 (10, 142)	981 (10, 142)
2,452 (25,356)	1,157 – 1,549 (11.8 – 15.8, 168 – 225)
5,884 (60, 853)	1,863 – 2,550 (19 – 26, 270 – 370)

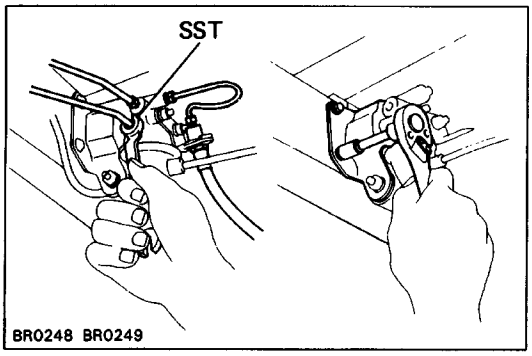
If the measured value is not within standard, replace the valve body.



REMOVAL OF LSP & BV OR LSPV

(See page BR–64)

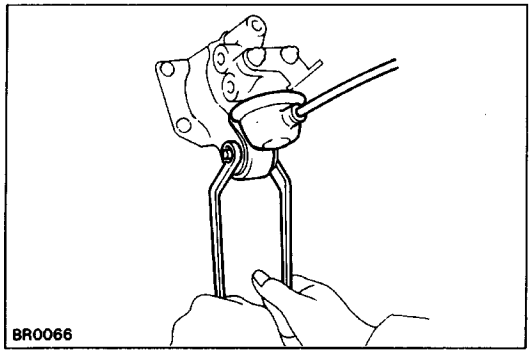
1. DISCONNECT SHACKLE NO.2 FROM BRACKET



2. REMOVE LSP & BV (LSPV) ASSEMBLY

(a) Using SST, disconnect the brake tube from the valve body.
SST 09751–36011

(b) Remove the valve bracket mounting bolts and remove the LSP & BV (LSPV) assembly.

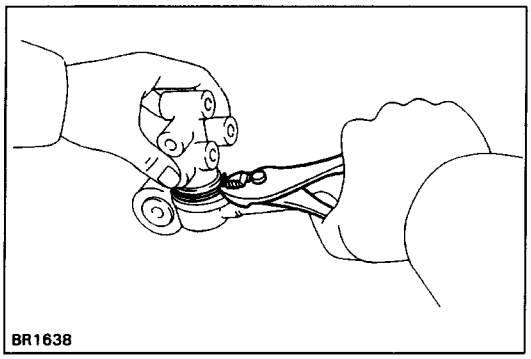


DISASSEMBLY OF LSP & BV OR LSPV ASSEMBLY

1. REMOVE VALVE BRACKET

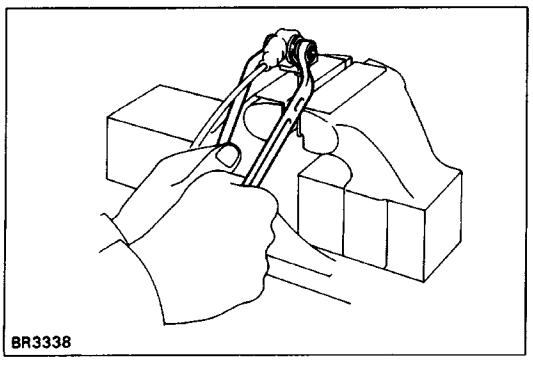
(a) Remove the nut and bolt as shown.

(b) Remove the two nuts, and remove the bracket and set plate from the valve body.



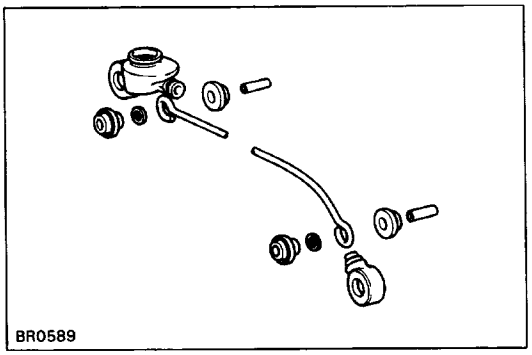
2. DISCONNECT SPRING FROM VALVE

Using pliers, remove the clip, and remove the spring from the valve.



3. REMOVE SHACKLE NO. 1 AND NO.2

Remove the nut and bolt, and then remove the shackle No.1 and No.2, and two plate washers from the load sensing spring assembly.

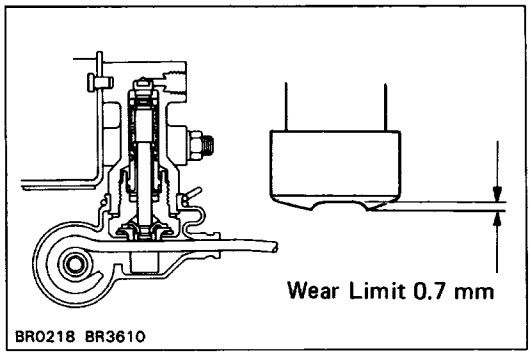


4. DISASSEMBLE LOAD SENSING SPRING

Disassemble the following parts.

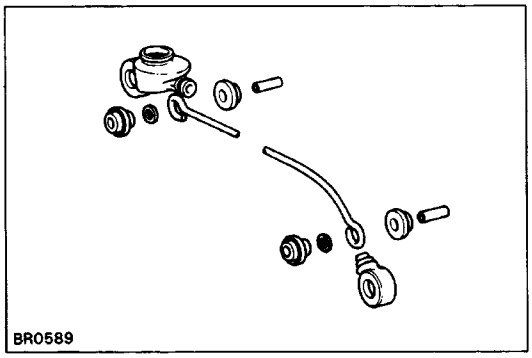
(a) Bushings
(b) Collars
(c) Rubber plates
(d) Load sensing valve boot
(e) Load sensing spring boot

INSPECTION OF LSP & BV OR LSPV



INSPECT VALVE PISTON PIN AND LOAD SENSING CONTACT SURFACE FOR WEAR

Wear limit: 0.7 mm (0.028 in.)



ASSEMBLY OF LSP & BV OR LSPV

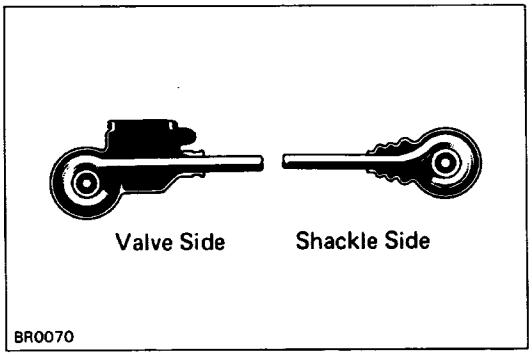
(See page BR–64)

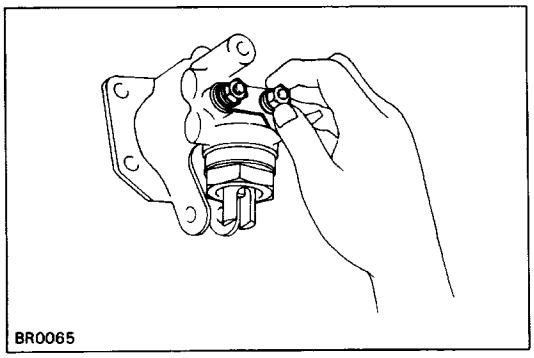
1. ASSEMBLE FOLLOWING PARTS TO LOAD SENSING SPRING:

(a) Load sensing valve boot
(b) Load sensing spring boot
(c) Bushings
(d) Rubber plates
(e) Collars

HINT: Apply lithium soap glycol grease to all rubbing ar–eas.

Do not mistake the valve side for the shackle side of the load sensing spring.

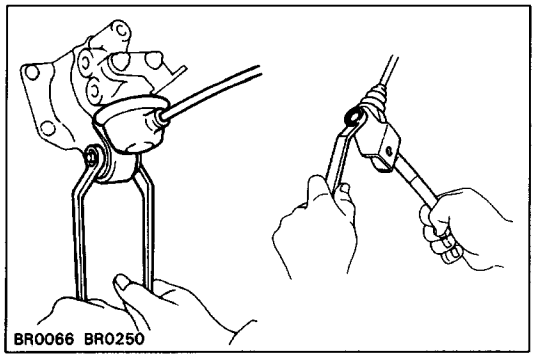




2. ASSEMBLE VALVE BODY TO BRACKET

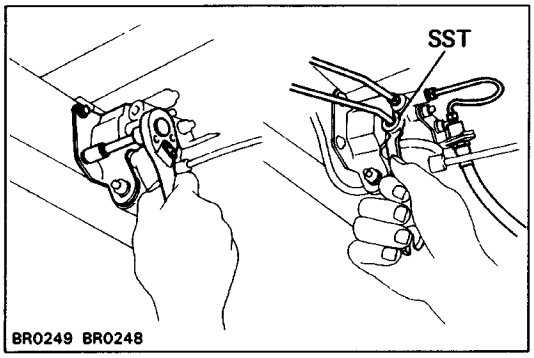
Assemble the valve body to the valve body bracket.

HINT: Finger tighten the valve body mounting nuts.


BR0066 BR0250

3. CONNECT VALVE BODY AND NO. 1 SHACKLE TO LOAD SENSING SPRING

CAUTION: When connecting the shackle to the load sensing spring with a bolt and nut, insert the bolt from the front side of vehicle.



BR0249 BR0248

INSTALLATION OF LSPV & BV OR LSPV

1. INSTALL LSP & BV (LSPV) ASSEMBLY TO FRAME

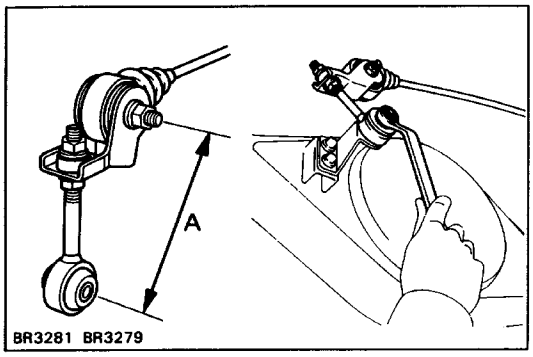
Torque: 19 N–m (195 kgf –cm, 14 ft–lbf)

2. CONNECT BRAKE TUBE

Using SST, connect the brake tubes.

Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)

SST 09751–36011



BR3281 BR3279

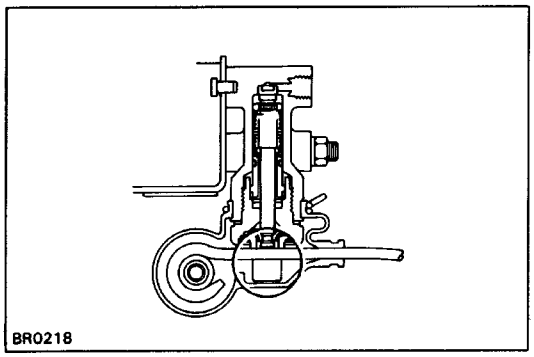
3. CONNECT SHACKLE NO.2 BRACKET

(a) Install the shackle No.2 to the load sensing spring.

(b) Set dimension A.

Initial set: 2WD 78 mm (3.07 in.)
4WD 120 mm (4.72 in.)

(c) Connect the shackle No.2 to the shackle bracket.


BR0218

4. SET REAR AXLE LOAD (See page BR–64)

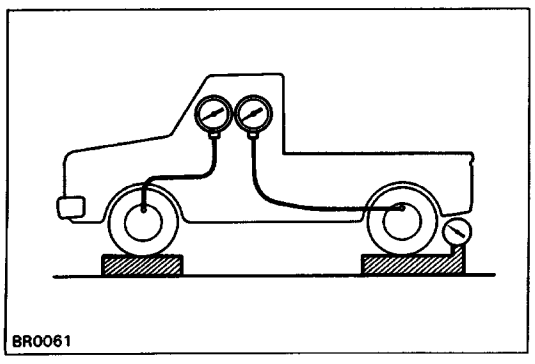
5. SET VALVE BODY

(a) When pulling down the load sensing spring, confirm that. the valve piston moves down smoothly.

(b) Position the valve body so that the valve piston lightly contacts load sensing spring.

(c) Tighten the valve body mounting nuts.

6. BLEED BRAKE LINE (See page BR–8)


BR0061

7. CHECK AND ADJUST LSP & BV OR (LSPV) FLUID PRESSURE
(See page BR–64)

8. APPLY SEALANT TO SHACKLE NO.2

Apply sealant to the top portion of the shackle No.2 bolt threads not to lose the upper lock nut.

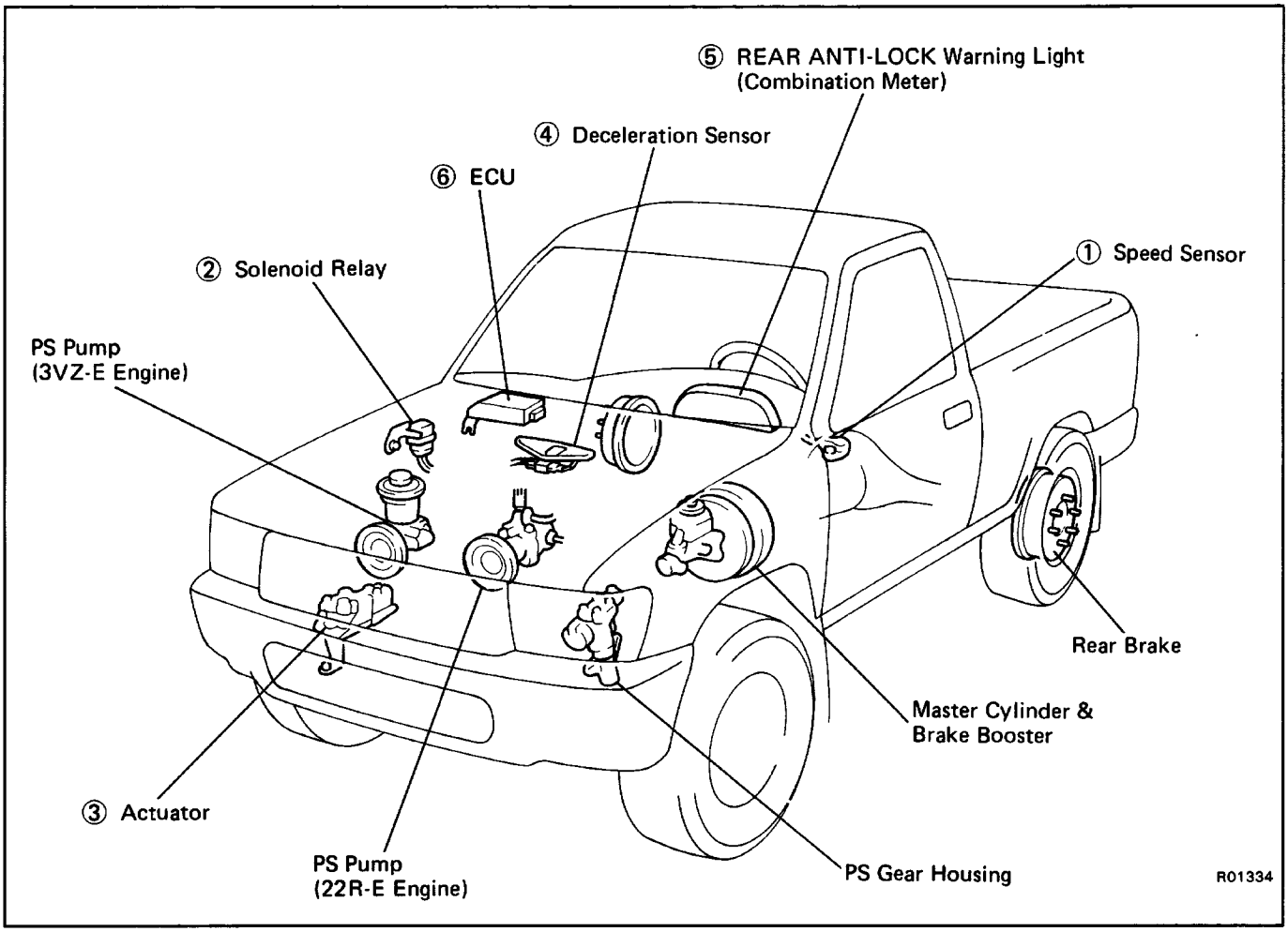
Sealant: Part No. 08833–00070, THREE BOND 1324 or equivalent

REAR–WHEEL ANTI–LOCK BRAKE SYSTEM

General Description

- The Rear–Wheel Anti–Lock Brake System is a brake system which controls the wheel cylinder hydraulic pressure of the rear wheels during sudden braking and braking on slippery road surfaces, preventing the rear wheels from locking.
- In case a malfunction occurs, a diagnosis function and fail–safe system have been adopted for the Rear–Wheel Anti–Lock Brake System to increase serviceability.

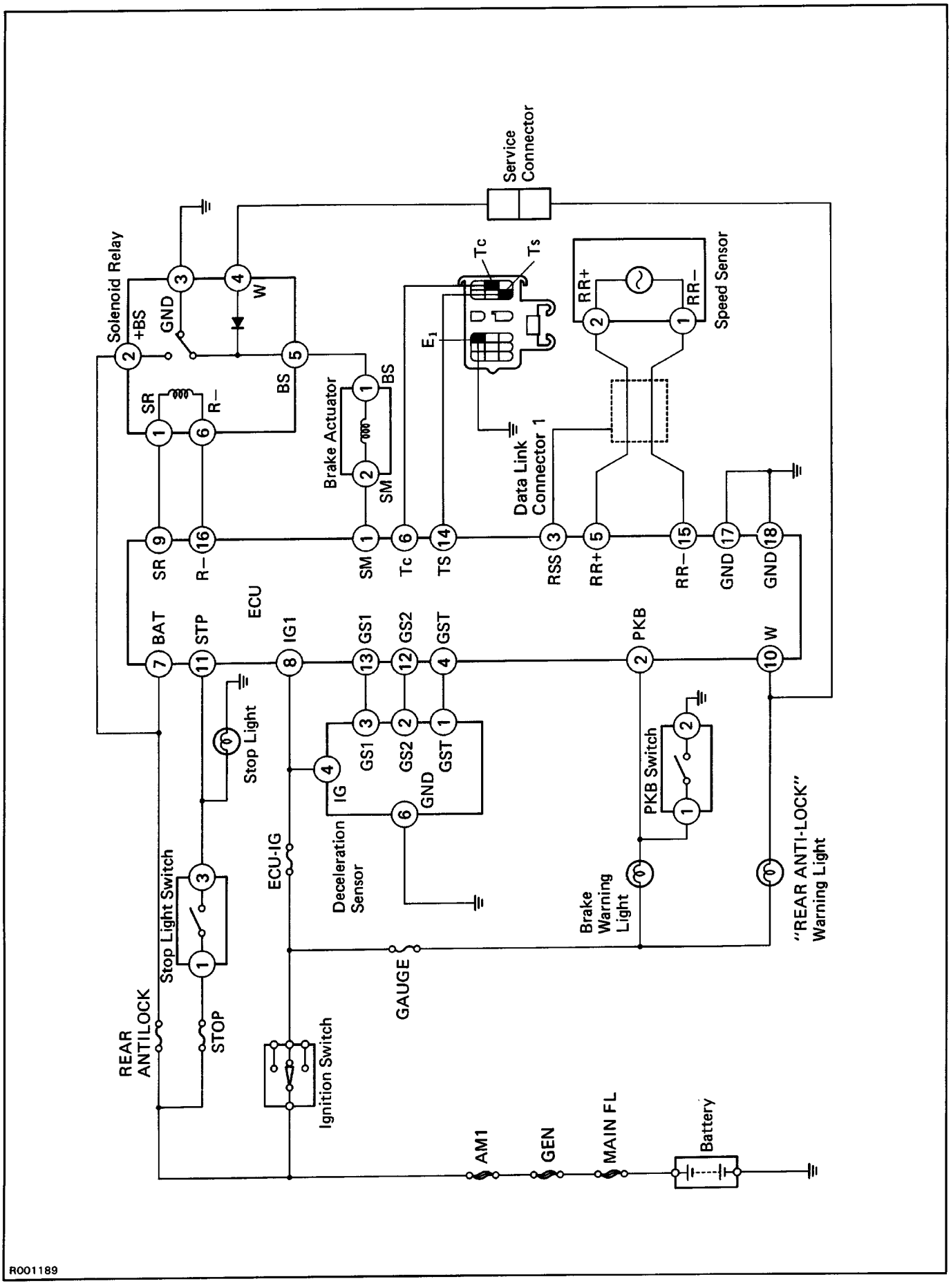
LOCATION OF SYSTEM COMPONENTS



FUNCTION OF COMPONENTS

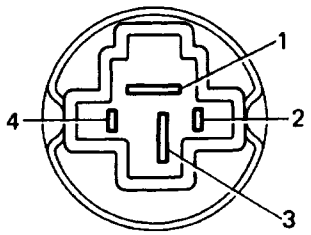
No.	Components	Function
1	Speed Sensor	Detects the wheel speed from the rotation of the rear differential ring gear.
2	Solenoid Relay	Supplies electric current to the solenoid valve of the actuator.
3	Actuator	Controls the brake fluid pressure to rear brake wheel cylinders through signals from the ECU.
4	Deceleration Sensor	Detects the vehicle deceleration rate from the deceleration of the body.
5	REAR ANTI–LOCK Warning Light	Lights up to alert the driver when trouble has occurred in the Rear–wheel Anti–Lock Brake System.
6	ECU	According the wheel speed signals from the speed sensor and vehicle deceleration signals from the deceleration sensor, it calculates acceleration, deceleration and slip values and sends signals to the actuator to control brake fluid pressure.

WIRING DIAGRAM

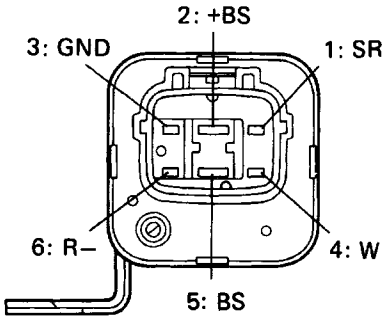


CONNECTORS

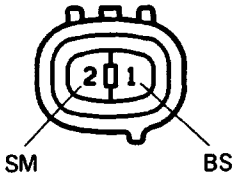
Stop Light Switch



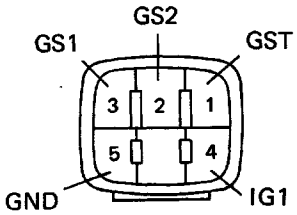
Solenoid Relay



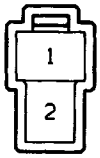
Brake Actuator



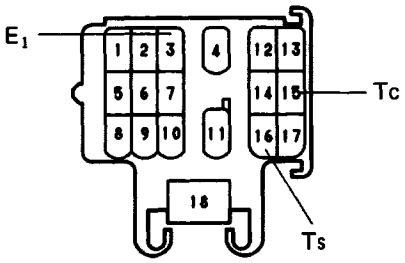
Deceleration Sensor



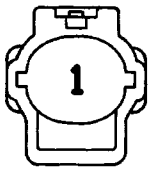
Parking Brake Switch



Data Link Connector 1

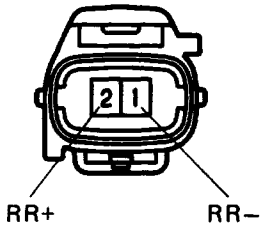


Service Connector

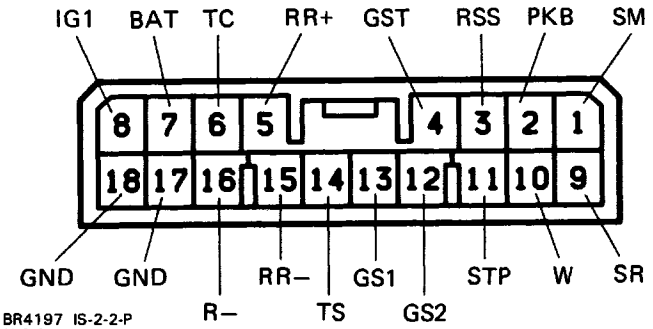


(Solenoid Relay Side)

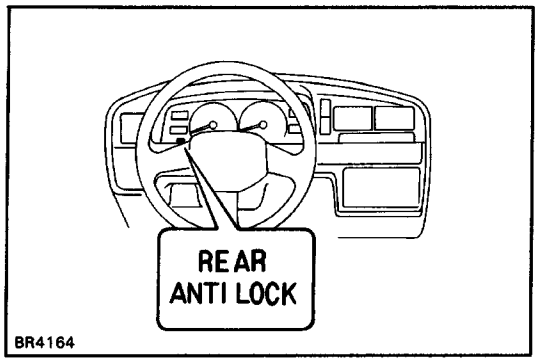
Speed Sensor



Rear-Wheel Anti-Lock Brake System ECU



BE0336 BR4197 IS-2-2-P
R01331 H-2-2
SH-18-1 R01332 Ie-2-2-F
V-18-2



Diagnosis System

DESCRIPTION

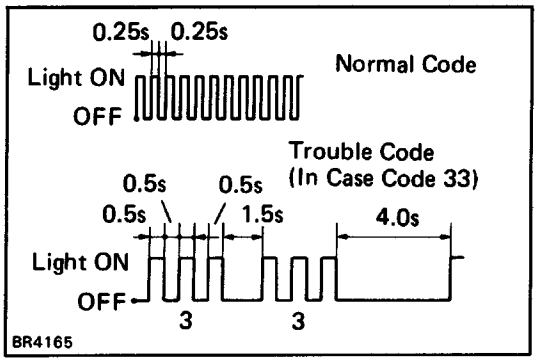
If a functional malfunction occurs, diagnosis system will identify the problem and ECU stores the codes for the trouble items.

At the same time, the system informs the driver of a mal–function via the "REAR ANTILOCK" warning light in the combination meter.

By turning on the ignition switch and disconnecting the service connector, the trouble can be identified by the number of blinks (diagnosis code) of the warning light.

In event of two codes, that having the smallest number (code) will be identified first.

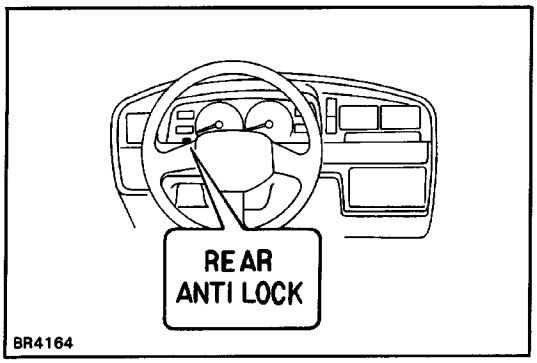
HINT: The warning light do not show the diagnostic trouble codes while the vehicle is running.



INSPECTION OF DIAGNOSIS SYSTEM

1. INSPECT BATTERY POSITIVE VOLTAGE

Inspect that the battery positive voltage is about 12 V.

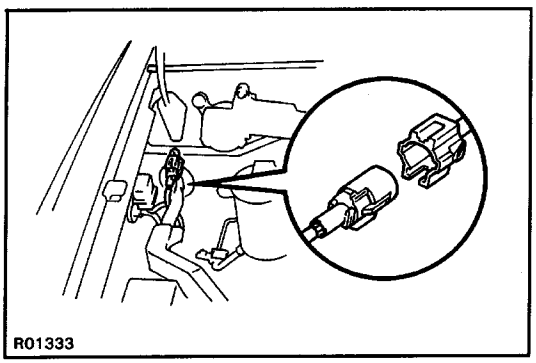


2. CHECK THAT WARNING LIGHT TURNS ON

(a) Turn the ignition switch to ON.

(b) Check that the "REAR ANTILOCK" warning light turns on for about 3 seconds.

If not, inspect and repair or replace the fuse, bulb and wire harness.

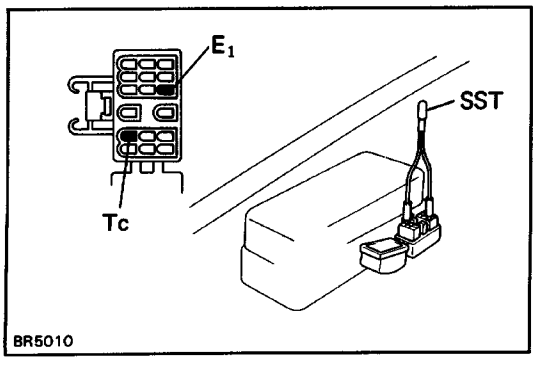


3. READ DIAGNOSTIC TROUBLE CODE

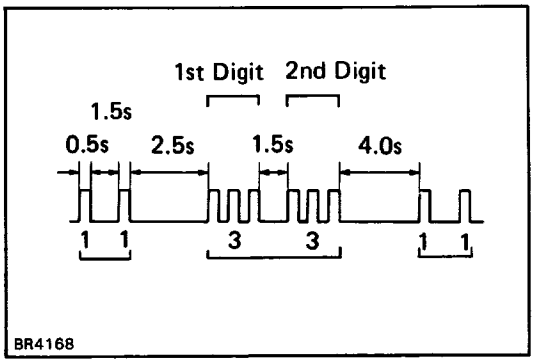
(a) Turn the ignition switch to ON.

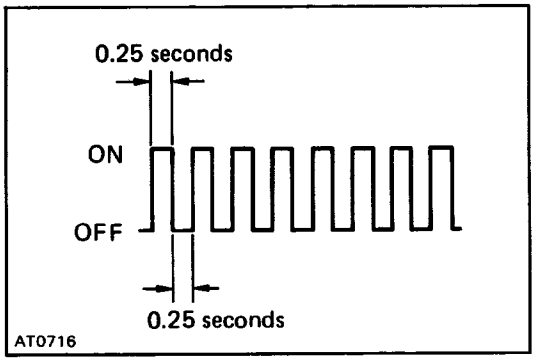
(b) Disconnect the service connector.

SST 09843–18020



(c) Using SST, connect the terminal Tc to E, of the data link connector 1.





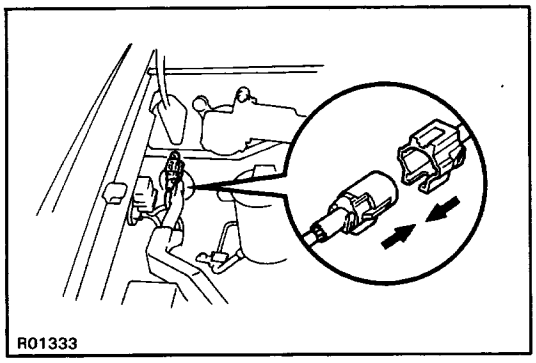
(d) In event of a malfunction, 4 seconds later the warning light will begin to blink. Read the number of blinks.
(See DIAGNOSTIC TROUBLE CODE on page BR–75)
HINT: The first number of blinks will equal the first digit of a two digit diagnostic trouble code. After a 1.5 seconds pause, the 2nd number of blinks will equal the 2nd number of a two digit code. If there are two or more codes, there will be a 2.5 seconds pause between each, and indication will begin after 4.0 seconds pause from the smaller value and continue in order to larger.

(e) If the system is operating normally (no malfunction), the warning light will blink 2 times per second.

(f) Repair the malfunctioning parts.

(g) After the malfunctioning parts has been repaired, clear the diagnostic trouble codes stored in the ECU . (See page BR–76)
HINT: If you disconnect the battery cable while repairing, all diagnostic trouble codes in the ECU will be erased.

(h) Disconnect the terminal Tc from El of the data link connector 1.

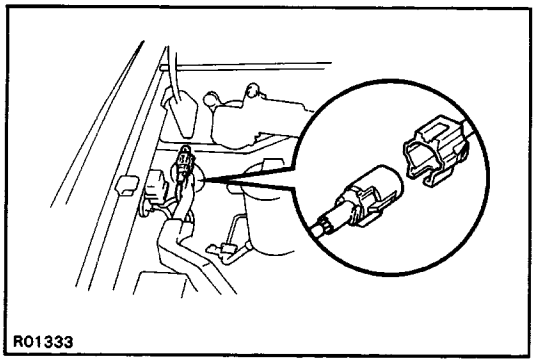


(i) Connect the service connector.
Turn the ignition switch to ON, and check that the ”REAR ANTILOCK” warning light goes off after the warning light goes on for about 2 seconds.

DIAGNOSTIC TROUBLE CODE

Code No.	Light Pattern	Diagnosis	Trouble Part
11		Open circuit in solenoid relay circuit or solenoid circuit	• Solenoid • Solenoid relay • Wire harness and connector of solenoid and/or solenoid relay circuit
12		Short circuit in solenoid relay circuit	
25		Short circuit in solenoid circuit	
33		Open or short circuit in speed sensor circuit	• Speed sensor • Wire harness and connector of speed sensor circuit
41		Low battery positive voltage (9.5 V or lower	• Battery
42		Abnormally high battery positive voltage 0 7 V or higher)	
43		Mechanical malfunction in deceleration sensor	• Deceleration sensor • Wire harness and connector of deceleration sensor circuit
44		Electrical malfunction in deceleration sensor circuit	
Always ON		Malfunction in ECU	• ECU

BR4169



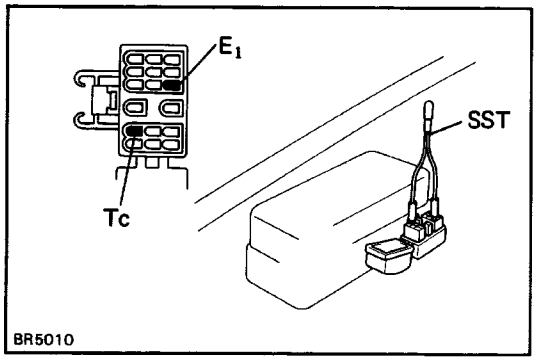
CLEARING OF DIAGNOSTIC TROUBLE CODES

CLEAR DIAGNOSTIC TROUBLE CODES

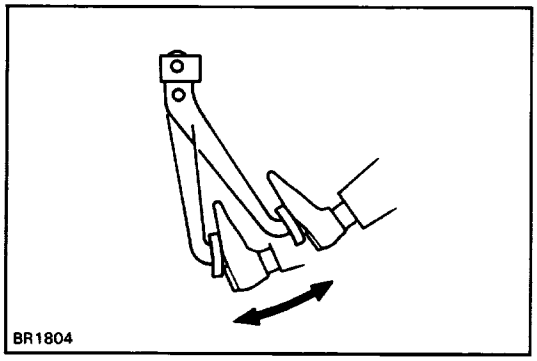
(a) Turn the ignition switch to ON.

(b) Disconnect the service connector.

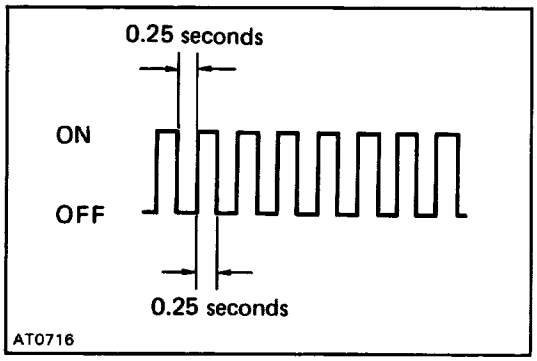
HINT: Keep the vehicle stopped (vehicle speed 0 km/h (0 mph)).



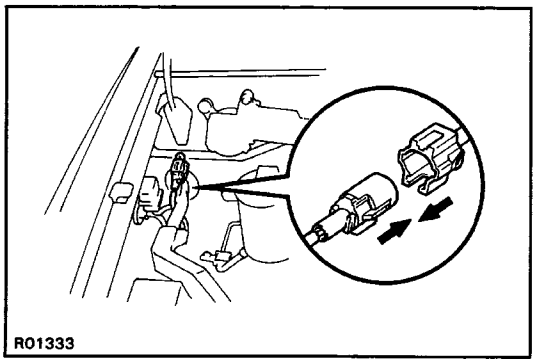
(c) Using SST, connect the terminal Tc to E, of the data link connector 1.
SST 09843–18020



(d) Clear the diagnostic trouble codes stored in ECU by depressing the brake pedal 8 or more times within 3 seconds.

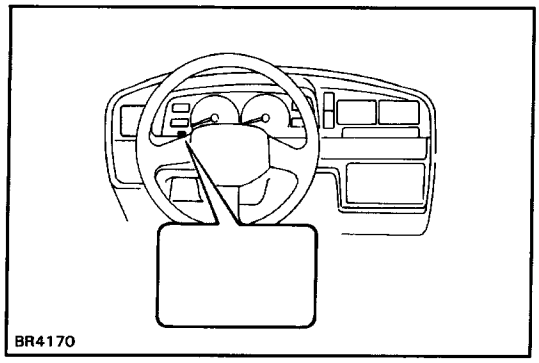


(e) Check that the warning light shows the –normal code.
If the warning light still shows the diagnostic trouble codes, check for cause and repair or replace the trouble
parts, then clear the diagnostic trouble codes again.



(f) Connect the service connector.

(g) Disconnect the terminal Tc from E, of the data link connector 1.



(h) Check that the warning light goes off.

Troubleshooting

Problem		No.
”REAR ANTILOCK” warning light	Always comes on after ignition switch is turned to ON.	1
	Does not come on for about 3 seconds after ignition switch on.	2
	Comes on and off.	3
	Comes on while running.	1
Brake working	Brakes pull.	4
	Braking inefficient.	4
	Rear–Wheel Anti–Lock Brake System operates at ordinary braking.	4
	Rear–Wheel Anti–Lock Brake System operates just before stopping at ordinary braking.	4
	Brake pedal pulsates abnormally while Rear–Wheel Anti–Lock Brake System is operating.	4
	Skidding noise occurs while Rear–Wheel Anti–Lock Brake System working. (Rear–Wheel Anti–Lock Brake System works inefficiently)	5

1 ”REAR ANTILOCK” warning light comes on.

Disconnect service connector and connect the terminal Tc to E, of the data link connector 1. (See page BR–73)

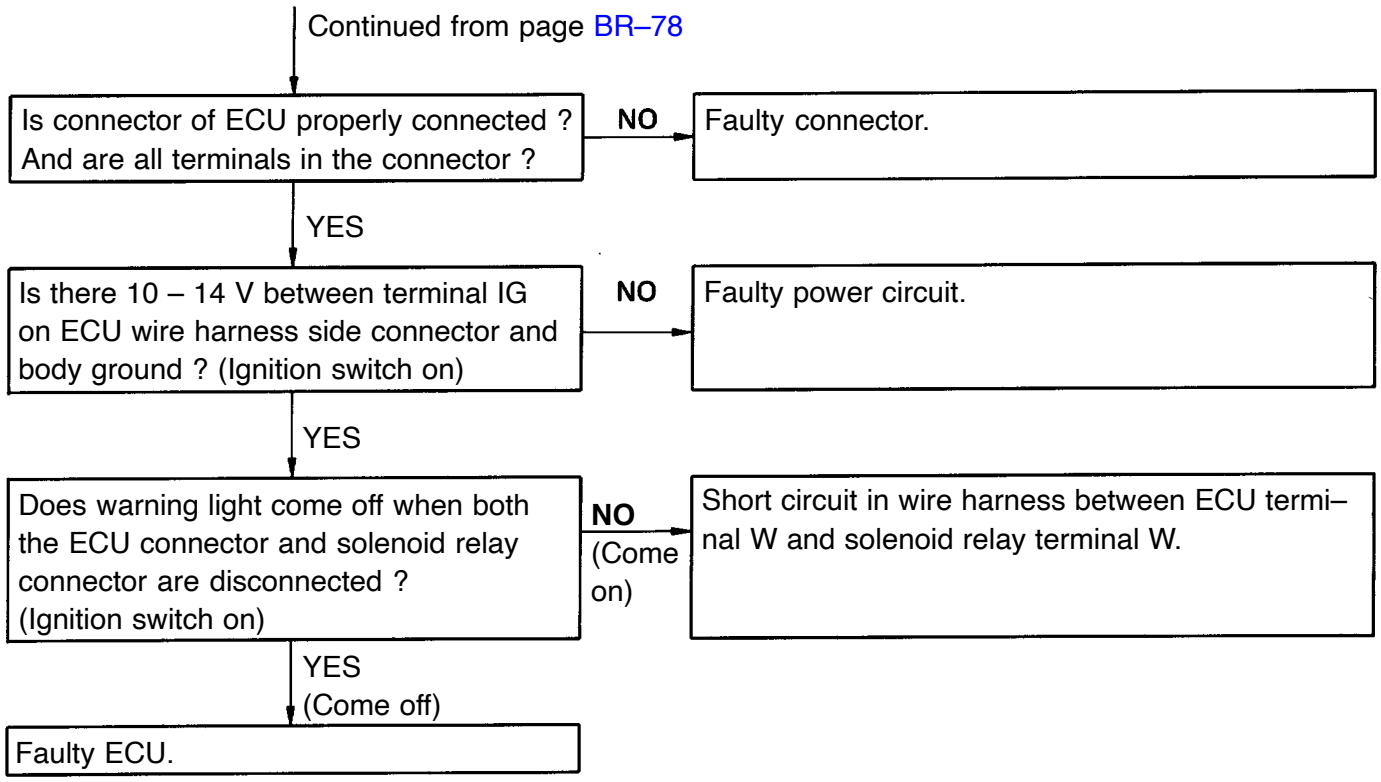
↓

Does warning light always come on or show the normal code ?
(Ignition switch on)

NO → See diagnostic trouble code. (See page BR–75)

↓ YES

Continued on page BR–79


Continued from page BR–78
Is connector of ECU properly connected ? And are all terminals in the connector ?
NO
Faulty connector.
YES
Is there 10 – 14 V between terminal IG on ECU wire harness side connector and body ground ? (Ignition switch on)
NO
Faulty power circuit.
YES
Does warning light come off when both the ECU connector and solenoid relay connector are disconnected ? (Ignition switch on)
NO
(Come on)
Short circuit in wire harness between ECU terminal W and solenoid relay terminal W.
YES
(Come off)
Faulty ECU.

2	**"REAR ANTILOCK" warning light does not come on for about 2 seconds after ignition switch on.**

Disconnect service connector and ground the terminal W of the wire harness side connector. (Ignition switch on)

↓

Does warning light come on ?

NO → Bulb burned out or open circuit in wire harness between warning light and service connector terminal W.

↓ YES

Disconnect connector from ECU and solenoid relay, and ground terminal W of ECU wire harness side connector. (ignition switch on)

↓

Does warning light come on ?

NO → Open circuit in wire harness between ECU terminal W and warning light.

↓ YES

With ignition switch off, disconnect solenoid relay connector, and check continuity between terminal W and BS on solenoid relay side.

↓

Reverse tester leads and check again. Is there one way continuity between terminals ?

NO → Short circuit in solenoid relay inside diode.

↓ YES

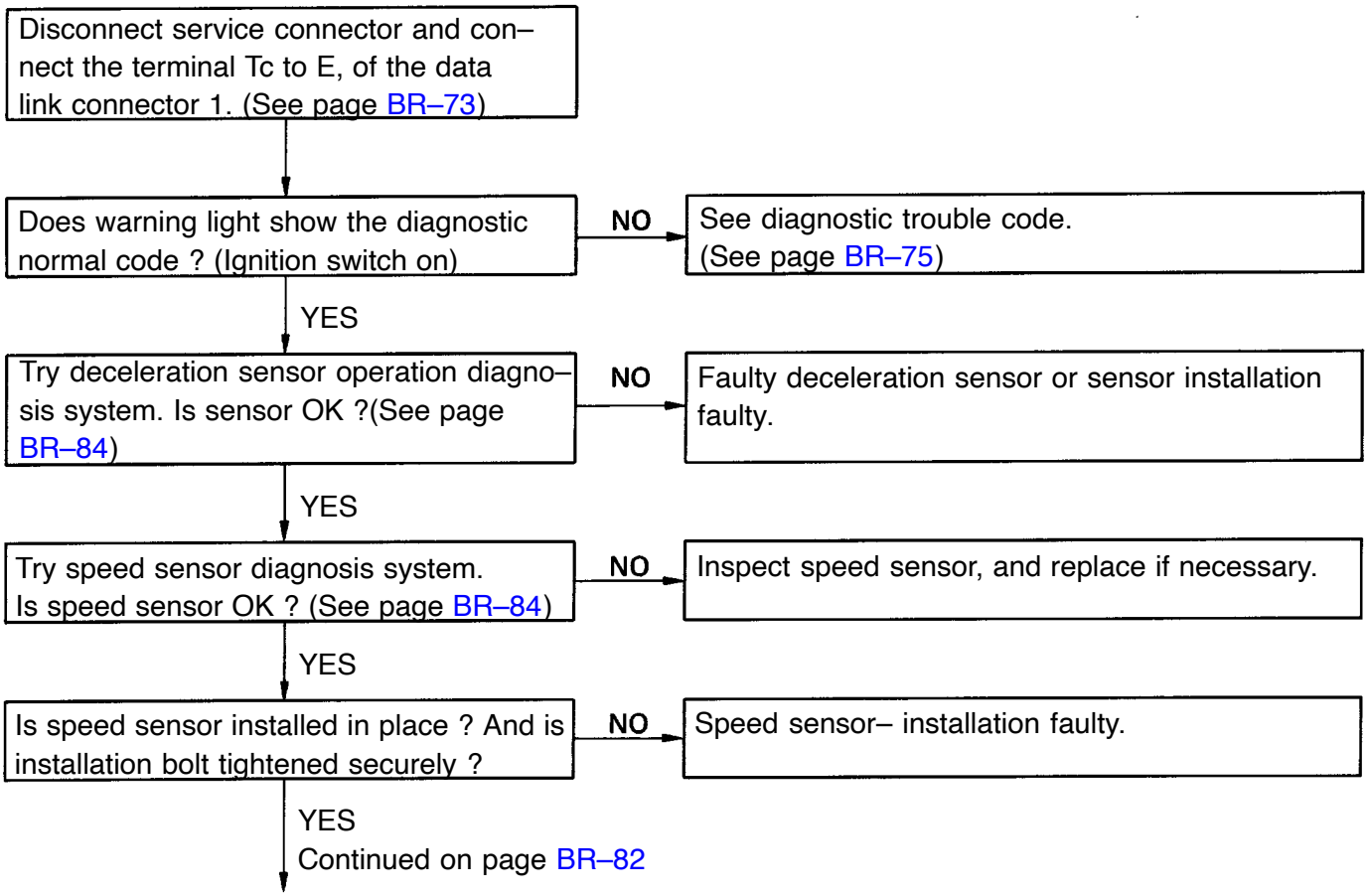
Faulty ECU.

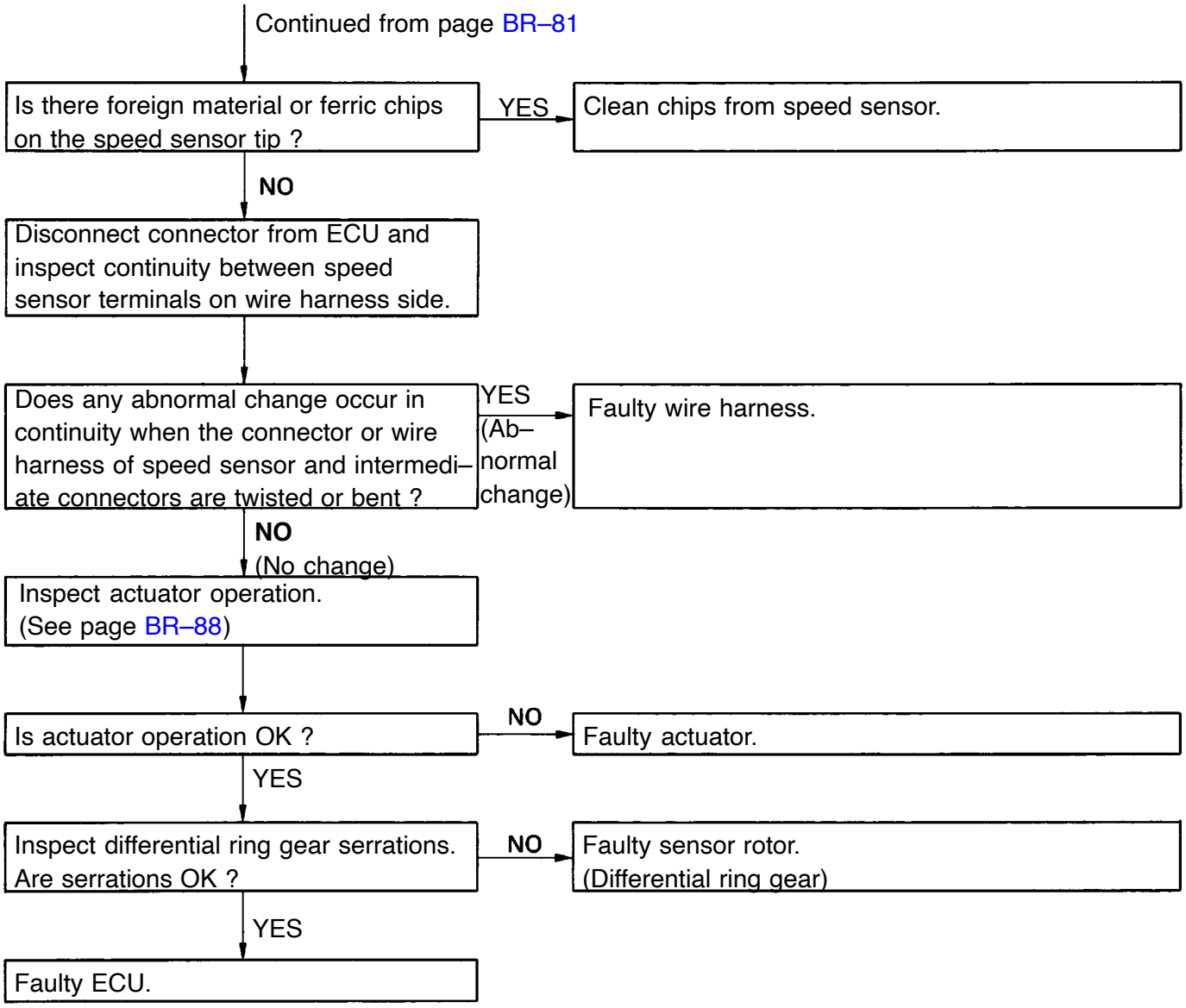
HINT: If the diode is short–circuited, a malfunction at ECU terminal W will occur.
When inspecting the terminal, connect the ECU connector and disconnect solenoid relay connector. Then turn the ignition switch on, and check that the warning light goes on. If it does, the ECU terminal is OK.

3	**"'REAR ANTILOCK" warning light comes on and off .**

- Short circuit in wire harness between ECU terminal TS and data link connector 1 terminal Ts.
- Short circuit in wire harness between ECU terminal TC and data link connector 1 terminal Tc.

4	• **Braking inefficient.** • **Rear–Wheel Anti–Lock Brake System operates at ordinary braking.** • **Rear–Wheel Anti–Lock Brake System operates just before stopping at ordinary braking.** • **Brake pedal pulsates abnormally while Rear–Wheel Anti–Lock Brake System working.**




Continued from page BR–81
Is there foreign material or ferric chips on the speed sensor tip ?
YES
Clean chips from speed sensor.
NO
Disconnect connector from ECU and inspect continuity between speed sensor terminals on wire harness side.
Does any abnormal change occur in continuity when the connector or wire harness of speed sensor and intermediate connectors are twisted or bent ?
YES (Abnormal change)
Faulty wire harness.
NO (No change)
Inspect actuator operation. (See page BR–88)
Is actuator operation OK ?
NO
Faulty actuator.
YES
Inspect differential ring gear serrations. Are serrations OK ?
NO
Faulty sensor rotor. (Differential ring gear)
YES
Faulty ECU.

5	**Rear–Wheel Anti–Lock Brake System works inefficiently.**

Disconnect service connector and connect the terminal Tc to E , of the data link connector
1. (See page BR–73)

↓

Does warning light show the diagnostic normal code ?
(Ignition switch on)

NO → See diagnostic trouble code.
(See page BR–75)

↓ YES

Is there battery positive voltage between ECU terminal STP and body ground when depressing brake pedal ?

NO → Open circuit in stop light switch and/or wire harness.

↓ YES

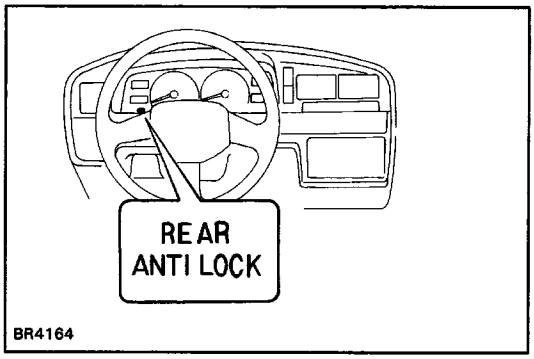
Inspect actuator.
(See page BR–87)

Deceleration Sensor and Speed Sensor Diagnosis System

PRECAUTION

- While checking the deceleration sensor and speed sen–sor diagnosis system, the Rear–Wheel Anti–Lock Brake System does not work and brake system works as nor–mal brake system.

INSPECTION OF DIAGNOSIS SYSTEM



1. INSPECT BATTERY POSITIVE VOLTAGE

Inspect that the battery positive voltage is about 12 V.

2. CHECK THAT WARNING LIGHT TURNS ON

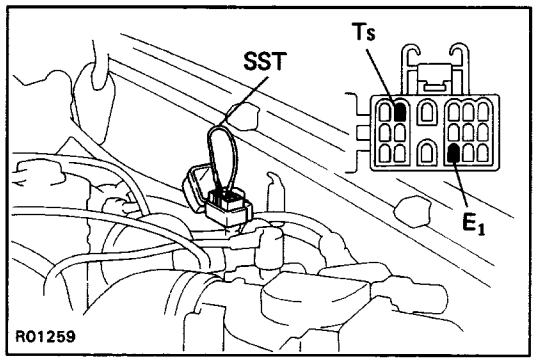
(a) Turn the ignition switch to ON.

(b) Check that the ”REAR ANTI–LOCK” warning light turns on for about 3 seconds.

If not, inspect and repair or replace the fuse, bulb and wire harness.

(e) Check that the ”REAR ANTI–LOCK” warning light turns off.

(d) Turn the ignition switch to OFF.

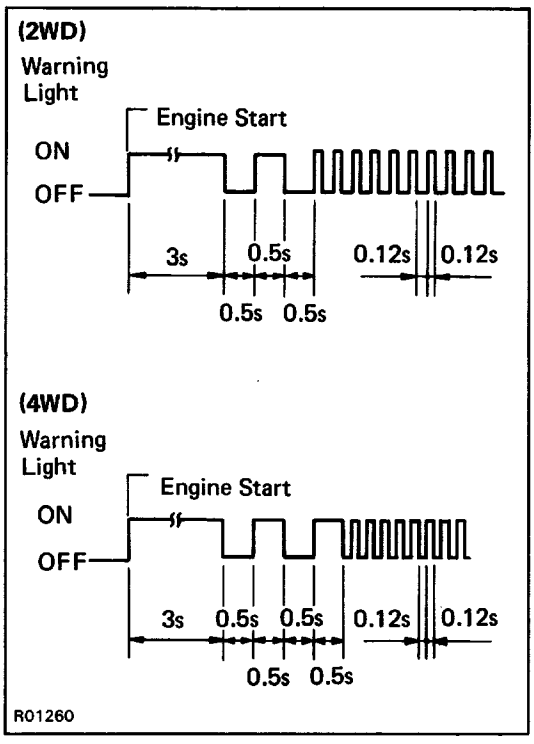


3. PERFORM FOLLOWING STEPS

(a) Using SST, connect the terminal Ts to El of the data link connector 1.

SST 09843–18020

(b) Start the engine.

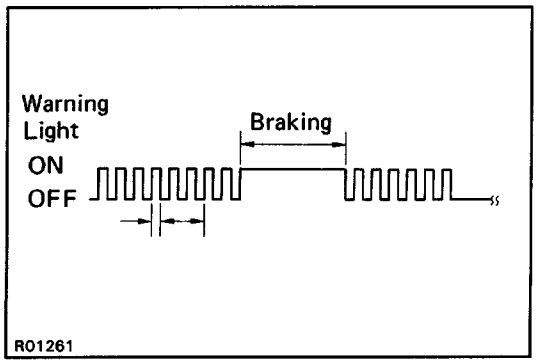


(c) (2 WD model)

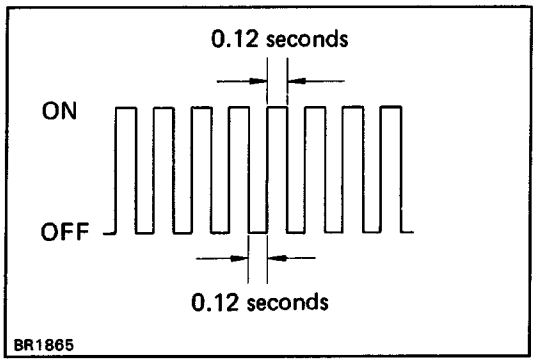
Check that the warning light blinks about 4 times every 1 second after blinking 1 time in 1.5 seconds as shown.

(d) (4 WD model)

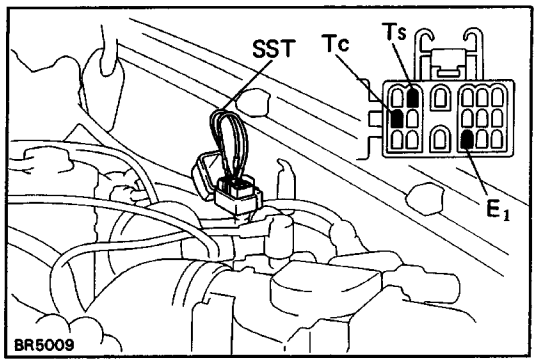
Check that the warning light blinks about 4 times every 1 second after blinking 2 times in 2.0 seconds as shown.



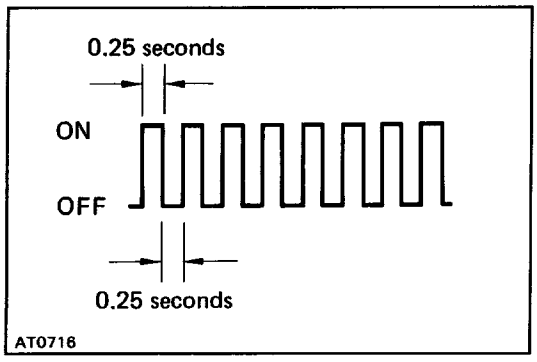
(e) Drive the vehicle straight ahead at about 20 km/h (12.4 mph) or more, depress the brake pedal strongly.
(f) Check that the warning light turns on while braking.



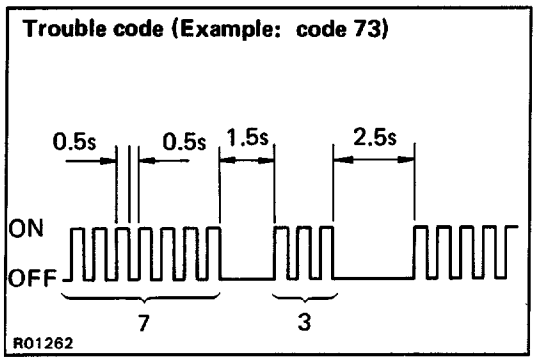
(g) Drive the vehicle straight ahead at about 50 km/h (31 mph) or more, and stop the vehicle.
(h) Check that the warning light blinks about 4 times every 1 second as shown.



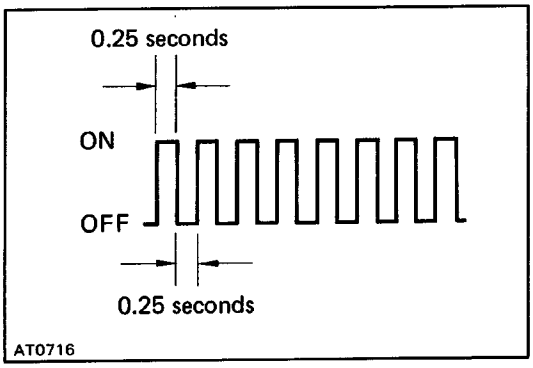
(i) Using SST, connect terminals Tc and E 1 of the data link connector 1.
SST 09843–18020

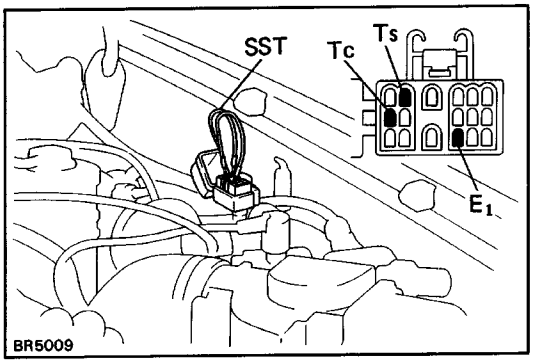


(j) Check that the warning light shows the normal code.



(k) In event of a malfunction, 2.5 seconds later the warning light will begin to blink. Read the number of blinks.
(See DIAGNOSTIC TROUBLE CODE on page BR–86)
HINT: The first number of blinks will equal the first digit of a two digit diagnostic trouble code. After a 1.5 seconds pause, the 2nd number of blinks will equal the 2nd number of a two digit code. If there are two or more codes, there will be a 2.5 seconds pause between each,
and indication will begin after 2.5 seconds pause from the smaller value and continue in order to larger.





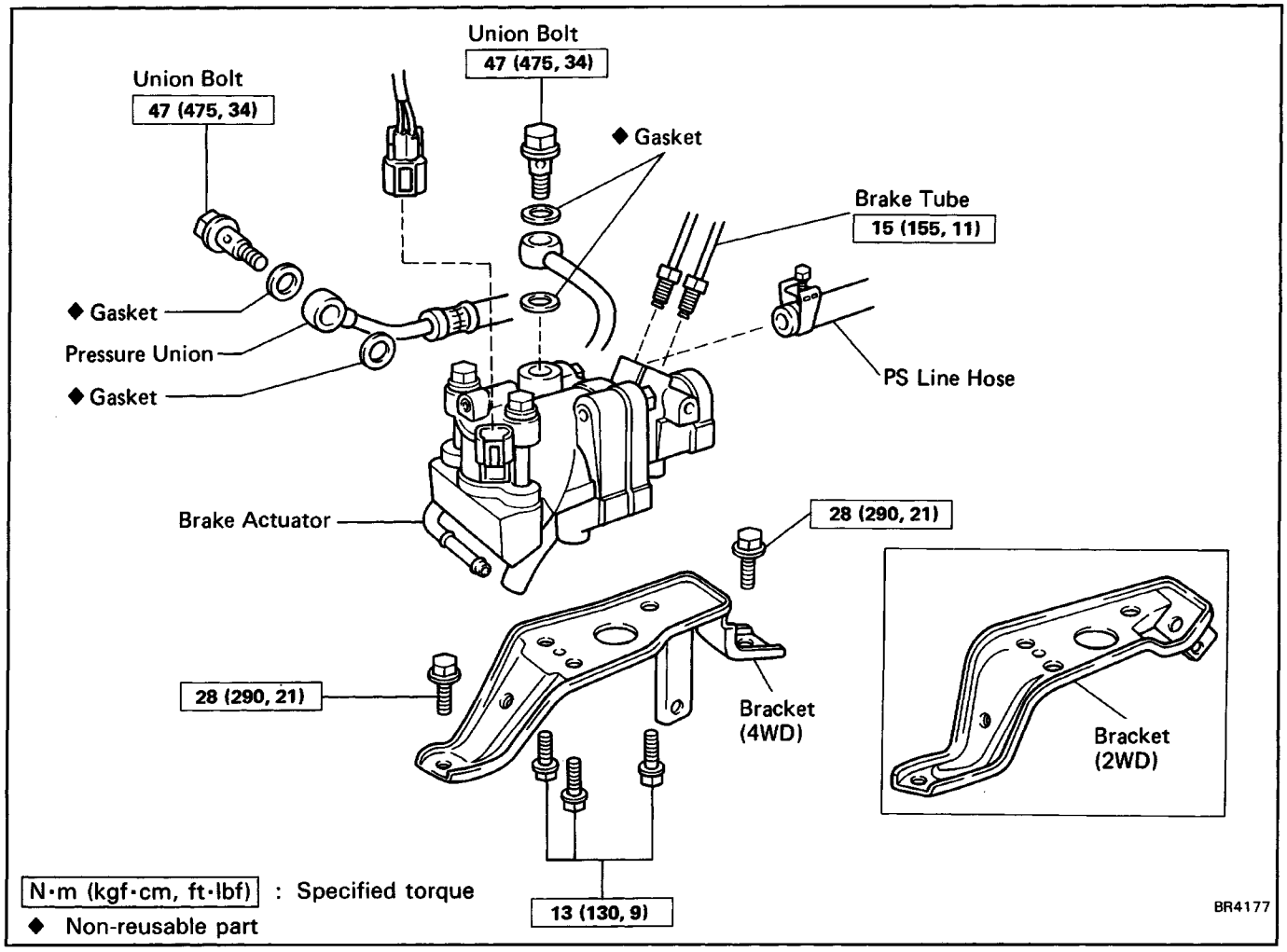
(l) If the system is operating normally (no malfunction), the warning light will blink once every 0.5 seconds.
(m) Repair the system.
(n) After the malfunctioning components have been repaired, clear the diagnostic trouble codes stored in the ECU.
(See page BR–76)
HINT: If you disconnect the battery cable while repair–
ing, all diagnostic trouble codes in the ECU will be erased.
(o) Remove the SST from terminals Ts, Tc and E 1 of the data link connector 1.
SST 09843–18020

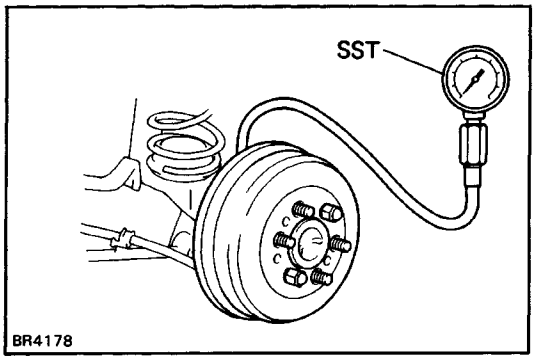
DIAGNOSTIC TROUBLE CODE

Code No.	Light Pattern	Diagnosis	MAlfunctioning Part
	ON / OFF 	Speed sensor and sensor rotor are normal	
73		Low output voltage of speed sensor signal	Speed sensor Sensor rotor Differential ring gear
77		Abnormal change of output voltage of speed sensor signal	Sensor rotor Differential ring gear
79		Sticking of deceleration sensor pendulum	Deceleration sensor

R01263

Brake Actuator
COMPONENTS

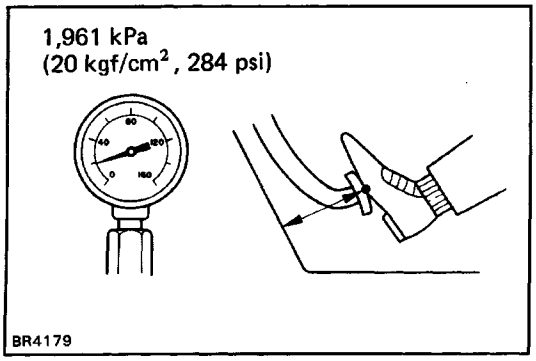




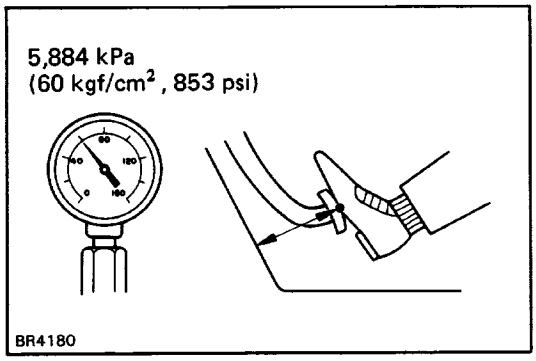
INSPECTION OF BRAKE ACTUATOR
1. CHECK BRAKE FLUID PRESSURE

(a) Remove the bleeder plug from the rear wheel cylinder and connect SST.
SST 09709–29017

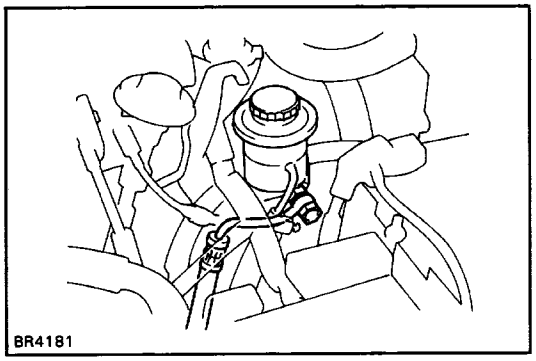
(b) Bleed the air from SST.



(c) With the engine off, hold the brake pedal depressed for about 10 seconds with the pressure at 1,961 kPa (20 kgf/crn^2, 284 psi), and check that there is no change in the pedal reserve distance.
If there is a change in the brake pedal reserve distance, check the brake line, master cylinder and wheel cylinder for fluid leakage.



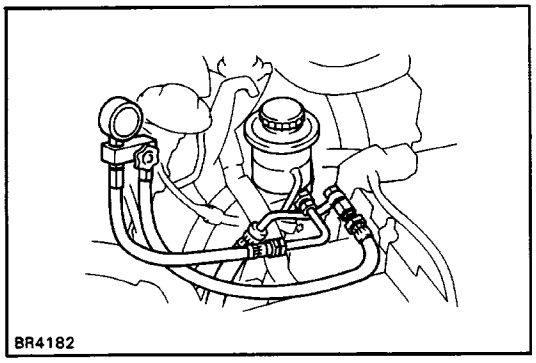
(d) With the engine running, hold the brake pedal de–pressed for about 1 0 seconds with the pressure at 5,844 kPa (60 kgf/cm^2, 853 psi), and check that there is no change in the pedal reserve distance.
If there is a change in the brake pedal reserve distance, inspect the brake actuator.



2. CHECK POWER STEERING FLUID PRESSURE

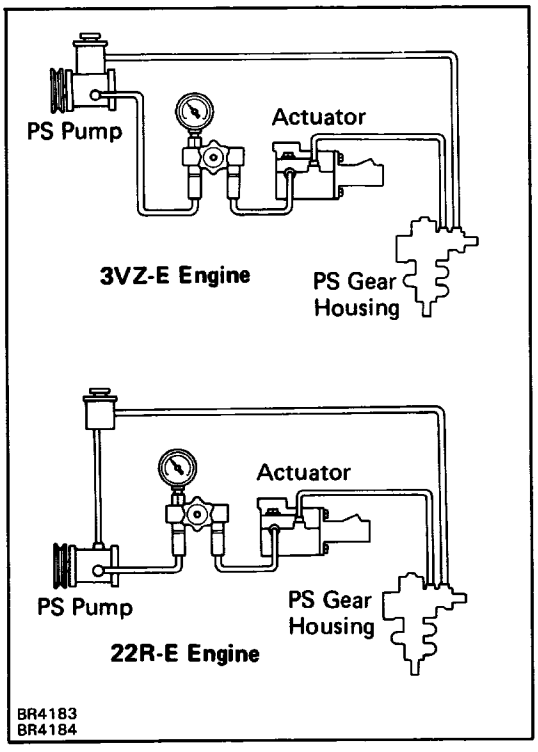
(a) (4WD w/ 22R–E Engine)
Using SST, disconnect the power steering pressure line from the power steering pump.
SST 0963 1–22020

(b) (Except 4WD w/ 22R–E Engine)
Remove the union bolt and disconnect the power steering pressure line from the power steering pump.



(c) Connect the power steering pressure gauge be–tween the power steering pump and hose with the gauge valve on the actuator side.

(d) Bleed the system and check that the fluid level is correct.
(See page BR–94)



(e) Start the engine and run it at idle.

(f) Close the pressure gauge valve and observe the reading on the gauge.
Minimum pressure: 7,355 kPa (75 kgf/cm^2, 1,067 psi)
HINT:

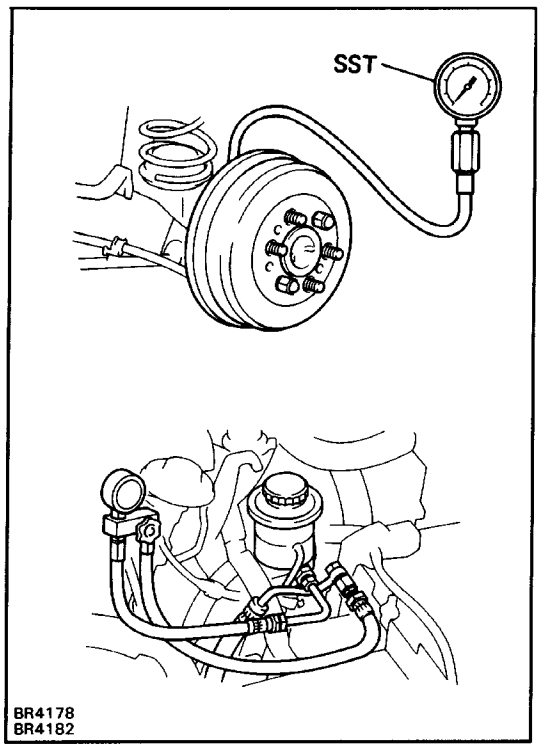
- Do not keep the valve closed for more than 10 sec. onds.
- Check with the fluid temperature at least 80°C (176°F).

If pressure is low, repair or replace the power steering pump.

3. CHECK RELATION BETWEEN BRAKE FLUID AND POWER STEERING FLUID PRESSURE

HINT:

- Be sure the tires in the straight–ahead position.
- Be sure the power steering pressure gauge valve is; fully open.
- Check with the power steering fluid temperature a– least 80°C (176°F).

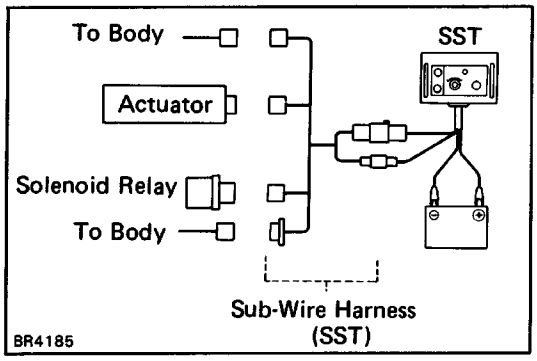


With the engine running, the brake and power steering fluid pressure should conform to the following table.

kPa (kgf/cm^2, psi)

Brake Fluid Pressure	2,941 (30, 427)	9,807 (100, 1,422)
PS Fluid Pressure	1,569 – 2,550 (16 – 26, 228 – 370)	3,236 – 4,609 (33 – 47, 469 – 668)

If not within specification, check the actuator.

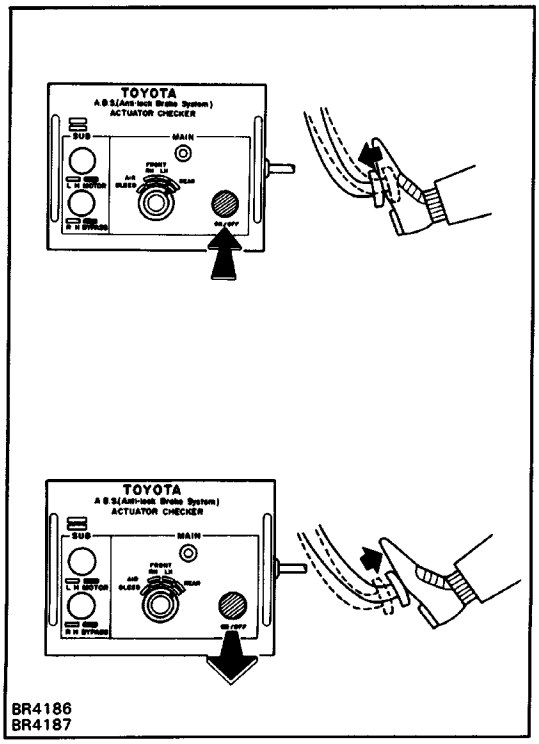


4. CHECK ACTUATOR OPERATION

(a) Disconnect the connector from the actuator.
(b) Disconnect the connector from the solenoid relay.
(c) Connect the actuator checker (SST) to the actuator, solenoid relay and body side wire harness through the sub–wire harness (SST) as shown.
SST 09990–00150 and 09990–00205
(d) Connect the red cable of the checker to the battery positive (+) terminal and black to the negative (–) terminal.
(e) Start the engine, and run it at idle.
(f) Turn the selector switch of actuator checker to "REAR" position.
(g) Strongly depress the brake pedal and hold it.
(h) Push the ON/OFF switch, and check that the brake pedal sinks a little and that it returns to the original position when the switch is released.
NOTICE:

- **To avoid damaging the master cylinder piston cup, do not push on SST switch before depressing the brake pedal and do not release your foot from the brake pedal while SST switch is pushing on.**
- **Do not keep the ON/OFF switch pushing more than 10 seconds.**

If operation is not as specified, replace the actuator.
(i) Release the switch, then release the brake pedal.



5. REMOVE ACTUATOR CHECKER (SST)

Remove SST, then connect the connectors of the actuator and solenoid relay.

SST 09990–00150 and 09990–00205

6. REMOVE SST FROM WHEEL CYLINDER

SST 09709–29017

7. REMOVE PRESSURE GAUGE FROM PS PUMP

Remove the pressure gauge from the PS line, then bleed the power steering system.

8. BLEED SYSTEM

(a) Fill brake reservoir with brake fluid.

(b) Fill PS reservoir with fluid.

Fluid type: ATF DEXRON© II

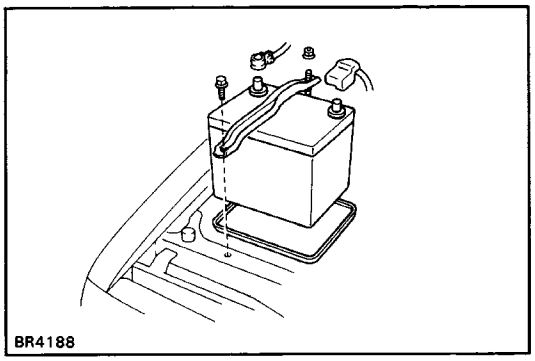
(c) Bleed the system.

(See page BR–94)

REMOVAL OF BRAKE ACTUATOR

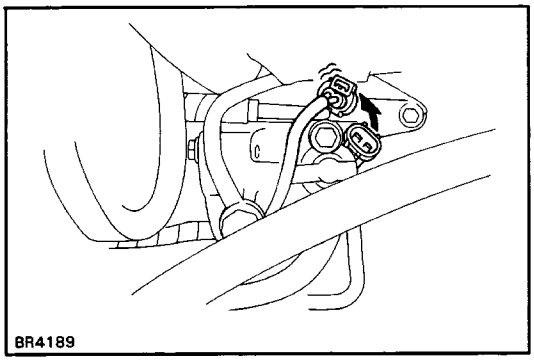
1. REMOVE BATTERY

Disconnect the wire harnesses from the terminals and remove the battery and tray.



2. DISCONNECT CONNECTOR

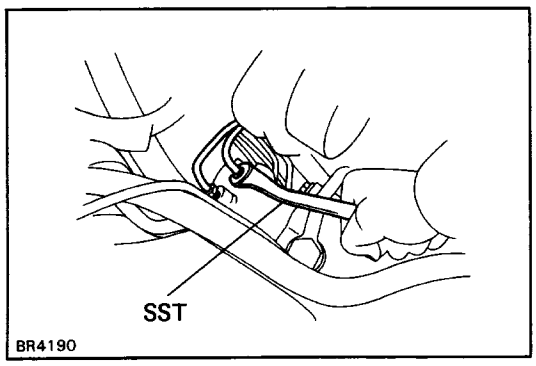
Disconnect the connector from the actuator.

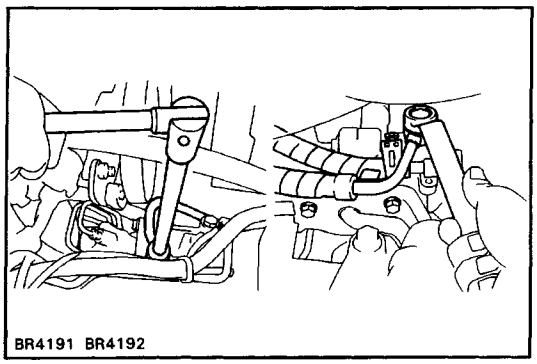


3. DISCONNECT TWO BRAKE TUBES

Using SST, disconnect the two brake tubes.

SST 09751–36011




BR4191 BR4192

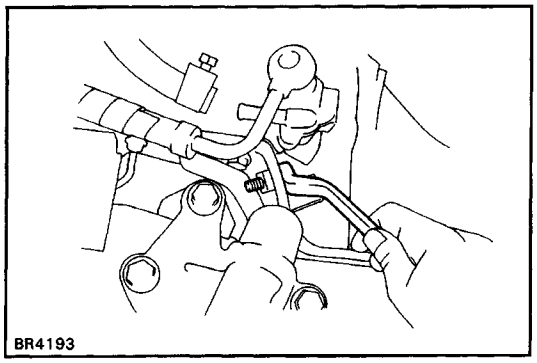
4. DISCONNECT POWER STEERING LINES FROM ACTUATOR

HINT: Turn the steering wheel clockwise until it locks before disconnecting the PS lines. And if you cannot work from the upper side, work from the wheel house.

(a) Remove the two union bolts and disconnect the two power steering pressure tubes.

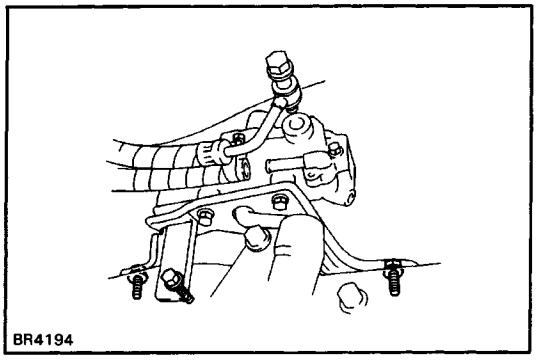
(b) (22R–E Engine)
Disconnect the power steering line hose.

(c) (3VZ–E Engine)
Disconnect the two power steering line hoses.


BR4193

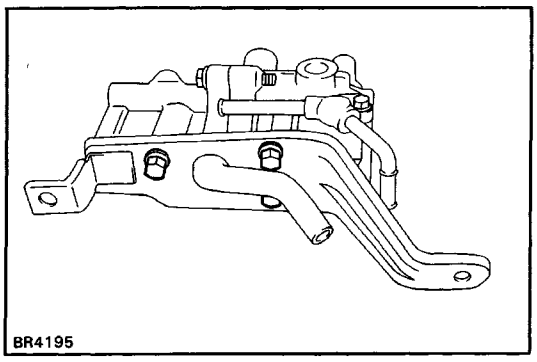
5. REMOVE PS TUBE CLAMP INSTALLATION BOLT

Remove the installation bolt of the power steering tube clamp.


BR4194

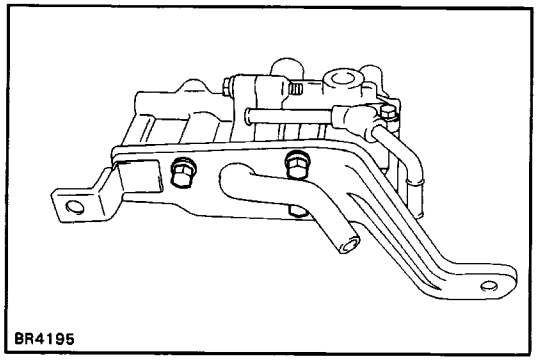
6. REMOVE ACTUATOR

Remove the three bolts and remove the actuator from the wheel house.


BR4195

7. REMOVE BRACKET FROM ACTUATOR

Remove the three bolts and separate the actuator and bracket.

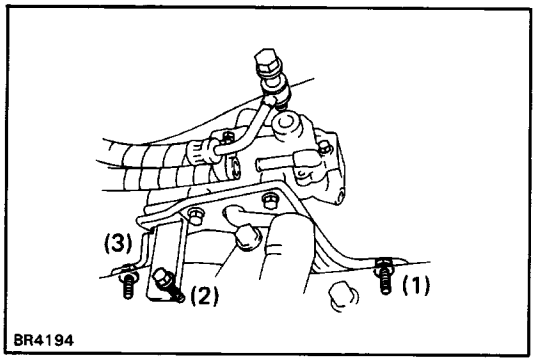

BR4195

INSTALLATION OF BRAKE ACTUATOR

1. INSTALL BRACKET TO ACTUATOR

Install the bracket to the actuator with the three bolts.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



BR4194

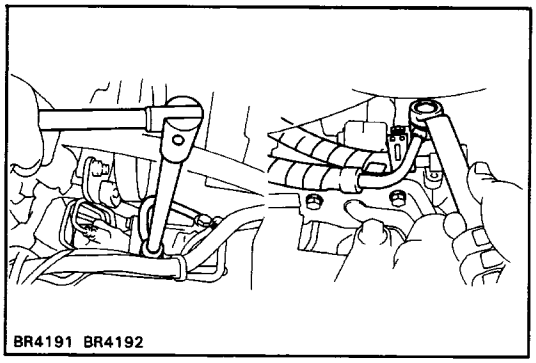
2. INSTALL ACTUATOR

Install the actuator in place and tighten the three bolts.

Torque: 28 N–m (290 kgf–cm, 21 ft–lbf)

HINT: Install the bolts in following order.

(1) Front side bolt
(2) Wheel house side bolt of rear bolts
(3) Upper side bolt on frame of rear bolts

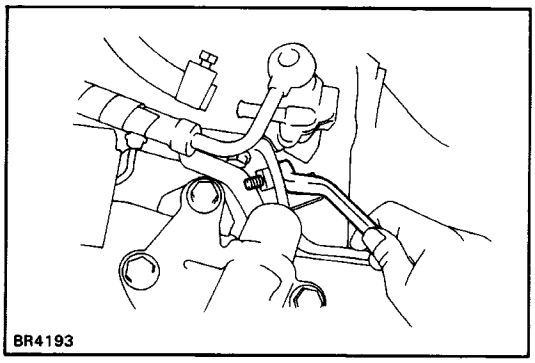

BR4191 BR4192

3. CONNECT POWER STEERING LINES

(a) Set the pressure union and new gaskets in place, then install the union bolt.

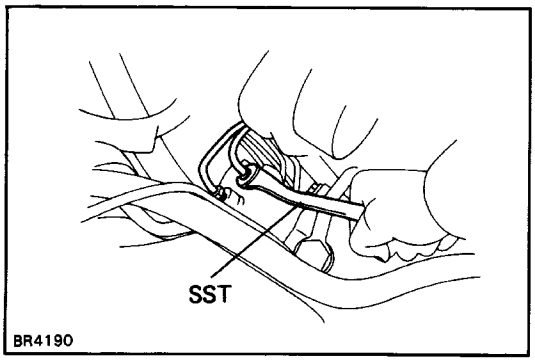
Torque: 47 N–m (475 kgf–cm, 34 ft–lbf)

(b) Similarly connect the other pressure tube.
(c) Connect the PS line hose to the actuator, then fix it with the hose clamp.
(d) (3VZ–E Engine)
Similarly connect the other PS line hose.


BR4193

4. INSTALL PS TUBE CLAMP

Install the PS pressure tube clamp in place and tighten the bolt.



BR4190

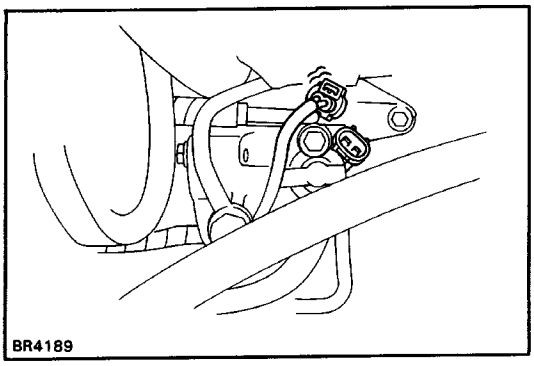
5. CONNECT TWO BRAKE TUBES

Using SST, connect the two brake tubes to the actuator.

SST 09751–36011

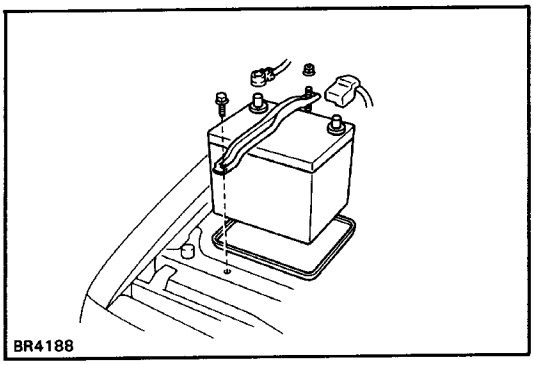
Torque: 15 N–m (155 kgf–cm, 11 ft–lbf)

HINT: First connect the painted brake tube to the painted hole of the actuator, then the other.



6. CONNECT CONNECTOR

Connect the connector to the actuator.



7. INSTALL BATTERY

Install the tray and battery in place, then connect the wire harnesses to the terminals.

8. BLEED SYSTEM

(a) Fill brake reservoir with brake fluid.

(b) Fill PS reservoir with fluid.

Fluid type: ATF DEXRON©II

(c) Bleed the system.

(See page BR–94)

BLEEDING OF REAR–WHEEL ANTI–LOCK BRAKE SYSTEM

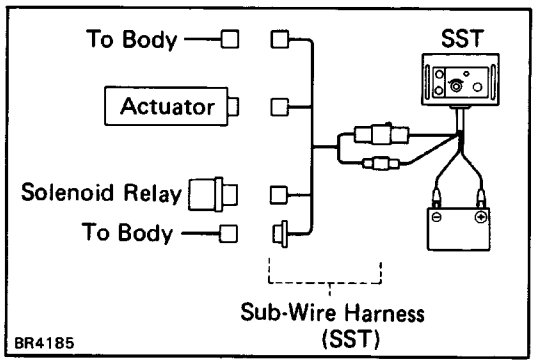
HINT: Whenever PS hoses or PS pressure tube are disconnected or actuator is removed from the vehicle, the Rear–Wheel Anti–Lock Brake System should be bled in the following procedure.
At the other times, use the conventional procedure.

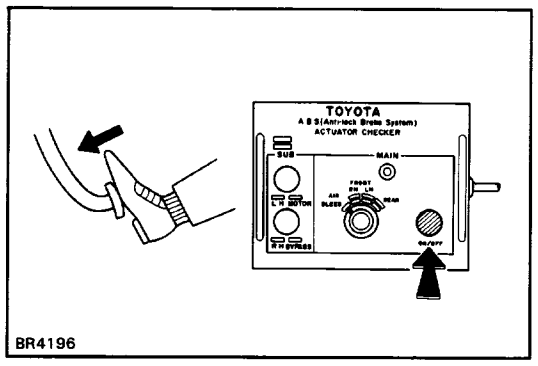
1. BLEED POWER STEERING SYSTEM

Use the conventional procedure.

2. BLEED BRAKE SYSTEM

(a) Bleed the system with the engine running.
(b) Bleed the system with the engine off.





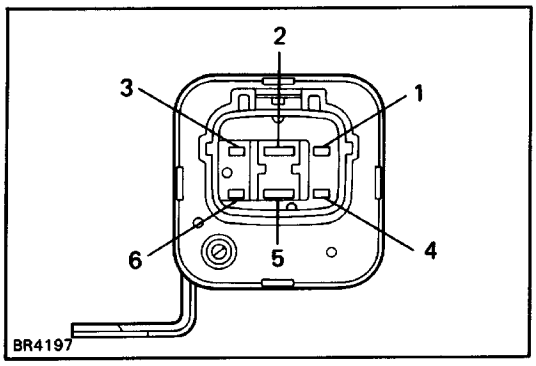
3. BLEED POWER STEERING SYSTEM AGAIN

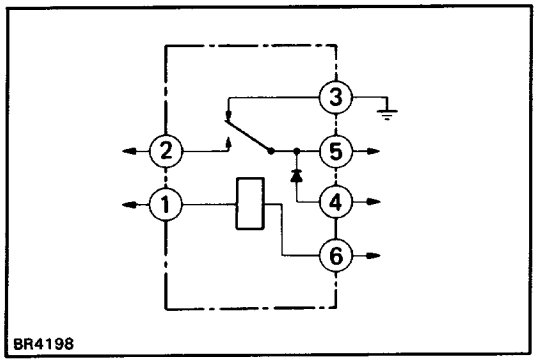
(a) Disconnect the connector from the actuator.
(b) Disconnect the connector from the solenoid relay.
(c) Connect the actuator checker (SST) to the actuator, solenoid relay and body side wire harness through the sub–wire harness (SST) as shown.
SST 09990–00150 and 09990–00205
(d) Connect the red cable of the checker to the battery positive (+) terminal and black to the negative¿ –) terminal.
(e) Start the engine, and run it at idle.
(f) Turn the selector switch of actuator checker to ”AIR BLEED” position.
(g) Strongly depress the brake pedal and hold it.
(h) Push on and release the ON/OFF switch three seconds each for five times.

NOTICE:

- **To avoid damaging the master cylinder piston cup, do not push on SST switch before depressing the brake pedal and do not release your foot from the brake pedal while SST switch is pushing on.**
- **Do not keep the ON/OFF switch pushing more than 10 seconds.**

(i) Release the switch, then release the brake pedal.
(j) Check the PS and brake fluid level, and add the fluid if necessary.
(k) Remove SST, then connect the connectors of the actuator and solenoid relay.
SST 09990–00150 and 09990–00205





Control Relay

INSPECTION OF SOLENOID RELAY

INSPECT SOLENOID RELAY OPERATION

Inspect the relay continuity between terminals.

Terminal / Condition	6	1	2	3	5	4
Constant	○—○			○	○—▶○	
Apply battery positive voltage between terminals 1 and ’6			○		○—▶○	

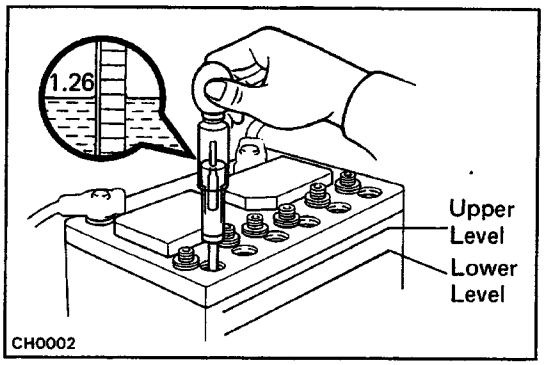
If relay operation is not as specified, replace the solenoid relay.

CHARGING SYSTEM

PRECAUTIONS

1. Check that the battery cables are connected to the correct terminals.
2. Disconnect the battery cables when the battery is given a quick charge.
3. Do not perform tests with a high voltage insulation resistance tester.
4. Never disconnect the battery while the engine is running.

ON–VEHICLE INSPECTION



1. INSPECT BATTERY SPECIFIC GRAVITY AND ELECTROLYTE LEVEL

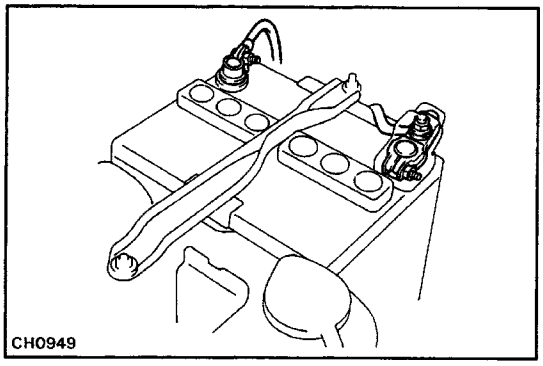
(a) Check the specific gravity of each cell.

Standard specific gravity

When fully charged at 20°C (68°F):
22R–E 1.25 – 1.27
3VZ–E 55D 23R 1.25 – 1.27
80D 26R 1.27 – 1.29

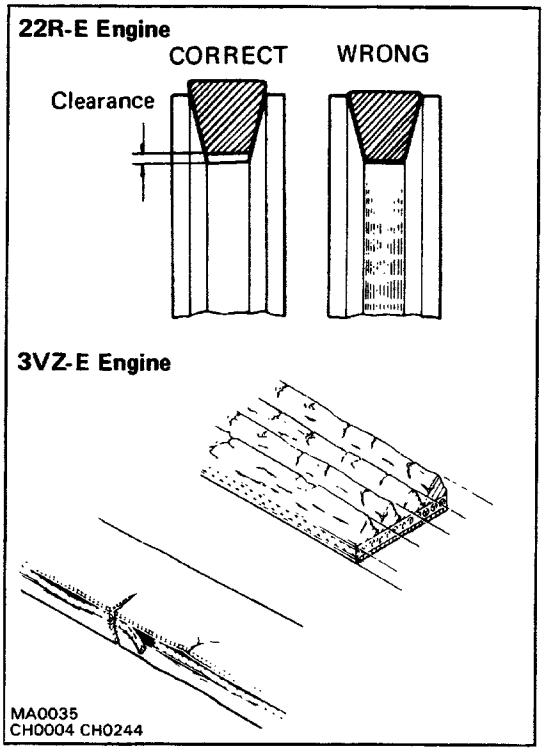
If not within specifications, charge the battery.

(b) Check the electrolyte quantity of each cell.
If insufficient, refill with distilled (or purified) water.



2. CHECK BATTERY TERMINALS AND FUSIBLE LINKS

(a) Check that the battery terminals are not loose or corroded.
(b) Check the fusible links for continuity.



3. INSPECT DRIVE BELT

(a) Visually check the belt for excessive wear, frayed cords etc.

HINT:
22R–E: Check that the belt does not touch the bottom of the pulley groove.
If any defect has been found, replace the drive belt.
3VZ–E: Cracks on the ribbed side of the belt are considered acceptable.
If the belt has chunks missing from the ribs, it should be replaced.

PRECAUTIONS

1. Check that the battery cables are connected to the correct terminals.
2. Disconnect the battery cables when the battery is given a quick charge.
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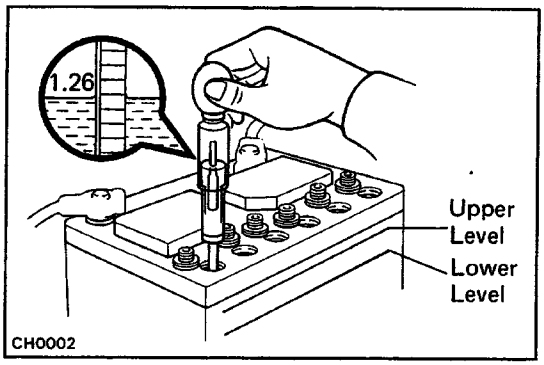
ON–VEHICLE INSPECTION



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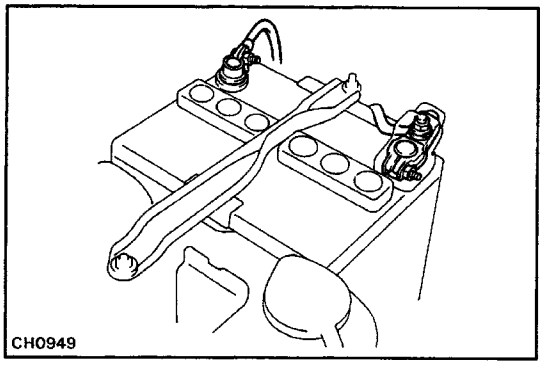

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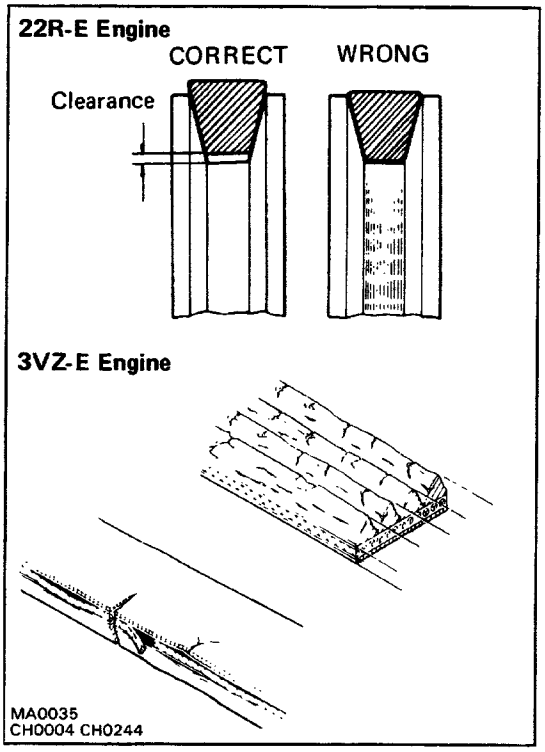

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HINT:
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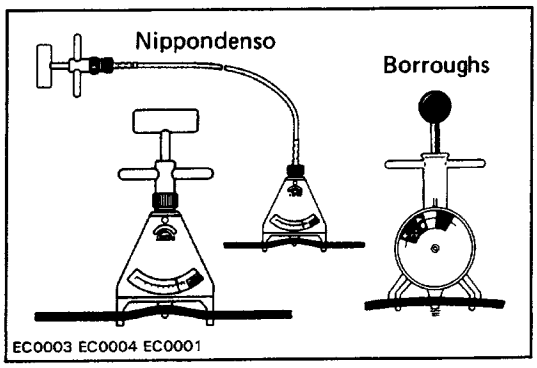
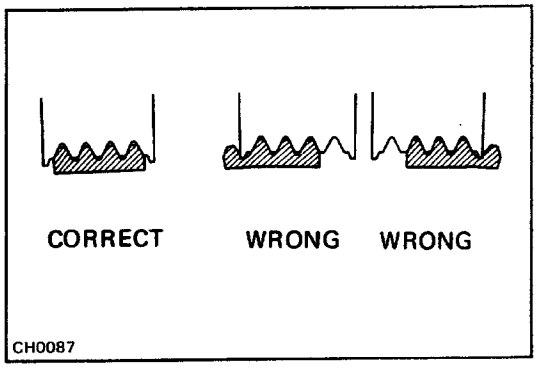
If the belt has chunks missing from the ribs, it should be replaced.





(b) Using a belt tension gauge, check the drive belt tension .

Belt tension gauge:

Nippondenso BTG–20 (95506–00020) or Borroughs No. BT–33–73F

Drive belt tension:

22R–E New belt 125 ± 25 lbf

Used belt 80 ± 20 lbf

3VZ–E New belt 160 ± 20 lbf

Used belt 100 ± 20 lbf ,

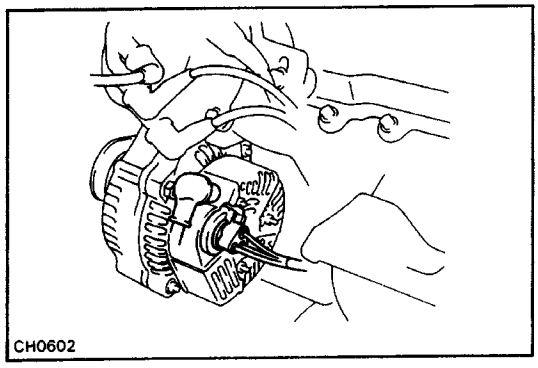
If necessary, adjust the drive belt tension.

HINT:

- ”New belt” refers to a belt which has been used less than 5 minutes on a running engine.
- ”Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing the drive belt, check that it fits properly in the ribbed grooves. Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the crank pulley.
- After installing a new belt, run the engine for approx. 5 minutes and then recheck the tension.

4. INSPECT FUSES FOR CONTINUITY

- ENGINE 10A
- CHARGE 7–5A
- IGN 7.5A



5. VISUALLY CHECK GENERATOR WIRING AND LISTEN FOR ABNORMAL NOISES

(a) Check that the wiring is in good condition.

(b) Check that there is no abnormal noise from the gener–ator while the engine is running.

6. INSPECT DISCHARGE WARNING LIGHT CIRCUIT

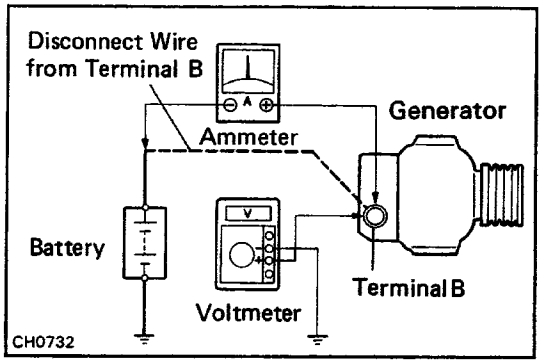
(a) Turn the ignition switch ON. Check that the discharge warning light is lit.

(b) Start the engine. Check that the light goes off.

If the light does not operate as specified, troubleshoot the warning light circuit.

7. CHECK CHARGING CIRCUIT WITHOUT LOAD

HINT: If a battery/generator tester is available, connect the tester to the charging circuit according to the manufac–turer's instructions.



(a) If a tester is not available, connect a voltmeter and ammeter to the charging circuit as follows:

- Disconnect the wire from terminal B of the gener–ator and connect the wire to the negative (–) ter–minal of the ammeter.
- Connect the test lead from the positive (+) termi–nal of the ammeter to terminal B of the generator.
- Connect the positive (+) lead of the voltmeter to terminal B of the generator.
- Ground the negative (–) lead of the voltmeter.

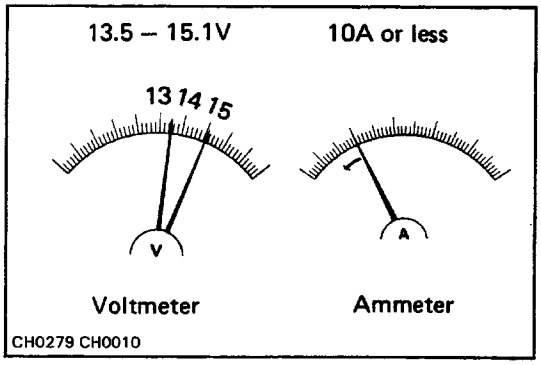
(b) Check the charging circuit as follows:

With the engine running from idling to 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: 10 A or less

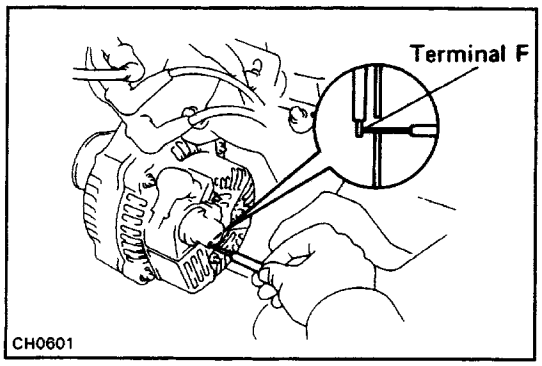
Standard voltage: 13.9 – 15.1 V at 250C (770F)
13.5 – 14.3 V at 1150C (239°F)

If the voltage reading is greater than standard voltage, replace the IC regulator.



If the voltage reading is less than standard voltage, check the IC regulator and generator as follows:

- With terminal F grounded, start the engine and check the voltage reading of terminal B.
- If the voltage reading is higher than standard voltage, replace the IC regulator.
- If the voltage reading is less than standard voltage, repair the generator.



8. INSPECT CHARGING CIRCUIT WITH LOAD

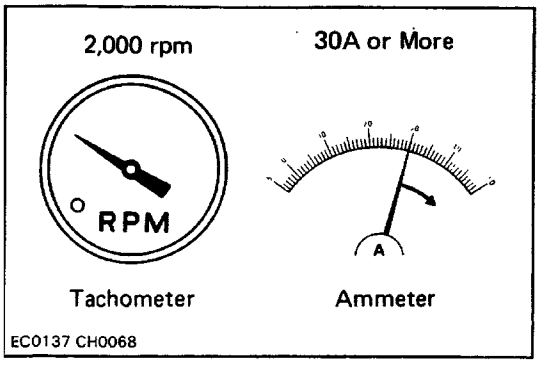
(a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater fan control switch at HI.

(b) Check the reading on the ammeter.

Standard amperage: 30 A or more

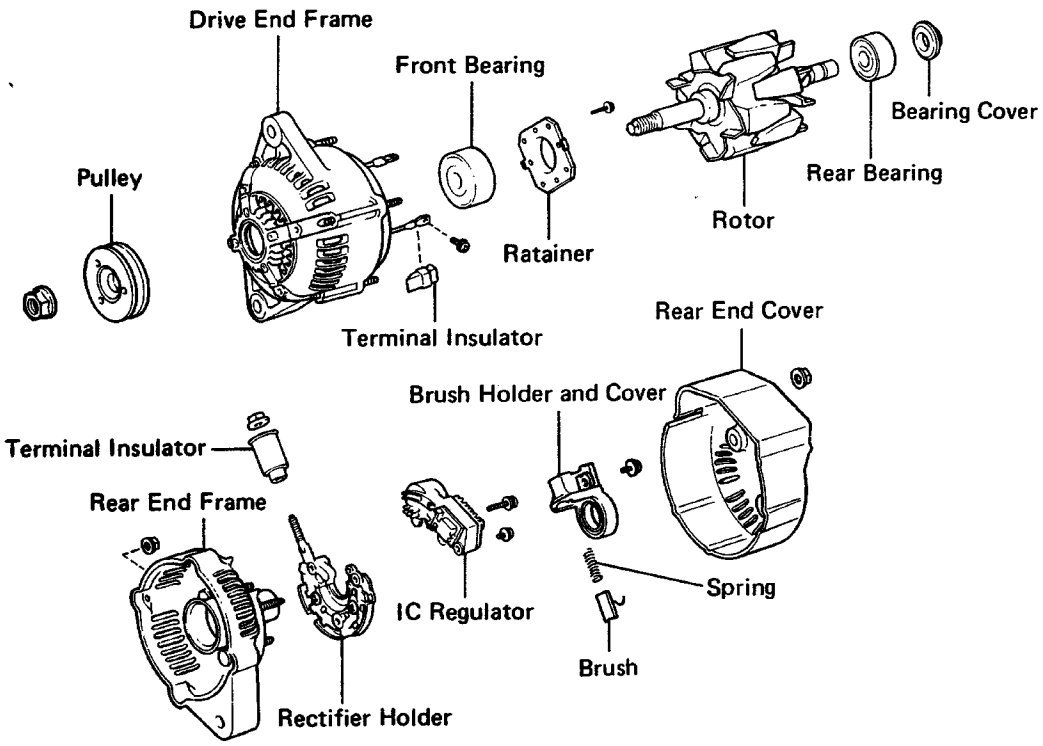
If the ammeter reading is less than 30 A, repair the gener–ator. (See page CH–5)

HINT: If the battery is fully charged, the indication will sometimes be less than 30 A.

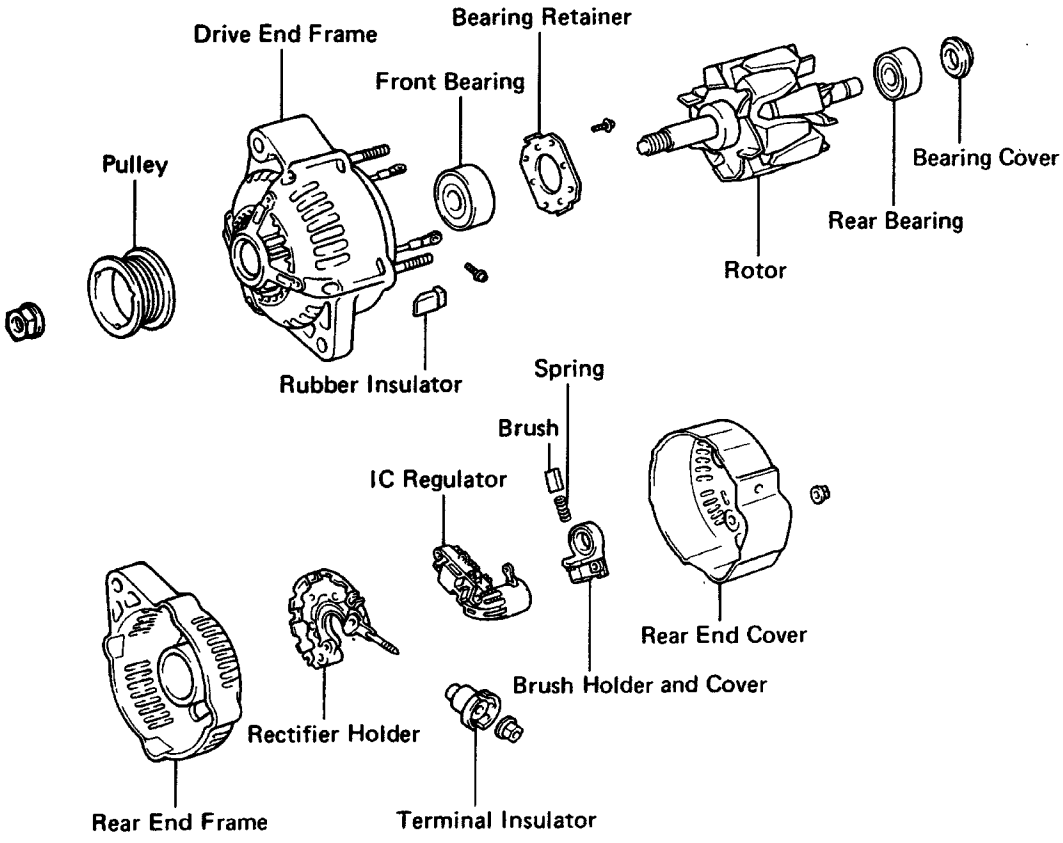


GENERATOR
COMPONENTS

22R-E Engine



3VZ-E Engine

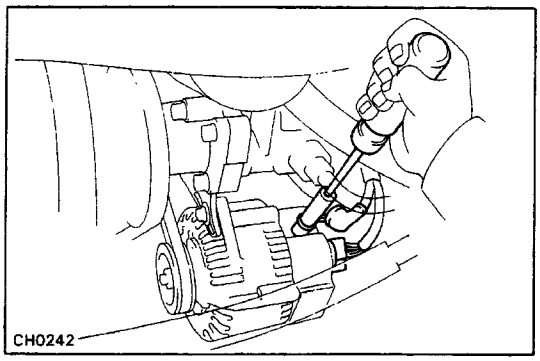


CH0238
CH0603

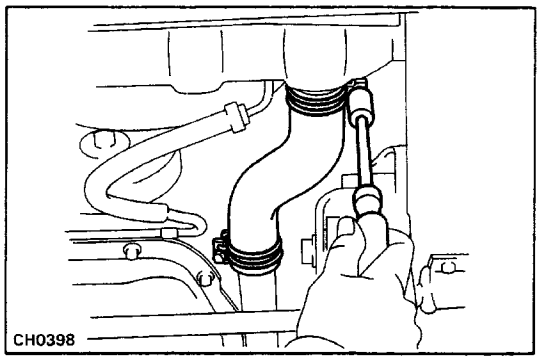
REMOVAL OF GENERATOR (22R–E)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

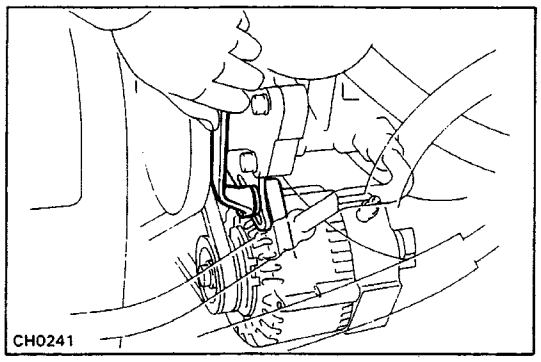
2. (w/ PS)
DRAIN COOLANT



3. DISCONNECT WIRING FROM GENERATOR
(a) Disconnect the connector from the generator.
(b) Remove the nut and wire from the generator.



4. (w/ PS)
REMOVE WATER INLET HOSE
(a) Remove the engine under cover.
(b) Remove the water inlet hose.
(c) (with A/C)
Remove the No. 2 fan shroud.



5. REMOVE GENERATOR DRIVE BELT
(a) Loosen the generator pivot and remove the adjusting bolt.
(b) Remove the drive belt.

6. REMOVE GENERATOR
(a) Hold the generator and remove the pivot.
(b) Remove the generator.

REMOVAL OF GENERATOR (3VZ–E)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DISCONNECT WIRING FROM GENERATOR

(a) Disconnect the connector from the generator.

(b) Remove the nut and disconnect the wire from the generator.

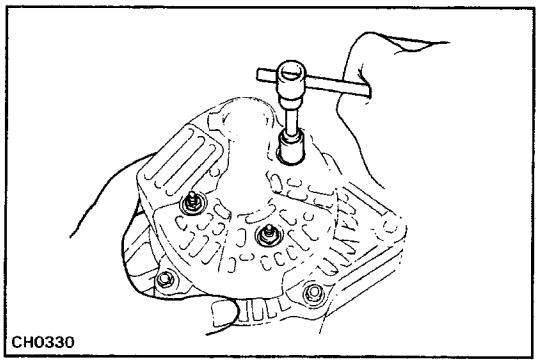
3. REMOVE GENERATOR DRIVE BELT

Loosen the generator pivot bolts, adjusting nut and lock bolt and remove the generator drive belt.

4. REMOVE GENERATOR

(a) Remove the pivot bolt and adjusting lock bolts.

(b) Remove the generator.



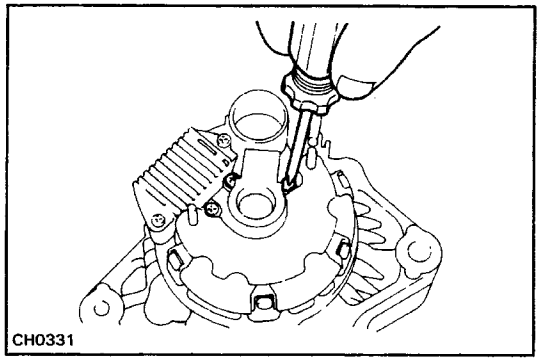
DISASSEMBLY OF GENERATOR

(See page CH–5)

1. REMOVE REAR END COVER

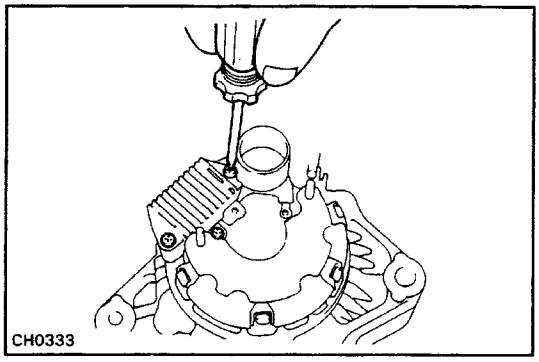
(a) Remove the nut and terminal insulator.

(b) Remove the three nuts and end cover.



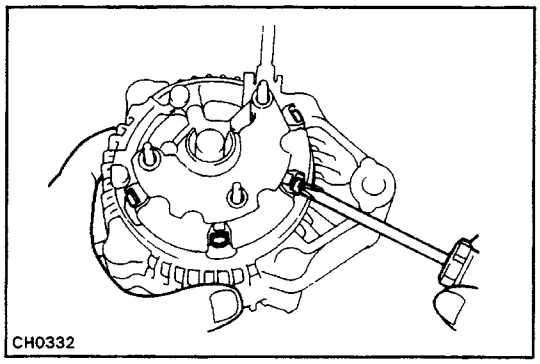
2. REMOVE BRUSH HOLDER

Remove the two screws, brush holder and cover.



3. REMOVE IC REGULATOR

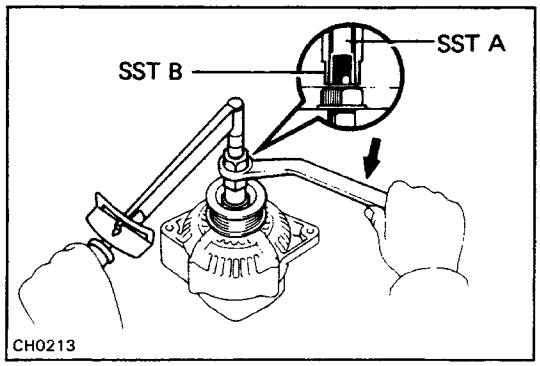
Remove the three screws and IC regulator.



4. REMOVE RECTIFIER HOLDER

(a) Remove the four screws and rectifier holder.

(b) Remove the four rubber insulators.



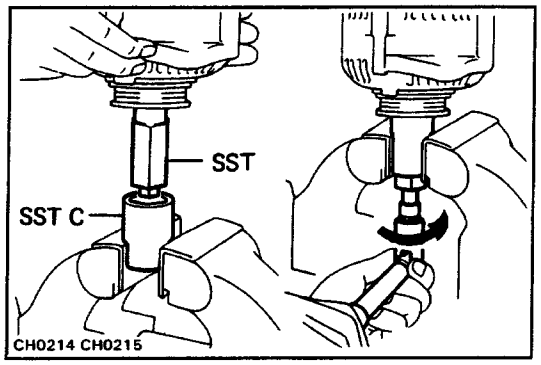
5. REMOVE PULLEY

(a) Hold SST A with a torque wrench, and tighten SST B clockwise to the specified torque.

SST 09820–63010

Torque: 39 N – m(400 kgf – cm, 29 ft – lbf)

(b) Check that SST A is secured to the rotor shaft.



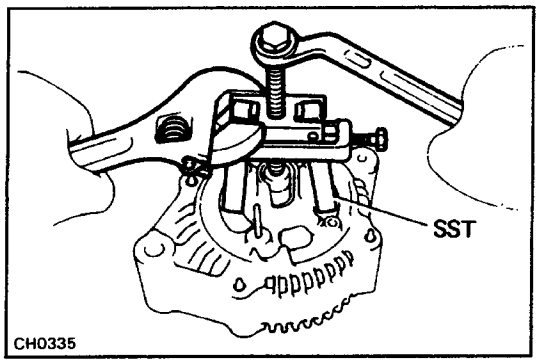
(c) As shown in the illustration, mount SST C in a vise, and install the generator with SST (A and B) to SST C.
(d) To loosen the pulley nut, turn SST A in the direction shown in the illustration.

NOTICE: To prevent damage to the rotor shaft, do not loosen the pulley nut more than one–half of a turn.

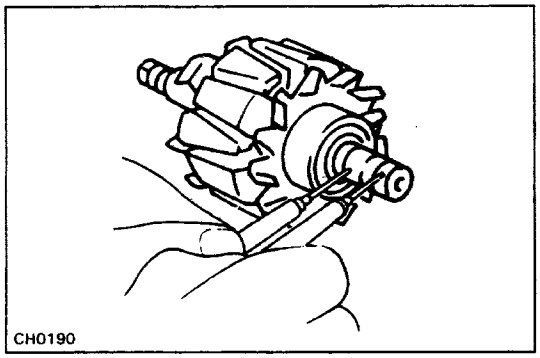
(e) Remove the generator with SST (A and B) from SST C.
(f) Turn SST B and remove SSTs A and B.
(g) Remove the pulley nut and pulley.

6. REMOVE REAR END FRAME

(a) Remove the four nuts.
(b) Using SST, remove the¿ rear end frame.
SST 09286–46011



7. REMOVE ROTOR FROM DRIVE END FRAME


CH0190

INSPECTION AND REPAIR OF GENERATOR

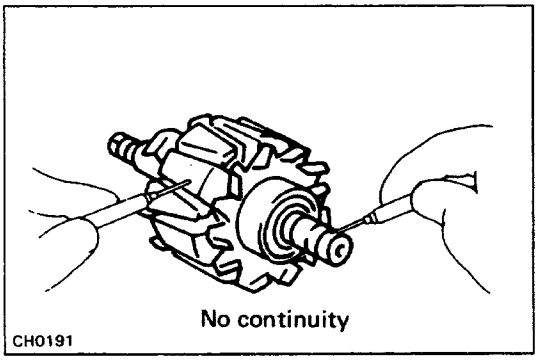
Rotor

1. INSPECT ROTOR FOR OPEN CIRCUIT –

Using an ohmmeter, check that there is continuity between the slip rings.

Standard resistance (Cold): 2.8 – 3.0Ω

If there is no continuity, replace the rotor.

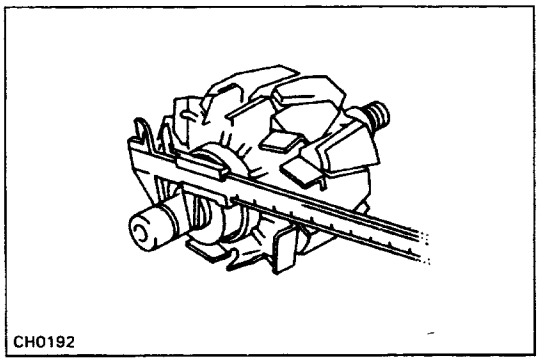


CH0191

2. INSPECT ROTOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the slip ring and the rotor.

If there is continuity, replace the rotor.


CH0192

3. INSPECT SLIP RINGS

(a) Check that the slip rings are not rough or scored.
If rough or scored, replace the rotor.

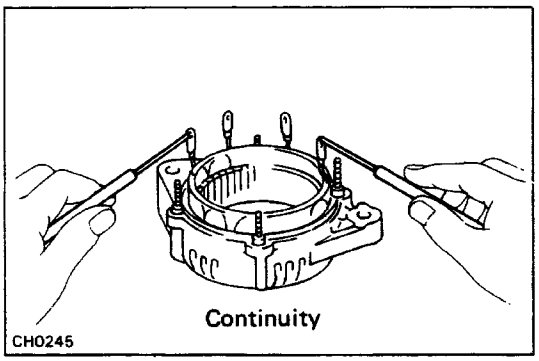
(b) Using vernier calipers, measure the slip ring diameters.
Standard diameter: 14.2 – 14.4 mm (0.559 – 0.567 in.)
Minimum diameter: 12.8 mm (0.504 in.)
If the diameter is less than minimum, replace the rotor.

Stator

1. INSPECT STATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the coil leads.

If there is no continuity, replace the drive end frame assembly.

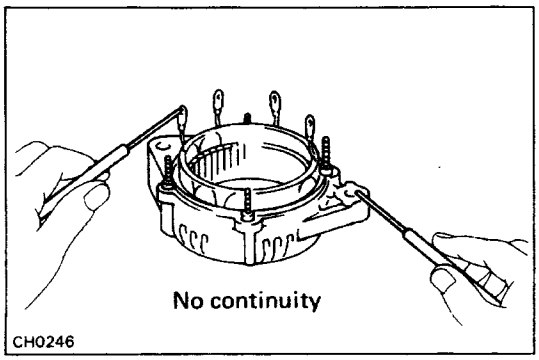


CH0245

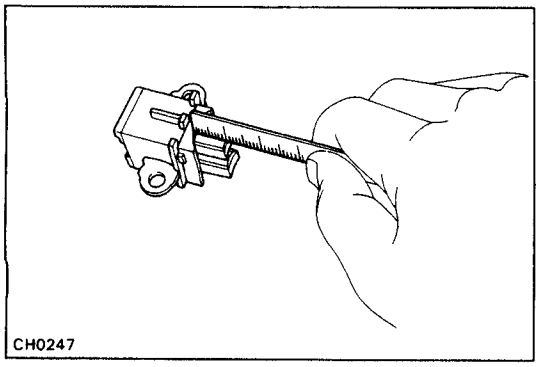
2. INSPECT STATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the coil leads and drive end frame.

If there is continuity, replace the drive end frame assembly.



CH0246



Brushes

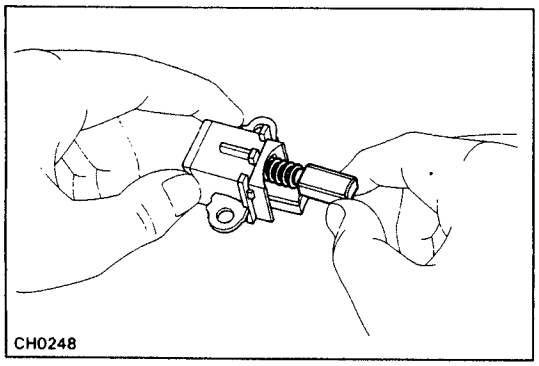
1. INSPECT EXPOSED BRUSH LENGTH

Using a scale, measure the exposed brush length.

Standard exposed length: 10.5 mm (0.413 in.)

Minimum exposed length: 1.5 mm l0.059 in.)

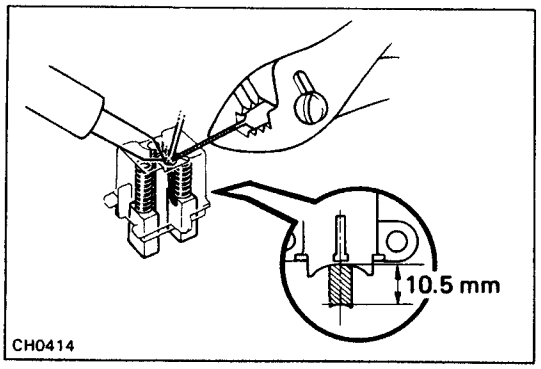
If the exposed length is less than minimum, replace the brushes.



2. IF NECESSARY, REPLACE BRUSHES

(a) Unsolder and remove the brush and spring.

(b) Run the wire of the brush through the hole in the brush holder, and insert the spring and brush into the brush holder.



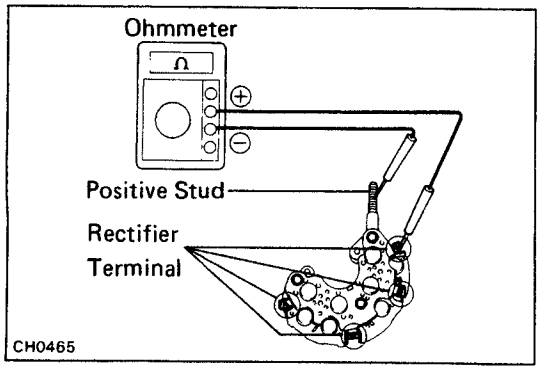
(c) Solder the brush wire to the brush holder at the exposed length.

Exposed length: 10.5 mm (0.413 in.)

(d) Check that the brush moves smoothly in the brush holder.

(e) Cut off the excess wire.

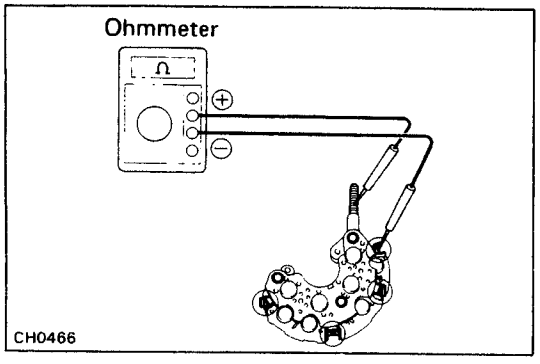
(f) Apply insulation paint to the soldered point.



Rectifier

1. INSPECT POSITIVE SIDE RECTIFIER

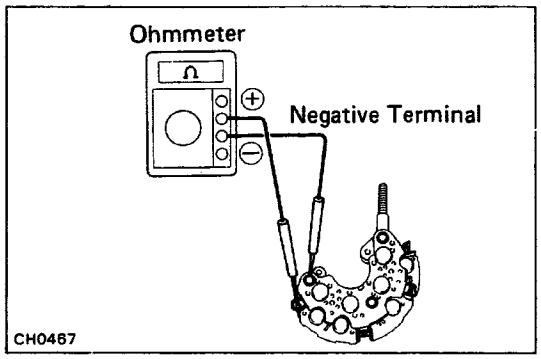
(a) Using an ohmmeter, connect one tester probe to the positive stud and the other to each rectifier terminal.



(b) Reverse the polarity of the tester probes.

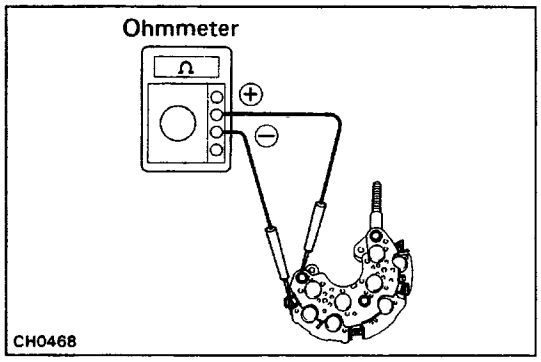
(c) Check that one shows continuity and the other shows no continuity.

If not, replace the rectifier holder.



2. INSPECT NEGATIVE SIDE RECTIFIER

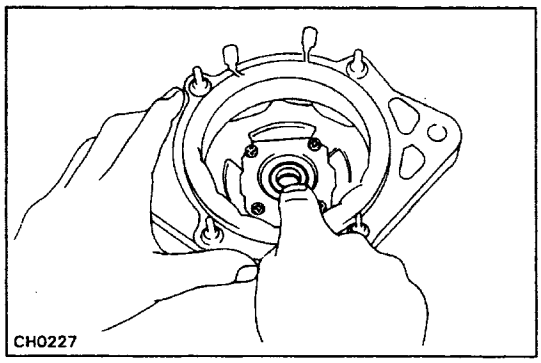
(a) Connect one tester probe to each rectifier terminal and the other to each rectifier negative terminal.



(b) Reverse the polarity of the tester probes.

(c) Check that one shows continuity and the other shows no continuity.

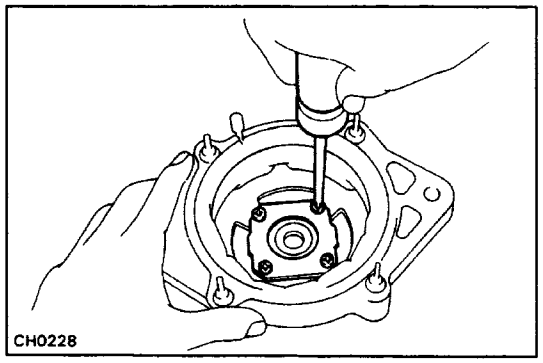
If not, replace the rectifier holder.



Bearings

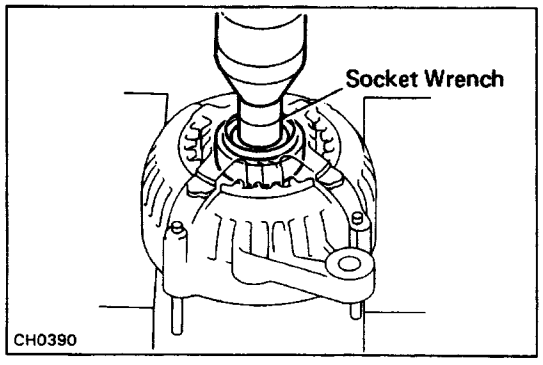
1. INSPECT FRONT BEARING

Check that the bearing is not rough or worn.

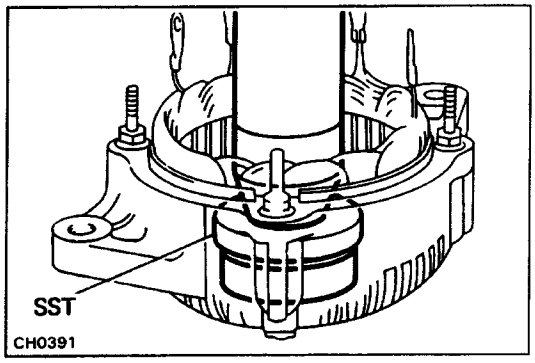


2. IF NECESSARY, REPLACE FRONT BEARING

(a) Remove the four screws and bearing retainer.



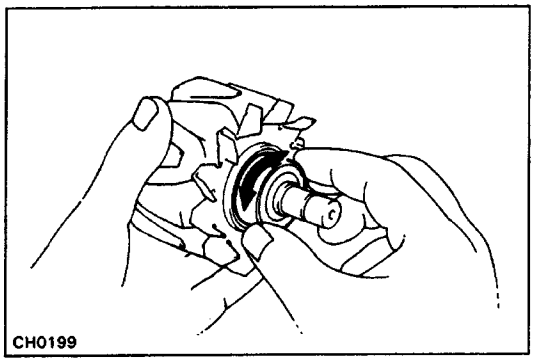
(b) Using a press and socket wrench, press out the front bearing.



(c) Using SST and a press, press the front bearing into the drive end frame.
SST 09608–20012 (09608–00030)
(d) Install the bearing retainer with the four screws.

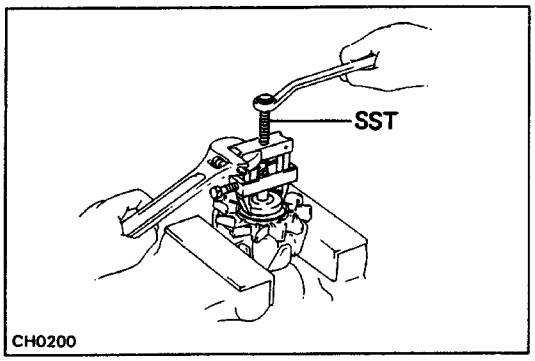
3. INSPECT REAR BEARING

Check that the bearing is not rough or worn.

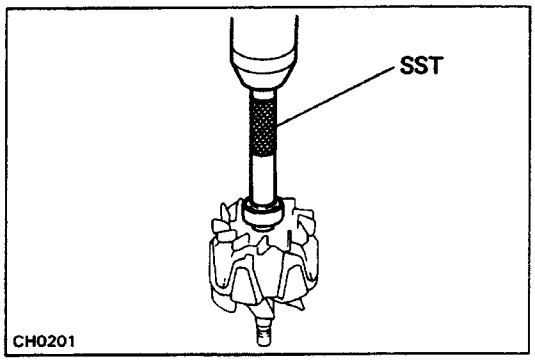


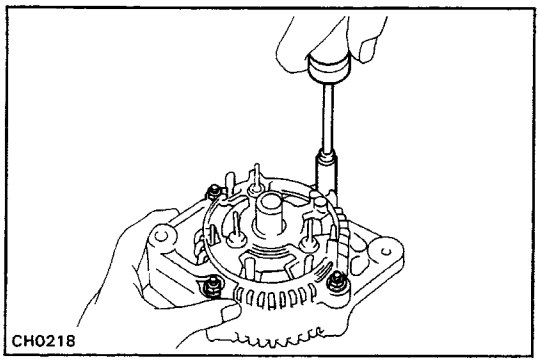
4. IF NECESSARY, REPLACE REAR BEARING

(a) Using SST, remove the bearing cover and bearing.
SST 09820–00021



(b) Using SST and a press, press in a new bearing and the bearing cover.
SST 09285–76010





ASSEMBLY OF GENERATOR

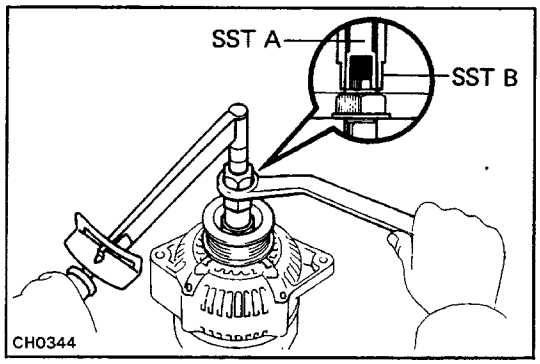
(See page CH–5)

1. INSTALL ROTOR TO DRIVE END FRAME

2. INSTALL REAR END FRAME

(a) Using a plastic–faced hammer, lightly tap in the rear end frame.

(b) Install the four nuts.



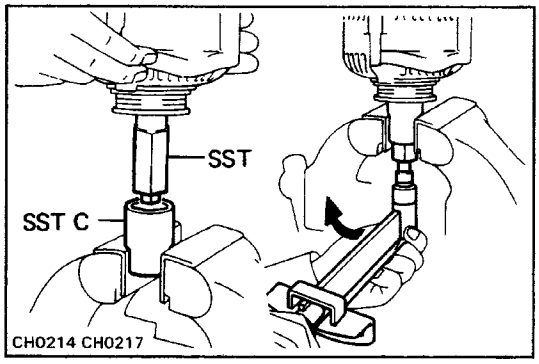
3. INSTALL PULLEY

(a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.

(b) Hold SST A with a torque wrench, and tighten SST B clockwise to the specified torque.
SST 09820–63010

Torque: 39 N–m (400 kgf –cm, 29 ft–lbf)

(c) Check that SST A is secured to the pulley shaft.



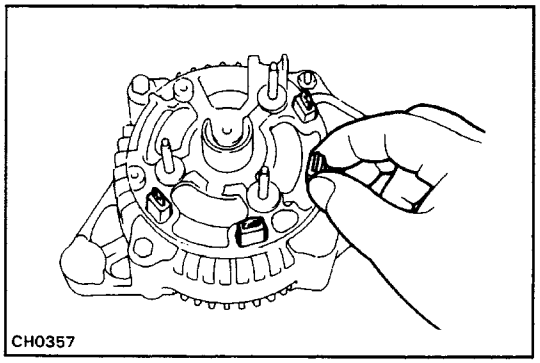
(d) As shown in the illustration, mount SST C in a vise, and install the generator with SST (A and B) to SST C.

(e) To torque the pulley nut, turn SST A in the direction shown in the illustration.

Torque: 110 N–m (1,125 kgf –cm, 81 ft–lbf)

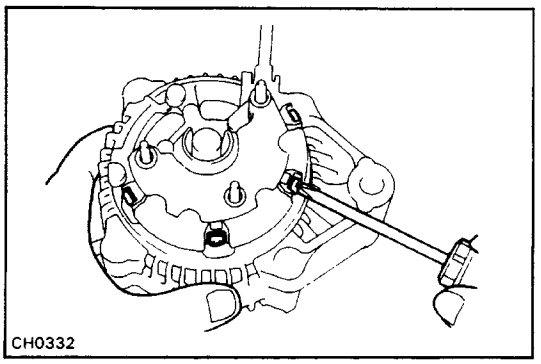
(f) Remove the generator with SST (A and B) from SST C.

(g) Turn SST B and remove SSTs A and B.

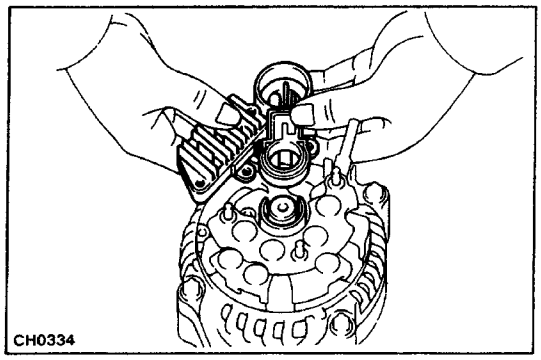


4. INSTALL RECTIFIER HOLDER

(a) Install the four rubber insulators on the lead wires.



(b) Install the rectifier with the four screws.

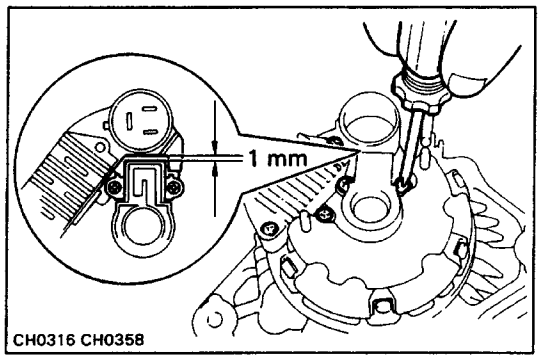


5. INSTALL BRUSH HOLDER AND IC REGULATOR

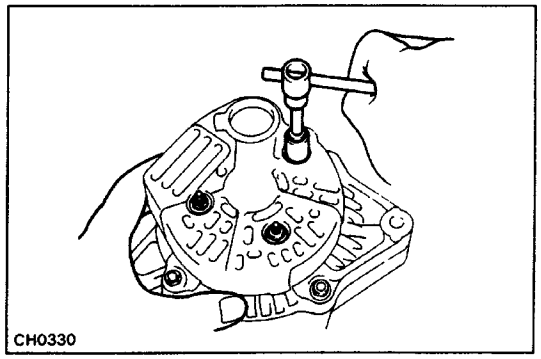
(a) Place the brush holder cover to the brush holder.

(b) Install the IC regulator and brush holder to the rear end frame horizontally as shown in the illustration.

HINT: Check that the brush holder's cover doesn't slip to one side during installation.



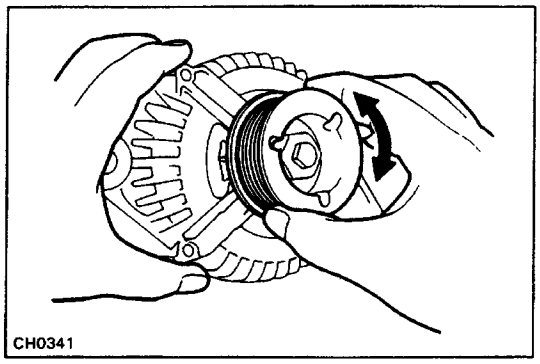
(c) Tighten the five screws until there is a clearance of at least 1 mm (0.04 in.) between the brush holder cover and connector.



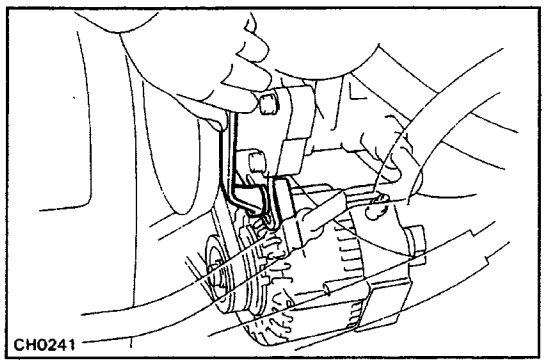
6. INSTALL REAR END COVER

(a) Install the end cover with the three nuts.

(b) Install the terminal insulator with the nut.



7. MAKE SURE ROTOR ROTATES SMOOTHLY



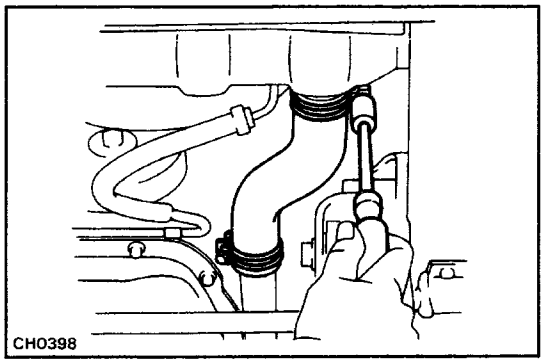
INSTALLATION OF GENERATOR (22R–E)

1. INSTALL GENERATOR

Mount the generator on the bracket with the pivot and adjusting bolt.

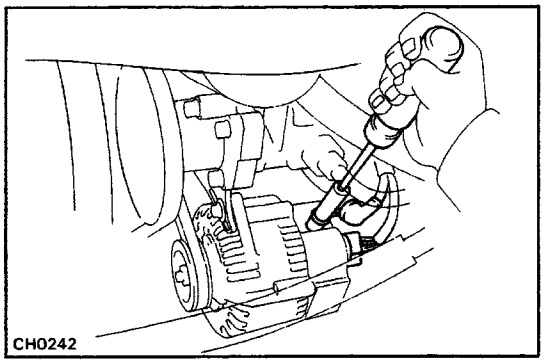
2. INSTALL AND ADJUST DRIVE BELT

(See page MA–6)



3. INSTALL WATER INLET HOSE

(a) Install the water inlet hose.
(b) Install the engine under cover.
(c) (with A/C)
Install the No.2 fan shroud.



4. CONNECT WIRING TO GENERATOR

(a) Connect the wire to the generator and install the nut.
(b) Connect the connector to the generator.

5. FILL WITH COOLANT

Close the radiator drain cock and fill with coolant.

6. CONNECT NEGATIVE CABLE TO BATTERY

7. PERFORM ON–VEHICLE INSPECTION

(See page CH–2)

INSTALLATION OF GENERATOR (3VZ–E)

1. INSTALL GENERATOR

Mount the generator on the generator bracket with pivot bolt and adjusting lock bolts.
Do not tighten the bolts.

2. INSTALL DRIVE BELT

(See step 3 on page CH–2)

3. CONNECT WIRING TO GENERATOR

(a) Connect the wire to the generator with the nut.
(b) Connect the connector to the generator.

4. CONNECT NEGATIVE CABLE TO BATTERY

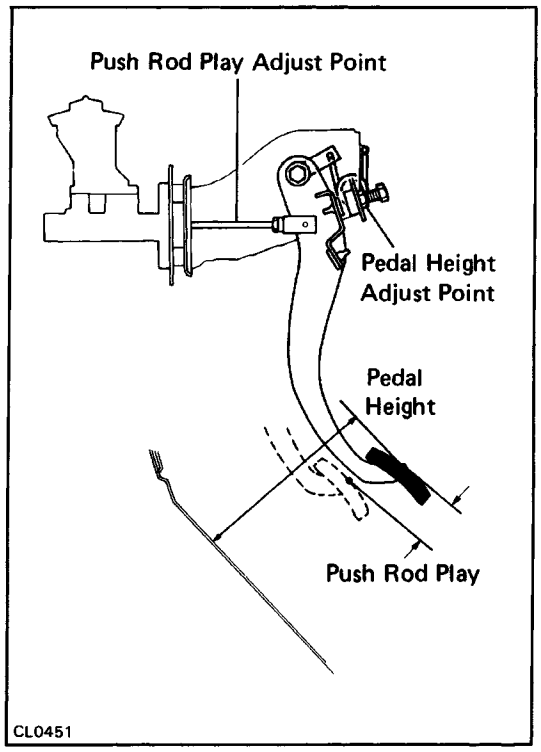
5. PERFORM ON–VEHICLE INSPECTION

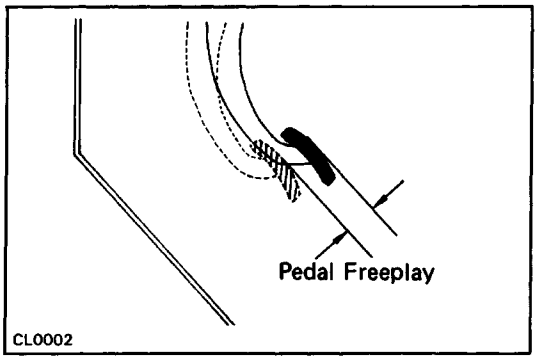
(See pages CH–2 to 3)

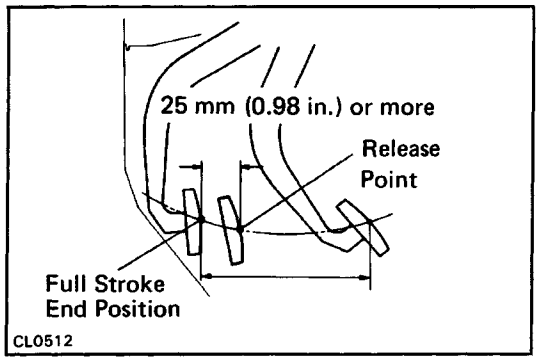
CLUTCH

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Hard to shift or will not shift	Clutch pedal freeplay excessive Air in clutch lines Clutch release cylinder faulty Clutch master cylinder faulty Clutch disc out of true, runout is excessive or lining broken Splines on input shaft or clutch disc dirty or burred Clutch pressure plate faulty	Adjust pedal freeplay Bleed clutch system Repair release cylinder Repair master cylinder Inspect clutch disc Repair as necessary Replace clutch cover	CL–3 CL–4 CL–10 CL–7 CL–13 CL–12 CL–14
Transmission jumps out of gear	Clutch pilot bearing worn	Replace pilot bearing	CL–14
Clutch slips	Clutch pedal freeplay insufficient Clutch disc lining oily or worn out Pressure plate faulty Release fork binding	Adjust pedal freeplay Inspect clutch disc Replace clutch cover Inspect release fork	CL–3 CL–13 CL–14
Clutch grabs/ chatters	Clutch disc lining oily or worn out Pressure plate faulty Clutch diaphragm spring bent Engine mounts loose	Inspect clutch disc Replace clutch cover Align clutch diaphragm Repair as necessary	CL–13 CL–14 CL–15
Clutch pedal spongy	Air in clutch lines Clutch release cylinder faulty Clutch master cylinder faulty	Bleed clutch system Repair release cylinder Repair master cylinder	CL–4 CL–10 CL–7
Clutch noisy	Loose part inside housing Release bearing worn or dirty Pilot bearing worn Release fork or linkage sticking	Repair as necessary Replace release bearing Replace pilot bearing Repair as necessary	 CL–15 CL–14







CHECK AND ADJUSTMENT OF CLUTCH PEDAL

1. CHECK THAT PEDAL HEIGHT AND PUSH ROD PLAY ARE CORRECT

Pedal height

(from asphalt sheet): 2WD 154.5 mm (6.0827 in.)
4WD 151.5 mm (5.9646 in.)

(from floor panel): 157.5 mm (6.201 in.)

Push rod play at pedal top: 1.0 – 5.0 mm (0.039 – 0.197 in.)

If incorrect, adjust the pedal height and push rod play.

2. IF NECESSARY, ADJUST PEDAL HEIGHT AND PUSH ROD PLAY

(a) Loosen the lock nut and turn the stopper bolt until the height is correct. Tighten the lock nut.

(b) Loosen the lock nut and turn the push rod until the push rod play is correct. Tighten the lock nut.

3. CHECK THAT PEDAL FREEPLAY IS CORRECT

Push in on the pedal until the beginning of clutch resis–tance is felt.

Pedal freeplay: 5 – 15 mm (0.20 – 0.59 in.)

4. IF NECESSARY, ADJUST PEDAL FREEPLAY

(a) Loosen the lock nut and turn the push rod until the freeplay is correct.

(b) Tighten the lock nut.

(c) After adjusting the pedal freeplay, check the pedal height.

5. INSPECT CLUTCH RELEASE POINT

(a) Pull the parking brake lever and install wheel stop–per.

(b) Start the engine and idle the engine.

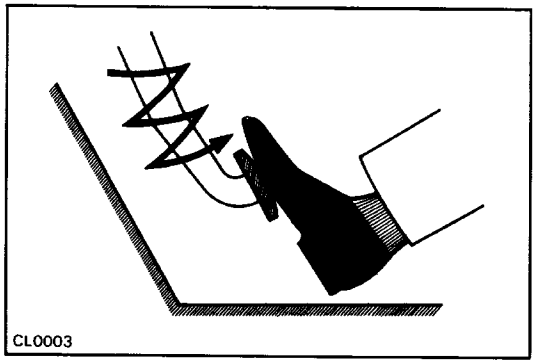
(e) Without depressing the clutch pedal, slowly shift the shift lever into reverse position until the gears contact.

(d) Gradually depress the clutch pedal and measure the stroke distance from the point the gear noise stops (release point) up to the full stroke end position.

Standard distance: 25 mm (0.98 in.) or more
(From pedal stroke end position to release point)

If the distance not as specified, perform the following op–eration.

- Inspect pedal height.
- Inspect push rod play and pedal free play.
- Bleed the clutch line.
- Inspect the clutch cover and disc.


CL0003

BLEEDING OF CLUTCH SYSTEM

HINT: If any work is done on the clutch system or if air is suspected in the clutch lines, bleed the system of air.

NOTICE: Do not let brake fluid remain on a painted surface. Wash it off immediately.

1. FILL CLUTCH RESERVOIR WITH BRAKE FLUID

Check the reservoir frequently. Add fluid if necessary.

2. CONNECT VINYL TUBE TO BLEEDER PLUG

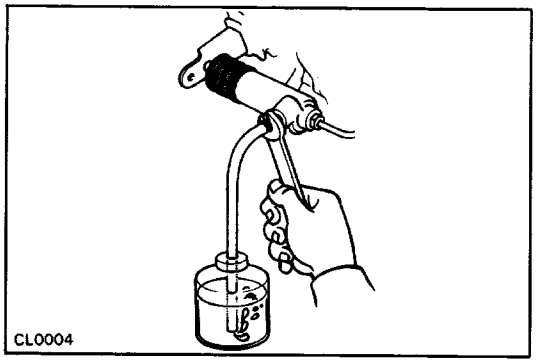
Insert the other end of the tube in a half–full container of brake fluid.

3. BLEED CLUTCH LINE

(a) Slowly pump the clutch pedal several times.

(b) While pressing on the pedal, loosen the bleeder plug until the fluid starts to run out. Then close the bleeder plug.

(c) Repeat this procedure until there are no more air bubbles in the fluid.


CL0004

INSPECTION OF CLUTCH START SYSTEM

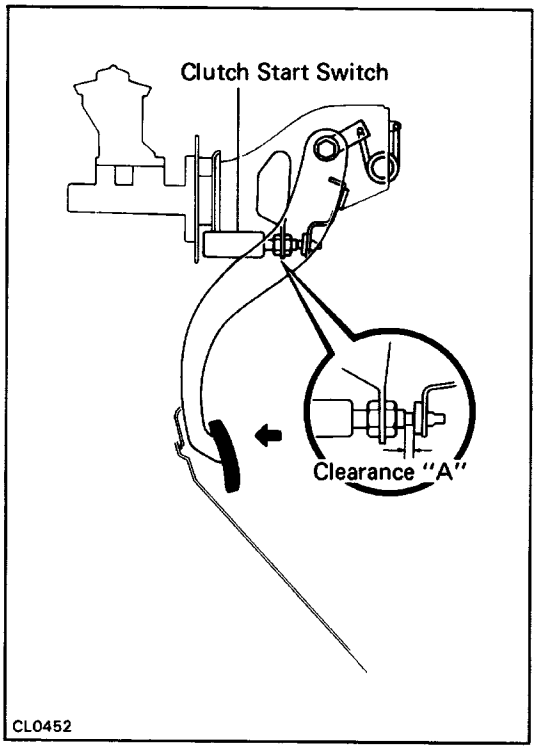
CHECK CLUTCH PEDAL

1. CHECK THAT PEDAL HEIGHT IS CORRECT

(See page CL–3)

2. CHECK THAT PEDAL FREEPLAY AND PUSH ROD PLAY ARE CORRECT

(See page CL–3)



CL0452

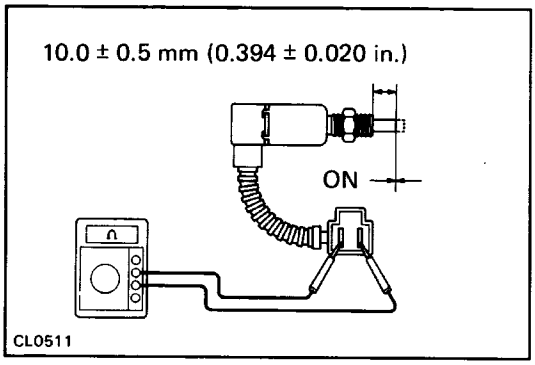
CHECK CLUTCH START SYSTEM

CHECK CLUTCH START SYSTEM

(a) Check that the engine does not start when the clutch pedal is released.

(b) Check that the engine starts when the clutch pedal is fully depressed.

(c) Check that clearance "A" is greater than 1 mm (0.04 in.) when the clutch is fully depressed.
If necessary, adjust or replace the clutch start switch.



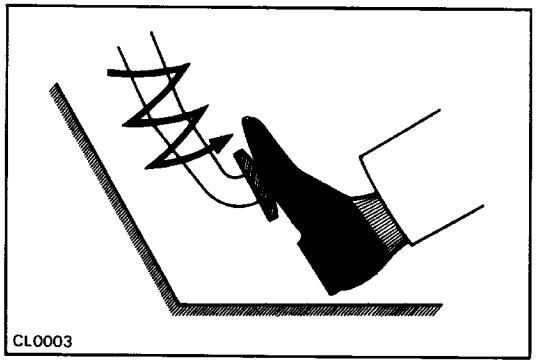
CL0511

INSPECTION AND ADJUSTMENT OF CLUTCH START SWITCH

1. INSPECT CONTINUITY OF CLUTCH START SWITCH

(a) Check that there is continuity between terminals when the switch is ON (pushed).

(b) Check that there is no continuity between terminals when the switch is OFF (free).
If continuity is not as specified, replace the switch.


CL0003

BLEEDING OF CLUTCH SYSTEM

HINT: If any work is done on the clutch system or if air is suspected in the clutch lines, bleed the system of air.

NOTICE: Do not let brake fluid remain on a painted surface. Wash it off immediately.

1. FILL CLUTCH RESERVOIR WITH BRAKE FLUID

Check the reservoir frequently. Add fluid if necessary.

2. CONNECT VINYL TUBE TO BLEEDER PLUG

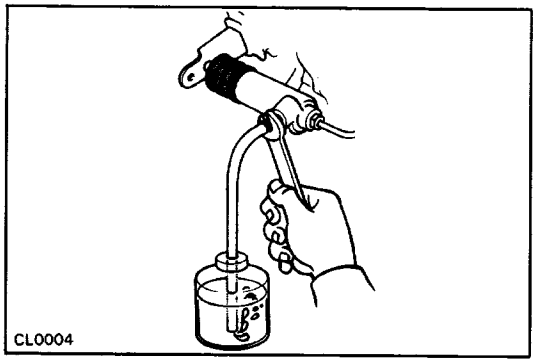
Insert the other end of the tube in a half–full container of brake fluid.

3. BLEED CLUTCH LINE

(a) Slowly pump the clutch pedal several times.

(b) While pressing on the pedal, loosen the bleeder plug until the fluid starts to run out. Then close the bleeder plug.

(c) Repeat this procedure until there are no more air bubbles in the fluid.


CL0004

INSPECTION OF CLUTCH START SYSTEM

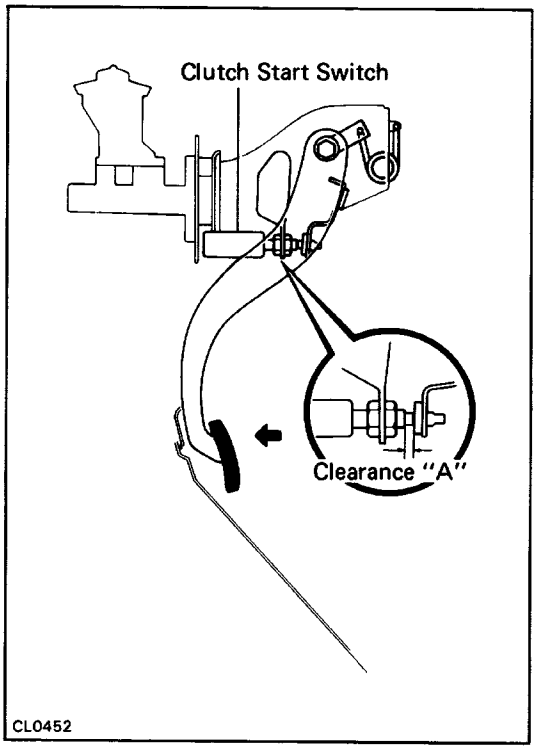
CHECK CLUTCH PEDAL

1. CHECK THAT PEDAL HEIGHT IS CORRECT

(See page CL–3)

2. CHECK THAT PEDAL FREEPLAY AND PUSH ROD PLAY ARE CORRECT

(See page CL–3)



CL0452

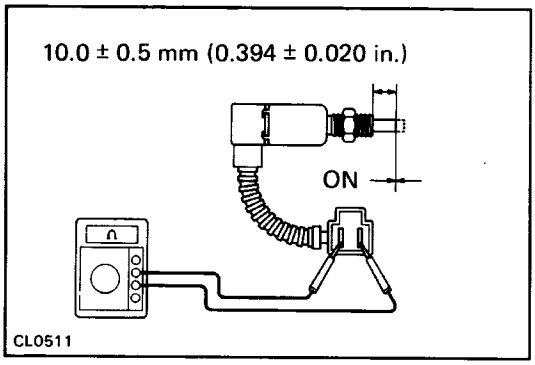
CHECK CLUTCH START SYSTEM

CHECK CLUTCH START SYSTEM

(a) Check that the engine does not start when the clutch pedal is released.

(b) Check that the engine starts when the clutch pedal is fully depressed.

(c) Check that clearance "A" is greater than 1 mm (0.04 in.) when the clutch is fully depressed.
If necessary, adjust or replace the clutch start switch.



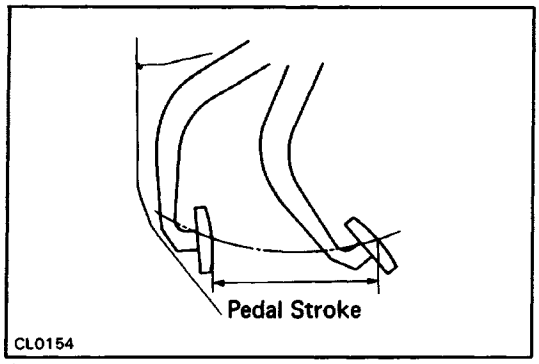
CL0511

INSPECTION AND ADJUSTMENT OF CLUTCH START SWITCH

1. INSPECT CONTINUITY OF CLUTCH START SWITCH

(a) Check that there is continuity between terminals when the switch is ON (pushed).

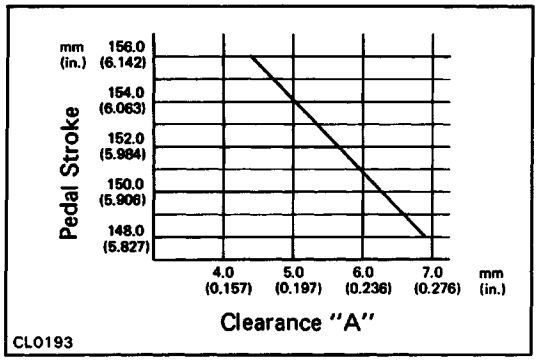
(b) Check that there is no continuity between terminals when the switch is OFF (free).
If continuity is not as specified, replace the switch.



2. ADJUST CLUTCH START SWITCH

(a) Measure the pedal stroke, and check the switch clearance "A" using the chart left.

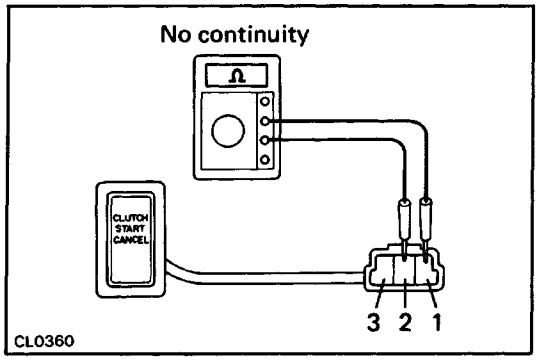
(b) Loosen and adjust the switch position.



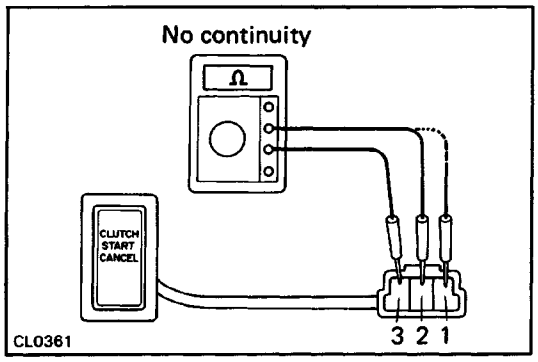
(c) Recheck that the engine does not start when the clutch pedal is released.

INSPECTION OF CLUTCH START CANCEL SWITCH

1. INSPECT CONTINUITY OF CLUTCH START CANCEL SWITCH



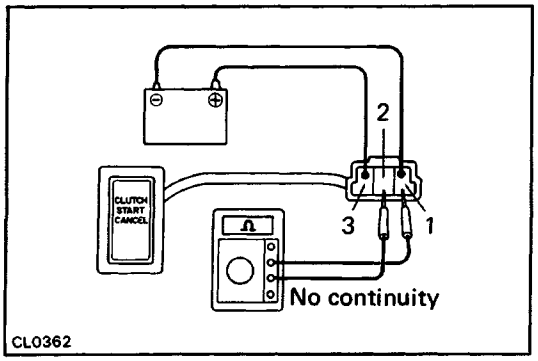
(a) Check that there is no continuity when connect the positive (+) lead from the ohmmeter to terminal 2 and the negative (–) lead to terminal 1.



(b) Check that there is no continuity when connect the positive (+) lead from the ohmmeter to terminal 3 and the negative (–) lead to terminal 1.

(c) Check that there is no continuity between terminals 2 and 3.

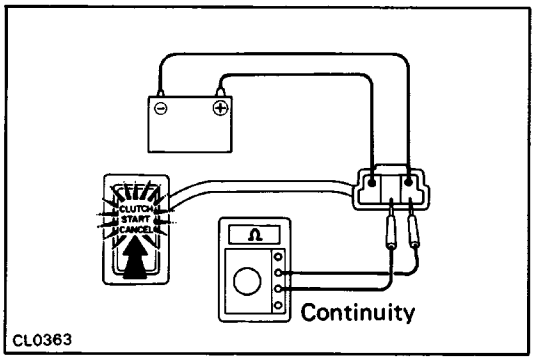
If continuity is not as specified, replace the clutch start cancel switch.



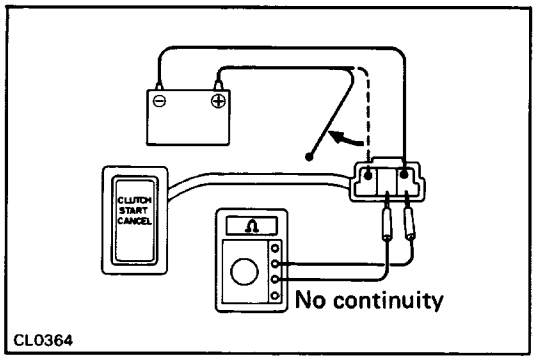
2. INSPECT OPERATION OF CLUTCH START CANCEL SWITCH

(a) Connect positive (+) lead from the battery to terminal 3 and connect negative (–) lead to terminal 1.

(b) Check that there is no continuity when connect the positive (+) lead from the ohmmeter to terminal 2 and the negative (–) lead to terminal 1.



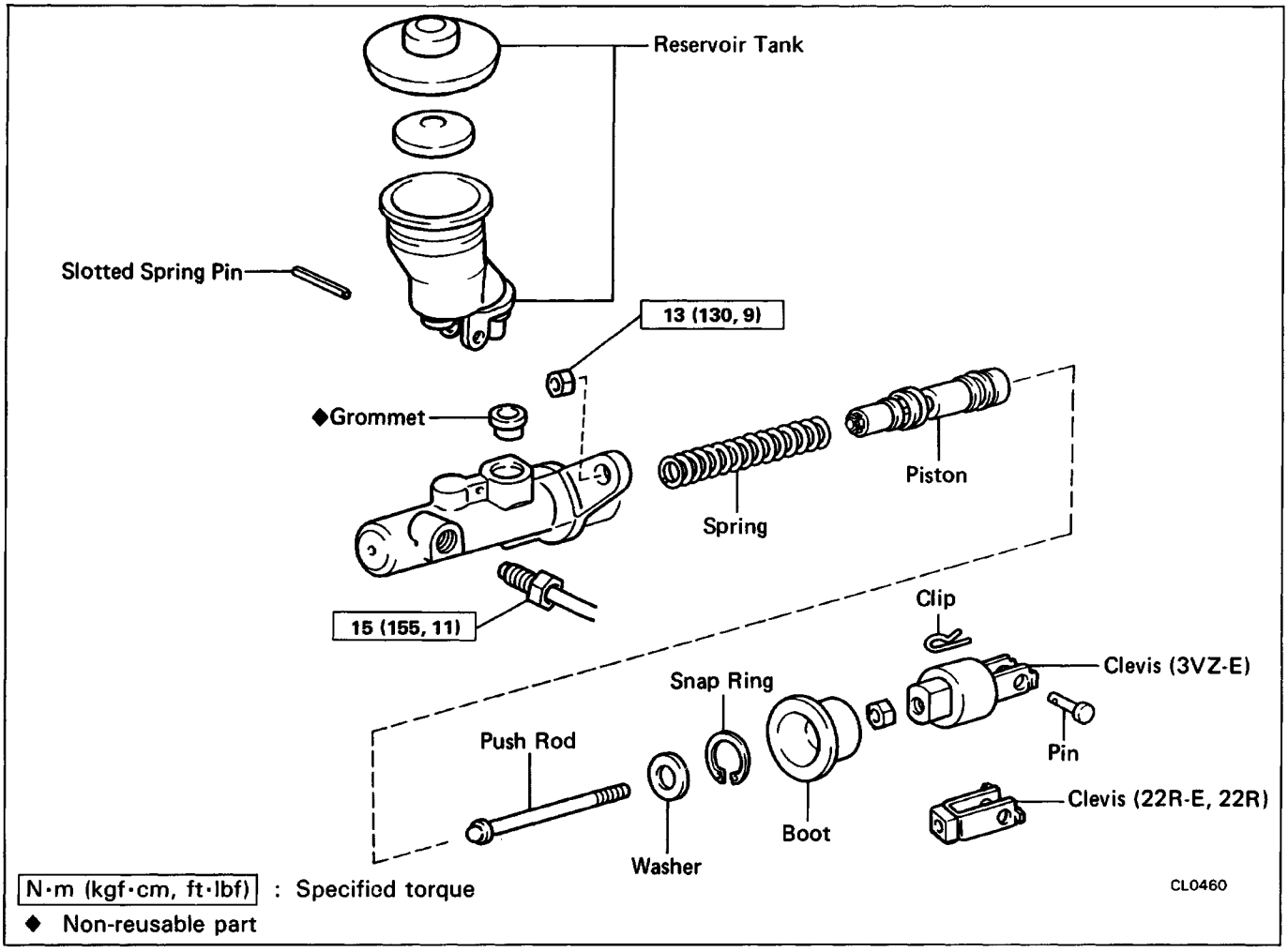
(c) When pushing the switch, check that the indicator light comes on and there is continuity between terminals 1 and 2.



(d) Check that there is no continuity between terminals 1 and 2 when disconnect the battery lead.
If operation is not as specified, replace the clutch start cancel switch.

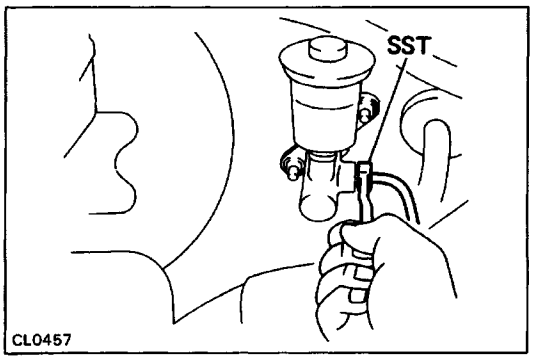
CLUTCH MASTER CYLINDER

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part



REMOVAL OF MASTER CYLINDER

1. REMOVE PUSH ROD PIN

2. DISCONNECT CLUTCH LINE UNION

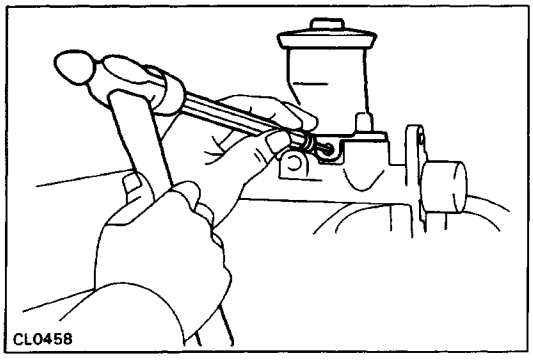
Using SST, disconnect the union nut.

SST 09751–36011

3. REMOVE MASTER CYLINDER

(a) Remove the mounting nut.

(b) Pull out the master cylinder.

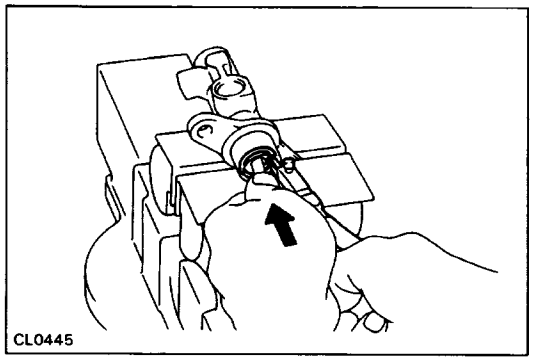


DISASSEMBLY OF MASTER CYLINDER

1. REMOVE RESERVOIR TANK

(a) Using a pin punch and a hammer, drive out the slotted spring pin.

(b) Remove reservoir tank and grommet.



2. REMOVE PUSH ROD

(a) Pull back the boot and, using snap ring pliers, remove the snap ring.
(b) Pull out the push rod and washer.
(c) Remove the piston from the cylinder.

INSPECTION OF MASTER CYLINDER

HINT: Clean the disassembled parts with compressed air.

1. INSPECT MASTER CYLINDER BORE FOR SCORING OR CORROSION.

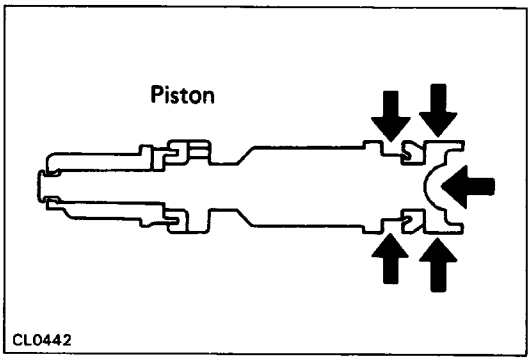
If a problem is found, clean or replace the cylinder.

2. INSPECT PISTON AND CUPS FOR WEAR, SCORING, CRACKS OR SWELLING

If either one requires replacement, use the parts from the cylinder kit.

3. INSPECT PUSH ROD FOR WEAR OR DAMAGE

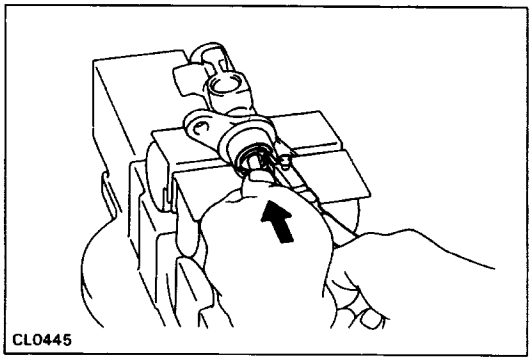
If necessary, replace the push rod.



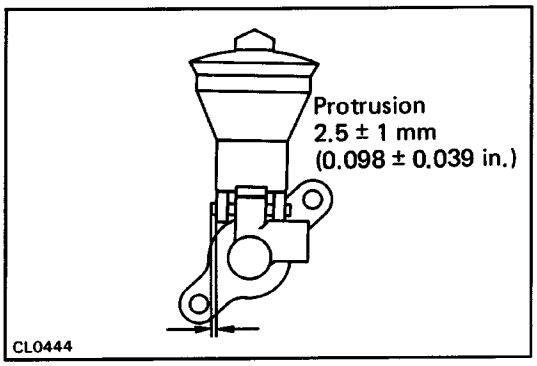
ASSEMBLY OF MASTER CYLINDER

1. COAT PARTS WITH LITHIUM SOAP BASE GLYCOL GREASE, AS SHOWN

2. INSERT PISTON INTO CYLINDER



3. INSTALL PUSH ROD ASSEMBLY WITH SNAP RING



4. INSTALL RESERVOIR TANK

(a) Install reservoir tank and new grommet.

(b) Using a pin punch and a hammer, drive in the slotted spring pin.

INSTALLATION OF MASTER CYLINDER

(See page CL–7)

1. INSTALL MASTER CYLINDER

Install the mounting nut, and torque them.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

2. CONNECT CLUTCH LINE UNION

Using SST, connect the union.

SST 09751–36011

3. CONNECT PUSH ROD AND INSTALL PIN

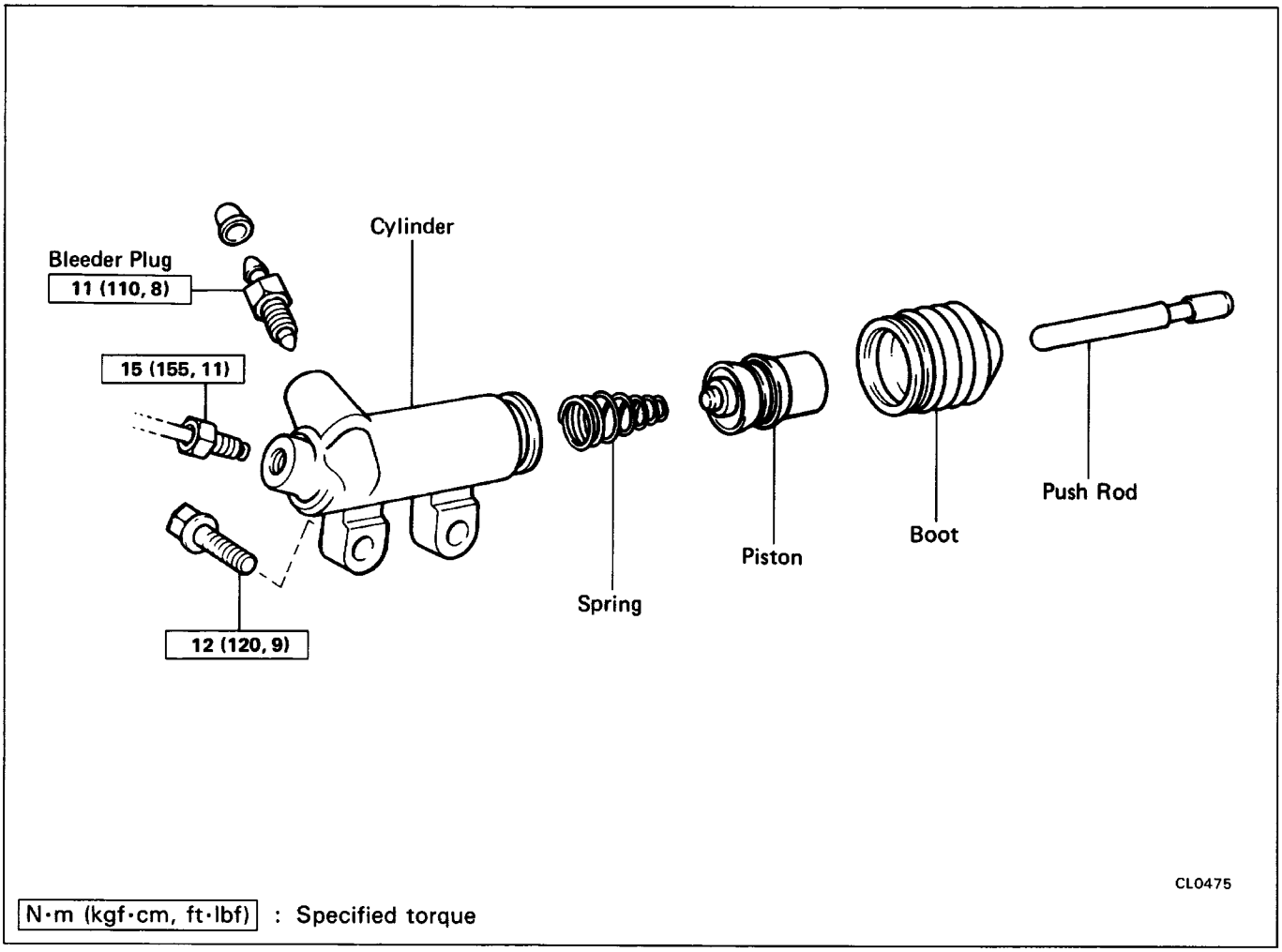
Install the clip in the push rod pin.

4. BLEED SYSTEM AND ADJUST CLUTCH PEDAL

(See page CL–4)

CLUTCH RELEASE CYLINDER

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

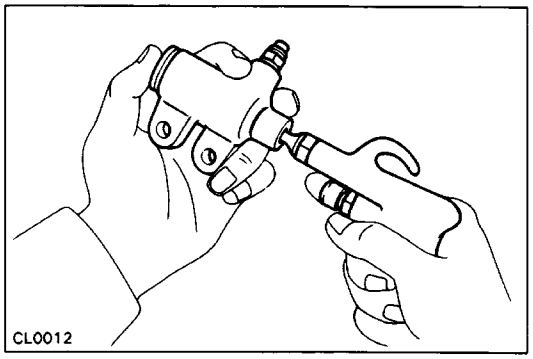
REMOVAL OF RELEASE CYLINDER

1. DISCONNECT CLUTCH LINE UNION

Using SST, disconnect the union.

SST 09751–36011

2. REMOVE TWO BOLTS AND PULL OFF RELEASE CYLINDER



DISASSEMBLY OF RELEASE CYLINDER

1. PULL OUT PUSH ROD

2. REMOVE BOOT

3. REMOVE PISTON

INSPECTION OF RELEASE CYLINDER

HINT: Clean the disassembled parts with compressed air.

1. INSPECT RELEASE CYLINDER BORE FOR SCORING OR CORROSION

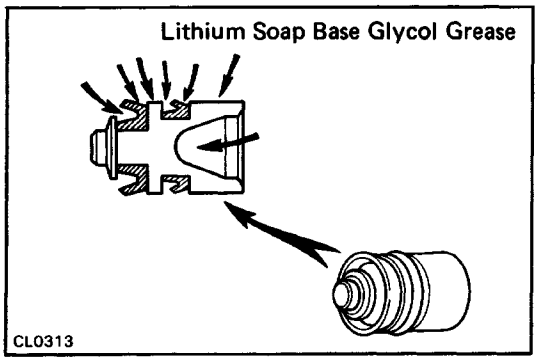
If a problem is found, clean or replace the cylinder.

2. INSPECT PISTON AND CUPS FOR WEAR, SCORING, CRACKS OR SWELLING

If either one requires replacement, use the parts from the cylinder kit.

3. INSPECT PUSH ROD FOR WEAR OR DAMAGE

If necessary, replace the push rod.



ASSEMBLY OF RELEASE CYLINDER

(See page CL–10)

1. COAT PISTON WITH LITHIUM SOAP BASE GLYCOL GREASE, AS SHOWN

2. INSTALL PISTON

3. INSTALL BOOT AND INSERT PUSH ROD

INSTALLATION OF RELEASE CYLINDER

(See page CL–10)

1. INSTALL RELEASE CYLINDER WITH TWO BOLTS

Torque: 12 N–m (120 kgf–cm, 9 ft–lbf)

2. CONNECT CLUTCH LINE UNION

Using SST, connect the union.

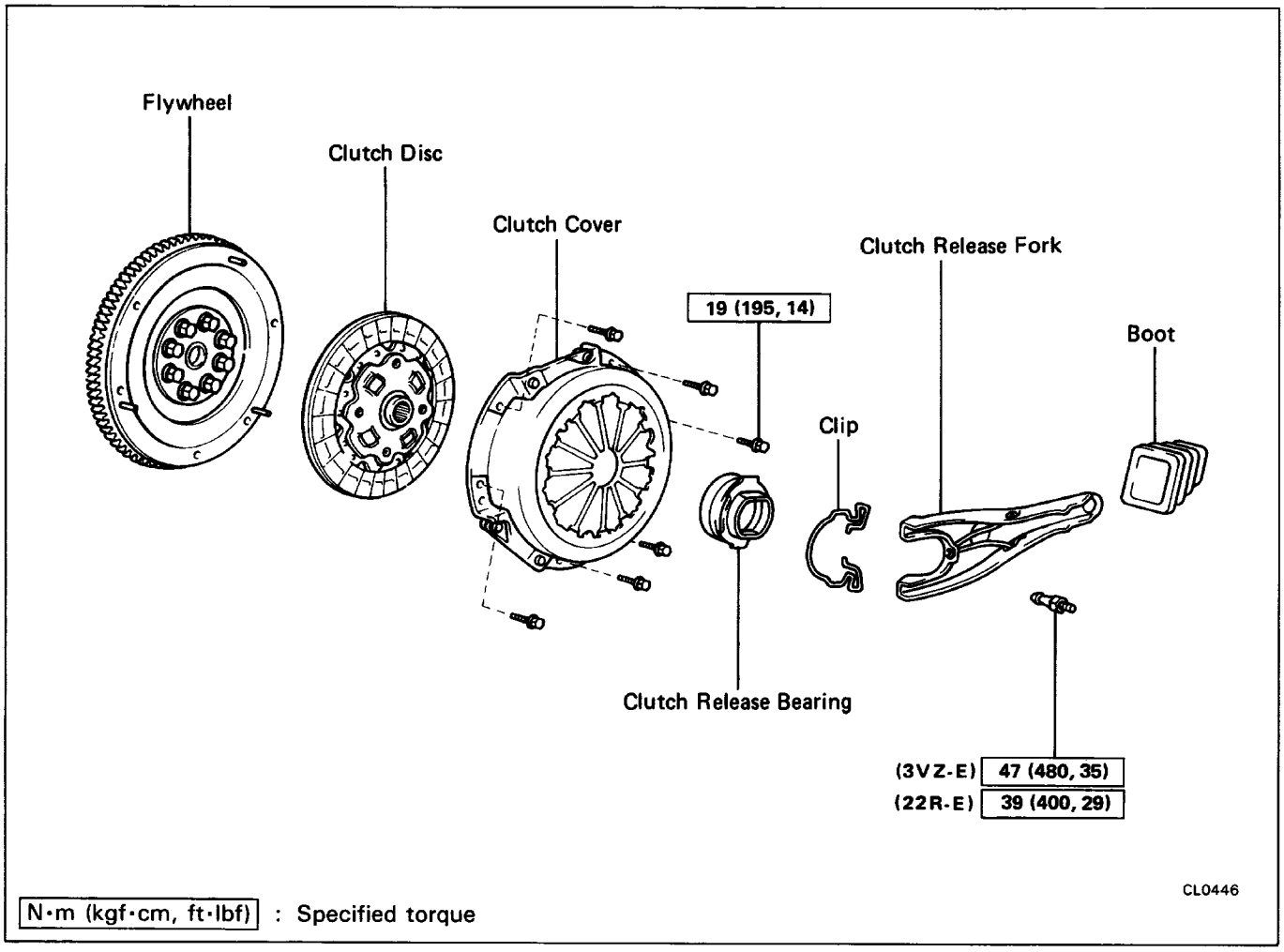
SST 09751–36011

3. BLEED CLUTCH SYSTEM

(See page CL–4)

CLUTCH UNIT

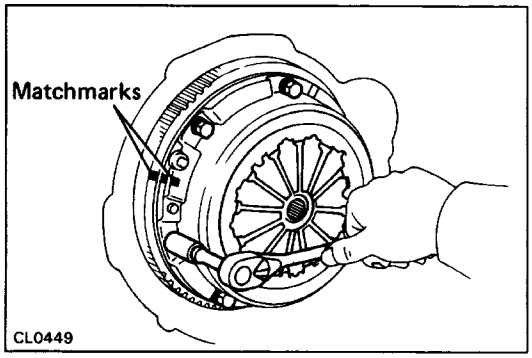
COMPONENTS



REMOVAL OF CLUTCH UNIT

1. REMOVE TRANSMISSION (See pages MT–4, TF–5)

HINT: Do not drain the transmission oil.

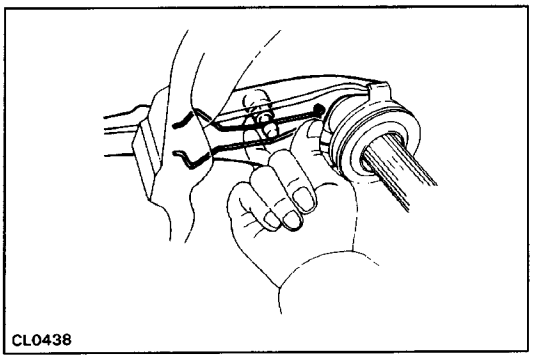


2. REMOVE CLUTCH COVER AND DISC

(a) Put matchmarks on the clutch cover and flywheel.

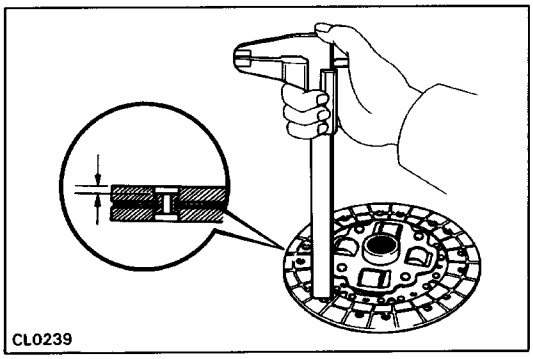
(b) Loosen the set bolts one turn at a time until spring tension is released.

(c) Remove the set bolts and pull off the clutch cover and disc.



3. REMOVE BEARING,HUB AND FORK FROM TRANSMISSION

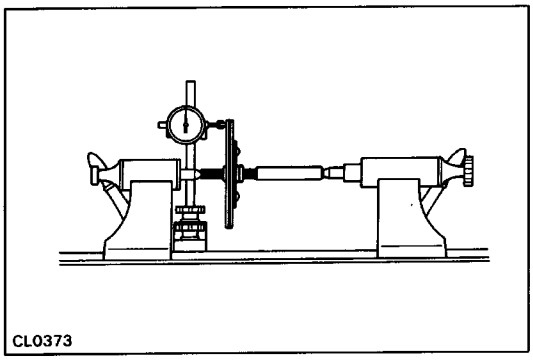
(a) Remove the retaining clip pull off the bearing.
(b) Remove the fork and boot.



INSPECTION OF CLUTCH PARTS

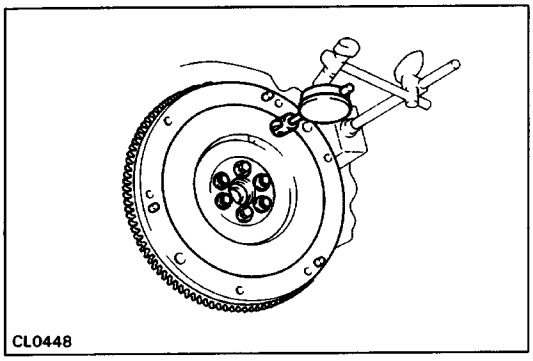
1. INSPECT CLUTCH DISC FOR WEAR OR DAMAGE

Using calipers, measure the rivet head depth.
Minimum rivet depth: 0.3 mm (0.012 in.)
If a problem is found, repair or replace the clutch disc.



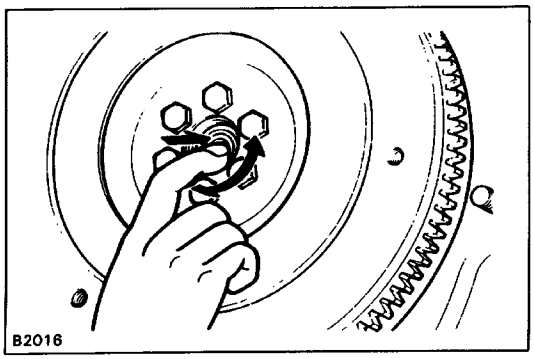
2. INSPECT CLUTCH DISC RUNOUT

Using a dial indicator, check the disc runout.
Maximum runout: 0.8 mm (0.031 in.)
If runout is excessive, replace the disc.



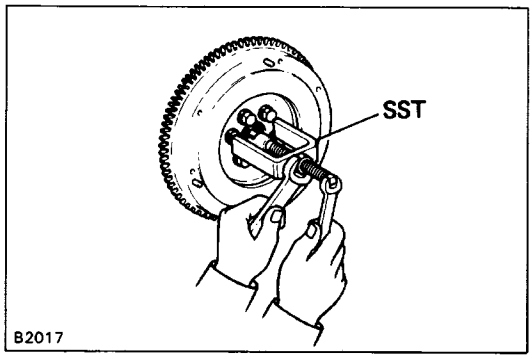
3. INSPECT FLYWHEEL RUNOUT

Using a dial indicator, check the flywheel runout.
Maximum runout: 0.1 mm (0.004 in.)
If runout is excessive, repair or replace flywheel.



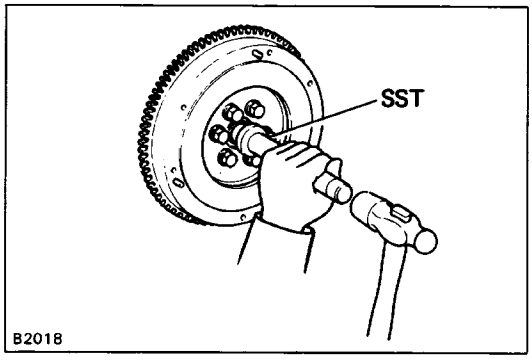
4. INSPECT PILOT BEARING

Turn the bearing by hand while applying force in the rotation direction.
If the bearing sticks or has much resistance, replace the pilot bearing.
HINT: The bearing is permanently lubricated and requires no cleaning or lubrication.



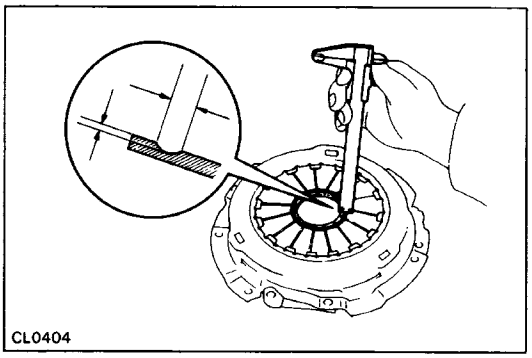
5. IF NECESSARY, REPLACE PILOT BEARING

(a) Using SST, remove the pilot bearing.
SST 09303–35011



(b) Using SST, install the pilot bearing.
SST 09304–30012

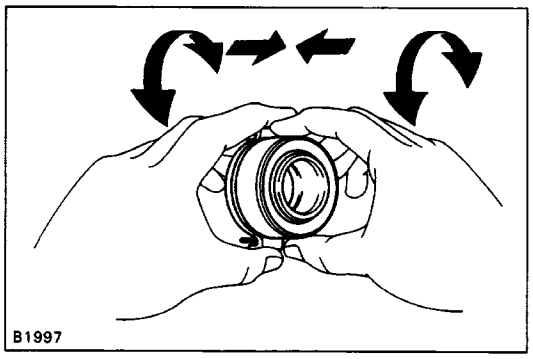
HINT: After assembling the pilot bearing to the hud, in–sure that it rotates smoothly.



6. INSPECT DIAPHRAGM SPRING FOR WEAR

Using calipers, measure the diaphragm spring for depth and width of wear.

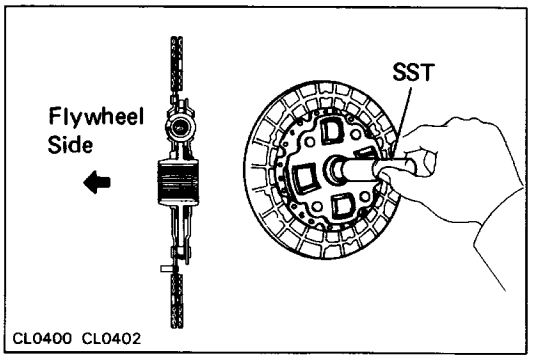
Maximum: Depth 0.6 mm (0.024 in.)
Width 5.0 mm l0.197 in.)



7. INSPECT RELEASE BEARING

Turn the bearing by hand while applying force in the rota–tion direction.
If the bearing sticks or has much resistance, replace the release bearing.

HINT: The bearing is permanently lubricated and re–quires no cleaning or lubrication.

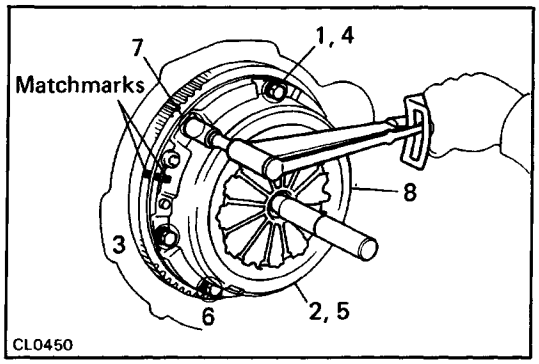


INSTALLATION OF CLUTCH UNIT

(See page CL–12)

1. INSTALL DISC ON FLYWHEEL

Using SST, install the disc on the flywheel.
SST 09301–20020



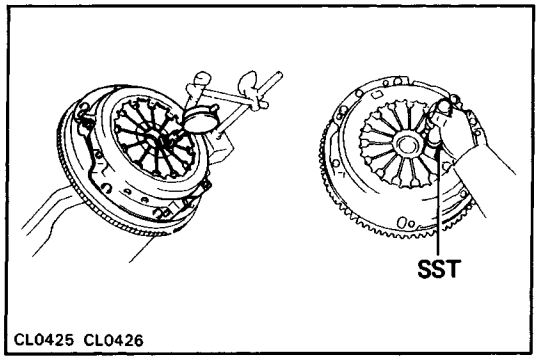
2. INSTALL CLUTCH COVER

(a) Align the matchmarks on the clutch cover and fly–wheel.

(b) Torque the bolts on the clutch cover in the order shown.

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)

HINT: Temporarily tighten the No. 1 and No. 2 bolts.



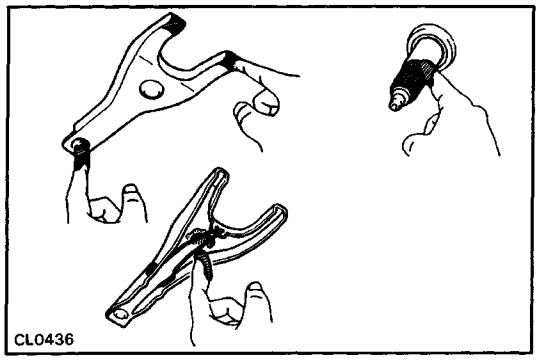
3. CHECK DIAPHRAGM SPRING TIP ALIGNMENT

Using a dial indicator with roller instrument, check the di–aphragm spring tip alignment.

Maximum non–alignment: 0.5 mm (0.020 in.)

If alignment is not as specified, using SST, adjust the di–aphragm spring tip alignment.

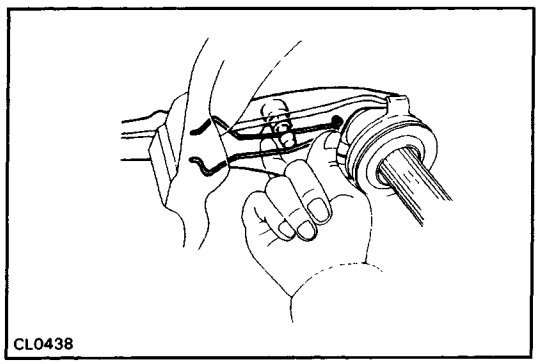
SST 09333–00013



4. APPLY MOLYBDENUM DISULPHIDE LITHIUM BASE GREASE (NLGI NO.2) OR MP GREASE

Apply molybdenum disulphide lithium base grease to the following parts:

- Release fork and hub contact point
- Release fork and push rod contact point
- Release fork pivot point
- Clutch disc spline



5. INSTALL BOOT, FORK, HUB AND BEARING ON TRANSMISSION

6. INSTALL TRANSMISSION

(See pages MT–5, TF–4)

MAINTENANCE OPERATIONS

MA02S–05

ENGINE

Cold Engine Operations

1. (3VZ–E ENGINE)

REPLACE TIMING BELT

(a) Remove the timing belt.

(See pages EG–32)

(b) Install the timing belt.

(See pages EG–41)

2. INSPECT DRIVE BELTS

(a) Visually check the belt for excessive wear, frayed cords etc.

HINT:

Conventional type:

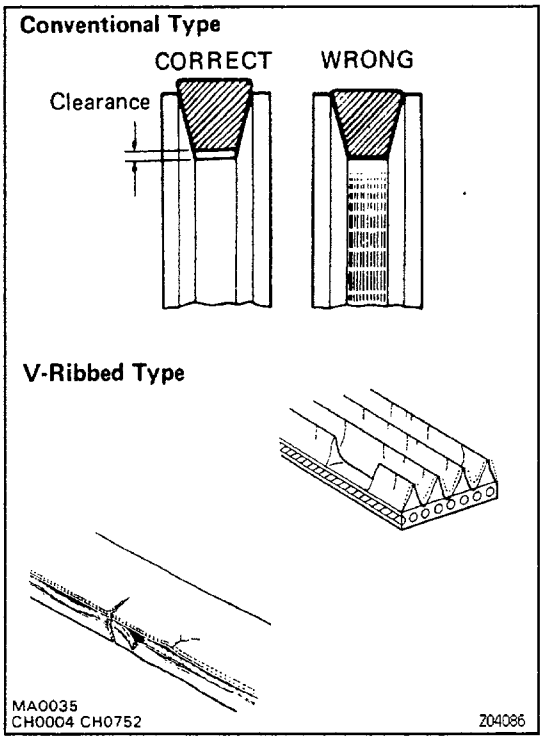
Check that the belt does not touch the bottom of the pulley groove.

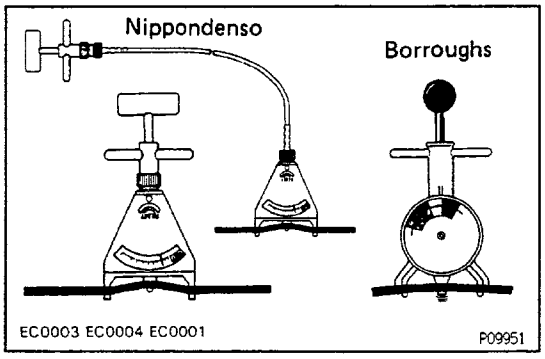
If necessary, replace the drive belt.

V–Ribbed type:

Cracks on the ribbed side of the belt are considered acceptable.

If the belt has chunks missing from the ribs, it should be replaced.





(b) Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:

Nippondenso BTG – 20 (95506–00020) or Borroughs No. BT–33–73F

Drive belt tension:

22R–E Used belt 80 ± 20 lbf

New belt 125± 25 lbf

3VZ – E

Generator Used belt 100 ± 20 lbf

New belt 160 ± 20 lbf

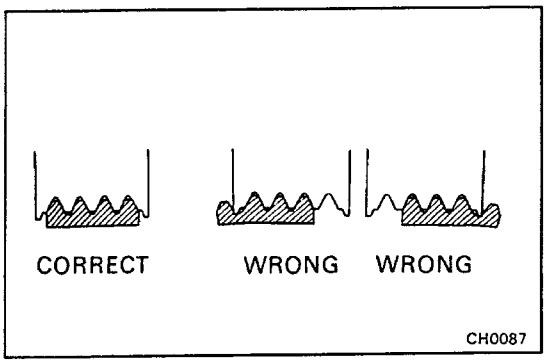
PS Used belt 80 ± 20 lbf

New belt 125 ± 25 lbf

A/C Used belt 80 20 lbf

New belt 125 ± 25 lbf

If necessary, adjust the drive belt tension.



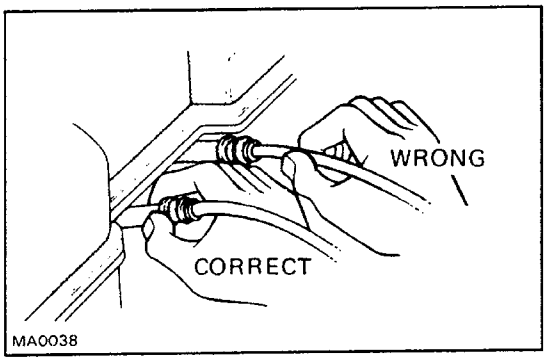
HINT:

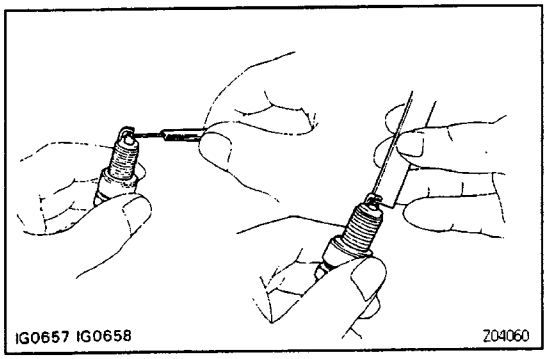
- ”New belt” refers to a belt which has been used less than 5 minutes on a running engine.
- ”Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.
- After replacing the drive belt, check that it fits properly in the ribbed grooves, especially in the places difficult to see.
- After installing a new belt, run the engine for approx. 5 minutes and then recheck the tension.

3. REPLACE SPARK PLUGS

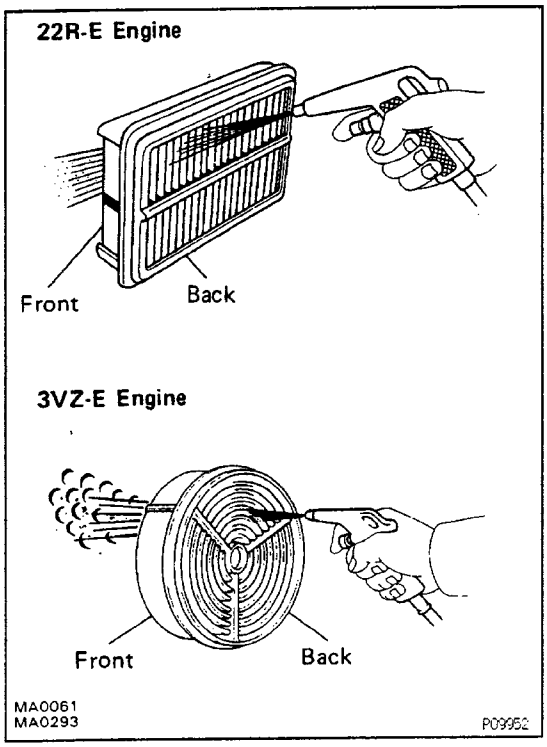
(a) Disconnect the high–tension cords at the boot.
Do not pull on the cords.

(b) (2213 – E)
Remove the spark plugs.
(3VZ – E)
Using plug wrench (16 mm), remove the spark plugs.





(c) Check the electrode gap of new spark plugs.
Correct electrode gap:
0.8 mm (0.031 in.)
Recommended spark plugs:
22R–E ND W16EXR–U
NGK BPRSEY
3VZ–E ND K76R–U
NGK BKR5EYA



4. INSPECT AIR FILTER

(a) Visually check that the air cleaner element is not excessively dirty, damaged or oily.

HINT: Oiliness may indicate a stuck PCV valve.
If necessary, replace the air cleaner element.

(b) Clean the element with compressed air.
First blow from back side thoroughly, then blow off the front side of the element.

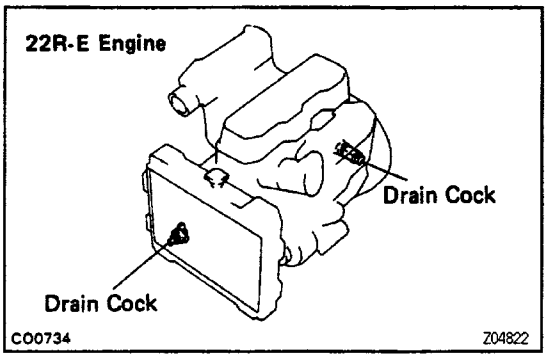
5. REPLACE AIR FILTER

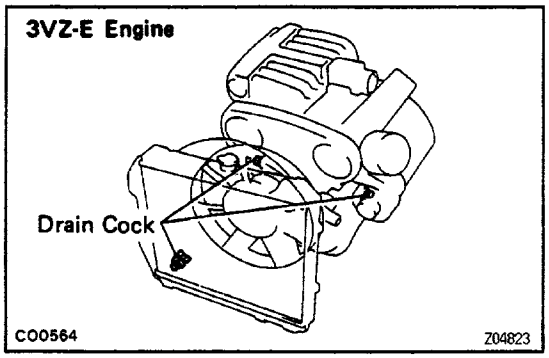
Replace the used air cleaner element with a new one.

6. REPLACE ENGINE OIL AND OIL FILTER

22R – E (See page EG–236)
3VZ– E (See page EG–278)
Oil grade:
API grade SG Energy – Conserving II multigrade and recommended viscosity oil
Engine oil capacity:
Drain and refill

22 R – E
w/o Oil filter change
3.8 liters (4.0 US qts, 3.3 Imp. qts)
w/ Oil filter change
4.3 liters (4.5 US qts, 3.8 Imp. qts)
3VZ–E
w/o Oil filter change
2WD 4.0 liters (4.2 US qts, 3.5 Imp. qts)
4WD 4.2 liters (4.4 US qts, 3.7 Imp. qts)
w/ Oil filter change
2WD 4.3 liters (4.5 US qts, 3.8 Imp. qts)
4WD 4.5 liters (4.8 US qts, 4.0 Imp. qts)





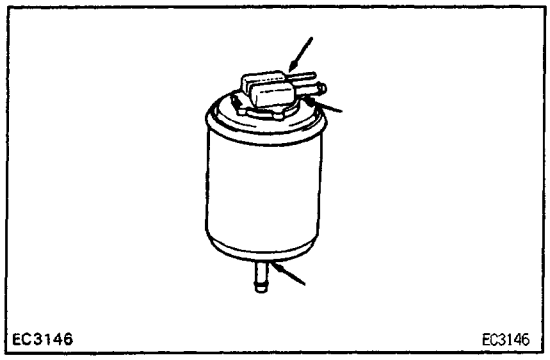
7. REPLACE ENGINE COOLANT

(a) Drain the coolant from the radiator and engine drain cocks.
(b) Close the drain cocks.
(c) Fill system with coolant.

Coolant capacity (w/ Heater or air conditioner):
22R–E
Ex. 4WD A/T 8.4 liters (8.8 US qts, 7.4 Imp. qts)
4WD A/T 9.1 liters 0.6 US qts, 8.0 Imp. qts)
3VZ–E
2WD M/T 10.4 liters (11.O US qts, 9.2 Imp. qts)
A/T 10.2 liters (10.8 US qts, 9.5 Imp. qts)
4WD M/T 10.5 liters (11.1 US qts, 9.2 Imp. qts)
A/T 10.3 liters (10.9 US qts, 9.1 Imp. qta)

HINT:
Use a good brand of ethylene–glycol base coo–lant, mixed according to the manufacturer's in–structions.
Using coolant which has more than 50% ethyl–ene–glycol (but not more than 70%) is recom–mended.

NOTICE:
- Do not use an alcohol type coolant.
- The coolant should be mixed with demineralized water or distilled water.

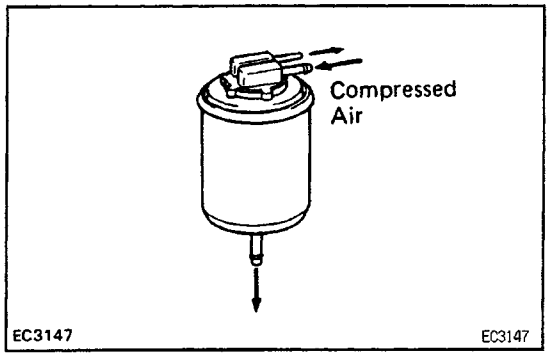


8. INSPECT CHARCOAL CANISTER

(a) Remove charcoal canister.

HINT:Label hoses for correct installation.

(b) Visually inspect canister case.

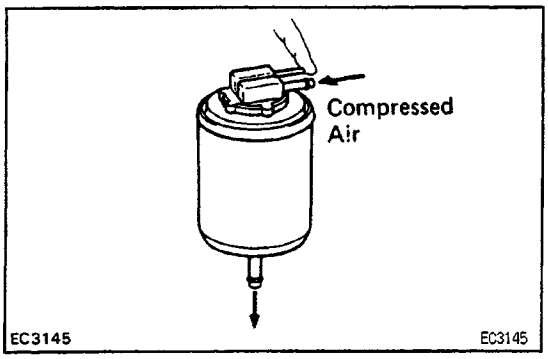


(c) Check for clogged filter and stuck check valve.

(1) Using low compressed air (4.71 kPa (48 gf/cm2, 0.68 psi), blow into the tank pipe and check that air flows without resistance from the other pipes.

(2) Blow air (4.71 kPa (48 gf/cm2, 0.68 psi) into the purge pipe and check that air does not flow from the other pipes.

If a problem is found, replace the charcoal canister.



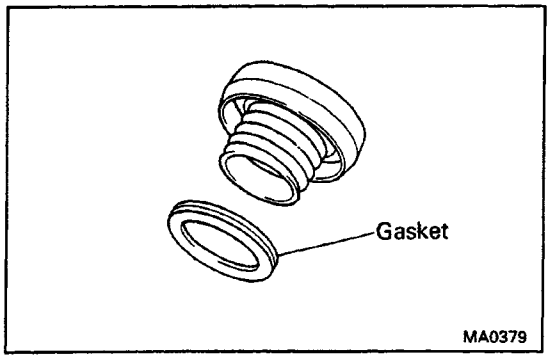
(d) Clean filter in canister.

(1) Clean the filter by blowing 294kPa (3 kgf/cm^2,43 psi) of compressed air into the tank pipe while holding the purge pipe closed.

NOTICE:

- **Do not attempt to wash the canister.**
- **No activated carbon should come out.**

(e) Install charcoal canister.



9. REPLACE GASKET IN FUEL TANK CAP

(a) Remove the old gasket (0–ring) from the tank cap. Do not damage the cap.

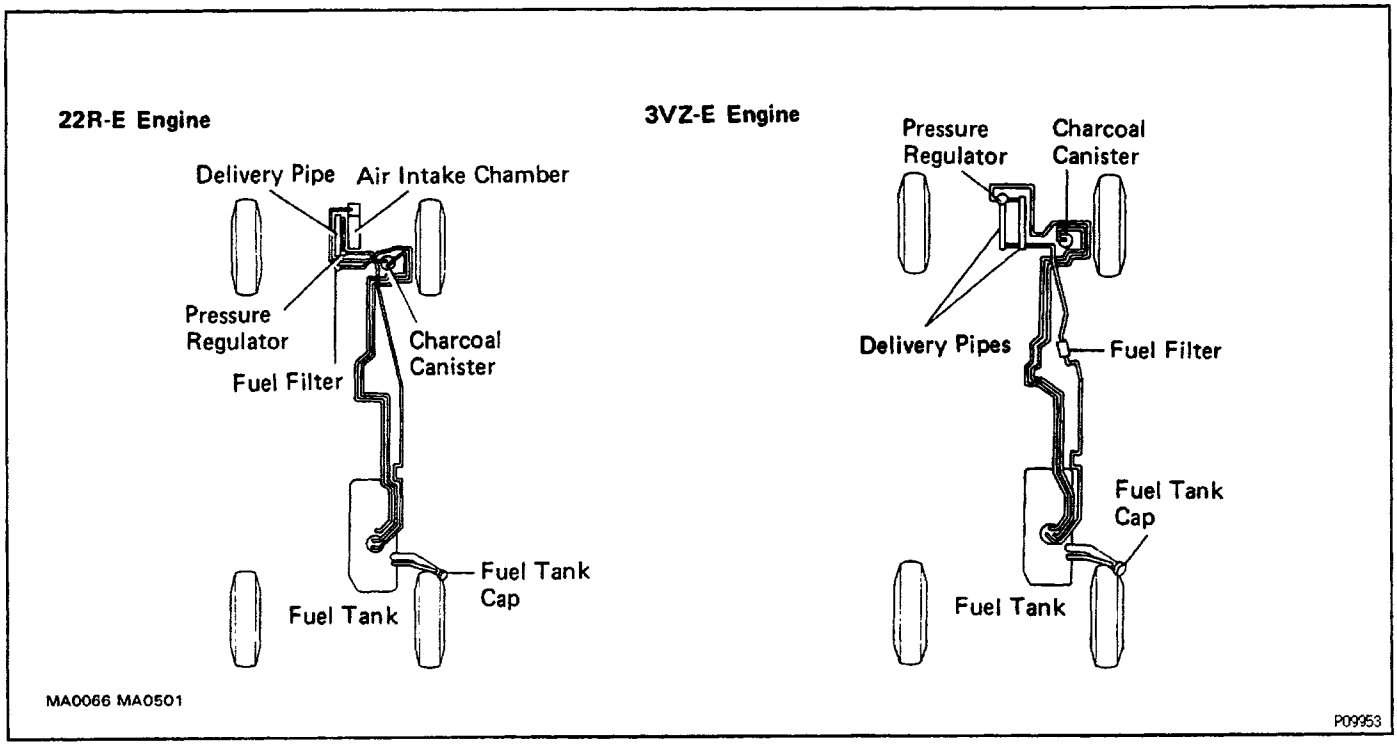
(b) Install a new gasket by hand.

(c) Inspect the cap for damage or cracks.

(d) Install the cap and check the torque limiter.

10. INSPECT FUEL LINES AND CONNECTIONS

Visually inspect the fuel lines for cracks, leakage loose connections, deformation or tank band looseness.



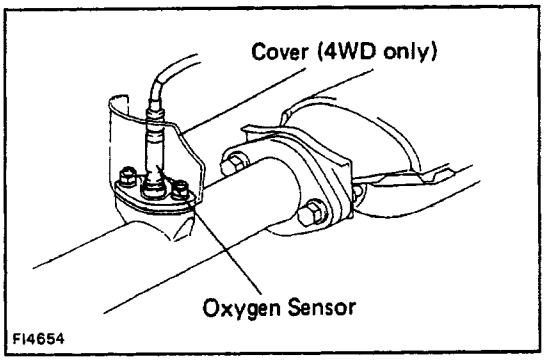
11. INSPECT EXHAUST PIPES AND MOUNTINGS

Visually inspect the pipes, hangers and connections for severe corrosion, leaks or damage.

12. (3VZ–E ENGINE)

ADJUST VALVE CLEARANCE

(See page EG–18)



13. (FEDERAL AND CANADA)

REPLACE OXYGEN SENSOR

(a) Disconnect the oxygen sensor wiring connector.

(b) Remove the cover (4WD), oxygen sensor and gasket from the exhaust pipe.

(c) Install a new gasket, oxygen sensor and cover (4WD) to the exhaust pipe.

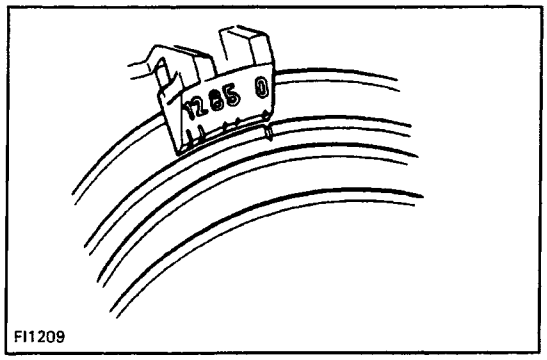
Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)

(d) Inspect oxygen sensor operation.

Inspect feedback control.

22R–E (See page EG–212)

3VZ–E (See page EG–252)



Hot Engine Operations

14. (22R–E ENGINE)

ADJUST VALVE CLEARANCE

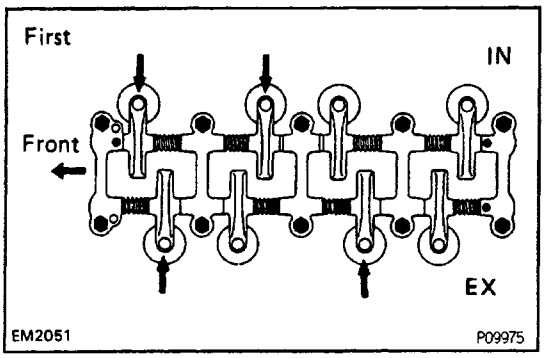
(a) Warm up the engine to normal operating temperature.

(b) Stop the engine and remove the cylinder head cover.

(c) Set No.1 cylinder to TDC/compression.

- Turn the crankshaft with a wrench to align the timing marks at TDC. Set the groove on the pulley to the "O" position.
- Check that the rocker arms on No.1 cylinder are loose and rocker arms on No.4 cylinder are tight.

If not, turn the crankshaft one complete revolution and align marks as above.

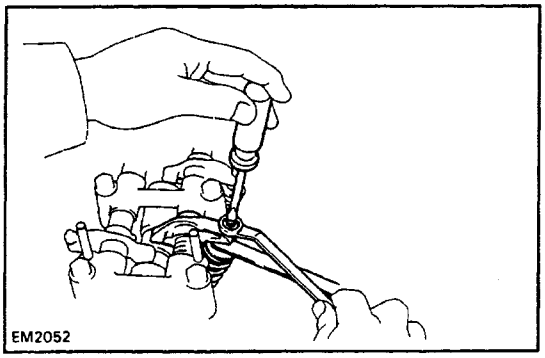


(d) Adjust the clearance of half of the valves.

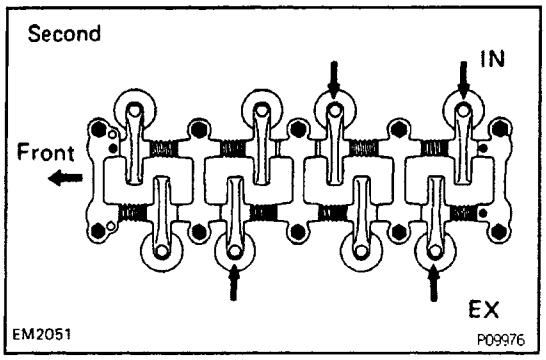
- Adjust only the valves indicated by arrows.

Valve clearance:

Intake 0.20 mm (0.008 in.)
Exhaust 0.30 mm (0.012 in.)



- Use a thickness gauge to measure between the valve stem and rocker arm. Loosen the lock nut and turn the adjusting screw to set the proper clearance. Hold the adjusting screw in position, and tighten the lock nut.
- Recheck the clearance. The thickness– gauge should move with a very slight drag.



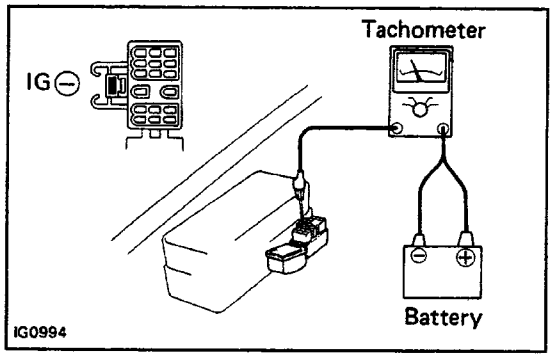
(e) Turn the crankshaft one complete revolution (360 °) and align timing marks in the manner mentioned above. Adjust only the valves indicated by arrows.

(f) Reinstall the cylinder head cover.

16. ADJUST IDLE SPEED

(a) Preparation

- Install air cleaner
- Connect all pipes and hoses of air intake system

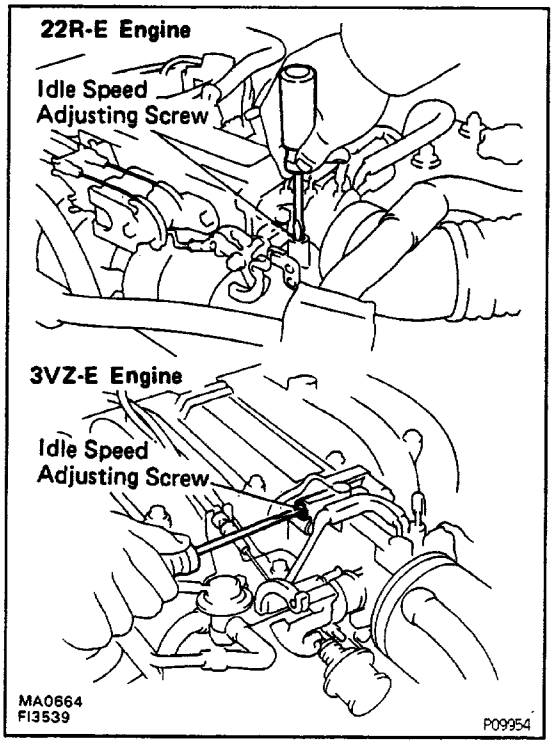


- Connect all vacuum lines (i.e., EVAP, EGR system, etc.)
- Make sure all MFI system wiring connectors are fully connected
- Engine should be at normal operating tempera– ture
- Switch off accessories
- Set transmission in neutral

(b) Connect a tachometer– to the engine
Connect the tachometer– test probe to the iG E) ter– .rninal of the DLC1.

NOTICE:

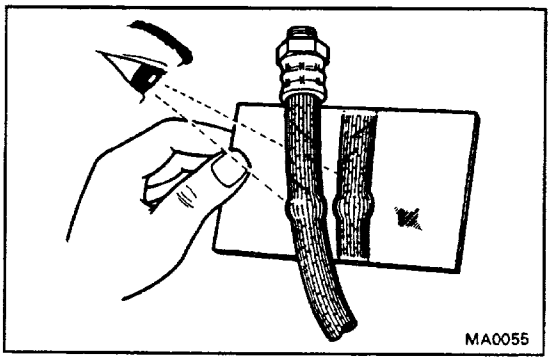
- **NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.**



(c) Race the engine at 2,500 rpm for approx. 2 minutes.
(d) Set the idle speed by turning the idle speed adjusting screws.

Idle speed:
22R–E 4WD A/T 850 rpm
Ex. 4WD A/T 750 rpm
3VZ–E 800 rpm

(e) Remove the tachometer.



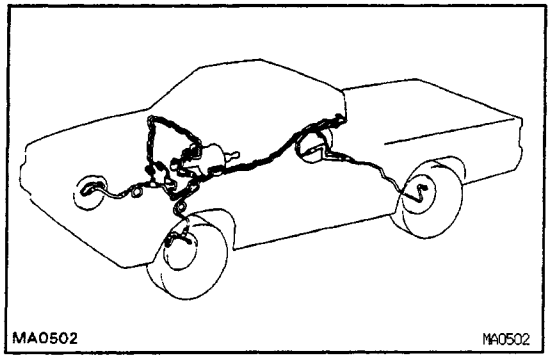
BRAKES

16. INSPECT BRAKE LINE PIPES AND HOSES

HINT: Inspect in a well – lighted area. Inspect the entire circumference and length of the brake hoses using a mirror as required. Turn the front wheels fully right or left before inspecting the front brake.

(a) Check all brake lines and hoses for:

- Damage

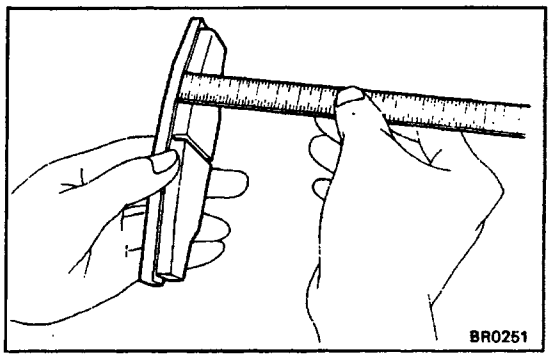


- Wear
- Deformation
- Cracks
- Corrosion
- Leaks
- Bends
- Twists

(b) Check all clamps for tightness and connections for leakage. .

(c) Check that the hoses and lines are clear of sharp edges, moving parts and the exhaust system.

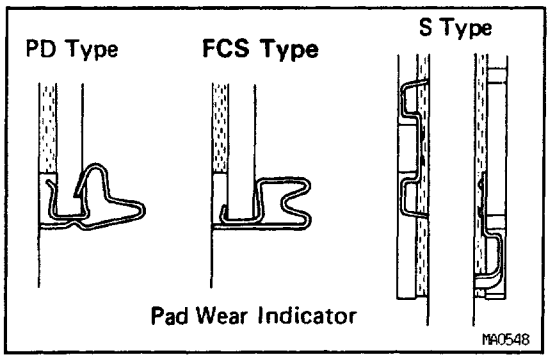
(d) Check that the lines installed in grommets pass thr–ough the center of the grommets.



17. INSPECT FRONT BRAKE PADS AND DISCS (See BR section)

(a) Check the thickness of the disc brake pad and check for irregular wear.

Minimum lining thickness:
1.0 mm (0.039 in.)



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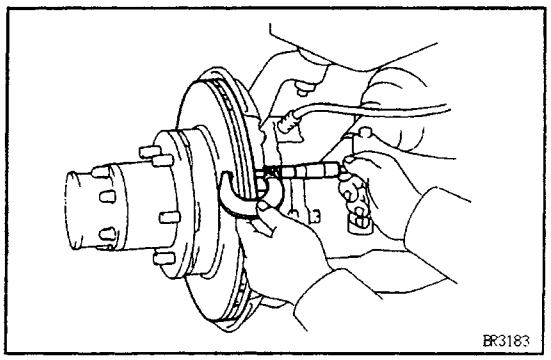
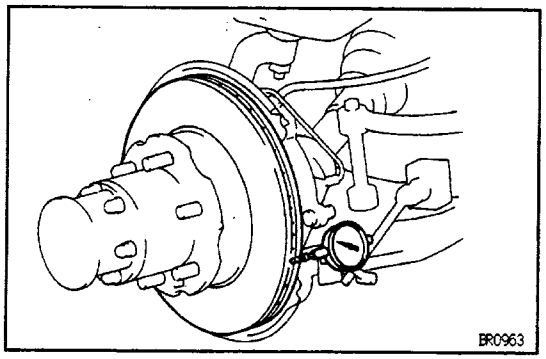
HINT: If a squealing or scraping noise occurs from the brake during driving, check the pad wear indicator. If there are traces of the indicator contacting the disc rotor, the disc pad should be replaced.



(b) Check the disc for wear.

Minimum disc thickness:
2WD FS17 type 21.0 mm (0.827 in.)
FS18 type 20.0 mm (0.787 in.)
PD60 type 23.0 mm (0.906 in.)
PD66 type 28.0 m m (1.102 in.)
4WD S 12 + 12 Type 18.0 mm (0.790 in.)

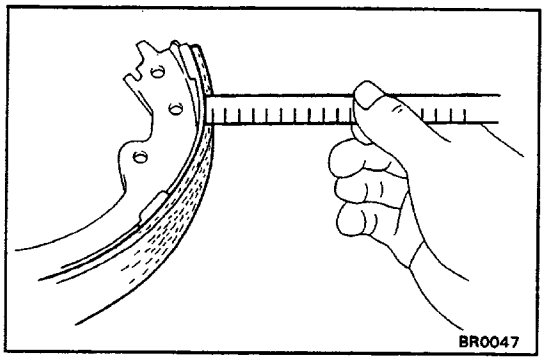


(c) Check the disc for runout.

Minimum disc runout:

Ex. C & C 0.09 mm (0.0035 in.)

C & C 0.12 mm (0.0047 in.)

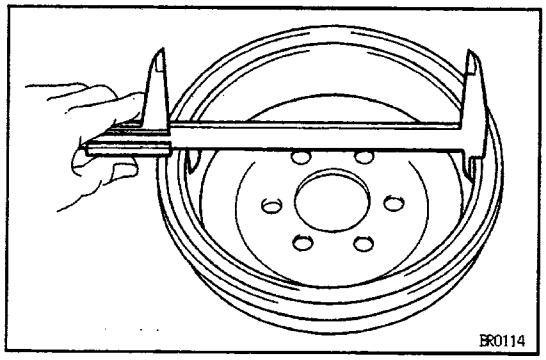


18. INSPECT REAR BRAKE LININGS AND DRUMS (See BR section)

(a) Check the lining – to – drum contact condition and lining wear.

Minimum lining thickness:

1.0 mm (0.0039 in.)



(b) Check the brake drum for scoring or wear.

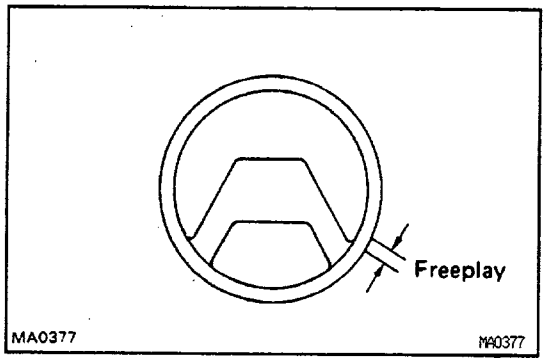
Maximum drum inside diameter:

2WD 256.0 mm (10.079 in.)

4WD 297.0 mm (11.693 in.)

(c) Clean the brake parts with a damp cloth.

NOTICE: Do not use compressed air to clean the brake parts.



CHASSIS

19. INSPECT STEERING LINKAGE

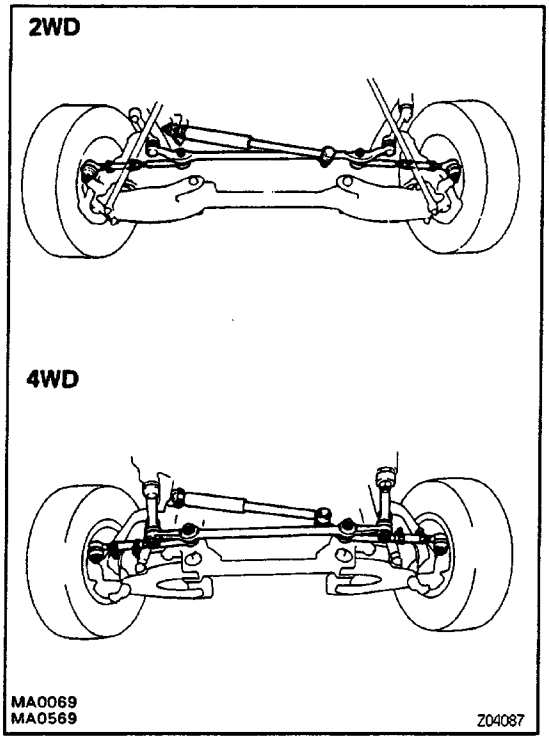
(a) Check the steering wheel freeplay.

Maximum:

30 mm (1.18 in.)

With the vehicle stopped and pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure.

If incorrect, adjust or repair.

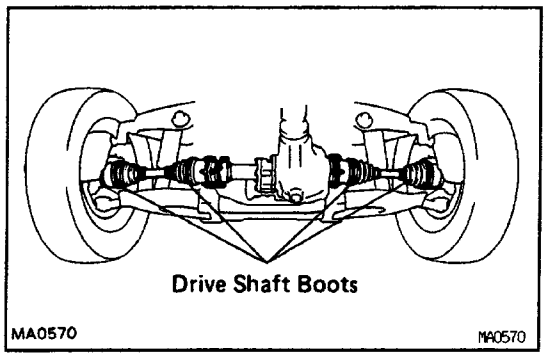


(b) Check the steering linkage for looseness or damage.
Check that:

- Tie rod ends and relay rod ends do not have excessive play.
- Dust seals are not damaged.

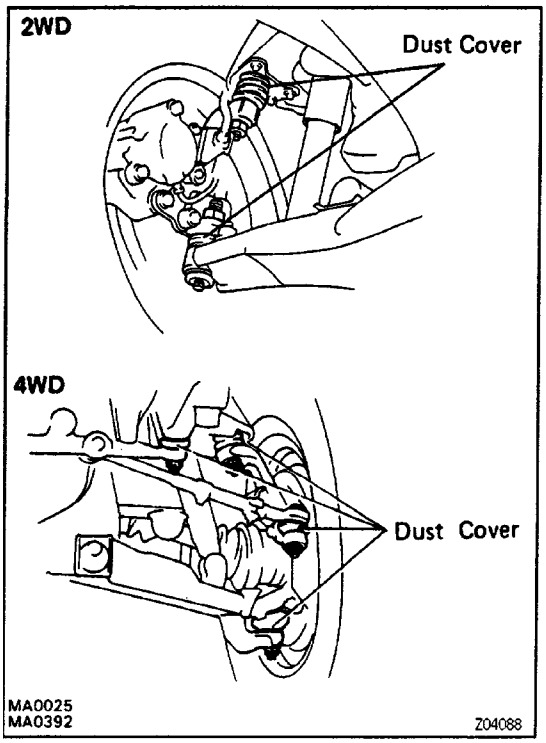
20. INSPECT STEERING GEAR HOUSING

Check the steering gear housing for oil leaks.
If leakage is found, check for cause and repair.



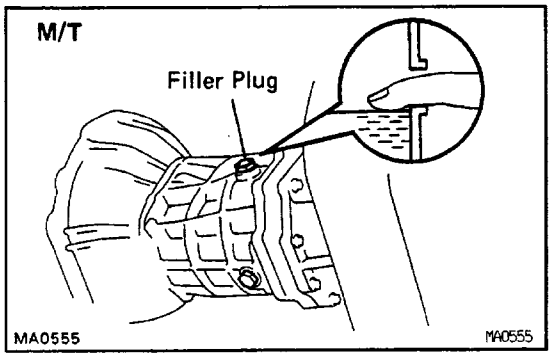
21. (4WD)
INSPECT DRIVE SHAFT BOOTS

Inspect the drive shaft boots for clamp looseness, grease leakage or damage.



22. INSPECT BALL JOINTS AND DUST COVERS

(a) Inspect the ball joints for excessive looseness. (See SA section)
(b) Inspect the dust cover for damage.



23. (2WD)

CHECK OIL LEVEL IN MANUAL TRANSMISSION, AUTOMATIC TRANSMISSION AND DIFFERENTIAL

Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

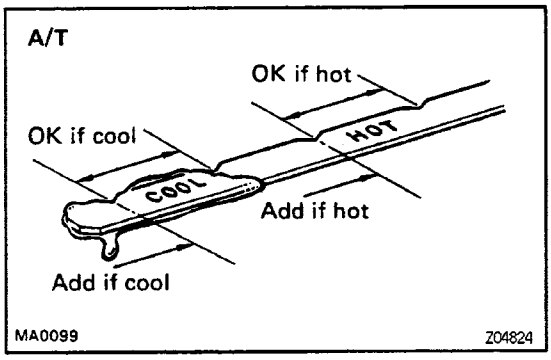
Transmission oil (M/T) –

Oil grade:

API GL–4 or GL–5

Viscosity:

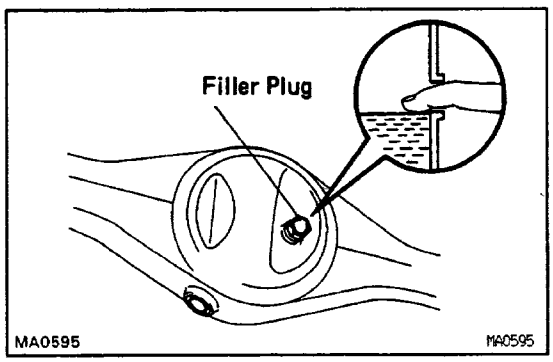
SAE 75W–90



Check the automatic transmission for oil leakage. If leakage is found, check for cause .and repair.

Transmission fluid (A/T):

ATF DEXRON• II



Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

Differential oil – –

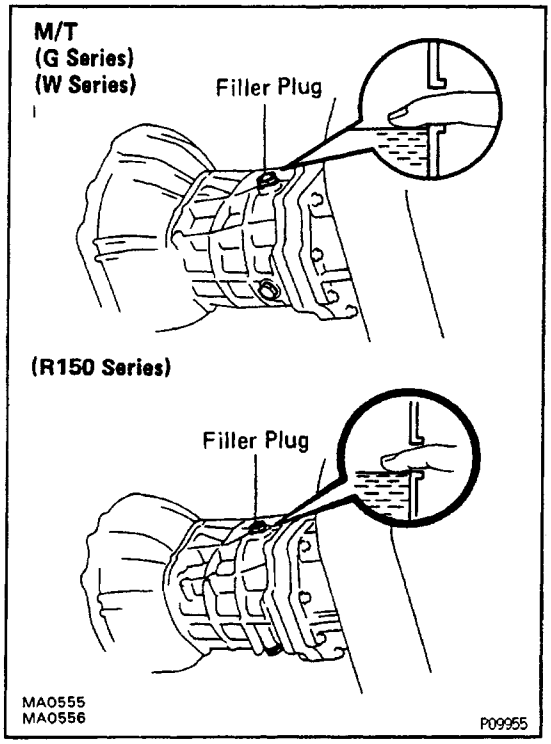
Oil grade:

AN GL–5 hypoid gear oil

Viscosity:

Above –18 ° C (0 ° F) SAE 90

Below –18 ° C (0° F) SAE 80W–90 or 80W

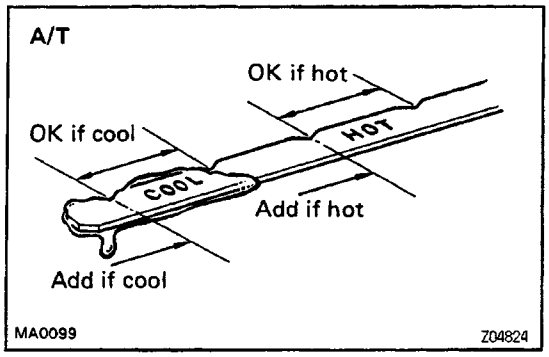


24. (4WD)

CHECK OIL LEVEL IN MANUAL TRANSMISSION, AUTOMATIC TRANSMISSION, TRANSFER AND DIFFERENTIAL

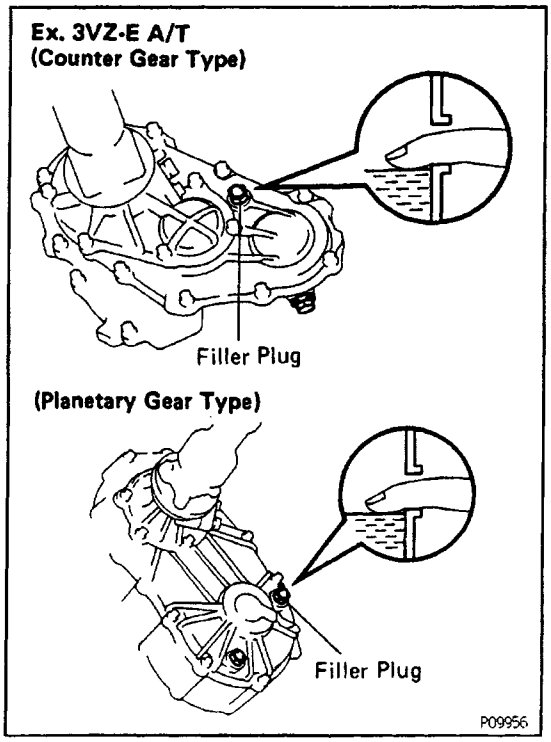
Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

Transmission oil (M/T) –
Oil grade:
API GL–4 or GL–5
Viscosity:
SAE 75W–90



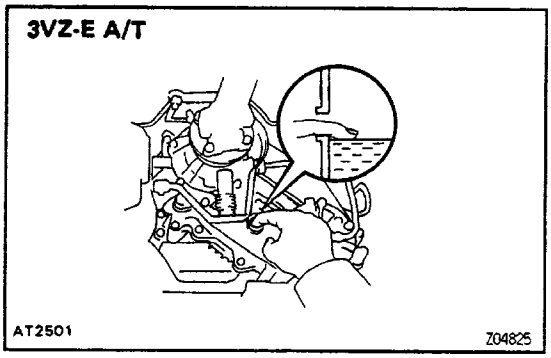
Check the automatic transmission for oil leakage. If leakage is found, check for cause and repair.

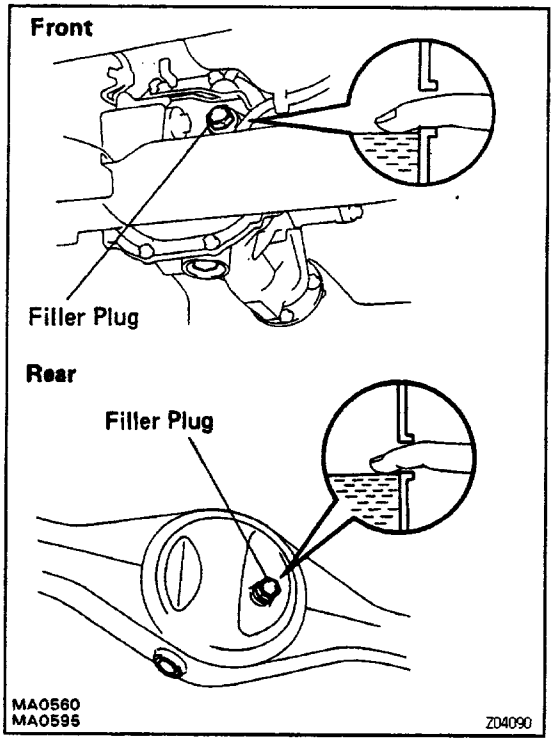
Transmission fluid (A/T):
ATF DEXRON ® II



Remove the filler– plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

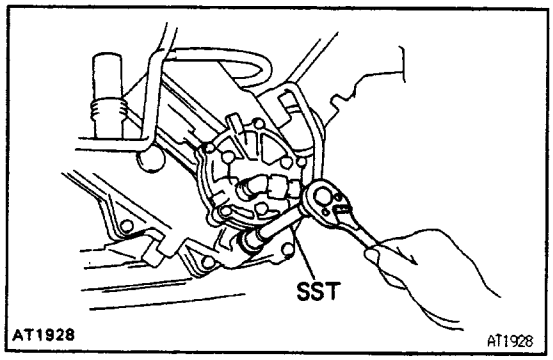
Transfer oil (Ex. 3vZ – E A/T) –
Oil grade: AN GL–4 or GL–5
Viscosity: SAE 75W–90
Transfer fluid (3VZ– E A/T):
ATF DEXRON ® II





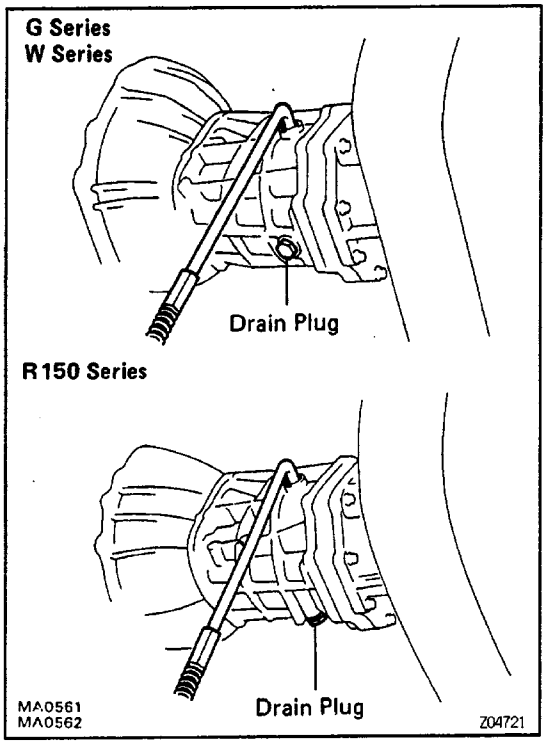
Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

Differential oil –
Standard differential
Oil grade:
API GL–5 hypoid gear oil
Viscosity:
Above –18 ° C (0°F) SAE 90
Below –18 ° C (0 ° F) SAE 80W – 90 or 80W
A.D.D.
Oil grade:
Toyota 'GEAR OIL SUPER' oil or hypoid gear oil API GL–5
Viscosity:
SAE 75W–90

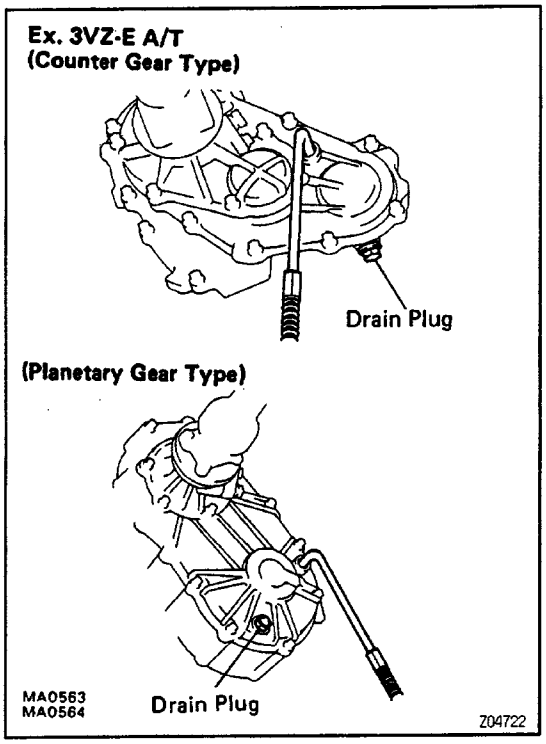


25. REPLACE MANUAL TRANSMISSION. TRANSFER (4 WD) AND DIFFERENTIAL OIL

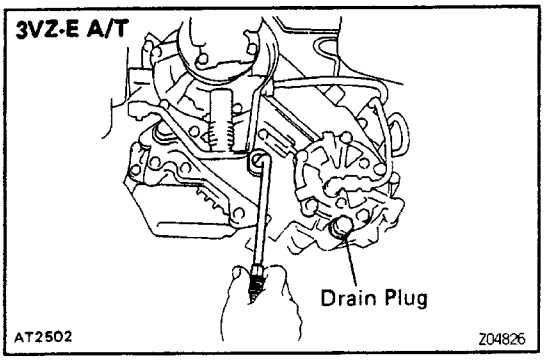
(a) (Transfer)
Remove the transfer cover.
(b) Using SST (A340H Transfer), remove the drain plug and drain the oil.
SST 09043–38100
(c) Reinstall drain plug securely.
(d) Add new oil until it begins to run out of the filler hole.
Oil grade and viscosity:
See pages MA –16 to 18

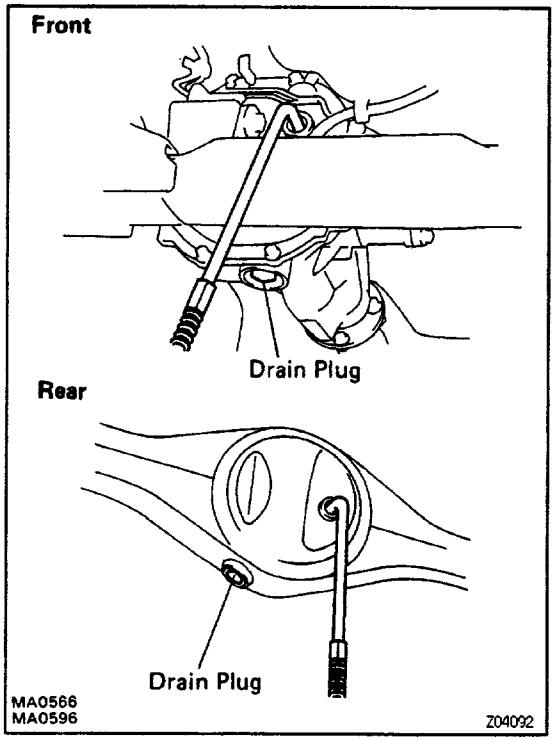


Oil capacity:
Transmission –
2WD
W55 2.6 liters (2.7 US qts, 2.3 Imp. qts)
R150 3.0 liters (3.2 US qts, 2.6 Imp. qts)
4WD
G58 3.9 liters (4.1 US qts, 3.4 Imp. qts)
W56 2.9 liters (3.1 US qts, 2.5 Imp. qts)
RI 50F 3.0 liters (3.2 US qts, 2.6 Imp. qts)

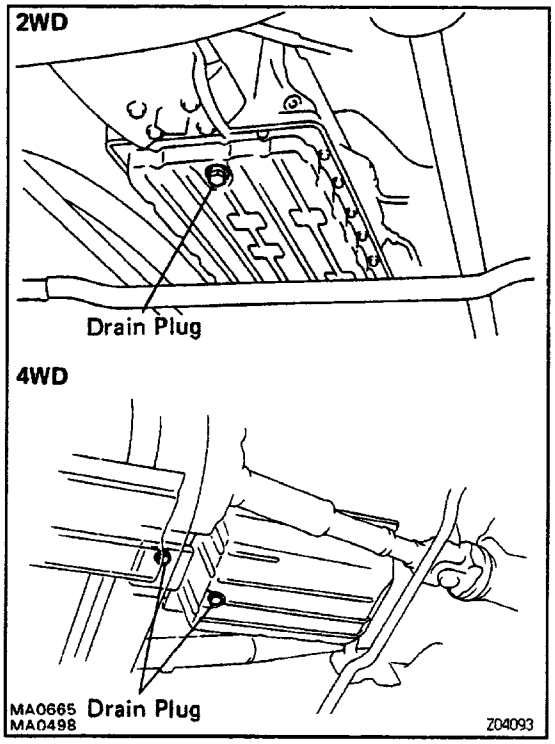


Transfer –
Counter Gear Type
1.6 liters (1.7 US qts, 1.4 Imp. qts)
Planetary Gear Type
1.1 liters (1.2 US qts, 1.0 Imp. qts)
A340H
0.8 liters (0.8 US qts, 0.7 Imp. qts)



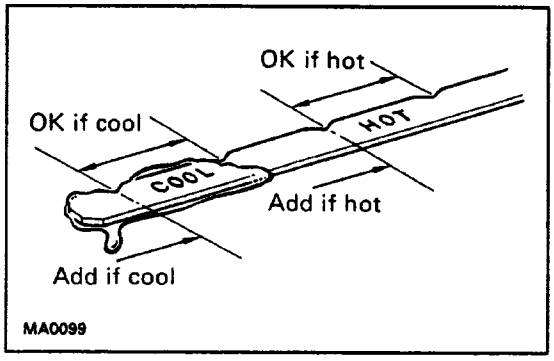


Differential –
2WD
7.5 in. 1.35 liters (1.4 US qts, 1.2 Imp. qts)
8.0 in. 1.8 liters (1.9 US qts, 1.6 Imp. qts)
4WD
Front Standard differential
1.6 liters (1.7 US qts, 1.4 Imp. qts)
A.D.D.
1.86 liters (2.0 US qts, 1.6 Imp. qts)
Rear
2.2 liters 2.3 US qts, 1.9 Imp. qts)



26. REPLACE AUTOMATIC TRANSMISSION FLUID

(a) Remove the drain plug(s) and drain the fluid.
(b) Reinstall the drain plug(s) securely.
(c) With the engine OFF, add new fluid through the dip–stick tube.
Fluid:
ATP DEXRON ® II
Drain and refill capacity:
2WD
A43D 2.4 liters (2.5 US qts, 2.1 Imp. qts)
A340E 1.6 liters (1.7 US qts, 1.4 Imp. qts)
4WD
A340H 4.5 liters (4.8 US qts, 4.0 Imp. qts)
A340F 2.0 liters (2.1 US qts, 1.8 Imp. qts)



(d) Start the engine and shift the selector into ail posi–tions from ”P” through ”L” and then shift into ”P”.
(e) (A340H)
Shift the transfer lever position: H2→H4→L4 and L4 →H4→H2.
(f) With the engine idling, check the fluid level.
Add fluid up to the cool level on the dipstick.

(g) Check that the fluid level is in the ”HOT” range at the normal operating temperature (70 – 80 ° C or 158 – 176 *F) and add as necessary.

NOTICE: Do not overfill.

27. REPACK FRONT WHEEL BEARINGS AND THRUST BUSH

(a) Change the front wheel bearing grease.
(See SA section)

2WD –

Grease grade:
Lithium base multipurpose grease (NLGI No.2)
Wheel bearing friction preload (at starting):
5.9–18N(0.6–1.8kgf,1.3–4.Olbf)

4WD –

Grease grade:
Lithium base multipurpose grease (NLGI No.2)
Wheel bearing friction preload (at starting):
27 – 55 N (2.8 – 5.6 kgf, 6.2 – 12.3 lbf)

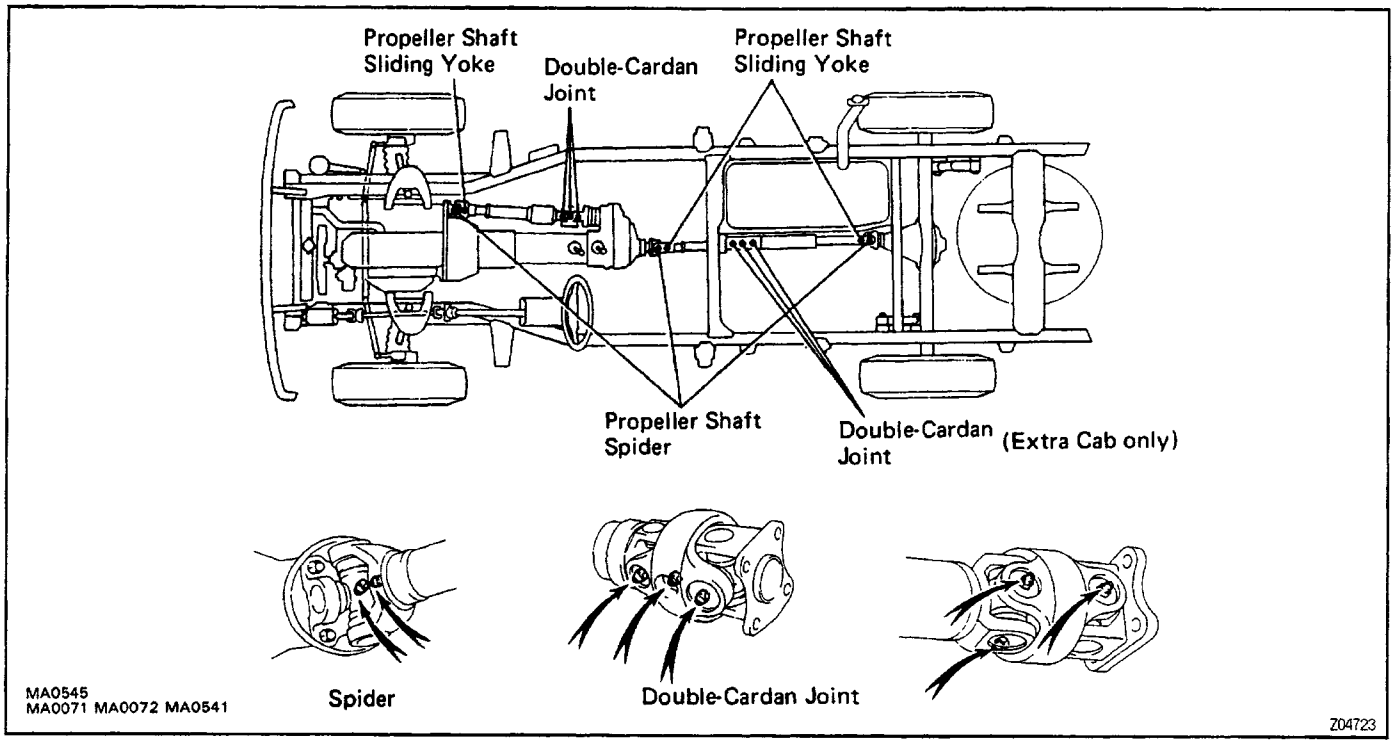
(b) Repack the drive shaft thrust bush grease.
(See SA section)

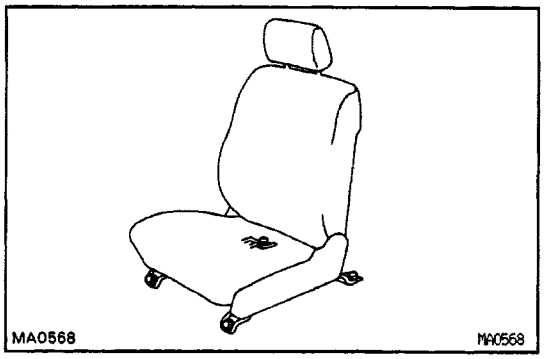
28. (4WD)

LUBRICATE PROPELLER SHAFT

Lubricate propeller shaft, referring to the lubrication chart. Before pumping in grease, wipe off any mud and dust on the grease fitting.

Grease grade:
Propeller shaft (ex. Double–cardan joint) –
Lithium base chassis grease (NLGI No.2)
Double–cardan joint – Molybdenum disulphide
Lithium base chassis grease (NLGI No.2)



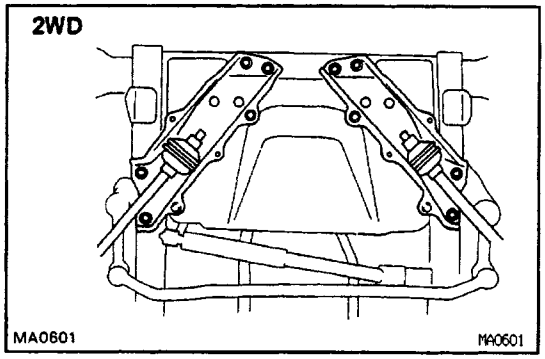


29. TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY

Tighten the following parts:

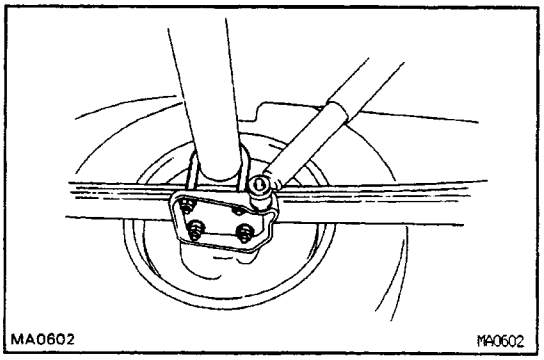
- Seat mounting bolts

Torque: 37 N–m (375 kgf–cm, 27 ft–lbf)



- Strut bar bracket–to –frame mounting bolts (2 WD)

Torque: 52 N–m (530 kgf–cm, 38 ft–lbf)



- Leaf spring U – bolt mounting nuts

Torque:

2WD 0.5 ton 147 N–m (1,500 kgf–cm, 108 ft–lbf)

Others 123 N–m (1,250 kgf–cm, 90 ft–lbf)

Under Severe Conditions:

In addition to the above maintenance items, check for loose or missing bolts and nuts on the following.

- Steering system
- Drive train

- Suspension system
- Fuel tank mounts
- Engine mounts, etc.

30. FINAL INSPECTION

(a) Check operation of body parts:

- Hood
  Auxiliary catch operates properly
- Hood locks securely when closed
  Doors
  Door locks operate properly
- Doors close properly
  Seats
- Seat adjusts easily and locks securely in any positions
  Seat backs lock securely at any angle
  Fold–down seat backs lock securely

(b) Road test

- Engine and chassis parts do not have abnormal noises.
- Vehicle does not wander or pull to one side.
- Brakes work properly and do not drag.

(c) Be sure to deliver a clean vehicle and especially check:

- Steering wheel
- Shift lever knob
- All switch knobs
- Door handles
- Seats

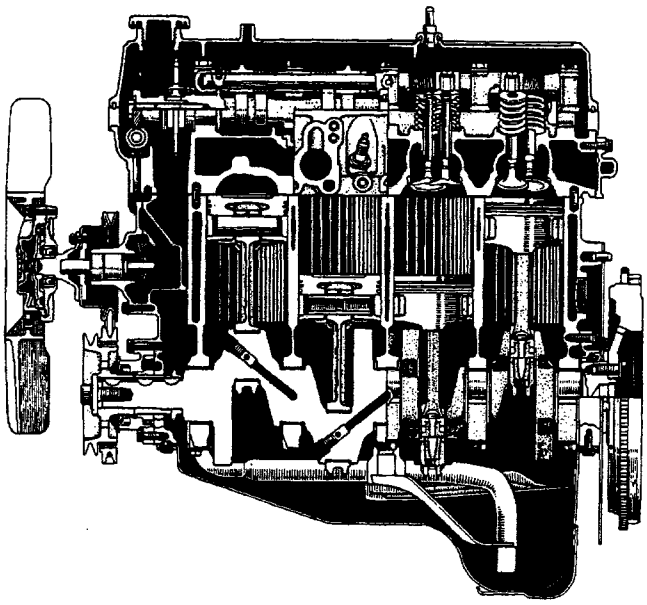
22R–E ENGINE

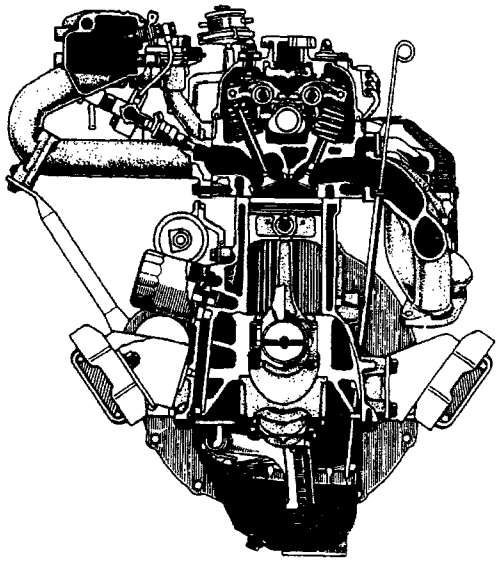
ENGINE MECHANICAL

DESCRIPTION

The 22R–E engine is an in–line 4 cylinder 2.4 liter OHC 8 valve engine.

EG1UV–01





EM5984
EM5985

P09078

The 22R–E engine is in–line 4–cylinder engine with the cylinders numbered 1–2–3–4 from the front. The crankshaft is supported by 5 bearings inside the crankcase. These bearing are made of kelmet.

The crankshaft is integrated with 4 weights which are cast with it for balance. Oil holes are made in the center of the crankshaft to supply oil to the connecting rods, bearing, pistons and other components.

The firing order is 1–3–4–2. The cylinder head is made of aluminum alloy, with a cross flow type intake and exhaust layout and with pent roof type combustion chambers. The spark plugs are located to the left of the combustion chambers.

Coolant is introduced into the intake manifold, improving drivability during engine warm up.

Exhaust and intake valves are equipped with springs made, of special valve spring carbon steel which are capable of following no matter what the engine speed.

The camshaft is driven by a timing chain. The cam journal is supported at 3 places, located at the center and the front and rear of ends of each cylinder head. Lubrication of the cam journal gear is accomplished by oil supplied through the oil passage in the cylinder head.

Adjustment of the valve clearance is done by means of an adjusting screw on the rocker arm for easy adjustment.

The timing chain cover is made of aluminum alloy, with a water pump and oil pump on the outside.

Pistons are made of highly temperature–resistant aluminum alloy, and a depression is built into the piston head to prevent interference with valves.

Piston pins are the full–floating type, with the pins fastened to neither the connecting rods nor the piston boss, but with a snap ring fitted to both ends of each pin to prevent it from slipping out.

The No. 1 compression ring is made of stainless steel and the No. 2 compression ring is made of cast iron. The oil ring is made of stainless steel. The outer diameter of each piston ring is slightly larger than the diameter of the piston and the flexibility of the rings allows them to hug the cylinder walls when they are mounted on the piston. No. 1 and No. 2 compression rings work to prevent leakage of gas from the cylinder and the oil ring works to scrape oil off the cylinder walls to prevent it from entering the combustion chambers.

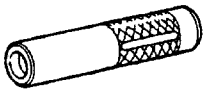
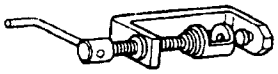
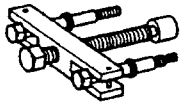
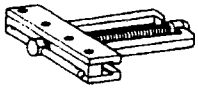
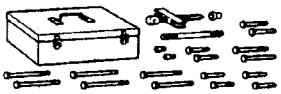
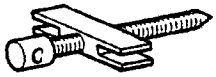
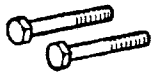
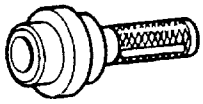
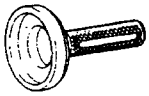
The cylinder block is made of cast iron. It has 4 cylinders which are approximately 2 times the length of the piston stroke. The top of each cylinder is closed off by the cylinder head and in the lower end of the cylinders the crankshaft is installed, supported by 5 journals. In addition, the cylinder block contains a water jacket, through which coolant is pumped to cool the cylinders.

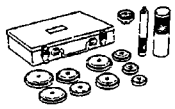
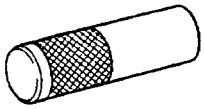
The oil pan is bolted onto the bottom of the cylinder block. The oil pan is an oil reservoir made of pressed steel sheet. A dividing plate is included inside the oil pan to keep sufficient oil in the bottom of the pan even when the vehicle is tilted. The dividing plate prevents the intake of air and allows oil circulation to be maintained even if the oil forms waves when the vehicle brakes suddenly.

PREPARATION

EGOAY–0A

SST (SPECIAL SERVICE TOOLS)

	09201–41020 Valve Stem Oil Seal Replacer	
	09201 –60011 Valve Guide Bushing Remover & Replacer	
	09202–43013 Valve Spring Compressor	
	09213–31021 Crankshaft Pulley Puller	
	09213–36020 Timing Gear Remover	
	09213–60017 Crankshaft Pulley & Gear Puller Set	
	(09213–00020) Body With .Bolt	
	(00213–00030) Handle	
	(09213–00060) Bolt Set	
	09222–30010 Connecting Rod Bushing Remover & Replacer	
	09223–50010 Crankhaft Front oil Seal Replacer	Camshaft oil seal
	09223–41020 Crankshaft Rear Oil Seal Replacer	
	09213–70010 Crankshaft Pulley Holding Tool	

	09606–35014 Axle Hub & Drive Pinion Bearing Tool Set	
	(09608–06040) Front Hub Inner Bearing Cone Replacer	
	09330–00021 Companion Flange Holding Tool	Crankshaft pulley
	09843–18020 Diagnosis Check Wire	

EG0AZ–08

RECOMMENDED TOOLS

	09090–04010 Engine Sling Device	For suspension engine
	09200–00010 Engine Adjust Kit	
	09258–00030 Hose Plug Set	Plug for the vacuum hose, fuel hose etc.
	09904–00010 Expander Set	

EG0BC–07

EQUIPMENT

Battery specific gravity gauge	
Belt tension gauge	
Caliper gauge	
CO/HC meter	
Compression gauge	
Connecting rod aligner	
Cylinder gauge	
Dial indicator	

Dye penetrant	
Engine tune–up tester	
Heater	
Magnetic finger	
Micrometer	
Piston ring compressor	
Piston ring expander	
Plastigage	
Precision straight edge	
Soft brush	
Spring tester	Valve spring
Steel square	Valve spring
Thermometer	
Torque wrench	
Valve seat cutter	
Vernier calipers	

EG0B1–0C

SSM (SERVICE SPECIAL MATERIALS)

08826–00080 Seal packing or equivalent	Camshaft bearing cap Cylinder head cover Rear oil sear retainer
08833–00070 Adhesive 1324, THREE BOND 1324 or equivalent	Flywheel or drive plate mounting bolt

TROUBLESHOOTING

When the malfunction code is not confirmed in the diagnostic trouble code check and the problem still cannot be confirmed in the basic inspection, then proceed to this step and perform troubleshooting to the numbers in the order given in the table below.

	See page	IG–5	IG–5	EG1–212	EG1–131, 149 or 167	EG1–129, 147 or 165	EG1–129, 147 or 165	EG1–127, 145 or 163	EG1–132, 150 or 168	—	—	—	EG1–177	EG1–186	EG1–192	EG1–187	EG1–183 or 208	—
	Suspect area	RPM Signal Circuit	Ignition Circuit	Main Oxygen Sensor Circuit	Engine Coolant Temp. Sensor Circuit	Intake Air Temp. Sensor Circuit	Volume Air Flow Meter Circuit	Throttle Position Sensor Circuit	STA Signal Circuit	Knock Sensor Circuit	PNP Switch Signal Circuit	A/C Signal Circuit	Fuel Pump	Fuel Pressure Regulator	Fuel Lines	Injectors	Cold Start System	Idle Air Control Valve
	Symptom																	
Does not start	Engine does not crank																	
	Starter runs – engine does not crank																	
	No initial combustion	12	2				5						6				13	8
	No complete combustion				4		1							3		9	10	2
Difficult to start	Engine cranks slowly											2						
	Under normal condition	12	13		4	14							7	6	8	16	17	3
	Cold engine				1	6			2				8	7	9	10	5	4
	Hot engine				1	5							8	7	9	10	6	3
Poor idling	Incorrect first idle				3													4
	High engine idle speed				4	6		7			9	8				10	11	5
	Low engine idle speed				1		4									5		2
	Rough idling		18		2		12						7	6	8	16	17	9
	Misfire		4		6		8									9	10	
Poor drivability	Hesitation Poor acceleration			12	10	11	9	8					14	13	15	18	19	
	Back fire			6	3	7	5	4					9	8	10	11		
	Muffler explosion (after fire)			8	3	7	5	6						4		9	10	
	Serging													1		4		
	Knocking									1								
Engine stall	Soon after starting				8		7						3	2	4	9	10	6
	After accelerator pedal depressed						1	3						5	6	7		
	After accelerator pedal released						3											1
	During A/C operation											1						2
	When N to D shift										1							2
Others	Poor fuel economy			21	16	22	18	17			19	20				14	15	
	Engine overheat									9								
	Engine overcool																	
	Excessive oil consumption																	
	Low oil pressure																	
	High oil pressure																	
	Starter keeps running																	
	Battery often discharges																	

HINT: When inspecting a wire harness or circuit, the electrical wiring diagrams at the end of repair manual should be referred to and the circuits of related systems also should be checked.

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	See page	EG1–198	EG1–199	CL section	EG1–14	MA–11	EG1–39	EG1–39	EG1–226	EG1–23	EG1–238	EG1–51	EG1–54	EG1–21	EG1–58	–	EG1–229
	Suspect area / Symptom	Dash Pot	Throttle Opener	Clutch	Compression	Valve Clearance	Valve Timing	Timing Belt	Water Pump	Valve Stem Guide Bushing	Oil Pump	Connecting Rod Bearing	Crankshaft Bearing	Cylinder Head	Piston Ring	Flywheel or Drive Plate	Radiator and Radiator Cap
Does not start	Engine does not crank																
	Starter runs – engine does not crank															2	
	No initial combustion				9		10	11									
	No complete combustion				5		7	8							6		
Difficult to start	Engine cranks slowly											3	4				
	Under normal condition				9		11								10		
	Cold engine																
	Hot engine																
Poor idling	Incorrect first idle	2	3														
	High engine idle speed	2															
	Low engine idle speed																
	Rough idling				10	13	14	15						20	11		
	Misfire				7												
Poor drivability	Hesitation Poor acceleration			1	7	16	17										
	Back fire						2										
	Muffler explosion (after fire)						2										
	Serging																
	Knocking						5		9								6
Engine stall	Soon after starting																
	After accelerator pedal depressed																
	After accelerator pedal released																
	During A/C operation																
	When N to D shift																
Others	Poor fuel economy	4		5	11		13								12		
	Engine overheat						7	5	6		10			11			3
	Engine overcool																
	Excessive oil consumption				3					2				5	4		
	Low oil pressure										2	3	4				
	High oil pressure										1						
	Starter keeps running																
	Battery often discharges																

V01854

Thermostat	Drive Belt	Engine Coolant Temp. Sender Gauge	Oil Pressure Switch	Generator	Cylinder Block	EFI Main Relay	Circuit Opening Relay	Fuel Cut System	Fuel Pressure Control System	ECM	Fuel Quality	Fuel Leakage	Coolant Leakage	Oil Leakage	Starter Relay	PNP Switch or Clutch Start SW	Starter	Spark Plug	Distributor	EGR System	Accelerator Pedal Link	Brakes drag even when released
EG1–228	CH section	BE section	BE section	CH section	EG1–55	EG1–206	EG1–207	EG1–219	EG1–210	EG1–215	—	—	EG1–225	EG1–235	ST section	AT or CL section	ST section	IG–6	IG–7	EG1–88 or 92	—	—
															1	3	2					
																	1					
						3	4			14	7								1			
										11												
																	1					
										18	1							2	15	5		
										11	3											
									4	11	2											
										5											1	
										12											1	
										6										3		
										19	1							4	5	3		
										11	1							3	5	2		
										20	3							5	6	4		2
										12										1		
								1		11												
										5								2	3			
8										10	2							3		4		
										11	1									5		
										8								4		2		
										4										2		
										3												
										3												
								8			2	1						9	10	7	3	6
4		13			12								1					8				
2		3																				
					6									1								
			5											1								
			2																			
															1		2					
	1			2																		

V01855

TUNE–UP

EG1UX–01

ENGINE COOLANT INSPECTION

(See steps 1 and 2 on page EG1–225)

EG1UY–01

ENGINE OIL INSPECTION

(See steps 1 and 2 on page EG1–235)

EG1UZ–01

AIR FILTER INSPECTION

(See step 4 on page MA–7)

EG1V0–02

BATTERY INSPECTION

(See CM section)

EG1V1–01

HIGH–TENSION CORD INSPECTION

(See page IG–6)

EG1V2–01

SPARK PLUGS INSPECTION

(See page IG–8)

EG1V3–01

DRIVE BELTS INSPECTION

(See step 2 on page MA–6)

EG1V4–01

VALVE CLEARANCE INSPECTION AND ADJUSTMENT

(See step 14 on page MA–11)

EG1V5–01

IGNITION TIMING INSPECTION AND ADJUSTMENT

(See step 5 on page IG–10)

EG1V6–01

IDLE SPEED INSPECTION AND ADJUSTMENT

(See step 15 on page MA–11)

HINT: Adjust idle mixture as necessary.

IDLE AND OR 2500 RPM CO HC CHECK

HINT: This check method is used only to determine whether or not the idle and/or 2,500 rpm CO/HC complies with regulations.

1. INITIAL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air intake system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected

HINT: All vacuum hoses for the air suction, EGR sys–tems, etc. should be properly connected.

(f) MFI system wiring connectors fully plugged
(g) Ignition timing set correctly
(h) Transmission in neutral
(i) Idle speed set correctly
(j) Tachometer and CO/HC meter calibrated and at hand

2. START ENGINE

3. RACE ENGINE AT 2,500 RPM FOR APPROX.3 MINUTES

4. INSERT CO / HC METER TESTING PROBE INTO TAILPIPE AT LEAST 40 cm (1.3 ft)

5. IMMEDIATELY CHECK CO/HC CONCENTRATION AT IDLE AND/OR 2,500 RPM

HINT:
When performing the 2 mode (2,500 rpm and idle) test, follow the measurement order prescribed by the applicable local regulations.

EG1V8–01

TROUBLESHOOTING

If the HC/CO concentration does not comply with regulations, perform troubleshooting in the order given below.

1. Check oxygen sensor operation
(See page EG1–212)

2. See the table below for possible cause, and then inspect and correct the applicable causes if neces–sary.

HC	CO	Symptoms	Causes
High	Normal	Rough idle	1. Faulty ignition: • Incorrect timing • Fouled, shorted or improperly gapped plugs • Open or crossed high–tension cords • Cracked distributor cap 2. Incorrect valve clearance 3. Leaky EGR valve 4. Leaky exhaust valves 5. Leaky cylinder
High	Low	Rough idle (Fluctuating HC reading)	1. Vacuum leak: • Vacuum hose • Intake manifold • Intake chamber • PCV line • Throttle body
High	High	Rough idle (Black smoke from exhaust)	1. Clogged air filter 2. Plugged PCV valve 3. Pulsed Secondary Air Injection (PAIR) system problems 4. Faulty MFI system: • Faulty pressure regulator • Clogged fuel return line • Faulty volume air flow meter • Defective engine coolant temp. sensor • Defective intake air temp. sensor • Faulty ECM • Faulty injector • Faulty cold start injector

V01856

COMPRESSION CHECK

HINT: If there is lack of power, excessive oil con–sumption or poor fuel mileage, measure the cylinder compression pressure.

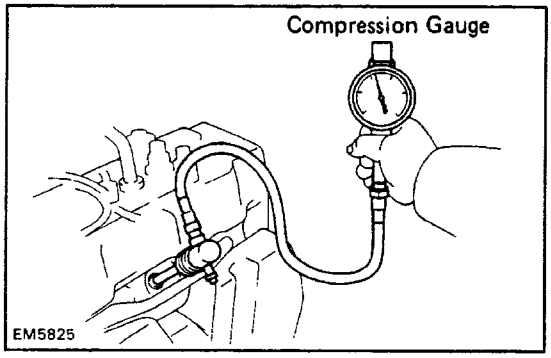
1. WARM UP ENGINE

2. REMOVE SPARK PLUGS

3. DISCONNECT DISTRIBUTOR CONNECTOR

4. DISCONNECT COLD START INJECTOR CONNEC–TOR

5. MEASURE CYLINDER COMPRESSION PRESSURE



(a) Insert a compression gauge into the spark plug hole.

(b) Fully open the throttle.

(c) While cranking the engine with the starter motor, measure the compression pressure.

NOTICE: This test must be done for as short a time as possible to avoid overheating of the catalytic converter.

HINT: A fully charged battery must be used to obtain at least 250 rpm.

(d) Repeat steps (a) through (c) for each cylinder.

Compression pressure:
1,177 kPa (12.0 kgf/cm^2, 171 psi)

Minimum pressure:
981 kPa (10.0 kgf/cm^2, 142 psi)

Difference between each cylinder:
98 kPa (1.0 kgf/cm^2, 14 psi) or less

(e) If cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylin–der through the spark plug hole and repeat steps (a) through (c) for the low compression cylinder.

- If adding oil helps the compression, chances are that the piston rings and /or cylinder bore are worn or damaged.
- If pressure stays low, a valve may be sticking or seating improperly, or there may be leakage past the gasket.

6. CONNECT COLD START INJECTOR CONNECTOR

7. CONNECT DISTRIBUTOR CONNECTOR

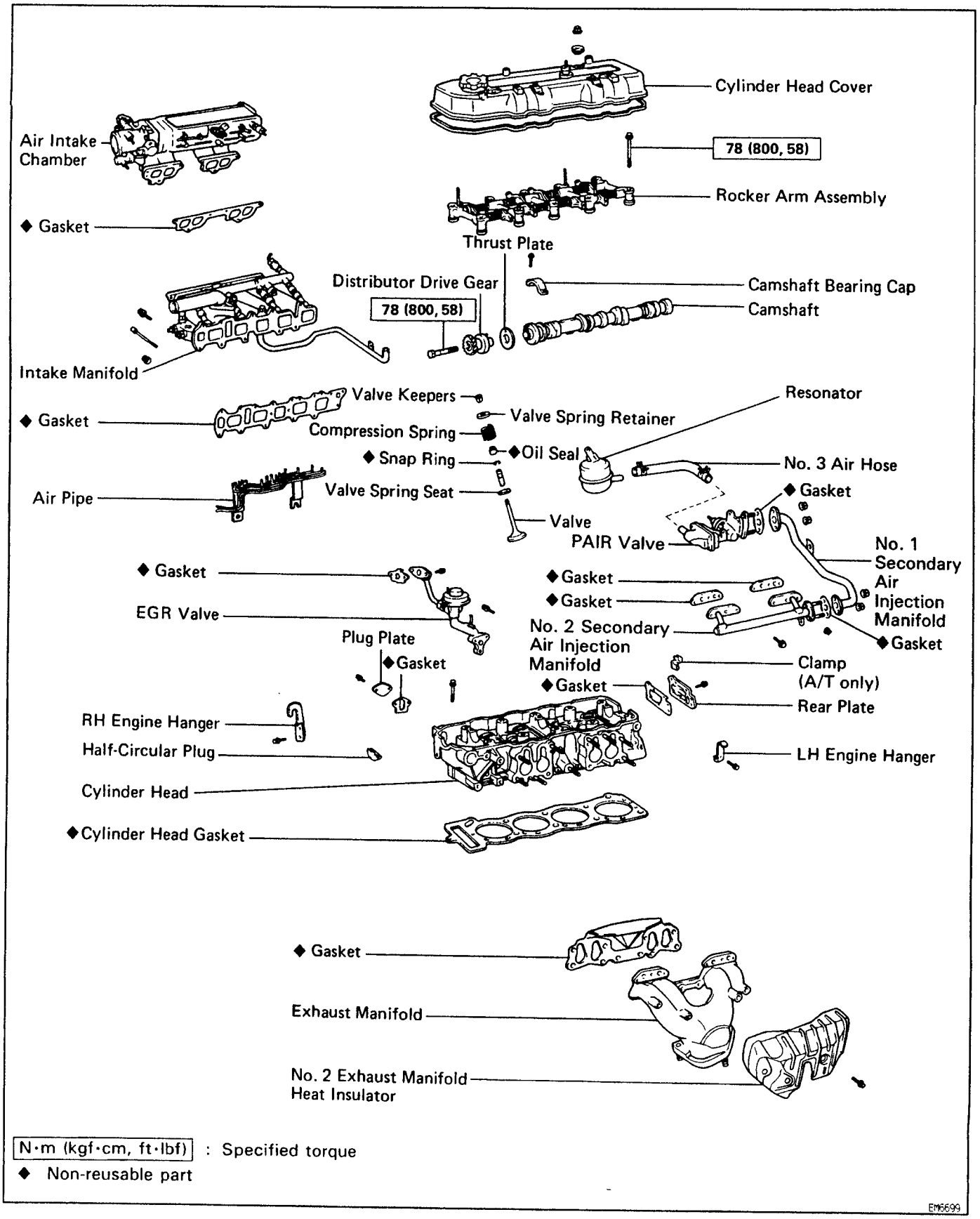
8. INSTALL SPARK PLUGS

Torque: 18N–m (180 kgf–cm, 13ft–lbf)

CYLINDER HEAD

COMPONENTS

EG1VA–01



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

EM6699

EG1VB–01

PREPARATION FOR REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DRAIN COOLANT FROM RADIATOR AND CYLIN–DER BLOCK

(See step 3 on page EG1–225)

3. REMOVE INTAKE AIR CONNECTOR

4. DISCONNECT EXHAUST PIPE FROM EXHAUST MANIFOLD

(a) Remove the exhaust pipe clamp.

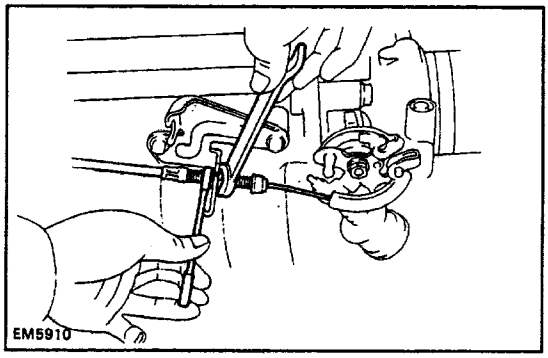
(b) Remove the three nuts, and disconnect the exhaust pipe.

5. REMOVE OIL DIPSTICK

6. REMOVE DISTRIBUTOR AND SPARK PLUGS

7. REMOVE RADIATOR INLET HOSE

8. DISCONNECT HEATER WATER INLET HOSE FROM HEATER WATER INLET PIPE



9. DISCONNECT ACCELERATOR CABLE

10. (A/T)

DISCONNECT THROTTLE CABLE

Disconnect the throttle cable from the bracket and clamp. .

11. DISCONNECT GROUND STRAP FROM ENGINE REAR SIDE

12. DISCONNECT FOLLOWING PARTS:

(a) No.1 and No. 2 PCV hoses

(b) Brake booster hose

(c) (w/PS)

Air control valve hoses

(d) (with A/C)

VSV hoses

(e) EVAP hose

(f) EGR vacuum modulator hose

(g) EGR valve hose

(h) Fuel pressure up hose

(i) PAIR valve hose

(j) Pressure regulator hose

(k) Vacuum hoses from throttle body

(l) No. 2 and No. 3 water by–pass hoses from the thr–ottle body

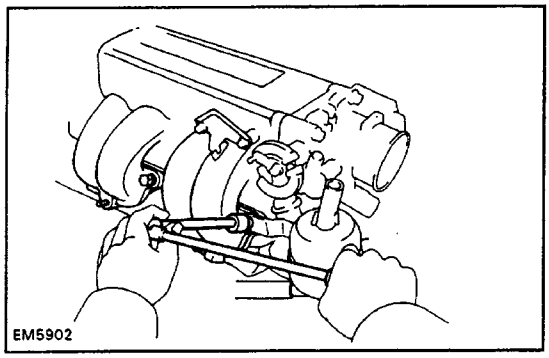
(m) (w/Oil cooler)

Disconnect the No. 1 oil cooler hose from the intake manifold.

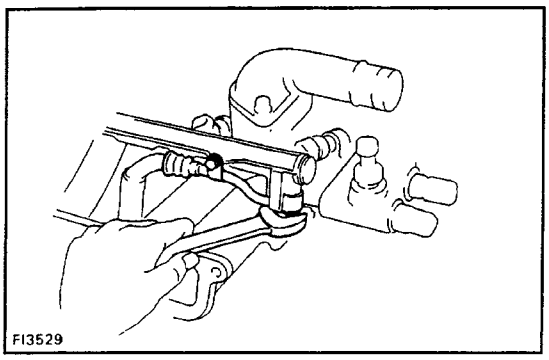
(w/o Oil cooler)

Disconnect the No. 1 water by–pass hose from the intake manifold. ‘

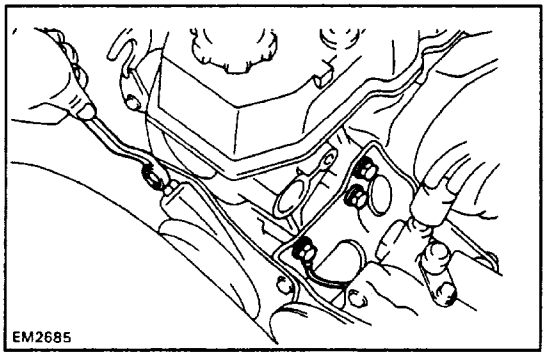
13. REMOVE EGR VACUUM MODULATOR
14. DISCONNECT FOLLOWING WIRES:
(a) Cold start injector wire
(b) Throttle position wire
(c) (California only)
EGR gas temp. sensor wire



15. REMOVE CHAMBER WITH THROTTLE BODY
(a) Remove the union bolt holding the cold start injector pipe to the chamber.
(b) Remove the bolts holding the No. 1 EGR pipe to the chamber.
(c) Remove the bolts holding the manifold stay to the chamber.
(d) Remove the four bolts, two nuts, bond strap and fuel hose clamp.
(e) Remove the chamber with the throttle body, resona–tor and gasket.
16. DISCONNECT FUEL RETURN HOSE
17. DISCONNECT FOLLOWING WIRES:
(a) Knock sensor wire
(b) Oil pressure sender gauge wire
(c) Starter wire (terminal 50)
(d) Transmission wires
(e) (with A/C)
Compressor wires
(f) Injector wires
(g) Engine coolant temp. sender gauge wire
(h) (A/T)
OD temp. switch wire
(i) Igniter wire
(j) VSV wires
(k) Start injector time switch wire
(l) Engine Coolant temp. sensor wire



18. DISCONNECT FUEL HOSE FROM DELIVERY PIPE
Remove the bolt, union bolt and two gaskets.
19. DISCONNECT BY – PASS HOSE FROM INTAKE MANIFOLD
20. (w/PS)
REMOVE PS BELT

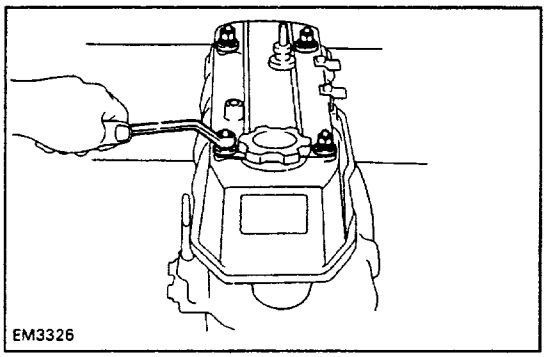


21. (w/PS)
DISCONNECT PS BRACKET FROM CYLINDER HEAD
Remove the four bolts, disconnect the ground strap and bracket.

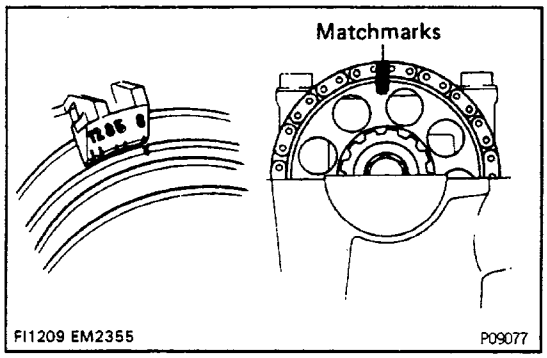
EG1VC–01

CYLINDER HEAD REMOVAL

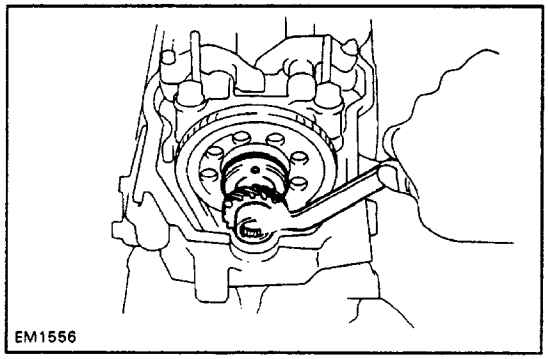
1. REMOVE HEAD COVER
(a) Remove the ground strap from the body.
(b) Remove the four nuts and seals.
(c) Remove the head cover.
NOTICE: Cover the oil return hole in the head with a rag to prevent objects from falling in.



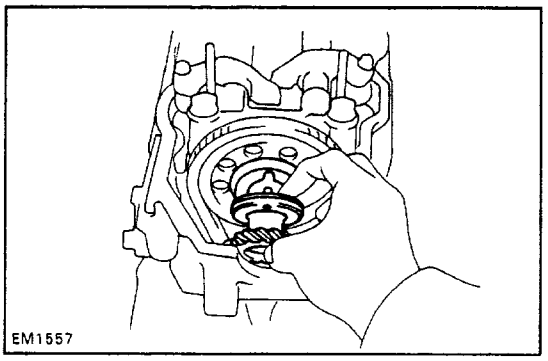
2. REMOVE CAM SPROCKET BOLT
(a) Turn the crankshaft until the No. 1 cylinder position is set at TDC compression.
(b) Place matchmarks on the sprocket and chain.
(c) Remove the half–circular plug.

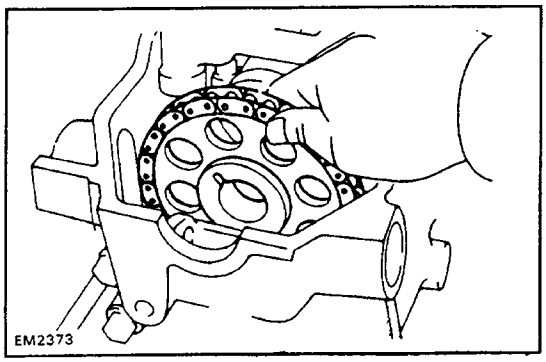


(d) Remove the cam sprocket bolt.



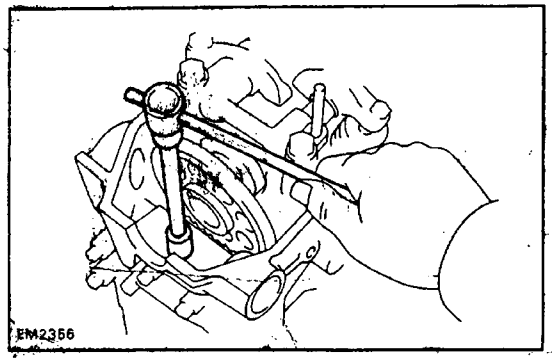
3. REMOVE DISTRIBUTOR DRIVE GEAR AND CAM–SHAFT THRUST PLATE





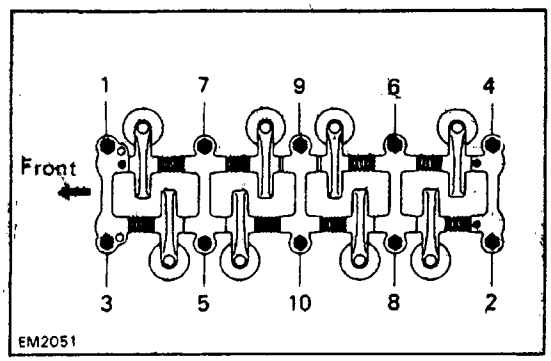
4. REMOVE CAM SPROCKET

Remove the cam sprocket and chain from the cam–shaft and leave on the vibration damper.



5. REMOVE CHARY COVER BOLT

Remove the bolt in.–front of the head before the other head bolts are removed.



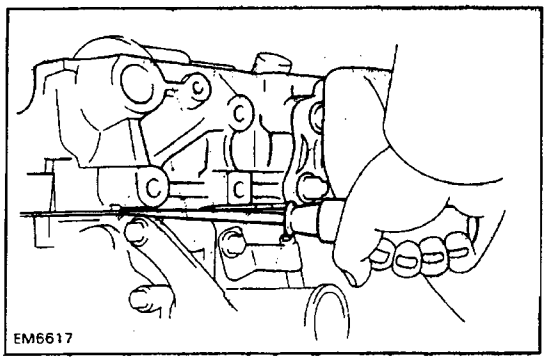
6. REMOVE CYLINDER HEAD BOLTS

Remove the head bolts gradually in two or three passes and in the numerical order shown.

NOTICE: Head warpage or cracking could result from removing bolts incorrect order.

7. REMOVE ROCKER ARM ASSEMBLY

If may be necessary to use a pry bar on the front and rear of the rocker arm assembly to separate it from the head.

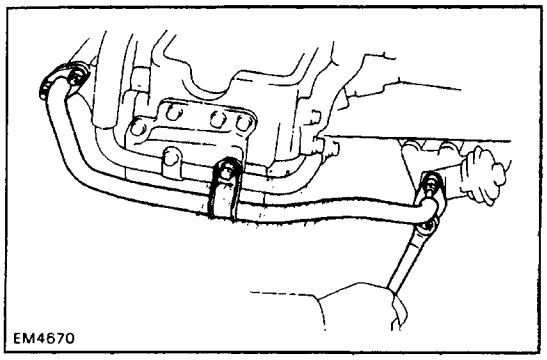


8. REMOVE CYLINDER HEAD

Lift the cylinder head from the dowels on the cylinder block and place the head on wooden blocks on a bench.

HINT: If the cylinder head is difficult to lift off, pry with a screwdriver between the head and block sa–liences.

NOTICE: Be careful not to damage the cylinder head and block surfaces of the cylinder head gasket.



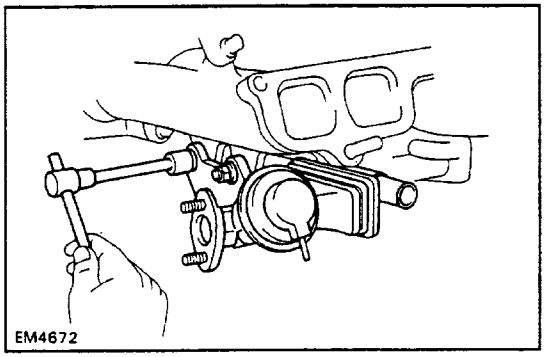
CYLINDER HEAD DISASSEMBLY

EG1VD–01

(See page EG1–15)

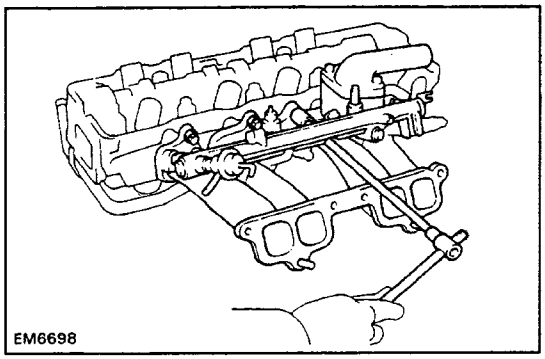
1. REMOVE NO. 1 SECONDARY AIR INJECTION MANIFOLD

Remove the bolt, four nuts, No. 1 secondary air in–jection manifold and two gaskets.

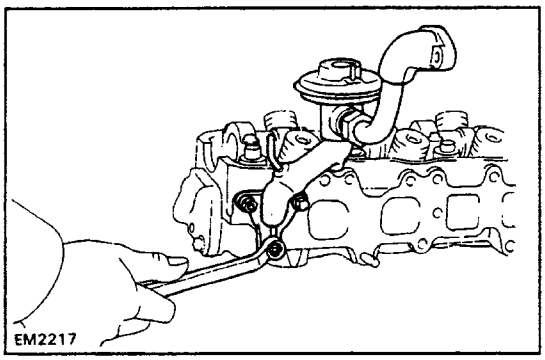


2. REMOVE INTAKE MANIFOLD WITH DELIVERY PIPE AND INJECTORS

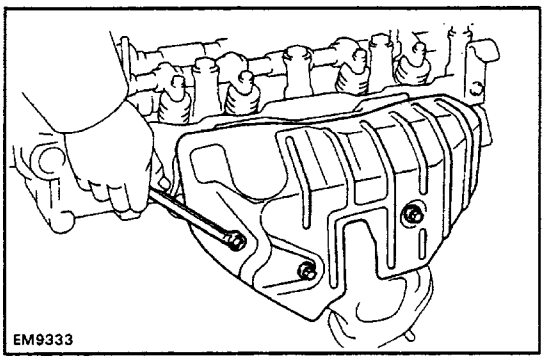
(a) Remove the two nuts and reed valve.



(b) Remove the bolt and the heater inlet pipe from the cylinder head.
(c) Remove the seven bolts, one hexagon bolt, two nuts and No. 1 air pipe.
(d) Remove the intake manifold together with the delivery pipe, injectors and heater water inlet pipe.

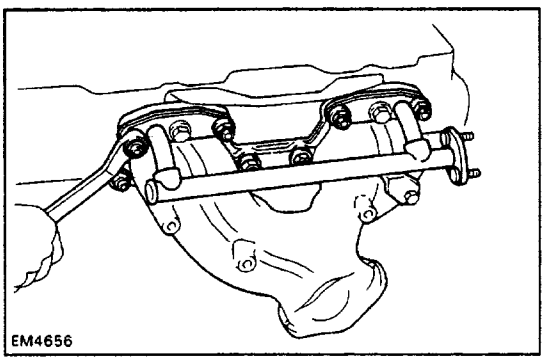


3. REMOVE EGR VALVE



4. REMOVE EXHAUST MANIFOLD WITH NO. 2 SECONDARY AIR INJECTION MANIFOLD

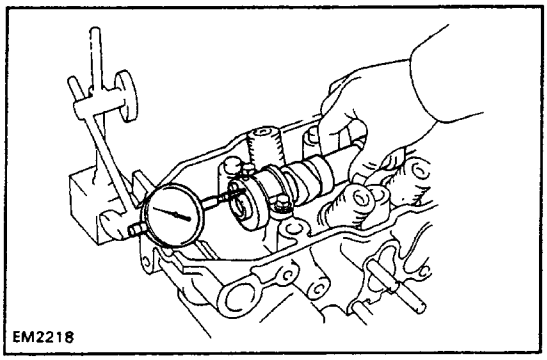
(a) Remove the three bolts and No. 2 exhaust manifold heat insulator.



(b) Remove the eight nuts, exhaust manifold and No. 2 secondary air injection manifold.

5. REMOVE TWO ENGINE HANGERS AND GROUND STRAP

6. REMOVE CYLINDER HEAD REAR OVER



7. MEASURE CAMSHAFT THRUST CLEARANCE

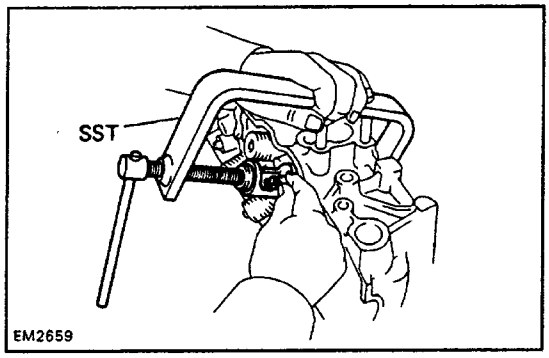
Using a dial gauge, measure the camshaft thrust clearance.

Standard clearance: 0.08 – 0.18 mm (0.0031–0.0071 in.)

Maximum clearance: 0.25 mm (0.0098 in.)

If clearance is greater than maximum, replace the head.

8. REMOVE CAM BEARING CAPS AND SHAFT



9. REMOVE VALVES

(a) Using SST, compress the valve retainer until the two keepers can be removed.

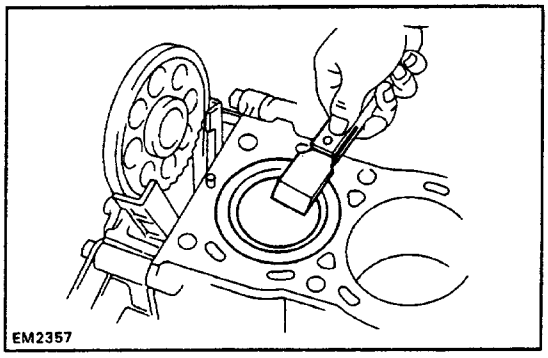
SST 09202–43013

(b) Remove the valve keepers, retainer, spring and valve.

(c) Pry out the oil seal.

(d) Using a small screwdriver or magnet, remove the valve spring seat.

HINT: Keep the valves arranged so they can be ins–talled in the same order as removed.



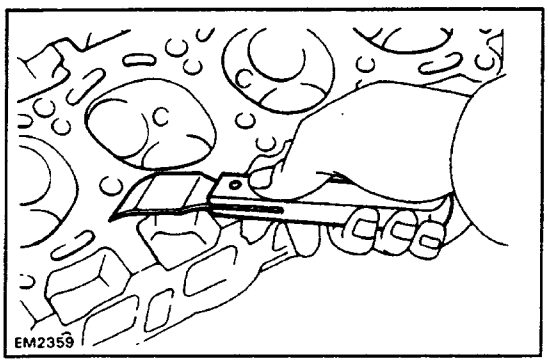
INSPECTION, CLEANING AND REPAIR OF CYLINDER HEAD COMPONENTS

1. CLEAN TOP OF PISTONS AND TOP OF CYLINDER BLOCK

(a) Turn the crankshaft and bring each piston to top dead center. Using a gasket scraper, remove all the carbon from the piston tops.

(b) Using a gasket scraper, remove all gasket material from the top of the block. Blow carbon and oil from the bolt holes.

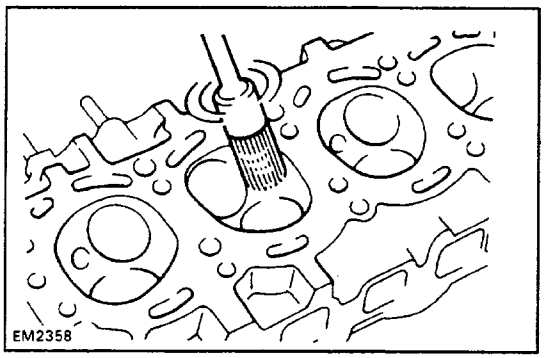
CAUTION: Protect your eyes when using high pressure sir.



2. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all gasket material from the head and manifold surfaces.

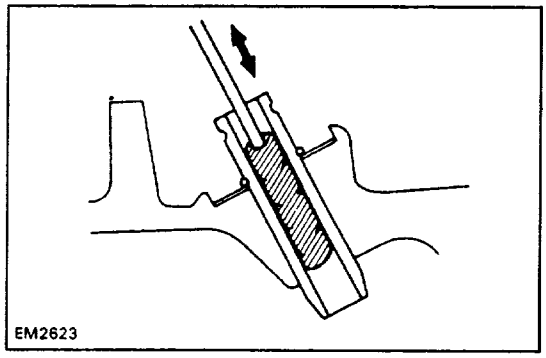
NOTICE: Be careful not to scratch the surfaces.



3. CLEAN COMBUSTION CHAMBERS

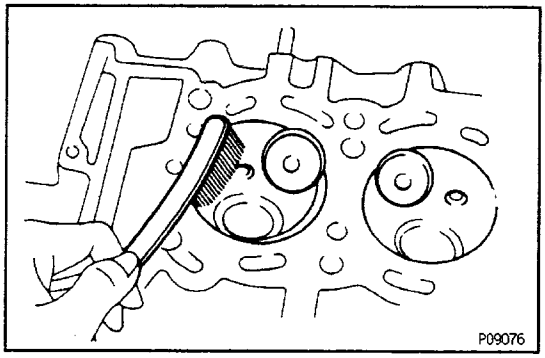
Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE: Be careful not to scratch the head gasket contact surface.



4. CLEAN VALVE GUIDE BUSHINGS

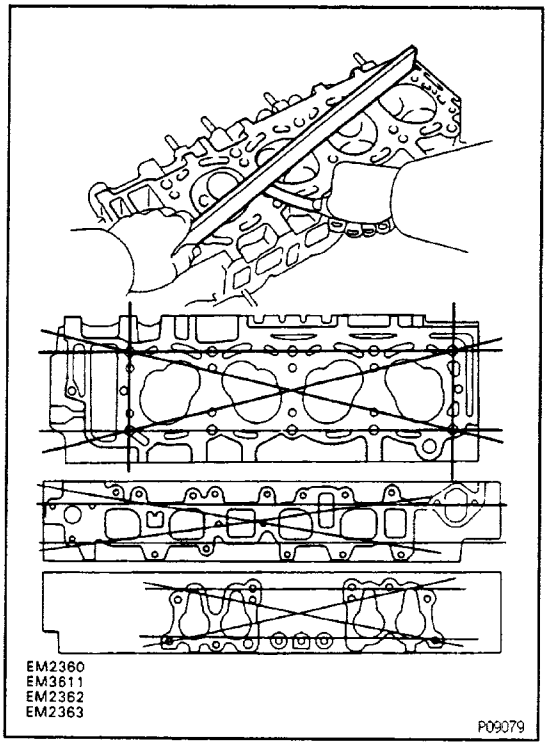
Using a valve guide brush and solvent, clean all the valve guide bushings.



5. CLEAN CYLINDER HEAD

Using a soft brush and solvent, clean the head.

NOTICE: Do not clean the head in a hot tank as this will seriously damage it.



6. INSPECT CYLINDER HEAD FOR FLATNESS

Using a precision straight edge and thickness gauge, measure the surface contacting the cylinder block and manifold for warpage.

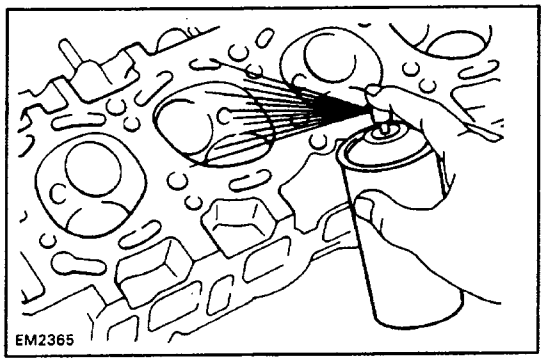
Maximum head surface warpage:

0.15 mm (0.0059 in.)

Maximum manifold surface warpage:

0.20 mm (0.0079 in.)

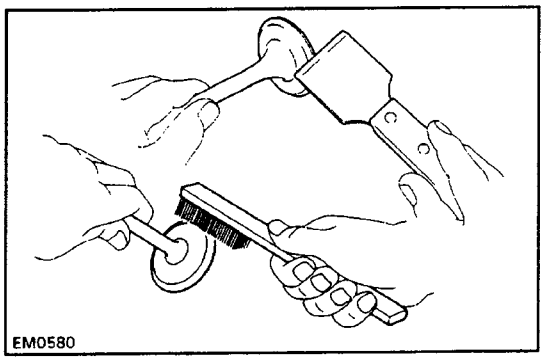
If warpage is greater than maximum, replace the cylinder head.



7. INSPECT CYLINDER HEAD FOR CRACKS

Using a dye penetrant, check the combustion chambers, intake and exhaust ports, head surface and the top of the head for cracks.

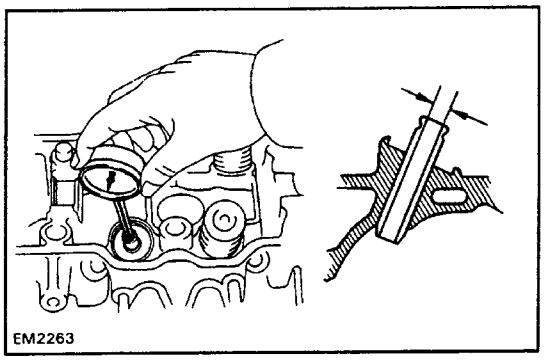
If a crack is found, replace the head.



8. CLEAN VALVES

(a) Using a gasket scraper, chip off any carbon from the valve head.

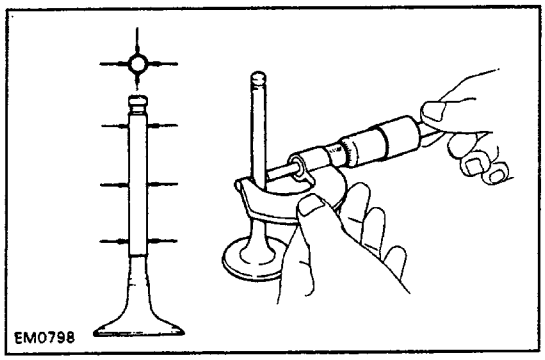
(b) Using a wire brush, thoroughly clean the valve.



9. INSPECT VALVE STEMS AND GUIDE BUSHINGS

(a) Using a caliper gauge, measure the inside diameter of the valve guide bushing.

Standard inside diameter: 8.01 – 8.03 mm
(0.3154 – 0.3161 in.)



(b) Using a micrometer, measure the diameter of the valve stem.

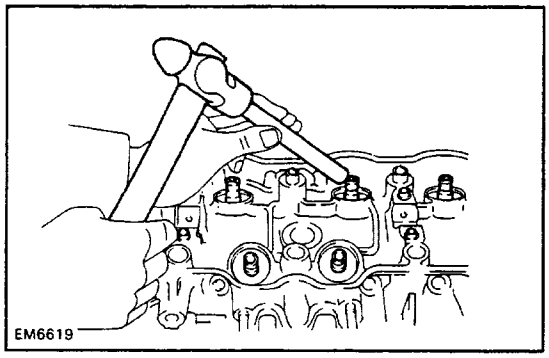
Standard valve stem diameter:
Intake 7.970 – 7.985 mm
(0.3138 – 0.3144 in.)
Exhaust 7.965 – 7.980 mm
(0.3136 – 0.3142 in.)

(c) Subtract the valve stem diameter measurement from the valve guide bushing diameter measurement.

Standard oil clearance:
Intake 0.025 – 0.060 mm
(0.0010 – 0.0024 in.)
Exhaust 0.030 – 0.650 mm
(0.0012 – 0.0026 in.)

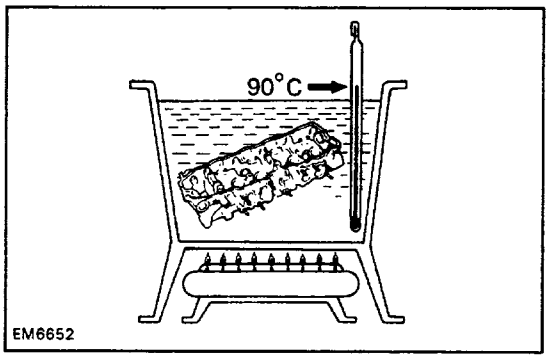
Maximum stem oil clearance:
Intake 0.08 mm (0.0031 in.)
Exhaust 0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the valve and guide bushing.

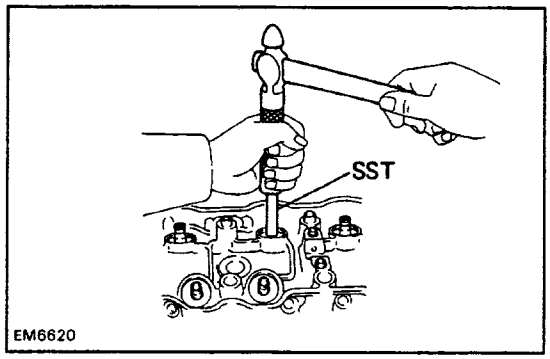


10. IF NECESSARY, REPLACE VALVE GUIDE BUSH–INGS

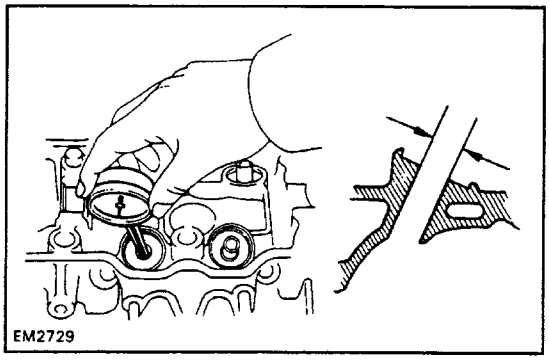
(a) Using a brass bar and hammer, break the valve –guide bushing.



(b) Gradually heat the cylinder head to approx. 90•C (194•F).



(c) Using SST and a hammer, drive out valve guide bus–hing.
SST 09201–60011

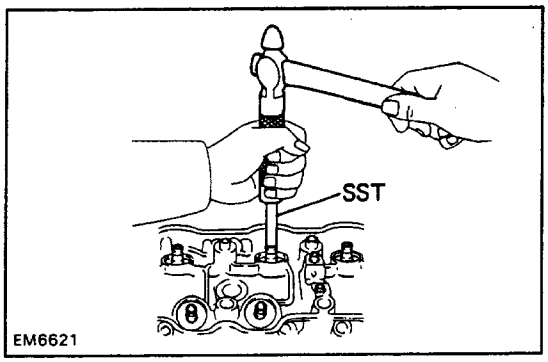


(d) Using a caliper gauge, measure the valve guide bus–hing bore of the cylinder head.

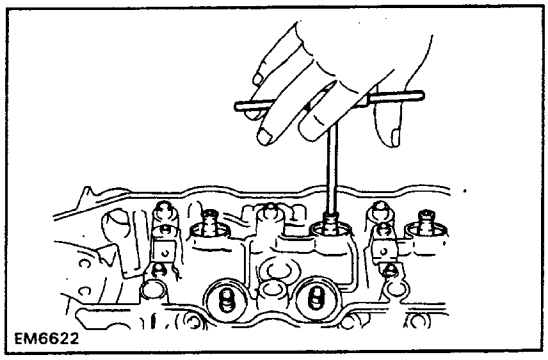
Bore intake and exhaust

Bushing bore mm (in.)	Bushing size
13.000 – 13.018 (0.5118 – 0.5125)	Use STD
Over 13.018 (0.5125)	Use O/S 0.05

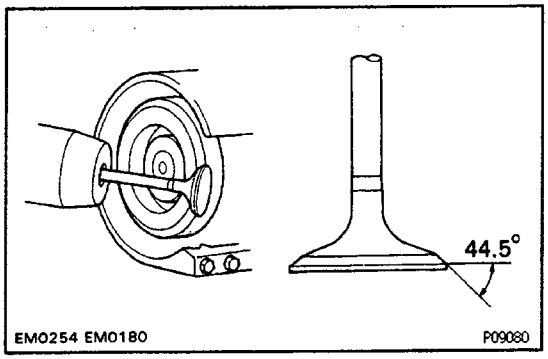
(e) Select a new valve guide bushing.
If the valve guide bushing bore of the cylinder head is more than 13.018 mm (0.512 in.), machine the bore to the following dimension.
Rebored valve guide bushing bore dimension (cold):
13.050 – 13.068 mm (0.5138 – 0.5145 in.)



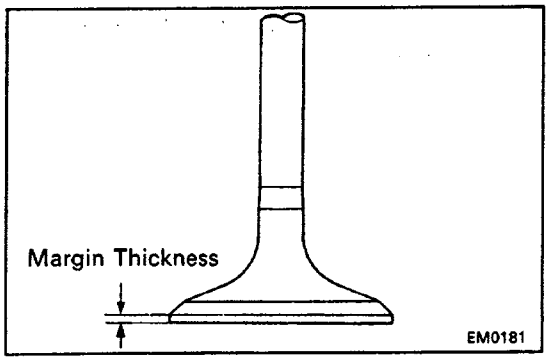
(f) Gradually heat the cylinder head to approx. 90•C (194• F).
(g) Using SST a and hammer, drive in a new valve guide bushing unit the snap ring makes contact with the cylinder head.
SST 09201–6001 1



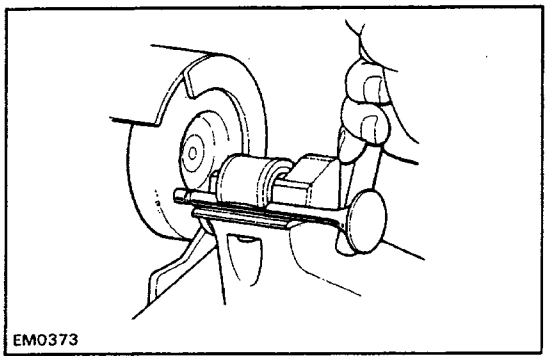
(h) Using a sharp 8 mm (0.31 mm) reamer, ream the valve guide bushing to obtain standard specified clearance (See page EG1–23) between the valve guide bushing and new valve.



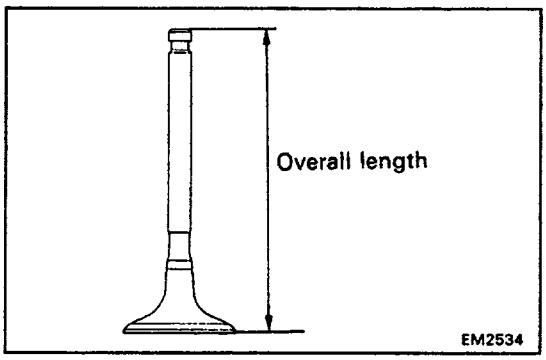
11. INSPECT AND GRIND VALVES
(a) Grind the valve only enough to remove pits and carbon.
(b) Check that valve is ground to the correct valve face angle.
Valve face angle: 44.5•



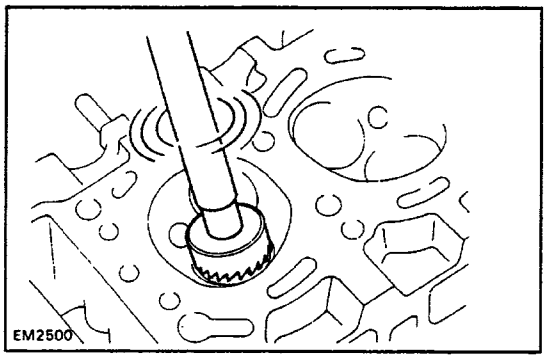
(c) Check the valve head margin thickness.
Standard margin thickness: 1.0 mm (0.039 in.)
Minimum margin thickness: 0.6 mm (0.024 in.)
If the valve head margin thickness is less than mini–mum, replace the valve.



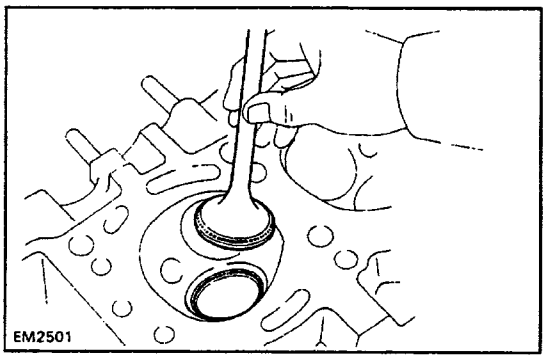
(d) Check the surface of the valve stem tip for wear.
If the valve stem tip is worn, regrind it with grinder or replace the valve if necessary.
NOTICE: Do not grind off more than minimum overall length.
Minimum overall length:
Intake 113.0 mm (4.449 in.)
Exhaust 111.9 mm (4.406 in.)



(e) Check the valve overall length.
Standard overall length:
Intake 113.5 mm (4.468 in.)
Exhaust 112.4 mm (4.425 in.)
Minimum overall length:
Intake 113.0 mm (4.449 in.)
Exhaust 111.9 mm (4.406 in.)
If the valve overall length is less than minimum, re–place the valve.

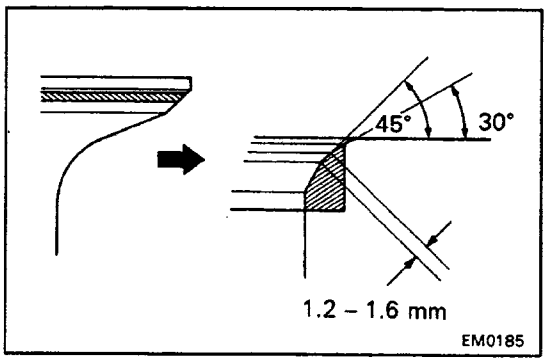


12. INSPECT AND CLEAN VALVE SEATS
(a) Using a 45• carbide cutter, resurface the valve seats. Remove only enough metal to clean the seats.

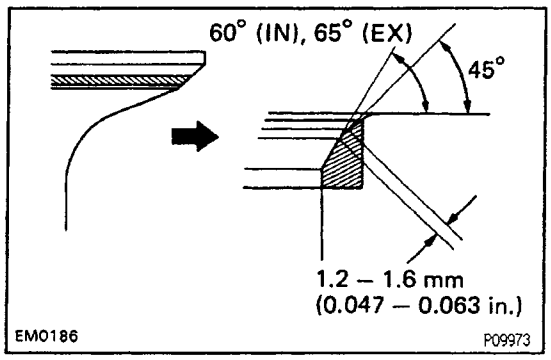


(b) Check the valve seating position.
Apply a light coat of prussian blue (or white lead) to the valve face. Install the valve. Lightly press the valve against the seat. Do not rotate the valve.
(c) Check the valve face and seat for the following:
- If blue appears 360• around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360• around the valve seat, the guide and seat are concentric. If not, resurface the seat.
- Check that the seat contact is on the middle of the valve face with the following width:

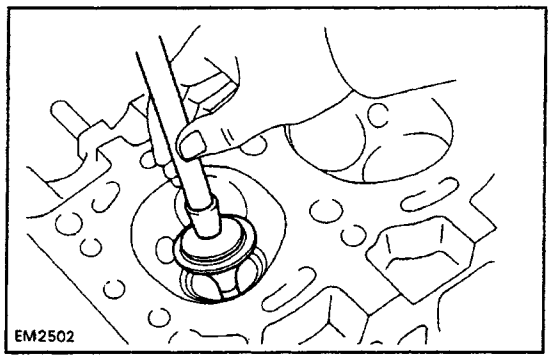
1.2 – 1.6 mm (0.047 – 0.063 in.)
If not, correct the valve seat as follows:



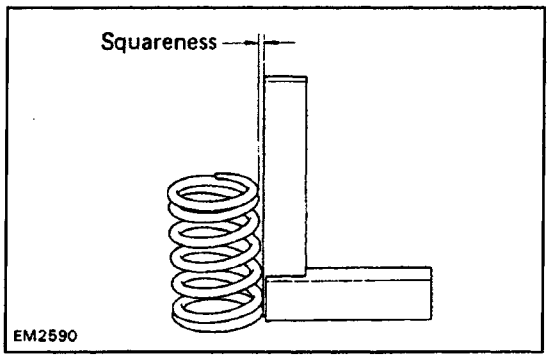
- If seating is too high on the valve face, use 30• and 45• cutters to correct the seat.



- If seating is too low on the valve face, use 60• (IN) or 65• (EX) and 45• cutters to correct the seat.



(d) Hand–lap the valve and valve seat with abrasive compound.

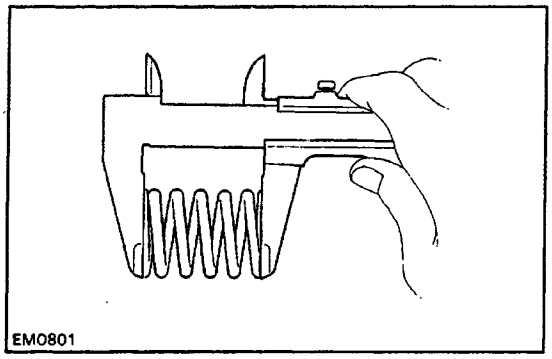


13. INSPECT VALVE SPRINGS

(a) Using a steel square, measure the squareness of the valve spring.

Maximum squareness: 1.6 mm. (0.063 in.)

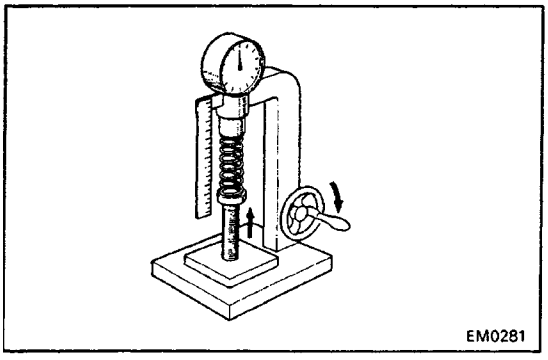
If squareness is greater than maximum, replace the valve spring.



(b) Using vernier calipers, measure the free length of the valve spring.

Free length: 48.5 mm (1.909 in.)

If the free length is not within specification, replace the valve spring.



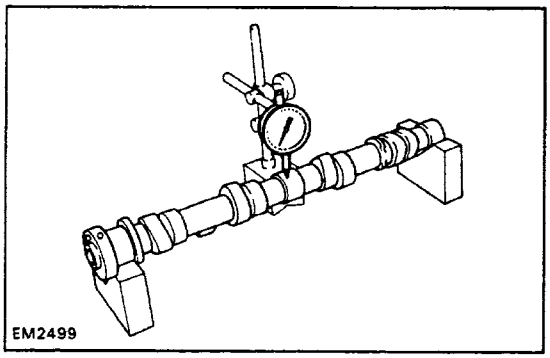
(c) Using a spring tester, check the tension of each spring at the specified installed height.

Installed height: 40.5 mm (1.594 in.)

Standard installed tension: 294 N (30.0 kgf, 66.1 lbf)

Minimum installed tension: 279 N (28.5 kgf, 62.8 lbf)

If the installed tension is less than minimum, replace the spring.

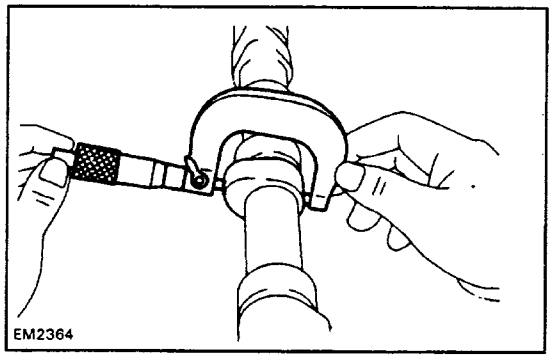


14. INSPECT CAMSHAFT AND BEARING CAPS

(a) Place the cam shaft on V – blocks and , using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.2 mm (0.008 in.)

If the circle runout is greater than maximum, replace the camshaft.



(b) Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

Intake 42.63 – 42.72 mm (1.6783 – 1.6818 in.)

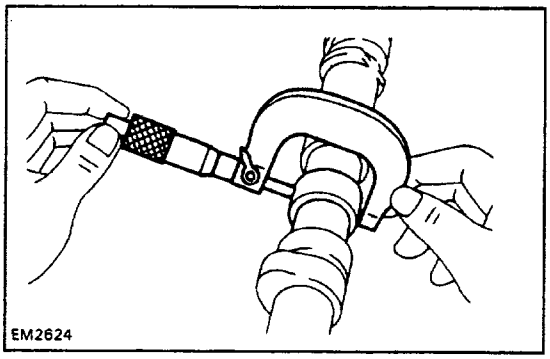
Exhaust 42.69 – 42.78 mm (1.6807 – 1.6842 in.)

Maximum cam lobe height:

Intake 42.25 mm (1.6634 in.)

Exhaust 42.30 mm (1.6654 in.)

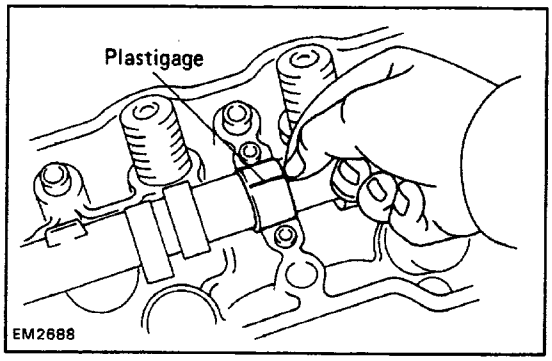
If the lobe height is less than ,minimum, replace the camshaft.



(c) Using a micrometer, measure the journal diameter.

Standard diameter: 32.98 – 33.00 mm (1.2984 – 1.2992 in.)

If the journal diameter is less than specified, replace the camshaft.

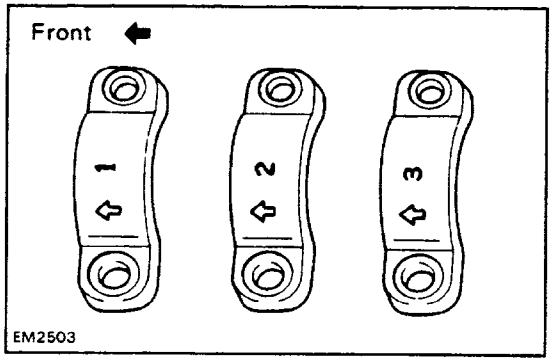


15. INSPECT CAMSHAFT OIL CLEARANCE

(a) Clean the bearing caps and camshaft journal.

(b) Place the camshaft in the cylinder head.

(c) Lay a strip of Plastigage across each journal.

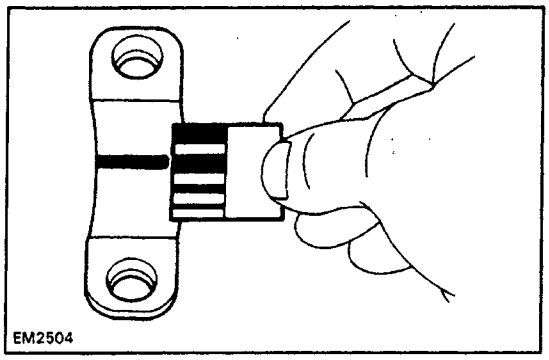


(d) Install the correct numbered bearing cap on each journal with the arrows pointing toward the front.

Torque each bolt.

Torque: 20 N–m (200kgf.–cm, 14ft–lbf)

HINT: Do not turn the camshaft while the Plastigags is in place.



(e) Remove the caps and measure the Piastigage at its widest point.

Standard clearance: 0.01 – 0.05 mm (0.0004 – 0.0020 in.)

Maximum clearance: 0.1 mm (0.004 in.)

!f clearance is greater than maximum, replace the cylinder head and/or camshaft.

(f) Clean out the pieces of Plastigage from the bearing and journal.

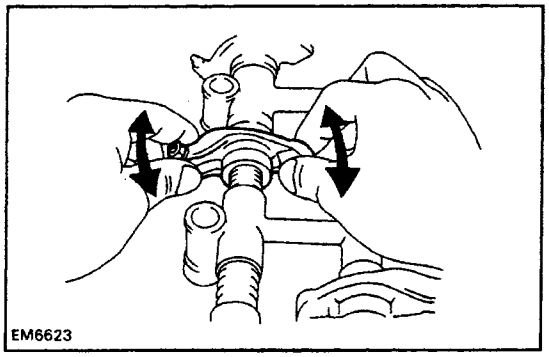
16. INSPECT ROCKER ARMS

Check the clearance between the rocker arms and shaft by moving the rocker arms as shown. Little or no movement should be felt.

If movement is felt, disassemble the rocker arm assembly and measure the oil clearance as follows:

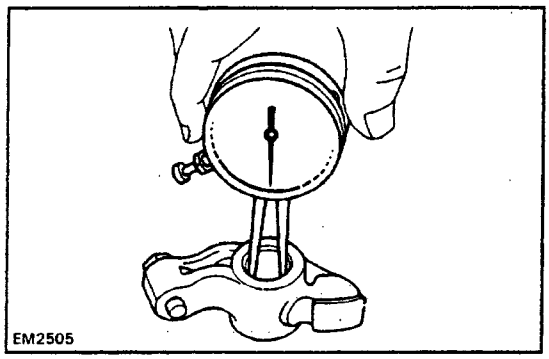
(a) Disassemble rocker arm assembly.

- Remove the three screws.
- Slide the rocker stands, spring and rocker arms off the shafts.



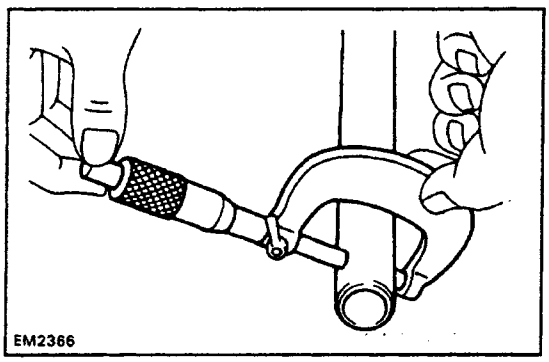
(b) Using a dial indicator or telescoping gauge, measure the inside diameter of the rocker arm.

Standard inside diameter: 16.000 – 16.018 mm. (0.6299 – 0.6306 in.)



(c) Using a micrometer, measure the outside diameter of the shaft.

Standard diameter: 15.97 –15.99 mm (0.6287 – 0.6295 in.)



(d) Subtract the shaft diameter measurement from the rocker arm diameter measurement.

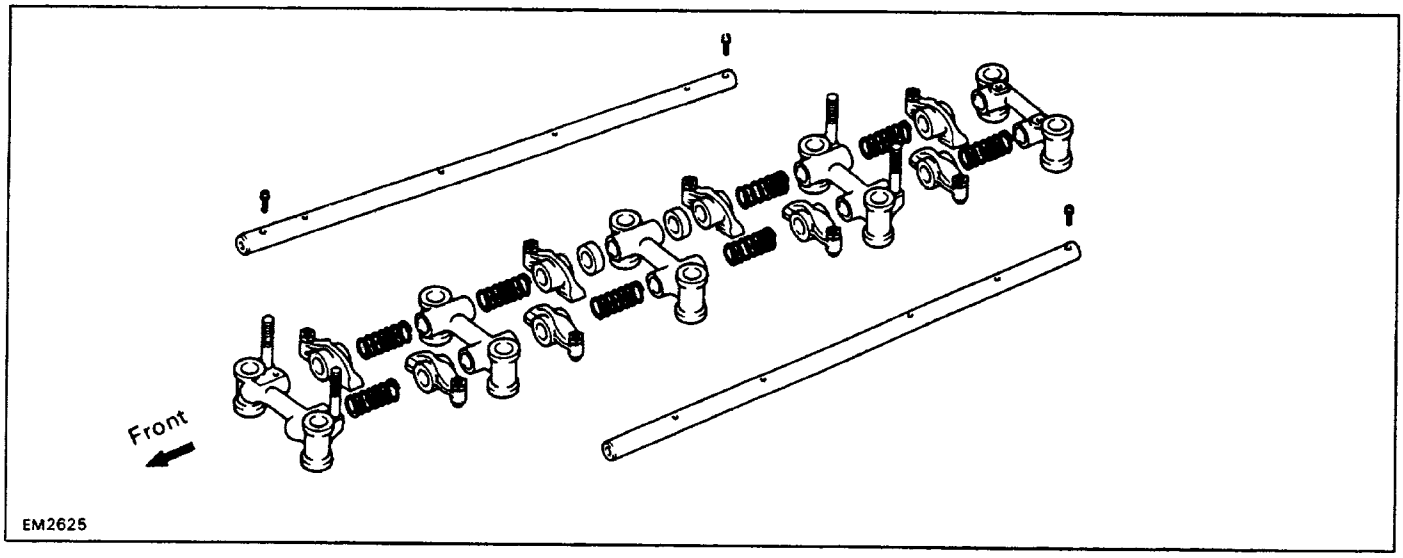
Standard oil clearance: 0.01 – 0.05 mm (0.0004 – 0.0020 in.)

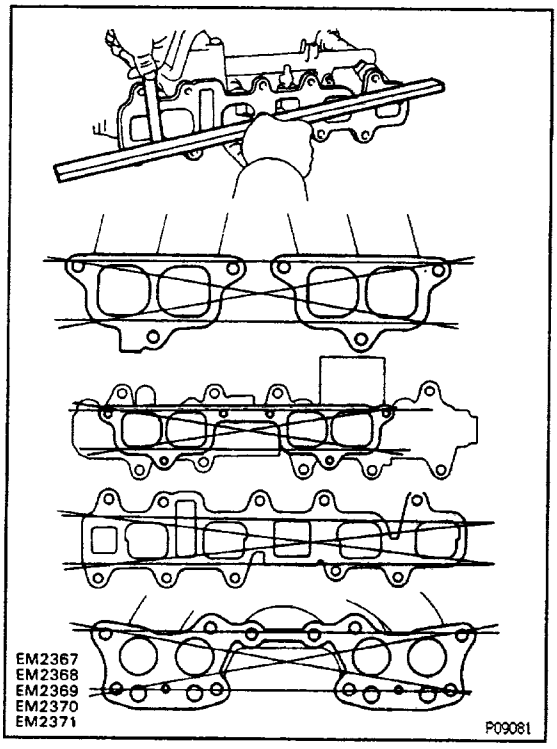
Maximum oil clearance: 0.08 mm (0.0031 in.)

If the oil clearance is grater than maximum, replace the rocker arm and/or shaft.

(e) Assemble the rocker arm assembly as shown, and install the three screws.

HINT: All rocker arms are the same but all rocker stands are different and must be assembled in the correct order.





17. INSPECT INTAKE, EXHAUST MANIFOLDS AND AIR INTAKE CHAMBER

Using a precision straight edge and thickness gauge, check the surface contacting the cylinder head or intake manifold for warpage.

Maximum intake warpage: 0.2 mm (0.008 in.)
Maximum exhaust warpage: 0.7 mm (0.28 in.)
Maximum air intake chamber warpage: 0.2 mm (0.008 in.)

If warpage is greater than maximum, replace the manifold and/or air intake chamber.

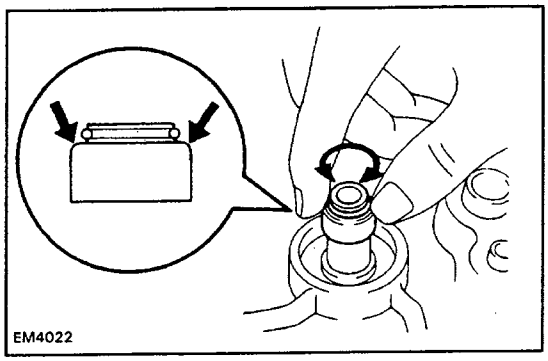
CYLINDER HEAD ASSEMBLY

EG1VF–02

(See page EG1–15)

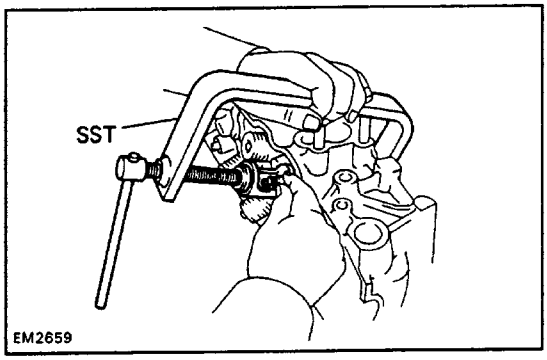
HINT:

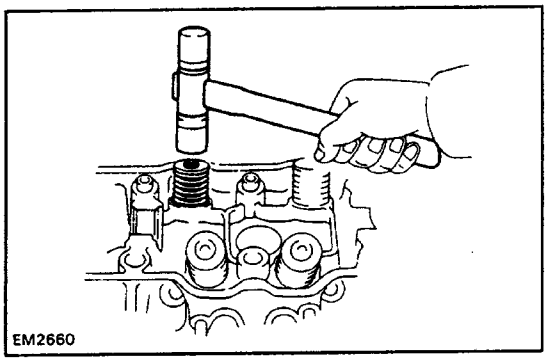
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new parts.



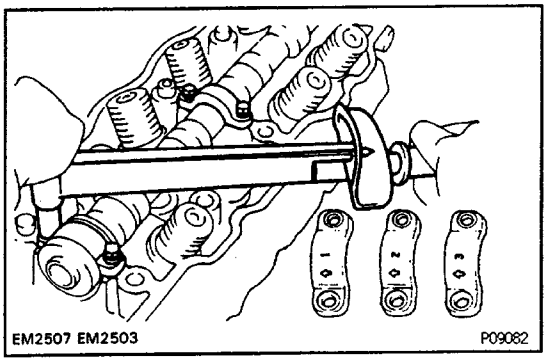
1. INSTALL VALVES

(a) Install a new oil seal on the valve guide bushing.
HINT Pushing down at the place shown in the illus–tration.
(b) Rotate the oil seal to check that it is firmly installed.
(c) Lubricate and insert valve in the valve guide bushing.
Check that valves are installed in the correct order.
(d) Install spring seat, spring and spring retainer on the cylinder head.
(e) Using SST, compress valve retainer and place two keepers around the valve stem.
SST 09202–43013



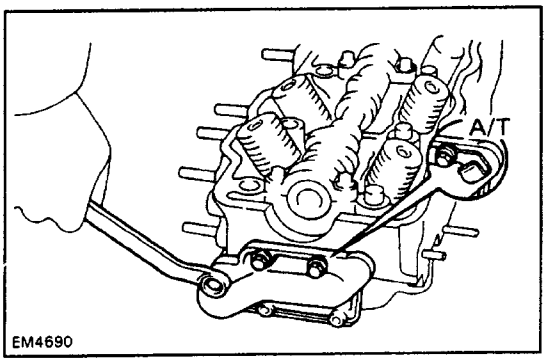


(f) Tap the stem lightly to assure proper fit.



2. INSTALL CAMSHAFT

(a) Place the camshaft in the cylinder head and install the bearing caps in numbered order from the front with arrows pointed toward the front.
(b) Install and torque the cap bolts.
Torque: 20N–m (200kgf–cm, 14ft–lbf)
(c) Turn the camshaft to position the dowel at the top.

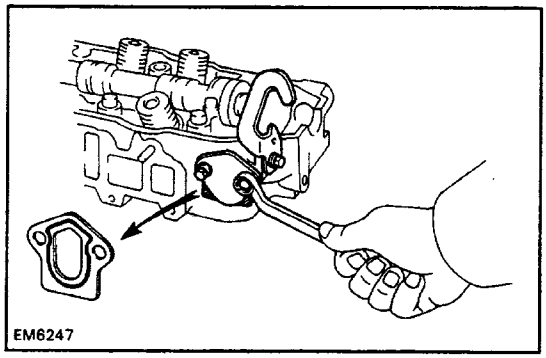


3. INSTALL CYLINDER HEAD REAR COVER

Install a new gasket, cylinder head rear cover and throttle cable clamp (for A/T) with the four bolts.

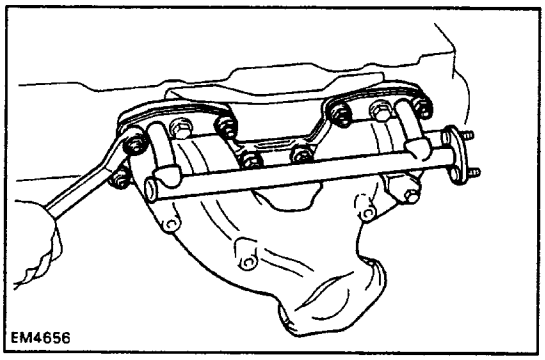
4. INSTALL LH ENGINE HANGER AND GROUND STRAP

5. INSTALL RH ENGINE HANGER



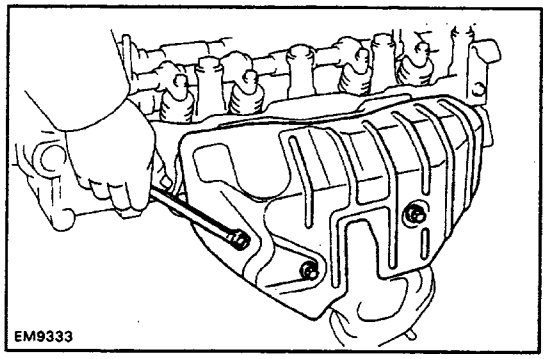
6. INSTALL PLUG PATE

Install a new gasket and plug plate with the two bolts.
HINT: Attach the flat side of the gasket to the cylinder head.

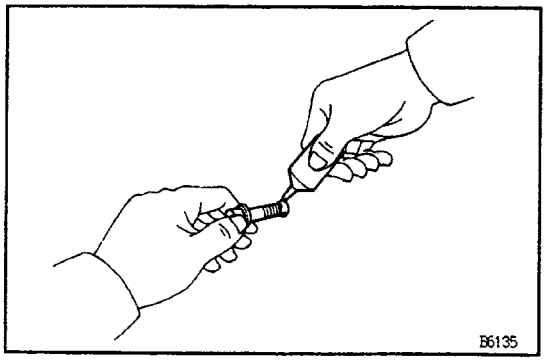


7. INSTALL EXHAUST MANIFOLD

(a) Position a new gasket on the cylinder head.
(b) Install the exhaust manifold with the eight nuts.
Torque the nuts.
Torque: 44N–m (450kgf–cm, 33ft–lbf)



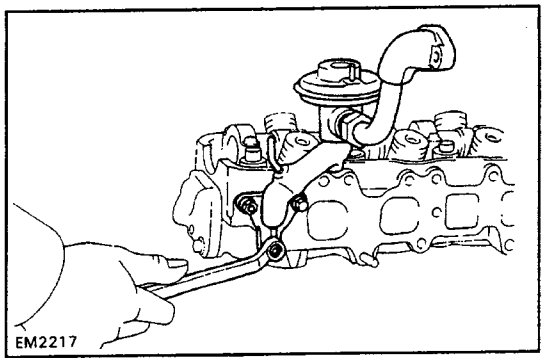
(c) Install the No. 2 exhaust manifold heat insulator with the three bolts.
Torque: 19N–m (195kgf–cm, 14ft.–lbf)



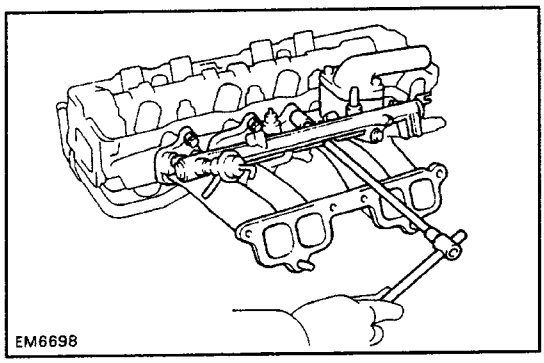
8. INSTALL EGR VALVE

(a) Clean the set bolt (closest to the front) threads and cylinder head bolt holes of any sealer, oil or foreign particles.
Remove any oil with kerosene or gasoline.
(b) Apply sealant to 2 or 3 threads of the bolt end.
Sealant: Part No. 08833–00070, THREE BOND 1324 or equivalent

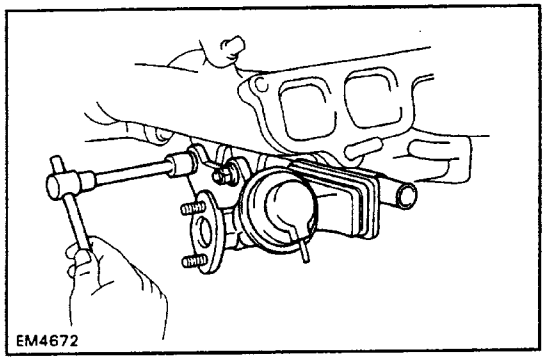
- This adhesive will not harden while exposed to air. It will act as a sealer or binding agent only when applied to threads, etc. and air is cut off.



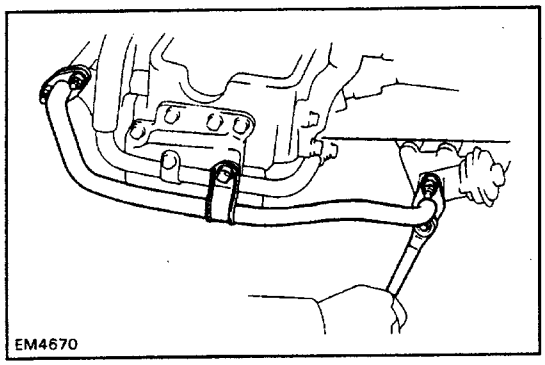
(c) Install the EGR valve with the two bolts and nut.



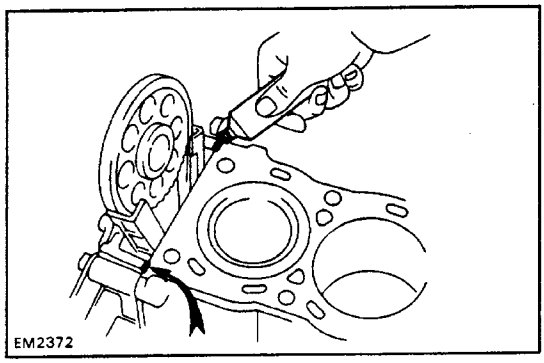
9. INSTALL INTAKE MANIFOLD
(a) Position a new gasket on the cylinder head.
(b) Install the intake manifold with the delivery pipe and injectors and No. 1 air pipe.
(c) Install the seven bolts, one hexagon bolt and two nuts. Torque the bolts and nuts.
Torque: 19Nm (195kgf–cm, 14ft–lbf)
(d) Install the heater inlet pipe to the cylinder head with the bolt.



(e) Install the PAIR valve with the two nuts.
Torque: 13N–m (130kgf–cm, 9 ft–lbf)



10. INSTALL NO. 1 SECONDARY AIR INJECTION MANIFOLD
(a) Position new gaskets on the PAIR valve and No. 1 secondary air injection pipe.
(b) Install the No. 1 secondary air injection pipe with the four nuts and bolt.
Torque: 13Nm (130kgf–cm. 9ft–lbf)



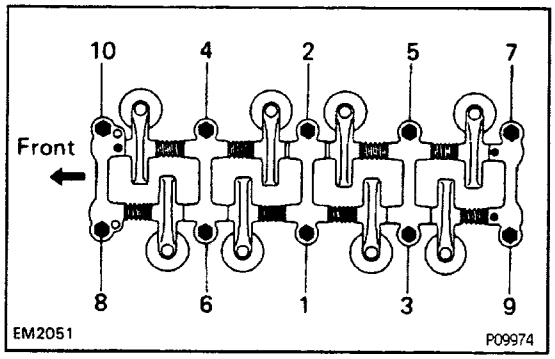
EG1VG–02

CYLINDER HEAD INSTALLATION

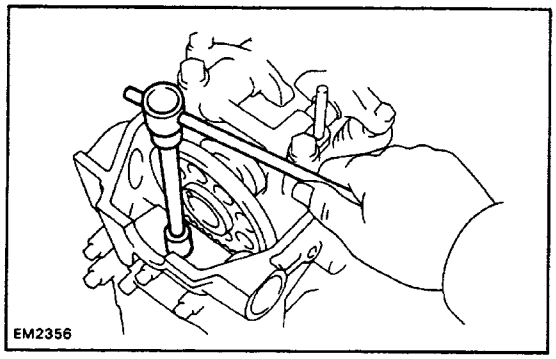
(See page EG1–15)

1. APPLY SEAL PACKING TO CYLINDER BLOCK
(a) Apply seal packing to two locations as shown.
Seal packing: Part No. 08826–00080 or equivalent
(b) Place a new head gasket over dowels on the cylinder block.
2. INSTALL CYLINDER HEAD

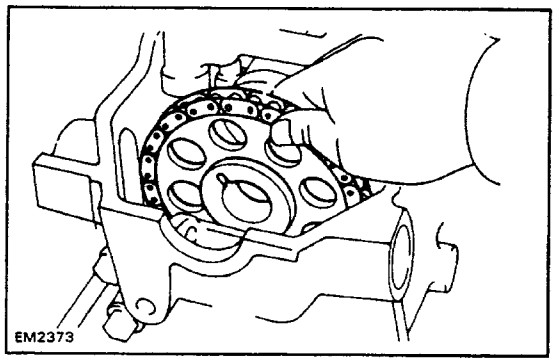
(a) If the sprocket was removed, align the alignment marks placed on the sprocket and chain during re–moval.
(b) position the cylinder head over dowels on the block.



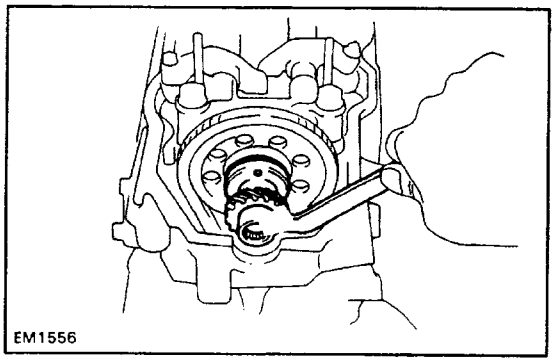
3. INSTALL ROCKER ARM ASSEMBLY
(a) Place the rocker arm assembly over the dowels on the cylinder head.
(b) Install and tighten the head bolts gradually in three passes in the sequence shown. Torque the bolts on the final pass.
Torque: 78N–m (800kgf–cm, 58ft–lbf)



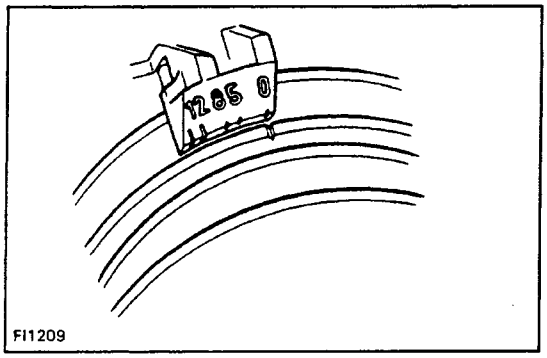
4. INSTALL CHAIN COVER BOLT
Torque the bolt.
Torque: 13N–m (130kgf–cm, 9ft–lbf)



(a) While holding up on the sprocket and chain, turn the crankshaft until the No. 1 and No. 4 cylinders are at top dead center.
(b) Place the chain sprocket over the camshaft dowel.
HINT: If the chain does not seem long enough,turn the crankshaft back and forth while pulling up on the chain and sprocket.



5. INSTALL DISTRIBUTOR DRIVE GEAR AND CAM–SHAFT THRUST PLATE
Place the distributor drive gear and camshaft thrust plate over the chain sprocket. Torque the bolt.
Torque: 78N–m (800kgf–cm, 58ft–lbf)



6. ADJUST VALVE CLEARANCE

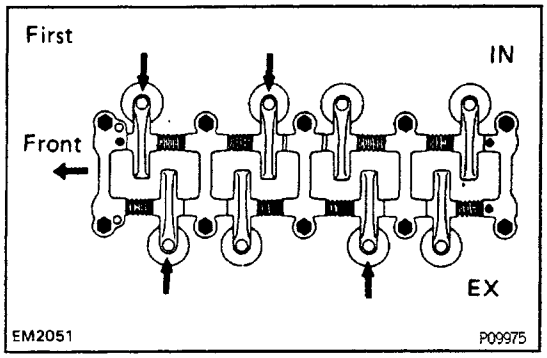
(a) Set the No. 1 cylinder to TDC/compression.

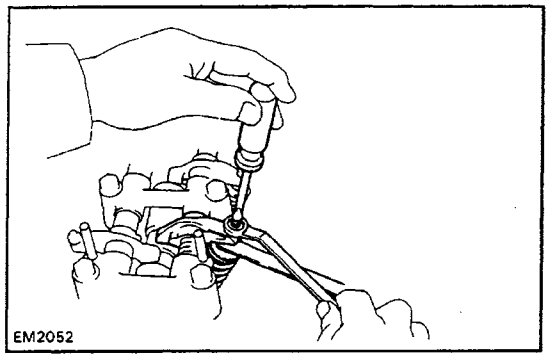
- Turn the crankshaft with a wrench to align the timing, marks at TDC. Set the groove on the pulley at the ”0” mark position of the chain cover.
- Check that the rocker arms on the No. 1 cylinder are loose and the rocker arms on No. 4 cylinder are tight.
  If not, turn the crankshaft one complete revolution and align the marks as above.

(b) Adjust the clearance of half of the valves.
Adjust only the valves indicated by arrows as shown.

Valve clearance (Cold):
Intake 0.20 mm (0.008 in.)
Exhaust 0.30 mm (0.012 in.)

HINT: After installing the cylinder head, warm up the engine and adjust the valve clearance.

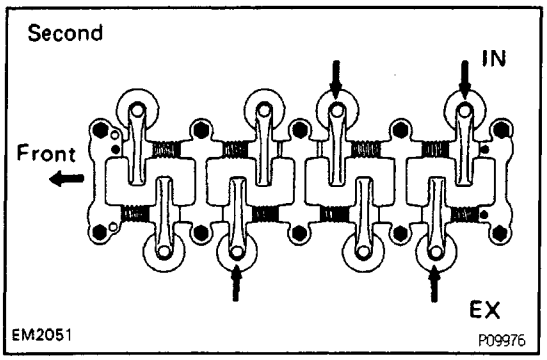




Use a thickness gauge to measure between the valve stern and rocker arm. Loosen the lock nut and turn the adjusting screw to set the proper clearance. Hold the adjusting screw in position and tighten the lock nut.

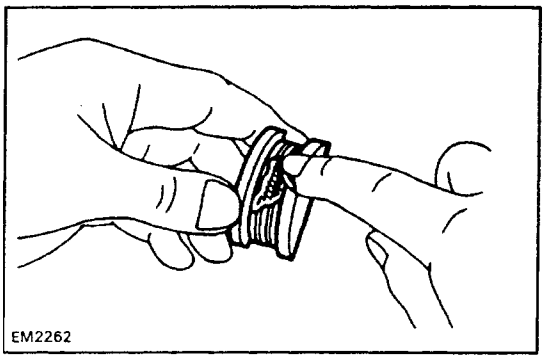
Torque: 25N–m (250kgf–cm, 18ft–lbf)

Recheck the clearance. The thickness gauge should move. with a very slight drag.



(c) Turn the crankshaft one revolution and adjust the other valves.

(d) Set the No. 1 cylinder to TDC/compression.

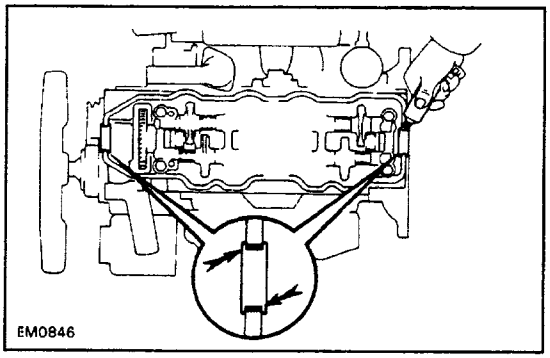


7. INSTALL HALF–CIRCULAR PLUGS

(a) Apply seal packing to the cylinder head installation surface of the plug.

Seal packing: Part No. 08826–00080 or equivalent

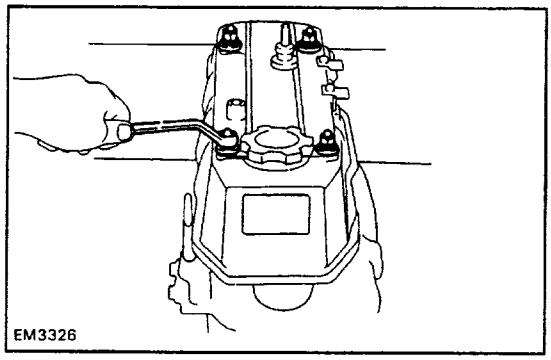
(b) Install the half–circular plugs to the cylinder head.



8. INSTALL HEAD COVER

(a) Apply seal packing to the four locations shown.

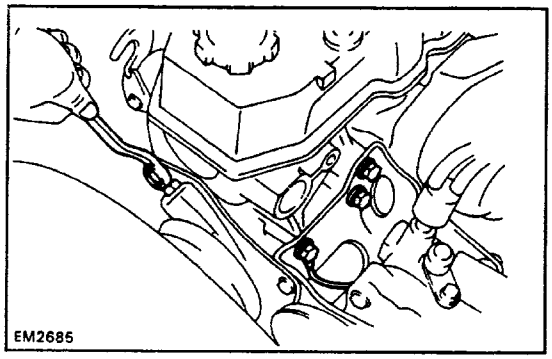
Seal packing: Part No. 08826–00080 or equivalent



(b) Install the gasket to the cylinder head.

(c) Place the head cover on the cylinder head and install the four seals and nuts.

Torque: 5.9N–m (60kgf–cm, 52in.–lbf)



EG1VH–02

POST INSTALLATION

1. (w/PS)

CONNECT PS BRACKET TO CYLINDER HEAD

Install the four bolts and bond strap. Torque the bolts.

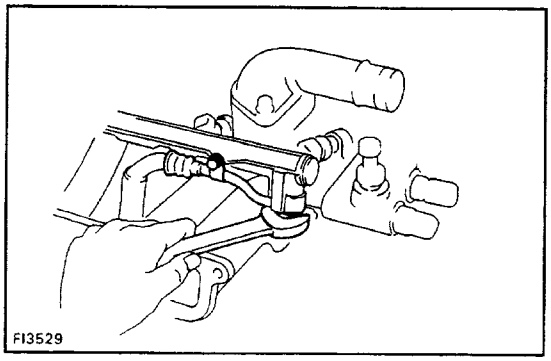
Torque: 44N–m (450kgf–cm, 33ft–lbf)

2. (w/PS)

INSTALL DRIVE BELT AND ADJUST BELT TEN–SION

(See step 2 on page MA–6)

3. CONNECT BY–PASS HOSE TO INTAKE MANIFOLD



4. CONNECT FUEL HOSE TO DELIVERY PIPE

Install new gaskets and the fuel hose with union bolt.

Torque: 44N–m (450kgf–cm, 33ft–lbf)

5. CONNECT FOLLOWING WIRES:

(a) Engine coolant temp. sensor wire

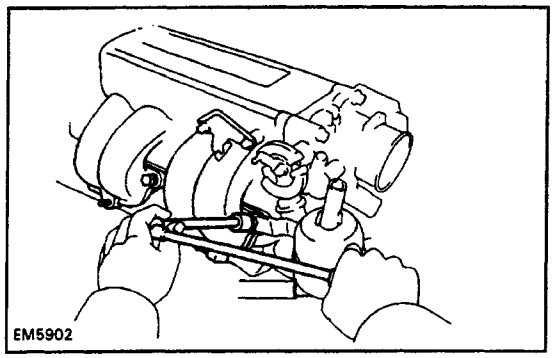
(b) Cold start injector time switch wire

(c) VSV wires

(d) Igniter wire

(e) (A/T)
OD temp. switch wire
(f) Engine coolant temp. sender gauge wire
(g) Injector wires
(h) (with A/C)
Compressor wires
(i) Transmission wires
(j) Starter wire (terminal 50)
(k) Oil pressure sender gauge wire
(l) Knock sensor wire

6. CONNECT FUEL RETURN HOSE



7. INSTALL CHAMBER WITH THROTTLE BODY

(a) Position new gaskets on the intake manifold and No. 1 EGR pipe.
(b)– Install the chamber, throttle body, fuel hose clamp, resonator and bond strap with the four bolts and two nuts.
(c) Connect the chamber and stay with a bolt.
(d) Install the bolts holding the EGR valve to the chamber.
(e) Install the new gaskets and cold start injector pipe.

8. CONNECT FOLLOWING WIRES:

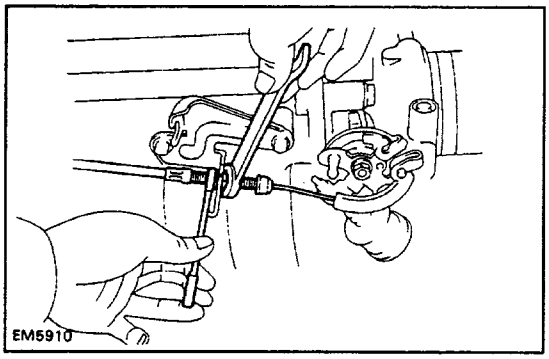
(a) (California only)
EGR gas temp. sensor wire
(b) Throttle position wire
(c) Cold start injector wire

9. INSTALL EGR VACUUM MODULATOR

10. CONNECT FOLLOWING PARTS:

(a) (w/ Oil cooler)
Connect the No. 1 oil cooler hose to the intake man–ifold.
(w/o Oil cooler)
Connect the No. 1 water by–pass hose to the intake manifold.
(b) No. 2 and No. 3 water by–pass hoses to the throttle body
(c) Vacuum hoses to throttle body
(d) Pressure regulator hose
(e) Fuel pressure up hose
(f) PAIR valve hose
(g) EGR valve hose

(h) EGR vacuum modulator hose
(i) EVAP hose
(j) (with A/C)
VSV hoses
(k) (w/PS)
Air control valve hoses
(l) Brake booster hose
(m) No. 1 and No. 2 PCV hoses

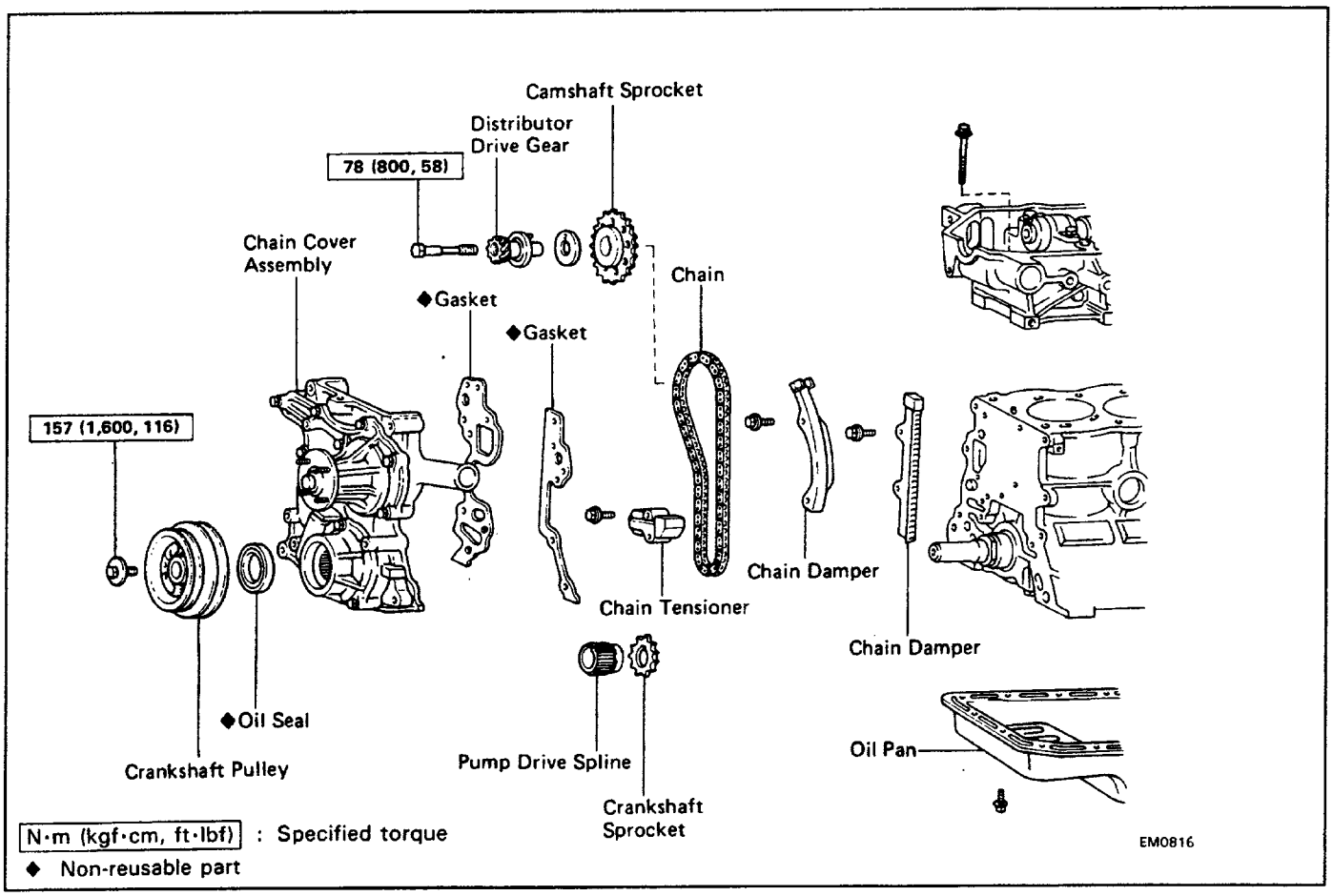


11. CONNECT GROUND STRAP TO ENGINE REAR SIDE
12. (A/T)
CONNECT THROTTLE CABLE
Connect the throttle cable to the clamp and bracket.
13. CONNECT ACCELERATOR CABLE
14. CONNECT HEATER WATER INLET HOSE TO HEATER WATER INLET PIPE
15. INSTALL RADIATOR INLET HOSE
16. INSTALL SPARK PLUGS AND DISTRIBUTOR
(See pages IG–6, 9)
17. INSTALL OIL DIPSTICK
18. CONNECT EXHAUST PIPE TO EXHAUST MANIFOLD
(a) Install the new gaskets, and connect the exhaust pipe to the exhaust manifold with the three nuts.
(b) Install the exhaust pipe clamp.
19. INSTALL INTAKE AIR CONNECTOR
20. FILL WITH ENGINE OIL
(See step 3 on page EG1–236)
21. FILL WITH COOLANT
(See step 3 on page EG1–225)
22. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY
23. START ENGINE
Warm up the engine and inspect for leaks.
24. PERFORM ENGINE ADJUSTMENT
(See page EG1–10)
25. RECHECK COOLANT AND ENGINE OIL LEVEL
26. ROAD TEST
Road test the vehicle.
27. RECHECK COOLANT AND ENGINE OIL LEVEL

TIMING CHAIN

EG1VJ–01

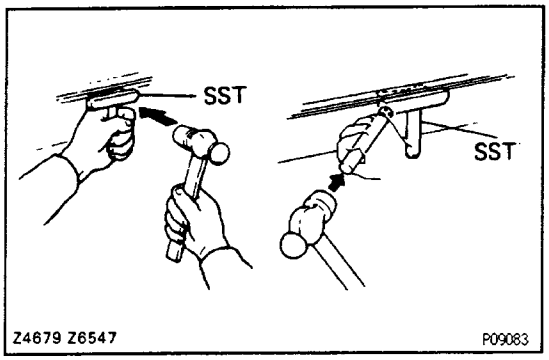
COMPONENTS



EG1VK–02

PREPARATION OF REMOVAL

1. REMOVE CYLINDER HEAD
(See page EG1–16)
2. REMOVE RADIATOR
(See page EG1–230)
3. (4WD)
REMOVE FRONT DIFFERENTIAL
(See SA section)



4. REMOVE OIL PAN

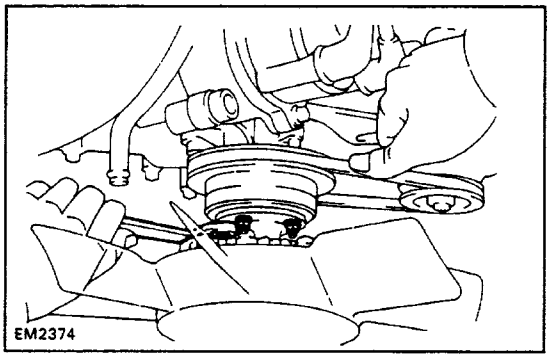
(a) Remove the engine undercover.
(b) Remove the engine mounting bolts.
(c) (2WD)
Place a jack under the transmission and raise the engine approx. 25 mm (0.98 in.)
(d) Remove the sixteen bolts and nuts.
(e) Using SST and brass bar, separate the oil pan from the cylinder block.

SST 09032 – 00100
HINT: When removing the oil pan, be careful not to damage the oil pan flange.

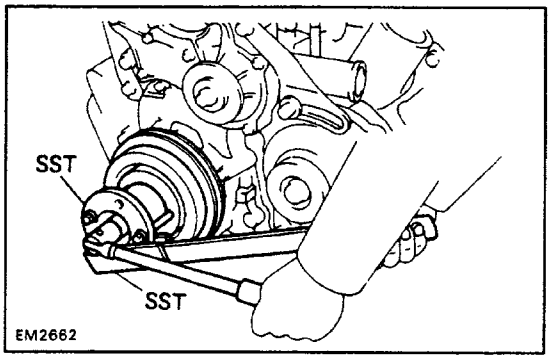
EG1VL–02

TIMING CHAIN REMOVAL

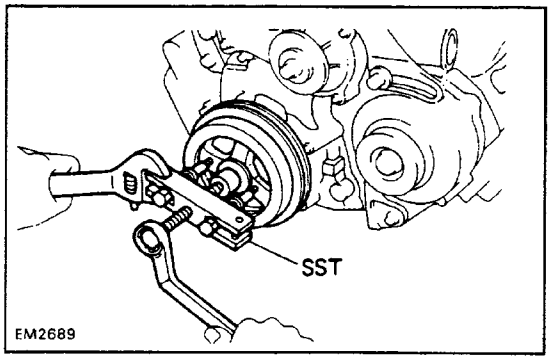
1. (W/PS)
REMOVE PS BELT
2. (with A/C)
REMOVE A/C BELT, COMPRESSOR AND BRACKET



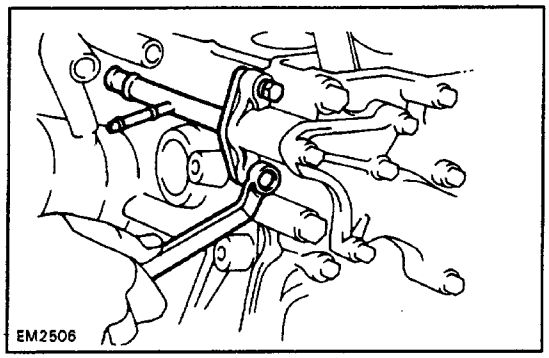
3. REMOVE FLUID COUPLING WITH FAN AND WATER PUMP PULLEY
(a) Loosen the water pump pulley set bolts.
(b) Loosen the belt adjusting bolt and pivot bolt of the generator, and remove the drive belt.
(c) Remove the set nuts, fluid coupling with fan and water pump pulley.



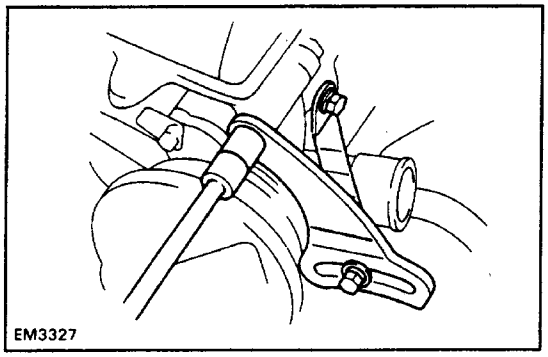
4. REMOVE CRANKSHAFT PULLEY
(a) (with A/C (w/o Air pump) or w/PS (w/ Air pump)) Remove the No. 2 crankshaft pulley.
(b) Using SST to hold the crankshaft pulley, loosen the pulley bolt.
SST 09213–70010 and 09330–00021



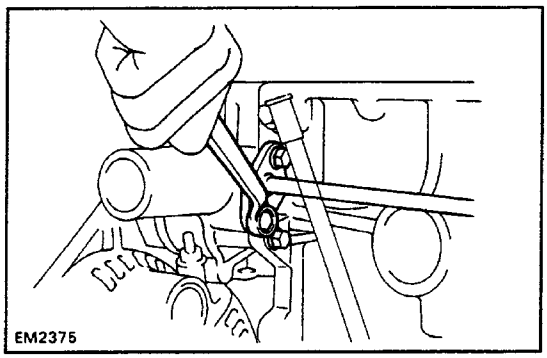
(c) Using SST, remove the crankshaft pulley.
SST 09213–310231
HINT: If the front seal is to be replaced, see page EG1–236.



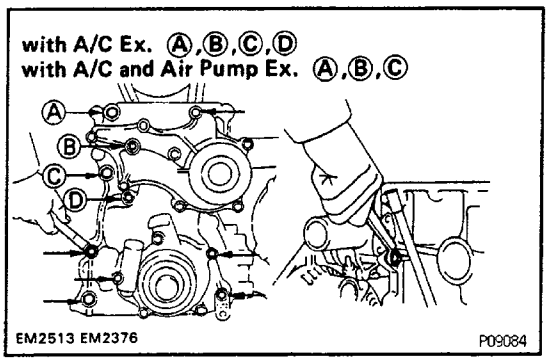
5. REMOVE NO. 1 WATER BY–PASS PIPE
Remove the two bolts and pipe.



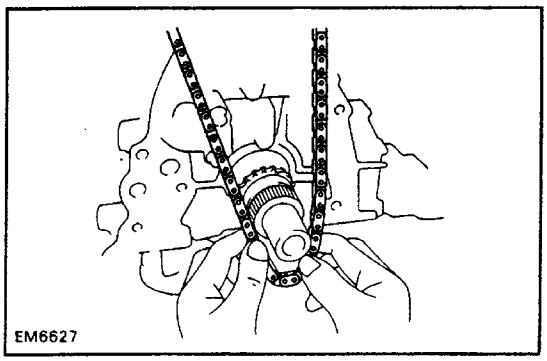
6. REMOVE FAN BELT ADJUSTING BAR
(a) (w/ PS)
Remove the bolt and PS lower bracket.
(b) Remove the three bolts and bar.



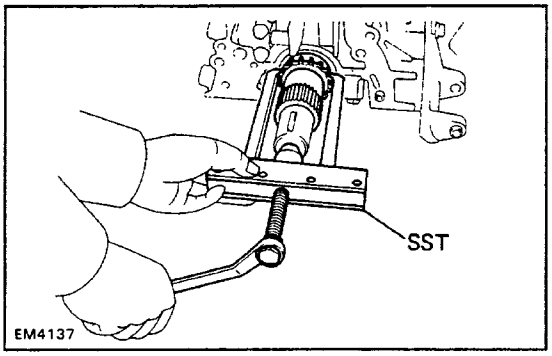
7. DISCONNECT HEATER WATER OUTLET PIPE
Remove the two bolts, and disconnect heater water outlet pipe.



8. REMOVE CHAIN COVER ASSEMBLY
(a) Remove timing chain cover bolts shown by the arrows.
(b) Using a plastic faced hammer, loosen the chain cover and remove it.



9. REMOVE CHAIN AND CAMSHAFT SPROCKET
(a) Remove the chain from the damper.
(b) Remove the cam sprocket and chain together.



10. REMOVE PUMP DRIVE SPLINE AND CRANKSHAFT SPROCKET

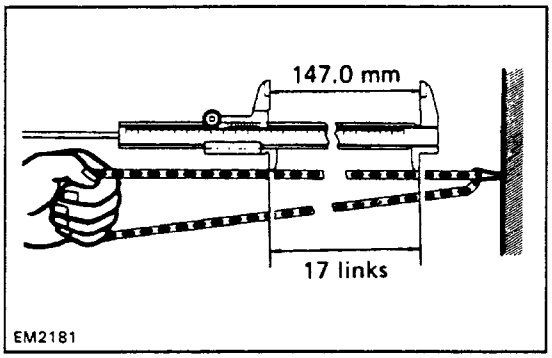
If the oil pump drive spline and sprocket cannot be removed by hand, use SST to remove them together.

SST 09213–36020

11. REMOVE GASKET MATERIAL ON CYLINDER BLOCK

EG1VM–01

COMPONENTS INSPECTION



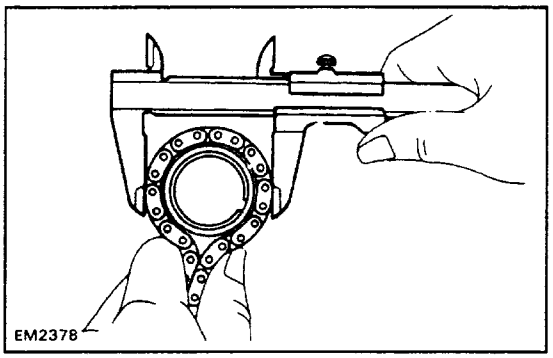
1. MEASURE CHAIN AND SPROCKET WEAR

(a) Measure the length of 17 links with the chain fully stretched.

(b) Make the same measurements at least three other places selected at random.

Chain elongation limit at 17 links: 147.0 mm (5.787 in.)

If over the limit at any one place the chain.



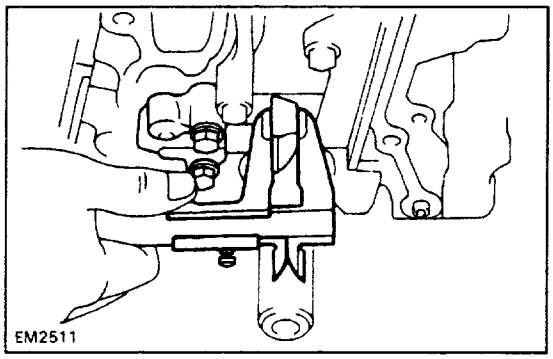
(c) Wrap the chain around the sprocket.

(d) Using a caliper gauge, measure the outer sides of the chain rollers as shown. Measure both sprockets.

Crankshaft sprocket minimum: 59.4 mm (2.339 in.)

Camshaft sprocket minimum: 113.8 mm (4.480 in.)

If the measurement is less than minimum, replace the chain and two sprockets.

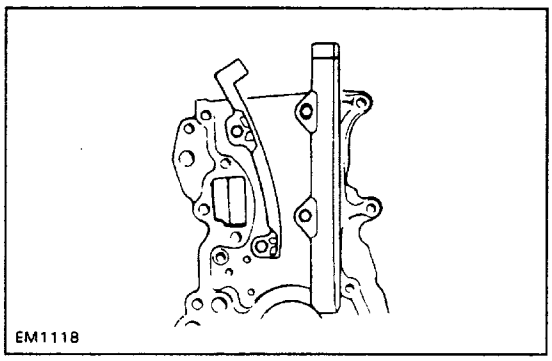


2. MEASURE CHAIN TENSIONER

Using a caliper gauge, measure the tensioner as shown.

Tensioner minimum: 11.0 mm (0.433 in.)

If the tensioner is worn or less than minimum, replace the chain tensioner.



3. MEASURE CHAIN DAMPERS

Using a micrometer, measure each damper.

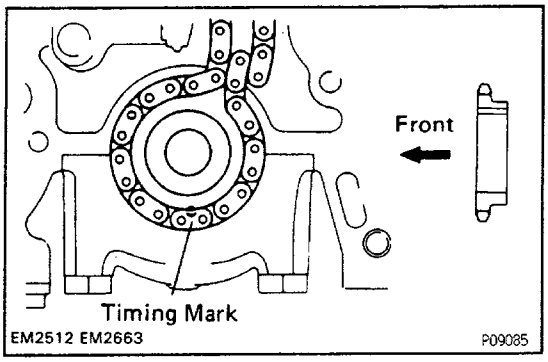
Damper wear limit: 0.5 mm (0.020 in.)

If either damper is worn or less than minimum, replace the damper.

EG1VN–03

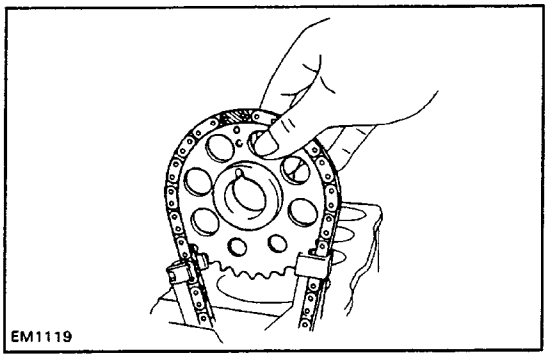
TIMING CHAIN INSTALLATION

(See page EG1–39)



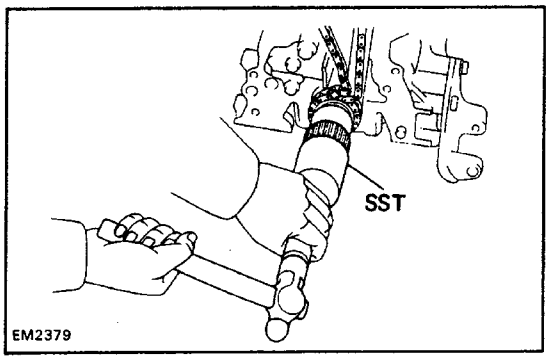
1. INSTALL CRANKSHAFT SPROCKET AND CHAIN

(a) Turn the crankshaft until the shaft key is on top.
(b) Slide the sprocket over the key on the crankshaft.
(c) Place the timing chain on the sprocket with the single bright chain link aligned with the timing mark on the sprocket.



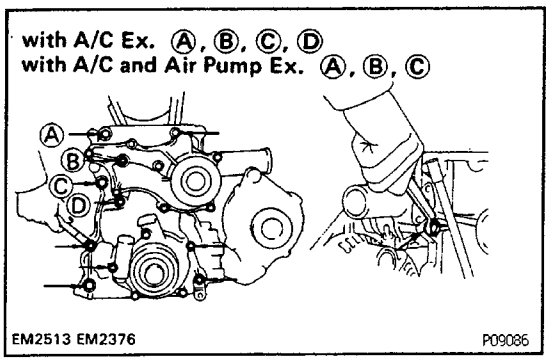
2. PLACE CHAIN ON CAMSHAFT SPROCKET

(a) Place the timing chain on the sprocket so that the bright chain link is aligned with the timing mark on the sprocket.
(b) Make sure the chain is positioned between the dampers.
(c) Turn the camshaft sprocket counterclockwise to take the slack out of the chain.



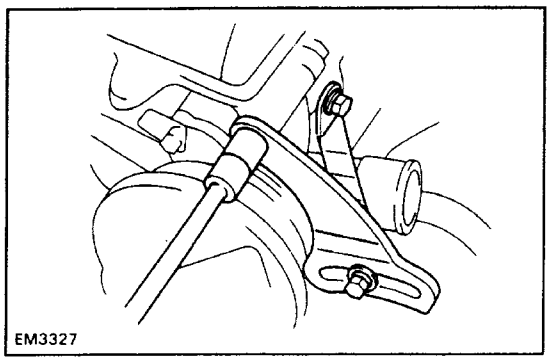
3. INSTALL OIL PUMP DRIVE SPLINE

Slide the oil pump drive spline over the crankshaft key.
HINT: If the oil pump drive spline is difficult to install by hand, install using SST.
SST 09608–35014 (09608–06040)



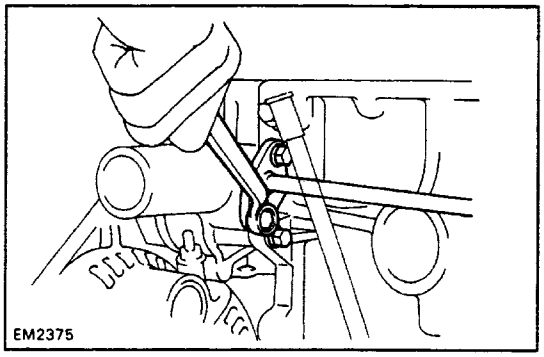
4. INSTALL TIMING CHAIN COVER ASSEMBLY

(a) Remove the old cover gaskets. Clean the gasket surface. Install new gaskets over the dowels.
(b) Slide the cover assembly over the dowels and pump spline.
(c) Insert the bolts as shown and torque them.
Torque: 8 mm bolt 13 N–m(130kgf–cm, 9ft–lbf)
10 mm bolt 13 N–m(400kgf–cm, 29ft–lbf)

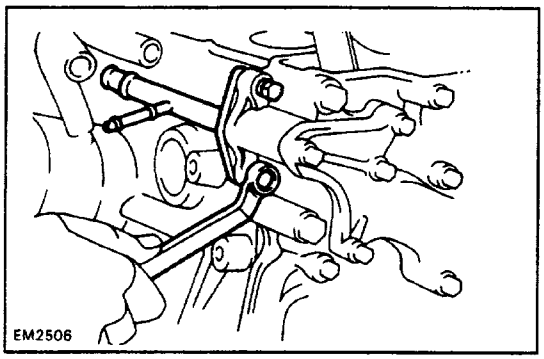


5. INSTALL FAN BELT ADJUSTING BAR

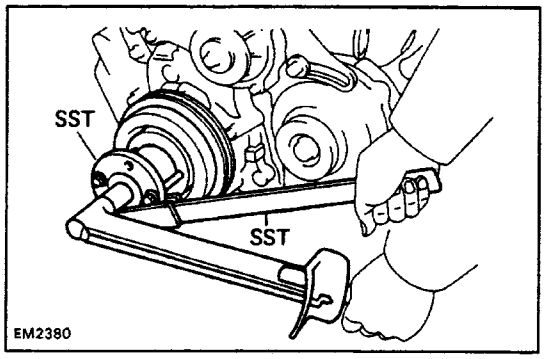
(a) Temporarily install the adjusting bar to the alternator.
(b) Install the adjusting bar to the chain cover and cylinder head.
Torque: 13N–m(130kgf–cm, 9ft–lbf)



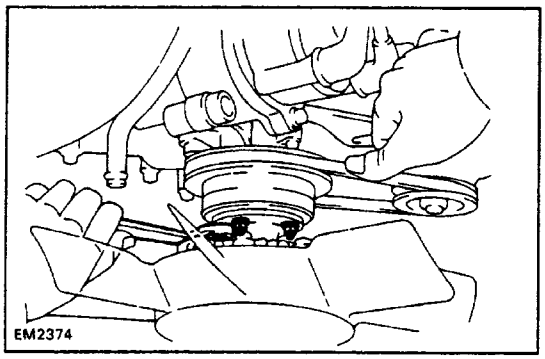
6. INSTALL HEATER WATER OUTLET PIPE
Connect the heater water outlet pipe to the timing chain cover with the two bolts.



7. INSTALL NO.1 WATER BY–PASS PIPE
Install the pipe with the two bolts.

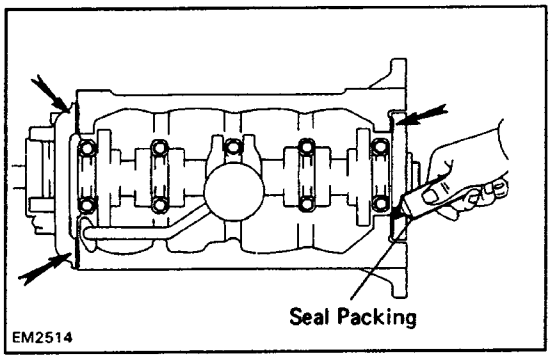


8. INSTALL CRANKSHAFT PULLEY
(a) Install the crankshaft pulley and bolt.
(b) Using SST to hole the crankshaft pulley, torque the. bolt.
SST 09213–70010 and 09660–00021
Torque: 157N–m(1,600kgf–cm, 116ft–lbf)
(c) (with A/C) Install the NO.2 crankshaft pulley.



9. INSTALL WATER PUMP PULLEY AND FLUID COUPLING WITH FAN
(a) Temporarily install the water pump pulley and fluid coupling with fan with the four nuts.
(b) Place the drive belt onto each pulley.
(c) Stretch the belt tight and tighten the four nuts.
10. ADJUST DRIVE BELT TENSION
(See page MA–6)
11. (with A/C) INSTALL A/C COMPRESSOR BRACKET, COMPRESSOR AND BELT
(See page MA–6)
12. (w/PS) INSTALL PS BELT
(See page MA–6)
13. INSTALL OIL PAN
(a) Remove any old packing material and be careful not to drop any oil on the contacting surfaces of the oil pan and cylinder block.

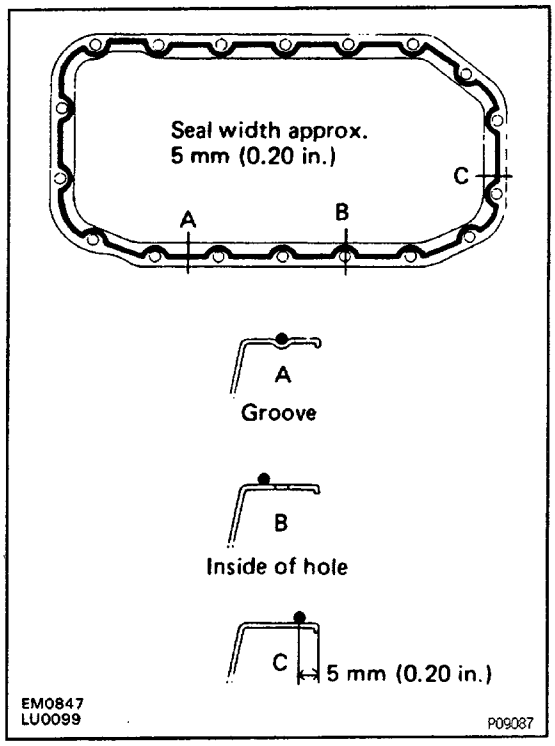
- Using a razor blade and gasket scraper, remove all the packing (FIPG) material from the gasket surfaces.
- Thoroughly clean all components to remove all the loose material.
- Clean both sealing surfaces with a non–residue solvent.



NOTICE: Do not use a solvent which will affect the pai–nted surfaces.

(b) Apply seal packing to the joint part of the cylinder block and chain cover, cylinder block and rear oil seal retainer.

Seal packing: Part No.08826–00080 or equivalent



(c) Apply seal packing to the oil pan as shown in the illustration.

Seal packing: Part No.08826–00080 or equivalent

Install a nozzle that has been cut to a 5–mm (0.20 in.) opening.

HINT: Avoid applying an excess amount to the sur–face. Be especially careful near oil passages.

- If parts are not assembled within 5 minutes of applying the seal packing, the effectiveness of the seal packing is lost and the seal packing must be removed and reapplied.
- Immediately remove the nozzle from the tubs and reinstall the cap after using the seal packing.

(d) Install the oil pan over the studs on the block with the sixteen bolts and two nuts. Torque the bolts and nuts.

Torque: 13N–m(130kgf–cm, 9ft–lbf)

(e) Lower the engine and install the engine mounting bolts.

(f) Install the engine under cover.

EG1VP–02

POST INSTALLATION

1. INSTALL RADIATOR

2. INSTALL CYLINDER HEAD

(See page EG1–34**)**

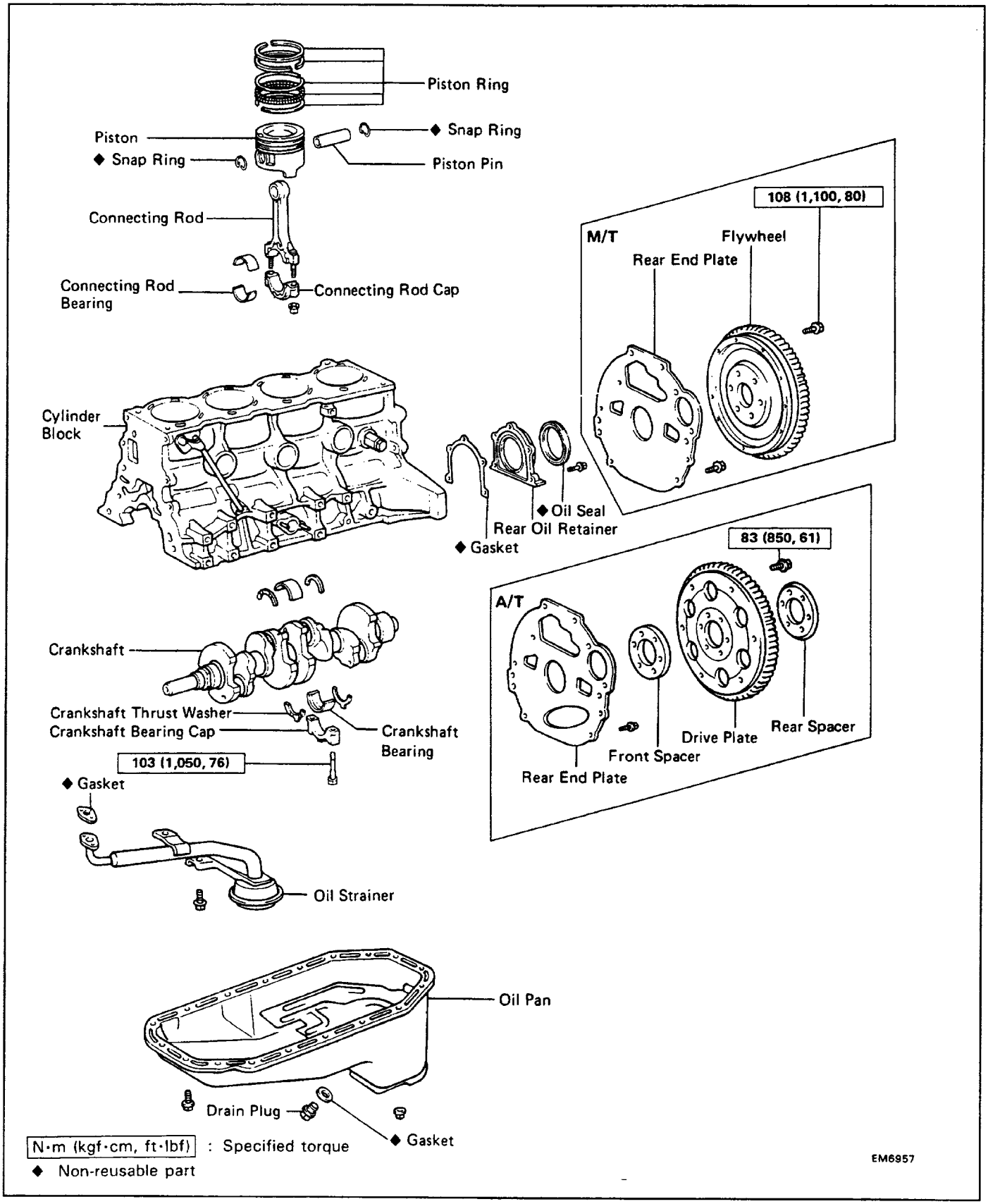
3. (4WD) INSTALL FRONT DIFFERENTIAL

(See SA section)

CYLINDER BLOCK

EG1VQ–01

COMPONENTS



EG1VR–02

ENGINE REMOVAL

1. REMOVE HOOD

2. REMOVE BATTERY

3. REMOVE ENGINE UNDER COVER

4. DRAIN COOLANT FROM RADIATOR AND CYLIN–DER BLOCK

(See step 3 on page EG1–225**)**

5. DRAIN ENGINE OIL

(See step 1 on page EG1–236**)**

6. REMOVE AIR CLEANER CASE AND INTAKE AIR CONNECTOR

7. REMOVE RADIATOR

(See page EG1–230**)**

8. REMOVE PS PUMP BELT

(a) Stretch the belt tight and loosen the PS pump pulley lock nut.

(b) Remove the PS belt.

9. (with A/C)

REMOVE A/C BELT

10. REMOVE GENERATOR DRIVE BELT, FLUID COU–PLING AND FAN PULLEY

(See step 3 on page EG1–40**)**

11. DISCONNECT FOLLOWING WIRES AND CONNEC–TORS:

(a) Ground strap from LH fender apron

(b) Generator connector and wire

(c) Igniter connector

(d) Generator wires

(e) High–tension cord for ignition coil

(f) Distributor wire from igniter

(g) Ground strap from engine rear side

(h) ECM connectors

(i) (M/T)

Starter relay connector

(j) Check connector

(k) (with A/C)

A/C compressor connector

12. DISCONNECT FOLLOWING HOSES:

(a) PS air hoses from gas filter and air pipe

(b) Brake booster hose

(c) (w/Cruise control)

Cruise control vacuum hose

(d) Charcoal canister hose from canister

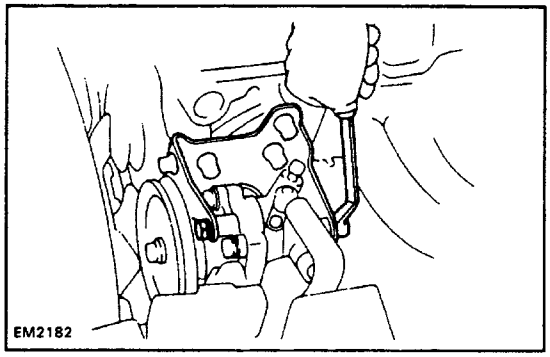
13. DISCONNECT FOLLOWING CABLE:

(a) Accelerator cable

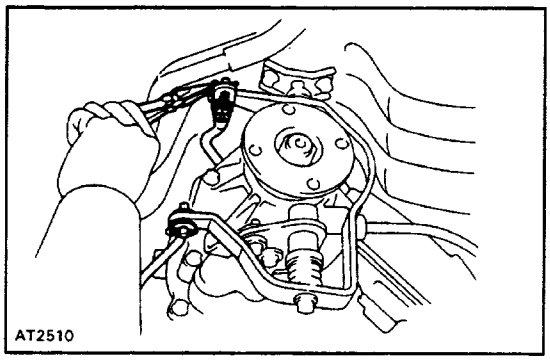
(b) (A/T)

Throttle cable

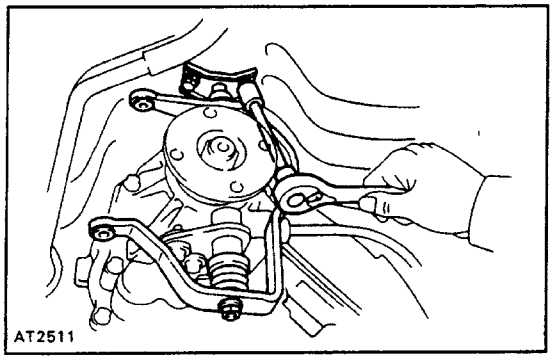
(c) (w/Cruise control)
Cruise control cable



14. (w/PS)
REMOVE PS PUMP FROM BRACKET
(a) Remove the drive belt.
(b) Remove the four bolts.
(c) Remove the PS pump.
HINT: Lay the PS pump to one side without disconn–ecting the hoses.
15. DISCONNECT GROUND STRAP FROM PS PUMP BRACKET
16. (with A/C)
REMOVE COMPRESSOR FROM BRACKET
(a) Loosen the drive belt adjusting bolt and remove the drive belt.
(6) Remove the compressor on the front side without disconnecting the hoses.
17. DISCONNECT GROUND STRAPS FROM ENGINE REAR SIDE AND RH SIDE
18. (M/T)
REMOVE SHIFT LEVER(S) FROM INSIDE OF VEHI–CLE
19. REMOVE REAR PROPELLER SHAFT
(See PR section)
20. (2WD A/T)
DISCONNECT MANUAL SHIFT LINKAGE FROM PNP SWITCH



21. (4WD A/T)
DISCONNECT TRANSFER SHIFT LINKAGE
(a) Disconnect the No.1 and No.2 transfer shift linkages from the cross shaft.



(b) Remove the cross shaft from the body.

22. DISCONNECT SPEEDOMETER CABLE

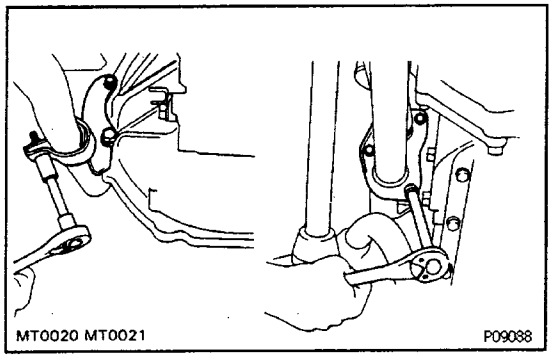
NOTICE: Do not lose the felt dust protector and washers.

23. (4WD)
REMOVE TRANSFER UNDER COVER

24. (4WD)
REMOVE STABILIZER BAR

25. (4WD)
REMOVE FRONT PROPELLER SHAFT
(See PR section)

26. REMOVE NO.1 FRAME CROSSMEMBER



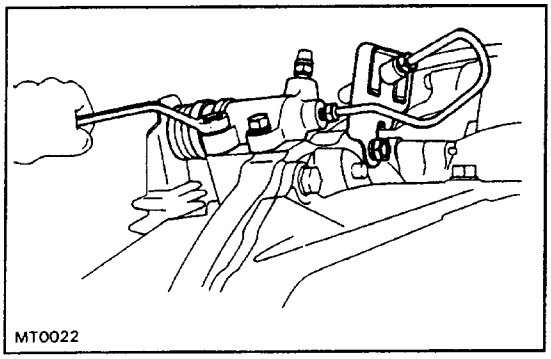
27. REMOVE FRONT EXHAUST PIPE

(a) Disconnect the oxygen sensor connector.

(b) Disconnect the exhaust pipe from the exhaust mani–fold.

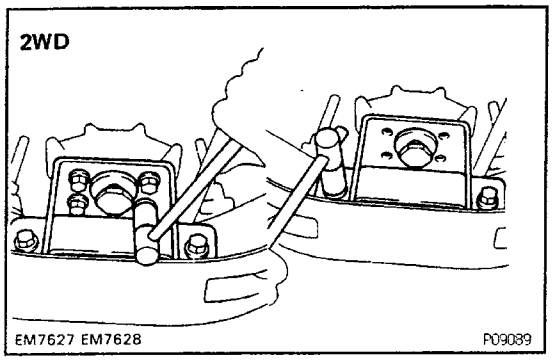
(c) Remove the exhaust pipe clamp from the clutch housing.

(d) Remove the exhaust pipe from the catalytic converter.



28. (M/T)
REMOVE CLUTCH RELEASE CYLINDER WITH BRACKET FROM TRANSMISSION

29. (4WD)
REMOVE NO.1 FRONT FLOOR HEAT INSULATOR AND BRAKE TUBE HEAT INSULATOR

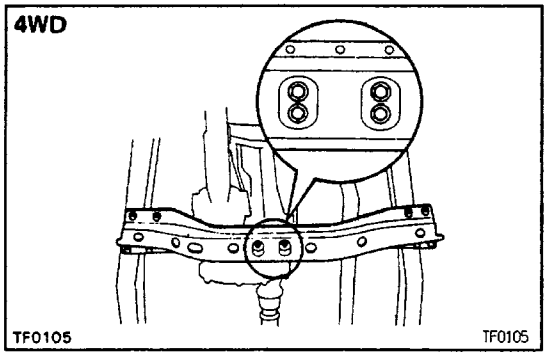


30. (2WD)
REMOVE ENGINE REAR MOUNTING AND BRACKET

(a) Remove the four bolts from the engine rear mounting.

(b) Raise the transmission slightly by raising the engine with a jack.

(c) Remove the four bolts from the support member.



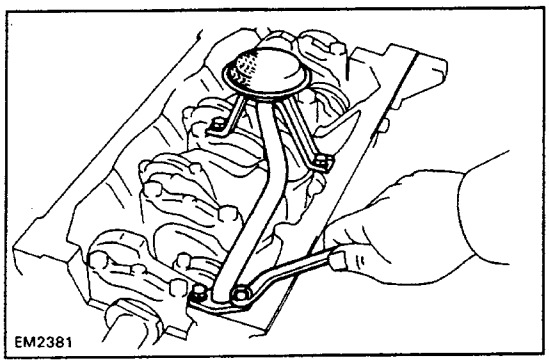
31. (4WD)
REMOVE NO.2 FRAME CROSSMEMBER FROM SIDE FRAME
(a) Remove the four bolts from the engine rear mounting.
(b) Raise the transmission slightly with a jack.
(c) Remove the four bolts from the side frame and remove the No.2 frame crossmember.
32. REMOVE ENGINE WITH TRANSMISSION FOR VE–HICLE
(a) Attach the engine hoist chain to the lift brackets of the engine.
(b) Remove the mounting nuts and bolts.
(c) Lift engine out of the vehicle slowly and carefully.

HINT: Make sure the engine is clear of all wiring and hoses.
33. REMOVE TRANSMISSION FROM ENGINE
(a) (A/T)
Remove the A/T oil cooler pipes.
(b) Remove the starter.
(c) Remove the two stiffener plates and exhaust pipe bracket from engine.
(d) Remove the transmission from the engine.
34. (M/T)
REMOVE CLUTCH COVER AND DISC

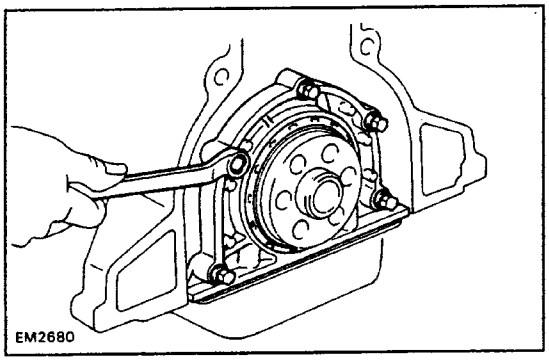
EG1VS–02

CYLINDER BLOCK DISASSEMBLY

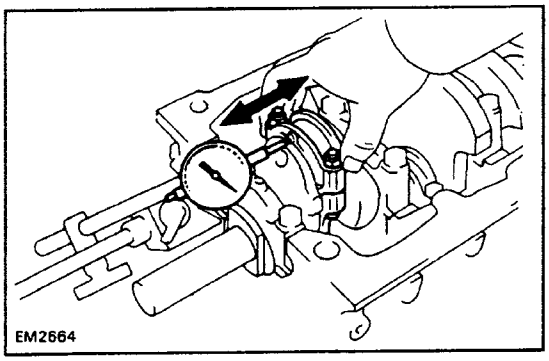
(See page EG1–46)
1. REMOVE FLYWHEEL OR DRIVE PLATE
2. REMOVE REAR END PLATE
3. INSTALL ENGINE STAND FOR DISASSEMBLY
4. REMOVE CYLINDER HEAD
(See page EG1–18)
5. REMOVE TIMING CHAIN (See page EG1–40)
6. REMOVE GENERATOR (See CH section)
7. REMOVE LH ENGINE MOUNTING BRACKET AND GENERATOR BRACKET
8. REMOVE CHAIN DAMPERS
9. REMOVE CHAIN TENSIONER
10. REMOVE OIL FILTER
(See step 2 on page EG1–236)
11. REMOVE RH ENGINE MOUNTING BRACKET, CHA–MBER STAY AND GROUND STRAP
12. (A/T)
REMOVE FLEXIBLE HOSE CLAMP
13. REMOVE OIL PRESSURE SENDER GAUGE OR SWITCH
14. REMOVE KNOCK CONTROL SENSOR
15. REMOVE FUEL–FILTER AND BRACKET



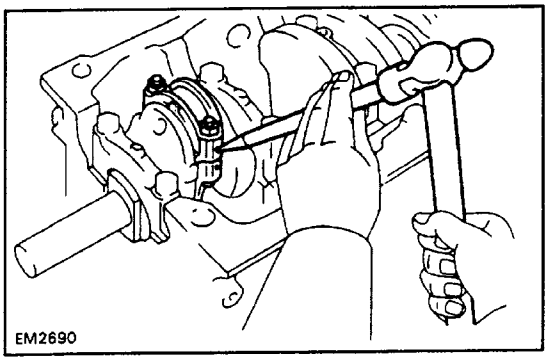
16. REMOVE OIL STRAINER
Remove the four bolts, strainer and gasket.



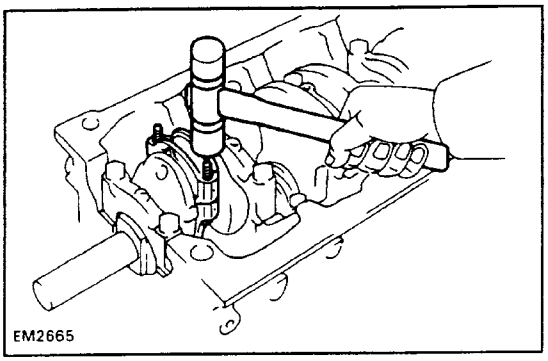
17. REMOVE REAR OIL SEAL RETAINER
Remove the five bolts, rear oil seal retainer and gasket.



18. MEASURE CONNECTING ROD THRUST CLEARANCE
Using a dial gauge, measure the thrust clearance.
Standard clearance: 0.16 – 0.26 mm
(0.063 – 0.0102 in.)
Maximum clearance: 0.3 mm(0.012 in.)
If clearance is greater than maximum, replace the connecting rod and/or crankshaft.

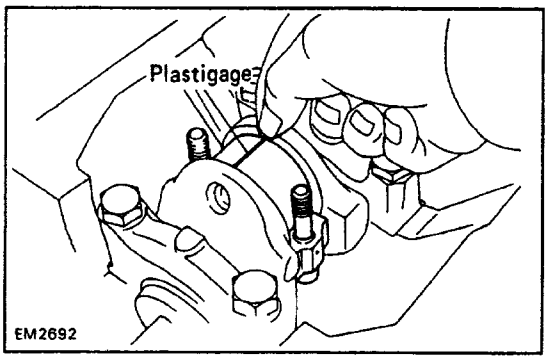


19. MEASURE CONNECTING ROD OIL CLEARANCE
(a) Using a punch or numbering stamp, mark connecting rods and caps to ensure correct reassembly.
(b) Remove the rod cap nuts.

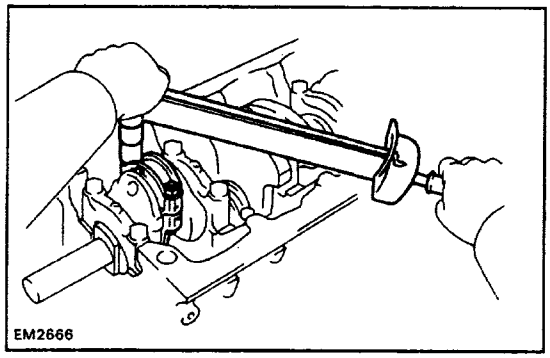


(c) Using a plastic–faced hammer, tap the rod bolts lightly and lift off the rod cap.

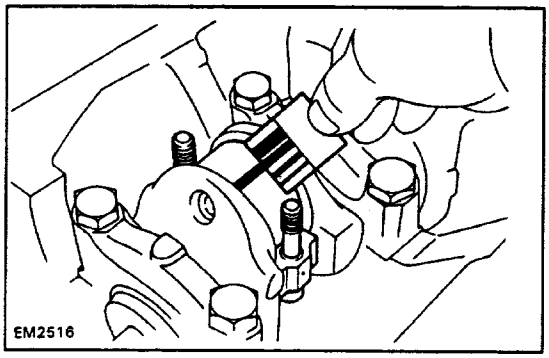
HINT: Keep the bearing inserted in the cap.
(d) Clean the bearing and crankshaft pins.
(e) Inspect each bearing for pitting and radial scratches.
If bearing are damaged, replace the bearings.



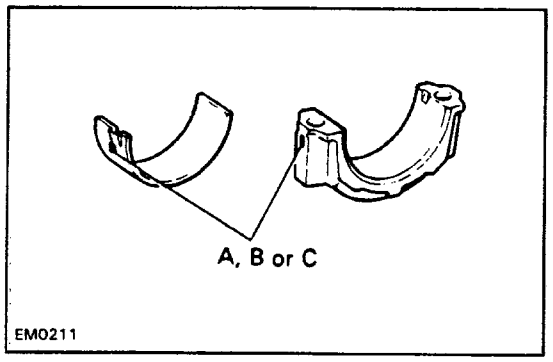
(f) Lay a strip of Plastigage across the crankshaft pin.



(g) Align the rod and cap marks and fit on the cap. Install and torque the cap nuts.
Torque: 69 N–m(700 kgf–cm, 51 ft–lbf)
HINT:
- Do not turn the crankshaft.
- Apply a light coat of engine oil on the nut threads and under the nut before installation.



(h) Remove the rod cap.
(i) Measure the Plastigage at its widest point.
Standard clearance: 0.025 – 0.055 mm
(0.0010 – 0.8022 in.)
Maximum clearance: 0.10 mm (0.0039 in.)
If the clearance is greater than maximum, replace the bearings and/or grind the crank pins.
Undersized bearing: U/S 0.25
Clean any Plastigage from bearing and crankshaft pin.



HINT: If replacing a standard size bearing, replace with one having the same letter as marked on the bearing cap. There are three sizes of standard bear–ings supplied, marked A, B or C respectively.

mm (in.)

Size	Big End Inner Diameter	Crank Pin Diameter	Bearing Center Wall Thickness
A	56.000 – 56.006 (2.2047 – 2.2050)	52.988 – 53.000 (2.0861 – 2.0866)	1.484 – 1.488 (0.0584 – 0.0586)
B	56.006 – 56.012 (2.2050 – 2.2052)		1.488 – 1.492 (0.0586 – 0.0587)
C	56.012 – 56.018 (2.2052 – 2.2054)		1.492 – 1.496 (0.0587 – 0.0589)
U /S 0.25	56.000 – 56.018 (2.2047 – 2.2054)	52.701 – 52.711 (2.0748 – 2.0752)	1.626 – 1.636 (0.0640 – 0.0644)

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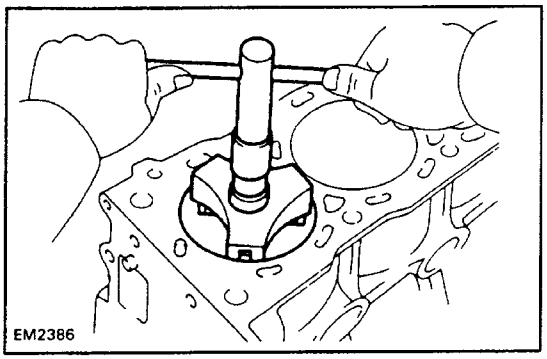
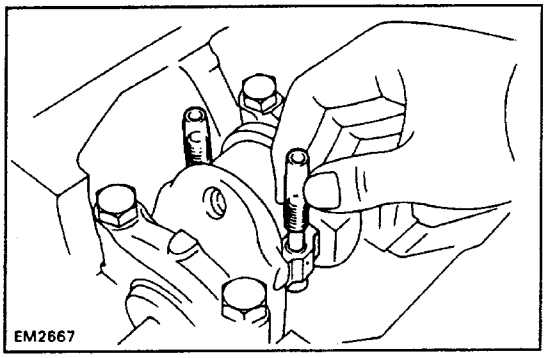
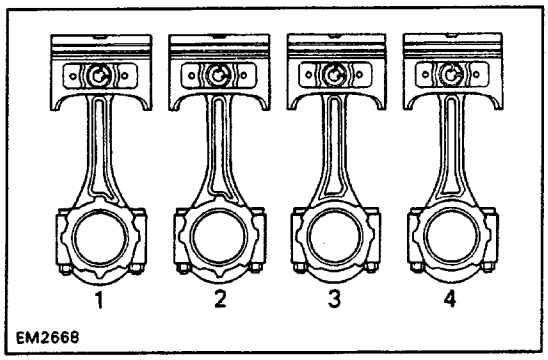


20. PUSH OUT PISTON AND CONNECTING ROD ASSEMBLY

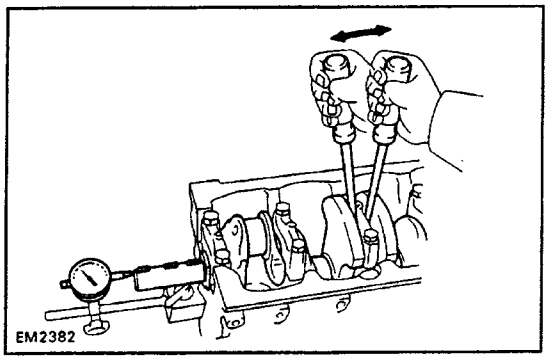
(a) Remove all the carbon from top of the bore to the top of the cylinder.



(b) Cover the rod bolts with a short piece of hose to protect the crank pin from damage.
(c) Push the piston and connecting rod assembly out through the top of the cylinder block.



(d) Arrange the piston and connecting rod caps in order.



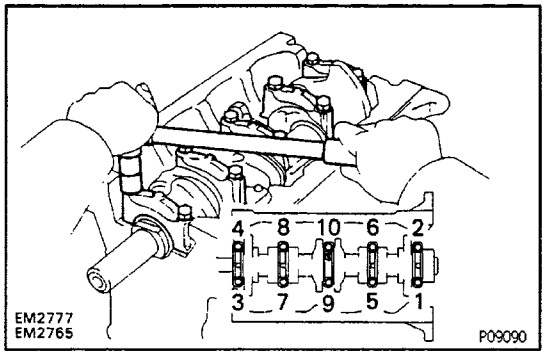
21. MEASURE CRANKSHAFT THRUST CLEARANCE

Using a dial gauge, measure the crankshaft thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard clearance: 0.02 – 0.22 mm
(0.0008 – 0.0087 in.)
Maximum clearance: 0.3 mm (0.012 in.)

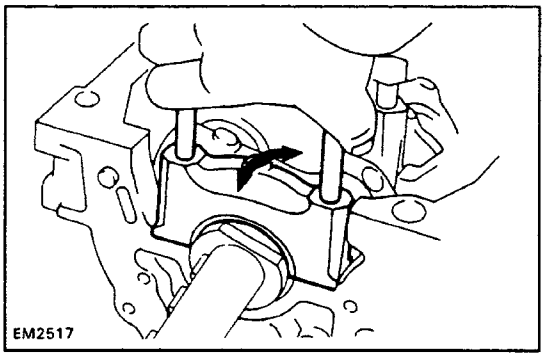
If the clearance is greater than maximum, replace the thrust washers as a set and/or crankshaft.

Thrust washer thickness:
Standard
2.690 – 2.740 mm (0.1059 – 0.1079 in.)
0/S 1.25
2.753 – 2.803 mm (0.1084 – 0.1104 in.)
4/S 2.50
2.815 – 2.865 mm (0.1108 – 0.1128 in.)



22. MEASURE CRANKSHAFT OIL CLEARANCE

(a) Gradually loosen and remove the bearing cap bolts in three passes and in numerical order shown.



(b) Using the removed bearing cap bolts, pry the bearing cap fore and aft, and remove it with the lower bearing and thrust washers (No.3 journal only).

HINT:

- Keep the lower bearing inserted in the cap.
- Arrange the caps and lower thrust washers in correct order.

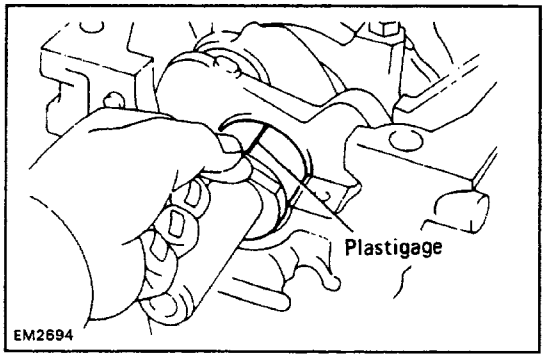
(c) Lift off the crankshaft.

HINT: Keep the upper bearings and upper thrust washers (for the No.3 journal only) inserted in the cylinder block.

(d) Clean the journals and bearings.

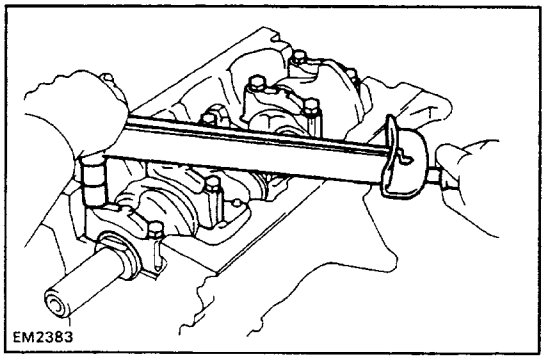
(e) Check the journals and bearings for pitting and scr–atches.

If the journal or bearing is damaged, grind or replace the crankshaft and replace the bearing.



(f) Install the upper main bearings on the cylinder block and crankshaft.

(g) Lay a strip of Plastigage across the main journals.



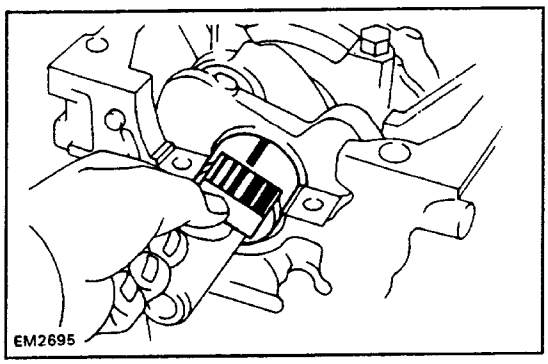
(h) Install the main bearing caps with the front mark facing forward. Install and torque the cap bolts.

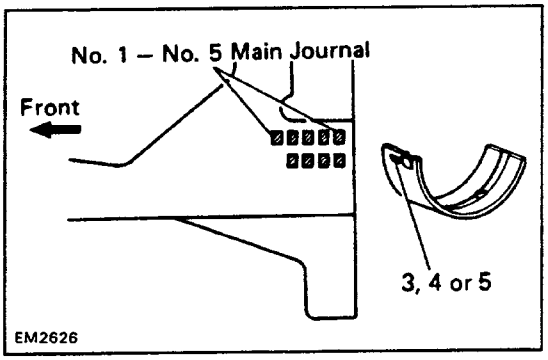
Torque: 103 N–m (1,050 kgf–cm, 76 ft–lbf)

HINT:

Do not turn the crankshaft.

Apply a light coat of engine oil on the bolt threads before installation.





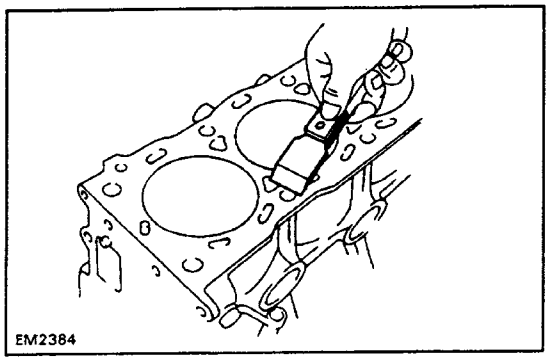
(i) Remove the main bearing caps.
(j) Measure the Plastigage at its widest point.
Standard clearance: 0.025 – 0.055 mm (0.0010 – 0.0022 in.)
Maximum clearance: 0.08 mm (0.0031 in.)
If the clearance is greater than maximum, replace the bearings and/or grind the main journals.
Undersized bearing: U/S 0.25
(k) Clean out the pieces of Plastigage from the bearings and journals.
HINT: If using a standard bearing, replace with one having the same number as marked on the cylinder block. There are three sizes of standard bearings, marked 3, 4, 5 accordingly.

mm (in.)

Size	Cylinder Block Main Journal Bore	Main Journal Diameter	Bearing Center Wall Thickness
3	64.004 – 64.010 (2.5198 – 2.5201)	59.984 – 60.000 (2.3616 – 2.3622)	1.988 – 1.992 (0.0783 – 0.0784)
4	64.010 – 64.016 (2.5201 – 2.5203)		1.992 – 1.996 (0.0784 – 0.0786)
5	64.016 – 64.022 (2.5203 – 2.5205)		1.996 – 2.000 (0.0786 – 0.0787)
U /S Q.25	64.004 – 64.022 (2.5198 – 2.5205)	59.701 – 59.711 (2.3504 – 2.3508)	2.126 – 2.136 (0.0837 – 0.0841)

V01859

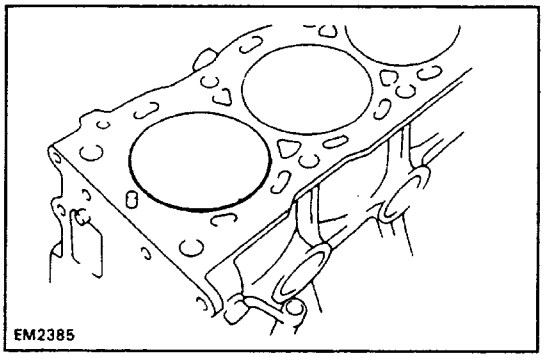
23. REMOVE CRANKSHAFT ,
(a) Lift out the crankshaft.
(b) Remove the upper main bearings from the cylinder block.
(c) Arrange the caps and bearings in order.



EG1VT–01

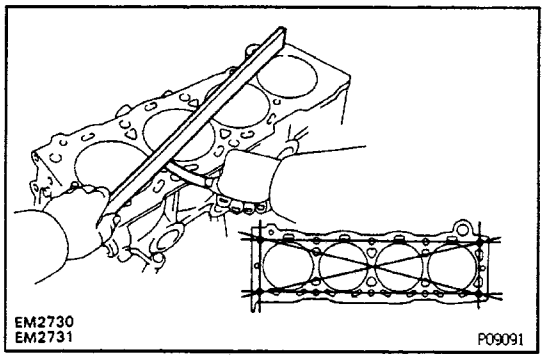
CYLINDER BLOCK INSPECTION

1. REMOVE GASKET MATERIAL
Using a gasket scraper, remove all gasket material from cylinder block surfaces.
2. CLEAN CYLINDER BLOCK
Using a soft brush and solvent, clean the block.



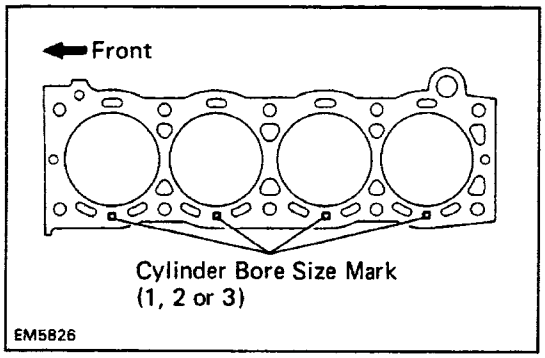
3. INSPECT CYLINDERS

Visually inspect cylinders for vertical scratches.
If deep scratches are present, rebore all four cylinders.
(See page EG1–66**)**



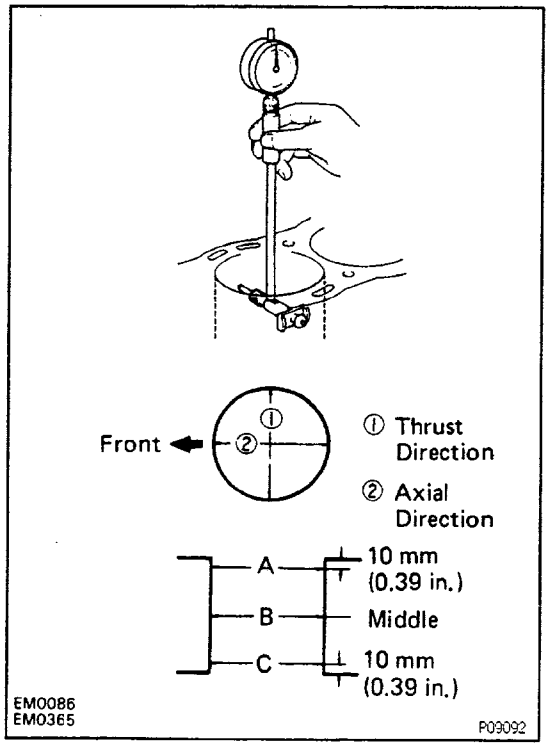
4. INSPECT CYLINDER BLOCK WARPAGE

Warpage limit: 0.5 mm (0.0020 in.)
If warpage is greater than specified value, replace the cylinder block.



5. MEASURE CYLINDER BORE

HINT: There are three sizes of the standard cylinder bore diameter, marked ”1’, ”2”, and ”3”, accordingly. The mark is stamped on the cylinder block.

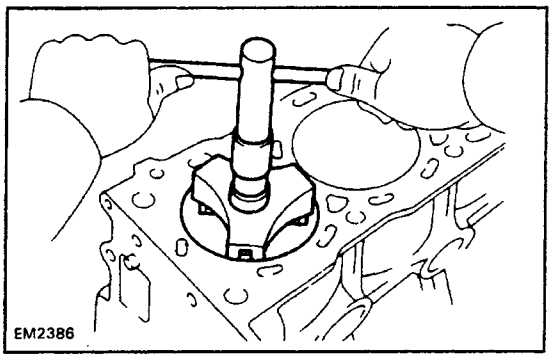


Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.

Standard diameter:

STD Mark ’1’
92.00 – 92.01 mm
(3.6220 – 3.6224 in.)
Mark ’2’
92.01 – 92.02 mm
(3.6224 – 3.6228 in.)
Mark ’3’
92.02 – 92.03 mm
(3.6228 – 3.6232 in.)
O/S 0.50
92.50 – 92.53 m m
(3.6417 – 3.6429 in.)
1.00
93.00 – 93.03 mm
(3.6614 – 3:6626 in.)

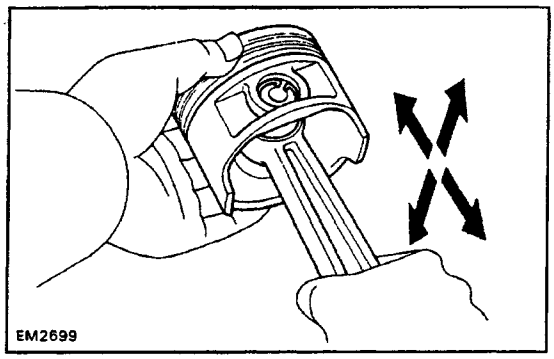
Maximum diameter:
STD 92.23 mm (3.6311 in.)
0/S 0.50 92.73 mm (3.6508 in.)
0/S 1.00 93.23 mm (3.6705 in.)
If the diameter is greater than maximum, rebore all four cylinders, or replace the cylinder block.



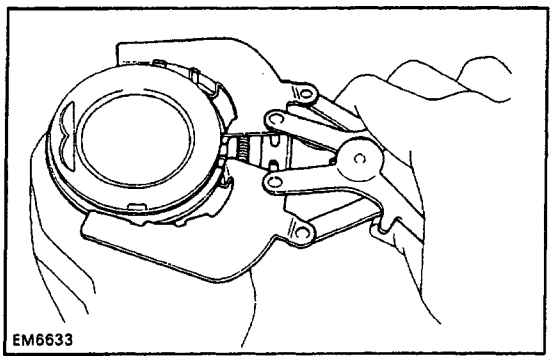
6.REMOVE CYLINDER RIDGE
If wear is less than 0.2 mm (0.008 in.), use a ridge reamer to machine the top of the cylinder.

EG1VU–01

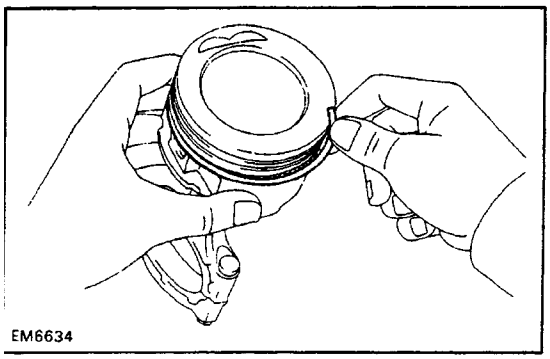
DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLY



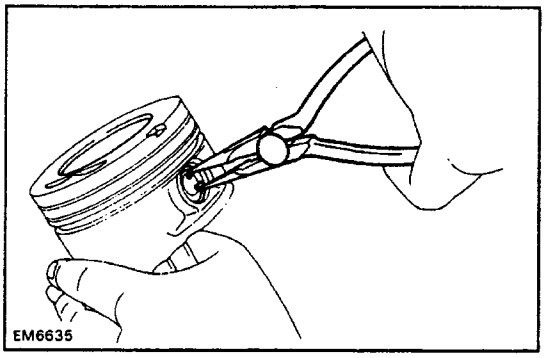
1. CHECK FIT BETWEEN PISTON AND PIN
Try to move the piston back and forth on the piston pin. If any movement is felt, replace the piston and pin.



2. REMOVE PISTON RINGS
(a) Using a piston ring expander, remove the compression rings.

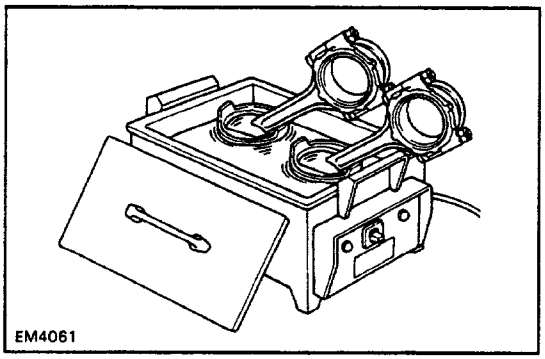


(b) Remove the two side rails and oil ring expander by hand.
HINT: Keep the rings for each cylinder separated.

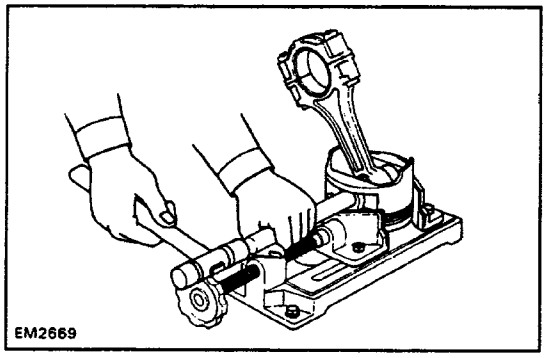


3. DISCONNECT CONNECTING ROD FROM PISTON

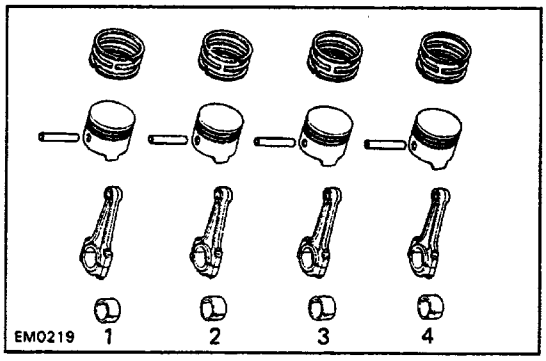
(a) Using needle – nose pliers, remove the snap rings from the piston.



(b) Heat the piston in hot water approx. 60•C(140•F).

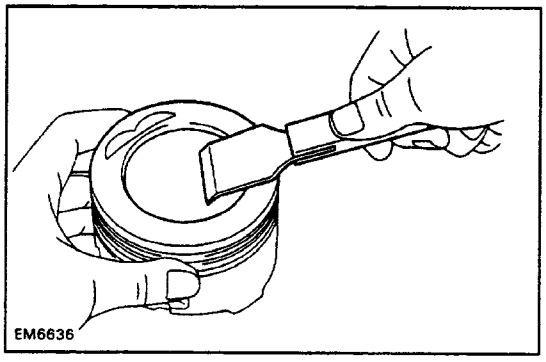


(c) Using a plastic–faced hammer and brass bar, lightly tap out the piston pin from the piston.



HINT:

- The piston and pin are a matched set.
- Keep the piston, pin, rings and connecting rod together for each cylinder.

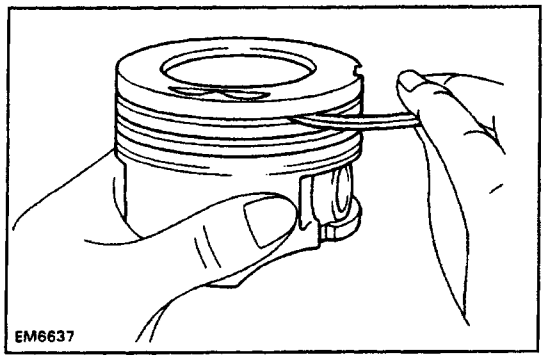


EG1VV–02

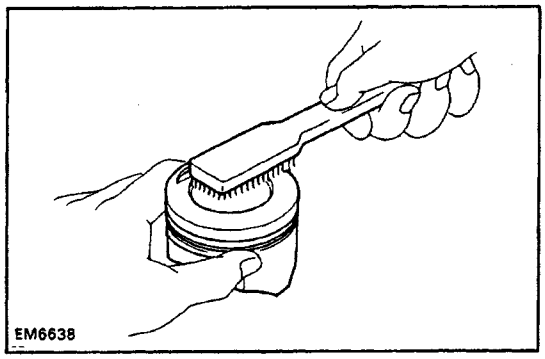
INSPECTION OF PISTON AND CONNECTING ROD

1. CLEAN PISTON

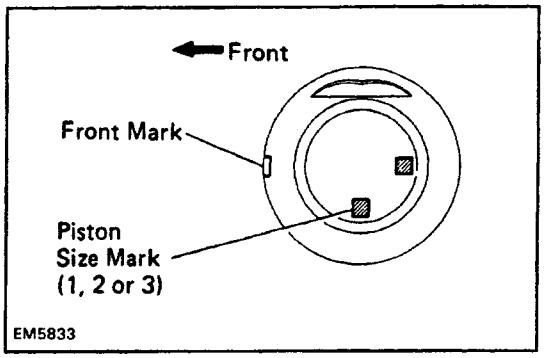
(a) Using a gasket scraper, remove the carbon from the piston top.



(b) Using a groove cleaning tool or broken ring, clean the ring grooves.

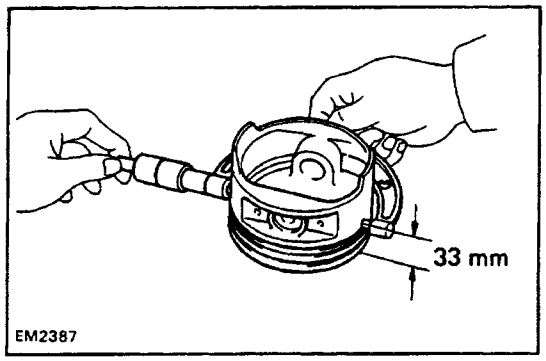


(c) Using solvent and a brush, thoroughly clean the piston.
NOTICE: Do not use a wire brush.



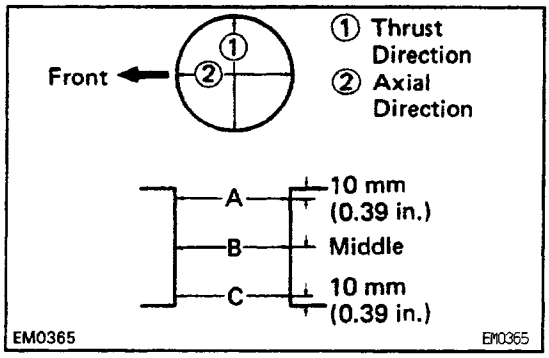
2. INSPECT PISTON DIAMETER AND OIL CLEARANCE

HINT: There are three sizes of the standard piston diameter, marked "'1", "2", and "3", accordingly. The mark is stamped on the top of the piston.

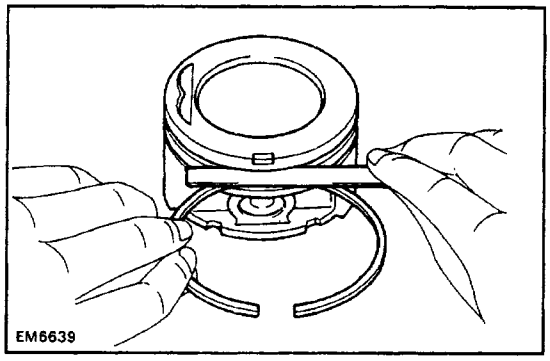


(a) Using a micrometer and with the piston upside down, measure the piston diameter at right angles to 'the piston pin hole center line, at the indicated distance from the piston head.
Distance: 33 mm (1.30 in.)

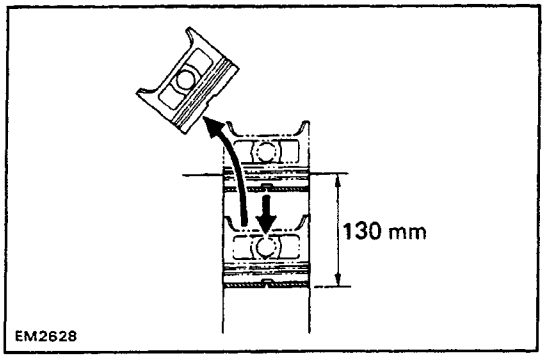
Piston diameter:
STD Mark ”
91.975 – 91.985 mm
(3.6211 – 3.6214 in.)
Mark ”2’
91.985 – 91.995 mm
(3.6214 – 3.6218 in.)
Mark ’3”
91.995 – 92.005 mm
(3.6218 – 3.6222 in.)
0/S 0.50
92.475 – 92.505 mm
(3.6407 – 3.6419 in.)
1.00
92.975 – 93.005 mm
(3.6604 – 3.6616 in.)



(b) Measure the cylinder bore diameter in thrust direc–tions (See page EG1–56) and subtract the piston di–ameter measurement from the cylinder bore diameter measurement.
Piston clearance: 0.015 – 0.035 mm
(0.0006 – 0.0014 in.)
If not within specification, replace the pistons. If necessary, rebore or replace the cylinder block.
HINT: (Use cylinder block sub–assembly)
When installing a standard piston, install one with the same mark as the standard bore diameter mark on the cylinder block.



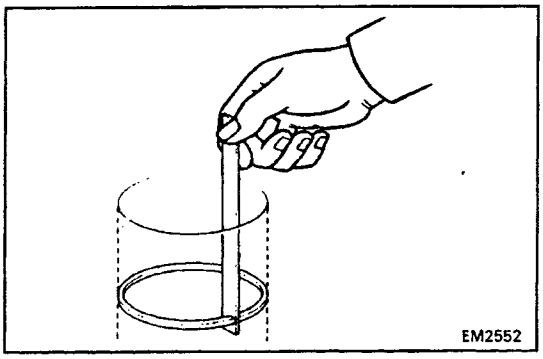
3. MEASURE CLEARANCE BETWEEN PISTON GROOVE AND PISTON RING
Using a thickness gauge, measure the clearance be–tween the piston ring and the ring land.
Standard ring groove clearance: 0.03 – 0.07 mm
(0.0012 – 0.0028 in.)
Maximum ring groove clearance: 0.2 mm (0.008 in.)
If the clearance is greater than maximum, replace the piston ring and/or piston.



4. MEASURE RING END GAP

(a) Insert the piston ring into the cylinder.

(b) Using a piston, push the ring a little beyond the bottom of the ring travel.
(130 mm (5.12 in.) from top surface of cylinder block)

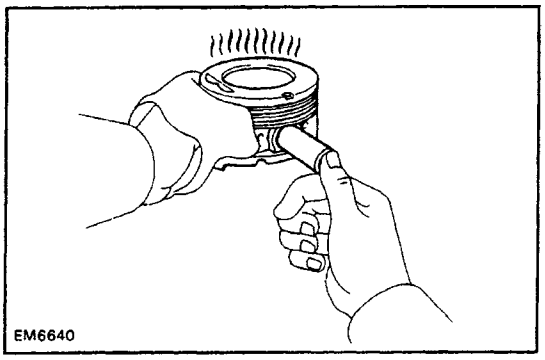


(c) Using a thickness gauge, measure the end gap.

Ring end gap:

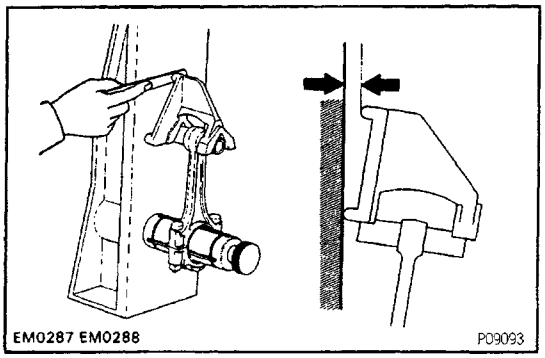
Standard No.1 0.25 – 0.47 mm
(0.0098 – 0.0185 in.)
No–2 0.60 – 0.82 mm
(0.0236 – 0.0323 in.)
Oil 0.20 – 0.57 mm
(0.0079 – 0.0224 in.)
Maximum No.1 1.07 mm (0.0421 in.)
No.2 1.42 mm (0.0559 in.)
Oil 1.17 mm (0.0461 in.)

If the gap is greater than maximum, replace the ring.
Do not file the ring end.



5. INSPECT PISTON PIN FIT

At 80•C(176• F), you should able to push the pin into the piston with your thumb.
If the pin can be installed at a lower temperature, replace it and the piston.



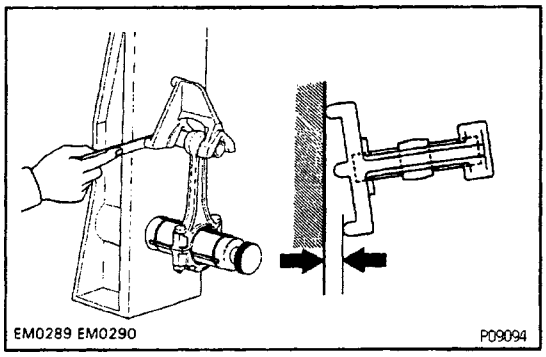
6. INSPECT CONNECTING RODS

(a) Using a rod aligner, check the connecting rod align–ment.
If the rod is bent or twisted, replace the connecting rod.

- Check that the rod is not bent.

Maximum bend:

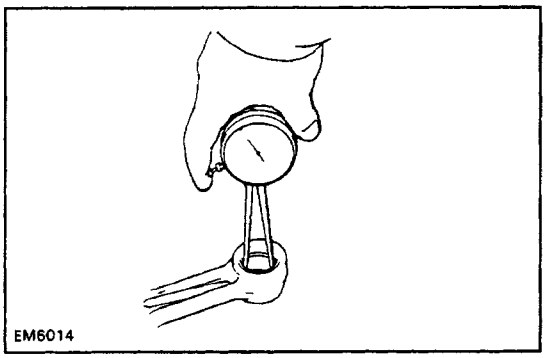
0.05 mm (0.0020 in.) per 100 mm (3.94 in.)



• Cheek that the rod is not twisted.

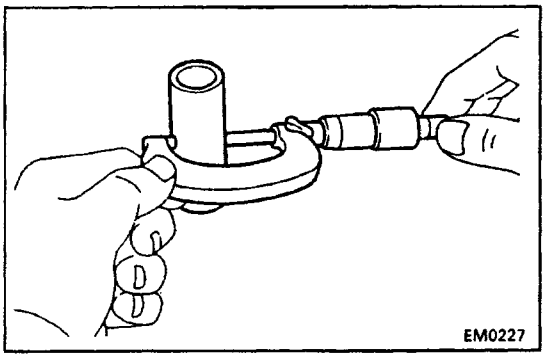
Maximum twist:

0.15 mm (0.0059 in.) per 100 mm (3.94 in.)



(b) Measure the oil clearance between the rod bushing and piston pin.

• Using an inside dial indicator, measure the inside diameter of the rod bushing.



• Using a micrometer, measure the diameter of the piston pin.
• Check that the difference between the meas–urements is less than the oil clearance limit.

Standard oil clearance: 0.005 – 0.011 mm (0.0002 – 0.0004 in.)

Maximum oil clearance: 0.015 mm (0.0006 in.)

If the clearance is greater than maximum, replace the rod bushing.

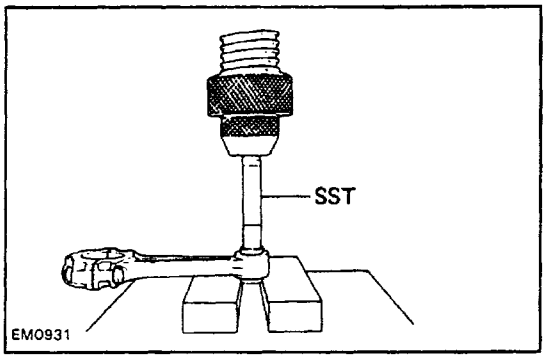
EG1VW–01

ROD BUSHING REPLACEMENT

1. REMOVE ROD BUSHING

Using SST, remove the rod bushing from the conne–cting rod.

SST 09222–30010

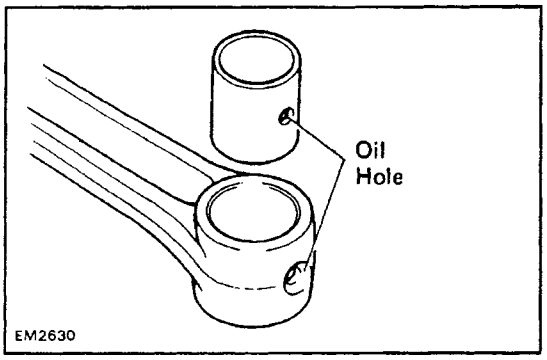


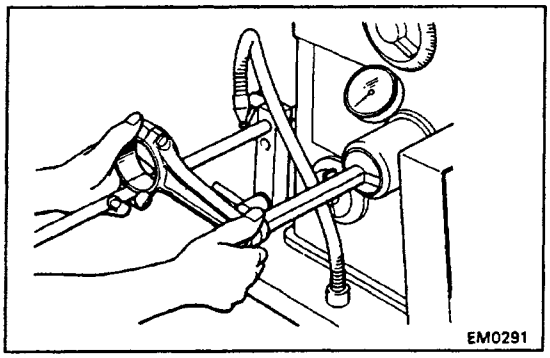
2. INSTALL NEW ROD BUSHING

Using SST, install the rod bushing to the connecting rod.

SST 09222 – 30010

HINT: Align the bushing oil hole with the connecting rod oil hole.





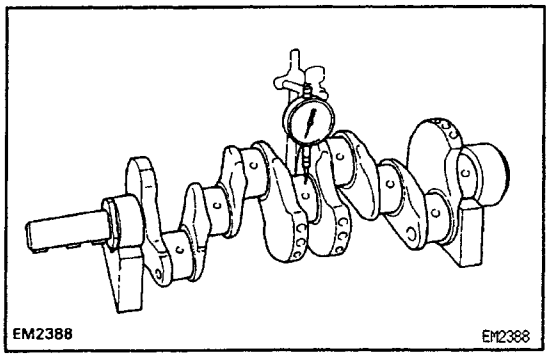
3. HONE NEW BUSHING AND CHECK PIN FIT IN CONNECTING ROD

(a) Hone the new bushing and check that the oil clearance is within standard specification.

Standard oil clearance: 0.005 – 0.011 mm (0.0002 – 0.0004 in.)

(b) Check the pin fit at the normal room temperature. Coat the pin with engine oil and push the pin into the rod with thumb pressure.

CRANKSHAFT INSPECTION AND REPAIR



1. MEASURE CRANKSHAFT FOR RUNOUT

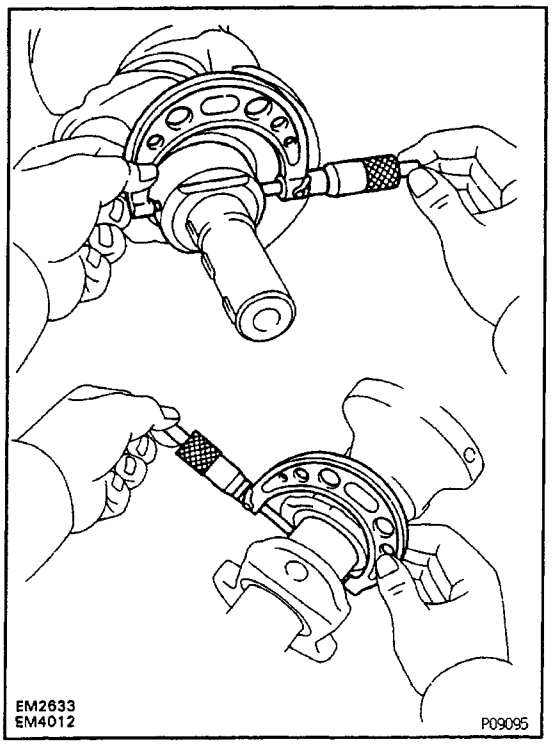
(a) Place the crankshaft on V–blocks.

(b) Using a dial gauge, measure the runout at the center journal.

Maximum circle runout: 0.1 mm (0.004 in.)

If the runout is greater than maximum, replace the crankshaft.

HINT: Use a long spindle on the dial gauge.



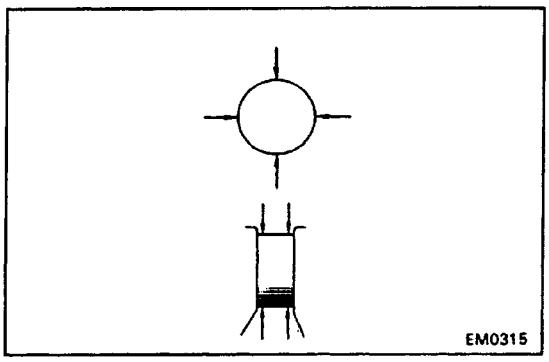
2. INSPECT MAIN JOURNALS AND CRANK PINS

(a) Using a micrometer, measure the diameter of the main journal and crank pin.

Main journal diameter: 59.984 – 60.000 mm (2.3616 – 2.3622 in.)

Crank pin diameter: 52.988 – 53.000 mm (2.0861 – 2.0866 in.)

If journals are worn, regrind or replace the crankshaft.



(b) Measure the journals for out–of–round and taper as shown.

Maximum taper: 0.01 mm (0.0004 in.)

Maximum out–of–round: 0.01 mm (0.0004 in.)

If taper and out–of–round are greater than maximum, regrind and/or replace the crankshaft.

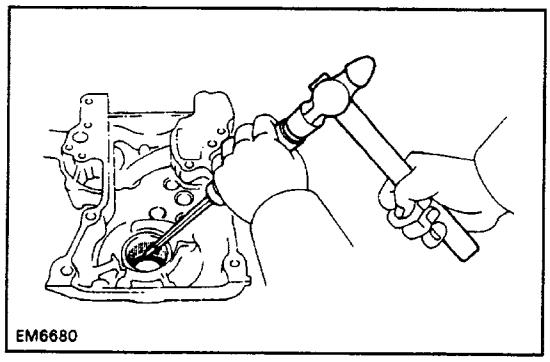
3. GRIND CRANK PIN AND/OR MAIN JOURNAL, IF NECESSARY

(a) Grind the crank pins and/or main journals to the undersized finished diameter.
Bearing size (U/S 0.25)
Main journal finished diameter:
59.701 – 59.711 mm (2.3504 – 2.3508 in.)
Crank pin finished diameter:
52.701 – 52.711 mm (2.0748 – 2.0752 in.)
(b) Install a new pin and/or main undersized bearings.

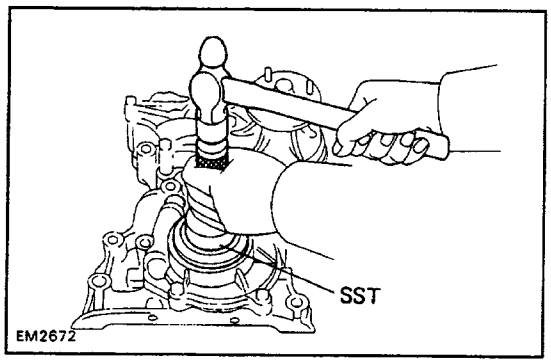
OIL SEALS REPLACEMENT

EG1VY–01

HINT: There are two ways of oil seal replacement in accordance with the timing chain cover or rear oil seal retainer condition.

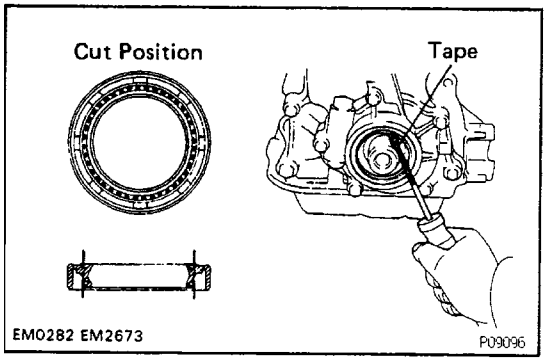

EM6680

1. IF TIMING CHAIN COVER IS REMOVED FROM CYLINDER BLOCK (Replacement of front oil seal)
(a) Using a screwdriver, remove the oil seal.



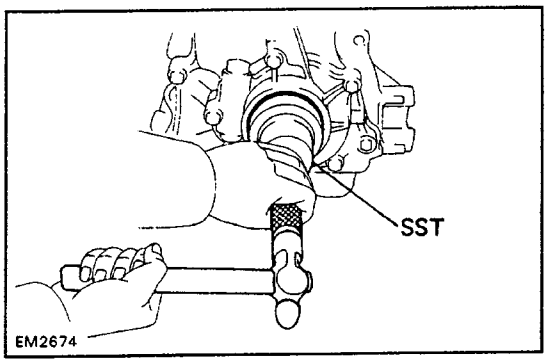
EM2672

(b) Apply MP grease to a new oil seal lip.
(c) Using SST, install the oil seal.
SST 09223–50010

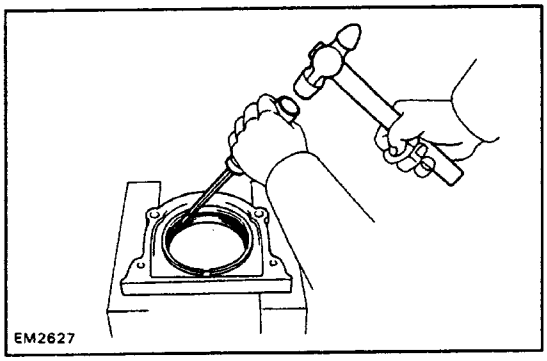


EM0282 EM2673 P09096

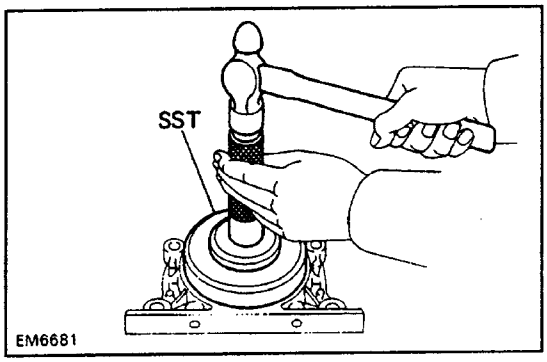
2. IF TIMING CHAIN COVER IS INSTALLED ON CYL–INDER BLOCK (Replacement of front oil seal)
(a) Using a knife, cut off the oil seal lip.
(b) Using a screwdriver, pry out the oil seal.
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



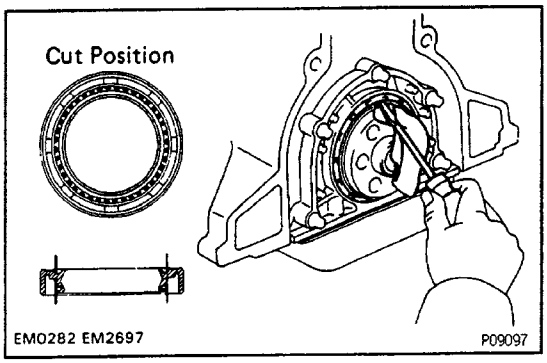
(c) Apply MP grease to a new oil seal lip.
(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the timing chain cover edge.
SST 09223 – 50010



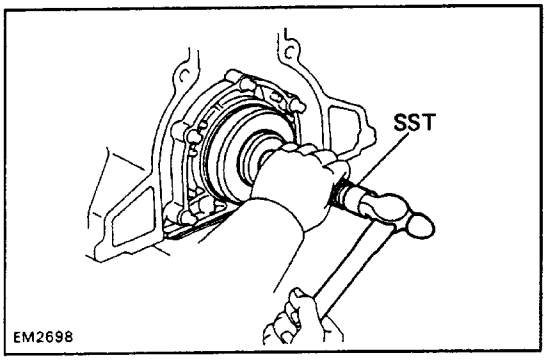
3. IF REAR OIL SEAL RETAINER IS REMOVED FROM CYLINDER BLOCK (Replacement of rear oil seal)
(a) Using a screwdriver, remove the oil seal.



(b) Apply MP grease to a new oil seal lip.
(c) Using SST, install the oil seal.
SST 09223–41020



4. IF REAR OIL SEAL RETAINER IS INSTALLED ON CYLINDER BLOCK (Replacement of rear oil seal)
(a) Using a knife, cut off lip of oil seal.
(b) Using a screwdriver, pry out the oil seal.
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.
(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223–41020

EG1VZ–01

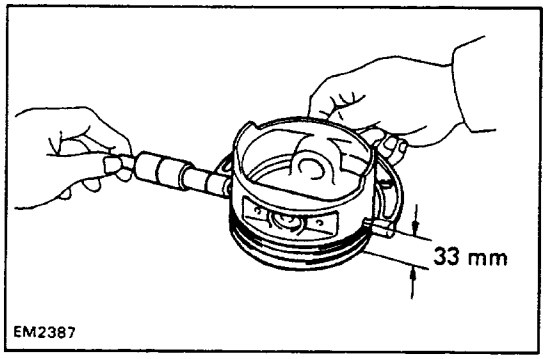
Size	Outside Diameter mm 0 n.)
O/S 0. 50	92.475 – 92.505 (3.6407 – 3.6419)
O/S 1.00	92.975 – 93.005 (3.6604 – 3.6616)

V01771

CYLINDERS BORING

1. SELECT OVERSIZED PISTON

O/S pistons with pins are available in the sizes listed. Replace pistons in matched sets. Take the largest bore measured and select the oversized piston for that bore. Bore all cylinders for the oversized piston sel–ected.



2. CALCULATE DIMENSION TO BORE CYLINDERS

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 33 mm (1.30 in.) from the piston head.

(b) Calculate the size each cylinder is to be rebored as follows:

Size to be rebored = P + C – H

P = piston diameter

C = piston clearance

0.015 – 0.035 mm (0.0006 – 0.0014 in.)

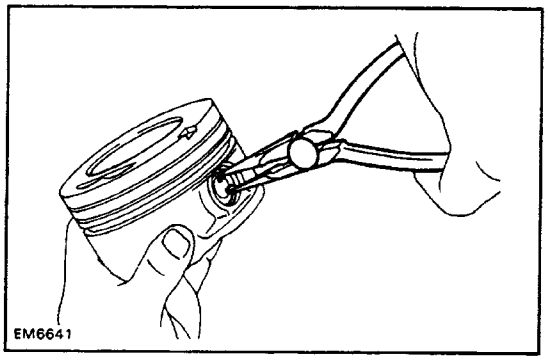
H = allowance for honing

0.02 mm (0.0008 in.) or less

3. BORE AND HONE CYLINDERS TO CALCULATED DIMENSIONS

Maximum honing: 0.02 mm (0.0008 in.)

NOTICE: Excess honing will destroy the finished round–ness.

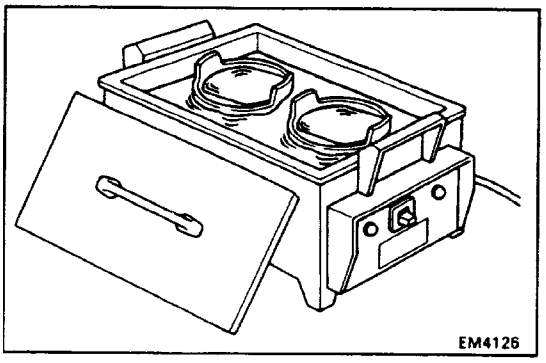


EG1WO–01

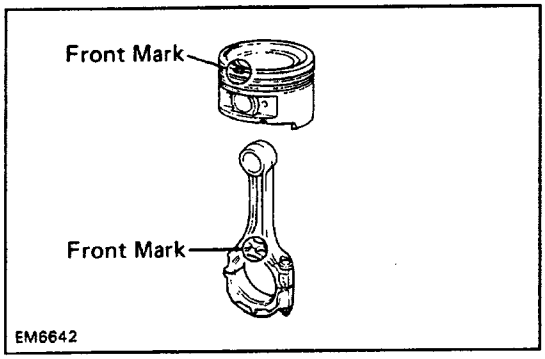
PISTON AND CONNECTING ROD ASSEMBLY

1. ASSEMBLE PISTON AND CONNECTING ROD

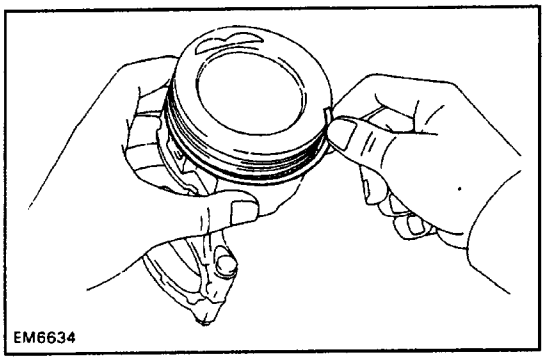
(a) Install a new snap ring on one side of the piston pin hole.



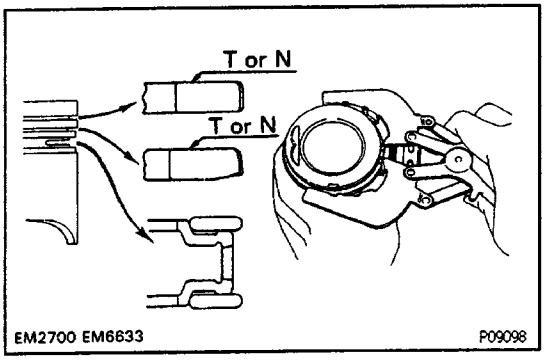
(b) Heat the piston in hot water to approx. 80•C(176•F).



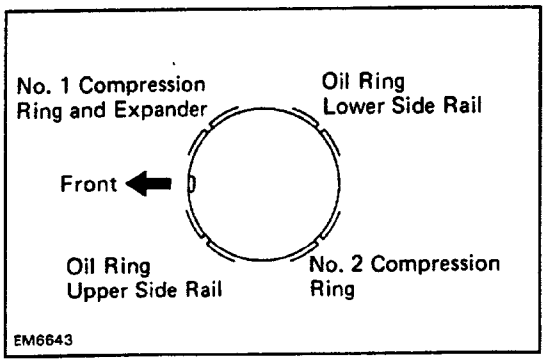
(c) Align the notch on the piston with the mark on the rod and push the piston pin in with your thumb.
(d) Install a new snap ring on the other side of the pin.



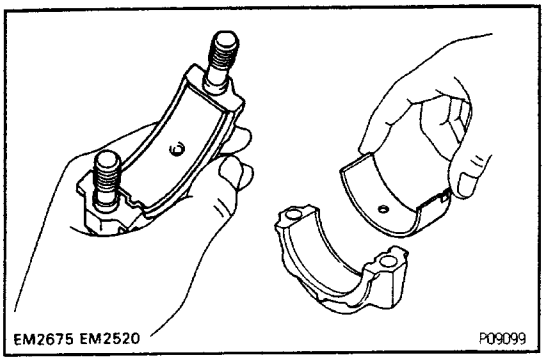
2. PLACE RINGS ON PISTON
(a) Install the oil ring expander and two side rails by hand.



(b) Using a ring expander, install the two compression rings with the code marks facing upward.



(c) Position the piston rings so that the ring end gaps are as shown.
NOTICE: Do not align the end gaps.



3. INSTALL BEARINGS
(a) Install the bearing in the connecting rod and rod cap.
(b) Lubricate the face of the bearings with engine oil.
NOTICE: Install the bearings with the oil hole in the connecting rod.

E61W1_0

INSTALLATION OF CRANKSHAFT, PISTON AND CONNECTING ROD ASSEMBLY

(See page EG1–46)

GENERAL ASSEMBLY

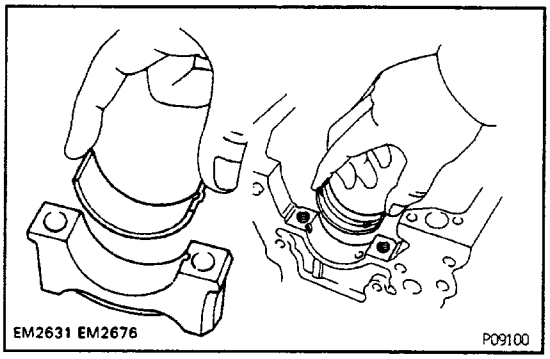
HINT:

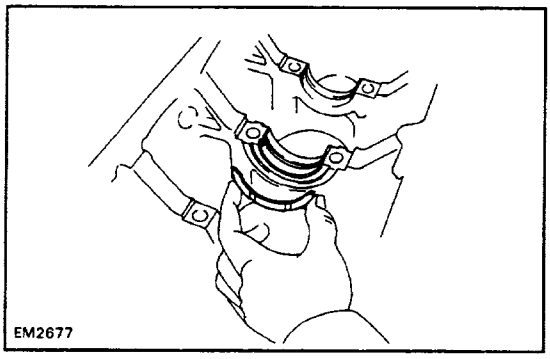
- Thoroughly clean all parts to be assembled.
- Before installing parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, 0–ring and oil seals with new parts.

1. INSTALL MAIN BEARINGS

Install the bearing in the cylinder block and bearing caps.

NOTICE: Install the upper bearing with the oil hole in the block.

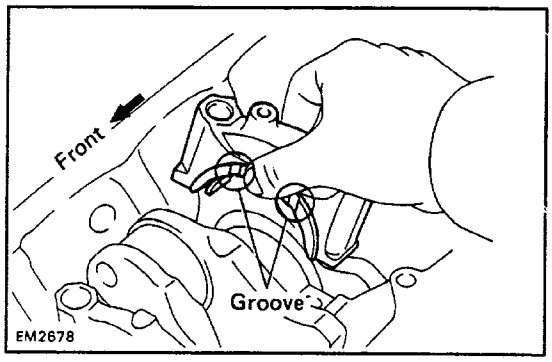




2. INSTALL UPPER THRUST WASHERS

Install the thrust washers under the No.3 main bearing cap position of the block with the oil grooves facing outward.

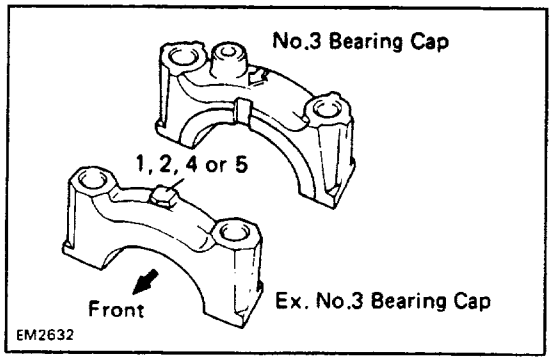
3. PLACE CRANKSHAFT ON CYLINDER BLOCK



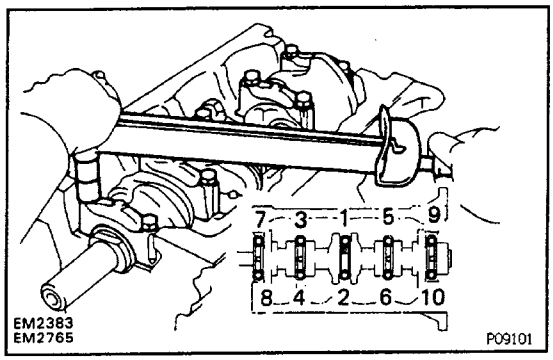
4. INSTALL MAIN BEARING CAPS WITH LOWER THRUST WASHERS

HINT: Each bearing cap is numbered.

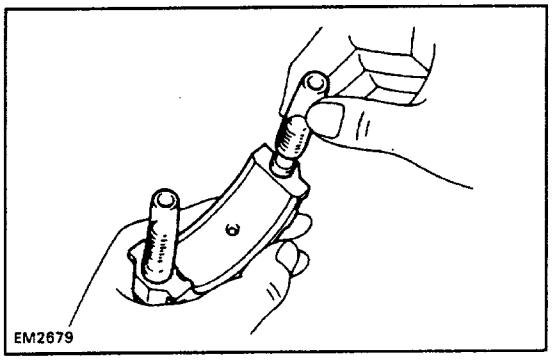
(a) Install the thrust washers on the No.3 bearing cap with the grooves facing outward.



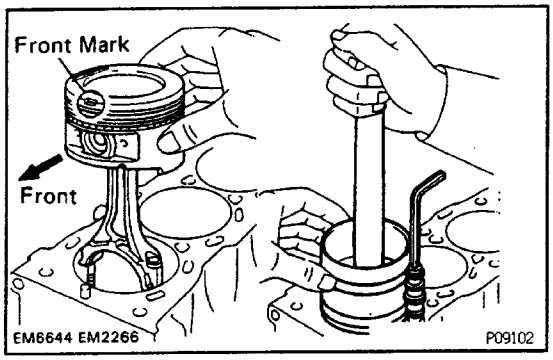
(b) Install the bearing caps in their proper locations.



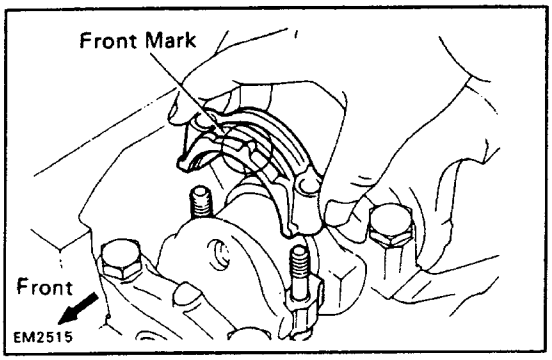
(c) Apply a light coat of engine oil on the threads and under the cap bolt heads.
(d) Install and tighten the cap bolts in two or three passes and in the sequence shown.
Torque: 103 N–m(1,050 kgf–cm, 76 ft–lbf)
(e) Check that the crankshaft turns smoothly.
(f) Check the crankshaft thrust clearance.
(See page EG1–53



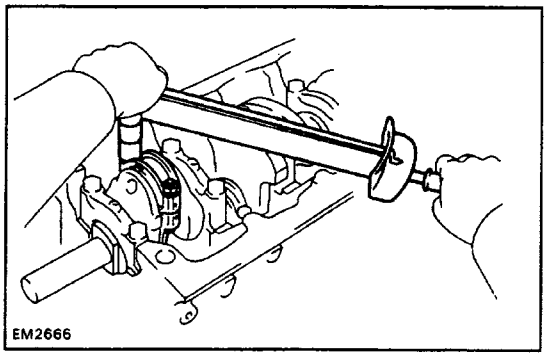
5. INSTALL PISTON AND CONNECTING ROD ASSEMBLY
(a) Cover the rod bolts with a short piece of hose to protect the crankshaft from damage.



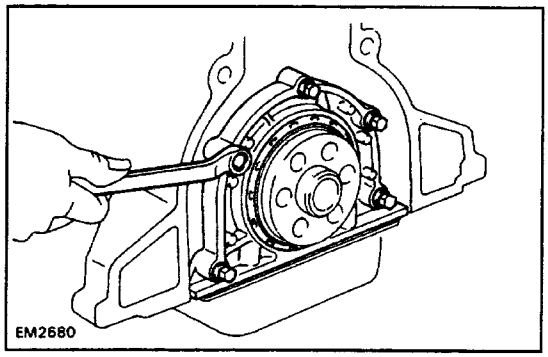
(b) Lubricate the cylinder bore and rod journal with clean engine oil.
(c) Using a ring compressor, tighten the compressor snugly but NOT tightly against the piston and gently tap the correctly numbered piston and rod assembly into its cylinders with a wooden hammer handle or like object. Make sure the notch and mark are facing forward.
HINT: If the ring compressor is wound too tightly around the piston, the bottom edge of the ring compressor will catch against the beveled surface at the top of the cylinder when tapping the piston in.



6. INSTALL CONNECTING ROD CAPS
(a) Match the numbered cap with the numbered rod.
(b) Install the cap with the front mark facing forward.



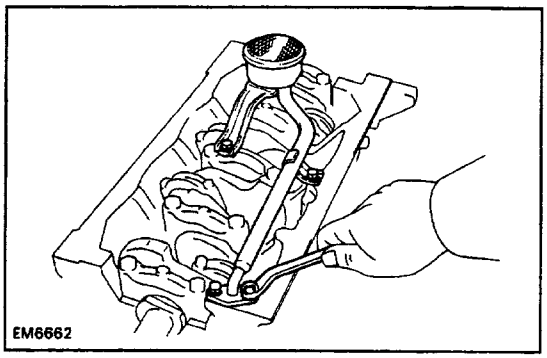
(c) Apply a light coat of engine oil on the threads and under the rod nuts.
(d) Install and tighten the rod nuts alternately and in two or three passes.
Torque: 69 N–m (700 kgf–cm, 51 ft–lbf)
(e) Check that the crankshaft turns smoothly.
(f) Check the rod thrust clearance.
(See page EG1–51)



EG1W2–01

CYLINDER BLOCK ASSEMBLY

(See page EG1–46)
1. INSTALL REAR OIL SEAL RETAINER
Install a new gasket and the retainer with the four bolts. Torque the bolts.
Torque: 18 N–m (180 kgf–cm, 13 ft–lbf)



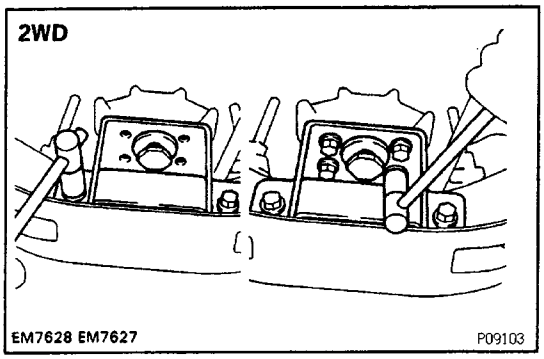
2. INSTALL OIL STRAINER
(a) Clean the oil strainer.
(b) Place the gasket in place and install the oil strainer assembly with the four bolts. Torque the bolts.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)
3. INSTALL FUEL FILTER BRACKET AND FILTER
4. INSTALL KNOCK CONTROL SENSOR
5. INSTALL OIL PRESSURE SENDER GAUGE
6. (A/T)
INSTALL FLEXIBLE HOSE CLAMP
7. INSTALL RH ENGINE MOUNTING BRACKET, CHAMBER STAY AND GROUND STRAP
8. INSTALL OIL FILTER
(See step 2 on page EG1–236)
9. INSTALL CHAIN TENSIONER
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)
10. INSTALL CHAIN DAMPERS
Torque: 22 N–m (220 kgf–cm, 16 ft–lbf)
11. INSTALL GENERATOR BRACKET AND LH ENGINE MOUNTING BRACKET
12. INSTALL TIMING CHAIN (See page EG1–43)
13. INSTALL GENERATOR
14. INSTALL CYLINDER HEAD (See page EG1–34)
15. REMOVE ENGINE STAND
16. INSTALL REAR END PLATE
17. INSTALL FLYWHEEL OR DRIVE PLATE
Install the flywheel (M / T) or spacer, drive plate, spacer (A/T) on the crankshaft with the six bolts. Torque the bolts.

Torque: M/T 108 N–m (1,100 kgf–cm, 80 ft–lbf)
A/T 83 N–m (850 kgf–cm, 61 ft–lbf)

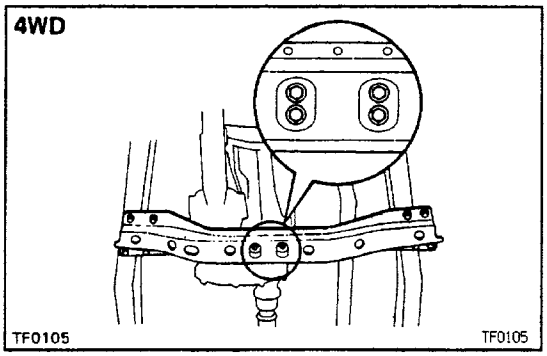
EG1W3–04

ENGINE INSTALLATION

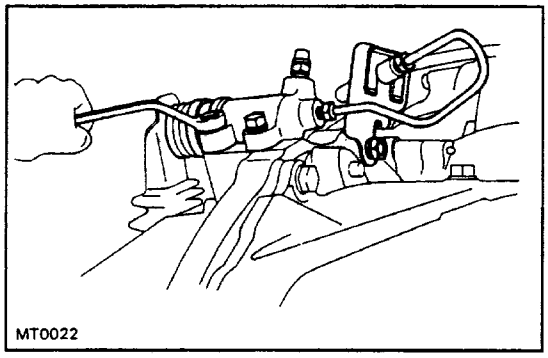
1. (M/T)
INSTALL CLUTCH DISC AND COVER TO FLY–WHEEL
(See CL section)
2. CONNECT TRANSMISSION TO ENGINE
3. PLACE ENGINE WITH TRANSMISSION IN VEHICLE
(a) Attach the engine hoist chain to the lifting brackets on the engine.
(b) Lower the engine with transmission into the engine compartment.
4. (4WD)
PLACE JACK UNDER TRANSMISSION
Be sure to put a wooden block between the jack and the transmission pan.
5. JACK UP AND PUT TRANSMISSION ONTO MEMBER
6. INSTALL ENGINE MOUNTING TO FRAME BRACK–ET
(a) Align the engine mounting and frame bracket.
(b) Install the engine mounting bolts on each side of the engine.
(c) Remove the hoist chain.
7. (2WD)
INSTALL ENGINE REAR MOUNTING AND BRACKET
(a) Raise the transmission slightly by raising the engine with a jack and a wooden block under the transmis–sion.



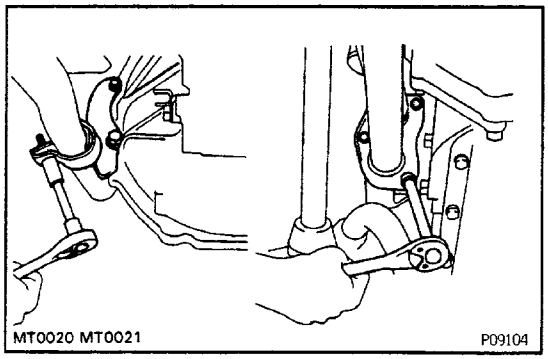
(b) Install the engine rear mounting bracket to the sup–port member. Torque the bolts.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)
(c) Lower the transmission and rest it on the extension housing.
(d) Install the bracket to the mounting. Torque the bolts.
Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)



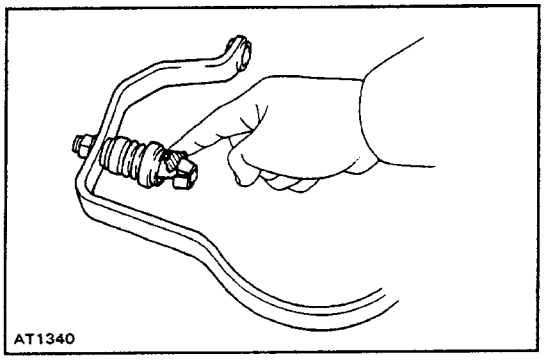
(4WD)
INSTALL NO.2 FRAME CROSSMEMBER
(a) Raise the transmission slightly with a jack.
(b) Install the No.2 frame crossmember to the side frame with the bolts. Torque the bolts
Torque: 95 N–m (970 kgf–cm, 70 ft–lbf)
(c) Lower the transmission and transfer.
(d) Install the four mounting bolts to the engine rear mounting. Torque the bolts.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)
8. (4WD)
INSTALL BRAKE TUBE HEAT INSULATOR AND NO. 1 FRONT FLOOR HEAT INSULATOR



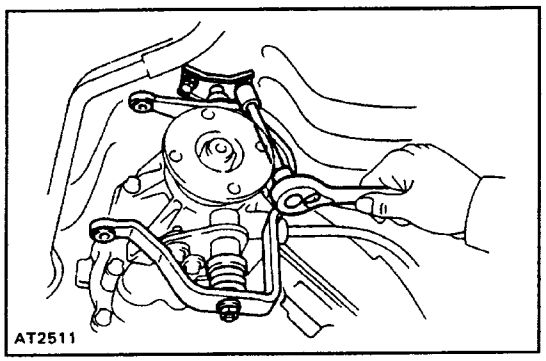
9. (M/T)
INSTALL CLUTCH RELEASE CYLINDER WITH BRACKET TO TRANSMISSION
Torque:
Bracket 39 N–m (400 kgf–cm, 28 ft–lbf)
Release cylinder 12 N–m (120 kgf–cm, 9 ft–lbf)



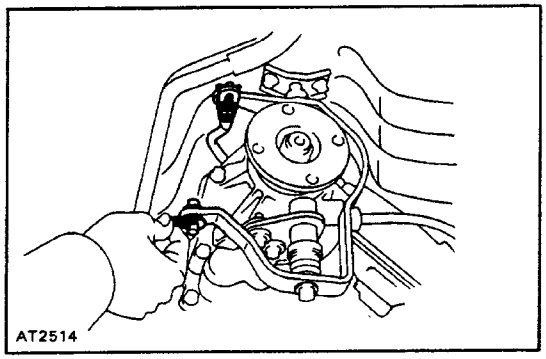
10. INSTALL EXHAUST PIPE
(a) Connect the exhaust pipe to the catalytic converter.
(b) Connect the exhaust pipe to the exhaust manifold.
(c) Install the exhaust pipe clamp.
(d) Connect the oxygen sensor connector.
11. INSTALL NO.1 FRAME CROSSMEMBER
12. (4WD)
INSTALL FRONT PROPELLER SHAFT
(See PR section)
13. (4WD)
INSTALL STABILIZER BAR
(See SA section)
14. (4WD)
INSTALL TRANSFER UNDER COVER
15. CONNECT SPEEDOMETER CABLE



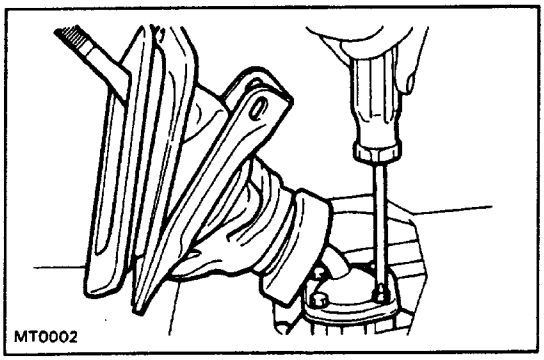
16. (4WD A/T)
CONNECT TRANSFER SHIFT LINKAGE
(a) Apply MP grease to the cross shaft joint.



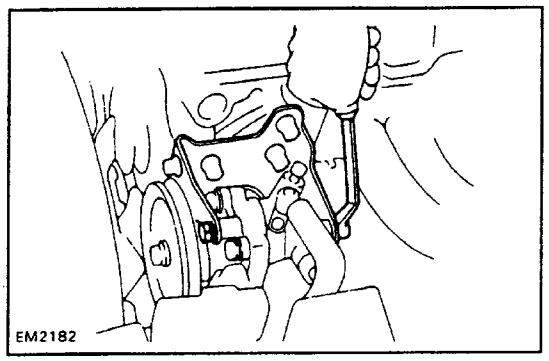
(b) Install the cross shaft to the body.



(c) Connect the No.1 and No.2 transfer shift linkage to the cross shaft.
17. (A/T)
CONNECT MANUAL SHIFT LINKAGE TO PNP SWITCH
18. INSTALL PROPELLER SHAFT
(See PR section)
19. (R150)
INSTALL SHIFT LEVER RETAINER



20. (M/T)
INSTALL SHIFT LEVER
(a) Apply MP grease to the shift lever.
(b) Instal) the shift lever to the transmission.
21. CONNECT GROUND STRAPS TO ENGINE REAR SIDE AND RH SIDE
22. (with A/C)
INSTALL COMPRESSOR TO BRACKET
(a) Install the compressor with the four bolts.
(b) Install the drive belt and adjust the belt tension.



23. CONNECT GROUND STRAP FOR PS PUMP BRA–CKET
24. (w/PS)
INSTALL PS PUMP WITH PS PUMP BRACKET
Install the PS pump with the four bolts.
25. CONNECT FOLLOWING CABLES:
(a) (A/T)
Throttle cable

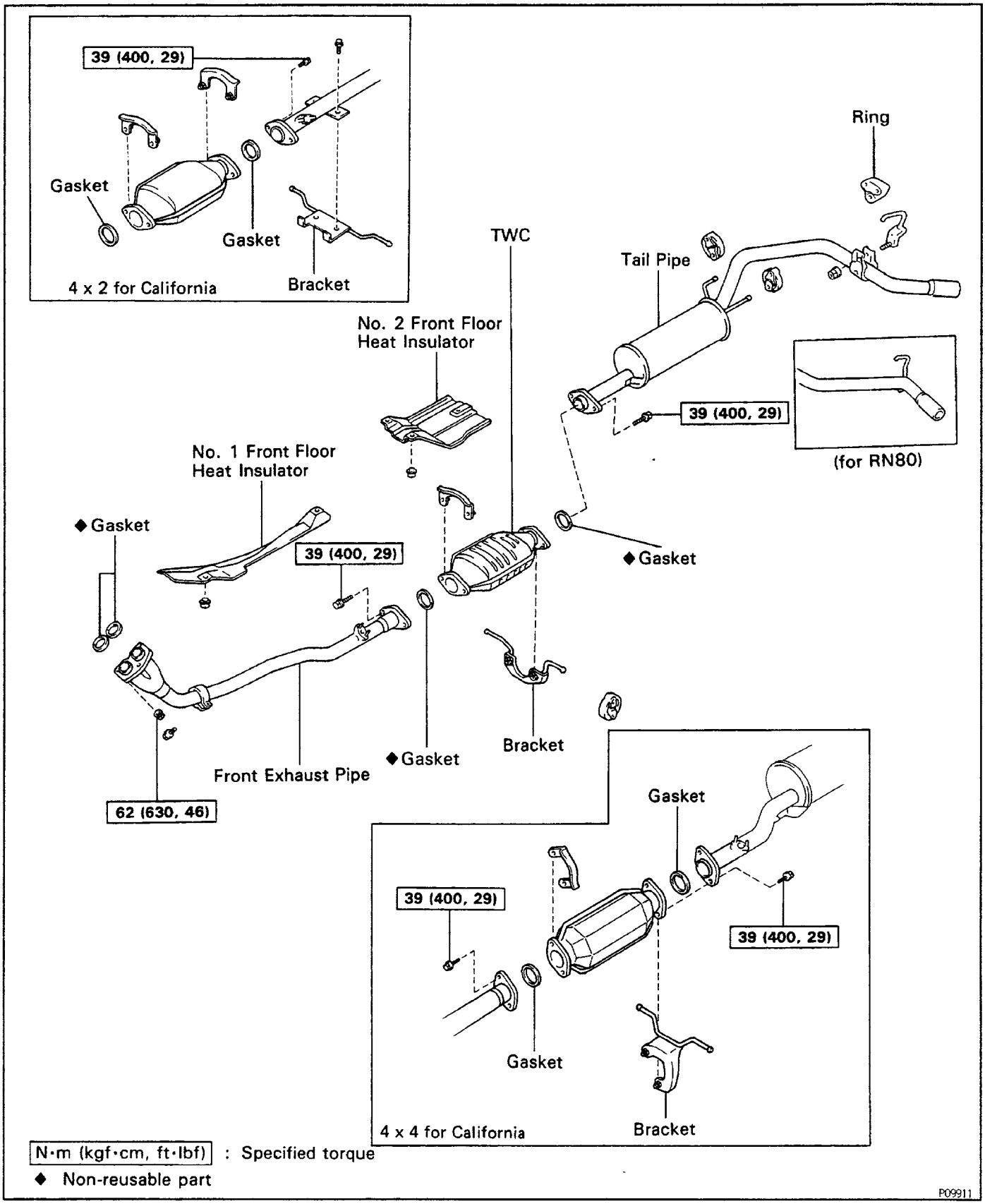
(b) (w/Cruise control)
Cruise control cable
(c) Accelerator cable
26. CONNECT FOLLOWING HOSES:
(a) Charcoal canister hose to canister
(b) (w/Cruise control)
Cruise control vacuum hose
(c) Brake booster hose
(d) PS air hoses to gas filter and air pipe
27. CONNECT FOLLOWING WIRES AND CONNEC–TORS:
(a) (with A/C)
A/C compressor connector
(b) Check connector
(c) (M/T)
Starter relay connectors
(d) ECM connectors
(e) Ground strap to engine rear side
(f) Distributor wire
(g) High–tension cords
(h) Generator wires
(i) Igniter connector
(j) Generator connector and wire
(k) Ground strap to LH fender apron
28. INSTALL FAN PULLEY, BELT GUIDE, FLUID COU–PLING AND GENERATOR DRIVE BELT
(See step 9 on page EG1–44**)**
29. (with A/C)
INSTALL A/C BELT
(see step 2 on page MA–6**)**
30. INSTALL PS PUMP AND BELT
(a) Place the PS drive belt onto each pulley.
(b) Stretch the belt tight and tighten the nuts.
(c) Torque the PS pump pulley lock nut.
Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)
(d) adjust the belt tension.
(See step 2 on page MA–6)
31. INSTALL RADIATOR
32. INSTALL AIR CLEANER CASE AND INTAKE AIR CONNECTOR
33. FILL WITH ENGINE OIL
(See step 3 on page EG1–236**)**
34. FILL WITH COOLANT
(See step 3 on page EG1–225**)**
35. INSTALL ENGINE UNDER COVER
36. INSTALL BATTERY
37. INSTALL HOOD
38. START ENGINE
Warm up the engine and inspect for leaks.

39. PERFORM ENGINE ADJUSTMENT
(See page EG1–10)
40. ROAD TEST
Road test the vehicle.
41. RECHECK COOLANT AND ENGINE OIL LEVEL

EXHAUST SYSTEM

EG1W4–01

COMPONENTS



SERVICE SPECIFICATIONS

EG1WS–01

SERVICE DATA

Compression pressure		STD	1,177 kPa	12.0 kgf/cm²	171 psi
		Limit	981 kPa	10.0 kgf/cm²	142 psi
	Difference between each cylinder		980 kPa (1.0 kgf/cm², 14 psi) or less		
Cylinder head	Head surface warpage	Limit	0.15 mm		0.0059 in.
	Manifold surface warpage	Limit	0.20 mm		0.0079 in.
	Valve seat Refacing angle	Intake	30°, 45°, 60°		
		Exhaust	30°, 45°, 65°		
		Contacting angle	45°		
		Contacting width	1.2 – 1.6 mm		0.047 – 0.063 in.
Valve guide bushing	Inner diameter	Intake	8.01 – 8.03 mm		0.3154 – 0.3161 in.
		Exhaust	8.01 – 8.03 mm		0.3154 – 0.3161 in.
	Outer diameter	STD	13.040 – 13.051 mm		0.5134 – 0.5138 in.
		O/S 0.05	13.090 – 13.101 mm		0.5154 – 0.5158 in.
	Replacing temperature (cylinder head side)		Approx. 90°C (194°F)		
Valve	Valve overall length	STD Intake	113.5 mm		4.468 in.
		Exhaust	112.4 mm		4.425 in.
	Valve face angle		44.5°		
	Stem diameter	STD Intake	7.970 – 7.985 mm		0.3138 – 0.3144 in.
		Exhaust	7.965 – 7.980 mm		0.3136 – 0.3142 in.
	Stem end refacing	Limit	0.5 mm		0.020 in.
	Stem oil clearance	STD Intake	0.025 – 0.06 mm		0.0010 – 0.0024 in.
		Exhaust	0.03 – 0.065 mm		0.0012 – 0.0026 in.
		Limit Intake	0.08 mm		0.0031 in.
		Exhaust	0.10 mm		0.0039 in.
	Valve head edge thickness	STD	1.0 mm		0.039 in.
		Limit	0.6 mm		0.024 in.
Valve spring	Free length		48.5 mm		1.909 in.
	Installed load at 40.5 mm (1.594 in.)				
		STD	294 N	30.0 kgf	66.1 lbf
		Limit	279 N	28.5 kgf	62.8 lbf
	Squareness	Limit	1.6 mm		0.063 in.
Rocker arm and shaft	Rocker arm inside diameter		16.000 – 16.018 mm		0.6299 – 0.6306 in.
	Rocker shaft diameter		15.97 – 15.99 mm		0.6287 – 0.6295 in.
	Shaft to arm oil clearance	STD	0.01 – 0.05 mm		0.0004 – 0.0020 in.
		Limit	0.08 mm		0.0031 in.
Intake, exhaust manifolds and air intake chamber	Manifold surface warpage				
	Limit Intake		0.2 mm		0.008 in.
	Exhaust		0.7 mm		0.028 in.
	Air intake chamber		0.2 mm		0.008 in.
Chain and sprocket	Crankshaft sprocket wear	Limit	59.4 mm		2.339 in.
	Camshaft sprocket wear	Limit	113.8 mm		4.480 in.

Tension and damper	Tensioner head thickness	Limit		11.0 mm	0.433 in.
	No. 1 damper wear	Limit		0.5 mm	0.020 in.
	No. 2 damper wear	Limit		0.5 mm	0.020 in.
Camshaft	Thrust clearance	STD		0.08 – 0.18 mm	0.0031 – 0.0071 in.
		Limit		0.25 mm	0.0098 in.
	Journal oil clearance	STD		0.01 – 0.05 mm	0.0004 – 0.0020 in.
		Limit		0.1 mm	0.004 in.
	Journal diameter	STD		32.98 – 33.00 mm	1.2984 – 1.2992 in.
	Circle runout	Limit		0.2 mm	0.008 in.
	Cam height	STD	Intake	42.63 – 42.72 mm	1.6783 – 1.6891 in.
			Exhaust	42.69 – 42.78 mm	1.6807 – 1.6842 in.
		Limit	Intake	42.25 mm	1.6634 in.
			Exhaust	42.30 mm	1.6654 in.
Cylinder block	Cylinder head surface warpage		Limit	0.05 mm	0.0020 in.
	Cylinder bore STD		No. 1	92.00 – 92.01 mm	3.6220 – 3.6224 in.
			No. 2	92.01 – 92.02 mm	3.6224 – 3.6228 in.
			No. 3	92.02 – 92.03 mm	3.6228 – 3.6232 in.
	Cylinder bore wear		Limit	0.02 mm	0.008 in.
	Cylinder block main journal bore				
		STD	No. 3	64.004 – 64.010 mm	2.5198 – 2.5201 in.
			No. 4	64.010 – 64.016 mm	2.5201 – 2.5203 in.
			No. 5	64.016 – 64.022 mm	2.5203 – 2.5205 in.
		U/S 0.25		64.004 – 64.022 mm	2.5198 – 2.5205 in.
Piston and piston ring	Piston diameter	STD	No. 1	91.975 – 91.985 mm	3.6211 – 3.6214 in.
			No. 2	91.985 – 91.995 mm	3.6214 – 3.6218 in.
			No. 3	91.995 – 92.005 mm	3.6218 – 3.6222 in.
		O/S 0.50		92.475 – 92.505 mm	3.6407 – 3.6419 in.
		O/S 1.00		92.975 – 93.005 mm	3.6604 – 3.6616 in.
	Piston to cylinder clearance			0.015 – 0.035 mm	0.0006 – 0.0014 in.
	Ring to ring groove clearance				
		STD		0.03 – 0.07 mm	0.0012 – 0.0028 in.
		Limit		0.2 mm	0.008 in.
	Piston ring end gap	STD	No. 1	0.25 – 0.47 mm	0.0098 – 0.0185 in.
			No. 2	0.60 – 0.82 mm	0.0236 – 0.0323 in.
			Oil	0.20 – 0.57 mm	0.0079 – 0.0224 in.
		Limit	No. 1	1.07 mm	0.0421 in.
			No. 2	1.42 mm	0.0559 in.
			Oil	1.17 mm	0.0461 in.
	Piston pin installing temperature			80°C	176°F
Connecting rod and bearing	Thrust clearance	STD		0.16 – 0.26 mm	0.0063 – 0.0102 in.
		Limit		0.3 mm	0.012 in.
	Bearing oil clearance	STD		0.025 – 0.055 mm	0.0010 – 0.0022 in.
		Limit		0.10 mm	0.0039 in.

Connecting rod and bearing (cont'd)	Big end inner diameter	STD	A	56.000 – 56.006 mm	2.2047 – 2.2050 in.
			B	56.006 – 56.012 mm	2.2050 – 2.2052 in.
			C	56.012 – 56.018 mm	2.2052 – 2.2054 in.
		U/S 0.25		56.000 – 56.018 mm	2.2047 – 2.2054 in.
	Connecting rod bearing center wall thickness				
		STD	A	1.484 – 1.488 mm	0.0584 – 0.0586 in.
			B	1.488 – 1.492 mm	0.0586 – 0.0587 in.
			C	1.492 – 1.496 mm	0.0587 – 0.0589 in.
		U/S 0.25		1.626 – 1.636 mm	0.0640 – 0.0644 in.
	Pin to bushing oil clearance				
		STD		0.005 – 0.011 mm	0.0002 – 0.0004 in.
		Limit		0.015 mm	0.0006 in.
	Rod bend per 100 mm (3.94 in.)				
		Limit		0.05 mm	0.0020 in.
	Rod twist per 100 mm (3.94 in.)				
		Limit		0.15 mm	0.0059 in.
Crankshaft	Thrust clearance	STD		0.02 – 0.22 mm	0.0008 – 0.0087 in.
		Limit		0.3 mm	0.012 in.
	Thrust washer thickness	STD		2.690 – 2.740 mm	0.1059 – 0.1079 in.
		O/S 1.25		2.753 – 2.803 mm	0.1084 – 0.1104 in.
		O/S 2.50		2.815 – 2.865 mm	0.1108 – 0.1128 in.
	Main journal oil clearance	STD		0.025 – 0.055 mm	0.0010 – 0.0022 in.
		Limit		0.08 mm	0.0031 in.
	Main journal diameter	STD		59.984 – 60.000 mm	2.3616 – 2.3622 in.
	Main journal finished diameter				
		U/S 0.25		59.701 – 59.711 mm	2.3504 – 2.3508 in.
	Main bearing center wall thickness				
	STD		No. 3	1.988 – 1.992 mm	0.0783 – 0.0784 in.
			No. 4	1.992 – 1.996 mm	0.0784 – 0.0786 in.
			No. 5	1.996 – 2.000 mm	0.0786 – 0.0787 in.
		U/S 0.25		2.216 – 2.136 mm	0.0837 – 0.0841 in.
	Crank pin diameter	STD		52.988 – 53.000 mm	2.0861 – 2.0866 in.
	Crank pin finished diameter				
	U/S 0.25			52.701 – 52.711 mm	2.0748 – 2.0752 in.
	Circle runout Limit			0.1 mm	0.004 in.
	Main journal taper and out–of–round				
	Limit			0.01 mm	0.0004 in.
	Crank pin journal taper and out–of round				
	Limit			0.01 mm	0.0004 in.

EG1W6–01

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Cylinder head x Cylinder head cover	5.9	60	52 in.·lbf
Cylinder head x Camshaft bearing cap	20	200	14
Cylinder head x Spark plug	18	180	13
Cylinder head x Intake manifold	19	195	14
Cylinder head x No. 1 secondary air injection manifold	13	130	9
Cylinder head x EGR valve	13	130	9
Cylinder head x Exhaust manifold	44	450	33
Cylinder head x Cylinder head rear cover	13	130	9
Cylinder block x Cylinder head	78	800	58
Cylinder block x Chain damper	22	220	16
Cylinder block x Chain tensioner	19	195	14
Cylinder block x Engine mounting	39	400	29
Cylinder block x Rear oil seal retainer	18	180	13
Cylinder block x Fuel filter bracket	19	195	14
Oil cooler relief valve x Cylinder block	69	700	51
Cylinder block x Crankshaft bearing cap	103	1,050	76
Cylinder block x Oil strainer	13	130	9
Cylinder block x Oil pan	13	130	9
Cylinder block x Engine mounting bracket	44	400	33
Valve clearance adjusting screw	25	250	18
Camshaft x Distributor drive gear	78	800	58
Crankshaft pulley x No. 2 crankshaft pulley	19	195	14
Air intake chamber x EGR pipe	13	130	9
Air intake chamber x Intake manifold	19	195	14
Air intake chamber x Accelerator control cable bracket	13	130	9
Intake manifold x Water outlet	19	195	14
Intake manifold x PAIR valve	13	130	9
No. 1 secondary air injection manifold x PAIR valve	13	130	9
No. 1 secondary air injection manifold x No. 2 secondary air injection manifold	13	130	9
Exhaust manifold x No. 2 exhaust manifold heat insulator	19	195	14
Exhaust manifold x No. 2 secondary air injection manifold			
10 mm bolt	44	450	33
8 mm bolt	22	220	16
Connecting rod x Connecting rod cap	69	700	51
Crankshaft x Crankshaft pulley	157	1,600	116
Crankshaft x Flywheel	108	1,100	80
Crankshaft x Drive plate	83	850	61
Oil pan x Drain plug	25	250	18

EMISSION CONTROL SYSTEMS

SYSTEM PURPOSE

System	Abbreviation	Purpose
Positive crankcase ventilation	PCV	Reduces blow–by gas (HC)
Fuel evaporative emission control	EVAP	Reduces evaporative HC
Exhaust gas recirculation	EG R	Reduces NOx
Pulsed secondary air injection	PAIR	Reduces HC and CO
Three –way catalytic converter	TWC	Reduces HC CO and NOx
Multiport fuel injection *	MFI	Regulates all engine conditions for reduction of exhaust emissions.

Remark: *For inspection and repair of the MFI system,refer to the MFI section this manual.

PREPARATION

EG05U–01

SST (SPECIAL SERVICE TOOLS)

09843–18024 Diagnosis Check Wire 	

EG05V–01

RECOMMENDED TOOLS

09082–00015 TOYOTA Electrical Tester 	

EG05W–05

EQUIPMENT

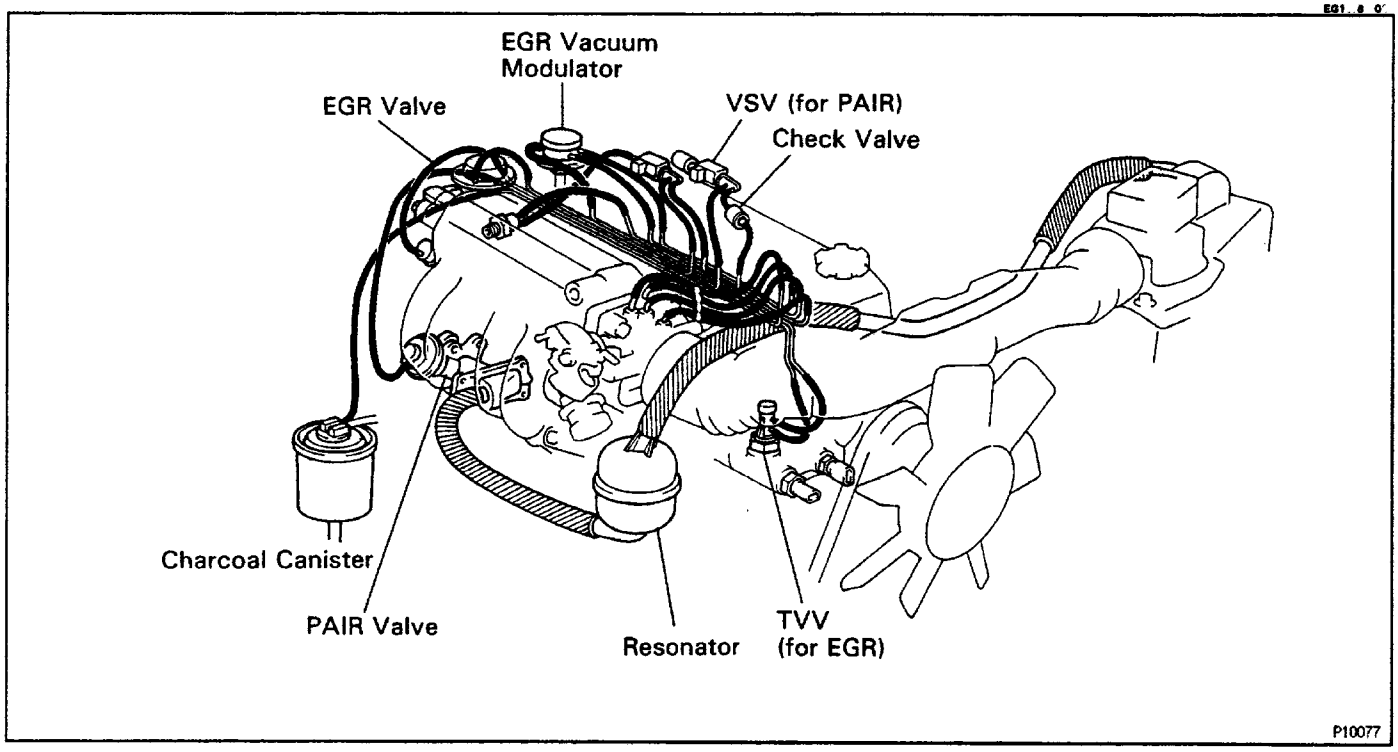
Heater	TVV
Thermometer	TVV
Tachometer	
Torque wrench	
Vacuum gauge	

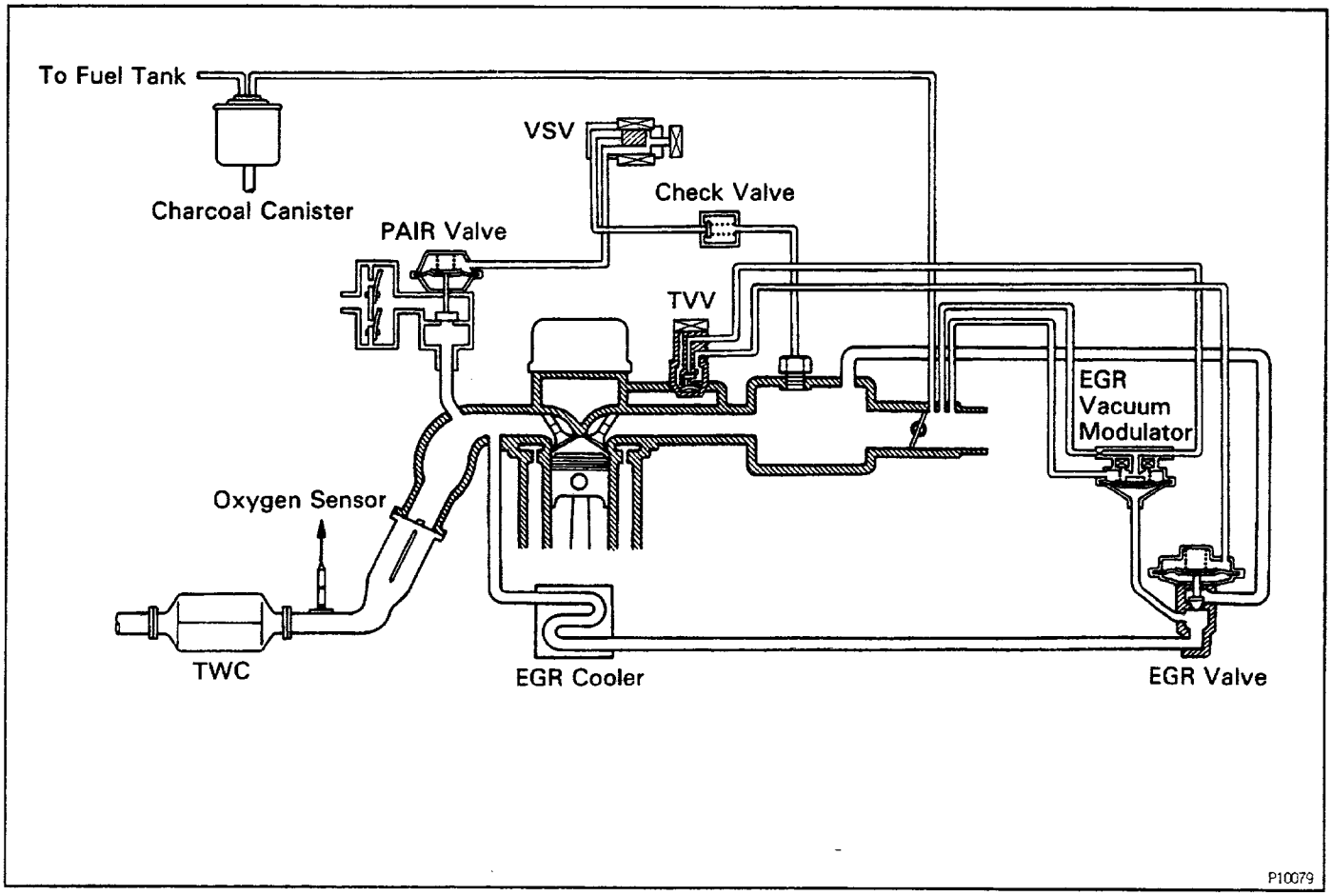
EG05X–05

SSM (SPECIAL SERVICE MATERIALS)

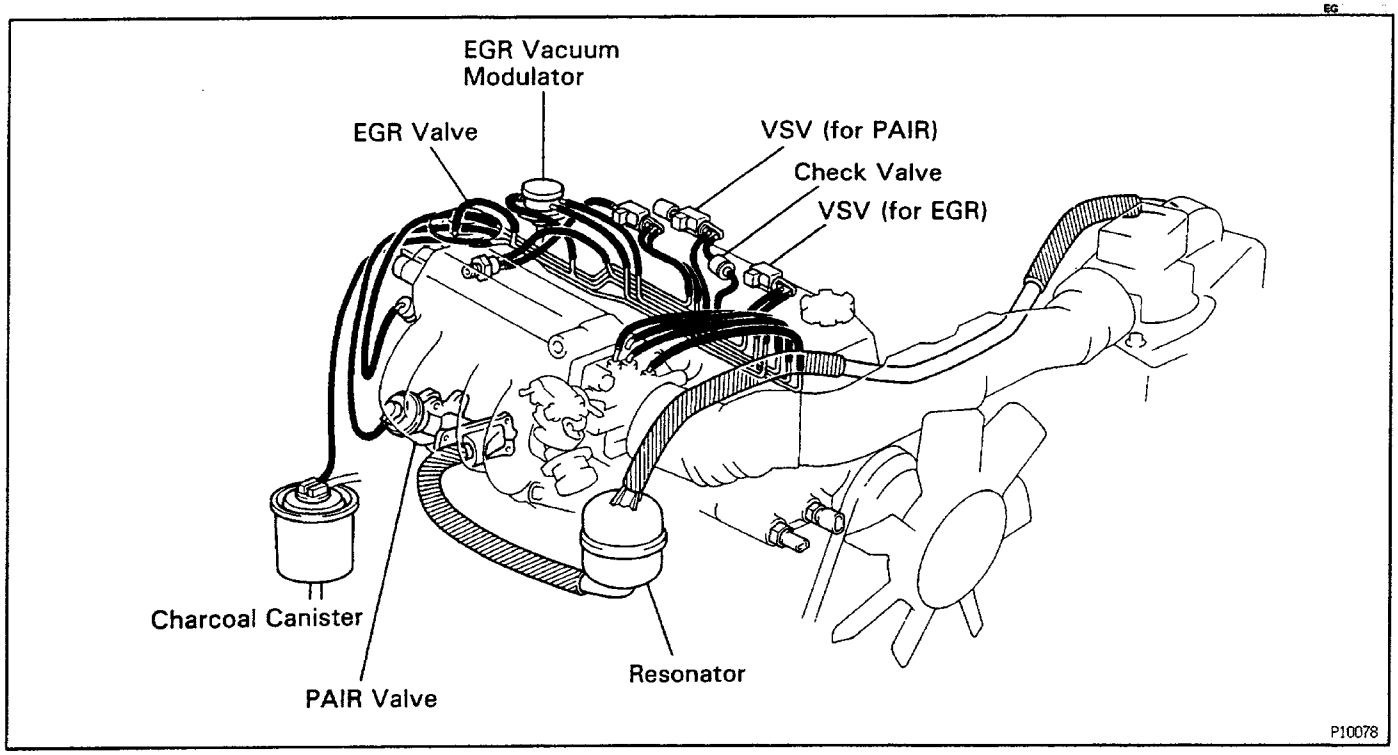
08833–00070 Adhesive 1324, THREE BOND 1324 or equivalent	TVV

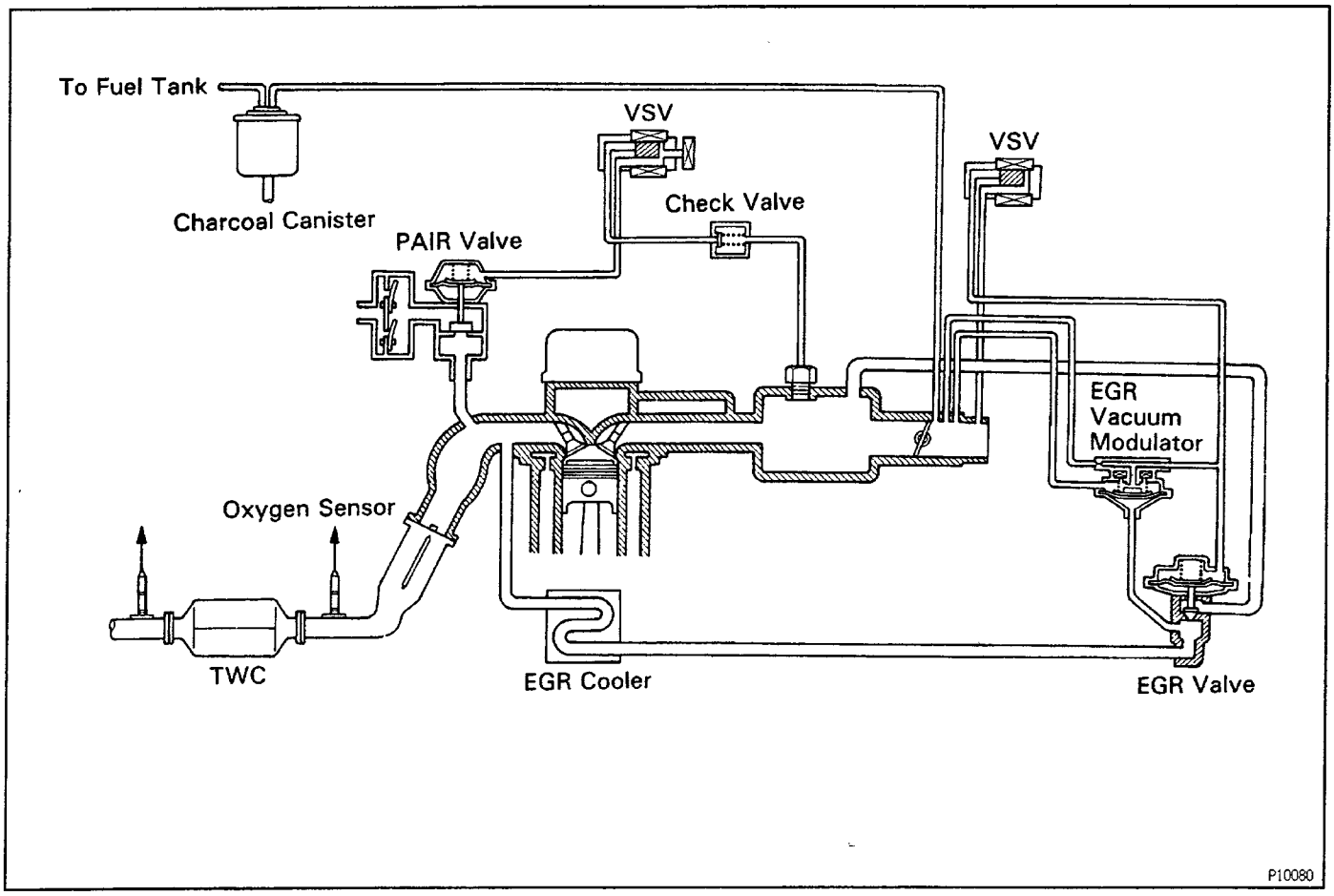
LAYOUT AND SCHEMATIC DRAWING (Federal and Canada)





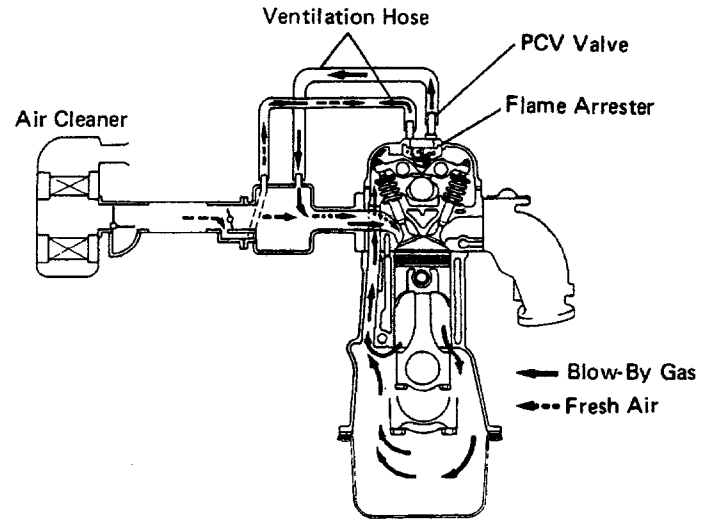
LAYOUT AND SCHEMATIC DRAWING (Calif.)





POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

EG1WA–01

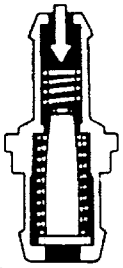


EC2572

To reduce HC emission, crankcase blow-by gas (HC) is routed through the PCV valve to the intake manifold for combustion in the cylinders.

Engine not Running or Backfiring

Intake Manifold Side

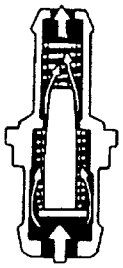


Cylinder Head Side

EC1001

- PCV VALVE IS CLOSED.

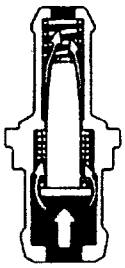
Normal Operation



EC1002

- PCV VALVE IS OPEN.
- VACUUM PASSAGE IS LARGE.

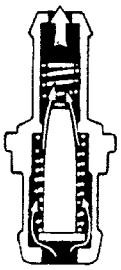
Idling or Decelerating



EC1003

- PCV VALVE IS OPEN.
- VACUUM PASSAGE IS SMALL.

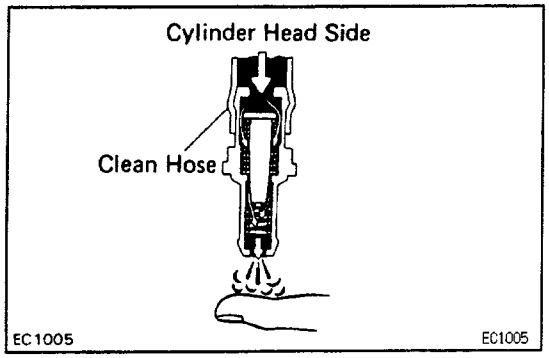
Acceleration or Heavy Load



EC1004

- PCV VALVE IS FULLY OPEN.

V01772



EG1WB–01

PCV VALVE INSPECTION

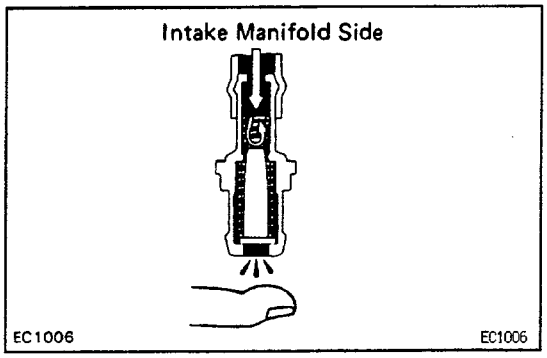
1. REMOVE PCV VALVE

2. ATTACH CLEAN HOSE TO PCV VALVE

3. BLOW AIR FROM CYLINDER HEAD SIDE

Check that air passes through easily.

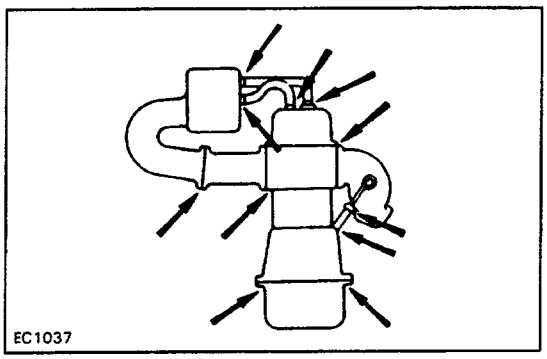
NOTICE:Do not suck air through the valve. Petroleum substances inside the valve are harmful.



4. BLOW AIR FROM INTAKE MANIFOLD SIDE

Check that air passes through with difficulty. If the PCV valve fails either check, replace it.

5. REINSTALL PCV VALVE



EG1WC–01

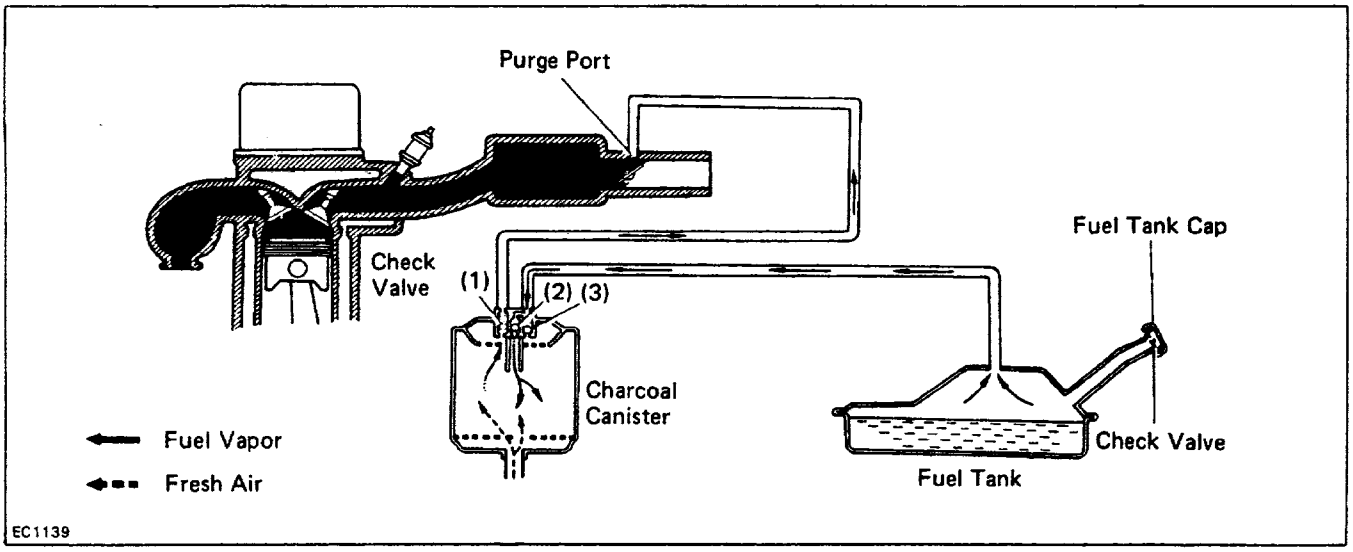
PCV HOSES AND CONNECTIONS INSPECTION

VISUALLY INSPECT HOSES,CONNECTIONS AND GASKETS

Check for cracks,leaks or damage.

EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM

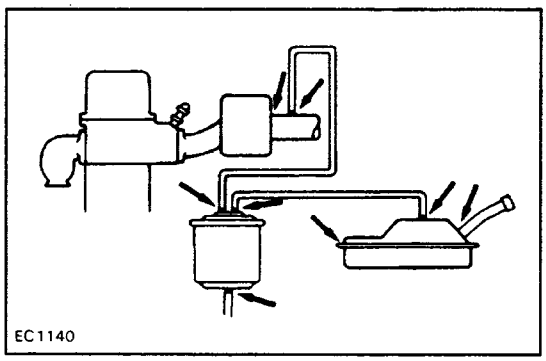
EG1WD–01



To reduce HC emission, evaporated fuel from the fuel tank is routed through the charcoal canister to the throttle body for combustion in the cylinders.

Throttle Valve Opening	Check Valve in Charcoal Canister			Check Valve in Fuel Tank Cap	Evaporated Fuel (HC)
	(1)	(2)	(3)		
Positioned below purge port	CLOSED	—			HC from tank is absorbed in the canister.
Positioned above purge port	OPEN		—		HC from canister is led into throttle body.
High pressure in tank		OPEN	CLOSED	CLOSED	HC from tank is absorbed in the canister.
High vacuum in tank	—	CLOSED	OPEN	OPEN	(Air is led into the tank.)

V01773



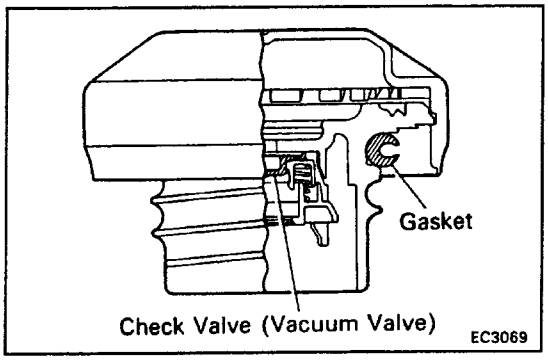
INSPECTION OF FUEL VAPOR LINES,FUEL TANK AND TANK CAP

1. VISUALLY INSPECT LINES AND CONNECTIONS

Look for loose connections,sharp bends or damage.

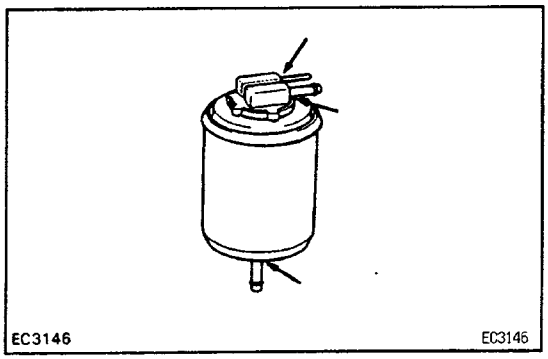
2. VISUALLY INSPECT FUEL TANK

Look for deformation,cracks or fuel leakage.



3. VISUALLY INSPECT FUEL TANK CAP

Look for a damaged or deformed gasket and cap. If necessary, repair or replace the cap.



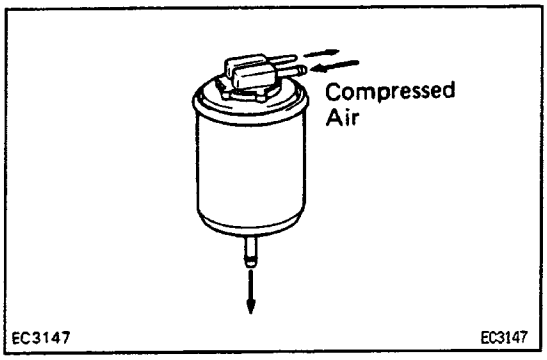
CHARCOAL CANISTER INSPECTION

EG1WF–01

1. REMOVE CHARCOAL CANISTER

2. VISUALLY INSPECT CHARCOAL CANISTER CASE

Look for cracks or damage.

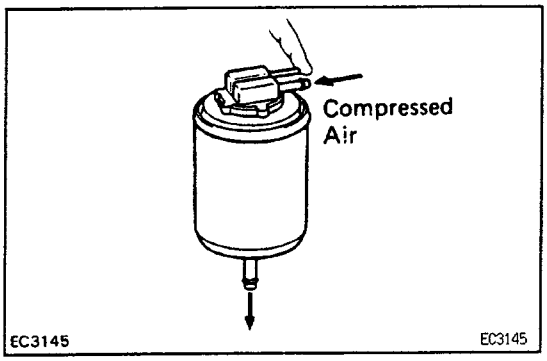


3. CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE

(a) Using low pressure compressed air,blow air into the tank pipe and check that the air flows without re–sistance from the other pipes.

(b) Blow into the purge pipe and check that the air does not flow from the other pipes.

If a problem is found, replace the charcoal canister.



4. CLEAN FILTER IN CANISTER

Clean the filter by blowing 294 kPa(3 kgf/cm^2,43psi) of compressed air into the tank pipe, while holding the purge pipe closed.

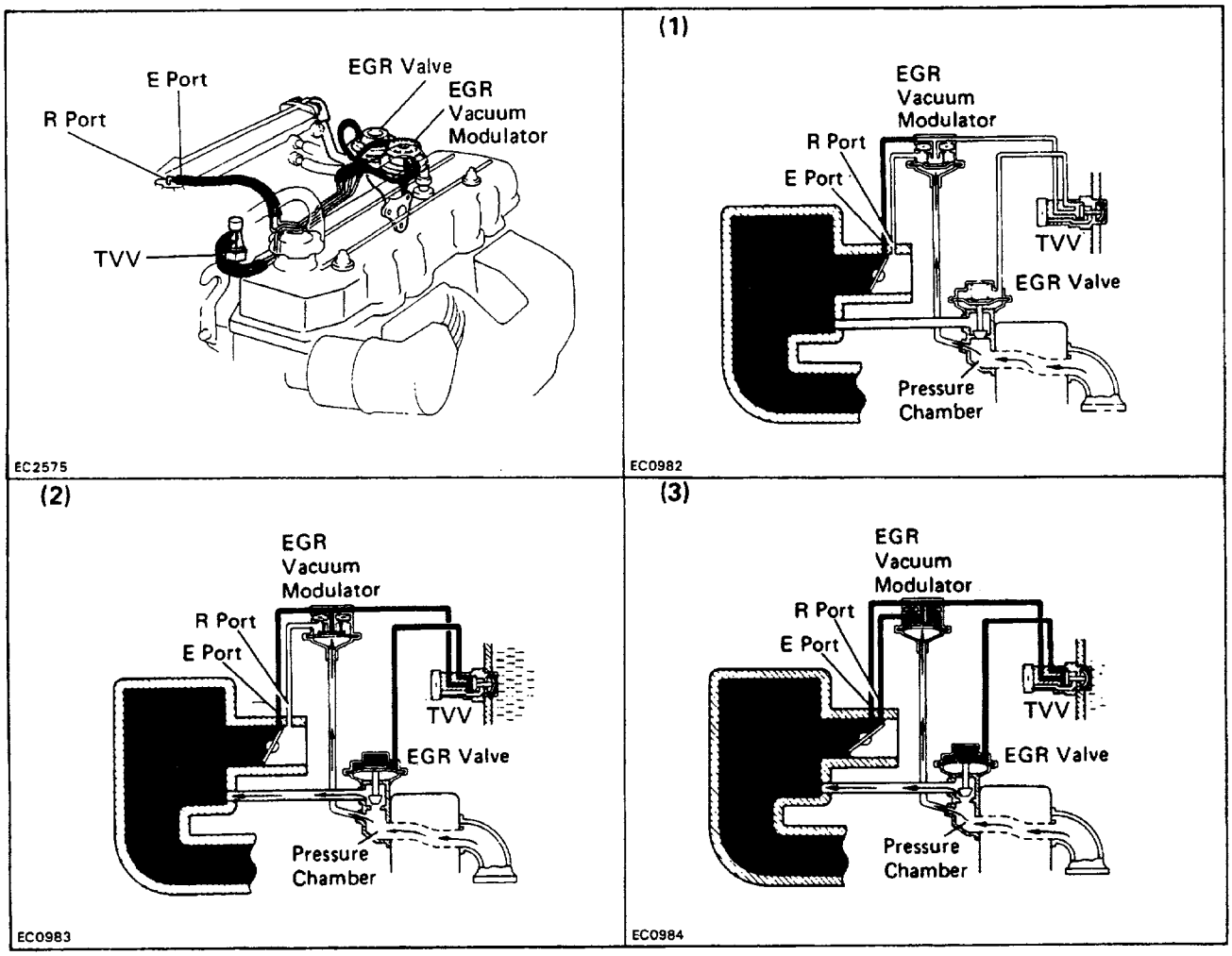
HINT:

- Do not attempt to wash the canister.
- No activated carbon should come out.

5. INSTALL CHARCOAL CANISTER

EXHAUST GAS RECIRCULATION (EGR) SYSTEM (Federal and Canada)

EG1WG–01



To reduce NOx emission, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

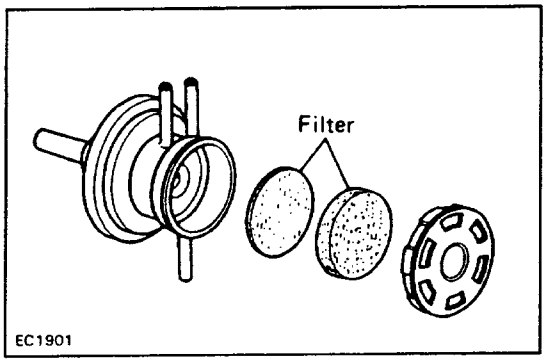
Coolant Temp.	TVV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 30°C (86°F)	CLOSED	—	—		—	CLOSED	Not recirculated
Above 44°C (111°F)	OPEN	Positioned below E port	—		—	CLOSED	Not recirculated
		Positioned between E port and R port	(1) LOW	*Pressure constantly alternating between low and high	OPENS passage to atmosphere	CLOSED	Not recirculated
			(2) HIGH		CLOSES passage to atmosphere	OPEN	Recirculated
		Positioned above R port	(3) HIGH	**	CLOSES passage to atmosphere	OPEN	Recirculated (increase)

Remarks: * Pressure increases→Modulator closes→EGR valve opens→Pressure drops ——┐
↑—— EGR valve closes←Modulator opens←——┘

**When the throttle valve is positioned above the R port, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the EGR gas, even if the exhaust pressure is insufficiently low.

V01774

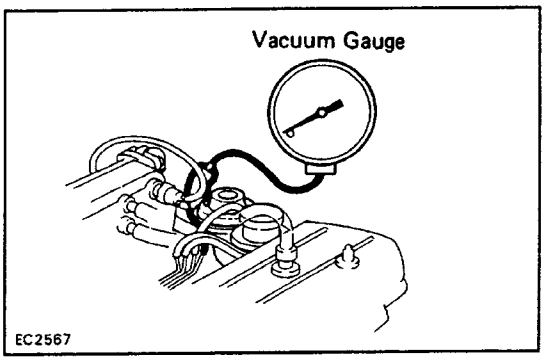
EG1WN–01



EGR SYSTEM INSPECTION

1. CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR

(a) Check the filter for contamination or damage.
(b) Using compressed air,clean the filter.

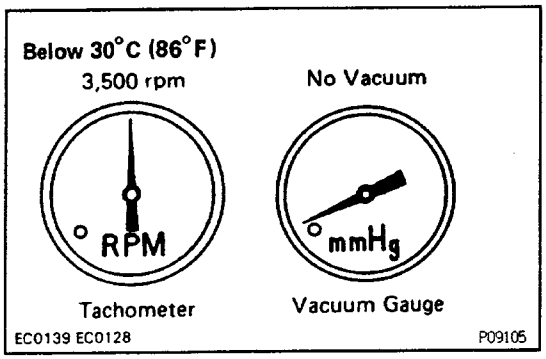


2. PREPARATION

Disconnect the vacuum hose from the EGR valve and, using a three way union,connect a vacuum gauge to it.

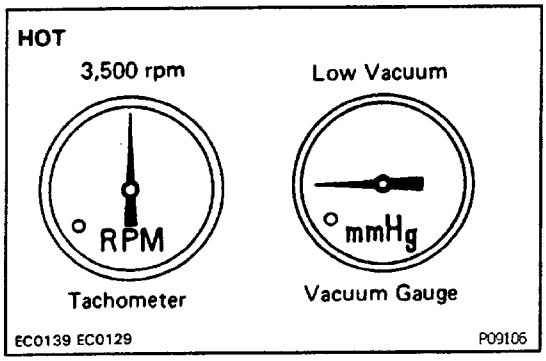
3. CHECK SEATING OF EGR VALVE

Start the engine and check that the engine starts and runs at idle.



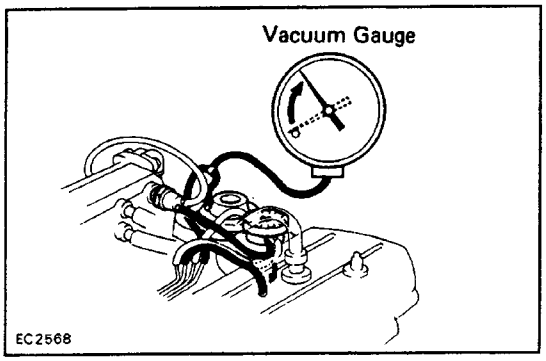
4. CHECK TVV WITH COLD ENGINE

(a) The coolant temperature should be below 30•C(86•F).
(b) Check that the vacuum gauge indicates zero at 3.500 rpm.

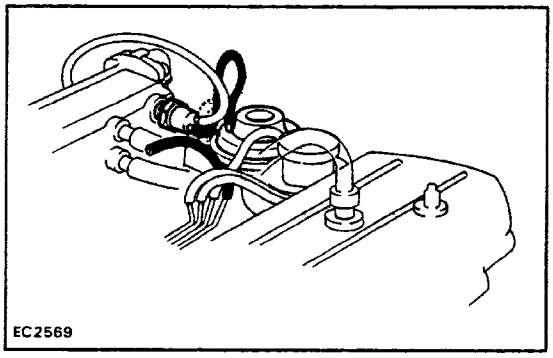


5. CHECK TVV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine.
(b) Check that the vacuum gauge indicates low vacuum at 3,500 rpm.



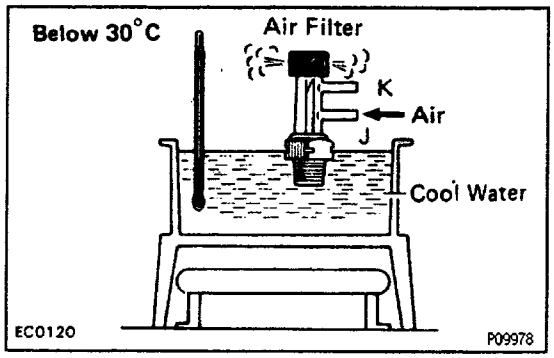
(c) Disconnect the vacuum hose from R port of the EGR vacuum modulator and connect R port directly to the intake manifold with another hose.
(d) Check that the vacuum gauge indicates high vacuum at 3,000 rpm.
HINT: As a large amount of EGR gas enters, the engine will misfire slightly at this time.
(e) Disconnect the vacuum gauge and reconnect the vacuum hoses to the proper locations.



6. CHECK EGR VALVE

(a) Apply vacuum directly to the EGR valve with the engine idling.
(b) Check that the engine runs rough or dies.
(c) Reconnect the vacuum hoses to the proper locations.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART

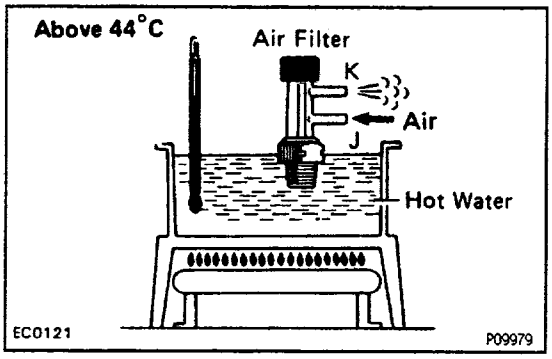


TVV INSPECTION

EG1WJ–01

CHECK TVV BY BLOWING AIR INTO PIPE

(a) Drain the coolant from the radiator into a suitable container.
(b) Remove the TVV.
(c) Cool the TVV to below 30 •C(86•F).
(d) Check that the air flows from pipe J to the air filter.

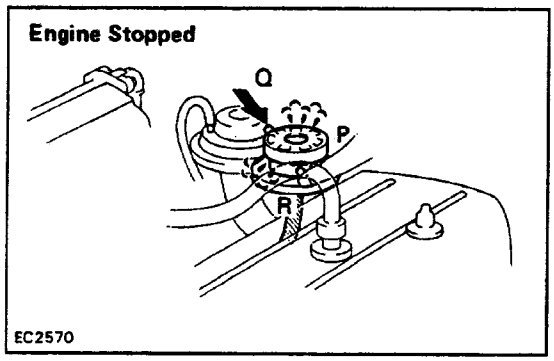


(e) Heat the TVV to above 44 •C(111 • F).
(f) Check that the air flows from pipe J to pipe K.
(g) Apply sealant to the threads of the TVV and reinstall.

Sealant: Part No. 08833–00070, THREE BOND 1324 or equivalent

(h) Fill the radiator with coolant.

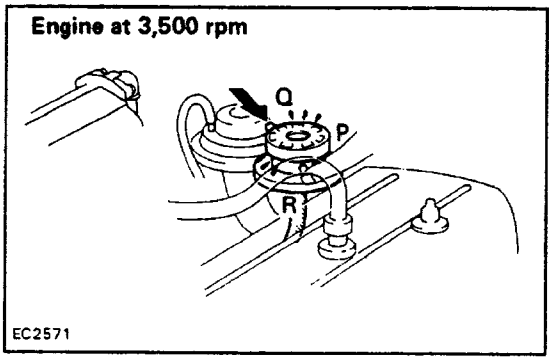
If a problem is found, replace the TVV.



EGR VACUUM MODULATOR INSPECTION

CHECK EGR VACUUM MODULATOR OPERATION

(a) Disconnect the vacuum hoses from ports, Q and R of the EGR vacuum modulator.
(b) Plug ports P and R with your finger.
(c) Blow air into Q. Check that the air passes through to the air filter side freely.
(d) Start the engine and maintain the speed at 3,500 rpm.



(e) Repeat the above test. Check that there is a strong resistance to air flow.
(f) Reconnect the vacuum hoses to the proper locations.

EG1WL–01

EGR VALVE INSPECTION

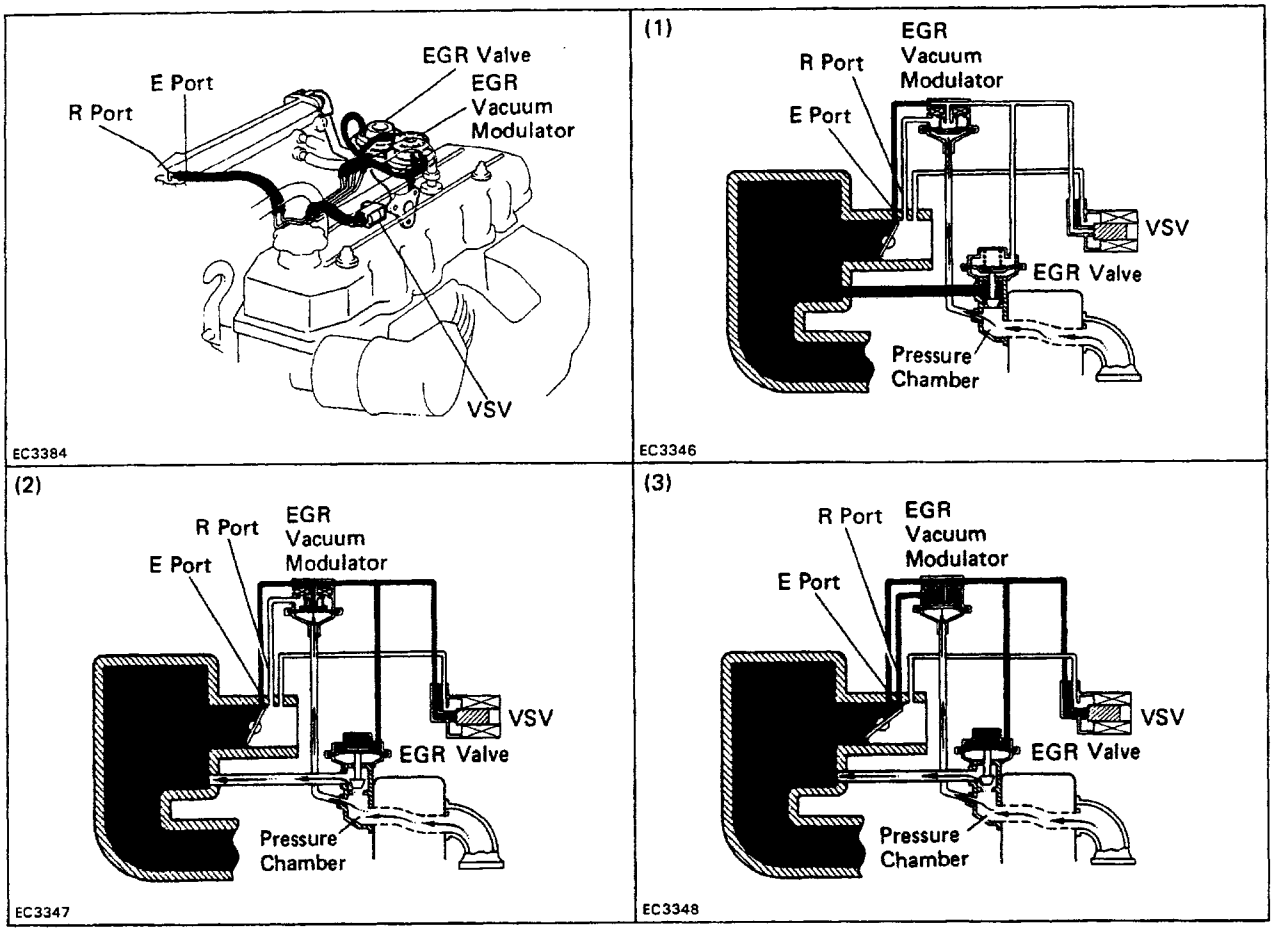
1. REMOVE EGR VALVE

Check the valve for sticking and heavy carbon deposits. If a problem is found, replace it.

2. INSTALL EGR VALVE WITH NEW GASKET

EXHAUST GAS RECIRCULATION (EGR) SYSTEM (Calif.)

EG1WM–01



To reduce NOx emission, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

Coolant Temp.	Driving Condition	VSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 34°C (93°F)	—	ON	—	—		—	CLOSED	Not recirculated
Above 40°C (104°F)	Low load	ON	—	—		—	CLOSED	Not recirculated
	Heavy load, etc.	OFF	Positioned below E port	—		—	CLOSED	Not recirculated
			Positioned between E port and R port	(1) LOW	*Pressure constantly alternating between low and high	OPENS passage to atmosphere	CLOSED	Not recirculated
				(2) HIGH		CLOSES passage to atmosphere	OPEN	Recirculated
			Positioned above R port	(3) HIGH	**	CLOSES passage to atmosphere	OPEN	Recirculated (increase)

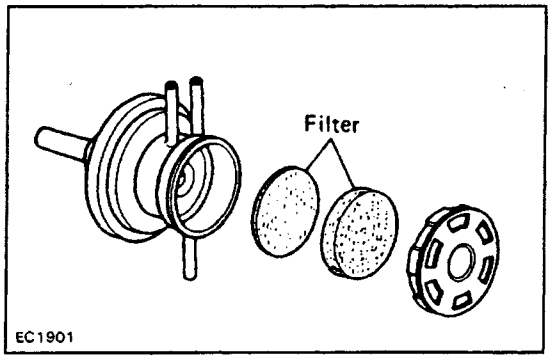
Remarks: * Pressure increases→Modulator closes→EGR valve opens→Pressure drops
↑ EGR valve closes←Modulator opens←

**When the throttle valve is positioned above the R port, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the EGR gas, even if the exhaust pressure is insufficiently low.

V01775

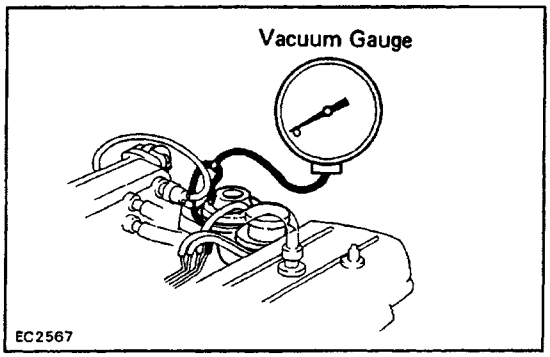
EG1WN–01

EGR SYSTEM INSPECTION



1. CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR

(a) Check the filter for contamination or damage.
(b) Using compressed air, clean the filter.

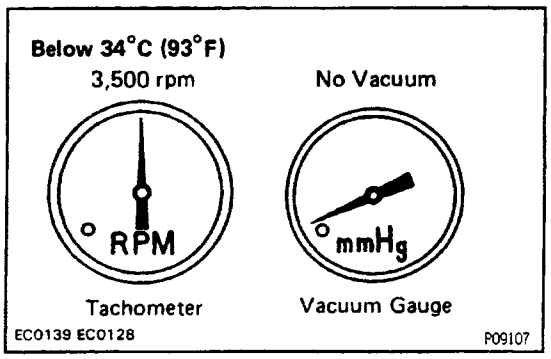


2. PREPARATION

Disconnect the vacuum hose from the EGR valve, and using a three way union, connect a vacuum gauge to it.

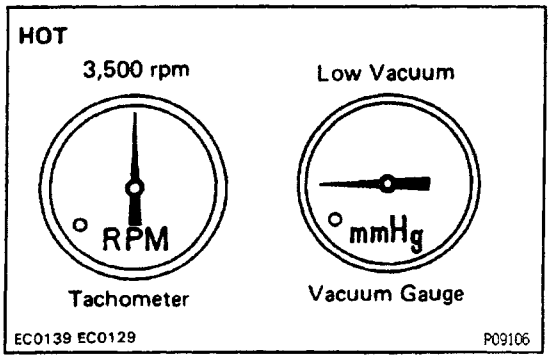
3. CHECK SEATING OF EGR VALVE

Start the engine and check that the engine starts and runs at idle.



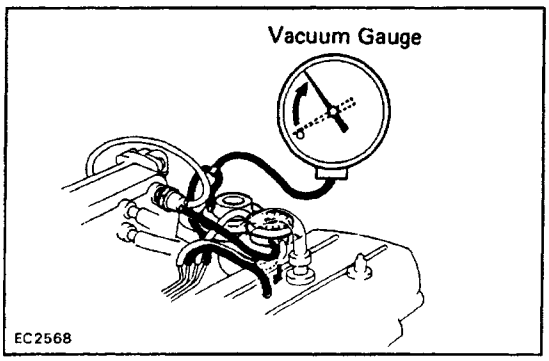
4. CHECK VSV WITH COLD ENGINE

(a) The coolant temperature should be below 34 •C (93• F).
(b) Check that the vacuum gauge indicates zero at 3,500 rpm.



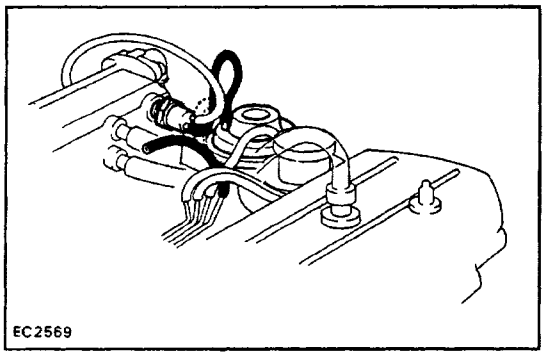
5. CHECK VSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine.
(b) Check that the vacuum gauge indicates low vacuum at 3,500 rpm.



(c) Disconnect the vacuum hose from R port of the EGR vacuum modulator and connect R port directly to the intake manifold with another hose.
(d) Check that the vacuum gauge indicates high vacuum at 3,000 rpm.

HINT: As a large amount of EGR gas enters, the engine will misfire slightly at this time.
(e) Disconnect the vacuum gauge and reconnect the vacuum hoses to the proper locations.


EC2569

6. CHECK EGR VALVE

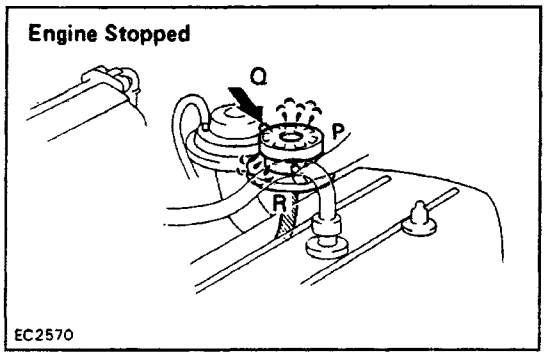
(a) Apply vacuum directly to the EGR valve with the engine idling.
(b) Check that the engine runs rough or dies.
(c) Reconnect the vacuum hoses to the proper locations.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART

EGR VACUUM MODULATOR INSPECTION

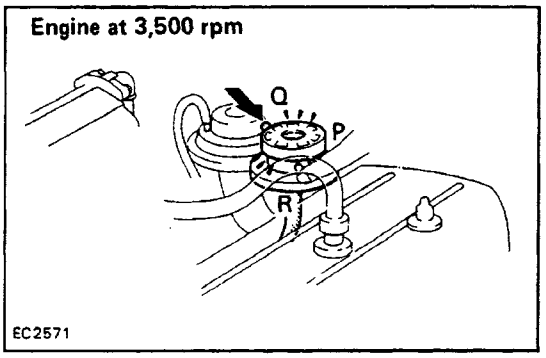
CHECK EGR VACUUM MODULATOR OPERATION

(a) Disconnect the tow vacuum hoses from ports P, Q and R of the EGR vacuum modulator.
(b) Plug ports P and R with your finger.
(c) Blow air into port Q. Check that the air passes through to the air filter side freely.



EC2570

(d) Start the engine and maintain the speed at 3,500 rpm.
(e) Repeat the above test. Check that there is a strong resistance to air flow.
(f) Reconnect the vacuum hoses to the proper locations.



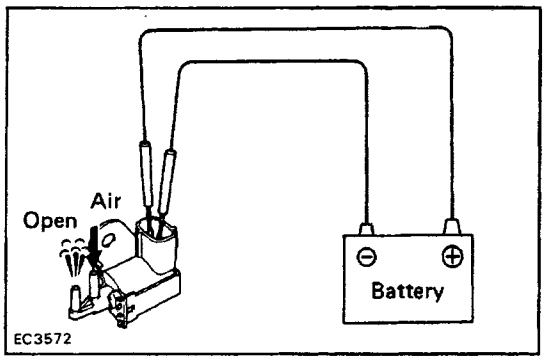
EC2571

EG1WQ–01

VSV INSPECTION

1. CHECK VACUUM CIRCUIT CONTINUITY IN THE VSV BY BLOWING AIR INTO PIPE

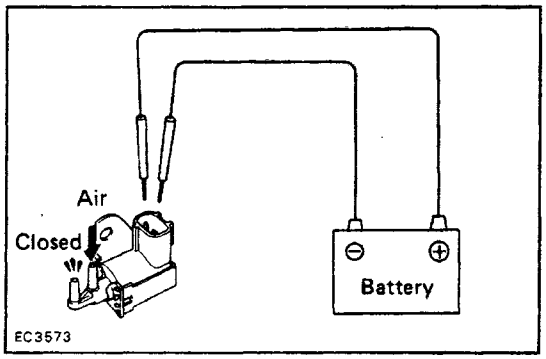
(a) Connect the VSV terminals to the battery terminals as illustrated.
(b) Blow air into a pipe and check that the VSV is open.



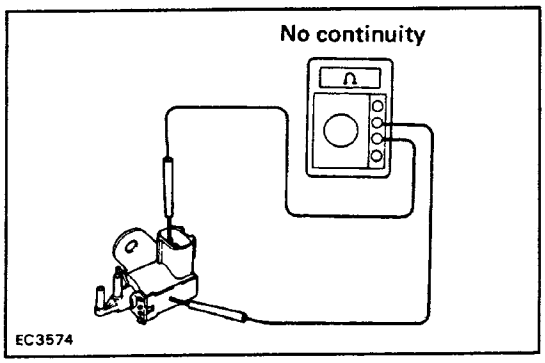
EC3572

(c) Disconnect the battery.
(d) Blow air into a pipe and check that VSV is closed.

If a problem is found, replace the VSV.

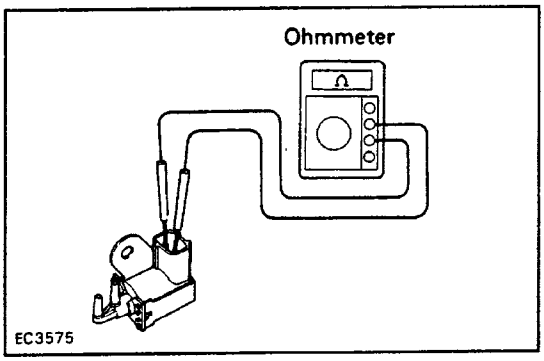


EC3573



2. CHECK FOR SHORT CIRCUIT

Using an ohmmeter, check that there is no continuity between the terminals and the VSV body.



3. CHECK FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between the terminals.

Specified resistance: 30 – 50 Ω at 20• C(68• F)

If the resistance is not within specification, replace the VSV.

EG1WR–01

EGR VALVE INSPECTION

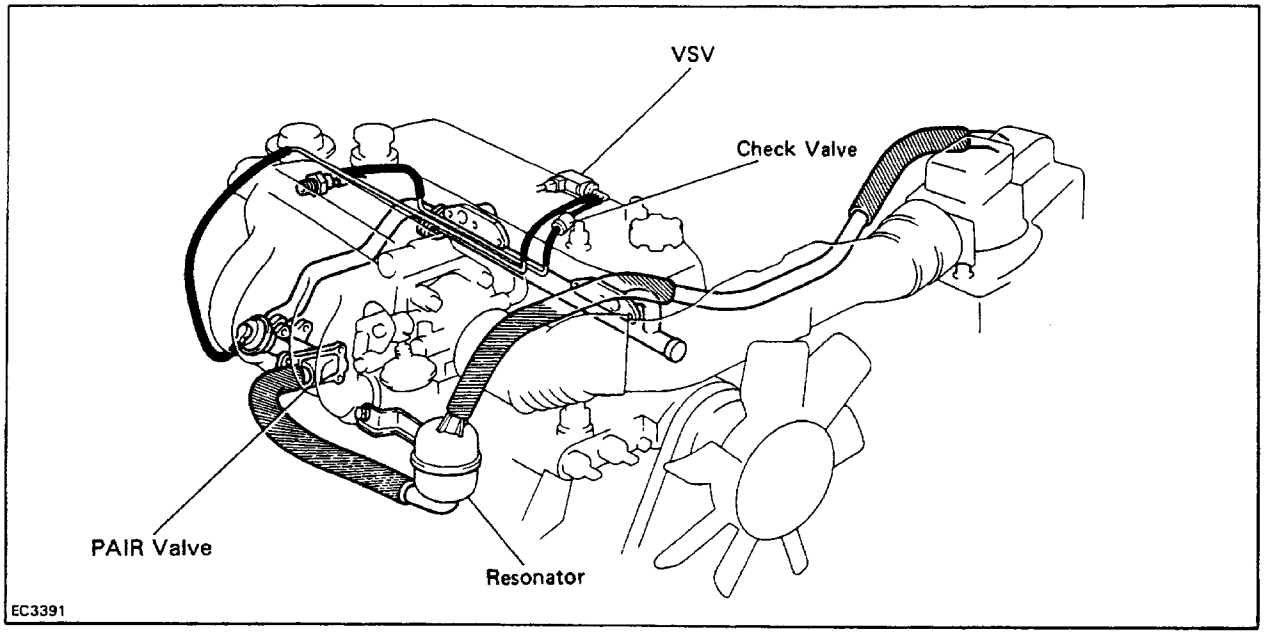
1. REMOVE EGR VALVE

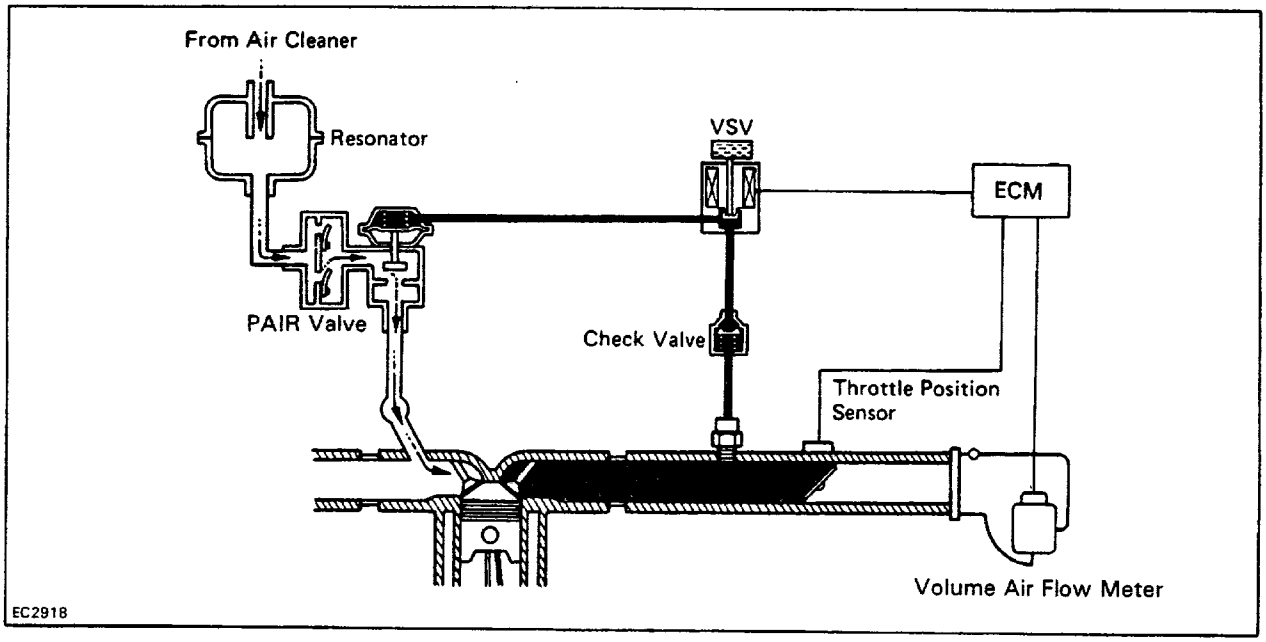
Check the valve for sticking and heavy carbon de–posits. If a problem is found, replace it.

2. INSTALL EGR VALVE WITH NEW GASKET

PULSED SECONDARY AIR INJECTION (PAIR) SYSTEM

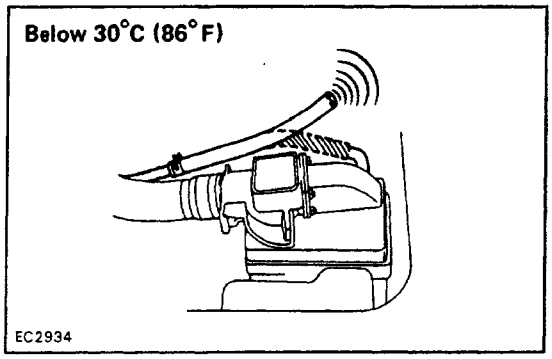
EG1W8–01





To reduce HC and CO emissions, this system draws in air into exhaust ports to accelerate oxidation, using vacuum generated by the exhaust pulsation in the exhaust manifold.

Condition	Coolant Temp.	Throttle valve position	Vehicle speed	Engine RPM	vsv	PAIR
Normal driving	Below 30•C (86• F)			Below 3,600 rpm	ON	ON
				Above 3,600 rpm	OFF	OFF
Deceleration	Above 40•C) (104•F)	Idling	Below 4 km/h (2 mph)	Below 1,000 rpm	OFF	OFF
				Above 1,000 rpm	ON	ON
			Above 4 km/h (2 mph)	Below 1,000 rpm	ON	ON
				Above 1,000 rpm	ON	ON



EG1WT–02

PAIR SYSTEM INSPECTION

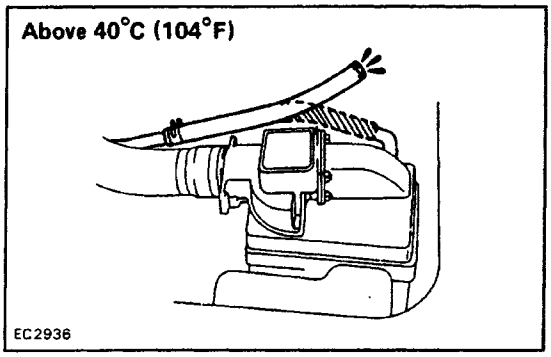
1. VISUALLY CHECK HOSES AND TUBES FOR CRACKS, KINKS, DAMAGE OR LOOSE CONNEC–TIONS

2. CHECK PAIR SYSTEM WITH COLD ENGINE

(a) The coolant temperature should be below 30 •C(86• F).

(b) Disconnect the NO.1 PAIR hose from the air cleaner case.

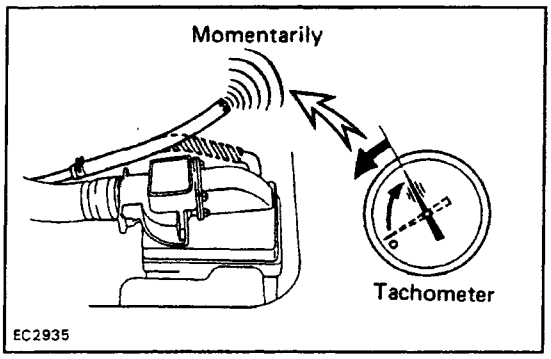
(c) Check that a bubbling noise is heard from the N0.1 PAIR hose at idle.



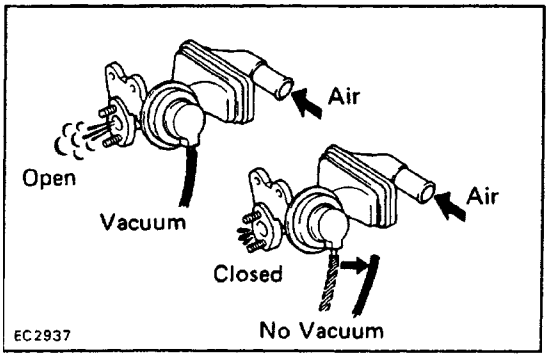
3. CHECK PAIR SYSTEM WITH WARM ENGINE

(a) Warm up the engine to above 40•C(104•F).

(b) With the engine idling, check that a bubbling noise is not heard from the NO. 1 hose.



(c) Race the engine and quickly close the throttle valve. Check that a bubbling noise stops momentarily.



EG1WU–01

PAIR VALVE INSPECTION

CHECK PAIR VALVE BY BLOWING AIR INTO PIPE

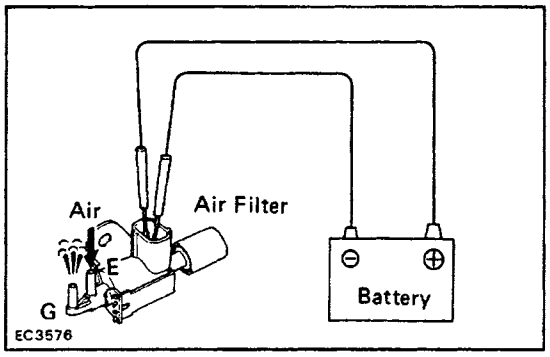
(a) Apply vacuum to the pair valve diaphragm.

(b) Blow air into a pipe and check that the pair valve is

(c) Release the vacuum and check that the pair valve is closed.

EG1WV–01

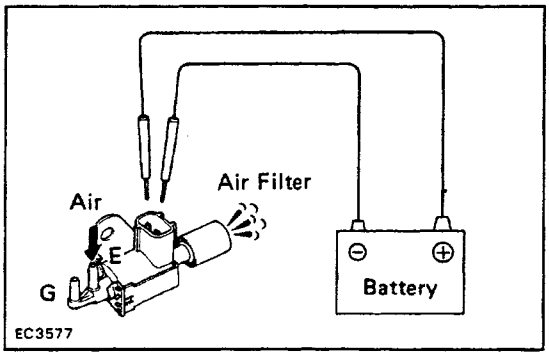
VSV INSPECTION



1. CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE

(a) Connect the VSV terminals to the battery terminals as illustrated.

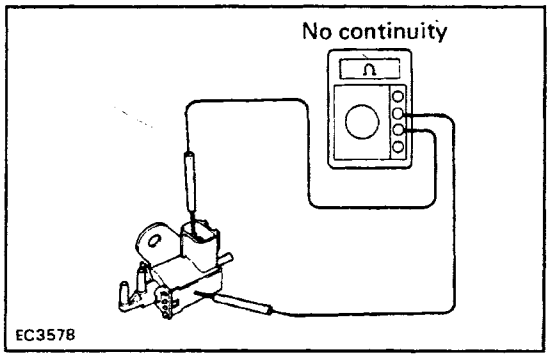
(b) Blow air into pipe E and check that air comes out of pipe G.



(c) Disconnect the battery.

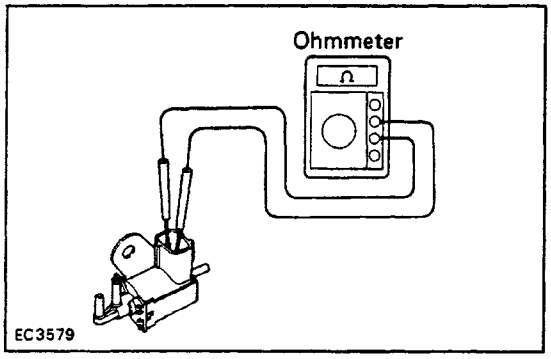
(d) Blow air into pipe E and check that air comes out of air filter.

If a problem is found, repair the VSV.



2. CHECK FOR SHORT CIRCUIT

Using an ohmmeter, check that there is no continuity between the terminal and the VSV body. If there is continuity, replace the VSV. –



3. CHECK FOR OPEN CIRCUIT

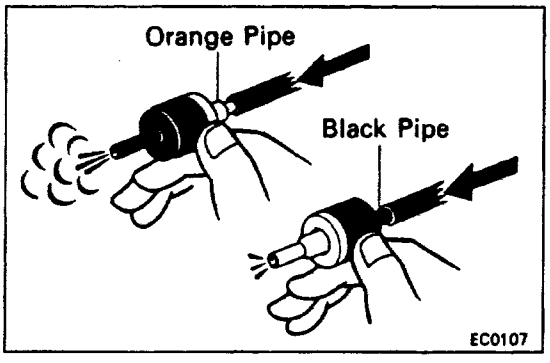
Using an ohmmeter, measure the resistance between the terminals as shown.

Specified resistance: 30–50 Ω at 20• C(68• F)

If the resistance is not within specification, replace the VSV.

EG1WW–01

CHECK VALVE INSPECTION



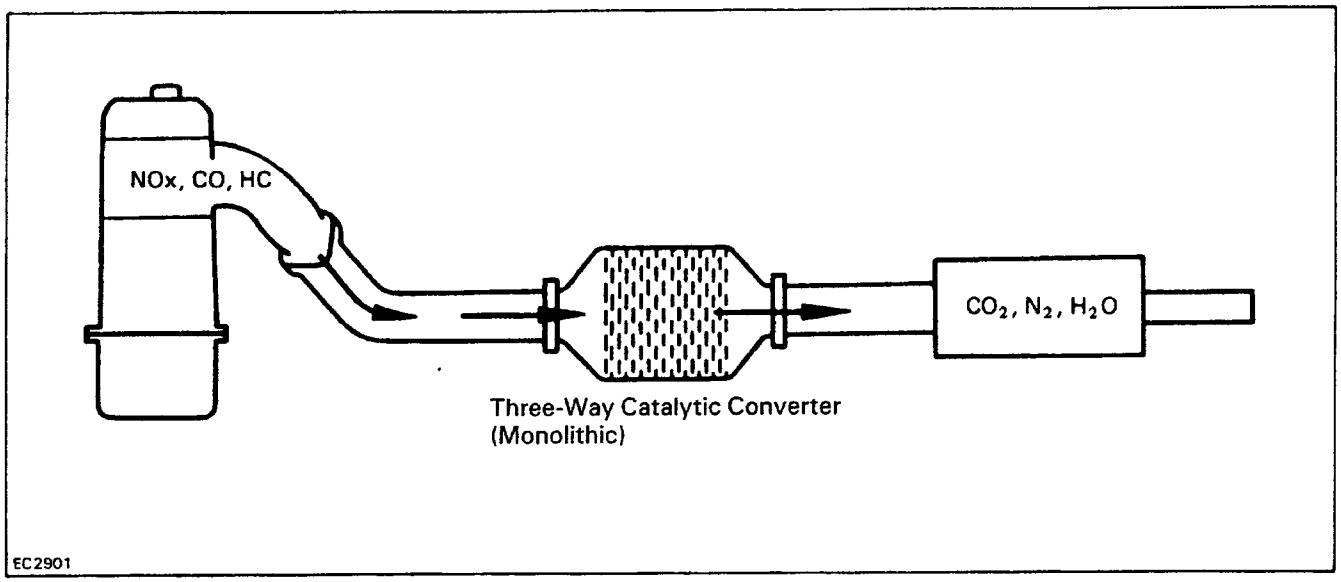
CHECK VALVE BY BLOWING AIR INTO EACH PIPE

(a) Check that air flows from the orange pipe to the black pipe.

(b) Check that air does not flow from the black pipe to the orange pipe.

THREE–WAY CATALYTIC CONVERTER (TWC) SYSTEM

EG1WX–01



To reduce HC, CO and NOx emissions, they are oxidized, reduced and converted to nitrogen (N_2), carbon dioxide ($C0_2$) and water (H_2O) by the catalytic converter.

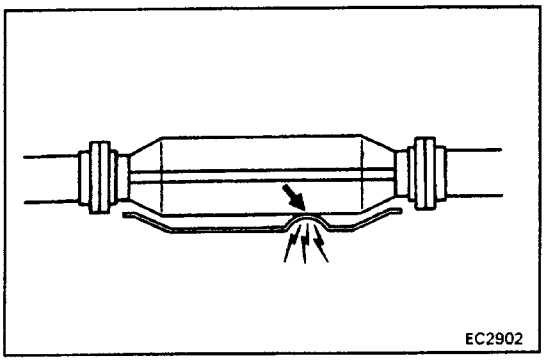
Exhaust Port		TWC		Exhaust Gas
HC, CO and NOx	→	Oxidation and reduction	→	CO_2 H_2O N_2

V01777

EXHAUST PIPE ASSEMBLY INSPECTION

1. CHECK CONNECTIONS FOR LOOSENESS OR DAMAGE

2. CHECK CLAMPS FOR WEAKNESS, CRACKS OR DAMAGE

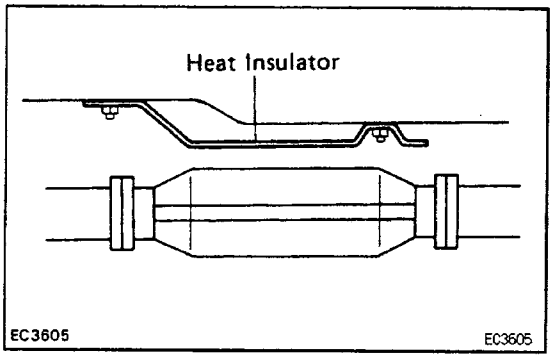


EG1WZ–01

CATALYTIC CONVERTER INSPECTION

CHECK FOR DENTS OR DAMAGE

If any part of the protector is damaged or dented to the extent that it contacts the catalytic converter, repair or replace it.

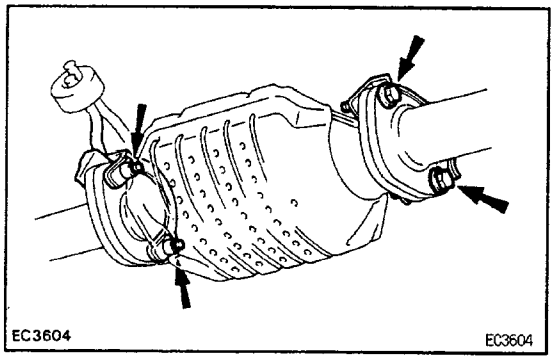


HEAT INSULATOR INSPECTION

EG1X0–01

1. CHECK HEAT INSULATOR FOR DAMAGE

2. CHECK FOR ADEQUATE CLEARANCE BETWEEN CATALYTIC CONVERTER AND HEAT INSULATOR



CATALYTIC CONVERTER REPLACEMENT

1. REMOVE CONVERTER

(a) Jack up the vehicle.

(b) Check that the converter is cool.

(c) Remove the bolts at the front and rear of the con–verter.

(d) Remove the converter and gaskets.

2. INSTALL CONVERTER

(a) Place new gaskets on the converter front and rear pipes, and connect the converter to the exhaust pipes.

(b) Torque the bolts.

Torque: Catalytic converter–Exhaust pipe
39 N–m (400kgf–cm, 29ft–lbf)

(c) Reinstall the bracket bolts and tighten them.

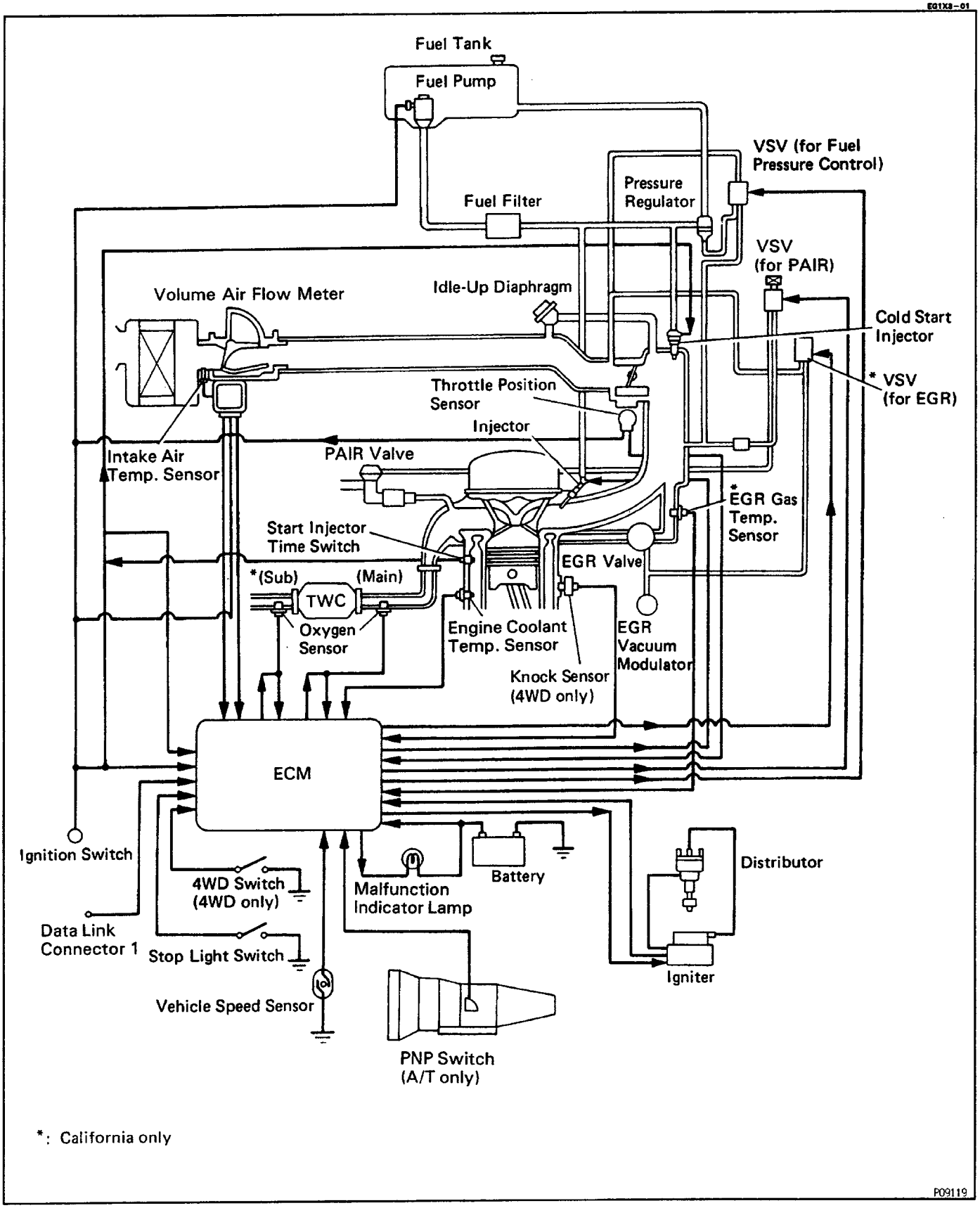
SERVICE SPECIFICATIONS
TORQUE SPECIFICATIONS

EG1X2–01

Part tightened	N·m	kgf·cm	ft·lbf
Cylinder Head x EGR Valve	13	130	9
Air Intake Chamber x EGR Pipe	13	130	9
Intake Manifold x PAIR Reed Valve	13	130	9
No. 1 Air Injection Manifold x PAIR Reed Valve	13	130	9
	13	130	9

MFI SYSTEM

DESCRIPTION



The MFI system is composed of three basic subsystems: Fuel, Air Induction and Electronic Control Systems.

FUEL SYSTEM

An electric fuel pump supplies sufficient fuel, under a constant pressure, to the MFI injectors. In accordance with signals from the ECM, these injectors inject the most appropriate quantity of fuel for the engine condition into the intake manifold.

Each injector injects, at the same time, one half of the fuel required for ideal combustion with each engine revolution.

AIR INDUCTION SYSTEM

The air induction system provides just the right amount of air for the engine operating condition.

ELECTRONIC CONTROL SYSTEM

The 22R–E engine is equipped with a Toyota Computer Controlled System (TCCS) which centrally controls the MFI, ESA, A/T (4WD), diagnosis systems, etc. by means of an Engine Control Module (ECM, formerly the MFI computer) employing a microcomputer.

By means of the ECM, the TCCS controls the following functions:

1. Multiport Fuel Injection (MFI)

The receives signals from various sensors indicating changing engine operating conditions such as: Intake air volume
Intake air temperature
Coolant temperature
Engine rpm
Acceleration/deceleration
Exhaust oxygen content etc.

These signals are utilized by the ECM to determine the injection duration necessary for an optimum air–fuel ratio.

2. Electronic Spark Advance (ESA)

The ECM is programmed with data for optimum ignition timing under all operating conditions various engine functions (RPM, intake air volume, coolant temperature etc.), the microcomputer (ECM) triggers the spark at precisely the right instant. .

3. Diagnosis Function

When the ECM detects malfunction or abnormalities in the sensor network, it lights the Mal–function Indicator Lamp in the combination meter. At the same time, the trouble is identified and a diagnostic trouble code is recorded by the ECM. The diagnostic trouble code can be read by the number of blinks of the malfunction Indicator lamp when terminals TE1 and E1 are connected. The diagnostic trouble codes are explained on pages EG1–114,115.

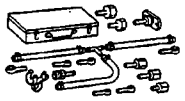
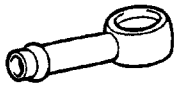
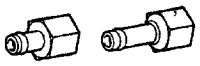
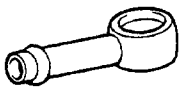
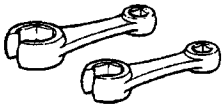
4. Fail–Safe Function

In the event of a sensor malfunction, a backup circuit will take over to provide minimal drivability, and the Malfunction Indicator Lamp will light up.

PREPARATION

EG0CF–06

SST (SPECIAL SERVICE TOOLS)

 09268–41045 Injection Measuring Tool Set	
 (09268–41080) No.6 Union	
 – . (09268–52010) Injection Measuring Attachment	
 (90405–09015) No.1 Union	
 09268–45012 EFI Fuel Pressure Gauge	
 09631–22020 Power Steering Hose Nut 14 x 17 mm Wrench Set	Fuel line flare nut
 09842–30070 Wiring ”F” EFI Inspection	
 09843–18020 Diagnosis Check Wire	

EG0CG–03

RECOMMENDED TOOLS

 09082–00015 TOYOTA Electrical Tester	
 09200–00010 Engine Adjust Kit	
 09258–00030 Hose Plug Set	Plug for the vacuum hose, fuel hose etc.

EQUIPMENT

EG0CH – 04

Graduated cylinder	Injector
Carburetor cleaner	Throttle body
Sound scope	Injector
Tachometer	
Torque wrench	
Vacuum gauge	
Soft brush	Throttle body

PRECAUTIONS

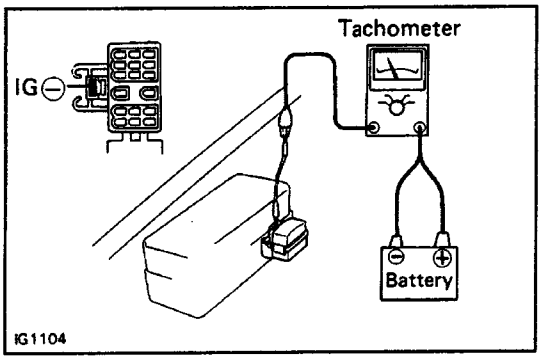
1. Before working on the system, disconnect the negative terminal from the battery.

HINT: Any diagnostic trouble code retained by the computer will be erased when the battery terminal is removed.

Therefore, if necessary, read the diagnosis before removing the battery terminal.

2. Do not smoke or work near an open flame when working on the fuel system.

3. Keep gasoline away from rubber or leather parts.



EG1X5–01

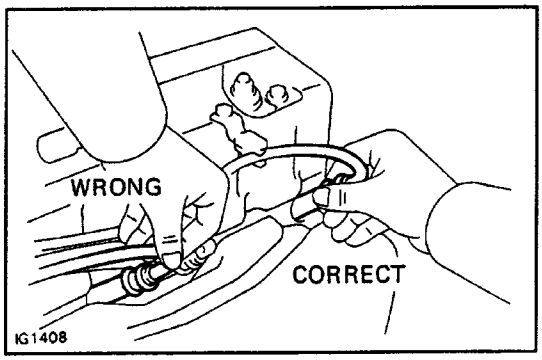
MAINTENANCE PRECAUTIONS

1. CHECK CORRECT ENGINE TUNE–UP

2. PRECAUTION WHEN CONNECTING GAUGE

(a) When a tachometer is connected to the system,connect the tachometer test probe to the IG(–) terminal of the DLC1.

(b) Use the battery as the power source for the timing light, tachometer, etc.



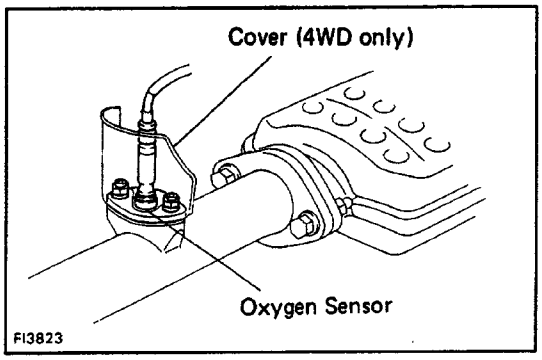
3. IN EVENT OF ENGINE MISFIRE, THE FOLLOWING PRECAUTIONS SHOULD BE TAKEN

(a) Check proper connection of battery terminals, etc.

(b) Handle high–tension cords carefully.

(c) After repair work, check that the ignition coil terminals and all other ignition system lines are reconnected securely.

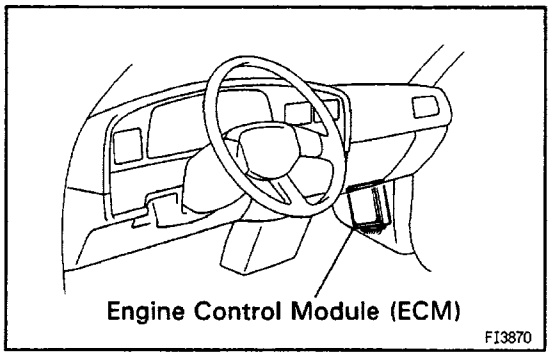
(d) When cleaning the engine compartment, be especially careful to protect the electrical system from water.



4. PRECAUTIONS WHEN HANDLING OXYGEN SENSOR

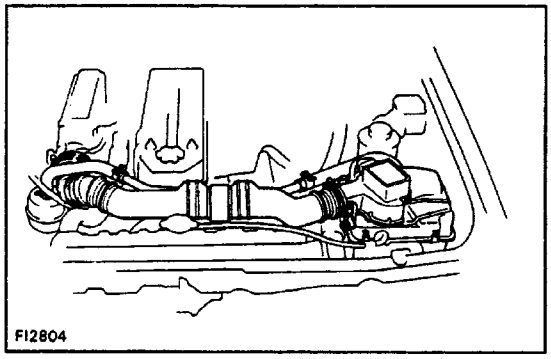
(a) Do not allow the oxygen sensor to drop or hit against an object.

(b) Do not allow the sensor to come into contact with water.


Engine Control Module (ECM)
FI3870

IF VEHICLE EQUIPPED WITH A MOBILE RADIO SYSTEM (HAM, CB, ETC.)

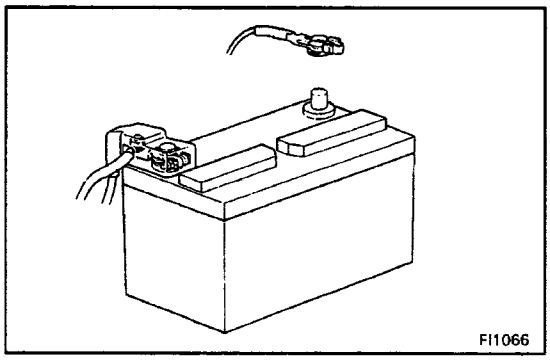
The ECM is designed so that it will not be affected outside interference.
However, if your vehicle is equipped with an amateur radio transceiver, etc. (even one with about 10 W output), it may, at times, have an effect upon ECM operation, especially if the antenna and feeder are installed nearby. Therefore, observe the following precautions:
(a) Install the antenna as far away as possible from the ECM. The ECM is located in the right side kick panel so the antenna should be installed at the rear, left side of the vehicle.
If installing on the bumper, do so on the right side, if possible.
(b) Keep the antenna feeder as far away as possible from the ECM wires – at least 20 cm (7.87 in.) – and, especially, do not wind them together.
(c) Check that the feeder and antenna are properly adj–usted.
(d) Do not equip your vehicle with a powerful mobile radio system.
(e) Do not open the cover or the ECM unless absolutely necessary. (If the terminals are touched, the IC may be destroyed by static electricity.)


FI2804

EG1X7–01

AIR INDUCTION SYSTEM

1. Separation of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause the engine to run out of tune.
2. Disconnection, looseness or cracks in the parts of the air induction system between the air flow meter and cylinder head will cause air suction and cause the engine to run out of tune.

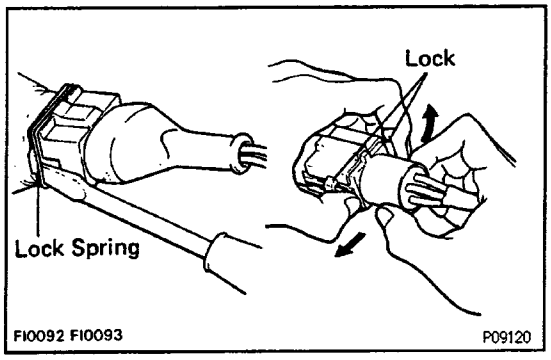

FI1066

EG1X8–01

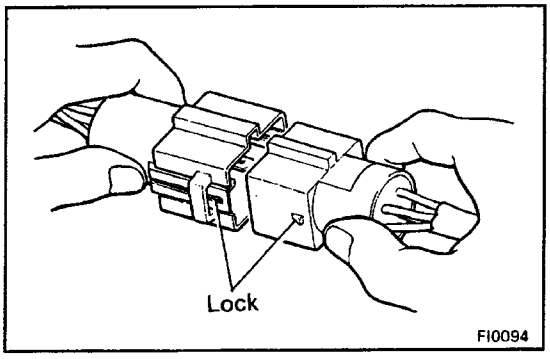
ELECTRONIC CONTROL SYSTEM

1. Before removing MFI wiring connectors, terminals, etc., first disconnect power by either turning the ignition switch OFF or disconnecting the battery terminals.
2. When installing a battery, be especially careful not to incorrectly connect the positive and negative cables.

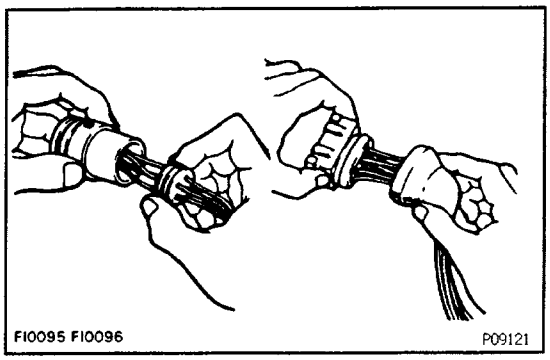
3. Do not permit parts to receive a severe impact during removal or installation. Handle all MFI parts carefully especially the ECM.
4. Take great care during troubleshooting as there are numerous transistor circuits and even slight terminal contact can cause further troubles.
5. Do not open the ECM cover.
6. When inspecting during rainy weather, take care to prevent entry of water. Also, when the engine compartment, prevent water from getting on the MFI parts and wiring connectors.
7. Parts should be replaced as an assembly.



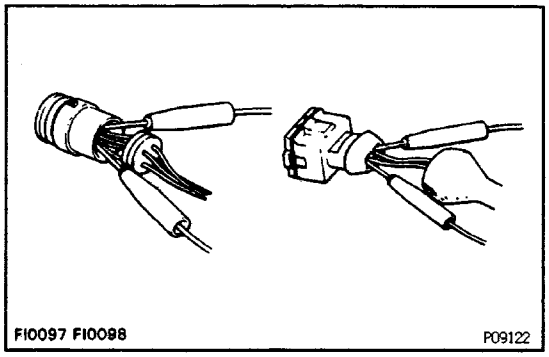
8. Sufficient care is required when pulling out and inserting wiring connectors.
(a) To pull the connector out, release the lock and pull on the connector.



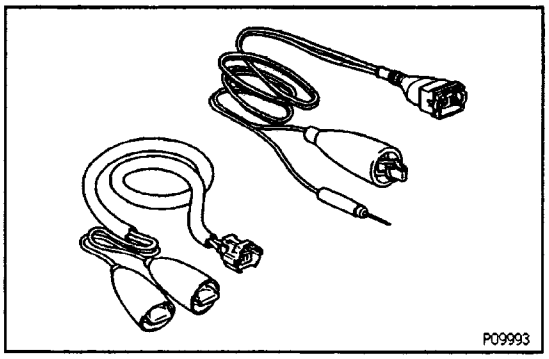
(b) Fully insert the connector and check that it is locked.



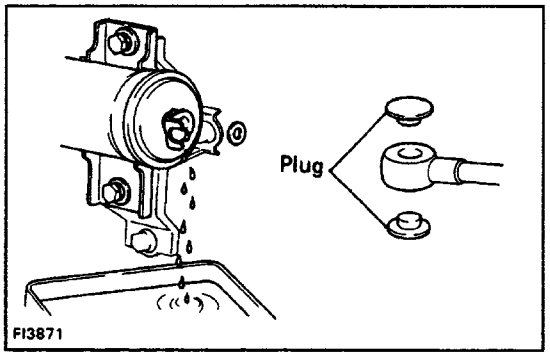
9. When inspecting a connector with a volt/ohmmeter.
(a) Carefully take out the water– proofing rubber if it is a water–proof type connector.



(b) Insert tester probe into the connector from the wiring side when checking the continuity, amperage or vol–tage.
(c) Do not apply unnecessary force to the terminal.
(d) After the check, securely install the water–proofing rubber on the connector.



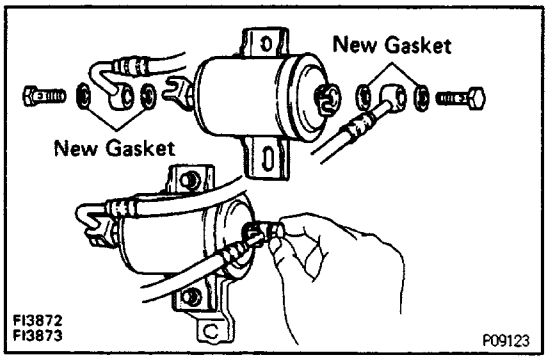
10. Use SST for inspection or testing of the injector, cold start injector or their wiring connectors.
SST 09842 – 30050 and 09842 – 30070

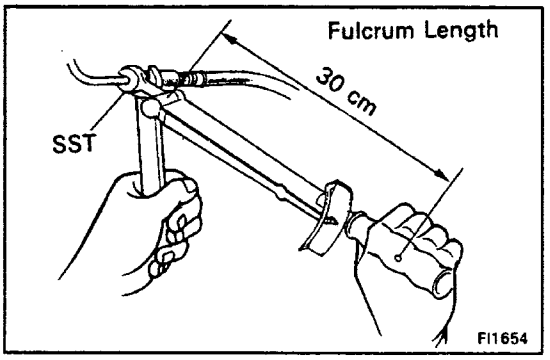


EG1X9–01

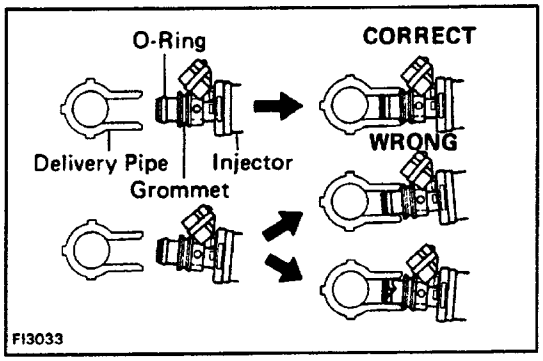
FUEL SYSTEM

1. When disconnecting the connection of the high fuel pressure line, a large amount of gasoline may come out so observe the following procedure:
(a) Put a container under the connection.
(b) Slowly loosen the connection.
(c) Disconnect the connection.
(d) Plug the connection with a rubber plug.
2. When connecting the flare nut or union bolt on the high pressure pipe union, observe the following procedure:
(Union bolt type)
(a) always use a new gasket.
(b) Tighten the union bolt by hand.
(c) Torque the bolt to the specified torque.
Torque: 30 N–m (310 kgf–cm, 22 ft–lbf)

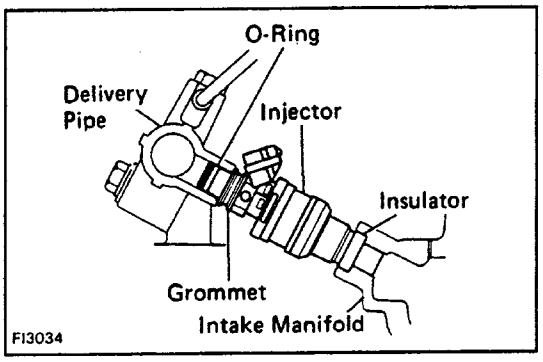




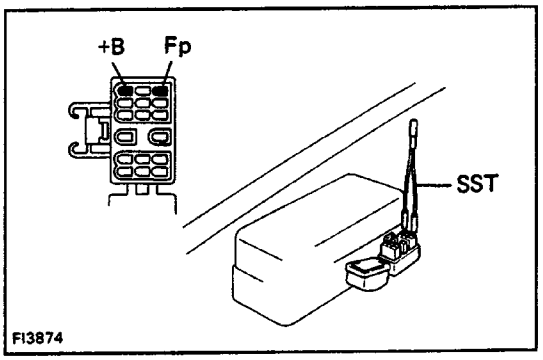
(Flare nut type)
(a) Apply a light coat of engine oil to the flare and tighten the flare nut by hand.
(b) Then using SST, tighten the nut to the specified torque.
SST 09631–22020
Torque: 27 N–m (280 kgf–cm, 20 ft–lbf)
HINT: use a torque with a fulcrum length of 30 cm (11.81 in.).



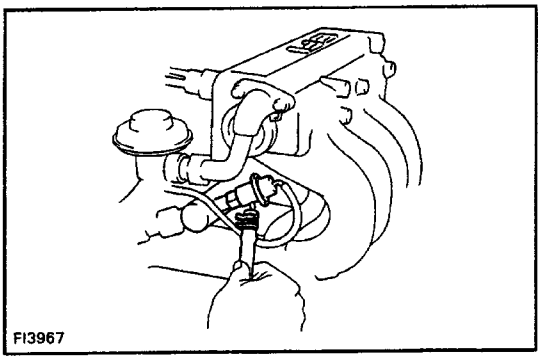
3. Take the following precautions when removing and installing the injectors.
(a) Never re–use the O–ring.
(b) When placing a new 0–ring on the injector, take care not to damage it in any way.
(c) Lubricate the O–ring spindle oil or gasoline before installing – never use engine, gear or brake oil.



4. Install the injector to the delivery pipe and intake manifold as shown in the illustration.



5. Check that there are no fuel leaks after performing any maintenance on the fuel system.
(a) With engine stopped, turn the ignition switch On.
(b) Using SST, connect terminals Fp and B of the DLC1.
SST 09843–18020
HINT: The DLC1 is located near the No. 2 relay block.



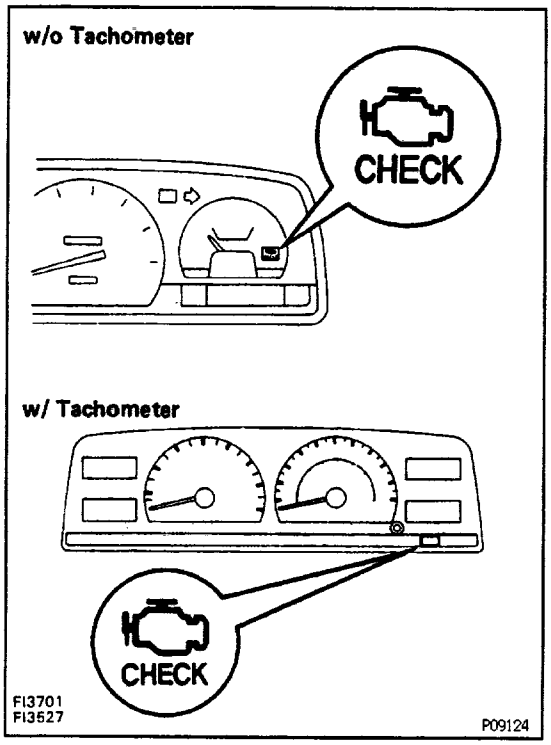
(c) When the pressure regulator fuel return hose (shown in the illustration at left), is pinched, the pressure within the high pressure line will rise to approx. 392 kPa (4 kgf/cm^2, 57 psi). In this state, check to see that there are no leaks from any part of the fuel system.
NOTICE: Always pinch the hose. Avoid bending the hose as it may cause the hose to crack.

DIAGNOSIS SYSTEM

DESCRIPTION

EG1XA–01

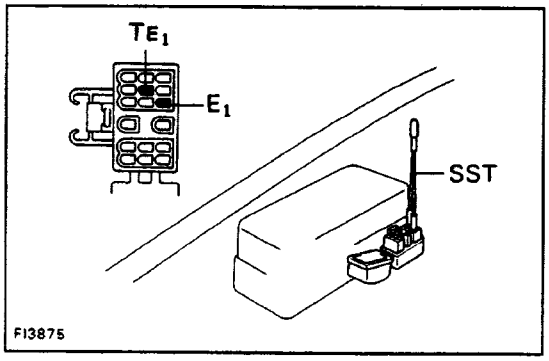
The ECM contains a built–in self–diagnosis system which detects troubles within the engine signal network and flashes the Malfunction Indicator Lamp in the combination meter.
By analyzing various signals shown in the table(See pages EG1–114,115)the detects system malfunctions which are related to the various operating parameter sensors or to the actuator.
The ECM stores the failure code associated with the detected failure until the diagnosis system is cleared by removing the EFI fuse with the ignition switch off.
The malfunction Indicator Lamp in the combination meter informs the driver that a malfunction has been detected. The light goes automatically when the malfunction has been corrected.



MALFUNCTION INDICATOR LAMP

EG1XB–01

1. The Malfunction Indicator Lamp will come on when the ignition switch is placed at On and the engine is not running.
2. When the engine is started, the Malfunction Indicator Lamp should go off.
If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.



DIAGNOSTIC TROUBLE CODES OUTPUT

To obtain an output of diagnostic trouble codes, proceed as follows:

1. Initial conditions

(a) Battery voltage 11 volts or more.
(b) Throttle valve fully closed (throttle position sensor IDL points closed).
(c) Transmission in neutral range.

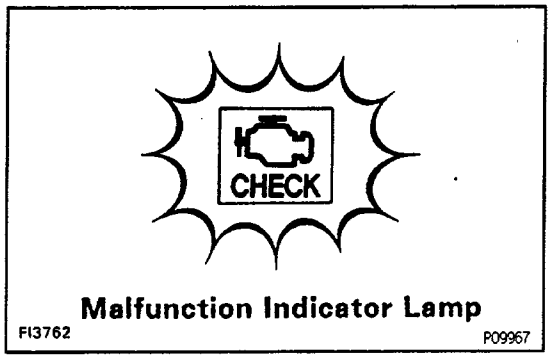
(d) Accessories switched OFF.
(e) Engine at normal operating temperature.

2. Turn the ignition switch ON. Do not start the engine.

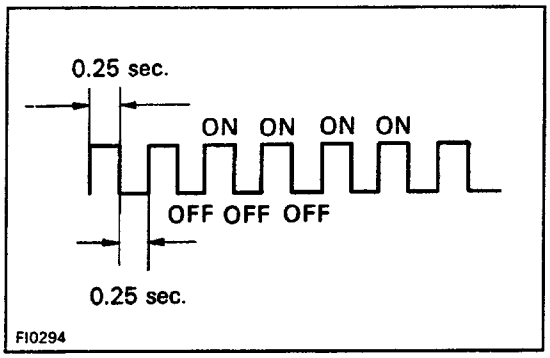
3. Using SST, connect terminals TE, and E, of the DLC 1.

SST 09843–18020

HINT: The DLC1 is located near the No. 2 relay block.



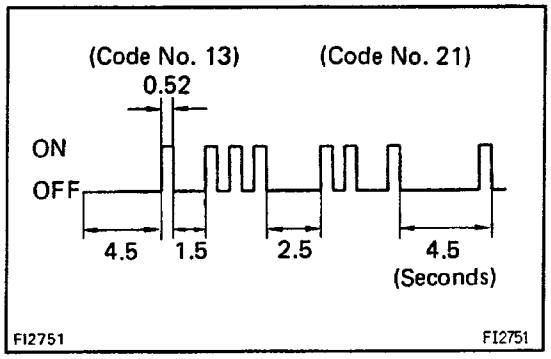
4. Read the diagnostic trouble code as indicated by the number of flashes of the Malfunction Indicator Lamp.



Diagnostic trouble code (Seepage EG1–114 and 115)

(a) Normal System Operation

The lamp will blink 2 times per second.

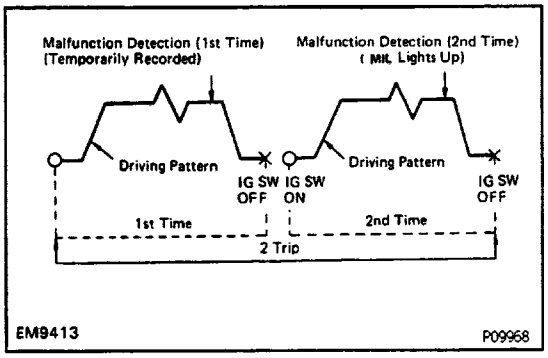


(b) Malfunction Code Indication

- The lamp will blink a number of times equal to the malfunction code with pauses as follows: 1. Between the first digit and second digit, 1.5 seconds. 2. Between code and code, 2.5 seconds. 3. Between all malfunction codes, 4.5 seconds.

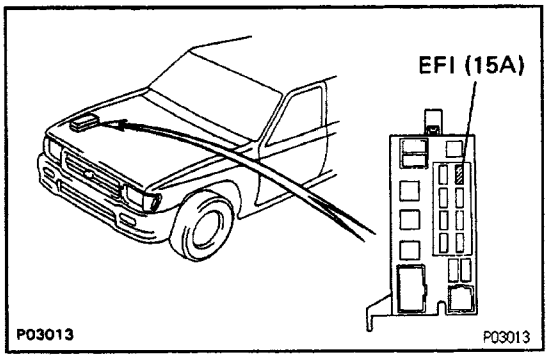
The diagnostic trouble code series will be repeated as long as the DLC1 terminals TE1 and E1 are connected.

HINT: In the event of a number of trouble codes, indication will begin from the small value and continue to the larger in order.



(c) (2 trip detection logic)
The diagnostic trouble codes 21, 25, 26, 27 and 71 use ”2 trip detection logic”. With this logic, when a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same case is detected again during the second drive test, this second detection causes the Malfunction Indicator Lamp to light up.
The 2 trip repeats the same mode a 2nd time. (However, the IG SW must be turned OFF between the 1st time and 2nd time).

5. After the diagnostic check, remove SST.



EG1XC–01

DIAGNOSTIC TROUBLE CODES CANCELLATION

1. After repair of the trouble area, the diagnostic trouble code retained in memory by the ECM must be canceled out by removing the EFI fuse (15A) 30 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch off.

HINT:

- Cancellation can also be done by removing the battery negative (–) terminal, but in this case other memory systems (radio ETR, etc.) will also be canceled out.
- If the diagnostic trouble code is not canceled out, it will be retained by the ECM and appear along with a new code in the event of future trouble.
- If it is necessary to work on engine components requiring removal of the battery terminal, a check must first be made to see if a diagnostic trouble code has been recorded.

2. After cancellation, road test the vehicle, if necessary, confirm that a ’normal’ code is now read on the Malfunction Indicator Lamp.
If the same diagnostic trouble code appears, it indicates that the trouble area has not been repaired thoroughly.

EG1XD–02

DIAGNOSIS INDICATION

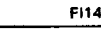
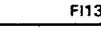
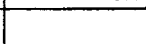
(1) When 2 or more codes are indicated, the lowest number (code) will appear first.
(2) All detected diagnostic trouble codes, except for code No. 51 and No. 53, will be retained in memory by the ECM from the time of detection until canceled out.
(3) Once the malfunction is cleared, the Malfunction Indicator Lamp on the instrument panel will go off but the diagnostic trouble code(s) remain stored in ECM memory (except for code 51 and 53).

EG1XE–01

DIAGNOSTIC TROUBLE CODES

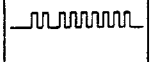
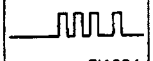
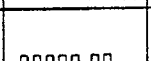
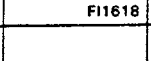
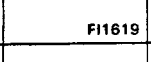
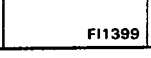
HINT:

- If a malfunction is detected during the diagnostic trouble code check, refer to the circuit indicated in the table, and turn to the corresponding page.
- Your readings may vary from the parameters listed in the table, depending on the instruments used.

Code No.	Number of blinks Malfunction Indicator Lamp	System	MIL	Diagnosis	Trouble Area	*2 Memory	See Page
–	 FI1401	Normal	–	No trouble code is recorded.	———	–	–
12	 FI1389	RPM Signal	ON	No NE signal is input to the ECM for 2 secs. or more after STA turns ON.	• Open or short in NE circuit • Distributor • Open or short in STA circuit • ECM	○	IG–4 EG1–132 EG1–150 EG1–168
13	 FI1390	RPM Signal	ON	NE signal is not input to ECM for 300 msec. or more when engine speed is 1,500 rpm or more.	• Open or short in NE circuit • Distributor • ECM	○	IG–4
14	 FI1391	Ignition Signal	ON	IGF signal from igniter is not input to ECM for 4 consecutive ignition.	• Open or short in IGF or IGT circuit from igniter to ECM • Igniter • ECM	○	EG1–134 EG1–152 EG1–170
21	FI1400	Main Oxygen Sensor Signal	ON	(1) Open or short in heater circuit of main oxygen sensor for 500 msec. or more. (HT) (2) At normal driving speed (below 60 mph and engine speed is above 1,700 rpm), amplitude of main oxygen sensor signal (OX 1) is reduced to between 0.35–0.70 V continuously for 60 secs. or more. *6 (2 trip detection logic) (2)	• Open or short in heater circuit of main oxygen sensor • Main oxygen sensor heater • ECM • Open or short in main oxygen sensor circuit • Main oxygen sensor • ECM	○	EG1–138 EG1–156 EG1–174
22	 FI1392	Engine Coolant Temp. Sensor Signal	ON	Open or short in engine coolant temp. sensor circuit for 500 msec. or more. (THW)	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM	○	EG1–131 EG1–149 EG1–167
24	 FI1611	Intake Air Temp. Sensor Signal	'3 ON	Open or short in intake air temp. sensor circuit for 500 rnsec. or more. (THA)	• Open or short in intake air temp. circuit • Intake air temp. sensor • ECM	○	EG1–129 EG1–147 EG1–165
25	 FI2562	Air–Fuel Ratio Lean Mal–function	ON	(1) Oxygen sensor output is less than 0.45 V for at least 90 secs. when oxygen sensor is warmed up (racing at 2,000 rpm). –Only for code 25. *4 (2) When the air–fuel compensation value fluctuates more than 20% from the ECM set range within 60 secs. period while driving at 15 km/h (9 mph) or more at coolant temp. of 70°C (158°F) or above. *6 (2 trip detection logic) (1) and (2)	• Engine ground bolt loose • Open in E1 circuit • Open in injector circuit • Fuel line pressure (Injector blockage, etc.) • Open or short in oxygen sensor circuit • Oxygen sensor • Ignition system • Engine coolant temp. sensor • Volume air flow meter (Air intake) • ECM	○	EG1–138 EG1–156 EG1–174 EG1–136 EG1–154 EG1–172
*5 26	 FI2563	Air–Fuel Ratio Rich Mal–function	ON		• Engine ground bolt loose • Open in E1 circuit • Short in injector circuit • Fuel line pressure (injector leakage, etc.) • Open or short in cold start injector circuit • Cold start injector • Open or short in oxygen sensor circuit • Oxygen sensor • Engine coolant temp. sensor • Volume air flow meter • Compression pressure • ECM	○	

V01785

DIAGNOSTIC TROUBLE CODES (Cont'd)

Code No.	Number of blinks Malfunction Indicator Lamp	System	MIL	Diagnosis	Trouble Area	*2 Memory	See Page
*5 27	 FI3294	Sub–Oxygen Sensor Signal	ON	(1) When sub–oxygen sensor is warmed up and full acceleration continued for 2 seconds, output of main oxygen sensor is 0.45 V or more (rich) and output of sub–oxygen sensor is 0.45 V or less (lean). (OX2) (2) Open or short detected continuously for 500 msec. or more in sub–oxygen sensor heater circuit *6 (2 trip detection logic) (1) and (2)	• Short or open in sub–oxygen sensor circuit • Sub–oxygen sensor • Open or short in sub–oxygen sensor heater • ECM	○	EG1–138 EG1–156 EG1–174
31	 FI1394	Volume Air Flow Meter Signal	ON	Open or short detected continuously for 500 msec. or more in volume air flow meter circuit • Open – VC or E2 • Short – VC–E2 or VS–VC	• Open or short in volume air flow meter circuit • Volume air flow meter • ECM	○	EG1–129 EG1–147 EG1–165
41	 FI1396	Throttle Position Sensor Signal	–3 ON	Open or short detected in throttle position sensor signal (VTA) for 500 msec. or more.	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM	○	EG1–128 EG1–146 EG1–164
42	 FI1397	Vehicle Speed Sensor Signal	OFF	SPD signal is not input to the ECM for at least 8 seconds during high load driving with engine speed between 2,200 rpm and 5,000 rpm.	• Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM	○	–
43	 FI1398	Starter Signal	OFF	Starter signal (STA) is not input to ECM even once until engine reaches 800 rpm or more when cranking.	• Open or short in starter signal circuit • Open or short in IG SW or main relay circuit • ECM	○	EG1–132 EG1–150 EG1–168
52	 FI1618	Knock Sensor Signal	ON	With engine speed 2,000 rpm or more signal from knock sensor is not input to ECM for 25 revolution. (KNK)	• Open or short in knock signal circuit • Knock sensor (looseness, ect.) • ECM	○	–
53	 FI1619	Knock Control Signal	ON	The engine control computer (for knock control) malfunction is detected.	• ECM	×	–
*5 71	 FI2622	EGR System Mal–function	ON	With the coolant temp. at 65°C (149°F) or more, 50 seconds from start of EGR operation. The EGR gas temp. is less than 70°C (158°F) and the EGR gas temp. has risen less than 3°C during the 50 seconds. *6 (2 trip detection logic)	• Open in EGR gas temp. sensor circuit • Open in VSV circuit for EGR • EGR vacuum hose disconnected, valve stuck • Clogged in EGR gas passage • ECM	○	EG1–140 EG1–158 EG1–176
51	 FI1399	Switch Condition Signal	OFF	Displayed when IDL contact OFF or shift position in "R", "D", "2", or "I" ranges with the check terminals E1 and TE1 connected.	• Throttle position sensor IDL circuit • PNP switch circuit • Accelerator pedal, cable • ECM	×	EG1–127 EG1–145 EG1–163

REMARKS

*1: "ON" displayed in the diagnosis mode column indicates that the Malfunction Indicator Lamp is lighted up when a malfunction is detected.

"OFF" indicates that the MIL does not light up during malfunction diagnosis, even if a malfunction is detected.

*2: "0" in the memory column indicates that a diagnostic code is recorded in the ECM memory when a malfunction occurs. " x " indicates that a diagnostic code is not recorded in the ECM memory even if a malfunction occurs. Accordingly, output of diagnostics results is performed with the IG SW ON.

*3: The "Malfunction Indicator Lamp comes on if malfunction occurs only for California specifications.

*4: No. (2) in the diagnostic contents of codes No.25 and 26 apply to California specification vehicles only. While

(1) applies to all models.

*5: Codes 27 and 71 are used only for California specifications.

*6: "2 trip detection logic" (See page EG1–112)

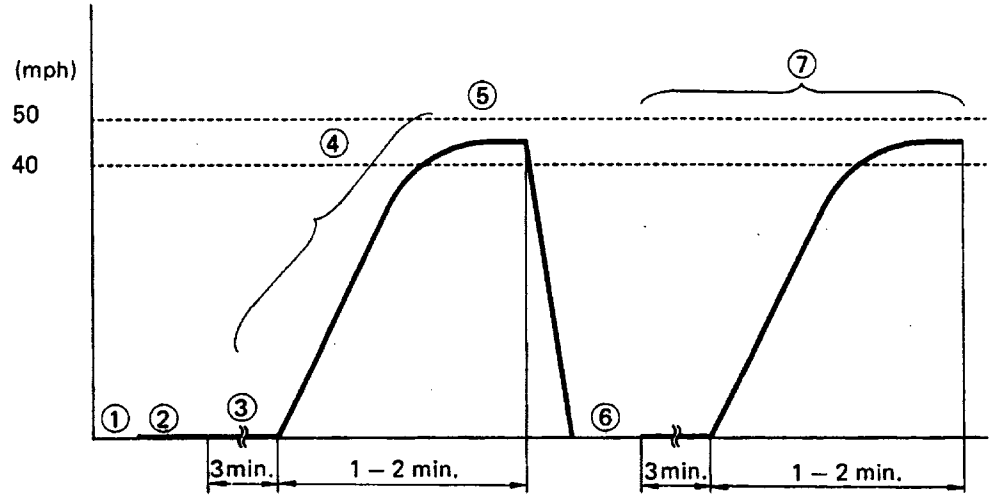
V01786

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern.
(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
(b) To check that the malfunction is corrected when the repair is completed confirming that diagnostic trouble code is no longer detected.

DTC	21	Main Oxygen Sensor Circuit

Malfunction: Main Oxygen Sensor Deterioration



P02539

(1) Disconnect the fuse EFI (15 A) for 10 sec. or more, with IG switch OFF.
(2) Start the engine and warm the engine up with all ACC switch OFF.
(3) After the engine is warmed up, let it idle for 3 min.
(4) Accelerate gradually and maintain at approximately 1,500 rpm, or within the 1,300 to 1,700 rpm range. Turn the A/C on, and drive in ”D” for A/T, or in case of M/T, upshift appropri–ately shift carefully so that the engine speed would not fall below 1,200 rpm. depress the accelerator pedal gradually and maintain a steady speed to avoid engine braking.
(5) Maintain the vehicle speed at 40 – 50 mph.
Keep the vehicle running for 1 – 2 min. after starting acceleration.
(6) After driving, stop at a safe place and turn the IG switch OFF for 3 sec. or more.
(7) Start the engine and perform steps (3), (4) and (5) again.
HINT: If a malfunction is detected, the Malfunction Indicator Lamp will light up during step (7).
NOTICE: If this procedure is not strictly followed, you can not detect the malfunctions.

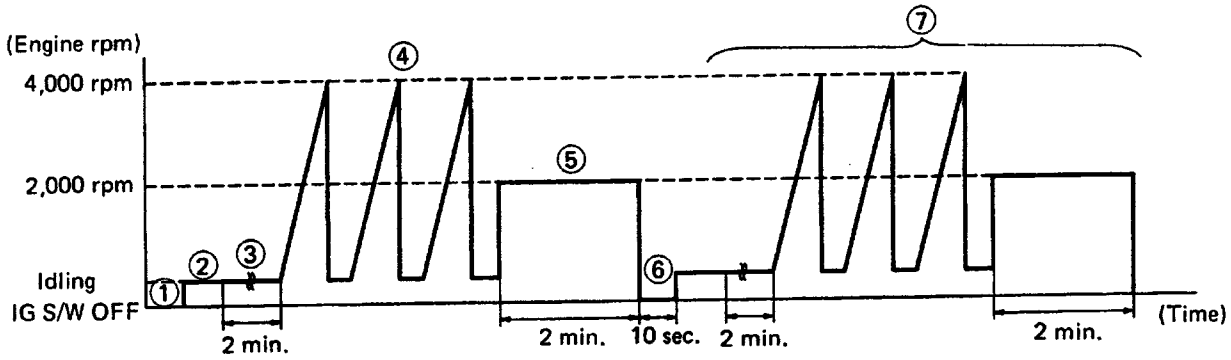
V01787

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

Purpose of the driving pattern.
(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
(b) To check that the malfunction is corrected when the repair is completed confirming that diagnostic trouble code is no longer detected.

DTC	25	Air–Fuel Ratio Lean Malfunction

Malfunction: Open or Short in Oxygen Sensor



P02492

(1) Disconnect the fuse EFI (15 A) for 10 sec. or more, with IG switch OFF.
(2) Start the engine and warm the engine up.
(3) After the engine is warmed up, let it idle for 2 min.
(4) After performing the idling in (3), perform sudden racing to 4,000 rpm three times.
(5) After performing the sudden racing in (4), perform racing at 2,000 rpm for 2 min.
(6) After performing the racing in (5), turn the IG switch OFF for 10 sec.
(7) Start the engine and perform steps (2), (3), (4) and (5) again:
HINT: 1f a malfunction is detected, the Malfunction Indicator Lamp will light up during step.
NOTICE: If this procedure is not strictly followed, you can not detect the malfunctions.

V01788

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

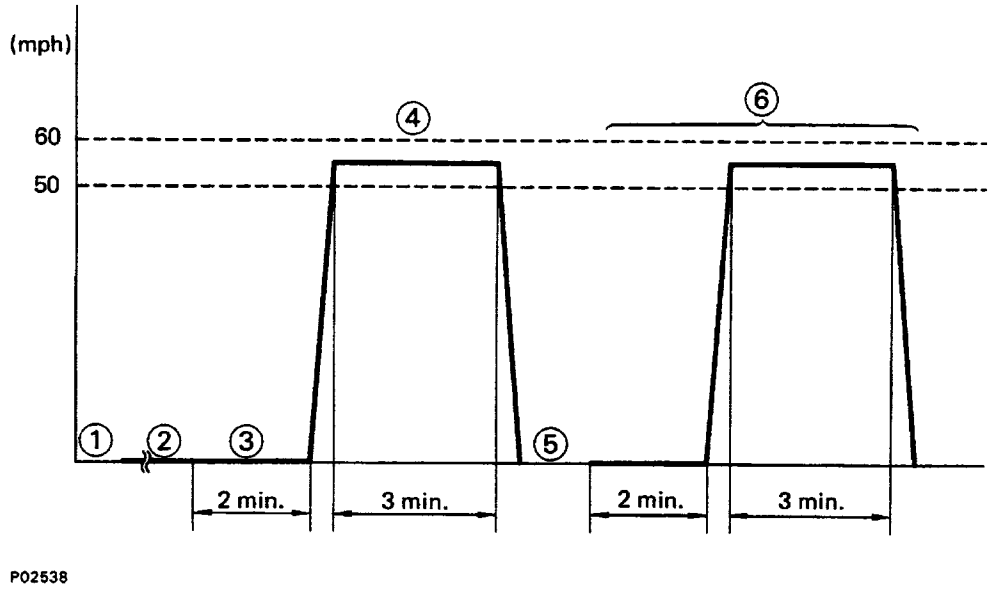
Purpose of the driving pattern.

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed confirming that diagnostic trouble code is no longer detected.

DTC	25	Air–Fuel Ratio Lean Malfunction (CALIFORNIA)
	26	Air–Fuel Ratio Rich Malfunction (CALIFORNIA)

Malfunction: Open or Short in Oxygen Sensor, Open or Short in Injector Leak, Blockage



① Disconnect the EFI fuse (15 A) for 10 sec. or more, with IG switch OFF.
② Start the engine and warm the engine up with all ACC switch OFF.
③ After the engine is warmed up, let it idle for 2 min.
④ With the transmission in 5th gear ("D" range for A/T), drive at 50 – 60 mph for 3 min.
⑤ After driving, stop at a safe place and turn the IG switch OFF for 3 – 10 sec.
⑥ Start the engine and perform steps (3) and (4) again.

HINT: If a malfunction is detected, the Malfunction Indicator Lamp will light up during step (6).

NOTICE: If this procedure is not strictly followed, you can not detect the malfunctions.

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

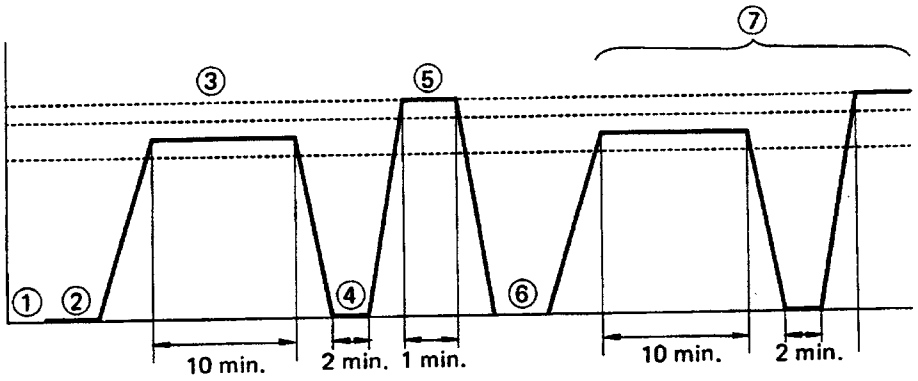
Purpose of the driving pattern.

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed confirming that diagnostic trouble code is no longer detected.

DTC	27	Sub–Oxygen Sensor Circuit

Malfunction: Open or Short in Sub–Oxygen Sensor



P02541

① Disconnect the fuse EFI (15 A) for 10 sec. or more, with IG switch OFF.
② Start the engine and warm the engine up with all ACC switch OFF.
③ After the engine is warmed up, let it drive at 50 – 55 mph for 10 min. or more.
④ After driving, stop at a safe place and perform idling for 2 min. or less.
⑤ After performing the idling in (4) , perform acceleration to 60 mph with the throttle fully open and drive at 60 mph for 1 min.
⑥ After driving, stop at a safe place and turn the IG switch OFF for 3 sec. or more..
⑦ Start the engine and perform steps (3) , (4), and (5) again.

HINT: If a malfunction is detected, the Malfunction Indicator Lamp will light up during step (7).

NOTICE: If this procedure is not strictly followed, you can not detect the malfunctions.

V01790

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

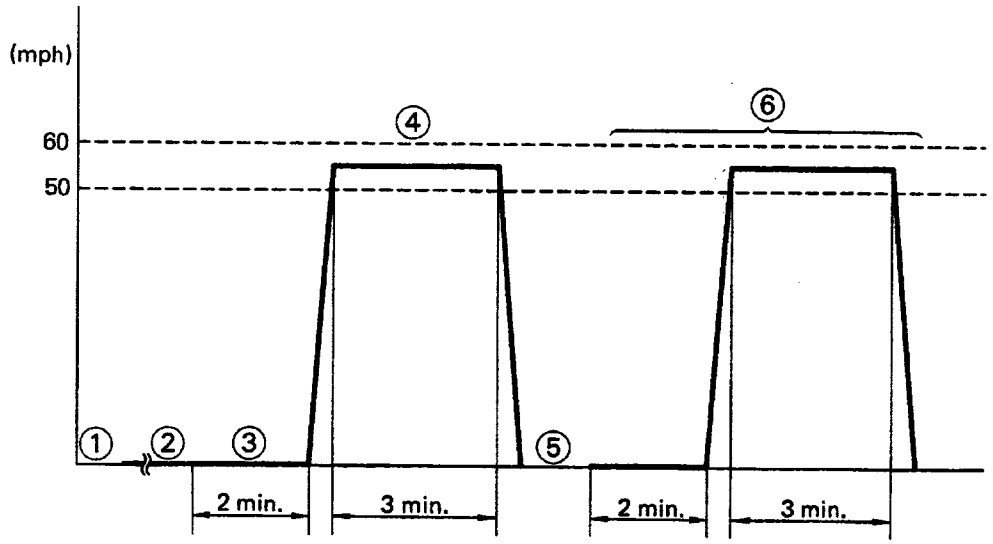
Purpose of the driving pattern.

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed confirming that diagnostic trouble code is no longer detected.

DTC	71	EGR System Malfunction

Malfunction: Short in VSV Circuit for EGR, Loose EGR Hose, Valve Stuck



P02538

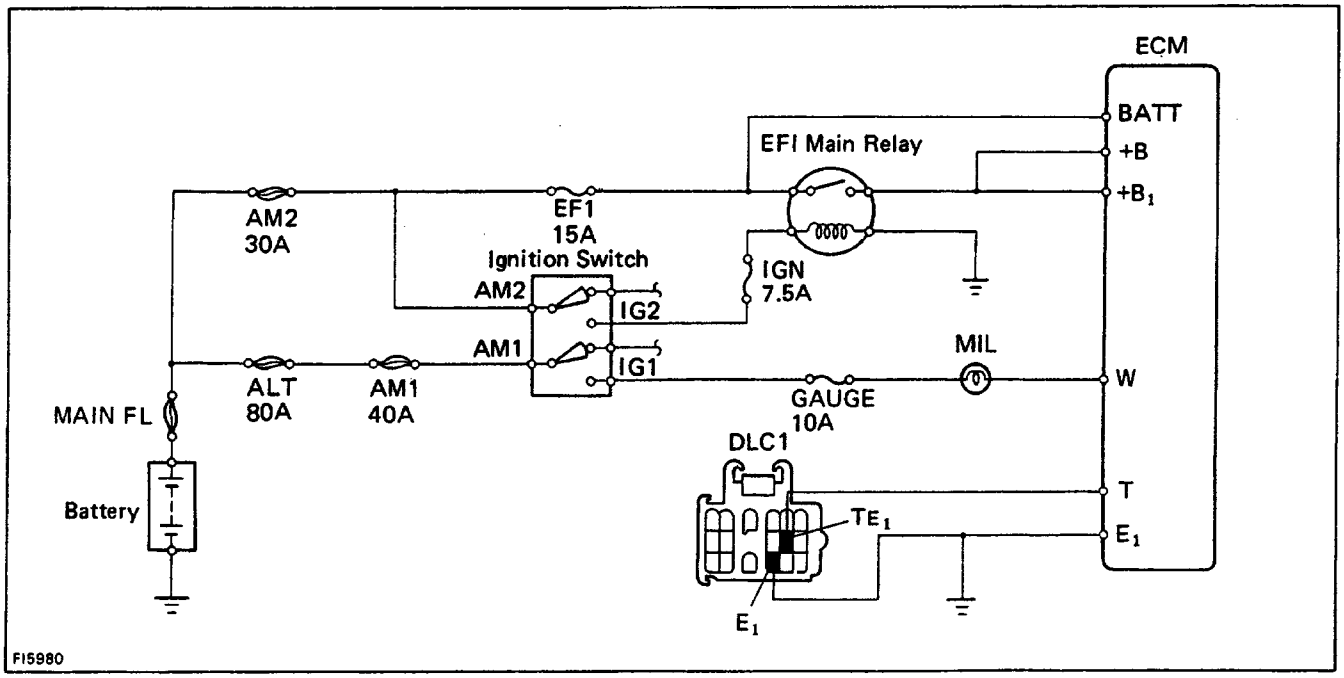
① Disconnect the EFI fuse (15 A) for 10 sec. or more, with IG switch OFF.
② Start the engine and warm the engine up with all ACC switch OFF.
③ After the engine is warmed up, let it idle for 2 min.
④ With the transmission in 5th gear ("D" range for AIT), drive at 50 – 60 mph for 3 min.
⑤ After driving, stop at a safe place and turn the IG switch OFF for 3 – 10 sec.
⑥ Start the engine and perform steps (3), and (4) again.

HINT: If a malfunction is detected, the Malfunction Indicator Lamp will light up during step (6).

NOTICE: If this procedure is not strictly followed, you can not detect the malfunctions.

V01791

INSPECTION OF DIAGNOSIS CIRCUIT



1. Does Malfunction Indicator Lamp come on when ignition switch is at ON?
   - YES → System Normal
   - NO → Does MIL come on when ECM terminal W is grounded to the body?
     - YES → Check wiring between ECM terminal E1 and body ground.
       - OK → Try another ECM.
       - BAD → Repair or replace.
     - NO → Check bulb, fuse and wiring between ECM and ignition switch.
       - BAD → Repair or replace.

2. Does MIL go off when the engine is started?
   - YES → System Normal
   - NO → Check wiring between ECM and MIL.
     - BAD → Repair.
     - OK → Is there diagnostic trouble code output when DLC 1 terminals TE1 and E1 are connected?
       - NO → Check wiring between ECM terminal T and DLC1 terminal TE1, and ECM terminal E1 and DLC 1 terminal E1.
         - OK → Try another ECM.
       - YES → Does MIL go off after repair according to malfunction code?
         - NO → Further repair required.
         - YES → System OK → Cancel out diagnostic trouble code.

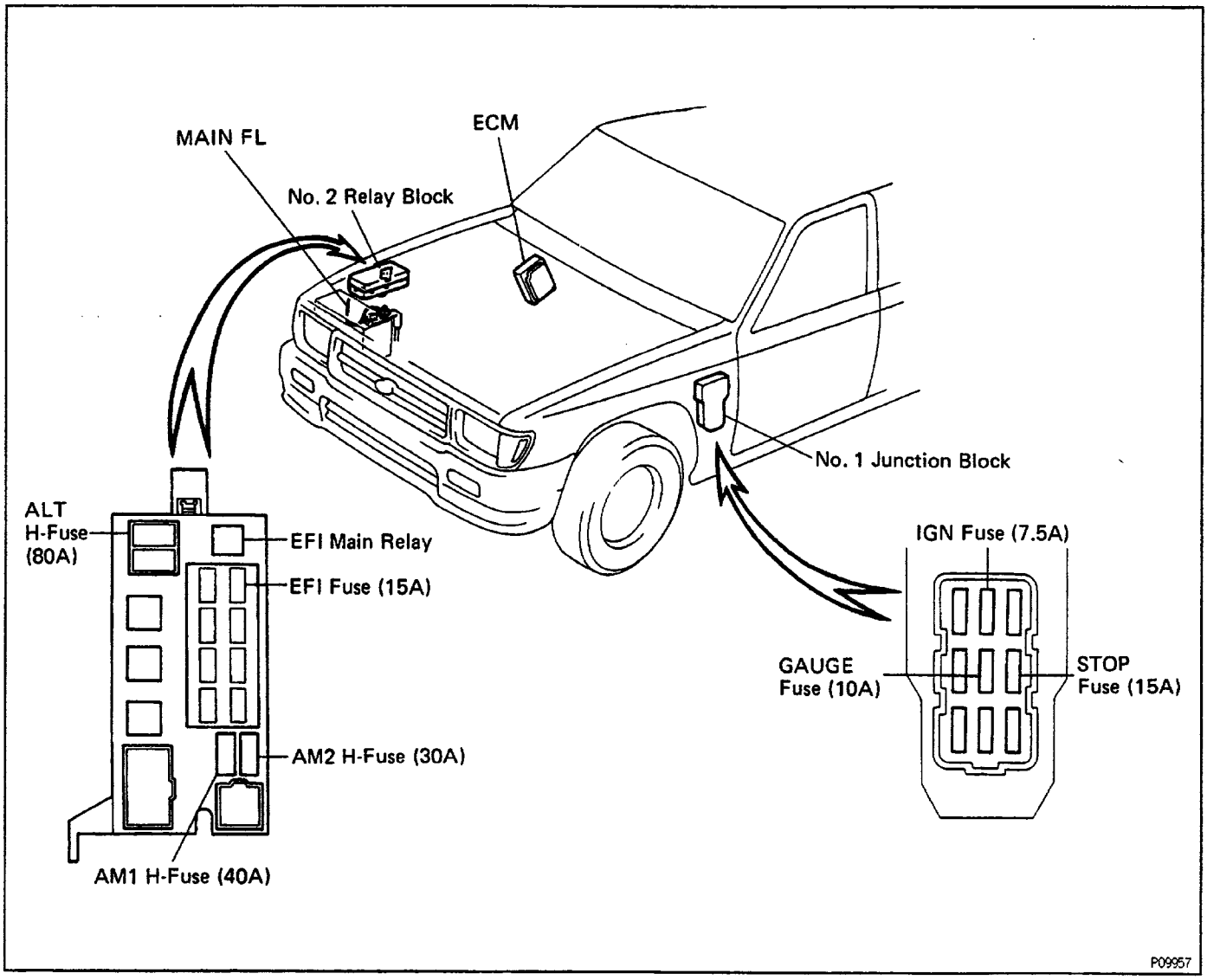
V01792

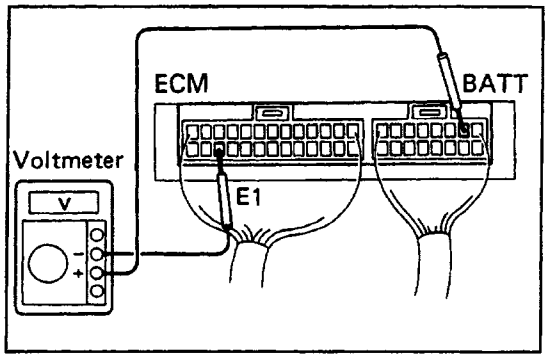
TROUBLESHOOTING WITH VOLT OHMMETER

HINT: Because the following troubleshooting procedures are designed for inspection of each separate system, the actual troubleshooting procedure may vary somewhat.
However, please refer to these procedures and perform actual troubleshooting, conforming to the inspection methods described.
For example it is better to first make a simple check of the fuses, fusible links and connecting condition of the connectors before making your inspection according to the procedures listed.
The following troubleshooting procedures are based on the supposition that the trouble lies in either a short or open circuit in a component outside the computer or a short circuit within the computer. If engine trouble occurs even though proper operating voltage is detected in the computer connector, then the ECM is faulty and should be replaced.

FUSES, H–FUSES AND FUSIBLE LINK LOCATION

EG1XG–01





SYSTEM CHECK PROCEDURE (2WD)

EG1XH–01

HINT:

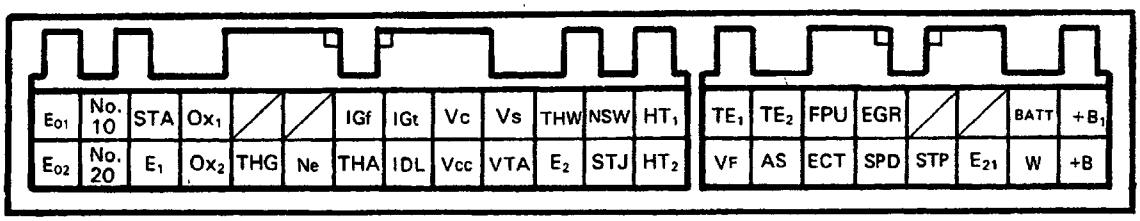
- Perform all voltage measurements with the connec–tors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is in "ON" position.
  Using a voltmeter with high impedance (l0 kΩ/V minimum), measure the voltage at each terminal of the wiring connectors.

Terminals of ECM (2WD)

Symbol	Terminal Name	Symbol	Terminal Name
E_{01}	ENGINE GROUND	E_2	SENSOR GROUND
E_{02}	ENGINE GROUND	*2 NSW	PNP SWITCH
No.10	INJECTOR	STJ	COLD START INJECTOR
No.20	INJECTOR	HT_1	OXYGEN SENSOR HEATER (MAIN)
STA	STARTER SWITCH	*1 HT_2	OXYGEN SENSOR HEATER (SUB)
E_1	ENGINE GROUND	TE_1	DLC 1
Ox_1	OXYGEN SENSOR (MAIN)	V_F	DLC 1
*1 Ox_2	OXYGEN SENSOR (SUB)	TE_2	DLC 1
*1 THG	EGR GAS TEMP. SENSOR	AS	PAIR VALVE
Ne	DISTRIBUTOR	Fpu	FUEL PRESSURE CONTROL VSV
IGf	IGNITER	*2 ECT	OD relay
THA	INTAKE AIR TEMP. SENSOR	*1 EGR	EAR VSV
IGt	IGNITER	SPD	SPEED SENSOR
IDL	THROTTLE POSITION SENSOR	STP	STOP LIGHT SWITCH
Vc	VOLUME AIR FLOW METER	E_{21}	SENSOR GROUND
Vcc	THROTTLE POSITION SENSOR	BATT	BATTERY POSITIVE VOLTAGE
Vs	VOLUME AIR FLOW METER	W	MALFUNCTION INDICATOR LAMP
VTA	THROTTLE POSITION SENSOR	$+B_1$	MAIN RELAY
THW	ENGINE COOLANT TEMP. SENSOR	+B	MAIN RELAY

*1: California only *2: A/T only

ECM Terminals



FI4266

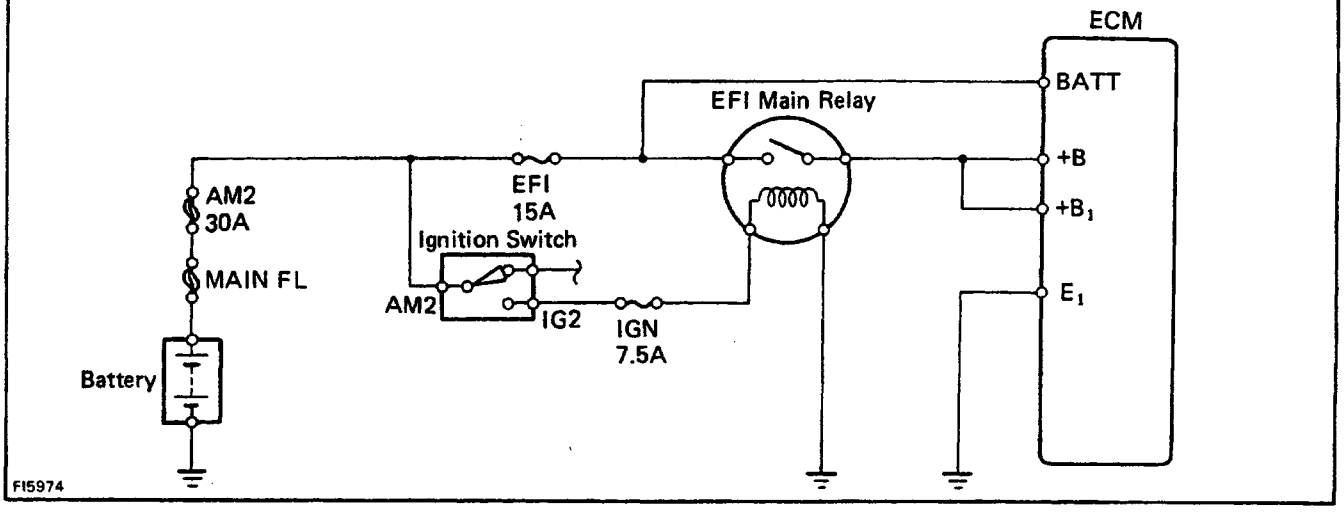
V01793

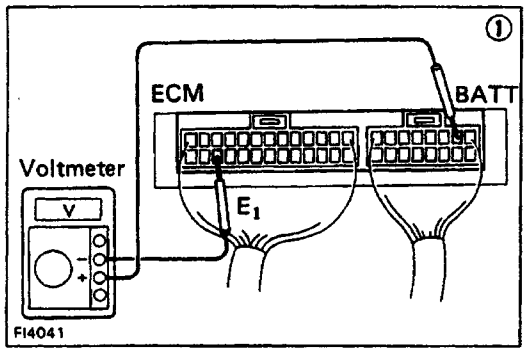
Voltage at ECM Wiring Connectors (2WD)

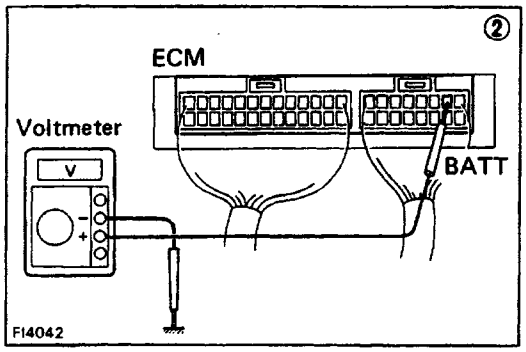
No.	Terminals	Condition		STD voltage	See page
1	BATT – E_1	–		9 – 14	EG1–125
	+B – E_1	Ignition switch ON			
	$+B_1$ – E_1				
2	IDL – E_2 (E_{21})	Ignition switch ON	Throttle valve open	9 – 14	EG1–127
	Vcc – E_2 (E_{21})		–	4.5 – 5.5	
	VTA – E_2 (E_{21})		Throttle valve fully closed	0.3 – 0.8	
			Throttle valve fully open	3.2 – 4.9	
3	Vc – E_2 (E_{21})	Ignition switch ON	–	6 – 10	EG1–129
	Vs – E_2 (E_{21})		Measuring plate fully closed	0.5 – 2.5	
			Measuring plate fully open	5 – 10	
		Idling		2 – 8	
	THA – E_2 (E_{21})	Ignition switch ON	Intake air temperature 20°C (68° F)	0.5 – 3.4	
4	THW – E_2 (E_{21})	Ignition switch ON	Coolant temperature 80°C (176° F)	0.2 – 1.0	EG1–131
5	STA – E_1	Ignition switch START position		6 – 12	EG1–132
6	No. 10 – E_{01} No. 20 – E_{02}	Ignition switch ON		9 – 14	EG1–133
7	IGt – E_1	Idling		0.7 – 1.0	EG1–134
8	W – E_1	No trouble (MIL off) and engine running		9 – 14	EG1–135
9	STJ – E_1	Ignition switch START position	Coolant temperature 80 °C (176°F)	6 – 12	EG1–136
10	STP – E_1	Stop light switch ON		7.5 – 14	EG1–137

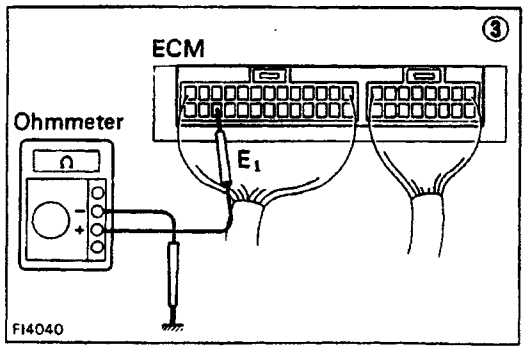
V01795

No.	Terminals	Trouble	Condition	STD Voltage
1	BATT – E_1	No voltage	–	9 – 14 V
	+B – E_1		Ignition switch ON	
	$+B_1$ – E_1			









- **BATT – E 1**

(1) There is no voltage between ECM terminals BATT and E1.

(2) Check that there is voltage between ECM terminal BATT and body ground.

NO → (3) Check wiring between ECM terminal E1 and body ground.

(3) OK → Try another ECM.

(3) BAD → Repair or replace.

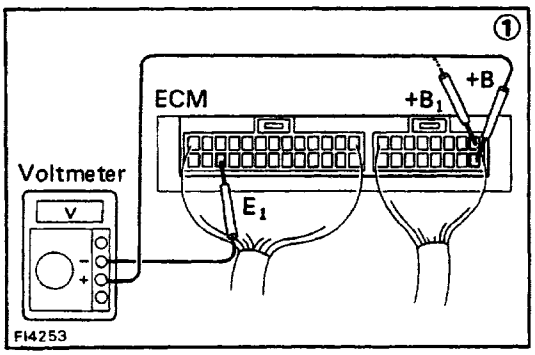
(2) OK → Check fuse and fusible link.

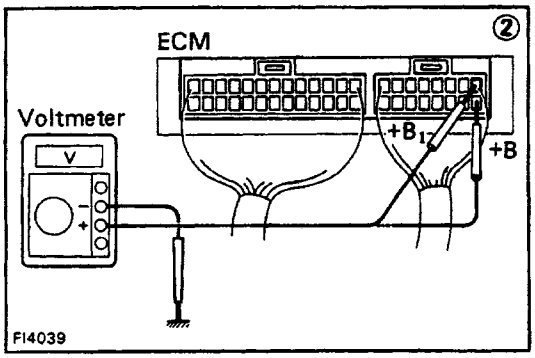
Check fuse and fusible link. BAD → Replace.

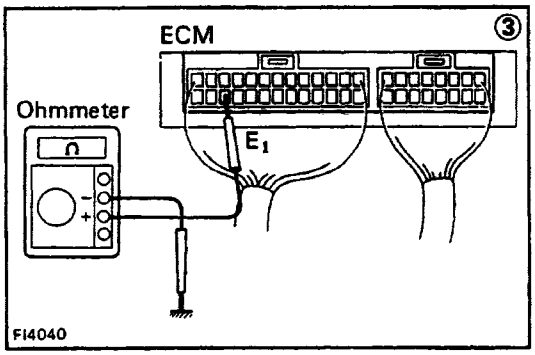
Check fuse and fusible link. OK → Check wiring between fuse and ECM.

Check wiring between fuse and ECM. BAD → Repair or replace.

V01796







• +B (+B1) – E 1

(1) There is no voltage between ECM terminals + B (+B1) and E1. **(IG SW ON)**

(2) Check that there is voltage between ECM terminal + B (+ B1) an body ground. **(IG SW ON)**

NO → **OK**

(3) Check wiring between ECM terminal E1 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

Check fuse, fusible link and ignition switch. BAD → Repair or replace.

OK

Check EFI main relay. BAD → Replace.

OK

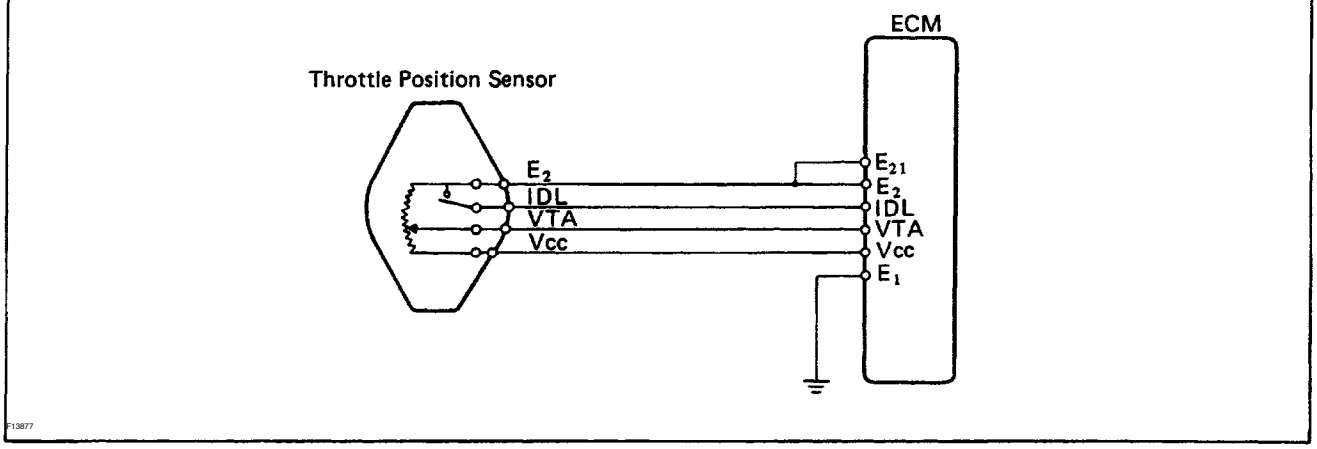
Check wiring between EFI main relay and battery. BAD → Repair or replace.

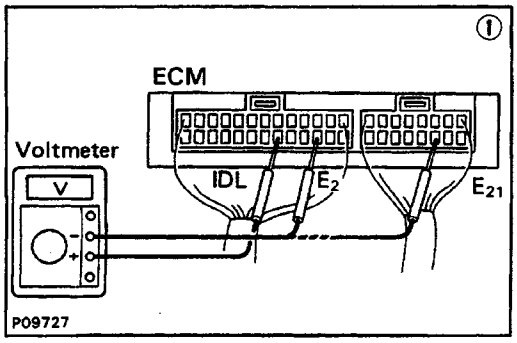
OK

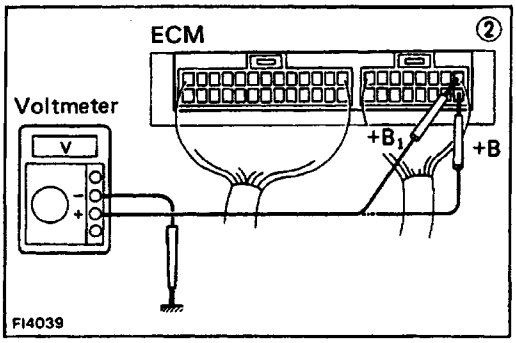
Check wiring between EFI main relay and ECM terminal +B (+B1). BAD → Repair or replace.

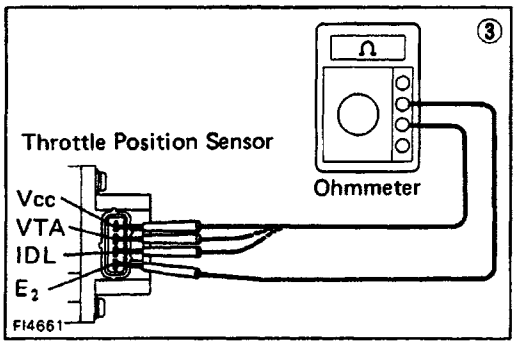
V01797

No.	Terminals	Trouble	Condition		STD Voltage
2	IDL – E_2 (E_{21})	No voltage	Ignition switch ON	Throttle valve open	9 – 14 V
	Vcc – E_2 (E_{21})			–	4.5 – 5.5 V
	VTA – E_2 (E_{21})			Throttle valve fully closed	0.3 – 0.8 V
				Throttle valve fully open	3.2 – 4.9 V









• IDL – E2 (E21)

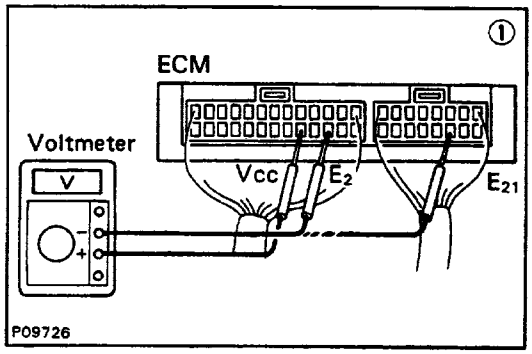
(1) There is no voltage between ECM terminals IDL and E2 (E21). **(IG SW ON)** (Throttle valve open)

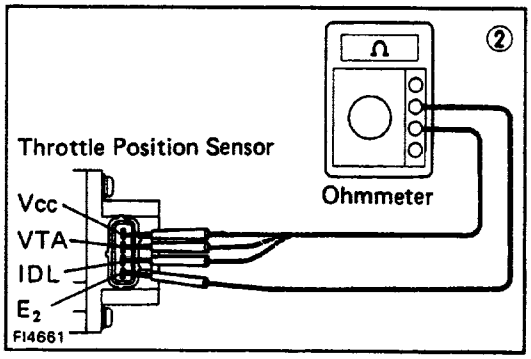
↓

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground. **(IG SW ON)**

- NO → Refer to No. 1. → BAD → Replace or repair.
- OK → Check wiring between ECM terminal E1 and body ground.
  - OK → Check throttle position sensor.
    - BAD → Replace or repair throttle position sensor.
    - OK → Check wiring between ECM and throttle position sensor.
      - OK → Try another ECM.
      - BAD → Replace or repair.
  - BAD → Replace or repair.

V01798





• Vcc – E2 (E21)

(1)There is no voltage between ECM terminals Vcc and E2(E21) **(IG SW ON)**

↓

Check that there is voltage between ECM terminals + B (+ B1) and E1. **(IG SW ON)**

↓ OK — NO → Refer to No. 1.

(2) Check throttle position sensor.

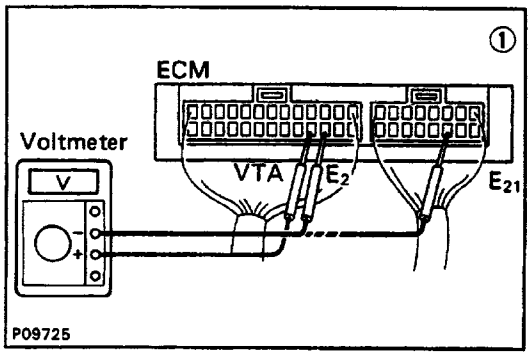
↓ BAD → Repair or replace.

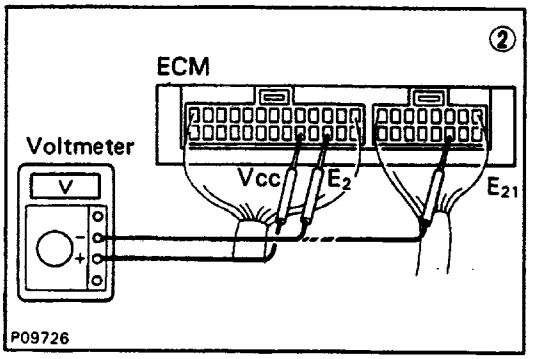
↓ OK

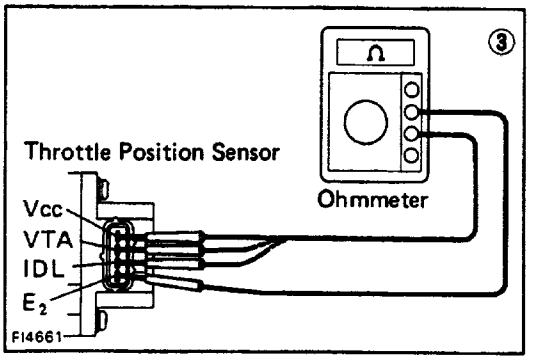
Check wiring between ECM and throttle position sensor.

↓ OK — BAD → Repair or replace wiring.

Try another ECM.







• VTA – E2 (E21)

(1) There is no voltage between ECM terminals VTA and E2 (E21). **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminals Vcc and E2 (E21). **(IG SW ON)**

↓ OK — NO → Perform inspection of Vcc – E2(E21).

Check throttle position sensor. — BAD → Repair or replace.

↓ OK

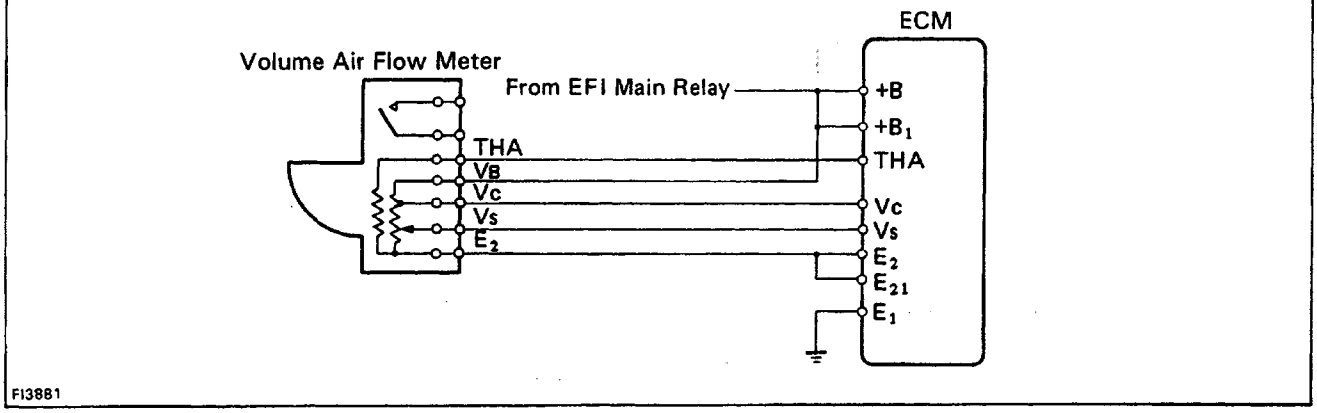
Check wiring between ECM and throttle position sensor. — BAD → Repair or replace.

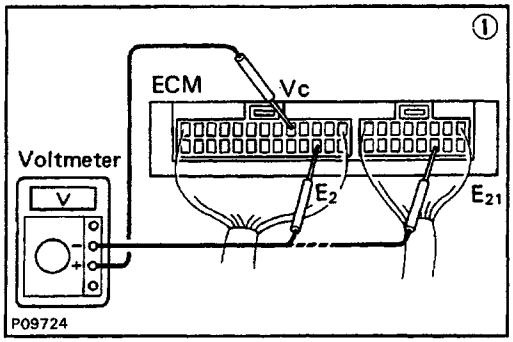
↓ OK

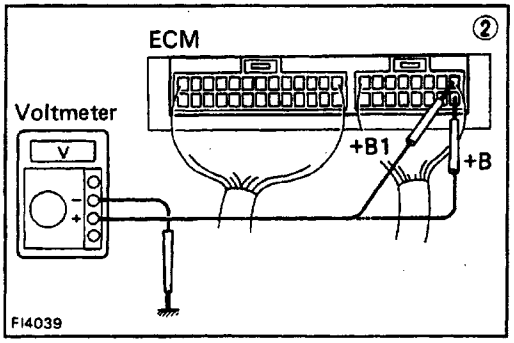
Try another ECM.

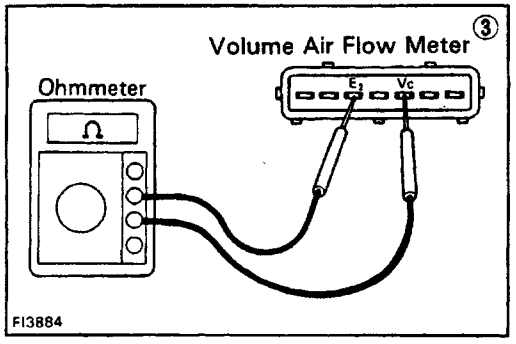
V01799

No.	Terminals	Trouble	Condition		STD Voltage
3	Vc – E_2 (E_{21})	No voltage	Ignition switch	–	6 – 10 V
	Vs – E_2 (E_{21})			Measuring plate fully closed	0.5 – 2.5 V
				Measuring plate fully open	5 – 10 V
			ON	Idling	2 – 8 V
	THA – E_2 (E_{21})		Ignition switch ON	Intake air temperature 20°C (68° F)	0.5 – 3.4 V









- **Vc–E2 (E21)**

(1) There is no voltage between ECM terminals Vc and E2 (E21). **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminals + B (+ B1) and E1. **(IG SW ON)**

OK → ↓ NO → Refer to No. 1.

↓

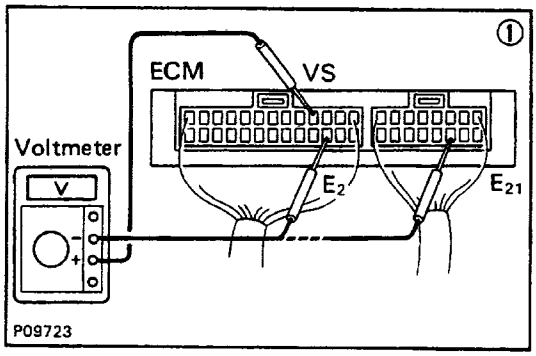
(3) Check volume air flow meter.

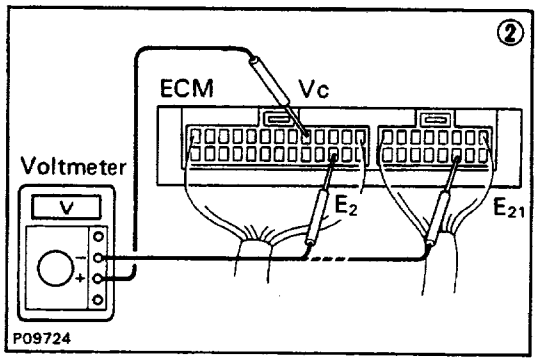
BAD → Replace or repair volume air flow meter.

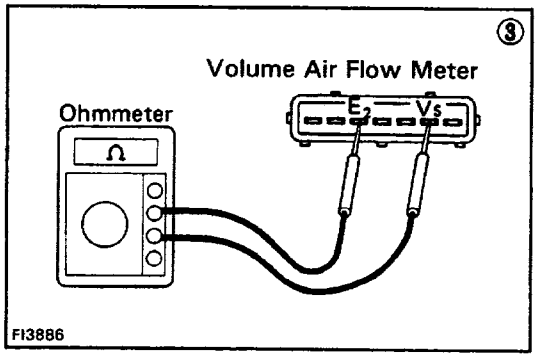
OK → Check wiring between ECM and volume air flow meter.

OK → Try another ECM.

BAD → Replace or repair wiring.







• Vs – E2 (E21)

(1) There is no voltage between ECM terminals Vs and E2 (E21) **(IG SW ON)**

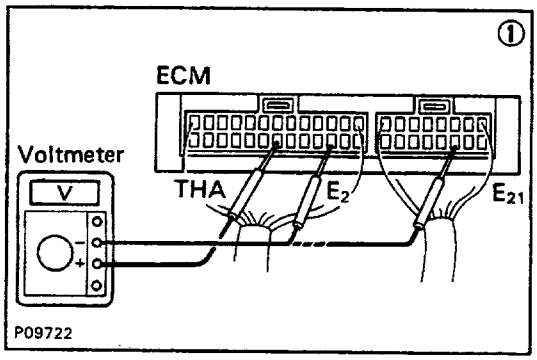
(2) Check that there is voltage between ECM terminals Vc and E2 (E12). **(IG SW ON)**

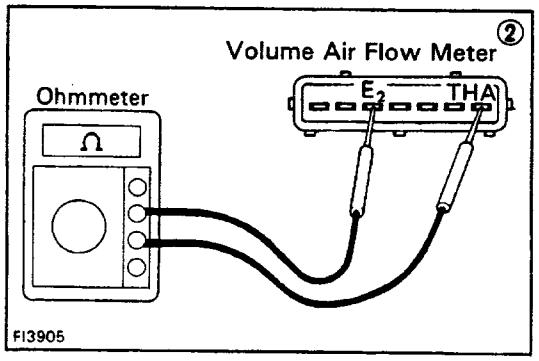
OK → (3) Check volume air flow meter.
- BAD → Repair or replace.

OK → Check wiring between ECM and volume air flow meter.
- BAD → Repair or replace.

OK → Try another ECM.

NO → Refer to Vc – E2 (E21).
- BAD → Repair or replace.





• THA – E2 (E21)

(1) There is no voltage between ECM terminals THA and E2(E21). **(IG SW ON)**

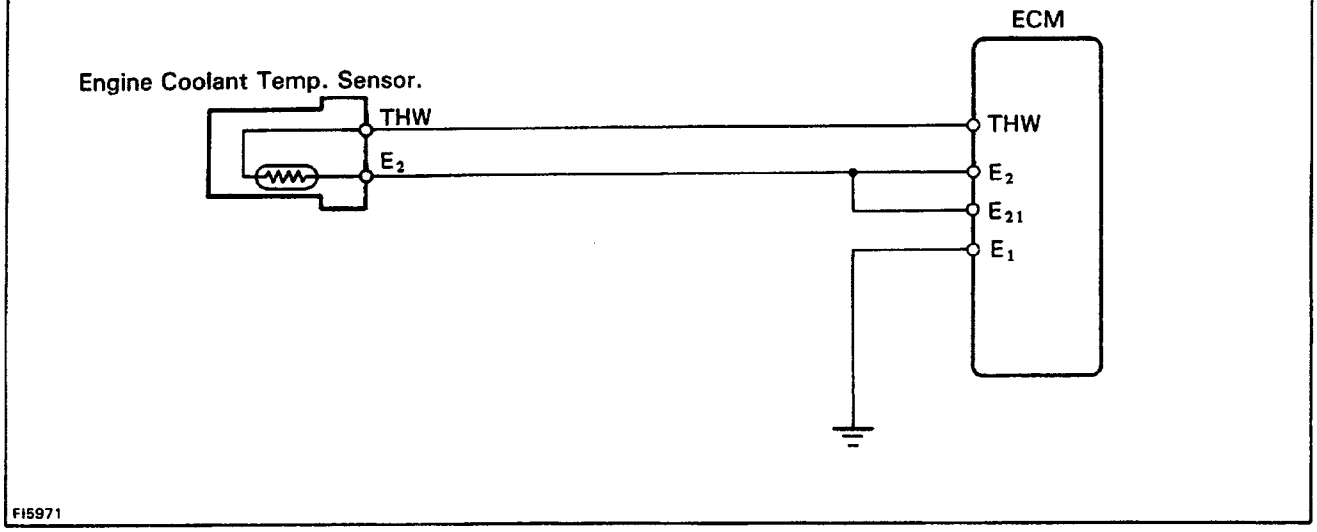
Check that there is voltage between ECM terminals + B (+ B1) and body ground. (IG SW ON)

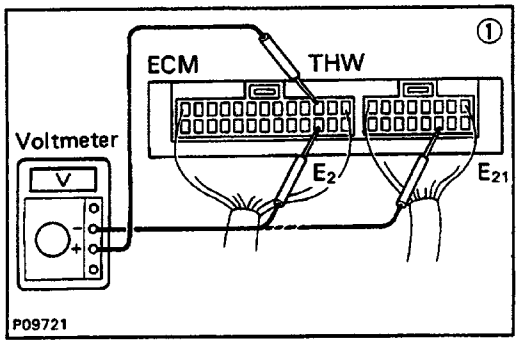
OK → Check intake air temp. sensor.
- BAD → Replace volume air flow meter.
- OK → Check wiring between ECM and intake air temp. sensor.
  - OK → Try another ECM.
  - BAD → Repair or replace wiring.

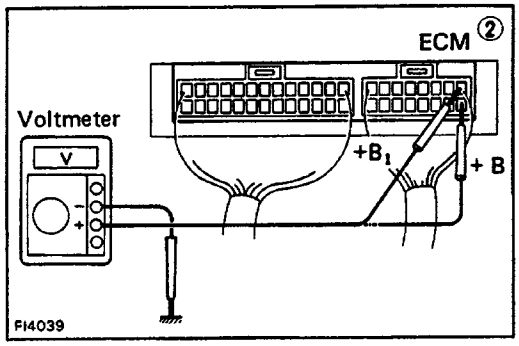
NO → Refer to No. 1.

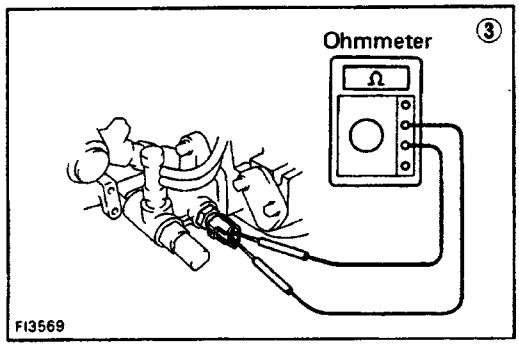
V01801

No.	Terminals	Trouble	Condition		STD Voltage
4	THW – E_2 (E_{21})	No voltage	Ignition switch ON	Coolant temperature 80°C (176° F)	0.2 – 1.0 V









(1) There is no voltage between ECM terminals THW and E2 (E21) **(IG SW ON)**

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground.**(IG SW ON)**

OK → Check wiring between ECM terminal E1 and body ground.

NO → Refer to No. 1.

OK → (3) Check engine coolant temp. sensor.

BAD → Repair or replace.

BAD → Replace engine coolant temp. sensor.

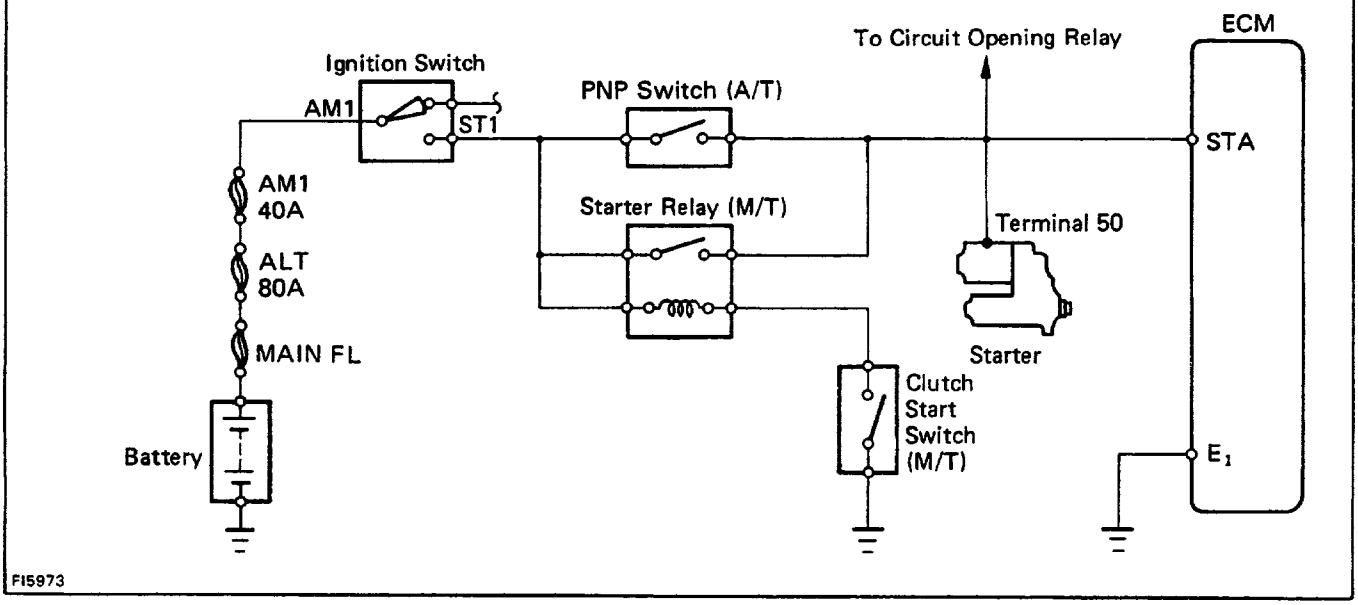
OK → Check wiring between ECM and engine coolant temp. sensor.

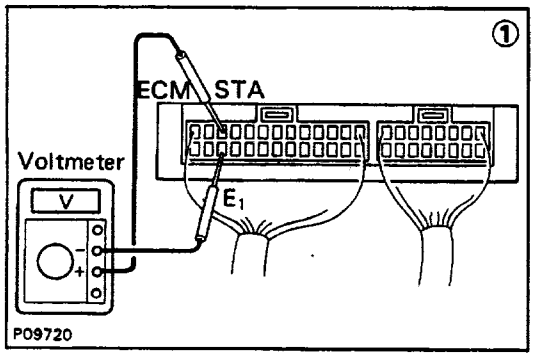
OK → Try another ECM

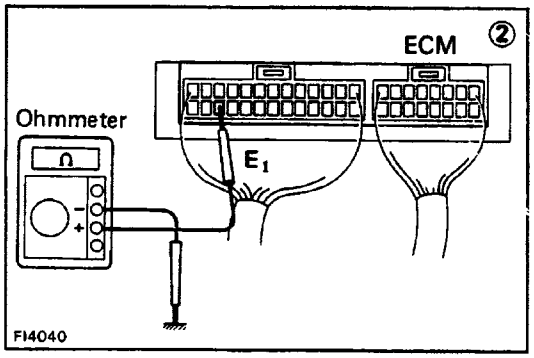
BAD → Repair or replace.

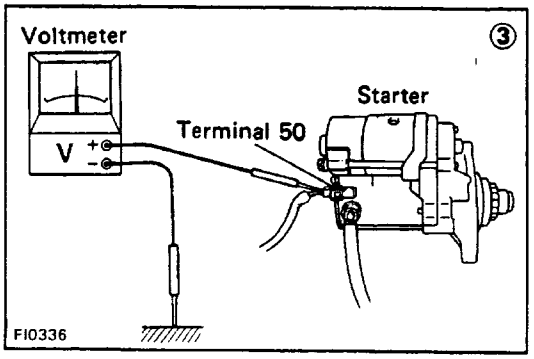
V01802

No.	Terminals	Trouble	Condition	STD Voltage
5	STA – E 1	No voltage	Ignition switch START position	6 –12v







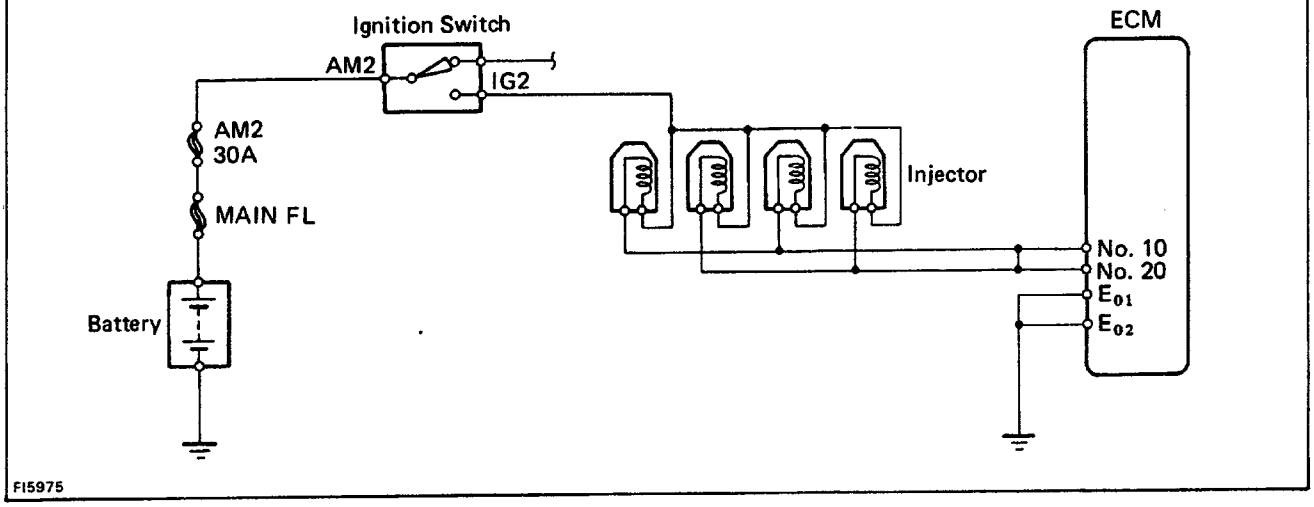


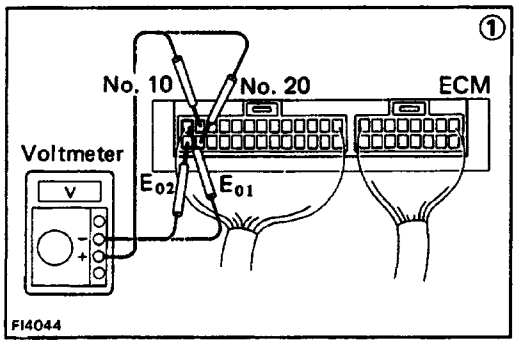
(1) There is no voltage between ECM terminals STA and E1 **(IG SW START)**

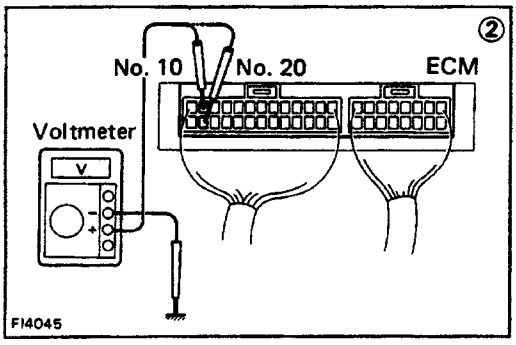
Check starter operation.
- OK → Check wiring between ECM and ignition switch terminal ST.
  - OK → (2) Check wiring between ECM terminal E1 an body ground.
    - OK → Try another ECM.
    - BAD → Repair or replace.
  - BAD → Repair or replace.
- BAD → Check fusible link, battery, wiring and ignition switch.
  - BAD → Repair or replace.
  - OK → (3) Check that there is voltage at terminal 50 of starter. **(IG SW START) STD Voltage: 6 –12 V**
    - OK → Check starter. (See ST section)
    - NO → Check wiring between ignition switch ST1 terminal and starter terminal 50.

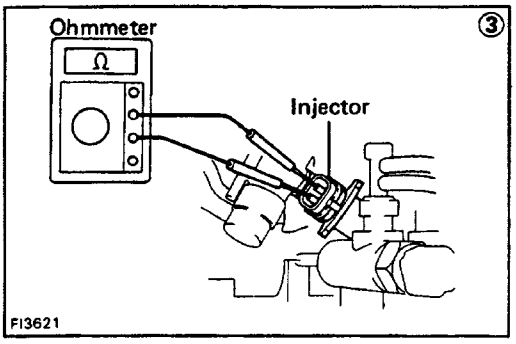
V01803

No.	Terminals	Trouble	Condition	STD Voltage
6	No. 10 _ E_{01} No. 20 E_{02}	.No voltage	Ignition switch ON	9 – 14 V









(1)There is no voltage between ECM terminals No. 10 and/or No. 20 and E01, and/or E02. **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminal No. 10 and/or No. 20 and body ground.

NO → OK

OK → Check wiring between ECM terminal E01, and/or E02 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

NO → Check fusible link and ignition switch.

BAD → Repair or replace.

OK →

(3) Check resistance of magnetic coil in each injector
STD resistance: 13.4 – 14.2Ω

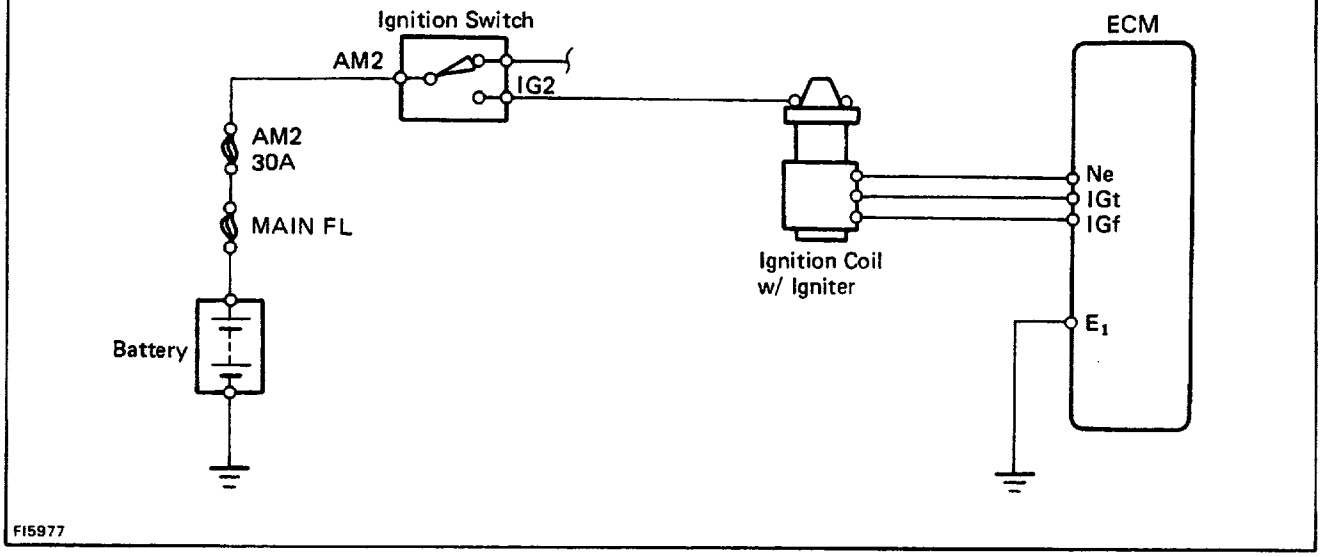
OK →

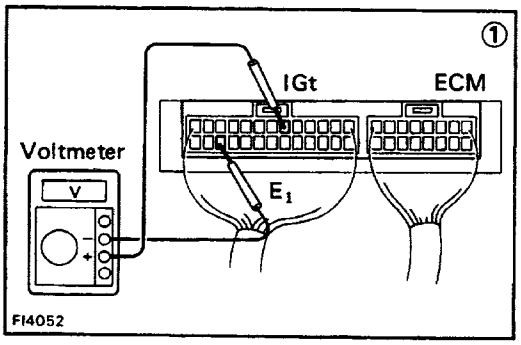
NO → Replace injector.

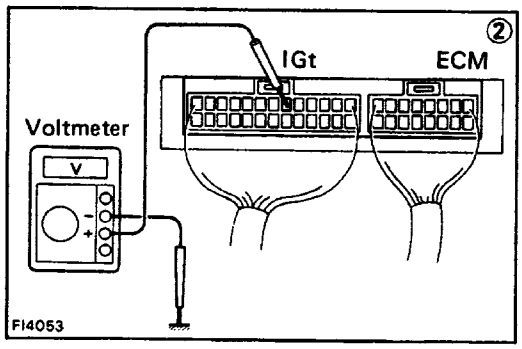
Check wiring between ECM terminal No. 10 and/or No. 20 and battery.

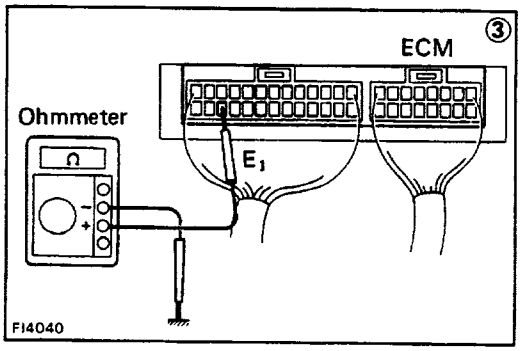
BAD → Repair or replace.

No.	Terminals	Trouble	Condition	STD Voltage
7	IGt – E1	No voltage	Idling	0.7 – 1.0 v









(1) There is no voltage between ECM terminals IGt and E1. **(idling)**

↓

(2) Check that there is voltage between ECM terminal IGt and body ground. **(Idling)**

NO → ↓

OK → (3) Check wiring between ECM terminal E1 and body ground.

BAD ↓

Refer to No. 1. — BAD → Repair or replace.

↓ OK

Check wiring between igniter and distributor. — BAD → Repair or replace.

↓ OK

Check distributor. — BAD → Replace.

↓ OK

Check wiring between ECM and igniter. — BAD → Repair or replace.

↓ OK

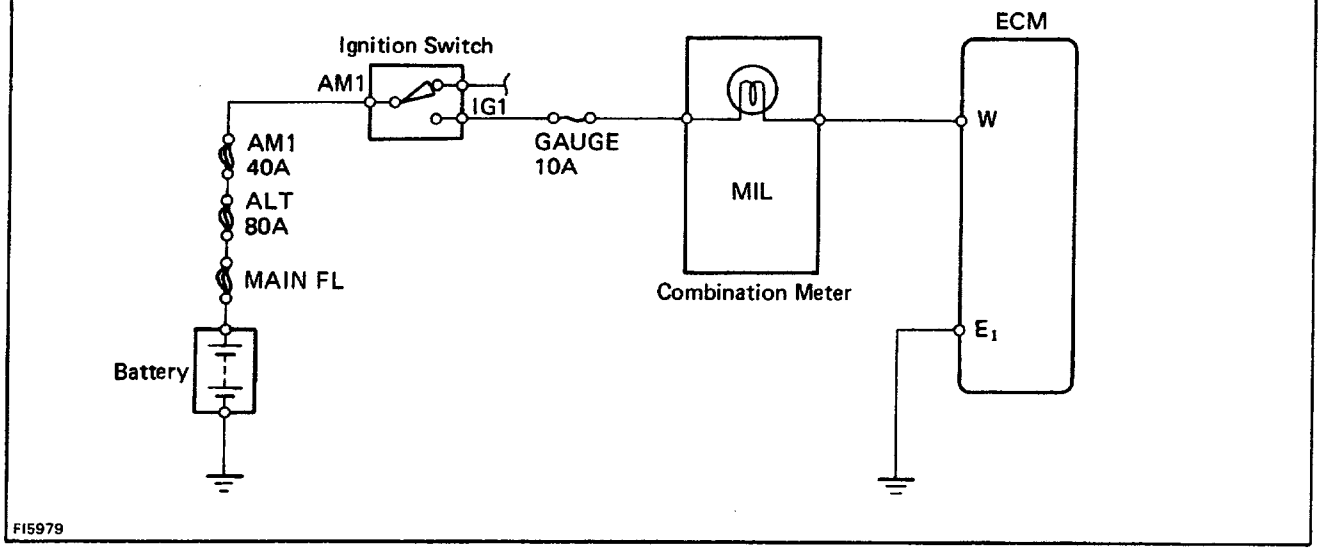
Check igniter. — BAD → Repair or replace.

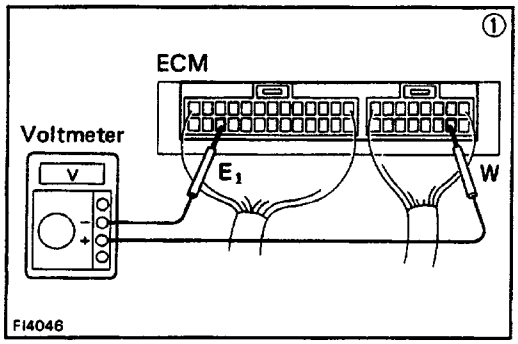
↓ OK

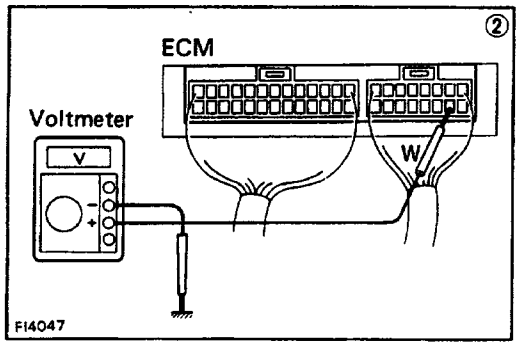
Try another ECM.

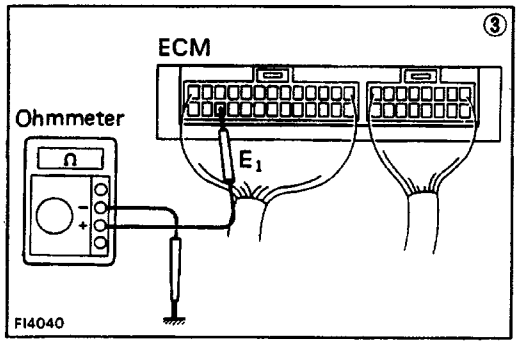
V01805

No.	Terminals	Trouble	Condition	STD Voltage
8	W – E1	No voltage	No trouble (MIL off) and engine running	9 – 14V









(1) There is no voltage between ECM terminals W and E1. **(Idling)**

↓

(2) Check that there is voltage between ECM terminal W and body ground.

NO → ↓

OK →

(3) Check wiring between ECM terminal E1 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

↓

Check GAUGE fuse (10 A) and MIL.

OK → ↓

BAD → Repair or replace.

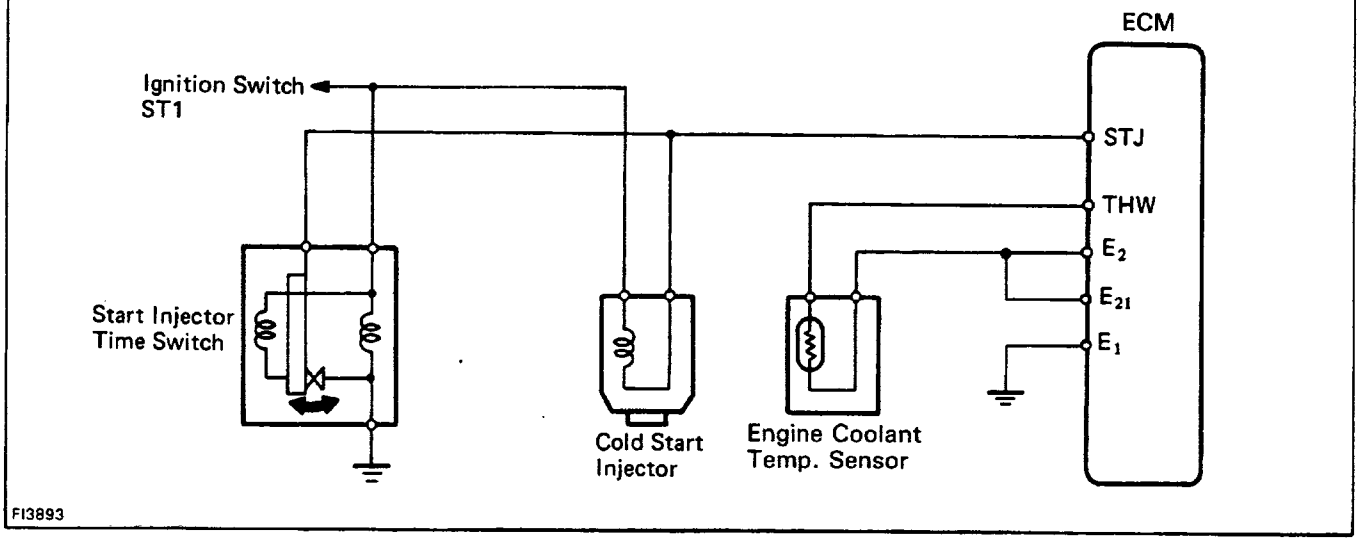
Fuse blows again → ↓

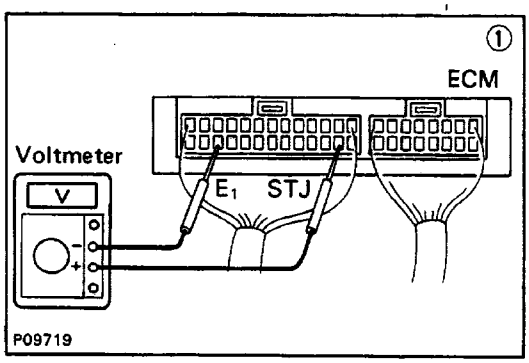
Check wiring between ECM terminal W and fuse.

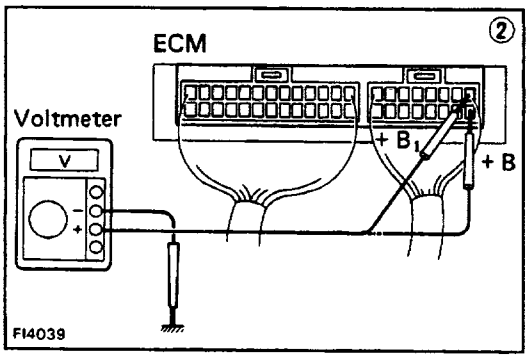
BAD → Repair or replace.

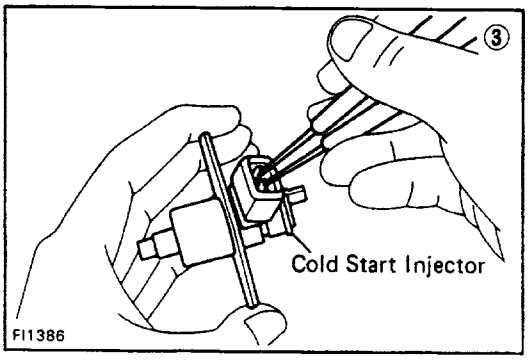
V01806

No.	Terminal	Trouble	Condition		STD Voltage
9	STJ – E 1	No voltage	Ignition switch . START position	Coolant temperature 80°C (176° F)	6 –12V









(1) There is no voltage between ECM terminals STJ and E1. (IG SW START)

(2) Check that there is voltage between ECM terminal +B (+ B, and body ground. (IG SW ON)

OK → (3) Check cold start injector.

NO → Refer to No. 1.

BAD → Replace cold start injector.

OK → Check wiring between ECM and cold start injector.

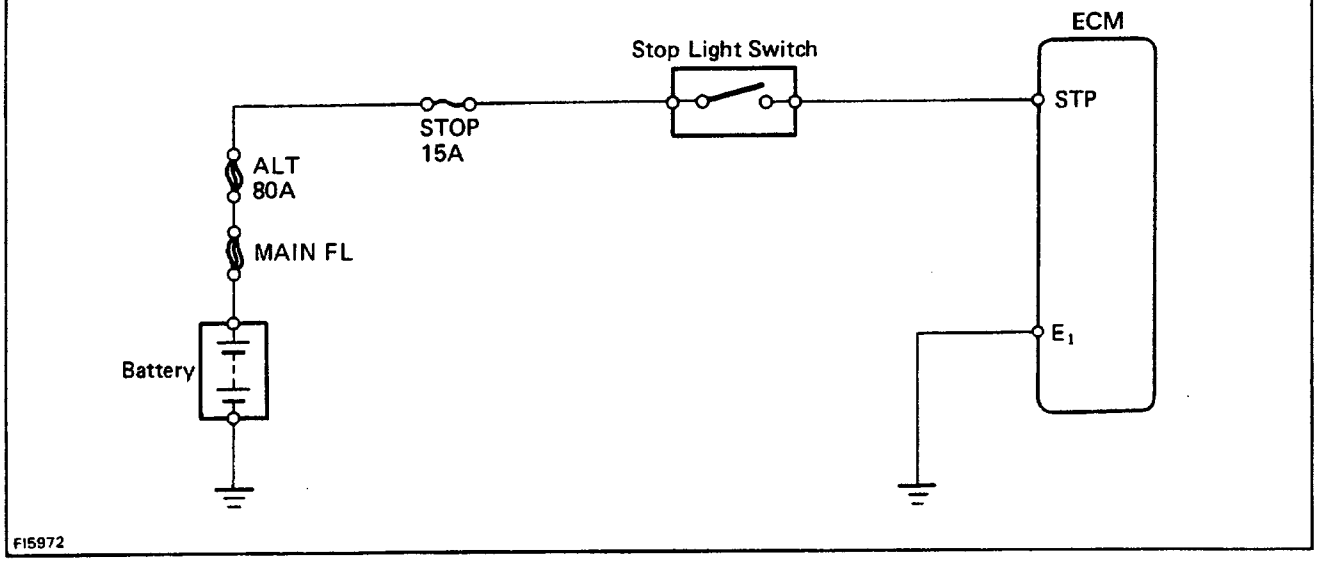
OK → Check wiring between ECM terminal E1 and body ground.

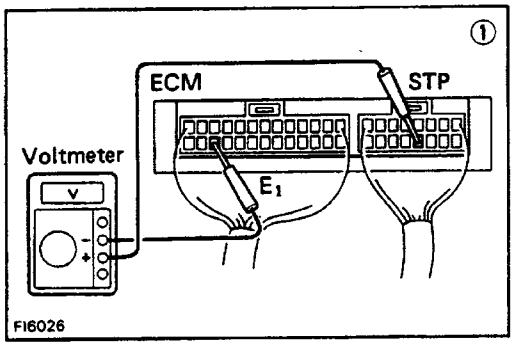
OK → Try another ECM.

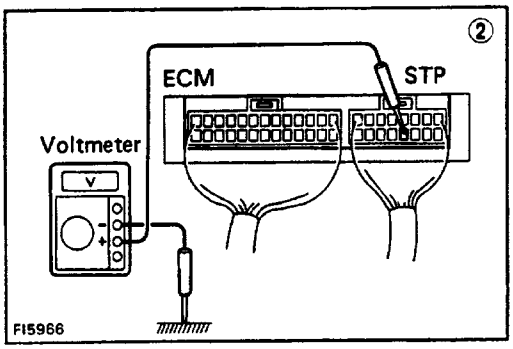
BAD → Repair or replace wiring.

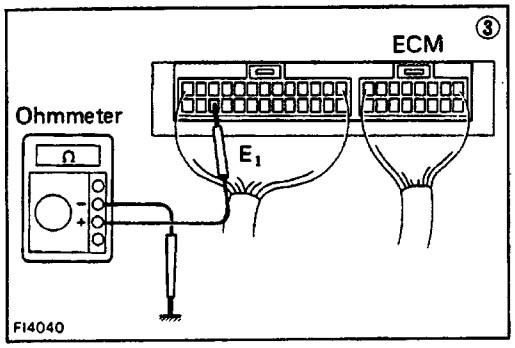
V01807

No.	Terminals	Trouble	Condition	STD Voltage
10	STP – E1	No voltage	Stop light switch ON	7.5 – 14 V









(1) There is no voltage between ECM terminals STP and E1.

↓

(2) Check that there is voltage between ECM terminal STP and body ground when the brake pedal is depressed.

NO → ↓ OK

↓

(3) Check wiring between ECM terminal E1 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

↓

Check STOP fuse (15A) and stop light switch.

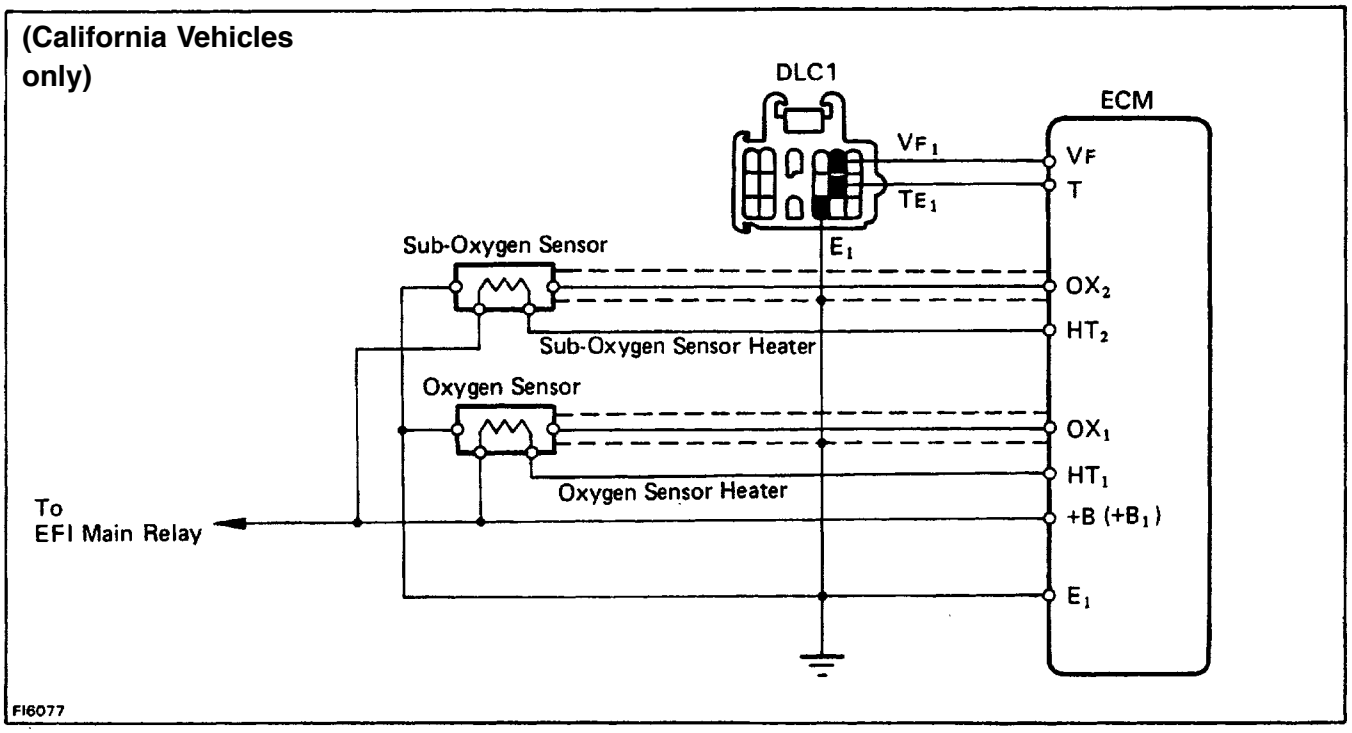
BAD → Repair or replace.

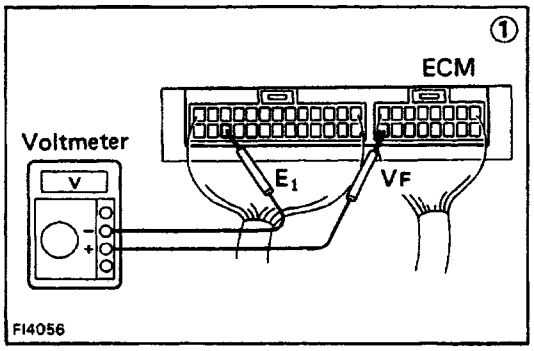
↓ OK

Check wiring between ECM terminal STP and battery.

BAD → Repair or replace.

V01808





(1) There is no voltage between ECM terminals VF and E1.

Check that there is voltage between ECM terminal VF and body ground.

NO

OK

Check wiring between ECM terminal E1 and body ground.

OK

BAD

Try another ECM.

Repair or replace.

Is air leaking into air induction system?

YES

Repair air leak.

NO

Check spark plugs.

BAD

Repair or replace.

OK

Check distributor and ignition system.

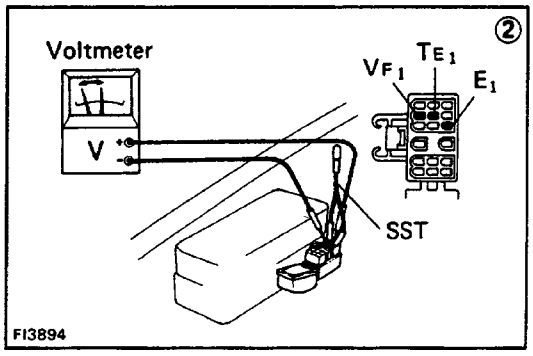
BAD

Repair or replace.

OK

CONTINUED ON PAGE EG1–139

V01809



CONTINUED FROM PAGE EG1–138

OK

Check fuel pressure. — BAD → Repair or replace.

OK

Check injector. — BAD → Repair or replace.

OK

Check cold start injector.* — BAD → Repair or replace.

OK

Check volume air flow meter. — BAD → Repair or replace.

OK

(2) Check operation of oxygen sensor. — OK → System normal.

BAD

Check wiring between oxygen sensor and ECM connector. — BAD → Repair wiring.

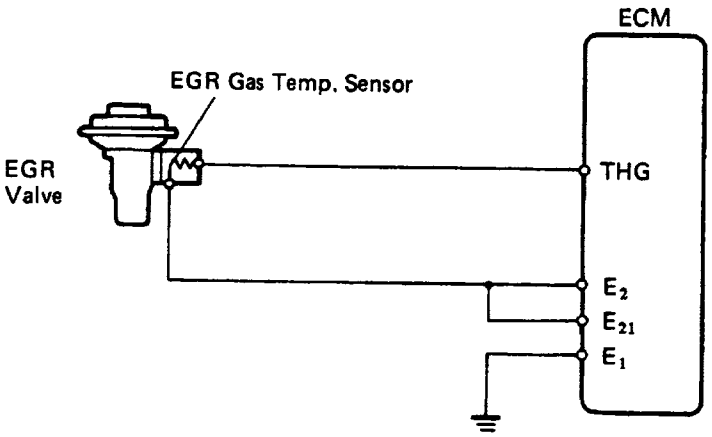
OK

Replace oxygen sensor.

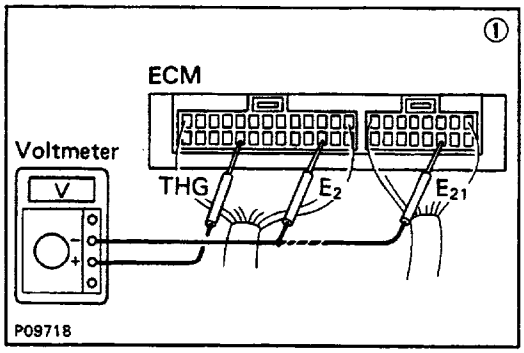
*Rich malfunction only.

V01810

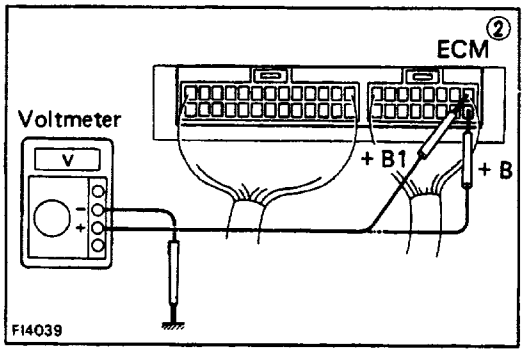
(California Vehicles only)



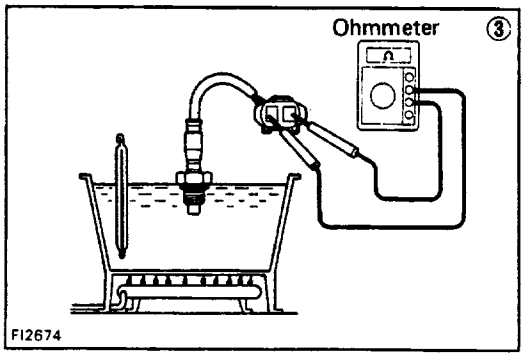
FI3895



P09718



FI4039



FI2674

(1) There is no voltage between ECM terminals THG and E2 (E21). **(Engine running at 2,000 rpm)**

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground. **(IG SW ON)**

OK → Check wiring between ECM terminal E1 and body ground.

NO → Refer to No. 1.

OK → Check EGR system.

BAD → Repair or replace.

BAD → Repair or replace.

OK → (3) Check EGR gas temp. sensor.

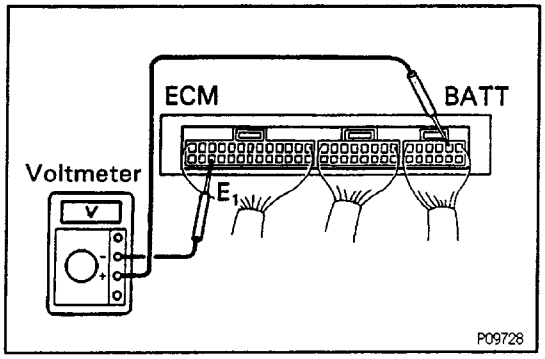
BAD → Replace EGR gas temp. sensor.

OK → Check wiring between ECM and EGR gas temp. sensor.

OK → Try another ECM.

BAD → Repair or replace.

V01811



MFI SYSTEM CHECK PROCEDURE (4WD M/T)

HINT:

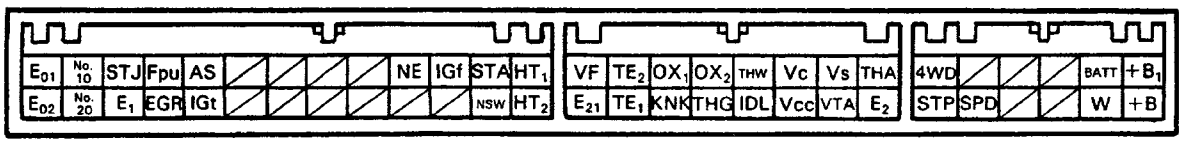
- Perform all voltage measurements with the connec–tors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is in ”ON” position.
  Using a voltmeter with high impedance (10 kΩ/V minimum), measure the voltage at each terminal of the wiring connector.

Terminals of ECM KWD M/T)

Symbol	Terminal Name	Symbol	Terminal Name
E_{01}	ENGINE GROUND	Ox_1	OXYGEN SENSOR (MAIN)
E_{02}	ENGINE GROUND	KNK	KNOCK SENSOR
No. 10	INJECTOR	* Ox_2	OXYGEN SENSOR (SUB)
No. 20	INJECTOR	* THG	EGR GAS TEMP. SENSOR
STJ	COLD START INJECTOR	THW	ENGINE COOLANT TEMP. SENSOR
E_1	ENGINE GROUND	IDL	THROTTLE POSITION SENSOR
Fpu	FUEL PRESSURE CONTROL VSV	Vc	VOLUME AIR FLOW METER
* EGR	EGR VSV	Vcc	THROTTLE POSITION SENSOR
AS	PAIR VSV	Vs	VOLUME AIR FLOW METER
IGt	IGNITER	VTA	–THROTTLE POSITION SENSOR
Ne	DISTRIBUTOR	THA	INTAKE AIR TEMP. SENSOR
IGf	IGNITER	E_2	SENSOR GROUND
STA	STARTER SWITCH	4WD	4WD SWITCH
NSW	PNP SWITCH	STP	STOP LIGHT SWITCH
HT_1	OXYGEN SENSOR HEATER (MAIN)	SPD	SPEED SENSOR
* HT_2	OXYGEN SENSOR HEATER (SUB)	BATT	BATTERY POSITIVE VOLTAGE
VF	DLC 1	W	MALFUNCTION INDICATOR LAMP
E_{21}	SENSOR GROUND	$+B_1$	MAIN RELAY
TE_2	D LC 1	+B	MAIN RELAY
TE_1	D LC 1		

* : California only

ECM Terminals



P09752

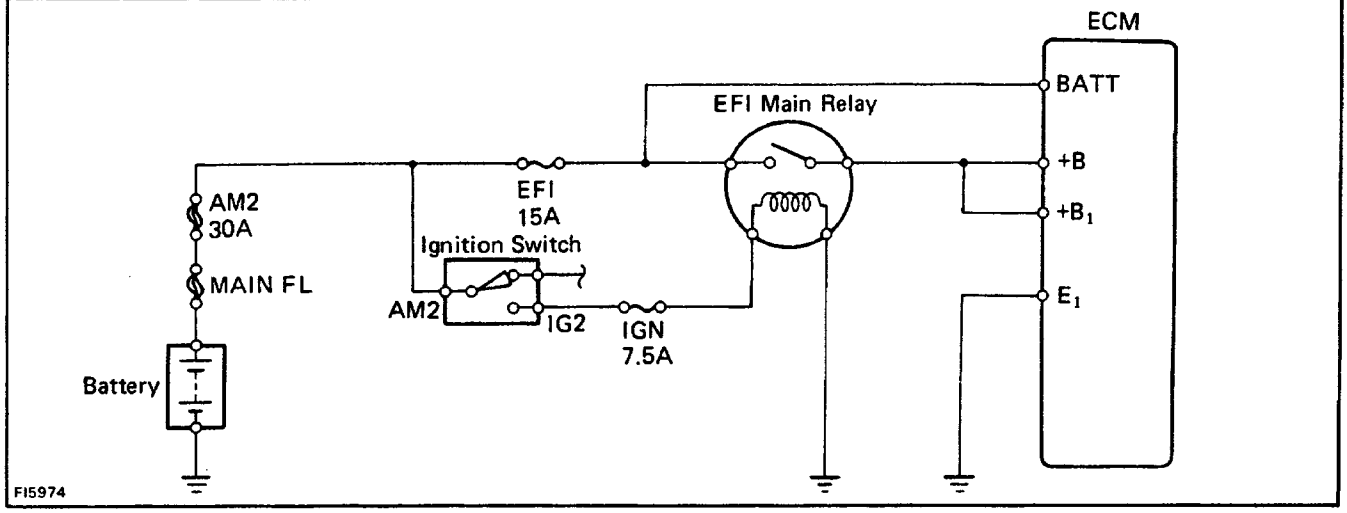
V01812

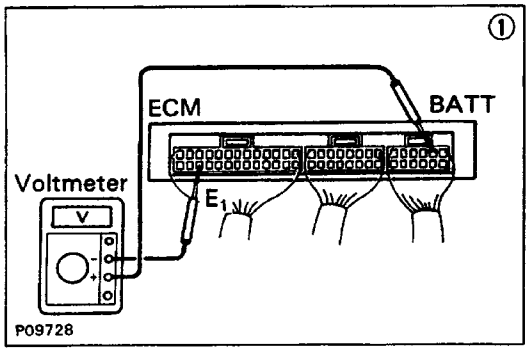
Voltage at ECM Wiring Connectors (4WD M/T)

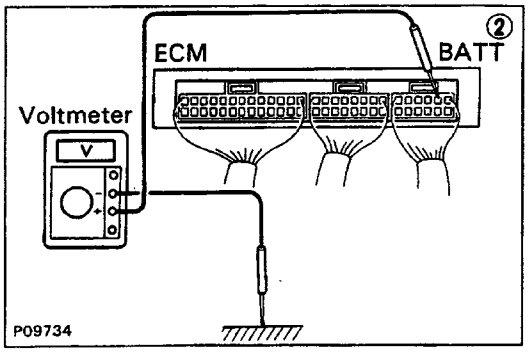
No.	Terminals	Condition		STD voltage	See page
1	BATT – E_1	–		9 – 14	EG1–143
	+B – E_1	Ignition switch ON			
	$+B_1$ – E_1				
2	IDL – E_2 (E_{21})	Ignition switch ON	Throttle valve open	9 – 14	EG1–145
	Vcc – E_2 (E_{21})		–	4.5 – 5.5	
	VTA – E_2 (E_{21})		Throttle valve fully closed	0.3 – 0.8	
			Throttle valve fully open	3.2 – 4.9	
3	Vc – E_2 (E_{21})	Ignition switch ON	–	6–10	EG1–147
	Vs – E_2 (E_{21})		Measuring plate fully closed	0.5–2.5	
			Measuring plate fully open	5–10	
		Idling		2–8	
	THA – E_2 (E_{21})	Ignition switch ON	Intake air temperature 20°C (68°F)	0.5 – 3.4	
4	THW – E_2 (E_{21})	Ignition switch ON	Coolant temperature 80°C (176°F)	0.2 – 1.0	EG1–149
5	STA – E_1	Ignition switch START position		6–12	EG1–150
6	No. 10 – E_{01} No. 20 – E_{02}	Ignition switch ON		9 – 14	EG1–151
7	IGt – E_1	Idling		0.7–1.0	EG1–152
8	W – E_1	No trouble (MIL off) and engine running		9 – 14	EG1–153
9	STJ – E_1	Ignition switch START position	Coolant temperature 80°C (1 76°F)	6–12	EG1–154
10	STP – E_1	Stop light switch ON		7.5 – 14	EG1–155

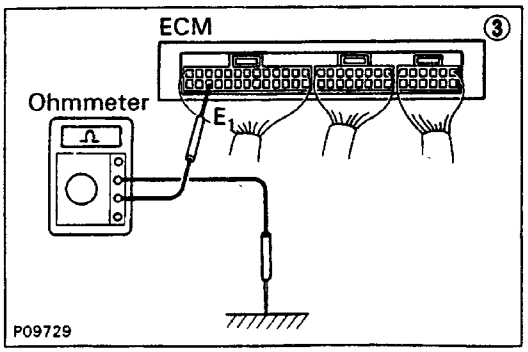
V01813

No.	Terminals	Trouble	Condition	STD Voltage
1	BATT – E_1	No voltage	–	9 – 14 V
	+B – E_1		Ignition switch ON	
	$+B_1$ – E_1			









- **BATT – E 1**

(1) There is no voltage between ECM terminals BATT and E1.

↓

(2) Check that there is voltage between ECM terminal BATT and body ground.

NO → ↓ OK

(3) Check wiring between ECM terminal E1 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

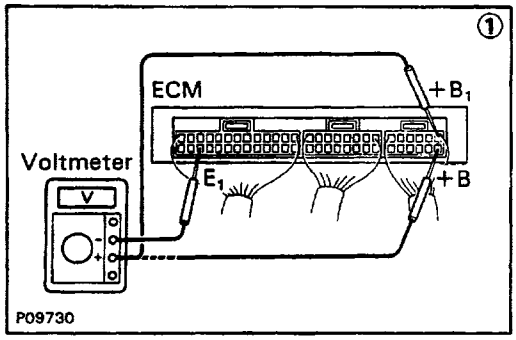
↓

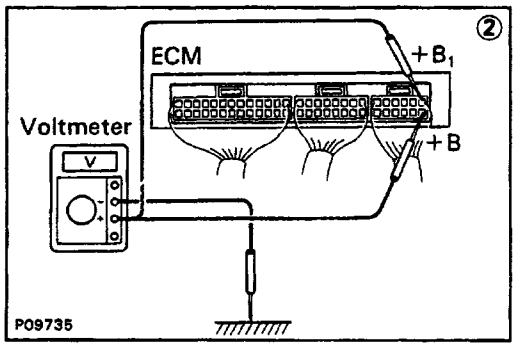
Check fuse and fusible link. BAD → Replace.

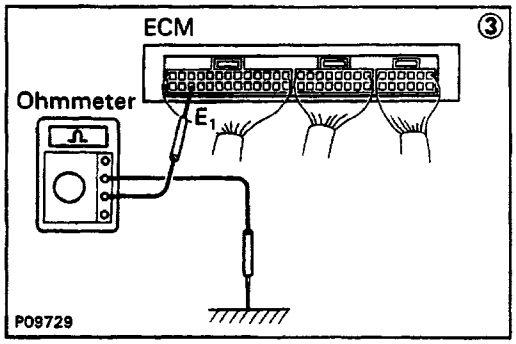
↓ OK

Check wiring between fuse and ECM. BAD → Repair or replace.

V01815







• +B (B1) – E1

(1) There is no voltage between ECM terminals + B (+ B1) and E1. **(IG SW ON)**

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground. **(IG SW ON)**

NO → OK

(3) Check wiring between ECM terminal E1 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

Check fuse, fusible link and ignition switch. → BAD → Repair or replace.

OK

Check EFI main relay. → BAD → Replace.

OK

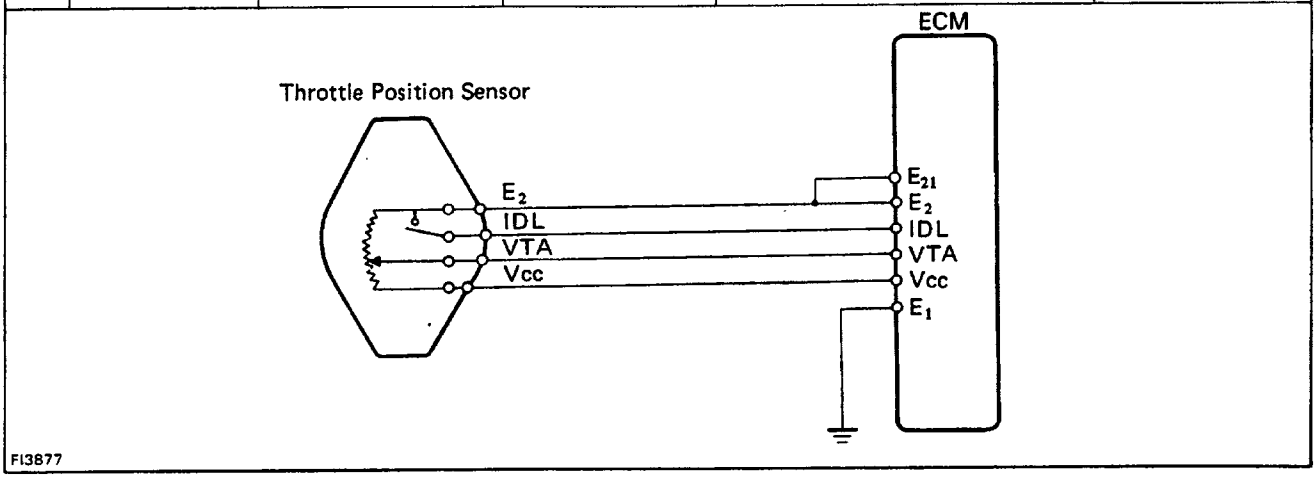
Check wiring between EFI main relay and battery. → BAD → Repair or replace.

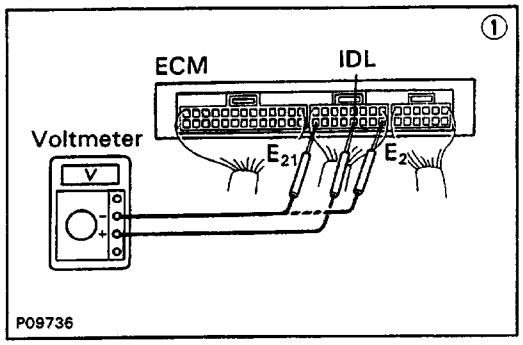
OK

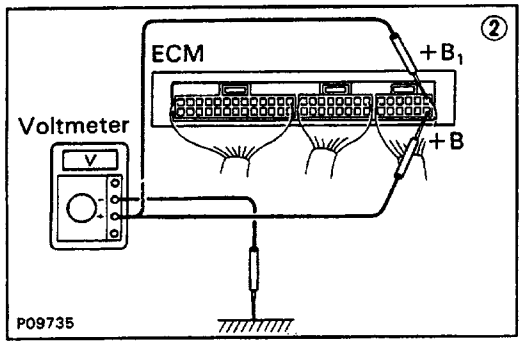
Check wiring between EFI main relay and ECM terminal + B (+ B1). → BAD → Repair or replace.

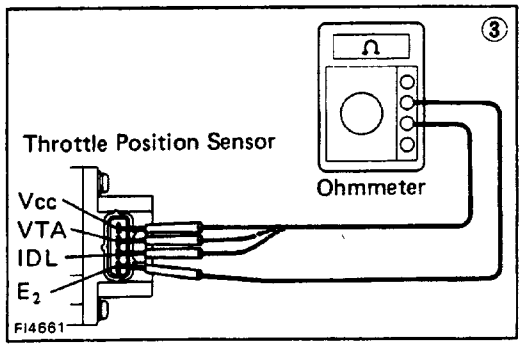
V01814

No.	Terminals	Trouble	Condition		STD Voltage
2	IDL – E_2 (E_{21})	No voltage	Ignition switch ON	Throttle valve open	9 – 14 V
	Vcc – E_2 (E_{21})			–	4.5 – 5.5 V
	VTA – E_2 (E_{21})			Throttle valve fully closed	0.3 – 0.8 V
				Throttle valve fully open	3.2 – 4.9 V









- **IDL – E2 (E21)**

(1) There is no voltage between ECM terminals IDL and E2 (E21). **(IG SW ON)**

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground. **(IG SW ON)**

NO → Refer to No. 1. → BAD → Replace or repair.

OK → Refer to No. 1. → OK

OK → Check wiring between ECM terminal E1 and body ground.

OK → (3) Check throttle position sensor.

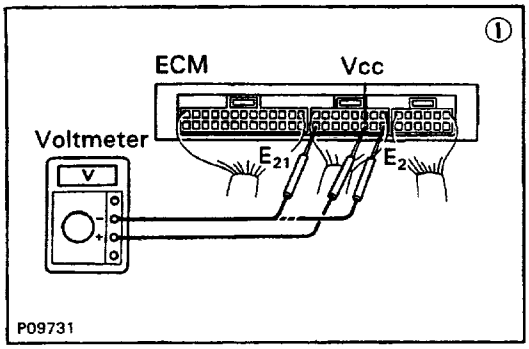
BAD → Replace or repair throttle position sensor.

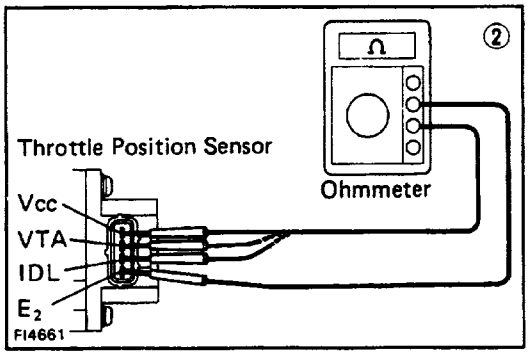
OK → Check wiring between ECM and throttle position sensor.

OK → Try another ECM.

BAD → Replace or repair.

BAD → Replace or repair.





- **Vcc – E2 (E21)**

(1) There is no voltage between ECM terminals Vcc and E2 (E21). **(IG SW ON)**

↓

Check that there is voltage between ECM terminals + B (+ B1) and E1. (IG SW ON)

OK → (2) Check throttle position sensor.

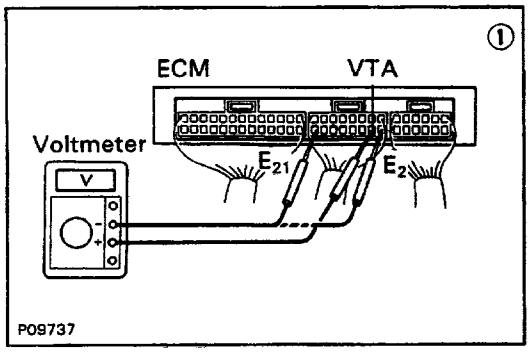
NO → Refer to No. 1.

BAD → Repair or replace.

OK → Check wiring between ECM and throttle position sensor.

OK → Try another ECM.

BAD → Repair or replace wiring.



- **VTA – E2 (E21)**

(1) There is no specified voltage between ECM terminals VTA and E2 (E21).**(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminals Vcc and E2 (E21). **(IG SW ON)**

OK → (3) Check throttle position sensor.

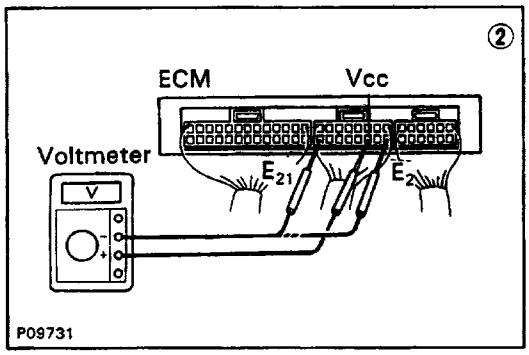
NO → Perform inspection of Vcc – E1 (E21)

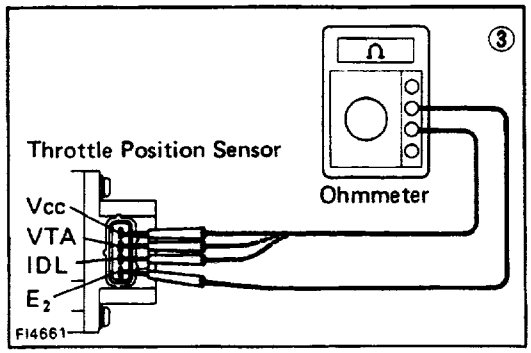
BAD → Repair or replace.

OK → Check wiring between ECM and throttle position sensor.

BAD → Repair or replace.

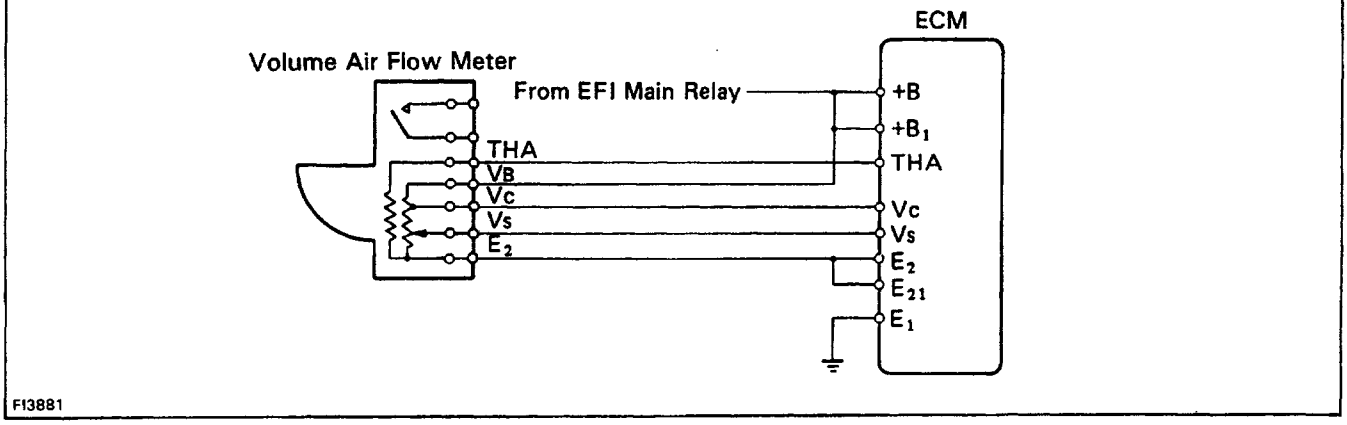
OK → Try another ECM.

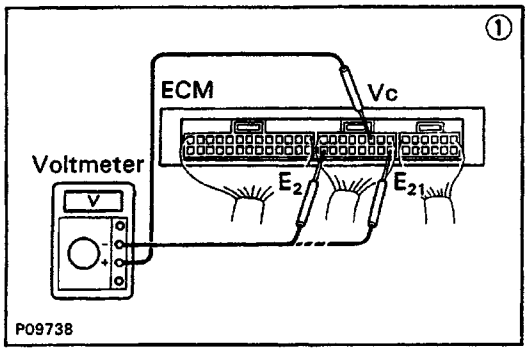


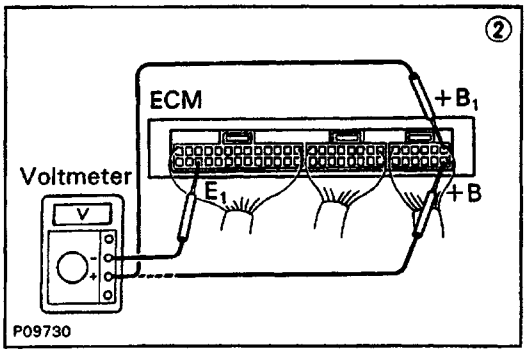


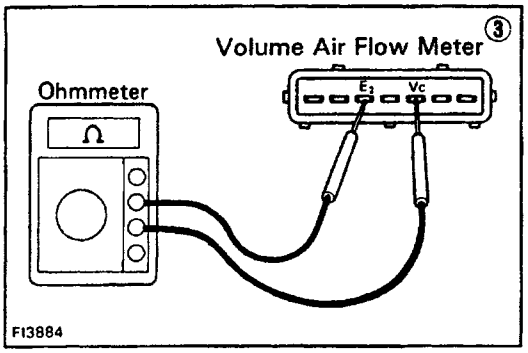
V01817

No.	Terminals	Trouble	Condition		STD Voltage
3	**Vc – E_2 (E_{21})**	No voltage	Ignition switch ON	–	**6 – 10 V**
	Vs – E_2 (E_{21})			Measuring plate fully closed	**0.5 – 2.5 V**
				Measuring plate fully open	**5 – 10 V**
			Idling		**2 – 8 V**
	THA – E_2 (E_{21})		Ignition switch ON	Intake air temperature 20°C (68° F)	**0.5 – 3.4 V**









- **Vc –E2 (E21)**

(1) There is no voltage between ECM terminals Vc and E2 (E21). **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminals + B (+ B1) and E1. **(IG SW ON)**

OK → (1) Check volume air flow meter.

NO → Refer to No. 1.

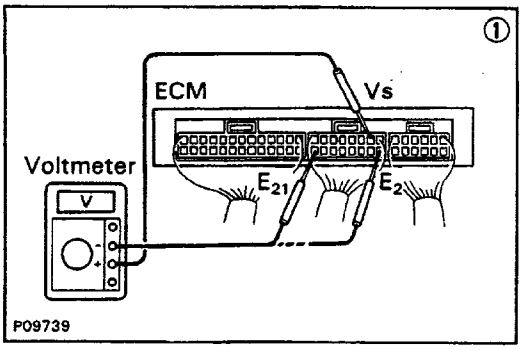
BAD → Replace or repair volume air flow meter.

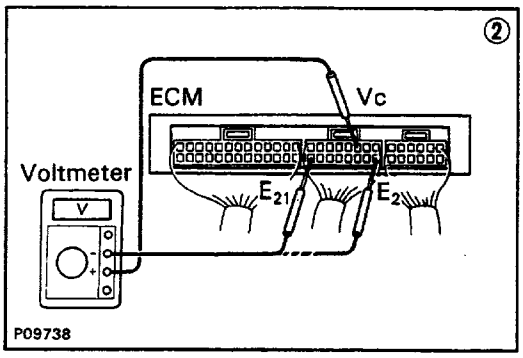
OK → Check wiring between ECM and volume air flow meter.

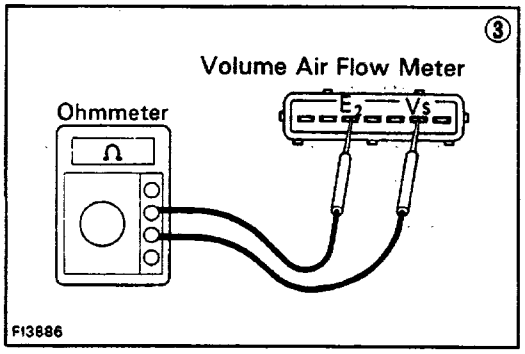
OK → Try another ECM.

BAD → Replace or repair wiring.

V01818







- **Vs – E2 (E21)**

(1) There is no voltage between ECM terminals Vs and E2 (E21). **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminals Vc and E2 (E21). **(IG SW ON)**

OK ↓ / NO → Refer to Vc – E2 (E21) → BAD → Repair– or replace.

↓

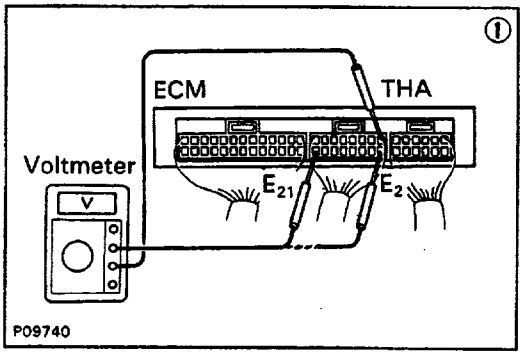
(3) Check volume air flow meter. → BAD → Repair or replace.

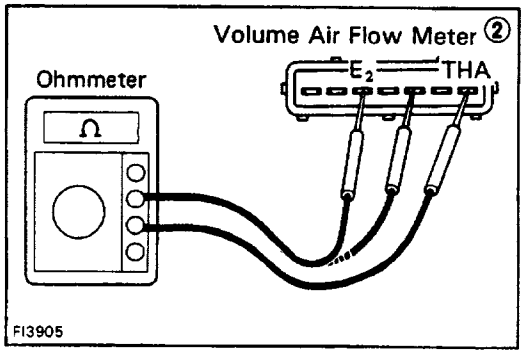
↓ OK

Check wiring between ECM and volume air flow meter. → BAD → Repair or replace.

↓ OK

Try another ECM.





- **THA – E2 (E21).**

(1) There is no voltage between ECM terminals THA and E2 (E21). **(IG SW ON)**

↓

Check that there is voltage between ECM terminal + B (+ B1) and body ground. **(IG SW ON)**

OK ↓ / NO → Refer to No. 1.

(2) Check intake air temp. sensor.

BAD ↓ Replace volume air flow meter.

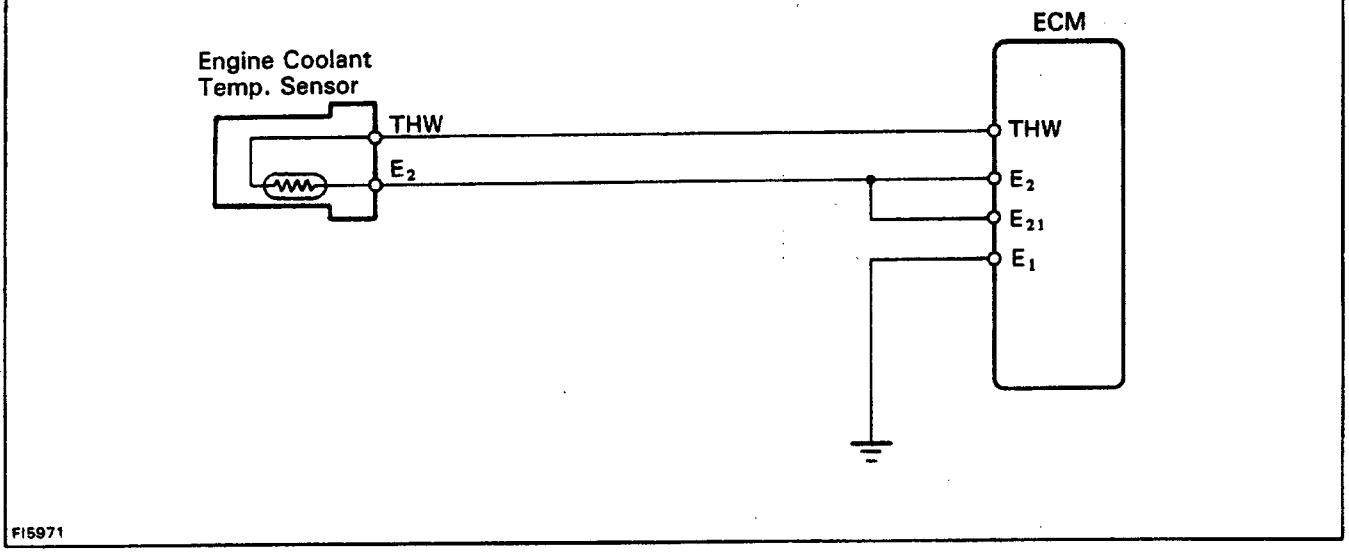
OK → Check wiring between ECM and intake air temp. sensor.

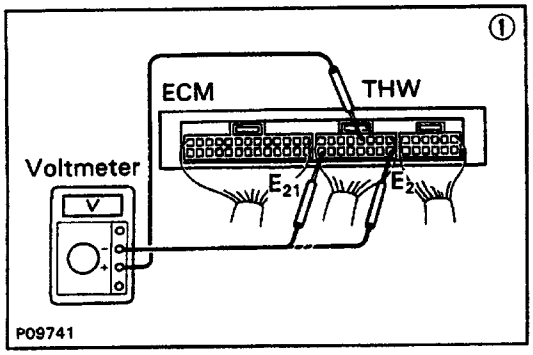
OK ↓ Try another ECM.

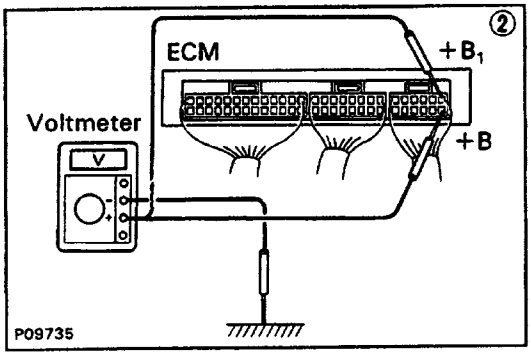
BAD → Repair or replace wiring.

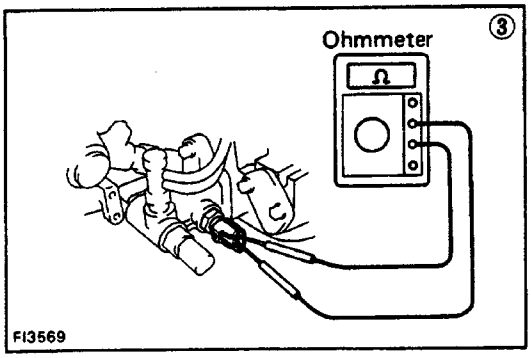
V01819

No.	Terminals	Trouble	Condition		STD– Voltage
4	THW – E_2 (E_{21})	No voltage	Ignition switch ON	Coolant temperature 80°C (176°)	0.2 – 1.0 V









(1) There is no voltage between ECM terminals THW and E2 (E21). **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminal +B (+B1) and body ground.* **(IG SW ON)**

OK → ↓

NO → Refer to No. 1.

↓

Check wiring between ECM terminal E1 and body ground.

OK → ↓

BAD → Repair or replace.

↓

Check engine coolant temp. sensor.

BAD → Replace engine coolant temp. sensor.

OK → ↓

Check wiring between ECM and engine coolant temp. sensor.

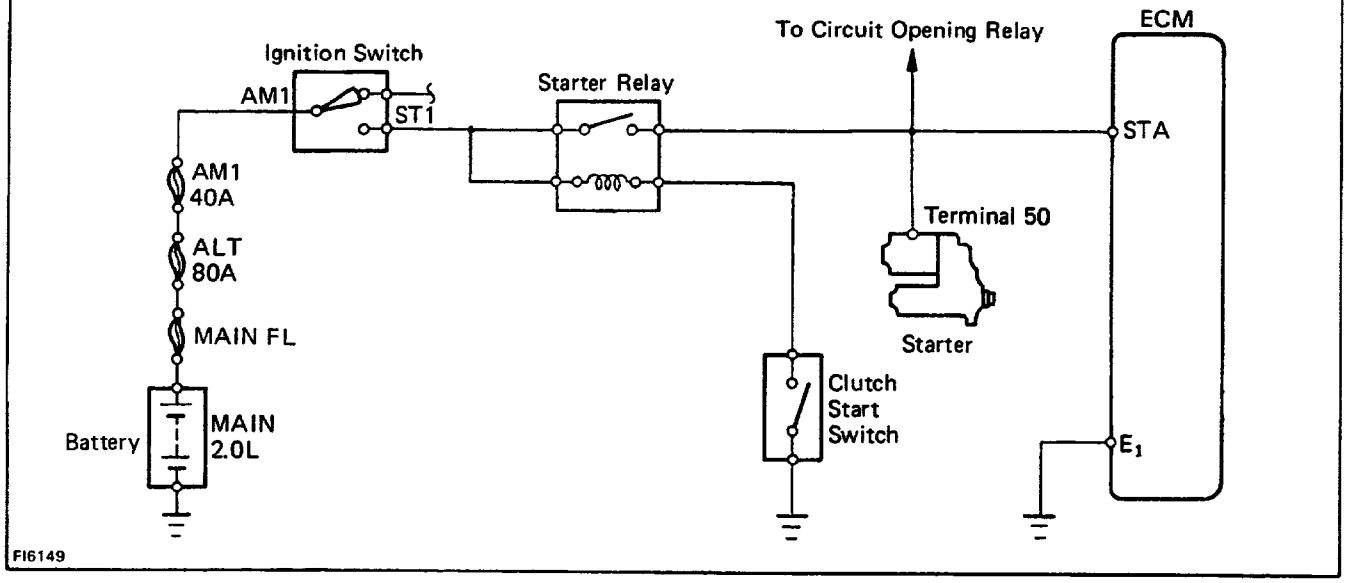
OK → ↓

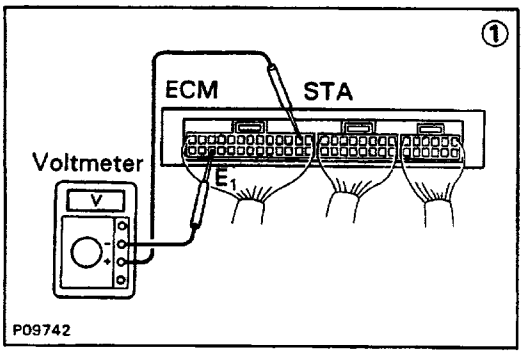
BAD → Repair or replace.

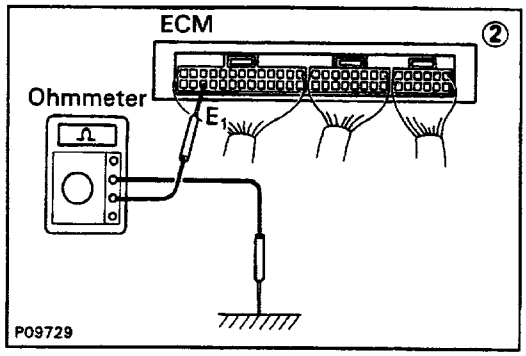
Try another ECM.

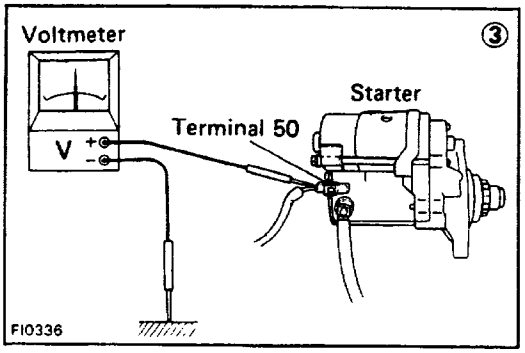
V01820

No.	Terminals	Trouble	Condition	STD Voltage
5	STA – E_1	No voltage	Ignition switch START position	6 – 12 V







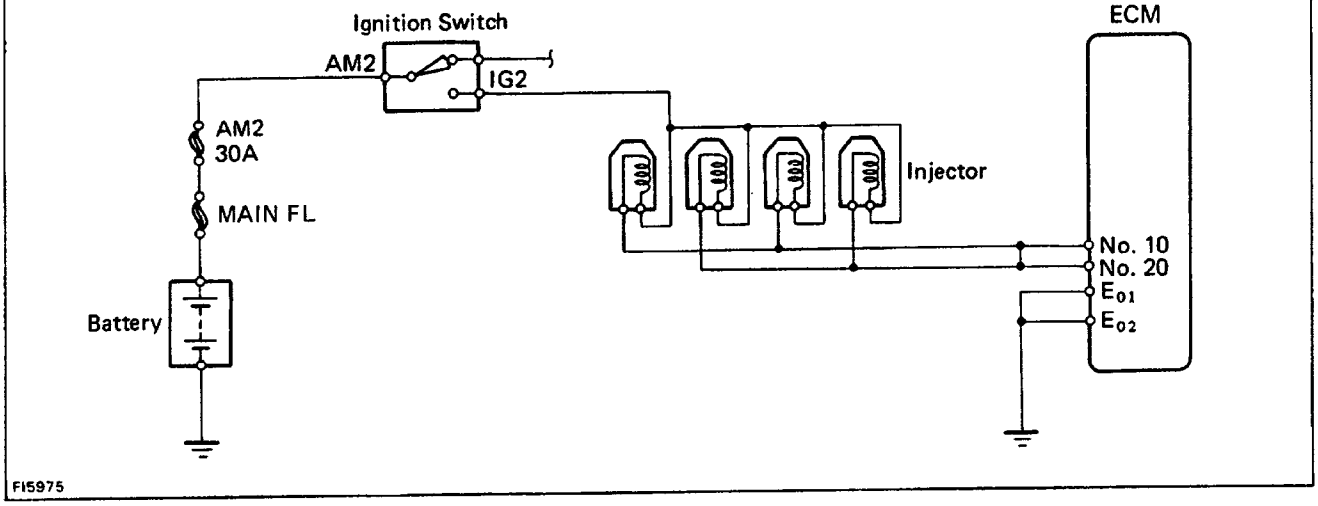


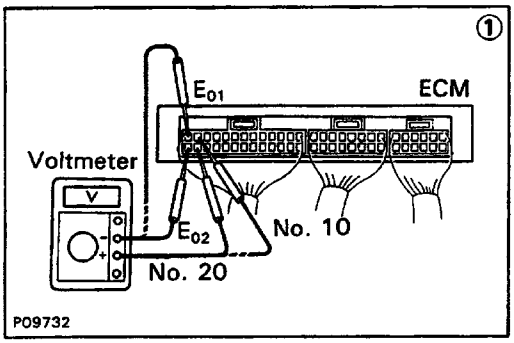
(1) There is no voltage between ECM terminals STA and E1.
(IG SW START)

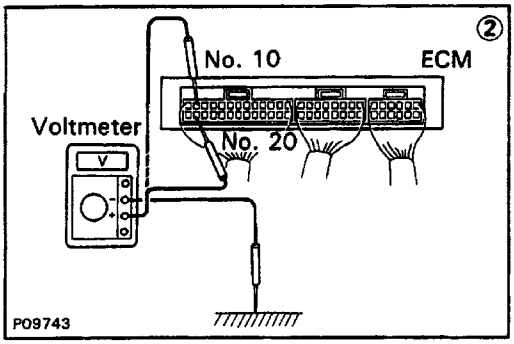
Check starter operation.
- OK → Check wiring between ECM and ignition switch terminal ST.
  - BAD → Repair or replace.
  - OK → (2) Check wiring between ECM terminal E1 and body ground.
    - BAD → Repair or replace.
    - OK → Try another ECM.
- BAD → Check fusible link, battery, wiring and ignition switch.
  - BAD → Repair or replace.
  - OK → (3) Check that there is voltage at terminal 50 of starter.
    (IG SW START) STD voltage: 6 –12 V
    - OK → Check starter. (See ST section)
    - NO → Check wiring between ignition switch ST1 terminal and starter terminal 50.

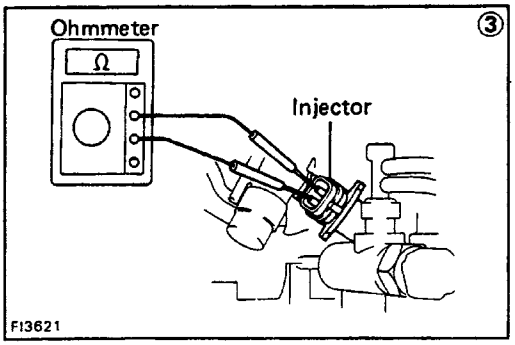
V01821

No.	Terminals	Trouble	Condition	STD Voltage
6	No. 10 – E_{01} No. 20 – E_{02}	No voltage	Ignition switch ON	9 – 14 V









(1) There is no voltage between ECM terminals No. 10 and/or No. 20 and E01, and/or E02– **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminal No. 10 and/or No. 20 and body ground.

NO → OK

OK → Check wiring between ECM terminal E01, and/or E02 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

NO → Check fusible link and ignition switch.

BAD → Repair or replace.

OK →

(3) Check resistance of magnetic coil in each injector.
STD resistance: 13.4 – 14.2Ω

OK →

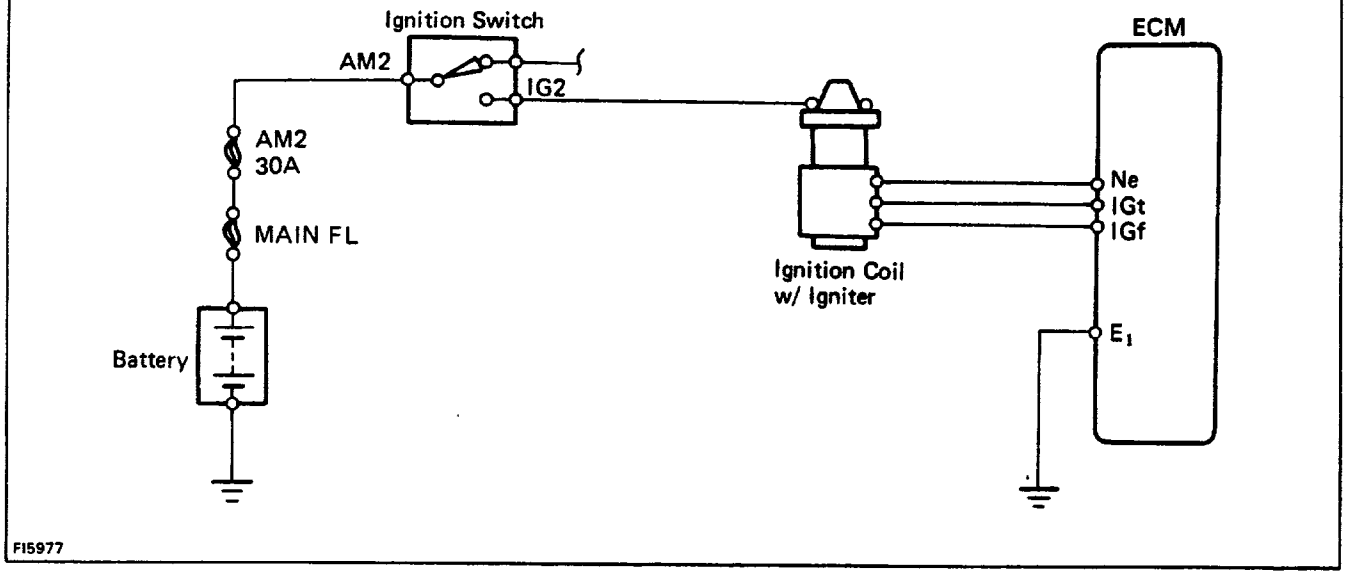
NO → Replace injector.

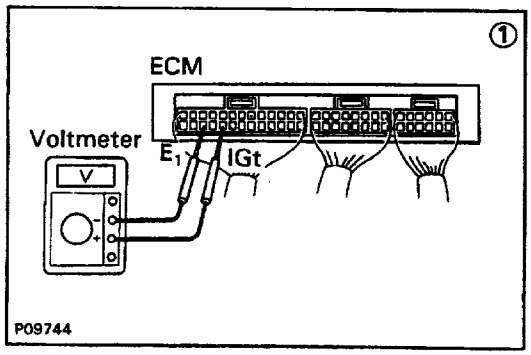
Check wiring between ECM terminal No. 10 and/or No. 20 and battery.

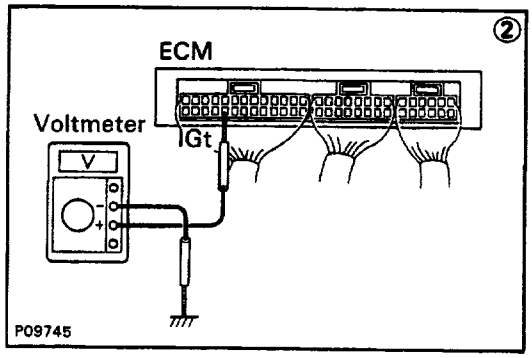
BAD → Repair or replace.

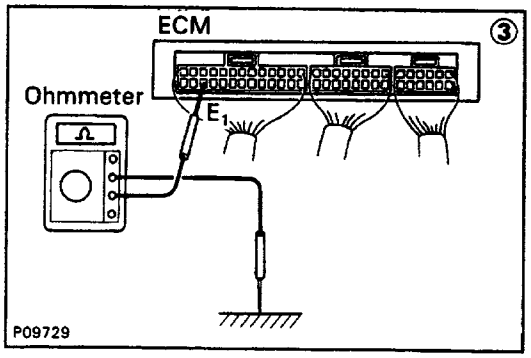
V01822

No.	Terminals	Trouble	Condition	STD Voltage
7	IGt – E_1	No voltage	Idling	0.7 – 1.0 V









(1) There is no voltage between ECM terminals IGt and E1. **(Idling)**

↓

(2) Check that there is voltage between ECM terminal IGt an body ground. **(Idling)**

NO → ↓

OK → (3) Check wiring between ECM terminal E1 and body ground.

BAD → Repair or replace.

↓

Refer to No. 1. — BAD → Repair or replace.

OK ↓

Check wiring between igniter and distributor. — BAD → Repair or replace.

OK ↓

Check distributor. — BAD → Replace.

OK ↓

Check wiring between ECM and igniter. — BAD → Repair or replace.

OK ↓

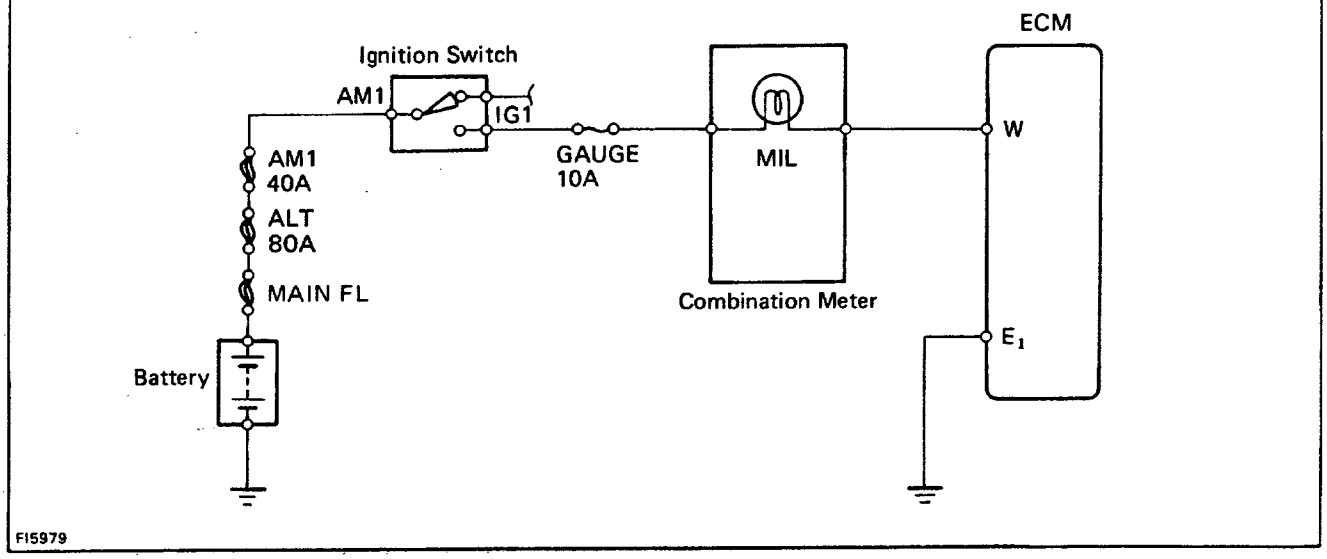
Check igniter. — BAD → Repair or replace.

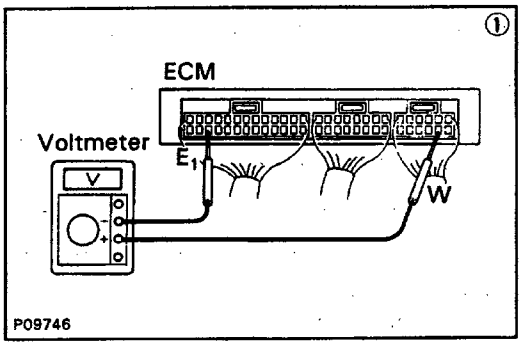
OK ↓

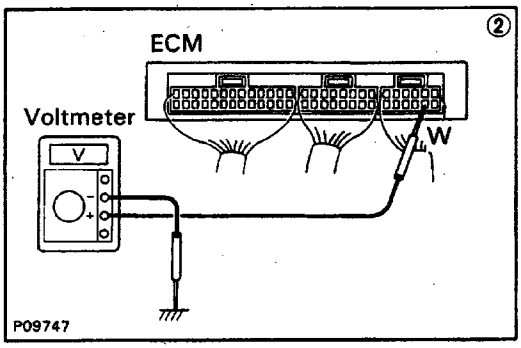
Try another ECM.

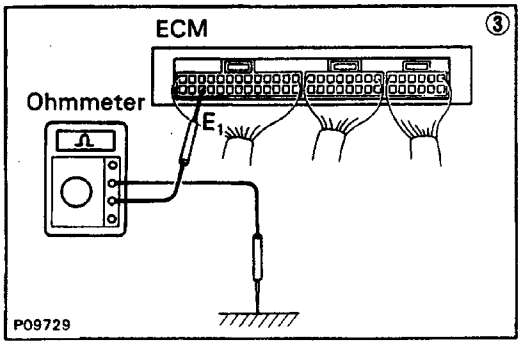
V01823

No.	Terminals	Trouble	Condition	STD Voltage
8	W – E_1	No voltage	No trouble (MIL off) and engine running	9 – 14 V









(1) There is no voltage between ECM terminals W and E1.
(Idling)

↓

(2) Check that there is voltage between ECM terminal W and body ground.

NO → ↓

OK → (3) Check wiring between ECM terminal E1 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

↓

Check GAUGE fuse (10 A) and MIL.

OK → ↓

BAD → Repair or replace.

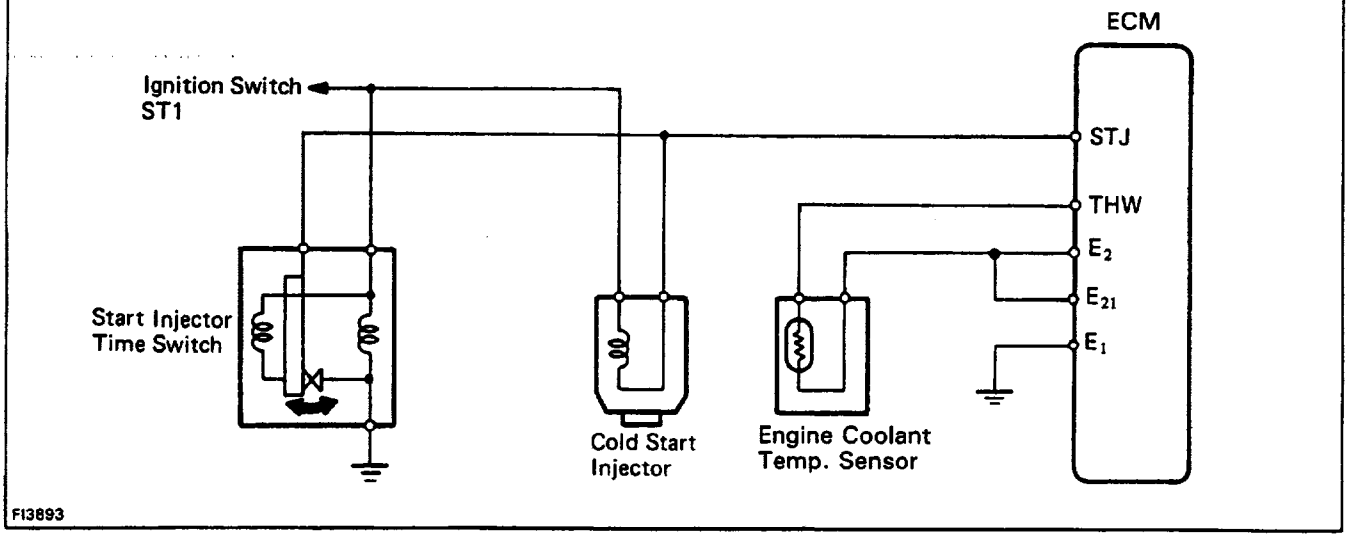
Fuse blows again → ↓

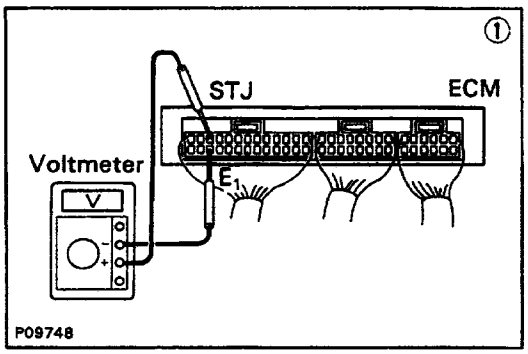
Check wiring between ECM terminal W and fuse.

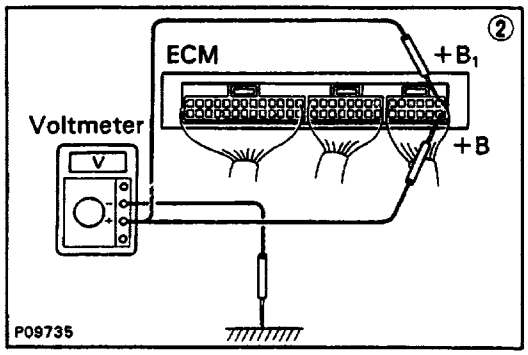
BAD → Repair or replace.

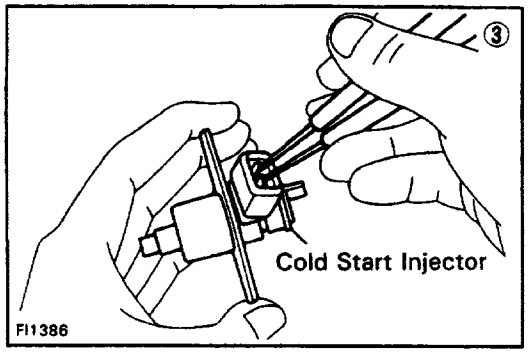
V01824

No.	Terminal	Trouble	Condition		STD Voltage
9	**STJ – E_1**	No voltage	Ignition switch ST position	Coolant temperature 80°C (176° F)	**6 – 12 V**









(1) There is no voltage between ECM terminals STJ and E1 **(IG SW ON)**

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground. **(IG SW ON)**

OK → (3) Check cold start injector.

NO → Refer to No. 1.

(3) Check cold start injector.

BAD → Replace cold start injector.

OK → Check wiring between ECM and cold start injector.

Check wiring between ECM and cold start injector.

OK → Check wiring between ECM terminal E1 and body ground.

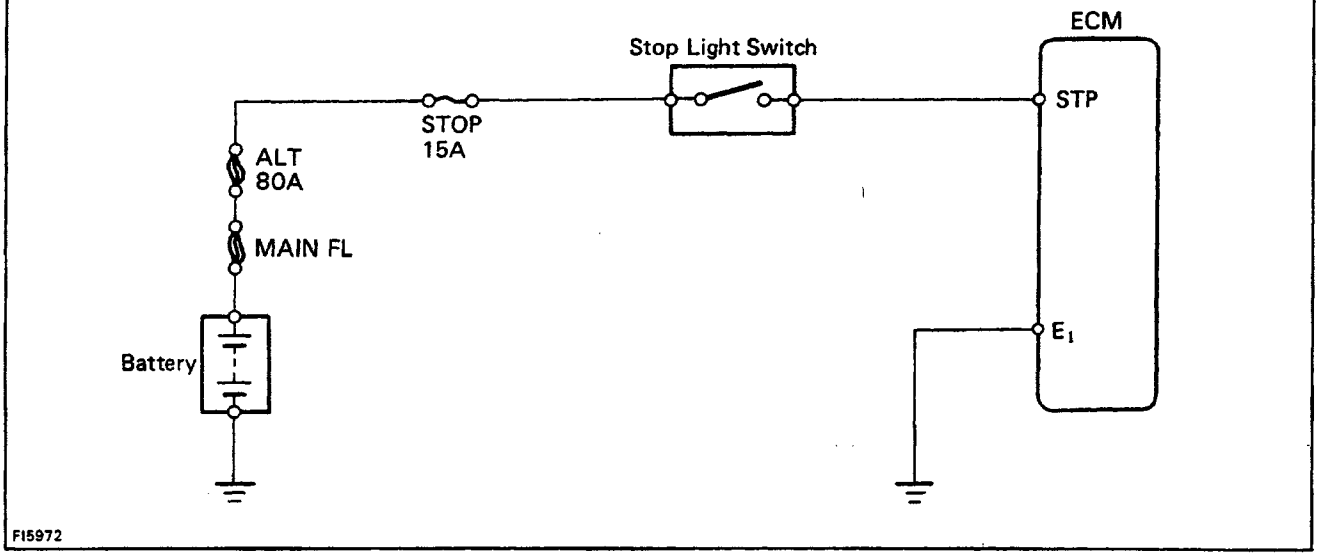
BAD → Repair or replace wiring.

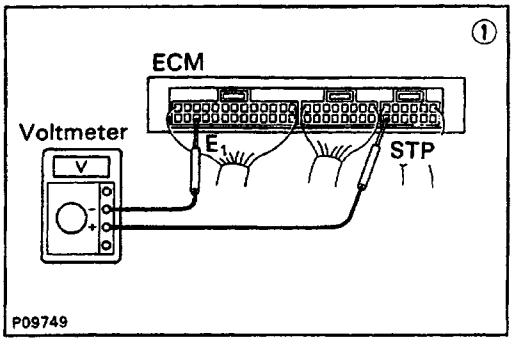
Check wiring between ECM terminal E1 and body ground.

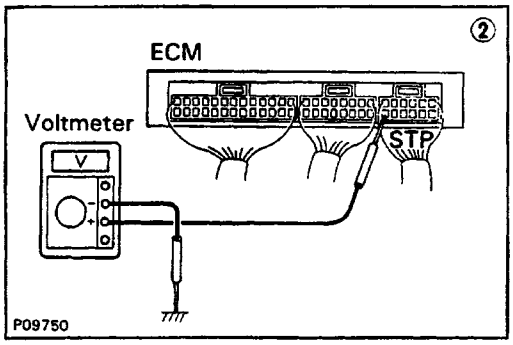
OK → Try another ECM.

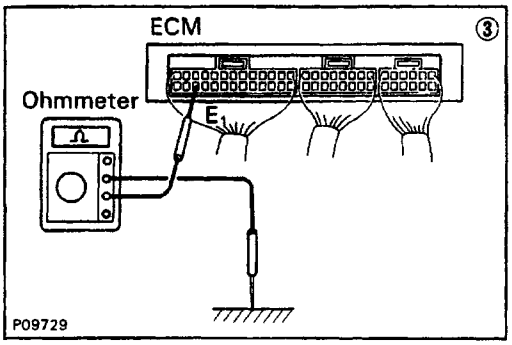
V01825

No.	Terminals	Trouble	Condition	STD Voltage
10	STP – E_1	No voltage	Stop tight switch ON	7.5 – 14 V









(1) There is no voltage between ECM terminals STP and E1.

(2) Check that there is voltage between ECM terminal STP an body ground when the brake pedal is depressed.

NO

OK

(3) Check wiring between ECM terminal E1 and body ground.

OK

BAD

Try another ECM.

Repair or replace.

Check STOP fuse (15A) and stop light switch.

BAD

Repair or replace.

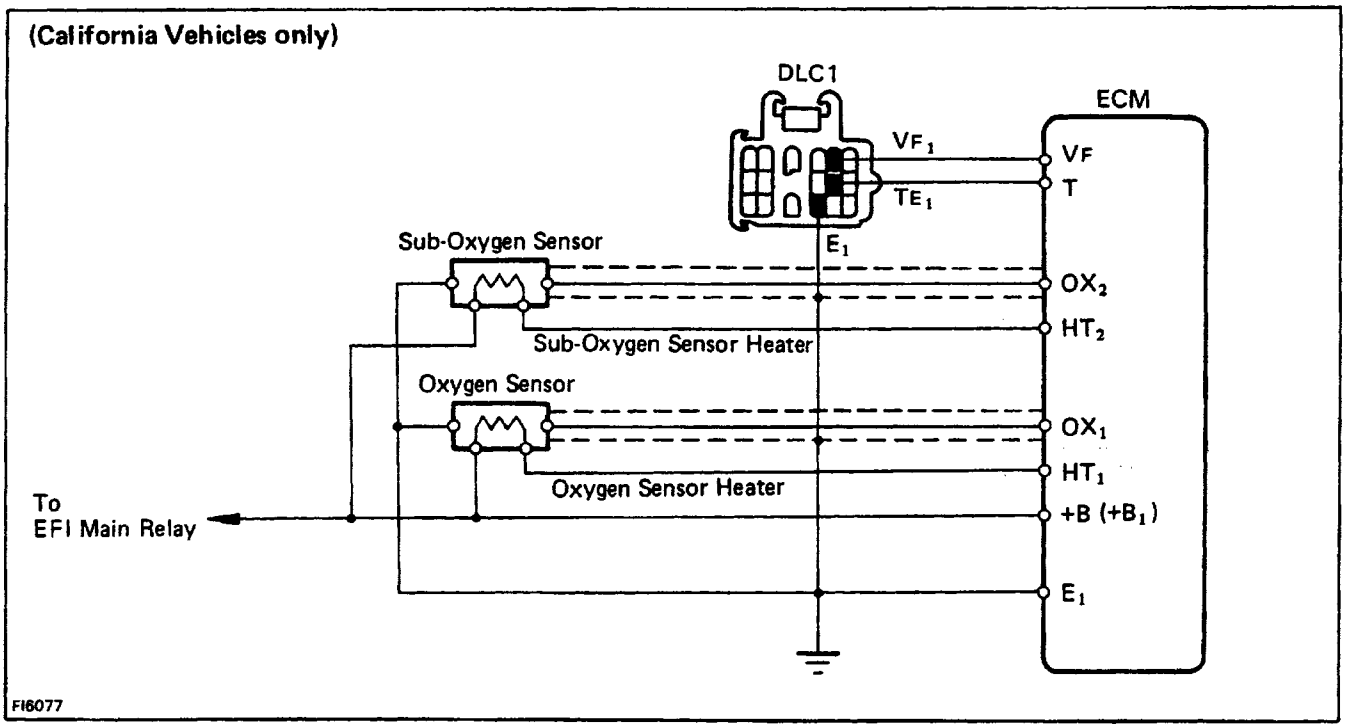
OK

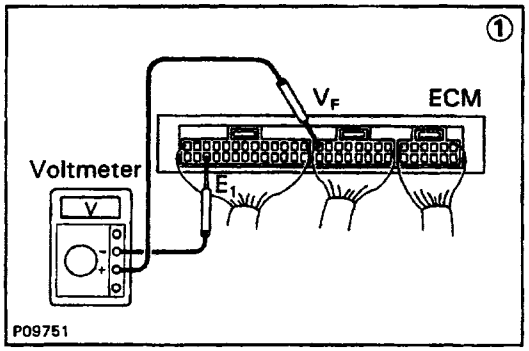
Check wiring between ECM terminal STP and battery.

BAD

Repair or replace.

V01826





(1) There is no voltage between ECM terminals VF and E1.

(2) Check that there is voltage between ECM terminal VF and body ground.

NO

OK

Check wiring between ECM terminal E1 and body ground.

OK

BAD

Try another ECM.

Repair or replace.

Is air leaking into air induction system?

YES

Repair air leak.

NO

Check spark plugs.

BAD

Repair or replace.

OK

Check distributor and ignition system.

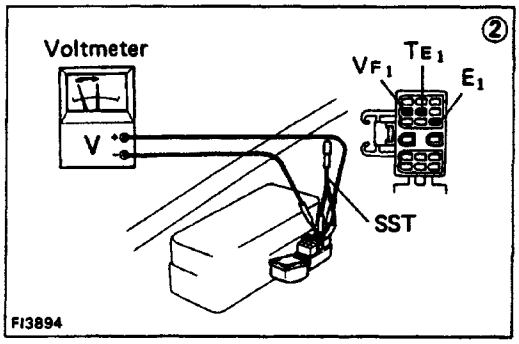
BAD

Repair or replace.

OK

CONTINUED ON PAGE EG1–157

V01827



CONTINUED FROM PAGE EG1–156

OK

Check fuel pressure. → BAD → Repair or replace.

OK

Check injector. → BAD → Repair or replace.

OK

Check cold start injector.* → BAD → Repair or replace.

OK

Check volume air flow meter. → BAD → Repair or replace.

OK

Check operation of oxygen sensor. → OK → System normal.

BAD

Check wiring between oxygen sensor and ECM connector. → BAD → Repair wiring.

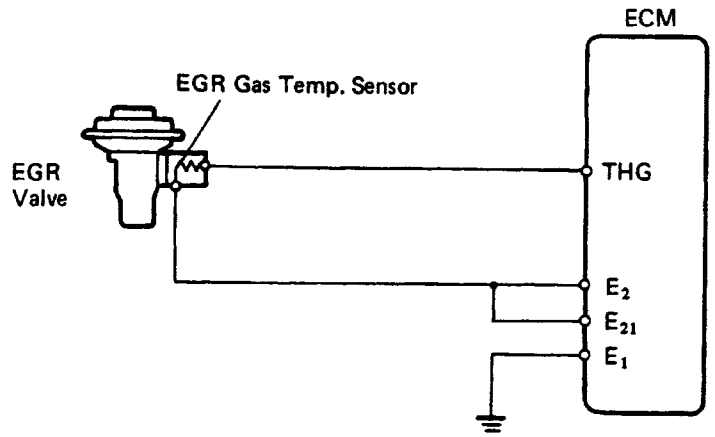
OK

Replace oxygen sensor.

*Rich malfunction only.

V01829

(California Vehicles only)



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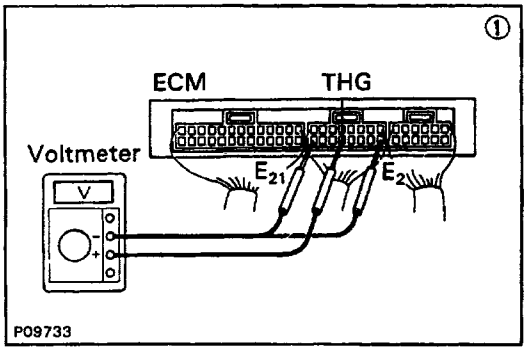
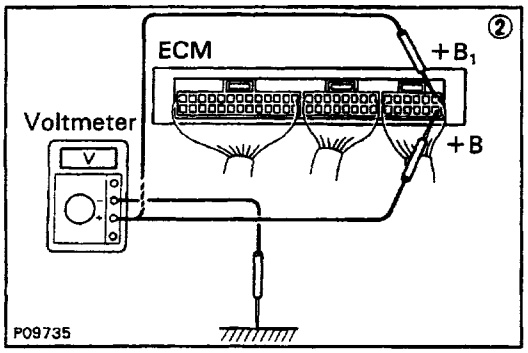
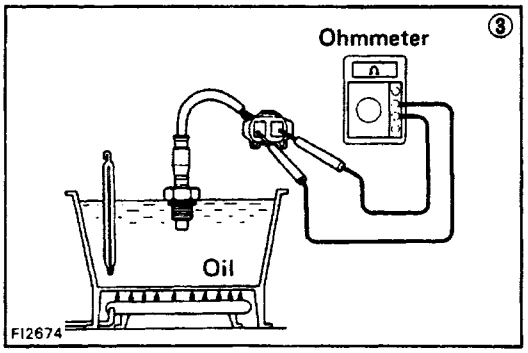


P09733



P09735



FI2674

(1) There is no voltage between ECM terminals THG and E2 (E21) **(Engine running at 2,000 rpm)**

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground. **(IG SW ON)**

OK → Check wiring between ECM terminal E, and body ground.

NO → Refer to No. 1.

OK → Check EGR system.

BAD → Repair or replace.

BAD → Repair or replace.

OK → (3) Check EGR gas temp. sensor.

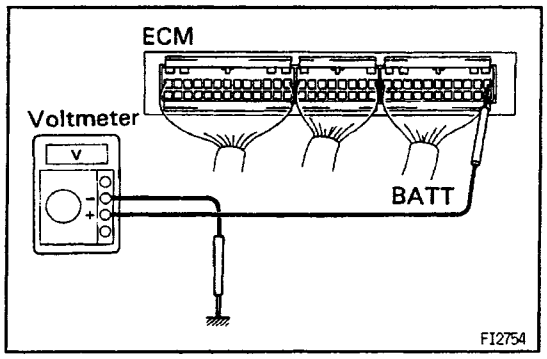
BAD → Replace EGR gas temp. sensor.

OK → Check wiring between ECM and EGR gas temp. sensor.

OK → Try another ECM.

BAD → Repair or replace.

V01828



MFI SYSTEM CHECK PROCEDURE (4WD A/T)

HINT:

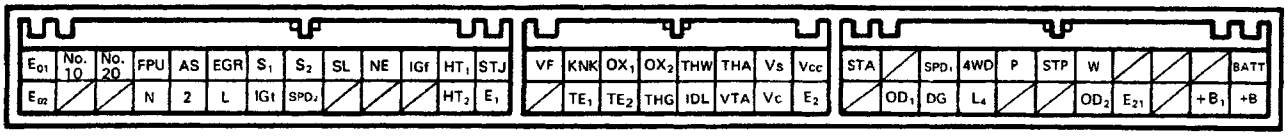
- Perform all voltage measurements with the connec–tors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is in ”ON” position.
  Using a voltmeter with high impedance (10 kΩ/V minimum), measure the voltage at each terminal of the wiring connector.

Terminals of ECM (4WD A/T)

Symbol	Terminal Name	Symbol	Terminal Name
E_{01}	ENGINE GROUND	TE_2	DLC 1
E_{02}	ENGINE GROUND	* Ox_2	OXYGEN SENSOR (SUB)
No.10	INJECTOR	* THG	EGR GAS TEMP. SENSOR
No.20	INJECTOR	THW	ENGINE COOLANT TEMP. SENSOR
Fpu	FUEL PRESSURE CONTROL VSV	IDL	THROTTLE POSITION SENSOR
N	PNP SWITCH	THA	INTAKE AIR TEMP. SENSOR
AS	PAIR VALVE	VTA	THROTTLE POSITION SENSOR
2	PNP SWITCH	Vs	VOLUME AIR FLOW METER
* EGR	EGR VSV	Vc	VOLUME AIR FLOW METER
L	PNP SWITCH	Vcc	THROTTLE POSITION SENSOR
S_1	No.1 SOLENOID	E_2	SENSOR GROUND
IGt	IGNITER	STA	STARTER SWITCH
S_2	No.2 SOLENOID	OD_1	CRUISE CONTROL COMPUTER
SPD_2	SPEED SENSOR	SPD_1	SPEED SENSOR
S_L	SL .SOLENOID	DG	DLC 1
Ne	DISTRIBUTOR	4WD	4WD SWITCH
IGf	IGNITER	L_4	TRANSFER POSITION SWITCH
HT_1	OXYGEN SENSOR HEATER (MAIN)	P	PATTERN SELECT SWITCH
* HT_2	OXYGEN SENSOR HEATER (SUB)	STP	STOP LIGHT SWITCH
STJ	COLD START INJECTOR	W	MALFUNCTION INDICATOR LAMP
E_1	ENGINE GROUND	OD_2	CRUISE CONTROL COMPUTER
V_F	DLC 1	E_{21}	SENSOR GROUND
KNK	KNOCK SENSOR	$+B_1$	MAIN RELAY
TE_1	DLC 1	BATT	BATTERY POSITIVE VOLTAGE
Ox_1	OXYGEN SENSOR (MAIN)	+B	MAIN RELAY

* : California only

ECM Terminals



FI2796

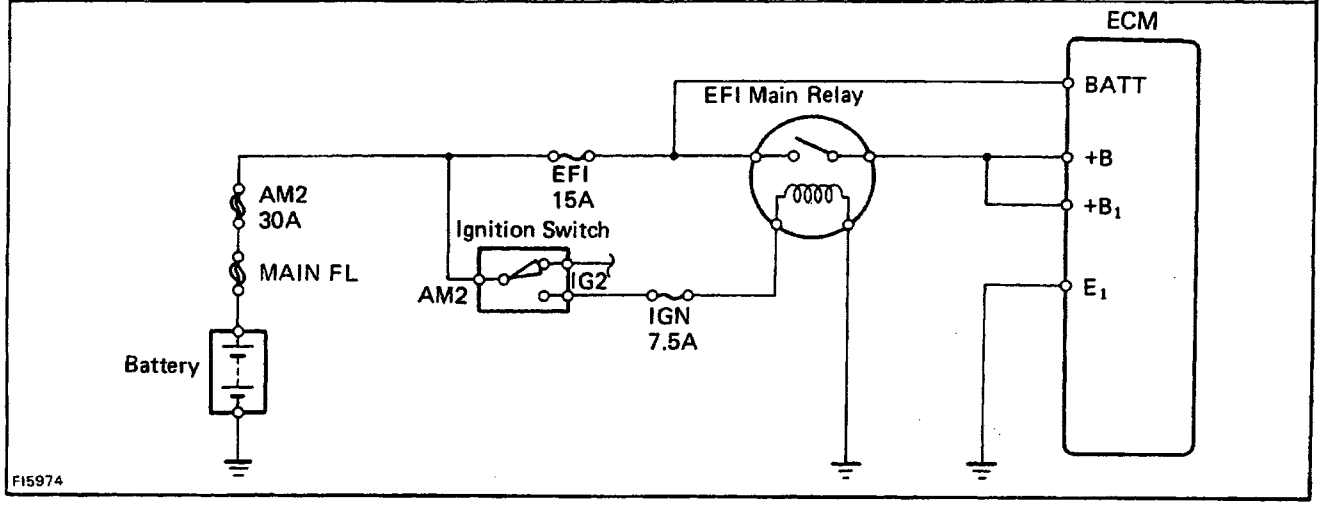
V01830

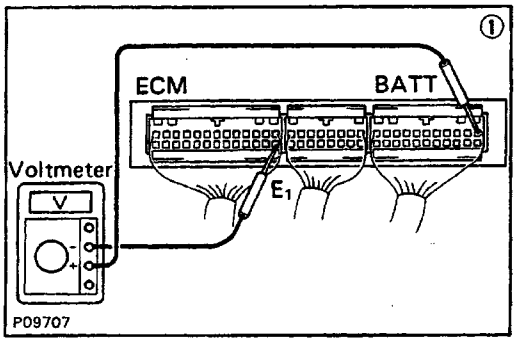
Voltage at ECM Connectors (4WD A/T)

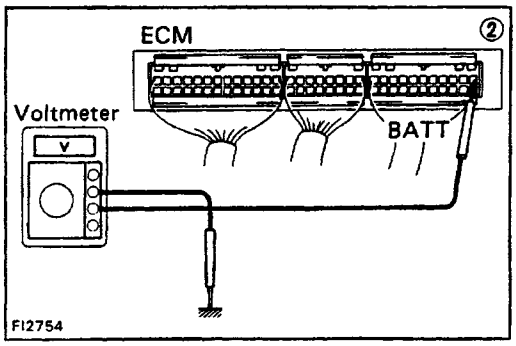
No.	Terminals	Condition		STD voltage	See page
1	BATT – E_1	–		9 – 14	EG1–161
	+B – E_1	Ignition switch ON			
	$+B_1$ – E_1				
2	IDL – E_2 (E_{21})	Ignition switch ON	Throttle valve open	9 – 14	EG1–163
	Vcc – E_2 (E_{21})		–	4.5 – 5.5	
	VTA – E_2 (E_{21})		Throttle valve fully closed	0.3 – 0.8	
			Throttle valve fully open	3.2 – 4.9	
3	Vc – E_2 (E_{21})	Ignition switch ON	–	6 – 10	EG1–165
	Vs – E_2 (E_{21})		Measuring plate fully closed	0.5 – 2.5	
			Measuring plate fully open	5 – 10	
		Idling		2 – 8	
	THA – E_2 (E_{21})	Ignition switch ON	Intake air temperature 20°C (68°F)	0.5 – 3.4	
4	THW – E_2 (E_{21})	Ignition switch ON	Coolant temperature 80°C (176°F)	0.2 – 1.0	EG1–167
5	STA – E_1	Ignition switch START position		6 – 12	EG1–168
6	No. 10 – E_{01} No. 20 – E_{02}	Ignition switch ON		9 – 14	EG1–169
7	IGt – E_1	Idling		0.7 – 1.0	EG1–170
8	W – E_1	No trouble (MIL off) and engine running		9 – 14	EG1–171
9	STJ – E_1	Ignition switch START position	Coolant temperature 80°C (176°F)	6 – 12	EG1–172
10	STP – E_1	Stop light switch ON		7.5 – 14	EG1–173

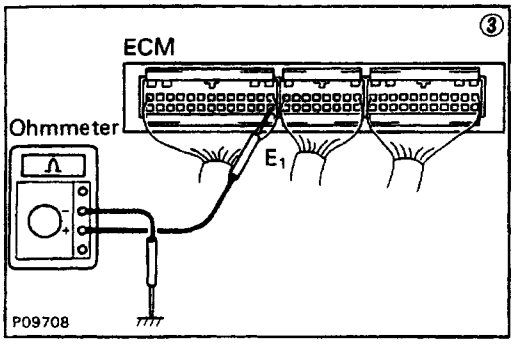
V01831

No.	Terminals	Trouble	Condition	STD Voltage
1	BATT – E_1	No voltage	–	9 – 14 V
	+B – E_1		Ignition switch ON	
	$+B_1$ – E_1			









- **BATT – E 1**

(1) There is no voltage between ECM terminals BATT and E1.

(2) Check that there is voltage between ECM terminal BATT and body ground.

NO / OK

(3) Check wiring between ECM terminal E1 and body ground.

OK: Try another ECM.

BAD: Repair or replace.

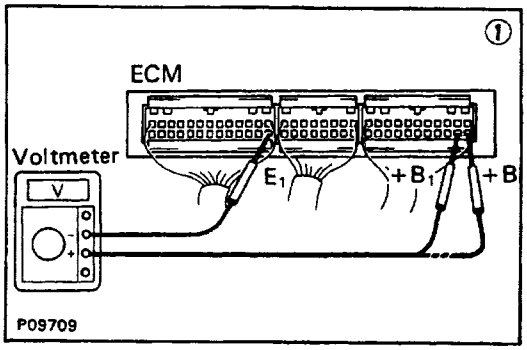
NO: Check fuse and fusible link.

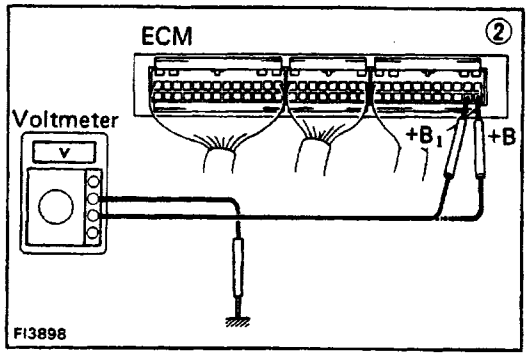
BAD: Replace.

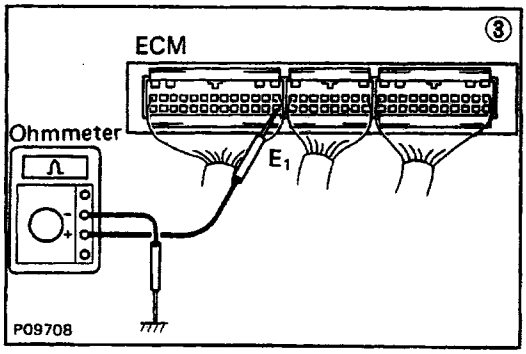
OK

Check wiring between fuse and ECM.

BAD: Repair or replace.







- **+B (B+) –E1**

(1) There is no voltage between ECM terminals +B (+B1) and E1. **(IG SW ON)**

(2) Check that there is voltage between ECM terminal + B (+B1) and body ground. **(IG SW ON)**

NO — **OK**

(3) Check wiring between ECM terminal E1 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

Check fuse, fusible link and ignition switch. — BAD → Repair or replace.

OK

Check EF I main relay. — BAD → Replace.

OK

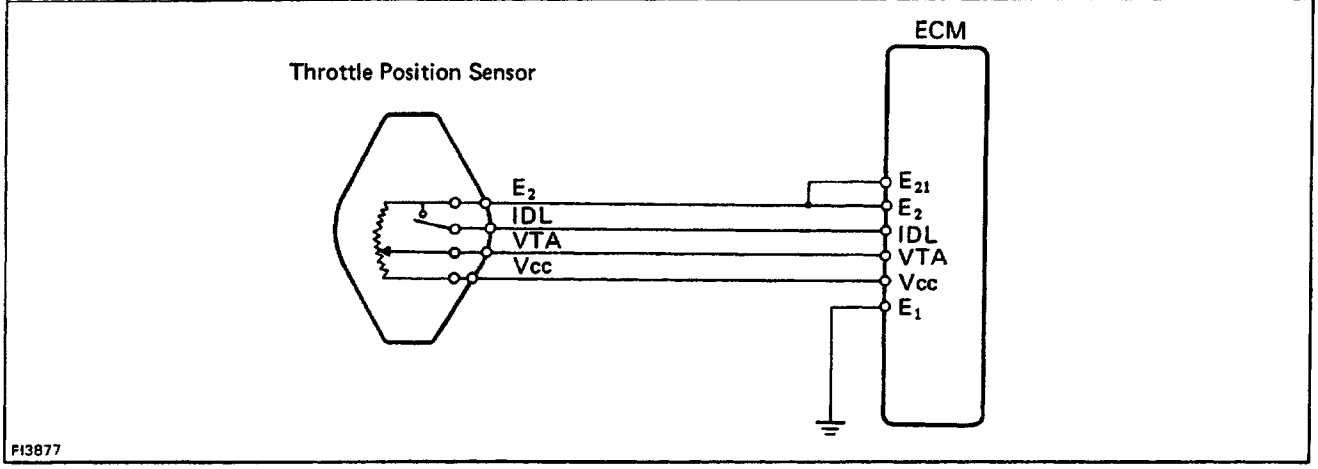
Check wiring between EFI main relay and battery. — BAD → Repair or replace.

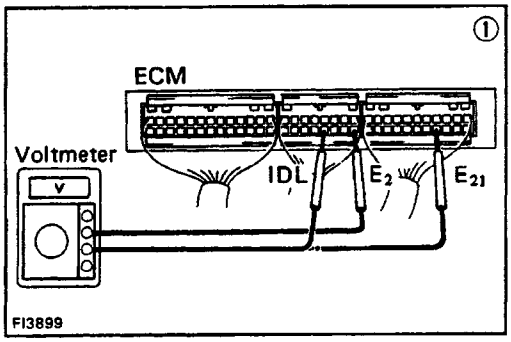
OK

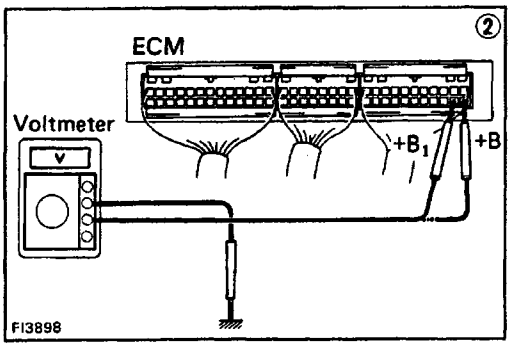
Check wiring between EM main relay and ECM terminal +B (+B1). — BAD → Repair or replace.

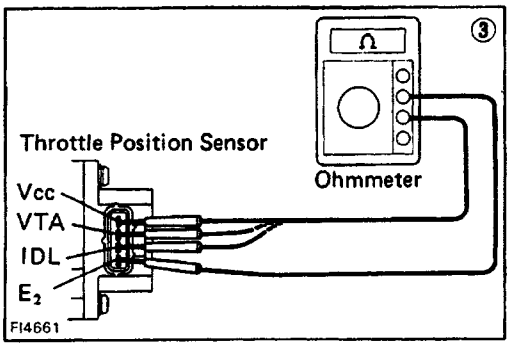
V01832

No.	Terminals	Trouble	Condition		STD Voltage
2	IDL – E_2 (E_{21})	No voltage	Ignition switch ON	Throttle valve open	9 – 14V
	Vcc – E_2 (E_{21})			–	4.5 – 5.5 V
	VTA – E_2 (E_{21})			Throttle valve fully dosed	0.3 – 0.8 V
				Throttle valve fully open	3.2 – 4.9 V









• IDL – E2 (E21)

(1) There is no voltage between ECM terminals IDL and E2 (E21). **(IG SW ON)** (Throttle valve open)

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground. **(IG SW ON)**

NO → Refer to No. 1. → BAD → Replace or repair.

Refer to No. 1. → OK → (3) Check throttle position sensor.

(2) → OK → Check wiring between ECM terminal E1 and body ground.

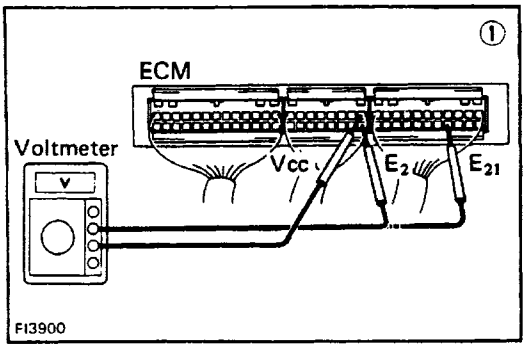
Check wiring between ECM terminal E1 and body ground. → BAD → Replace or repair. → BAD → Check wiring between ECM and throttle position sensor.

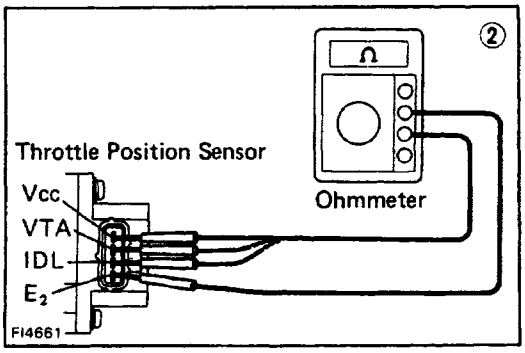
Check wiring between ECM terminal E1 and body ground. → OK → Check wiring between ECM and throttle position sensor.

(3) Check throttle position sensor. → BAD → Replace or repair throttle position sensor.

(3) Check throttle position sensor. → OK → Check wiring between ECM and throttle position sensor.

Check wiring between ECM and throttle position sensor. → OK → Try another ECM.





• Vcc – E2 (E21)

(1)There is no voltage between ECM terminals Vcc and E2. **(IG SW ON)**

(1) Check that there is voltage between ECM terminals + B (+ B1) and E1. **(IG SW ON)**

OK → Check throttle position sensor.

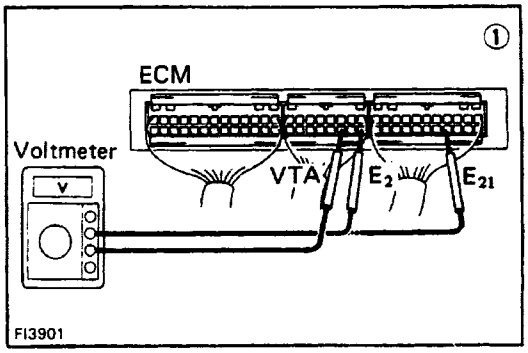
NO → Refer to No. 11 .

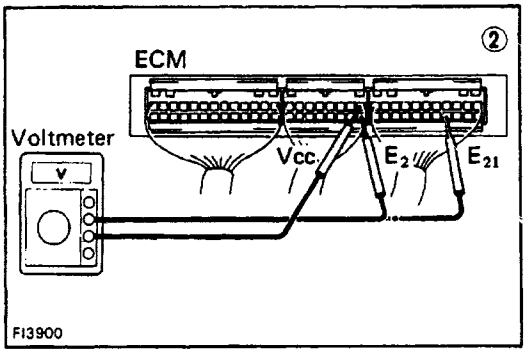
BAD → Repair or replace.

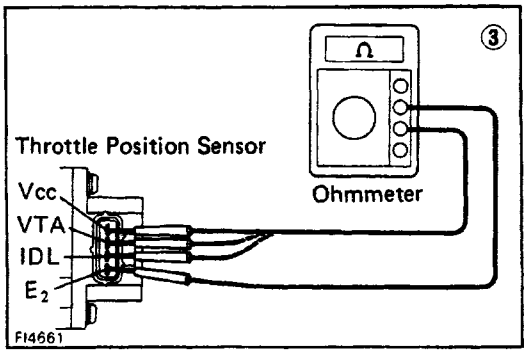
OK → Check wiring between ECM and throttle position sensor.

OK → Try another ECM.

BAD → Repair or replace wiring.







• VTA – E2 (E21)

(1) There is no voltage between ECM terminals VTA and E2 (E21). **(IG SW ON)**

(2) Check that there is voltage between ECM terminals Vcc and E2 (E21). **(IG SW ON)**

OK → (3) Check throttle position sensor.

NO → Perform inspection of Vcc – E2 (E21).

BAD → Repair or replace.

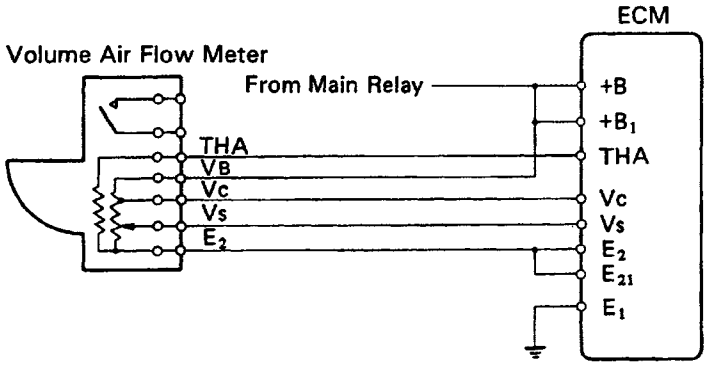
OK → Check wiring between ECM and throttle position sensor.

BAD → Repair or replace.

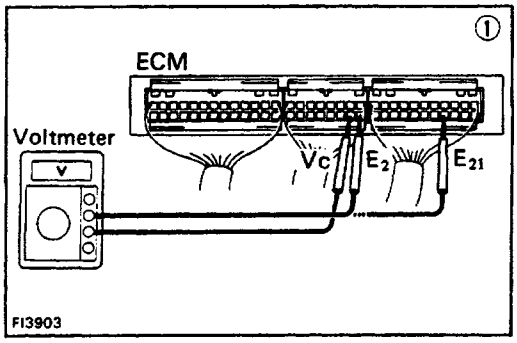
OK → Try another ECM.

V01835

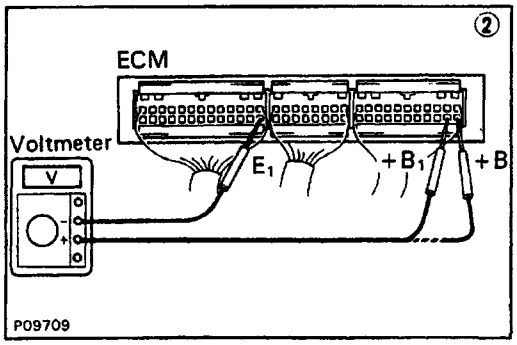
No.	Terminals	Trouble	Condition		STD Voltage
3	**Vc – E_2 (E_{21})**	No voltage	Ignition switch ON	–	**6 – 10 V**
	Vs – E_2 (E_{21})			Measuring plate fully closed	**0.5 – 2.5 V**
				Measuring plate fully open	**5 – 10 V**
			Idling		**2 – 8 V**
	THA – E_2 (E_{21})		Ignition switch ON	Intake air temperature 20°C (68°F)	**0.5 – 3.4 V**



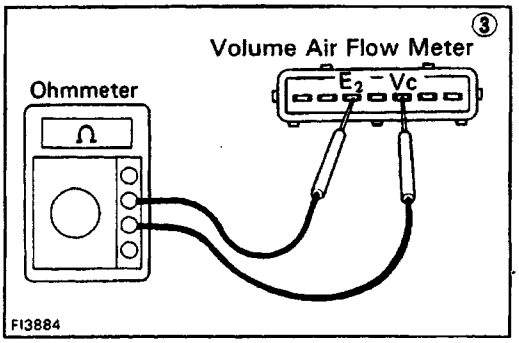
FI3881



FI3903



P09709



FI3884

- **Vc – E2 (E21)**

(1) There is no voltage between ECM terminals Vc and E2 (E21). **(IG SW ON)**

(2) Check that there is voltage between ECM terminals +B (+ B1) and E1. **(IG SW ON)**

OK → (3) Check volume air flow meter.

NO → Refer to No. 1.

(3) Check volume air flow meter.

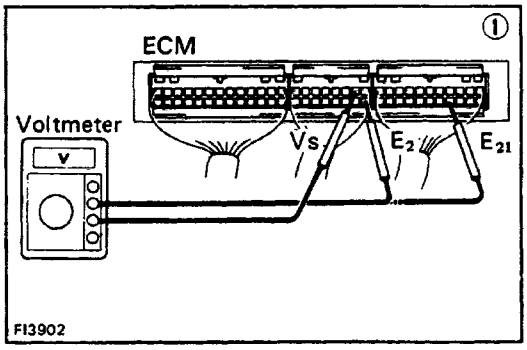
BAD → Replace or repair volume air flow meter.

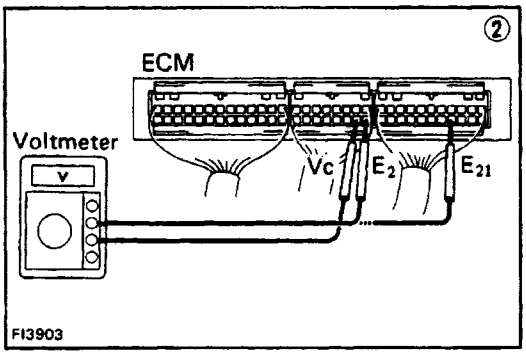
OK → Check wiring between ECM and volume air flow meter.

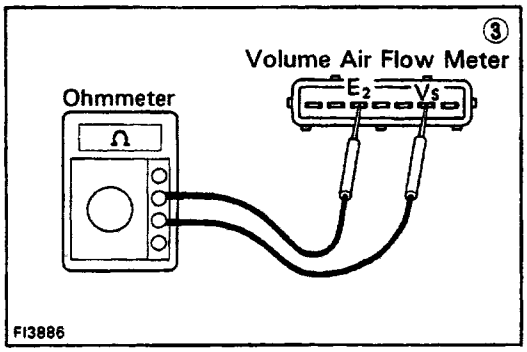
Check wiring between ECM and volume air flow meter.

OK → Try another ECM.

BAD → Replace or repair wiring.







- **Vs – E2 (E21)**

(1) There is no voltage between ECM terminals Vs and E2 (E21). **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminals Vc and E2 (E201). **(IG SW ON)**

OK ↓ / NO → Refer to Vcc – E2 (E21). BAD → Repair or replace.

↓

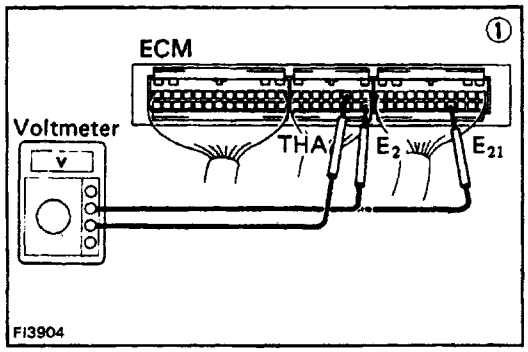
Check volume air flow meter. BAD → Repair or replace.

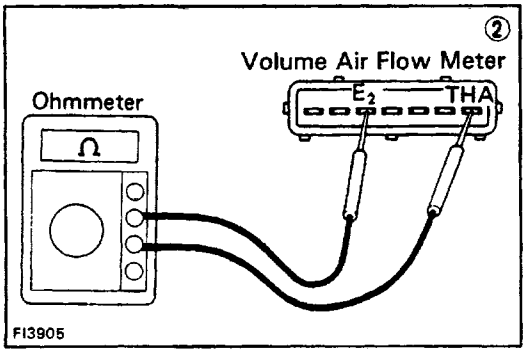
↓ OK

Check wiring between ECM and volume air flow meter. BAD → Repair or replace.

↓ OK

Try another ECM.





- **THA – E2 (E21)**

(1) There is no voltage between ECM terminals THA and E2 (E21). **(IG SW ON)**

↓

Check that there is voltage between ECM terminal +B (+ B1) and body ground. (**IG SW ON**)

OK ↓ / NO → Refer to No. 1.

↓

(2) Check intake air temp. sensor.

BAD ↓ / OK →

Replace volume air flow meter.

Check wiring between ECM and intake air temp. sensor.

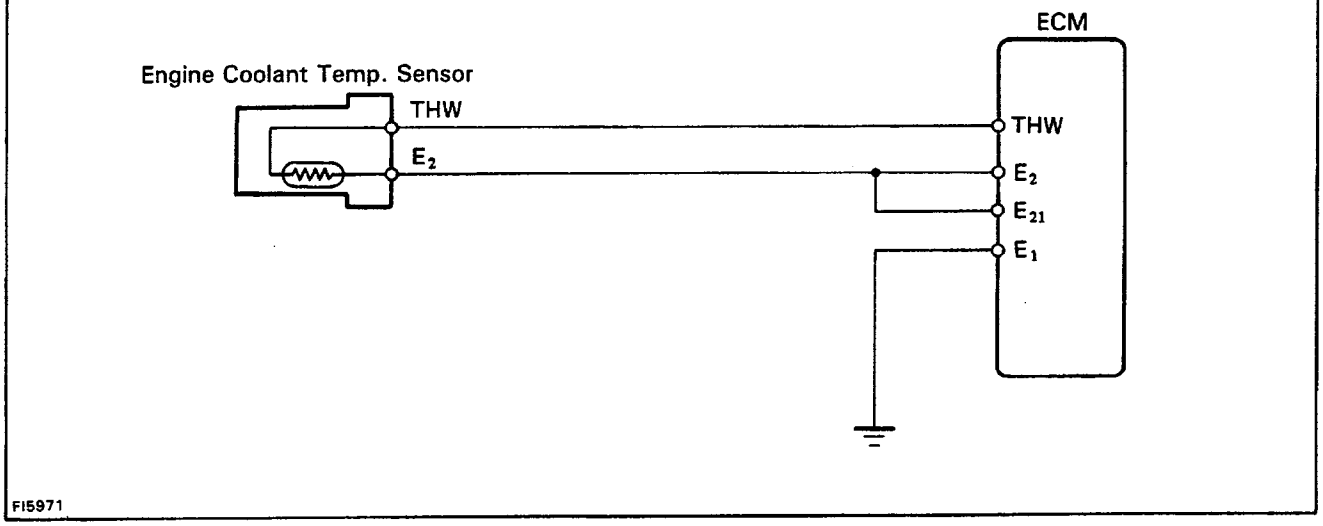
OK ↓ / BAD →

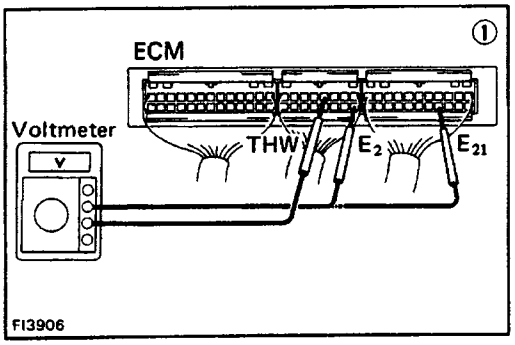
Try another ECM.

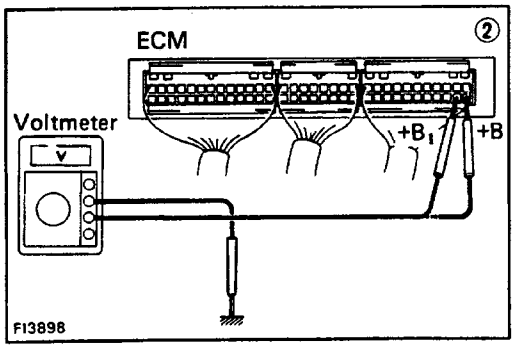
Repair or replace wiring.

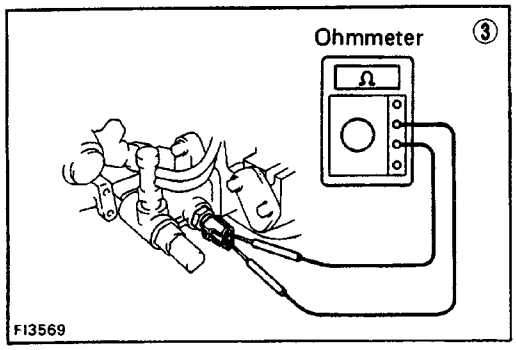
V01837

No.	Terminals	Trouble	Condition		STD Voltage
4	THW – E_2 (E_{21})	No voltage	Ignition switch ON	Coolant temperature 80°C (176°F)	0.2 – 1.0 V









(1) There is no voltage between ECM terminals THW and E2 (E21) **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground. **(IG SW ON)**

OK → ↓

NO → Refer to No. 1.

↓

Check wiring between ECM terminal E1 and body ground.

OK → ↓

BAD → Repair or replace.

↓

Check engine coolant temp. sensor.

BAD → ↓

OK → ↓

↓

Replace engine coolant temp. sensor.

↓

Check wiring between ECM and engine coolant temp. sensor.

OK → ↓

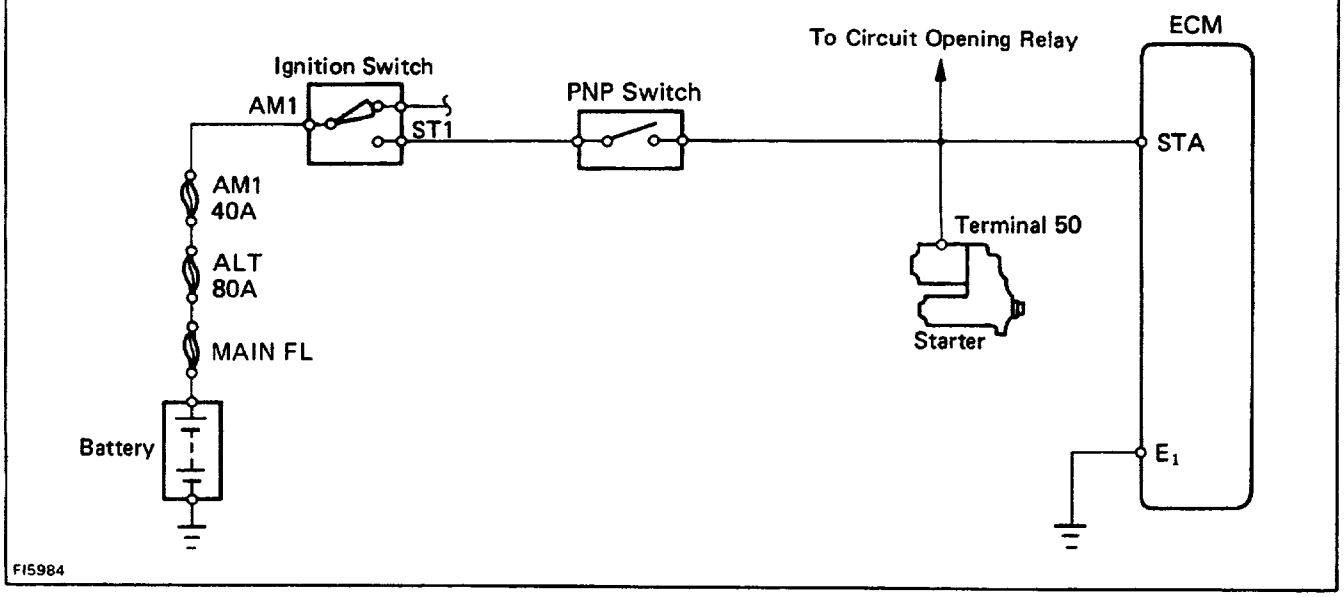
BAD → Repair or replace.

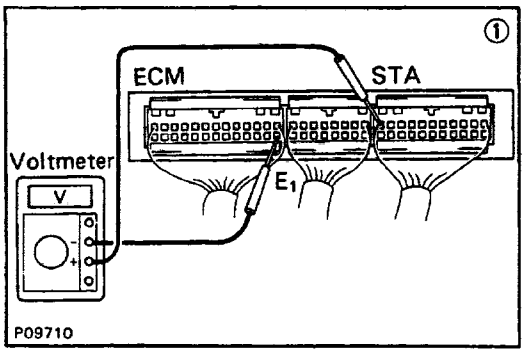
↓

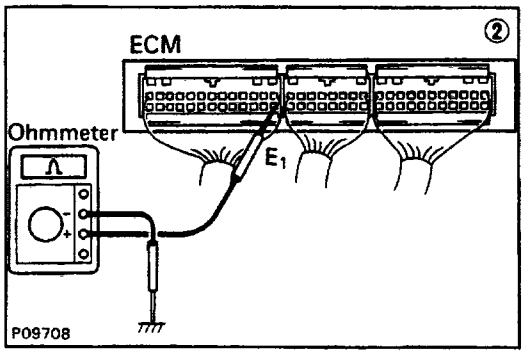
Try another ECM.

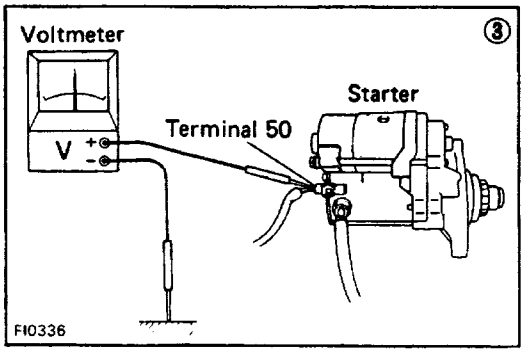
V01838

No.	Terminals	Trouble	Condition	STD Voltage
5	STA – E 1	No voltage	Ignition switch START position	6–12V







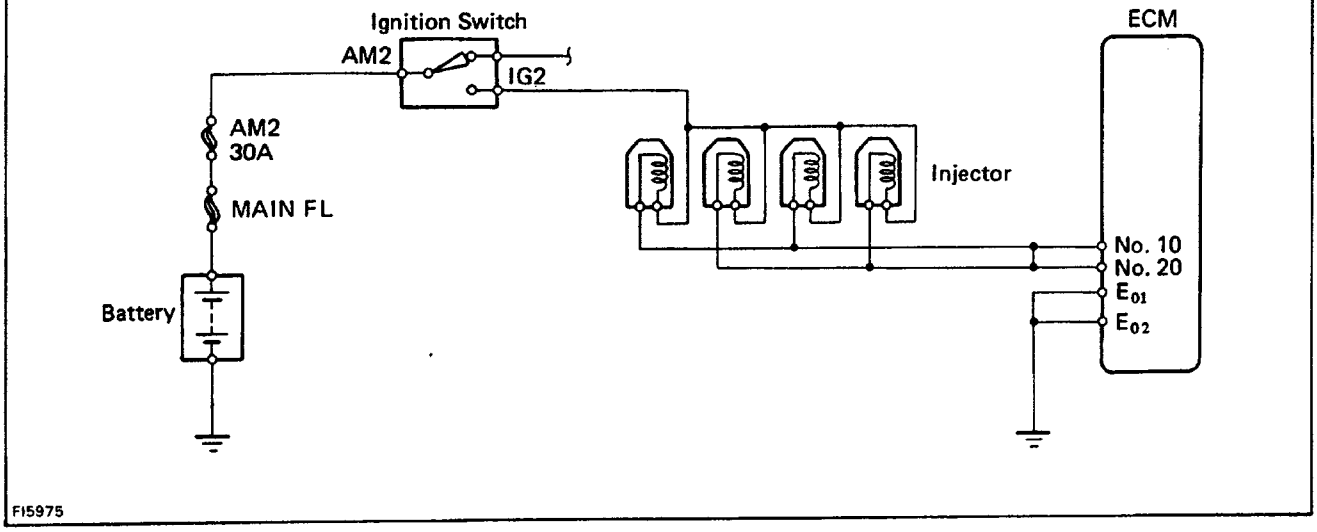


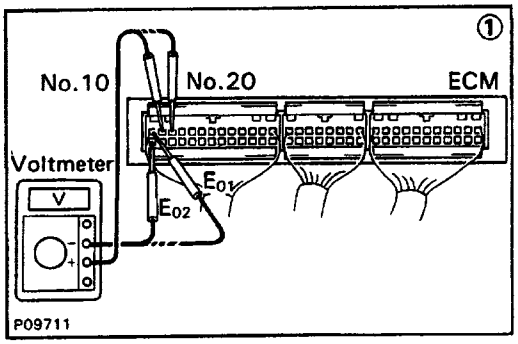
(1) There is no voltage between ECM terminals STA and E1 **(IG SW START)**

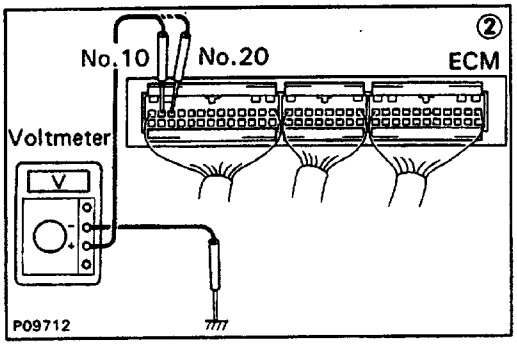
Check starter operation.
- OK → Check wiring between ECM and ignition switch terminal ST.
  - OK → Check wiring between ECM terminal E1 and body ground.
    - OK → Try another ECM.
    - BAD → Repair or replace.
  - BAD → Repair or replace.
- BAD → Check fusible link, battery, wiring and ignition switch.
  - BAD → Repair or replace.
  - OK → (3) Check that there is voltage at terminal 50 of starter. **(IG SW ST) STD voltage: 6 –12 V**
    - OK → Check starter. (See ST section)
    - NO → Check wiring between ignition switch ST1 terminal and starter terminal 50.

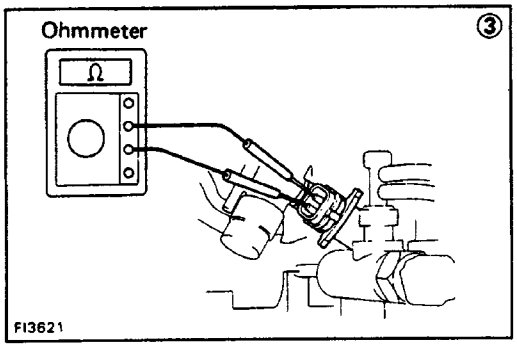
V01839

No.	Terminals	Trouble	Condition	STD Voltage
6	No. 10 – E_{01} No. 20 – E_{02}	No voltage	Ignition switch ON	9 – 14 V









(1) There is no voltage between ECM terminals No. 10 and/or No. 20 and E01, and/or E02– **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminal No. 10 a and/or No. 20 and body ground.

NO → OK

OK → Check wiring between ECM terminal E01, and/or E02 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

↓

Check fusible link and ignition switch.

BAD → Repair or replace.

↓ OK

(3) Check resistance of magnetic coil in each injector
STD resistance: 13.4 – 14.2 Ω

OK ↓

NO → Replace injector.

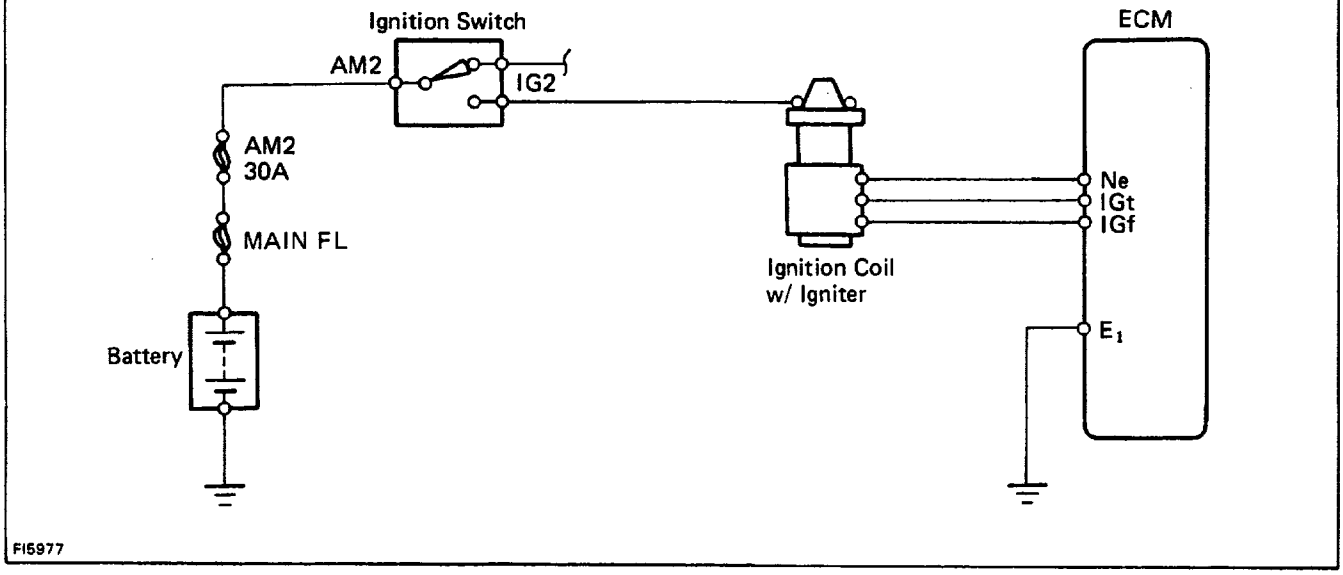
↓

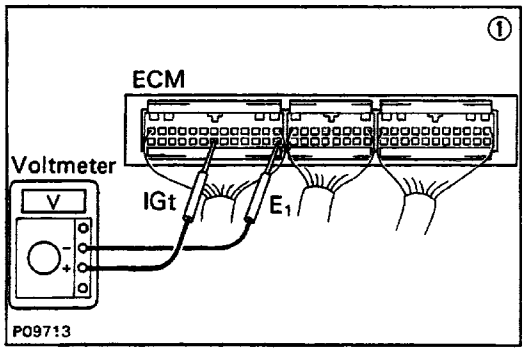
Check wiring between ECM terminal No. 10 and/or No. 20 and battery.

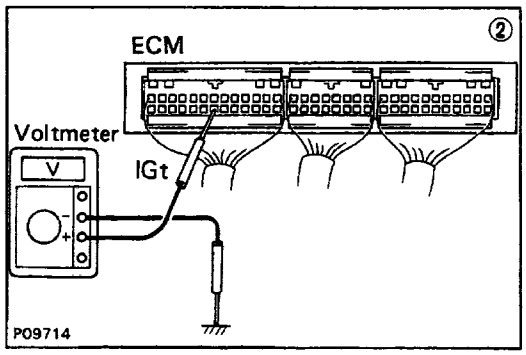
BAD → Repair or replace.

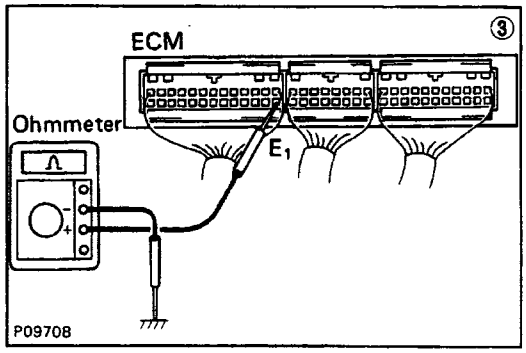
V01840

No.	Terminals	Trouble	Condition	STD Voltage
7	**IGt – E_1**	No voltage	Idling	**0.7 – 1.0 V**









(1) There is no voltage between ECM terminals IGt and E1. **(Idling)**

↓

(2) Check that there is voltage between ECM terminal IGt and body ground. **(Idling)**

NO → ↓ OK → (3) Check wiring between ECM terminal E1 and body ground.

BAD →

↓

Refer to No. 1. → BAD → Repair or replace.

↓ OK

↓

Check wiring between igniter and distributor. → BAD → Repair or replace.

↓ OK

↓

Check distributor. → BAD → Replace.

↓ OK

↓

Check wiring between ECM and igniter. → BAD → Repair or replace.

↓ OK

↓

Check igniter. → BAD → Repair or replace.

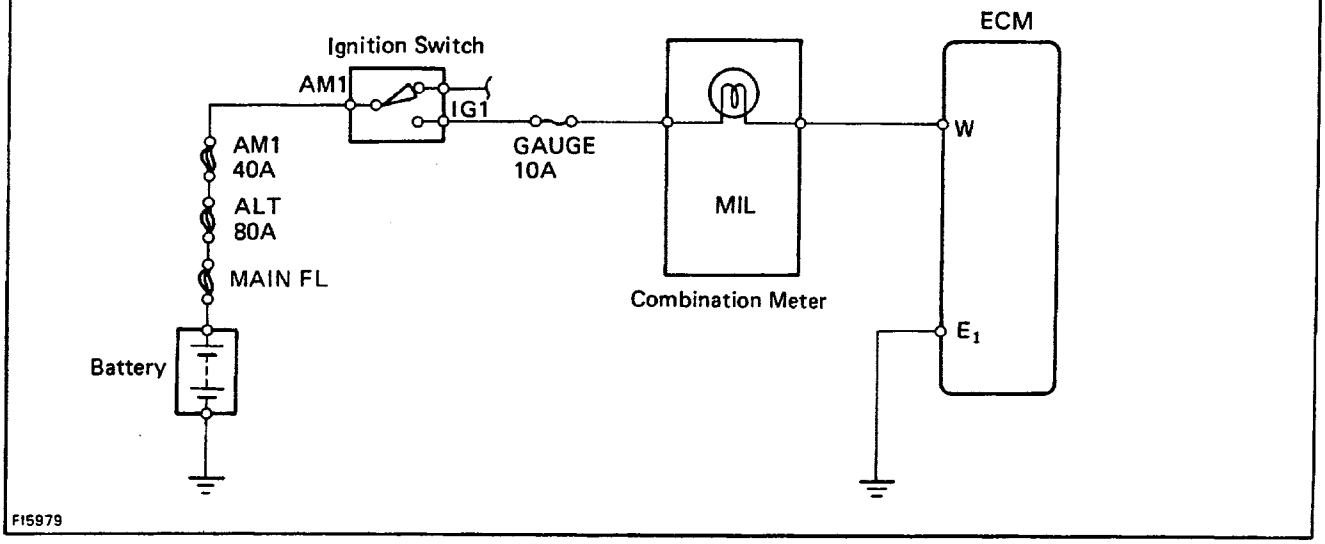
↓ OK

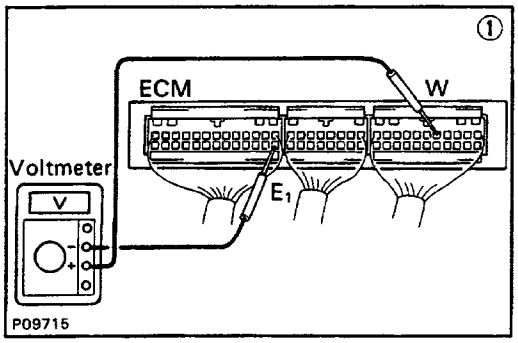
↓

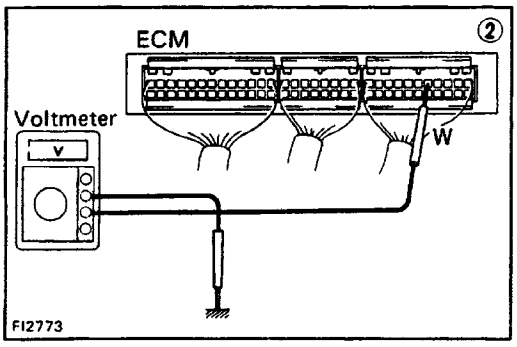
Try another ECM.

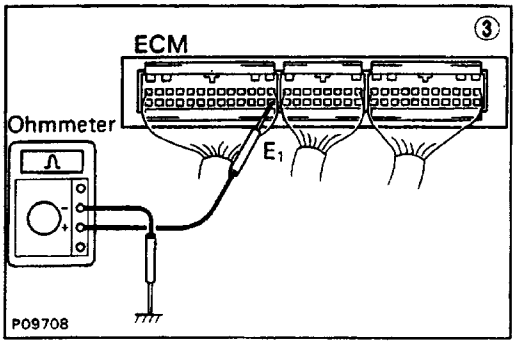
V01841

No.	Terminals	Trouble	Condition	STD Voltage.
8	W – E_1	No voltage	No trouble (MIL off) and engine running	9 – 14 V









(1) There is no voltage between ECM terminals W and E1. **(Idling)**

↓

(2) Check that there is voltage between ECM terminal W and body ground.

NO → ↓

OK →

(3) Check wiring between ECM terminal E1 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

↓

Check GAUGE fuse (10 A) and MIL.

OK → ↓

BAD →

Repair or replace.

Fuse blows again

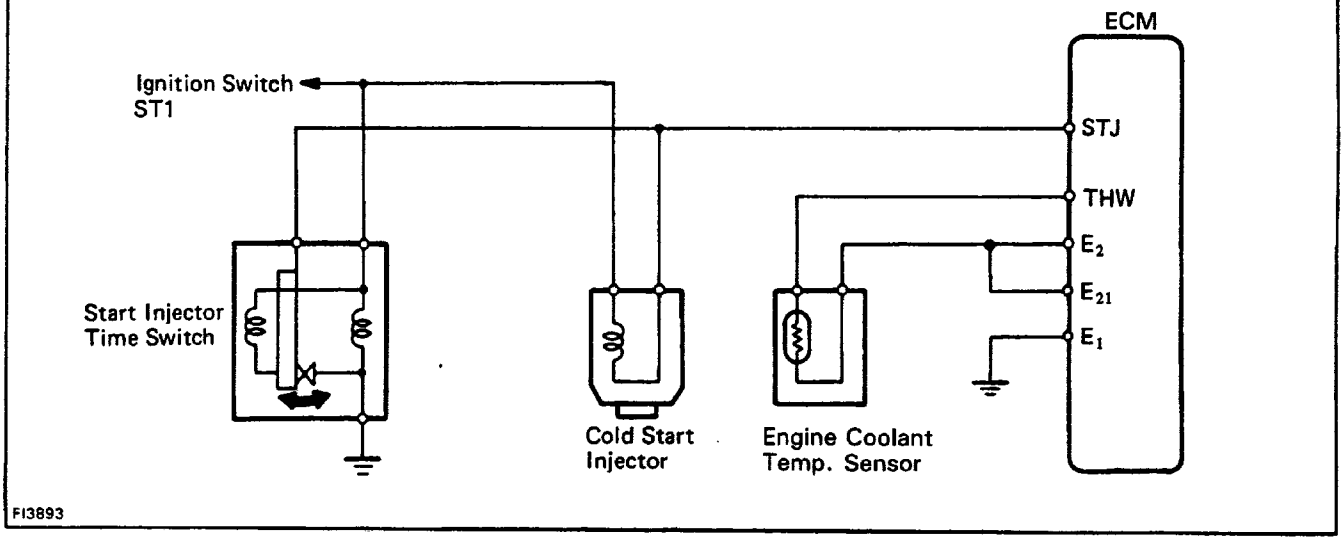
↓

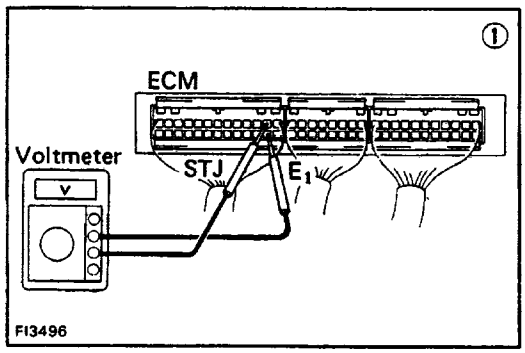
Check wiring between ECM terminal W and fuse.

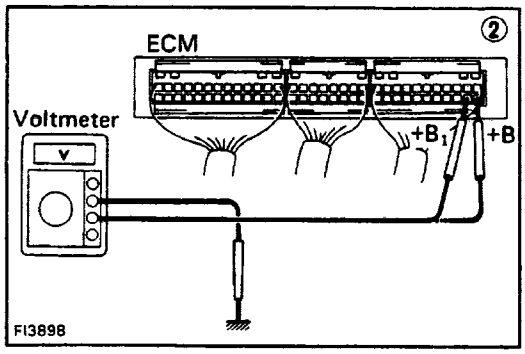
BAD → Repair or replace.

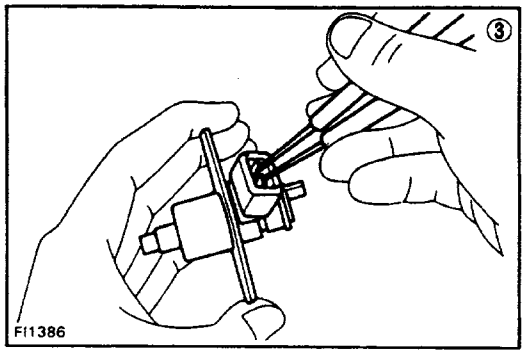
V01842

No.	Terminal	Trouble	Condition		STD Voltage
9	**STJ – E_1**	No voltage	Ignition switch START position	Coolant temperature 80°C (176° F)	**6 – 12 V**









(1) There is no voltage between ECM terminals STJ and E1. **(IG SW START)**

↓

(2) Check that there is voltage between ECM terminal +B (+ B1) and body ground. **(IG SW ON)**

- **NO** → Refer to No. 1.
- **OK** ↓

(3) Check cold start injector.

- **BAD** → Replace cold start injector.
- **OK** → Check wiring between ECM and cold start injector.

Check wiring between ECM and cold start injector.

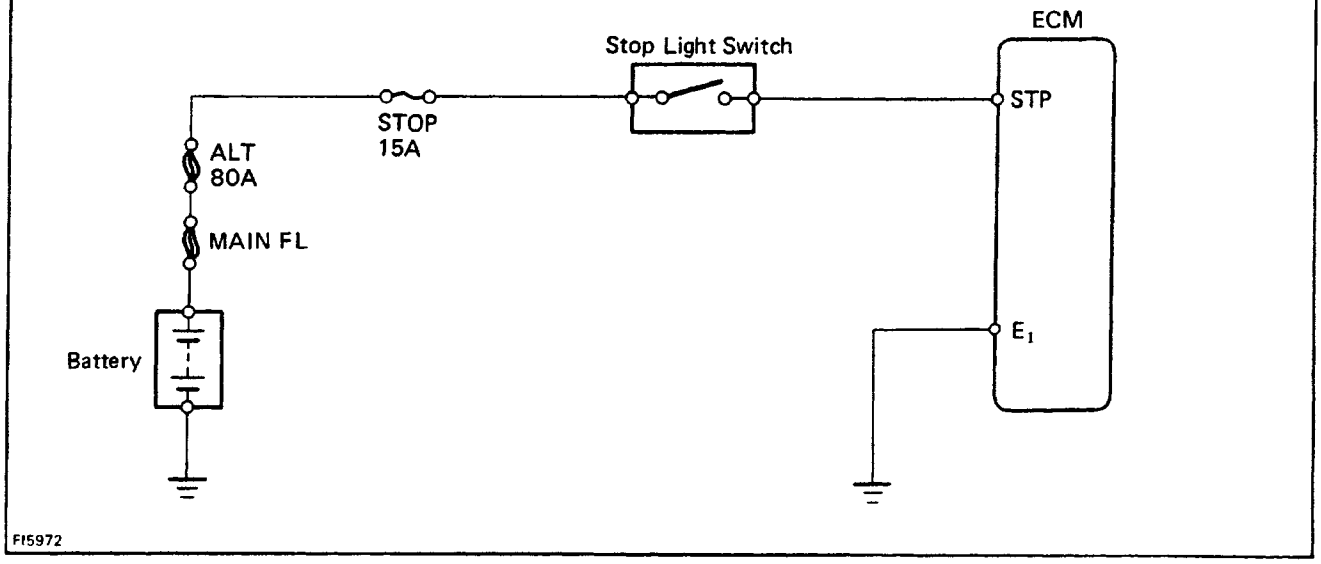
- **BAD** → Repair or replace wiring.
- **OK** ↓

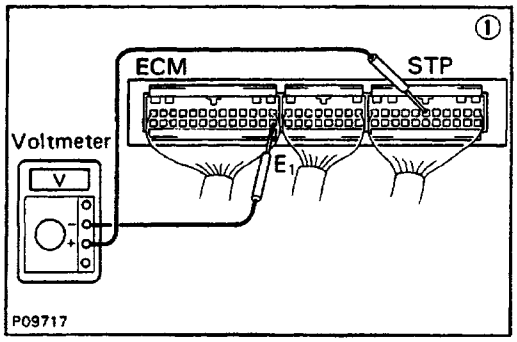
Check wiring between ECM terminal E1 and body ground.

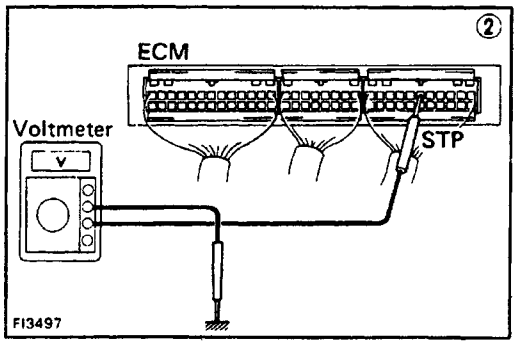
- **OK** → Try another ECM.

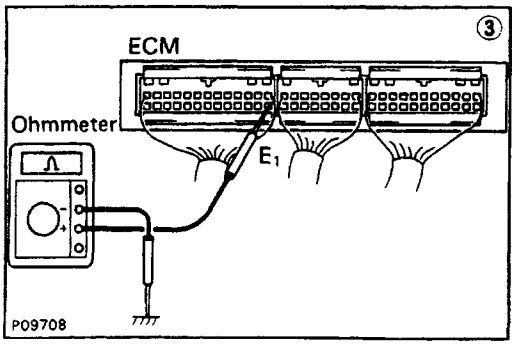
V01843

No.	Terminals	Trouble	Condition	STD Voltage
10	**STP – E_1**	No voltage	Stop light switch ON	**7.5 – 14 V**









(1) There is no voltage between ECM terminals STP and E1.

↓

(2) Check that there is voltage between ECM terminal STP and body ground when the brake pedal is depressed.

NO → Check STOP fuse (15A) and stop light switch. → BAD → Repair or replace.

Check STOP fuse (15A) and stop light switch. → OK → Check wiring between ECM terminal STP and battery. → BAD → Repair or replace.

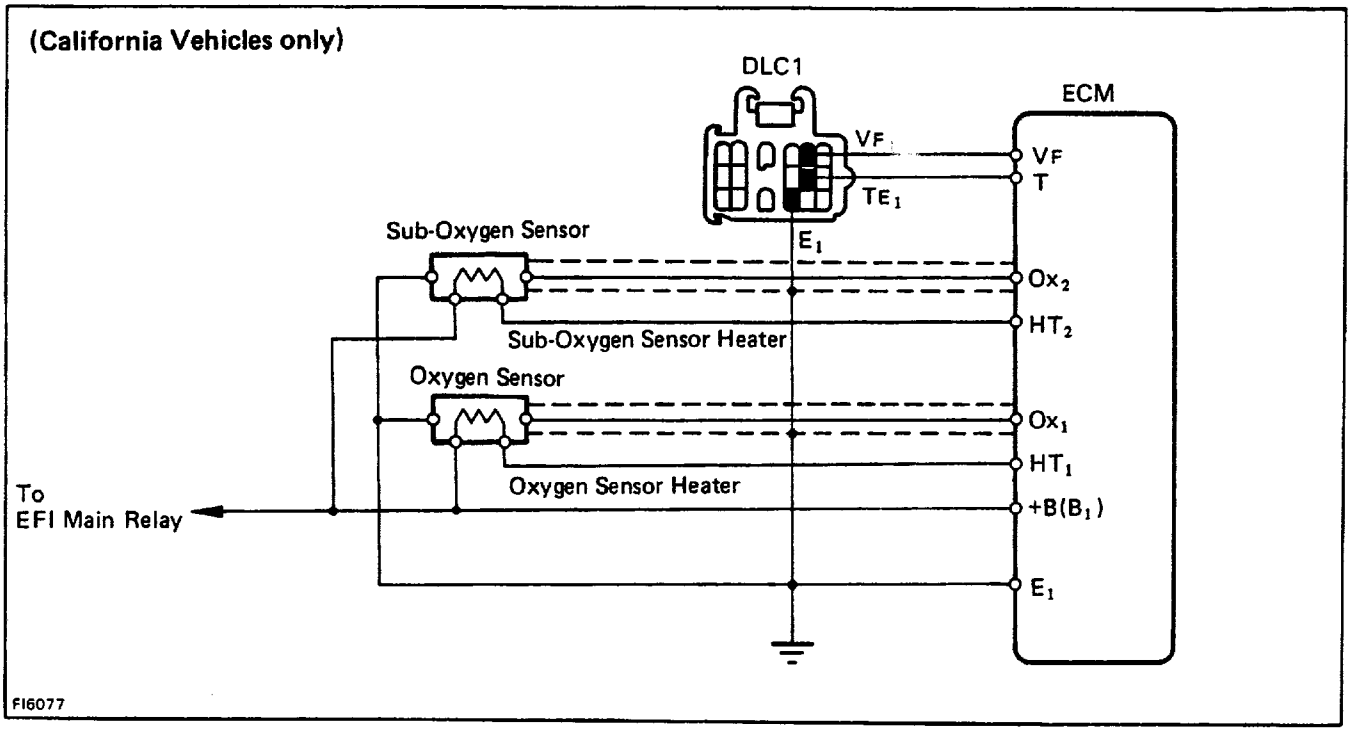
OK → (3) Check wiring between ECM terminal E1 and body ground.

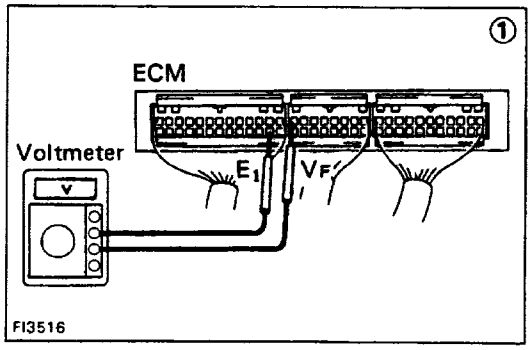
(3) Check wiring between ECM terminal E1 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

V01844





(1) There is no voltage between ECM terminals VF and E1.

(2) Check that there is voltage between ECM terminal VF and body ground.

NO — OK

(3) Check wiring between ECM terminal E1 and body ground.

OK — Try another ECM.

BAD — Repair or replace.

Is air leaking into air induction system?

YES — Repair air leak.

NO

Check spark plugs.

BAD — Repair or replace.

OK

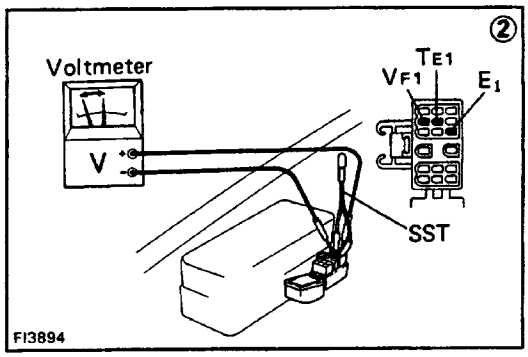
Check distributor and ignition system.

BAD — Repair or replace.

OK

CONTINUED 4N PAGE EG1–175

V01845



CONTINUED FROM PAGE EG1–174

OK

Check fuel pressure. — BAD → Repair or replace.

OK

Check injector. — BAD → Repair or replace.

OK

Check cold start injector.* — BAD → Repair or replace.

OK

Check volume air flow meter. — BAD → Repair or replace.

OK

Check operation of oxygen sensor. — OK → System normal.

BAD

Check wiring between oxygen sensor and ECM connector. — BAD → Repair wiring.

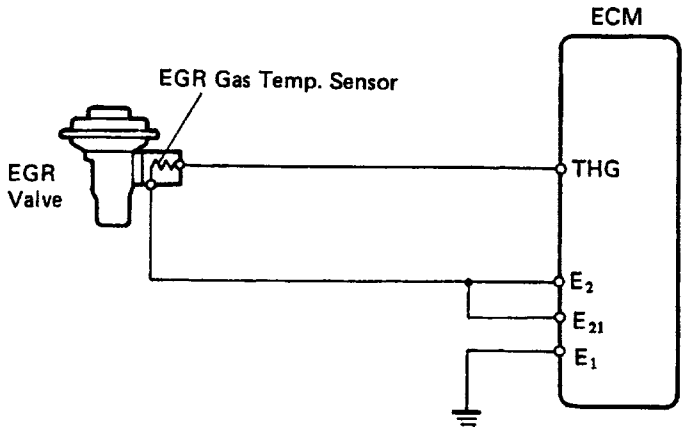
OK

Replace oxygen sensor.

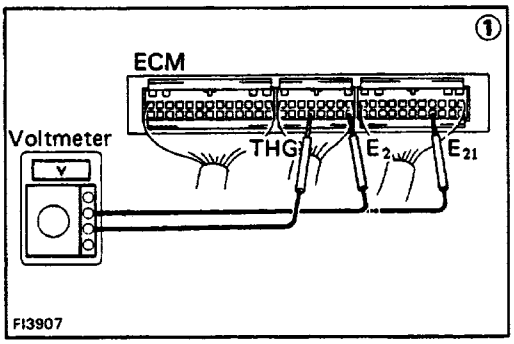
*Rich malfunction only.

V01847

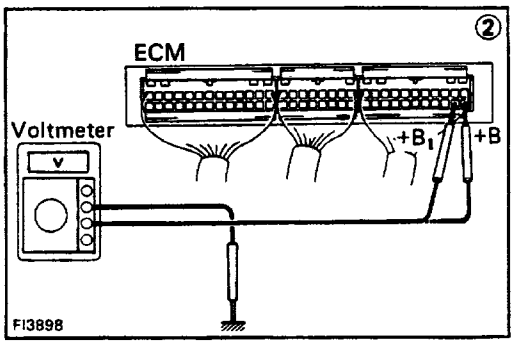
(California Vehicles only)



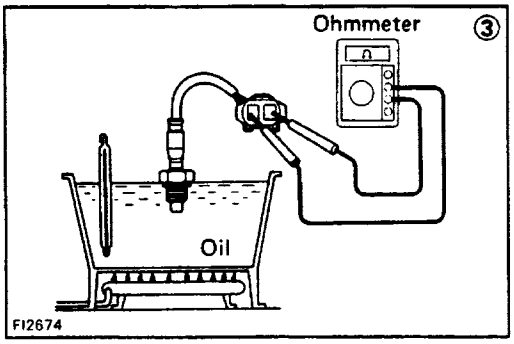
FI3895



FI3907



FI3898



FI2674

(1) There is no voltage between ECM terminals THG and E2 (E21) (Engine running at 2,000 rpm)

↓

(2) Check that there is voltage between ECM terminal +B (+B1) and body ground. **(IG SW ON)**

OK → ↓

NO → Refer to No. 1 .

↓

Check wiring between ECM terminal E1 and body ground.

OK → ↓

BAD → Repair or replace.

↓

Check EGR system.

BAD → Repair or replace.

OK → ↓

↓

Check EGR gas temp. sensor.

BAD → Replace EGR gas temp. sensor.

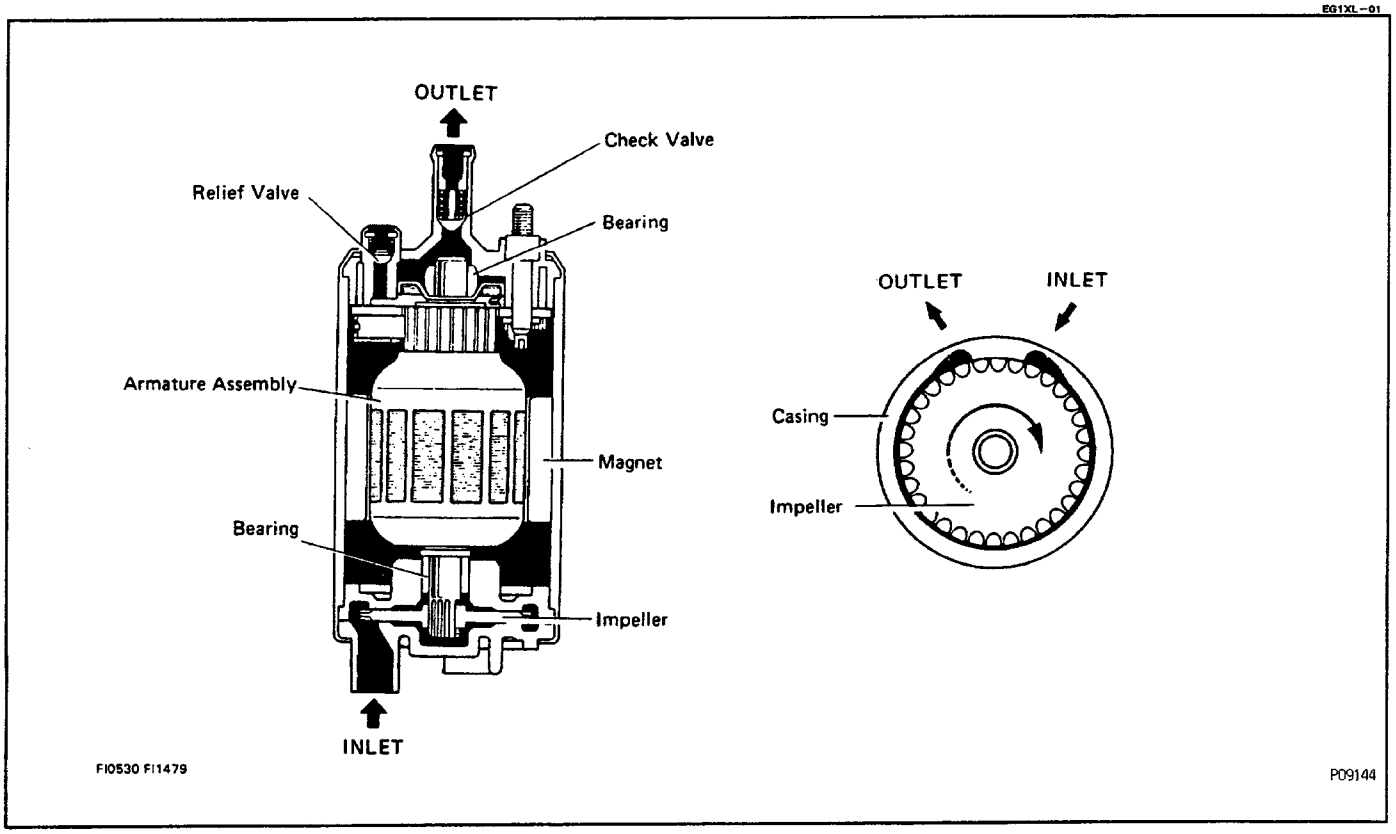
OK → Check wiring between ECM and EGR gas temp. sensor.

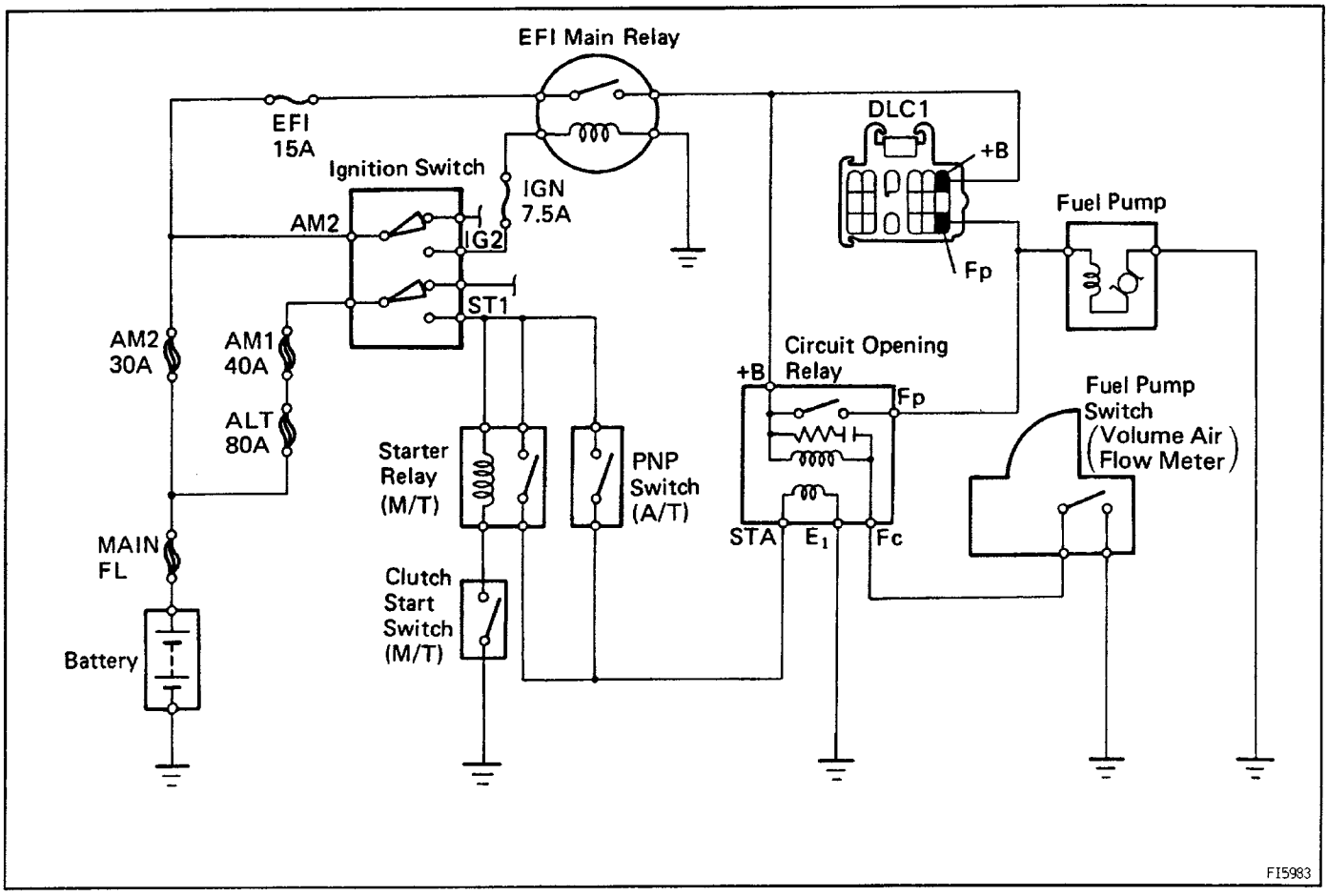
OK → Try another ECM.

BAD → Repair or replace.

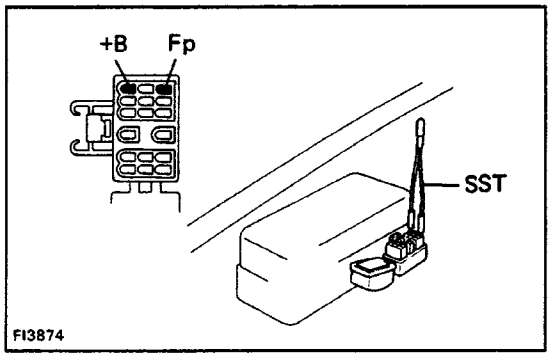
V01846

FUEL PUMP


EG1XL–01
OUTLET
Check Valve
Relief Valve
Bearing
Armature Assembly
Magnet
Bearing
Impeller
INLET
FI0530 FI1479
OUTLET
INLET
Casing
Impeller
P09144


EFI Main Relay
EFI
15A
Ignition Switch
IGN
7.5A
AM2
IG2
ST1
AM2
30A
AM1
40A
ALT
80A
MAIN
FL
Battery
Starter
Relay
(M/T)
PNP
Switch
(A/T)
Clutch
Start
Switch
(M/T)
DLC1
+B
Fp
Fuel Pump
Circuit Opening
Relay
+B
Fp
STA
E1
Fc
Fuel Pump
Switch
(Volume Air
Flow Meter)
FI5983

EG1XM–01



ON–VEHICLE INSPECTION

1. CHECK FUEL PUMP OPERATION

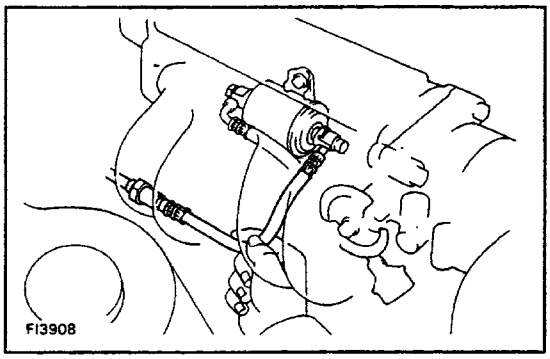
(a) Turn the ignition switch ON.

HINT: Do not start the engine.

(b) Using SST, connect terminals Fp and +B of the DLC1.

SST 09843–18020

HINT: The DLC1 is located near the No. 2 relay block.



(c) Check that there is pressure in the fuel inlet hose.

HINT: At this time, you will hear fuel return noise from the pressure regulator.

(d) Remove SST from the DLC1.

(e) Turn the ignition switch OFF.

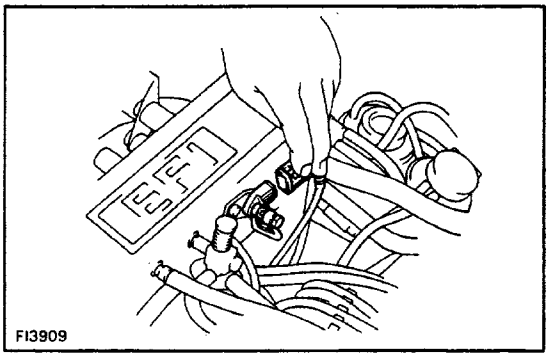
If there is no pressure, check the following parts:

- Fusible links
- Fuses (EFI 15A, IGN 7.5A)
- EFI main relay
- Circuit opening relay
- Fuel pump
- Wiring connections

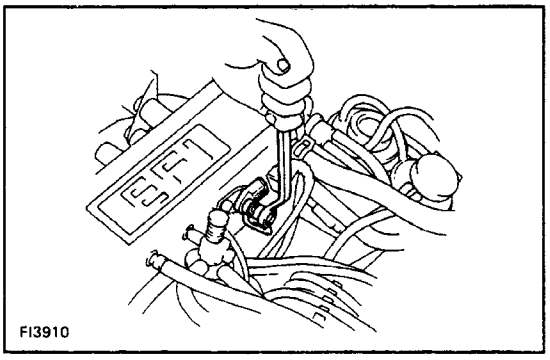
2. CHECK FUEL PRESSURE

(a) Check that the battery voltage is above 12 volts.

(b) Disconnect the cable from the negative terminal of the battery.



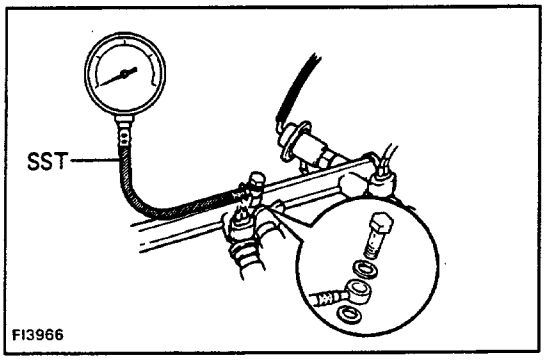
(c) Disconnect the wiring connector from the cold start injector.



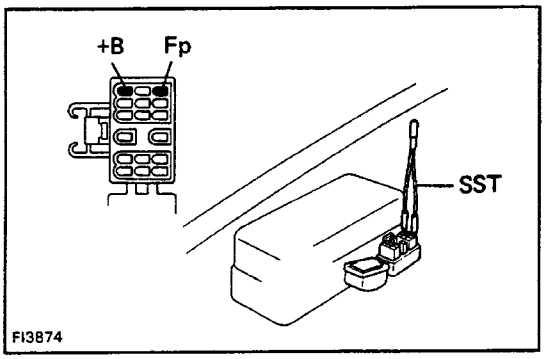
(d) Put a suitable container or shop towel under the cold start injector pipe.

(e) Slowly loosen the union bolts of the cold start injector pipe and remove the bolts, cold start injector pipe and four gaskets. ,

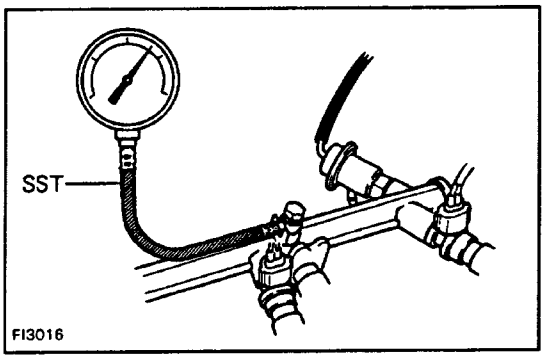
(f) Drain the fuel from the delivery pipe.



(g) Install a gasket, SST, another gasket and union bolt to the delivery pipe as shown in the illustration.
SST 09268–45012
(h) Wipe off any splattered gasoline.

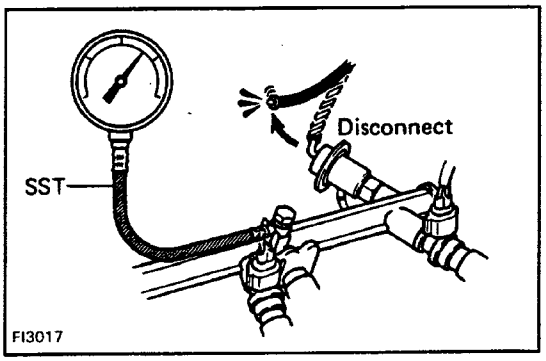


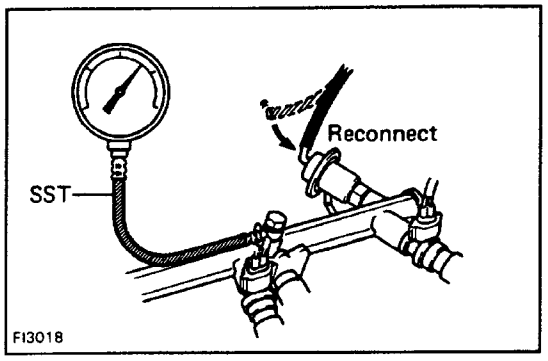
(i) Reconnect the battery negative terminal.
(j) Using SST, connect terminals Fp and +B of the DLC1.
SST 09843–18020



(k) Turn the ignition switch ON.
(l) Measure the fuel pressure.
Fuel pressure: 265–304 kPa
(2.7–3.1 kgf/cm^2, 38–44 psi)
If high, replace the pressure regulator.
If low, check the following parts:
- Fuel hoses and connections
- Fuel pump
- Fuel filter
- Pressure regulator

(m) Remove SST from the DLC1.
(n) Start the engine.
(o) Disconnect the vacuum hose from the pressure regulator and plug it closed.
(p) Measure the fuel pressure at idling.
Fuel pressure: 265–304 kPa
(2.7–3.1 kg f/cm^2, 38–44 psi)



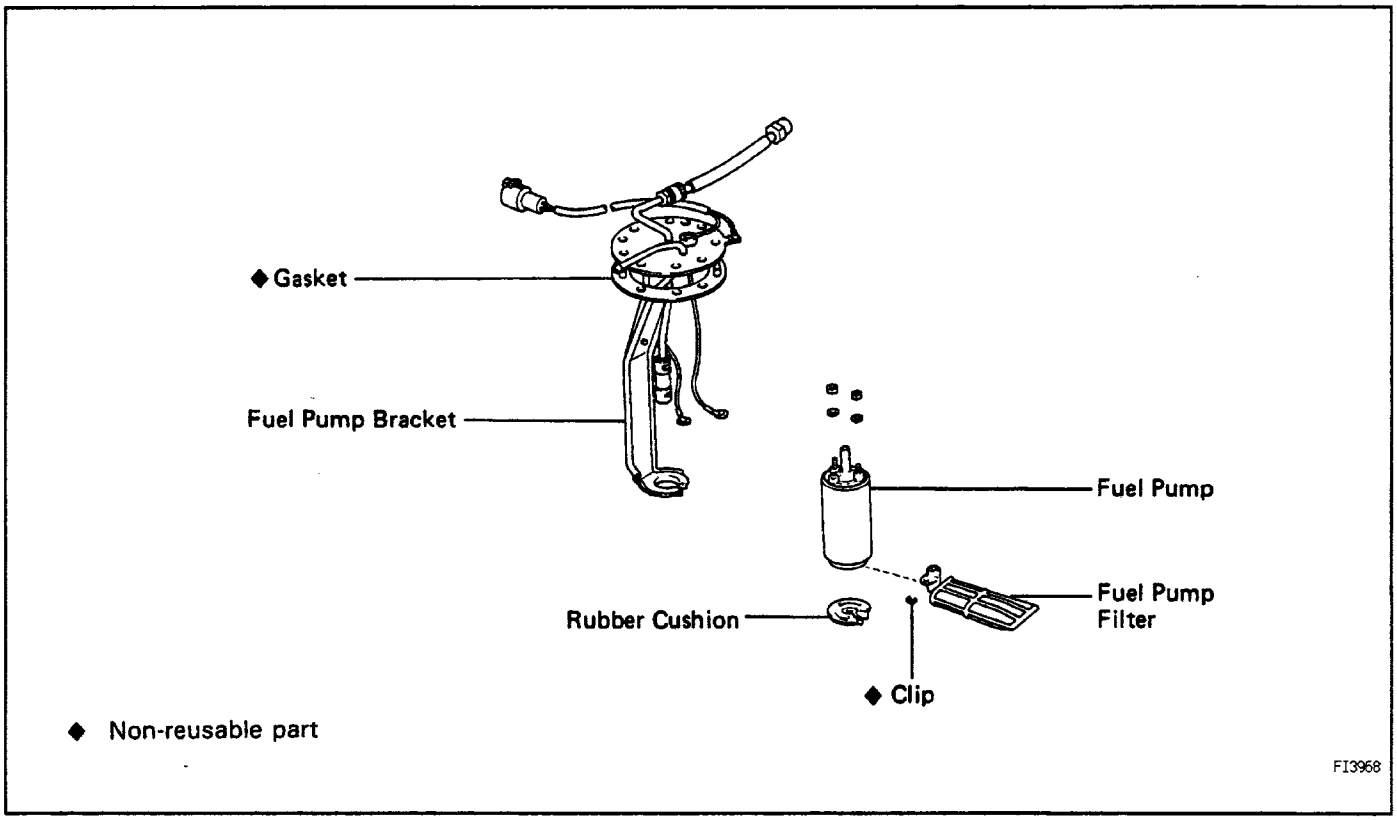


(q) Reconnect the vacuum hose to the pressure regulator.
(r) Measure the fuel pressure at idling.
Fuel pressure: 226–265 kPa
(2.3–2.6 kgf/cm^2, 33–37 psi)
If not within the specified pressure, check the vacuum hose and pressure regulator.
(s) Stop the engine. Check that the fuel pressure remains above 147 kPa (1.5 kgf/cm^2, 21 psi) for 5 minutes after the engine is turned off.

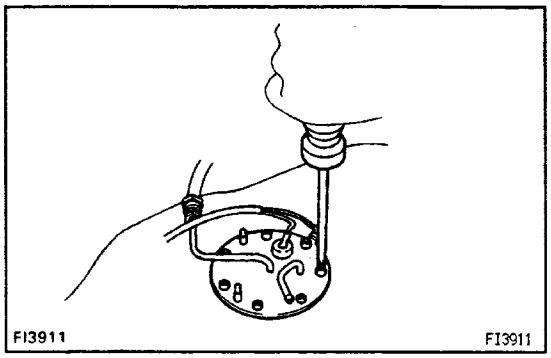
If not within the specification, check the fuel pump, pressure regulator and/or injectors.
(t) After checking fuel pressure, disconnect the battery ground strap and carefully remove the SST to prevent gasoline from splashing.
(u) Using new gaskets, reconnect the cold start injector pipe to the delivery pipe and cold start injector.
(v) Connect the wiring connector to the cold start injec–tor.
(w) Start the engine and check for fuel leakage.

FUEL PUMP REMOVAL

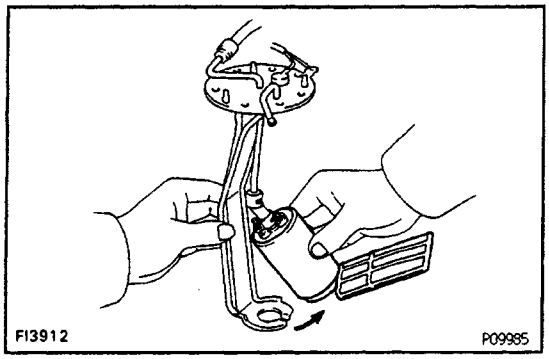
EG1XN–01



1. DRAIN FUEL FROM FUEL TANK
CAUTION: Do not smoke or work near an open flame when working on the fuel pump.
2. REMOVE FUEL TANK



3. REMOVE FUEL PUMP BRACKET
(a) Remove the seven bolts.
(b) Pull out the fuel pump bracket.

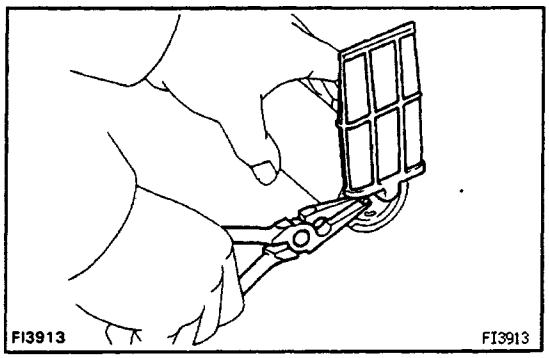


4. REMOVE FUEL PUMP

(a) Remove the two nuts and disconnect the wires from the fuel pump.

(b) Pull off the fuel pump from the lower side of the bracket.

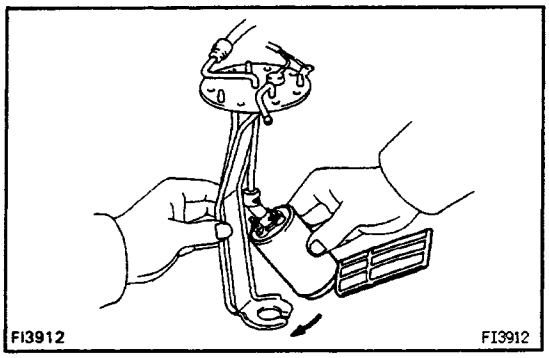
(c) Remove the fuel pump from the fuel hose.



5. REMOVE FUEL PUMP FILTER

(a) Remove the rubber cushion.

(b) Remove the clip and pull out the filter.



EG1XP–01

FUEL PUMP INSTALLATION

(See page EG1–180)

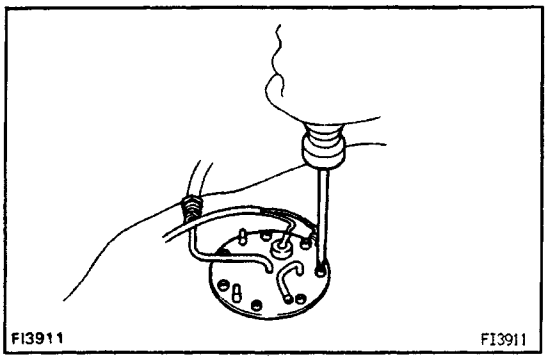
1. INSTALL FUEL PUMP FILTER

2. INSTALL FUEL PUMP

(a) Insert the outlet port of the fuel pump into the fuel hose.

(b) Install the rubber cushion to the lower side of the fuel pump.

(c) Push the lower side of the pump, together with the rubber cushion, into the pump bracket.



3. INSTALL FUEL PUMP BRACKET

(a) Place the bracket with a new gasket on the fuel tank.

(b) Install and torque the seven screws.

Torque: 3.8 N–m (40 kgf–cm, 34 in.–lbf)

4. INSTALL FUEL TANK

NOTICE:

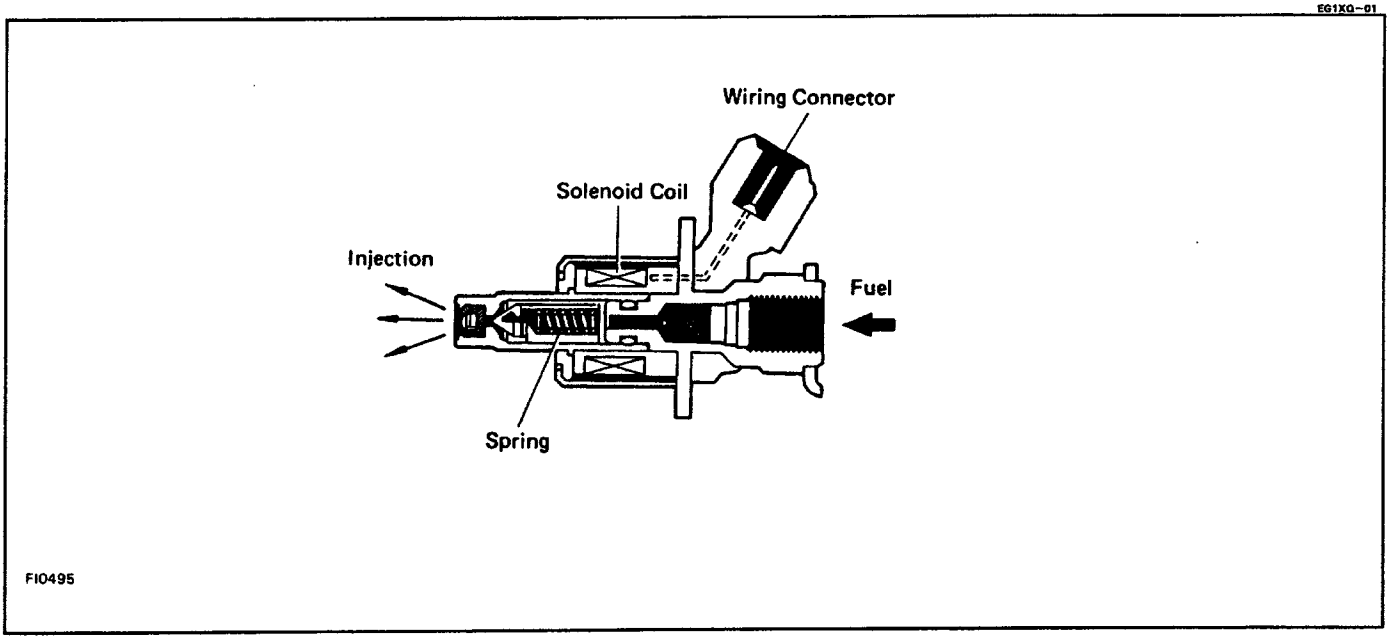
- **Tighten the fuel tank mounting bolts, etc. to the specified torque.**

- **Tighten the pipe and flare nut type hose to the specified torque.**
- **Push in the pipe and insert–type hose to the specified position, and install the clip to the specified location.**
- **If reusing the hose, reinstall the clip at the original location.**

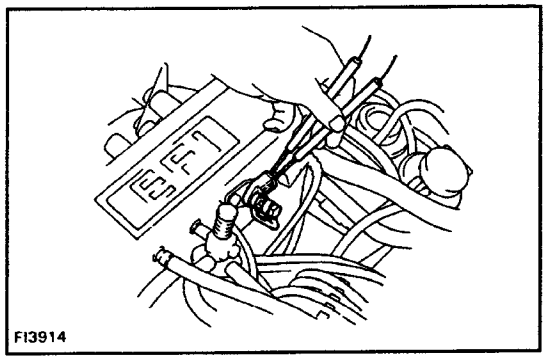
5. REFILL WITH FUEL

COLD START INJECTOR

EG1XQ–01



EG1XR–01



ON–VEHICLE INSPECTION

MEASURE RESISTANCE OF COLD START INJECTOR

(a) Disconnect the cold start injector connector.

(b) Using ohmmeter, check the resistance of the injector.

Resistance: 2 –4

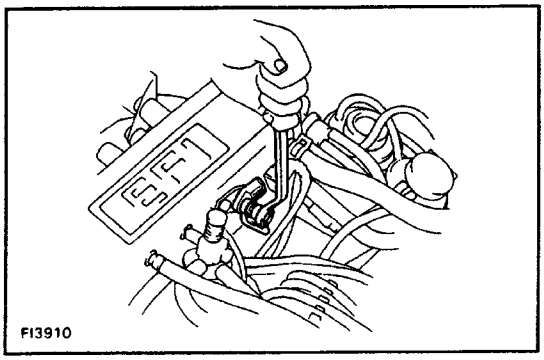
(c) Connect the cold start injector connector.

EG1XS–01

COLD START INJECTOR REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DISCONNECT COLD START INJECTOR CONNEC–TOR



3. REMOVE COLD START INJECTOR

(a) Put a suitable container or shop towel under the cold star injector pipe.

(b) Remove the union bolts and four gaskets, and remove the cold start injector pipe.

HINT: Slowly loosen the union bolt.

(c) Remove the two bolts and cold start injector with the gasket.

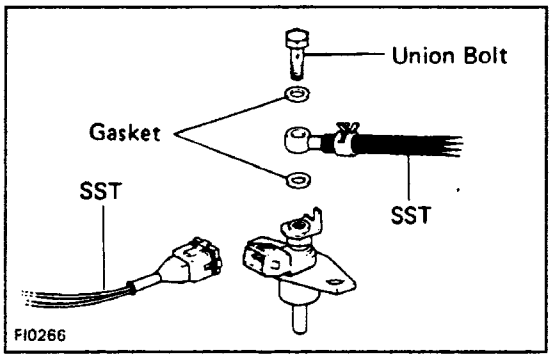
EG1XT–01

COLD START INJECTOR INSPECTION

CHECK INJECTION OF COLD START INJECTOR

HINT: The engine should be cold.

(a) Remove the cold start injector.



(b) Install a gasket, SST (two unions), another gasket and two union bolts to the delivery pipe and injector.

(c) Connect the SST (hose) to each union.

SST 09268–41045 (092368–41080)

(d) Connect the SST (wire) to the injector.

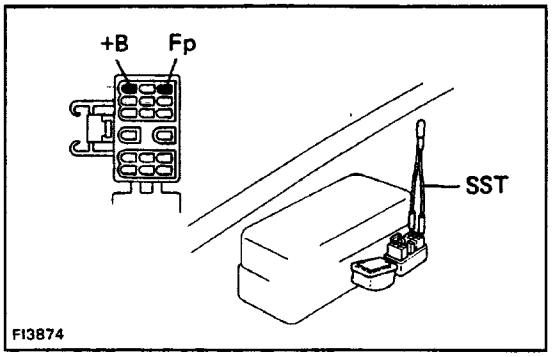
SST 09842–30050

CAUTION: Position the injector as far away from the battery as possible.

(e) Put a container under the injector.

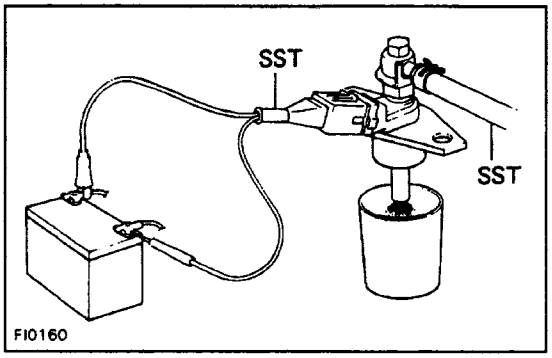
(f) Turn the ignition switch ON.

HINT: Do not start the engine.



(g) Using SST, connect terminals Fp and + B of the DLC 1.

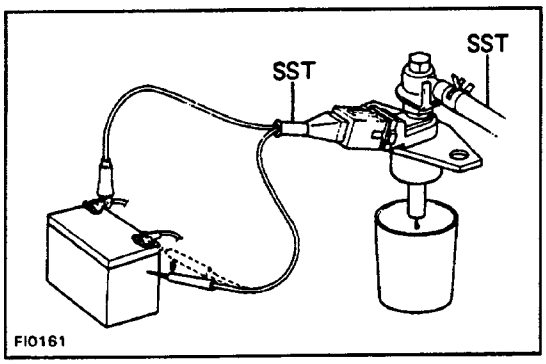
SST 09843–18020

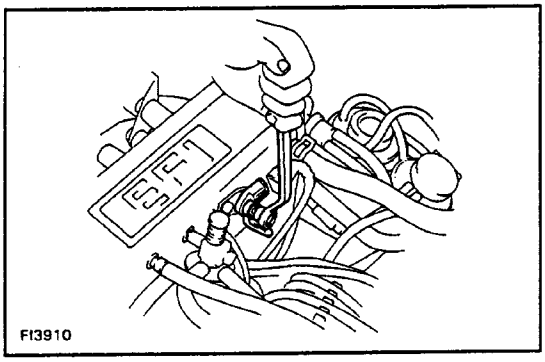


(h) Connect the test probes of the SST to the battery and check that the fuel injection is as shown.

SST 09842–30050

NOTICE: Perform this check within the shortest possible time.





(i) Disconnect the test probes from the battery and check fuel leakage from the injector.

Fuel drop: One drop or less per minute

(j) After checking, remove SST and restore the following parts to their original conditions.

- DLC1
- Ignition switch
- Cold start injector
- Injector wiring

COLD START INJECTOR INSTALLATION

1. INSTALL COLD START INJECTOR

(a) Using new gasket, install the cold start injector with the two bolts.

Torque: 7.8 N–m (80 kgf–cm, 69 in.–lbf)

(b) Install the fuel pipe between the cold start injector and fuel delivery pipe with new gaskets.

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)

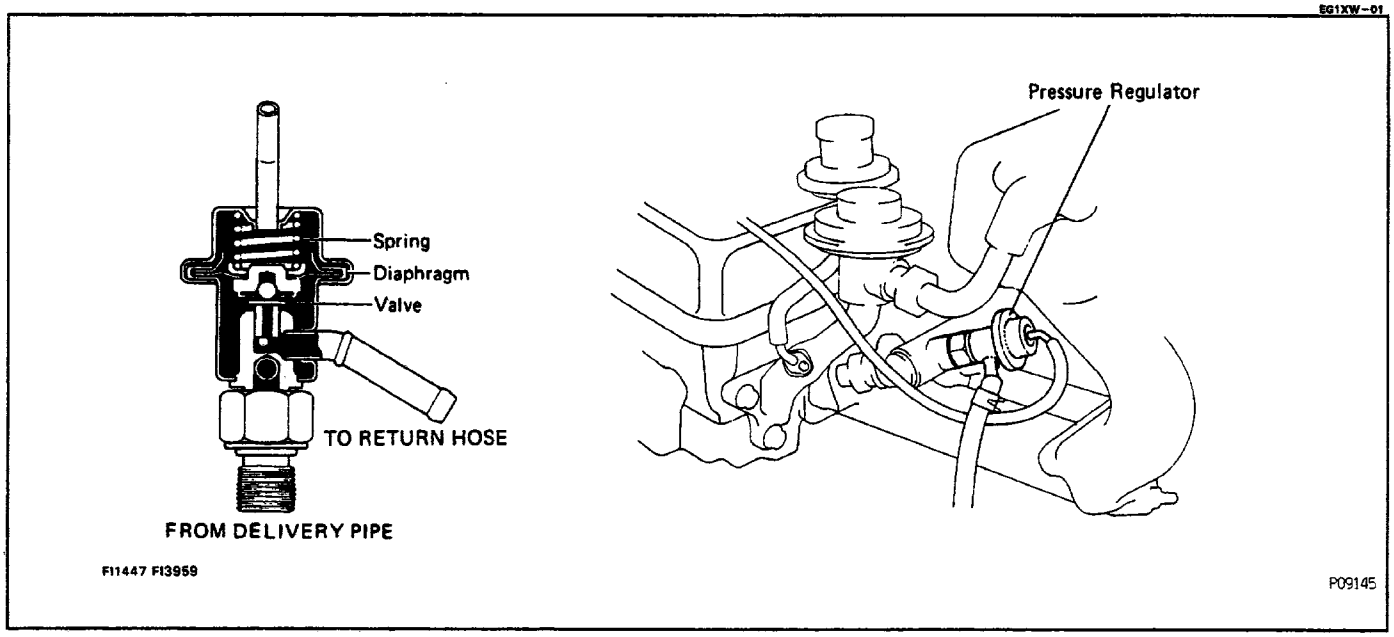
2. CONNECT COLD START INJECTOR CONNECTOR

3. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

4. CHECK FOR FUEL LEAKAGE

FUEL PRESSURE REGULATOR

EG1XW–01



EG1XX–0

ON–VEHICLE INSPECTION

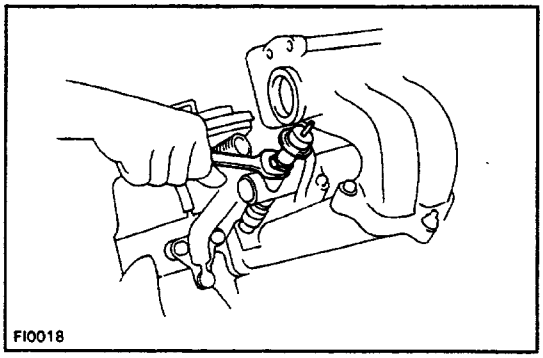
CHECK FUEL PRESSURE (See page EG1–178)

EG1XY–01

PRESSURE REGULATOR REMOVAL

1. DISCONNECT VACUUM SENSING HOSE

2. REMOVE NO. 1 EGR PIPE



3. DISCONNECT FUEL HOSE

(a) Put a suitable container or shop towel under the pressure regulator.

(b) Disconnect the fuel hose the pressure regulator.

4. REMOVE PRESSURE REGULATOR

Loosen the lock nut, and remove pressure regulator.

PRESSURE REGULATOR INSTALLATION

1. INSTALL PRESSURE REGULATOR

Install the pressure regulator. Torque the lock nut.

Torque: 29 N–m (300 kgf–cm. 22 ft–lbf)

2. CONNECT FUEL HOSE

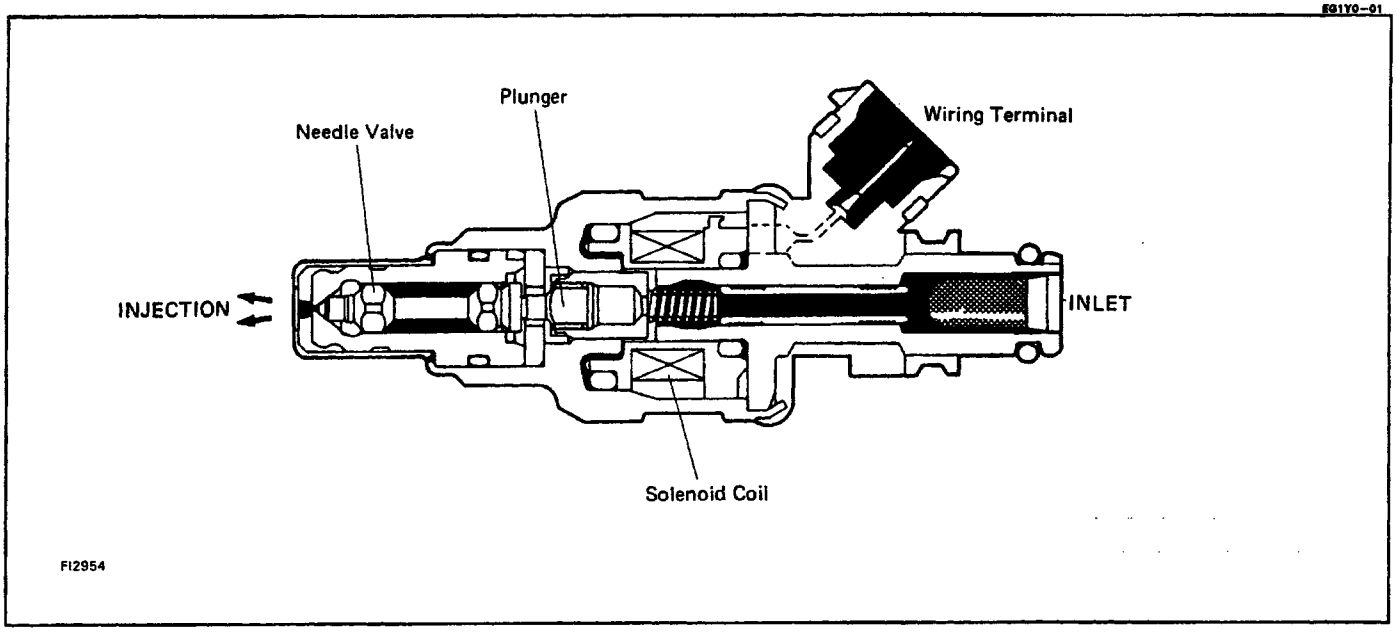
3. INSTALL NO. 1 EGR PIPE

Install a new gasket and No. 1 EGR pipe.

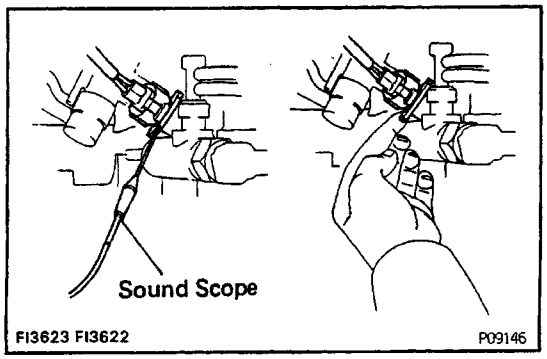
4. CONNECT VACUUM SENSING HOSE

INJECTOR

EG1Y0–01



EG1Y1–01



ON–VEHICLE INSPECTION

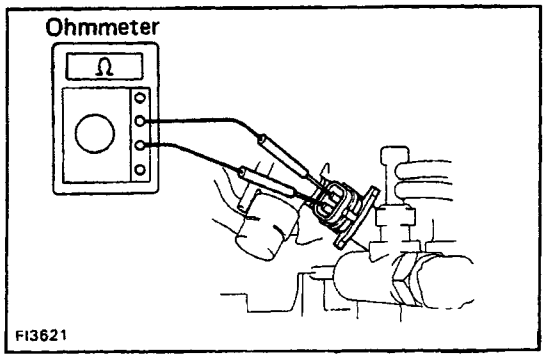
1. CHECK INJECTOR OPERATION

Check for operating sound from each injector.

(a) With the engine running or cranking, use a sound scope to check that there is normal operating noise in proportion to engine rpm.

(b) If you have no sound scope, you can check the injector transmission operation with you finger.

If no sound or an unusual sound is head, check the wiring connector, injector or injection signal from ECM.



2. MEASURE RESISTANCE OF INJECTOR

(a) Unplug the wiring connector from the injector.

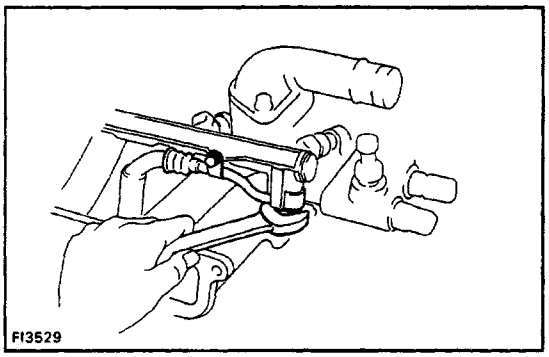
(b) Using an ohmmeter, measure the resistance of both terminals.

Resistance: 13.4–14.2

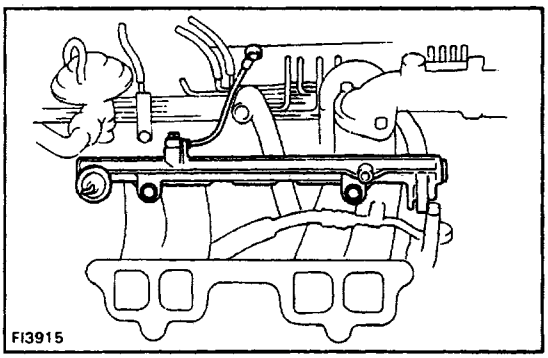
INJECTORS REMOVAL

EG1Y2–01

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. DRAIN COOLANT
3. REMOVE CHAMBER WITH THROTTLE BODY
(See steps 9 to 15 on pages EG1–16,17)
4. DISCONNECT WIRES
(See step 17 page EG1–17)



5. DISCONNECT FUEL HOSE FROM DELIVERY PIPE
Remove the bolt, union bolt and two gaskets.

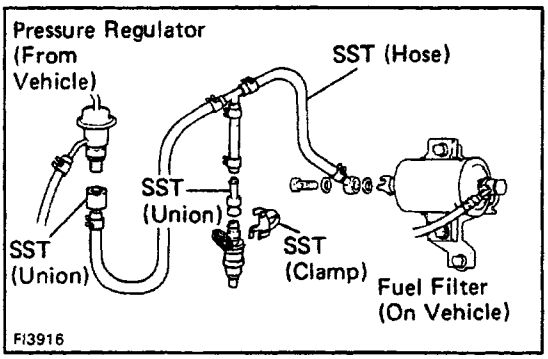


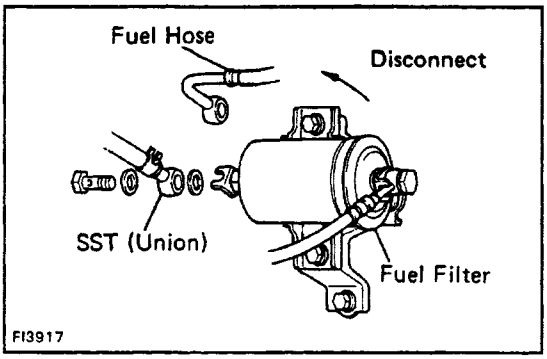
6. REMOVE DELIVERY PIPE WITH INJECTORS
Remove two bolts and then remove the delivery pipe with the injectors.

INJECTORS INSPECTION

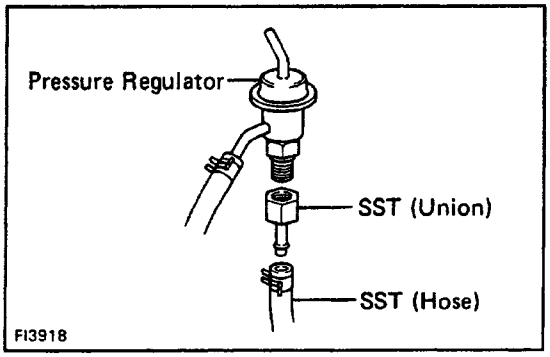
EG1Y3–01

1. TEST INJECTION OF INJECTOR
CAUTION: Keep injector clear of sparks during the test.

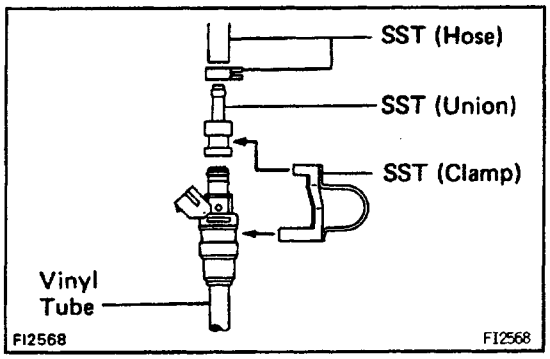




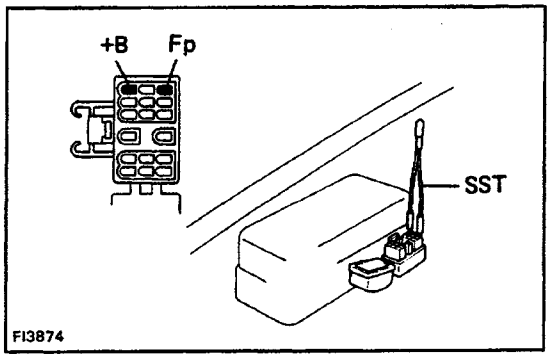
(a) Disconnect the fuel hose from the fuel filter outlet.
(b) Connect SST (Union) to the fuel filter outlet.
SST 09268–41045 (90405–09015)
HINT: Use the vehicle's fuel filter.



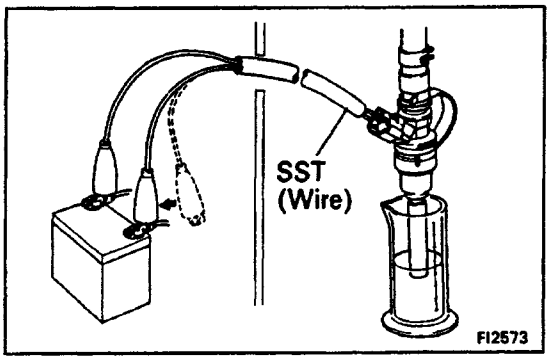
(c) Install SST (Union) to the removed pressure regulator.
SST 09268–41045 (09268–52010)



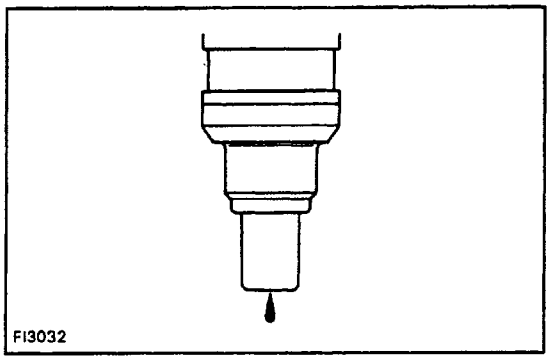
(d) Install SST (Union) to the injector and hold the injector and union with SST (Clamp).
SST 09268–41045
(e) Put the injector into the graduated cylinder.
HINT: Install a suitable vinyl tube unto the injector to prevent gasoline from splashing out.
(f) Connect the battery cable.
(g) Turn the ignition switch ON.
HINT: Do not start the engine.



(h) Using SST, connect terminals Fp and +B of the DLC1.
SST 09843–18020
HINT: Fuel pump will operate.



Connect SST (wire) to the injector and battery for 15 seconds and measure the injection volume with a graduated cylinder. Test each injector two or three times.
SST 09842 – 30070
Volume: 45–55 cm^3/15 sec. (2.7– 3.4 cu in.)
Difference between each injector:
6 cm^3 (0.4 cu in.) or less
If not within specified volume, replace the injector.



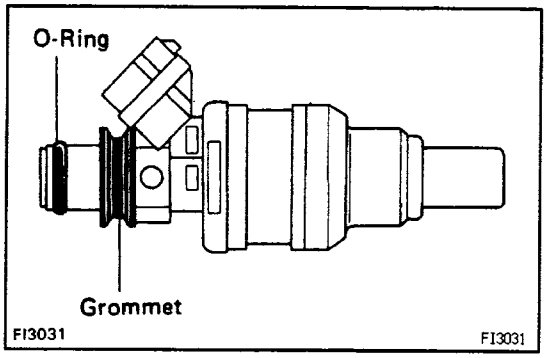
2. CHECK LEAKAGE
(a) In the condition above, disconnect SST from the battery and check for fuel leakage from the injector nozzle.
SST 09842–30060
Fuel drop: One drop or less per minute
(b) Disconnect the battery cable.
(c) Remove SST.

EG1Y4–01

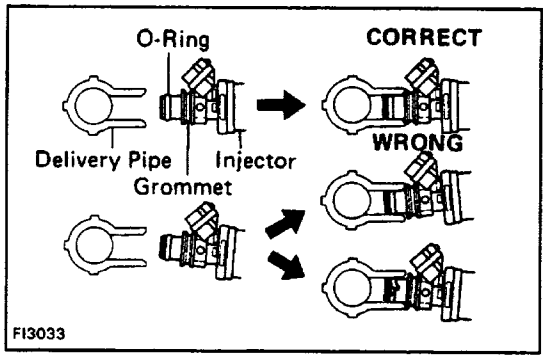
INJECTORS INSTALLATION

1. INSTALL INJECTORS INTO DELIVERY PIPE

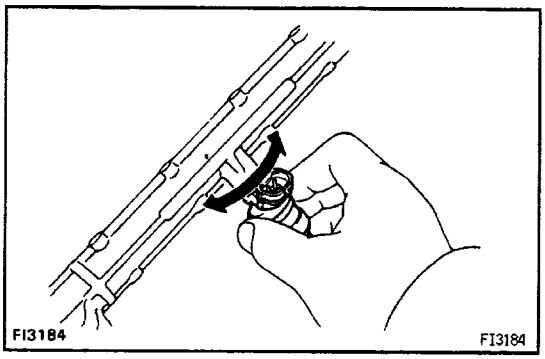
(a) Install the grommet and anew 0 –ring to the injector.



(b) Apply a light coat of gasoline to the O–rings and install the injectors into the delivery pipe.

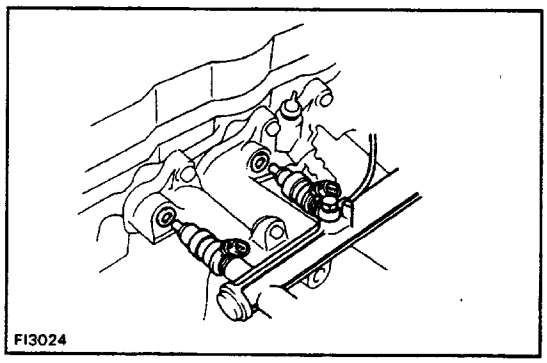


(c) Make sure that the injectors rotate smoothly.
HINT: If the injectors do not rotate smoothly, the O–rings are probably incorrectly installed. Replace the O –rings.



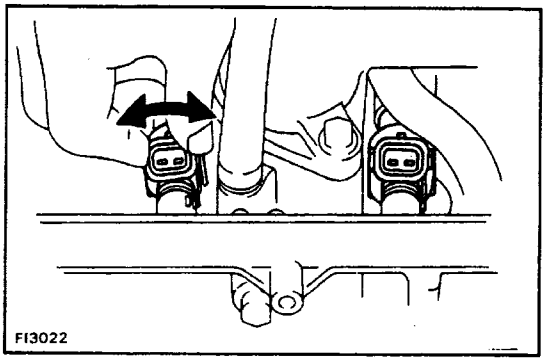
2. INSTALL DELIVERY PIPE WITH INJECTORS

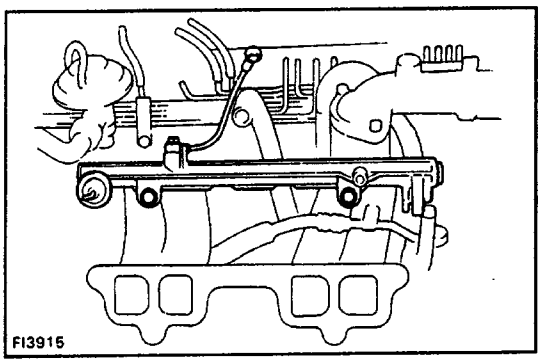
(a) Install the four insulators into the injector hole of the intake manifold.
(b) Place the injectors together with the delivery pipe to the manifold.



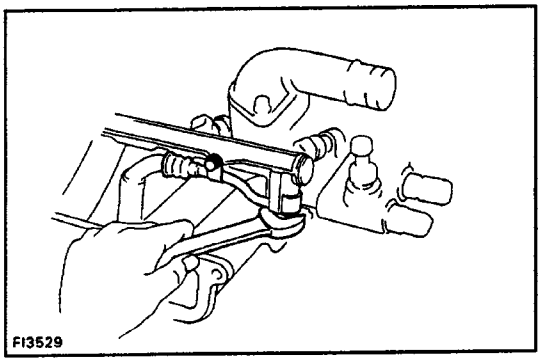
(c) Make sure that the injectors rotate smoothly.

HINT: If the injectors do not rotate smoothly, probable cause may be incorrect installation of O–rings. Replace O–rings again after removing the injectors.

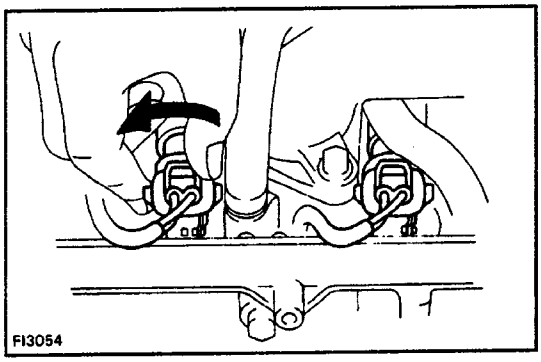




(d) install and torque the bolts.
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)

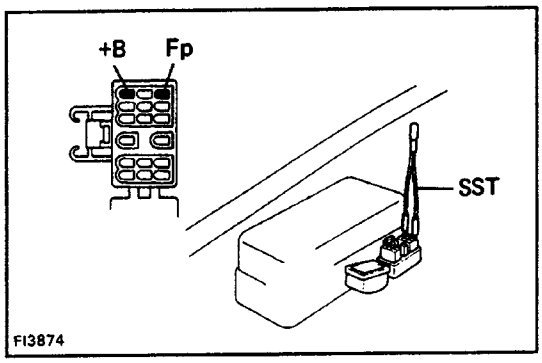


3. CONNECT FUEL HOSE TO DELIVERY PIPE
(a) Install the fuel hose with a bolt.
(b) Install the union bolt and new gaskets. Torque the union bolt.
Torque: 44 N–m (450 kgf–cm, 33 ft–lbf)



4. CONNECT WIRES
(See step 5 on page EG1–36)
Turn the injector so that the injector positioning guide is aligned with the positioning rib of the delivery pipe.

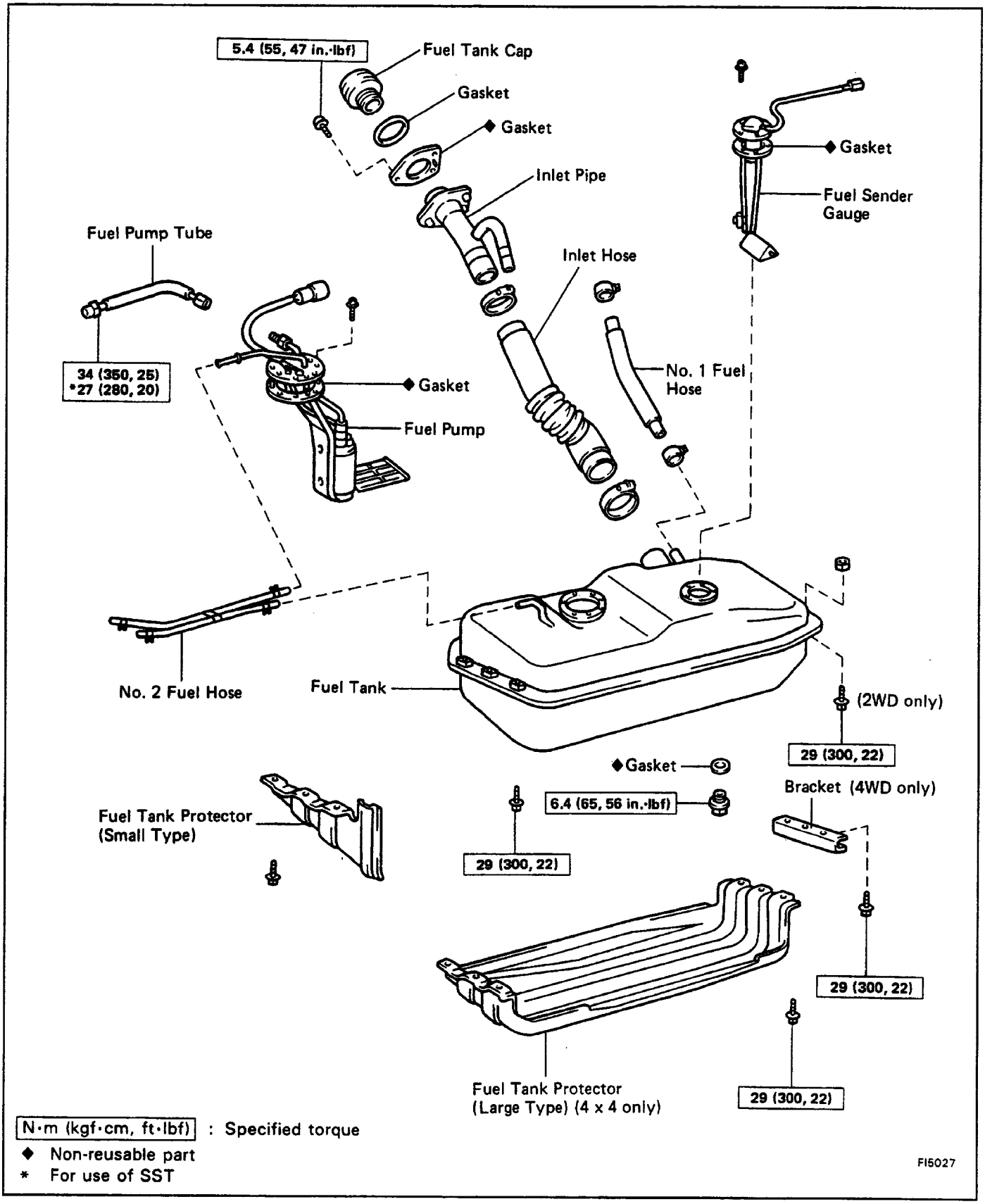
5. INSTALL CHAMBER WITH THROTTLE BODY
(See steps 7 to 14 on pages EG1–37, 38)
6. FILL WITH COOLANT
(See step 3 on page EG1–225)
7. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY



8. CHECK FOR FUEL LEAKAGE
(a) With the ignition switch ON, use SST to connect terminals Fp and +B of the DLC1.
SST 09843–18020
(b) Check for fuel leakage.
(c) Remove SST from the DLC1.

FUEL TANK AND LINE
COMPONENTS

EG1Y6–01



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
* For use of SST

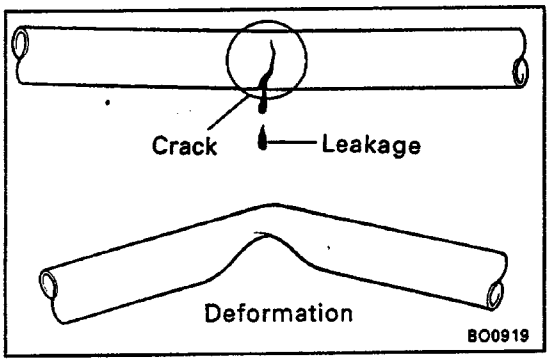
FI5027

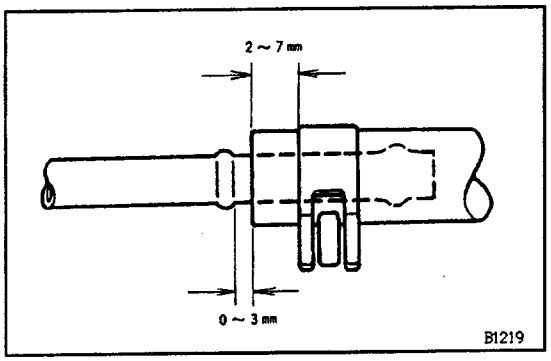
EG1Y6–01

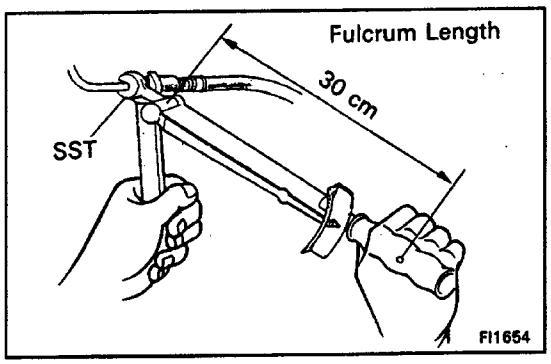
PRECAUTIONS

1. Always use new gaskets when replacing the fuel tank or component part.

2. Apply the proper torque to all parts tightened.







EG1Y7–01

FUEL LINES AND CONNECTIONS INSPECTION

(a) Inspect the fuel lines for cracks or leakage, and all connections for deformations.

(b) Inspect the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage.

(c) Inspect the fuel tank for deformations, cracks or fuel leakage.

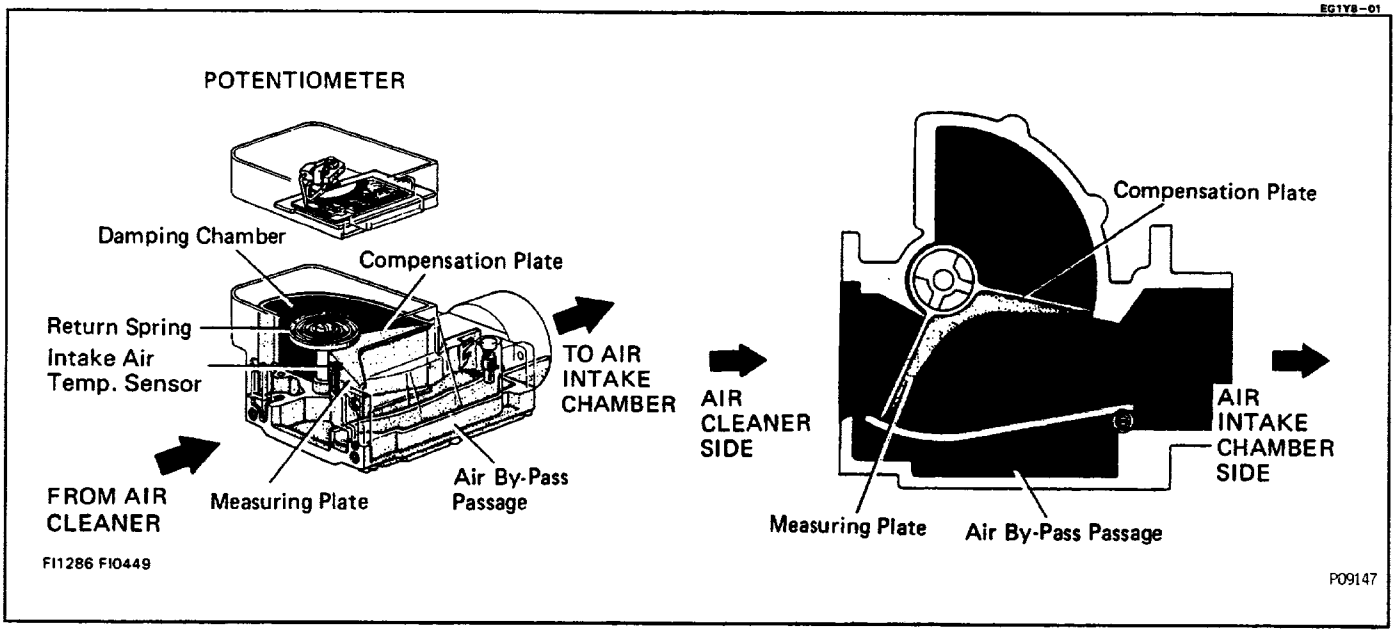
(d) Inspect the filler neck for damage or fuel leakage.

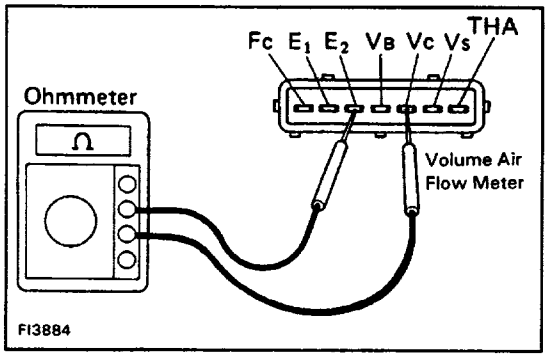
(e) Hose and tube connections are as shown in the il–lustration.

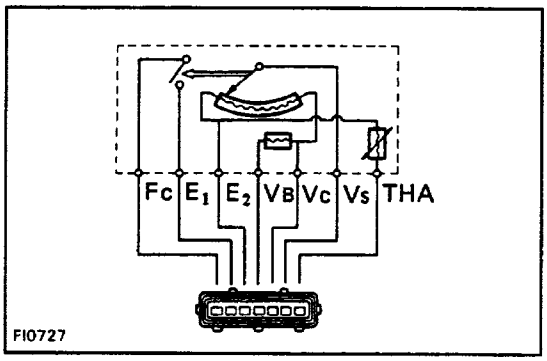
If a problem is found, repair or replace the parts as necessary. .

VOLUME AIR FLOW (VAF) METER

EG1Y8–01







EG1Y8–01

ON–VEHICLE INSPECTION

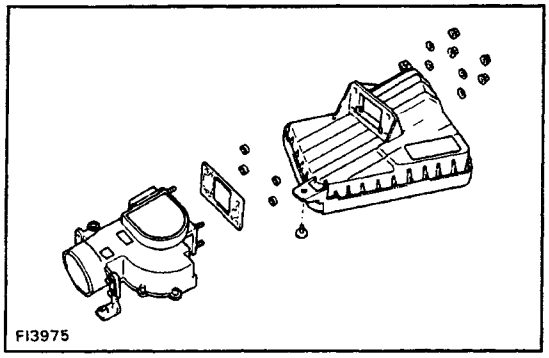
MEASURE RESISTANCE OF VOLUME AIR FLOW METER

(a) Disconnect the connector from the volume air flow meter.
(b) Using an ohmmeter, measure the resistance between each terminal.

Between terminals	Resistance	Temperature
E_2 – V_S	20 – 400 Ω	–
E_2 – V_C	100 – 300 Ω	–
E_2 – V_B	200 – 400 Ω	–
E_2 – THA	10 – 20 kΩ 4 – 7 kΩ 2 – 3 kΩ 0.9 – 1.3 kΩ 0.4 – 0.7 kΩ	–20°C (–4°F) 0°C (32°F) 20°C (68°F) 40°C (104°F) 60°C (140°F)
E_1 – F_C	Infinity	–

V02175

If not within specification, replace the volume air flow meter.



EG1YA–01

VAF METER REMOVAL

1. DISCONNECT INTAKE AIR CONNECTOR

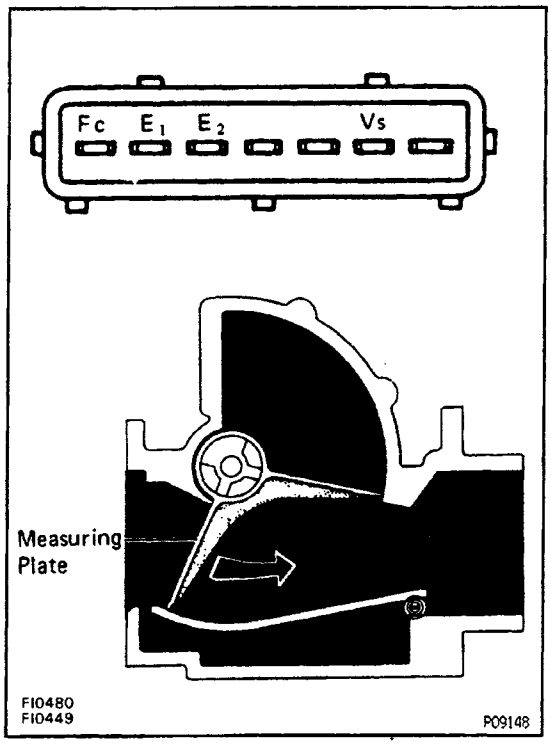
2. REMOVE AIR CLEANER CAP WITH VOLUME AIR FLOW METER

(a) Disconnect the volume air flow meter connector.

(b) Remove the air cleaner cap with volume air flow meter.

3. REMOVE VOLUME AIR FLOW METER

Remove the bolt, four nuts, washers, volume air flow meter and gasket.



EG1YB–01

VAF METER INSPECTION

MEASURE RESISTANCE OF VAF METER

Using an ohmmeter, measure the resistance between each terminal by moving the measuring plate.

Between terminals	Resistance (Ω)	Measuring plate opening
E1– Fc	Infinity	Fully closed
	Zero	Other than closed position
E2 – Vs	20–400	Fully closed
	20– 1,000	Fully open

HINT: Resistance between terminals E2 and Vs will change in a wave pattern as the measuring plate slowly opens.

EG1YC–01

VAF METER INSTALLATION

1. INSTALL VOLUME AIR FLOW METER

Install the gasket, volume air flow meter, washers, nuts and bolt. Torque the nuts and bolt.

2. INSTALL AIR CLEANER CAP WITH VAF METER

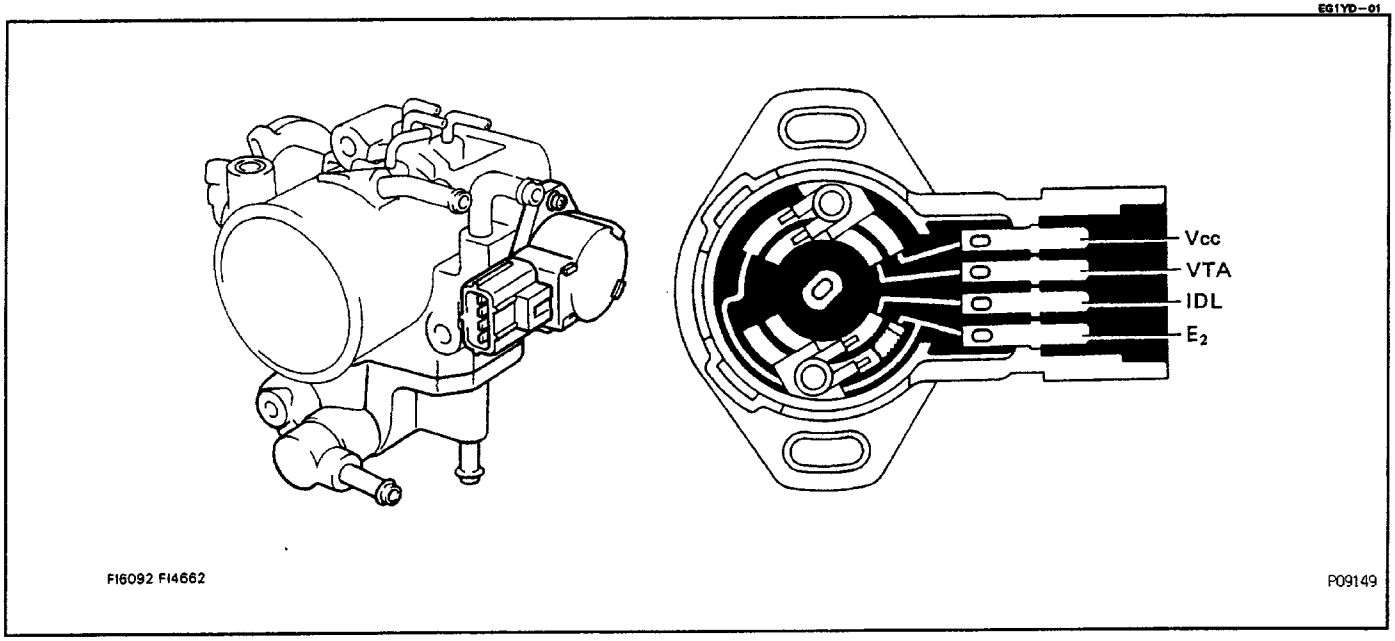
(a) Install the air cleaner cap with VAF meter to the air cleaner case.

(b) Connect the VAF meter connector.

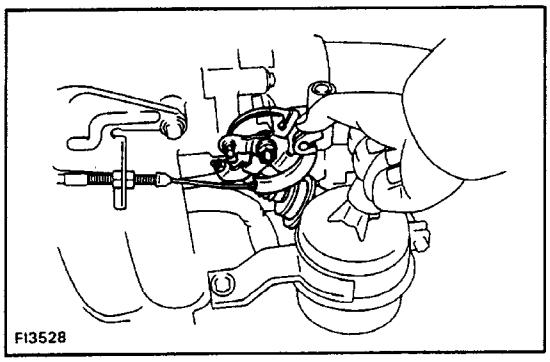
3. INSTALL INTAKE AIR CONNECTOR

THROTTLE BODY

EG1YD–01



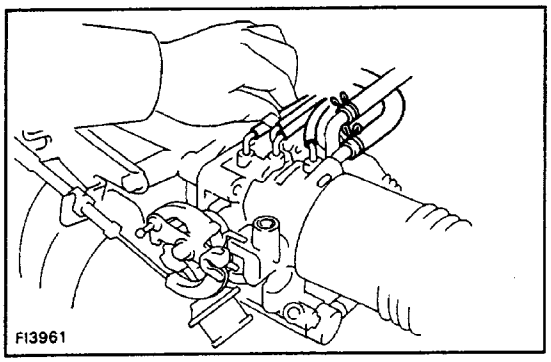
EG1YE–05



ON–VEHICLE INSPECTION

1. INSPECT THROTTLE BODY

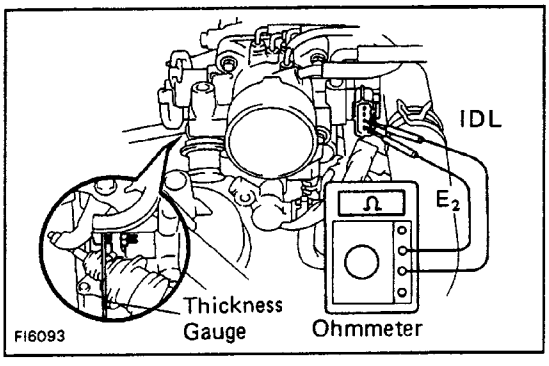
(a) Check that the throttle linkage moves smoothly.



(b) Check the vacuum at each port.

- Start the engine.
- Check the vacuum with your finger.

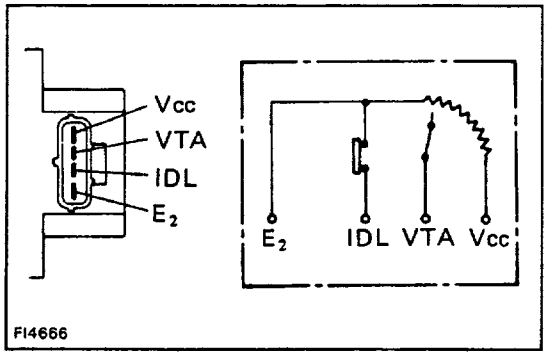
Port name	At idling	At 3,500 rpm
E	No vacuum	Vacuum
R	No vacuum	Vacuum
P	No vacuum	Vacuum



2. INSPECT THROTTLE POSITION SENSOR

Check the resistance between the terminals.

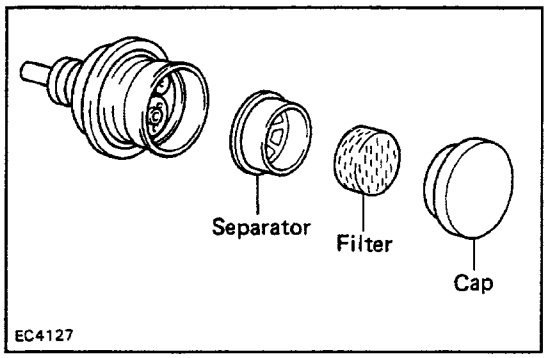
- Unplug the connector from the sensor.
  Insert a thickness gauge between the throttle stop screw and stop lever.
- Using an ohmmeter, check the resistance between each terminal.



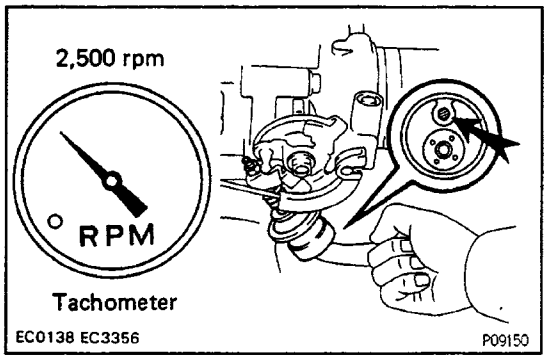
Clearance between lever and stop screw	Between terminals	Resistance
0 mm 10 in.	VTA – E2	0.47 – 8.1 kΩ
0.57 mm 10.0224 in.)	IDL – E2	2.3 kΩ or less
0.85 mm (0.0335 in.)	IDL – E2	Infinity
Throttle valve fully open	VTA – E2	3.1 – 12.1 kΩ
–	Vcc – E2	3.9 – 9.4 kΩ

V01951

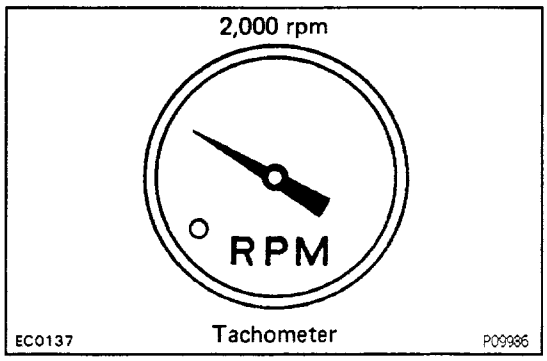
3. (M/T)
INSPECT DASH POT (DP)
A. Warm up engine
Allow the engine to warm up to normal operating temperature.
B. Check idle speed and adjust if necessary (See page MA–11)
Idle speed: 750 rpm



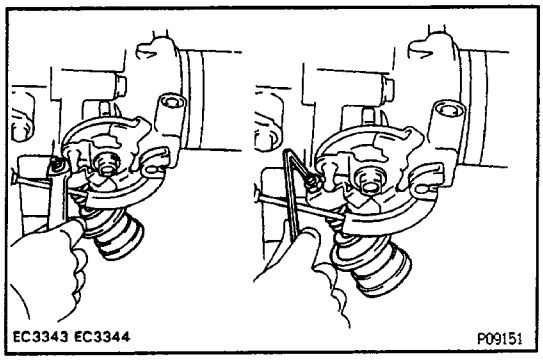
C. Remove cap, filter, and separator from DP



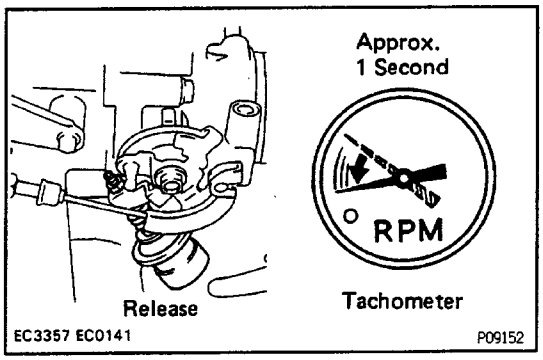
D. Check and adjust dash pot (DP) setting speed
(a) Maintain engine speed at 2,500 rpm.
(b) Plug the VTV hole with your finger.



(c) Release the throttle valve.
(d) Check the DP is set.
DP setting speed: 2,000 rpm



(e) If not as specified, adjust with the DP adjusting screw.



E. Check operation of VTV

(a) Set the DP setting speed in the same procedure as above; (a) to (c).

(b) Remove your finger from the hole and check that the engine returns to idle speed in approx. 1 second.

F. Reinstall DP separator, filter and cap

HINT: Install the filter with the coarser surface facing the atmospheric side (outward).

4. (A/T)

INSPECT THROTTLE OPENER

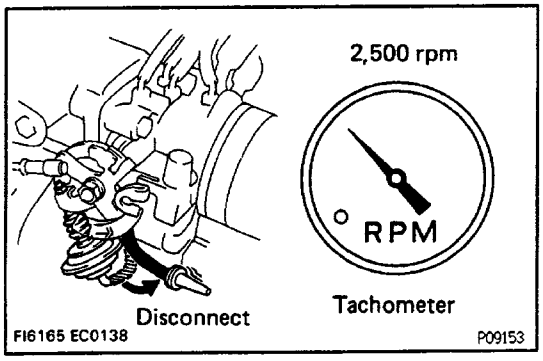
A. Warm up engine

Allow the engine to warm up to normal operating temperature.

B. Check idle speed

Idle speed: 2WD 750 50 rpm

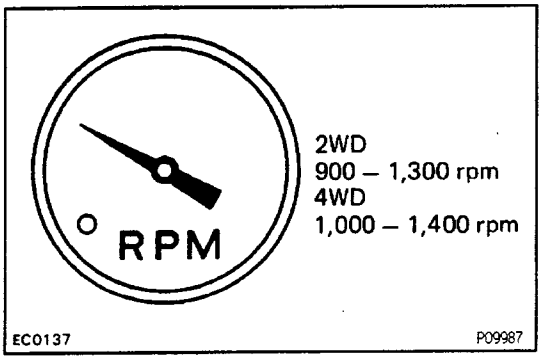
4WD 850 ± 50 rpm



C. Check and adjust throttle opener setting speed

(a) Disconnect the vacuum hose from the throttle opener, and plug the hose end.

(a) Disconnect the vacuum hose from the throttle opener, and plug the hose end.



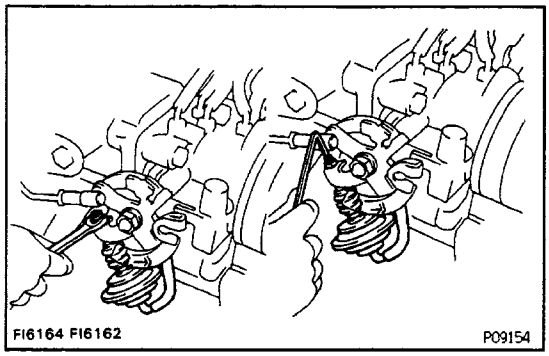
(c) Release the throttle valve.

(d) Check that the throttle opener is set.

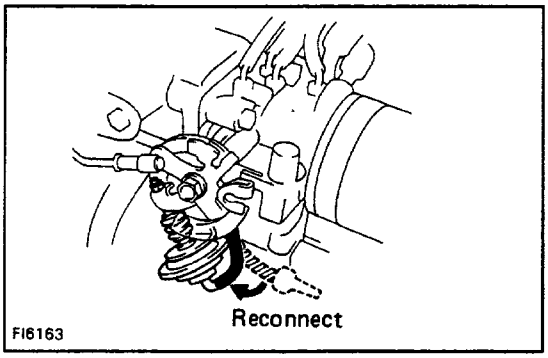
Throttle opener setting speed:

2WD 900–1,300 rpm

4WD 1,000–1,400 rpm



(e) If not as specified, adjust with the throttle opener adjusting screw.

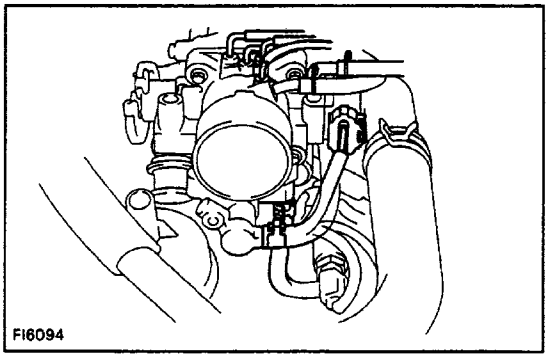


(f) Reconnect the vacuum hose to the throttle opener.

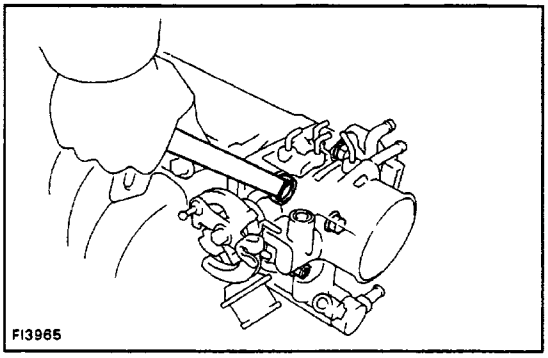
EG1YF–01

THROTTLE BODY REMOVAL

1. REMOVE INTAKE AIR CONNECTOR
2. DRAIN COOLANT
3. DISCONNECT ACCELERATOR CABLE



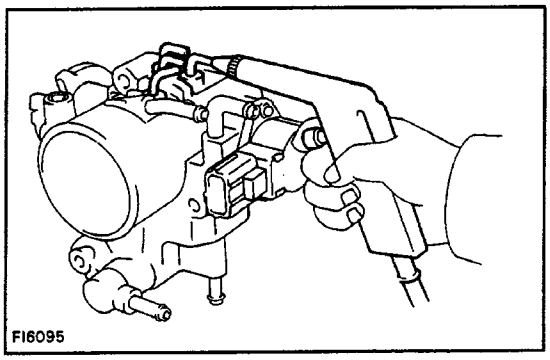
4. DISCONNECT FOLLOWING HOSES:
(a) (with A/C)
A/C idle up hose.
(b) PCV hose
(c) No. 2 and No. 3 water by–pass hoses.
(d) Label and disconnect the emission control hoses.
5. DISCONNECT THROTTLE SENSOR CONNECTOR



6. REMOVE THROTTLE BODY
Remove the three bolts and but, and remove the throttle body and gasket.

THROTTLE BODY INSPECTION

EG1YG–01

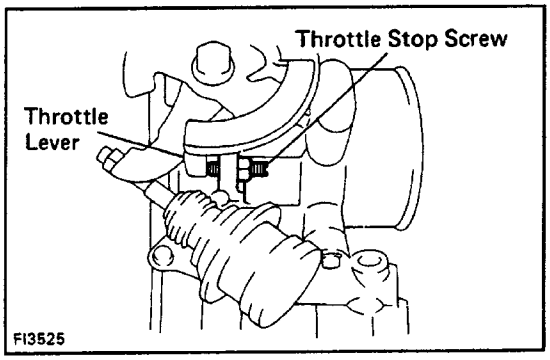


1. CLEAN THROTTLE BODY BEFORE INSPECTION

(a) Wash and clean the cast parts with a soft brush in carburetor cleaner.

(b) Using compressed air, clean all the passages and apertures in the throttle body.

NOTICE: To prevent deterioration, do not clean the throttle position sensor.

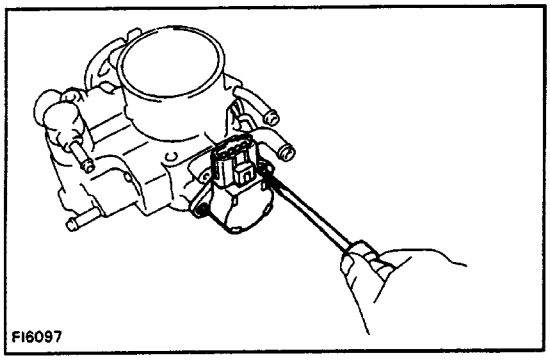


2. CHECK THROTTLE VALVE

Check that there is no clearance between the throttle stop screw and throttle lever when the throttle valve is fully closed.

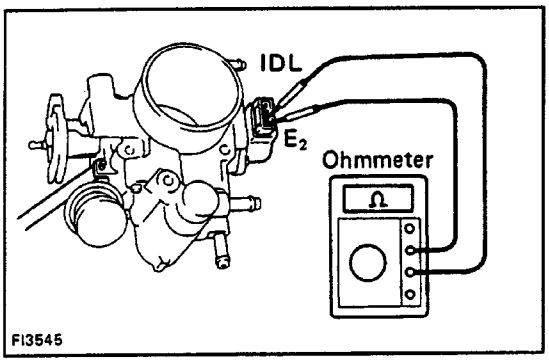
3. CHECK THROTTLE POSITION SENSOR

(See step 2 on page EG1–197)

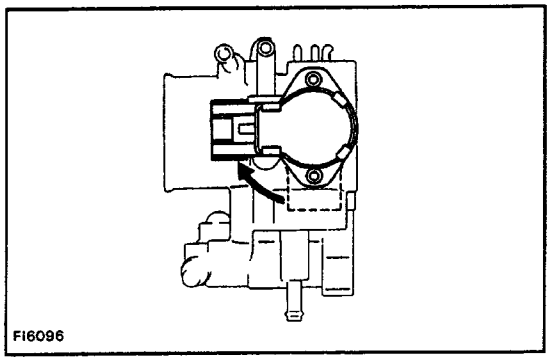


4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

(a) Loosen the two screws of the sensor.



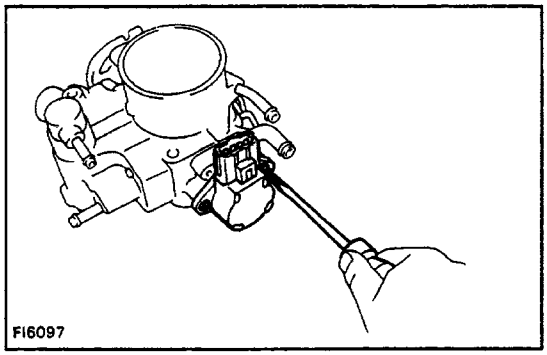
(b) Insert a thickness gauge (0.70 mm or 0.0276 in.) between the throttle stop screw and lever, and connect the ohmmeter to terminals IDL and E2.



(c) Gradually turn the sensor clockwise until the ohmmeter deflects, and secure the sensor with the two screws.

(d) Using a thickness gauge, recheck the continuity between terminals IDL and E2.

Clearance between lever and stop screw	Continuity (IDLE – E2)
0.57 mm (0.0224 in.)	Continuity
0.85 mm (0.0335 in.)	No continuity

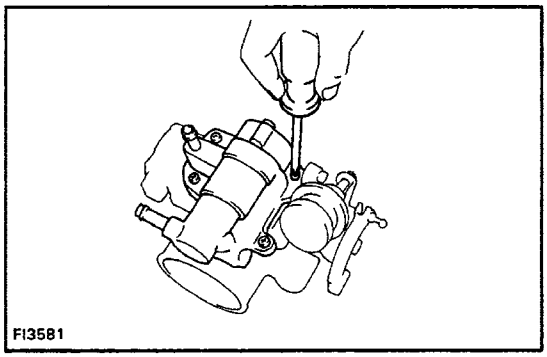


EG1YH–01

THROTTLE BODY DISASSEMBLY

1. REMOVE THROTTLE POSITION SENSOR

Remove the two screws and sensor.



2. REMOVE AUXILIARY AIR VALVE

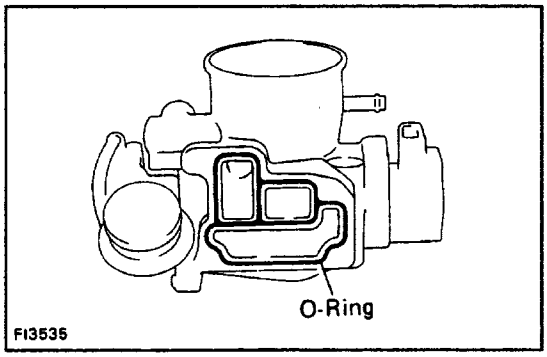
Remove the four screws, air valve and O–ring.

3. (M/T)

REMOVE DASH POT

4. (A/T)

REMOVE THROTTLE OPENER



EG1YJ–01

THROTTLE BODY ASSEMBLY

1. (M/T)

INSTALL DASH POT

2. (A/T)

INSTALL THROTTLE OPENER

3. INSTALL AIR VALVE

(a) Place a new O–ring on the throttle body.

(b) Install the air valve with the four screws.

4. INSTALL THROTTLE POSITION SENSOR

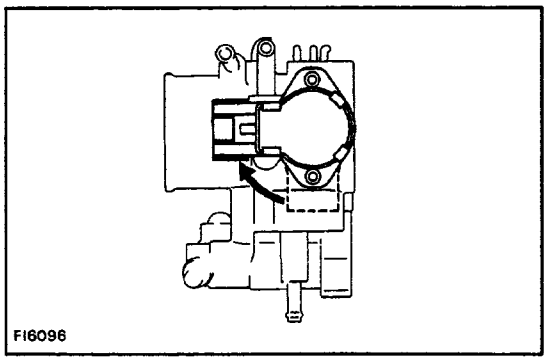
(a) Check that the throttle valve is fully closed.

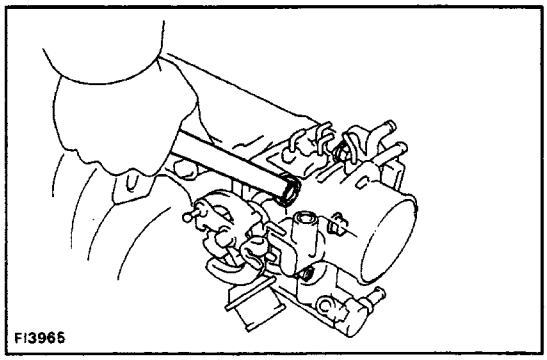
(b) Place the sensor on the throttle body as shown in the illustration.

(c) Turn the sensor clockwise, and temporarily install the two screws.

5. ADJUST THROTTLE POSITION SENSOR

(See step 4 on page EG1–202**)**





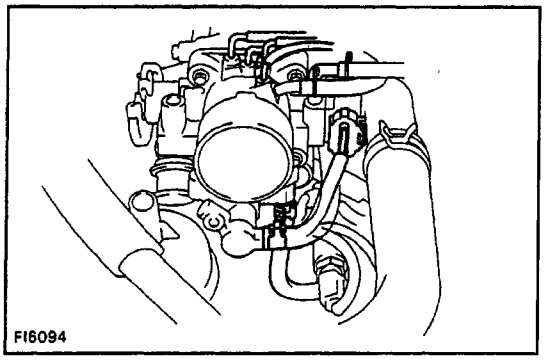
EG1YK–01

THROTTLE BODY INSTALLATION

1. INSTALL THROTTLE BODY

Using a new gasket, install the throttle body, three bolts and nut.

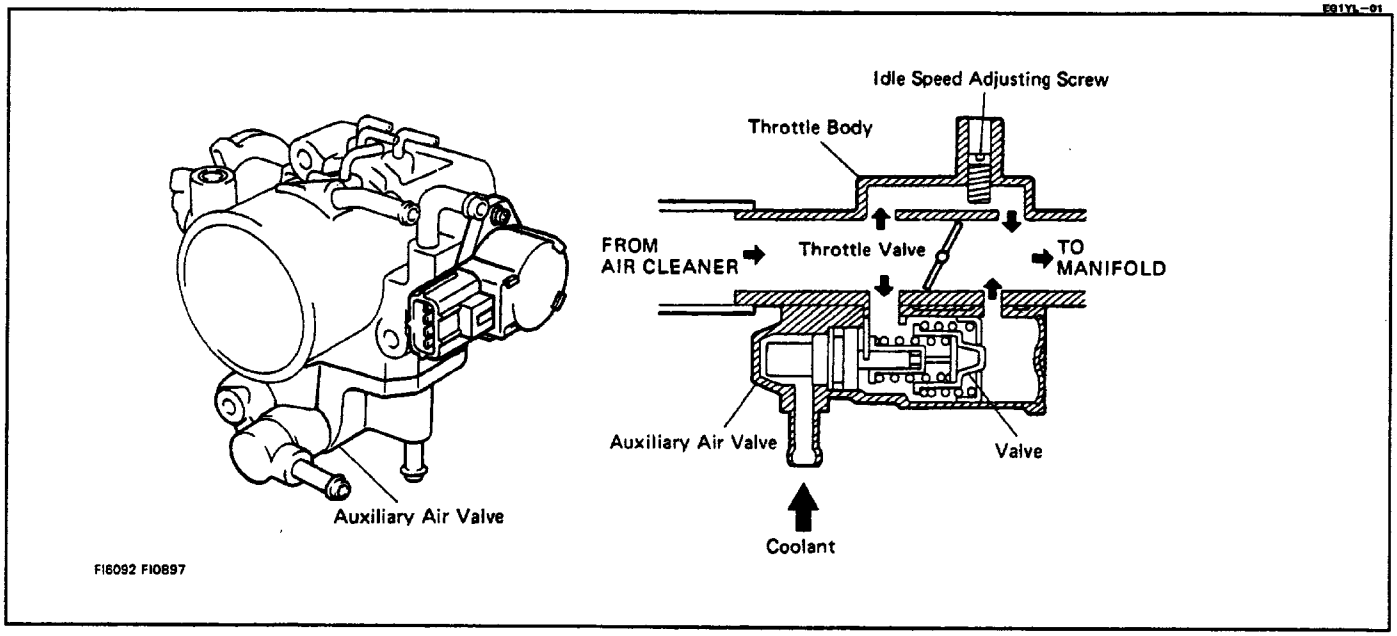
Torque: 19 N–m (195 kgf–cm. 14 ft–lbf)

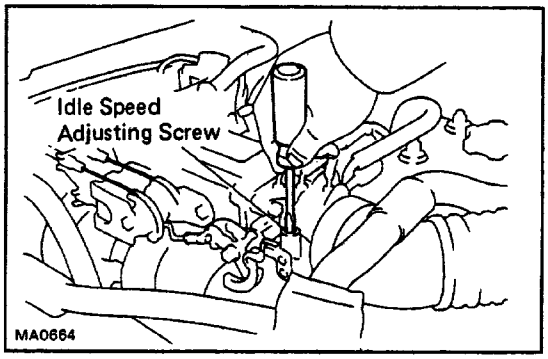


2. CONNECT THROTTLE SENSOR CONNECTOR
3. CONNECT FOLLOWING HOSES:
(a) Emission control hoses
(b) No. 2 and No. 3 water by–pass hoses
(c) PCV hose
(d) (with A/C) A/C idle up hose
4. CONNECT ACCELERATOR CABLE
5. INSTALL AIR INTAKE CONNECTOR
6. FILL WITH COOLANT

AUXILIARY AIR VALVE

EG1YL–01





EG1YM–02

ON –VEHICLE INSPECTION

CHECK OPERATION OF AUXILIARY AIR VALVE

Check the engine rpm by fully screwing in the idle speed adjusting screw.

At low temp. (Coolant temp.: below 80•C/176•F)

- When the idle speed adjusting screw is in, the engine rpm should drop.

After warm–up

- When the idle speed adjusting screw is in, the engine rpm should drop below idle speed stop.

EG1YN–01

AUXILIARY AIR VALVE REMOVAL

1. REMOVE THROTTLE BODY

(See page EG1–200**)**

2. REMOVE AUXILIARY AIR VALVE

(See step 2 on page EG1–202**)**

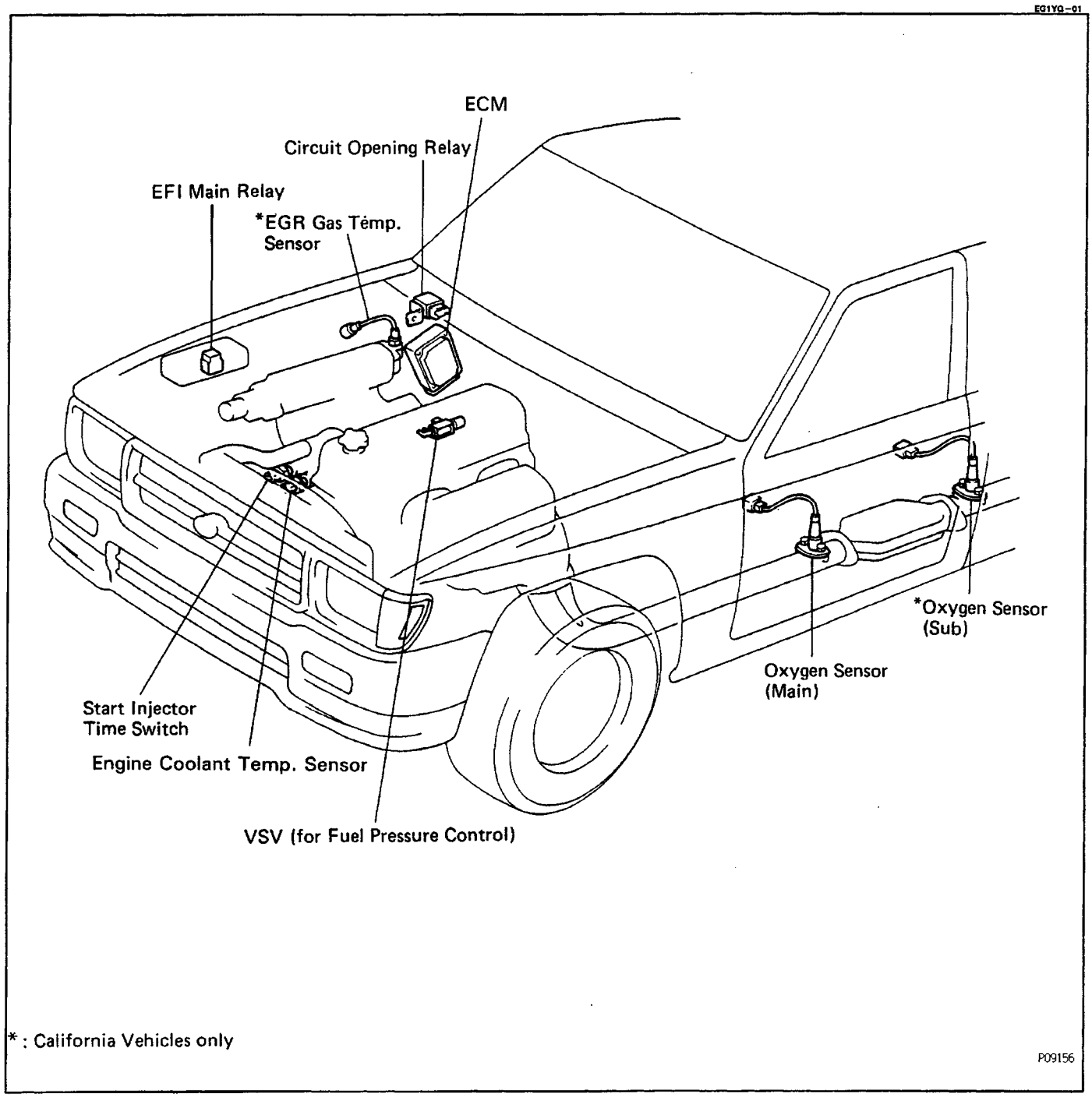
AUXILIARY AIR VALVE INSTALLATION w

1. INSTALL AUXILIARY AIR VALVE

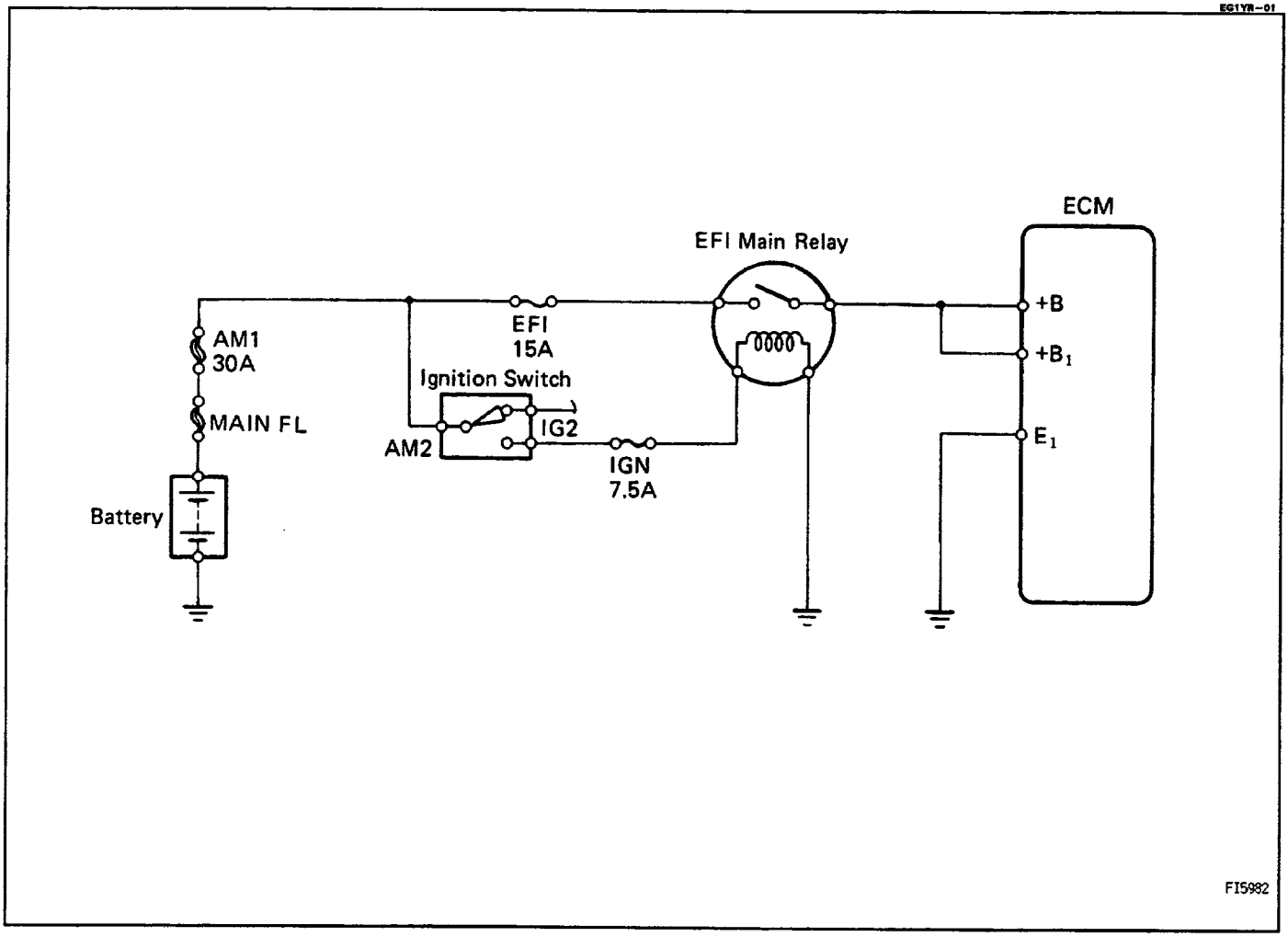
(See step 2 on page EG1–202**)**

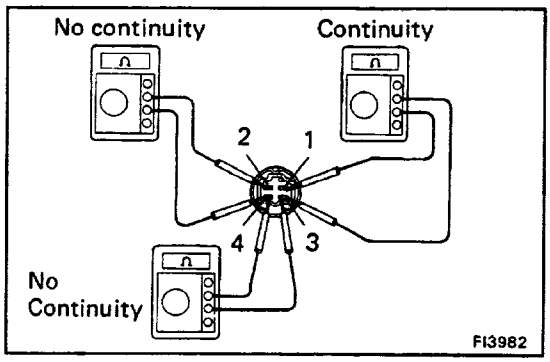
2. INSTALL THROTTLE BODY
(See page EG1–202)

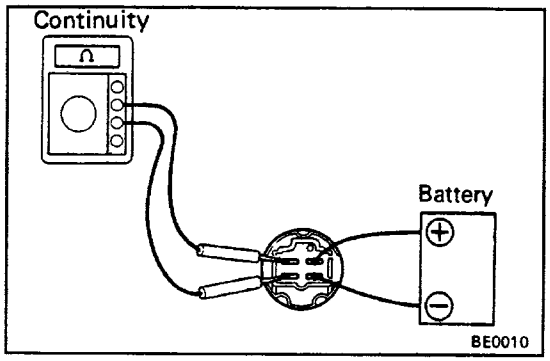
ELECTRONIC PARTS LOCATION



EFI MAIN RELAY







EFI MAIN RELAY INSPECTION

EG1YS–01

1. INSPECT RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 3.

(b) Check that there is no continuity between terminals 2 and 4.

(c) Check that there is no continuity between terminals 3 and 4.

If operation is not as specified, replace the relay.

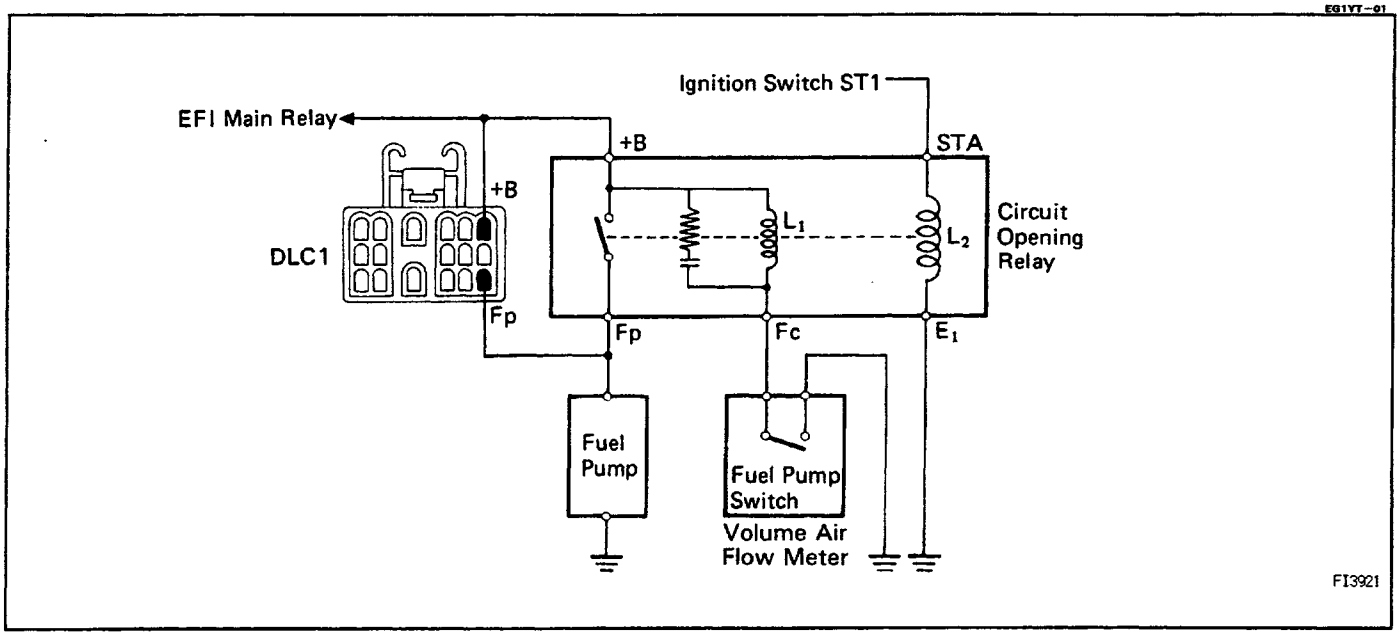
2. INSPECT RELAY OPERATION

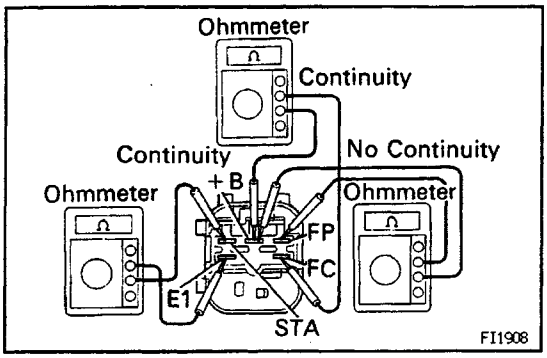
(a) Apply battery voltage across terminals 1 and 3.

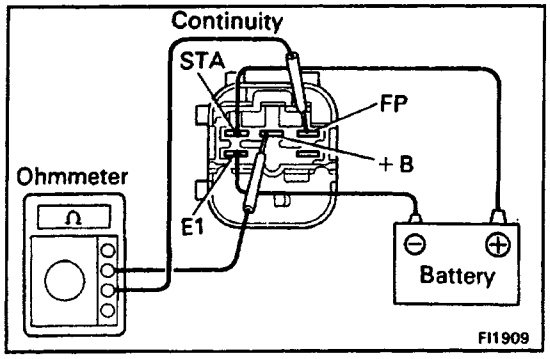
(b) Using an ohmmeter, check that there is continuity between terminals 2 and 4.

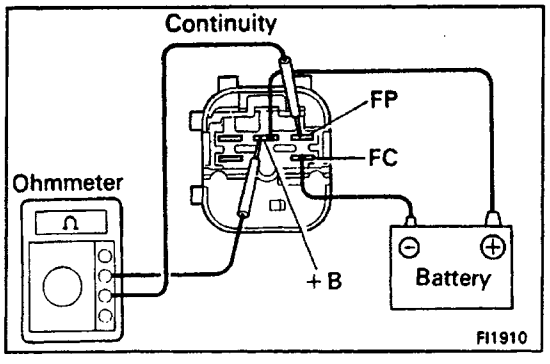
If operation is not as specified, replace the relay.

CIRCUIT OPENING RELAY









CIRCUIT OPENING RELAY INSPECTION

1. INSPECT RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals STA and E1.

(b) Check that there is no continuity between terminals B and FC.

(c) Check that there is no continuity between terminals B and FP.

If continuity is not as specified, replace the relay.

2. INSPECT RELAY OPERATION

(a) Apply battery voltage across terminals STA and E1.

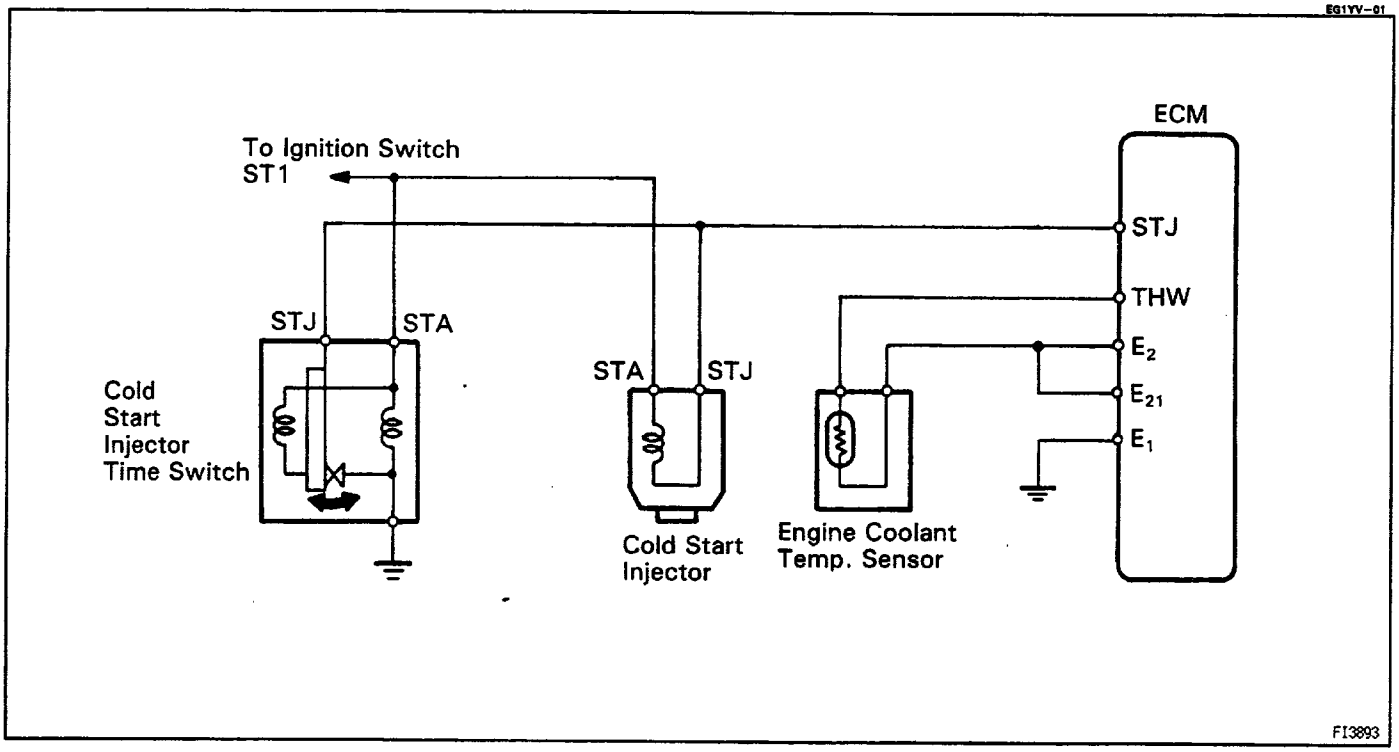
(b) Using an ohmmeter, check that there is continuity between terminals B and FP.

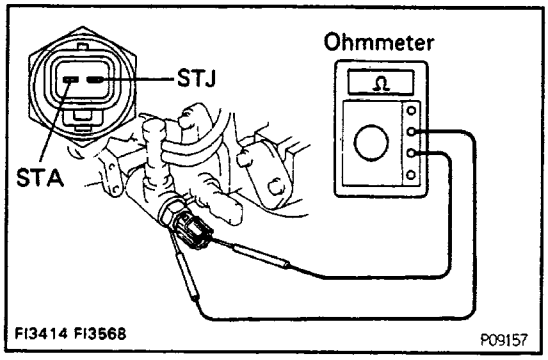
(c) Apply battery voltage across terminals B and FC.

(d) Check that there is continuity between terminals B and FP.

If operation is not as specified, replace the relay.

COLD START INJECTOR TIME SWITCH





START INJECTOR TIME SWITCH INSPECTION

EG1YW–01

MEASURE RESISTANCE OF START INJECTOR TIME SWITCH

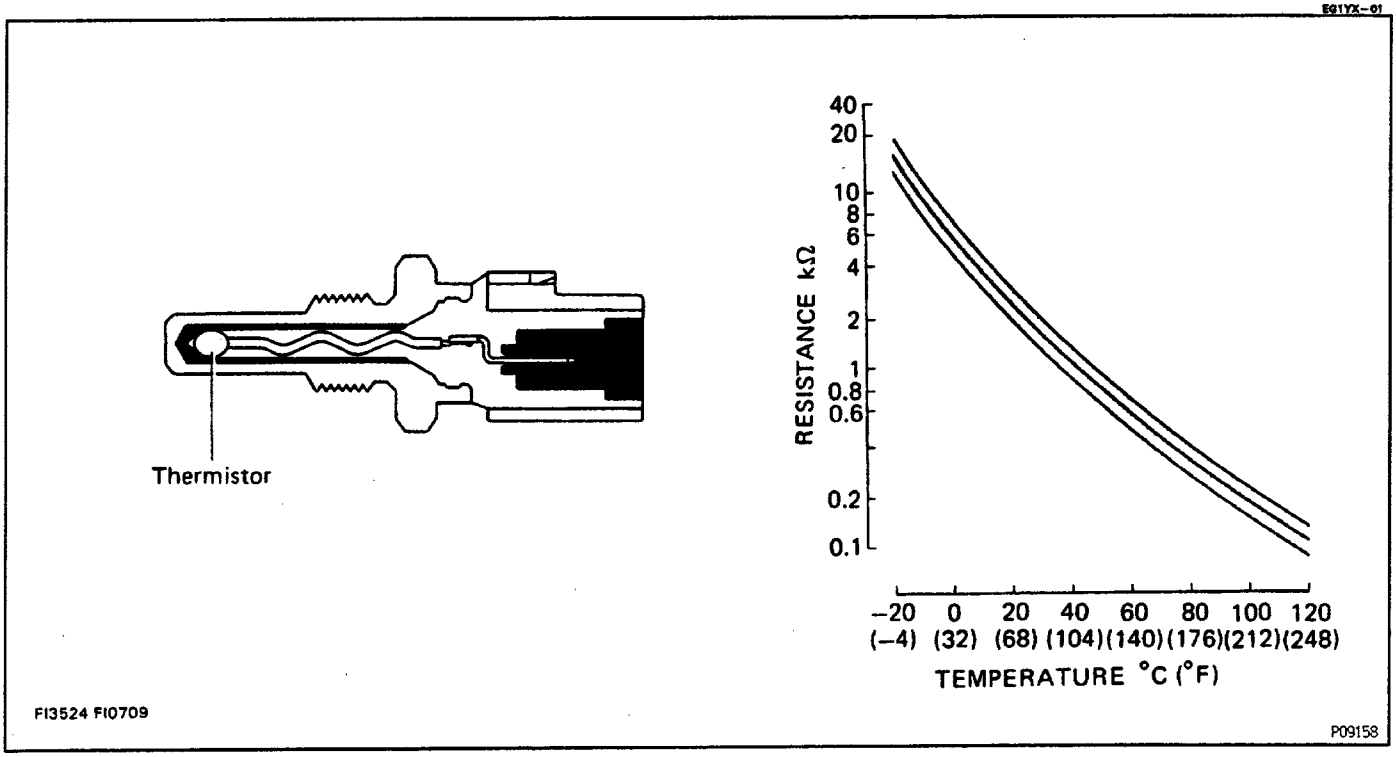
(a) Disconnect the connector.

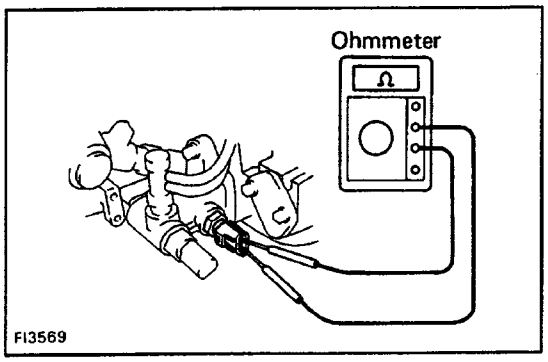
(b) Using an ohmmeter, measure the resistance between terminals.

Between terminals	Resistance (Ω)	Coolant temperature
STA – STJ	30– 50	below 10°C (54°F)
	65–90	above 30°C (86°F)
STA – Ground	30–90	–

V01952

ENGINE COOLANT TEMPERATURE (ECT) SENSOR

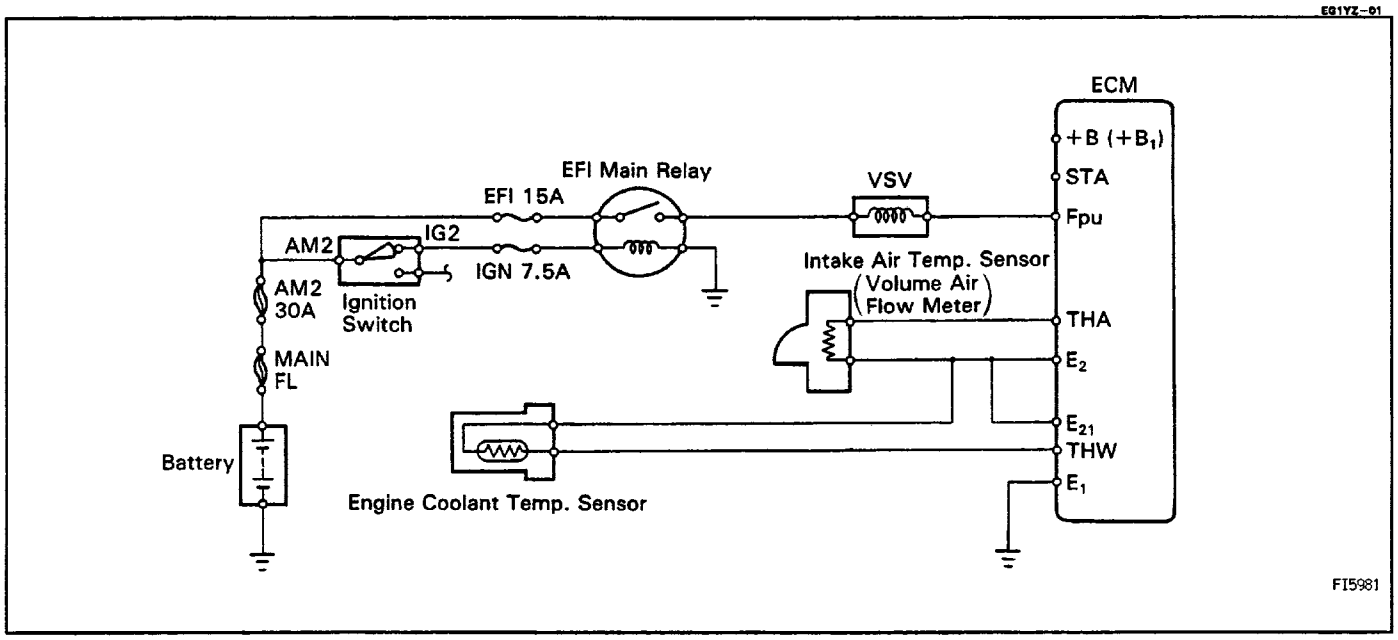


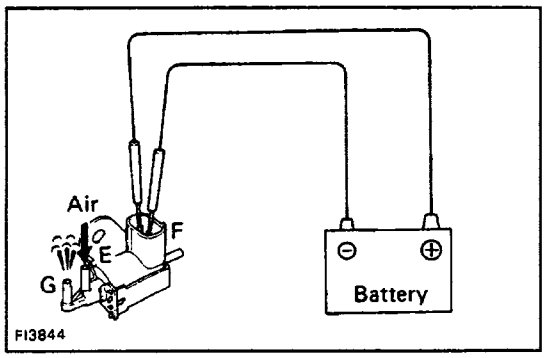


ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION

(a) Disconnect the connector.
(b) Using an ohmmeter, measure the resistance between the terminals.
Resistance: Refer to the chart above.

FUEL PRESSURE CONTROL SYSTEM





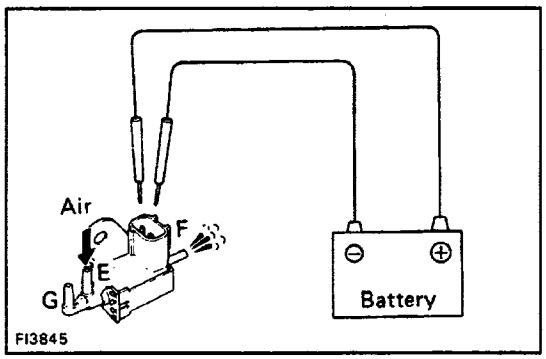
EG1Z0–01

VSV INSPECTION

1. CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE

(a) Connect the VSV terminals to the battery terminals as illustrated.

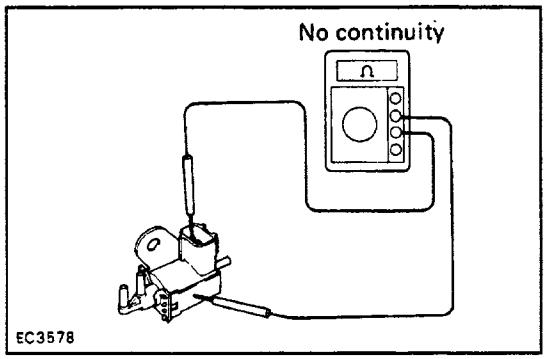
(b) Blow air into pipe E and check that air comes out of pipe G.



(c) Disconnect the battery.

(d) Blow air into pipe E and check that air comes out of pipe F.

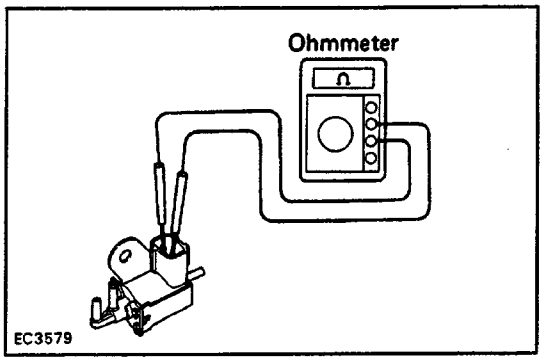
If a problem is found, repair or replace the VSV.



2. CHECK FOR SHORT CIRCUIT

Using an ohmmeter, check that there is no continuity between the terminal and the VSV body.

If there is continuity, replace the VSV.

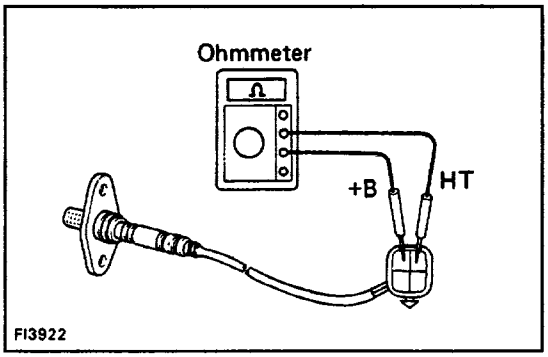


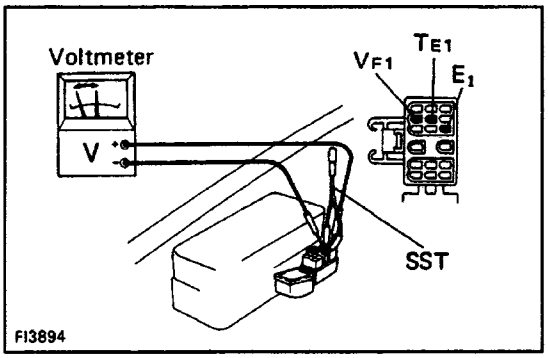
3. CHECK FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between both terminals as illustrated.

Specified resistance: 30–50 Ω at 20˚C (68˚ F)

If resistance is not within specification, replace the VSV.





OXYGEN SENSOR

EG1Z1–01

OXYGEN SENSOR INSPECTION

1. INSPECT HEATER RESISTANCE OF OXYGEN SENSOR

Using an ohmmeter, measure the resistance between the terminals +B and HT.

Resistance: 5.1.–6.3 Ω at 20•C (68•F)

If the resistance is not as specified, replace the oxygen sensor.

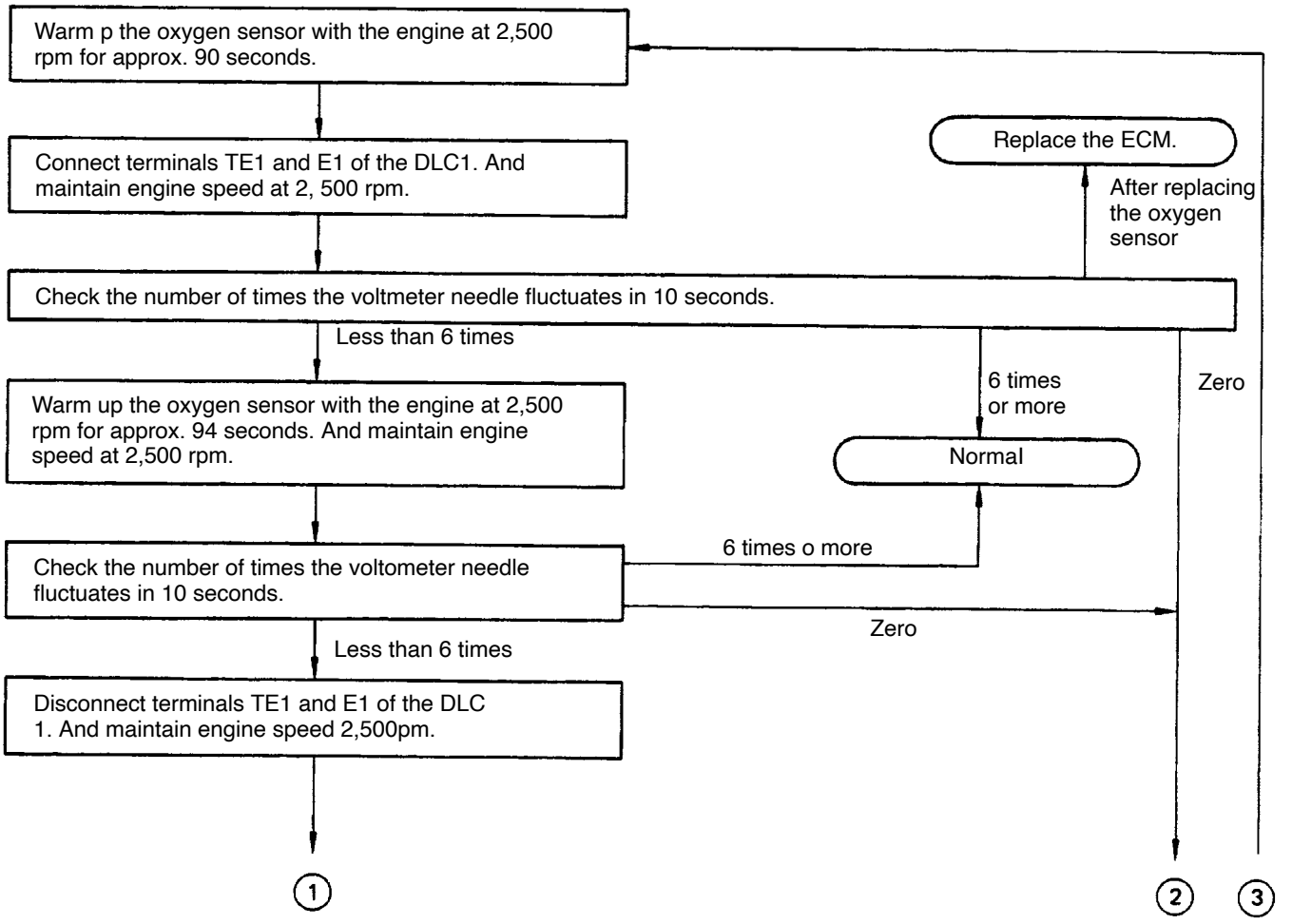
2. INSPECTION OF FEEDBACK VOLTAGE (VF1)

(a) Warm up the engine.

(b) Connect the voltmeter to the DLC1 terminals VF, and E1.

HINT: Use SST when connecting between terminals TE1 and E1 of the DLC1.

SST 09843–18020



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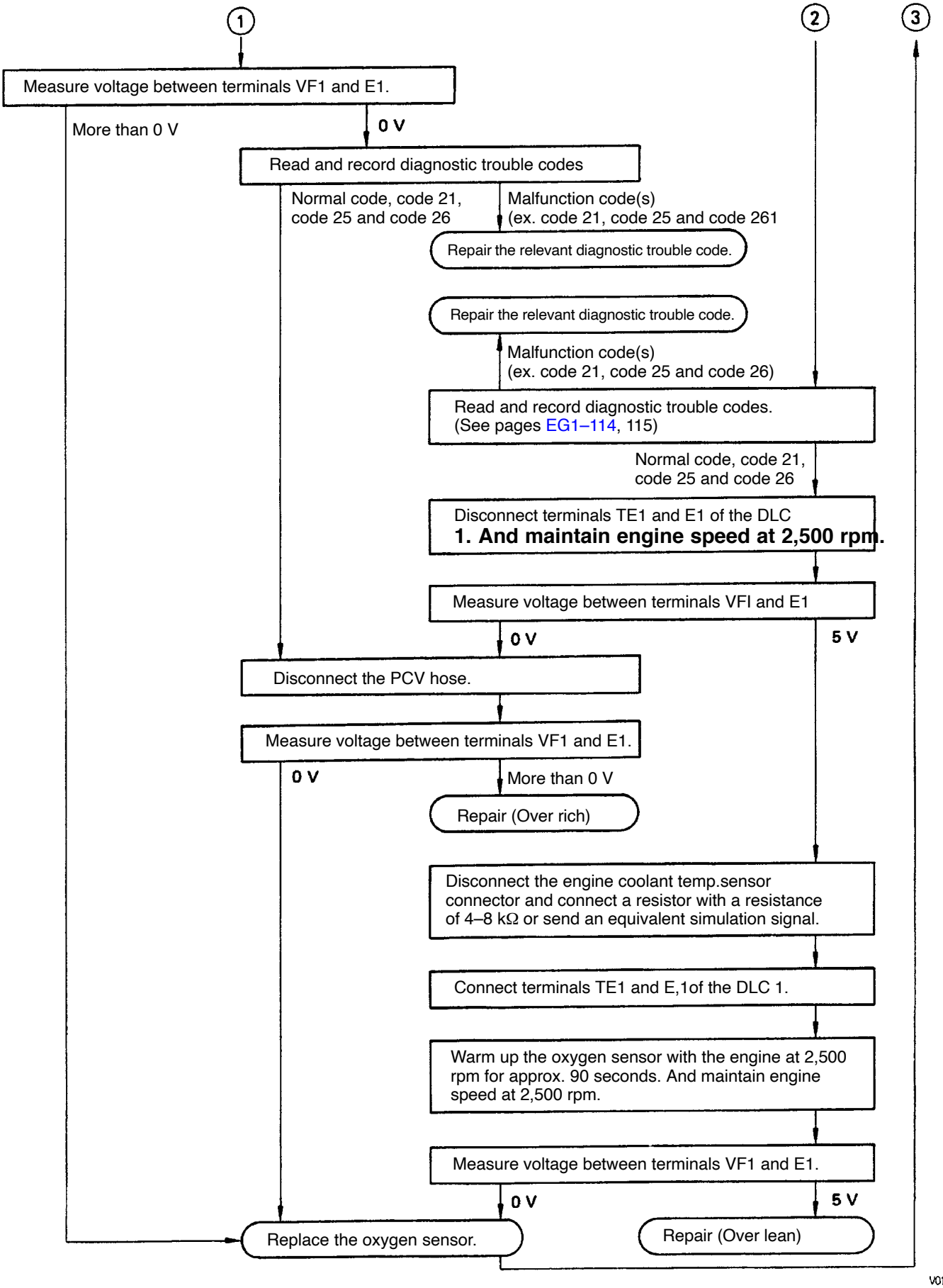
EG1–213

V01848

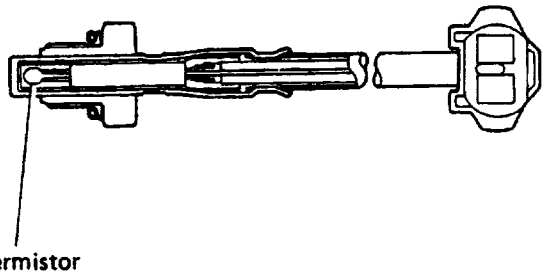
CONTINUED FROM PAGE EG1–212



EGR GAS TEMPERATURE SENSOR

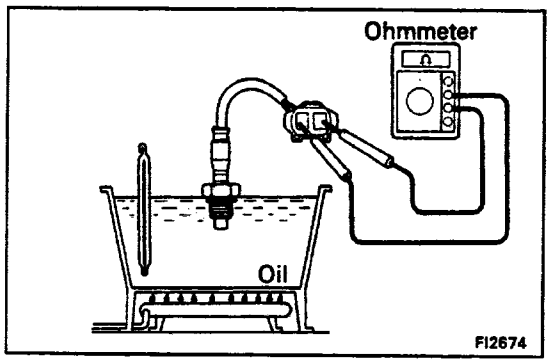
EG122–01

(California Vehicles only)



Thermistor

FI2673



EGR GAS TEMP. SENSOR INSPECTION

EG123–01

MEASURE RESISTANCE OF EGR GAS TEMP. SENSOR

Using an ohmmeter, measure the resistance between both terminals.

Resistance:

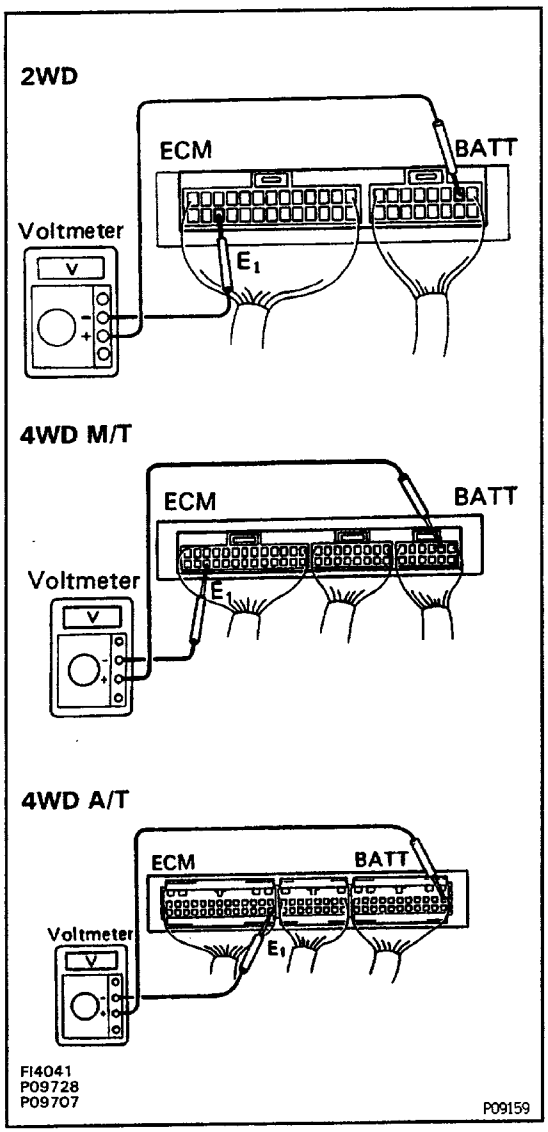
69–89 kΩ at 50•C (122•F)
11–15 kΩ at 100•C (212•F)
2 –4 kΩ at 150•C (302•F)

If the resistance is not as specified, replace the sensor.

ENGINE CONTROL MODULE (ECM)

ECM INSPECTION

HINT: The MFI circuit can be checked by measuring the voltage and resistance at the wiring connectors of the ECM.



INSPECT VOLTAGE OF ECM

Check the voltage between each terminal of the wiring connectors.

- Turn the ignition switch ON.
- Measure the voltage at each terminal.

HINT:

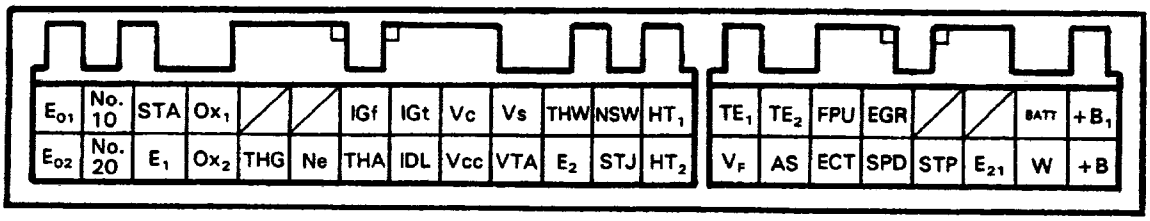
- Perform all voltage measurements with the connectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is ON.

Voltage at ECM Wiring Connectors

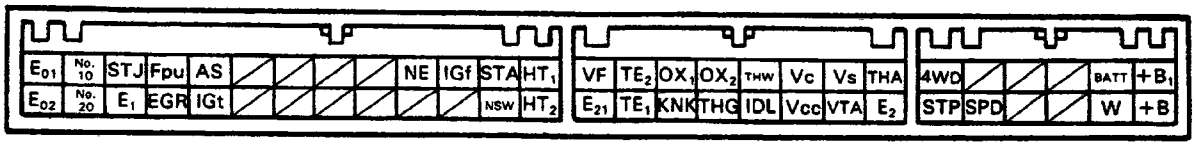
Terminals	Condition		STD voltage
BATT – E_1	–		9 – 14
+B – E_1	Ignition switch ON		
$+B_1$ – E_1			
IDL – E_2 (E_{21})	Ignition switch ON	Throttle valve open	9 – 14
Vcc – E_2 (E_{21})		–	4.5 – 5.5
VTA – E_2 (E_{21})		Throttle valve fully closed	0.3 – 0.8
		Throttle valve fully open	3.2 – 4.9
Vc – E_2 (E_{21})	Ignition switch ON	–	6 – 10
Vs – E_2 (E_{21})		Measuring plate fully closed	0.5 – 2.5
		Measuring plate fully open	5 – 10
	Idling .		2 – 8
THA – E_2 (E_{21})	Ignition switch ON	Intake air temperature 20°C (68°F)	0.5 – 3.4
THW – E_2 (E_{21})	Ignition switch ON	Coolant temperature 80 °C (176° F)	0.2 – 1.0
STA – E_1	Ignition switch START position		6 – 12
No. 10 – E_{01} No. 20 – E_{02}	Ignition switch ON		9 – 14
IGt – E_1	Idling		0.7 – 1.0
W – E_1	No trouble (MIL off) and engine running		9 – 14
STJ – E_1	Ignition switch START position	Coolant temperature 80°C (176°F)	6 – 12
STP – E_1	Stop light switch ON		7.5 – 14

ECM Terminals

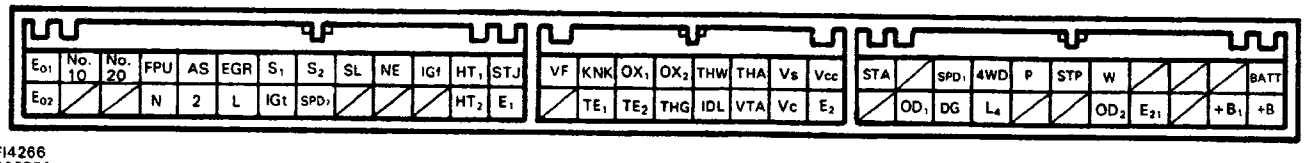
2WD



4WD M/T

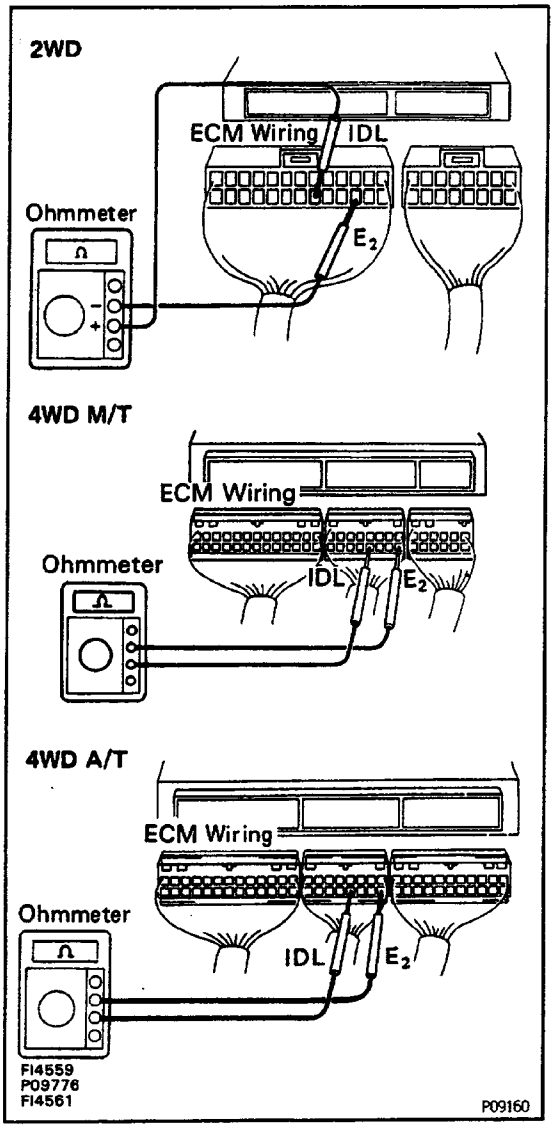


4WD A/T



FI4266
P09752
FI2796

V01850



2. INSPECT RESISTANCE OF ECM

NOTICE:

- **Do not touch the ECM terminals.**
- **The tester probe should be inserted into the wiring connector from the wiring side.**

Check the resistance between each terminal of the wiring connectors.

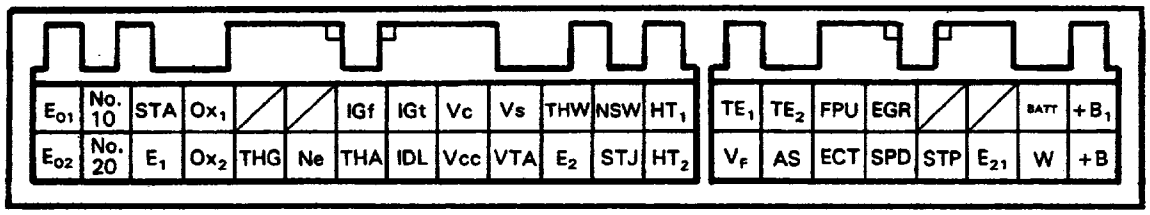
- Disconnect the connectors from the ECM.
- Measure the resistance at each terminal.

Resistance of ECM Wiring Connectors

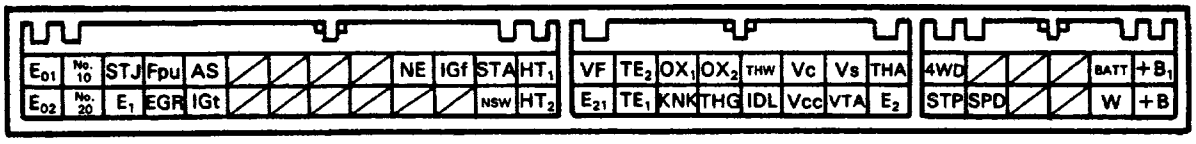
Terminals	Condition	Resistance 4kΩ1
IDL – E_2 (E_{21})	Throttle valve open	Infinity
	Throttle valve fully closed	2.3 or less
VTA – E_2 (E_{21})	Throttle valve fully open	3.1 – 12.1
	Throttle valve fully closed	0.47 – 6.1
Vcc – E_2 (E_{21})	–	3.9 – 9.0
THA – E_2 (E_{21})	Intake air temperature 20 °C (68 °F)	2 – 3
THW – E_2 (E_{21})	Coolant temperature 80 °C (176 °F)	0.2 – 0.4
+B – E_2 (E_{21})	–	0.2 – 0.4
Vc – E_2 (E_{21})	–	0.1 – 0.3
Vs – E_2 (E_{21})	Measuring plate fully closed	0.02 – 0.4
	Measuring plate fully open	0.02 – 1.00
Ne – E_1	Cold	0.185 – 0.275
	Hot	0.240 – 0.325
STJ – E_1	–	Infinity
FPU – E_1	–	Infinity
HT_1 – E_1	–	Infinity

ECM Terminals

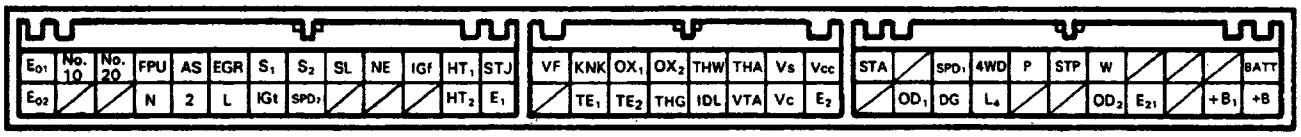
2WD



4WD M/T



4WD A/T



FI4266
P09752
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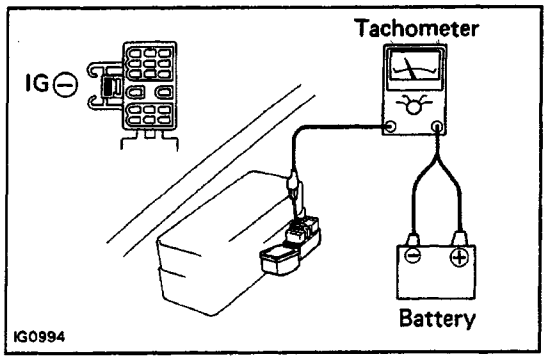


FUEL CUT RPM

EG1Z5-01

FUEL CUT RPM INSPECTION

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

2. CONNECT TACHOMETER

Connect the test probe of a tachometer to terminal IG (–) of the DLC1.

NOTICE

- **Never allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of yours before use.**

3. INSPECT FUEL CUT OPERATION

(a) Increase the engine speed to at least 2,500 rpm.

(b) Check for injector operating sound.

(c) Check that when the throttle lever is released, injector operation sound stops momentarily and then res–umes.

HINT:

- **The vehicle should be stopped.**
- **Accessories switched OFF.**

2WD A/T (stop light switch ON)

Fuel cut rpm: 1,300 rpm

Fuel return rpm: 1,000 rpm

Others

Fuel cut rpm: 1,900 rpm

Fuel return rpm: 1,600 rpm

4. REMOVE TACHOMETER

SERVICE SPECIFICATIONS

EG12E-01

SERVICE DATA

Pressure regulator	Fuel pressure	at No vacuum	265 – 304 kPa 2.7 – 3.1 kgf/cm² 38 – 44 psi	
Cold start injector	Resistance Fuel leakage		2 – 4 Ω One drop or less per minute	
Injector	Resistance Injection volume Difference between each injector Fuel leakage		13.4 – 14.2 Ω 45 – 55 cm³/15 sec. (2.7 – 3.4 cu in.) 6 cm³ (0.37 cu in.) or less One drop or less per minute	
Volume Air Flow Meter	Resistance	E_2 – Vs	20 – 400 Ω (Measuring plate fully closed) 20 – 1,200 Ω (Measuring plate fully open)	
		E_2 – Vc	100 – 300 Ω	
		E_2 – V_B	200 – 400 Ω	
		E_1 – Fc	∞ (Measuring plate fully closed) 0 Ω (Measuring plate open)	
		E_2 – THA	10 – 20 kΩ (–20°C, –4°F) 4 – 7 kΩ (0°C, 32°F) 2 – 3 kΩ (20°C, 68°F) 0.9 – 1.3 kΩ (40°C, 104°F) 0.4 – 0.7 kΩ (60°C, 140°F)	
Throttle body	Throttle valve fully closed angle		6°	
Throttle position sensor	Clearance between lever and stop screw		Between terminals	Resistance
	0 mm	0 in.	VTA – E_2	0.47 – 6.1 kΩ
	0.57 mm	0.0224 in.	IDL – E_2	2.3 kΩ or less
	0.85 mm	0.0335 in.	IDL – E_2	Infinity
	Throttle valve fully open position		VTA – E_2	3.1 – 12.1 kΩ
	–		Vcc – E_2	3.9 – 9.0 kΩ
Start injector time switch	Resistance	STA – STJ	30 – 50 Ω (below 10°C, 50°F) 65 – 90 Ω (above 30°C, 86°F)	
		STA – Ground	30 – 90 Ω	
Engine coolant temp. sensor	Resistance		10 – 20 kΩ (–20°C, –4°F) 4 – 7 kΩ (0°C, 32°F) 2 – 3 kΩ (20°C, 68°F) 0.9 – 1.3 kΩ (40°C, 104°F) 0.4 – 0.7 kΩ (60°C, 140°F) 0.2 – 0.4 kΩ (80°C, 176°F)	
VSV (FPU)	Resistance	at 20°C (68°F)	30 – 50 Ω	

V01953

Specifications (Cont'd)

Oxygen sensor heater	Resistance at 20°C (68°F)			5.1 – 6.3 Ω
EGR gas temp. sensor	Resistance			69 – 89 kΩ (50°C, 122°F) 11 – 15 kΩ (100°C, 212°F) 2 – 4 kΩ (150°C, 302°F)
Fuel cut rpm	Fuel cut rpm 2WD A/T (stop light switch ON) Others Fuel return rpm 2WD A/T (stop light switch ON) Others			 1,300 rpm 1,900 rpm 1,000 rpm 1,600 rpm

ECM (Voltage)

HINT:
- Perform all voltage and resistance measurements with the ECM connected.
- Verify that the battery voltage is 11 V or above when the ignition switch is ON.
- The testing probes must not make contact with the ECM oxygen VF terminals.

Terminals	STD voltage	Condition	
BATT – E_1	9 – 14	–	
+B – E_1		Ignition SW ON	
$+B_1$ – E_1			
IDL – E_2 (E_{21})	9 – 14	Ignition SW ON	Throttle valve open
Vcc – E_2 (E_{21})	4.5 – 5.5		–
VTA – E_2 (E_{21})	0.3 – 0.8		Throttle valve fully closed
	3.2 – 4.9		Throttle valve fully open
Vc – E_2 (E_{21})	6 – 10	Ignition SW ON	–
Vs – E_2 (E_{21})	0.5 – 2.5		Measuring plate fully closed
	5 – 10		Measuring plate fully open
	2 – 8	Idling	
THA – E_2 (E_{21})	0.5 – 3.4	Ignition SW ON	Intake air temperature 20°C (68°F)
THW – E_2 (E_{21})	0.2 – 1.0		Coolant temperature 80°C (1 76°F)
STA – E_1	6 – 12	Ignition SW START position	
No. 10 – E_{01} No. 20 – E_{02}	9 – 14	Ignition SW ON	
IGt – E_1	0.7 – 1.0	Cranking or idling	
W – E_1	9 – 14	No trouble (MIL off) and engine running	
STJ – E_1	6 – 12	Ignition SW START position	Coolant temperature 80°C (176°F)
STP – E_1	7.5 – 14	Stop light switch ON	

V01954

Specifications (Cont'd)

ECM (Resistance)	Terminals	Resistance (kΩ)	Condition
	IDL – E_2 (E_{21})	Infinity	Throttle valve open
		2.3 or less	Throttle valve fully closed
	VTA – E_2 (E_{21})	3.1 – 12.1	Throttle valve fully open
		0.47 – 6.1	Throttle valve fully closed
	Vcc – E_2 (E_{21})	3.9 – 9.0	–
	THA – E_2 (E_{21})	2 – 3	Intake air temperature 20 °C (68°F)
	THW – E_2 (E_{21})	0.2 – 0.4	Coolant temperature 80 °C (176°F)
	+B – E_2 (E_{21})	0.2 – 0.4	–
	Vc – E_2 (E_{21})	0.1 – 0.3	–
	Vs – E_2 (E_{21})	0.02 – 0.4	Measuring plate fully closed
		0.02 – 1.00	Measuring plate fully open
	Ne – E_1	0.185 – 0.275	Cold
		0.240 – 0.325	Hot
	STJ – E_1	Infinity	–
	FPU – E_1	Infinity	–
	HT – E_1	Infinity	–

V01955

EG1Z7–01

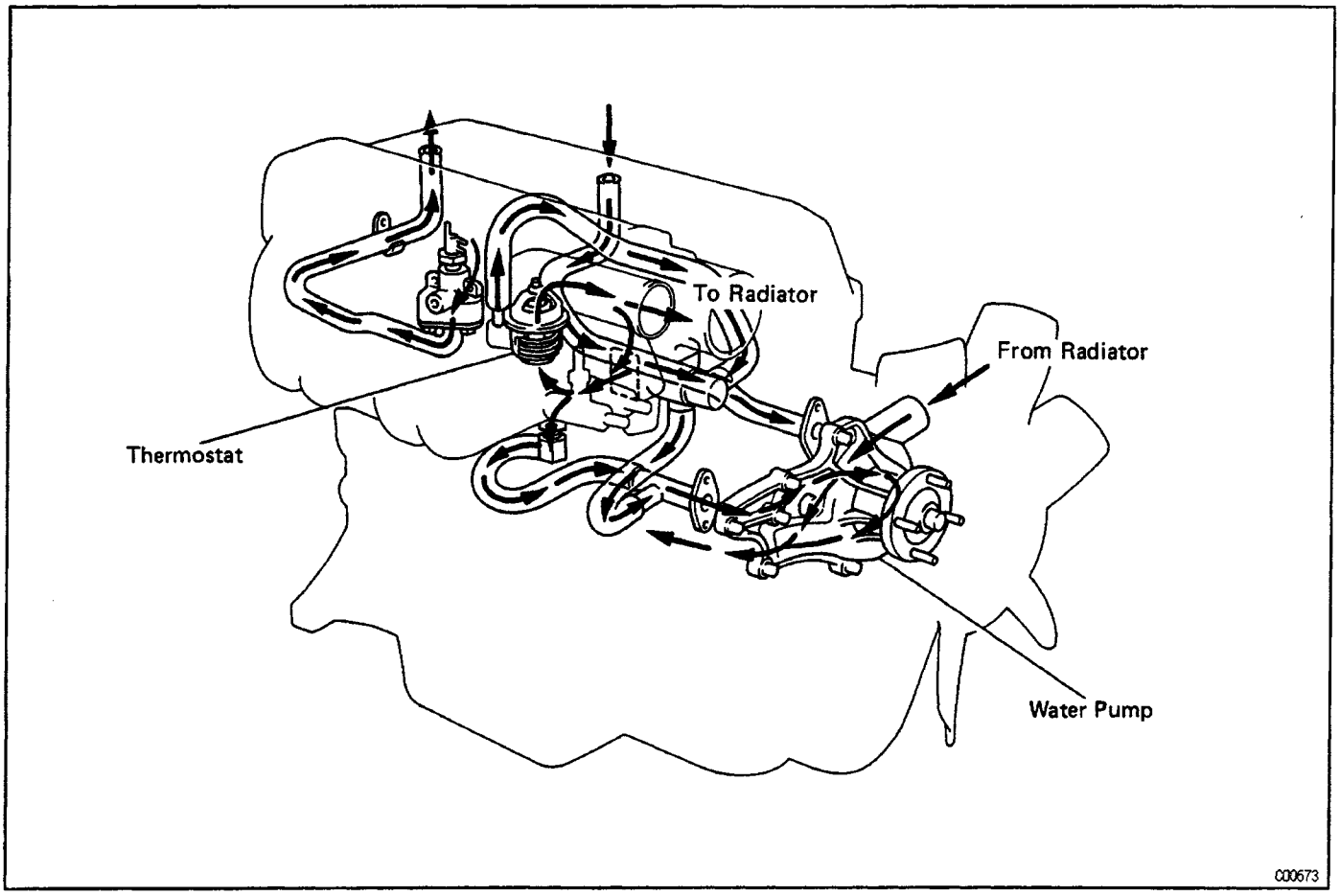
TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Fuel hose x Fuel filter	30	310	22
Fuel hose x Fuel main tube	30	310	22
Fuel filter x Fuel filter bracket	19	195	14
Delivery pipe x Pressure regulator	30	300	22
Delivery pipe x Intake manifold	19	195	14
Delivery pipe x Fuel tube	44	450	33
Delivery pipe x Fuel pipe	19	195	14
Fuel pipe x Cold start injector	19	195	14
Air intake chamber x Cold start injector	7.8	80	69 in.·lbf
Air intake chamber x Throttle body	19	195	14
Fuel pump	3.9	40	35 in.·lbf
Fuel drain plug	6.4	65	56 in.·lbf
Fuel tank x Body	29	300	22

COOLING SYSTEM

DESCRIPTION

This engine utilizes a pressurized water faced circulation cooling system which includes a thermostat mounted on the outlet side.



RADIATOR CAP

The radiator cap is a pressure type cap which seals the radiator, resulting in pressurization of the radiator as the coolant expands. The pressurization prevents the coolant from boiling even when the coolant temperature exceeds 100•C (212•F). A relief valve (pressurization valve) and a vacuum valve (negative pressure valve) are built into the radiator cap. When the pressure generated inside the cooling system exceeds the limit (coolant temperature: 110– 120•C (230–248• F) pressure: 58.8–103.0 kPa (0.6–1.05 kgf/cm^2, 8.5–14.9 psi) the relief valve is opened by the pressure and lets steam escape through pipe. The vacuum valve opens to allow atmos–pheric air to enter to alleviate the vacuum which develops in the cooling system after the engine is stopped and the coolant temperature drops.

RESERVOIR TANK

The reservoir tank is used to catch coolant which overflows the cooling system as a result of volumetric expansion when the coolant is heated. When the coolant temperature drops, the coolant in the reservoir tank returns to the radiator, thus keeping the radiator full at ail times and

avoiding needless coolant loss. To find out if the coolant needs to be replenished, check the reservoir tank level.

WATER PUMP

The water pump is used for forced circulation of coolant through the cooling system. It is mounted on the front of the timing chain cover and driven by a V belt.

THERMOSTAT

The thermostat is a wax type and is mounted in the water outlet housing. The thermostat includes a type of automatic valve operated by fluctuations in the coolant temperature. When the coolant temperature drops, the valve closes, preventing the circulation of coolant through the engine and thus permitting the engine to warm up rapidly. When the coolant temperature has risen, the valve opens, allowing the coolant in the engine to circulate through the radiator. Wax inside the thermostat expands when heated and contracts when cooled. Heating the wax thus generates pressure which overpowers the force of the spring which keeps the valve closed, thus opening the valve. When the wax cools, its contraction causes the force of the spring to take effect once more, closing the valve. The thermostat in this engine operates at a temperature of 88•C (190•F).

PREPARATION

RECOMMENDED TOOLS

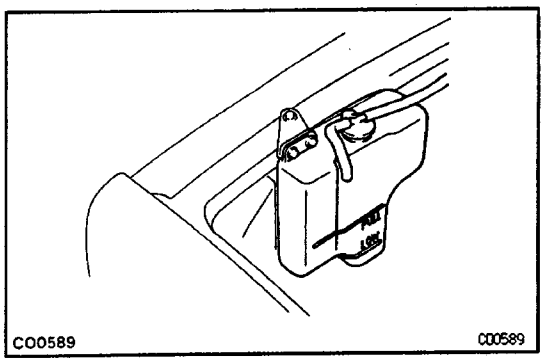
EG12V–03

	09082–00015 TOYOTA Electrical Tester	

EQUIPMENT

EG12W–03

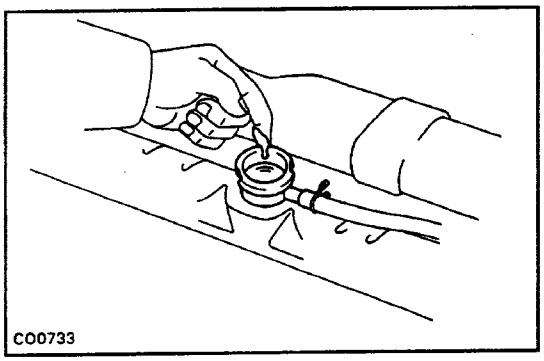
Heater	
Radiator cap tester	
Thermometer	
Torque wrench	



COOLANT CHECK AND REPLACEMENT

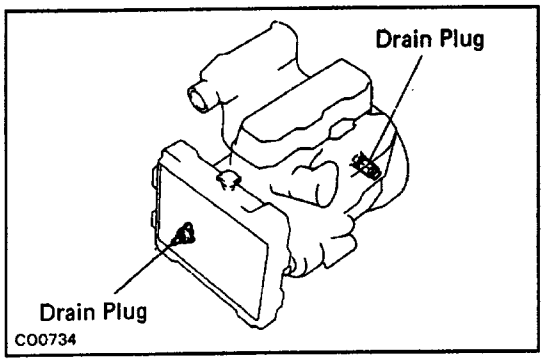
1. CHECK ENGINE COOLANT LEVEL IN RESERVOIR TANK

The coolant level should be between the ”LOW” and ” Full” lines.
If low, check for leaks and add coolant up to the ” FULL” line.



2. CHECK ENGINE COOLANT QUALITY

There should not be any excessive deposits of rust or scales around the radiator cap or radiator filler hole, and the coolant should be free from oil.
If excessively dirty, replace the coolant.



3. REPLACE ENGINE COOLANT

(a) Remove the radiator cap.
(b) Drain the coolant from the radiator and engine drain plugs.
(c) Close the drain cocks.
(d) Fill the system with coolant.
HINT:

- Use a good brand of ethylene–glycol base coo–lant, mixed according to the manufacturer’s in–structions.
- Using coolant which has more than 50% ethyl–ene–glycol (but not more than 70 %) is recom–mended.

NOTICE:

- **Do not use an alcohol type coolant.**
- **The coolant should be mixed with demineralized water or distilled water.**

Coolant capacity (w/ heater or air conditioner):

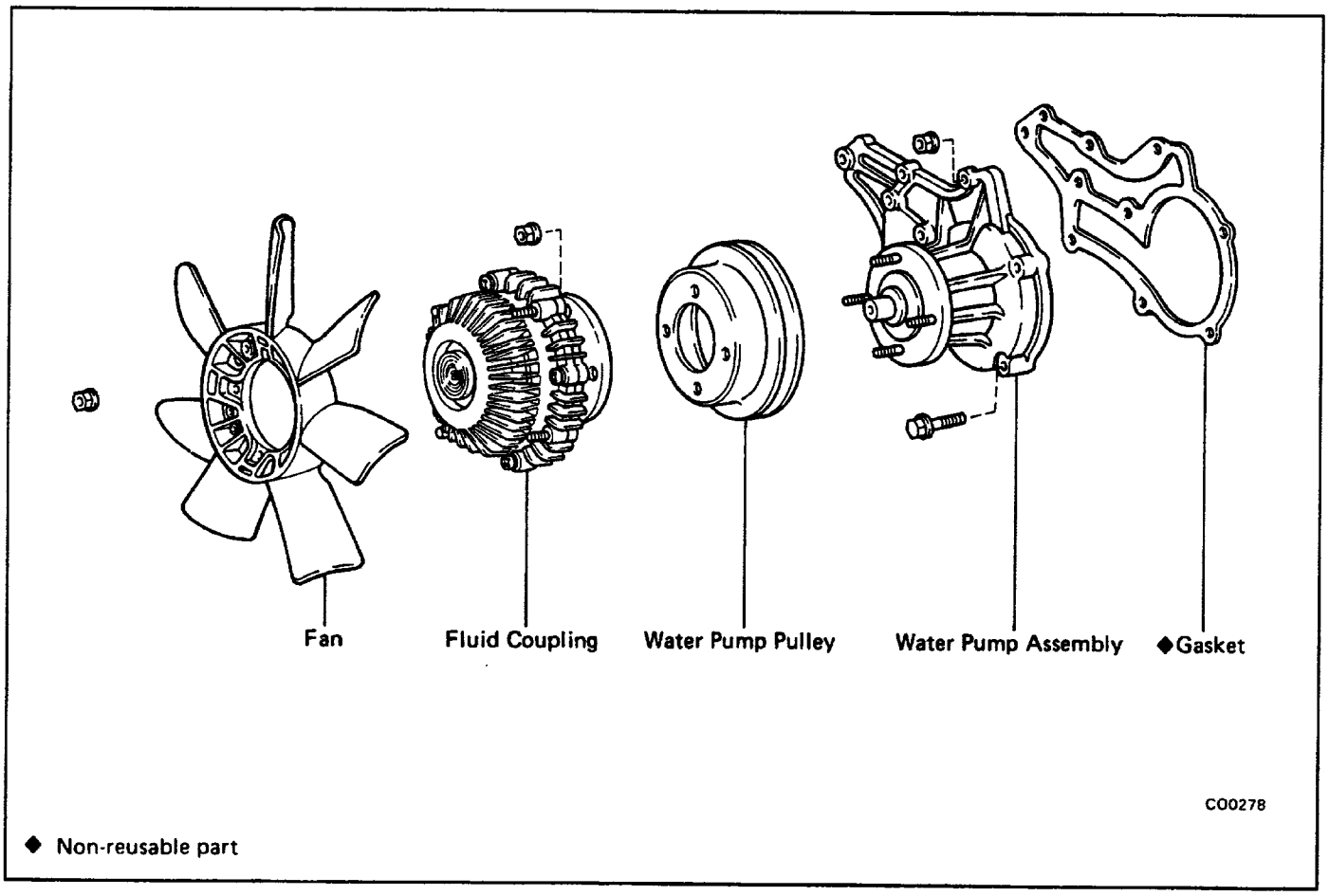
Ex. 4WD A/T
8.4 liters (8.9 US qts, 7.4 Imp. qts)
4WD A/T
9.1 liters (9.6 US qts, 8.0 Imp. qts)

(e) Install the radiator cap.
(f) Start the engine and check for leaks.
(g) Recheck the coolant level and refill as necessary.

WATER PUMP

EG1U3–01

COMPONENTS

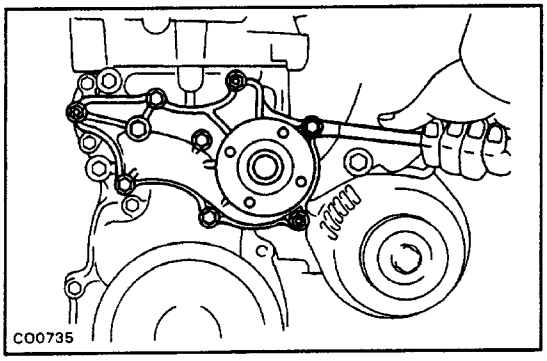


◆ Non-reusable part

EG1U4–01

WATER PUMP REMOVAL

1. DRAIN COOLANT
(See step 3 on page EG1–225)
2. (w/ PS)
REMOVE PS BELT
3. (with A/C)
REMOVE A/C BELT
4. REMOVE FLUID COUPLING WITH FAN AND WATER PUMP PULLEY
(See step 3 on page EG1–40)

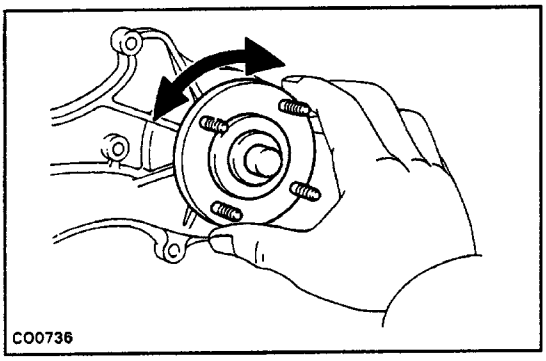


5. REMOVE WATER PUMP

Remove the six bolts, three nuts, water pump and gasket.

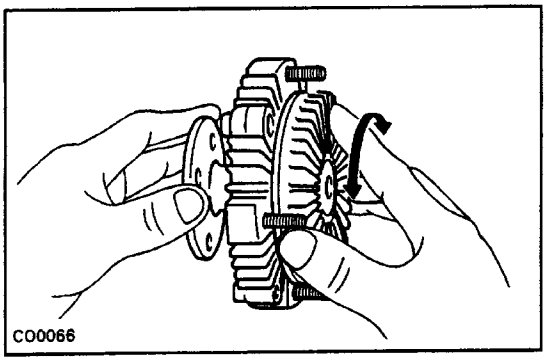
EG1U5–01

WATER PUMP INSPECTION



1. INSPECT WATER PUMP BEARING

Check that the water pump bearing moves smoothly and quietly.

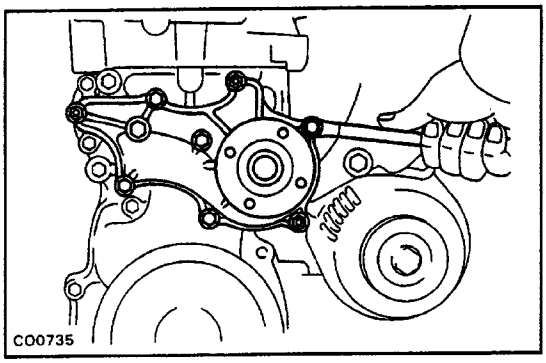


2. INSPECT FLUID COUPLING

Check the fluid coupling for damage and silicone oil leakage.

EG1U6–01

WATER PUMP INSTALLATION



(See page EG1–226)

1. INSTALL WATER PUMP OVER NEW GASKET

Install the water pump and a new gasket with the six bolts and three nuts.

2. INSTALL WATER PUMP PULLEY AND FLUID COUPLING WITH FAN

(See page MA–6 step 9 on page EG1–44)

3. (with A/C)

INSTALL A/C BELT (See page MA–6)

4. (w/ PS)

INSTALL PS BELT (See page MA–6)

5. REFILL COOLANT

(See page EG1–225)

THERMOSTAT

EG1U7–01

THERMOSTAT REMOVAL

1. DRAIN COOLANT

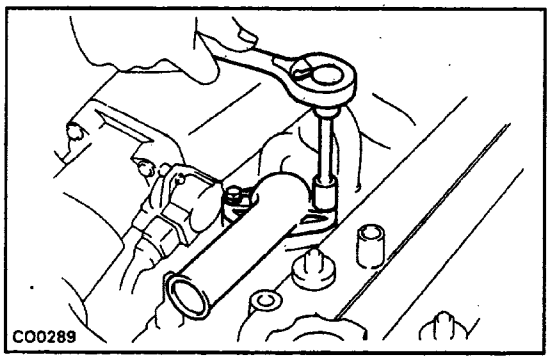
2. DISCONNECT FOLLOWING HOSES:

(a) Vacuum hoses

(b) PCV hose

(c) (with A/C)

Idle–up hose



3. DISCONNECT RADIATOR INLET HOSE

4. REMOVE THERMOSTAT

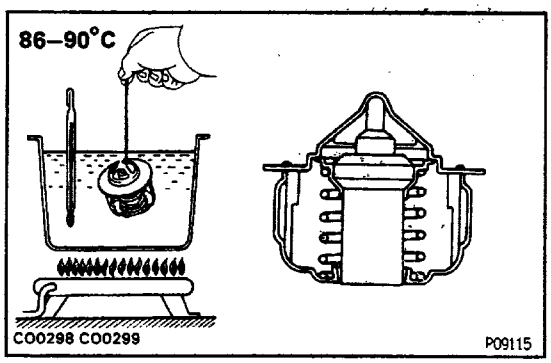
(a) Remove the two bolts and water outlet from the intake manifold.

(b) Remove the thermostat with the gasket.

(c) Remove the gasket from the thermostat.

EG1U8–01

THERMOSTAT INSPECTION



HINT: The thermostat is numbered according to the valve opening temperature.

(a) Immerse the thermostat in water and heat the water gradually.

(b) Check the valve opening temperature and valve lift.

Valve opening temperature:

86–90•C (187–184•F)

Valve lift:

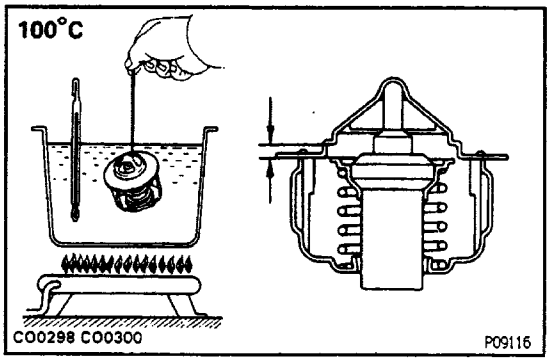
8 mm (0.31 in.) or more at 100•C (212•F)

If the valve opening temperature and valve lift are not within specifications, replace the thermostat.

(c) Check that the valve spring is tight when the thermostat is fully closed, and replace if it is not tight.

EG1U9–01

THERMOSTAT INSTALLATION



1. PLACE THERMOSTAT IN INTAKE MANIFOLD

(a) Place a new gasket to the thermostat.

(b) Install the thermostat to the intake manifold.

(c) Install the water outlet with the two bolts.

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)

2. CONNECT RADIATOR INLET HOSE

3. CONNECT FOLLOWING HOSES:

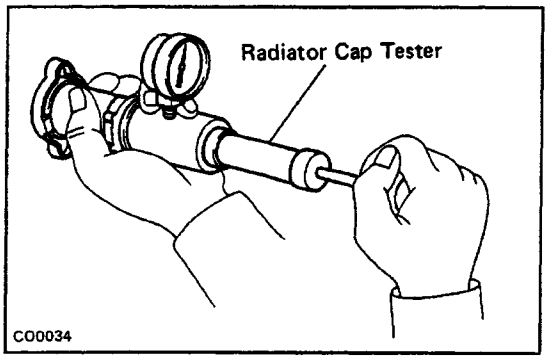
(a) (with A/C)
Idle–up hose
(b) PCV hose
(c) Vacuum hoses
4. FILL WITH ,COOLANT
5. START ENGINE AND CHECK FOR LEAKS

RADIATOR

EG1UA–01

RADIATOR CLEANING

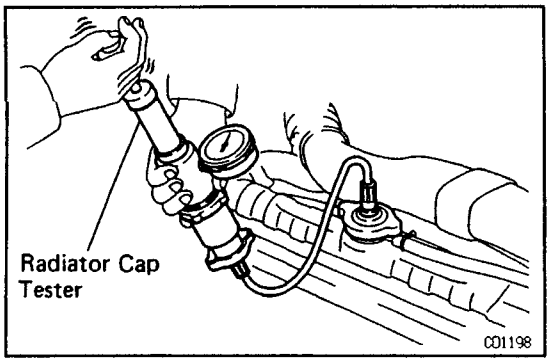
Using water or a steam cleaner, remove mud and dirt from the radiator core.
NOTICE: If using a high–pressure type cleaner, be careful not to deform the fins of the radiator core. For example, keep a distance of more than 40–50 cm (15.75 –19.69 in.) between the radiator core and cleaner nozzle when the cleaner nozzle pressure is 2.942–3.432 kPa (30 –35 kgf/cm^2. 427–498 psi).



EG1UB–01

RADIATOR INSPECTION

1. CHECK RADIATOR CAP
Using radiator cap tester, pump the tester until relief valve opens. Check that the valve opens between 174 kPa (0.75 kgf/cm^2, 10.7 psi) and 103 kPa (1.05 kgf/cm^2, 14.9 psi).
Check that pressure gauge does not drop rapidly when pressure on cap is below 59 kPa (0.6 kgf/cm^2, 8.5 psi).
If either check is not within limit, replace the radiator cap.



2. CHECK COOLING SYSTEM FOR LEAKS

(a) Fill the radiator with coolant and attach a radiator cap tester.

(b) Warm up the engine.

(c) Pump it to 118 kPa (1.2 kgf/cm^2, 17.1 psi), and check that the pressure does not drop.

If the pressure drops, check for leaks from the hoses, radiator or water pump. If no external leaks are found, check the heater core, block and intake manifold.

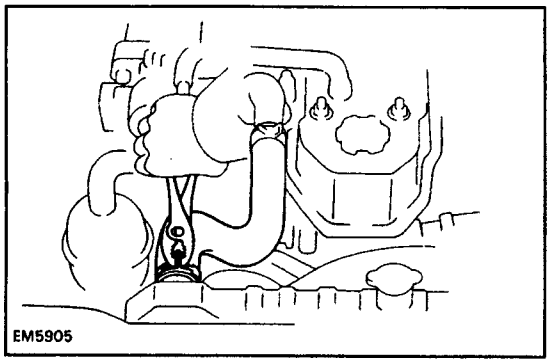
EG1UC–01

RADIATOR REMOVAL

1. DRAIN COOLANT

2. REMOVE ENGINE UNDER COVER

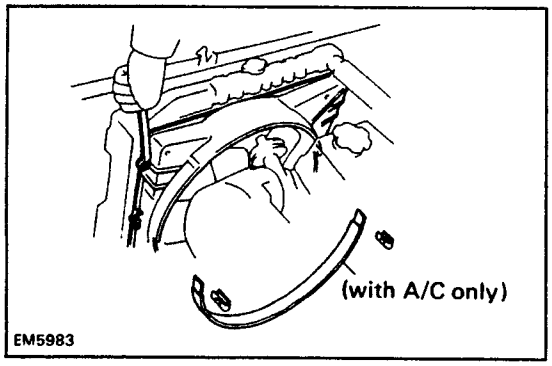
3. REMOVE AIR INTAKE CONNECTOR



4. REMOVE RADIATOR

(a) Disconnect the reservoir hose.

(b) Remove the radiator hoses.



(c) (with A/C)

Remove the No. 2 fan shroud.

(d) Remove the No. 1 fan shroud.

(e) (A/T)

Disconnect the oil cooler hoses.

HINT:

- Be careful as some oil will leak out. Catch it in a suitable container.
- Plug the hose to prevent oil from escaping.

(f) Remove the four bolts and radiator.

SERVICE SPECIFICATIONS

EG1UD–01

SERVICE DATA

Radiator	Relief valve opening pressure	STD	74 – 103 kPa 0.75 – 1.05 kgf/cm² 10.7 – 14.9 psi
		Limit	59 kPa 0.6 kgf/cm² 8.5 psi
Thermostat	Valve opening temperature Starts to open at Fully opens at Valve opening travel		 88°C 190°F 100°C 212°F 8 mm 0.30 in.

EG1UE–01

TORQUE SPECIFICATIONS

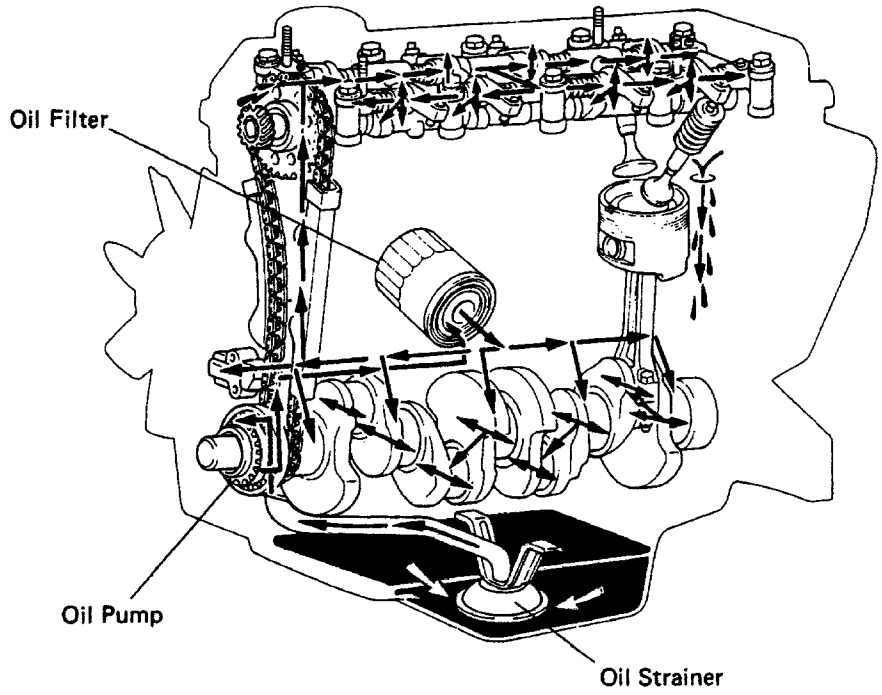
Part tightened	N·m	kgf·cm	ft·lbf
Water Outlet x Intake Manifold	13	130	9

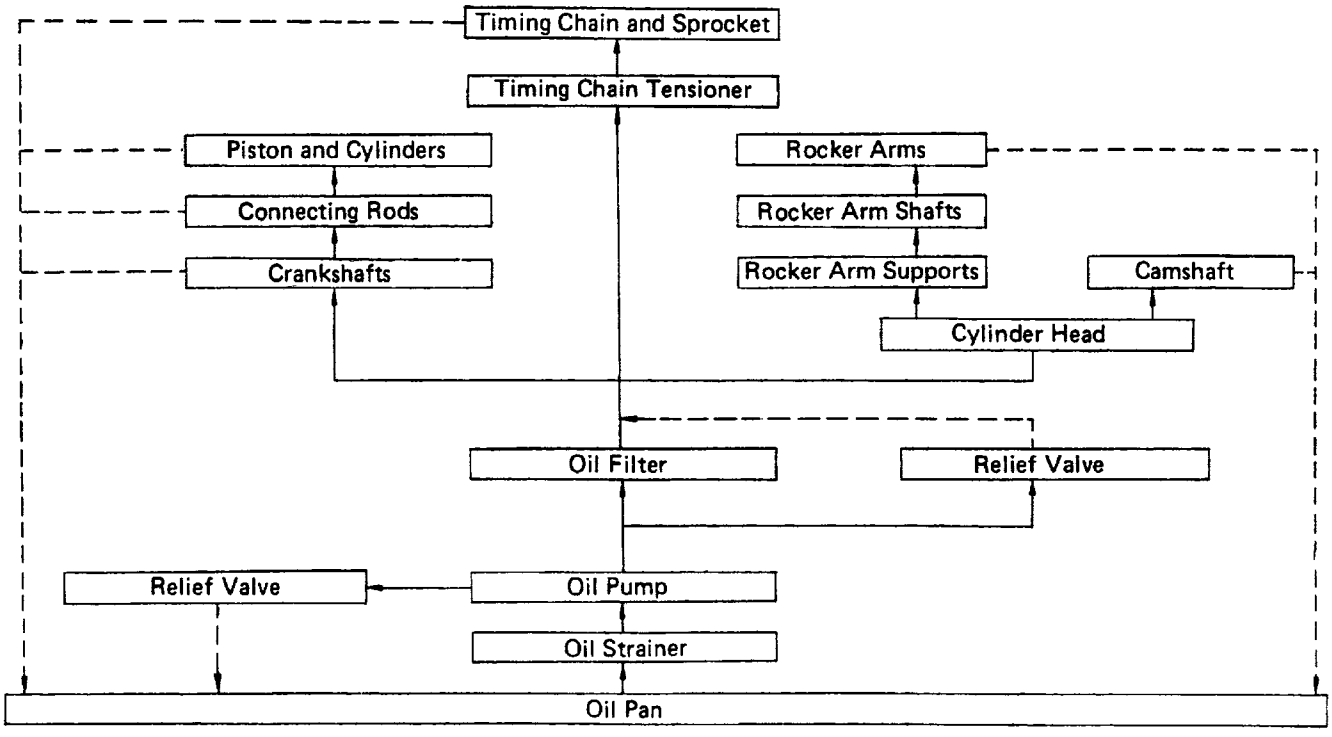
LUBRICATION SYSTEM

DESCRIPTION

A fully pressurized, fully filtered lubrication system is used in this engine.

EG1UF–01





LU0724

A pressure feeding lubrication system has been adopted to supply oil to the moving parts of this engine. The lubrication system consists of an oil pan, oil pump and oil filter, etc. The oil circuit is shown in the illustration at the top of the previous page. Oil–from the oil pan is pumped up by the oil pump. After it passes through the oil filter, it is fed through the various –oil holes in the crankshaft and cylinder block. After passing through the cylinder block and performing its lubricating function, the oil is returned by gravity to the oil pan. A dipstick on the side of the oil pump body is provided to check the oil level.

OIL PUMP

The oil pumps up oil from the oil pan and sends it under pressure to the various parts of the engine. An oil strainer is mounted in front of the inlet to the oil –pump to remove impurities. The oil pump itself is an internal gear pump, which uses a drive gear and driven gear inside the pump body. When the drive gear rotates, the driven gear rotates in the same direction. When both gears rotate, the space between the two gears changes. Oil is draw in when this space widens, and is discharged when the space becomes narrow.

OIL PRESSURE REGULATOR (RELIEF VALVE)

At high engine speeds, the oil pump supplies more oil to each part than is necessary. For this reason, an oil pressure regulator which works to prevent an oversupply oil is installed on the oil pump. During normal oil supply, a coil spring and valve keep the by–pass closed, but when too much oil is being supplied, the pressures become extremely high, over powering the force of the spring and opening the valve. This allows the excess oil to flow through the relief valve and return to the oil pan.

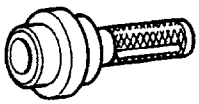
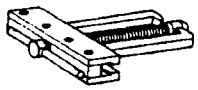
OIL FILTER

The oil filter is a full flow type with– a paper filter element and built–in relief valve. Particles of metal from wear, airborne dirt, carbon and other impurities can get in the oil during use and could cause accelerated wear or seizing if allowed to circulate through the engine. The oil filter, integrated into the oil line, removes these impurities as the oil passes through it. The filter is mounted outside the engine to simplify replacement of the filter element. A .relief valve is also included ahead of the filter element to relieve the high oil pressure in case the filter element becomes clogged with impurities. The relief valve opens when the oil pressure overpowers the force of the spring. Oil passing through the relief valve by–passes the oil filter and flows directly into the main oil hole in the engine.

PREPARATION

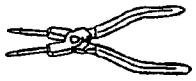
EG14U–05

SST (SPECIAL SERVICE TOOLS)

	09032–00100 Oil Pan Seal Cutter	
	09223–50010 Crankshaft Front oil Sea! Replacer	Crankshaft front oil seal
	09228–07500 Oil Filter Wrench	
	09213–36020 Timing Gear Remover	

EG14V–05

RECOMMENDED TOOLS

	09090–04000 Engine Sting Device	For suspending engine
	09200–00010 Engine Adjust Kit	
	09905–00013 Snap Ring Pliers	

EG14W–05

EQUIPMENT

Oil pressure gauge	
Torque wrench	

EG1UG–01

LUBRICANT

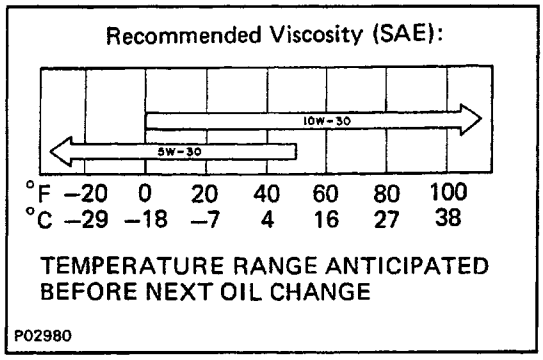
Item	Capacity			Classification
	Liters	US qts	Imp. qts	
Engine oil Drain and refill wlo Oil filter change wlOil fitter change Dry fill	 3.8 4.3 4.8	 4.0 4. 5 5.1	 3.3 3.8 4.2	API grade SG Energy–Conserving II multigrade and recommended vis–cosity oil

V01956

EG14Y–05

SSM (SPECIAL SERVICE MATERIALS)

08826–00080 Seal packing or equivalent	Oil pan



OIL PRESSURE CHECK

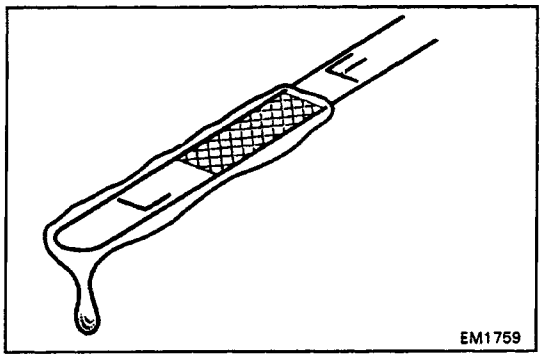
1. CHECK OIL QUALITY

EG1UH–01

Check the oil for deterioration, entry of water, discoloring or thinning.

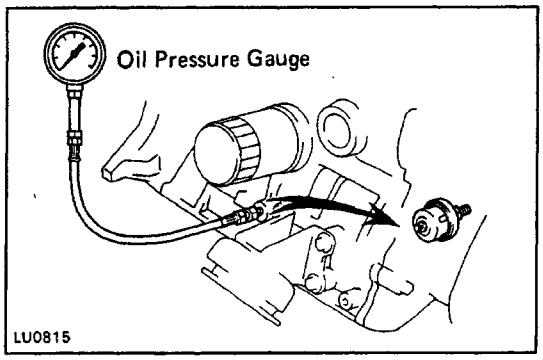
If oil quality is poor, replace.

Oil grade: API grade SG Energy–Conserving II multigrade engine oil. Recommended viscosity is as shown.



2. CHECK OIL LEVEL

The oil level should be between the "L" and "F" marks on the level gauge. If low, check for leakage and add oil up to the "F" mark.



3. REMOVE OIL PRESSURE SENDER GAUGE

4. INSTALL OIL PRESSURE GAUGE

5. START ENGINE

Start the engine and warm it up to normal operating temperature.

6. MEASURE OIL PRESSURE

Oil pressure:

At idle speed

29 kPa (0.3 kgf/cm^2, 4.3 psi) or more

At 3,000 rpm

245 – 490 kPa (2.5 – 5.0 kgf/cm^2, 36 – 71 psi)

HINT: Check for oil leakage after reinstalling the oil pressure sender gauge.

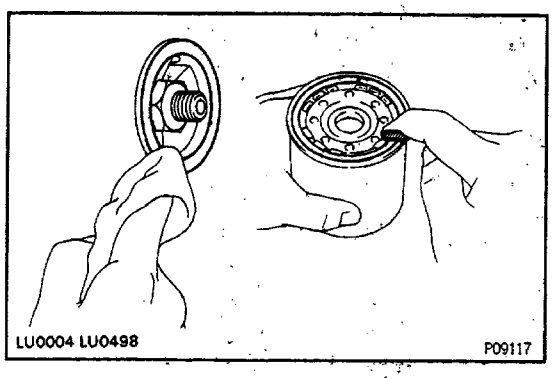
OIL AND FILTER REPLACEMENT

CAUTION:

- **Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities should be provided.**
- **Care should be taken, therefore, when changing engine oil, to minimize the frequency and length of time your skin is exposed to used engine oil. Protective clothing and gloves, that cannot be penetrated by oil, should be worn. The skin should be thoroughly washed with soap and water, or use waterless hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.**
- **In order to preserve the environment, used oil and used oil filters must be disposed of only at designated disposal sites.**

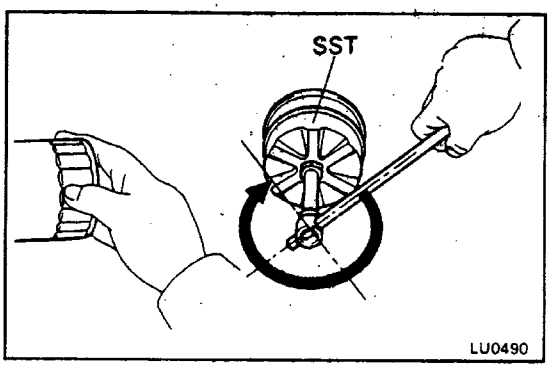
1. DRAIN ENGINE OIL

(a) Remove the oil filter cap.
(b) Remove the oil dipstick.
(c) Remove the oil drain plug and drain the oil into a container.



2. REPLACE OIL FILTER

(a) Using SST, remove the oil filter (located on right side of the engine block).
SST 09228–07500
(b) Clean the filter contact surface on the filter mounting.
(c) Lubricate the filter rubber gasket with engine oil.

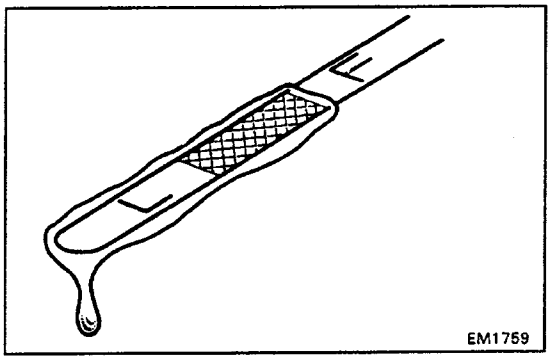


(d) Tighten the filter by hand until the gasket contacts the seat of the filter mounting. Then using SST, give it an additional 3/4 turn to seat the filter.
SST 09228–07500

3. FILL WITH ENGINE OIL

(a) Clean and install the oil drain plug with a new gasket.
(b) Fill the engine with new oil, API grade SG multigrade, fuel efficient and recommended viscosity oil.

Oil capacity:
Drain and refill
w/o Oil filter change
3.8 liters (4.0 US qts, 3.3 Imp. qts)
w/ Oil filter change
4.3 liters (4.5 US qts, 3.8 Imp. qts)
Dry fill
4.8 liters (5.1 US qts, 4.2 Imp. qts)

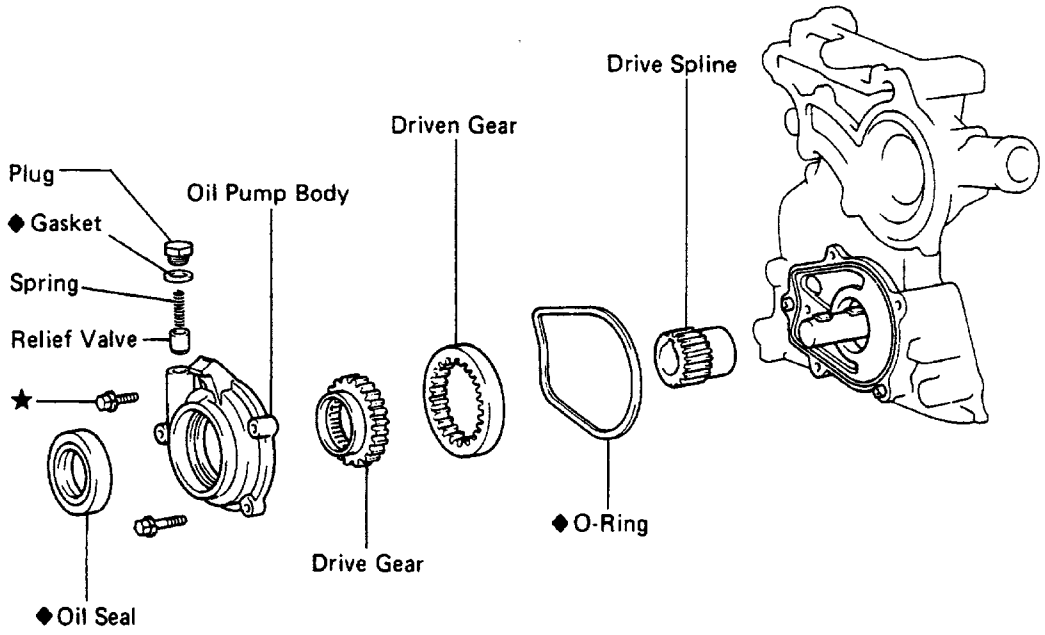


4. START ENGINE AND CHECK FOR LEAKS
5. RECHECK ENGINE OIL LEVEL
Recheck the engine oil level and refill as necessary.
HINT: Insert the oil dipstick with the curved tip poi–nted toward the engine.

OIL PUMP

EG1UK–01

COMPONENTS



LU0687

◆ Non-reusable part
★ Precoated part

EG1UL–01

OIL PUMP REMOVAL

HINT: When repairing the oil pump, the oil pan and strainer should be removed and cleaned.

1. REMOVE OIL PAN

(See steps 3 and 4 on page EG1–39**)**

2. REMOVE OIL STRAINER

Remove the four bolts holding the oil strainer.

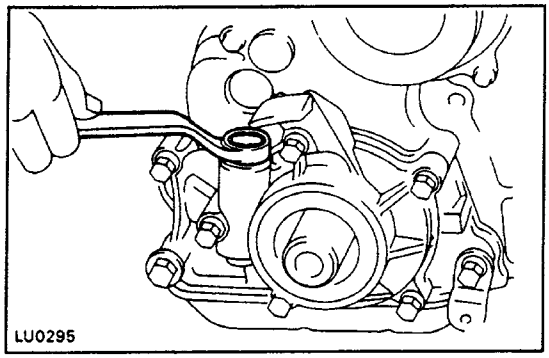
3. REMOVE DRIVE BELTS

4. REMOVE CRANKSHAFT PULLEY

(See steps 4 on page EG1–40**)**

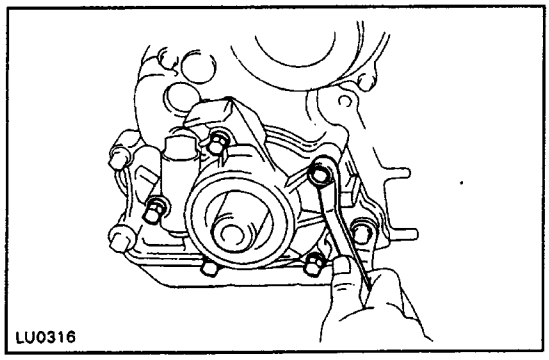
5. (with A/C)

REMOVE A/C COMPRESSOR AND BRACKET

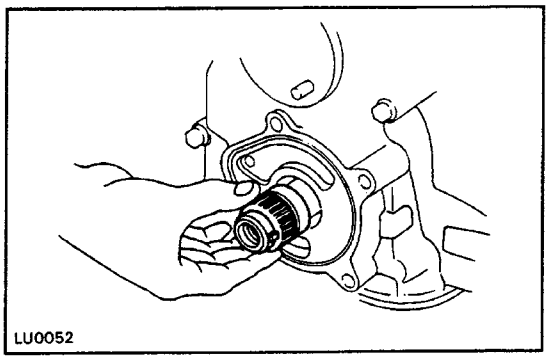


6. REMOVE OIL PUMP ASSEMBLY

(a) Loosen the oil pump relief valve plug.



(b) Remove the five bolts, the oil pump assembly and O–ring.

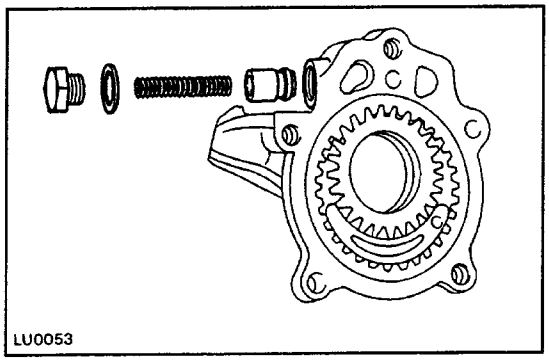


7. REMOVE OIL PUMP DRIVE SPLINE

HINT: If the oil pump drive spline cannot be removed by hand, use SST to remove the pump drive spline and crankshaft together.

(See page EG1–42)

SST 09213–36020



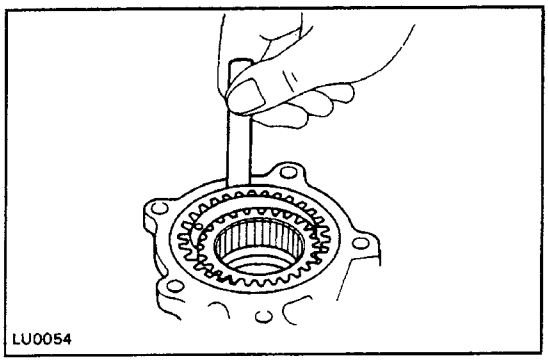
EG1UM–01

OIL PUMP DISASSEMBLY

1. REMOVE RELIEF VALVE

Unscrew the relief valve plug and gasket, and remove the spring and the relief valve.

2. REMOVE DRIVEN AND DRIVE GEARS



EG1UN–01

OIL PUMP INSPECTION

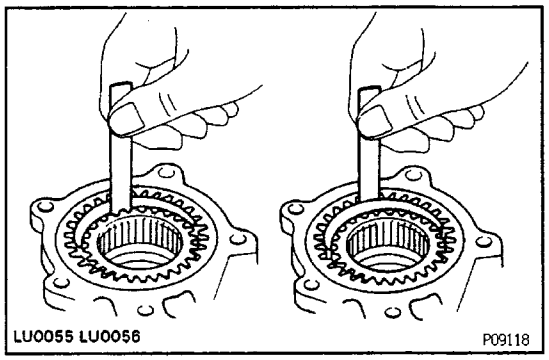
1. MEASURE BODY CLEARANCE

Using a thickness gauge, measure the clearance between the driven gear and body.

Standard clearance: 0.09–0.15 mm (0.0035–0.0059 in.)

Maximum clearance: 0.2 mm (0.008 in.)

If the clearance is greater than maximum, replace the gear and/or body.



2. MEASURE TIP CLEARANCE

Using a thickness gauge, measure the clearance between both of the gear tips and crescent.

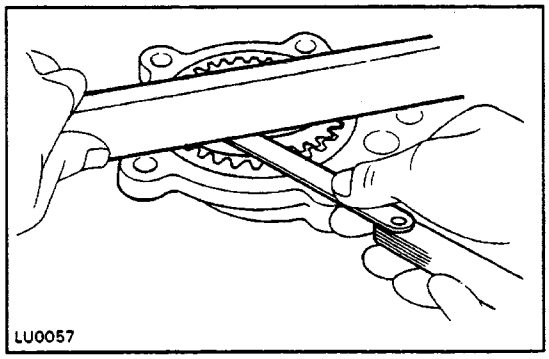
Standard clearance:

Driven 0.15–0.21 mm (0.0059–0.0083 in.)

Drive 0.22–0.25 mm (0.0087–0.0098 in.)

Maximum clearance: 0.3 mm (0.012 in.)

If the clearance is greater than maximum, replace the gears and/or body.



3. MEASURE SIDE CLEARANCE

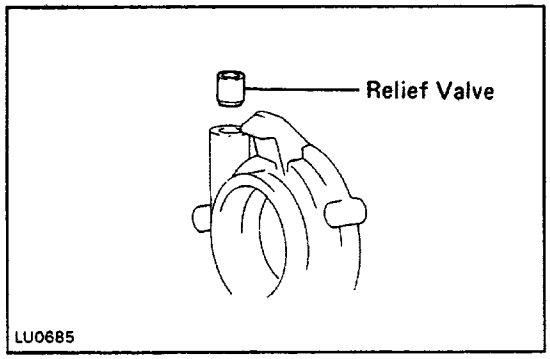
Using a thickness gauge and flat block, measure the side clearance as shown.

Standard clearance: 0.03–0.09 mm

(0.00 12 – 0.0035 in.)

Maximum clearance: 0.15 mm (0.006 in.)

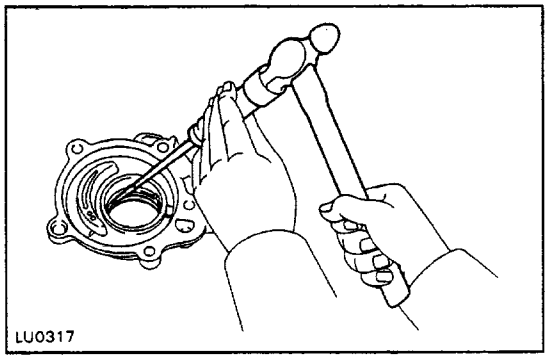
If the clearance is greater than maximum, replace the gears and/or body.



PRESSURE REGULATOR INSPECTION EG1UP–01

Coat the valve piston with engine oil and check that it falls smoothly into the valve hole by its own weight.

If the valve does not fall smoothly, replace the valve and/or oil pump assembly.

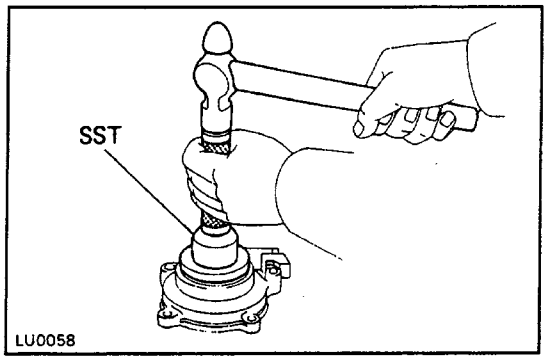


FRONT OIL SEAL REPLACEMENT EG1UQ–01

1. REMOVE OIL SEAL

(a) Remove the drive and driven gears.

(6) Using a screwdriver, remove the oil seal.

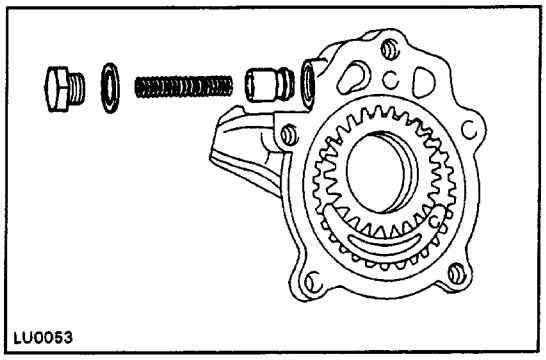


2. INSTALL OIL SEAL

(a) Apply MP grease to a new oil seal lip.

(b) Using SST, drive in the new oil seal.

SST 09223–50010



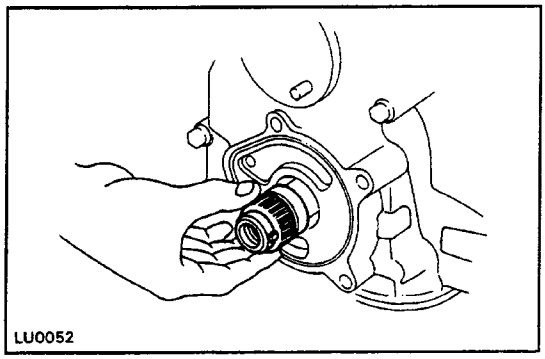
EG1UR–01

OIL PUMP ASSEMBLY.

(See page EG1–238)

(a) Install the relief valve and spring in the body, and screw on the relief valve plug with a new gasket.

(b) Insert the drive and driven gears into the pump body.



EG1U8–01

OIL PUMP INSTALLATION

(See page EG1–238)

1. INSTALL OIL PUMP DRIVE SPLINE AND O–RING

(a) Slide the pump drive spline onto the crankshaft.

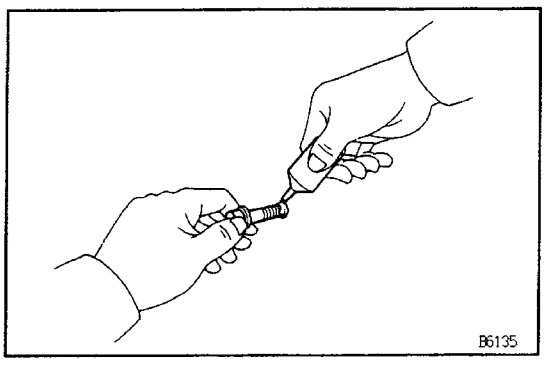
HINT: If the oil pump drive spline cannot be installed by hand, use SST. (See page EG1–43)

(b) Place the 0–ring into the groove.

2. INSTALL OIL PUMP

(a) Clean the threads of the upper set bolt and timing chain cover bolt hole of any sealer, oil or foreign particles.

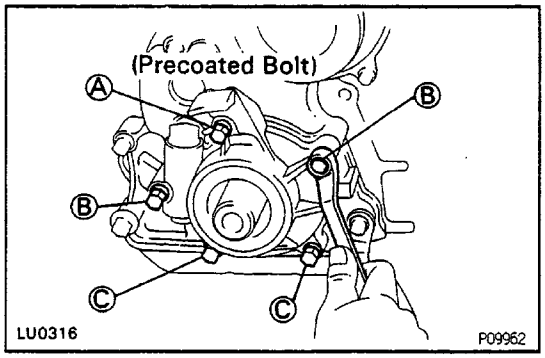
Remove any oil with kerosene or gasoline.



(b) Apply sealant to 2 or 3 threads of the bolt end.

Sealant: Part No. 08833–00070, THREE BOND 1324 or equivalent

HINT: This adhesive will not harden while exposed to air. It will act as a sealant or binding agent only when applied to threads, etc. and air is cut off.



(c) Torque the five bolts.

Torque: (A) 25 N–m (250 kgf–cm, 18 ft–lbf)
(B) 19 N–m (195 kgf–cm, 14 ft–lbf)
(C) 13 N–m (130 kgf–cm, 9 ft–lbf)

(d) Torque the relief valve plug.

Torque: 37 N–m (375 kgf–cm, 27 ft–lbf)

3. INSTALL CRANKSHAFT PULLEY
(See step 8 on page EG1–44)
4. INSTALL AND ADJUST DRIVE BELT
(See page MA–6)
5. INSTALL OIL STRAINER
(See step 2 on page EG1–70)
6. INSTALL OIL PAN
(See step 13 on page EG1–44)

SERVICE SPECIFICATIONS

EG1UT–01

SERVICE DATA

Oil pressure (normal operating temperature) at Idle speed at 3,000 rpm			29 kPa (0.3 kgf/cm², 4.3 psi) or more 245 – 490 kPa 2.5 – 5.0 kgf/cm² 36 – 71 psi	
Oil pump	Body clearance	STD	0.09 – 0.15 mm	0.0035 – 0.0059 in.
		Limit	0.2 mm	0.008 in.
	Tip clearance			
	Drive gear to crescent	STD	0.15 – 0.21 mm	0.0059 – 0.0083 in.
		Limit	0.3 mm	0.012 in.
	Drive gear to crescent	STD	0.22 – 0.25 mm	0.0087 – 0.0098 in.
		Limit	0.3 mm	0.012 in.
	Side clearance	STD	0.03 – 0.09 mm	0.0012 – 0.0035 in.
		Limit	0.15 mm	0.0059 in.
	Relief valve operating pressure		441 kPa 4.5 kgf/cm²	64 psi

V01957

EG1UU–01

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Cylinder Block x Rear Oil Seal Retainer	18	180	13
Cylinder Block x Oil Cooler Relief Valve	69	700	51
Cylinder Block x Oil Strainer	13	130	9
Cylinder Block x Oil Pan	13	130	9
Oil pan x Drain Plug	25	250	18

3VZ–E ENGINE

ENGINE MECHANICAL

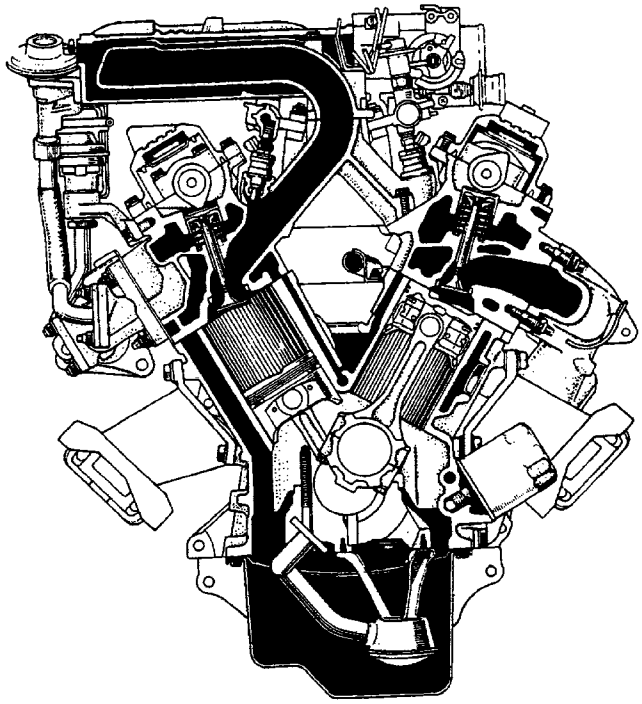
DESCRIPTION

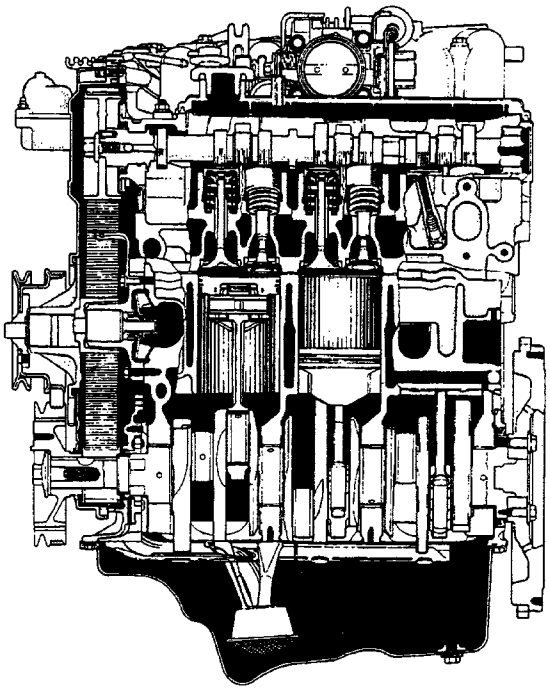
EG128–01

The 3VZ–E engine is a V–6 3.0 liter OHC 12–valve engine.

OPERATION

EGCAX–06





P02944
P03056

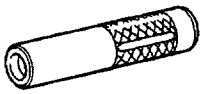
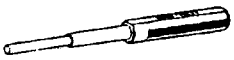
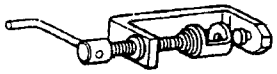
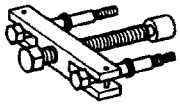
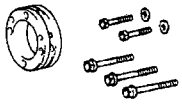
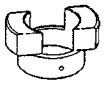
Z04875

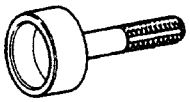
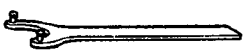
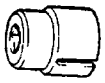
The 3VZ–E engine has 6–cylinders in a V arrangement at a bank angle of 60•. From the front of the right bank the cylinders are numbered 1 – 3 – 5, and from the front of the left bank the cylinders are numbered 2 – 4 – 6.
The crankshaft is supported by 4 bearings inside the crankcase. The bearings are made of aluminum alloy.
The crankshaft is integrated with 5 weights which are cast with it for balance. There are oil holes in the center of the crankshaft to supply oil to the connecting rods and bearings, etc.
The firing order is 1 – 2 – 3 – 4 – 5 – 6. The cylinder head is made of aluminum alloy, with a cross flow type intake and exhaust layout, and semi–heron type combustion chambers.
At the front and rear of the intake port of the intake manifold, a water passage has been provided which connects the left and right cylinder heads.
Each intake exhaust valve is equipped with irregular pitch springs made of special valve spring carbon steel which are capable of following no matter what the engine speed.
The left and right camshafts are driven by a single timing belt. The cam journal is supported at 5 places, between the valve lifters of each cylinder and on the front end of the cylinder head.
The cam journal and the cam are lubricated by oil supplied through the oiler port in the center of the camshaft.
Adjustment of the valve clearance is done by means of an outer shim type system with the valve adjusting shims located above the valve lifters so that the shims can be replaced without removing the camshafts.
The timing belt cover is composed of the resin type No.1 and No.2 above and below the fan bracket, and the No.3 and No.4, which are made of steel sheet to make removal of the intake manifold easier.
The pistons are made of high temperature resistant aluminum alloy, and the piston head is concaved to prevent interference with the valves.
The piston pins are the semi–floating type, with the connecting rods and pins pressure fitted so that the piston and pin float.
The No. 1 compression ring is made of stainless steel and the No.2 compression ring is made of cast iron. The oil ring is made of a combination of steel and stainless steel. The outer diameter of each piston ring is slightly larger than the diameter of the piston, and when the piston ring is attached to the cylinder, the expansion of the piston ring produces a close fit with the cylinder walls.
The No.1 and No.2 compression rings work to prevent gas leakage, and the oil ring works to scrape oil off the cylinders and prevent it from entering the combustion chambers.
The cylinder block is made of cast iron with a bank angle of 60•. It has 6 cylinders which are approximately twice the length of the piston stroke. The top of each cylinder is closed off by the cylinder head and the lower end becomes the crankcase where the crankshaft is installed. In addition, the cylinder block contains a water jacket to cool the cylinders.
The oil pan is bolted onto the bottom of the cylinder block. The oil pan is an oil reservoir made of pressed steel sheet. A baffle plate has been installed between the oil pan and cylinder block to reduce oil stir from the crankshaft and connecting rod.
Plastic region tighten bolts are used for the cylinder head, main bearing cap and connecting rod.

PREPARATION

EG1DM–03

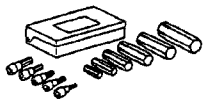
SST (SPECIAL SERVICE TOOLS)

	09032–00100 Oil Pan Sea! Cutter	Oil pan Oil pan baffle plate
	09201–41020 Valve Stem Oil Seal Replacer	
	09201–60011 Valve Guide Bushing Remover & Replacer	
	09202–43013 Valve Spring Compressor	
	09213–31021 Crankshaft Pulley Puller	
	09213–5$012 Crankshaft Pulley Holding Tool	
	(90201–08131) Washer	
	(91111–50845) Bolt	
	09214–60010 Crankshaft Pulley & Gear Replacer	Crankshaft timing pulley Camshaft oil seal
	09221–25024 Piston Pin Remover & Replacer	
	(09221–00020) Body	
	(09221 –00030) Spring	
	(09221–00181) B	

	(09221– 00190) Guide “K”	
 I01725	(09221 –00200) Guide “L”	
	09223–56010 Crankshaft Rear Oil Seal Replacer	
	09248–55020 Valve Clearance Adjust Tool Set	
	(09248–05011) Valve Lifter Press	
	(09248–05021) Valve Lifter Stopper	
	09278–54012 Drive Shaft Holding Tool	Camshaft timing pulley
	09309–37010 Transmission Bearing Replacer	Crankshaft front oil seal
	09330–00021 Companion Flange Holding Tool	Crankshaft pulley
	09816–30010 Oil Pressure Switch Socket	Oil pressure sender gauge
	09817–16011 Back–up Light Switch Toot	Knock sensor
	09843–18020 Diagnosis Check Wire	

RECOMMENDED TOOLS

EG1DN–01

	09040–00010 Hexagon Wrench Set	
	09090–04010 Engine Sling Device	For suspending engine
	09200–00010 Engine Adjust Kit	
	09258–00030 Hose Plug Set	Plug for the vacuum hose, fuel hose etc.
	09904–00010 Expander Set	

EQUIPMENT

EG1DP–02

Battery specific gravity gauge	
Belt tension gauge	
Caliper gauge	
CD/HC meter	
Compression gauge	
Connecting rod aligner	
Cylinder gauge	
Dial indicator	
Dye penetrant	
Engine tune–up tester	
Heater	
Magnetic finger	
Micrometer	
Piston ring compressor	
Piston ring expander	

Plastigage	
Precision straight edge	
Soft brush	
Spring tester	Valve spring
Steel square	Valve spring
Thermometer	
Torque wrench	
Valve seat cutter	
Vernier calipers	

COOLANT

EG0B1–0D

Item		Capacity	Classification
Engine coolant	2WD (M/T)	9.9 liters (10.5 US qts, 8.7 Imp. qts)	Ethylene–glycol base
	(A/T)	9.7 liters (10.3 US qts, 8.5 Imp. qts)	
	4WD (M/T)	10.0 liters (10.6 US qts, 8.8 Imp. qts)	
	(A/T)	9.8 liters (110.4 US qts, 8.6 Imp. qts)	

EG0B1–0E

LUBRICANT

Item	Capacity	Classification
Engine oil (2WD)		APIA grade SKAG Energy–Conserving II multigrade and recommended viscosity oil.
Dry fill	5.3 liters (5.6 US qts, 4.7 Imp. qts)	
Drain and refill		
w/o Oil filter change	4.3 liters (4.5 US qts, 3.8 Imp. qts)	
w/ Oil filter change	4.0 liters (4.2 US qts, 3.5 Imp. qts)	
Engine oil (4WD)		
Dry fill	5.4 liters (5.7 US qts, 4.8 Imp. qts)	
Drain and refill		
w/o Oil filter change	4.5 liters (4.8 US qts, 4.0 Imp. qts)	
w/ Oil filter change	4.2 liters (4.4 US qts, 3.7 Imp. qts)	

EG1DQ–02

SSM (SPECIAL SERVICE MATERIALS)

08826–00080 Seal packing or equivalent	Camshaft bearing cap Cylinder head cover Rear oil seal retainer Oil pump
08826–00080 Seal packing or equivalent	Oil pan baffle plate Oil pan Oil pressure sender gauge
08826–00100 Seal Packing 1282B, Three Bond 1282B or equivalent	Water outlet No.2 idler pulley Water pump No. 1 water by–pass pipe
08833–00070 Adhesive 1324, THREE BOND 1324 or equivalent	Flywheel bolt Drive plate bolt

TROUBLESHOOTING

When the malfunction code is not confirmed in the diagnostic code check and the problem still cannot be confirmed in the basic inspection, then proceed to this step and perform troublesh–ooting according to the numbers in the order given in the table below.

	See page	IG–16	IG–16	EG2–199	EG2–192	EG2–190	EG2–190	EG2–185	EG2–193	–	EG2–193	–	EG2–202	EG2–212	EG2–160	EG2–220	EG2–247	–
	Suspect area	RPM Signal Circuit	Ignition Circuit	Heated Oxygen Sensor Circuit	Engine Coolant Temp Sensor Circuit	Intake Air Temp. Sensor Circuit	Volume Air Flow Meter Circuit	Throttle Position Sensor Circuit	STA Signal Circuit	Knock Sensor Circuit	PNP Signal Circuit	A/C Signal Circuit	Fuel Pump	Fuel Pressure Regulator	Fuel Lines	injectors	Cold Start System	Idle Speed Control Valve
	Symptom																	
Does not start	Engine does not crank																	
	Starter runs – engine does not crank		.															
	No initial combustion	12	2				5						6				13	8
	(Vv complete combustion				4		1							3		9	10	2
Difficult to start	Engine cranks slowly											2						
	Under normal conditions	12	13		4	14							7	6	8	16	17	3
	Cold engine				1	6			2				8	7	9	10	5	4
	Hot engine				1	5							8	7	9	10	6	3
Poor idling	Incorrect first idle				3													4
	High engine idle speed				4	6		7			9	8				10	11	5
	Low engine idle speed				1		4									5		2
	Rough idling		18		2		12						7	6	8	16	17	9
	Misfire		4		6		8									9	10	
Poor drivability	Hesitation Poor acceleration			12	10	11	9	8					14	13	15	18	19	
	Back fire			6	3	7	5	4					9	8	10	11		
	Muffler explosion rafter fire			8	3	7	5	6						4		9	10	
	Surging													1		4		
	Knocking									1								
Engine stall	Engine stall soon after starting				8		7						3	2	4	9	10	6
	After accelerator pedal depressed						1	3						5	6	7		
	After accelerator pedal released						3											1
	During A/C operation											1						2
	When N to D shift										1							2
Others	Poor fuel economy			21	16	22	18	17			19	20				14	15	
	Engine overheat									9								
	Engine overcool																	
	Excessive oil consumption																	
	Low oil pressure																	
	High oil pressure																	
	Starter keeps running																	
	Battery often discharge																	

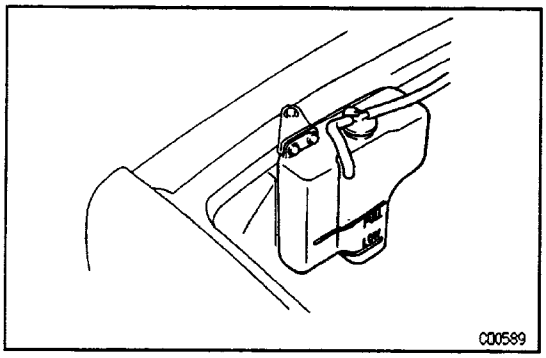
V01922

HINT: When inspecting a wire harness or circuit, the electrical wiring diagrams at the end of repair manual should be referred to and the circuits of related systems also should be checked.

EFI Main Relay EG2–245	Circuit Opening Relay EG2–246	Fuel Cut System EG2–257	Fuel Pressure Control System EG2–249	Engine Control Module EG2–254	Fuel Quality —	Fuel Leakage —	Engine Coolant Leakage —	Oil Leakage —	Starter Relay ST–13	PNP SW or Clutch Start SW AT 83,144 CL–4	Starter ST–2	Spark Plug IG–20	Distributor IG–23	EGR System EG2–148	Accelerator Pedal Link —	Brakes drag even when released —	Cooling Fan System —	Dash Pot EG2–237	Throttle Opener EG2–238	Clutch CL–1	Compression EG2–30	Valve Clearance EG2–18
									1	3	2											
											1											
3	4			14	7								1								9	
				11																	5	
											1											
				18	1							2	15	5							9	
				11	3																	
			4	11	2																	
				5											1			2	3			
				12											1			2				
				6										3								
				19	1							4	5	3							10	13
				11	1							3	5	2							7	
				20	3							5	6	4		2				1	7	16
				12										1								
		1		11																		
				5								2	3									
				10	2							3		4			7					
				11	1									5								
				8								4		2								
				4										2								
				3																		
				3																		
		8			2	1						9	10	7	3	6		4		5	11	
							1					8					2					
																	1					
								1													3	
								1														
									1		2											

	See page	EG2–46	EG2–38	EG2–265	EG2–65	EG2–280	EG2–99	EG2–102	EG2–64	EG2–110	–	EG2–269	EG2–268	CH–2	BE–36	BE–37	CH–5	EG2–106
	Suspect area / Symptom	Valve Timing	Timing Belt	Water Pump	Valve Stem Guide Bushing	Oil Pump	Connecting Rod Bearing	Crankshaft Bearing	Cylinder Head	Piston Ring	Flywheel or Drive Plate	Radiator and Radiator Cap	Thermostat	Dive Belt	Engine Coolant Temp. Sender Gauge	Oil Pressure Switch	Generator	Cylinder Block
Does not sta rt	Engine does not crank																	
	Starter runs – engine does not crank										2							
	No initial combustion	10	11															
	No complete combustion	7	8							6								
Difficult to start	Engine cranks slowly						3	4										
	Under normal conditions	11								10								
	Cold engine																	
	Hot engine																	
Poor idling	incorrect first idle																	
	Nigh engine idle speed																	
	Low engine idle speed																	
	Rough idling	14	15						20	11								
	Misfire																	
Poor drivability	Hesitation Poor acceleration	17																
	Back fire	2																
	Muffler explosion (after fire)	2																
	Surging																	
	Knocking	5		9								6	8					
Engine stall	Engine stall soon after starting																	
	After accelerator pedal depressed																	
	After accelerator pedal released																	
	During A/C operation																	
	When N to D shift																	
Others	Poor fuel economy	13								12								
	Engine overheat	7	5	6		10			11			3	4		13			12
	Engine overcool												2		3			
	Excessive oil consumption				2				5	4								6
	Low oil pressure					2	3	4								5		
	High oil pressure					1										2		
	Starter keeps running																	
	Battery often discharge													1			2	

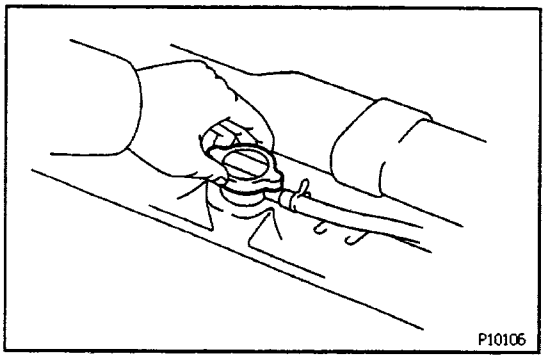
V01924



TUNE–UP

1. CHECK ENGINE COOLANT LEVEL AT RESERVOIR TANK

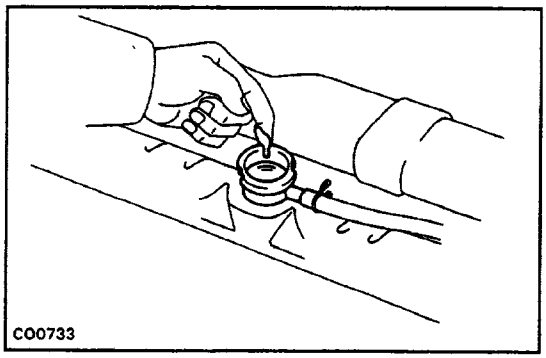
The engine coolant level should be between the ” LOW” and ”FULL” lines.
If low, check for leaks and add engine coolant up to the ”FULL” line.



2. CHECK ENGINE COOLANT QUALITY

(a) Remove the radiator cap.

CAUTION: To avoid the danger of being burned, do not remove it while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.



(b) There should not be any excessive deposits of rust or scales around the radiator cap or radiator filler hole, and the hole, and the coolant should be free from oil.
If excessively dirty, clean the coolant passages and replace the coolant.

Capacity (w/ Heater):
9.9 liters (10.5 US qts, 8.7 Imp.qts) for 2WD M/T
9.7 liters (10.3 US qts, 8.5 Imp.qts) for 2WD A/T
10.0 liters (10.6 US qts, 8.8 Imp.qts) for 4WD M/T
9.8 liters (10.4 US qts, 8.6 Imp.qts) for 4WD A/T

HINT:

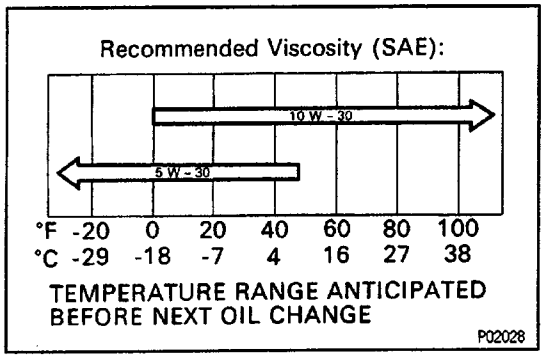
- Use a good brand of ethylene–glycol base cool–ant and mix it according to the manufacturer’s directions.
- Using coolant which includes more than 50% ethylene –glycol(but not more than 70%) is rec–ommended.

NOTICE:

- **Do not use a alcohol type coolant.**
- **The coolant should be mixed with demineralized water or distilled water.**

(c) Reinstall the radiator cap.

EG1DT–02



ENGINE OIL INSPECTION

1. CHECK OIL QUALITY

Check the oil for deterioration, entry of water, dis–coloring or thinning.

If oil quality is poor, replace the oil.

Oil grade:

API grade SG Energy–Conserving II multigrade engine oil. Recommended viscosity is as shown,

Drain and refill capacity (2WD):

w/ Oil filter change

4.3 liters (4.5 US qts, 3.8 Imp. qts)

w/o Oil filter change

4.0 liters (4.2 US qts, 3.5 Imp. qts)

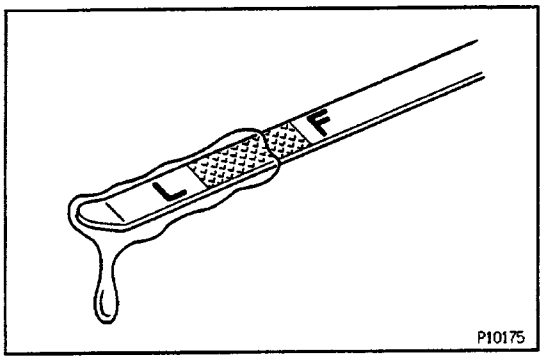
Drain and refill capacity (4WD):

w/ Oil filter change

4.5 liters (4.8 US qts. 4.0 Imp. qts)

w/o Oil filter change

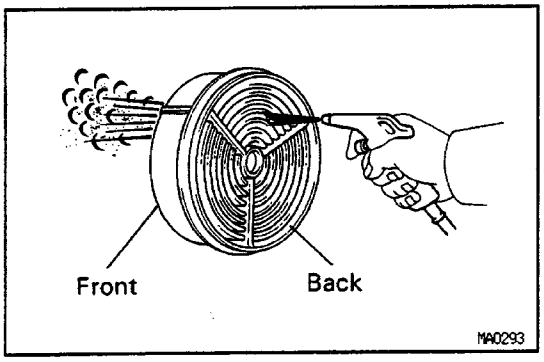
4.2 liters (4.4 US qts, 3.7 Imp. qts)



2. CHECK ENGINE OIL LEVEL

The oil level should be between the ”L” and ”F” marks on the dipstick.

If low, check for leakage and add oil up to the ”F” mark.



AIR FILTER INSPECTION AND CLEANING

1. REMOVE AIR FILTER

2. INSPECT AND CLEAN AIR FILTER

(a) Visually check that the air filter is not excessively damaged or only.

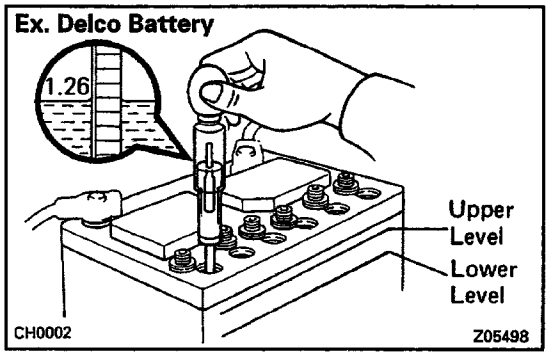
HINT: Oiliness may indicate a stuck PCV valve.

If necessary, replace the air filter.

(b) Clean the air filter with compressed air.

First blow from the inside thoroughly, then blow off the outside of the air filter.

3. REINSTALL AIR FILTER



BATTERY INSPECTION

1. (Ex. Delco Battery)

CHECK BATTERY SPECIFIC GRAVITY AND ELECTROLYTE LEVEL

(a) Check the electrolyte quantity of each cell.

If insufficient, refill with distilled (or purified) water.

(b) Check the specific gravity of each cell.

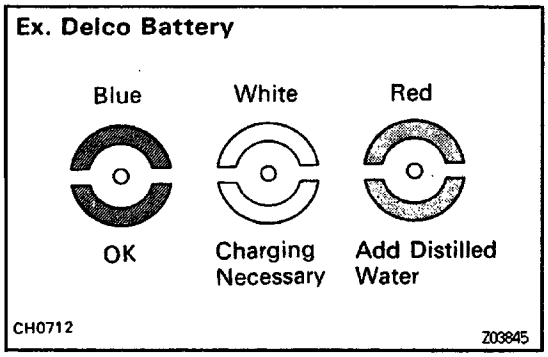
Standard specific gravity at 20˚C (68˚F):

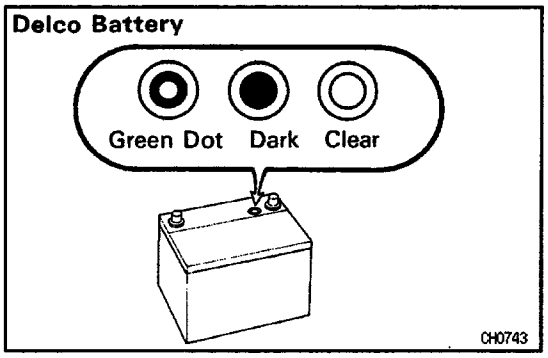
1.25 – 1.27 for 55D 23R type

1.27 – 1.29 for 80D 26R type

If not within specifications, charge the battery.

HINT: Check the indicator as shown in the illustration.





2. (Delco Battery)

CHECK HYDROMETER

Green Dot visible:

Battery is adequately charged.

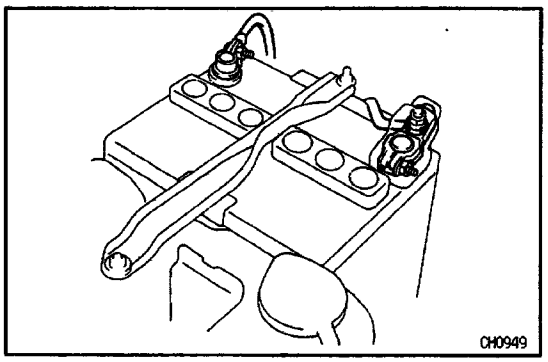
Dark (Green Dot not visible):

Battery must be charged.

Clear or Light Yellow:

Replace battery.

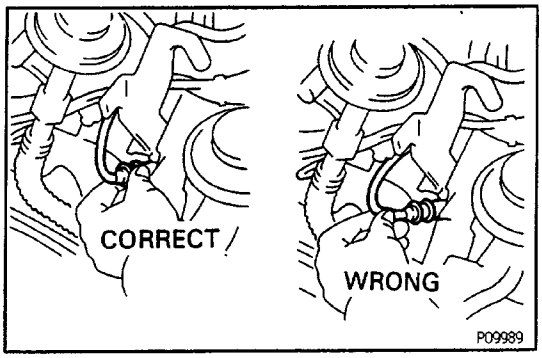
HINT: There is no need to add water during the entire service life of the battery.



3. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

(a) Check that the battery terminals are not loose or corroded.

(b) Check the fusible link and fuses for continuity.



EG1Z8–01

HIGH–TENSION CORDS INSPECTION

1. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS

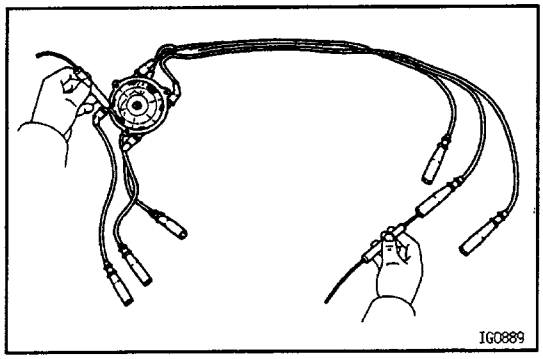
Disconnect the high – tension cords at the rubber boot. Do not pull on the curds.

NOTICE: Pulling on or bending the cords may damage the conductor inside.

2. REMOVE DISTRIBUTOR CAP WITH HIGH–TENSION CORDS

3. INSPECT HIGH–TENSION CORD TERMINALS

Check the terminals for corrosion, breaks or distor–tion. Replace cords as required.



4. INSPECT HIGH–TENSION CORD RESISTANCE

Using an ohmmeter, measure the resistance without disconnecting the distributor cap.

Maximum resistance:

25 kQ per cord

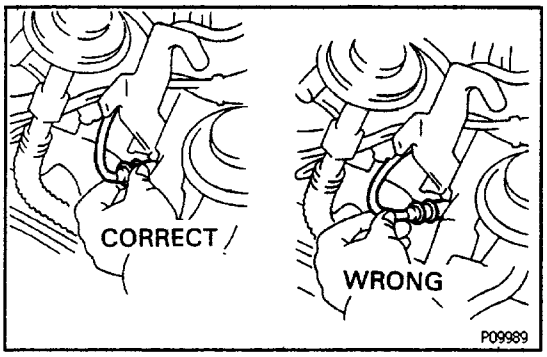
If the resistance is greater than maximum, check the terminals. If any defect has been found, replace the high–tension cord and/or distributor cap.

5. REINSTALL DISTRIBUTOR CAP AND HIGH–TENSION CORDS

6. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS

EG1ZC–01

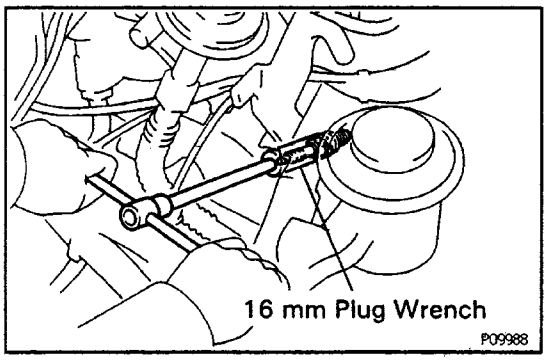
SPARK PLUGS INSPECTION



1. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS

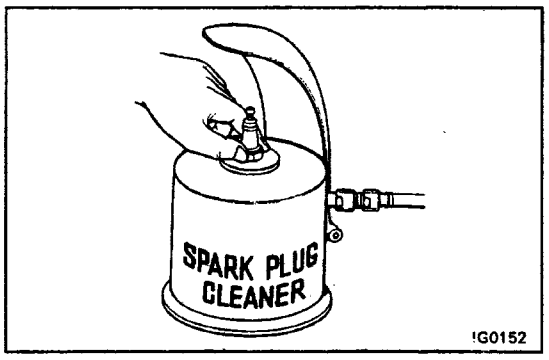
Disconnect the high – tension cords at the rubber boot. Do not pull on the cords.

NOTICE: Pulling on or bending the cords may damage the conductor inside.



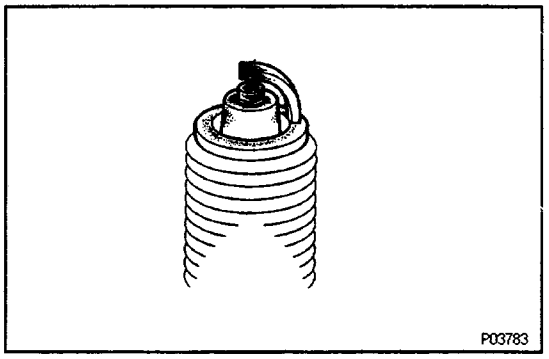
2. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the six spark plugs.



3. CLEAN SPARK PLUGS

Using a spark plug cleaner or wire brush, clean the spark plug.



4. VISUALLY INSPECT SPARK PLUGS

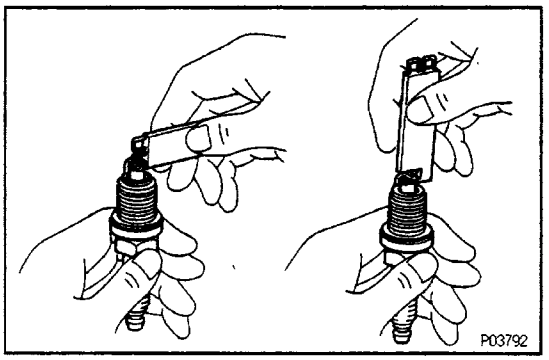
Check the spark plug for electrode wear, thread damage and insulator damage.

If abnormal, replace the spark plug.

Recommended spark plug:

K16R– U for ND

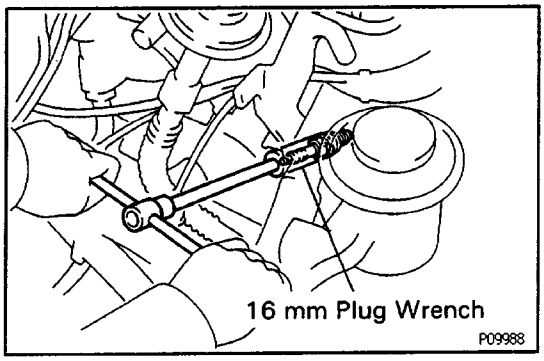
8KR5EYA for NGK



5. ADJUST ELECTRODE GAP

Carefully bend the outer electrode to obtain the cor–rect electrode gap.

Correct electrode gap: 0.8 mm (0.031 in.)

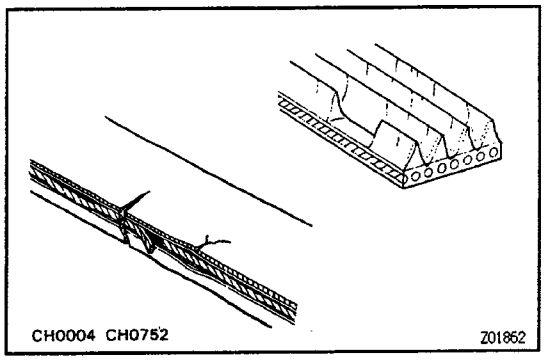


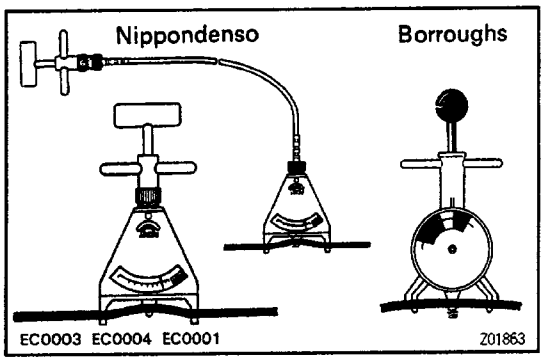
6. INSTALL SPARK PLUGS

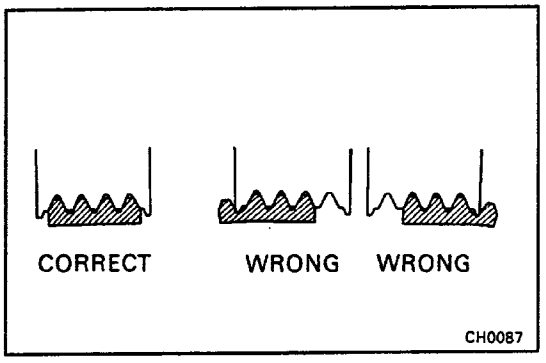
Using a 16 mm plug wrench, install the six spark plugs.

Torque: 18 N–m (18o kgf–cm, 13 ft–lbf)

7. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS







GENERATOR DRIVE BELT INSPECTION

INSPECT DRIVE BELTS

(a) Visually check the belt for excessive wear, frayed cords etc.

If necessary, replace the drive belt.

HINT: Cranks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.

(b) Using a belt tension gauge, measure the belt tension.

Belt tension gauge:

BTG–20 (95506–00020) for nippondenso

No. BT–33–73F for borroughs

Drive belt tension:

New belt

160 ±20 lbf

Used belt

100 ±20 lbf

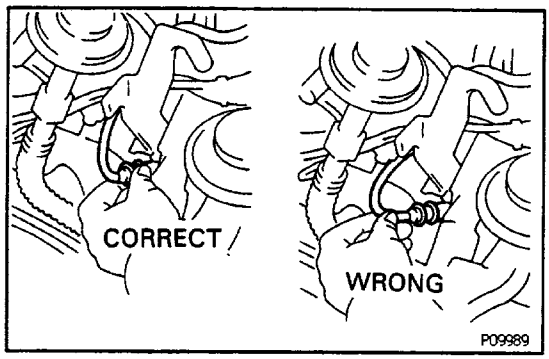
If necessary, adjust the belt tension.

HINT:

- ”New belt” refers to a belt which has been used less than 5 minutes on a running engine.
- ”Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing the belt, check that it fits properly in the ribbed grooves.
- Check by hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.
- After installing a new belt, run the engine for about 5 minutes and recheck the belt tension.

VALVE CLEARANCE INSPECTION AND ADJUSTMENT

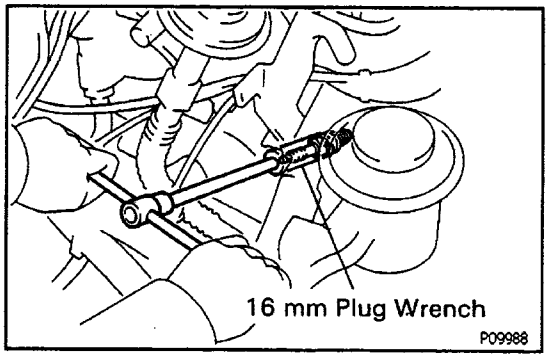
HINT: Inspect and adjust the valve clearance when the engine is cold.



1. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS

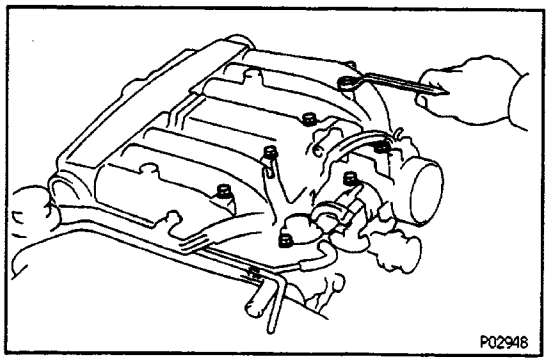
Disconnect the high – tension cords at the rubber boot. Do not pull on the cords.

NOTICE: Pulling on or bending the cords may damage the conductor inside.



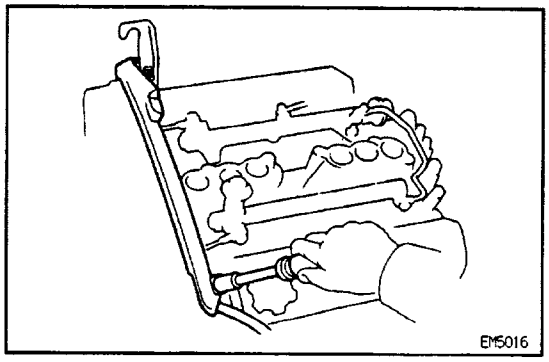
2. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the six spark plugs.



3. REMOVE AIR INTAKE CHAMBER

(See step 18 on pages EG2–53 to 55)

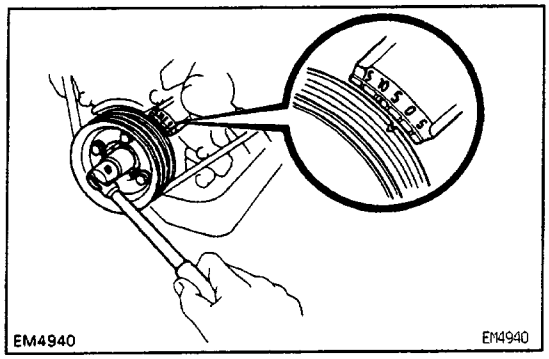


4. REMOVE ENGINE WIRE

Remove the two bolts and engine wire.

5. REMOVE CYLINDER HEAD COVERS

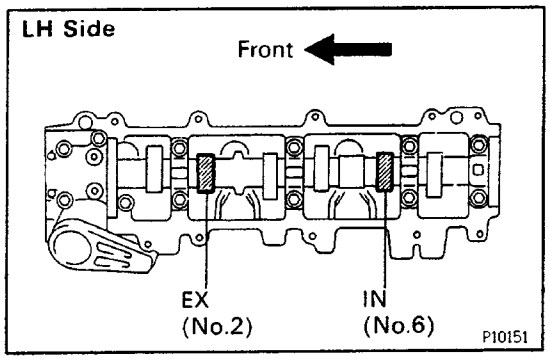
(See step 35 on page EG2–58)



6. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley and align its groove with timing mark "0" of the No.1 timing belt cover.

(b) Check that the valve lifters on the No.1 cylinder are loose and valve lifters on the No.4 are tight.
If not, turn the crankshaft one revolution (360•) and align the mark as above.



7. INSPECT VALVE CLEARANCE

(a) Check the clearance of the 1N (No.6) and EX (No.2) valves.
Using a feeler gauge, measure the clearance be–tween the valve lifter and camshaft.
Record the out– of –specification valve clear–ance measurements. They will be used later to determine the required replacement adjusting shim.

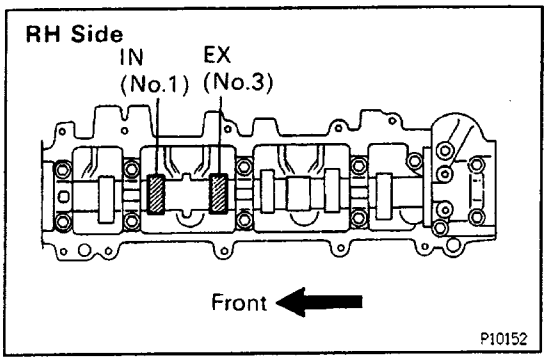
Valve clearance (Cold):

Intake

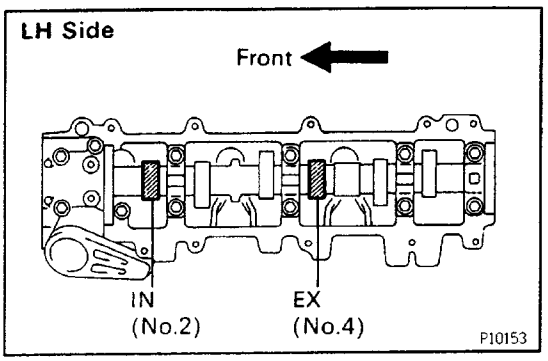
0.18 – 0.28 mm (0.007 – 0.011 in.)

Exhaust

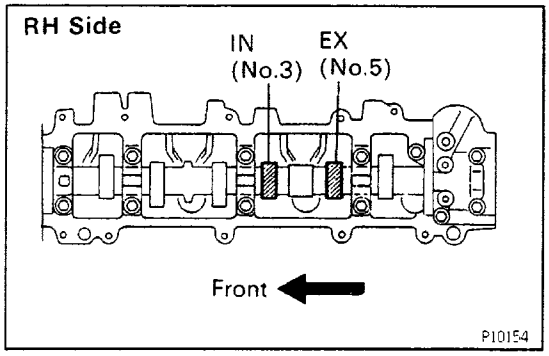
0.22 – 0.32 mm (0.009 – 0.013 in.)



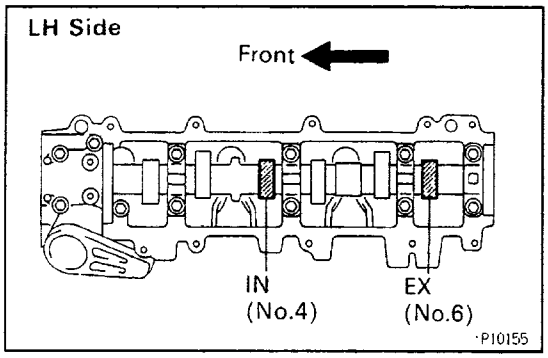
(b) Turn the crankshaft 1/3 revolution (120•), check the clearance of the IN (No. 1) and EX (No. 3) valves.
Measure the valve clearance.
(See procedure in step (a))



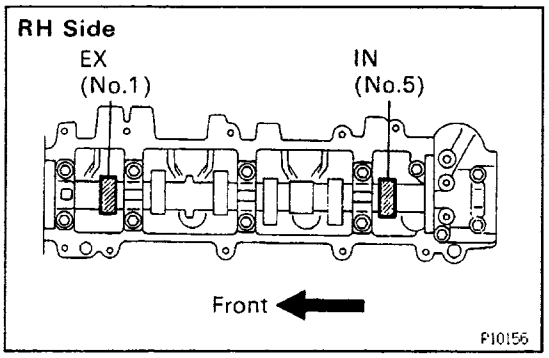
(c) Turn the crankshaft 1/3 revolution (120•), check the clearance of the IN (No. 2) and EX (No. 4) valves.
Measure the valve clearance.
(See procedure in step (a))



(d) Turn the crankshaft 1/3 revolution (120•), check the clearance of the IN (No. 3) and EX (No. 5) valves. Measure the valve clearance.
(See procedure in step (a))



(e) Turn the crankshaft 1/3 revolution (120•), check the clearance of the IN (No. 4) and EX (No. 6) valves. Measure the valve clearance.
(See procedure in step (a))

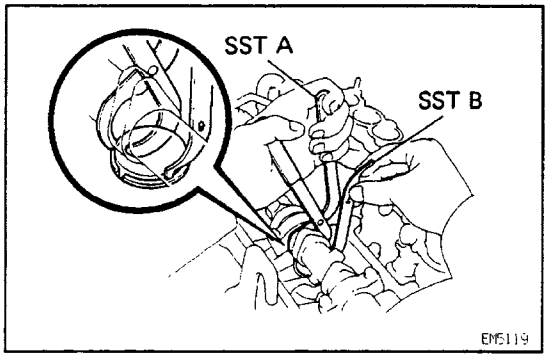


(f) Turn the crankshaft 1/3 revolution (120•), check the clearance of the IN (No. 5) and EX (No. 1) valves. Measure the valve clearance.
(See procedure in step (a))

8. ADJUST VALVE CLEARANCE

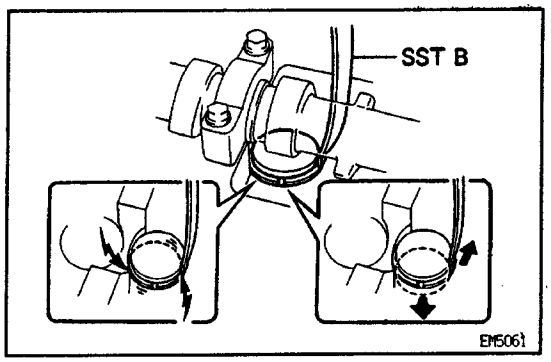
(a) Remove the adjusting shim.

- Turn the crankshaft so that the cam lobe of the camshaft on the adjusdting valve upward.
- Position the notch of the valve lifter facing the spark plug side.



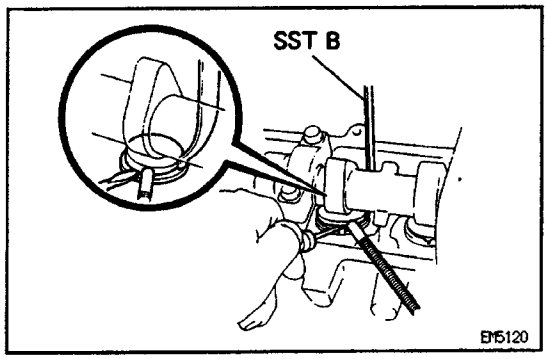
- Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

SST 09248–55020 (09248–05011, 09248–05021)



HINT: For easy removal of the shim, When setting SST 8, set it on the lifter so there is a wide space in the removal direction.*

- Remove the adjusting shim with a small screw–driver and magnetic finger.



(b) : Determine the replacement adjusting shim size by following–the Formula or Chart:

- Using a rnicrometer, measure – the thickness of the removed shim.
- Culculate the thickness of a new shim so that the valve clearance comes within specified value.
  T ..... Thickness of removed shim
  A ..... Measured valve clearance
  N ..... Thickness of new shim

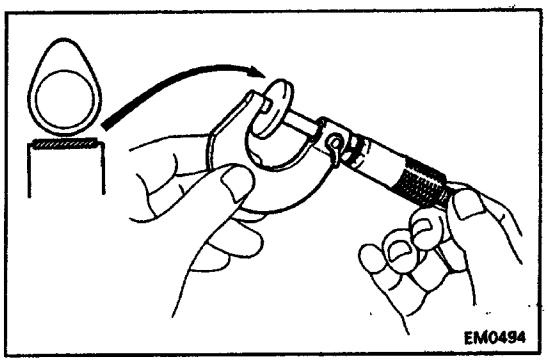
Intake:

N = T + (A – 0.23 mm (0.009 in.))

Exhaust:

N = T + (A – 0.27 mm (0.011 in.))

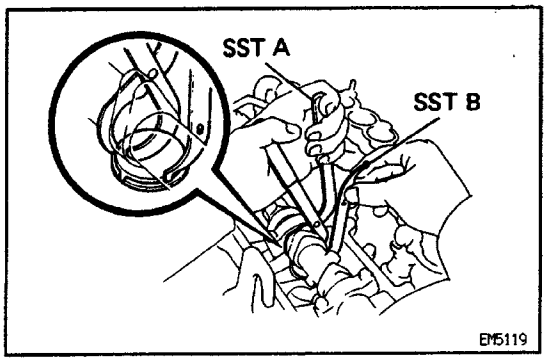
- Select a new shim with a thickness as close as possible to the calculated value.



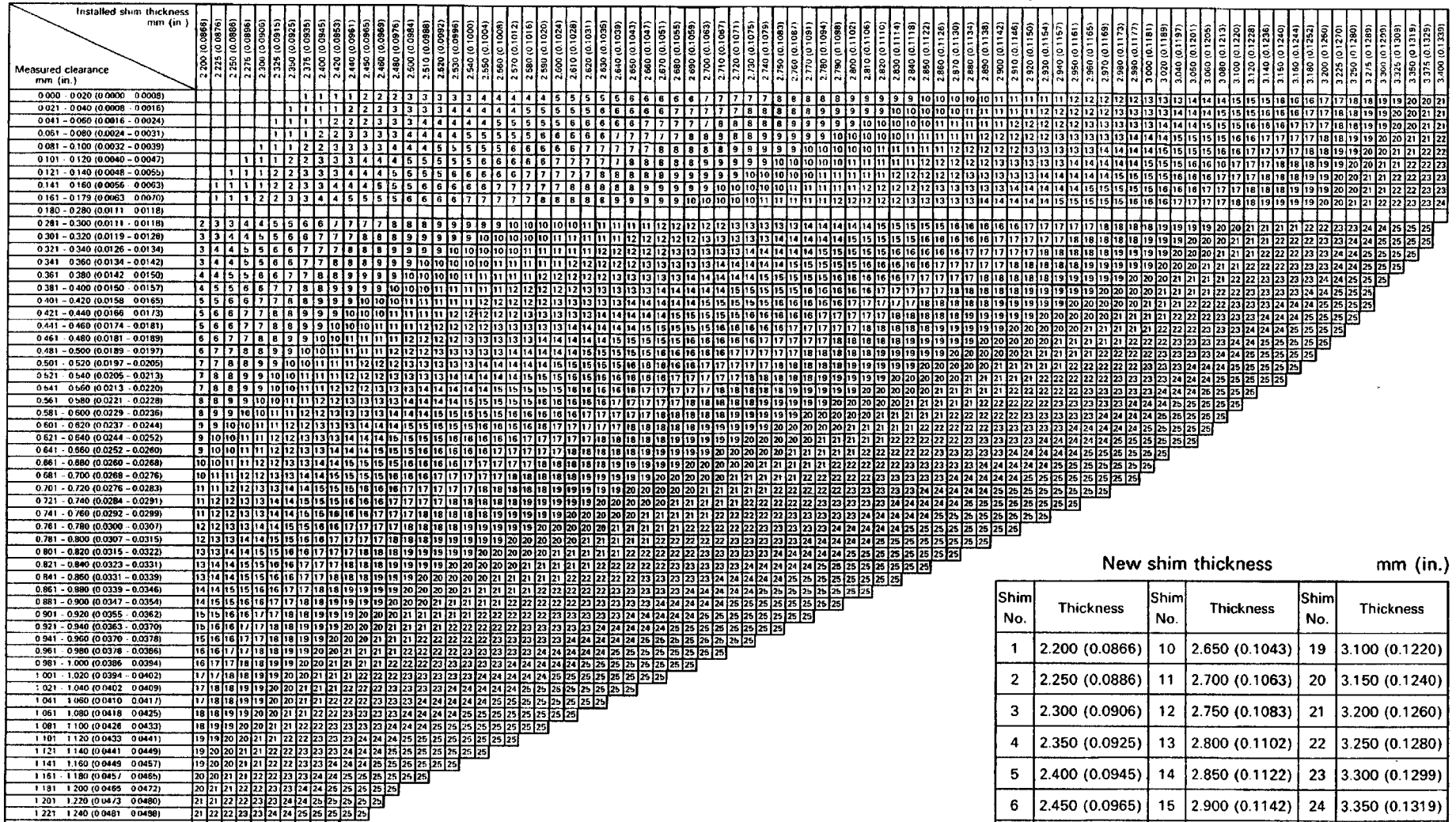
HINT: Shims are available in twenty–five sized in increments of 0.05 mm (0.0020 ire:), from 2.20 mm (0.09B4 in.) to 3.40 mm (0.1299 in.).

(c) Install a new adjusting shim.

- Place a new adjusting shim on the valve lifter.
- Using SST (A), press down the valve lifter and remove SST (B).
  SST 09248 – 55020 (09248–05011, 09248–05021)



Adjusting Shim Selection Chart (Intake)



Intake valve clearance (Cold):

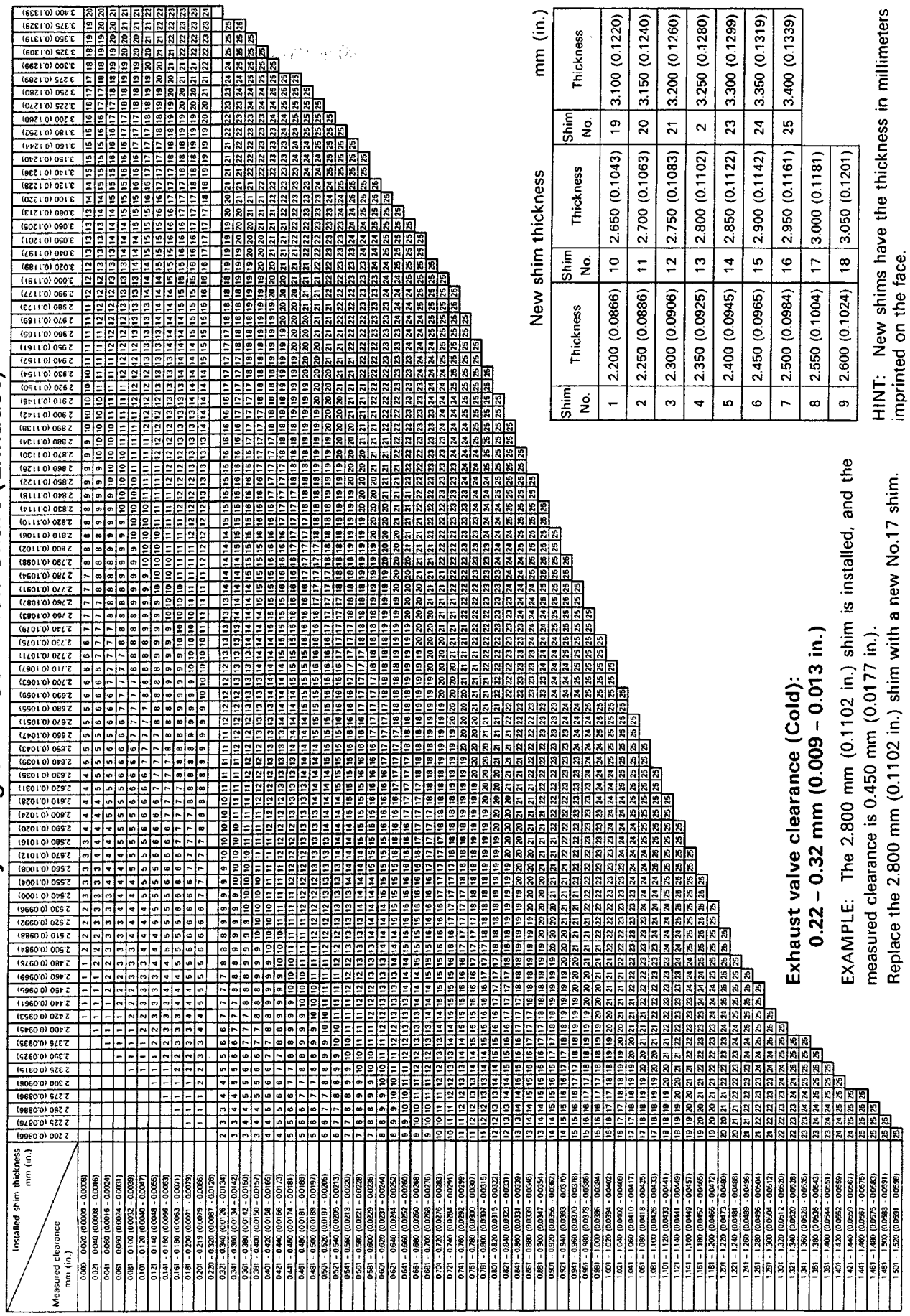
0.18 – 0.28 mm (0.007 – 0.011 in.)

EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.450 mm (0.0177 in.).
Replace the 2.800 mm (0.1102 in.) shim with a new No.17 shim.

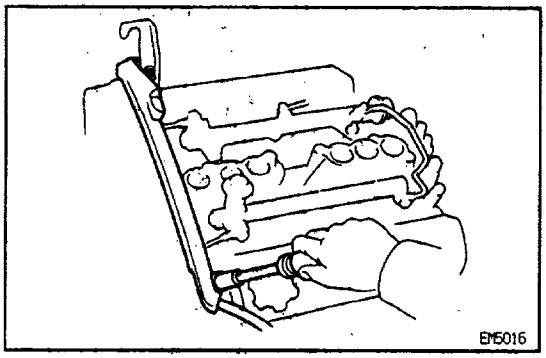
New shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness	Shim No.	Thickness
1	2.200 (0.0866)	10	2.650 (0.1043)	19	3.100 (0.1220)
2	2.250 (0.0886)	11	2.700 (0.1063)	20	3.150 (0.1240)
3	2.300 (0.0906)	12	2.750 (0.1083)	21	3.200 (0.1260)
4	2.350 (0.0925)	13	2.800 (0.1102)	22	3.250 (0.1280)
5	2.400 (0.0945)	14	2.850 (0.1122)	23	3.300 (0.1299)
6	2.450 (0.0965)	15	2.900 (0.1142)	24	3.350 (0.1319)
7	2.500 (0.0984)	16	2.950 (0.1161)	25	3.400 (0.1339)
8	2.550 (0.1004)	17	3.000 (0.1181)		
9	2.600 (0.1024)	18	3.050 (0.1201)		

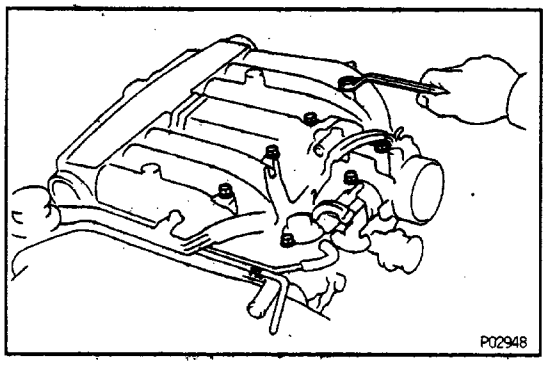
HINT: New shims have the thickness in millimeters imprinted on the face.


Adjusting Shim Selection Chart (Exhaust)
Installed shim thickness mm (in.)
Measured clearance mm (in.)
Exhaust valve clearance (Cold):
0.22 – 0.32 mm (0.009 – 0.013 in.)
EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.450 mm (0.0177 in.).
Replace the 2.800 mm (0.1102 in.) shim with a new No.17 shim.
New shim thickness
mm (in.)
Shim No. | Thickness | Shim No. | Thickness | Shim No. | Thickness
1 | 2.200 (0.0866) | 10 | 2.650 (0.1043) | 19 | 3.100 (0.1220)
2 | 2.250 (0.0886) | 11 | 2.700 (0.1063) | 20 | 3.150 (0.1240)
3 | 2.300 (0.0906) | 12 | 2.750 (0.1083) | 21 | 3.200 (0.1260)
4 | 2.350 (0.0925) | 13 | 2.800 (0.1102) | 2 | 3.250 (0.1280)
5 | 2.400 (0.0945) | 14 | 2.850 (0.1122) | 23 | 3.300 (0.1299)
6 | 2.450 (0.0965) | 15 | 2.900 (0.1142) | 24 | 3.350 (0.1319)
7 | 2.500 (0.0984) | 16 | 2.950 (0.1161) | 25 | 3.400 (0.1339)
8 | 2.550 (0.1004) | 17 | 3.000 (0.1181)
9 | 2.600 (0.1024) | 18 | 3.050 (0.1201)
HINT: New shims have the thickness in millimeters imprinted on the face.

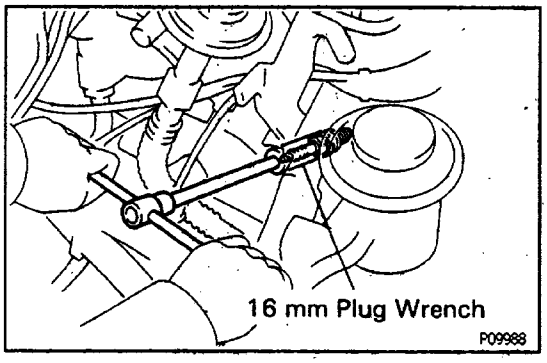
V02187



9. INSTILL CYLINDER HEAD COVERS
(See step 7 on page EG2–80)
10. INSTALL ENGINE WIRE
Install the engine wire with the two bolts.



11. INSTALL AIR INTAKE CHAMBER
(See step 24 on pages EG2–84 to 87)



12. INSTALL SPARK PLUGS
Using a 16 mm plug wrench, install the six spark plugs.

Torque: 18 N–m (18a kgf–cm, 13 ft–lbf)

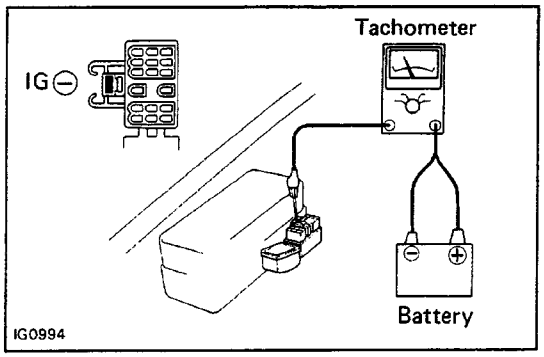
13. RECONNECT– HIGH –TENSION CORDS TO SPARK PLUGS

EG1ZF–01

IGNITION TIMING INSPECTION AND ADJUSTMENT

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

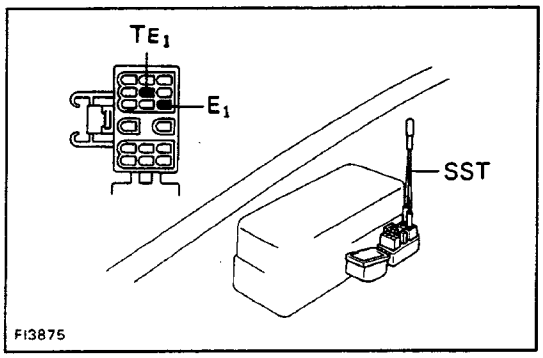


2. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE

Connect the test probe of a tachometer to terminal IG (–) of the data link connector 1.

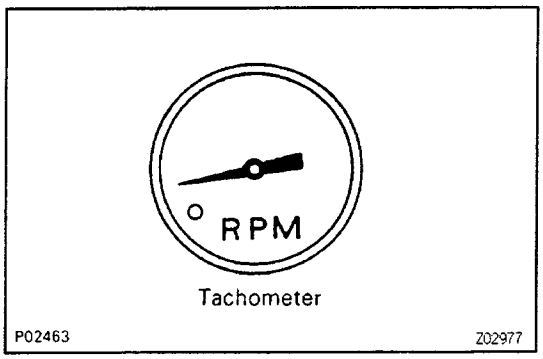
NOTICE:

- Never allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.
- As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.



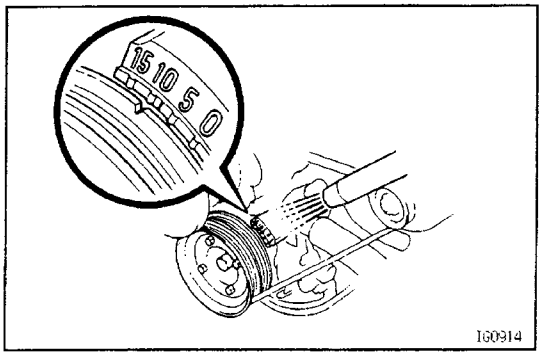
3. ADJUST IGNITION TIMING

(a) Using SST, connect terminals TE1 and E1 of the the data link connector 1.
SST 09843–18020



(b) Check the idle speed.

Idle speed:
800 ± 50 rpm

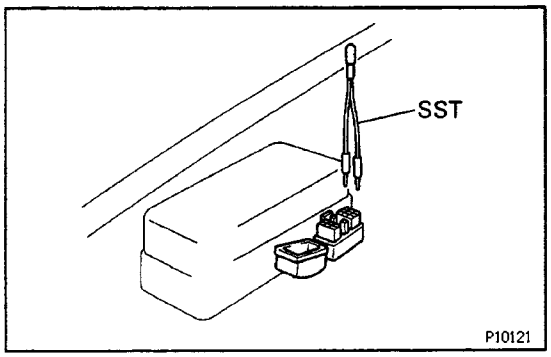


(c) Using a timing light, check the ignition timing.

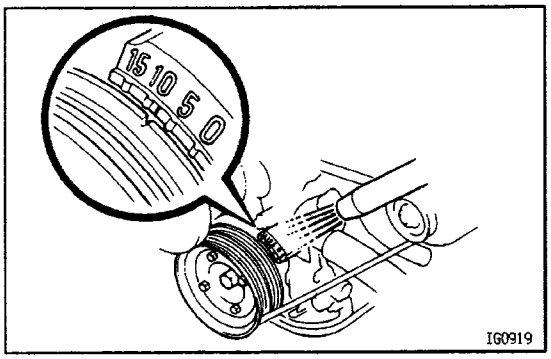
Ignition timing:
10 • BTDC @ idle
(Transmission in neutral position)

(d) Loosen the hold–down bolt, and adjust by turning the distributor.

(e) Tighten the hold–down bolt, and recheck the ignition timing.
Torque: 18N–m (185 kgf–cm, 13 ft–lbf)



(f) Remove the SST from the data link connector 1.
SST 09843–18020



4. FURTHER CHECK IGNITION TIMING

Check that the ignition timing advances.
Ignition timing:
8° BTDC @ idle

5. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

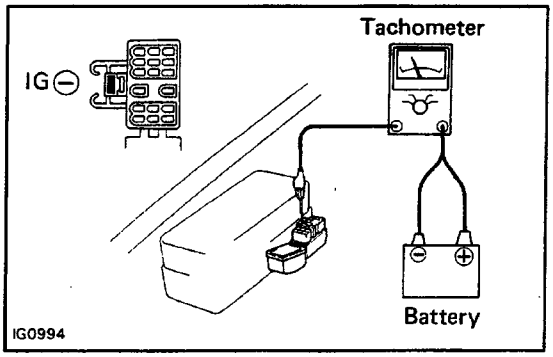
IDLE SPEED INSPECTION AND ADJUSTMENT

1. INITIAL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected
HINT: All vacuum hoses for EGR systems, etc. should be properly connected.
(f) MFI system wiring connectors fully plugged
(g) Ignition timing set correctly
(h) Transmission in neutral position

2. CONNECT TACHOMETER

Connect the test probe of a tachometer to terminal IG (–) of the data link connector 1.

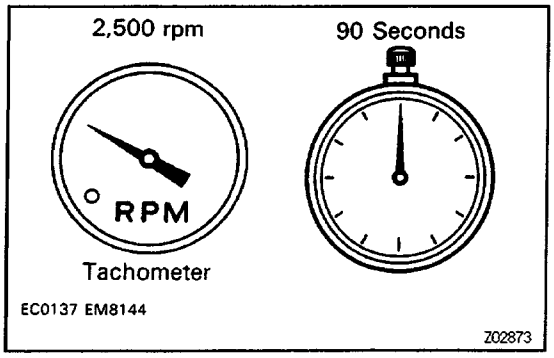


NOTICE:

- **INever allow the tachometer terminal to touch ground as it could result in damage to the ign¿ter and/or. ignition coil.**
- **As some tachometers are not compatible with thisignition system, we recommend that you confirm the compatibility of your unit before use.**

3. ADJUST IDLE SPEED

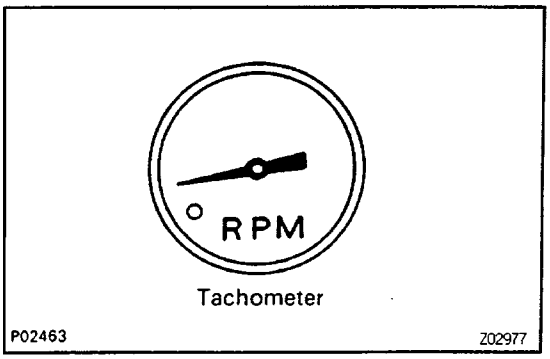
(a) Race the engine speed at 2,500 rpm for approx. 90 seconds.



(b) Check the idle speed.

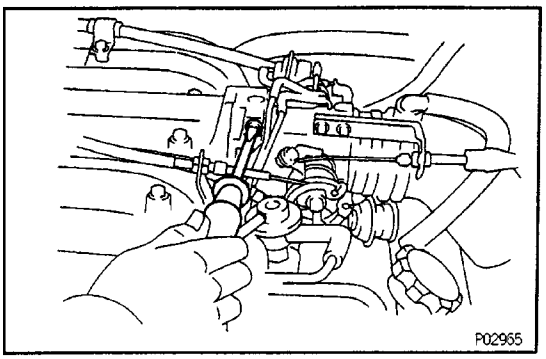
Idle speed:

800 ± 50 rpm



(c) Adjust the idle speed by turning the idle speed adjusting screw.

4. DISCONNECT TACHOMETER



IDLE AND OR 2500 RPM CO HC CHECK

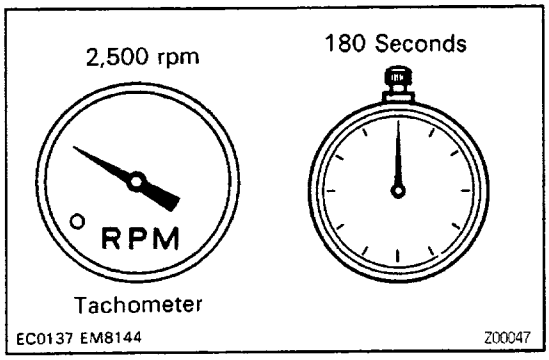
HINT: This check is used only to determine whether or not the idle CO/HC complies with regulations.

1. INITIAL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected

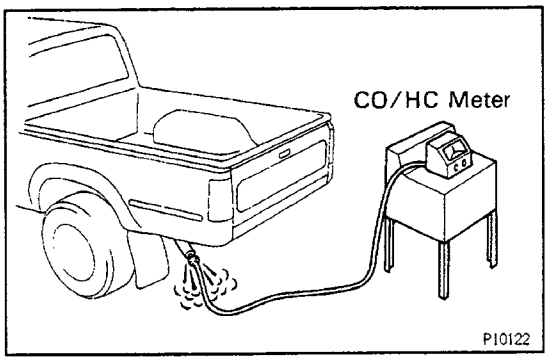
HINT: All vacuum hoses for EGR systems, etc. should be properly connected.

(f) MFI system wiring connectors fully plugged
(g) Ignition timing set correctly
(h) Idle speed set correctly
(i) Transmission in neutral position
(j) Tachometer and CO/HC meter calibrated by hand



2. START ENGINE

3. RACE ENGINE AT 2,500 RPM FOR APPROX. 180 SECONDS



4. INSERT CO/HC METER TESTING PROBE INTO TAILPIPE AT LEAST 40 cm (1.3 ft) DURING IDLING

5. IMMEDIATELY CHECK CO/HC CONCENTRATION AT IDLE AND/OR 2,500 RPM

HINT: When performing the 2 mode (2,500 rpm and idle) test, follow the measurement order prescribed by the applicable local regulations.

Troubleshooting

If the CO/HC concentration does not comply with regulations, perform troubleshooting in the order given below.

(a) Check heated oxygen sensor operation.
(See MFI System on page EG2–252)

(b) See the table below for possible causes, and then inspect and correct the applicable causes if neces–sary.

CO	HC	Problems	Causes
Normal	High	Rough idle	1. Faulty ignitions: • Incorrect timing • Fouled, shorted or improperly gapped plugs • Open or crossed high–tension cords • Cracked distributor cap 2. Incorrect valve clearance 3. Leaky EGR valve 4. Leaky intake and exhaust valves 5. Leaky cylinder
Low	High	Rough idle (Fluctuating HC reading)	1. Vacuum leaks: • PCV hose • EGR valve • Intake manifold • Air intake chamber • Throttle body • Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Plugged PCV valve 3. PAIR system problems 4. Faulty M F I systems: • Faulty pressure regulator • Clogged fuel return line • Defective ECT sensor • Defective intake air temperature sensor • Faulty ECM • Faulty injector • Faulty cold start injector • Faulty throttle position sensor • Faulty volume air flow meter

V02257

COMPRESSION CHECK

HINT: If there is lack of power, excessive oil con–sumptiom or poor fuel economy, measure the com–pression pressure.

1. WARM UP AND STOP ENGINE

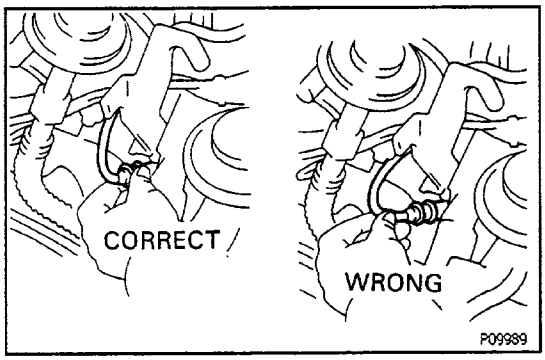
Allow the engine to warm up to normal operating temperature.

2. REMOVE AIR CLEANER HOSE

3. DISCONNECT COLD START INJECTOR CONNECTOR

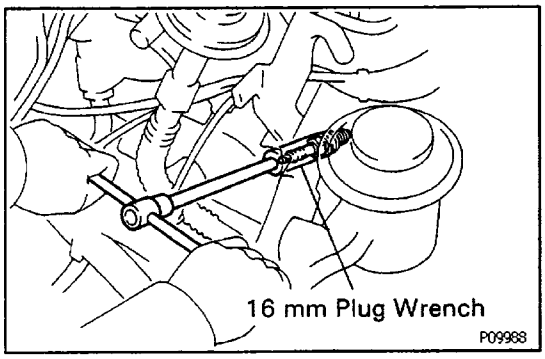
4. DISCONNECT IGNITER CONNECTOR

5. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS



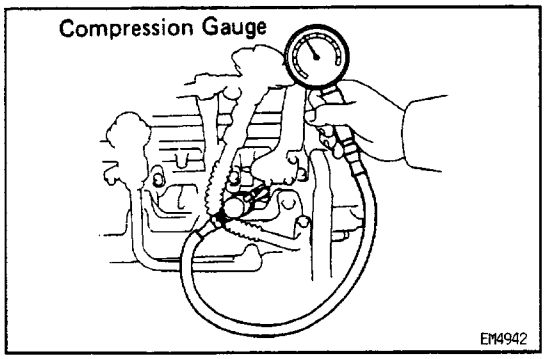
Disconnect the high – tension cords at the rubber boot. Do not pull on the cords.

NOTICE: Pulling on or bending the cords may damage the conductor inside.



6. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the six spark plugs.



7. CHECK CYLINDER COMPRESSION PRESSURE

(a) Insert a compression gauge into the spark plug hole.
(b) Fully open the throttle.
(c) While cranking the engine, measure the compression pressure.

HINT: Always use a fully charged battery to obtain engine speed of 250 rpm or more.

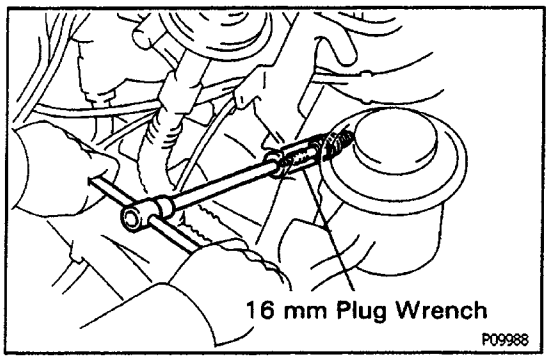
(d) Repeat steps
(a) through
(c) for each cylinder.

NOTICE: This measurement must be done in as short a time as possible.

Compression pressure:
1,177 kPa (12.0 kg f/cm^2, 171 psi) .
Minimum pressure:
981 kPa (10.0 kg f/cm^2, 142 psi)
Difference between each cylinder:
98 kPa (1.0 kg f/cm^2, 14 psi) or less

(e) If the cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylin–der through the spark plug hole and repeat steps (a) through (c) for cylinders with low compression.

- If adding oil helps the compression, chances are that the piston rings and/or cylinder bore are worn or damage.
- If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.



8. REINSTALL SPARK PLUGS

Using a 16 mm plug wrench, install the six spark plugs.

Torque: 18 N–m (780 kgf–cm, 13 ft–lbf)

9. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS

10. CONNECT IGNITER CONNECTOR

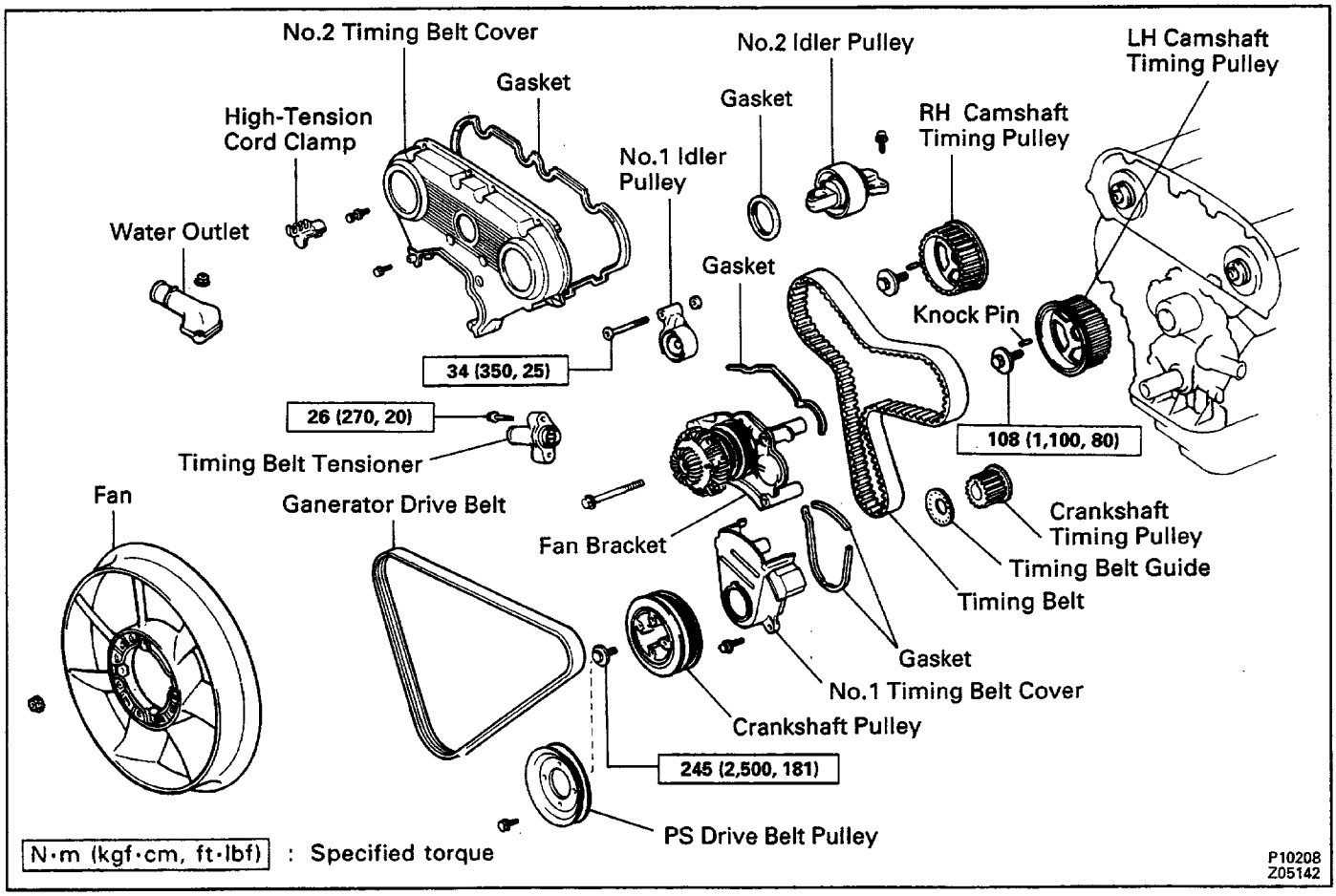
11. CONNECT COLD START INJECTOR CONNECTOR

12. INSTALL AIR CLEANER HOSE

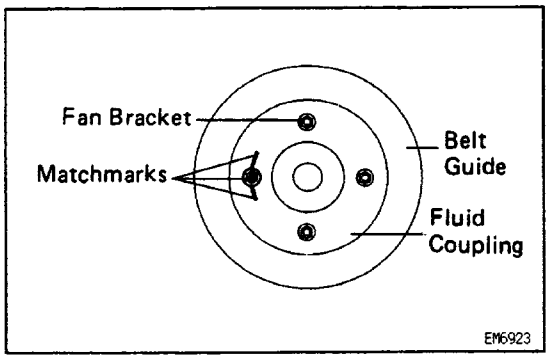
TIMING BELT

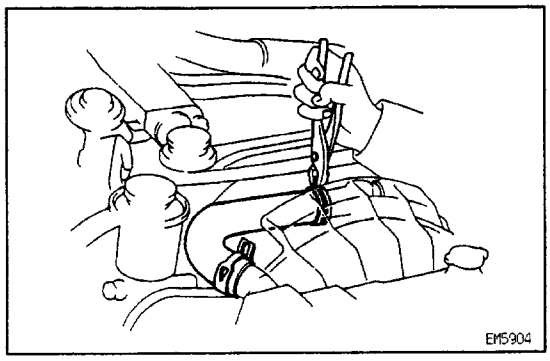
EG1E5–02

COMPONENTS



EG205–01





TIMING BELT REMOVAL

(See Components)

NOTICE: If removing and later reinstalling the fluid coupling from the fan bracket, place matchmarks on the fluid coupling and fan bracket so that the fluid coupling can be replaced exactly as before.

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. REMOVE ENGINE UNDER COVER

3. DRAIN ENGINE COOLANT

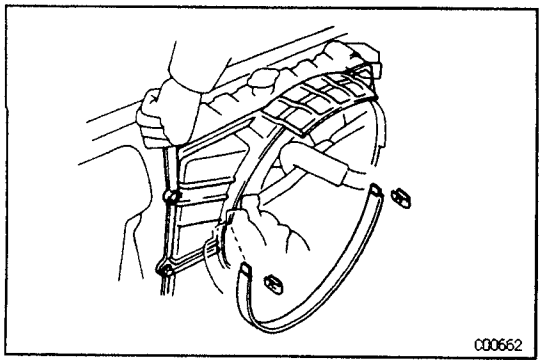
4. REMOVE RADIATOR

(a) Disconnect the reservoir hose.

(b) (A/T only)

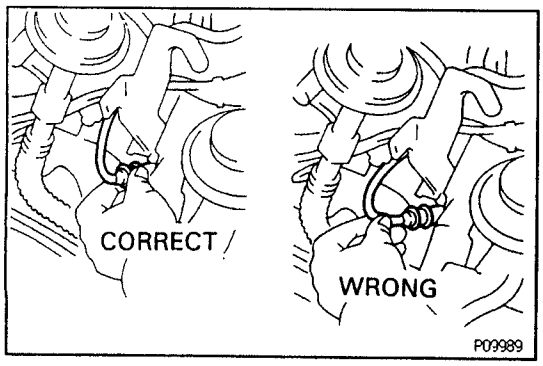
Disconnect the oil cooler hoses.

(c) Remove the radiator hoses.



(d) Remove the two clips and No.2 fan shroud.
(e) Remove the four bolts and No.1 fan shroud.
(f) Remove the four bolts and radiator.

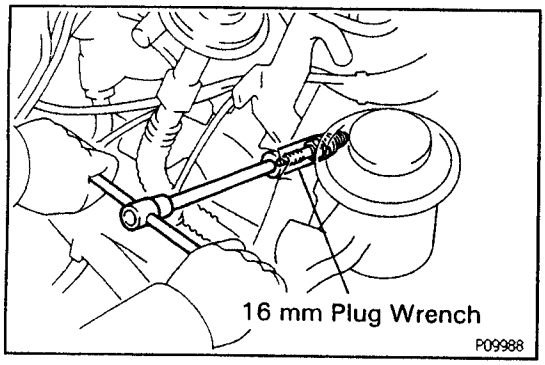
5. DISCONNECT N0.2 AND NO.3 AIR HOSES FROM AIR PIPE



6. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS

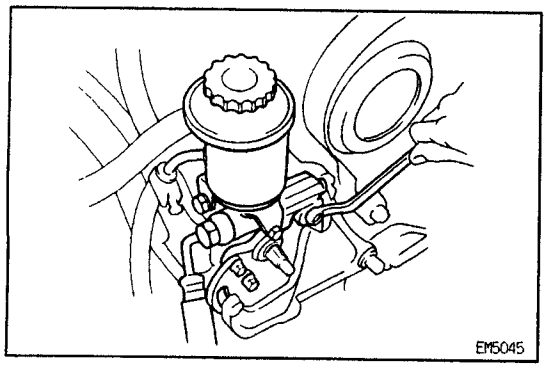
Disconnect the high – tension cords at the rubber boot. Do not pull on the cords.

NOTICE: Pulling on or bending the cords may damage the conductor inside.

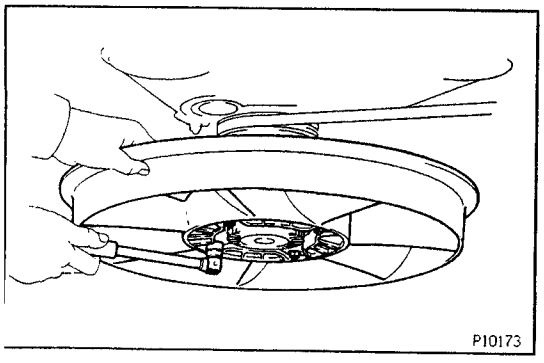


7. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the six spark plugs.



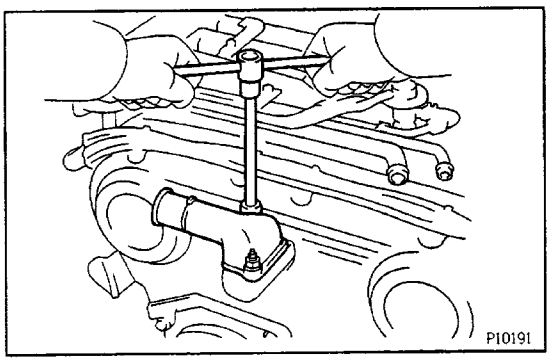
8. REMOVE PS DRIVE BELT AND PUMP PULLEY
9. DISCONNECT PS PUMP FROM ENGINE
10. REMOVE A/C DRIVE BELT



11. REMOVE COOLING FAN

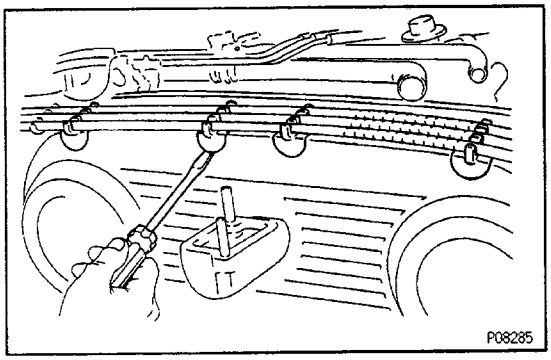
Remove the four nuts and cooling fan.

12. REMOVE GENERATOR DRIVE BELT



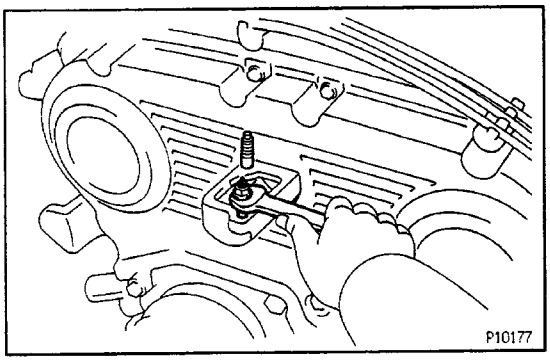
13. REMOVE WATER OUTLET

Remove the two nuts and water outlet.

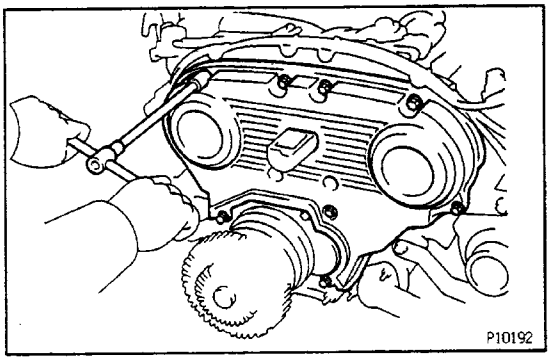


14. REMOVE NO.2 TIMING BELT COVER

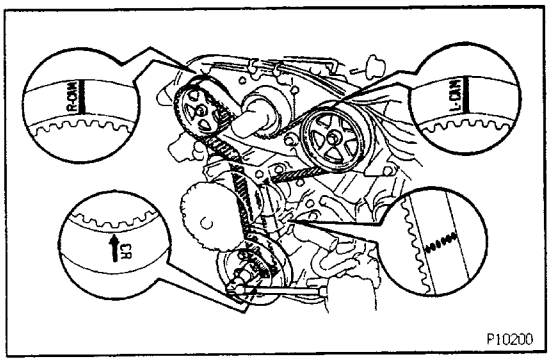
(a) Using a screwdriver, disconnect the four high–tension cord clamps from the mounting bolts of the No.2 timing belt cover.



(b) Using the two water inlet nuts, remove the two stud bolts.



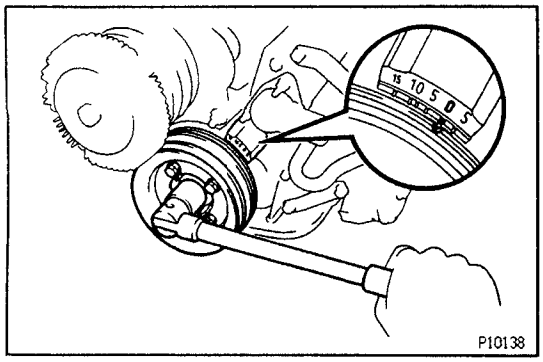
(c) Remove the eleven bolts, timing belt cover and three gaskets.



15. IF RE–USING TIMING BELT, CHECK INSTALLATION MARKS ON TIMING BELT

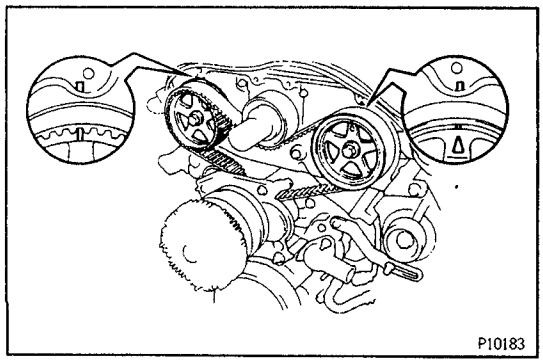
Check that there are four installation marks on the timing belt by turning the crankshaft pulley as shown in the illustration.

HINT: If the installation marks have disappeared, place a new installation mark on the timing belt before removing each part.

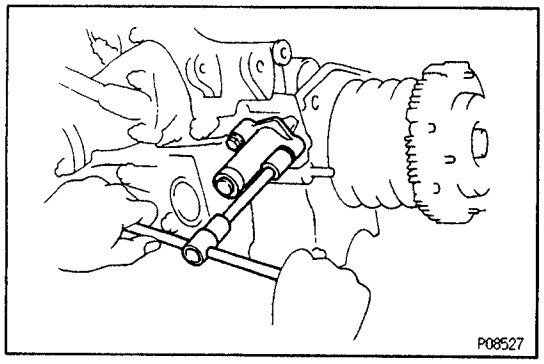


16. SET NO.1 CYLINDER AT TDC/COMPRESSION

(a) Turn the crankshaft pulley and align its groove with timing mark ”0” of the No.1 timing belt cover.

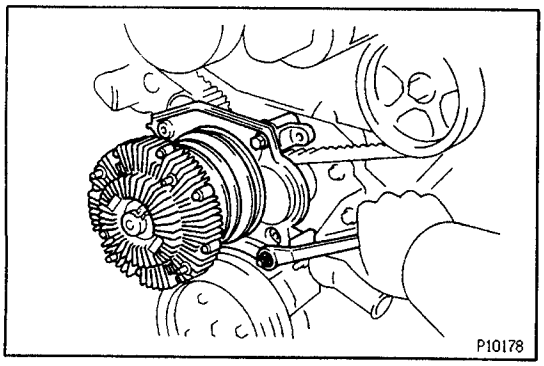


(b) Check that the timing marks of the camshaft timing pulleys and No.3 timing belt cover are aligned. If not, turn the crankshaft pulley one revolution (360°).



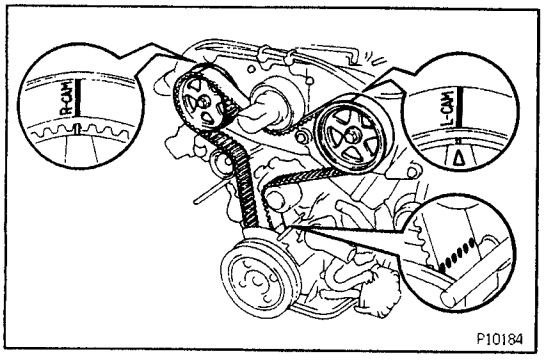
17. REMOVE TIMING BELT TENSION ER

Alternately loosen the two bolts, and remove them, the belt tensionet– and dust boot.



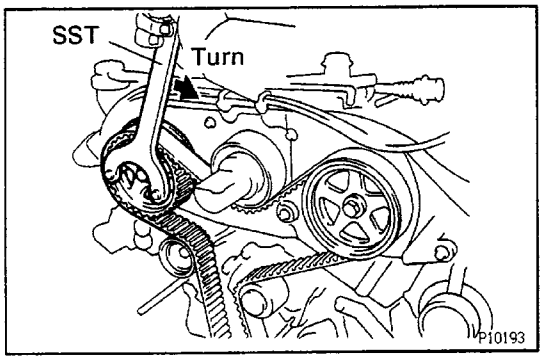
18. REMOVE FAN BRACKET

Remove the two bolts, nut, fan bracket and gasket.

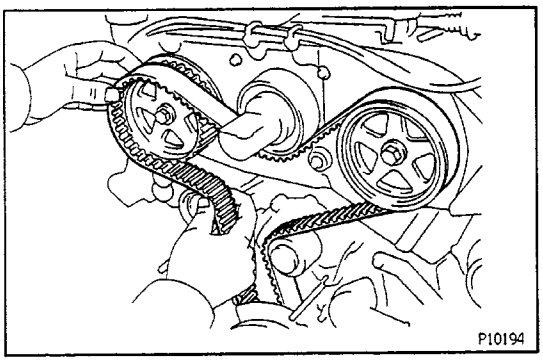


19. DISCONNECT TIMING BELT FROM CAMSHAFT TIMING PULLEYS

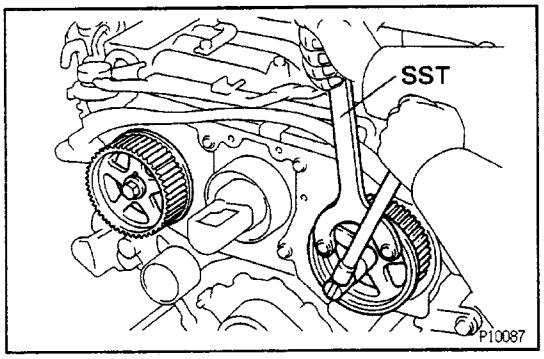
HINT (When re–using timing belt): If the installation marks have disappeared, before disconnect the timing belt from the camshaft timing pulleys, place new in–stallation marks on the timing belt to match the timing marks of the camshaft timing pulleys, and place the a new installation mark on the timing belt to match the end of the No. 1 timing belt. cover.



(a) Using SST, loosen the tension spring between the LH and RH camshaft timing pulleys by slightly turning the LH camshaft timing pulley clockwise.

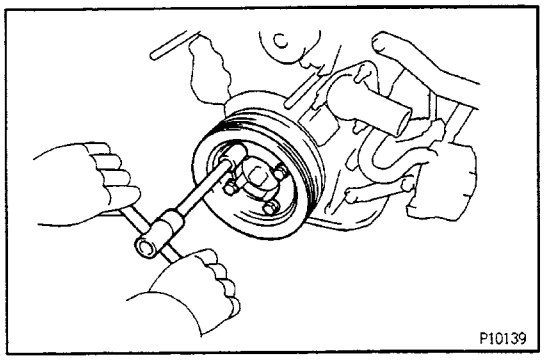


(b) Disconnect the timing belt from the camshaft timing pulleys.



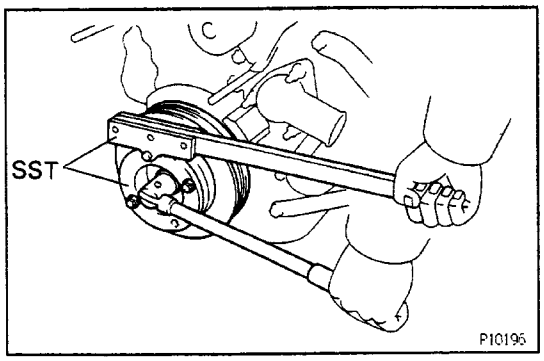
20. REMOVE CAMSHAFT TIMING PULLEYS

Using SST, remove the pulley bolt, timing pulley and knock pin. Remove the two timing pulleys.
SST 09278–54012



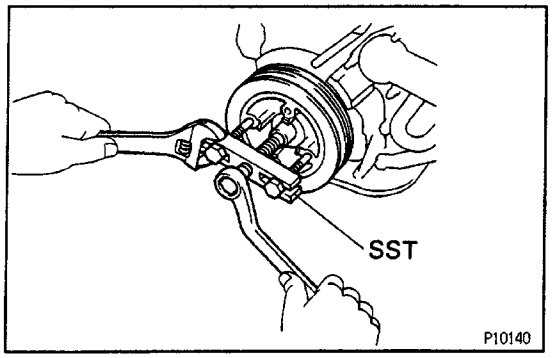
21. REMOVE CRANKSHAFT PULLEY

(a) Remove the four bolts and PS drive belt pulley.

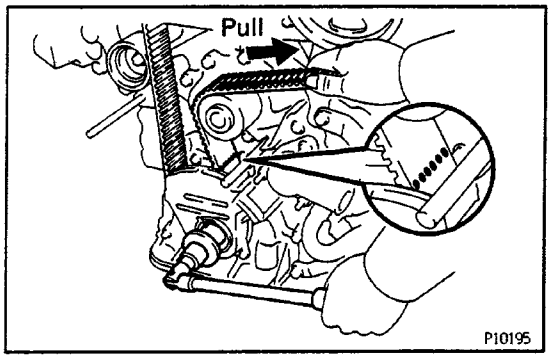


(b) Using SST, loosen the pulley bolt.
SST 09213–58012 (90201–08131, 91111–50845), 09330–00021

(c) Remove the SST and pulley bolt.

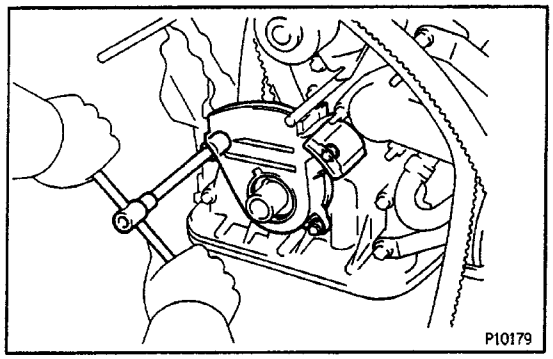


(d) Using SST, remove the pulley.
SST 09213–31021

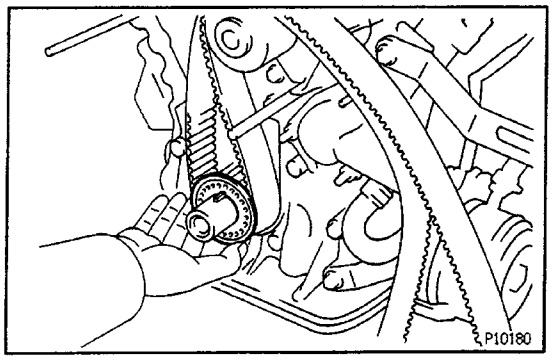


22. REMOVE N0.1 TIMING BELT COVER

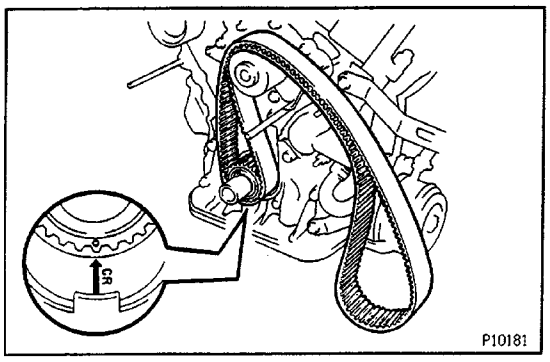
HINT (When re–using timing belt): Before removing the timing belt cover, using the crankshaft pulley bolt, turn the crankshaft and align the installation mark of the timing belt with the end of the timing belt cover.



Remove the three bolts, timing belt cover and gasket.

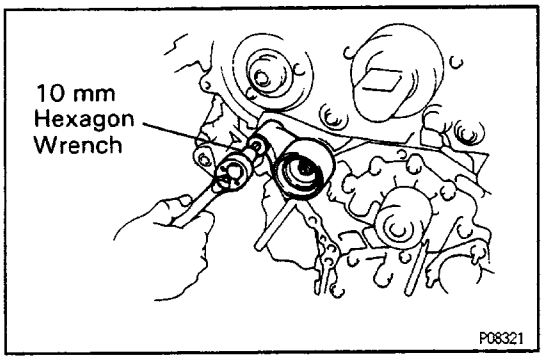


23. REMOVE TIMING BELT GUIDE



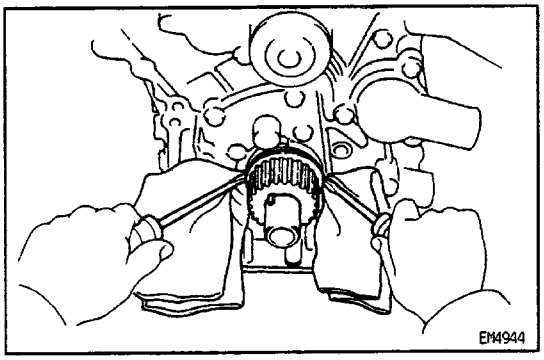
24. REMOVE TIMING BELT

HINT (When re–using timing belt): If the installation marks have disappeared, place a new installation mark on the timing belt to the match the dot mark of the crankshaft timing pulley.



25. REMOVE No.1 IDLER PULLEY

Using a 10 mm hexagon wrench, remove the pivot bolt, idler pulley and plate washer.

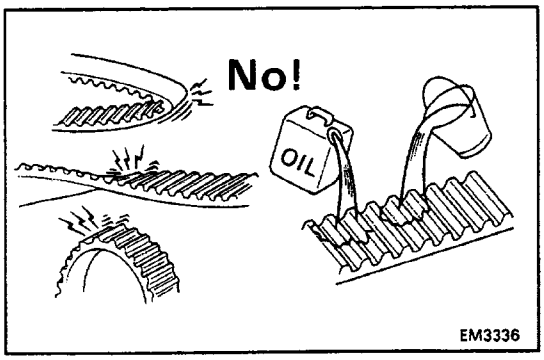


26. REMOVE CRANKSHAFT TIMING PULLEY

If the timing pulley cannot be removed by hand, use two screwdrivers.

HINT: Position shop rags as shown to prevent damage.

TIMING BELT COMPONENTS INSPECTION



1. INSPECT TIMING BELT

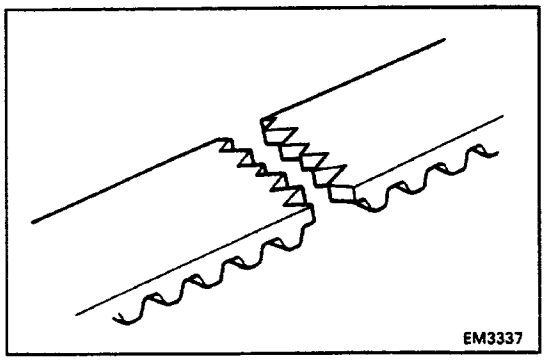
NOTICE:

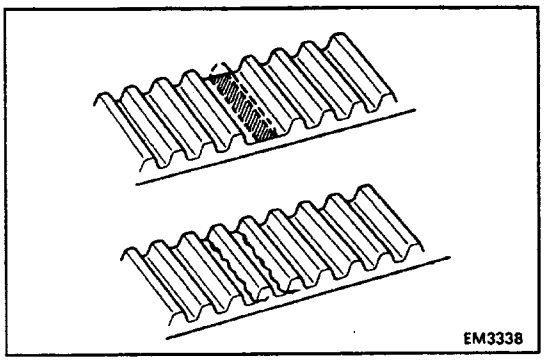
- **Do not bend, twist or turn the timing belt inside out. Do not allow the timing belt to come into contac with oil, water or steam.**
- **Do not utilize timing belt tension when installing or removing the mounting bolt of the camshaft timing pulley.**

If there are any defects as shown in the illustration, check the following points:

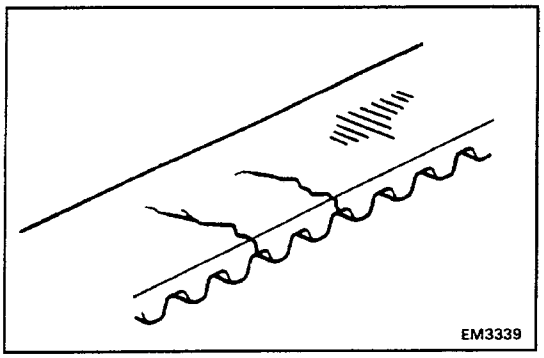
(a) Premature parting

- Check the proper installation.
- Check the timing cover gasket f6r damage and proper installation.

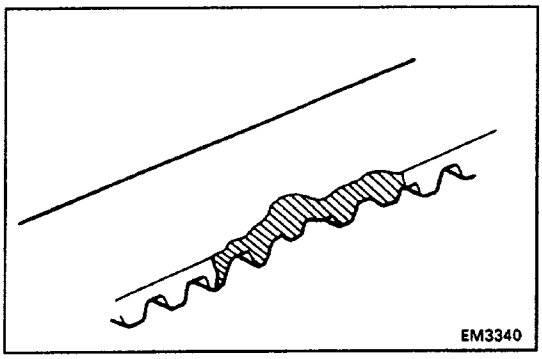




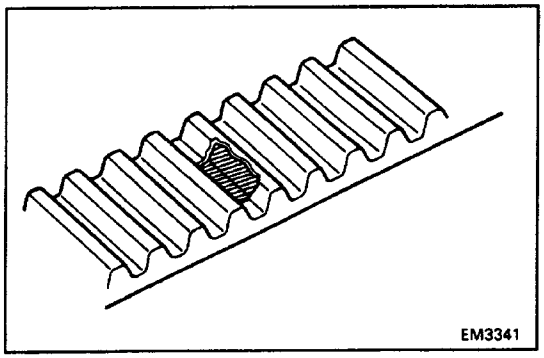
(b) If the belt teeth are cracked or damaged, check to see if either camshaft or water pump is locked.



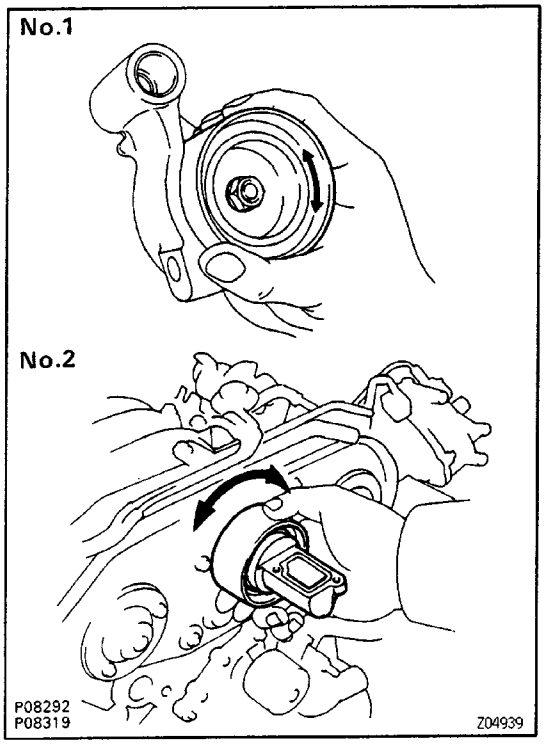
(c) If there is noticeable wear or cracks on the belt face; check to see if there are nicks on the side of the idle pulley lock.



(d) If there is wear or damage on only one side of the belt, check the belt guide and the alignment of each pulley.

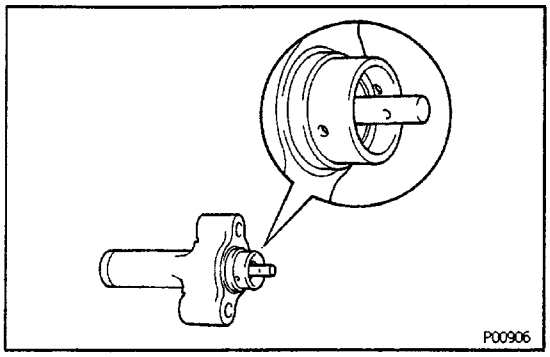


(e) If there is noticeable wear on the belt teeth, check the timing cover for damage, correct gasket installation, and foreign material on the pulley teeth.
If necessary, replace the timing belt.



2. INSPECT IDLER PULLEYS

Check that the idler pulley turns smoothly.
If necessary, replace the idler pulley.

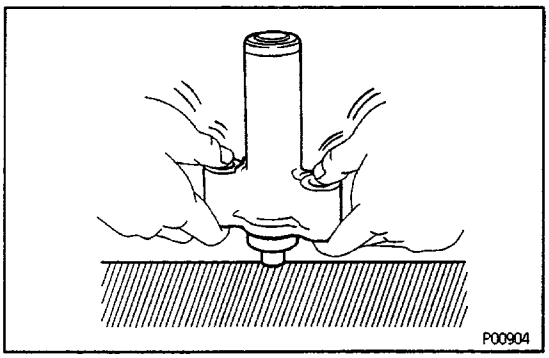


3. INSPECT TIMING BELT TENSIONER

(a) Visually check tensioner for oil leakage.

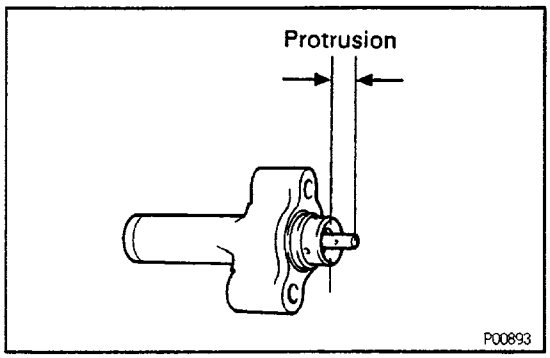
HINT: If there is only the faintest trace of oil on the seal on the push rod side, the tensioner is all right.

If leakage is found, replace the tensioner.



(b) Hold the tensioner with both hands, and push the push rod firmly against the floor or wall to check that it doesn't move.

If the push rod moves, replace the tensioner.



(c) Measure the protrusion of the push rod from the housing end.

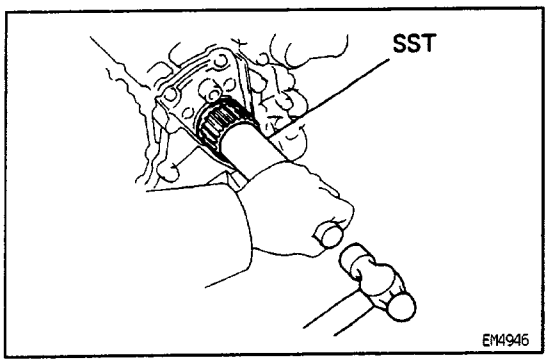
Protrusion:

10.0 – 10.5 mm (0.394 – 0.413 in.)

If the protrusion is not as specified, replace the ten–sioner.

EG20F–01

TIMING BELT INSTALLATION

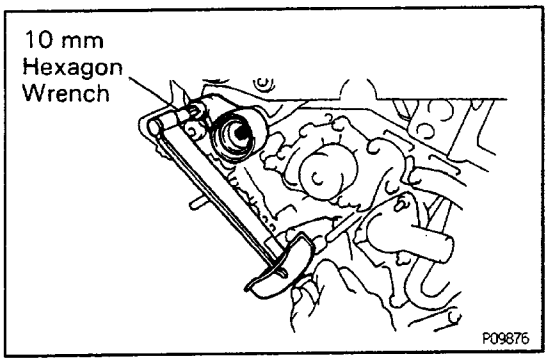


(See Components)

1. INSTALL CRANKSHAFT TIMING PULLEY

(a) Align the timing pulley set key with the key groove of the pulley.

(b) Using SST and a hammer, tap in the timing pulley, facing the flange side inward.
SST 09214–60010

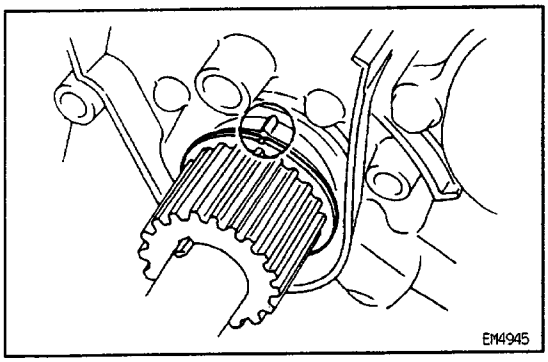


2. INSTALL NO.1 IDLER PULLEY

(a) Using a 10 mm hexagon wrench, install the plate washer and idler pulley with the pivot bolt.

Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)

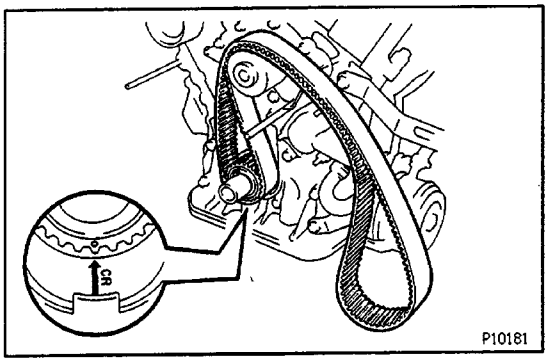
(b) Check that the pulley bracket moves smoothly.



3. TEMPORARILY INSTALL TIMING BELT

NOTICE: The engine should be cold.

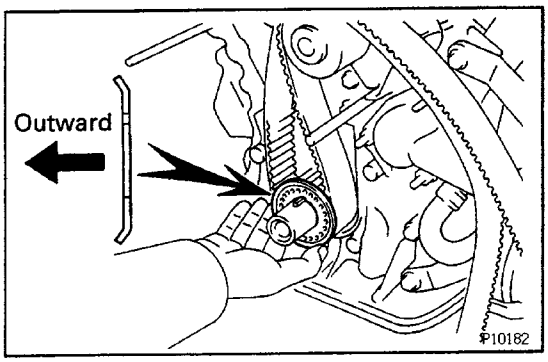
(a) Using the crankshaft pulley bolt, turn the crankshaft and align the timing marks of the crankshaft timing pulley and oil pump body.



(b) Remove any oil or water on the crankshaft timing pulley and water pump pulley, and keep them clean.

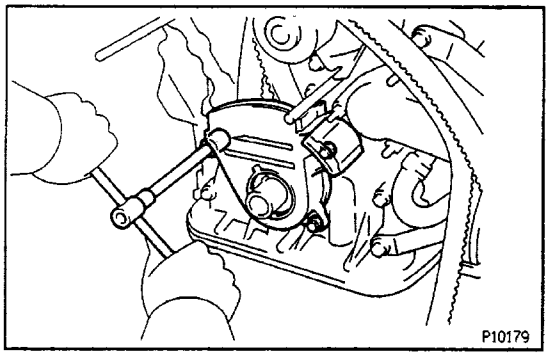
(c) Align the installation mark on the timing belt with the dot mark of the crankshaft timing pulley.

(d) Install the timing belt on the crankshaft timing pulley and water pump pulley.



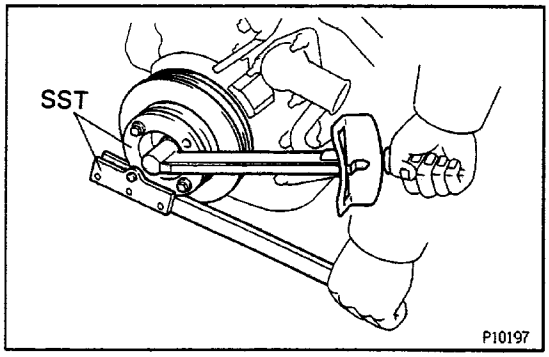
4. INSTALL TIMING BELT GUIDE

Install the belt guide, facing the cup side outward.



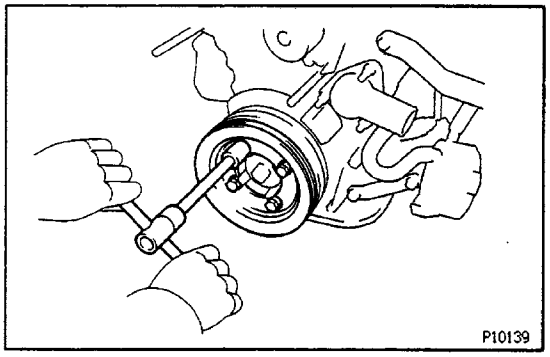
5. INSTALL NO.1 TIMING BELT COVER

(a) Install the gasket to the timing belt cover.
(b) Install the timing belt cover with the three bolts.

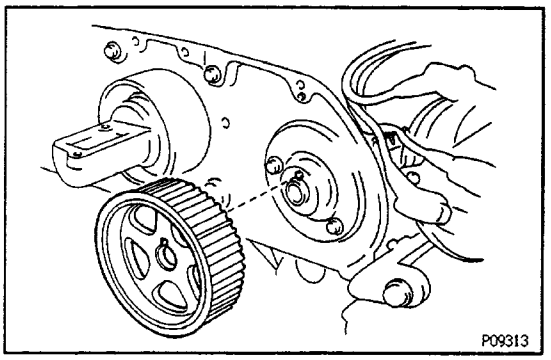


6. INSTALL CRANKSHAFT PULLEY

(a) Align the pulley set key with the key groove of the crankshaft pulley.
(b) Temporarily install the pulley bolt.
(c) Using SST, tighten the pulley bolt.
SST 09213–58012 (90201 –08131, 91111 –50845), 09330–00021
Torque: 245 N–m (2,500 kgf–cm, 181 ft–lbf)

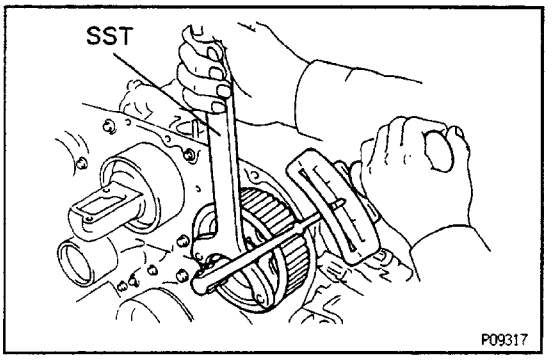


(d) Install the PS drive belt pulley with the four bolts.

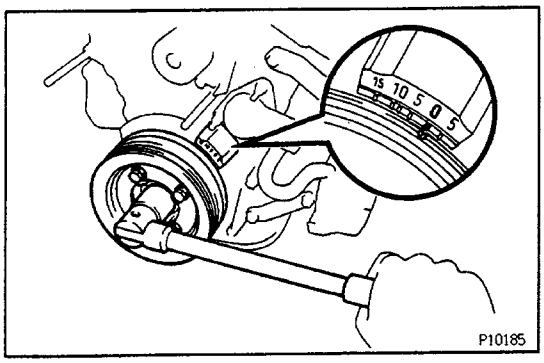


7. INSTALL LH CAMSHAFT TIMING PULLEY

(a) Install the knock pin to the camshaft.
(b) Align the knock pin hole of the camshaft with the knock pin groove of the timing pulley.
(c) Slide the timing pulley on the camshaft, facing the flange side outward.



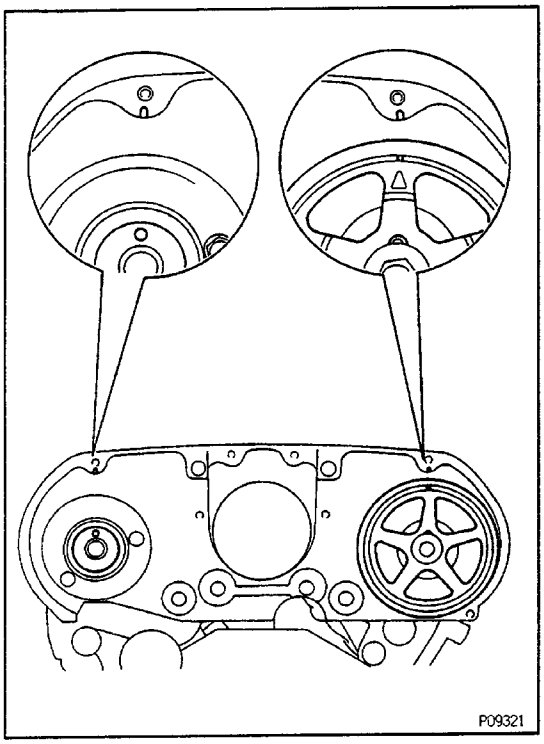
(d) Using SST, install the pulley bolt.
SST 09278–54012
Torque: 108 N–m (1,100 kgf–cm, 80 ft–lbf)



8. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) (Crankshaft Position)

Turn the crankshaft pulley, and align its groove with timing mark ”0” of the No.1 timing belt cover.

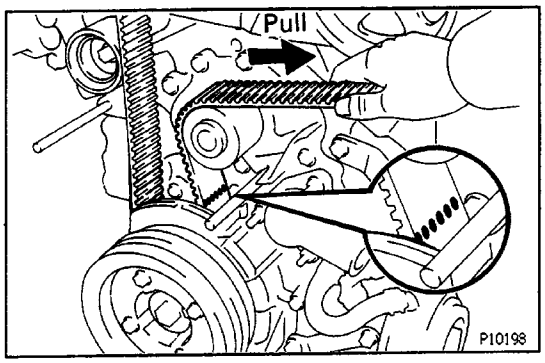


(b) (RH Camshaft Pulley Position)

Turn the camshaft, align the knock pin hole of the camshaft with the timing mark of the No.3 timing belt cover.

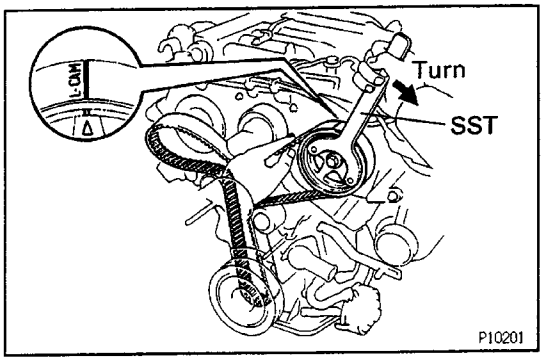
(c) (LH Camshaft Pulley Position)

Turn the camshaft timing pulley, align the timing marks of the camshaft timing pulley and No.3 timing belt cover.



9. CONNECT TIMING BELT TO LH CAMSHAFT TIMING PULLEY

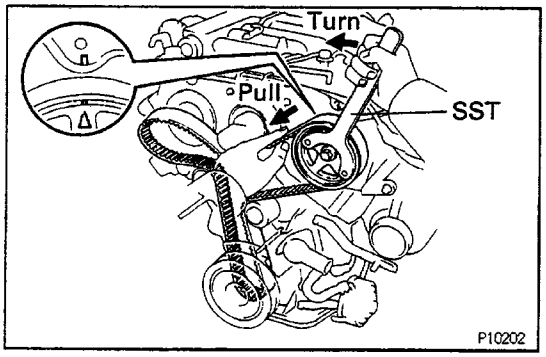
(a) Check that the installation mark on the timing belt is aligned with the end of the No.1 timing belt cover.



(b) Remove any oil or water on the LH camshaft timing pulley, and keep it clean.

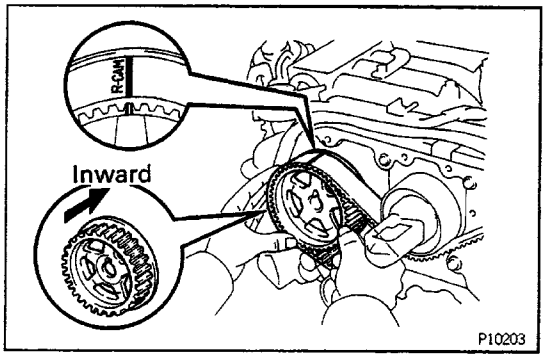
(c) Using SST, slightly turn the LH camshaft timing pulley clockwise. Align the installation mark on the timing belt with the timing mark of the camshaft timing pulley, and hang the timing belt on the LH camshaft timing pulley.

SST 09278–54012



(d) Using SST, align the timing marks of the LH camshaft pulley and No.3 timing belt cover.
SST 09278–54012

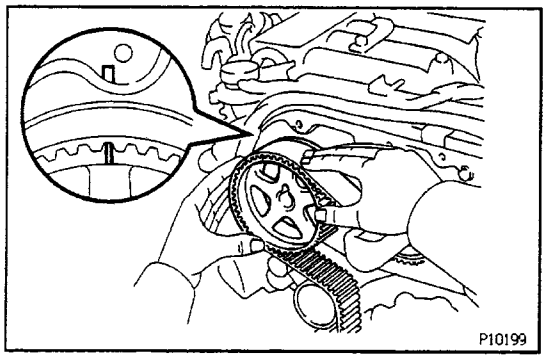
(e) Check that the timing belt has tension between the crankshaft timing pulley and LH camshaft timing pulley.



10. INSTALL RH CAMSHAFT TIMING PULLEY AND TIMING BELT

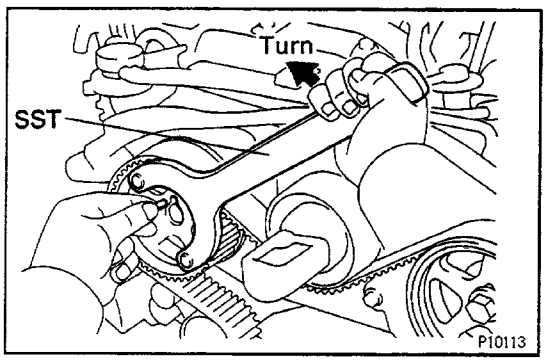
(a) Remove any oil or water on the RH camshaft timing pulley, No. 1 idler pulley and No.2 idler pulley, and keep them clean.

(b) Align the installation mark on the timing belt with the timing mark of the RH camshaft timing pulley, and hang the timing belt on the RH camshaft timing pulley, facing the flange side inward.

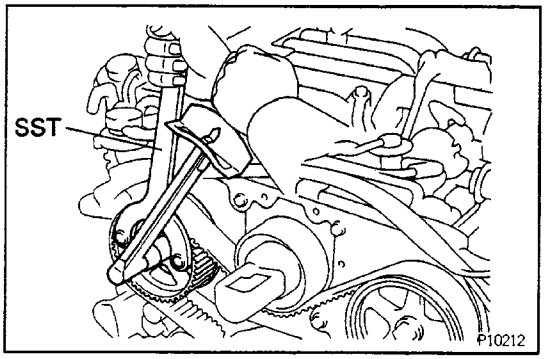


(c) Slide the RH camshaft timing pulley on the camshaft.

(d) Align the timing marks of the RH camshaft timing pulley and No.3 timing belt cover.

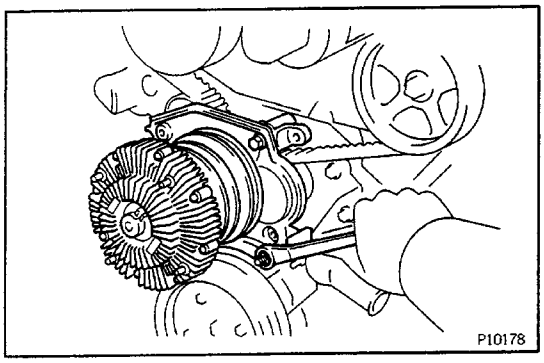


(e) Using SST, align the knock pin hole of the camshaft with the knock pin groove of the pulley and install the knock pin.
SST 08278–54012



(f) Using SST, install the pulley bolt.
SST 09278–54012

Torque: 108 N–m (1,100 kgf–cm, 80 ft–lbf)

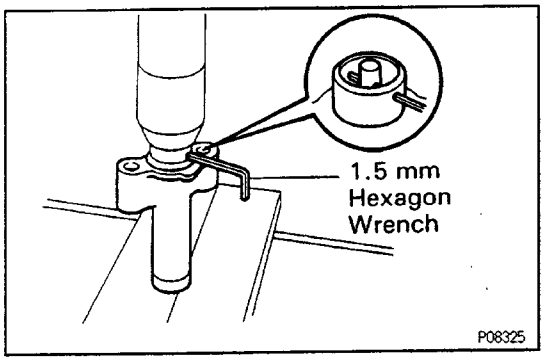


11. INSTALL FAN BRACKET

(a) Install the gasket to the fan pulley bracket.

(b) Install the fan bracket with the two bolts and nut.

Torque: 41 N–m (420 kgf–cm, 30 ft–lbf)

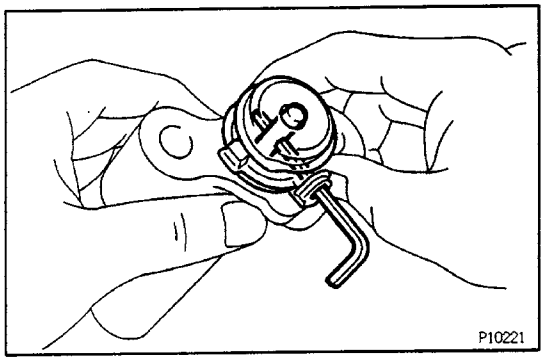


12. SET TIMING BELT TENSIONER

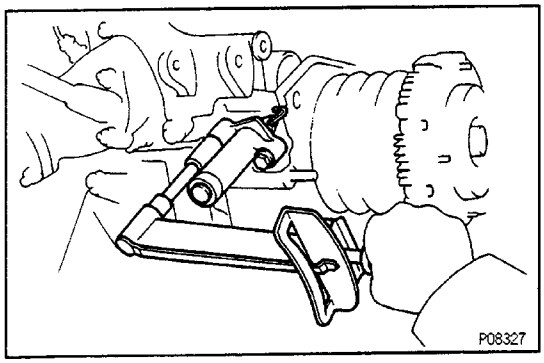
(a) Using a press, slowly press in the push rod using 981 – 9,807 N (100 – 1,000 kgf, 200 – 2,205 lbf) of force.

(b) Align the holes of the push rod and housing, pass a 1.5 mm hexagon wrench through the holes to keep the setting position of the push rod.

(c) Release the press.



(d) Install the dust boot to the tensioner.

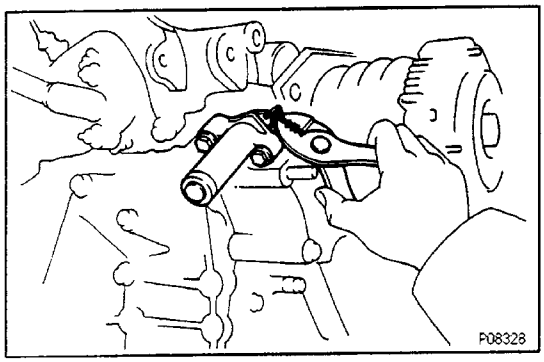


13. INSTALL TIMING BELT TENSIONER

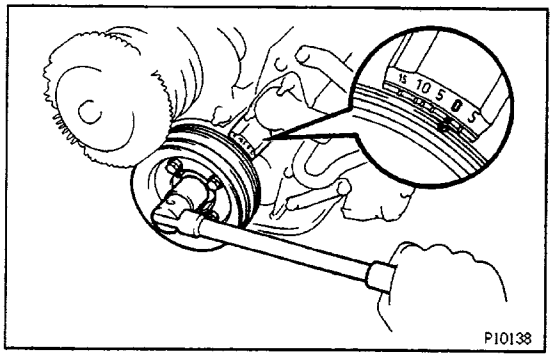
(a) Temporarily install the belt tensioner with the two bolts.

(b) Alternately tighten the two bolts.

Torque: 26 N–m (270 kgf–cm, 20 ft–lbf)

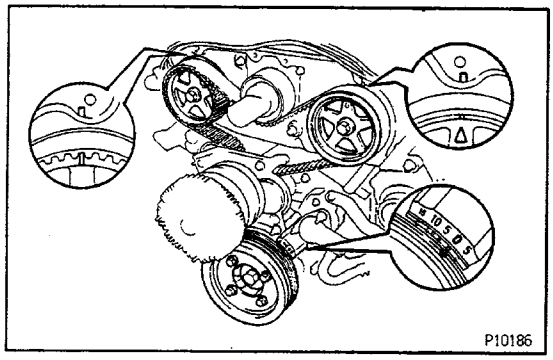


(c) Using pliers, remove the 1.5 mm hexagon wrench from the belt tensioner.

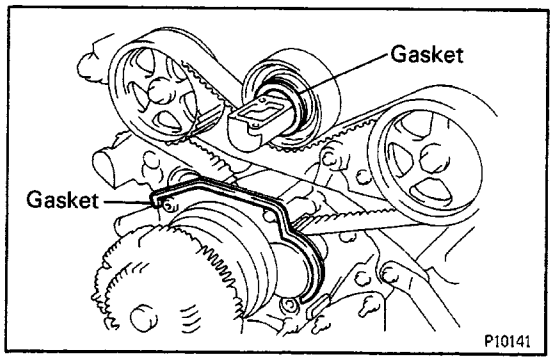


14. CHECK VALVE TIMING

(a) Slowly turn the crankshaft pulley two revolutions from TDC to TDC.
NOTICE: Always turn the crankshaft pulley clockwise.

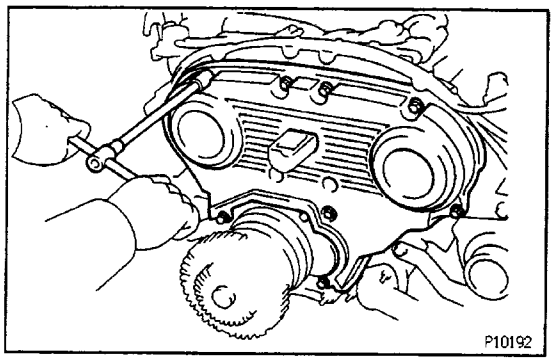


(b) Check that each pulley aligns with the timing marks as shown in the illustration.
If the timing marks do not align, remove the timing belt and reinstall it.

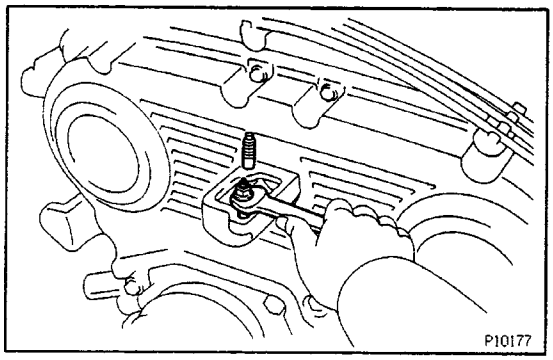


15. INSTALL NO.2 TIMING BELT COVER

(a) Install the gasket to the No.2 idler pulley.
(b) Install the gasket to the fan bracket.
(c) Install the gasket to the timing belt cover.



(d) Install the timing belt cover with the eleven bolts.



(e) Using the two water outlet nuts, install the two stud bolts.
(f) Connect the four clamps on the high–tension cords to the mounting bolts of the No.2 timing belt cover.

16. INSTALL WATER OUTLET

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the water outlet and the water outlet housing on the No.2 idler pulley.

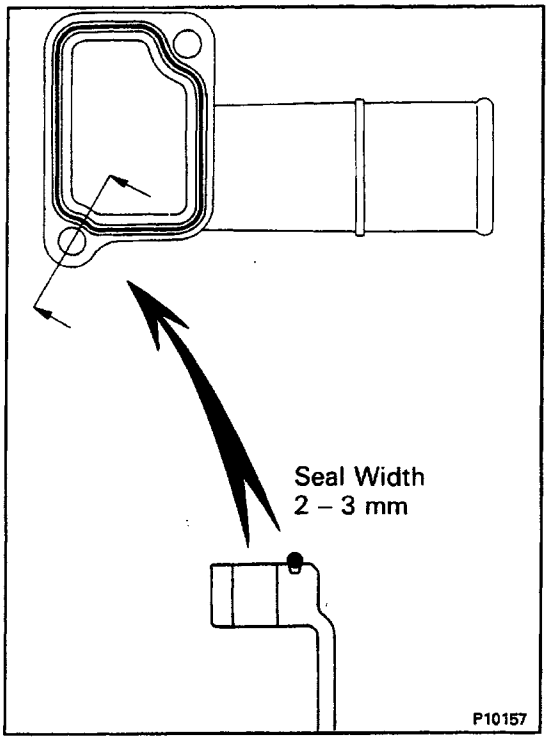
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

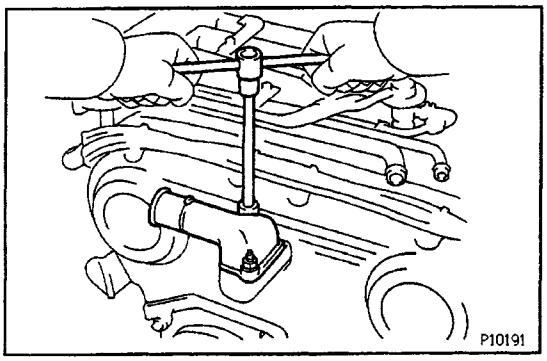
(b) Apply seal packing to the sealing groove of the water outlet as shown in the illustration.

Seat packing:

Part No. 08826–00100 or equivalent

- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

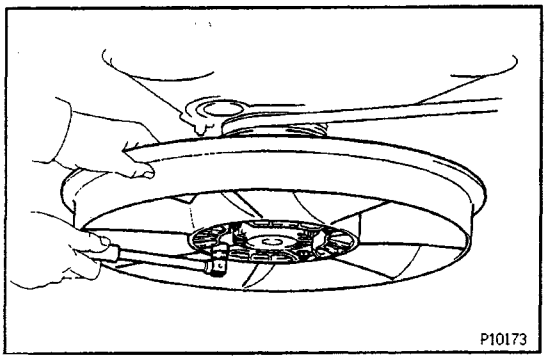




(c) Install the water outlet with the two bolts. Alternately tighten the bolts.

Torque: 8.3 N–m (85 kgf–cm, 73 in.–lbf)

17. INSTALL GENERATOR DRIVE BELT

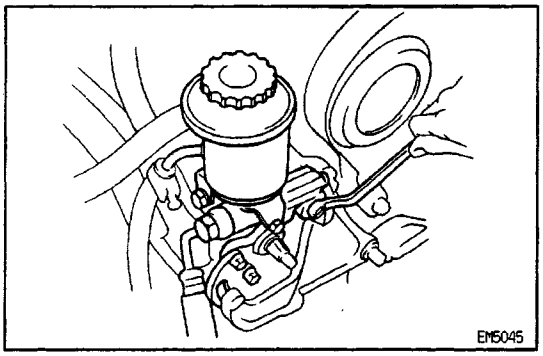


18. INSTALL COOLING FAN

Install the cooling fan with the four nuts.

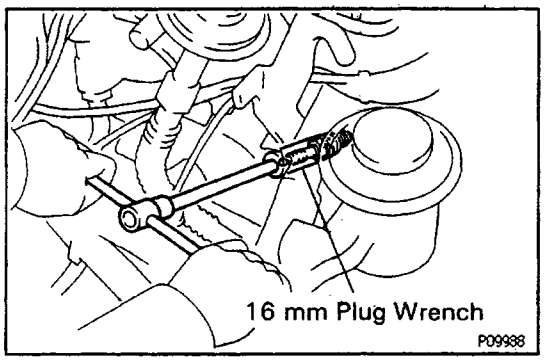
Torque: 5.4 N–m (55 kgf–cm, 48in.–lbf)

19. INSTALL A/C DRIVE BELT



20. INSTALL PS PUMP

21. INSTALL PS PUMP PULLEY AND DRIVE BELT



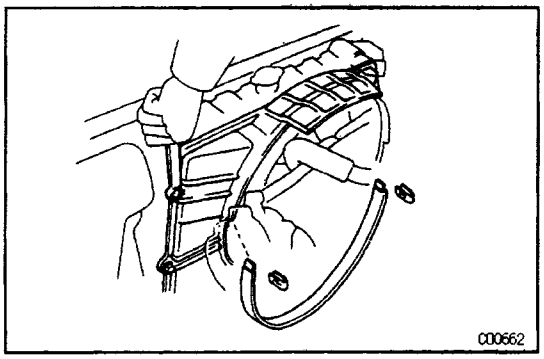
22. INSTALL SPARK PLUGS

Using a 16 mm plug wrench, install the six spark plugs.

Torque: 18 N–m (180 kgf–cm, 13 ft–lbf)

23. CONNECT HIGH–TENSION CORDS TO SPARK PLUGS

24. CONNECT NO.2 AND NO.3 AIR HOSES TO AIR PIPE

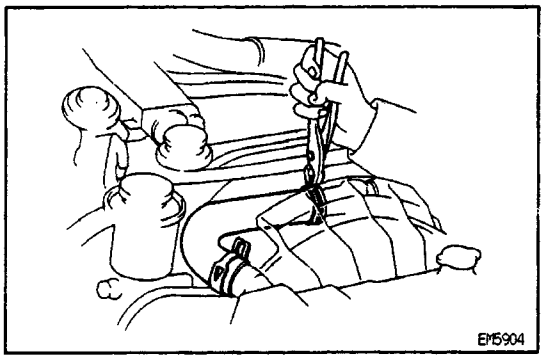


25. INSTALL RADIATOR

(a) Install the radiator with the four bolts.

(b) Install the No.1 fan shroud with the four bolts.

(c) Install the No.2 fan shroud with the two clips.



(d) Install the radiator hoses.

(e) (A/T only)
Connect the oil cooler hoses.

(f) Connect the reservoir tank hose.

26. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

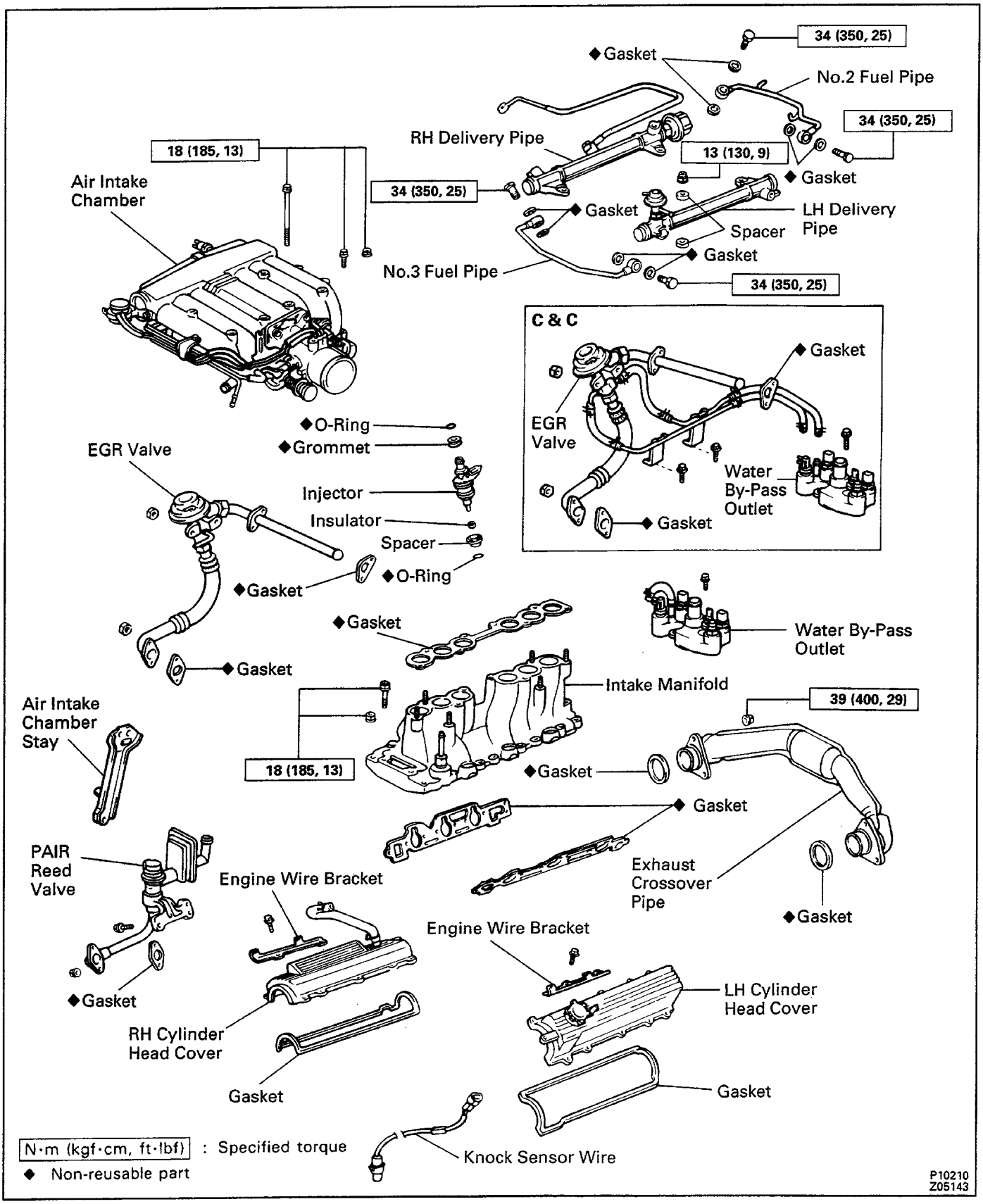
27. FILL WITH ENGINE COOLANT

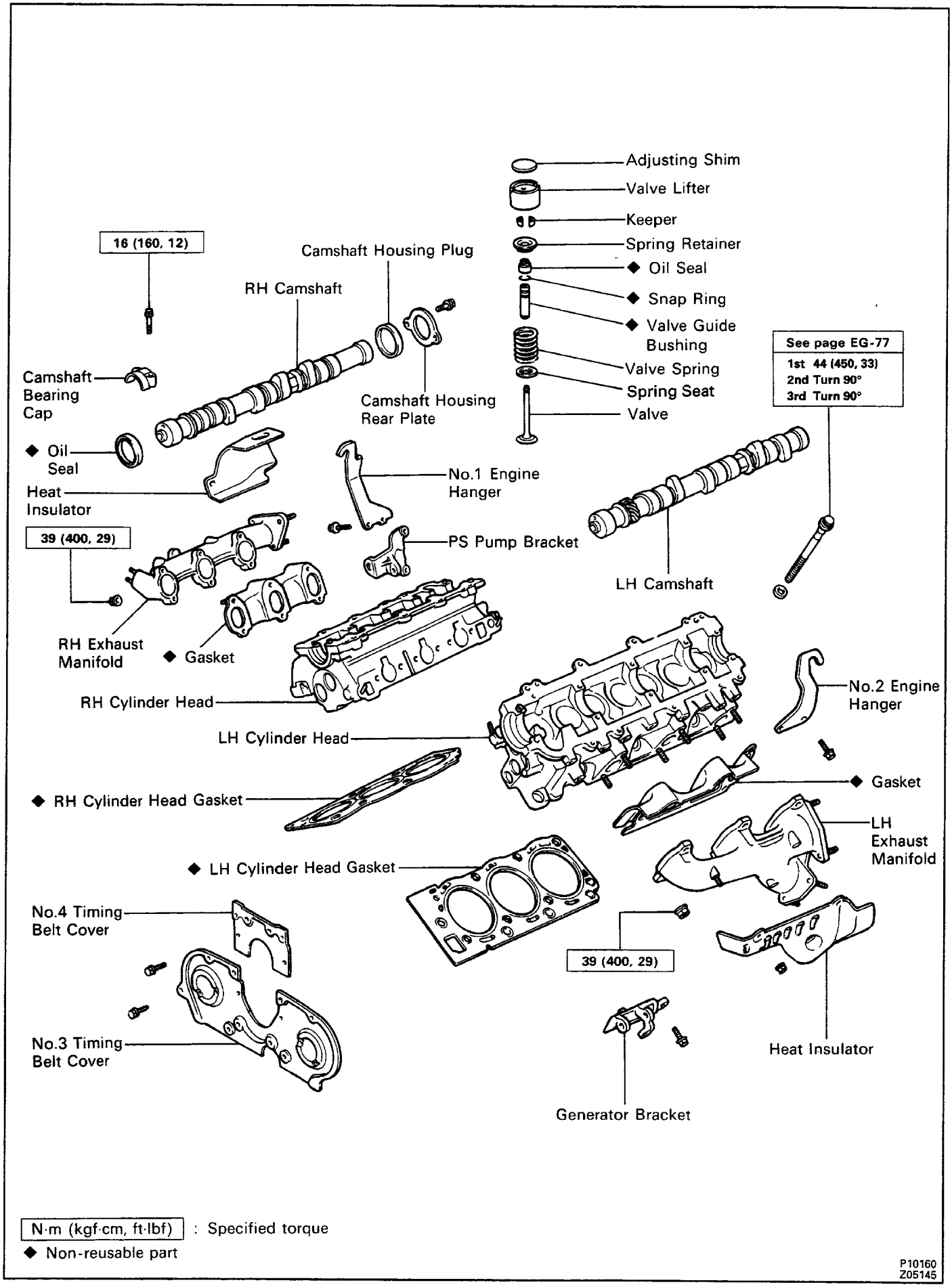
28. START ENGINE AND CHECK FOR LEAKS

29. RECHECK ENGINE COOLANT LEVEL

CYLINDER HEAD
COMPONENTS

EG1E9–03





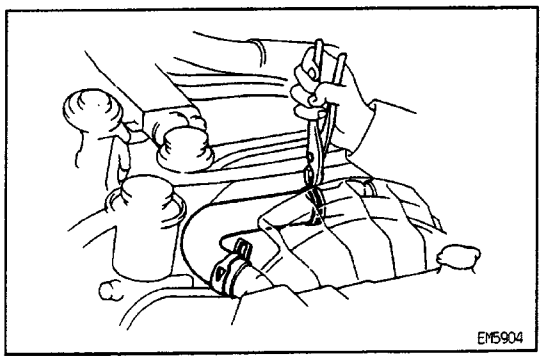
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

P10160
Z05145

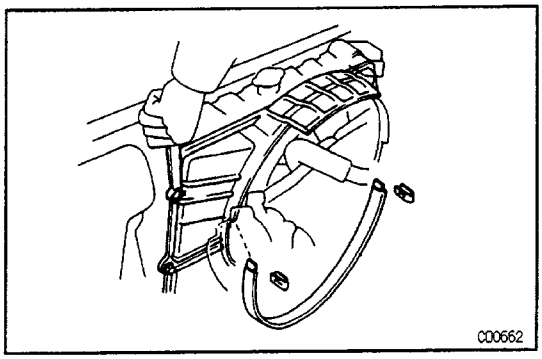
EG1ZW–01

CYLINDER HEADS REMOVAL

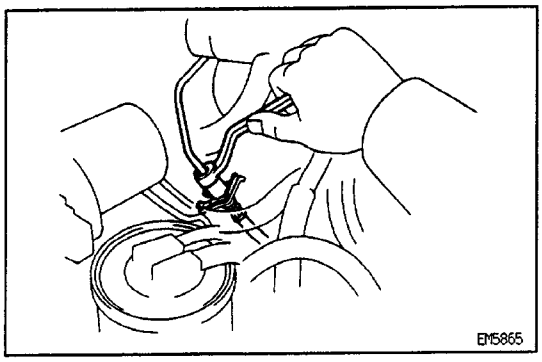
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. REMOVE AIR CLEANER AND HOSE
3. DRAIN ENGINE COOLANT



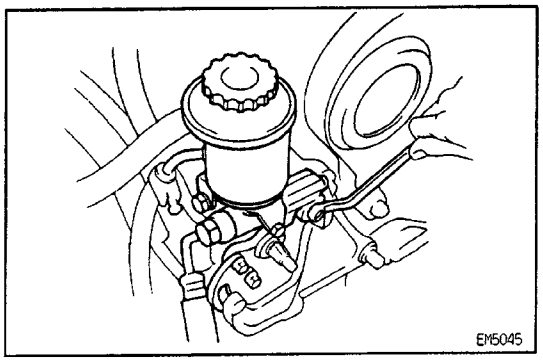
4. REMOVE RADIATOR
(a) Disconnect the reservoir hose.
(b) (A/T only)
Disconnect the oil cooler hoses.
(c) Remove the radiator hoses.



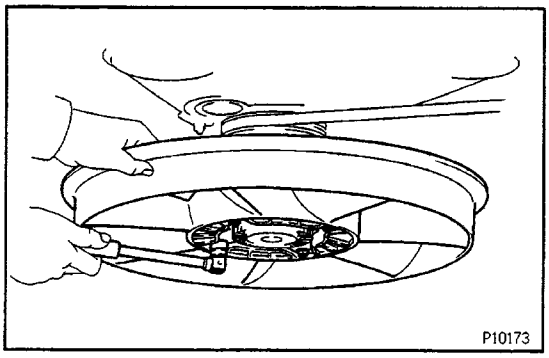
(d) Remove the two clips and No.2 fan shroud.
(e) Remove the four bolts and No.1 fan shroud.
(f) Remove the four bolts and radiator.



5. (M/T only)
DISCONNECT CLUTCH RELEASE CYLINDER HOSE



6. REMOVE PS DRIVE BELT AND PUMP PULLEY
7. DISCONNECT PS PUMP FROM ENGINE
8. REMOVE A/C DRIVE BELT



9. REMOVE COOLING FAN

Remove the four nuts and cooling fan.

10. REMOVE GENERATOR DRIVE BELT

11. DISCONNECT STRAP, WIRES, CONNECTORS. HOSES AND CABLES

(a) Disconnect the following strap, wires and connectors:

- Ground strap from LH fender apron
- Generator connector and wire
- Igniter connector
- Oil pressure sender gauge connector
- Ground strap from engine rear side
- ECM connectors
- VSV connectors
- A/C compressor connector
- (M/T only)
  Starter relay connector
- Solenoid resister connector
- Data link connector 1
  (w/ ADD)

ADD switch connector

(b) Disconnect the following hoses:

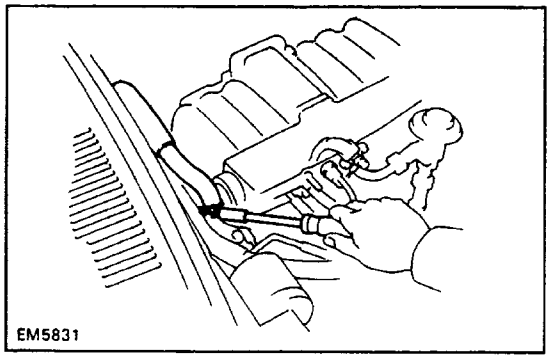
- PS air hoses from gas filter and air pipe
- Brake booster hose
- (w/ Cruise Control System)
  Cruise control vacuum hose
- Charcoal canister hose from canister
- VSV vacuum hoses

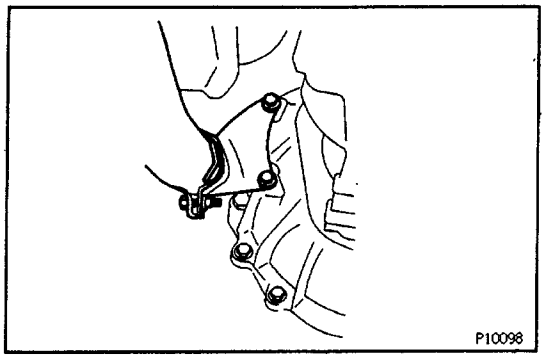
(c) Disconnect the following cables:

- Accelerator cable
- (A/T only)
  Throttle cable
- (w/ Cruise Control System)
  Cruise control cable

12. DISCONNECT HEATER HOSES

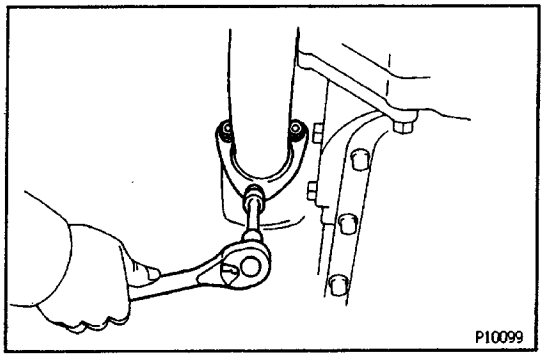
13. DISCONNECT FUEL INLET AND OUTLET HOSES



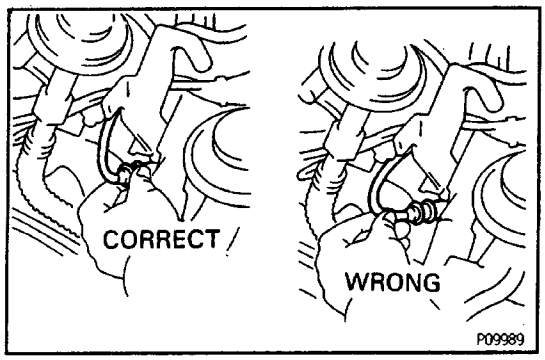


14. REMOVE FRONT EXHAUST PIPE

(a) Disconnect the heated oxygen sensor connector.
(b) Loosen the pipe clamp bolt. w
(c) Remove the two, bolts and pipe bracket.



(d) Remove the three nuts, and disconnect the exhaust pipe from the exhaust manifold. Remove the gasket.
(e) Remove the two bolts, joint retainer, exhaust pipe and gasket from the catalytic converter.



15. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS

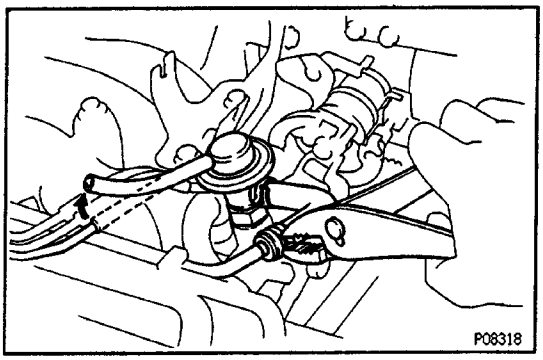
Disconnect the high – tension cords at the rubber boot. Do not pull on the cords.

NOTICE: Pulling on or bending the cords may damage the conductor inside.

16. REMOVE DISTRIBUTOR

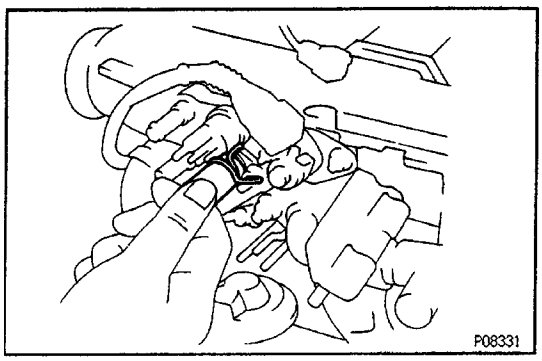
17. REMOVE TIMING BELT

(See steps 5 to 7, 13 to 20 and 25 on pages EG2–33 to 36 and 38)

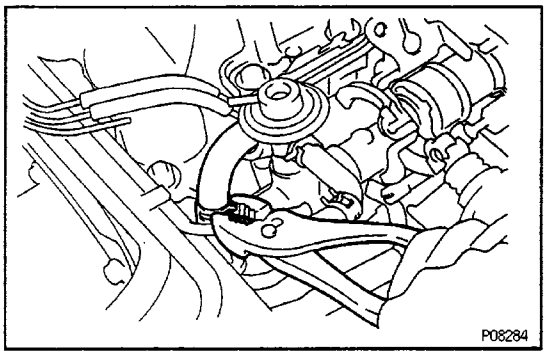


18. REMOVE AIR INTAKE CHAMBER

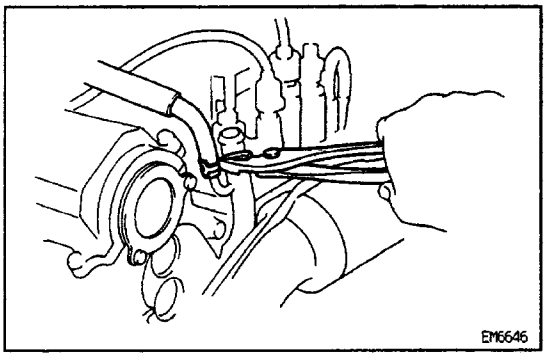
(a) Disconnect the throttle position sensor connector.
(b) Disconnect the charcoal canister vacuum hose from the throttle body.
(c) Disconnect the vacuum and fuel hoses from the pre–ssure regulator.



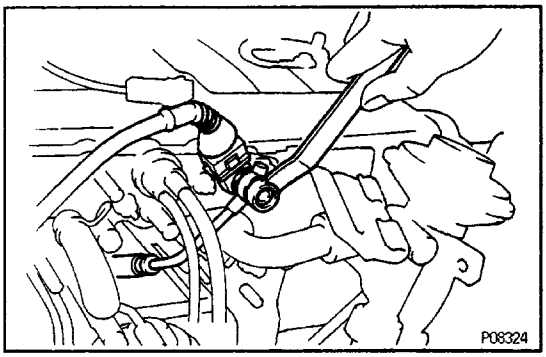
(d) Disconnect the PCV hose from the union.



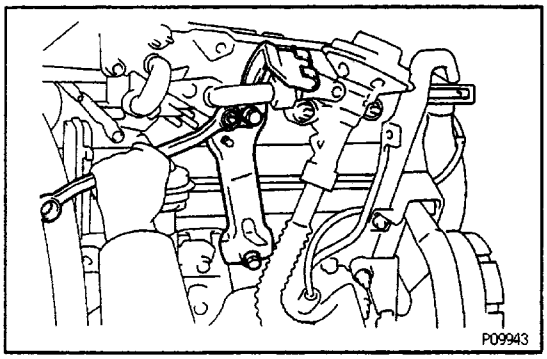
(e) Disconnect the No.4 water by–pass hose from the union of intake manifold.



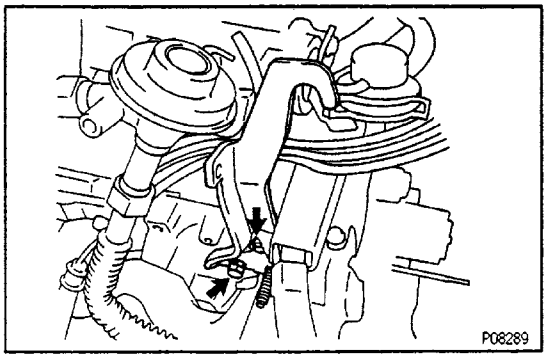
(f) Remove the No.5 water by–pass hose from the water by–pass pipe.



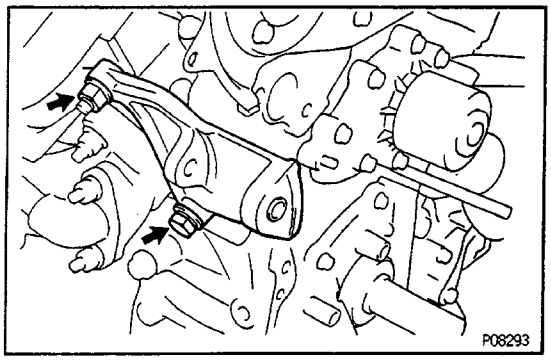
(g) Disconnect the cold start injector connector.
(h) Disconnect the vacuum hose from the gas filter.
(i) Remove the union bolt, two gaskets and cold start injector tube.
(j) (Calif. and C & C)
Disconnect the EGR gas temperature sensor con–nector.
(k) Disconnect the EGR vacuum hoses from the air pipe and EGR vacuum modulator.



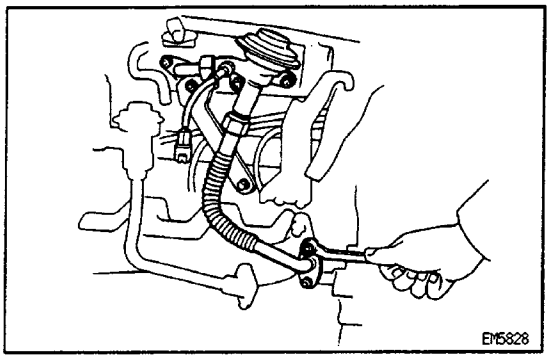
(i) Remove the nut, two bolts, intake chamber stay and throttle cable bracket.



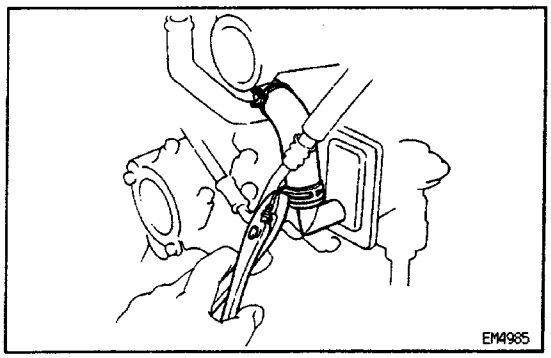
(m) Remove the two bolts and No. 1 engine hanger.



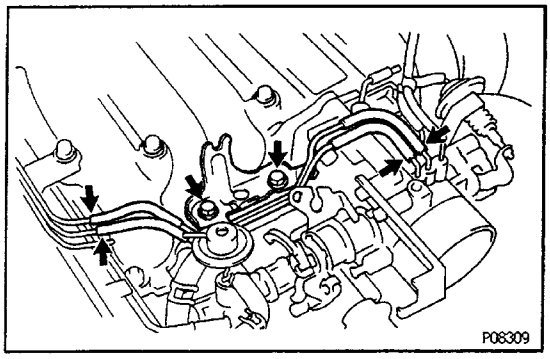
(n) Remove the nut, bolt and PS pump bracket.



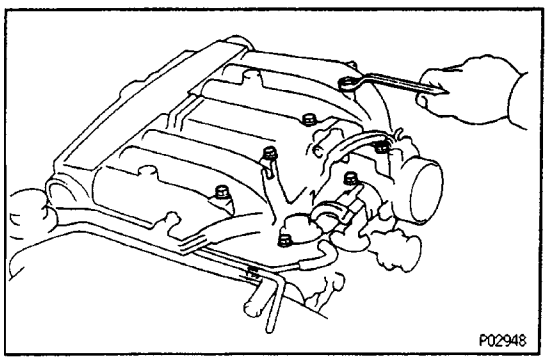
(o) (C & C only)
Disconnect the two water by–pass hoses from the EGR valve.
(p) Remove the five nuts, the EGR valve and pipes assembly and two gaskets.



(q) Disconnect the No.1 air hose from the PAIR reed valve.



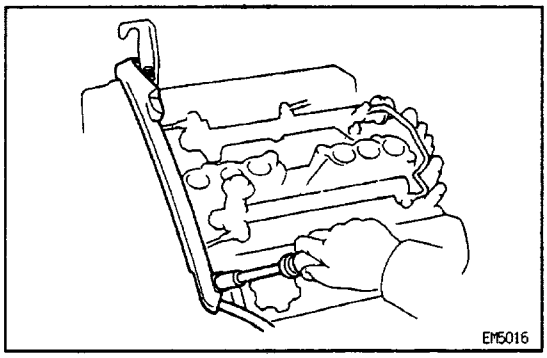
(r) Disconnect the four vacuum hoses from the air pipes.
(s) Remove the two bolts and accelerator cable bracket.



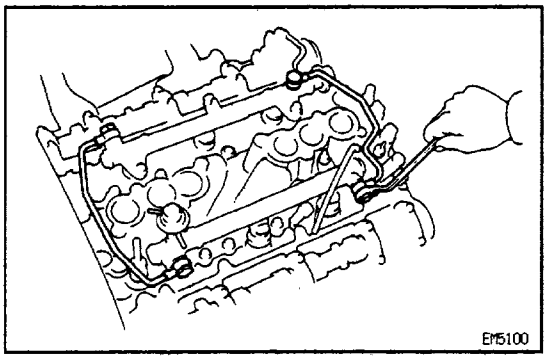
(t) Remove the six bolts, two nuts, intake chamber and gasket.

19. REMOVE ENGINE WIRE

(a) Disconnect the following:
- Knock sensor connector
- Cold start injector time switch connector
- ECT sensor connector
- ECT sender gauge connector
- No.1 ECT switch connector
- RH ground strap from No.3 camshaft bearing cap
- Injector connectors

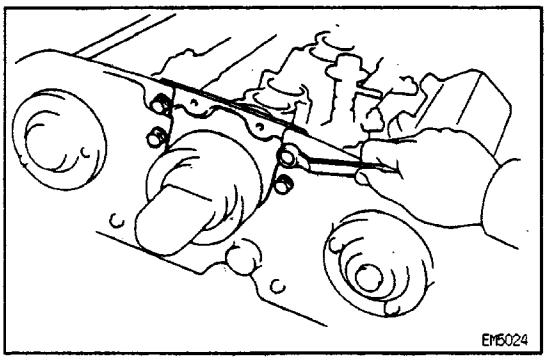


(b) Remove the two bolts and engine wire.



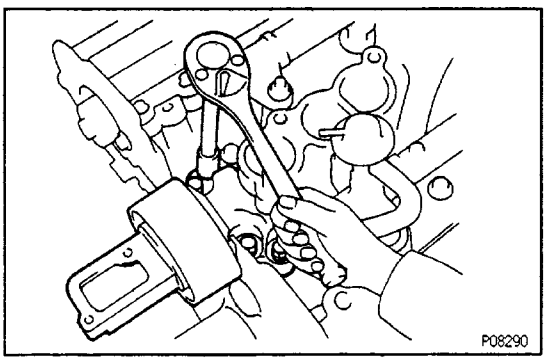
20. REMOVE NO.2 AND NO.3 FUEL PIPES

(a) Disconnect the vacuum hose from the TVV.
(b) Remove the four union bolts, eight gaskets, No.2 and No.3 fuel pipes.



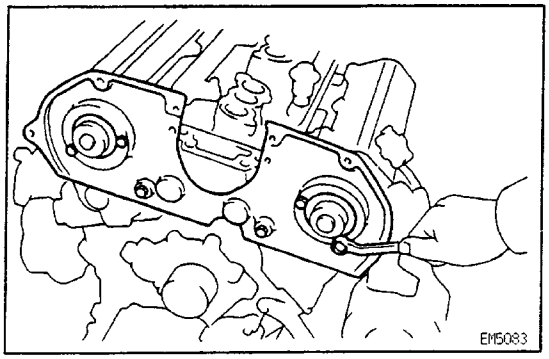
21. REMOVE NO.4 TIMING BELT COVER

Remove the four bolts and timing belt cover.



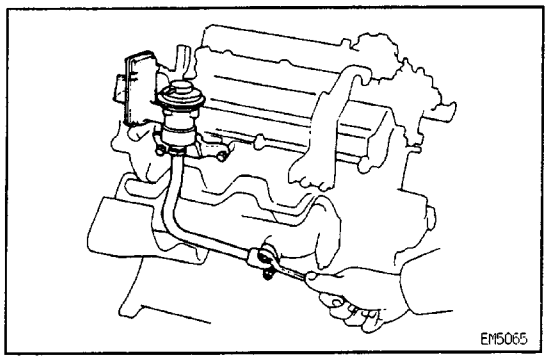
22. REMOVE NO.2 IDLER PULLEY

Remove the four bolts and idler pulley.



23. REMOVE No.3 TIMING BELT COVER

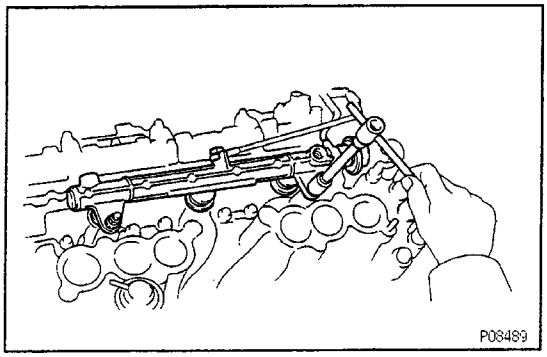
Remove the six bolts and timing belt cover.



24. REMOVE VSV BRACKET AND VSV FROM PAIR REED VALVE

25. REMOVE PAIR REED VALVE AND NO.1 AIR INJECTION MANIFOLD

Remove the two bolts, two nuts, the PAIR reed valve, injection manifold assembly and gasket.



26. REMOVE DELIVERY PIPES AND INJECTORS

(a) Remove the four nuts holding the delivery pipes to the intake manifold.

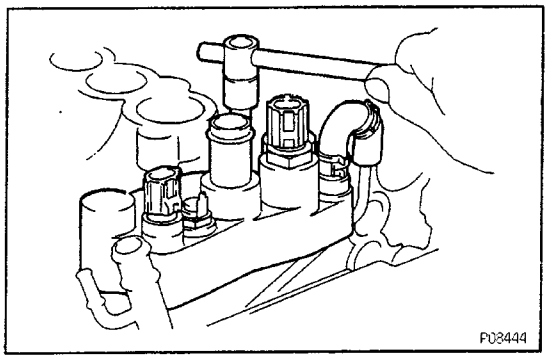
(b) Remove the the two delivery pipes and six injectors assemblies.

NOTICE: Be careful net to drop the injectors when removing the delivery pipes.

(c) Remove the four insulators, ten spacers and four 0–rings from the cylinder head.

(d) Pull out the six injectors from the delivery pipes.

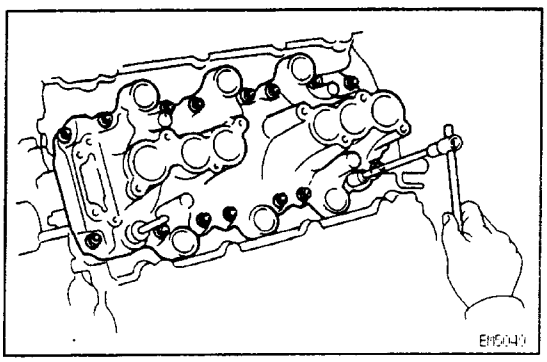
(e) Remove the O–ring and grommet from each injector.



27. REMOVE WATER BY–PASS OUTLET

(a) Disconnect the No.3 water hose from the No. 1 water by–pass pipe.

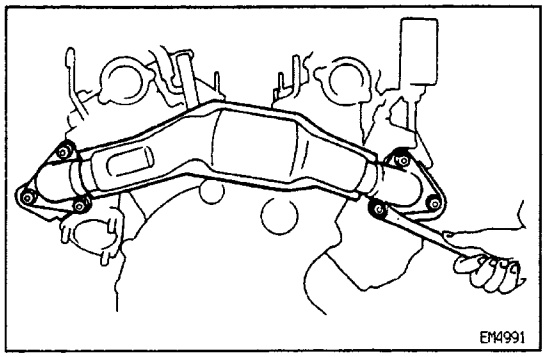
(b) Remove the two nuts, water by–pass outlet and gasket.



28. REMOVE INTAKE MANIFOLD

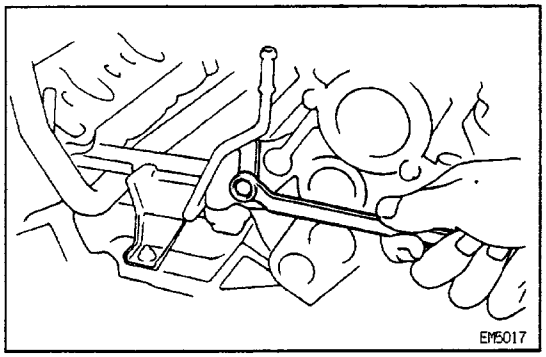
Remove the twelve bolts, four nuts, intake manifold and two gaskets.

29. REMOVE KNOCK SENSOR WIRE



30. REMOVE EXHAUST CROSSOVER PIPE

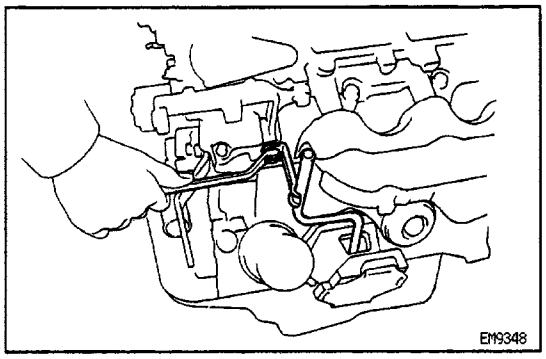
Remove the six nuts, crossover pipe and two gaskets.



31. DISCONNECT WATER BY–PASS PIPE FROM RH CYLINDER HEAD

Remove the bolt, and disconnect the water by–pass pipe from the RH cylinder head.

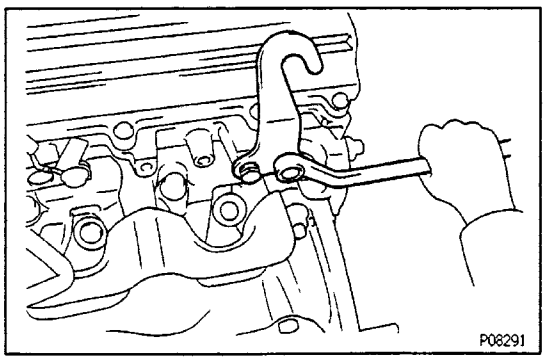
32. REMOVE GENERATOR



33. REMOVE OIL DIPSTICK GUIDE AND DIPSTICK

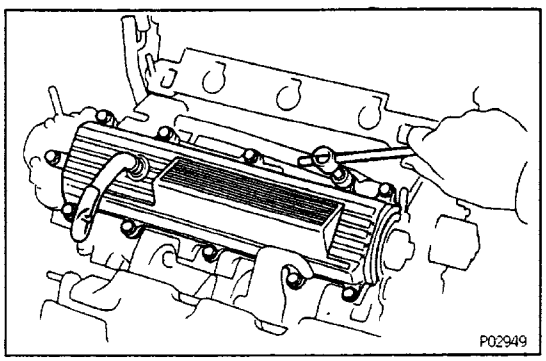
(a) Remove the oil dipstick.

(b) Remove the bolt and oil dipstick guide.



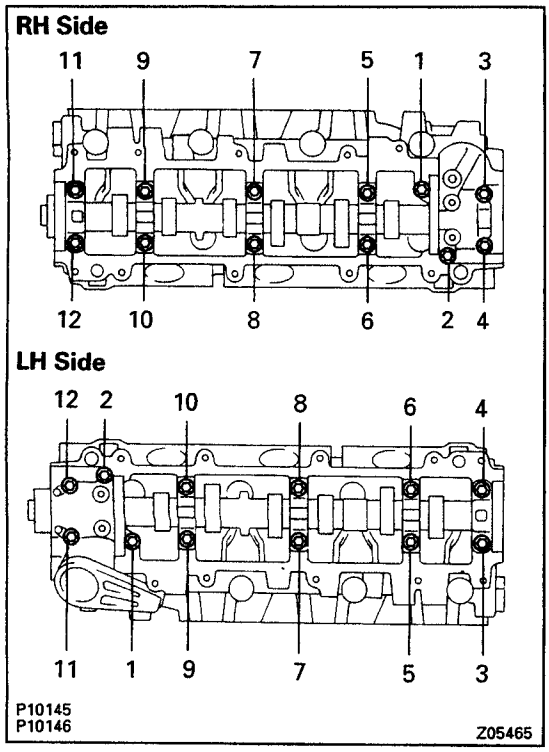
34. REMOVE NO.2 ENGINE HANGER FROM LH CYLINDER HEAD

Remove the two bolts and engine hanger.



35. REMOVE CYLINDER HEAD COVERS

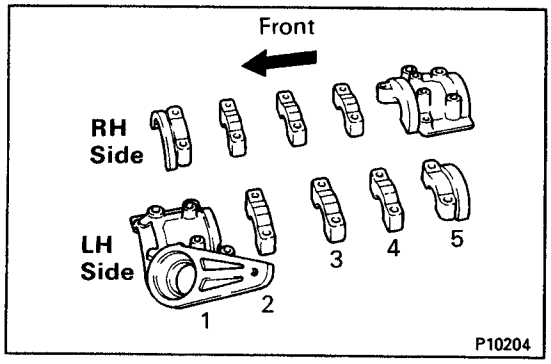
Remove the eleven bolts, engine wire bracket, cylin–der head cover and gasket. Remove the two cylinder head covers.



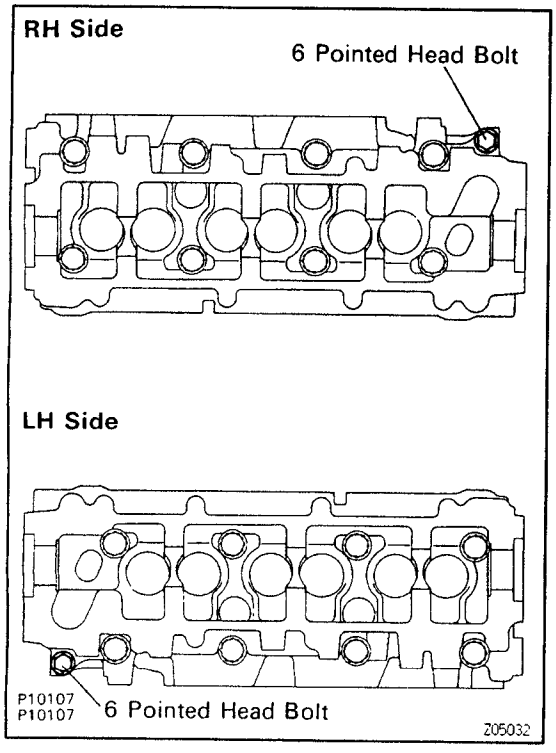
36. REMOVE CAMSHAFTS

(a) Uniformly loosen and remove the twelve bearing cap bolts one side of each cylinder head in several passes, in the sequence shown, then do the other side as shown.

(b) Remove the ten camshaft bearing caps, two oil seals and two camshafts.

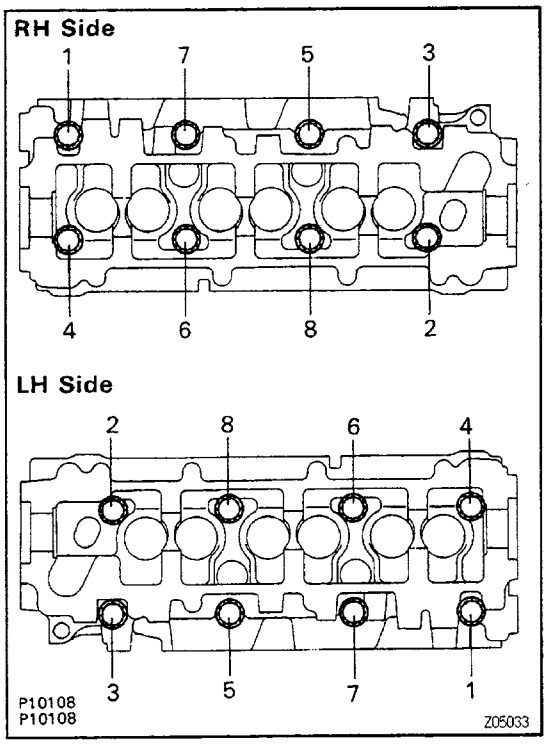


HINT: Arrange the bearing caps in correct order.



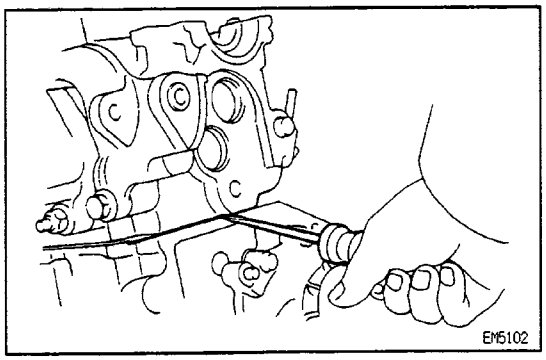
37. REMOVE CYLINDER HEADS

(a) Remove the cylinder head (6 pointed head) bolt from each cylinder head.



(b) Uniformly loosen the eight cylinder head bolts one side of each cylinder head in several passes, in the sequence shown, then do the other side as shown. Remove the eighteen cylinder head bolts and plate washers.

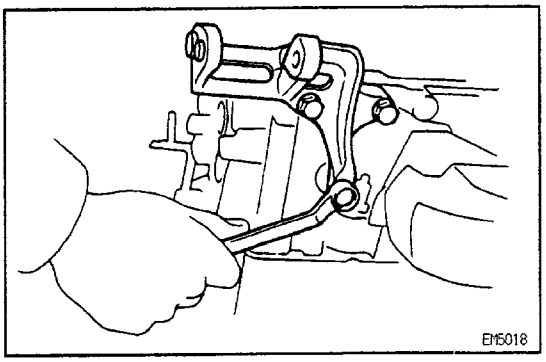
NOTICE: Head warpage or cracking could result from removing bolts in incorrect order.



(c) Lift the cylinder head from the dowels on the cylinder block, and place the two cylinder heads on wooden blocks on a bench.

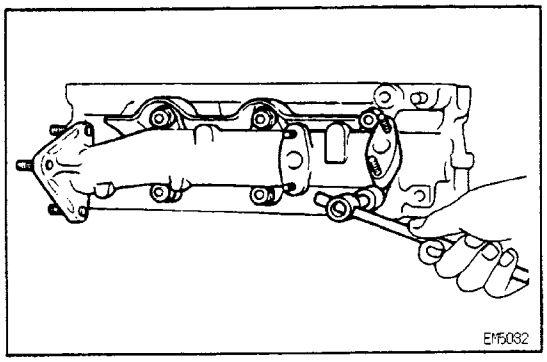
If the cylinder head is off, pry between the cylinder head and cylinder block with a screwdriver.

NOTICE: Be careful not to damage the contact surfaces of the cylinder head and cylinder block.



38. REMOVE GENERATOR BRACKET

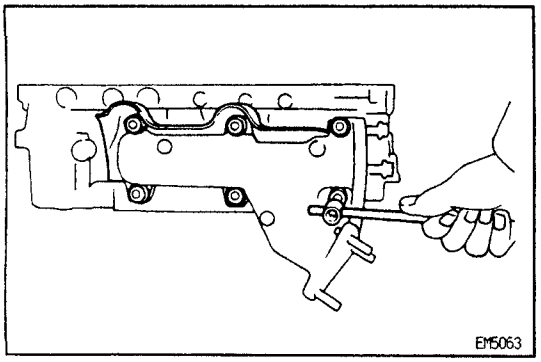
Remove the three bolts and brackets.



39. REMOVE EXHAUST MANIFOLD FROM RH CYLINDER HEAD

(a) Remove the bolt, nut and exhaust manifold heat insulator.

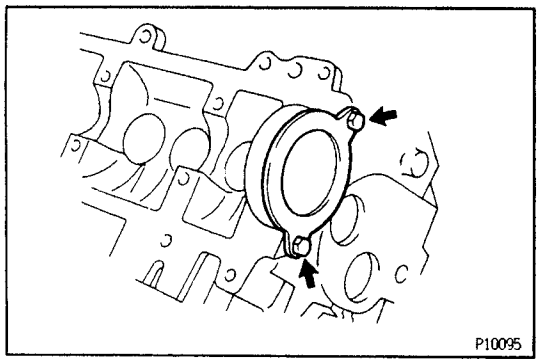
(b) Remove the six nuts, exhaust manifold and gasket.



40. REMOVE EXHAUST MANIFOLD FROM LH CYLINDER HEAD

(a) Remove the three nuts and exhaust manifold heat insulator.

(b) Remove the six nuts, exhaust manifold and gasket.



CYLINDER HEADS DISASSEMBLY

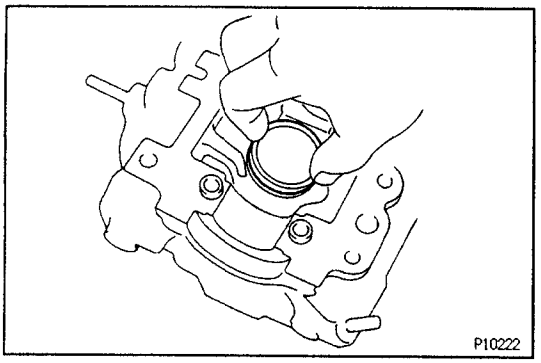
EG1ZX–01

(See Components)

1. REMOVE CAMSHAFT HOUSING PLUGS

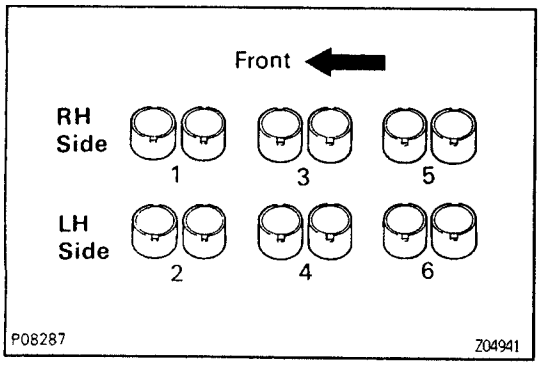
(a) Remove the two bolts and housing rear cover.

(b) Remove the housing plug.

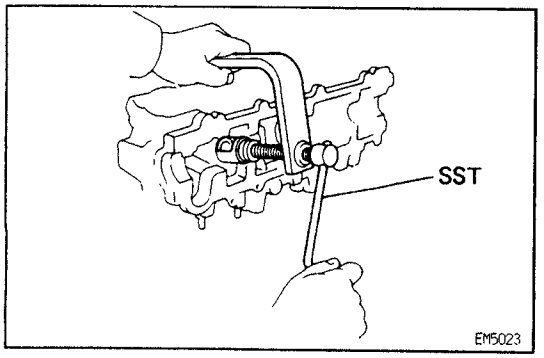


2. REMOVE VALVE LIFTERS AND SHIMS

Pull out the valve lifter and shim by hand.

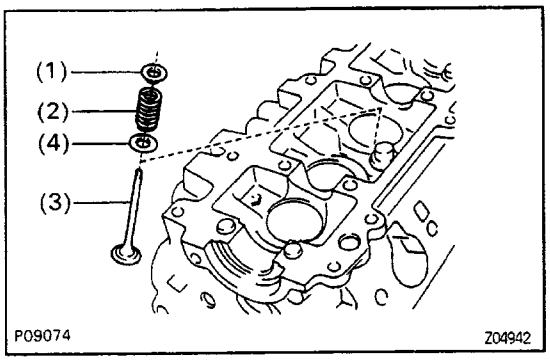


HINT: Arrange the valve lifters and shims in correct order.

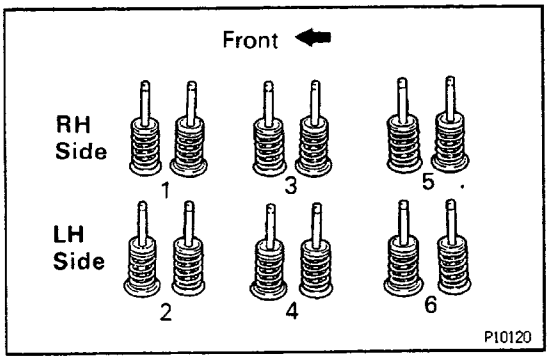


3. REMOVE VALVES

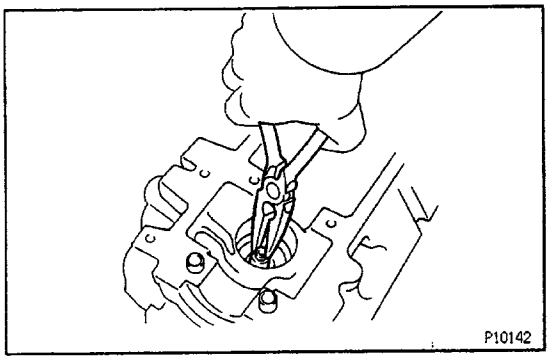
(a) Using SST, compress the valve spring and remove the two keepers.
SST 09202–43013



(b) Remove the following parts:
(1) Spring retainer
(2) Valve spring
(3) Valve
(4) Spring seat



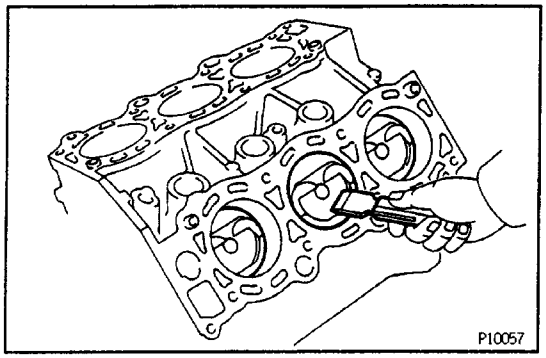
HINT: Arrange the valves, valve springs, spring seats and spring retainers incorrect order.



(c) Using needle–nose pliers, remove the oil seal.

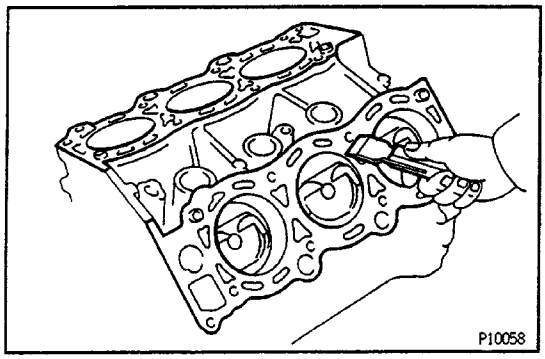
EG20E–01

CYLINDER HEAD COMPONENTS INSPECTION AND REPAIR



1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

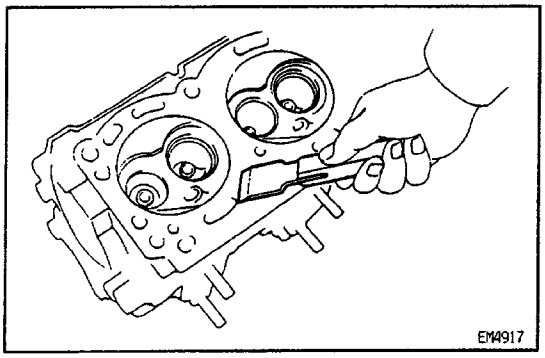
(a) Turn the crankshaft, and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston top surface.



(b) Using a gasket scraper, remove all the gasket material from the cylinder block surface.

(c) Using compressed air, blow carbon and oil from the bolt holes.

CAUTION: Protect your eyes when using high compressed air.

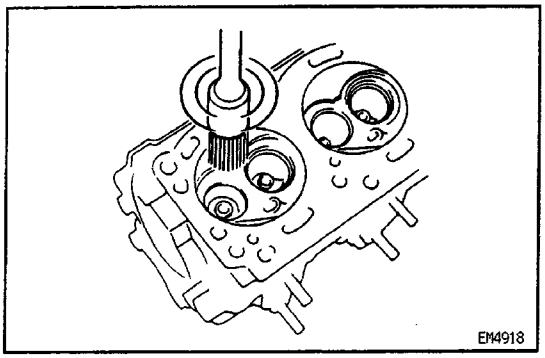


2. CLEAN CYLINDER HEAD

A. Remove gasket material

Using a gasket scraper, remove all the gasket material from the cylinder block contact surface.

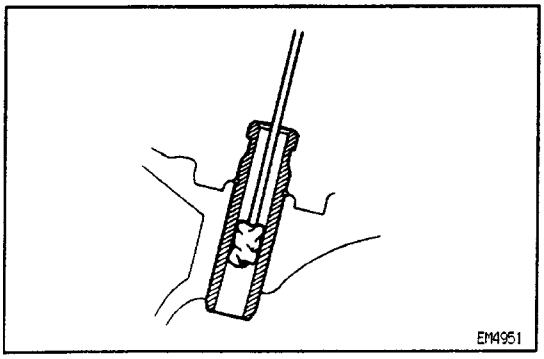
NOTICE: Be careful not to scratch the cylinder block contact surface.



B. Clean combustion chambers

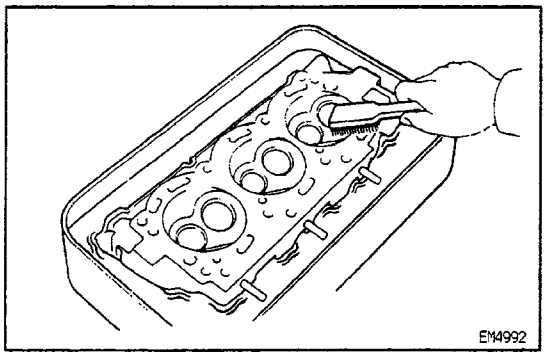
Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE: Be careful not to scratch the cylinder block contact surface.



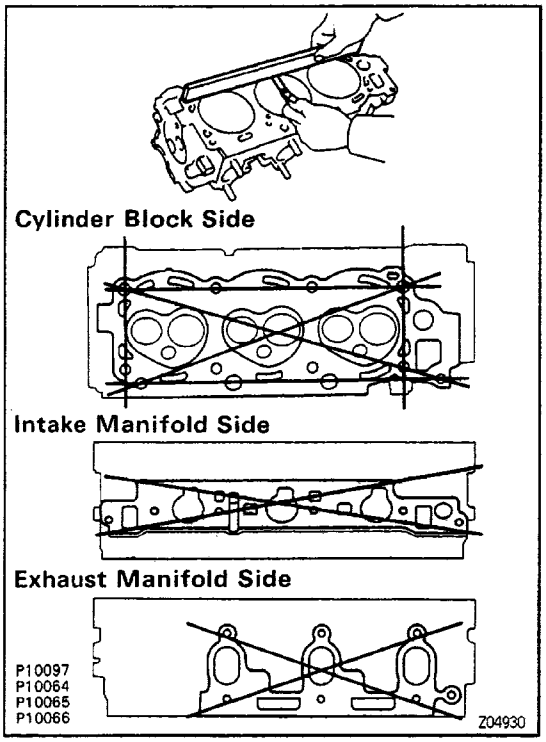
C. Clean valve guide bushings

Using a valve guide bushing brush and solvent, clean all the guide bushings.



D. Clean cylinder head

Using a soft brush and solvent, thoroughly clean the cylinder head.



3. INSPECT CYLINDER HEAD

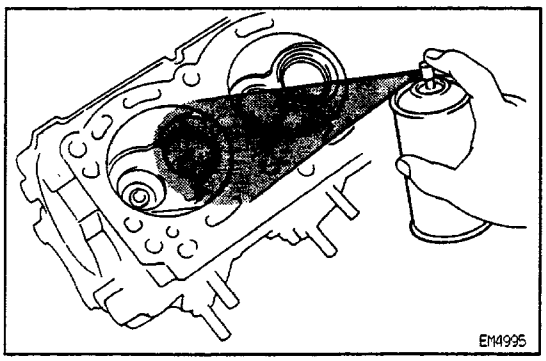
A. Inspect for flatness

Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder block and the manifolds for warpage.

Maximum warpage:

0.10 mm (0.0039 in.)

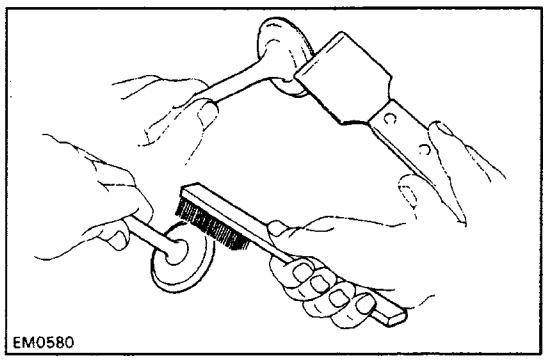
If warpage is greater than maximum, replace the cylinder head.



B. Inspect for cracks

Using a dye penetrant, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.

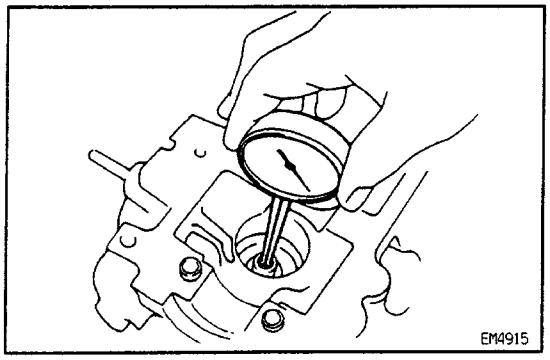
If cracked, replace the cylinder head.



4. CLEAN VALVES

(a) Using a gasket scraper, chip off any carbon from the valve head.

(b) Using a wire brush, thoroughly clean the valve.

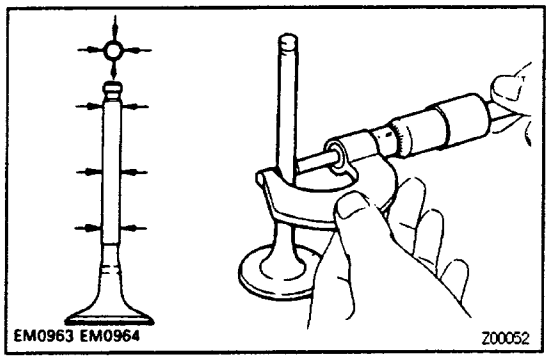


5. INSPECT VALVE STEMS AND GUIDE BUSHINGS

(a) Using a caliper gauge, measure the inside diameter of the guide bushing.

Bushing inside diameter:

8.010–8.030mm(0.3154–0.3161 in.)



(b) Using a micrometer, measure the diameter of the valve stem.

Valve stem diameter:

Intake

7.970 – 7.985 mm (0.3138 – 0.3144 in.)

Exhaust .

7.965 – 7.980 mm (0.3136 – 0.3142 in.)

(c) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

Standard oil clearance:

Intake

0.025 – 0.060 mm (0.0010 – 0.0024 in.)

Exhaust

0.030 – 0.065 mm (0.0012 – 0.0026 in.)

Maximum oil clearance:

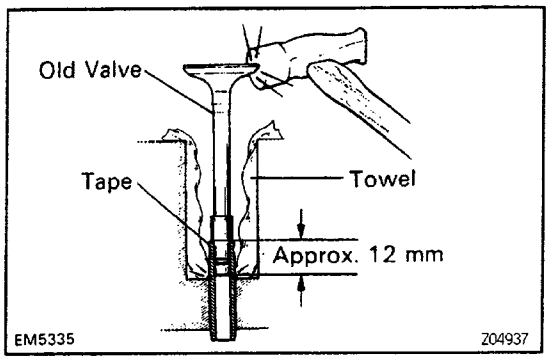
Intake

0.08 mm (0.0031 in.)

Exhaust

0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the valve and guide bushing.

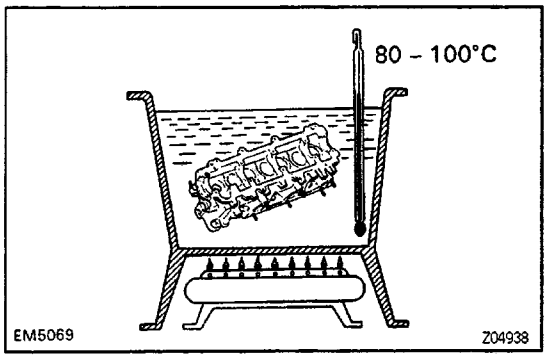


6. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

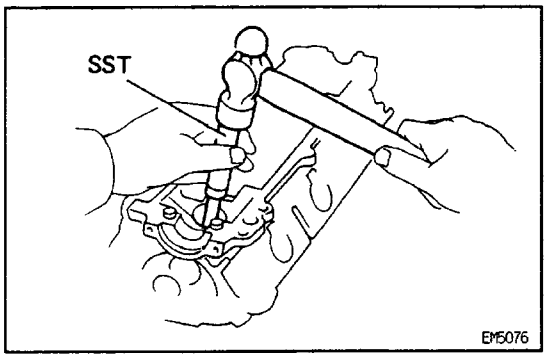
(a) Insert an old valve wrapped with tape into the valve guide bushing, and break off the valve guide bushing by hitting it with a hammer. Remove the snap ring.

HINT: Wrap the tape approx. 12 mm (0.47 in.) from the valve stem end.

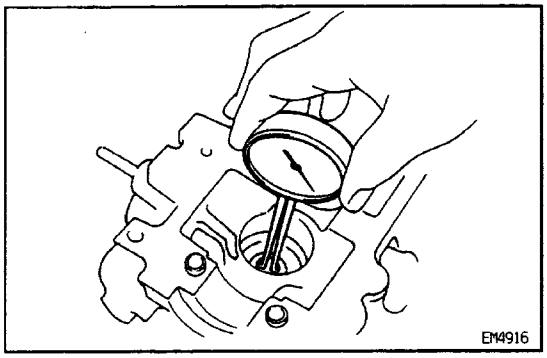
NOTICE: Be careful not to damage the valve lifter hole.



(b) Gradually heat the cylinder head to 80 – 100•C (176 – 2 12• F).



(c) Using SST and a 'hammer, tap out the guide bushing.
SST 09201–60011



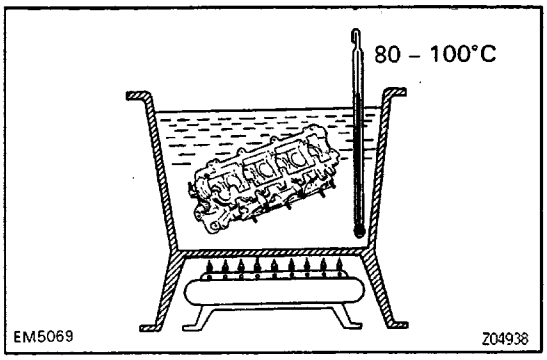
(d) Using a caliper gauge, measure the bushing bore di–ameter of the cylinder head.

Both intake and exhaust

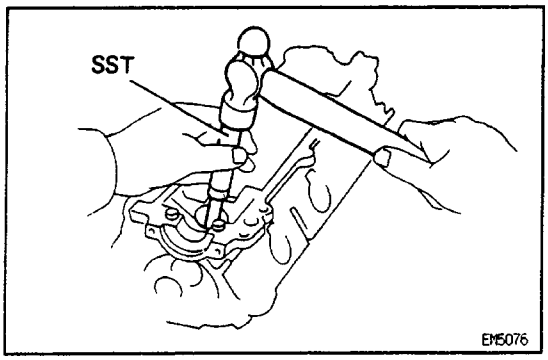
Bushing bore mm (in.)	Bushing size
13.000–13.027 (0.5118–0.5129)	Use STD
13.050 – 13.077 (0.5138 – 0.5148)	Use O/S 0.05

V02465

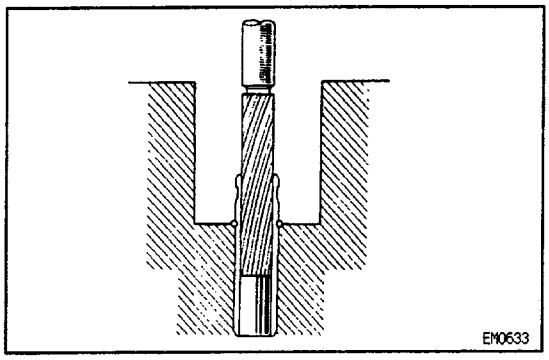
(e) Select a new guide bushing (STD or O/S 0.05).
If the bushing bore diameter of the cylinder head is greater than 13.027 mm (0.5129 in.), machine the bushing bore to the following dimension:
13.050 – 13.077 mm (0.5138 – 0.5148 in.)
If the bushing bore diameter of the cylinder head is greater than 13.077 mm (0.5148 in.), replace the cylinder head.



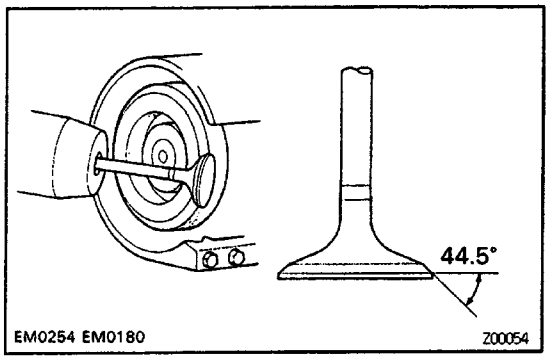
(f) Gradually heat the cylinder head to 80 – 100•C (176 – 212•F).



(g) Using SST and a hammer, tap in a new guide bushing until the snap ring makes contact with the cylinder head.
SST 09201–60011



(h) Using a sharp 8 mm reamer, ream the guide bushing to the obtain standard specified clearance (See step 5 above) between the guide bushing and valve stem.



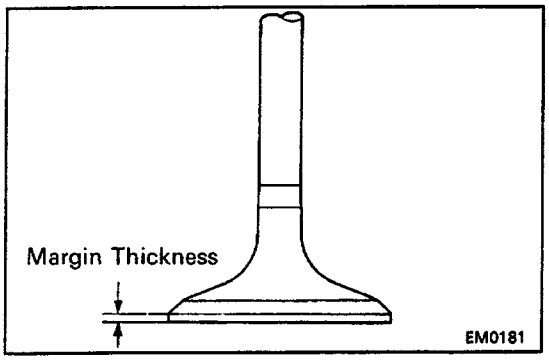
7. INSPECT AND GRIND VALVES

(a) Grind the valve enough to remove pits and carbon.

(b) Check that the valve is ground to the correct valve face angle.

Valve face angle:

44.5•



(c) Check the valve head margin thickness.

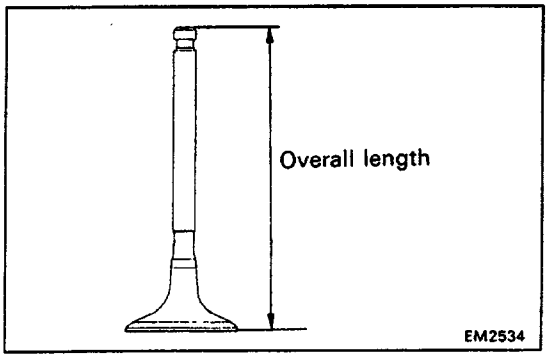
Standard margin thickness:

1.3 – 1.7 mm (0.051 – 0.067 in.)

Minimum margin thickness:

1.0 mm (0.039 in.)

If the margin thickness is less than minimum, replace the valve.



(d) Check the valve overall length.

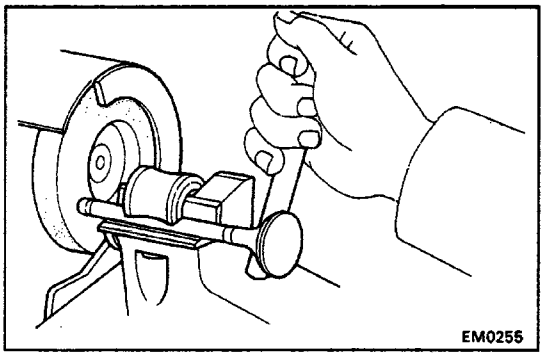
Standard overall length:

104.3 mm (4.106 in.)

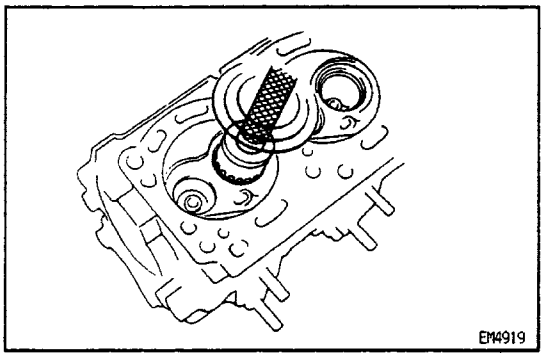
Minimum overall length:

103.8 mm (4.087 in.)

If the overall length is less than minimum, replace the valve.

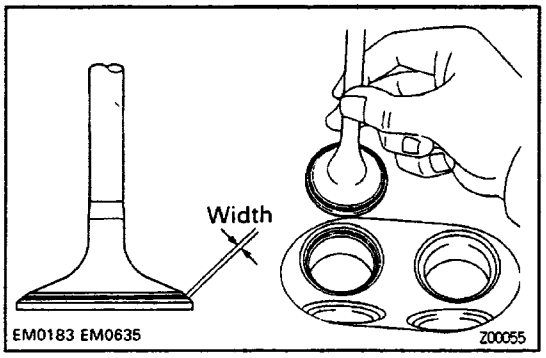


(e) Check the surface of the valve stem tip for wear.
If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.
NOTICE: Do not grind off more than minimum.



8. INSPECT AND CLEAN VALVE SEATS

(a) Using a 45• carbide cutter, resurface the valve seats.
Remove only enough metal to clean the seats.

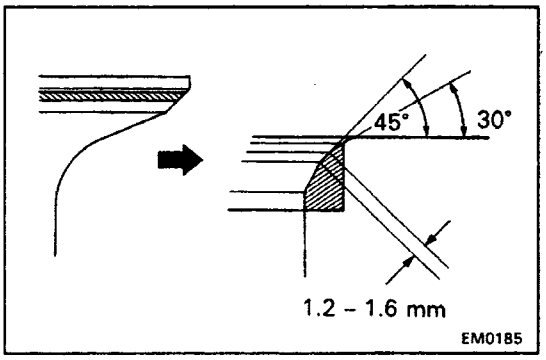


(b) Check the valve seating position.
Apply a light coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate valve.

(c) Check the valve face and seat for the following:

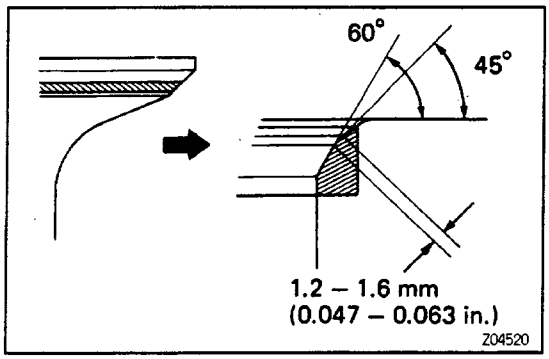
- If blue appears 360• around the face, the valve is concetric. If not, replace the valve.
- If blue appears 360• around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with the following width:

1.2 – 1.6 mm (0.047 – 0.063 in.)

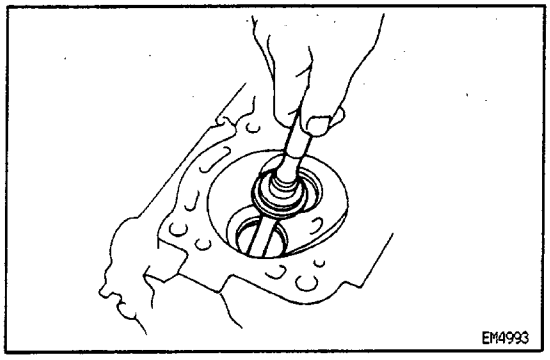


If not, correct the valve seats as follows:

(1) If the seating is too high on the valve face, use 3a• and 45• cutters to correct the seat.

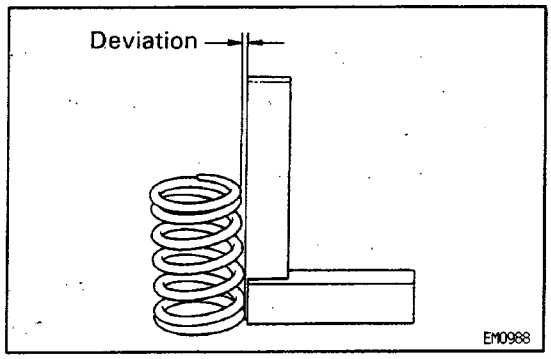


(2) If the seating is too low on the valve face, use 60• and 45• cutters to correct the seat.



(d) Hand–lap the valve and valve seat with an abrasive compound.

(a) After hand–lapping, clean the valve and valve seat.



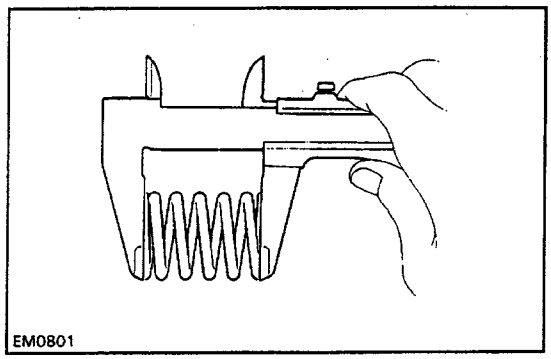
9. INSPECT VALVE SPRINGS

(a) Using a steel square, measure the deviation of the valve spring.

Maximum deviation:

1.23 mm (0.0484 in.)

If the deviation is greater than maximum, replace the valve spring.



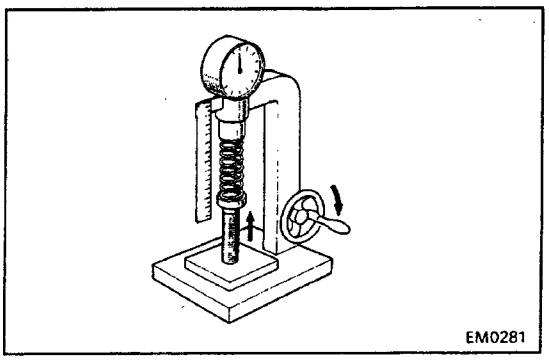
(b) Using a vernier caliper, measure the free length of the valve spring.

Free length:

46.50 mm (1.8307 in.) for white painted mark

47.01 mm (1.8508 in.) for green painted mark

If the free length is not as specified, replace the valve spring.



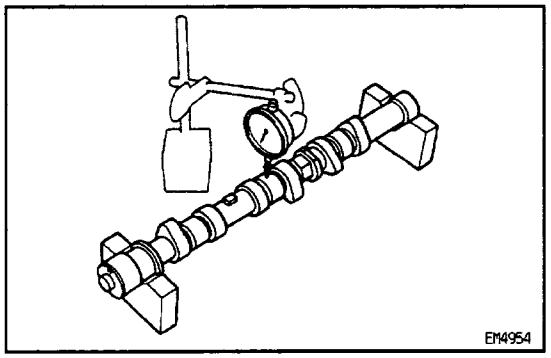
(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:

242 – 268 N (24.7 – 27.3 kgf, 54.5 – 60.2 lbf)

at 40.0 mm (1.575 in.)

If the installed tension is not as specified, replace the valve spring.



10. INSPECT CAMSHAFTS AND BEARINGS

A. Inspect camshaft for runout

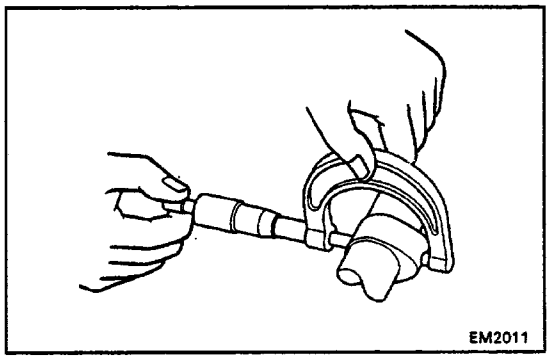
(a) Place the camshaft on V – blocks.

(b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout:

0.06 mm (0.0024 in.)

If the circle runout is greater than maximum, replace the camshaft.



B. Inspect cam lobes

Using a micrometer, measure the cam lobe height.

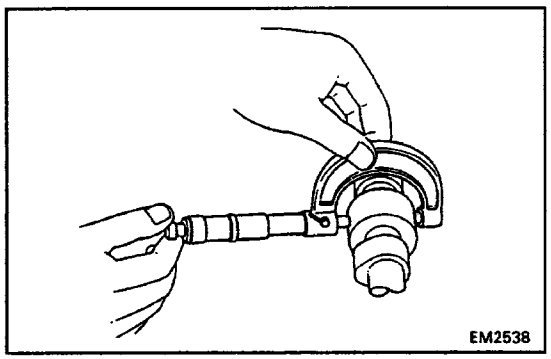
Standard cam lobe height:

47.830 – 47.930 mm (1.8830 – 1.8870 in.)

Minimum cam lobe height:

47.50 mm (1.8701 in.)

If the cam lobe height is less than minimum, replace the camshaft.



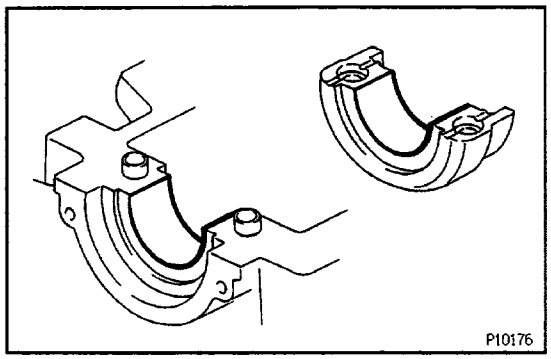
C. Inspect camshaft journals

Using a micrometer, measure the journal diameter.

Journal diameter:

33.959 – 33.975 mm (1.3370 – 1.3376 in.)

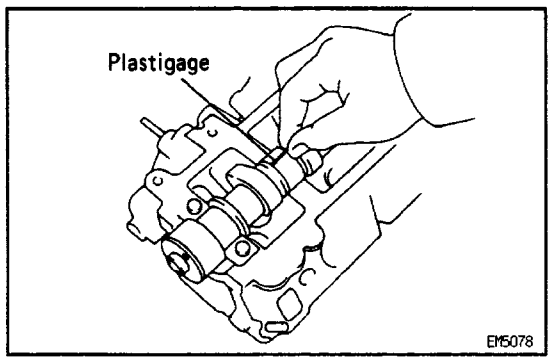
If the journal diameter is not as specified, check the oil clearance.



D. Inspect camshaft bearings

Check that bearings for flaking and scoring.

If the bearings are damaged, replace the bearing caps and cylinder head as a set.



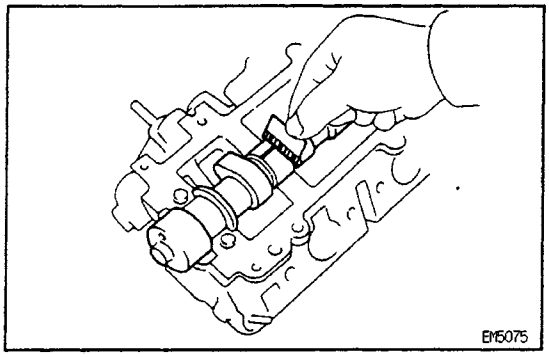
E. Inspect camshaft journal oil clearance

(a) Clean the bearing caps and camshaft journals.

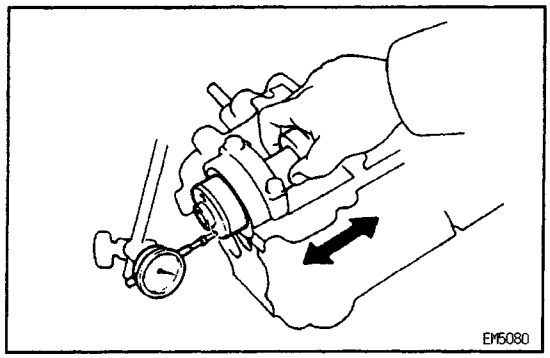
(b) Place the camshafts on the cylinder head.

(c) Lay a strip of Plastigage across each of the camshaft journals.

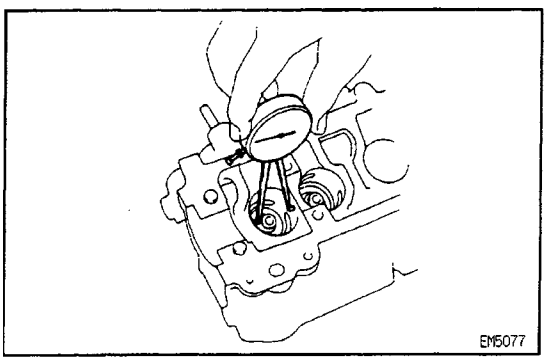
(d) Install the bearing caps.
(See step 5 on pages EG2–78 and 79)
Torque: 16 N–m (160 kgf–cm, 12 ft–lbf)
NOTICE: Do not turn the camshaft.
(e) Remove the bearing caps.



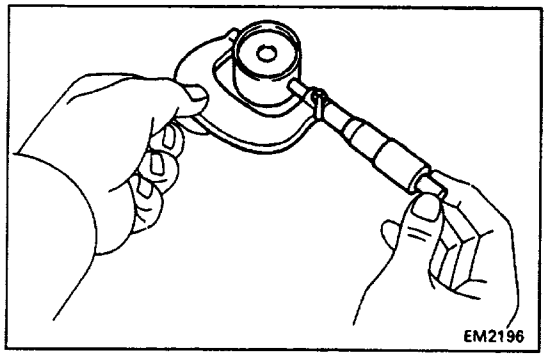
(f) Measure the Plastigage at its widest point.
Standard oil clearance:
0.025 – 0.066 mm (0.0010 – 0.0026 in.)
Maximum oil clearance:
0.10 mm (0.0039 in.)
If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.
(g) Completely remove the Plastigage.
(h) Remove the camshafts.



F. Inspect camshaft thrust clearance
(a) Install the camshaft.
(See step 5 on pages EG2–78 and 79)
(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.
Standard thrust clearance:
0.080 – 0.190 mm (0.0031 – 0.0075 in.)
Maximum thrust clearance:
0.25 mm (0.0098 in.)
If the thrust clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.
(c) Remove the camshafts.



11. INSPECT VALVE LIFTERS AND LIFTER BORES
(a) Using a caliper gauge, measure the lifter bore diameter of the clinder head.
Lifter bore diameter:
37.960 – 37.975 mm (1.4945 – 1.4951 in.)



(b) Using a micrometer, measure the lifter diameter.

Lifter diameter:

37.922 – 37.832 mm (1.4930 – 1.4934 in.)

(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

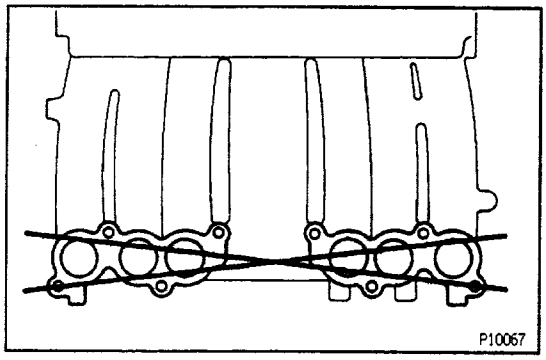
Standard oil clearance:

0.028 – 0.053 mm (0.0011 – 0.0021 in.)

Maximum oil clearance:

0.10 mm (0.0039 in.)

If the oil clearance is greater than maximum, replace the lifter. If necessary, replace the cylinder head.



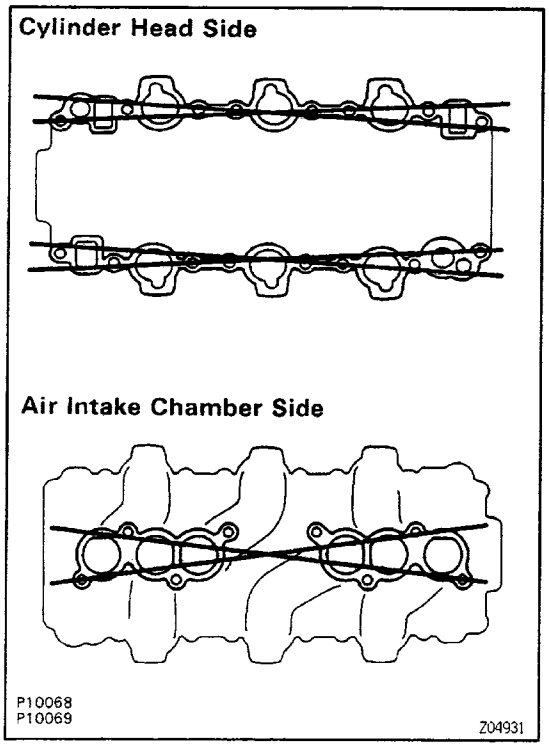
12. INSPECT AIR INTAKE CHAMBER

Using a precision straight edge and feeler gauge, measure the surface contacting the intake manifold for warpage.

Maximum warpage:

0.10 mm (0.0039 in.)

If warpage is greater than maximum, replace the chamber.



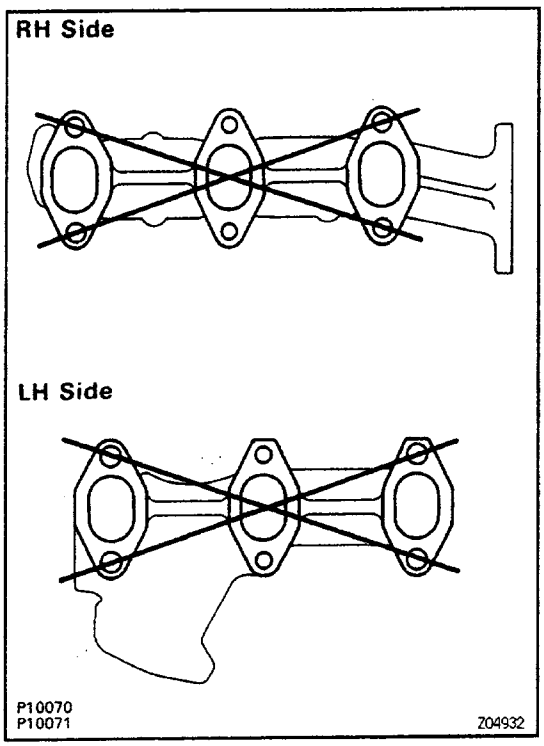
13. INSPECT INTAKE MANIFOLD

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head and air intake chamber for warpage.

Maximum warpage:

0.10 mm (0.0039 in.)

If warpage is greater than maximum, replace the manifold.



14. INSPECT EXHAUST MANIFOLD

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage. ,

Maximum warpage:

0.70 mm (0.0276 in.)

If warpage is greater than maximum, replace the manifold.

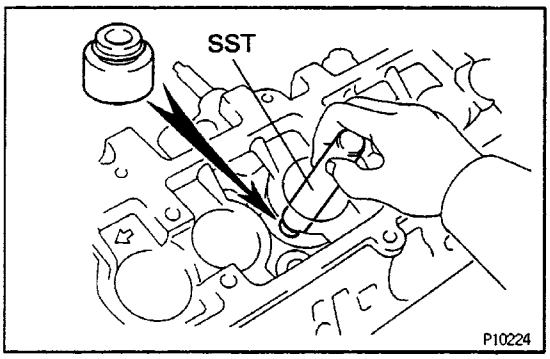
EG1ZY–01

CYLINDER HEADS ASSEMBLY

(See Components)

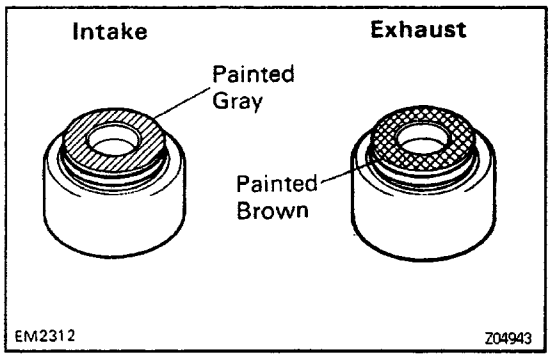
HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.

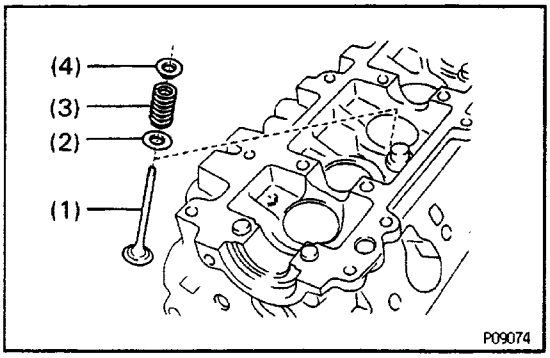


1. INSTALL VALVES

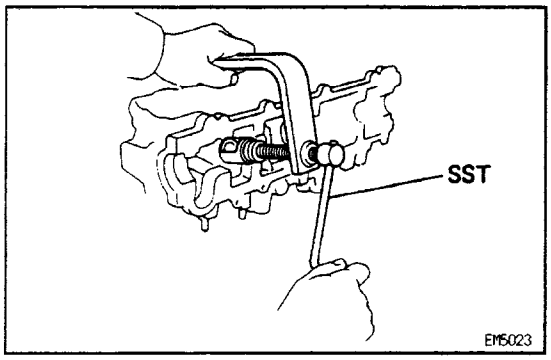
(a) Using SST, push in a new oil seal.
SST 09201 –41020



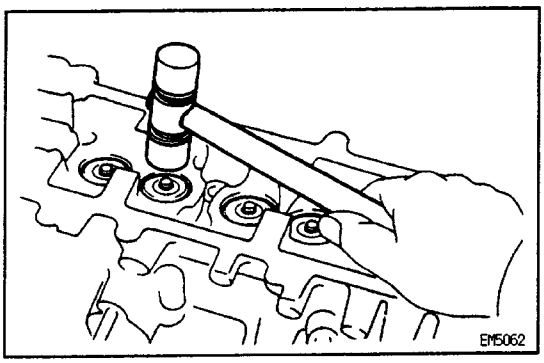
HINT: The intake valve oil seal is gray and the exhaust valve oil seal is brown.



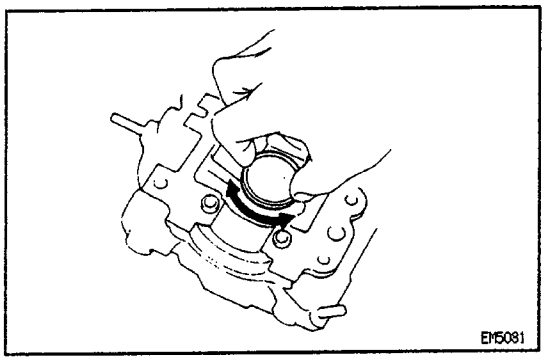
(b) Install the following parts:
(1) Valve
(2) Spring seat
(3) Valve spring
(4) Spring retainer



(c) Using SST, compress the valve spring and place the two keepers around the valve stem.
SST 09202–43013



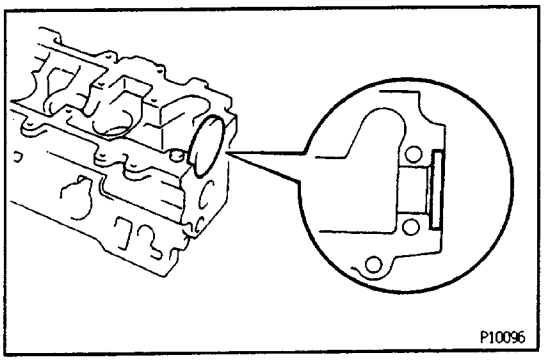
(d) Using a plastic–faced hammer, lightly tap the valve stem tip to assure proper fit.



2. INSTALL VALVE LIFTERS AND SHIMS

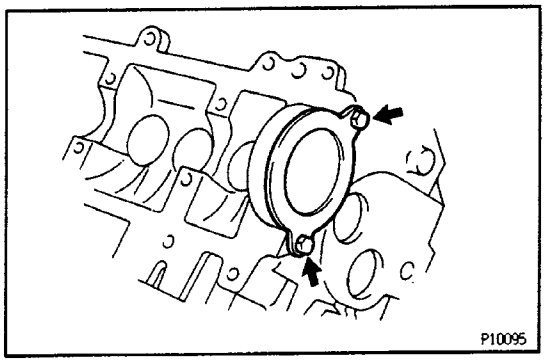
(a) Install the valve lifter– and shim.

(b) Check that the valve lifter rotates smoothly by hand.

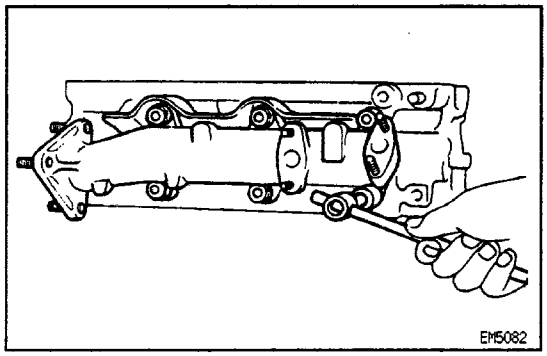


3. INSTALL CAMSHAFT HOUSING PLUGS

(a) Place a new housing plug in position on the cylinder head, facing the cup side inward.



(b) Install the housing rear plate with the two bolts.
Torque: 4.9 N–m (50 kgf–cm, 43 in.–lbf)



CYLINDER HEADS INSTALLATION

EG1ZZ–01

(See Components)

1. INSTALL RH EXHAUST MANIFOLD TO RH CYLINDER HEAD

(a) Install a new gasket and the exhaust manifold with the six nuts.

Torque: 38 N–m (400 kgf–cm, 29 ft–lbf)

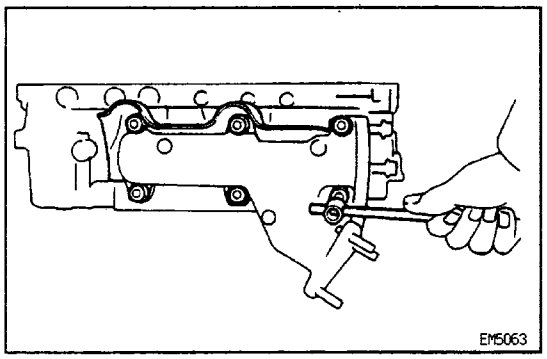
(b) Install the exhaust manifold heat insulator with the bolt and nut.

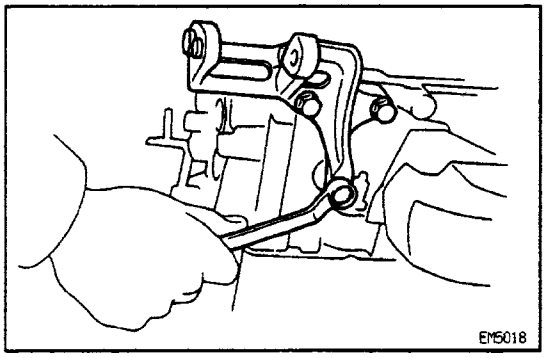
2. INSTALL RH EXHAUST MANIFOLD TO LH CYLINDER HEAD

(a) Install a new gasket and the exhaust manifold with the six nuts.

Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)

(b) Install the exhaust manifold heat insulator with the three bolts.

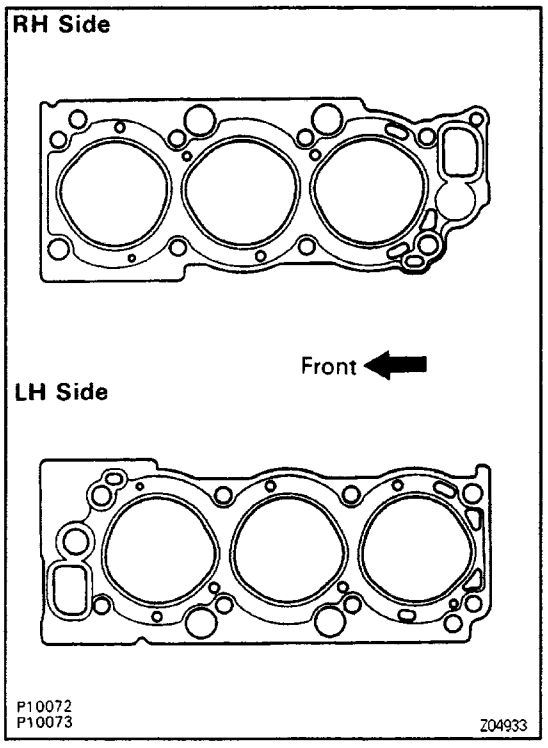




3. INSTALL GENERATOR BRACKET

Install the bracket with the three bolts.

Torque: 37 N–m (38o kgf–cm, 27 ft–!bf)



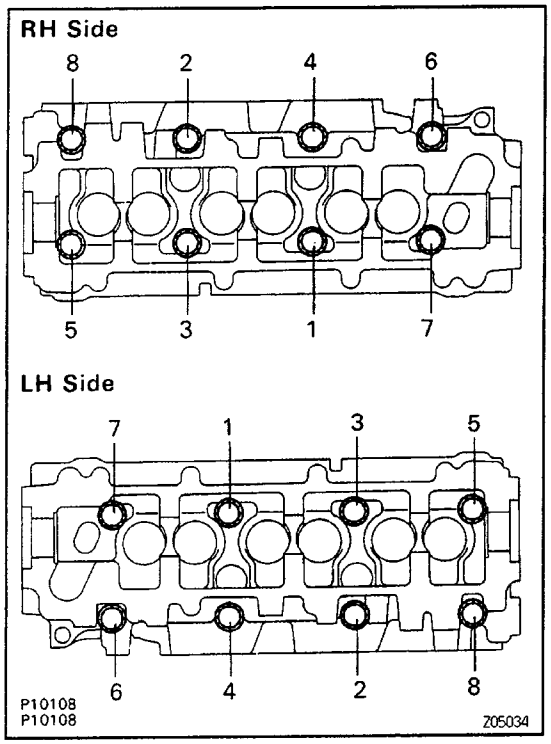
4. INSTALL CYLINDER HEADS

A. Place cylinder head on cylinder block

(a) Place two new cylinder head gaskets in position on the cylinder block.

NOTICE: Be careful of the installation direction.

(b) Place the two cylinder heads in position on the cyl–inder head gasket.



B. Install cylinder head (12 pointed head) bolts

HINT:

- The cylinder head bolts are tightened in three progressive steps (steps (c), (e) and (f)).
- If any bolts is broken or deformed, replace it.

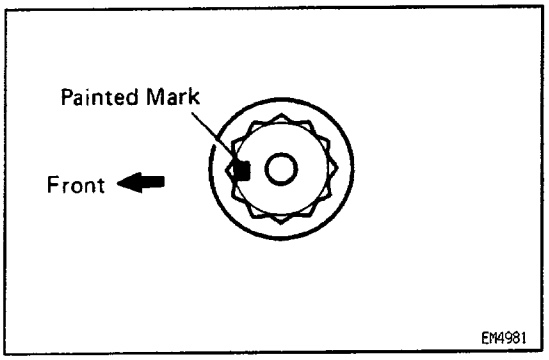
(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

(b) Install the plate washer to the cylinder head bolt.

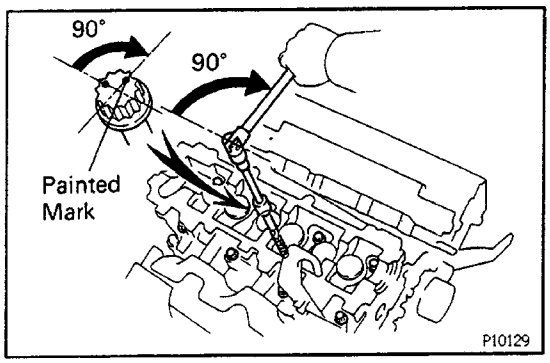
(c) Install and uniformly tighten the eight cylinder head bolts on one side of the cylinder head in several passes, in the sequence shown, then do the other side as shown.

Torque: 44 N–m (450 kgf–cm, 33 ft–lbf)

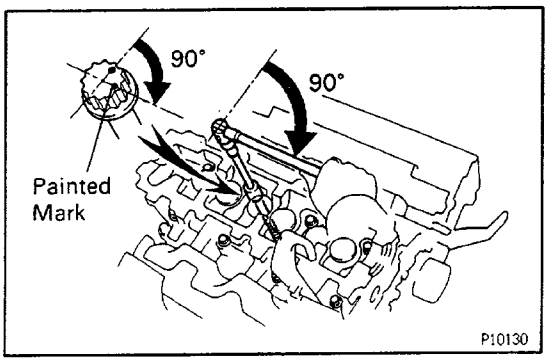
If any one of the bolts does not meet the torque specification, replace the bolt.



(d) Mark the front of the cylinder head bolt head with paint.

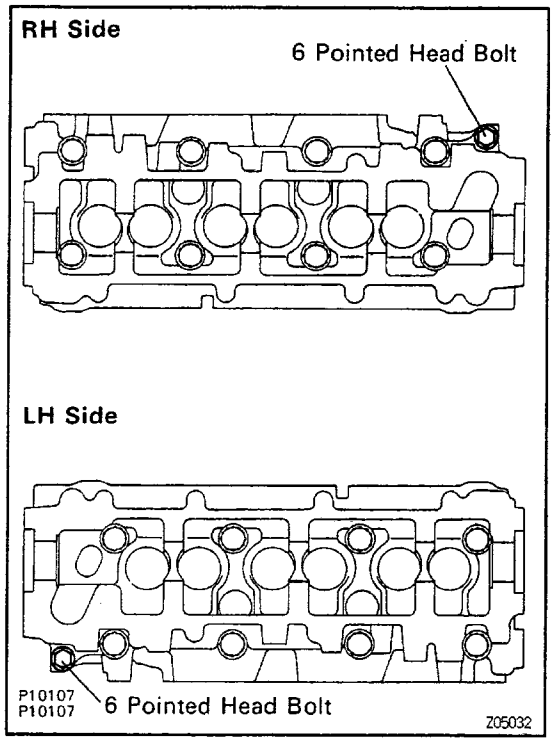


(e) Retighten the cylinder head bolts 90• in the numerical order shown.



(f) Retighten cylinder head bolts by an additional 90•.

(g) Check that the painted mark is now facing rearward.

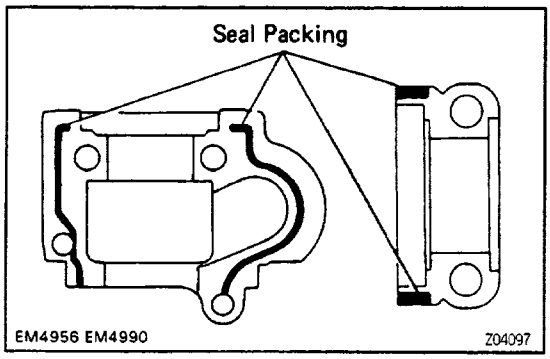


C. Install cylinder head (6 pointed head) bolts

(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

(b) Install the cylinder head bolt to each cylinder head.

Torque: 41 N–m (420 kgf–cm, 30 ft–lbf)

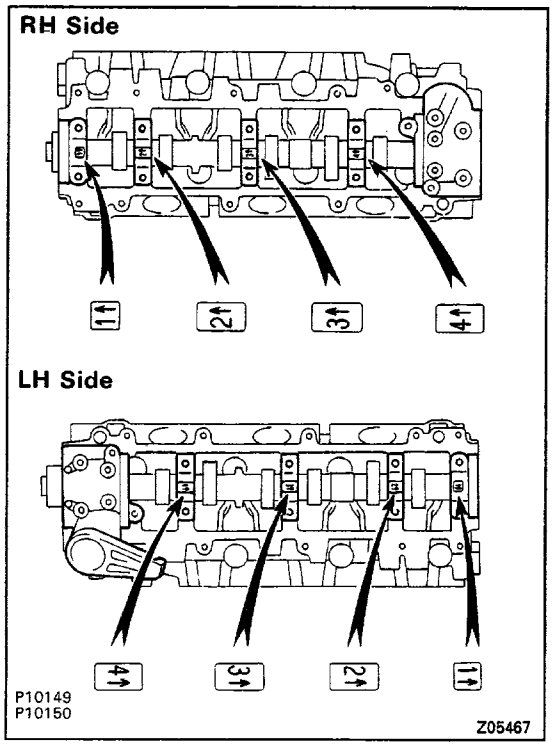


5. INSTALL CAMSHAFTS

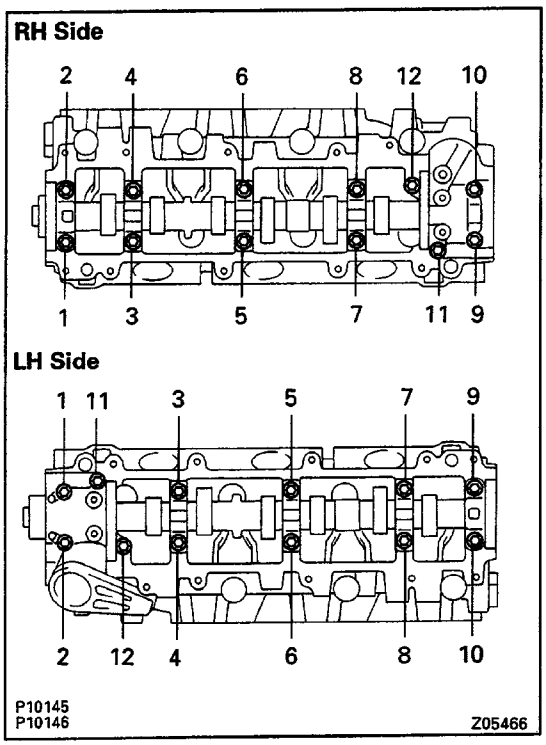
(a) Place the camshaft on the cylinder head.

(b) Apply seal packing to the No.1 and No.5 bearing caps as shown.

Seal packing: Part No. 08826–00080 or equivalent

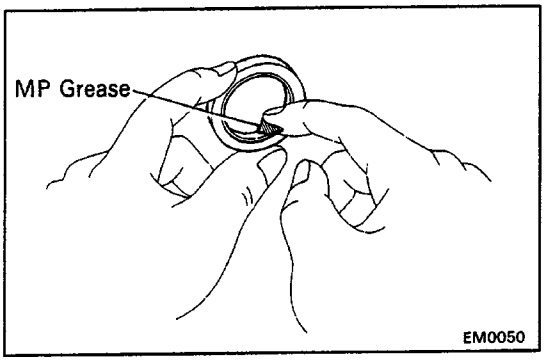


(c) Install the bearing caps in their proper locations.

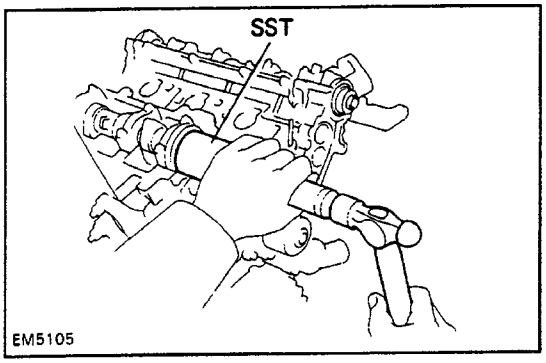


(d) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

(e) Install and uniformly tighten the twelve bearing cap bolts on one side in several passes, in the sequence shown, then do the other side as shown.
Torque: 16 N–m (160 kgf–cm, 12 ft–lbf)



(f) Apply MP grease to a new oil seal lip.

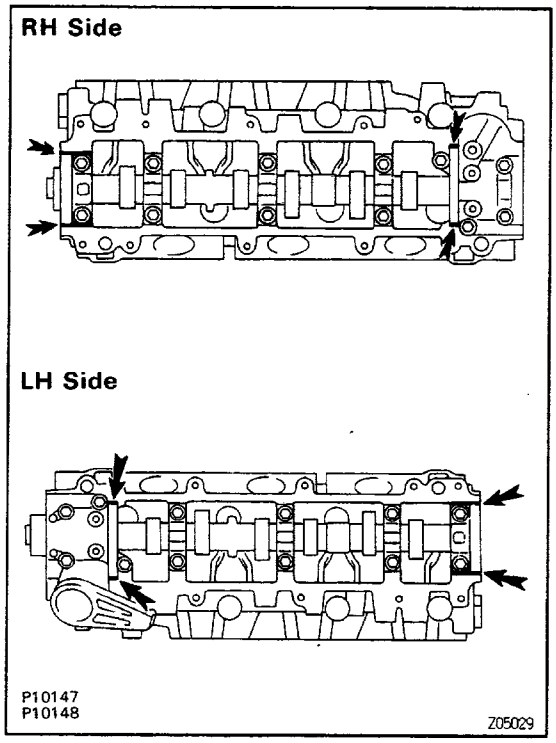


(g) Using SST, tap in the two camshaft oil seals.
SST 09214–60010

6. CHECK AND ADJUST VALVE CLEARANCE
(See Tune – Up, steps 7 and 8 on pages EG –19 to 21)

Turn the camshaft and position the cam lobe upward, check and adjust the valve clearance.

Valve clearance (Cold):
Intake
0.18 – 0.28 mm (0.007 – 0.011 in.)
Exhaust
0.22 – 0.32 mm (0.009 – 0.013 in.)



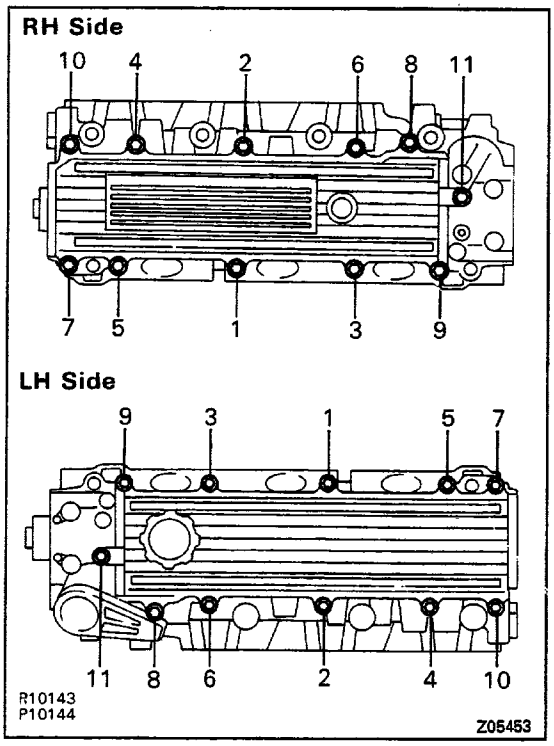
7. INSTALL CYLINDER HEAD COVERS

(a) Remove the old packing (FIPG) material.

(b) Apply seal packing to the cylinder head as shown in the illustration.

Seal packing:

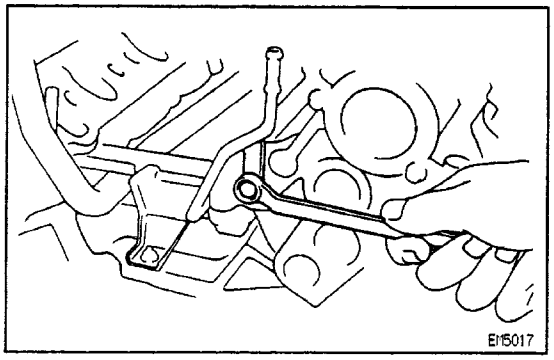
Part No. 08826–00080 or equivalent



(c) Install the gasket to the head cover.

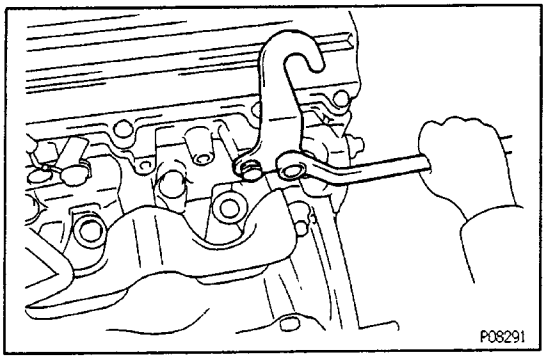
(d) Install the cylinder head cover with the eleven bolts. Uniformly tighten the bolts one side of the cylinder head cover in several passes, in the sequence shown, then do the other side as shown. Install the two cylinder head covers.

Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)



8. INSTALL WATER BY–PASS PIPE TO RH CYLINDER HEAD .

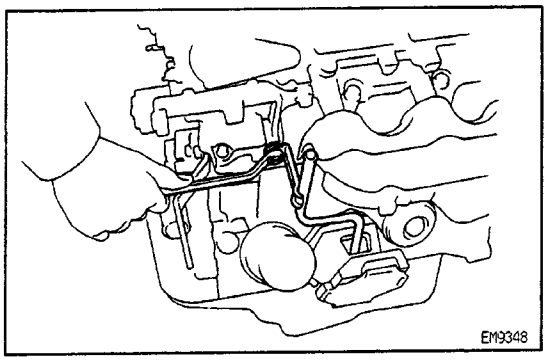
Install the water by– pass pipe with the bolt.



9. INSTALL NO.2 ENGINE HANGER

Install the engine hanger with the two bolts.

Torque: 40 N–m (410 kgf–cm, 30 ft–lbf)



10. INSTALL OIL DIPSTICK GUIDE AND DIPSTICK

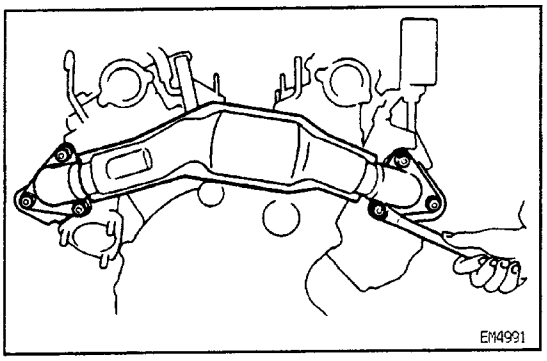
(a) Install a new 0–ring on the oil dipstick:

(b) Install the oil dipstick guide with the bolt.

Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)

(c) Install the oil dipstick.

11. INSTALL GENERATOR

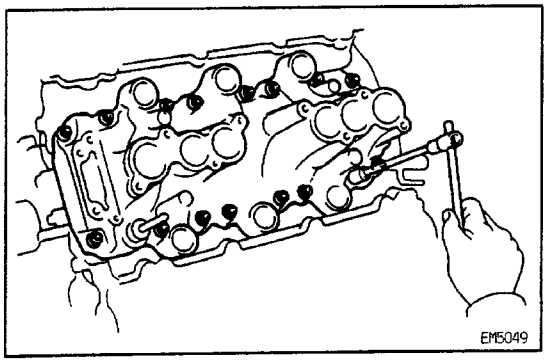


12. INSTALL EXHAUST CROSSOVER PIPE

Install two new gaskets and the crossover pipe with the six nuts.

Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)

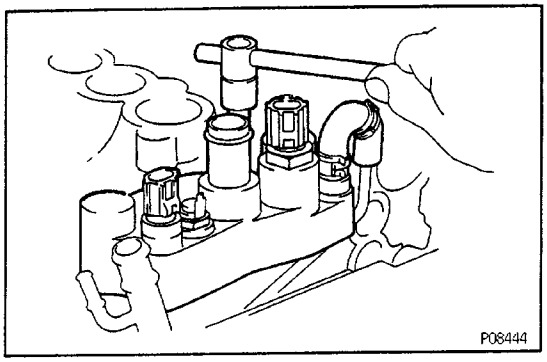
13. INSTALL KNOCK SENSOR WIRE



14. INSTALL INTAKE MANIFOLD

install two new gaskets and the intake manifold with the twelve bolts and four nuts.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

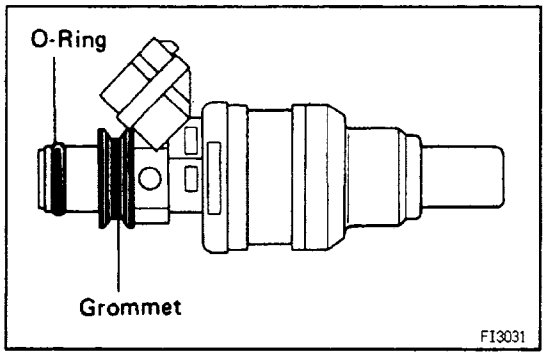


15. INSTALL WATER BY–PASS OUTLET

(a) Install a new gasket and the water by–pass outlet with the two nuts.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

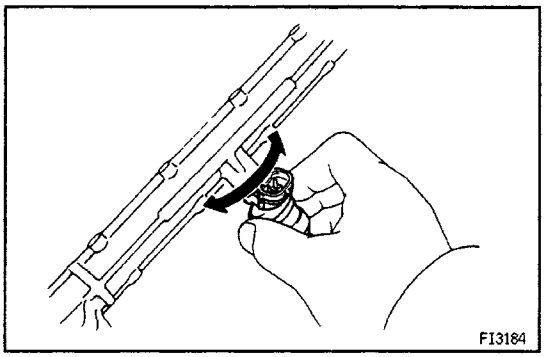
(b) Connect the No.3 water by–pass hose to the No.1 water by–pass pipe.



16. INSTALL INJECTORS AND DELIVERY PIPE

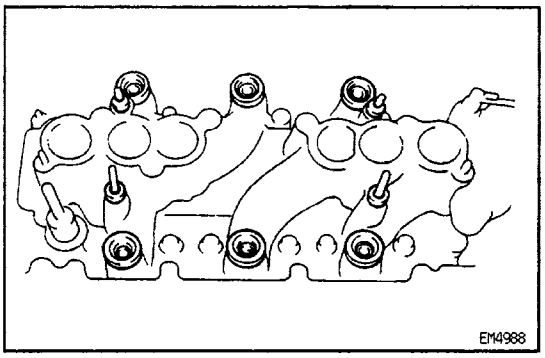
(a) Install a new grommet to the injector.

(b) Apply a light coat of gasoline to a new O–ring, and install it to the injector.



(c) While turning the injector clockwise and counter–clockwise, push it to the delivery pipe. Install the eight injectors.

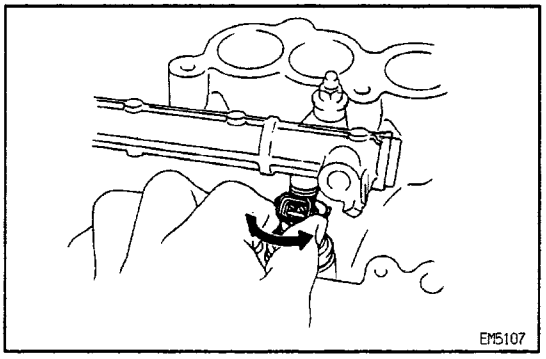
(d) Position the injector connector outward.



(e) Install a O–ring to the spacer.

(f) Place the six spacers and insulators into the injector holes.

(g) Place the four spacers on the stud bolts.



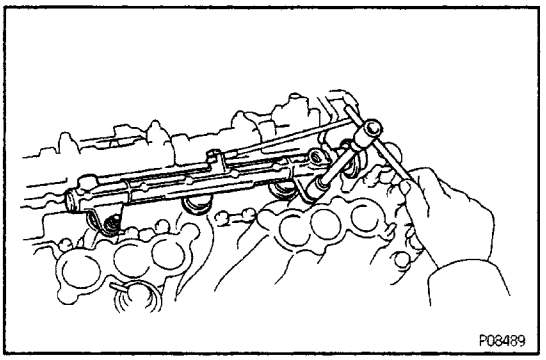
(h) Place the two delivery pipes together with the six injectors in position on the intake manifold.

(i) Temporarily install the four spacers and nuts.

(j) Check that the injectors rotate smoothly.

HINT: If injectors do not rotate smoothly, the probable cause is incorrect installation of O –rings. Replace the O–rings.

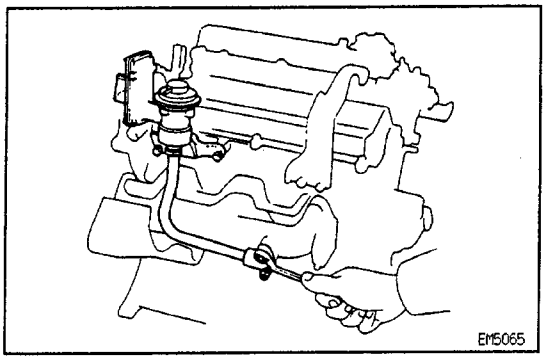
(k) Position the injector connector upward.



(l) Tighten the four nuts holding the delivery pipes to the intake manifold.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

(m) Install the No. 1 fuel pipe to the No.3 bearing cap with the bolt.



17. INSTALL PAIR REED VALVE AND NO.1 INJECTION MANIFOLD

(a) Position a new gasket on the RH exhaust manifold.

(b) Install the PAIR reed valve and injection manifold assembly with the two nuts and two bolts.

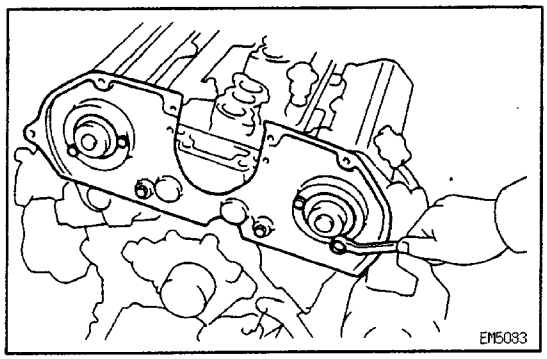
Torque:
37 N–m (380 kgf–cm, 27 ft–lbf) for bolt
29 N–m (300 kgf–cm, 22 ft–lbf) for nut

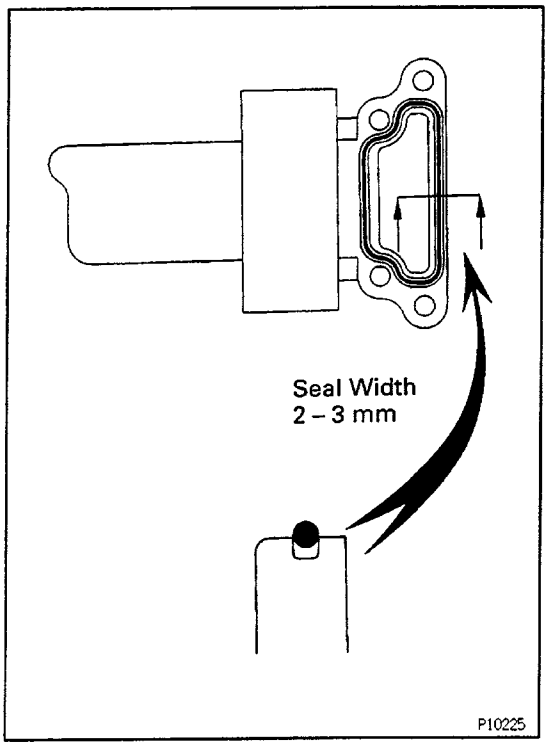
18. INSTALL VSV BRACKET AND VSV TO PAIR REED VALVE

19. INSTALL NO.3 TIMING BELT COVER

Install the timing belt cover with the six bolts.

Torque: 8.3 N–m (85 kgf–cm, 74 in.–lbf)





20. INSTALL NO.2 IDLER PULLEY

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the water outlet housing on the No.2 idler pulley and the intake manifold.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

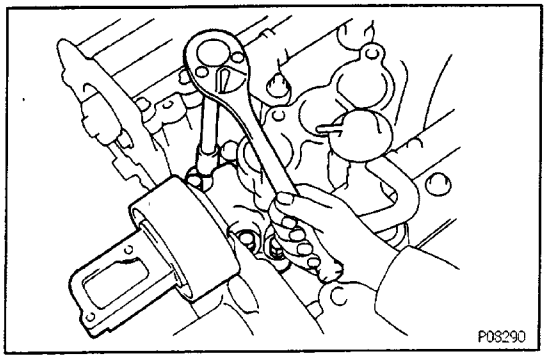
(b) Apply seal packing to the sealing groove of the water outlet housing on the idler pulley as shown in the illustration.

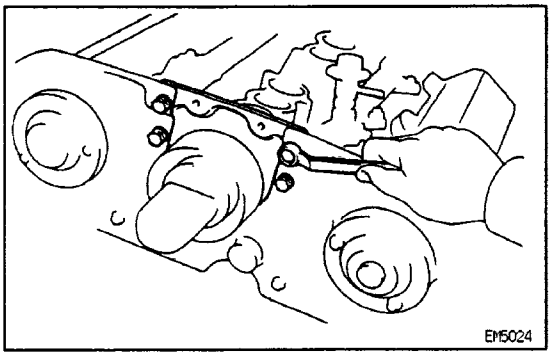
Seal packing:
Part No. 08826–00100 or equivalent

- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Install the idler pulley with the four bolts. Uniformly tighten the bolts in several passes.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

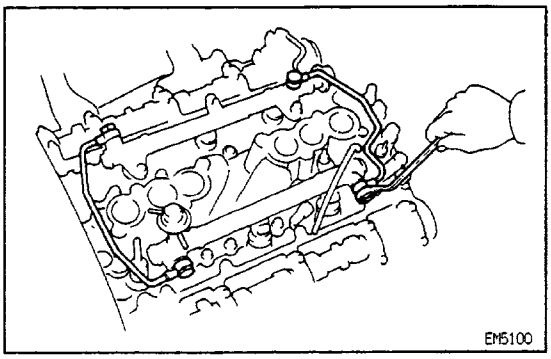




21. INSTALL NO.4 TIMING BELT COVER

Install the timing belt cover with the four bolts.

Torque: 8.3 N–m (85 kgf–em, 74 in.–lbf)



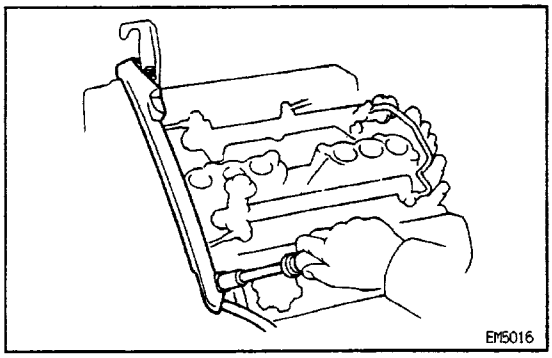
22. INSTALL NO.2 AND NO.3 FUEL PIPES

(a) Install the No.2 fuel pipe with four new gaskets and two union bolts.

Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)

(b) Install the No.3 fuel pipe with four new gaskets and two union bolts.

Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)

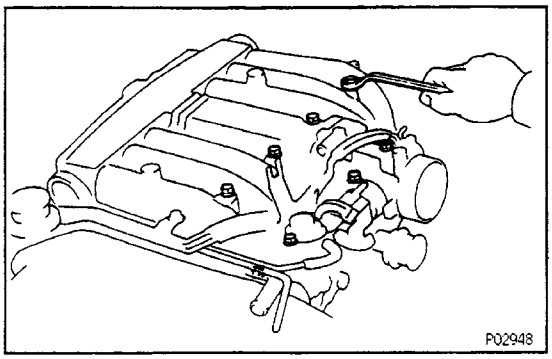


23. INSTALL ENGINE WIRE

(a) Install the engine wire with the two bolts.

(b) Connect the following connectors:

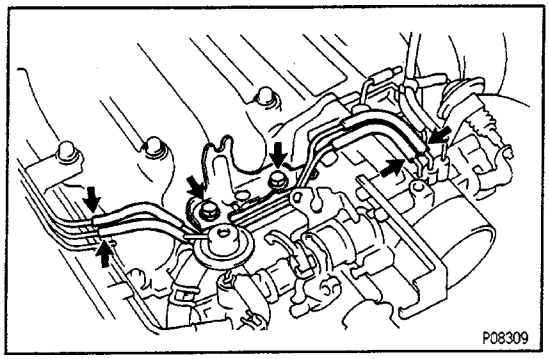
- Injector connectors
- RH ground strap
- ECT sender gauge connector
- ECT sensor connector
- No.2 ECT switch connector
- Cold start injector time switch connector
- Knock sensor connector



24. INSTALL AIR INTAKE CHAMBER

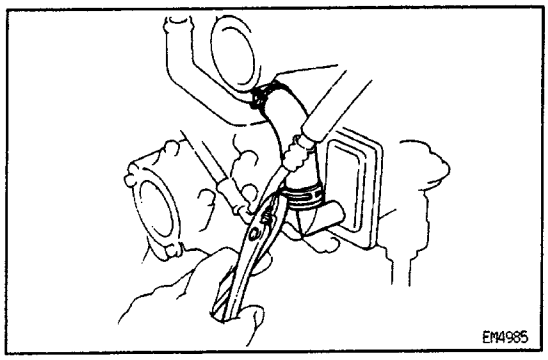
(a) Install a new gasket and the intake chamber with the six bolts and two nuts. .

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

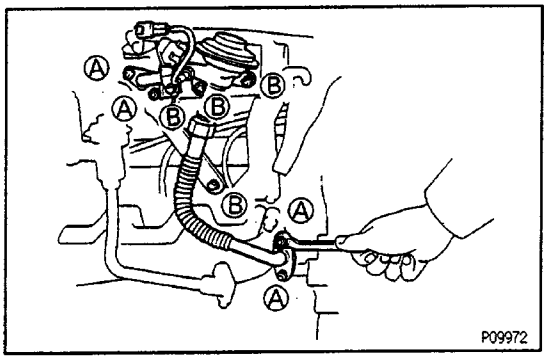


(b) Install the accelerator cable bracket with the two bolts.

(c) Connect the four vacuum hoses to the air pipes.



(d) Connect the No.1 air hose to the reed valve.



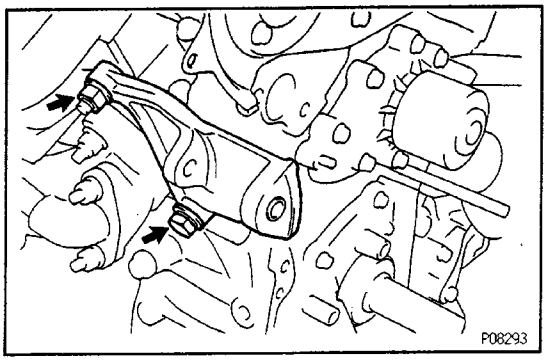
(e) Install two new gaskets, the EGR valve, pipes assembly, air intake chamber stay and throttle cable bracket with the six nuts and two bolts.

Torque:
29 N–m (300 kgf–cm, 22 ft–lbf) for (A)
18 N–m (185 kgf–cm, 13 ft–lbf) for (B)

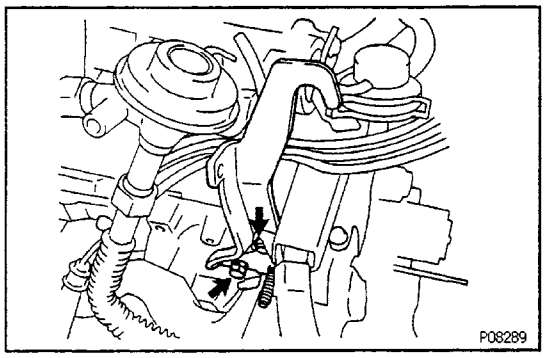
(f) (C & C only)
Disconnect the two water by–pass hoses from the EGR valve.

(g) Connect the EGR hoses to the air pipe and EGR vacuum modulator.

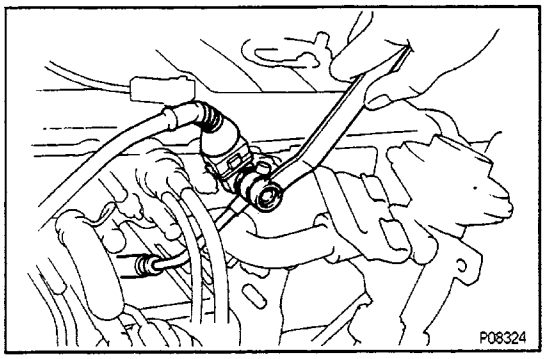
(h) (Calif. and C & C)
Connect the EGR gas temperature sensor connector.



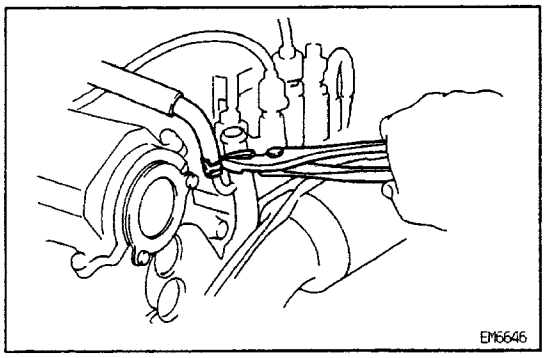
(i) Install the PS pump bracket with the bolt and nut.



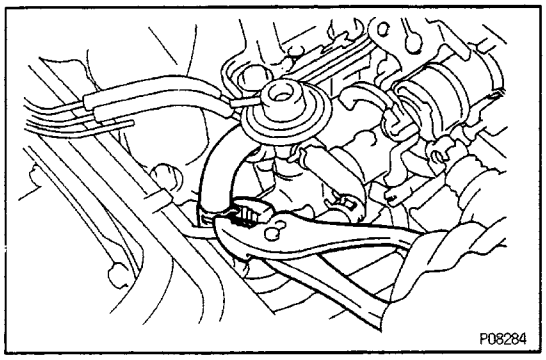
(j) Install No.1 engine hanger.
Torque: 40 N–m (410 kgf–cm, 30 ft–lbf)



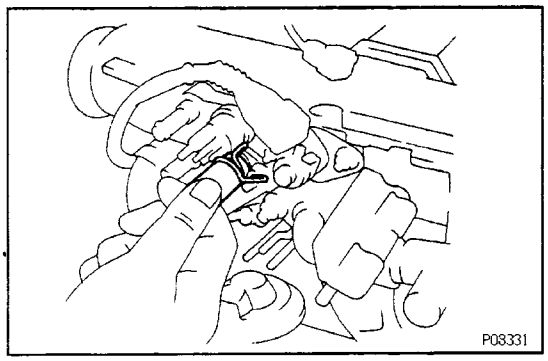
(k) Connect the cold start injector tube with two new gasket and the union bolt.
Torque: 15 N–m (150 kgf–cm, 11 ft–lbf)
(l) Connect the vacuum hose to the gas filter.
(m) Connect the cold start injector connector.



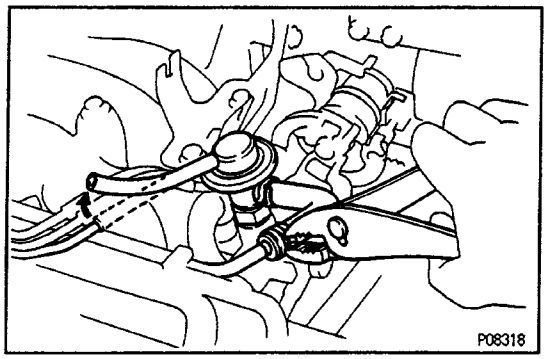
(n) Install the No.5 water by–pass hose to the water by –pass pipe.



(o) Connect the No.4 water by–pass hose to the union of intake manifold.

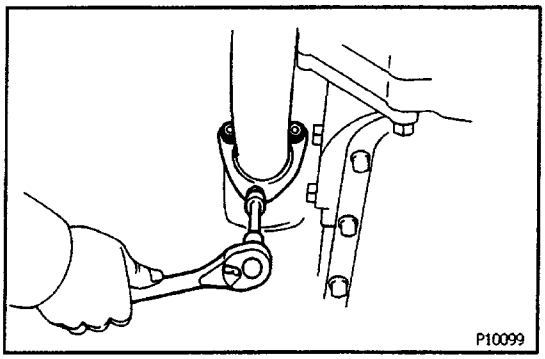


(p) Connect the PCV hose to the union.

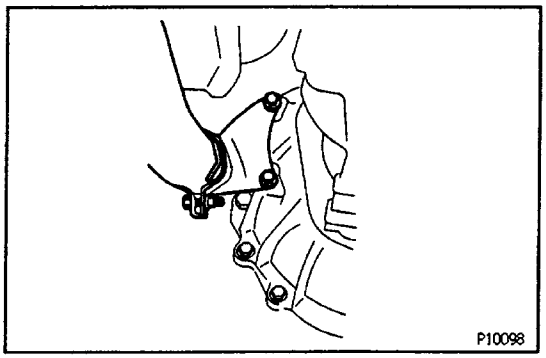


(q) Connect the vacuum and fuel hoses to the pressure regulator.
(r) Connect the charcoal canister vacuum hose to the throttle body.
(s) Connect the throttle position sensor connector.

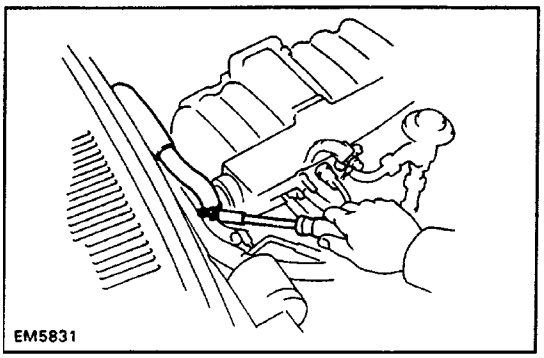
25.INSTALL TIMING BELT
See steps 2, 7 to 16, 22 and 24 on pages EG2–41 to 48)
26. INSTALL DISTRIBUTOR
(See steps 1 and 2 on pages IG–25 and 26)
27. CONNECT HIGH–TENSION CORDS TO SPARK PLUGS



28. INSTALL FRONT EXHAUST PIPE
(a) Connect the exhaust pipe to the LH exhaust manifold with new gasket and three new nuts.
Torque: 62 N–m (630 kgf–cm, 46 ft–lbf)
(b) Connect the exhaust pipe to the catalytic converter with new gasket and the two bolts.
Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)



(c) Install the pipe bracket to the transmission with the two bolts.
(d) Install the pipe bracket to the exhaust pipe with the pipe clamp.
(e) Connect the oxygen sensor connector–.



29. CONNECT FUEL INLET AND OUTLET HOSES
30. CONNECT HEATER HOSES

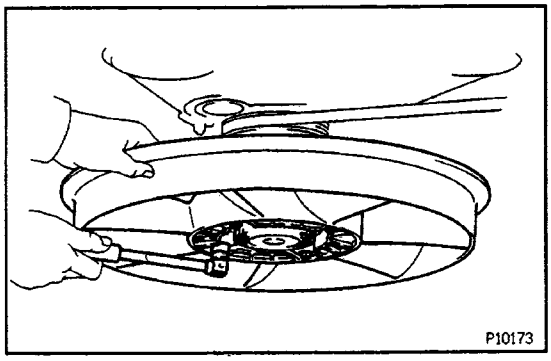
31. CONNECT CABLES, HOSES, CONNECTORS, STRAP AND WIRES

(a) Connect the following cables:
- Accelerator cable
- (A/T only)
  Throttle cable
- (w/ Cruise Control System)

Cruise control cable

(b) Connect the following hoses:
- PS air hoses to gas filter and air pipe
- Brake booster hose
  (w/ Cruise Control System)
- Cruise control vacuum hose
- Charcoal canister hose from canister
- VSV vacuum hoses

(c) Connect the following strap, wires and connectors:
- Ground strap to LH fender apron
- Generator connector and wire
- Igniter connector
- Oil pressure sender gauge connector
- Ground strap to engine rear side
- ECM connectors
- VSV connectors
- A/C compressor connector
- (M/T only)
  Starter relay connector
- Solenoid resister connector
- Data link connector 1
  (w/ ADD)
  ADD switch connector



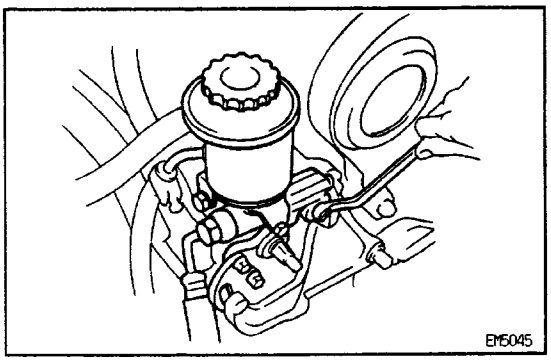
32. INSTALL GENERATOR DRIVE BELT

33. INSTALL COOLING FAN

Install the cooling fan with the four nuts.

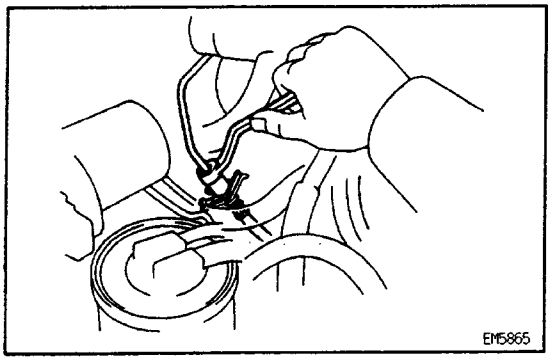
Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)

34. INSTALL A/C DRIVE BELT

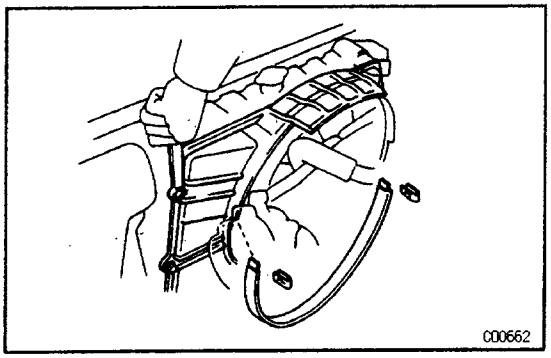


35. INSTALL PS PUMP

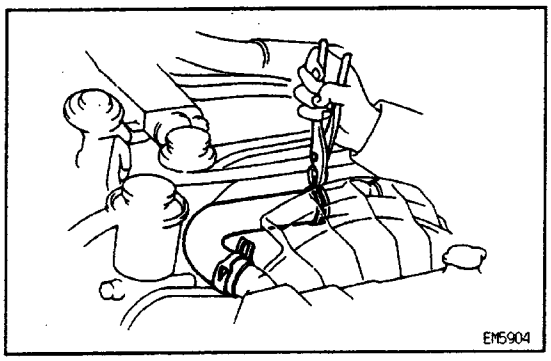
36. INSTALL PS PUMP PULLEY AND DRIVE BELT



37. (M/T only)
CONNECT CLUTCH RELEASE CYLINDER HOSE



38. INSTALL RADIATOR
(a) Install the radiator with the four bolts.
(b) Install the No. fan shroud with the four bolts.
(c) Install the No.2 fan shroud with the two clips.



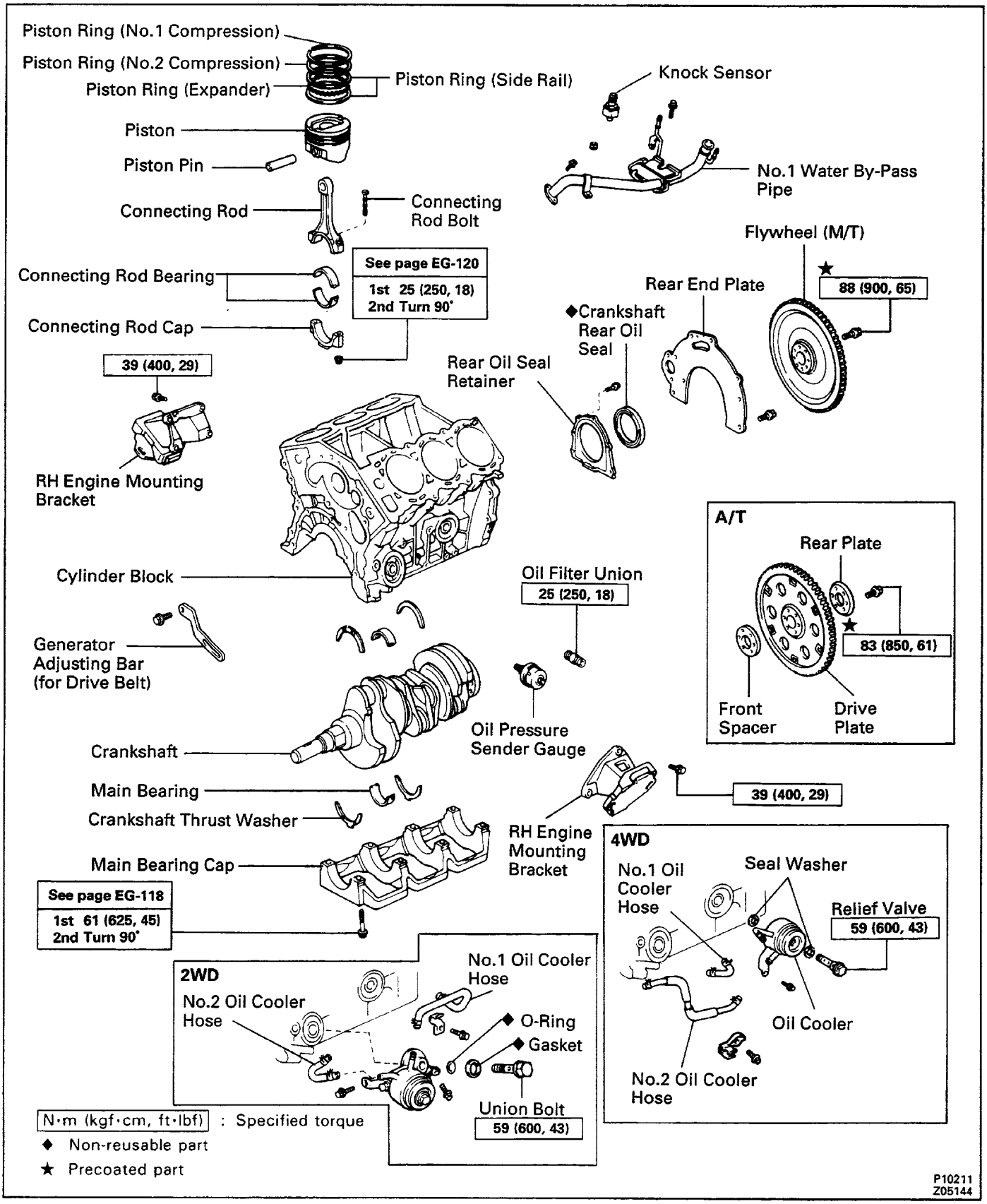
(d) Install the radiator hoses.
(e) (A/T only)
Connect the oil cooler hoses.
(f) Connect the reservoir tank hose.

39. INSTALL AIR CLEANER AND HOSE
40. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY
41. FILL WITH ENGINE COOLANT
42. START ENGINE AND CHECK FOR LEAKS
43. PERFORM ENGINE ADJUSTMENT
(See Tune – Up on pages EG2–12 to 27)
44. PERFORM ROAD TEST
Check for abnormal noise, shock, slipage, correct shift points and smooth operation.
45. RECHECK ENGINE COOLANT LEVEL AND OIL LEVEL

CYLINDER BLOCK

EG1EG–05

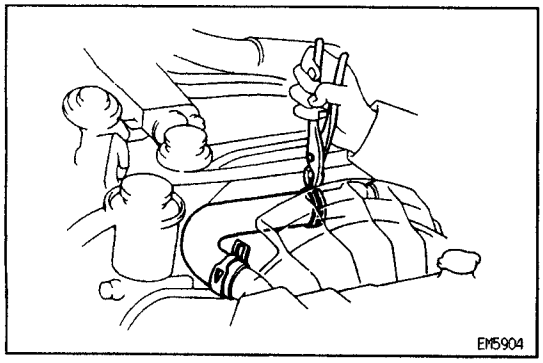
COMPONENTS



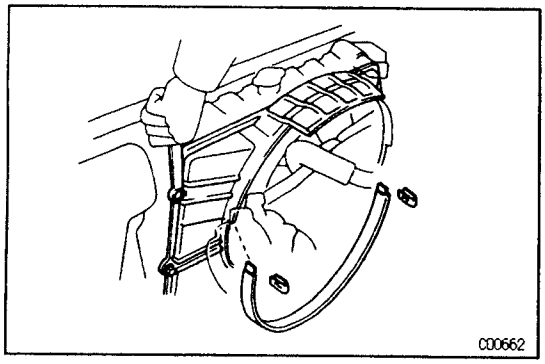
EG30W–01

ENGINE REMOVAL

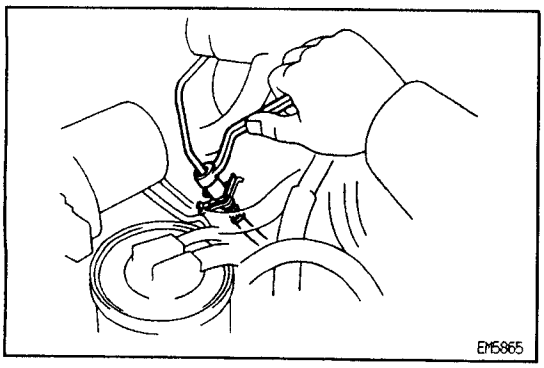
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. REMOVE HOOD
3. REMOVE BATTERY
4. REMOVE ENGINE UNDER COVER
5. DRAIN ENGINE COOLANT
6. DRAIN ENGINE OIL
7. REMOVE AIR CLEANER AND HOSE
8. REMOVE RADIATOR



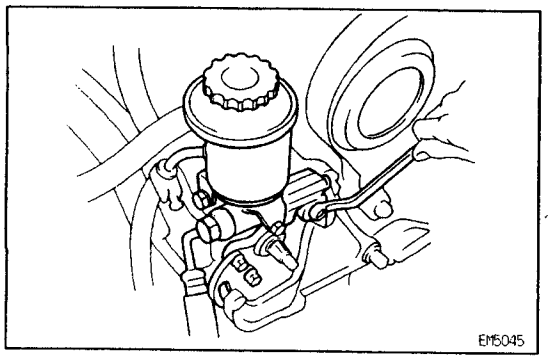
(a) Disconnect the reservoir hose.
(b) (A/T only)
Disconnect the oil cooler hoses.
(c) Remove the radiator hoses.



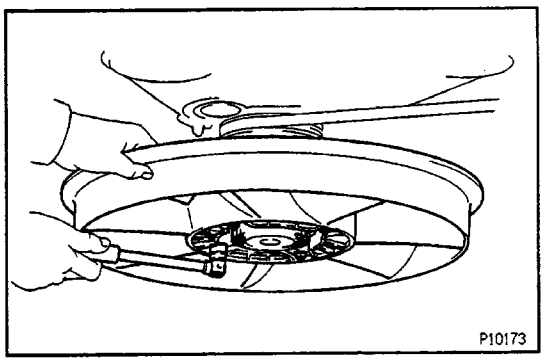
(d) Remove the two clips and No.2 fan shroud.
(e) Remove the four bolts and No.1 fan shroud.
(f) Remove the four bolts and radiator.



9. (M/T only)
DISCONNECT CLUTCH RELEASE CYLINDER HOSE



10. REMOVE PS DRIVE BELT AND PUMP PULLEY
11. DISCONNECT PS PUMP FROM ENGINE
12. REMOVE A/C DRIVE BELT



13. REMOVE COOLING FAN

Remove the four nuts and cooling fan.

14. REMOVE GENERATOR DRIVE BELT

15. DISCONNECT STRAP, WIRES. CONNECTORS, HOSES AND CABLES

(a) Disconnect the following strap, wires and connectors:

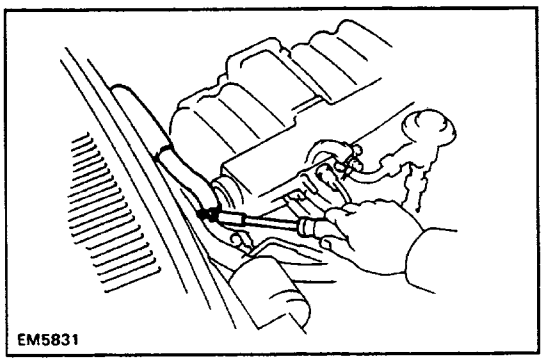
- Ground strap from LH fender apron
- Generator connector and wire
- Igniter connector
- Oil pressure sender gauge connector
- Ground strap from engine rear side
- ECM connectors
- VSV connectors
- A/C compressor connector
- (M/T only)
  Starter relay connector
- Solenoid resister connector
- Data link connector 1
- (w/ ADD)
  ADD switch connector

(b) Disconnect the following hoses:

- PS air hoses from gas filter and air pipe
- Brake booster hose
- (w/ Cruise Control System)
  Cruise control vacuum hose
- Charcoal canister hose from canister
- VSV vacuum hoses

(c) Disconnect the following cables:

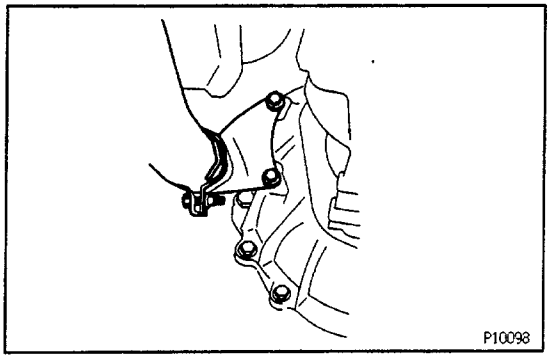
- Accelerator cable
- (A/T only)
  Throttle cable
- (w/ Cruise Control System)
  Cruise control cable



16. DISCONNECT HEATER HOSES

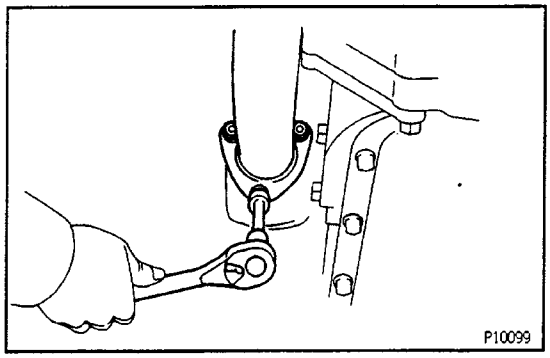
17. DISCONNECT FUEL INLET AND OUTLET HOSES

18. DISCONNECT A/C COMPRESSOR FROM ENGINE



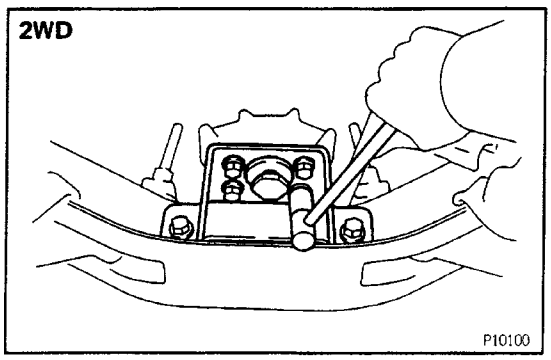
19. REMOVE FRONT EXHAUST PIPE

(a) Disconnect the heated oxygen sensor connector.
(b) Loosen the pipe clamp bolt.
(c) Remove the two bolts and pipe bracket.
(d) Remove the three nuts, and disconnect the exhaust pipe from the exhaust manifold. Remove the gasket.

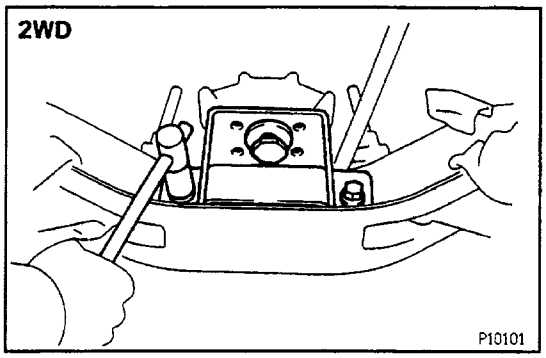


(e) Remove the two bolts, joint retainer, exhaust pipe and gasket from the catalytic converter.

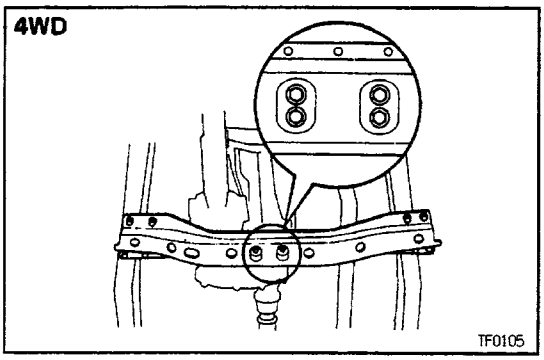
20. (M/T only)
REMOVE SHIFT LEVERS
21. REMOVE REAR PROPELLER SHAFT
(See page PR–5)
22. (4WD only)
REMOVE FRONT PROPELLER SHAFT
(See page PR–5)
23. (4WD A/T only)
DISCONNECT MANUAL SHIFT LINKAGE
24. DISCONNECT SPEEDOMETER CONNECTOR
NOTICE: Do not lose the felt dust protector and washers.
25. (4WD only)
REMOVE TRANSFER UNDER COVER
26. (4WD only)
REMOVE STABILIZER BAR
27. REMOVE NO.1 FRAME CROSSMEMBER
28. REMOVE N0.1 FRONT FLOOR HEAT INSULATOR AND BRAKE TUBE HEAT INSULATOR (4WD)



29. (2WD)
REMOVE ENGINE REAR MOUNTING BRACKET
(a) Remove the four bolts holding the mounting bracket to the mounting insulator.



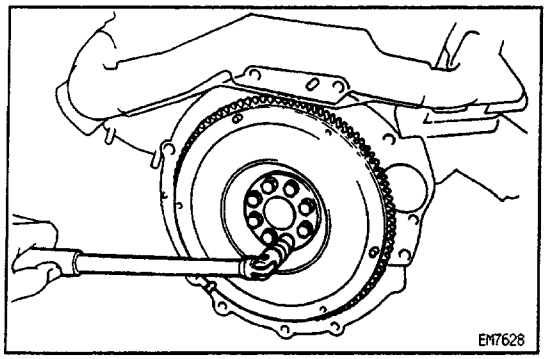
(b) Raise the transmission slightly by raising the engine with a jack.
(c) Remove the four bolts holding the mounting bracket to the support member, and remove the mounting bracket.



30. (4WD)
REMOVE NO.2 FRAME CROSSMEMBER
(a) Remove the four bolts holding the engine rear mou–nting insulator to the frame crossmember.
(b) Raise the transmission slightly with a jack.
(c) Remove the eight bolts holding the frame crossme–mber to the side frame. Remove the frame crossme–mber.

31. REMOVE ENGINE AND TRANSMISSION ASSEMBLY FROM VEHICLE
(a) Attach the engine chain hoist to the engine hangers.
(b) Remove the four bolts holding the RH and LH engine mounting insulators to the body mountings.
(c) Lift the engine and transmission assembly out of the vehicle slowly and carefully.
HINT: Make sure the engine is clear of all wiring, hoses and cables.
NOTICE: Be careful not hit the PNP switch.
(d) Place the engine and transmission assembly onto the stand.

32. REMOVE TRANSMISSION FROM ENGINE
33. (M/T only)
REMOVE CLUTCH COVER AND DISC



PREPARATION FOR DISASSEMBLY

EG20U–01

(See Components)

1. REMOVE FLYWHEEL OR DRIVE PLATE

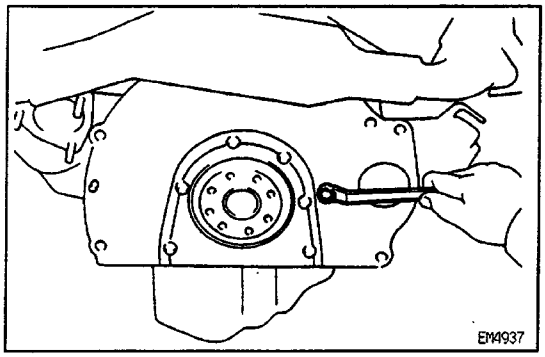
(a) Remove the eight bolts.

(b) (M/T)

Remove the flywheel.

(c) (A/T)

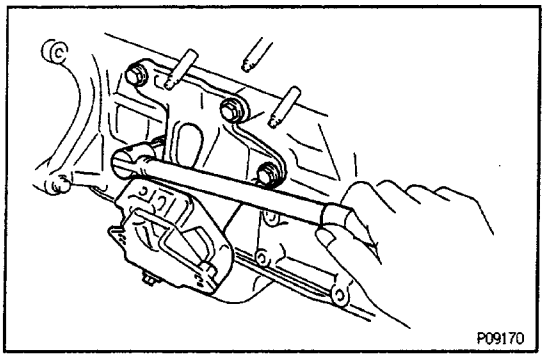
Remove the rear plate, drive plate and front spacer.



2. REMOVE REAR END PLATE

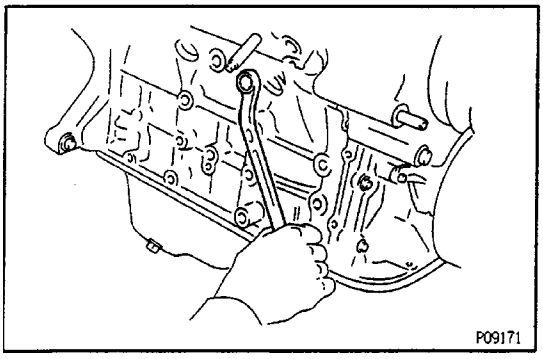
Remove the bolt and rear end plate.

3. INSTALL ENGINE STAND FOR DISASSEMBLY



4. REMOVE RH AND LH ENGINE MOUNTING BRACKETS

Remove the four bolts and mounting bracket. Remove the two mounting brackets.



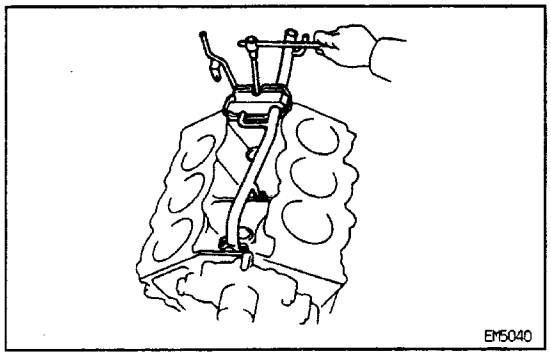
5. REMOVE ENGINE COOLANT DRAIN PLUGS

6. REMOVE TIMING BELT

(See pages EG2–33 to 38)

7. REMOVE CYLINDER HEADS

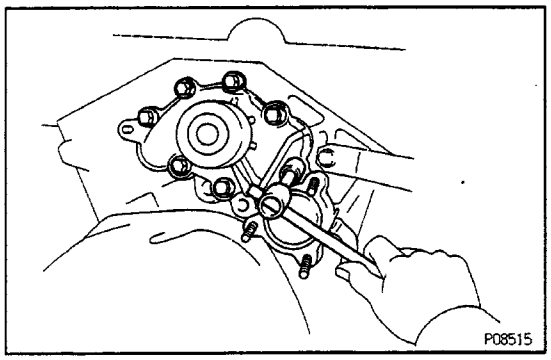
(See pages EG2–53 to60)



8. REMOVE No.1 WATER BY–PASS PIPE

Remove the two nuts, two bolts and water by–pass pipe.

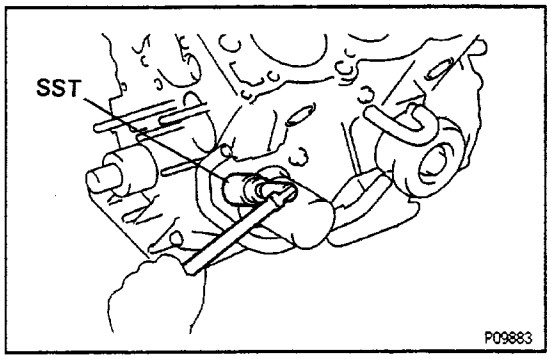
9. REMOVE THERMOSTAT



10. REMOVE WATER PUMP

Remove the seven bolts and water pump.

11. REMOVE GENERATOR ADJUSTING BAR

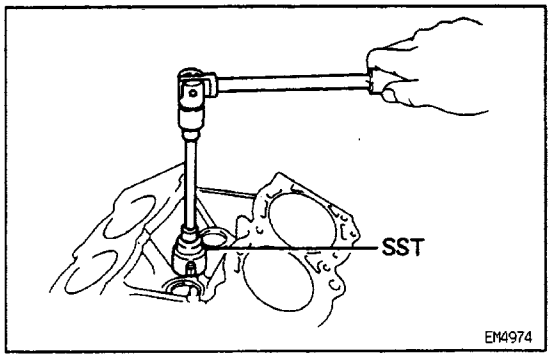


12. REMOVE OIL PRESSURE SENDER GAUGE

Using SST, remove the oil pressure sender gauge.

SST 09816 – 30010

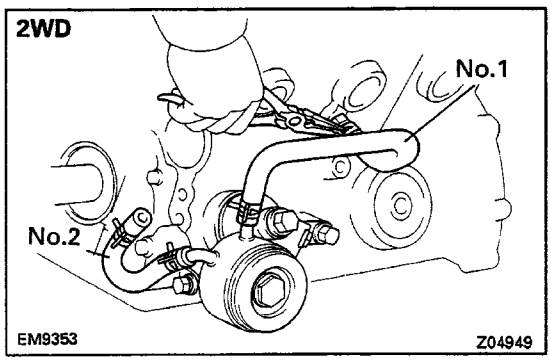
13. REMOVE OIL FILTER



14. REMOVE KNOCK SENSOR

Using SST, remove the knock sensor.

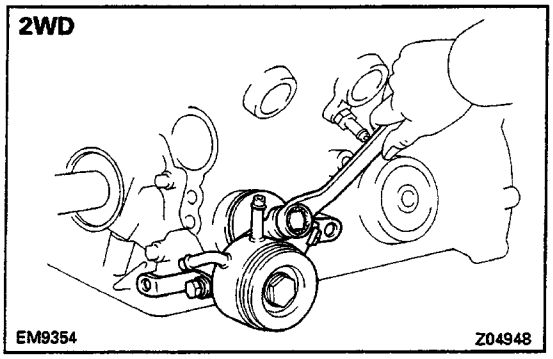
SST 09817–16011



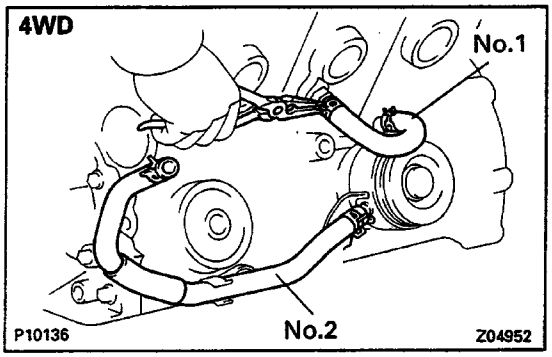
15. (2WD)

REMOVE OIL COOLER AND BRACKET ASSEMBLY

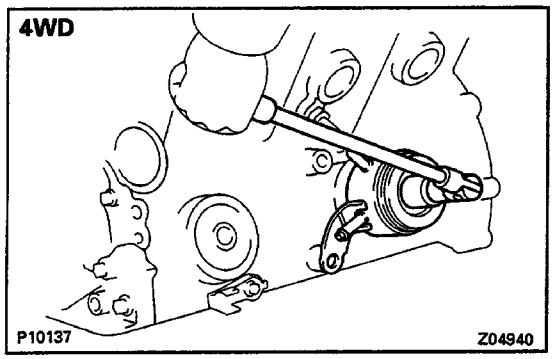
(a) Remove the No.1 and No.2 oil cooler hoses.



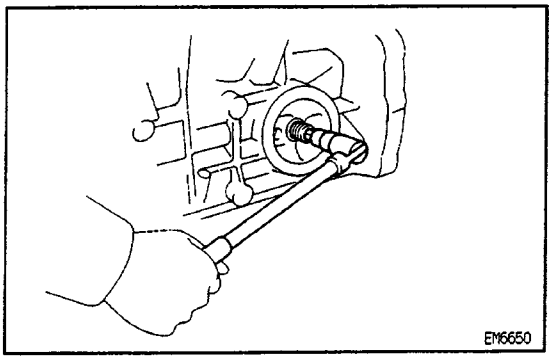
(b) Remove the two bolts holding the bracket to the cylinder block.
(c) Remove the union bolt, gasket, 0–ring, the oil cooler, bracket assembly and 0–ring.



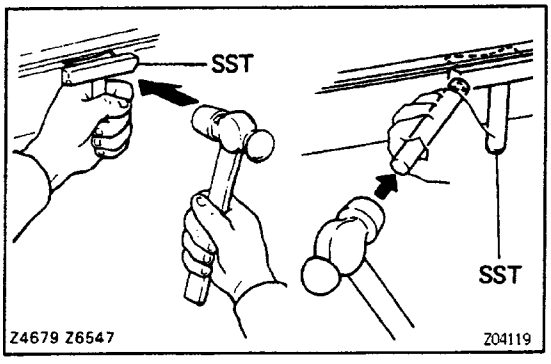
16. (4WD)
REMOVE OIL COOLER
(a) Remove the No.1 and No.2 oil cooler hoses.



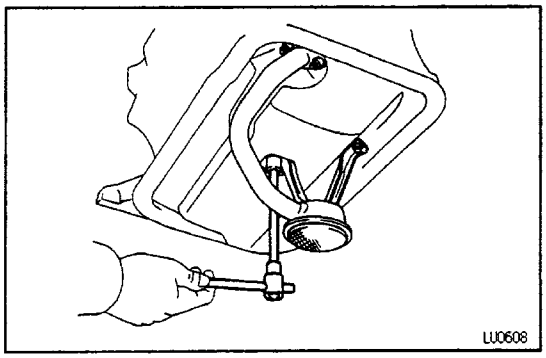
(b) Remove the bolt holding the bracket to the cylinder block.
(c) Remove the relief valve, seal washer, oil cooler and seal washer.
(d) Remove the O–ring and gasket from the oil cooler.



17. REMOVE OIL FILTER UNION
Using a 12 mm hexagon wrench, remove the oil filter union.

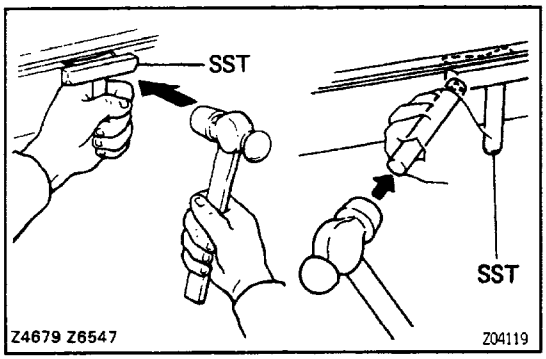


18. REMOVE OIL PAN
(a) Remove the seventeen bolts and two nuts.
(b) Insert the blade of SST between the baffle plate and oil pan, cut off applied sealer and remove the oil pan.
SST 09032–00100
NOTICE: Be careful not to damage the oil pan and baffle plate flanges.



19. REMOVE OIL STRAINER

Remove the two bolts, two nuts, oil strainer and gasket.



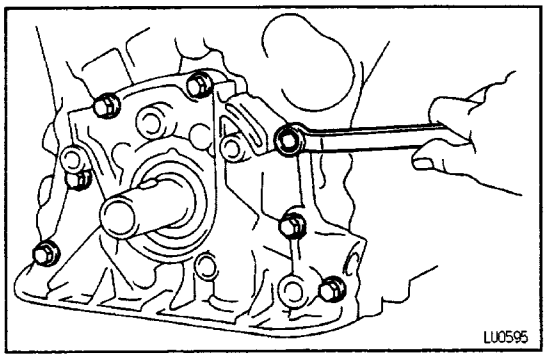
20. REMOVE OIL PAN BAFFLE PLATE

Insert the blade of SST between the cylinder block and baffle plate, cut off applied sealer and remove the baffle plate.

SST 09032 – 00100

NOTICE:

- **Do not use SST for the oil pump and rear oil seal retainer.**
- **Be careful not to damage the baffle plate flange.**

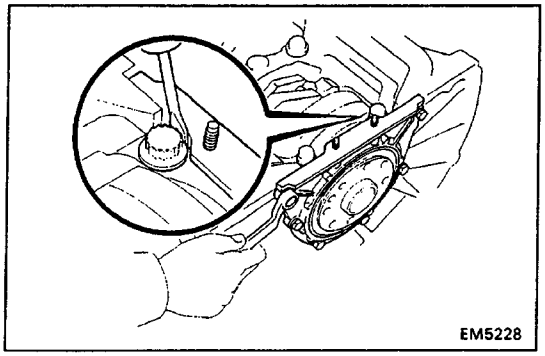


21. REMOVE OIL PUMP

(a) Remove the seven bolts.

(b) Using a plastic–faced hammer, carefully tap oft the oil pump.

(c) Remove the O–ring from the cylinder block.



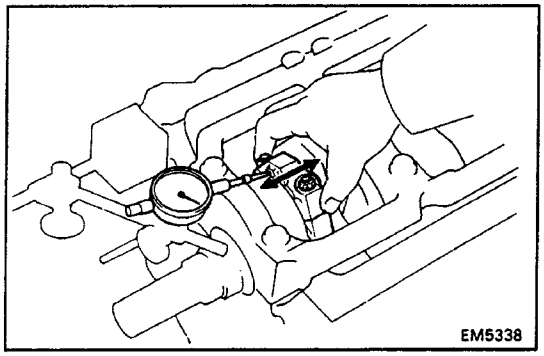
CYLINDER BLOCK DISASSEMBLY

EG1ZP–01

(See Components)

1. REMOVE REAR OIL SEAL RETAINER

Remove the six bolts and retainer.



2. CHECK CONNECTING ROD THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

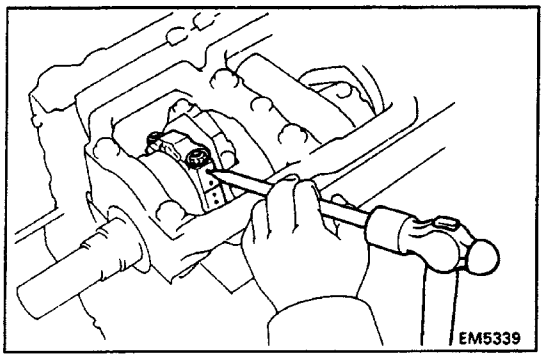
Standard thrust clearance:

0.150 – 0.330 mm (0.0059 – 0.0130 in.)

Maximum thrust clearance:

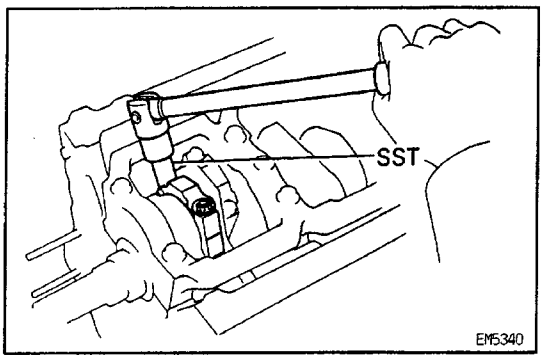
0.38 mm (0.0150 in.)

If the thrust clearance is greater than maximum, replace the connecting rod assembly. If necessary, replace the crankshaft.

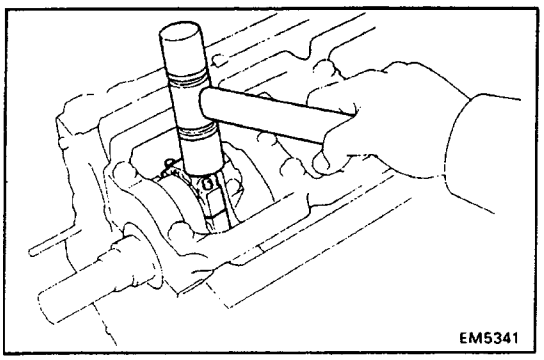


3. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

(a) Using a punch or numbering stamp, mark the connecting rod and cap to ensure correct reassembly.

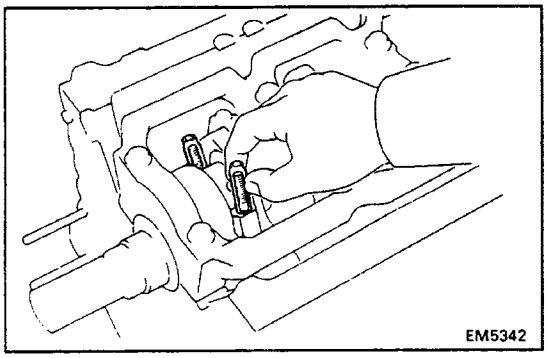


(b) Remove the connecting rod cap nuts.

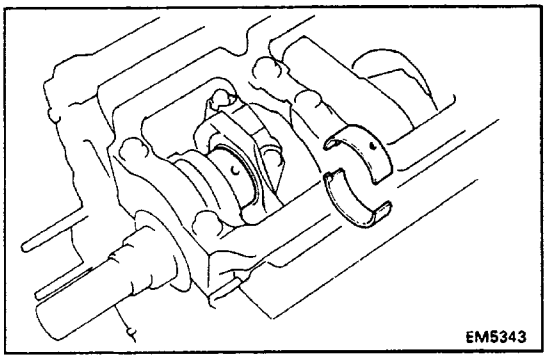


(c) Using a plastic–faced hammer, lightly tap the connecting rod bolts and lift off the connecting rod cap.

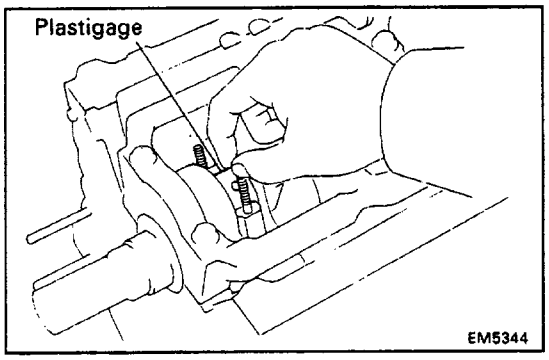
HINT: Keep the lower bearing inserted with the connecting rod cap.



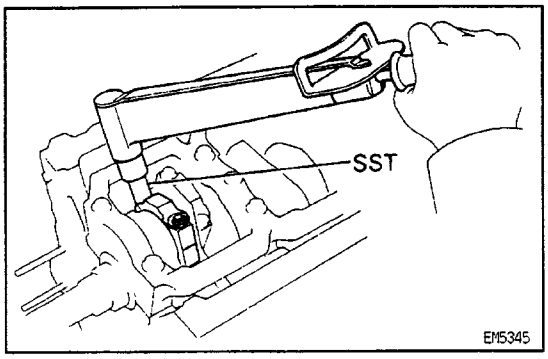
(d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



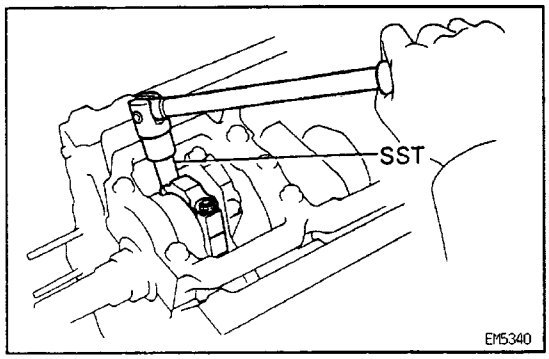
(e) Clean the crank pin and bearing.
(f) Check the crank pin and bearing for pitting and scr–atches.
If the crank pin or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft.



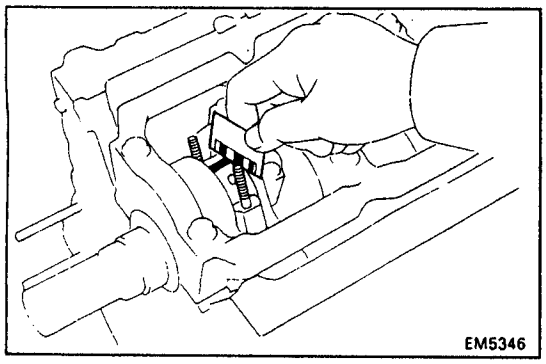
(g) Lay a strip of Plastigage across the crank pin.

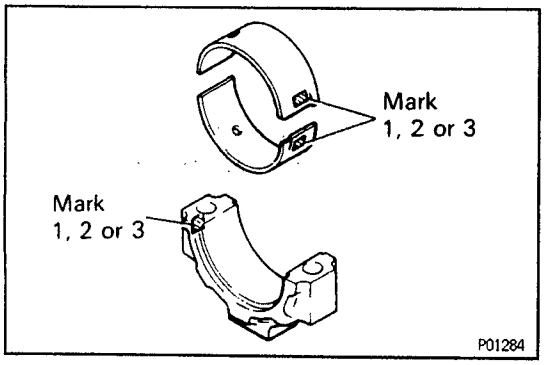


(h) Install the connecting rod cap with the two nuts.
(See step 7 on pages EG2–120)
Torque:
25 N–m (250 kgf–cm, 18 ft–lbf) for 1st
Turn 90• for 2nd
NOTICE: Do not turn the crankshaft.



(i) Remove the two nuts and connecting rod cap.
(See procedure (b) and (c) above)





Measure the Plastigage at its widest point.

Standard oil clearance:

STD

0.024 – 0.053 mm (0.0009 – 0.0021 in.)

U/S 0.25 and U/S 0.50

0.023 – 0.069 mm (0.0009 – 0.0027 in.)

Maximum oil clearance:

0.08 mm (0.0031 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the cra–nkshaft.

HINT: If using a standard bearing, replace with one having the same number marked on the connecting rod cap. There are three sizes of standard bearings, marked "'1", "2" and "3" accordingly.

(Reference)

Standard sized bearing center wall thickness:

Mark "1"

1.484 – 1.488 mm (0.0584 – 0.0586 in.)

Mark '2"

1.488 – 1.492 mm (0.0586 – 0.0587 in.)

Mark "3"

1.492 – 1.496 mm (0.0587 – 0.0589 in.)

Connecting rod big end inside diameter:

Mark '1'

58.000 – 58.008 mm (2.2835 – 2.2838 in.)

Mark '2"

58.008 – 58.016 mm (2.2838 – 2.2841 in.)

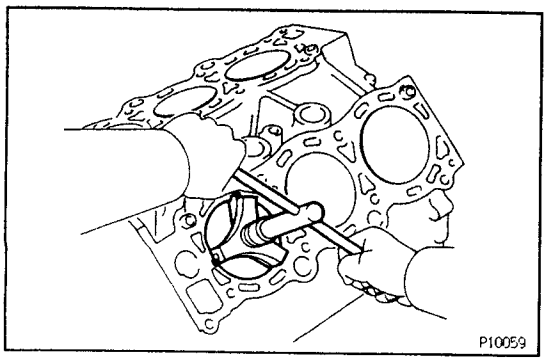
Mark "3"

58.016 – 58.024 mm (2.2841 – 2.2844 in.)

Crank pin diameter:

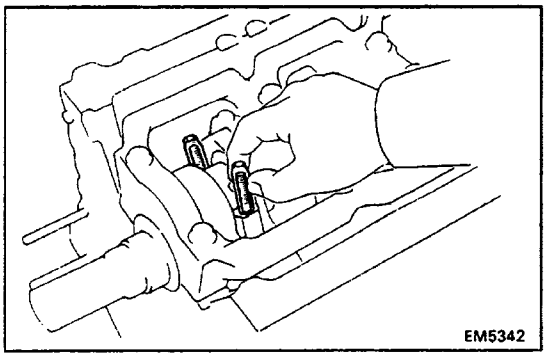
54.987 – 55.000 mm (2.1648 – 2.1654 in.)

(k) Completely remove the Plastigage.

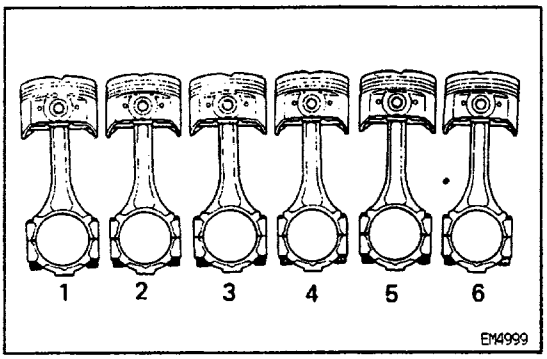


4. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

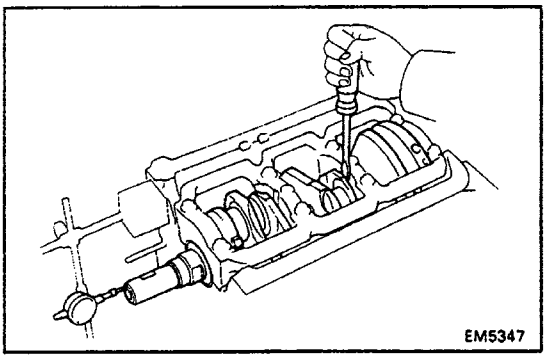
(a) Using a ridge reamer, remove the all carbon from the top of the cylinder.



(b) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.
(c) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.



HINT:
- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in correct order.



5. CHECK CRANKSHAFT THRUST CLEARANCE

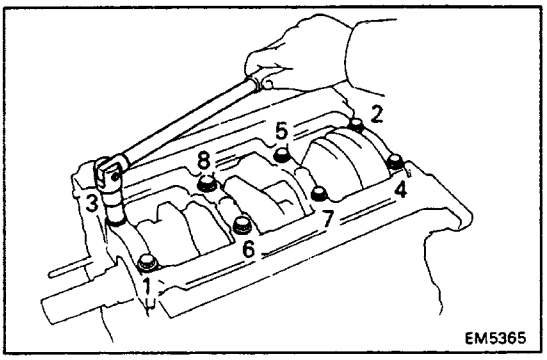
Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance:
0.020 – 0.220 mm (0.0008 – 0.0087 in.)

Maximum thrust clearance:
0.30 mm (0.0118 in.)

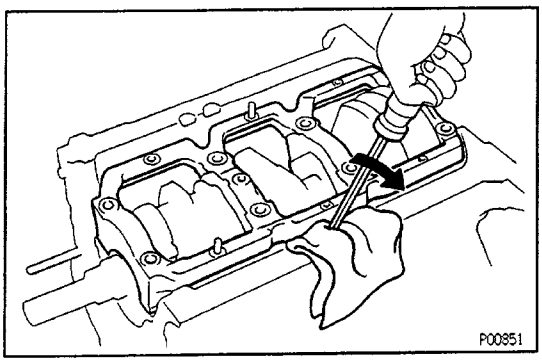
If the thrust clearance is greater than maximum, replace the thrust washers as a set.

Thrust washer thickness:
2.440 – 2.490 mm (0.0961 – 0.0980 in.)

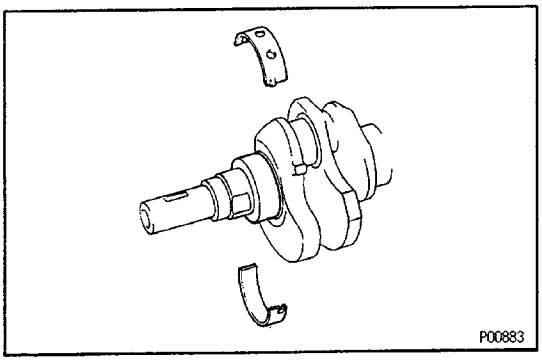


6. REMOVE MAIN BEARING CAP AND CHECK OIL CLEARANCE

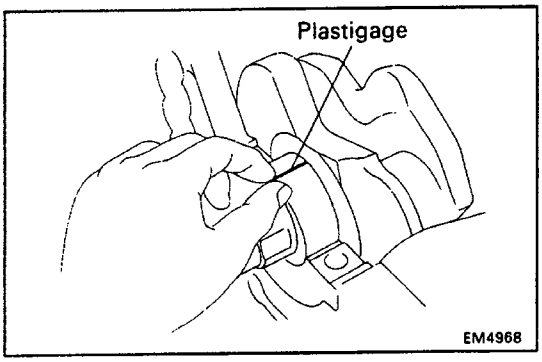
(a) Uniformly loosen and remove the main bearing cap bolts in several passes, in the sequence shown.



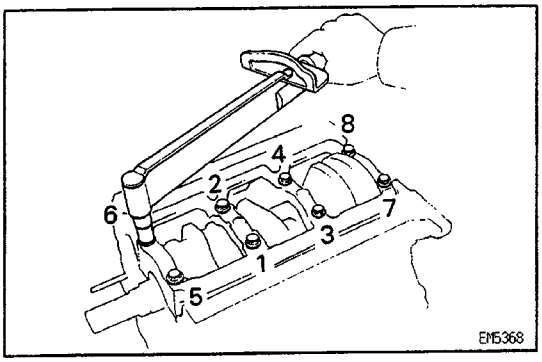
(b) Using a screwdriver, pry up the main bearing cap, and remove the main bearing cap, lower main bearings and lower thrust washers (No.2 journal position of main bearing cap only).
HINT: Keep the lower main bearings and lower thrust washers together with the main bearing cap.
(c) Lift out the crankshaft.
HINT: Keep the upper main bearings and upper thrust washers together with the cylinder block.



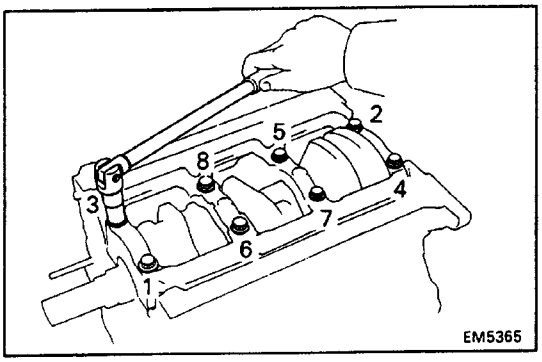
(d) Clean each main journal and bearing.
(e) Check each main journal and bearing for pitting and scratches.
If the journal or bearing is damaged, replace the bearings. If necessary, grind or replace the crankshaft.



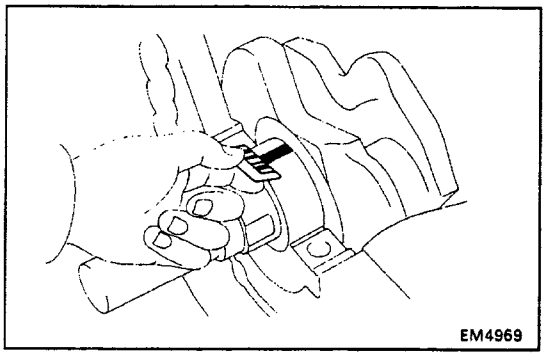
(f) Place the crankshaft on the cylinder block.
(g) Lay a strip of Plastigage across each journal.



(h) Install the main bearing cap with the eight bolts.
(See step 4 on page EG2–118)
Torque:
61 N–m (625 kgf–cm, 45 ft–lbf) for 1 at
Turn 90• for 2nd
NOTICE: Do not turn the crankshaft.



(i) Remove the eight bolts and main bearing cap.
(See procedure (a) and (b) above)



(j) Measure the Plastigage at its widest point.

Standard clearance:

N o.1

STD

0.025 – 0.052 mm (0.0010 – 0.0020 in.)

U/S 0.25 and U/S 0.50

0.024 – 0.080 mm (0.0009 – 0.0031 in.)

others

STD

0.029 – 0.056 mm (0.0011 – 0.0022 in.)

U/S 0.25 and U/S 0.50

0.028 – 0.077 mm (0.0011 – 0.0030 in.)

Maximum clearance:

0.08 mm (0.0031 in.)

HINT: If replacing the cylinder block subassembly, the bearing standard clearance will be:

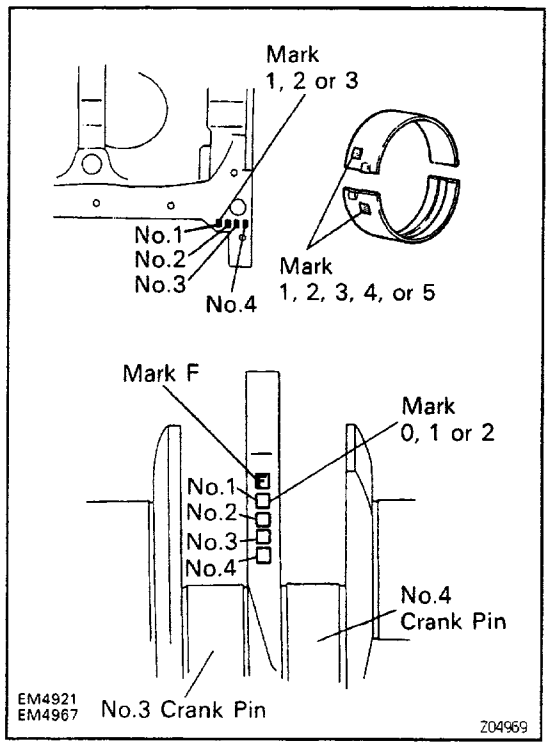
N o.1

0.027 – 0.063 mm (0.0011 – 0.0025 in.)

Others

0.031 – 0.067 mm (0.0012 – 0.0026 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the cra–nkshaft.



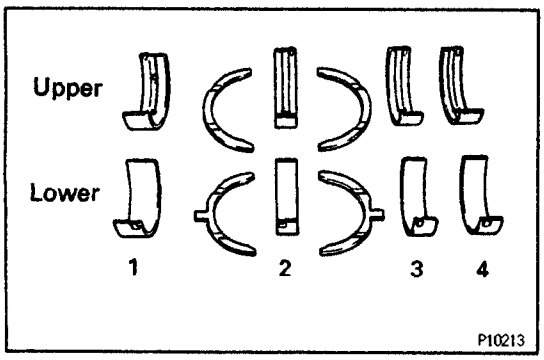
HINT: If using a standard bearing, replace with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylin–der block and crankshaft, then selecting the bearing with the same number as the total. There are five sizes of standard bearings, marked ”i ”, ”2”, ”3”,”4” and ”5” accordingly.

	Number marked								
Cylinder block	1			2			3		
Crankshaft	0	1	2	0	1	2	0	1	2
Use bearing	1	2	3	2	3	4	3	4	5

EXAMPLE: Cylinder block ”2” + Crankshaft ”’I”
= Total number 3 (Use bearing ”3”)

V00240

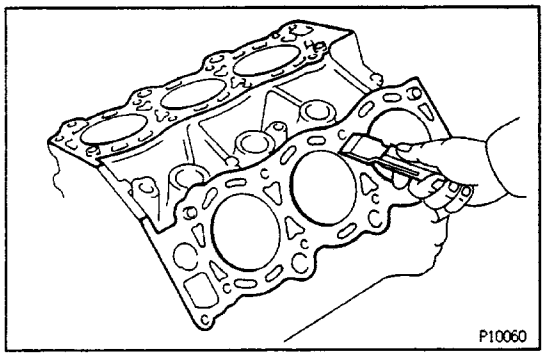
(Reference)
Standard sized bearing center wall thickness:
N o.1
Mark ”1 ”
1.991 – 1.994 mm (0.0784 – 0.0785 in.)
Mark ’2”
1.994 – 1.997 mm (0.0785 – 0.0786 in.)
Mark ’3’
1.997 – 2.000 mm (0.0786 – 0.0787 in.)
Mark ’4’
2.000 – 2.003 mm (0.0787 – 0.0789 in.)
Mark ’5’
2.003 – 2.006 mm (0.0789 – 0.0790 in.)
others
Mark ’11’
1.989 – 1.992 mm (0.0783 – 0.0784 in.)
Mark ’2’
1.992 – 1.995 mm (0.0784 – 0.0785 in.)
Mark ”3’
1.995 – 1.998 mm (0.0785 – 0.0787 in.)
Mark ’4’
1.998 – 2.001 mm (0.0787 – 0.0788 in.)
Mark ’5’
2.001 – 2.004 mm (0.0788 – 0.0789 in.)
Cylinder block main journal bore diameter:
Mark 1’
68.010 – 68.016 mm (2.6776 – 2.6778 in.)
Mark ’2’
68.016 – .68.022 mm (2.6778 – 2.6780 in.)
Mark ’3’
68.022 – 68.028 mm (2.6780 – 2.6783 in.)
Crankshaft main journal diameter:
Mark ’0’
63.996 – 64.000 mm (2.5195 – 2.5197 in.)
Mark ”1”
63.990 – 63.996 mm (2.5193 – 2.5195 in.)
Mark ’2’
63.985 – 63.990 mm (2.5191 – 2.5193 in.)
(k) Completely remove the Plastigage.



7. REMOVE CRANKSHAFT
(a) Lift out the crankshaft.
(b) Remove the upper main bearings and upper thrust washers from the cylinder block.
HINT: Arrange the main bearings and thrust washers in correct order.

EGOFC–02

CYLINDER BLOCK INSPECTION



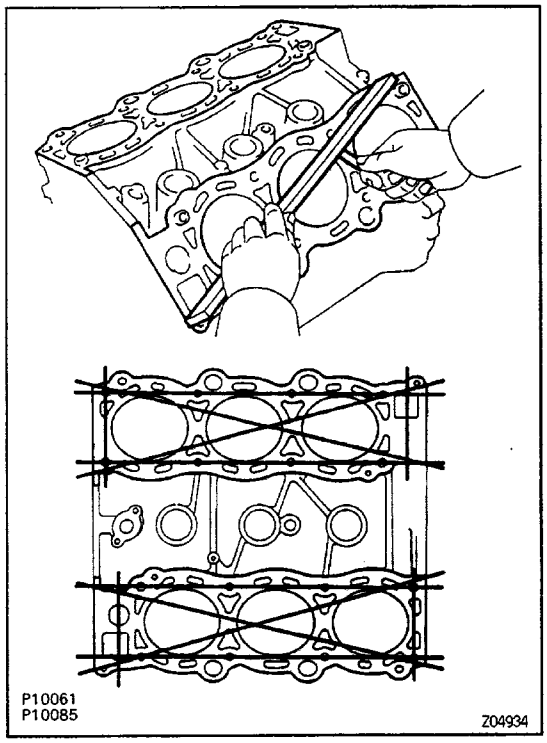
1. CLEAN CYLINDER BLOCK

A. Remove gasket material

Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

B. Clean cylinder block

Using a soft brush and solvent, thoroughly clean the cylinder block.



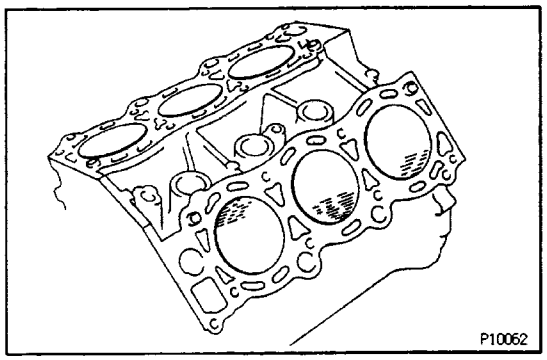
2. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS

Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder head gasket for warpage.

Maximum warpage:

0.05 mm (0.00020 in.)

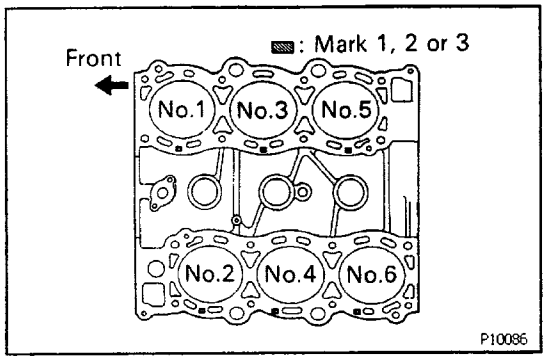
If warpage is greater than maximum, replace the cyl–inder block.



3. INSPECT CYLINDER FOR VERTICAL SCRATCHES

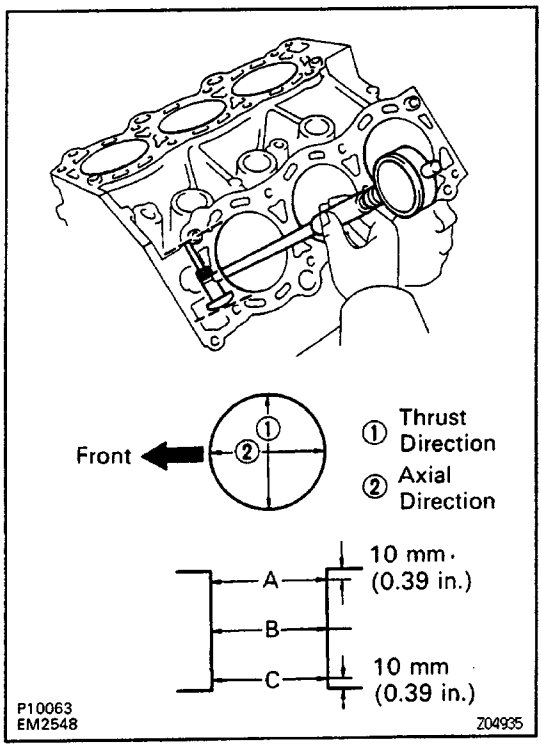
Visually check the cylinder for vertical scratches.

If deep scratches are present, rebore all the six cyl–inders. If necessary, replace the cylinder block.



4. INSPECT CYLINDER BORE DIAMETER

HINT: There are three sizes of the standard cylinder bore diameter, marked ’1”, ”2” and ”3” accordingly. The mark is stamped on the top of the cylinder block.



Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.

Standard diameter:

STD

Mark '1'

87.500 – 87.510 mm (3.4449 – 3.4453 in.)

Mark "2"

87.510–87.520 m m (3.4453–3.4457 in.)

Mark "3"

87.520–87.530 mm (3.4457–3.4461 in.)

Maximum diameter:

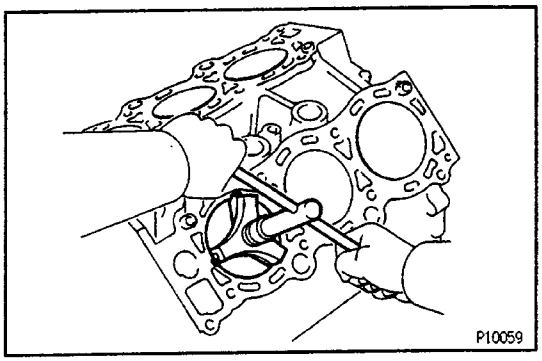
STD

87.73 mm (3.4539 in.)

0/S 0.50

88.23 mm (3.4736 in.)

If the diameter is greater than maximum, rebore all the six cylinders, If necessary, replace the cylinder block.

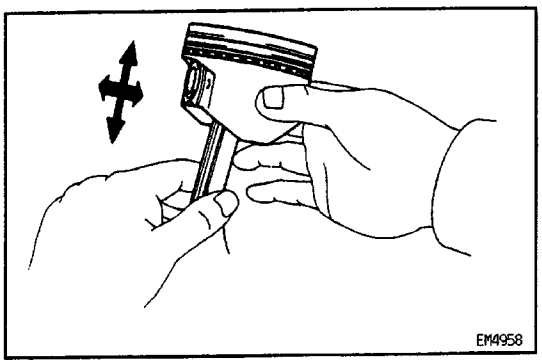


5. REMOVE CYLINDER RIDGE

If the wear is less than 0.2 mm (0.008 in.), using a ridge reamer, grind the top of the cylinder.

EG1EL–02

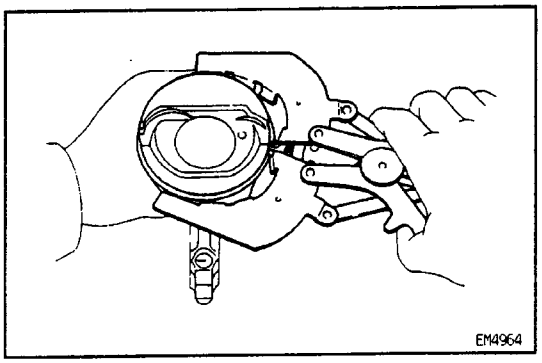
PISTON AND CONNECTING ROD DISASSEMBLY



1. CHECK FIT BETWEEN PISTON AND PISTON PIN

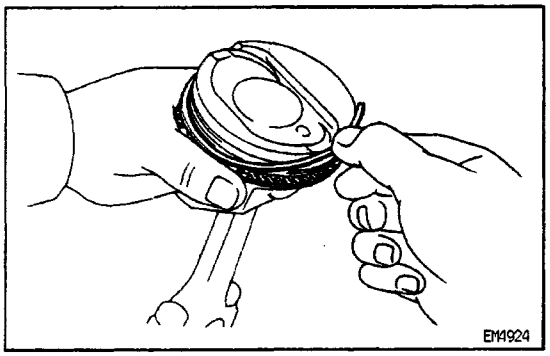
Try to move the piston back and forth on the piston pin.

If any movement is felt, replace the piston and pin as a set.

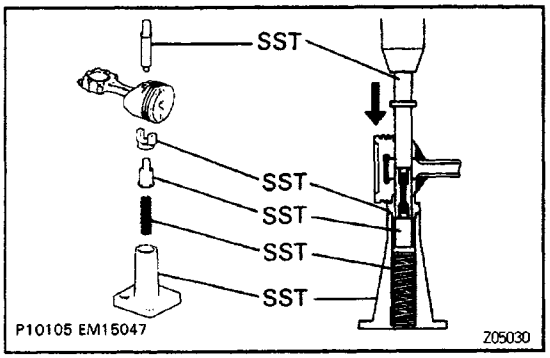


2. REMOVE PISTON RINGS

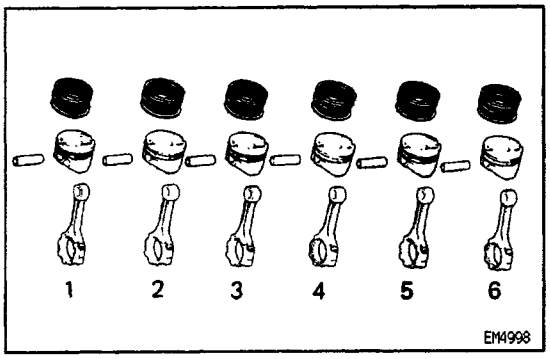
(a) Using a piston ring expander, remove the two compression rings.



(b) Remove the two side rails and oil ring by hand.
HINT: Arrange the piston rings in correct order only.



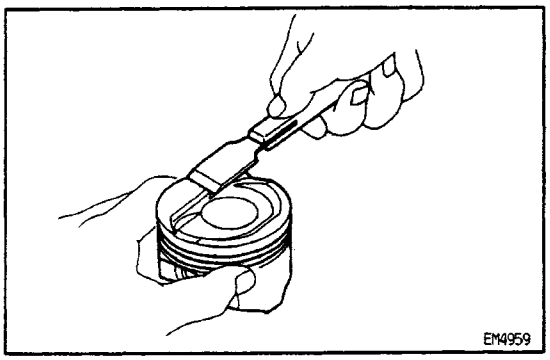
3. DISCONNECT CONNECTING ROD FROM PISTON
Using SST and a press, press out the piston pin from the piston. Remove the connecting rod.
SST 09221– 25024 (09221 –00020, 09221– 00030, 09221– 00181, 09221 –00190, 09221– 00200)



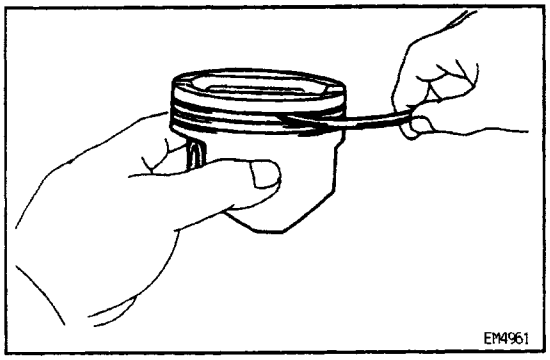
HINT:
The piston and pin are a matched set.
Arrange the pistons, pins, rings, connecting rods and bearings in correct order.

EG1ZQ–01

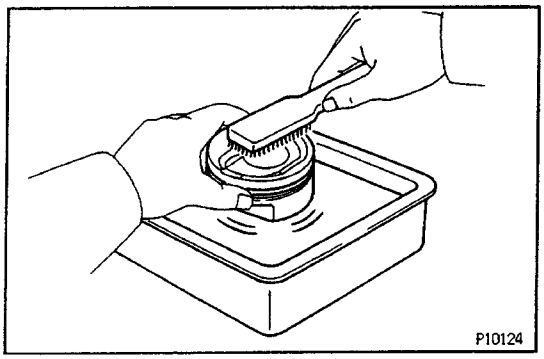
PISTON AND CONNECTING ROD INSPECTION



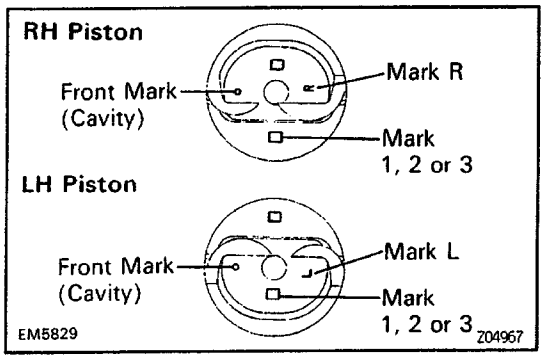
1. CLEAN PISTON
(a) Using a gasket scraper, remove the carbon from the piston top.



(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



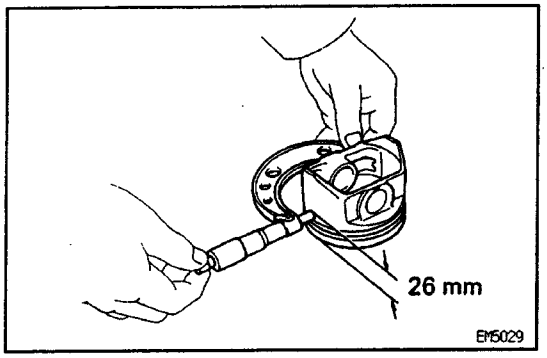
(c) Using solvent and a brush, thoroughly clean the piston.
NOTICE: Do not use a wire brush.



2. INSPECT PISTON

A. Inspect piston oil clearance

HINT: There are three sizes of the standard piston diameter, marked "2" and "3" accordingly. The mark is stamped on the piston top.



(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 26 mm (1.02 in.) from the piston head.

Piston diameter:

STD

Mark "1"

87.360 – 87.370 mm (3.4394 – 3.4398 in.)

Mark "2'

87.370 – 87.380 mm (3.4398 – 3.4402 in.)

Mark "3"

87.380 – 87.390 mm (3.4402 – 3.4405 in.)

0/S 0.50

87.860 – 87.890 mm (3.4590 – 3.4602 in.)

(b) Measure the cylinder bore diameter in the thrust di–rections. (See step 4 on page EG2–107)

(c) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

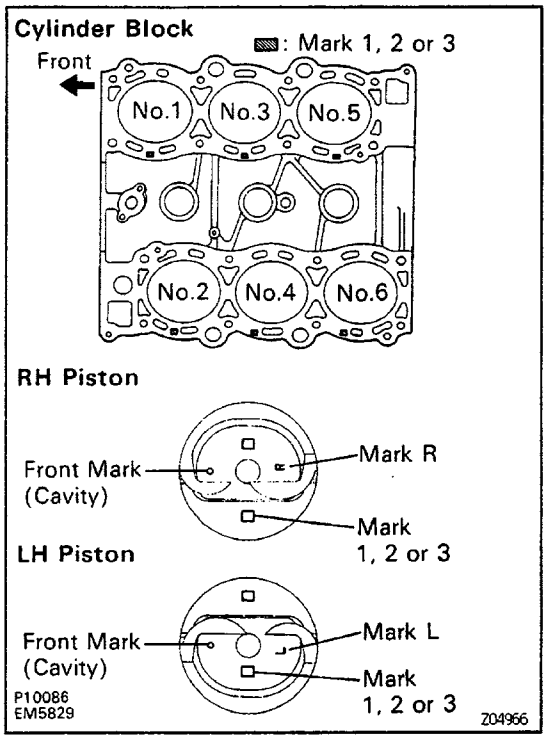
Standard oil clearance:

0.130 – 0.150 mm (0.0051 – 0.0059 in.)

Maximum oil clearance:

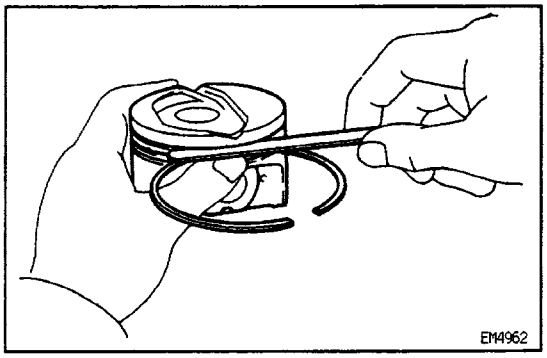
0.17 mm (0.0067 in.)

If the oil clearance is greater than maximum, replace all the six pistons. If necessary, rebore all the six cylinders or replace the cylinder block.



HINT (Use new cylinder block):

- Use a piston with the same number mark as the cylinder diameter marked on the cylinder block.
- The shape of the piston varies for the RH and LH banks. The RH piston is marked with ”R”, the LH piston with ”L”.



B. Inspect piston ring groove clearance

Using a feeler gauge, measure the clearance between new piston ring and the wall of the piston ring groove.

Standard ring groove clearance:

No.1

0.020 – 0.060 mm (0.0008 – 0.0024 in.)

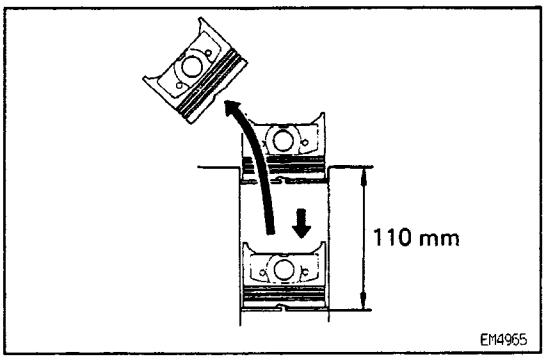
No.2

0.030 – 0.070 mm (0.0012 – 0.0028 in.)

Maximum ring groove clearance:

0.20 mm (0.0079 in.)

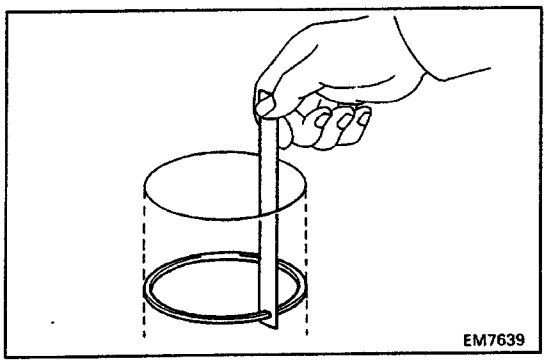
If the clearance is greater than maximum, replace the piston.



C. Inspect piston ring end gap

(a) Insert the piston ring into the cylinder bore.

(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 110 mm (4.33 in.) from the top of the cylinder block.



(c) Using a feeler gauge, measure the ring end gap.

Standard ring end gap:

N o.1

0.280 – 0.500 mm (0.0110 – 0.0197 in.)

No.2

0.380 – 0.600 mm (0.0150 – 0.0236 in.)

Oil (Side rail)

0.150 – 0.500 mm (0.0059 – 0.0197 in.)

Maximum ring end gap:

N o.1

1.10 mm (0.0433 in.)

N o.2

1.20 mm (0.0472 in.)

Oil (Side rail)

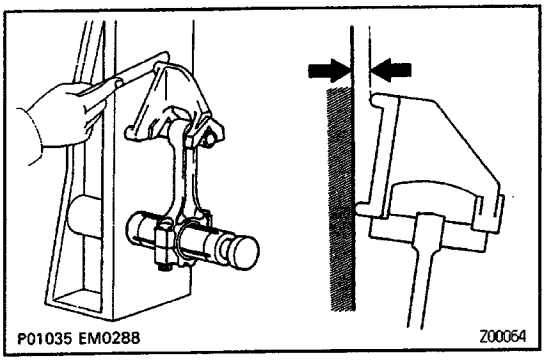
1.10 mm (0.0433 in.)

If the end gap is greater than maximum, replace the piston ring. If the end gap is greater than maximum, even with a new piston ring, rebore all the six cylin–ders or replace the cylinder block.

3. INSPECT CONNECTING ROD

A. Inspect connecting rod alignment

Using a rod aligner and feeler gauge, check the con–necting rod alignment.

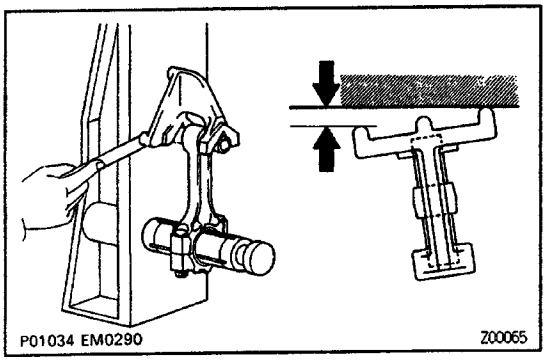


• Check for bend.

Maximum bend:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If bend is greater than maximum, replace the conne–cting rod assembly.

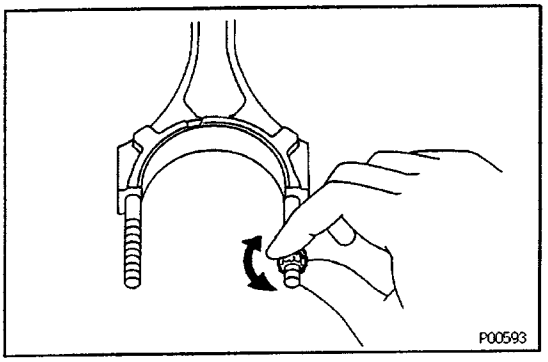


• Check for twist.

Maximum twist:

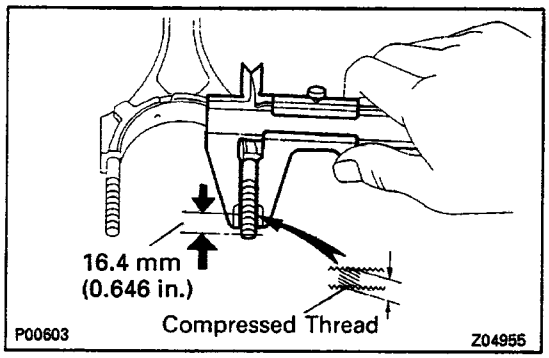
0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

If twist is greater than maximum, replace the conne–cting rod assembly.



B. Inspect connecting rod bolts

(a) Install the cap nut to the connecting rod bolt. Check that the rod cap nut can be turned easily by hand to the end of the thread.



(b) If the cap nut cannot be turned easily, measure the outer diameter of the compressed thread with a vernier caliper.

Standard outer diameter:
7.860 – 8.000 mm (0.3034 – 0.3150 in.)
Minimum outer diameter:
7.60 mm (0.2992 in.)

HINT: If the location of this area cannot be judged by visual inspection, measure the outer diameter at the location shown in the illustration.
If the outer diameter is less than minimum, replace the connecting rod and rod cap nut as a set.

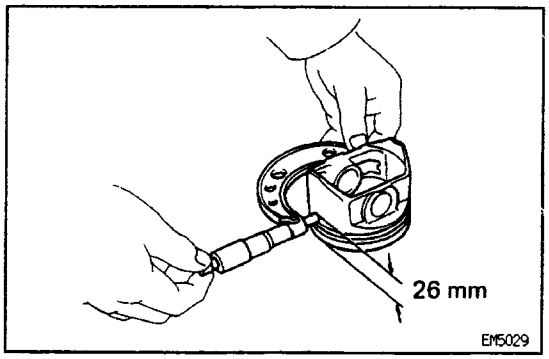
CYLINDER BORING

EG1ZR–01

HINT:
- Bore all the six cylinders for the oversized piston outside diameter.
- Replace all the piston rings with ones to match

the oversized pistons.

1. KEEP OVERSIZED PISTONS
Oversized piston diameter:
O/S 0.50
87.860 – 87.890 mm (3.4590 – 3.4602 in.)



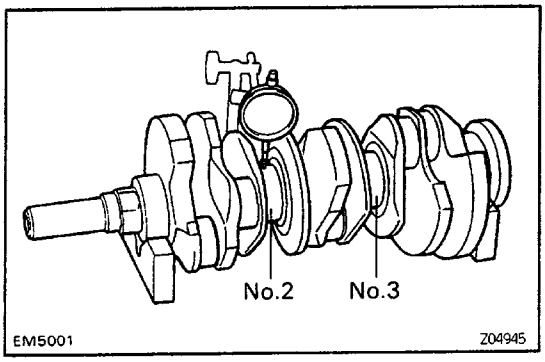
2. CALCULATE AMOUNT TO BORE CYLINDERS

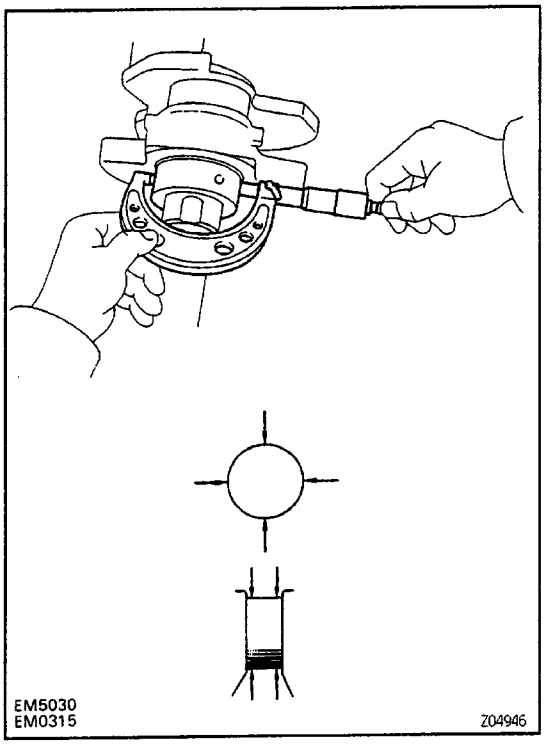
(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 26 mm (1.02 in.) from the piston head.
(b) Calculate the amount of each cylinder is to be rebored as follows:

Size to be rebored = P + C – H
P = Piston diameter
C = Piston oil clearance
0.130 – 0.150 mm (0.0051 – 0.0059 in.)
H = Allowance for honing
0.02 mm (0.0008 in.) or less

3. BORE AND HONE CYLINDER TO CALCULATED DIMENSIONS

Maximum honing:
0.02 mm (0.0008 in.)
NOTICE: Excess honing will destroy the finished roundness.





eotts–01

CRANKSHAFT INSPECTION AND REPAIR

1. INSPECT CRANKSHAFT FOR RUNOUT

(a) Place the crankshaft on V–blocks.

(b) Using a dial indicator, measure the circle runout at the No.2 and No.3 journals.

Maximum circle runout:

0.06 mm (0.0024 in.)

If the circle runout is greater than maximum, replace the crankshaft..

2. INSPECT MAIN JOURNALS AND CRANK PINS

(a) Using a micrometer, measure the diameter of each main journal and crank pin.

Main Journal diameter:

STD

63.985 – 64.000 mm (2.5191 – 2.5197 in.)

U/S 0.25

63.745 – 63.755 mm (2.5096 – 2.5100 in.)

U/S 0.50

63.495 – 63.505 mm (2.4998 – 2.5002 in.)

Crank pin diameter:

STD

54.987 – 55.000 mm (2.1648 – 2.1654 in.)

U/S 0.25

54.745 – 54.755 mm (2.1553 – 2.1557 in.)

U/S 0.50

54.495 – 54.505 mm (2.1455 – 2.1459 in.)

If the diameter is not as specified, check the oil clearance. (See 3 or 6 page EG2–99 or 102)

(b) Check each main journal and crank pin for taper and out–of–round as shown.

Maximum taper and out–of–round:

0.02 mm (0.0008 in.)

If the taper or out–of–round is greater than maximum, grind or replace the crankshaft.

3. IF NECESSARY, GRIND AND HONE MAIN JOURNALS AND/OR CRANK PINS

Grind and hone the main journals and/or crank pins to the finished undersized diameter (See procedure step 2).

Install new main journal and/or crank pin undersized bearings.

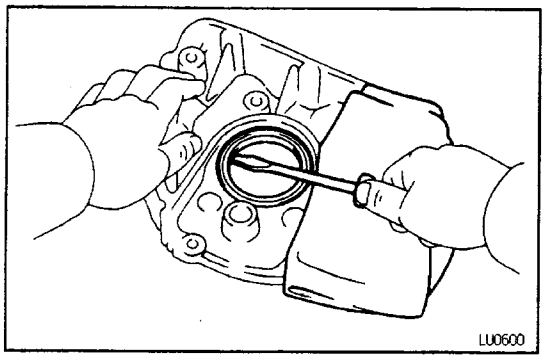
CRANKSHAFT OIL SEALS REPLACEMENT

HINT: There are two methods (A and B) to replace the oil seal which are as follows:

1. REPLACE CRANKSHAFT FRONT OIL SEAL

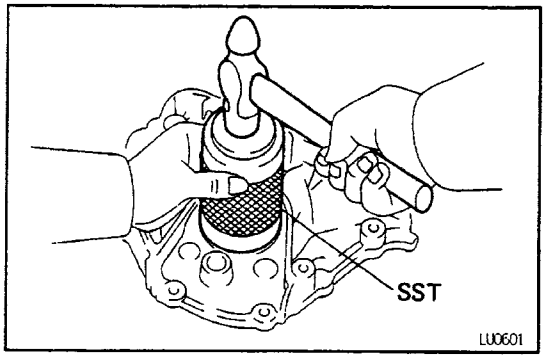
A. If oil pump is removed from cylinder block:

(a) Using a screwdriver, pry out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump body edge.
SST 09309–37010

(c) Apply MP grease to the oil seal lip.

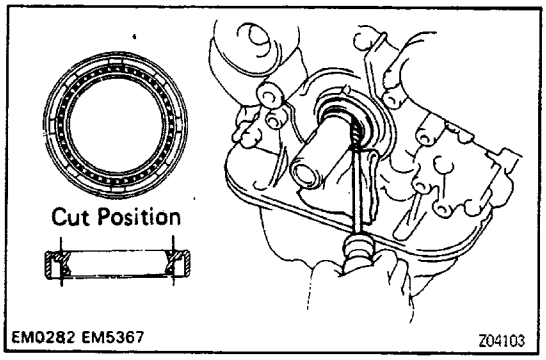


B. If oil pump is installed to the cylinder block:

(a) Using a knife, cut off the oil seal lip.

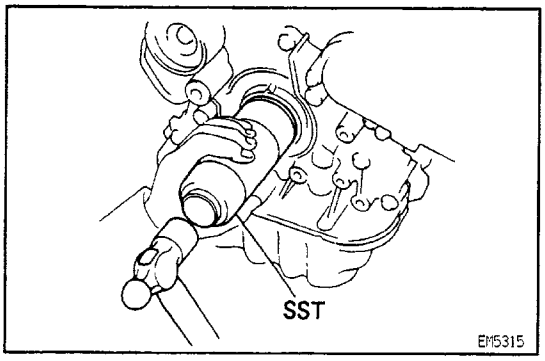
(b) Using a screwdriver, pry out the oil seal.

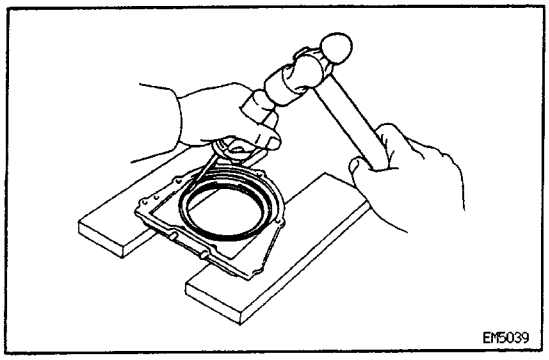
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.

(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump body edge.
SST 09306–37010

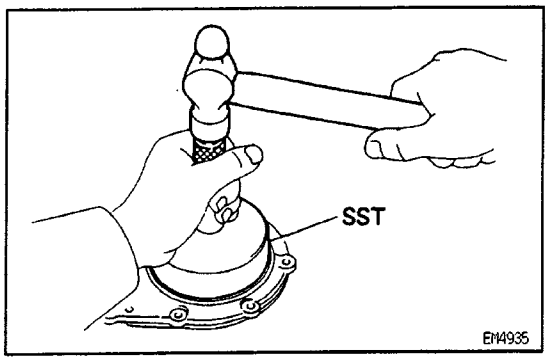




2. REPLACE CRANKSHAFT REAR OIL SEAL

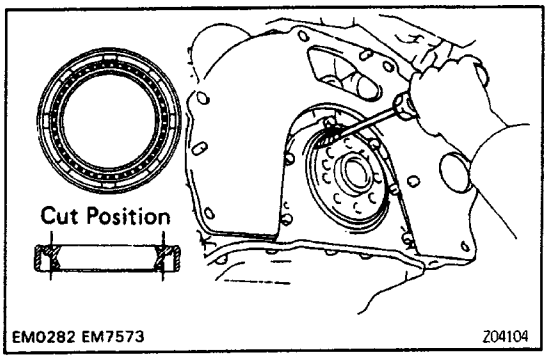
A. If rear oil seal retainer is removed from cylinder block:

(a) Using a screwdriver and hammer, tap out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223–56010

(c) Apply MP grease to the oil seal lip.

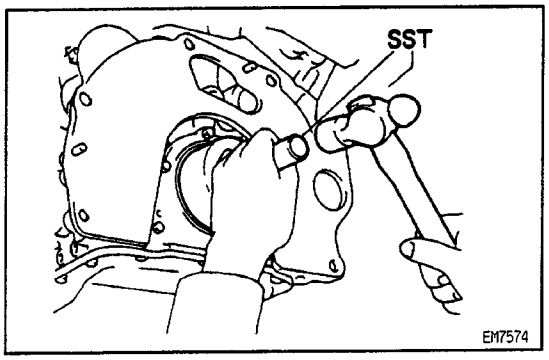


B. If rear oil seal retainer is installed to cylinder block:

(a) Using a knife, cut off the oil seal lip.

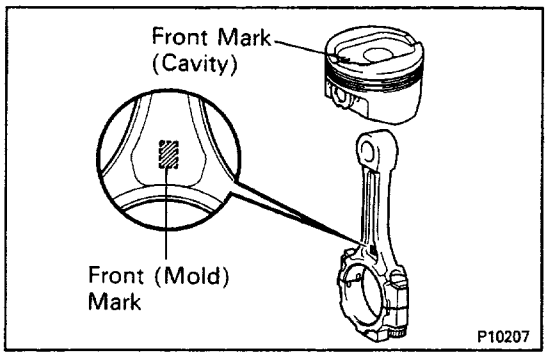
(b) Using a screwdriver, pry out the oil seal.

NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.

(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223–56410



PISTONS AND CONNECTING RODS ASSEMBLY EG1ER–02

1. ASSEMBLE PISTON AND CONNECTING ROD

(a) Coat the piston pin and piston pin holes with engine oil.

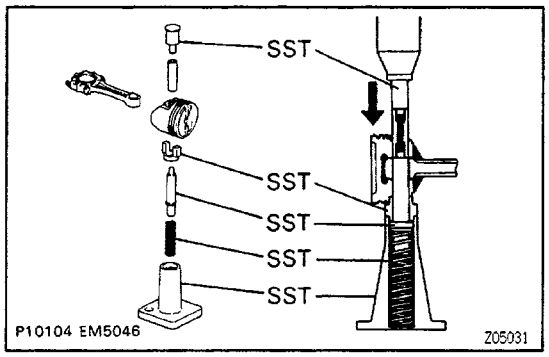
(b) Align the front marks of the piston and connecting rod.

Connecting rod front (mold) mark:

A1, 136, 1B, 8A, C3 or etc.

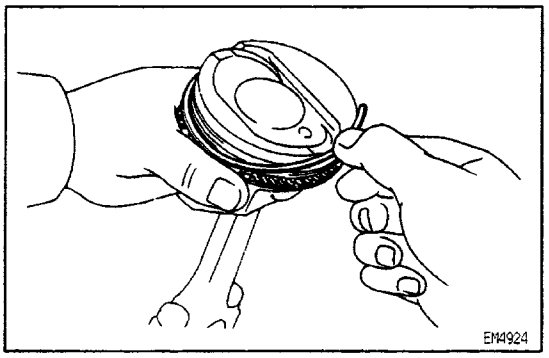
(c) Using SST, press in the piston pin.

SST 09221–25024 (09221–00020, 09221–00030, 09221–00181, 09221 –00190, 09221 –00200)



2. INSTALL PISTON RINGS

(a) Install the oil expander and two side rails by hand.



(b) Using a piston ring expander, install the two compression rings with the code marks facing upward.

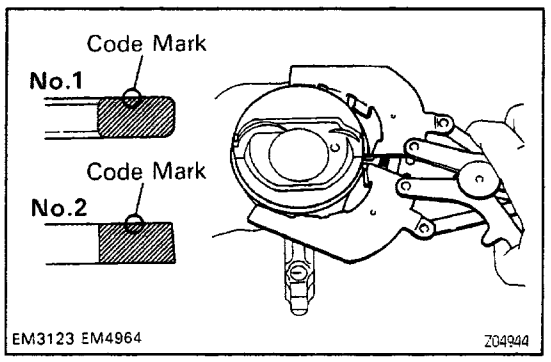
Code mark:

No.1

1 Ror T

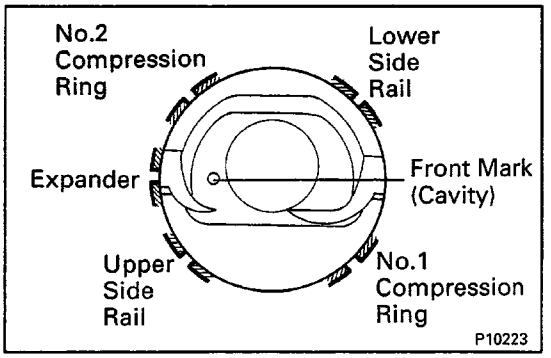
No.2

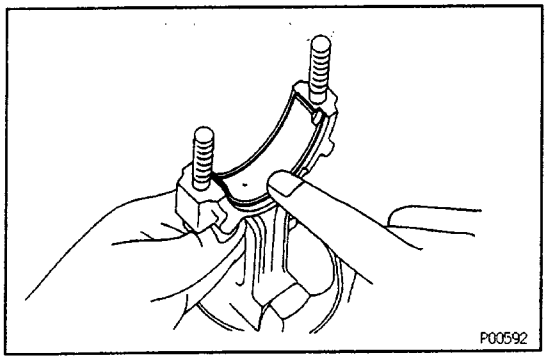
2R or T2



(c) Position the piston rings so that the ring ends are as shown.

NOTICE: Do not align the ring ends.





3. INSTALL BEARINGS

(a) Align the bearing claw with the groove of the con–necting rod or connecting cap.

(b) Install the bearings in the connecting rod and conne–cting rod cap.

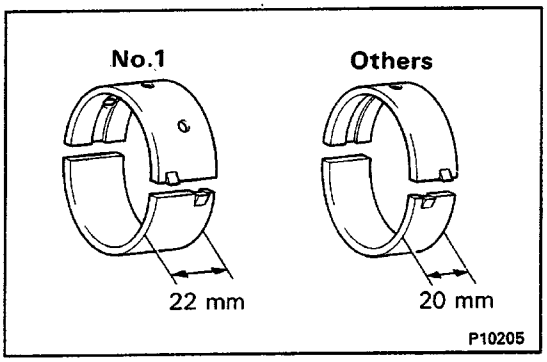
CYLINDER BLOCK ASSEMBLY

EG1ES–03

(See Components)

HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, 0–rings and oil seals with new parts.



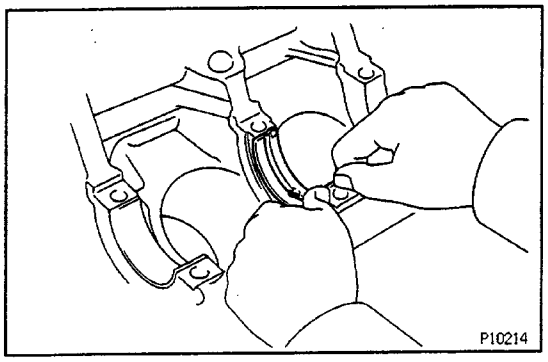
1. INSTALL MAIN BEARINGS

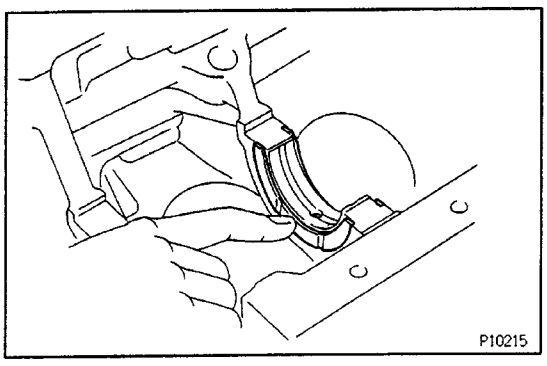
HINT:

- Main bearings come in widths of 20 mm (0.79 in.) and 22 mm (0.87 in.). Install the 22 mm (0.87 in.) bearings in the No.1 cylinder block journal posi–tion with the main bearing caps. Install the 20 mm (0.79 in.) bearings in the other positions.
- Upper bearings have an oil holes lower bearings do not.

(a) Align the bearing claw with the claw groove of the main bearing cap or cylinder block.

(b) Install the bearings in the cylinder block and main bearing cap.

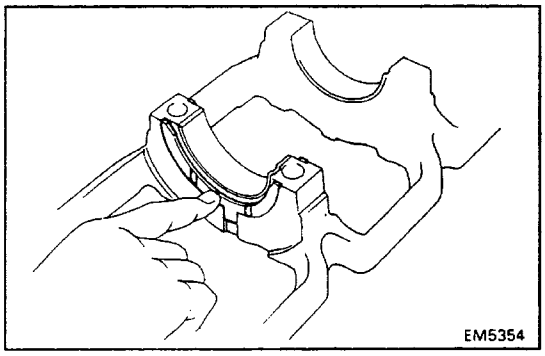




2. INSTALL UPPER THRUST WASHERS

Install the thrust washers under the No.2 journal po–sition of the cylinder block with the oil grooves facing outward.

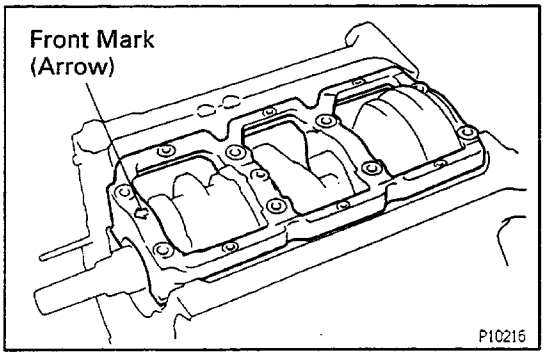
3. PLACE CRANKSHAFT ON CYLINDER BLOCK



4. INSTALL MAIN BEARING CAP AND LOWER THRUST WASHERS

A. Place main bearing cap and lower thrust washers on cylinder block

(a) Install the thrust washers on the No.2 journal position of the bearing cap with the grooves facing outward.

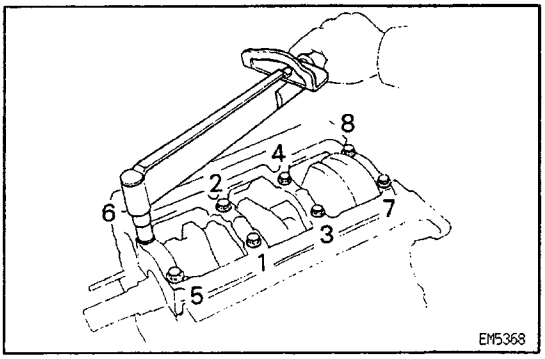


(b) Install the main bearing cap with the front mark facing forward.

B. Install main bearing cap bolts

HINT:

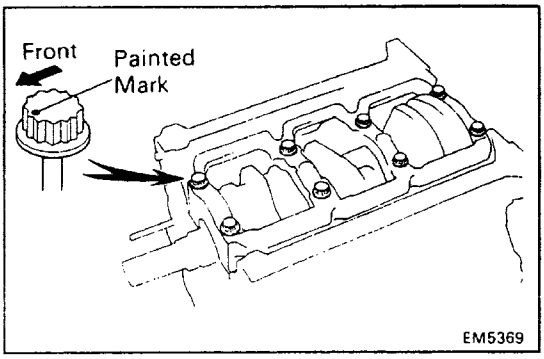
- The main bearing cap bolts are tightened in two progressive steps (steps (b) and (d)).
  If any main bearing cap bolt is broken or deformed, replace it.



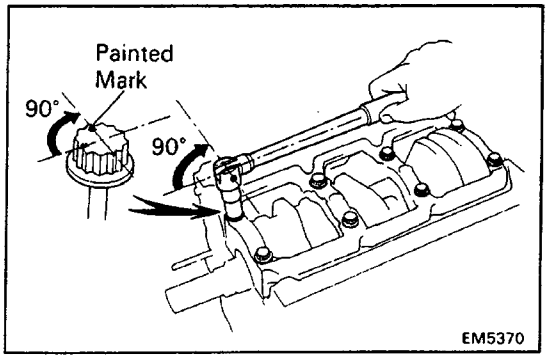
(a) Apply a light coat of engine oil on the threads and under the heads of the main bearing cap bolts.

(b) Install and uniformly tighten the eight main bearing cap bolts in several passes, in the sequence shown.
Torque: 61 N–m (625 kgf–cm, 45 ft–lbf)

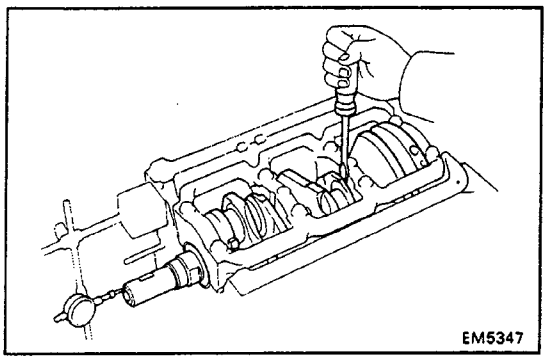
If any one of the main bearing cap bolts does not meet the torque specification, replace the cap bolt.



(c) Mark the front of the main bearing cap bolt with paint.



(d) Retighten the main bearing cap bolts 90• in the nu–merical order shown.
(e) Check that the painted mark is now at a 90• angle to the front.
(f) Check that the crankshaft turns smoothly.



5. CHECK CRANKSHAFT THRUST CLEARANCE

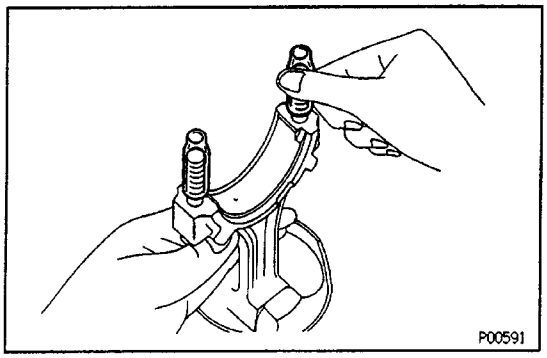
Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance:
0.020 – 0Z20 mm (0.0008 – 0.0087 in.)

Maximum thrust clearance:
0.30 mm (0.0118 in.)

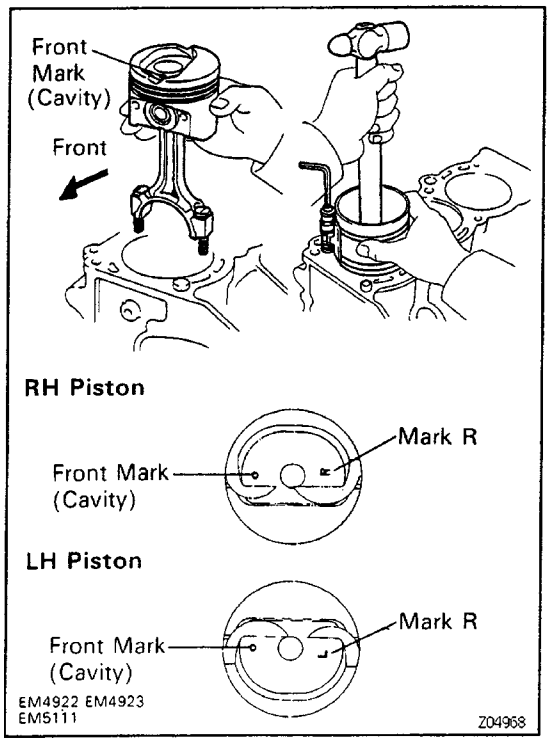
If the thrust clearance is greater than maximum, re–place the thrust washers as a set.

Thrust washer thickness:
2.440 – 2.490 mm (0.0961 – 0.0980 in.)



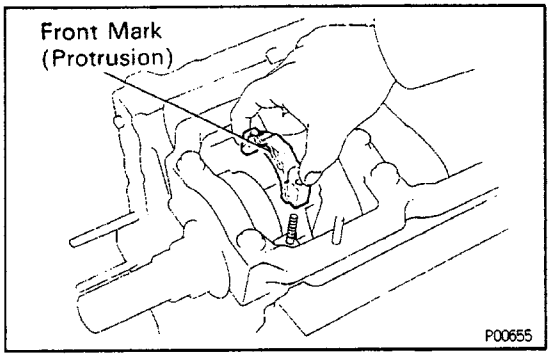
6. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

(a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



(b) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.

NOTICE: The shape of the piston varies for the RH and LH banks. The RH piston is marked with "R", The LH piston with "L".



7. INSTALL CONNECTING ROD CAPS

A. Place connecting rod cap on connecting rod

(a) Match the numbered connecting rod cap with the connecting rod.

(b) Install the connecting rod cap with the front mark facing forward.

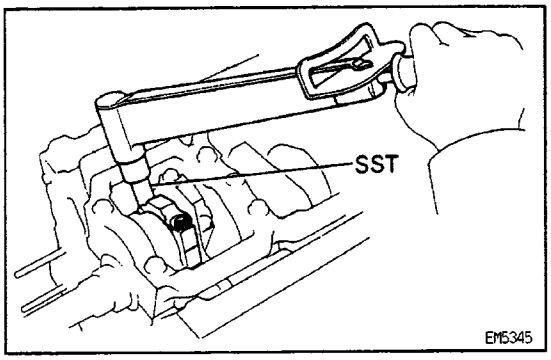
B. Install connecting rod cap nuts

HINT:

- The connecting rod cap nuts are tightened in two progressive steps (steps

(b) and (d)).

- If any connecting rod bolt is broken or deformed, replace it.

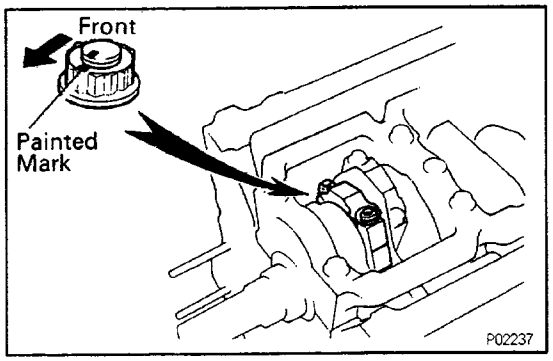


(a) Apply a light of engine oil on the threads and under the nuts of the connecting rod cap.

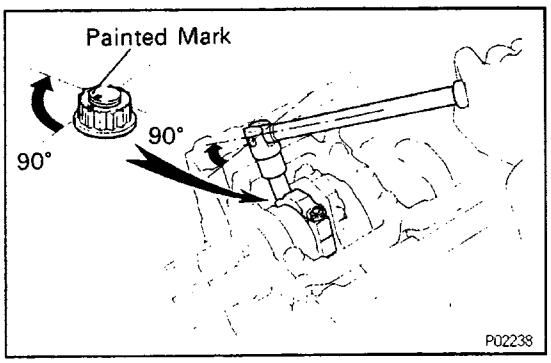
(b) Install and alternately tighten the nuts of the connecting rod cap in several passes.

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)

If any one of the connecting rod cap nuts does not meet the torque specification, replace the cap nut.



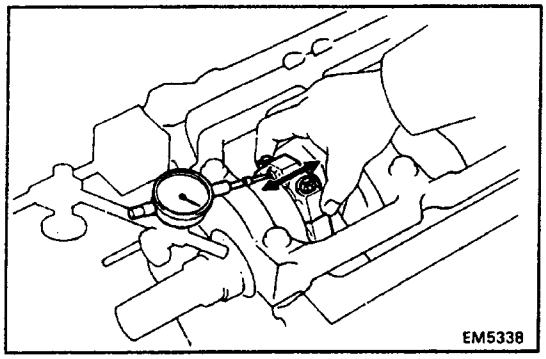
(c) Mark the front of the connecting rod cap nut and bolt with paint.



(d) Retighten the connecting rod cap nuts 90• as shown.

(e) Check that the painted mark is now at a 90• angle to the front.

(f) Check that the crankshaft turns smoothly.



8. CHECK CONNECTING ROD THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

Standard thrust clearance:

0.150 – 0.330 mm (0.0059 – 0.0130 in.)

Maximum thrust clearance:

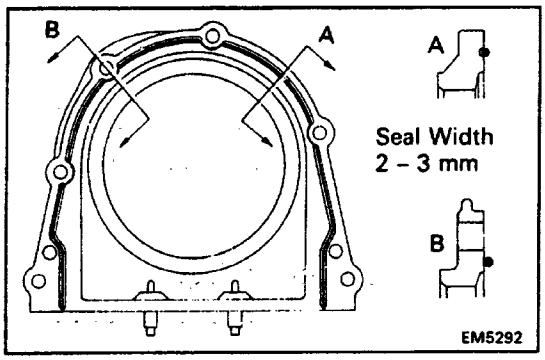
0.38 mm (0.0150 in.)

If the thrust clearance is greater than maximum, replace the connecting rod assembly. If necessary, replace the crankshaft.

9. INSTALL REAR OIL SEAL RETAINER

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the retainer and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

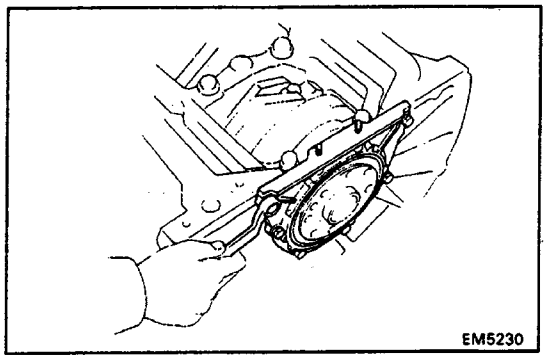


(b) Apply seal packing to the oil seal retainer as shown in the illustration.

Seal packing:

Part No.08826–00080 or equivalent

- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(c) Install the oil seal retainer with the six bolts.

Torque: 7.8 N–m (80 kgf–cm, 69 in.–lbf)

EG1ZU–02

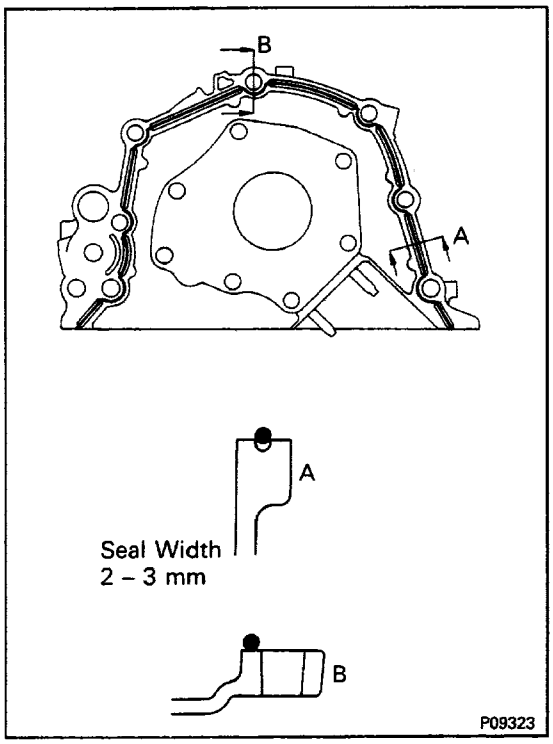
POST ASSEMBLY

(See Components)

1. INSTALL OIL PUMP

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the oil pump and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.



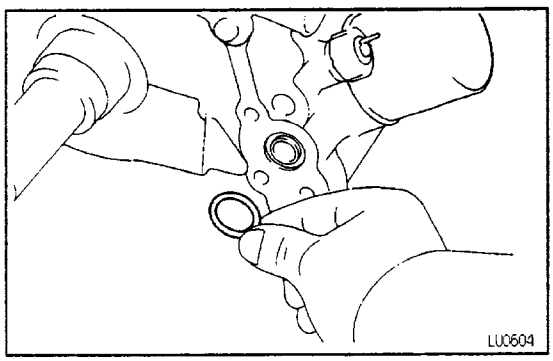
(b) Apply seal packing to the oil pump as shown in the illustration.

Seal packing:

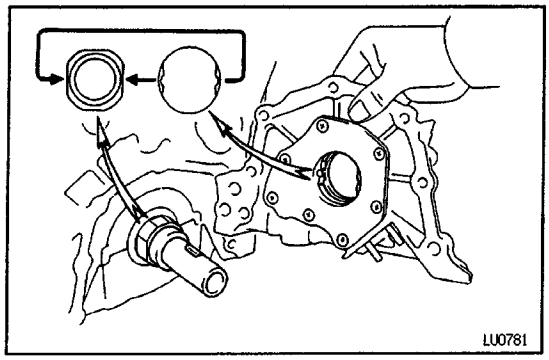
Part No. 08826–00080 or equivalent

NOTICE: Avoid applying en excessive amount to the surface. Be particularly careful near oil passage.

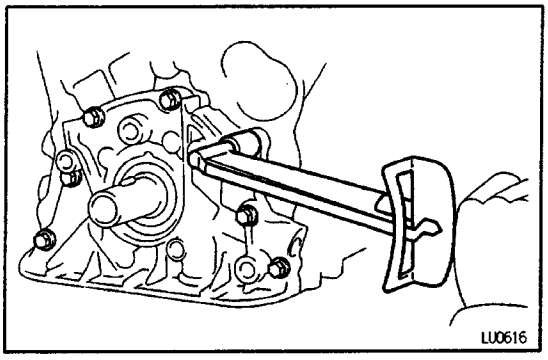
- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 4.12 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(c) Install a new O–ring to the cylinder block.



(d) Engage the spline teeth of the oil pump drive gear with the large teeth of the crankshaft, and slide the oil pump on the crankshaft.

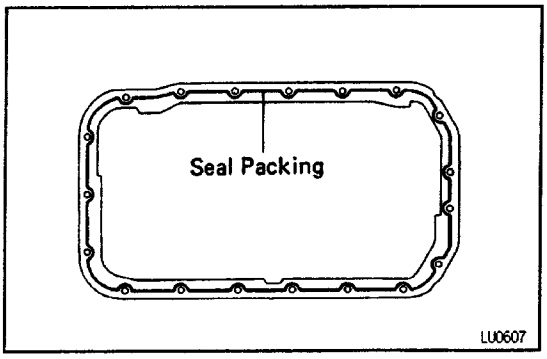


(e) Install the oil pump with the eight bolts. Uniformly tighten the bolts in several passes.
Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)

2. INSTALL OIL PAN BAFFLE PLATE

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the baffle plate and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

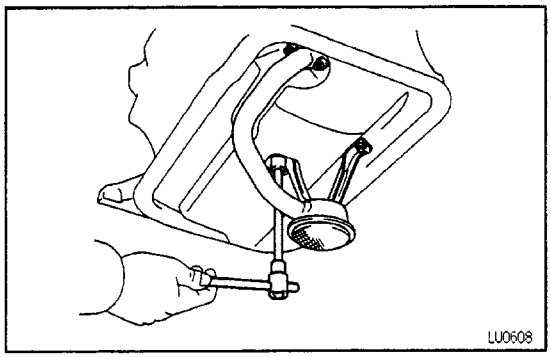


(b) Apply seal packing to the baffle plate as shown in the illustration.

Seal packing:
Part No. 08826–00080 or equivalent

- Install a nozzle that has been cut to a 3 – 4 mm (0.12 – 0.16 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Attach the baffle plate to the cylinder block.



3. INSTALL OIL STRAINER

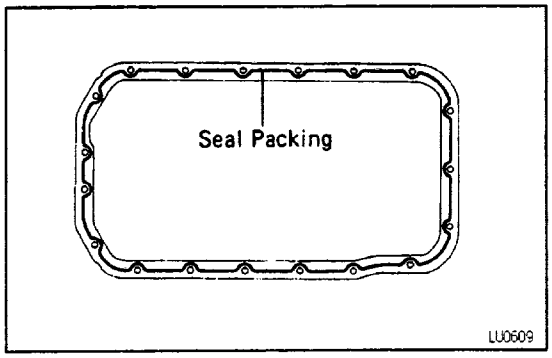
Install a new gasket and the oil strainer with the two nuts and two bolts.

Torque: 6.9 N–m (70 kgf–cm, 61 in. –lbf)

4. INSTALL OIL PAN

(a) Remove any old packing (FIPG) material and be ear–eful not to drop any oil on the contact surfaces of the oil pan and baffle plate.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.



(b) Apply seal packing to the oil pan as shown in the illustration.

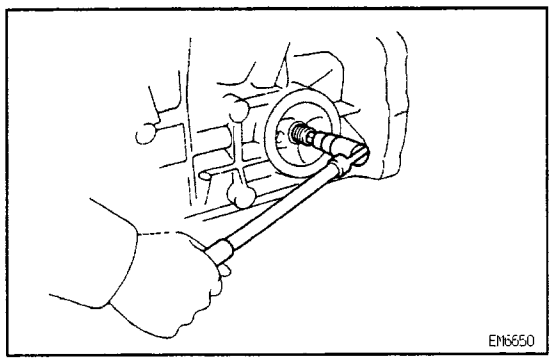
Seal packing:

Part No. 08826–00080 or equivalent

- Install a nozzle that has been cut to a 3 – 4 mm (0.12 – 0.16 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be re–moved and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Install the oil pan with the two nuts and seventeen bolts.

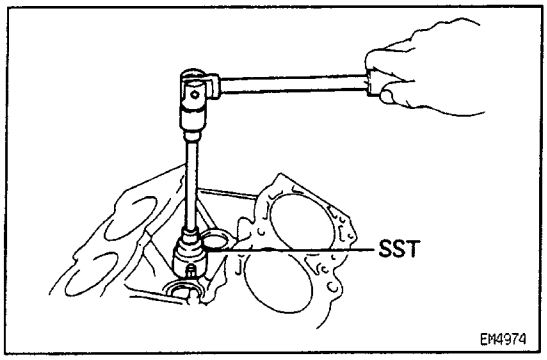
Torque: 5.9 N–m (60 kgf–cm, 52 in.–lbf)



5. INSTALL OIL FILTER UNION

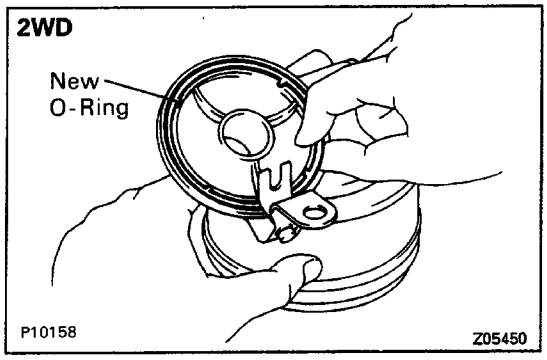
Using a 12 mm hexagon wrench, install and torque the oil filter union.

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)



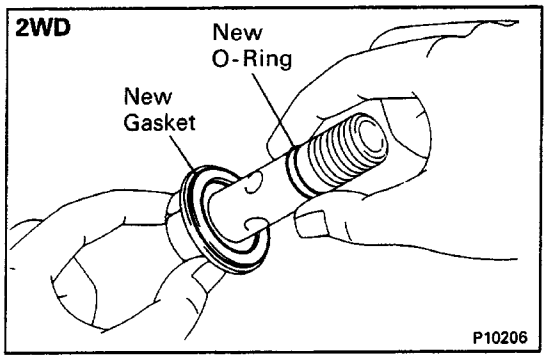
6. INSTALL KNOCK SENSOR

Using SST, install the knock sensor.
SST 09817–16011

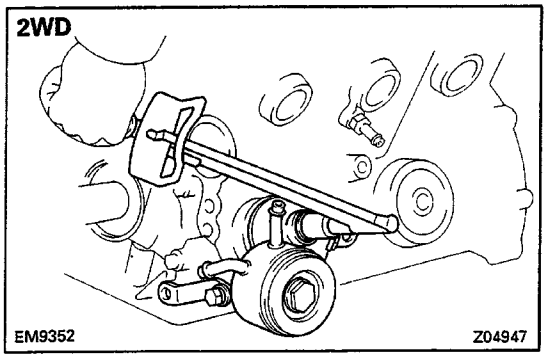


7. (2WD)
INSTALL OIL COOLER AND BRACKET ASSEMBLY

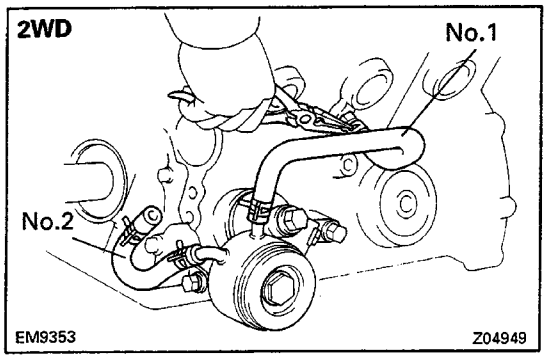
(a) Install a new 0–ring to the oil cooler bracket.



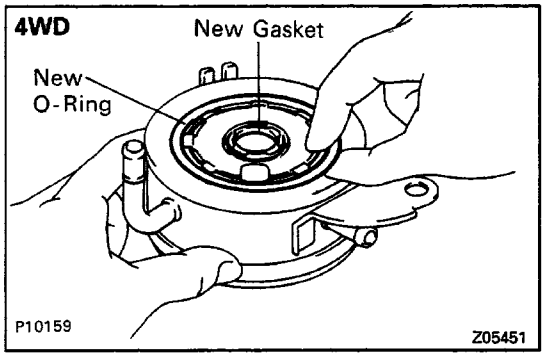
(b) Install new gasket and O–ring to the union bolt.
(c) Apply a light coat of engine oil on the O–ring.
(d) Apply a light coat of engine oil on the threads of the union bolt.



(e) Temporarily install the oil cooler and bracket assembly with the union bolt and two bolts.
(f) Tighten the union bolt.
Torque: 59 N–m (600 kgf–cm. 43 ft –lbf)
(g) Install the two bolts.
Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)

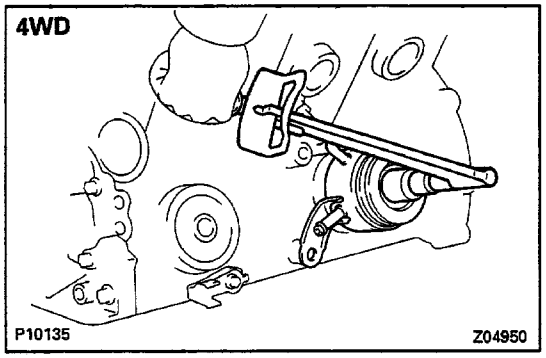


(h) install the No.1 and No.2 oil cooler hoses.

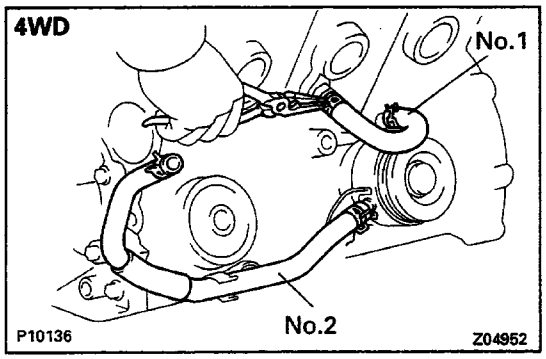


8. (4WD)
INSTALL OIL COOLER

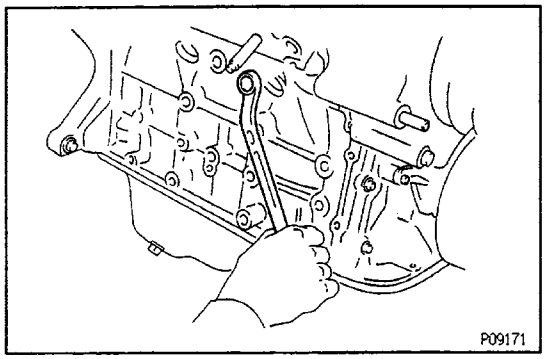
(a) Install new 0–ring and gasket to the oil cooler.
(b) Apply a light coat of engine oil on the threads of the relief valve.



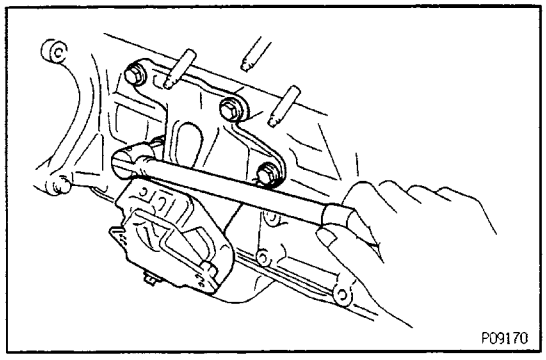
(c) Temporarily install the seal washer, oil cooler and seal washer with the relief valve and bolt.
(d) Tighten the relief valve.
Torque: 59 N–m (600 kgf–cm. 43 ft–lbf)
(e) Install the bolt.
Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)



(f) Install the No.1 and No.2 oil cooler hoses.



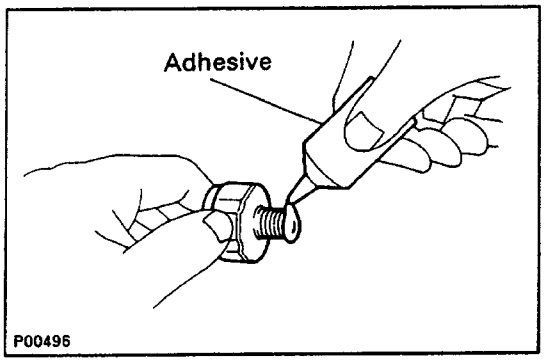
9. INSTALL ENGINE COOLANT DRAIN PLUGS
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)



10. INSTALL LH AND RH ENGINE MOUNTING BRACKETS

Install the mounting bracket with the four bolts. Install the two mounting brackets.
Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)

11. INSTALL OIL FILTER

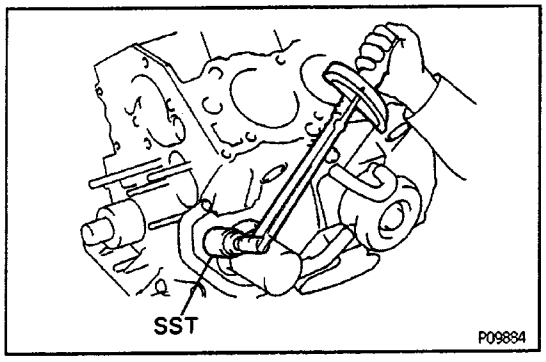


12. INSTALL OIL PRESSURE SENDER GAUGE

(a) Apply adhesive to two or three threads.

Adhesive:

Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent



(b) Using SST, install the oil pressure sender gauge.

SST 09816–30010

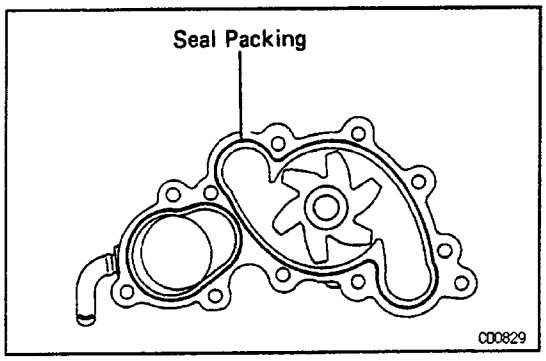
Torque: 15 N–m (150 kgf–cm. 11 ft–lbf)

13. INSTALL GENERATOR ADJUSTING BAR

14. INSTALL WATER PUMP

(a) . Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the water pump and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

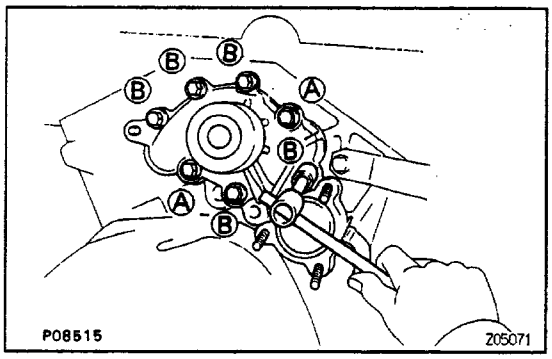


(b) Apply seal packing to the sealing groove of the water pump as shown in the illustration.

Seal packing:

Part No. 08826–00100 or equivalent

- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(c) Install the water pump with the seven bolts.

Torque:
18 N–m (185 kgf–cm, 13 ft–lbf) for (A)
20 N–m (200 kgf–cm, 14 ft–lbf) for (B)

15. INSTALL THERMOSTAT AND WATER INLET

16. INSTALL NO.1 WATER BY–PASS PIPE

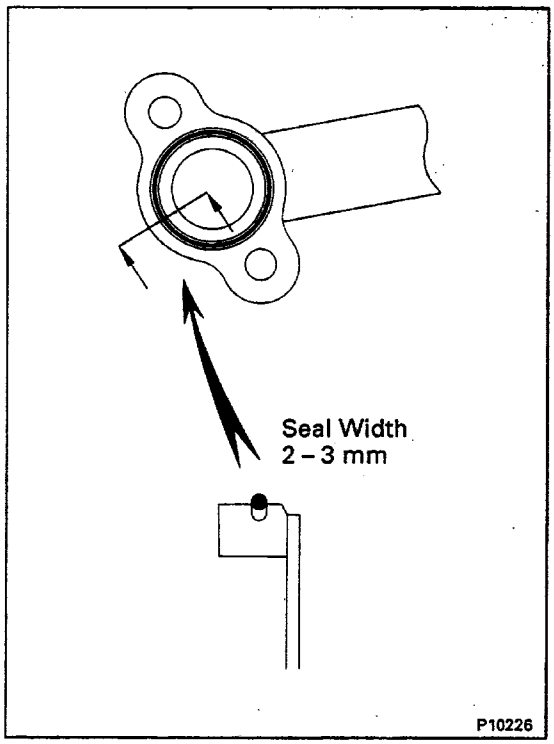
(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the water by–pass pipe and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

(b) Apply seal packing to the sealing groove of the water by–pass pipe as shown in the illustration.

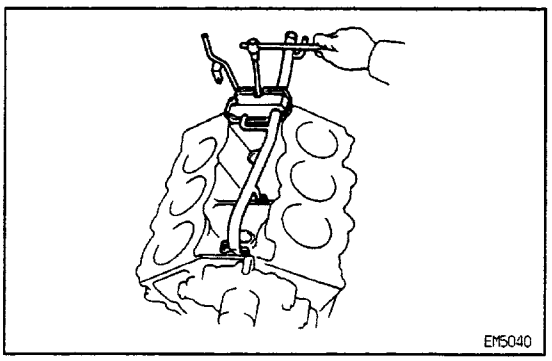
Seal packing:
Part No. 08826–00100 or equivalent

- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

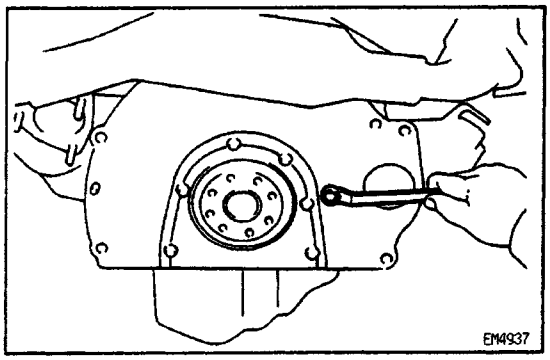


(c) Install the water by–pass pipe with the two bolts and two nuts.

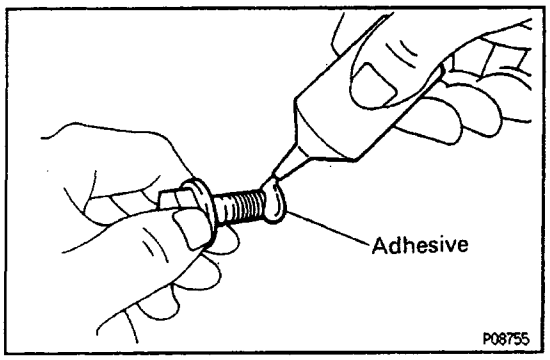
Torque:
4.9 N–m (50 kgf–cm, 43 in. –lbf) for bolt
6.9 N–m (70 kgf–cm, 61 in.–lbf) for nut



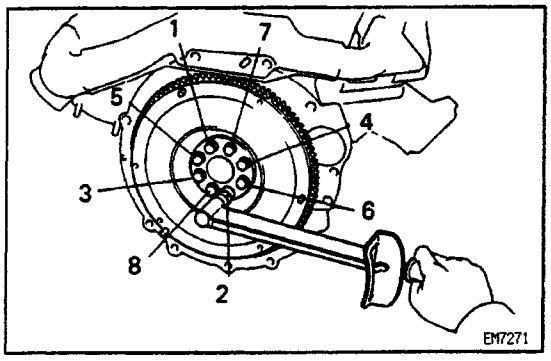
17. INSTALL CYLINDER HEADS
(See pages EG2–76 to 87)
18. INSTALL TIMING BELT
(See pages EG2–41 to 48)
19. REMOVE ENGINE STAND



20. INSTALL REAR END PLATE
Install the rear end plate with the bolt.
Torque: 7.4 N–m (75 kgf–cm, 65 in.–lbf)



21. INSTALL FLYWHEEL OR DRIVE PLATE
(a) Apply adhesive to two or three threads of the mou–nting bolt end.
Adhesive:
Pert No. 08833–00070, THREE BOND 1324 or equivalent



(b) (M /T)
Install the flywheel on the crankshaft.
(c) (A/T)
Install the front spacer, drive plate and rear plate on the crankshaft.
(d) Install and uniformly tighten the eight mounting bolts in several passes, in the sequence shown.
Torque:
88 N–m (900 kgf–cm, 65 ft–lbf) for M/T
83 N–m (850 kgf–cm, 61 ft–lbf) for A/T

EG20V–01

ENGINE INSTALLATION

1. (M/T only)
INSTALL CLUTCH DISC AND COVER

2. INSTALL TRANSMISSION TO ENGINE

3. INSERT ENGINE AND TRANSMISSION ASSEMBLY IN VEHICLE

(a) Attach the engine chain hoist to the engine hangers.

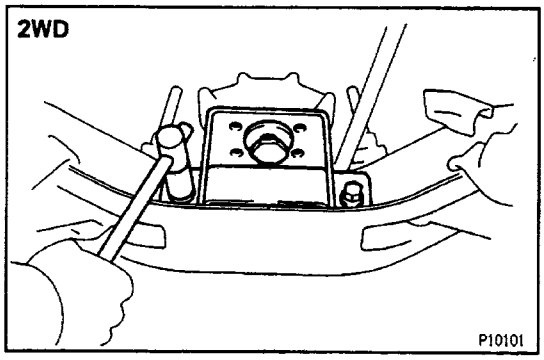
(b) Slowly lower the engine and transmission assembly into the engine compartment.

NOTICE: Be careful not to hit the PNP switch.

(c) Keep the engine level, and align the RH and LH mountings and body mountings.

(d) Attach the RH and LH mounting insulators to the body mountingssand temporarily install the four bolts.

(e) Jack up and put the transmission onto the member.

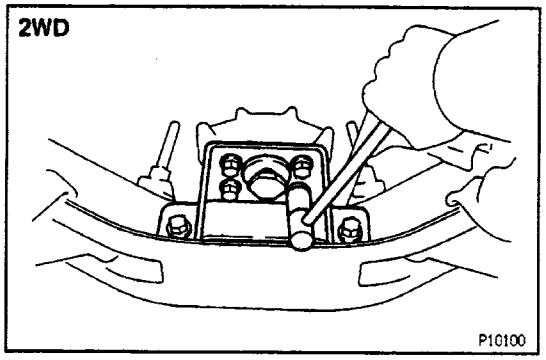


4. (2WD)
INSTALL ENGINE REAR MOUNTING BRACKET

(a) Raise the transmission slightly by raising the engine with a jack and a wooden block under the transmission.

(b) Install the engine rear mounting bracket to the support member.

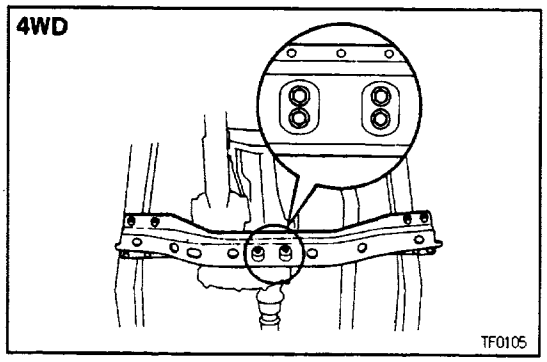
Torque: 25 N–m (260 kgf–cm. 19 ft–lbf)



(c) Lower the transmission and rest it on the extension housing.

(d) Install the mounting bracket to the mounting insulator.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



5. (4WD)
INSTALL NO.2 FRAME CROSSMEMBER

(a) Raise the transmission slightly with a jack.

(b) Install the frame crossmember to the side frame with the eight bolts.

Torque: 95 N–m (970 kgf–cm, 70 ft–lbf)

(c) Lower the transmission and transfer.

(d) Install the frame crossmember to the engine rear mounting insulator.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

6. TIGHTEN RH AND LH ENGINE MOUNTING INSULATOR BOLTS

Tighten the four bolts holding the mounting insulators to the body mountings.

Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)

7. (4WD only)
INSTALL NO.1 FRONT FLOOR AND BRAKE TUBE HEAT INSULATOR

8. INSTALL NO.1 FRAME CROSSMEMBER

9. (4WD only)
INSTALL STABILIZER BAR

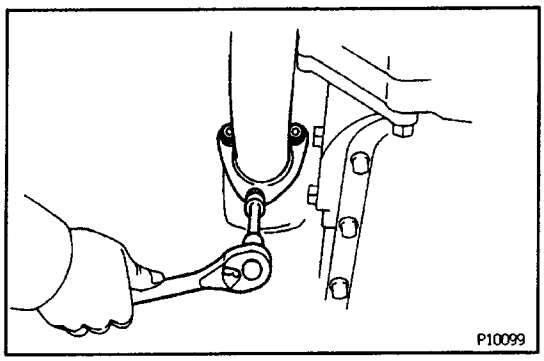
10. (4WD only)
INSTALL TRANSFER UNDER COVER

11. CONNECT SPEEDOMETER CONNECTOR

12. (4WD A/T only)
CONNECT MANUAL SHIFT LINKAGE

13. (4WD only)
INSTALL FRONT PROPELLER SHAFT
(See page PR–16)

14. INSTALL REAR PROPELLER SHAFT
(See page PR–15)



15. (M/T only)
INSTALL SHIFT LEVERS

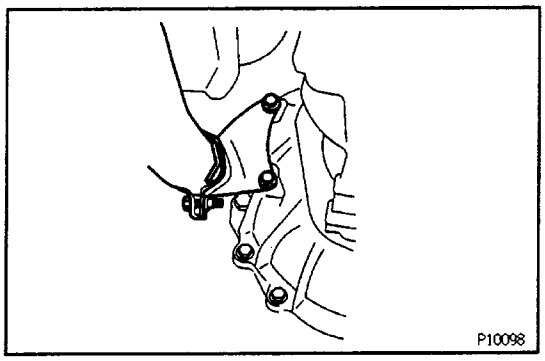
16. INSTALL FRONT EXHAUST PIPE

(a) Connect the exhaust pipe to the LH exhaust manifold with new gasket and three new nuts.

Torque: 62 N–m (630 kgf–cm, 46 ft–lbf)

(b) Connect the exhaust pipe to the catalytic converter with new gasket and the two bolts.

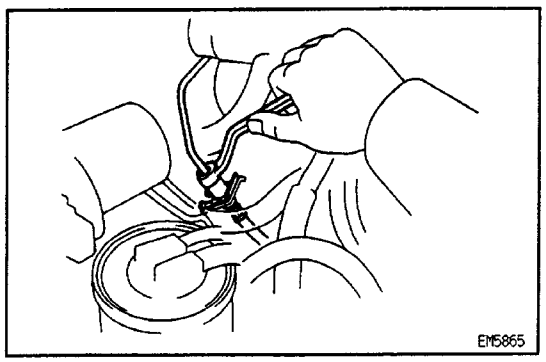
Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)



(c) Install the pipe bracket to the transmission with the two bolts.

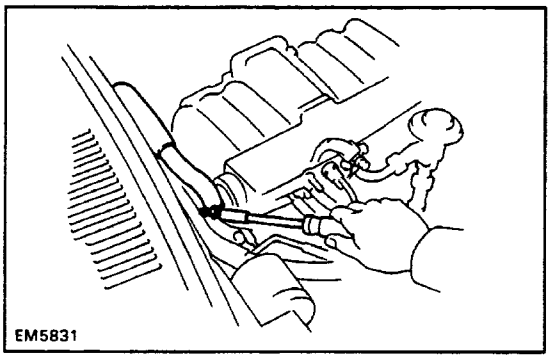
(d) Install the pipe bracket to the exhaust pipe with the pipe clamp.

(e) Connect the oxygen sensor connector.



17. (M/T only)
CONNECT CLUTCH RELEASE CYLINDER HOSE

18. INSTALL A/C COMPRESSOR



19. CONNECT HEATER HOSES

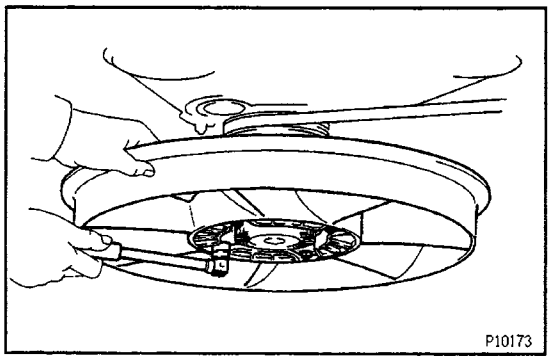
20. CONNECT FUEL INLET AND OUTLET HOSES

21. CONNECT STRAP, WIRES, CONNECTORS, HOSES AND CABLES

(a) Connect the following cables:
- Accelerator cable
- (A/T only)
  Throttle cable
- (w/ Cruise Control System)
  Cruise control cable

(b) Connect the following hoses:
- PS air hoses to gas filter and air pipe
- Brake booster hose
- (w/ Cruise Control System)
  Cruise control vacuum hose
- Charcoal canister hose to canister
- VSV vacuum hoses

(c) Connect the following strap, wires and connectors:
- Ground strap to LH fender apron
- Generator connector and wire
- Igniter connector
- Oil pressure sender gauge connector
- Ground strap to engine rear side
- ECM connectors
- VSV connectors
- A/C compressor connector
- (M/T only)
  Starter relay connector
- Solenoid resister connector
- Data link connector 1
- (w/ ADD)
  ADD switch connector



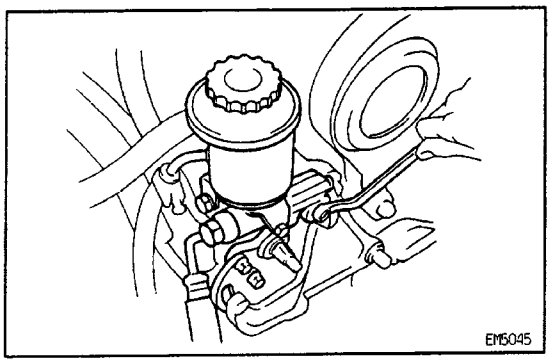
22. INSTALL GENERATOR DRIVE BELT

23. INSTALL COOLING FAN

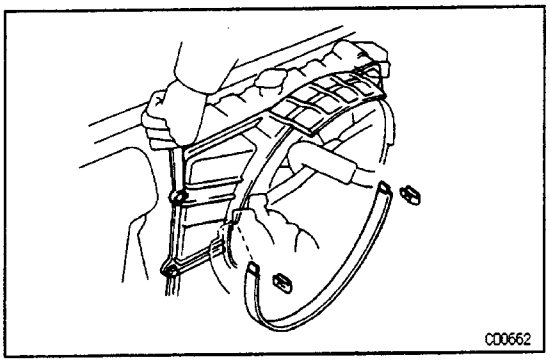
Install the cooling fan with the four nuts.

Torque: 5.4 N–m (55 kgf–cm, 48 in.–lbf)

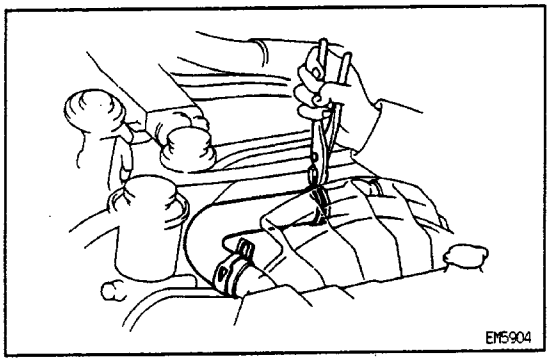
24. INSTALL A/C DRIVE BELT



25. INSTALL PS PUMP
26. INSTALL PS PUMP PULLEY AND DRIVE BELT



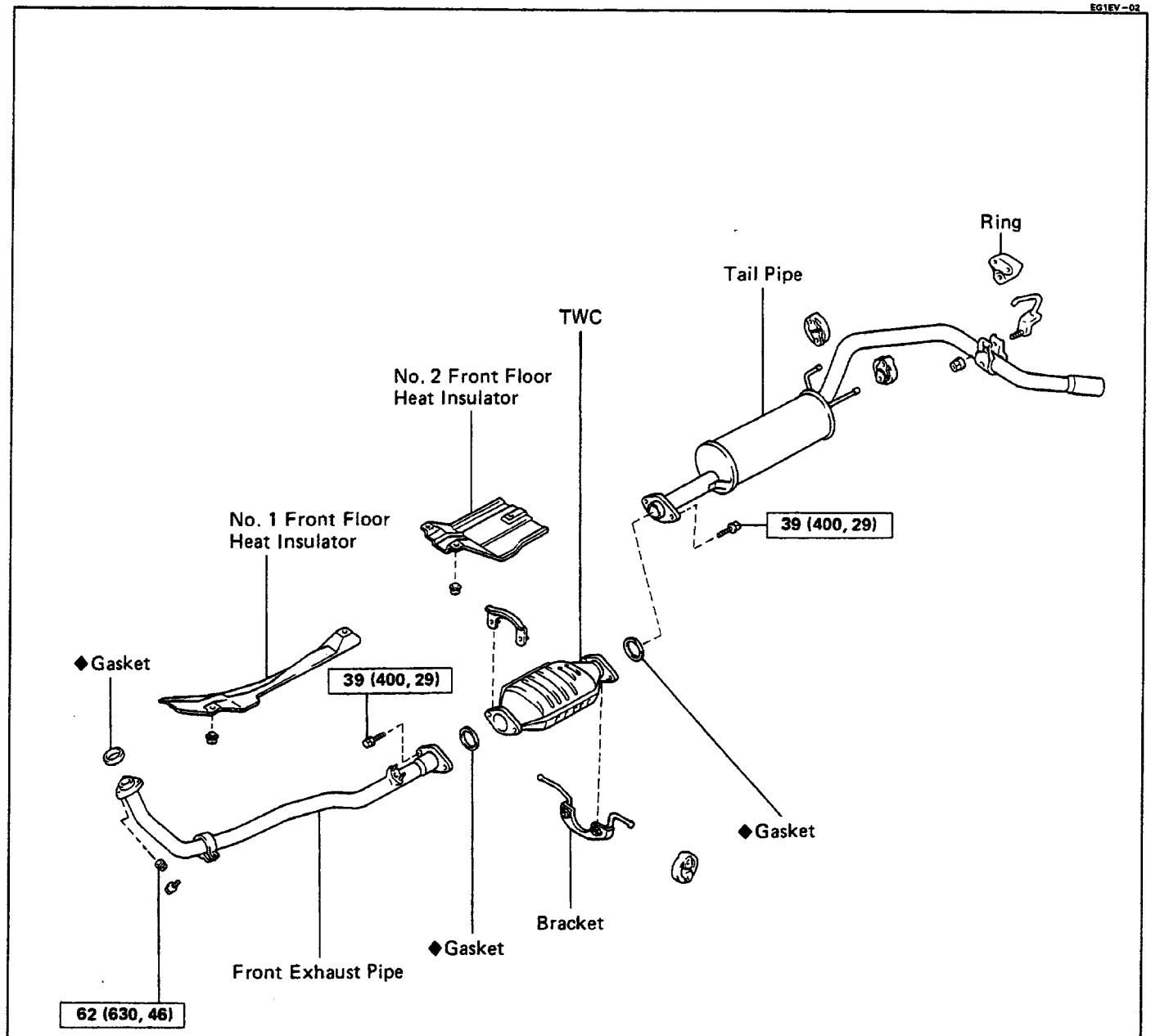
27. INSTALL RADIATOR
(a) Install the radiator with the four bolts.
(b) Install the No.1 fan shroud with the four bolts.
(c) Install the No.2 fan shroud with the two clips.



(d) Install the radiator hoses.
(e) (A/T)
Connect the oil cooler hoses.
(f) Connect the reservoir tank hose.

28. INSTALL AIR CLEANER AND HOSE
29. INSTALL BATTERY
30. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY
31. FILL WITH ENGINE COOLANT
32. FILL WITH ENGINE OIL
33. START ENGINE AND CHECK FOR LEAKS
34. PERFORM ENGINE ADJUSTMENT
(See Tune – Up on pages EG2–12 to 27)
35. INSTALL ENGINE UNDER COVER
36. INSTALL HOOD
37. PERFORM ROAD TEST
Check for abnormal noise, shock slippage, correct shift points and smooth operation.
38. RECHECK ENGINE COOLANT AND OIL LEVELS

EXHAUST SYSTEM



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

SERVICE SPECIFICATIONS

EG1EW–02

SERVICE DATA

Tune – up	Battery specific gravity (Ex. Delco battery)	
	55D 23R type	1.25 – 1.27 (when fully charged at 20°C (68°F))
	80D 26R type	1.27 – 1.29 (when fully charged at 20°C (68°F))
	High–tension cord resistance Limit	25 kΩ per cord
	High–tension cord resistance	
	Spark plug	
	ND	K16R–U
	Recommended spark plug NGK	BKR5EYA
	Correct electrode gap	0.8 mm (0.031 in.)
	Drive belt tension New belt	160 ± 20 lbf
	Used belt	100 ± 20 lbf
	Valve clearance (Cold) Intake	0.18 – 0.28 mm (0.007 – 0.011 in.)
	Exhaust	0.22 – 0.32 mm (0.009 – 0.013 in.)
	Valve clearance adjusting shim (for repair part)	
	Mark 2.200	2.200 mm (0.0866 in.)
	Mark 2.250	2.250 mm (0.0886 in.)
	Mark 2.300	2.300 mm (0.0906 in.)
	Mark 2.350	2.350 mm (0.0925 in.)
	Mark 2.400	2.400 mm (0.0945 in.)
	Mark 2.450	2.450 mm (0.0965 in.)
	Mark 2.500	2.500 mm (0.0984 in.)
	Mark 2.550	2.550 mm (0.1004 in.)
	Mark 2.600	2.600 mm (0.1024 in.)
	Mark 2.650	2.650 mm (0.1043 in.)
	Mark 2.700	2.700 mm (0.1063 in.)
	Mark 2.750	2.750 mm (0.1083 in.)
	Mark 2.800	2.800 mm (0.1102 in.)
	Mark 2.850	2.850 mm (0.1122 in.)
	Mark 2.900	2.900 mm (0.1142 in.)
	Mark 2.950	2.950 mm (0.1161 in.)
	Mark 3.000	3.000 mm (0.1181 in.)
	Mark 3.050	3.050 mm (0.1201 in.)
	Mark 3.100	3.100 mm (0.1220 in.)
	Mark 3.150	3.150 mm (0.1240 in.)
	Mark 3.200	3.200 mm (0.1260 in.)
	Mark 3.250	3.250 mm (0.1280 in.)
	Mark 3.300	3.300 mm (0.1299 in.)
	Mark 3.350	3.350 mm (0.1319 in.)
	Mark 3.400	3.400 mm (0.1339 in.)
	Ignition timing	10° BTDC @ idle
	Idle speed	(w/ Terminals TE1 and E1 connected of DLC1)
		800 ± 50 rpm
Compression pressure	at 250 rpm STD	1,177 kPa (12.0 kgf/cm², 171 psi) or more
	Limit	981 kPa (10.0 kgf/cm², 142 psi)
	Difference of pressure between each cylinder	98 kPa (1.0 kgf/cm², 14 psi) or less
Timing belt tensioner	Protrusion from housing end	10.0 – 10.5 mm (0.394 – 0.413 in.)

Cylinder head	Warpage	Limit	0.10 mm (0.0039 in.)
	Valve seat		
	Refacing angle		30°, 45°, 60°
	Contacting angle		45°
	Contacting width		1.2 – 1.6 mm (0.047 – 0.063 in.)
Valve guide bushing	Inside diameter		8.010 – 8.030 mm (0.3154 – 0.3161 in.)
	Outside diameter	STD	13.040 – 13.051 mm (0.5134 – 0.5138 in.)
		O/S 0.05	13.090 – 13.101 mm (0.5154 – 0.5158 in.)
Valve	Valve overall length	STD	104.3 mm (4.106 in.)
		Limit	103.8 mm (4.087 in.)
	Valve face angle		44.5°
	Stem diameter	STD (Intake)	7.970 – 7.985 mm (0.3138 – 0.3144 in.)
		(Exhaust)	7.965 – 7.980 mm (0.3136 – 0.3142 in.)
	Stern oil clearance	STD (Intake)	0.025 – 0.060 mm (0.0010 – 0.0024 in.)
		(Exhaust)	0.030 – 0.065 mm (0.0012 – 0.0026 in.)
		Limit (Intake)	0.08 mm (0.0031 in.)
		(Exhaust)	0.10 mm (0.0039 in.)
	Margin thickness	STD	1.3 – 1.7 mm (0.051 – 0.067 in.)
		Limit	1.0 mm (0.039 in.)
Valve spring	Deviation Limit		1.23 mm (0.0484 in.)
	Free length White painted mark		46.50 mm (1.8307 in.)
	Green painted mark		47.01 mm (1.8508 in.)
	Installed tension at 40.0 mm (1.575 in.)		242 – 268 N (24.7 – 27.3 kgf, 54.5 – 60.2 lbf)
Camshaft	Thrust clearance	STD	0.080 – 0.190 mm (0.0031 – 0.0075 in.)
		Limit	0.25 mm (0.0098 in.)
	Journal oil clearance	STD	0.025 – 0.066 mm (0.0010 – 0.0026 in.)
		Limit	0.10 mm (0.0039 in.)
	Journal diameter		33.959 – 33.975 mm (1.3370 – 1.3376 in.)
	Circle runout	Limit	0.06 mm (0.0024 in.)
	Cam lobe height	STD	47.830 – 47.930 mm (1.8830 – 1.8870 in.)
		Limit	47.50 mm (1.8701 in.)
Valve lifter	Lifter diameter		37.922 – 37.932 mm (1.4930 – 1.4934 in.)
	Lifter bore diameter		37.960 – 37.975 mm (1.4945 – 1.4951 in.)
	Oil clearance	STD	0.028 – 0.053 mm (0.0011 – 0.0021 in.)
		Limit	0.10 mm (0.0039 in.)
Air intake chamber	Warpage	Limit	0.10 mm (0.0039 in.)
Intake Manifold	Warpage	Limit	0.10 mm (0.0039 in.)
Exhaust Manifold	Warpage	Limit	0.70 mm (0.0276 in.)

Cylinder block	Cylinder head surface warpage	Limit	0.05 mm (0.0020 in.)
	Cylinder bore diameter	STD (Mark 1)	87.500 – 87.510 mm (3.4449 – 3.4453 in.)
		(Mark 2)	87.510 – 87.520 mm (3.4453 – 3.4457 in.)
		(Mark 3)	87.520 – 87.530 mm (3.4457 – 3.4461 in.)
		Limit (STD)	87.73 mm (3.4539 in.)
		(O/S 0.50)	88.23 mm (3.4736 in.)
	Main journal bore diameter	Mark 1	68.010 – 68.016 mm (2.6776 – 2.6778 in.)
		Mark 2	68.016 – 68.022 mm (2.6778 – 2.6780 in.)
		Mark 3	68.022 – 68.028 mm (2.6780 – 2.6783 in.)
Piston and piston ring	Piston diameter	STD (Mark 1)	87.360 – 87.370 mm (3.4394 – 3.4398 in.)
		(Mark 2)	87.370 – 87.380 mm (3.4398 – 3.4402 in.)
		(Mark 3)	87.380 – 87.390 mm (3.4402 – 3.4405 in.)
		O/S 0.50	87.860 – 87.890 mm (3.4590 – 3.4602 in.)
	Piston oil clearance	STD	0.130 – 0.150 mm (0.0051 – 0.0059 in.)
		Limit	0.17 mm (0.0067 in.)
	Piston ring groove clearance	STD (No.1)	0.020 – 0.060 mm (0.0008 – 0.0024 in.)
		(No.2)	0.030 – 0.070 mm (0.0012 – 0.0028 in.)
		Limit	0.20 mm (0.0079 in.)
	Piston ring end gap	STD (No.1)	0.280 – 0.500 mm (0.0110 – 0.0197 in.)
		(No.2)	0.380 – 0.600 mm (0.0150 – 0.0236 in.)
		(Oil)	0.150 – 0.500 mm (0.0059 – 0.0197 in.)
		Limit (No.1)	1.10 mm (0.0433 in.)
		(No.2)	1.20 mm (0.0472 in.)
		(Oil)	1.10 mm (0.0433 in.)
Connecting rod	Thrust clearance STD		0.150 – 0.330 mm (0.0059 – 0.0130 in.)
	Limit		0.38 mm (0.0150 in.)
	Connecting rod big end inner diameter (Reference)		
		STD (Mark 1)	58.000 – 58.008 mm (2.2835 – 2.2838 in.)
		(Mark 2)	58.008 – 58.016 mm (2.2838 – 2.2841 in.)
		(Mark 3)	58.016 – 58.024 mm (2.2841 – 2.2844 in.)
	Connecting rod bearing center wall thickness (Reference)		
		STD (Mark 1)	1.484 – 1.488 mm (0.0584 – 0.0586 in.)
		(Mark 2)	1.488 – 1.492 mm (0.0586 – 0.0587 in.)
		(Mark 3)	1.492 – 1.496 mm (0.0587 – 0.0589 in.)
	Connecting rod oil clearance	STD (STD)	0.024 – 0.053 mm (0.0009 – 0.0021 in.)
		(U/S 0.25, U/S 0.50)	0.023 – 0.069 mm (0.0009 – 0.0027 in.)
		Limit	0.08 mm (0.0031 in.)
	Rod bend	Limit per 100 mm (3.94 in.)	0.05 mm (0.0020 in.)
	Rod twist	Limit per 100 mm (3.94 in.)	0.15 mm (0.0059 in.)
	Connecting rod bolt thread outside diameter STD		7.860 – 8.000 mm (0.3094 – 0.3150 in.)
	Limit		7.60 mm (0.2992 in.)

Crankshaft	Thrust clearance STD	0.020 – 0.220 mm (0.0008 – 0.0087 in.)
	Limit	0.30 mm (0.0118 in.)
	Thrust washer thickness	2.440 – 2.490 mm (0.0961 – 0.0980 in.)
	Main journal oil clearance STD (No.1 for STD)	0.0025 – 0.0052 mm (0.0010 – 0.0020 in.)
	(No.1 for U/S 0.25, U/S 0.50)	0.0024 – 0.0080 mm (0.0009 – 0.0031 in.)
	(Others for STD)	0.0029 – 0.0056 mm (0.0011 – 0.0022 in.)
	(Others for U/S 0.25, U/S 0.50)	0.0028 – 0.0077 mm (0.0011 – 0.0030 in.)
	Limit	0.80 mm (0.0031 in.)
	Main journal diameter STD	63.985 – 64.000 mm (2.5190 – 2.5197 in.)
	U/S 0.25	63.745 – 63.755 mm (2.5096 – 2.5100 in.)
	U/S 0.50	63.495 – 63.505 mm (2.4998 – 2.5002 in.)
	Main journal diameter (Reference) STD (Mark 0)	63.996 – 64.000 mm (2.5195 – 2.5197 in.)
	(Mark 1)	63.990 – 63.996 mm (2.5193 – 2.5195 in.)
	(Mark 2)	63.985 – 63.990 mm (2.5191 – 2.5193 in.)
	Main bearing center wall thickness (Reference)	
	STD (No.1 for Mark 1)	1.991 – 1.994 mm (0.0784 – 0.0785 in.)
	(No.1 for Mark 2)	1.994 – 1.997 mm (0.0785 – 0.0786 in.)
	(No.1 for Mark 3)	1.997 – 2.000 mm (0.0786 – 0.0787 in.)
	(No.1 for Mark 4)	2.000 – 2.003 mm (0.0787 – 0.0789 in.)
	(No.1 for Mark 5)	2.003 – 2.006 mm (0.0789 – 0.0790 in.)
	(Others for Mark 1)	1.989 – 1.992 mm (0.0783 – 0.0784 in.)
	(Others for Mark 2)	1.992 – 1.995 mm (0.0784 – 0.0785 in.)
	(Others for Mark 3)	1.995 – 1.998 mm (0.0785 – 0.0787 in.)
	(Others for Mark 4)	1.998 – 2.001 mm (0.0787 – 0.0788 in.)
	(Others for Mark 5)	2.001 – 2.004 mm (0.0788 – 0.0789 in.)
	Crank pin diameter STD	54.987 – 55.000 mm (2.1648 – 2.1654 in.)
	U/S 0.25	54.745 – 54.755 mm (2.1553 – 2.1557 in.)
	U/S 0.50	54.495 – 54.505 mm (2.1455 – 2.1459 in.)
	Circle runout Limit	0.06 mm (0.0024 in.)
	Main journal taper and out–of–round Limit	0.02 mm (0.0008 in.)
	Crank pin journal taper and out–of–round Limit	0.02 mm (0.0008 in.)

TORQUE SPECIFICATIONS

EG1EX–02

Part tightened		N·m	kgf·cm	ft·lbf
No.1 idler pulley x Cylinder head		34	350	25
Crankshaft pulley x Crankshaft		245	2,500	181
Camshaft timing pulley x Camshaft		108	1,100	80
Fan bracket x Cylinder block		41	420	30
Timing belt tensioner x Fan bracket		26	270	20
Cooling fan x Fluid coupling		5.4	55	48 in.·lbf
Water outlet x No.2 idler pulley		8.3	85	74 in.·lbf
Spark plug x Cylinder head		18	180	13
Exhaust manifold x Cylinder head		39	400	29
Generator bracket x Cylinder head		37	380	27
Cylinder head x Cylinder block	for 12 pointed head (l st)	44	450	33
	(2nd)	Turn 90°		
	(3rd)	Turn 90°		
	for 6 pointed head	41	420	30

Camshaft bearing cap x Cylinder head		16	160	12
Cylinder head cover x Cylinder head		5.4	55	48 in.·lbf
Engine hanger x Cylinder head		40	410	30
Oil dipstick guide x Cylinder head		37	380	27
Exhaust crossover pipe x Exhaust Manifold		39	400	29
Intake manifold x Cylinder head		18	185	13
Water by–pass outlet x Intake manifold		18	185	13
Delivery pipe x Cylinder head		13	130	9
No.1 injection manifold x Exhaust Manifold		29	300	22
PAIR reed valve x Cylinder head		37	380	27
No.3 timing belt cover x Cylinder head		8.3	85	74 in.·lbf
No.2 idler pulley x Intake manifold		18	185	13
No.4 timing belt cover x No.3 timing belt cover		8.3	85	74 in.·lbf
No.2 fuel pipe x Delivery pipe		34	350	25
No.3 fuel pipe x Delivery pipe		34	350	25
Air intake chamber x Intake manifold		18	185	13
EGR pipe x Exhaust manifold		29	300	22
EGR pipe x Air intake chamber		29	300	22
EGR valve x Air intake chamber		18	185	13
Air intake chamber stay x Air intake chamber		18	185	13
Air intake chamber stay x Cylinder head		18	185	13
Cold start injector tube x Cold start injector		15	150	13
Main bearing cap x Cylinder block	for 1st	61	625	45
	for 2nd	Turn 90°		
Connecting rod cap x Connecting rod	1st	25	250	18
	2nd	Turn 90°		
Rear oil seal retainer x Cylinder block		7.8	80	69 in.·lbf
Oil pump x Cylinder block		20	200	14
Oil strainer x Main bearing cap		6.9	70	61 in.·lbf
Oil strainer x Oil pump		6.9	70	61 in.·lbf
Oil pan x Cylinder block		5.9	60	52 in.·lbf
Oil pan x Oil pump		5.9	60	52 in.·lbf
Oil pan x Rear ail seal retainer		5.9	60	52 in.·lbf
Oil filter union x Cylinder block		25	250	18
Oil cooler x Cylinder block	for union bolt (2WD)	59	600	43
	for relief valve (4WD)	59	600	43
	for bolt	39	400	29
Engine coolant drain plug x Cylinder block		29	300	22
RH engine mounting bracket x Cylinder block		40	410	30
LH engine mounting bracket x Cylinder block		40	410	30
Oil pressure sender gauge x Cylinder block		15	150	11
Water pump x Cylinder block	for short bolt	20	200	14
	for long bolt	18	185	13
No.1 water by–pass pipe x Cylinder block	for bolt	4.9	50	43 in.·lbf
	for nut	6.9	70	61 in.·lbf
Rear end plate x Cylinder block		7.4	75	65 in.·lbf
Crankshaft x Flywheel (M/T)		88	900	65
Crankshaft x Drive plate (A/T)		83	850	61
Cylinder block x Oil cooler relief valve		59	600	43

Rear engine mounting bracket x Support member (2W0)	**25**	**260**	**19**
Rear engine mounting bracket x Mounting insulator (2WD)	**13**	**130**	**9**
No.2 frame crossmember x Side frame (4WD)	**95**	**970**	**70**
No.2 frame crossmember x Rear engine mounting insulator (4WD)	**13**	**130**	**9**
RH engine mounting insulator x Body	**37**	**380**	**27**
LH engine mounting insulator x Body	**37**	**380**	**27**
Front exhaust pipe x Exhaust manifold	**62**	**630**	**46**
Front exhaust pipe x Three –way catalytic converter	**39**	**400**	**29**
Tailpipe x Three–way catalytic converter	**39**	**400**	**29**

EMISSION CONTROL SYSTEMS

SYSTEM PURPOSE

EG1EY–02

System	Abbreviation	Purpose
Positive crankcase ventilation	PCV	Reduces blow–by gas (HC)
Evaporative emission control	EVAP	Reduces evaporative H C
Exhaust gas recirculation	EGR	Reduces NOx
Pulsed secondary air injection	PAIR	Reduces HC and CO
Three–way catalytic converter	TWC	Reduces HC, CO and NOx
Multiport fuel injection*	MFI	Regulates all engine conditions for reduction of exhaust emissions.

Remark: For inspection and repair of the MFI system, refer to the MFI section of this manual.

V02295

PREPARATION

RECOMMENDED TOOLS

EG1EZ–01

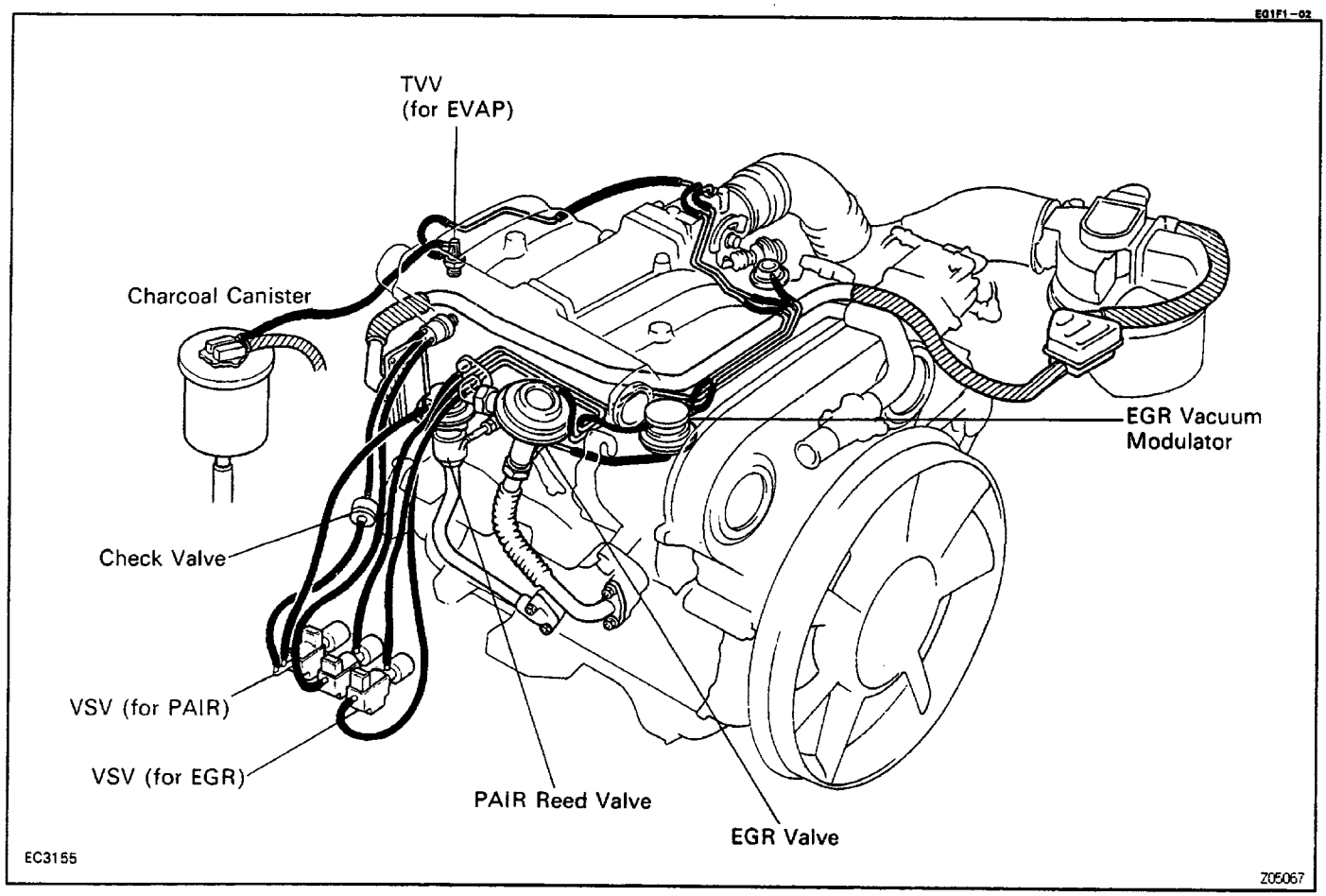
 09082–00015 TOYOTA Electrical Tester	
 09258–00030 Hose Plug Set	

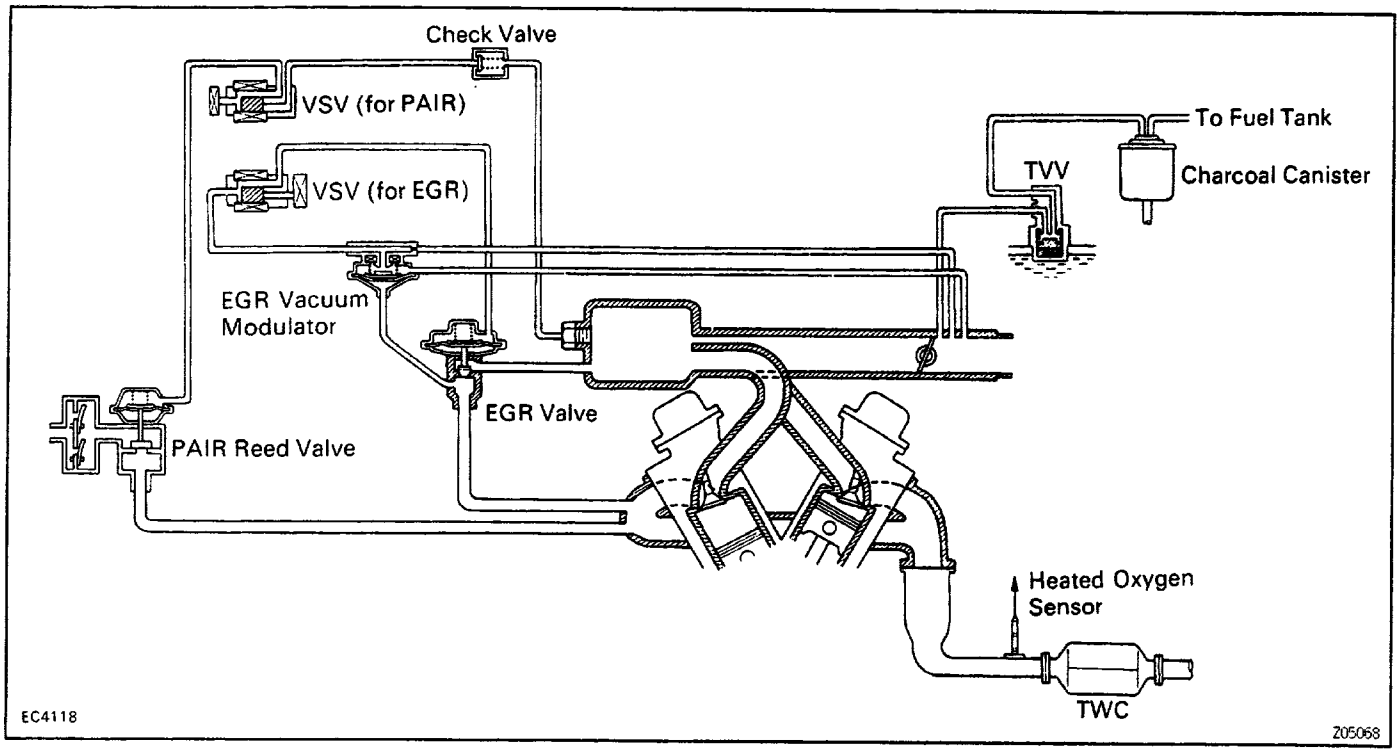
EG1F0–01

EQUIPMENT

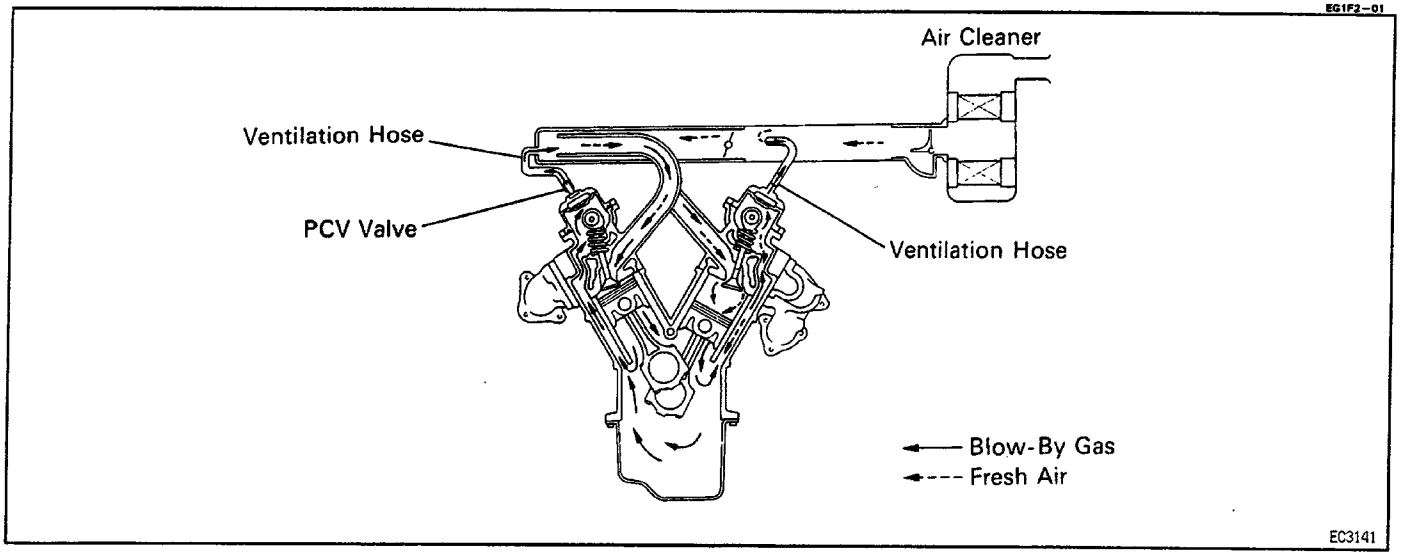
Torque wrench	
Vacuum gauge	

LAYOUT AND SCHEMATIC DRAWING



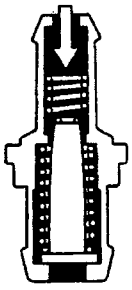


POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM



To reduce HC emission, crankcase blow–by gas (HC) is routed through the PCV valve to the intake manifold for combustion in the cylinders.

Engine not Running or Backfiring

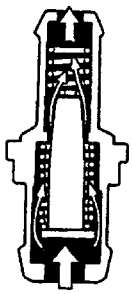


Cylinder Head Side

EC1001

○ PCV VALVE IS CLOSED.

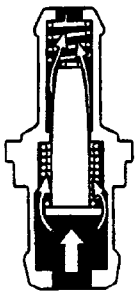
Normal Operation



EC1002

○ PCV VALVE IS OPEN.
○ VACUUM PASSAGE IS LARGE.

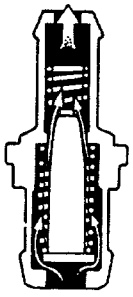
Idling or Decelerating



EC1003

○ PCV VALVE IS OPEN.
○ VACUUM PASSAGE IS SMALL.

Acceleration or Heavy Load



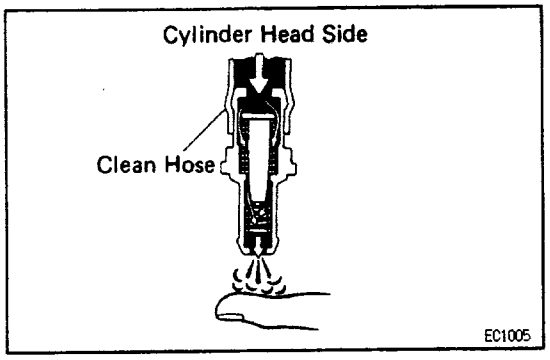
EC1004

○ PCV VALVE IS FULLY OPEN.

V01597

EG1F3–01

PCV VALVE INSPECTION



1. REMOVE PCV VALVE

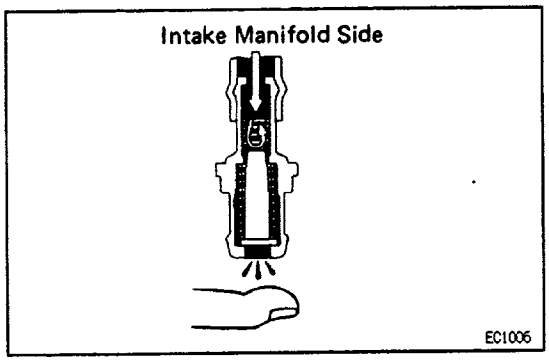
2. ATTACH CLEAN HOSE TO PCV VALVE

3. BLOW AIR FROM CYLINDER HEAD SIDE

Check that air passes through easily.

NOTICE: Do not suck air through the valve.

Petroleum substances inside the valve are harmful.



4. BLOW AIR FROM INTAKE MANIFOLD SIDE

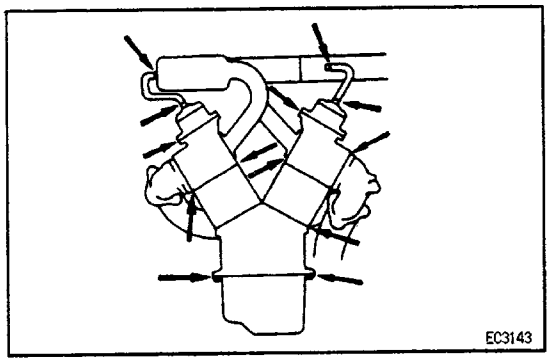
Check that air passes through with difficulty.

If the PCV valve fails either check, replace it.

5. REINSTALL PCV VALVE

EG1F4–01

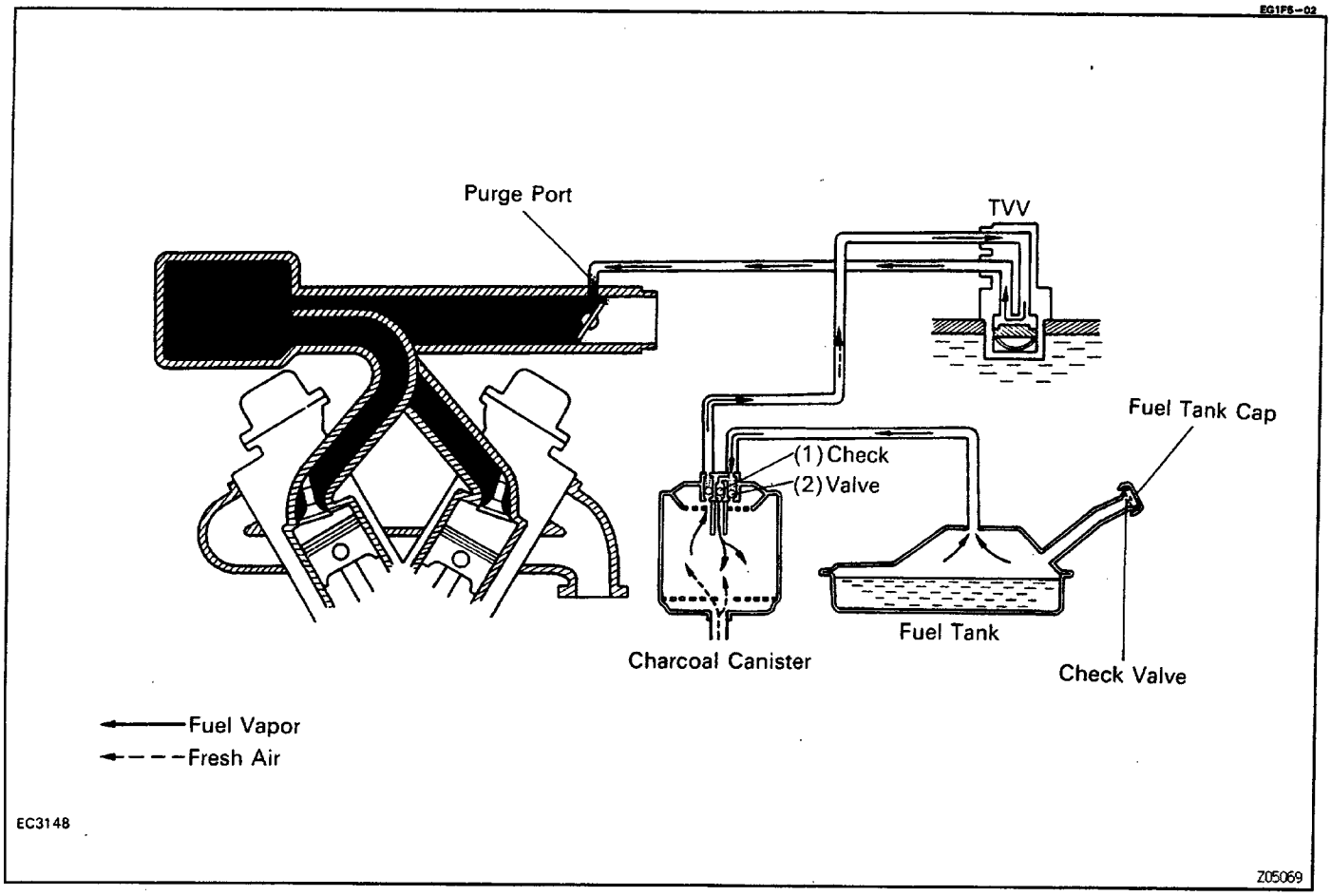
PCV HOSES AND CONNECTIONS INSPECTION



VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS

Check for cracks, leaks or damage.

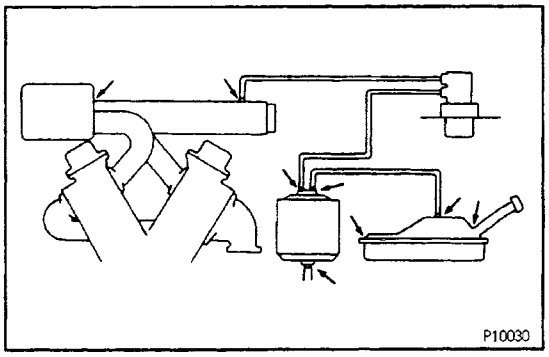
EVAPORATIVE (EVAP) EMISSION CONTROL SYSTEM



To reduce HC emission, evaporated fuel from the fuel tank is routed through the charcoal canister to the intake manifold for combustion in the cylinders. '

Engine Coolant Temp.	TVV	Throttle Valve Opening	Check Valve is Charcoal Canister			Check Valve in Cap	Evaporated Fuel (HC)
			(1)	(2)	(3)		
Below 35•C (95•F)	CLOSED	–	–	–	–	–	HC from tank is absorbed in the canister.
Above 54•C (129•F)	OPEN	Positioned below purge port	CLOSED	–	–	–	
		Positioned above purge port	OPEN	–		–	HC from canister is led into air intake manifold.
High pressure in tank	–	–	–	OPEN	CLOSED	CLOSED	HC from tank is absorbed in the canister.
High vacuum in tank	–	–	–	CLOSED	OPEN	OPEN	(Air is led into the fuel tank.)

V02190



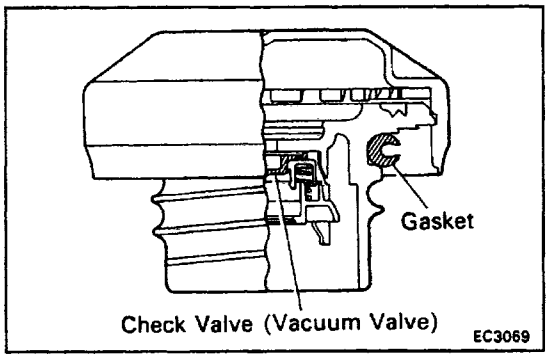
FUEL VAPOR LINES, FUEL TANK AND TANK CAP INSPECTION EG1F6-02

1. VISUALLY INSPECT LINES AND CONNECTIONS

Look for loose connections, sharp bends or damage.

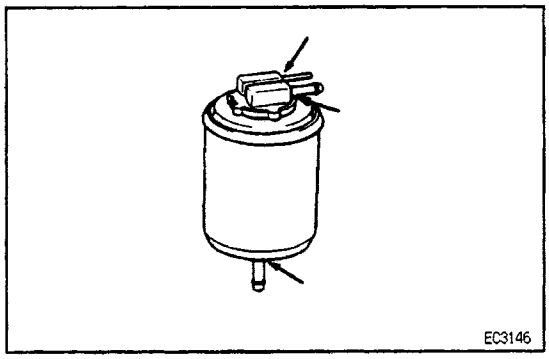
2. VISUALLY INSPECT FUEL TANK

Look for deformation, cracks or fuel leakage.



3. VISUALLY INSPECT FUEL TANK CAP

Look for a damaged or deformed gasket and cap.
If necessary, repair or replace the cap.

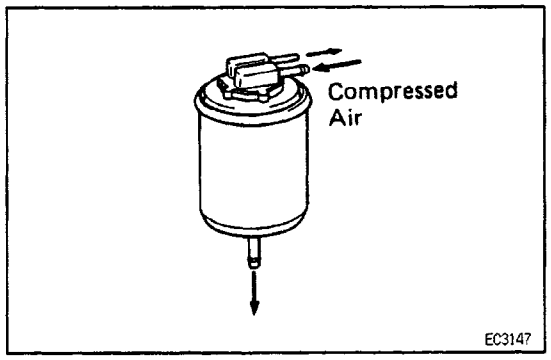


CHARCOAL CANISTER INSPECTION EG1F7-01

1. REMOVE CHARCOAL CANISTER

2. VISUALLY INSPECT CHARCOAL CANISTER CASE

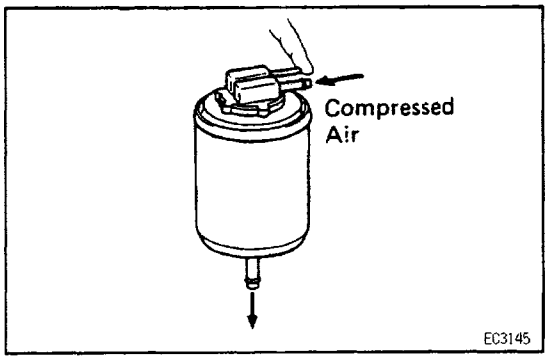
Look for cracks or damage.



3. CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE

(a) Using low pressure compressed air, blow air into the tank pipe and check that air flows without resistance from the other pipes.

(b) Blow air into the purge pipe and check that air does not flow from the other pipes.
If a problem is found, replace the charcoal canister.



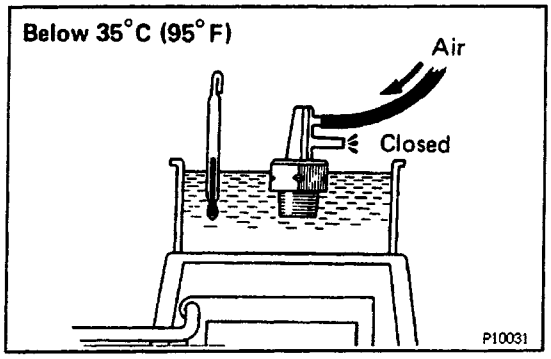
4. CLEAN FILTER IN CANISTER

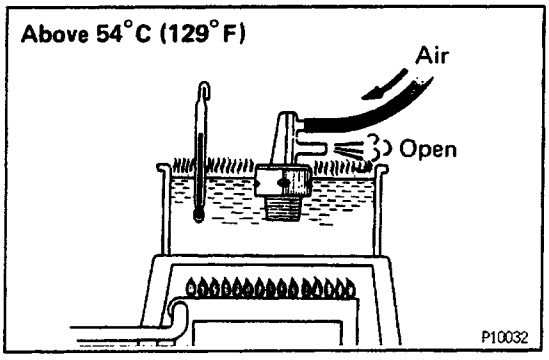
Clean the filter by blowing 294 kPa (3 kgf/cm2, 43 psi) of compressed air into the tank pipe, while holding the purge pipe closed.

HINT:

- Do not attempt to wash the canister.
- No activated carbon should come out.

5. INSTALL CHARCOAL CANISTER





EG210–01

TVV INSPECTION

CHECK TVV BY BLOWING AIR INTO PIPE

(a) Drain the coolant from the radiator into a suitable container.
(b) Remove the TVV from the intake manifold.
(c) Cool the TVV to below 35•C (95•F) with cool water.
(d) Blow air into a pipe and check that the TVV is closed.
(e) Heat the TVV to above 54•C (129•F) with hot water.
(f) Blow air into a pipe and check that the TVV is open.
If a problem is found, replace the TVV.
(g) Apply adhesive to two or three threads of the TVV, and reinstall it.

Adhesive:

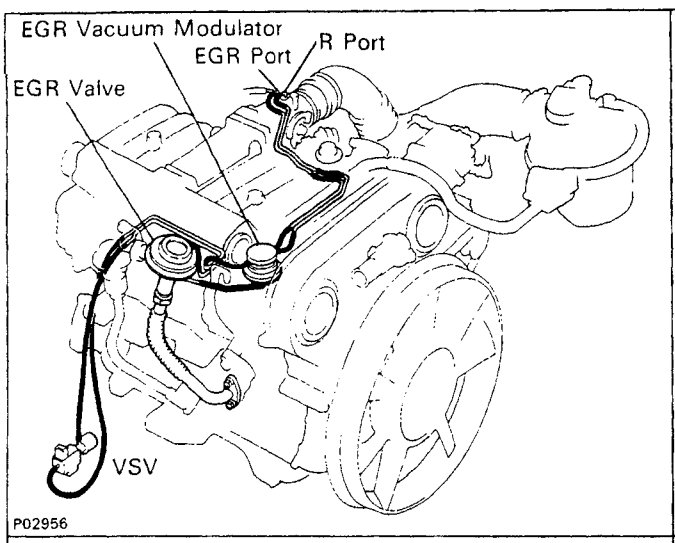
Part No. 08833–00070. THREE BOND 1324 or equivalent

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)

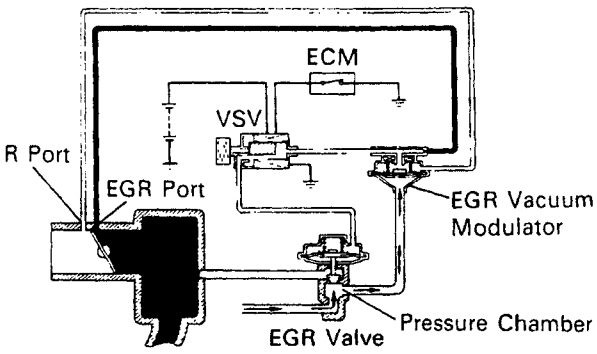
(h) Fill the radiator with engine coolant.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

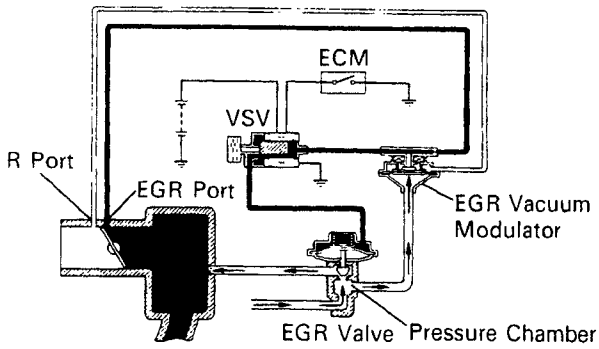
EG211–01



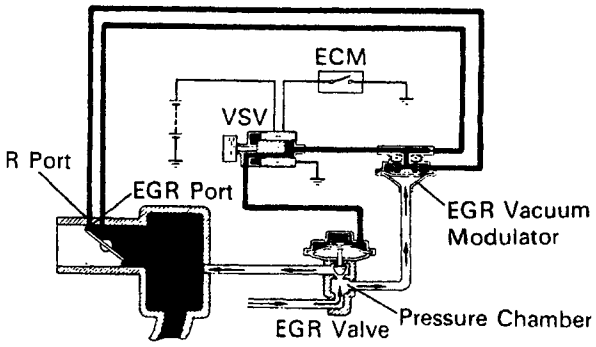
(1)



(2)



(3)



To reduce NOx emissions, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

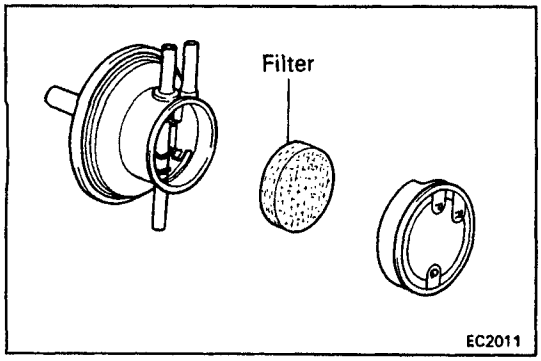
Engine Coolant Temp.	VSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EG R Valve	Exhaust Gas
Below 48•C (118•F)	CLOSED					CLOSED	Not recirculated
Above 52•C (126•F)	OPEN	Positioned below EGR port	-		-	CLOSED	Note Recirculated
		Positioned between EGR port and R port	(1) LOW	*Pressure constantly alternating between low and high	OPENS passage to atmosphere	CLOSED	Note Recirculated
			(2) HIGH		CLOSES passage to atmosphere	OPEN	Recirculated
		Positioned above R port	(3) HIGH	**	CLOSES passage to atmosphere	OPEN	Recirculated (increase)

Remarks: *Pressure increases → Modulator closes → .EGR valve opens → Pressure drops
EGR Valve closes ← Modulator opens

** When the throttle valve is positioned above the R port, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the EGR gas, even if the exhaust pressure is insufficiently low.

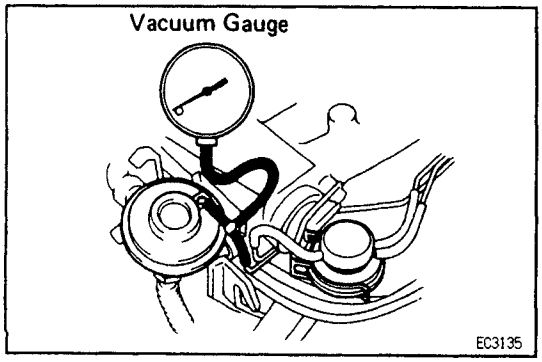
EG1FA–01

EGR SYSTEM INSPECTION



1. CHECK AND CLEAN FILTER !N EGR VACUUM MODULATOR

(a) Check the filter for contamination or damage.
(b) Using compressed air, clean the filter.

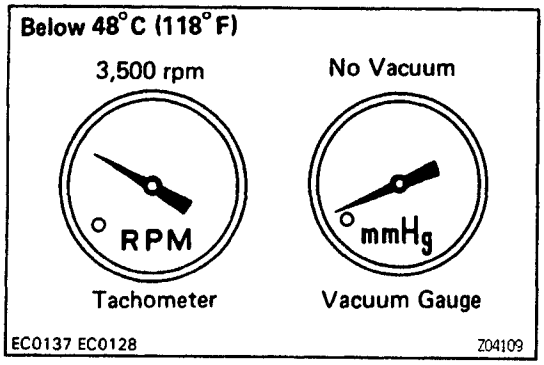


2. PREPARATION

Disconnect the vacuum hose from the EGR valve and using a three–way union, connect a vacuum gauge to it.

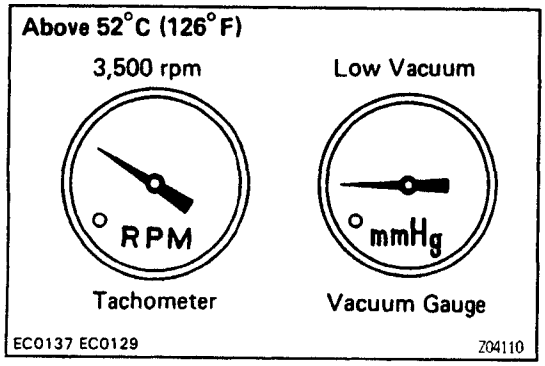
3. CHECK SEATING OF EGR VALVE

Start the engine and check that the engine starts and runs at idle.



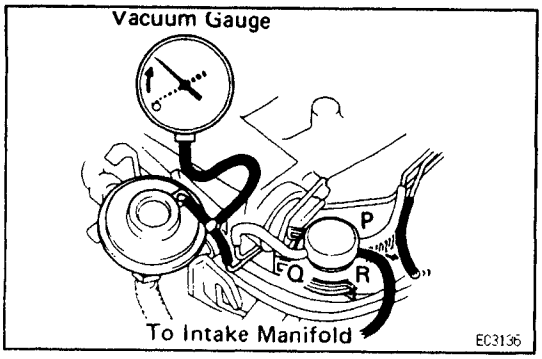
4. CHECK VSV WITH COLD ENGINE

(a) The engine coolant temperature should be below 48•C(118•F).
(b) Check that the vacuum gauge indicates zero at 3,500 rpm.



5. CHECK VSV AND EGR VACUUM MODULATOR WITH WARM ENGINE

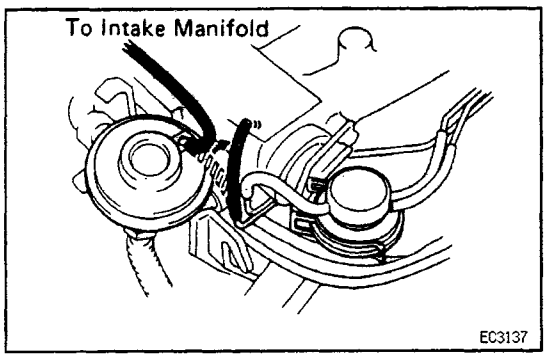
(a) Warm up the engine.
(b) Check that the vacuum gauge indicates zero at idle.
(c) Check that the vacuum gauge indicates low vacuum at 3,500 rpm.



(d) Disconnect the vacuum hose from R port of the EGR vacuum modulator and connect R port directly to the intake manifold with another hose.
(e) Check that the vacuum gauge indicates high vacuum at 3,500 rpm.

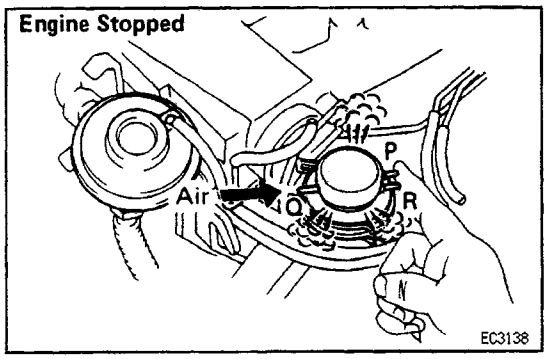
HINT: As a large amount of EGR gas enters, the engine will misfire slightly.

(f) Disconnect the vacuum gauge and reconnect the vacuum hoses to the proper locations.



6. CHECK EGR VALVE

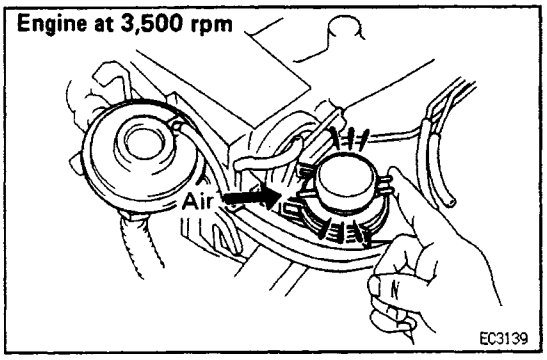
(a) Apply vacuum directly to the EGR valve with the engine idling.
(b) Check that the engine runs rough or dies.
(c) Reconnect the vacuum hoses to the proper locations.
If no problem is found with this inspection, the system is okay; otherwise inspect each part.



EGR VACUUM MODULATOR INSPECTION

CHECK EGR VACUUM MODULATOR OPERATION

(a) Disconnect the vacuum hoses from ports P, Q and R of the EGR vacuum modulator.
(b) Plug ports P and R with your finger.
(e) Blow air into port Q. Check that the air passes through to the air filter side freely.



(d) Start the engine and maintain speed at 3,500rpm.
(e) Repeat the above test. Check that there is a strong resistance to air flow.
(f) Reconnect the vacuum hoses to the proper locations.
If a problem is found, replace the EGR vacuum mod–ulator. ”

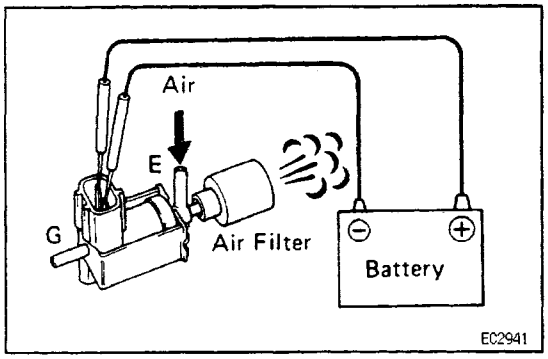
EG1FC–01

EGR VALVE INSPECTION

1. REMOVE EGR VALVE

Check the valve for sticking and heavy carbon de–posits.
If a problem is found, replace it.

2. INSTALL EGR VALVE WITH NEW GASKET

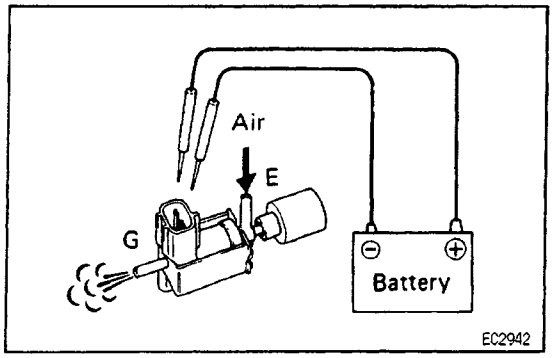


EG1FD–01

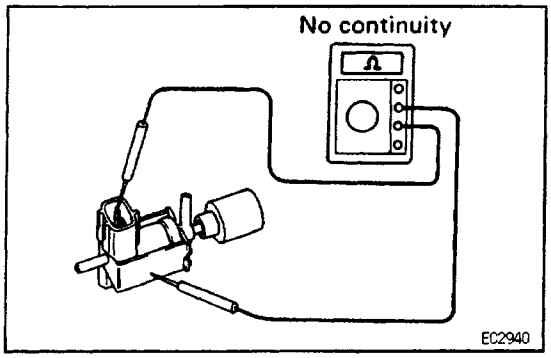
VSV INSPECTION

1. CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE

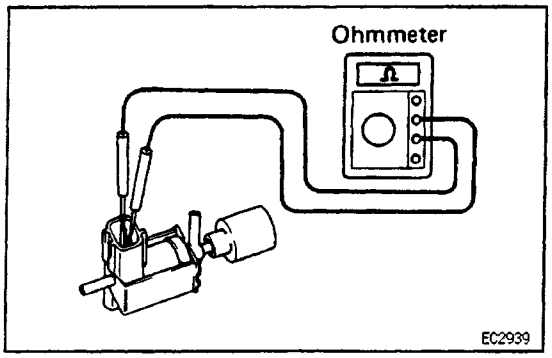
(a) Connect the VSV terminals to the battery terminals as illustrated.
(b) Blow air into a pipe E and check that air comes out of air filter.



(c) Disconnect the battery.
(d) Blow air into a pipe E and check that air comes out of pipe G.
If a problem is found, replace the VSV.



2. CHECK FOR SHORT CIRCUIT
Using an ohmmeter, check that there is no continuity between the terminals and the VSV body.
If there is continuity, replace the VSV.



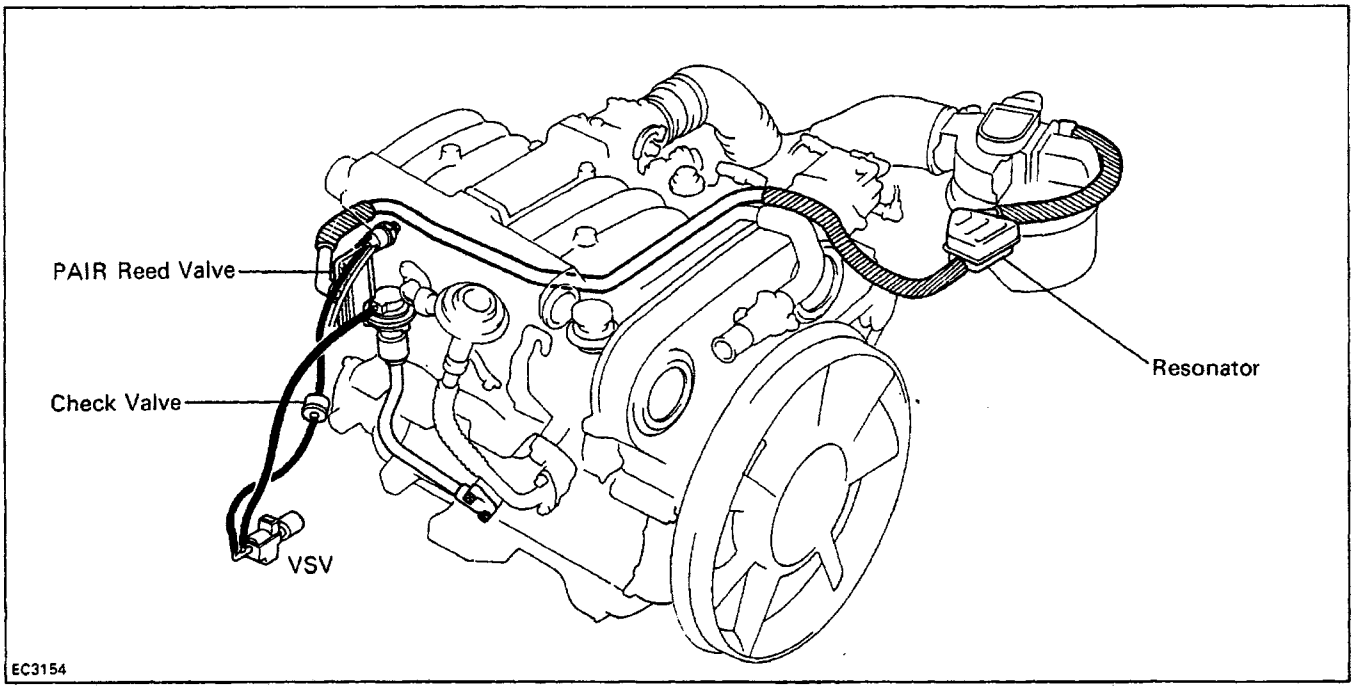
3. CHECK FOR OPEN CIRCUIT
Using an ohmmeter, measure the resistance between. the terminals.
Specified resistance: 30 – 50Ω at 20 •C (68 •F)
If the resistance is not within specification, replace the VSV.

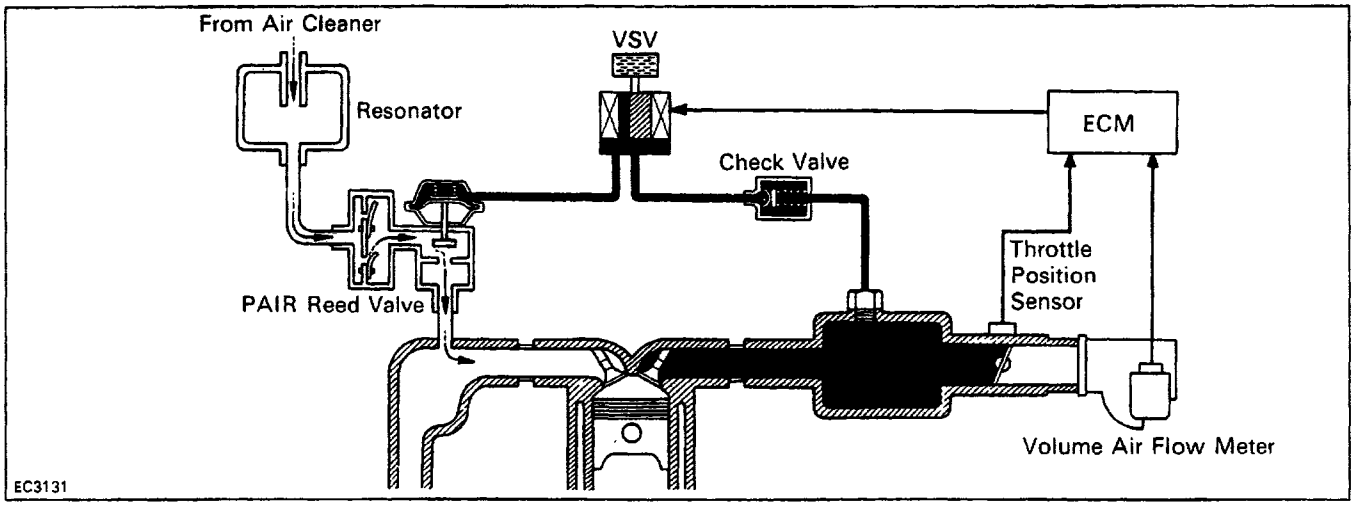
ENGINE COOLANT TEMP. SENSOR INSPECTION ecIFe–01

(See page EG2–348)

PULSED SECONDARY AIR INJECTION (PAIR) SYSTEM

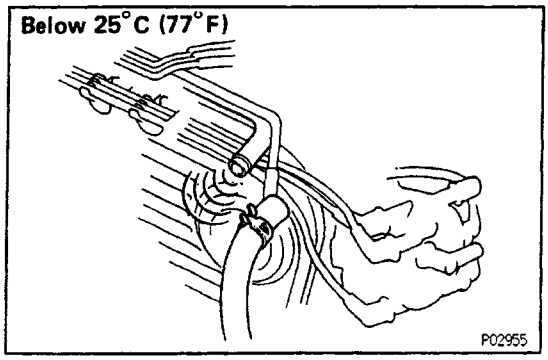
EG212–01





To reduce HC and CO emissions, this system draws in air into exhaust ports to accelerate oxidation, using vacuum generated by the exhaust pulsation in the exhaust manifold.

Condition	Engine Coolant Temp.	Throttle Valve Position	Engine RPM	VSV	PAIR
Normal driving	Below 25•C (77•F)		–	ON	ON
Deceleration	Above 35•C (95•F)	Idling	Below 1,000 rpm	OFF	OFF
			Between 1,200 – 3,200 rpm	ON	ON



EG1FG–01

PAIR SYSTEM INSPECTION

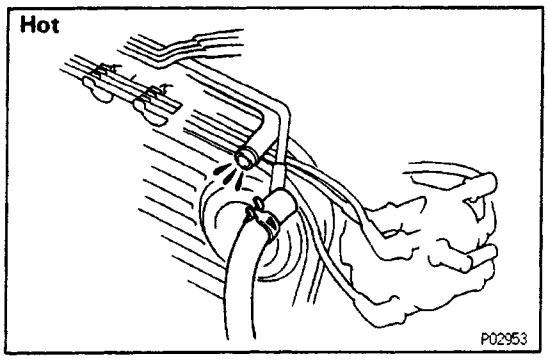
1. VISUALLY CHECK HOSES AND TUBES FOR CRACKS, KINKS, DAMAGE OR LOOSE CONNEC– TIONS

2. CHECK PAIR SYSTEM WITH COLD ENGINE

(a) The engine coolant temperature should be below 25 • C (77 •F).

(b) Disconnect the No.2 air hose from the air pipe.

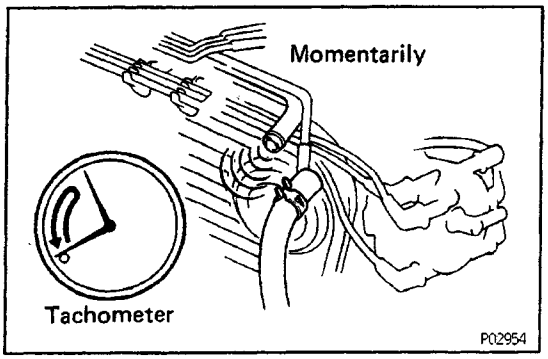
(c) Check that a bubbling noise is heard from the air pipe at idle.



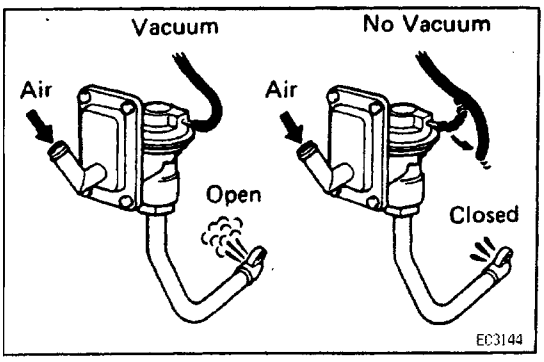
3. CHECK PAIR SYSTEM WITH WARM ENGINE

(a) Warm up the engine.

(b) With the engine idling, check that a bubbling noise is not heard from the air pipe.



(c) Race the engine above 2,000 rpm and quickly close the throttle valve. Check that a bubbling noise stops momentarily.



EG1FH–01

PAIR REED VALVE INSPECTION

CHECK REED VALVE BY BLOWING AIR INTO PIPE

(a) Apply vacuum to the reed valve diaphragm.

(b) Blow air into a pipe and check that the reed valve is open.

(c) Release the vacuum and check that the reed valve is closed.

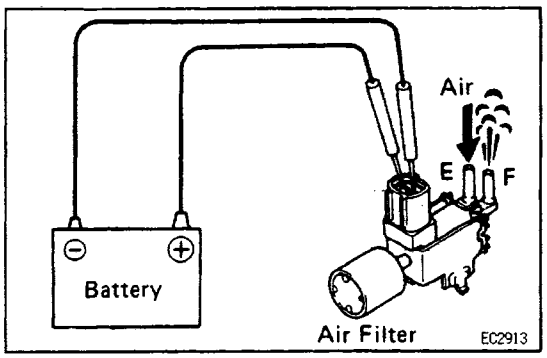
EG1FJ–01

VSV INSPECTION

1. CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE

(a) Connect the VSV terminals to the battery terminals as illustrated.

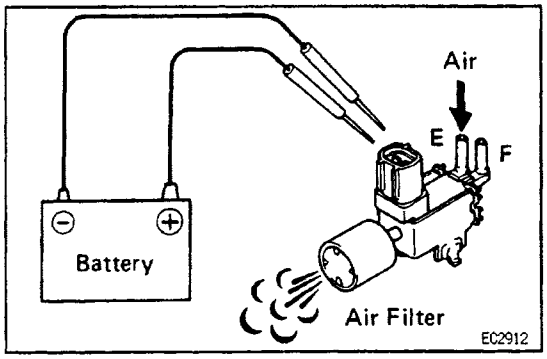
(b) Blow air into pipe E and check that air comes out of pips F.



(c) Disconnect the battery.

(d) Blow air into pipe E and check that air comes out of air filter.

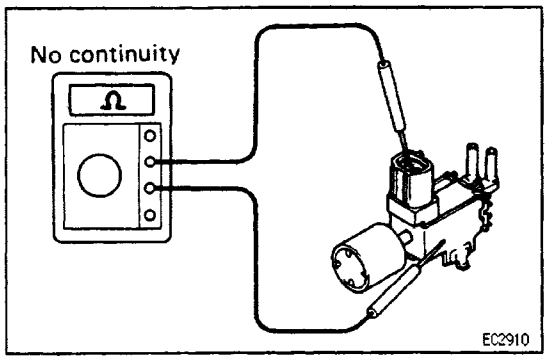
If a problem is found, replace the VSV.



2. CHECK FOR SHORT CIRCUIT

Using an ohmmeter, check that there is no continuity between the terminals and the VSV body.

If there is continuity, replace the VSV.

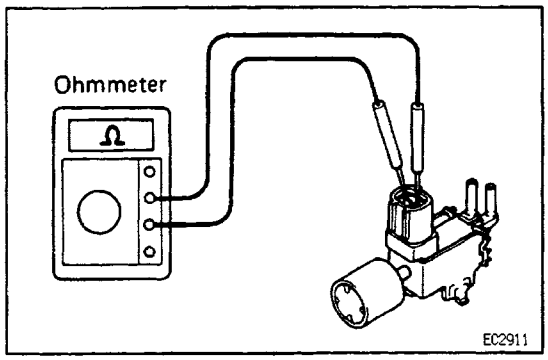


3. CHECK FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between the terminals.

Specified resistance: 30 – 50 at 20 •C (68 •F)

If the resistance is not within specification, replace the VSV.



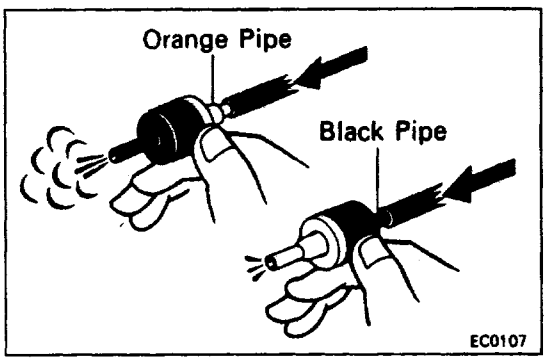
EG1FK–01

CHECK VALVE INSPECTION

CHECK VALVE BY BLOWING AIR INTO EACH PIPE

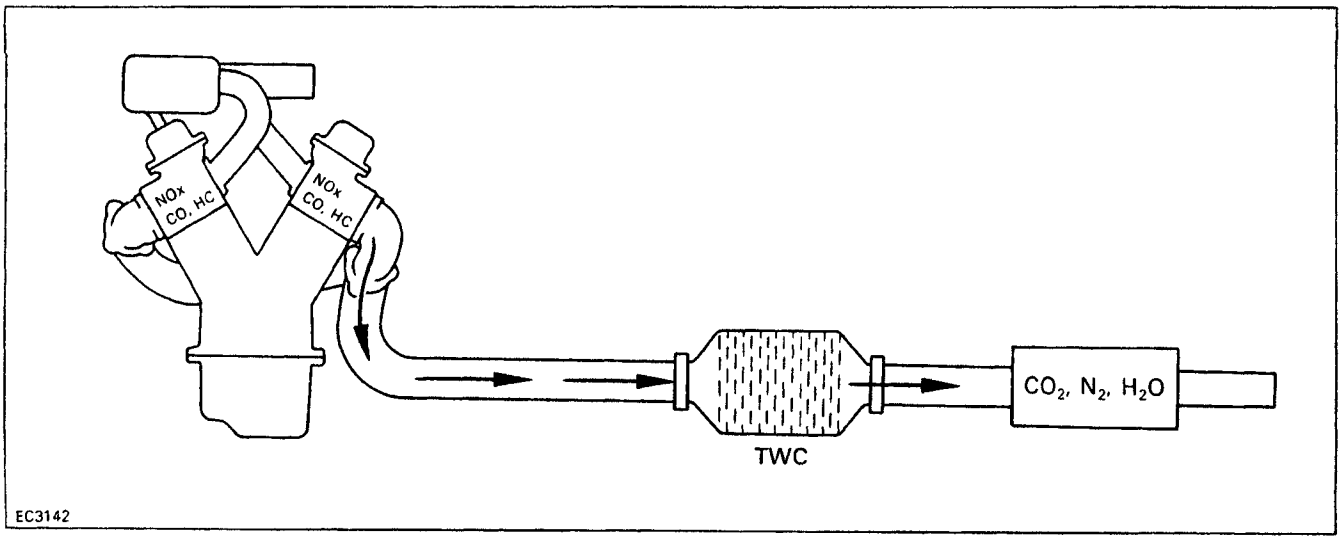
(a) Check that air flows from the orange pipe to the black pipe.

(b) Check that air does not flow fron the black pipe to the orange pipe.



THREE–WAY CATALYTIC CONVERTER (TWC) SYSTEM

EG214–01



To reduce HC, CO and NOx emissions, they are oxidized, reduced and converted to nitrogen (N_2), carbon dioxide (CO_2) and water (H_2) by the catalyst.

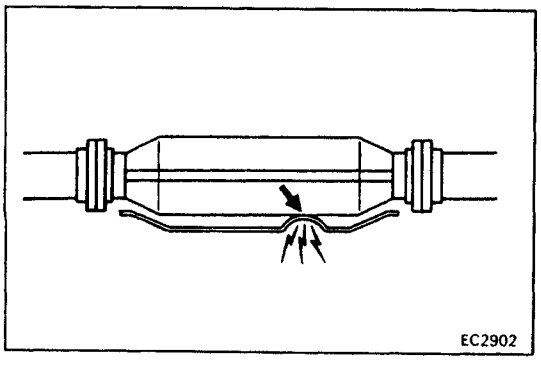
Exhaust Port		TW C		Exhaust Gas
HC, CO and NOx	→	Oxidation and reduction	→	CO_2 H_20 N_2

V01947

EXHAUST PIPE ASSEMBLY INSPECTION

1. CHECK CONNECTIONS FOR LOOSENESS OR DAMAGE

2. CHECK CLAMPS FOR WEAKNESS. CRACKS OR DAMAGE

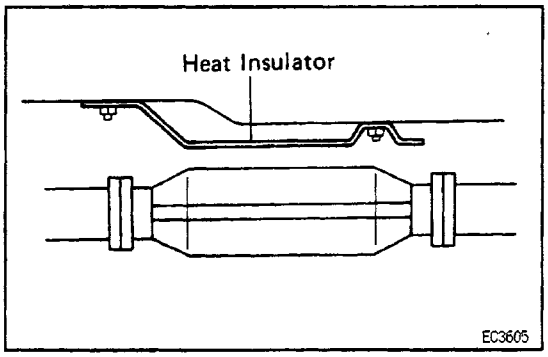


EG1F5–01

CATALYTIC CONVERTER INSPECTION

CHECK FOR DENTS OR DAMAGE

If any part of the protector is damaged or dented to the extent that it contacts the catalyst, repair or re–place it.

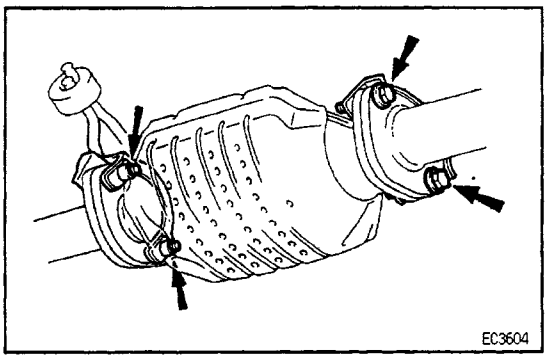


EG1FP–01

HEAT INSULATOR INSPECTION

1. CHECK HEAT INSULATOR FOR DAMAGE

2. CHECK FOR ADEQUATE CLEARANCE BETWEEN CATALYTIC CONVERTER AND HEAT INSULATOR



CATALYTIC CONVERTER REPLACEMENT

1. REMOVE CONVERTER

(a) Jack up the vehicle.

(b) Check that the converter is cool.

(c) Remove the bolts at the front and rear of the converter.

(d) Remove the converter and gasket.

2. INSTALL CONVERTER

(a) Place new gaskets on the converter front and rear pipes, and connect the converter to the exhaust pipes.

(b) Torque the bolts.

Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)

(c) Reinstall the bracket bolts and tighten them.

SERVICE SPECIFICATIONS

SERVICE DATA

EG213–01

VSV for EG R	Resistance (at 20°C (68°F))	30 – 50 Ω
VSV for PAIR	Resistance (at 20°C (68°F))	30 – 50 Ω

TORQUE SPECIFICATIONS

EG1FR–01

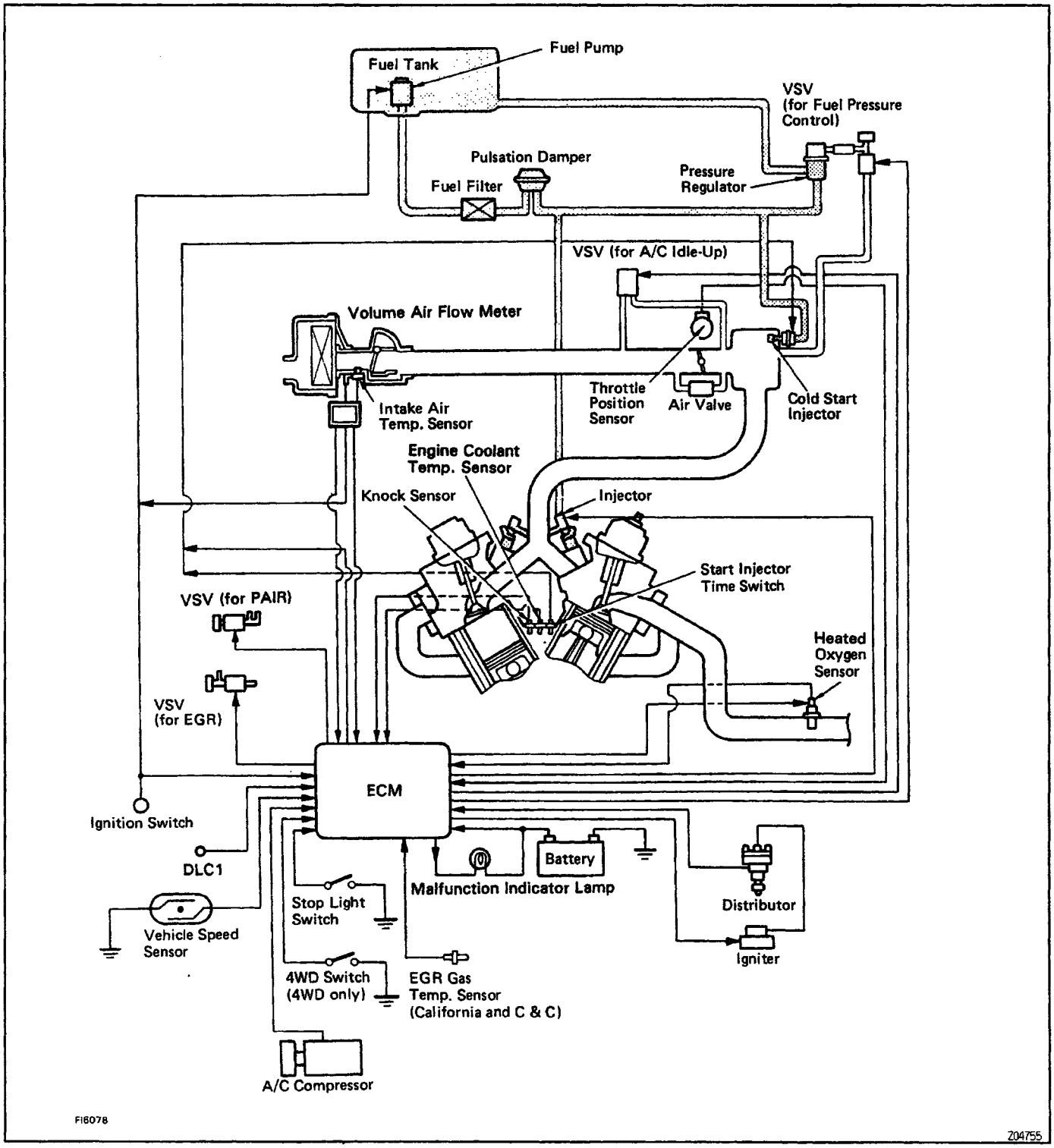
Part tightened	N·m	kgf·cm	ft·lbf
EGR valve x Air intake chamber	18	185	13
TWC x Exhaust pipe	39	400	29

MFI SYSTEM

DESCRIPTION

SYSTEM CIRCUIT

EG1F8–02



FUEL SYSTEM

An electric fuel pump supplies sufficient fuel, under a constant pressure, to the MFI injectors.
In accordance with signals from the ECM, these injectors inject the most appropriate quantity of fuel for the engine condition into the intake manifold. EG1FU–01

AIR INDUCTION SYSTEM

The air induction system provides just the right amount of air for the engine operating condition.

EG1FV–01

ELECTRONIC CONTROL SYSTEM

The 3VZ–E engine is equipped with a Toyota Computer Controlled System (TCCS) which centrally controls the MFI, ESA, Diagnosis systems, etc. by means of an Engine Control Module (ECM, formerly the MFI computer) employing a microcomputer. By means of the ECM, the TCCS controls the following functions.: EG1FW–02

1. Multiport Fuel Injection (MFI)

The ECM receives signals from various sensors indicating changing engine operating conditions such as:
Intake air volume
Intake air temperature
Engine coolant temperature
Engine speed
Acceleration/deceleration
Exhaust oxygen content etc.
These signals are utilized by the ECM to determine the injection duration necessary for an optimum air–fuel ratio.

2. Electronic Spark Advance (ESA)

The ECM is programmed with data for optimum ignition timing under all operating conditions. Using data provided by sensors which monitor various engine functions (RPM, intake air volume, engine coolant temperature, etc.), the microcomputer (ECM) triggers the spark at precisely the right instant.

3. Diagnosis Function .

When the ECM detects malfunction or abnormalities in the sensor network, it lights the mal–function indicator lamp in the combination meter. At the same time, the trouble is identified and a diagnostic trouble code is recorded by the ECM. The diagnostic trouble code can be read by the number of blinks of the malfunction indicator lamp when terminals TE1 and E1 are connected. The diagnostic trouble codes are explained on pages EG2–17S and 177.

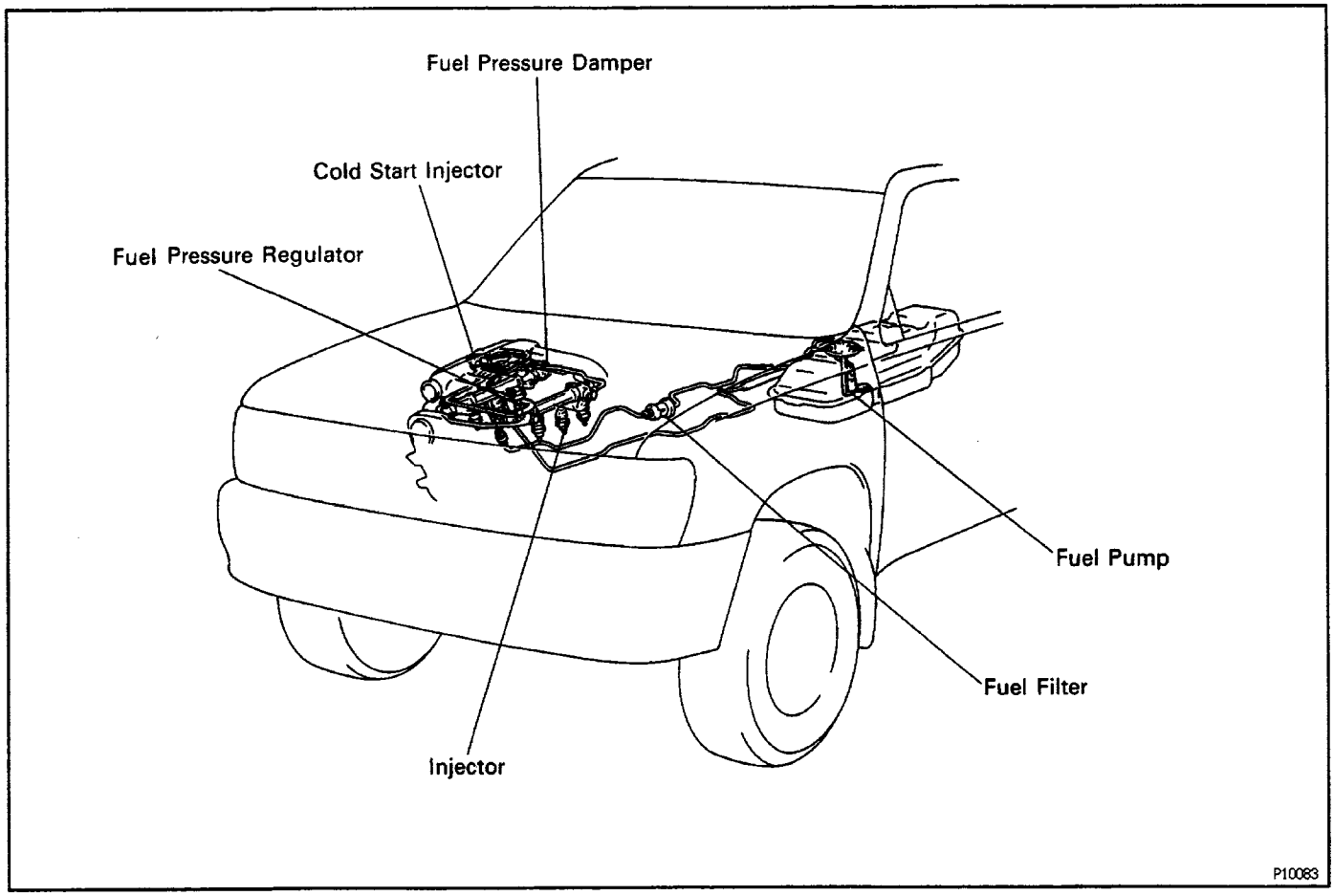
Fail–Safe Function

In the event of a sensor malfunction, a backup circuit will take over to provide minimal driveability, and the malfunction indicator lamp will light up.

OPERATION

EG1FX–02

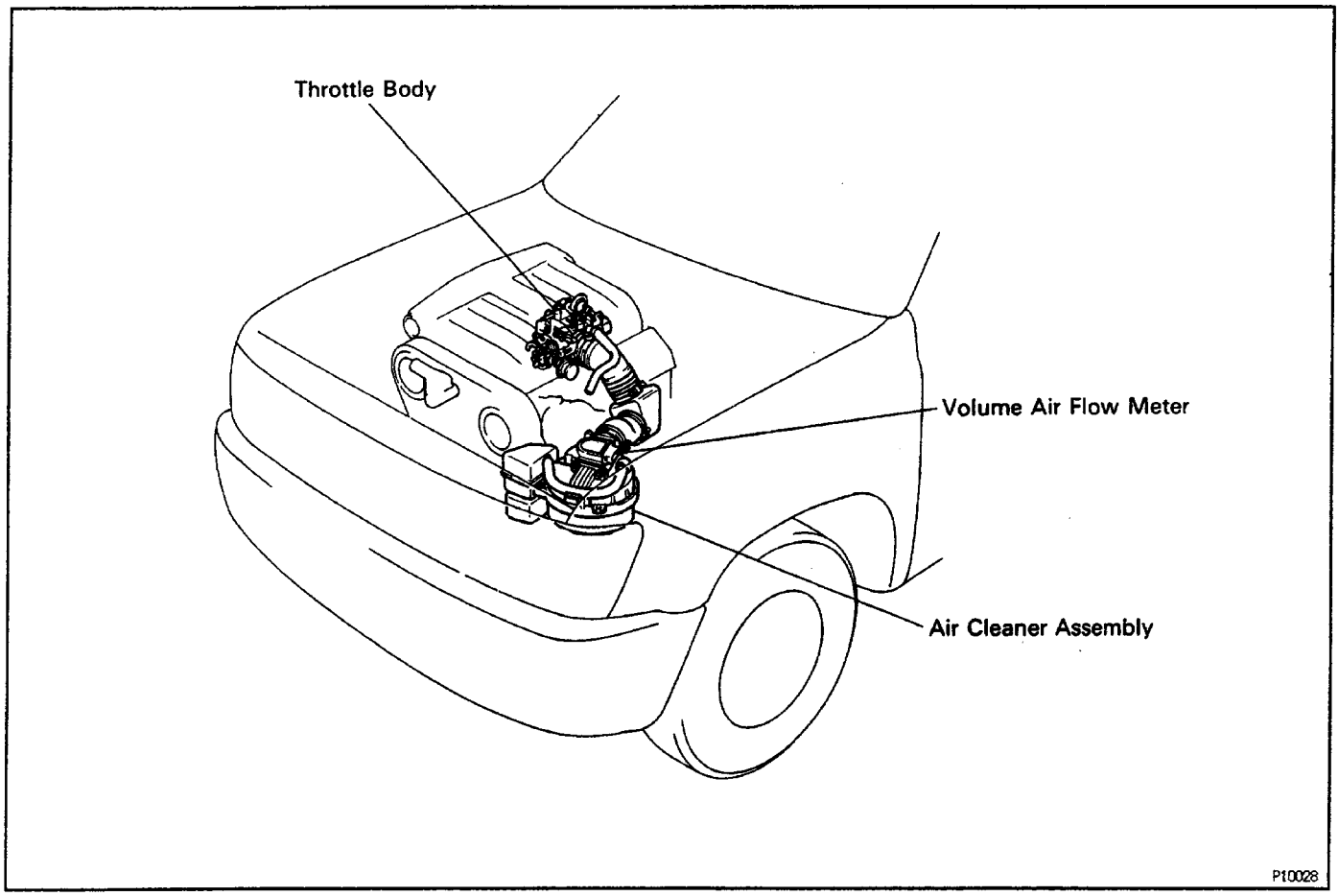
FUEL SYSTEM



Fuel is pumped. up by the fuel pump, flows through the fuel filter and is distributed to each injector and cold start injector at a set pressure maintained by the fuel pressure regulator.
The fuel pressure regulator adjusts the pressure of the fuel from the fuel line (high pressure side) to a pressure 284 kPa (2.9 kgf/crn2, 41 psi) higher than the pressure inside the intake manifold, and excess fuel is returned to the fuel tank through the return pipe. When the engine is hot, the fuel pressure is increased to control percolation in the fuel system and improve restartability and idling stability.
The pulsation damper absorbs the slight fluctuations in fuel pressure caused by fuel injector from the injector.
The injectors operate on input of injection signals from the ECM and inject fuel into the intake manifold.
When starting, the cold start injector operates when engine coolant temperature is less than 70• C, injecting fuel into the air intake chamber to improve startability.

EG1FY–02

AIR INDUCTION SYSTEM



Air filtered through the air cleaner passes through the volume air flow meter and the amount flowing to the air intake chamber is determined according to the throttle valve opening in the throttle body and the engine speed.

The volume air flow meter measures the intake air flow by the opening of the measuring plate in response to the volume of intake air to the engine.

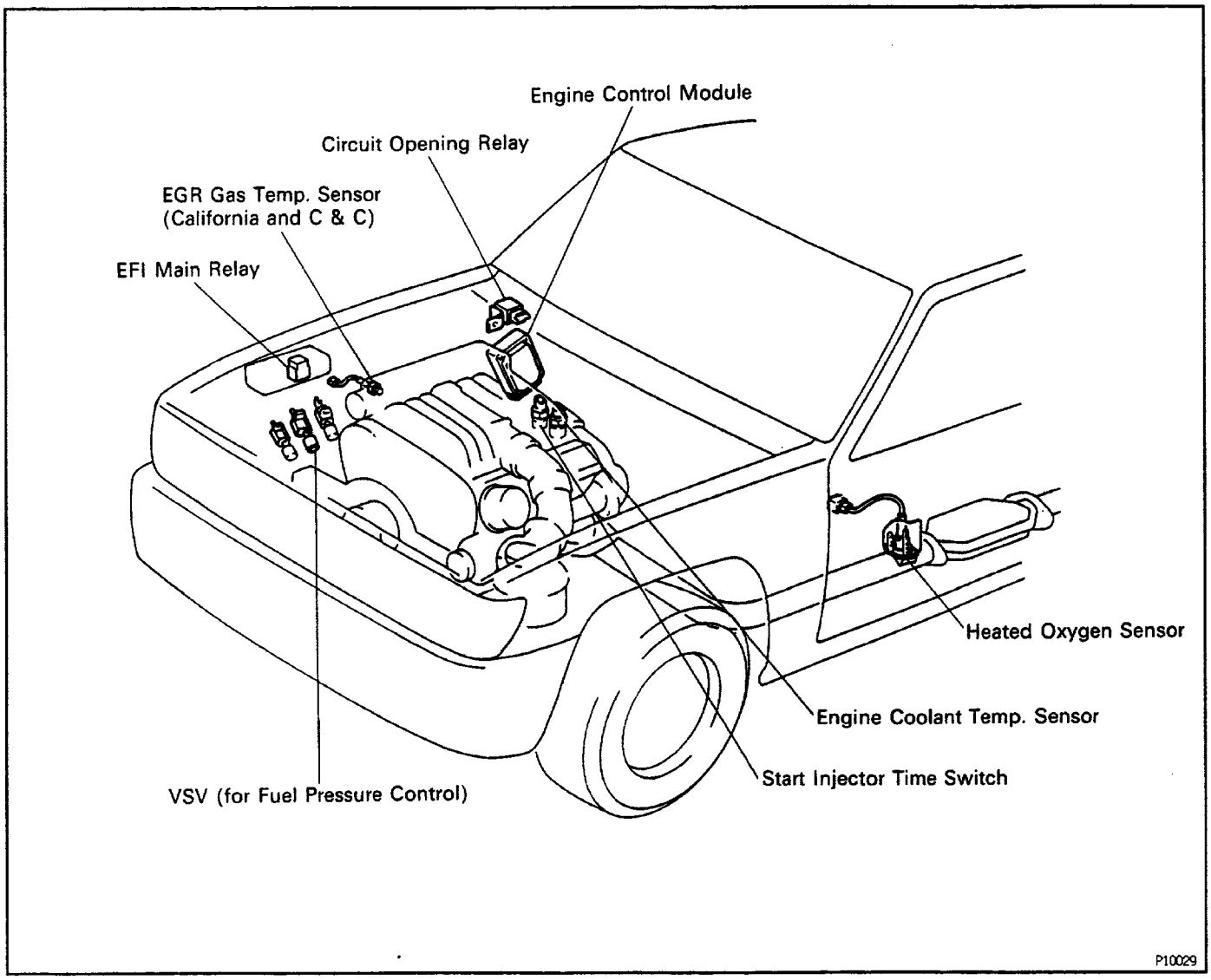
Located in the throttle body is the throttle valve, which regulates the volume of intake air to the engine. Intake air controlled by the throttle valve opening is distributed from the air intake chamber to the manifold of each cylinder and is drawn into the combustion chamber.

At low temperatures the air valve opens and the air flows through the air valve and the throttle body, into the air intake chamber. During engine warning up, even if the throttle valve is completely closed, air flows to the air intake chamber, thereby increasing the idle speed (first idle operation).

The air intake chamber prevents pulsation of the intake air, reduces the influence on the volume air flow meter and increases the accuracy of the measurement of the intake air volume. It also prevents intake air interference in each cylinder.

EG1FZ–02

ELECTRONIC CONTROL SYSTEM

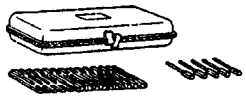
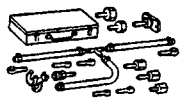
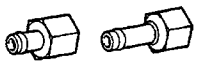
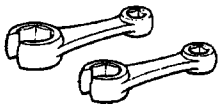


The control system consists of sensors which detect various engine conditions, and an ECM which determines the injection volume (timing) based on the signals from the sensors.
The various sensors detect the intake air volume, engine speed, oxygen density in the exhaust gas, engine coolant temperature, intake air temperature and atmospheric pressure etc. and convert the information into an electrical signal which is sent to the ECM. Based on these signals, the ECM calculates the optimum ignition timing for the current conditions and operates the injectors.
The ECM not only controls the fuel injection timing, but also the self diagnostic function which records the occurrence of a malfunction, ignition timing control, idle speed control, fuel pressure control and fuel pump control.

PREPARATION

EG1G0–02

SST (SPECIAL SERVICE TOOLS)

	09240–00020 Wire Gauge set	Throttle body
	09268–41045 Injection Measuring Tool Set	
	(09268–52010) Injection Measuring Attachment	
	09268–45012 EFi Fuel Pressure Gauge	
	09631 –22020 Power Steering Hose Nut 14 x 17 mm Wrench Set	Fuel line flare nut
	09842–30050 Wire 'A' EFI Inspection	
	09842–30070 Wiring "F" EFI Inspection	
	09843–18020 Diagnosis Check Wire	

EG1G1–01

RECOMMENDED TOOLS

	09082–00015 TOYOTA Electrical Tester	
	09200–00010 Engine Adjust Kit	
	09258–00030 Hose Plug Set	Plug for the vacuum hose, fuel hose etc.

EG1G2–02

EQUIPMENT

Graduated cylinder	Injector
Carburetor cleaner	Throttle body
Tachometer	
Soft brush	Throttle body

PRECAUTIONS

1. Before working on the fuel system, disconnect the negative terminal from the battery.

HINT: Any diagnostic trouble code retained by the computer will be erased when the battery terminal is removed.

Therefore, if necessary, read the diagnosis before removing the battery terminal.

2. Do not smoke or work near an open flame when working on the fuel system.

3. Keep gasoline away from rubber or leather parts.

EG1G4–03

MAINTENANCE PRECAUTIONS

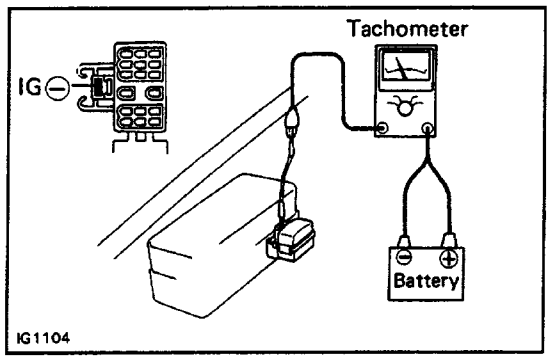
1. CHECK CORRECT ENGINE TUNE–UP

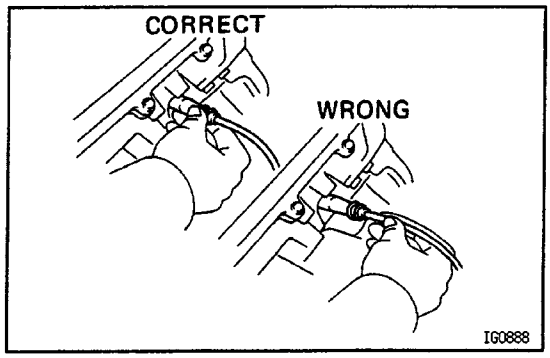
(See page EG2–12)

2. PRECAUTIONS WHEN CONNECTING GAUGE

(a) Connect the tachometer positive terminal to the IG E) terminal of the DLC1.

(b) Use the battery as the power source for the timing light, tachometer, etc.





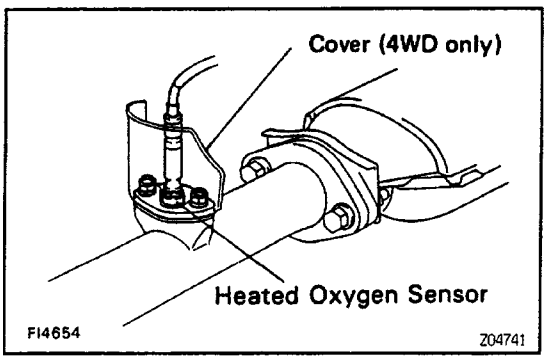
3. IN EVENT OF ENGINE MISFIRE, THE FOLLOWING PRECAUTIONS SHOULD BE TAKEN

(a) Check proper connection of battery terminals, etc.

(b) Handle high–tension cords carefully.

(c) After repair work, check that the ignition coil terminals and all other ignition system lines are reconnected securely.

(d) When clearing the engine compartment, be especially careful to protect the electrical system from water.



4. PRECAUTIONS WHEN HANDLING HEATED OXYGEN SENSOR

(a) Do not allow the heated oxygen sensor to drop or hit against an object.

(b) Do not allow the sensor come into contact with water.

IF VEHICLE IS EQUIPPED WITH MOBILE RADIO SYSTEM (HAM, CB, ETC)

The ECM has been designed so that it will not be affected by outside interference.
However, if your vehicle is equipped with a amateur radio transceiver, etc. (even one with approx. 10 W output), it may, at times, have an effect upon ECM operation, especially if the antenna and feeder are installed nearby.
Therefore, observe the following precautions:

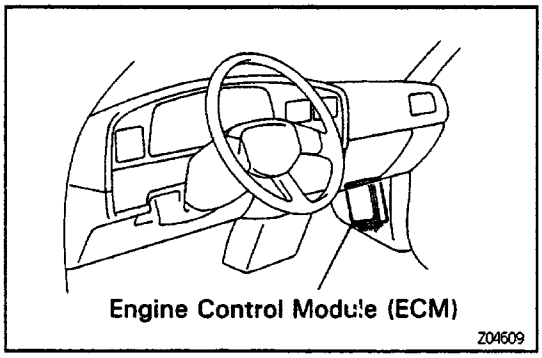
(a) Install the antenna as far away as possible from the ECM. The ECM is located in the right side kick panel so the antenna should be installed at the rear, left side of the vehicle.
If installing on the bumper, do so on the right side, if possible.

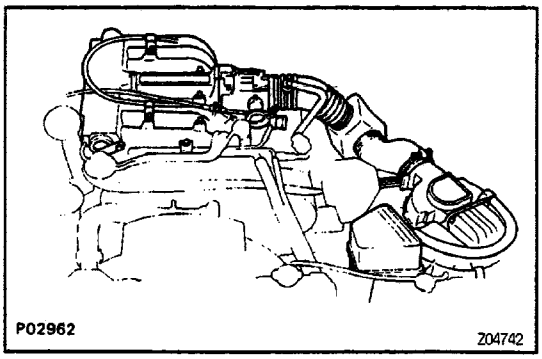
(b) Keep the antenna feeder as far away as possible from the ECM wires – at least 20 cm (7.87 in.) – and, especially, do not wind them together.

(c) Check that the feeder and antenna are properly adj–usted.

(d) Do not equip your vehicle with a powerful mobile radio system.

(e) Do not open the cover or the case of the ECM unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)

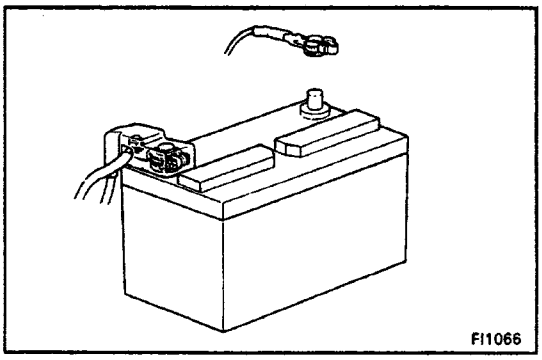

Engine Control Module (ECM)
Z04609


P02962
Z04742

AIR INDUCTION SYSTEM

EG1G6–03

1. Separation of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause the engine to run out of tune.
2. Disconnection, looseness or cracks in the parts of the air induction system between the volume air flow meter and cylinder head will cause air suction and cause bad engine tuning.

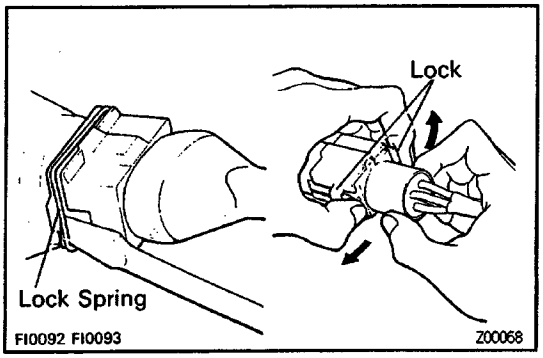

FI1066

ELECTRONIC CONTROL SYSTEM

EG1G7–03

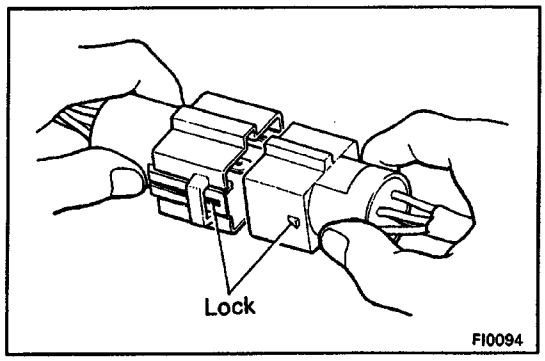
1. Before removing MFI wiring connectors, terminals, etc., first disconnect the power by either turning the ignition switch OFF or disconnecting the battery ter–minals.
2. When installing a battery, be especially careful not to incorrectly connect the positive and negative cables.

3. Do not permit parts to receive a severe impact during removal or installation. Handle all MFI parts carefully, especially the ECM.
4. Take great care during troubleshooting as there are numerous transistor circuits and even slight terminal contact can cause further troubles.
5. Do not open the ECM cover.
6. When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the MFI parts and wiring connectors.
7. Parts should be replaced as an assembly.

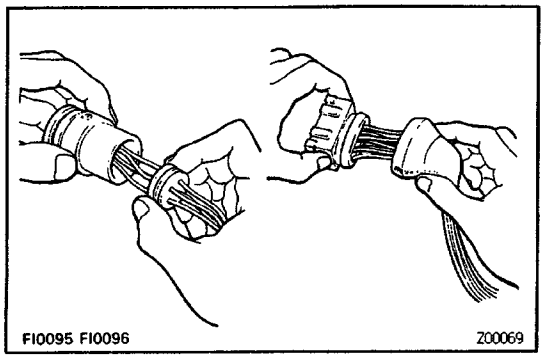


8. Care is required when pulling out the inserting wiring connectors.

(a) To pull the connector out, release the lock and pull on the connector.

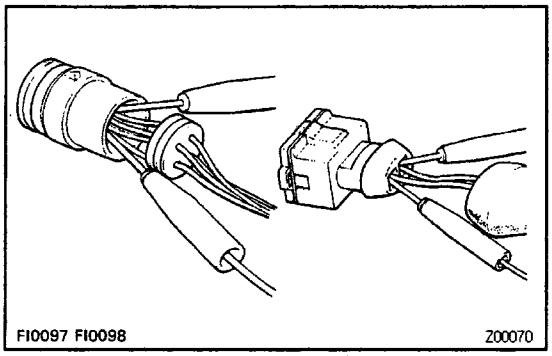


(b) Fully insert the connector and check that it is locked:

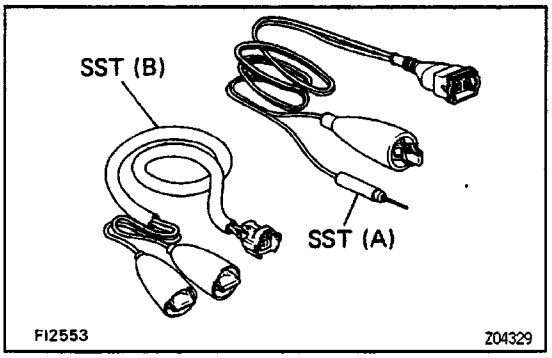


9. When inspecting a connector with a volt/ohmmeter.

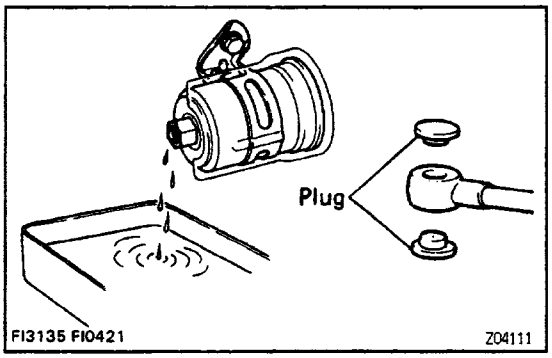
(a) Carefully take out the water–proofing rubber if it is a water–proof type connector.



(b) Insert the tester probe into the connector from the wiring side when checking the continuity, amperage or voltage.
(c) Do not apply unnecessary force to the terminal.
(d) After the check, securely install the water–proofing rubber on the connector.



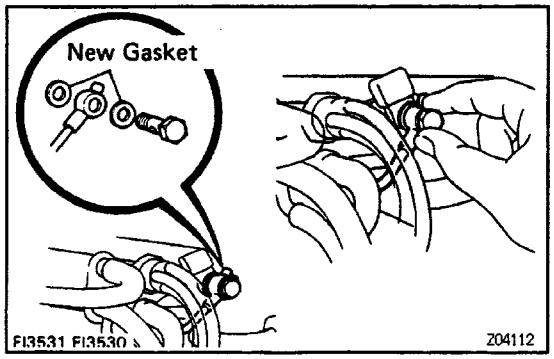
10. Use SST for inspection or testing of the injector, cold start injector or their wiring connectors.
SST 09842–30050 (A)
09842–30070 (B)

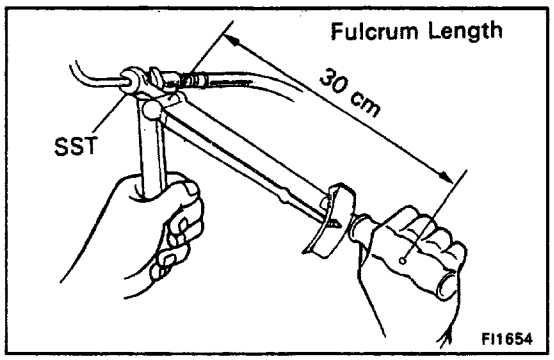


EG1TA–02

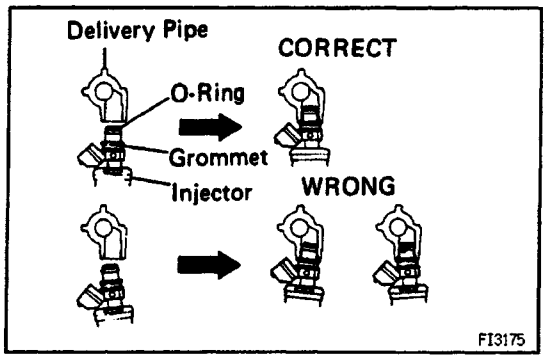
FUEL SYSTEM

1. When disconnecting the connection of the high fuel pressure line, a large amount of gasoline may come out so observe the following procedure:
(a) Put a container under the connection.
(b) Slowly loosen the connection.
(c) Disconnect the connection.
(d) Plug the connection with a rubber plug.
2. When connecting the flare nut or union bolt on the high pressure pipe union, observe the following pro–cedure:
(Union bolt type)
(a) Always use a new gasket.
(b) Tighten the union bolt by hand.
(c) Tighten the union bolt to the specified torque.
Torque: 15 N–m(150 kgf–cm, 11 ft–lbf)

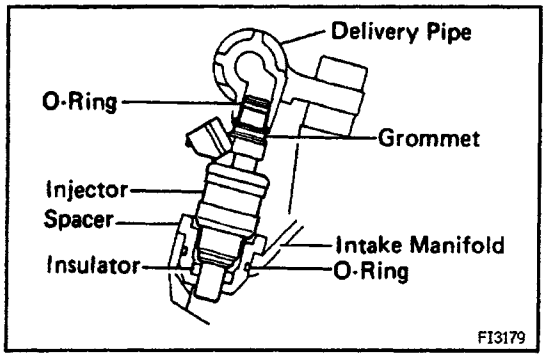




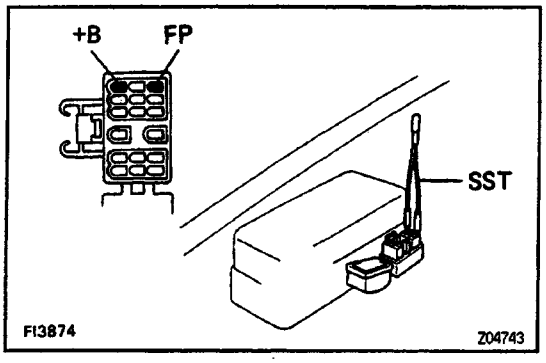
(Flare nut type)
(a) Apply a light coat of engine oil to the flare and tighten the flare nut by hand.
(b) Then using SST, tighten the flare nut to the specified torque.
SST 09631– 22020
Torque: 27 N–m (280 kgf–cm, 20 ft–lbf)
HINT: Use a torque wrench with a fulcrum length of 30 cm (11.81 in.)



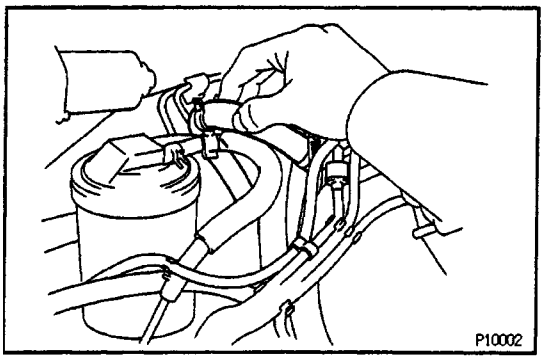
3. Observe the following precautions when removing and installing the injectors.
(a) Never reuse the O–ring.
(b) When placing a new O–ring on the injector, take care not to damage it in any way.
(c) Lubricate the new 0–ring with spindle oil or gasoline before installing – never use engine, gear or brake oil.



4. Install the injector to the delivery pipe and intake manifold as shown in the illustration.



5. Confirm that there are no fuel leaks after performing any maintenance on the fuel system
(a) With engine stopped, turn the ignition switch ON.
(b) Using SST, connect terminals FP and +B of the DLC 1.
SST 09843–18020



(c) When the fuel return hose is pinched, the pressure within the high pressure line will rise to approx. 392 kPa (4 kgf/cm2, 57 psi). In this state, check to see that there are no leaks from any part of the fuel system.
NOTICE: Always pinch the hose. Avoid bending the hose as it may cause the hose to crack.

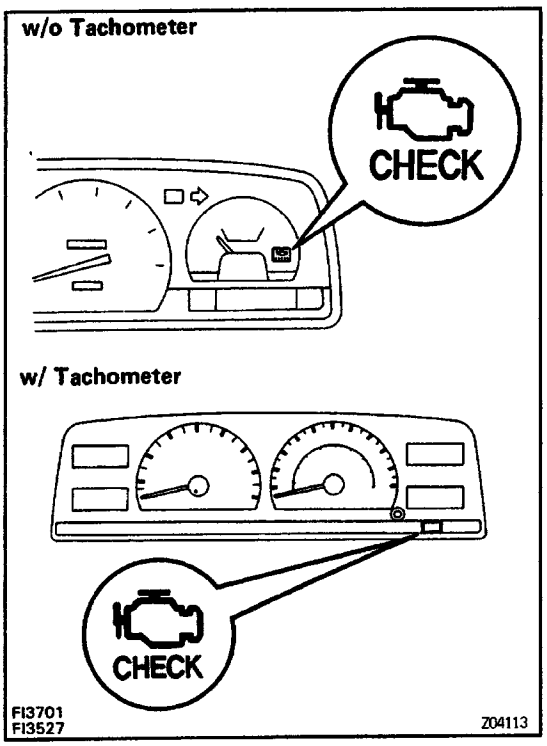
(d) Turn the ignition switch OFF.
(e) Remove SST
SST 09843–18020

DIAGNOSIS SYSTEM

EG1G9–03

DESCRIPTION

The ECM contains a built–in self diagnosis system by which troubles with the engine signal network are detected and a malfunction indicator lamp on the combination meter lights up.
By analyzing various signals as shown in the later table (See pages EG2–176 and 177) the ECM detects system malfunctions relating to the sensors of actuator.The self–diagnosis system has two modes, a normal mode and a test mode.
If a malfunction is detected when in the normal mode, the ECM lights up the malfunction indicator lamp to inform the driver of the occurrence of a malfunction. (For some codes the light does not come on.) The light goes off automatically when the malfunction has been repaired. But the diagnostic trouble code(s) remains stored in the ECM memory (except for code Nos. 43, 51 and 53). The ECM stores the code(s) until it is cleared by removing the EFI fuse with the ignition switch off.
The diagnostic trouble code(s) can be read by the number of blinks of the malfunction indicator lamp when TE1 and E1 terminals on the DLC1 are connected. When 2 or more codes are indicated, the lowest number (code) will appear first.
If a malfunction is detected when in the test mode, the ECM lights up the malfunction indicator lamp to inform the technician of the occurrence of a malfunction (except for code Nos. 42, 43 and 51). In this case, TE2 and E1 terminals on the DLC1 should be connected as shown later. (See page EG2–173)
In the test mode, even if the malfunction is corrected, the malfunction code is stored in the ECM memory even when the ignition switch is off (except code Nos. 42, 43, 51 and 53). This also applies in the normal mode. The diagnostic mode (normal or test) and the output of the malfunction indicator lamp can be selected by connecting the TE 1, TE2 and E 1 terminals on the DLC1, as shown later.
A test mode function has been added to the functions of the self –diagnosis system of the normal mode for the purpose of detecting malfunctions such as poor contacts, which are difficult to detect in the normal mode. This function fills up the self diagnosis system. The test mode can be implemented if technicians follow the procedure described later.
(See page EG2–173).



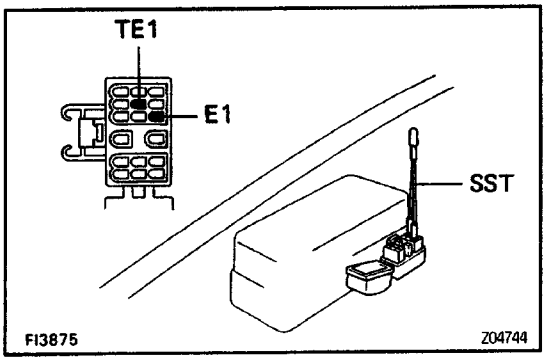
MALFUNCTION INDICATOR LAMP CHECK

1. The malfunction indicator lamp will come on when the ignition switch is placed at ON and the engine is not running.
2. When the engine is started, the malfunction indicator lamp should go off.
   If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.

DIAGNOSTIC TROUBLE CODES OUTPUT (Normal mode)

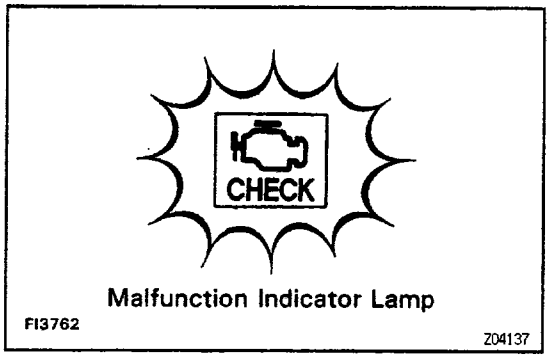
To obtain an output of diagnostic trouble codes, proceed as follows:

1. Initial conditions
(a) Battery voltage above 11 volts or more.
(b) Throttle valve fully closed (throttle position sensor IDL points closed).
(c) Transmission in neutral position.
(d) Accessories switched OFF.
(e) Engine at normal operating temperature.
2. Turn the ignition switch ON. Do not start the engine.

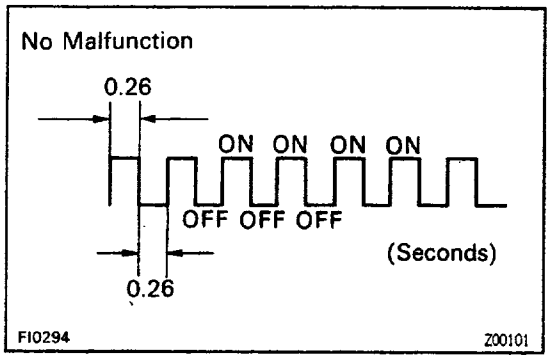


3. Using SST, connect terminals TE1 and E1 of the DLC 1.
   SST 09843–18020

HINT: The DLC1 is located near the No.2 relay block.

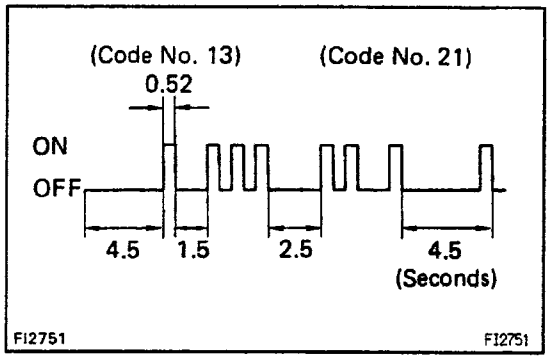


4. Read the diagnostic trouble code as indicated by the number of flashes of the malfunction indicator lamp. Diagnostic trouble code (See pages EG2–176 and 177)



(a) Normal System Operation (no malfunction)

- The light will alternately blink ON and OFF at 0.26 seconds intervals.



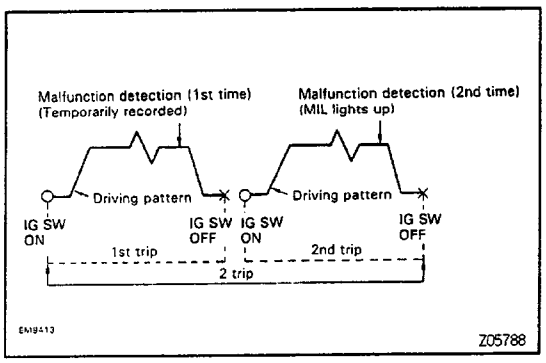
(b) Malfunction Code Indication

- The light will blink a number of times equal to the malfunction code with pauses as follows:

1. Between the first digit and second digit, 1.5 seconds.
2. Between code and code 2.5 seconds.
3. Between all malfunction codes 4.5 seconds.

The diagnostic trouble code series will be repeated as long as the DLC1 terminals TE1 and E1 are connected.

HINT: In the event of a number of trouble codes, indication will begin from the smallest value and continue to the largest in order.



(c) (2 trip detection logic)

The diagnostic trouble codes 21, 25, 26 and 71 are used ”2 trip detection logic” is used. With this logic, when a logic malfunction is first detected, the mal–function is temporarily stored in the ECM memory. If the same case is detected again during the second drive test, this second detection causes the malfunc–tion indicator lamp to light up.

The 2 trip repeats the same mode a 2nd time. (However, the IG SW must be turned OFF between the 1 st time and 2nd time).

5. After the diagnosis check, remove SST.

SST 09843–18020

(Test mode)

HINT:

- Compared to the normal mode, the test mode has high sensing ability to detect malfunctions.
- It can also detect malfunctions in the starter signal circuit, air conditioning signal and park/ neutral position switch signal.
- Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in test mode.

To obtain an output of diagnostic trouble codes, proceed as follows:

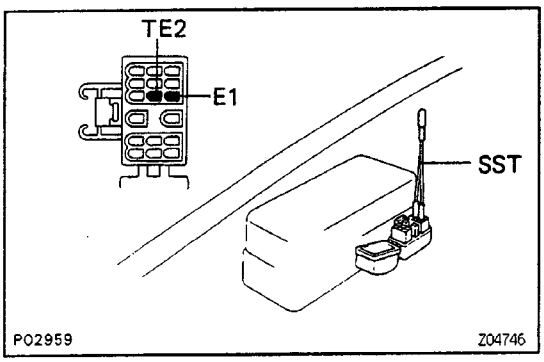
1. Initial conditions

(a) Battery voltage 11 volts or more

(b) Transmission in neutral position

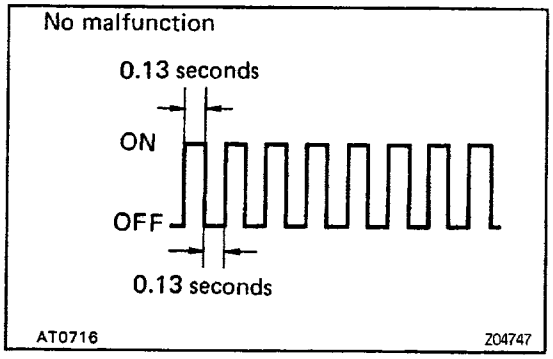
(c) Accessories switched OFF

(d) Engine at normal operating temperature



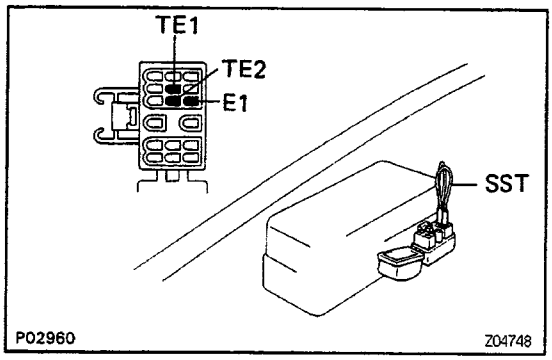
2. First using SST, connect terminals TE2 and El of the DLC1, then turn the ignition switch on to begin the diagnosis in the test mode. :

SST 09843 –18020



HINT: To confirm that the test mode is operating, check that the malfunction indicator lamp flashes when the ignition switch is turned ON.

3. Start the engine and drive the vehicle at a speed of 10 km/h or higher.
4. Simulate the conditions of the malfunction described by the customer.

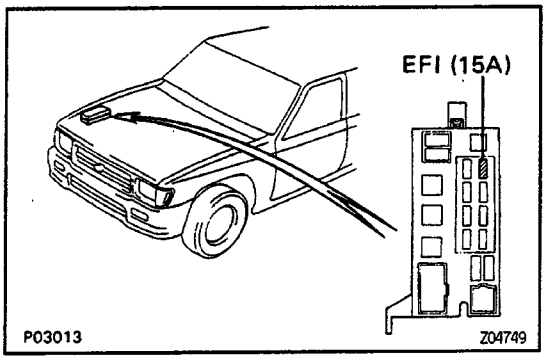


5. Connect terminals TE1 and E1 of the DLC1.
   SST 09843–18020

6. Read the diagnostic trouble code as indicated by the number of flashes of the malfunction indicator lamp. (See pages EG2–176 and 177)
7. After the diagnosis check, remove SST.
   SST 09843–18020

HINT:

- The test mode will not start if terminals TE2 and Ell are connected after the ignition switch is turned on.
- The starter signal and vehicle speed signal will be diagnosed by the ECM as malfunctions, and code Nos. 42 and 43 will be output, if the operation in step 3 is not performed.
- When the automatic transmission shift lever is in the ”D”, ”2”, ”L” or ”R” shift position, or when the air conditioning is on or when the accelerator pedal is depressed, code ”51 ” (Switch condition signal) is output, but this is not abnormal.



EG1GC–03

DIAGNOSTIC TROUBLE CODE CANCELLATION

1. After repairing the trouble, the diagnostic trouble code retained in memory by the ECM must be can–celed out by removing the EFI fuse (15A) for 30 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch off.

HINT:

- Cancellation can also be done by removing the battery negative (–) terminal, but in this case other memory systems (radio ETR, clock etc.) will also be canceled out.
- If the diagnostic trouble code is not canceled out, it will be retained by the ECM and appear along with a new code in the event of future trouble.
- If it is necessary to work on engine components requiring removal of the battery terminal, a check must first be made to see if a diagnostic trouble code has been recorded.

2. After cancellation, perform road test of the vehicle to check that a normal code is now read on the mal–function indicator lamp.
If the same diagnostic trouble code appears, it indi–cates that the trouble area has not been repaired thoroughly.

EG1GD–03

DIAGNOSIS INDICATION

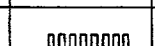
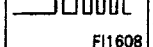
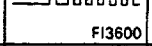
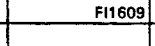
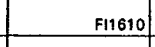
1. When 2 or more codes are indicated, the lowest number (code) will appear first.
2. All detected diagnostic trouble codes, except for code No.51 and No.53 will be retained in memory by the ECM from the time of detection until canceled out.
3. Once the malfunction is cleared, the malfunction in–dicator lamp on the combination meter will go oft but the diagnostic trouble code(s) remain stored in ECM memory (except for code Nos.16, 43. 51 and 53).

DIAGNOSTIC TROUBLE CODES

EG1TC–01

HINT:

- If a malfunction is detected during the diagnostic trouble code check, refer to the circuit indicated in the table, and turn to the corresponding page.
- Your readings may vary from the parameters listed in the table, depending on the instruments used.

Code No.	Number of blinks Malfunction Indicator Lamp	System	*1 Mal–function Indicator Lamp		Diagnosis	Trouble Area	*2 Memory	See Page
			Normal Mode	Test Mode				
–	 FI1401	Normal	–	–	Output when no other code is recorded.		–	–
12	 FI1606	RPM Signal	ON	N.A.	No G or NE signal –is input to the ECM for 2 secs. or more after STA turns 4N.	• Open or short in NE, G circuit • Distributor • Open or short in STA circuit • ECM	○	EG2–193
13	 FI1607	RPM Signal	ON	ON	NE signal is not input to ECM for 0.1 sec. or more when engine speed is 1,000 rpm or more.	• Open or short in NE circuit • Distributor • ECM	○	IG–1 6
14	 FI1608	Ignition Signal	ON	N.A.	IGF signal from igniter is not input to ECM for 6 consecutive ignition.	• Open or short in IGF or IGT circuit from igniter to ECM • Igniter • ECM	○	EG2–195
16	 FI3600	A/T Control Signal	ON	N.A.	Normal signal is not output from ECM CPU.	• ECM	X	–
21	 FI1609	Heated Oxygen Sensor Signal	ON	N.A.	(1) Open or short in heater circuit of heated oxygen sensor for 0.5 sec. or more. (HT) (2) At normal driving speed (below 60 mph and engine speed is above 1,500 rpm), amplitude of heated oxygen sensor signal (OX) is reduced to between 0.35 – 0.70 V continuously for 60 secs. or more. *6 (2 trip detection logic) (2)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM	○	EG2–199
				*7 ON		• Open or short in heated oxygen sensor circuit • Heated oxygen sensor • ECM		
22	 FI1610	Engine Coolant Temp. Sensor Signal	ON	ON	Open or short in engine coolant temp. sensor circuit for 0.5 sec. or more. (THW)	• . Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM	○	EG2–192
24	 FI1611	Intake Air Temp. Sensor Signal	*3 ON	ON	Open or short in intake air temp. sensor circuit for 0.5 sec. or more. (THA)	• Open or short in intake air temp. circuit . Intake air temp. sensor • ECM	○	EG2–190
25	 FI2562	Air–Fuel Ratio Lean Mal–function	ON	ON	(1) Heated oxygen sensor output is less than 0.45 V for at least 90 sacs. when heated oxygen sensor is warmed up (racing at 2.000 rpm) and drive at 50 – 100 km/h *4 (2) When the engine speed varies by more than15 rpm over the preceding crankshaft position period during a period of 50 seconds during idling with the engine coolant temp. 75•C (167°F) or more. *6 (2 trip detection logic) (1) and (2)	• Engine ground bolt loose • Open in E1 circuit • Open in injector circuit • Fuel line pressure (Injector blockage, etc.) • Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Ignition system • Engine coolant temp. sensor • Volume air flow meter (Air intake) • ECM	○	EG2–197 EG2–199
26	 FI2563	Air– Fuel Ratio Rich Mal–function	ON	ON		• Engine ground bolt loose • Open in E1 circuit • Short in injector circuit • Fuel line pressure (Injector . leakage, etc.) • Open or short in cold start injector circuit • Cold start injector • Open or short in heated oxygen sensor circuit • Heated oxygen sensor • Engine coolant temp. sensor • Volume air flow meter • Compression pressure • ECM	○	

V02183

DIAGNOSTIC TROUBLE CODES (Cont'd)

Code No.	Number of blinks Malfunction Indicator Lamp	System	*1 Malfunction Indicator Lamp		Diagnosis	Trouble Area	*2 Memory	See Page
			Normal Mode	Test Mode				
31	FI1612	Volume Air Flow Meter Signal	ON	ON	At idling, open or short detected continuously for 0.5 sec. or more in volume air flow meter circuit. • Open – VC • Short – VC – E2	• open or short in volume air flow meter circuit • Volume air flow meter • ECM	O	EG2–190
32	FI1613	Volume Air Flow Meter Signal	ON	ON	Open or short detected continuously for 0.5 sec: or more in volume air flow meter circuit. • Open – E2 • short – VS – VC		O	EG2–190
35	FI3048	6ARO Sensor Signal (only C&C)	ON	ON	Open or short detected in BARO sensor circuit for 0.5 sec. or more.	• ECM	O	–
41	FI1614	Throttle Position Sensor Signal	*3 ON	ON	Open or short detected in throttle position sensor signal (VTA) for 0.5 sec. or more. IDL contact is ON and VTA output exceeds 1.45 V	• Open or short in throttle positionsensor circuit • Throttle position sensor • ECM	O	EG2–188
42	FI1615	Vehicle Speed Sensor Signal	ON	OFF	SPD signal is not input to the ECM for at least 8 seconds during high load driving with engine speed between 2,750 rpm and 4,000 rpm.	• Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM	O	–
43	FI1616	Starter Signal	N.A.	OFF	Starter signal (STA) is not input to ECM even once until engine reaches 800 rpm or more when cranking.	• Open or short in starter signal circuit • Open or short in IG SW or main relay circuit • ECM	X	EG2–193
52	FI1618	Knock Sensor Signal	ON	N.A.	With engine speed between 1,600 rpm – 5,200 rpm, signal from knock sensor is not input to ECM for 6 revolution. (KNK)	• Open or short in knock sensor circuit • Knock sensor (looseness, etc.) • ECM	O	–
53	FI1619	Knock Control signal	ON	N.A.	Engine speed is between 650 rpm and 5,200 rpm and engine control module (for knock control) malfunction is detected.	• ECM	X	–
*5 71	FI2622	EGR System Mal–function	ON	ON	With the engine coolant temp. at 60•C (140•F) or more, 240 seconds from start of EGR operation. The EGR gas temp. is less than 55•C (131•F) and the EGR gas temp. has risen less than 20•C (36•C) during the 240 seconds. *6 (2 trip detection logic)	• Open in EGR gas temp. sensor circuit • Open in VSV circuit for EG R • EGR vacuum hose disconnected, valve stuck • Clogged in EGR gas passage • ECM	O	EG2–251
51	FI1617	Switch Condition Signal	N.A.	OFF	Displayed when A/C is ON, IDL contact OFF or shift position in "R", "D", "2", or "L" positions with the DLC1 terminals E1 and TE1 connected.	• A/C switch circuit • Throttle position sensor 1 D L circuit • Park/Neutral position switch circuit • Accelerator pedal, cable • ECM	X	EG2–188

REMARKS
*1: "ON' displayed in the diagnosis mode column indicates that the malfunction indicator lamp is lighted up when a malfunction is detected. "OFF" indicates that
the "CHECK" does not light up during malfunction diagnosis, even if a malfunction is detected. "N.A." indicates that the item is not included in malfunction
diagnosis.
*2: "O" in the memory column indicates that a diagnostic trouble code is recorded in the ECM memory when a malfunction occurs. "X" indicates that a diagnostic
trouble code is not recorded in the ECM memory even if a malfunction occurs. Accordingly, output of diagnostic results is performed with the IG SW ON.
*3: The malfunction indicator lamp comes on if malfunction occurs only for California specifications,
*4: No. (2) in the diagnostic contents of codes No.25 and 26 apply to California and C&C specification vehicles only, while (1) applies to all models.
*5: Code 71 is used only for California specifications and C&C.
*6: "2 trip detection logic" (See page EG2–173.)
*7: Except for California 2WD.

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

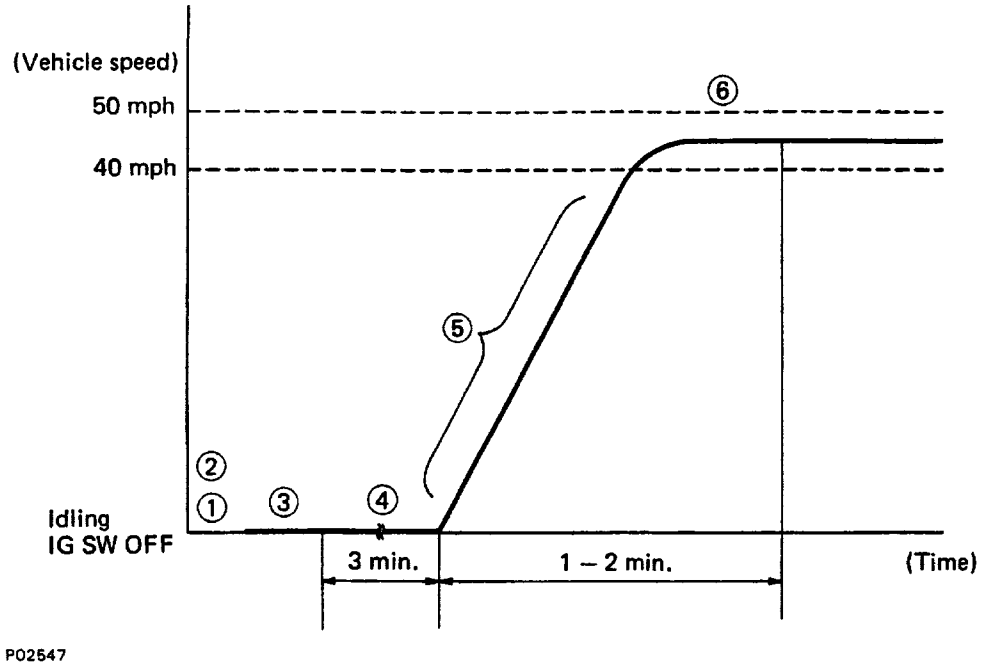
Purpose of the driving pattern.

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed confirming that diagnostic trouble code is no longer detected.

DTC 12 Heated Oxygen Sensor Circuit

Malfunction: Heated Oxygen Sensor Deterioration



(1) Disconnect the fuse EFI (1 5 A) for 10 sec. or more, with iG switch OFF.

(2) Initiate test mode (Connect terminal TE2 and E 1 of DLC 1) with IG switch OFF.

(3) Start the engine and warm the engine up with all ACC switch OFF. .

(4) After the engine is warmed up, let it idle for 3 min.

(5)Accelerate gradually and maintain at approximately 1, 500 rpm, or within the 1, 300 to 1,700 rpm range. Turn the A/C on, and drive in ”D” for AIT, or in case of M/T, upshift appropri– ately shift carefully so that the engine speed would not fall below 1,200 rpm. depress the accelerator pedal gradually and maintain a steady speed to avoid engine braking.

(6) Maintain the vehicle speed at 40 – 50 mph.

Keep the vehicle running for 1 – 2 min. after starting acceleration.

HINT: If a malfunction is detected the malfunction indication lamp will light up during step(6) .

NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

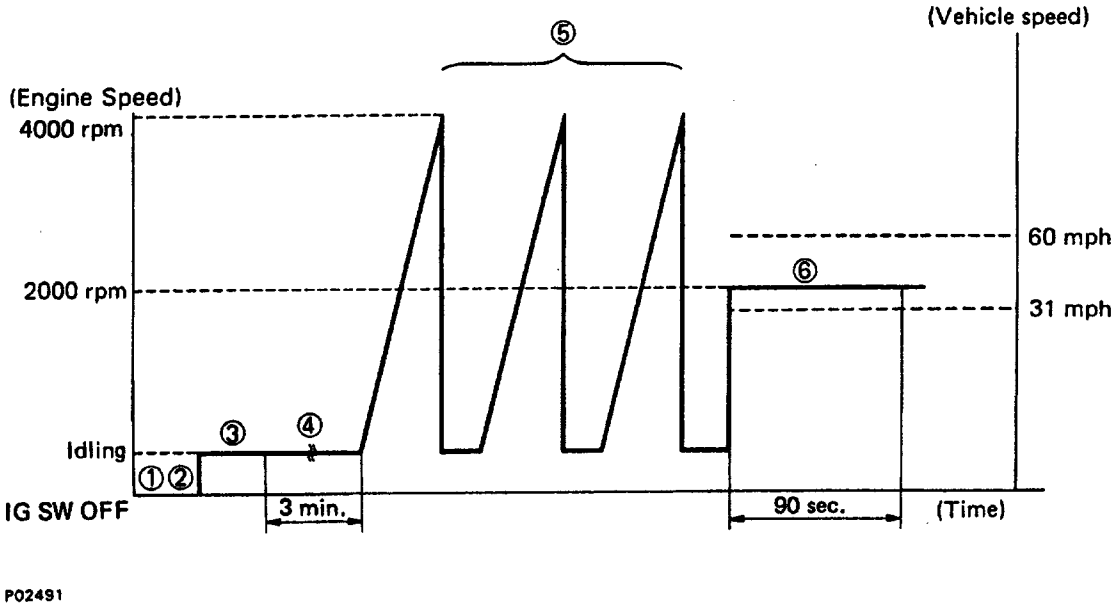
Purpose of the driving pattern.

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed confirming that diagnostic trouble code is no longer detected.

DTC	25	Air–Fuel Ratio Lean Malfunction
	26	Air–Fuel Ratio Lean Malfunction

Malfunction: Open or Short in Heated Oxygen Sensor.



(1) Disconnect the fuse EEI (1 5 A) for 10 sec. or more, with iG switch OFF.

(2) Initiate test mode (Connect terminal TE2 and E1 of DLC 1) with IG switch OFF.

(3) Start the engine and warm the engine up, with all ACC switch OFF.

(4) After the engine is warmed up, !et it idle for 3 min.

(5) After perform idling in @, perform sudden racing to 4,000 rpm three times.

(6) After perform sudden racing in @, perform driving at 31 – 60 mph (Engine speed 2,000 rpm) for 90 sec.

HINT: If a malfunction is detected the malfunction indication lamp will light up during step (6)

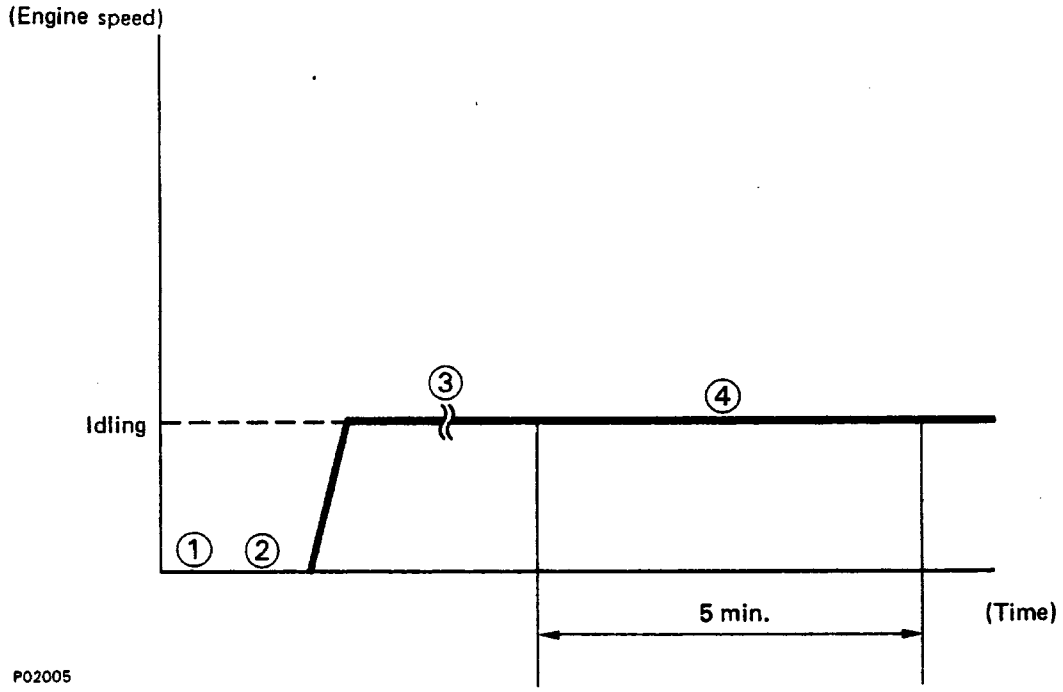
NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

Purpose of the driving pattern.
(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
(b) To check that the malfunction is corrected when the repair is completed confirming that diagnostic trouble code is no longer detected.

DTC	25	Air–Fuel Ratio Lean Malfunction(CALIFORNIA,C&C)
	26	Air–Fuel Ratio Rich Malfunction(CALIFORNIA,C&C)

Malfunction: Open or Short in Injector Leak, Blockage



HINT: When start this test, engine coolant temp. is 40•C (104•F) or less.
Before this test, check the feedback voltage for heated oxygen sensor.
(1) Disconnect the fuse EFI (15 A) for 10 sec. or more, with IG switch OFF.
(2) Initiate test mode (Connect terminal TE2 and Ell of DLC 1) with IG switch OFF.
(3) Start the engine and warm the engine up, with all ACC switch OFF.
(4) After the engine is warmed up, let it idle for 5 min. '
HINT: If a malfunction is detected the malfunction indicator lamp will light up during step(4).

NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

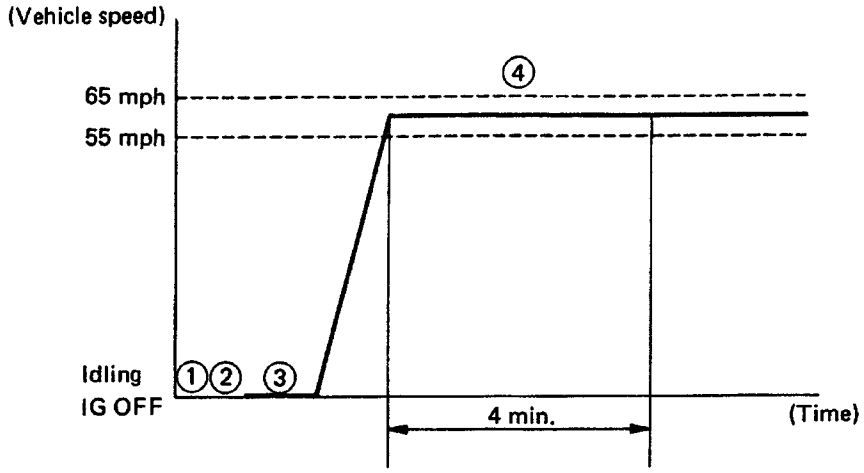
Purpose of the driving pattern.

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed confirming that diagnostic trouble code is no longer detected.

DTC	71	EGR System Malfunction

Malfunction: Short in VSV Circuit for EGR, Loose EGR Hose– Valve Stuck



P02545

HINT: When start this test, engine coolant temp. is 40•C (104•F) or less.

(1) Disconnect the fuse EFI (15 A) for 10 sec. or more, with IG switch OFF.

(2) Initiate test mode (Connect terminal TE2 and E 1 of DLC 1) with IG switch OFF.

(3) Start the engine and warm the engine up with all ACC switch OFF.

(4) With the transmission in 4th gear ("D" position and 0I¿ ON for A/T), drive 55 – 65 mph for 4 min.

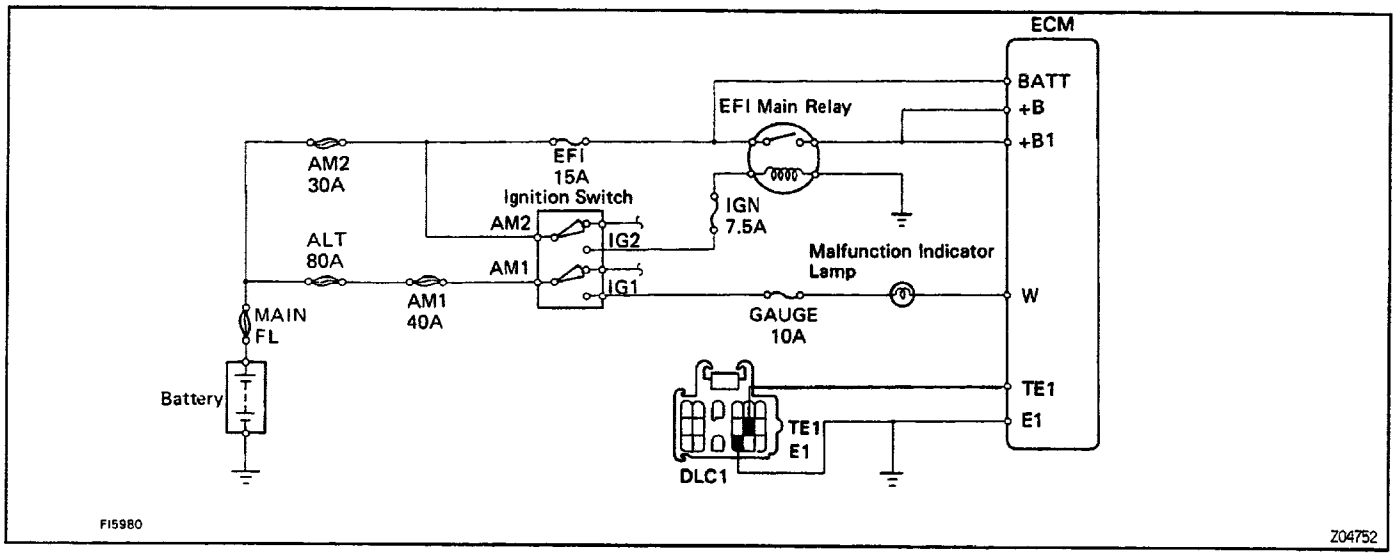
HINT: 1f a malfunction is detected the malfunction indication lamp will light up during step (4) .

NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

V01709

DIAGNOSIS CIRCUIT INSPECTION

EG1GF–03



1. Does malfunction, indicator lamp come on when ignition switch is at ON?
   - YES → System Normal
   - NO → Does malfunction indicator lamp come on when ECM terminal W is grounded to the body?
     - YES → Check wiring between ECM terminal E1 and body ground.
       - OK → Try another ECM.
       - BAD → Repair or replace.
     - NO → Check bulb, fuse and wiring between ECM and ignition switch.
       - BAD → Repair or replace.

2. Does malfunction indicator lamp go off when the engine is started?
   - YES → System Normal
   - NO → Check wiring between ECM and malfunction Indicator lamp.
     - BAD → Repair.
     - OK → Is there diagnostic trouble code output when DLC1 and terminals TE1 and E1 are connected?
       - NO → Check wiring between ECM terminal TE1 and D LC1 terminal TE1, and ECM terminal E1 and DLC1 terminal E1.
         - OK → Try another ECM.
       - YES → Does malfunction indicator lamp go off after repair according to malfunction code?
         - NO → Further repair required.
         - YES → System 0K → Cancel out diagnostic trouble code.

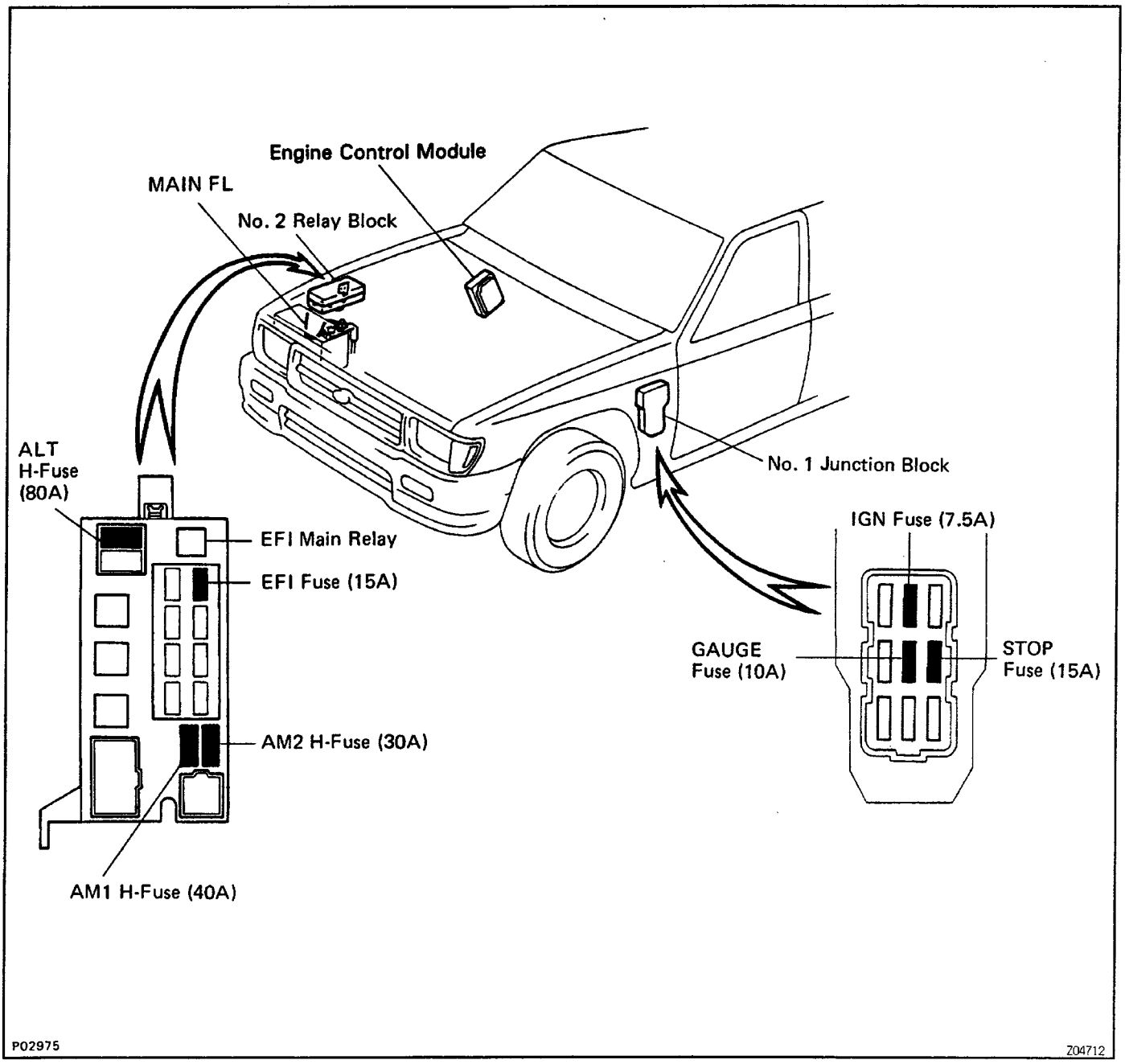
V02236

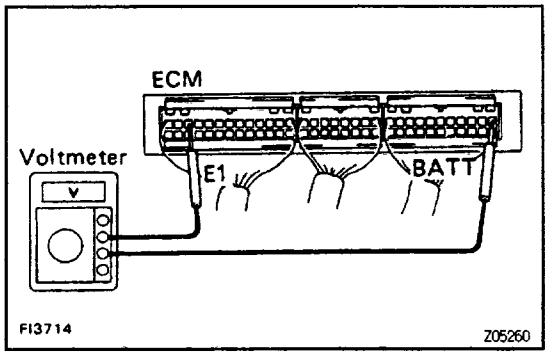
TROUBLESHOOTING WITH VOLT OHMMETER

HINT: Because the following troubleshooting procedures are designed for inspection of each separate system, the actual troubleshooting procedure may vary somewhat.
However, please refer to these procedures and perform actual troubleshooting, conforming to the inspection methods described.
For example, it is better to first make a simple check of the fuses, fusible links and connecting condition of the connectors before making your inspection according to the procedures listed.
The following troubleshooting procedures are based on the supposition that the trouble lies in either a short or open circuit in a component outside the –computer or a short circuit within the computer. If engine trouble occurs even though proper operating voltage is detected in the computer connector, then the engine control module is faulty and should be replaced.

FUSES AND FUSIBLE LINK LOCATION

EG1GH–02





MFI SYSTEM CHECK PROCEDURE

EG1GJ–02

HINT:

- Perform all voltage measurements with the connectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is in "ON" position. Using a voltmeter with high impedance (110 kΩ/V minimum), measure the voltage at each terminal of the wiring connectors.

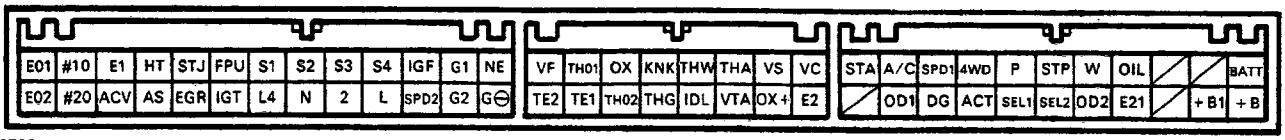
EG1GK–03

Engine Control Module (ECM) Terminals

Symbol	Terminal Name	Symbol	Terminal Name	Symbol	Terminal Name
NE	DISTRIBUTOR	VC	VOLUME AIR FLOW METER	BATT	BATTERY B+
G⊖	DISTRIBUTOR	E2	SENSOR GROUND	+B	EFI MAIN RELAY
G1	DISTRIBUTOR	VS	VOLUME AIR FLOW METER		–
G2	DISTRIBUTOR	*5 OX+	HEATED OXYGEN SENSOR	+B1	EFI MAIN RELAY
IGF	IGNITER	THA	INTAKE AIR TEMP. SENSOR		
*1 SPD2	VEHICLE SPEED SENSOR	VTA	THROTTLE POSITION SENSOR		–
*2 S4	TCM SOLENOID	THW	ENGINE COOLANT TEMP. SENSOR	*1 OIL	A/T OIL TEMP. WARNING LIGHT
*1 L	PARK/NEUTRAL POSITION SWITCH	IDL	THROTTLE POSITION SENSOR	E21	SENSOR GROUND
*1 S3	TCM SOLENOID	KNK	KNOCK SENSOR	W	MALFUNCTION INDICATOR LAMP
*1 2	PARK/NEUTRAL POSITION SWITCH	*3 THG	EGR GAS TEMP. SENSOR	*1 OD2	O/D MAIN SWITCH
*1 S2	TCM SOLENOID	OX	HEATED OXYGEN SENSOR	STP	STOP LIGHT SWITCH
*1 N	PARK/NEUTRAL POSITION SWITCH	*2 TH02	T/F FLUID TEMP. SENSOR	SEL2	–
*1 S1	TCM SOLENOID	*2 TH01	4WD OIL TEMP. SENSOR	*1 P	PATTERN SELECT SWITCH
*2 L4	TRANSFER POSITION SWITCH	TE1	D LC1	SEL1	–
FPU	VSV (for EG R)	VF	D LC 1	*4 4WD	4WD SWITCH
IGT	IGNtTER	TE2	DLC1	ACT	A/C AMPLIFIER
STJ	COLD START INJECTOR		–	SPD1	VEHICLE SPEED SENSOR
EGR	VSV (for EG R)		–	*1 DG	DLC1
HT	HEATED OXYGEN SENSOR			A/C	A/C MAGNET SWITCH
AS	VSV (for PAIR)		–	*1 OD1	CRUISE CONTROL ECU
E1	ENGINE GROUND		–	STA	STARTER SWITCH
ACV	VSV (for A/C)		–		–
#10	INJECTOR		–		–
#20	INJECTOR		–		–
E01	ENGINE GROUND		–		–
E02	ENGINE GROUND		–		–

*1: A/T only *2: 4WD A/T only *3: California only *3: California and C & C *4: 4WD only *5: California 2WD only

Engine Control Module (ECM) Terminals

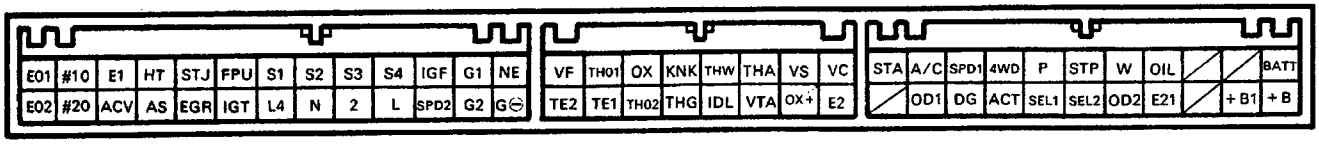


EG1TD–02

Engine Control Module (ECM) Wiring Connectors Voltage

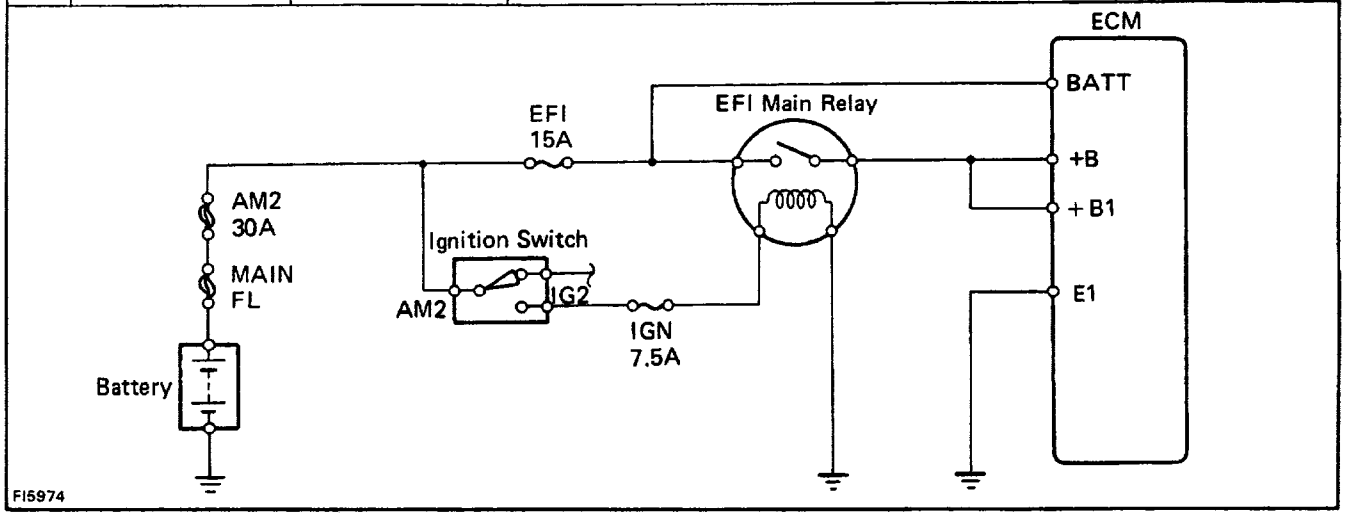
No.	Terminals	Condition		STD voltage	See page
1	BATT – E1	–		9 – 14	EG2–186
	+B – E1	Ignition SW ON			
	+B1 – E2				
2	IDL – E2 (E21)	Ignition SW ON	Throttle valve open	9 – 14	EG2–188
	VC – E2 (E21)		–	4.5 – 5.5	
	VTA – E2 (E21)		Throttle valve fully closed (Throttle opener must be cancelled first)	0.3 – 0.8	
			Throttle valve fully open	3.2 – 4.9	
3	VC – E2 (E21)	Ignition SW ON	–	4.5 – 5.5	EG2–190
	VS – E2 (E21)		Measuring plate fully closed	4.0 – 5.5	
			Measuring plate fully open	0.2 – 0.5	
		Idling		2.3 – 2.8	
		3,000 rpm		0.3 – 1.0	
	THA – E2 (E21)	Ignition SW ON	Intake air temperature 20°C (68°F)	0.5 – 3.4	
4	THW – E2 (E21)	Ignition SW O N	Engine coolant temperature 80°C (176°F)	0.2 – 1.0	EG2–192
5	STA – E1	Cranking		6 V or more	EG2–193
6	#10 – E01 #20 – E02	Ignition SW ON		9 – 14	EG2–194
7	IGT – E1	Idling		Pulse generation	EG2–195
8	W – E1	No trouble (malfunction indicator lamp off) and engine running		9 – 14	EG2–196
9	STJ – E1	Cranking	Engine coolant temperature 80°C (176°F)	6 V or more	EG2–197
10	STP – E1	Stop light switch ON		7.5 – 14	EG2–198

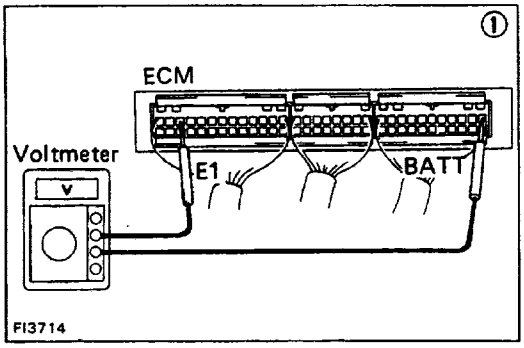
Engine Control Module (ECM) Terminals

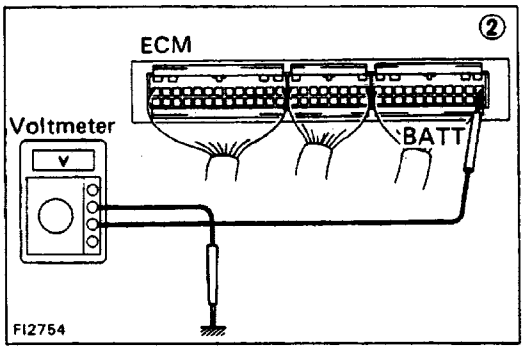


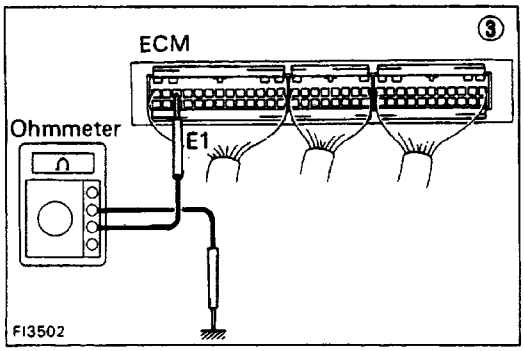
FI2796

No.	Terminals	Trouble	Condition	STD Voltage
1	BATT – E1	No voltage	–	9 – 14 V
	+B – E1		Ignition switch 4N	
	+B1 – E1			









• BATT– EI

(1) There is no voltage between ECM terminals BATT and E1.

(2) Check that there is voltage between ECM terminal BATT and body ground.

NO → OK

(3) Check wiring between ECM terminal E1 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

Check fuse and fusible link.

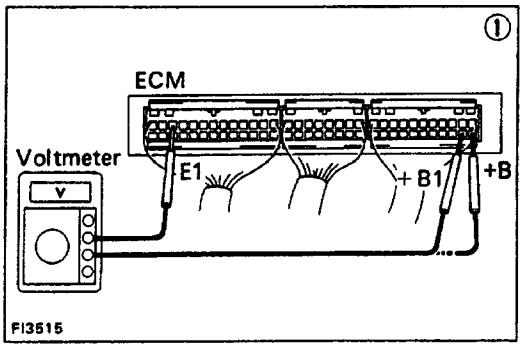
BAD → Replace.

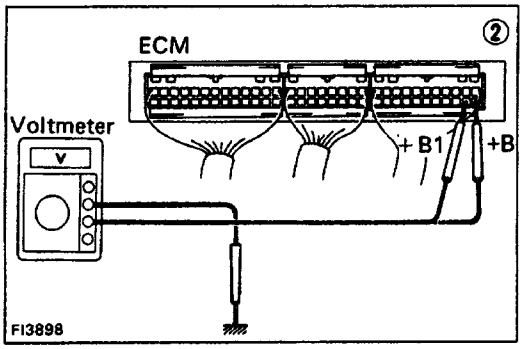
OK

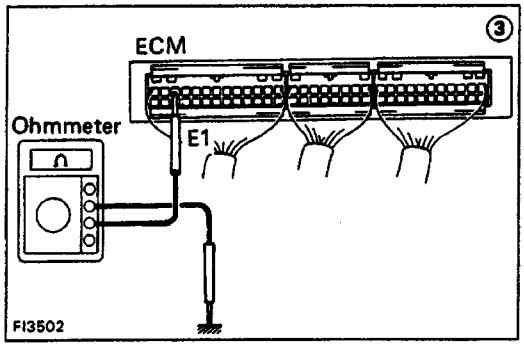
Check wiring between fuse and ECM.

BAD → Repair or replace.

V02191







- **+B (+B1) –E1**

(1) There is no voltage between ECM terminals + B (+ B1) and E1. **(IG SW ON) .**

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground. (**IG SW ON)**

NO — OK

(3) Check wiring between ECM terminal El and body ground.

OK → Try another ECM.

SAD → Repair or replace.

Check fuse, fusible link and ignition switch. — BAD → Repair or replace.

OK

Check EF 1 main relay. — BAD → Replace.

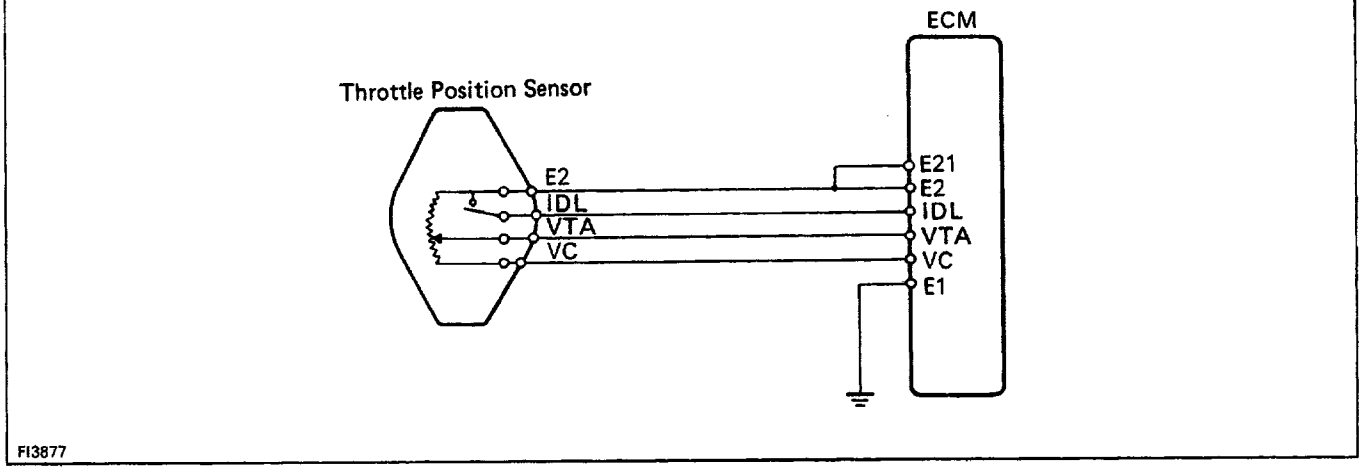
OK

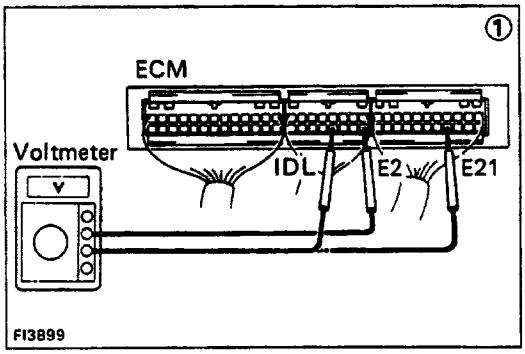
Check wiring between E F I main relay and battery. — BAD → Repair or replace.

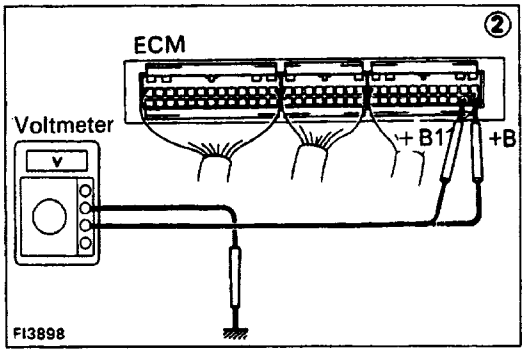
OK

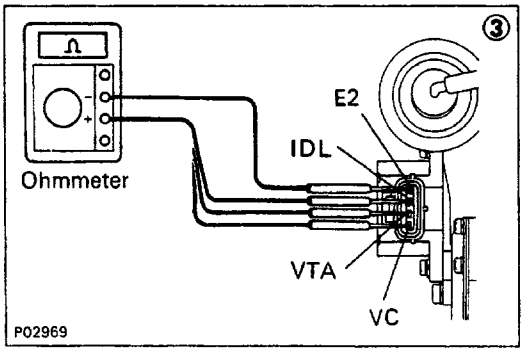
Check wiring between EFI main relay and ECM terminal + B (+B1). — BAD → Repair or replace.

No.	Terminals	Trouble	Condition	STD Voltage
2	IDL – E2 (E21)	No voltage	Ignition switch O N	Throttle valve open	9 – 14 V
	VC – E2 (E21)			–	4.5 – 5.5 V
	VTA – E2 (E21)			Throttle valve fully closed (Throttle opener must be cancelled first)	0.3 – 0.8 V
				Throttle valve fully open	3.2 – 4.9 V

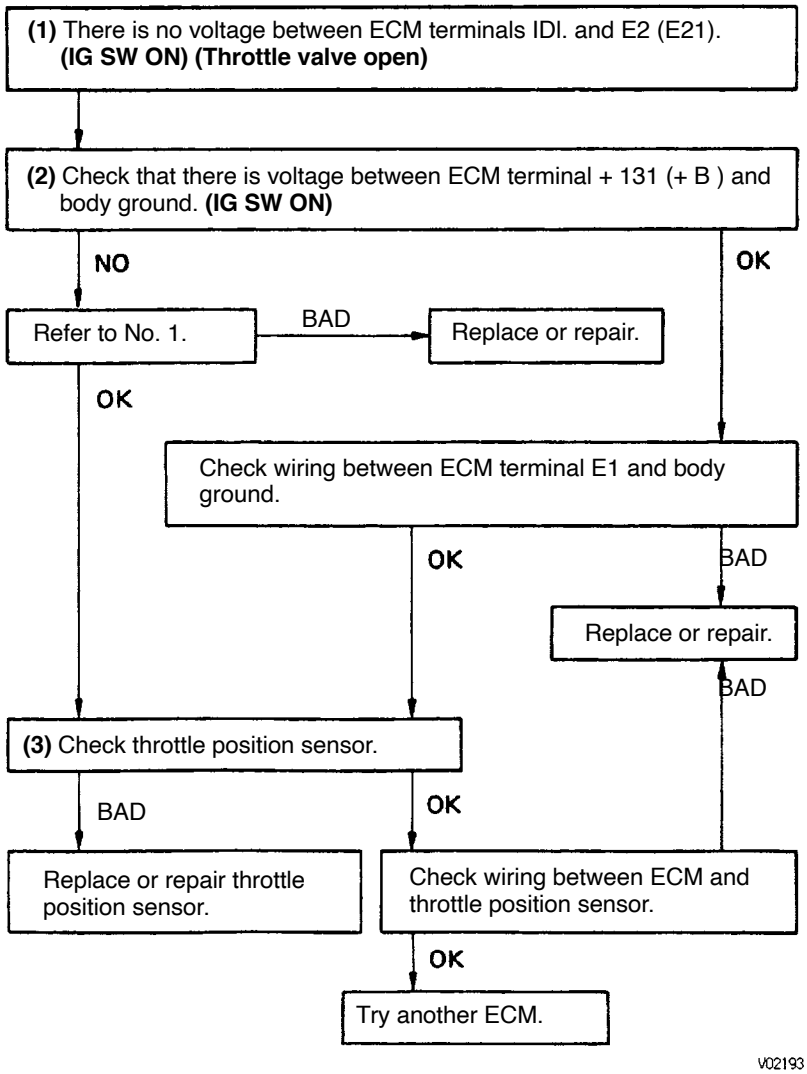


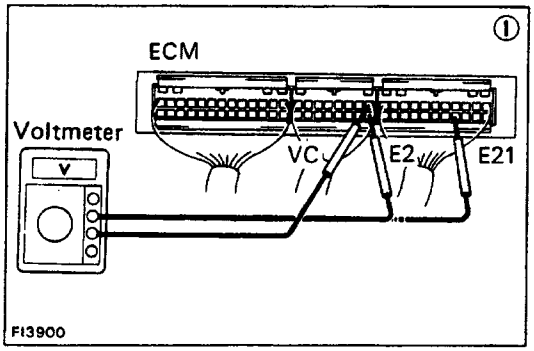


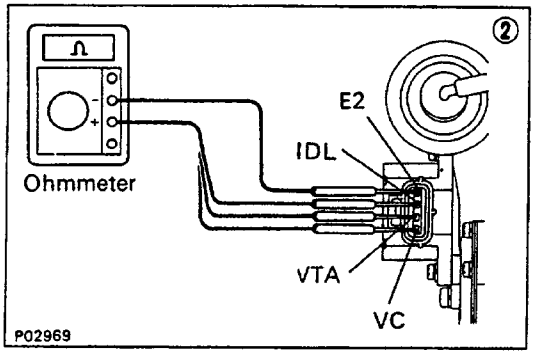




• IDL – E2 (E21)







• VC – E2 (E21)

(1) There is no voltage between ECM terminals VC and E2 (E21).
(IG SW ON)

↓

Check that there is voltage between ECM terminals + B1(+ B) and E1.
(IG SW ON)

↓ **OK** — **NO** → Refer to No. 1.

↓

(2) Check throttle position sensor.

↓ BAD → Repair or replace.

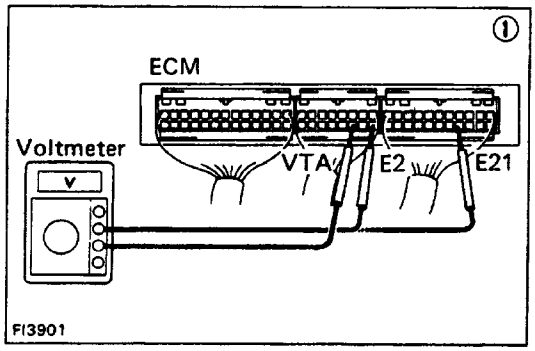
↓ **OK**

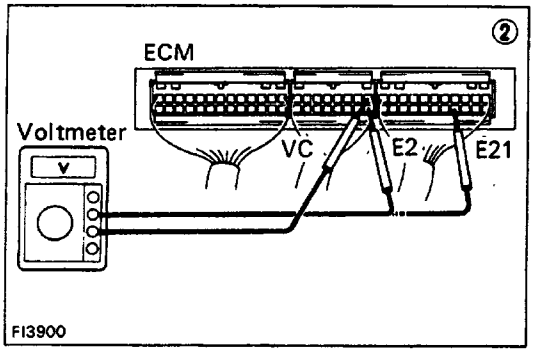
Check wiring between ECM and throttle position

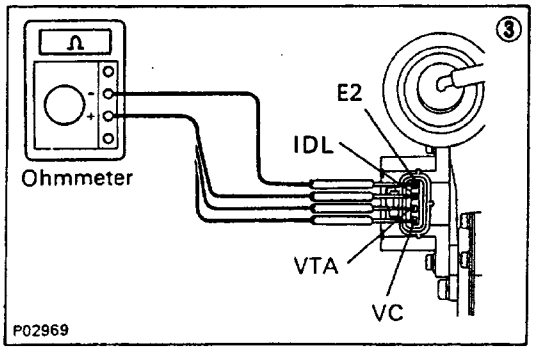
↓ **OK** — BAD → Repair or replace wiring.

↓

Try another ECM.







• VTA – E2 (E21)

(1) There is no voltage between ECM terminals VTA and E2 (E21).
(IG SW ON)

↓

(2) Check that there is voltage between ECM terminals VC and E2 (E21).
(IG SW ON)

↓ **OK** — **NO** → Perform inspection of VC – E2 (E21).

↓

(3) Check throttle position sensor. — BAD → Repair or replace.

↓ **OK**

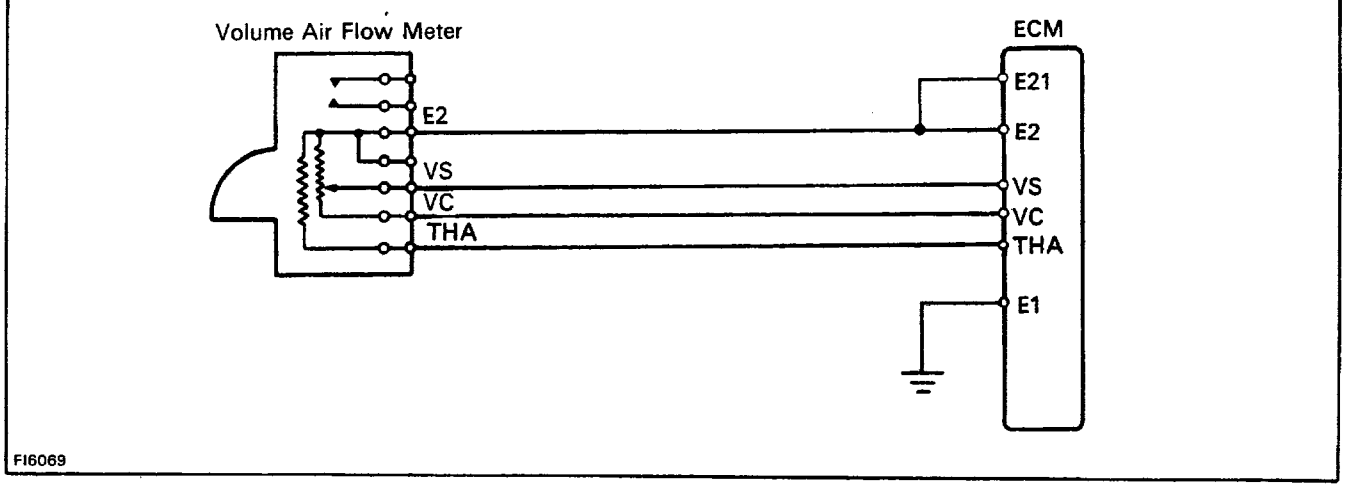
Check wiring between ECM and throttle position sensor. — BAD → Repair or replace.

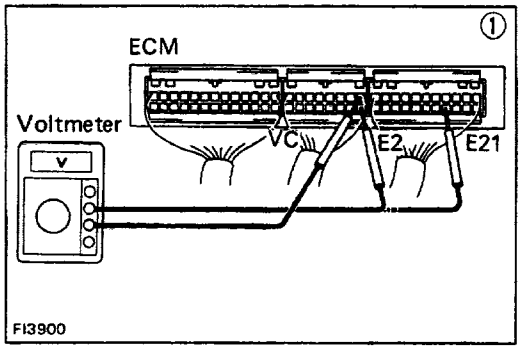
↓ **OK**

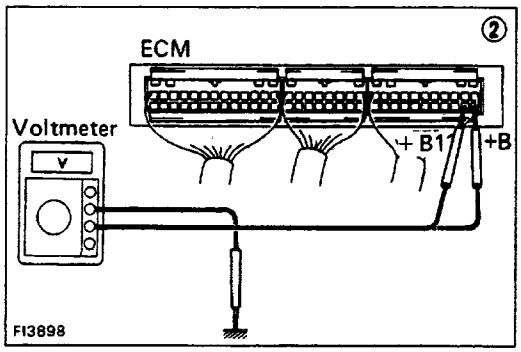
Try another ECM.

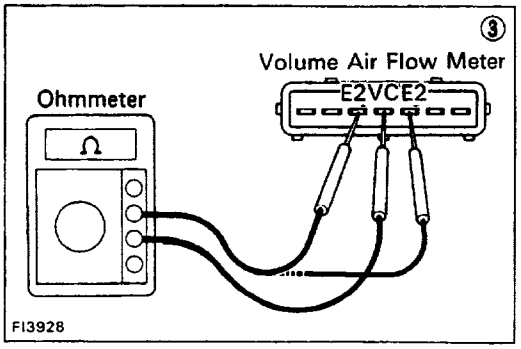
V02194

No.	Terminals	Trouble	Condition		STD Voltage
3	VC – E2 (E21)	No voltage	Ignition SW ON	–	4.5 – 5.5 V
	VS – E2 (E21)			Measuring plate fully closed	4.0 – 5.5 V
				Measuring plate fully open	0.2 – 0.5 V
			Idling		2.3 – 2.8 V
	THA – E2 (E21)		IG SW ON	Intake air temperature 20°C (68°F	0.5 – 3.4 V









- **VC – E2 (E21)**

(1) There is no voltage between ECM terminals VC and E2 (E21). **(I G SW ON)**

↓

(2) Check that there is voltage between ECM terminal + B (+ 131) and body ground. **(IG SW ON)**

OK → ↓

NO → Refer to No. 1.

(3) Check volume air flow meter.

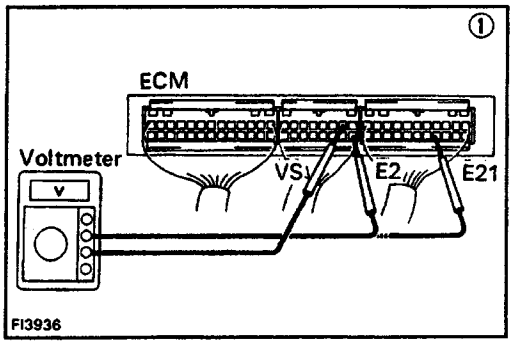
BAD → Replace or repair volume air flow meter.

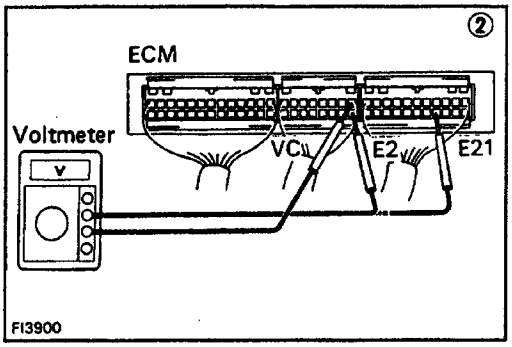
OK → Check wiring between ECM and volume air flow meter.

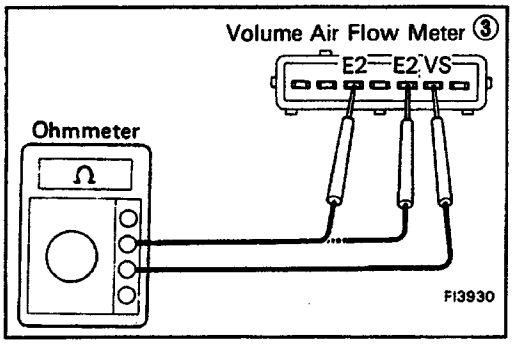
OK → Try another ECM.

BAD → Replace or repair wiring.

V02195







• VS – E2 (E21)

(1) There is no voltage between ECM terminals VS and E2 (E21). **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminals VC and E2 (E21). **(IG SW ON)**

↓ OK / NO → Refer to VC – E2 (E21). → BAD → Repair or replace.

↓ OK

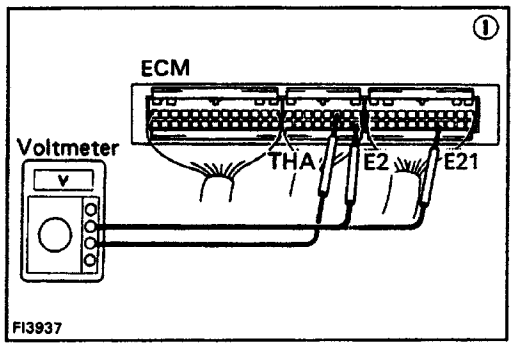
b Check volume air flow meter. → BAD → Repair or replace.

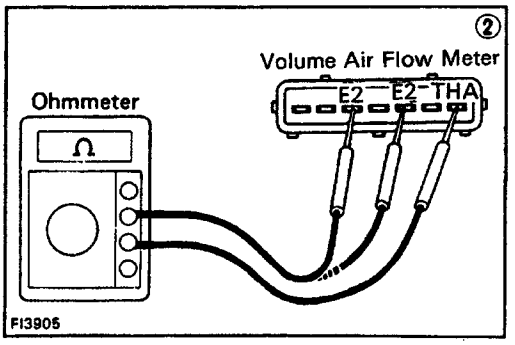
↓ OK

Check wiring between ECM and volume air flow meter. → BAD → Repair or replace.

↓ OK

Try another ECM.





• THA – E2 (E21)

(1) There is no voltage between ECM terminals THA and E2 (E21). **(IG SW ON)**

↓

Check that there is voltage between ECM terminal + B (+ B1) and body ground. **(IG SW ON)**

↓ OK / NO → Refer to No. 1.

↓ OK

(2) Check intake air temp. sensor.

↓ BAD → Replace volume air flow meter.

↓ OK

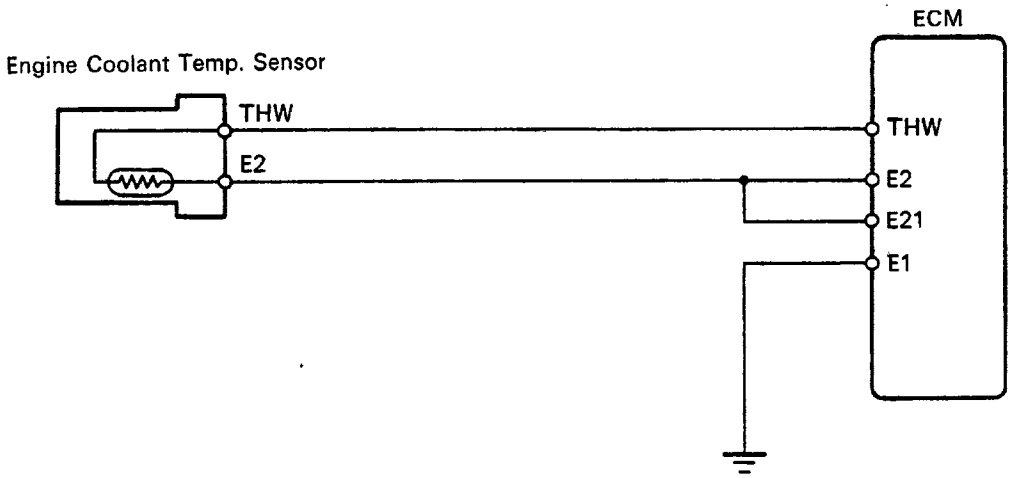
Check wiring between ECM and volume air flow meter.

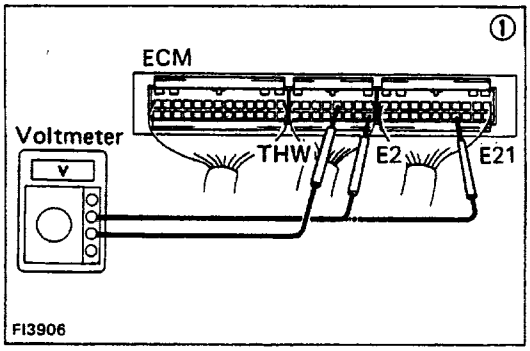
↓ OK → Try another ECM.

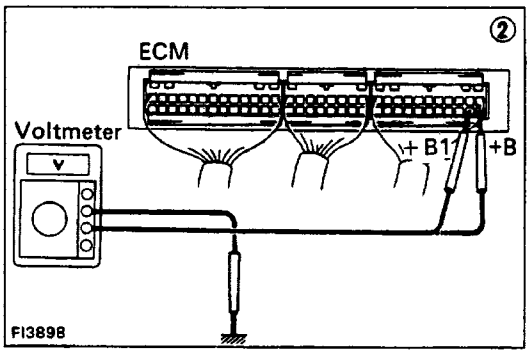
↓ BAD → Repair or replace wiring.

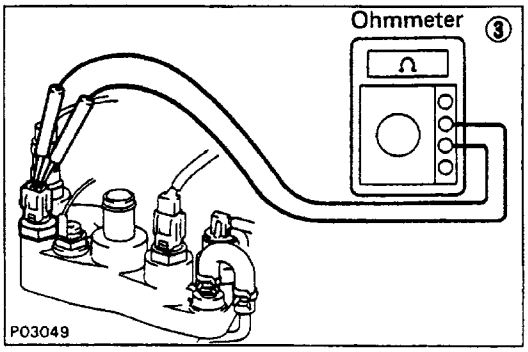
V02196

No.	Terminals	Trouble	Condition		STD Voltage
4	THW – E2 (E21)	No voltage	Ignition switch ON	Engine coolant temperature 80°C (176°F)	0.2 – 1.0 V









(1) There is no voltage between ECM terminals THW and E2 (E21). (IG SW ON)

↓

(2) Check that there is voltage between ECM terminal +B (+ B1) and body ground. **(IG SW ON)**

OK → ↓

NO → Refer to No. 1.

↓

Check wiring between ECM terminal E1 and body ground.

OK → ↓

BAD → Repair or replace.

(3) Check engine coolant temp. sensor.

BAD → Replace engine coolant temp. sensor.

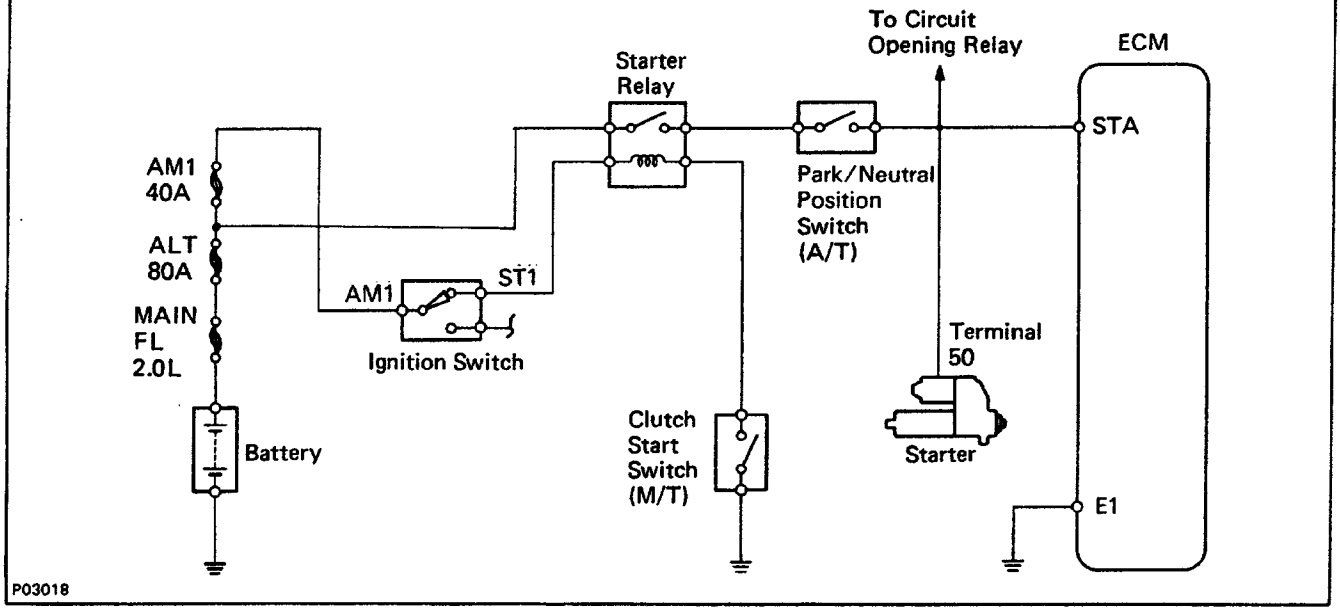
OK → Check wiring between ECM and engine coolant temp. sensor.

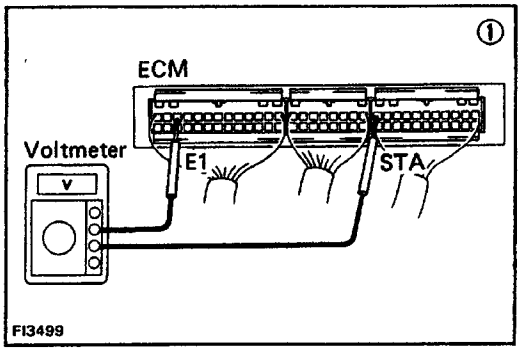
OK → Try another ECM.

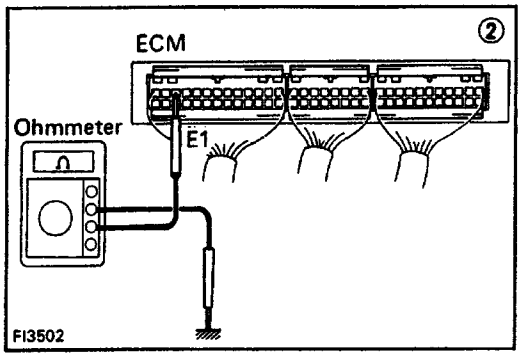
BAD → Repair or replace.

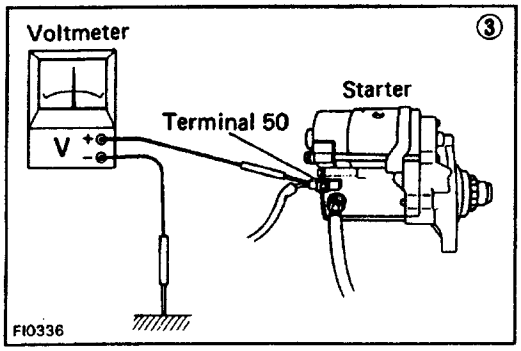
V02197

No.	Terminals	Trouble	Condition	STD Voltage
5	STA – E1	No voltage	Cranking	6 V or more









(1) There is no voltage between ECM terminals STA and E1. **(IG SW START)**

Check starter operation. — OK → Check wiring between . ECM terminal STA and starter terminal 50.

Check starter operation. — BAD → Check fusible link, battery, wiring and ignition switch.

Check wiring between . ECM terminal STA and starter terminal 50. — OK → **(2)** Check wiring between ECM terminal E1 and body ground..

Check wiring between . ECM terminal STA and starter terminal 50. — BAD → Repair or replace.

(2) Check wiring between ECM terminal E1 and body ground.. — BAD → Repair or replace.

Check fusible link, battery, wiring and ignition switch. — BAD → Repair or replace.

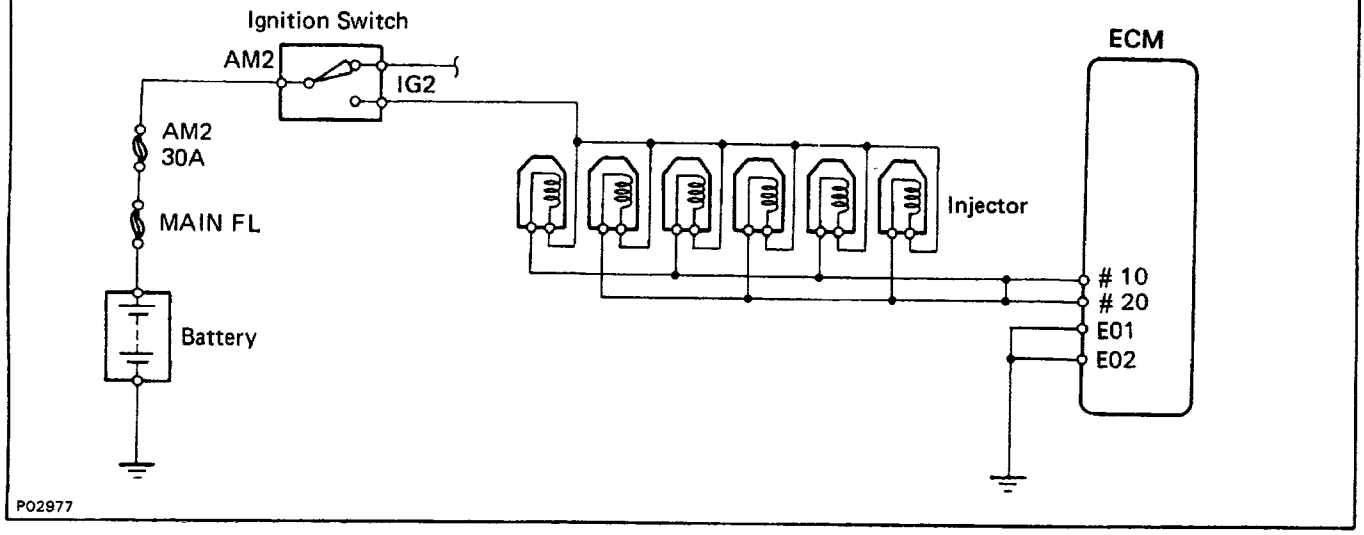
Check fusible link, battery, wiring and ignition switch. — OK → **(3)** Check that there is voltage at terminal 50 of starter. **(IG SW START) STD voltage: 6 V or more**

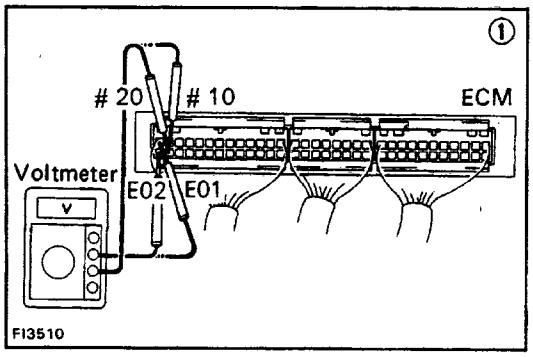
(3) Check that there is voltage at terminal 50 of starter. **(IG SW START) STD voltage: 6 V or more** — OK → Check starter.

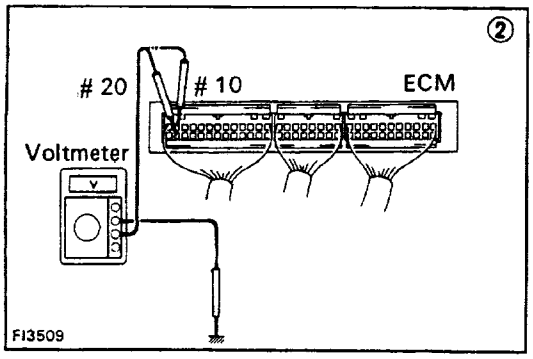
(3) Check that there is voltage at terminal 50 of starter. **(IG SW START) STD voltage: 6 V or more** — NO → Check wiring between ignition switch ST1 terminal and starter terminal 50.

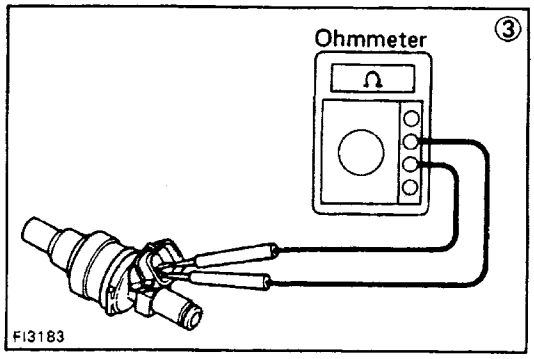
V02198

No.	Terminals	Trouble	Condition	STD Voltage
6	# 10 _ E01 # 20 _ E02	No voltage	Ignition switch ON	9 – 14 V









(1) There is no voltage between ECM terminals # 10 and/or # 20 and E01 and/or E02. **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminal # 10 and/or # 20 and body ground,

NO → ↓

OK → Check wiring between ECM terminal E01 and/or E02 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

↓

Check fusible link and ignition switch.

BAD → Repair or replace.

OK → ↓

Check resistance of magnetic coil in each injector.
STD resistance: 13.4 – 14.2 Ω

OK → ↓

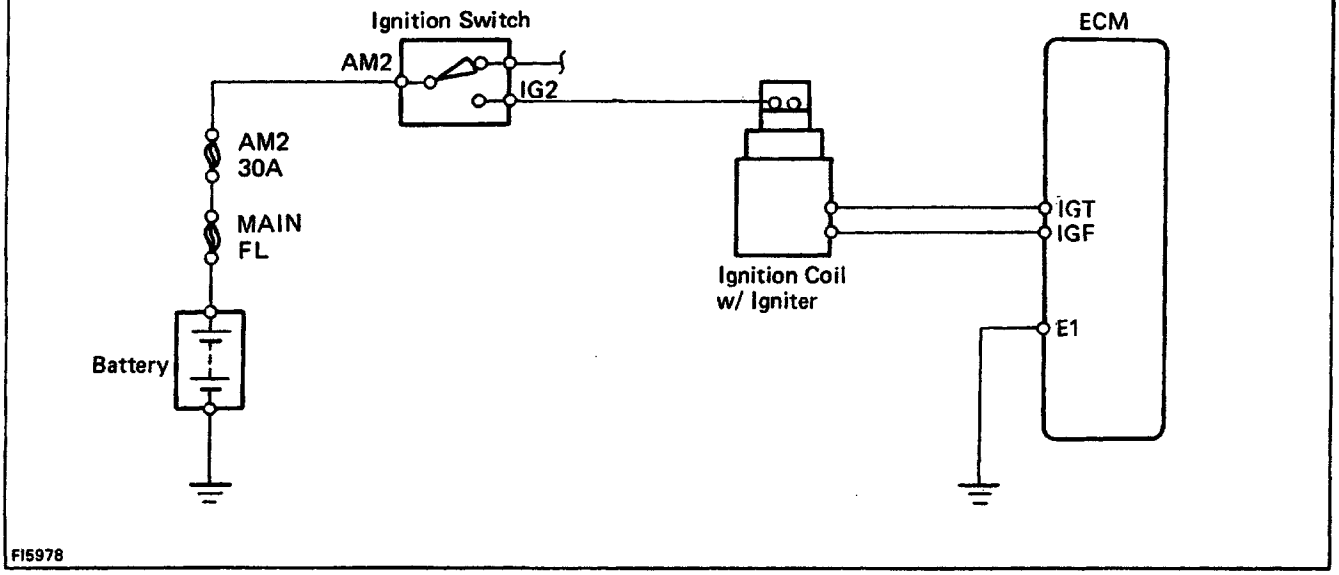
NO → Replace injector.

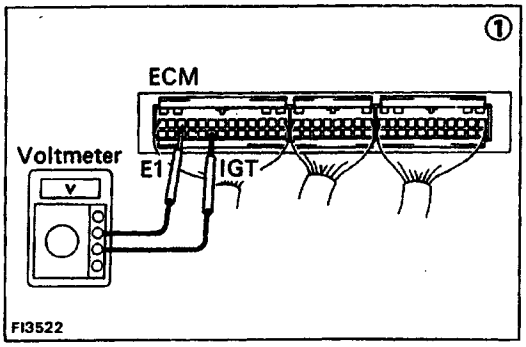
Check wiring between ECM terminal # 10 and/or # 20 and battery.

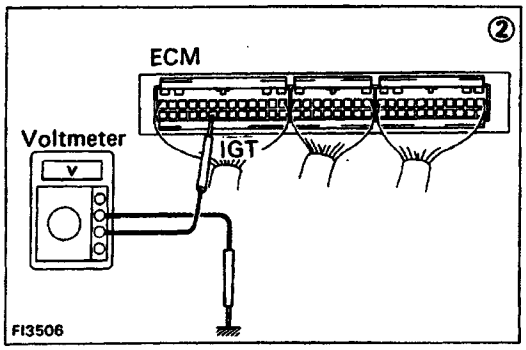
BAD → Repair or replace.

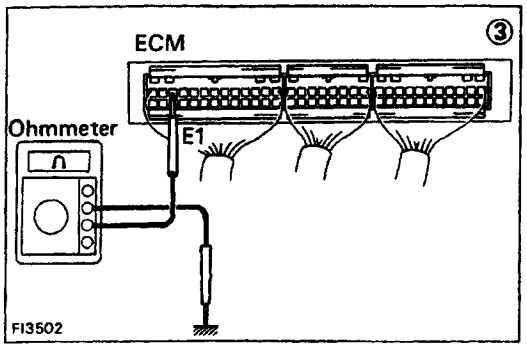
V02199

No.	Terminals	Trouble	Condition	STD Voltage
7	IGT – E1	No voltage	Idling	Pulse generation









(1) There is no voltage between ECM terminals IGT and El. **(idling)**

(2) Check that there is voltage between ECM terminal IGT and body ground. (idling)

OK

(3) Check wiring between ECM terminal E1 and body ground.

BAD

Refer to No. 1. — BAD → Repair or replace.

OK

Check wiring between igniter and distributor. — BAD → Repair or replace.

OK

Check distributor. — BAD → Replace.

OK

Check wiring between ECM and igniter. — BAD → Repair or replace.

OK

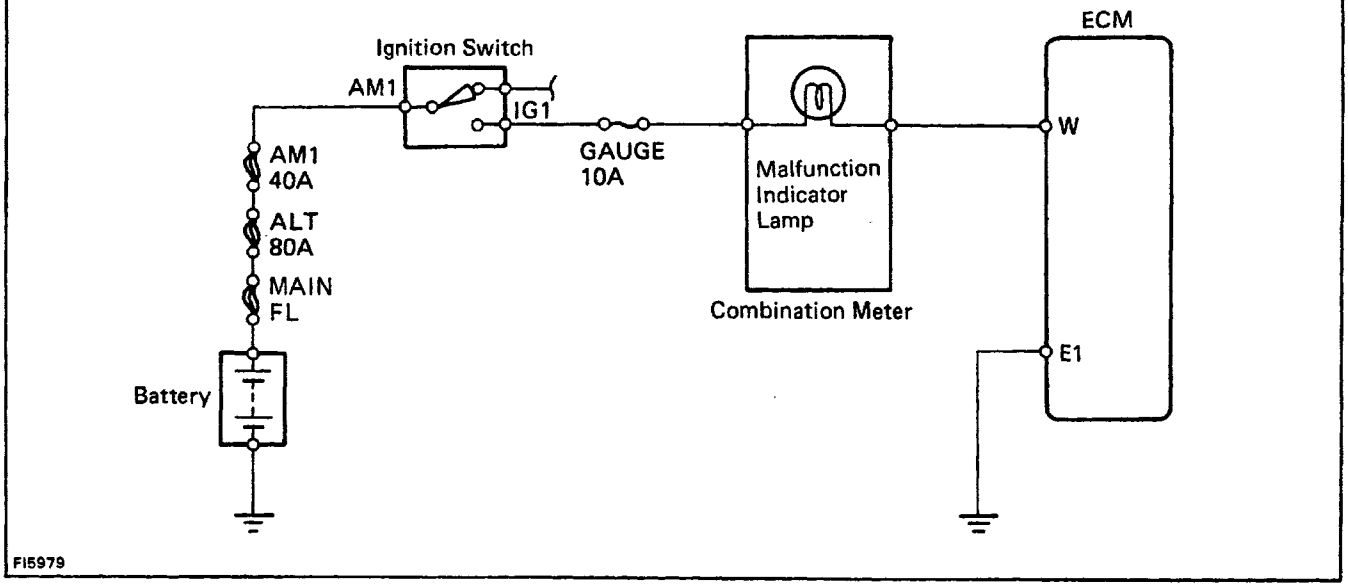
Check igniter. — BAD → Repair or replace.

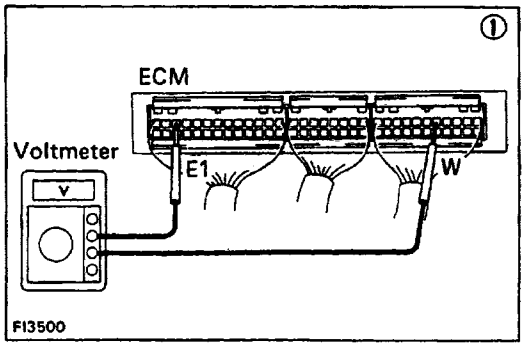
OK

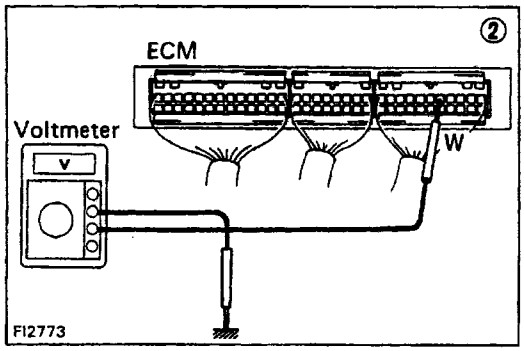
Try another ECM.

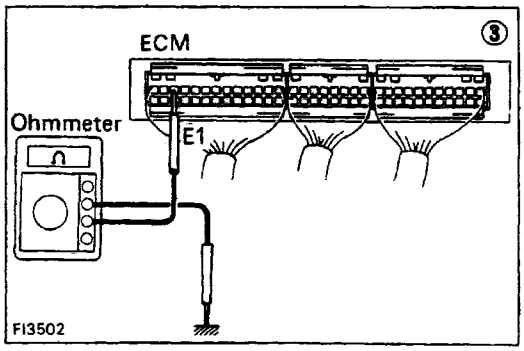
V02200

No.	Terminals	Trouble	Condition	STD Voltage
8	W – E1	No voltage	No trouble (malfunction indicator lamp off) and engine running	9 – 14 V









(1) There is no voltage between ECM terminals W and El. **(idling)**

↓

(2) Check that there is voltage between ECM terminal W and body ground.

NO → ↓ OK

(3) Check wiring between ECM terminal E1 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

↓

Check GAUGE fuse (10A) and malfunction indicator lamp.

OK → ↓ BAD → Repair or replace.

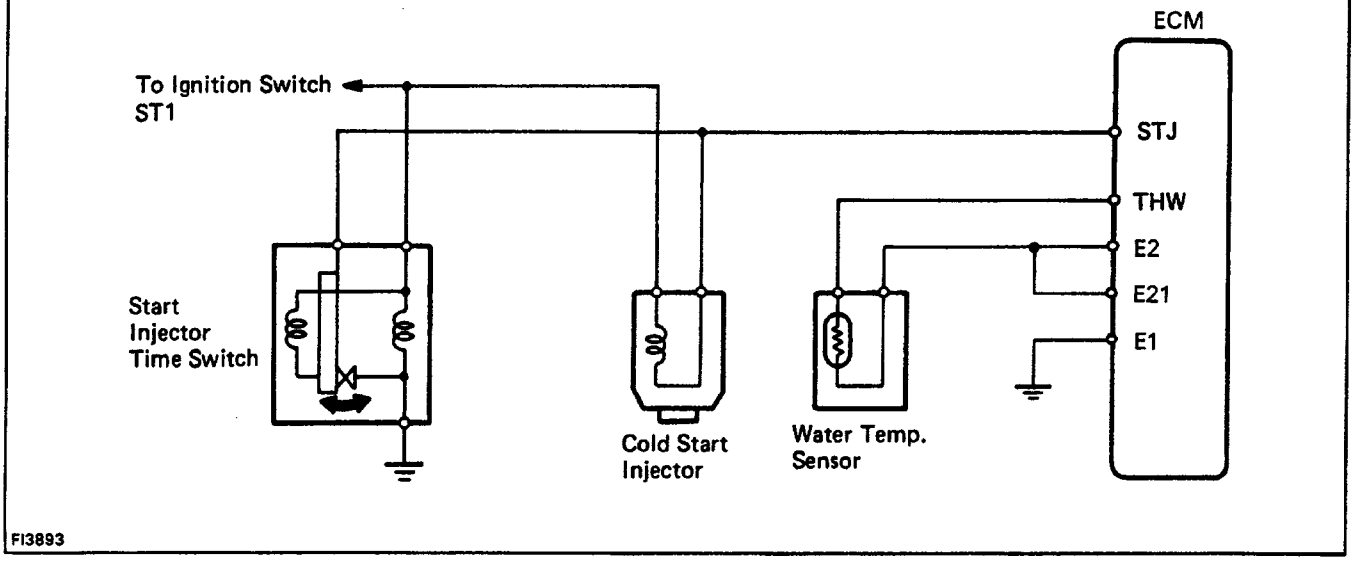
↓ Fuse blows again

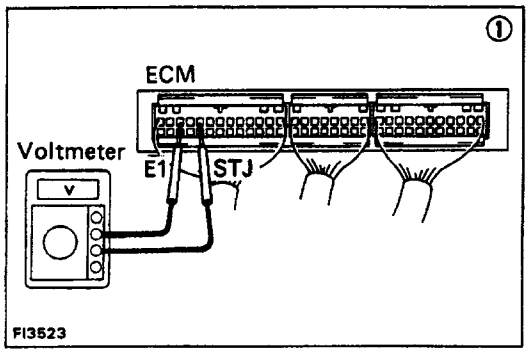
Check wiring between ECM terminal W and fuse.

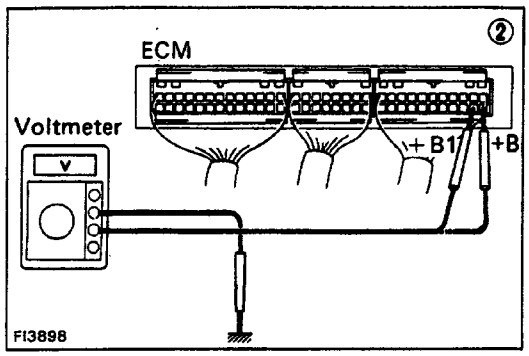
BAD → Repair or replace.

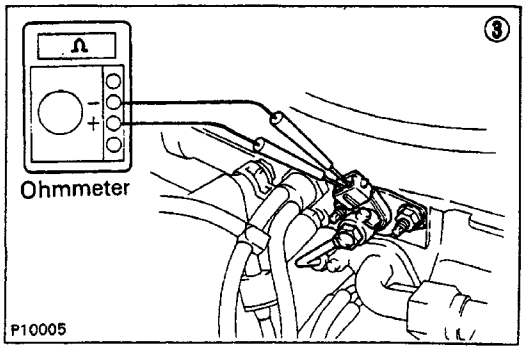
V02201

No.	Terminals	Trouble	Condition		STD Voltage
9	STJ – E1	No voltage	Cranking	Engine coolant temperature 80° (176° F)	6 V or more









(1) There is no voltage between ECM terminals STJ and E1. **(IG SW START)**

↓

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground. (IG SW ON)

OK → (3) Check cold start injector.

NO → Refer to No. 1.

BAD → Replace cold start injector.

OK → Check wiring between ECM and cold start injector.

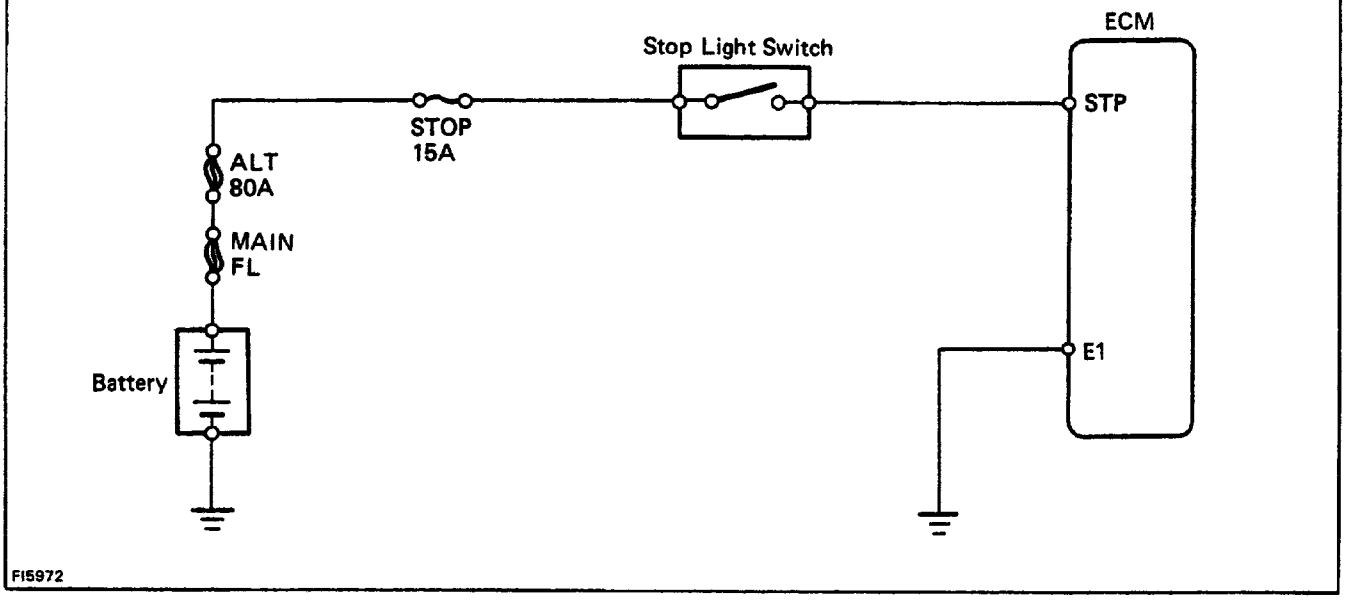
OK → Check wiring between ECM terminal E1 and body ground.

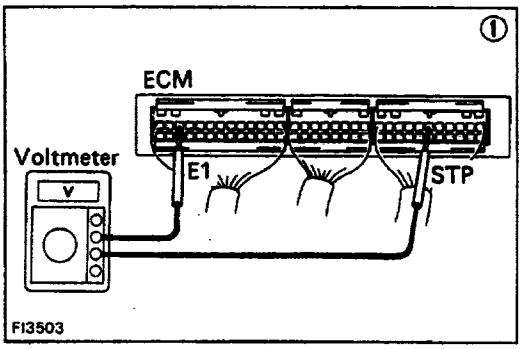
OK → Try another ECM.

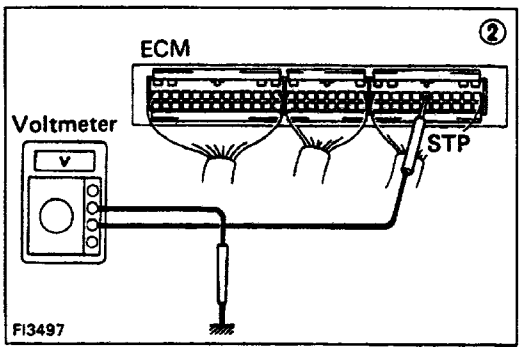
BAD → Repair or replace wiring.

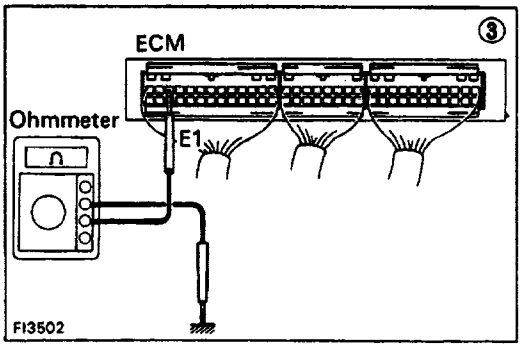
V02202

No.	Terminals	Trouble	Condition	STD Voltage
10	STP – E1	No voltage	Stop light switch ON	7.5 – 14 V









(1) There is no voltage between ECM terminals STP and E1.

↓

(2) Check that there is voltage between ECM terminal STP and body ground when the brake pedal is depressed.

NO → Check STOP fuse 15A) and stop light switch. → BAD → Repair or replace.

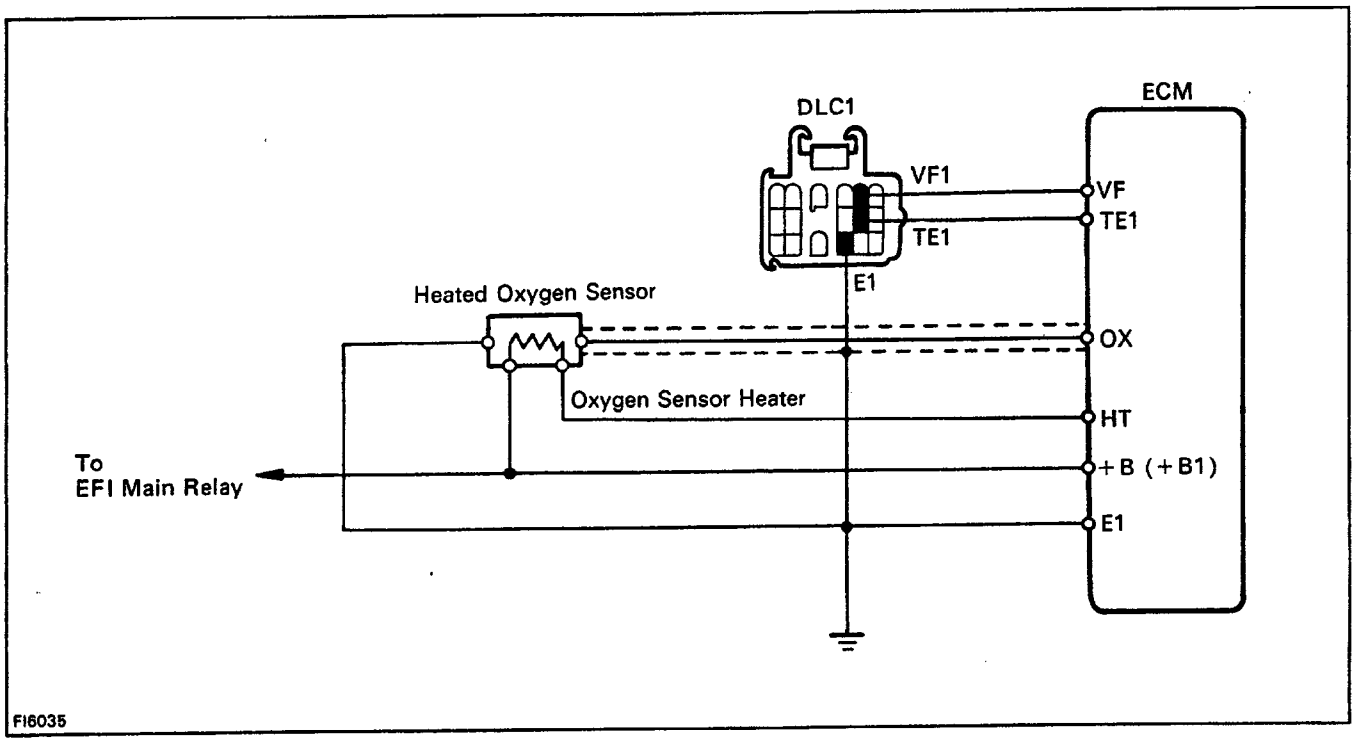
Check STOP fuse 15A) and stop light switch. → OK → Check wiring between ECM terminal STP and battery. → BAD → Repair or replace.

OK → (3) Check wiring between ECM terminal E1 and body ground,

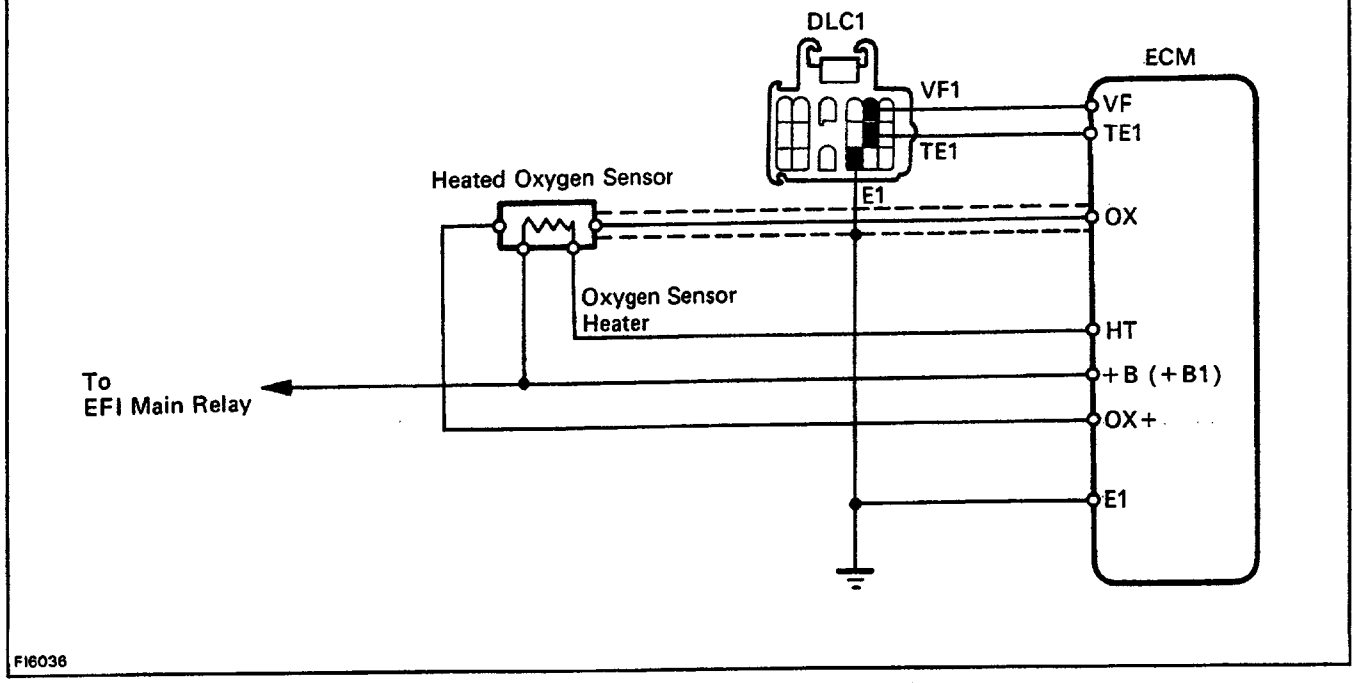
(3) Check wiring between ECM terminal E1 and body ground, → OK → Try another ECM.

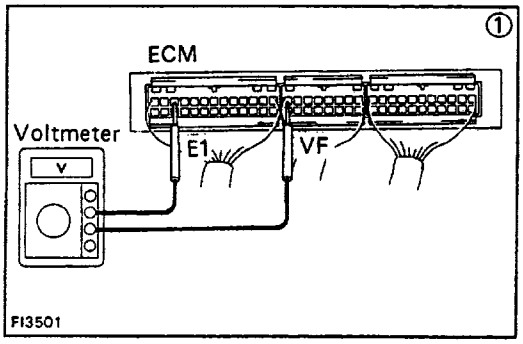
(3) Check wiring between ECM terminal E1 and body ground, → BAD → Repair or replace.

V02203



(California 2WD only)





(1) There is no voltage between ECM terminals 11F and E1.

Check that there is voltage between ECM terminal VF and body ground.

NO

OK

Check wiring between ECM terminal E1 and body ground.

OK

Try another ECM.

BAD

Repair or replace.

Is air leaking into air induction system?

YES

Repair air leak.

NO

Check spark plugs.

BAD

Repair or replace.

OK

Check distributor and ignition system.

BAD

Repair or replace.

OK

Check fuel pressure.

BAD

Repair or replace.

OK

Check injector.

BAD

Repair or replace.

OK

Check cold start injector.*

BAD

Repair or replace.

OK

Check volume air flow meter.

BAD

Repair or replace.

OK

Check operation of heated oxygen sensor.

OK

System normal.

BAD

Check wiring between heated oxygen sensor and ECM connector.

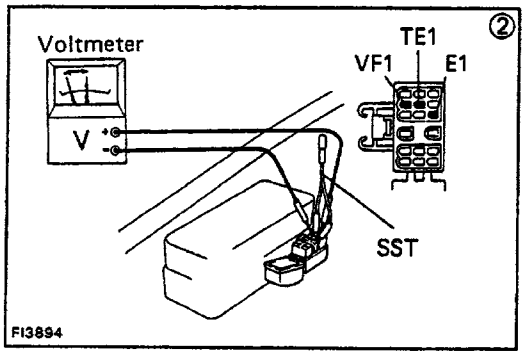
BAD

Repair wiring.

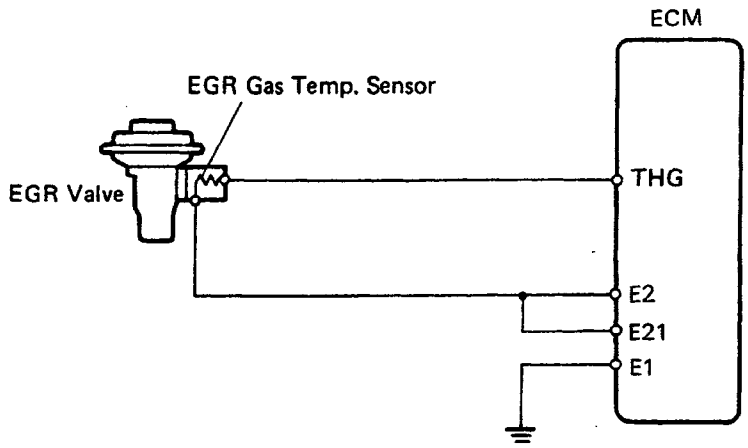
OK

Replace heated oxygen sensor.

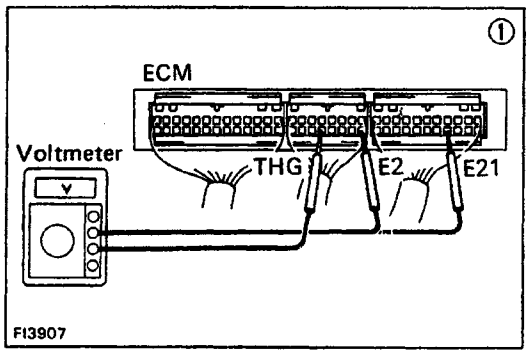
*Rich malfunction only



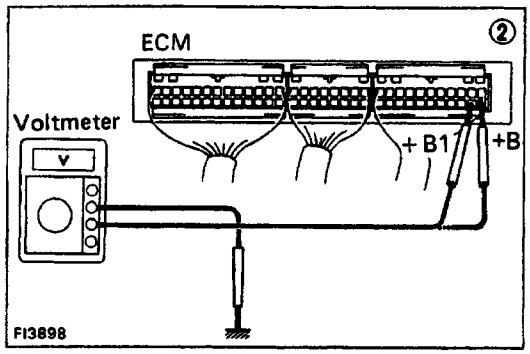
(California Vehicles and C & C)



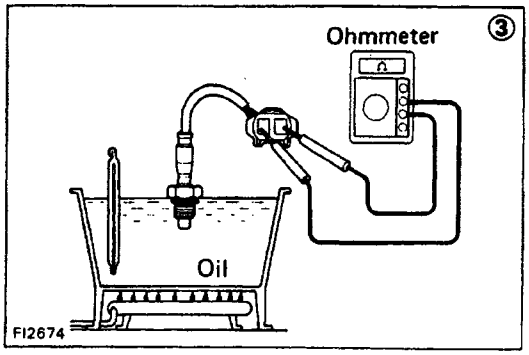
FI3895



FI3907



FI3898



FI2674

(1) There is no voltage between ECM terminals THG and E2 (E21). **(Engine running at 2,000 rpm)**

↓

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground. **(IG SW ON)**

OK ↓ / NO → Refer to No. 1.

↓

Check wiring between ECM terminal E1 and body ground.

OK ↓ / BAD → Repair or replace.

↓

Check EGR system. — BAD → Repair or replace.

OK ↓

Check EGR gas temp. sensor.

BAD ↓ / OK →

Replace EGR gas temp. sensor.

Check wiring between ECM and EG R gas temp. sensor.

OK ↓ / BAD →

Try another ECM.

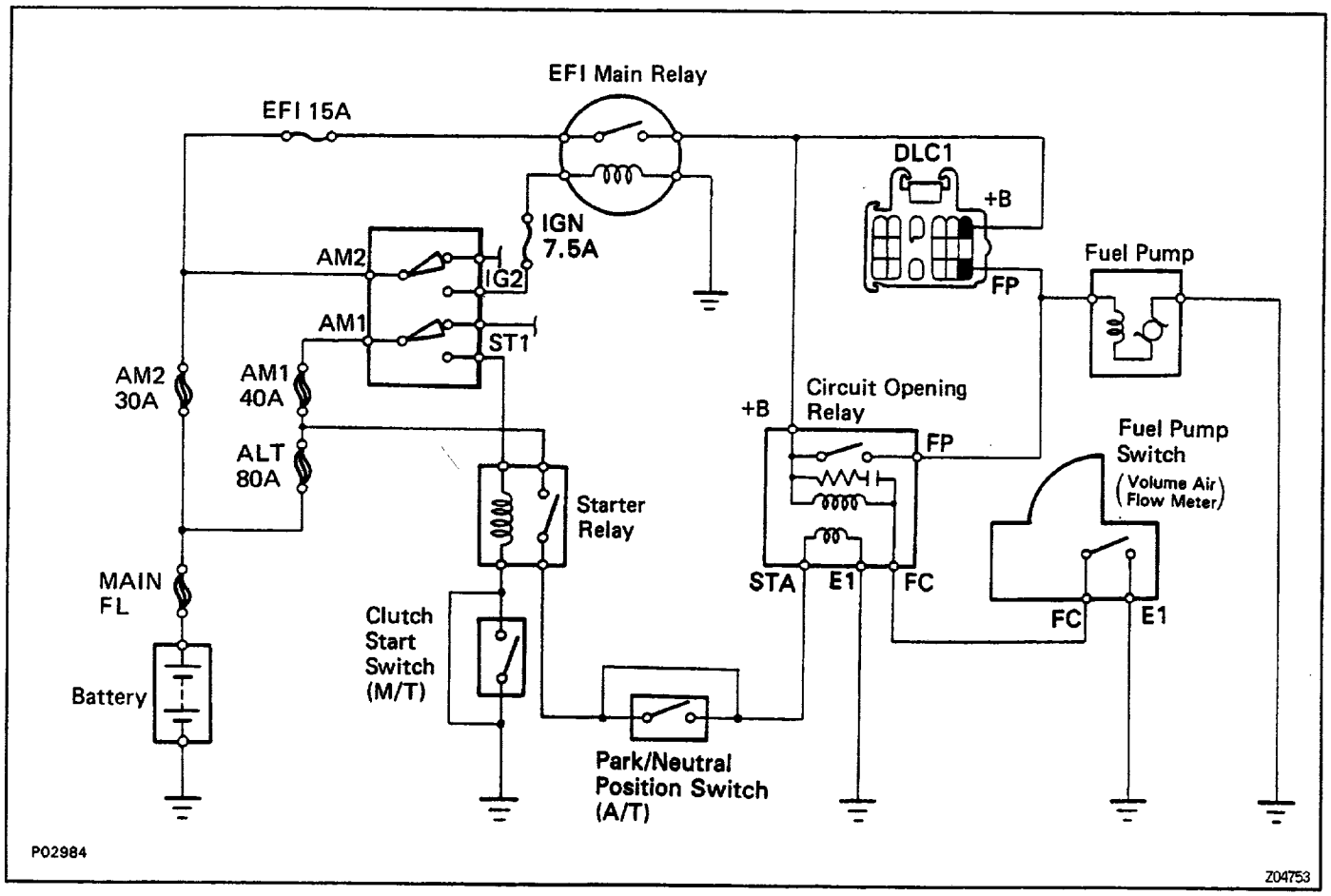
Repair or replace.

V02206

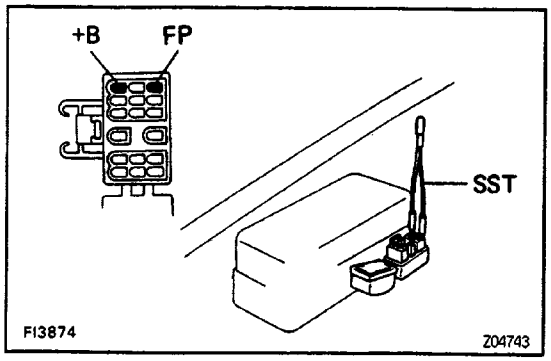
FUEL PUMP

EG1GM–02

SYSTEM CIRCUIT



EG1TE–02



ON–VEHICLE INSPECTION

1. CHECK FUEL PUMP OPERATION

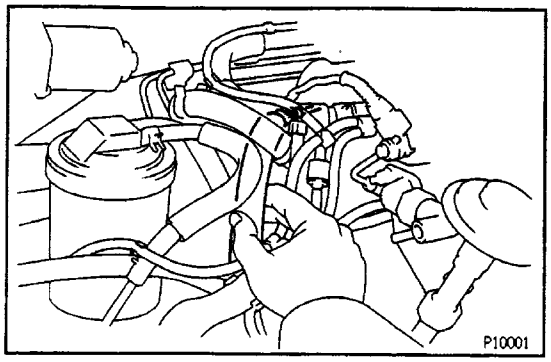
(a) Turn the ignition switch ON.

HINT: Do not start the engine.

(b) Using SST, connect terminals FP and +B of the DLC 1.

SST 09843–18020

HINT: The DLC1 is located near the No.2 relay block.

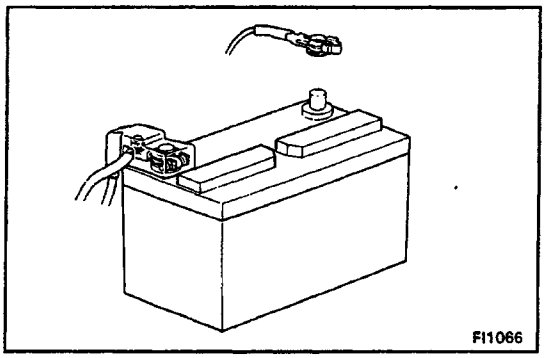


(c) Check that there is pressure in the fuel inlet hose.

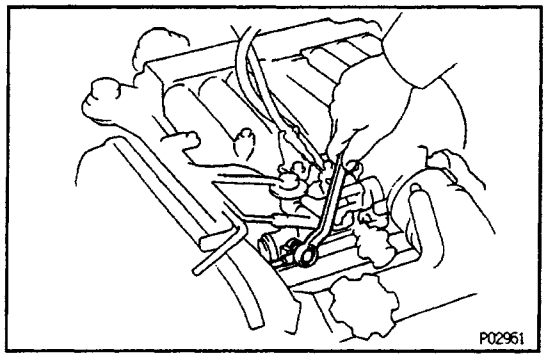
HINT: At this time, you will hear fuel return noise from the fuel return hose.

(d) Remove SST from the DLC1. ,
SST 09843–18020
(e) Turn the ignition switch OFF.
If there is no pressure, check the following parts:
- Fusible link
- Fuses (EFI 15A, IGN 7.5A)
- EFI main relay
- Circuit opening relay
- Fuel pump
- Wiring connections

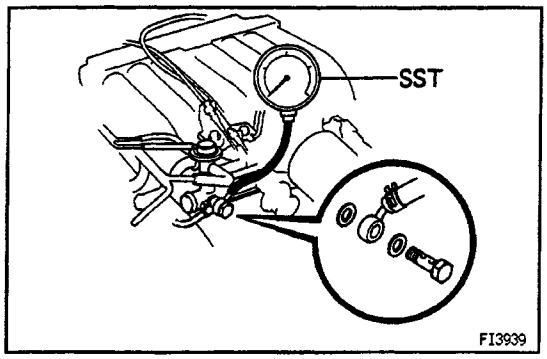
2. CHECK FUEL PRESSURE



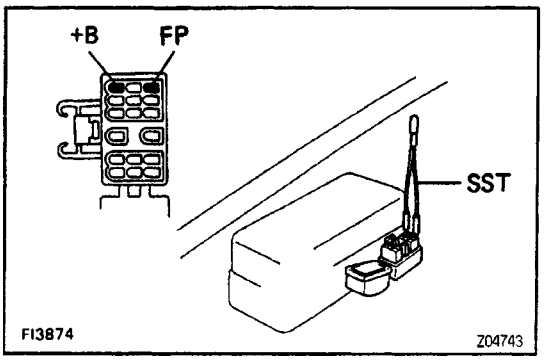
(a) Check that the battery voltage is above 12V.
(b) Disconnect the negative terminal of the battery.



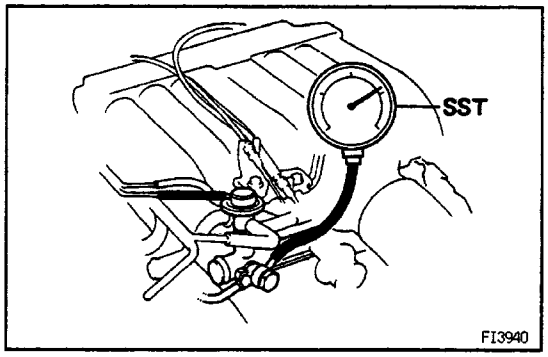
(c) Place a suitable container or shop towel under the LH delivery pipe.
(d) Slowly loosen the union bolt of the No.3 fuel pipe and remove the union bolt and two gaskets from the delivery pipe.
(e) Drain fuel in the LH delivery pipe.



(f) Install the No.3 fuel pipe and SST (pressure gauge) to the LH delivery pipe with three new gaskets and SST (union bolt) as shown in the illustration.
SST 09268–45012
Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)
(g) Wipe off any splattered gasoline.
(h) Reconnect the battery negative terminal.



(i) Using SST, connect terminals FP and +B of the DLC 1.
SST 09843–18020
(j) Turn the ignition switch ON.



(k) Measure the fuel pressure.

Fuel pressure:

265 – 304 kPa (2.7 – 3.1 kgf/cm^2, 38 – 44 psi)

If pressure is high, replace the fuel pressure regulator.

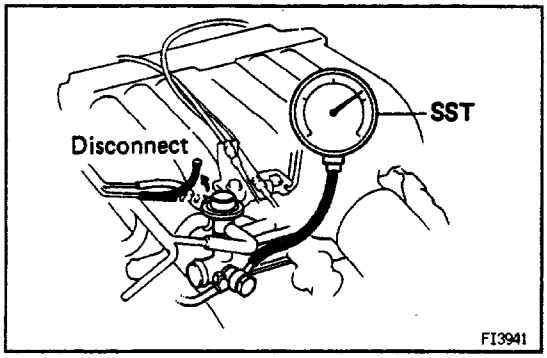
If pressure is low, check the following parts:

- Fuel hoses and connections
- Fuel pump
- Fuel filter
- Fuel pressure regulator

(l) Remove SST from the DLC 1.

SST 09843–18020

(m) Start the engine.

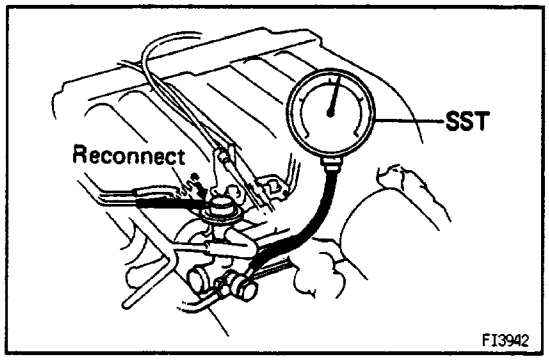


(n) Disconnect the vacuum hose from the fuel pressure regulator and plug it closed.

(o) Measure the fuel pressure at idling.

Fuel pressure:

265 – 304 kPa (2.7 – 3.1 kgf/cm^2, 38 – 44 psi)



(p) Reconnect the vacuum hose to the fuel pressure regulator.

(q) Measure the fuel pressure at idling.

Fuel pressure:

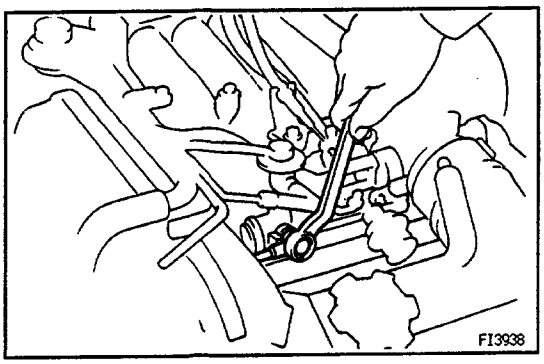
226 – 255 kPa (2.3 – 2.6 kgf/cm^2, 33 – 37 psi)

If not within the specified pressure, check the vacuum hose and fuel pressure regulator.

(r) Stop the engine. Check that the fuel pressure remains above 147 kPa (1.5 kgf/cm^2, 21 psi) for 5 minutes after the engine is turned oft.

If not within specification, check the fuel pump, fuel pressure regulator and/or injectors.

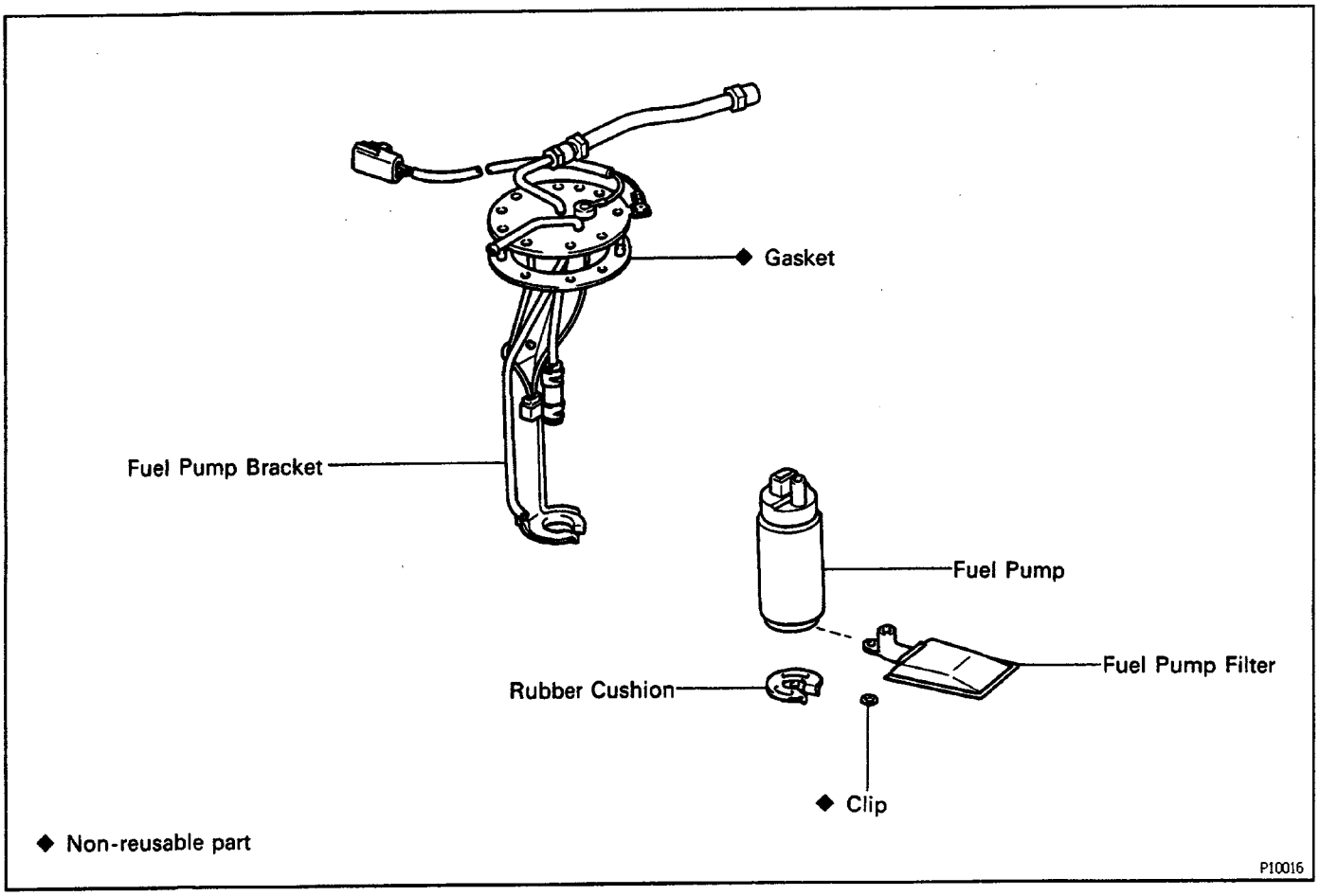
(s) After checking fuel pressure, disconnect the battery negative terminal and carefully remove the SST to prevent gasoline from splashing.



(t) Using two new gaskets, reconnect the No.3 fuel pipe to the delivery pipe.
Torque: 34 N–m (350 kgf–cm. 25 ft–lbf)
(u) Reconnect the battery negative terminal.
(v) Start the engine and check for fuel leakage.

COMPONENTS FOR REMOVAL AND INSTALLATION

EG1TF–01



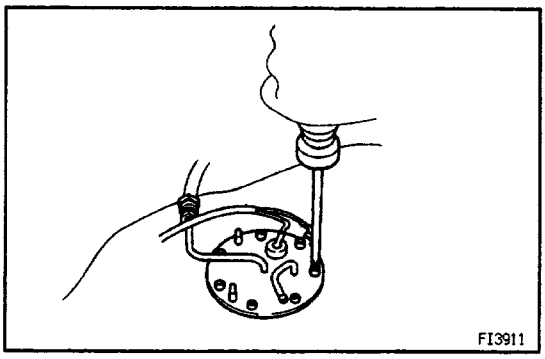
FUEL PUMP REMOVAL

EG1GP–02

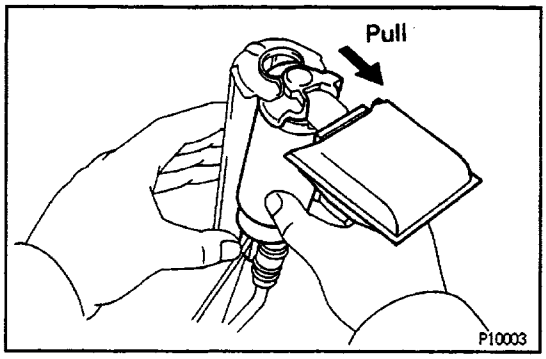
1. DRAIN FUEL FROM FUEL TANK

CAUTION: Do not smoke or work near an open flame when working on the fuel pump.

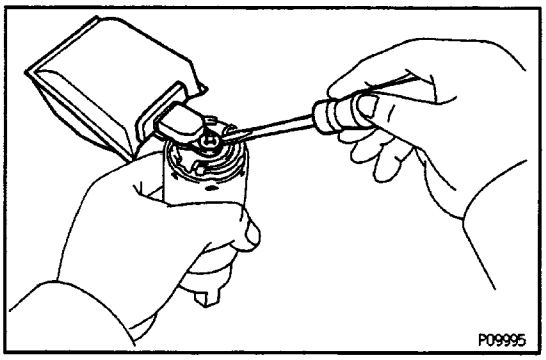
2. REMOVE FUEL TANK



3. REMOVE FUEL PUMP BRACKET
(a) Remove the seven bolts.
(b) Pull out the fuel pump bracket.



4. REMOVE FUEL PUMP FROM FUEL PUMP BRACKET
(a) Pull off the lower side of the fuel pump from the pump bracket.
(b) Disconnect the fuel pump connector.
(c) Disconnect the fuel hose from the fuel pump, and remove the fuel pump.
(d) Remove the rubber cushion from the fuel pump.

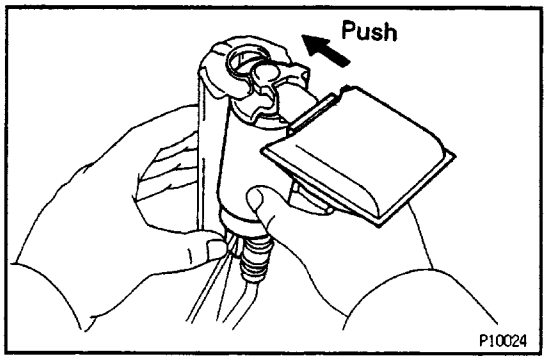


5. REMOVE FUEL PUMP FILTER FROM FUEL PUMP
(a) Using a small screwdriver, remove the clip.
(b) Pull out the pump filter.

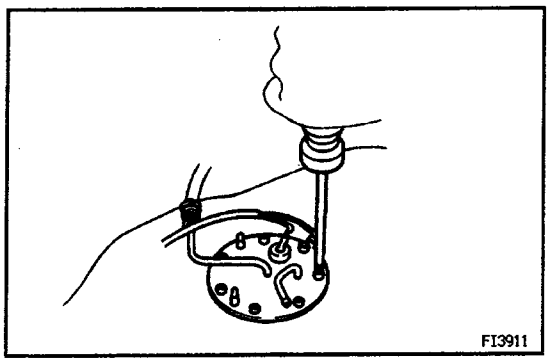
FUEL PUMP INSTALLATION

(See Components for Removal and Installation)

1. INSTALL FUEL PUMP FILTER TO FUEL PUMP
Install the pump filter with a new clip.



2. INSTALL FUEL PUMP TO FUEL PUMP BRACKET
(a) Install the rubber cushion to the fuel–pump.
(b) Connect the fuel hose to the outlet port of the fuel pump.
(c) Install the fuel pump connector.
(d) Install the fuel pump by pushing the lower side of the fuel pump.



3. INSTALL FUEL PUMP BRACKET

(a) Place the bracket with a new gasket on the fuel tank.

(b) Install and tighten the seven bolts.

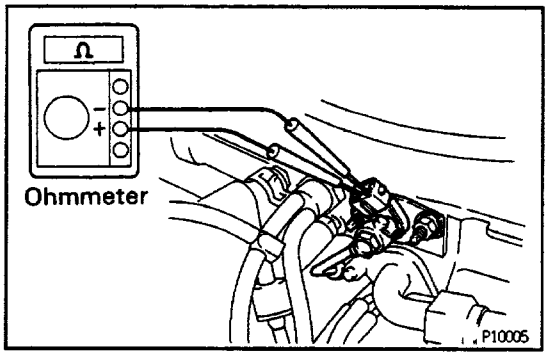
Torque: 3.9 N–m (40 kgf–cm, 34 in.–lbf)

4. INSTALL FUEL TANK

NOTICE:

- **Tighten the pipe and flare nut type hose to the specified torque.**
- **Push in the pipe and insert–type hose to the specified position, and install the clip to the specified location.**
- **If reusing the hose, reinstall the clip at the original location.**

5. REFILL WITH FUEL



COLD START INJECTOR

EG1GR–03

ON–VEHICLE INSPECTION

INSPECT RESISTANCE OF COLD START INJECTOR

(a) Disconnect the cold start injector connector.

(b) Using an ohmmeter, check the resistance of the injector.

Resistance:

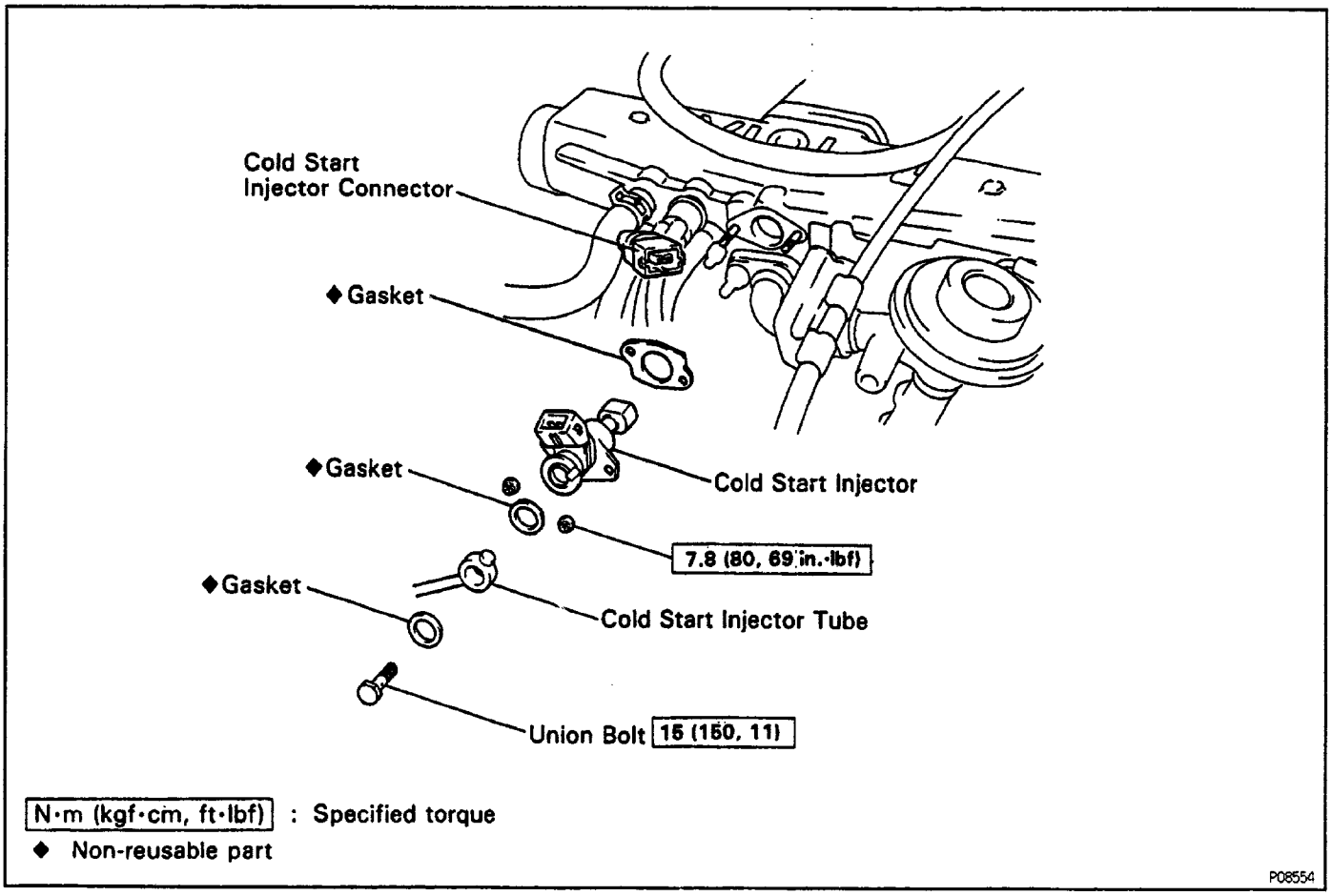
2–4

If the resistance is not as specified, replace the cold start injector.

(c) Connect the cold start injector connector.

EG1TH–01

COMPONENTS FOR REMOVAL AND INSTALLATION



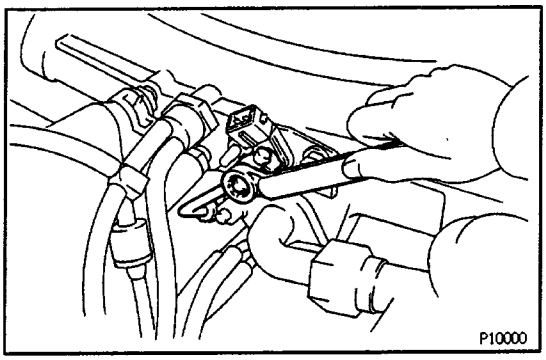
COLD START INJECTOR REMOVAL

EG1TJ–02

(See Components for Removal and Installation)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DISCONNECT COLD START INJECTOR CONNECTOR

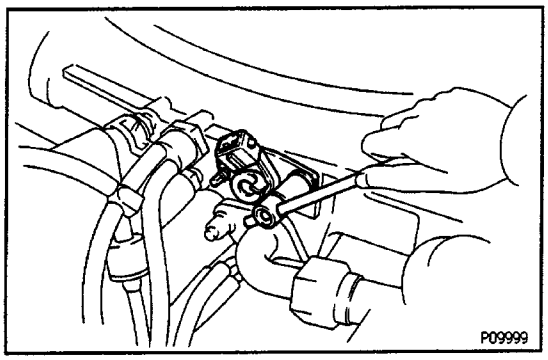


3. REMOVE COLD START INJECTOR

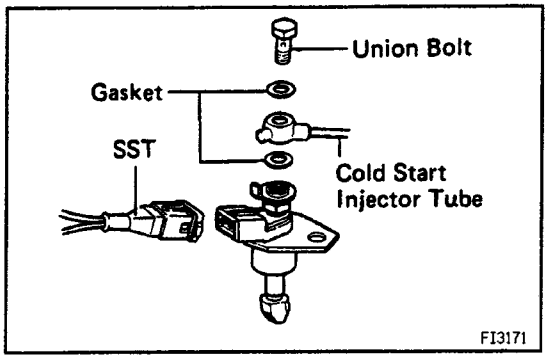
(a) Put a suitable container or shop towel under the cold start injector tube.

(b) Remove the union bolt and two gaskets, and disconnect the cold start injector tube.

HINT: Slowly loosen the union bolt.



(c) Remove the two nuts and cold start injector with the gasket.



COLD START INJECTOR INSPECTION

EG1GT–02

1. CHECK INJECTION OF COLD START INJECTOR

(a) Install cold start injector tube, two new gaskets and union bolt to the injector.

Torque: 15 N–m (150 kgf–cm. 11 ft–lbf)

(b) Connect the SST (wire) to the injector.

SST 09842–30050

CAUTION: Position the injector as far away from the battery as possible.

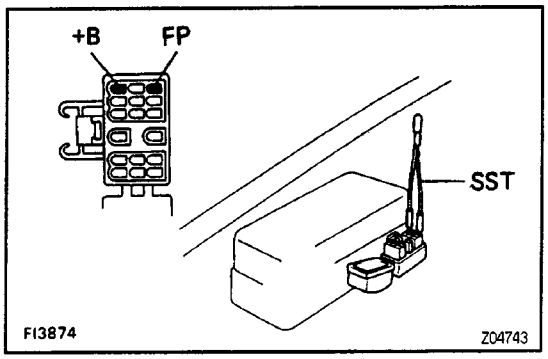
(c) Put a container under the injector.

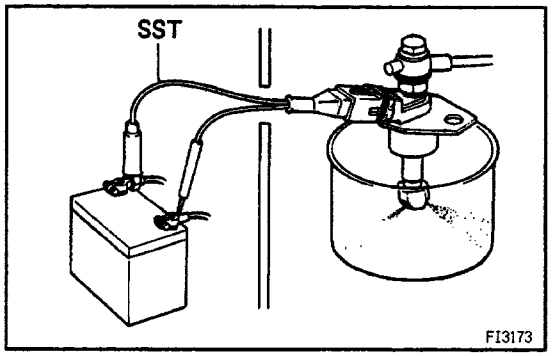
(d) Turn the ignition switch ON.

HINT: Do not start the engine.

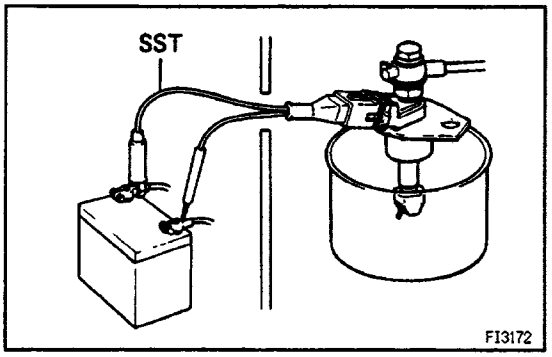
(e) Using SST, connect terminals FP and +B of the DLC 1.

SST 09843–18020





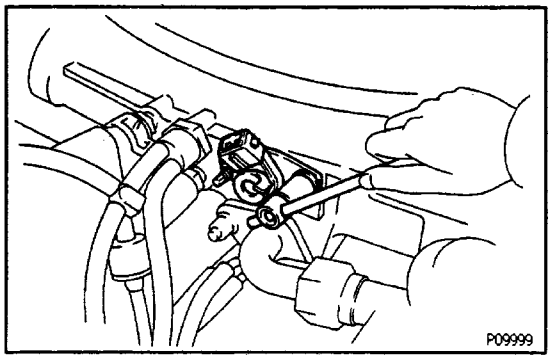
(f) Connect the test probes of the SST to the battery and check that the fuel injection is as shown.
SST 09842–30050
NOTICE: Perform this check within the shortest possible time.

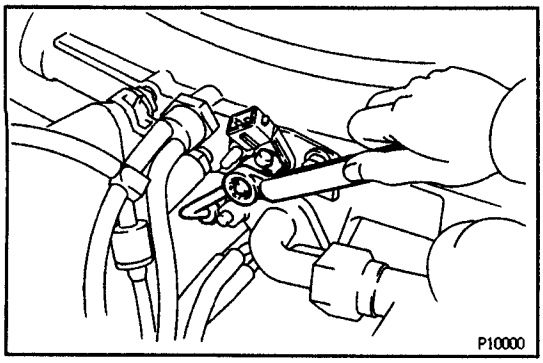


2. INSPECT LEAKAGE
(a) Disconnect the test probes of SST from the battery and check fuel leakage from the injector.
SST 09842–30050
Fuel drop:
One drop or less per minute
(b) After checking, remove SST and restore the following parts to their original positions.
- DLC1
- Ignition switch OFF
- Cold start injector
- Injector connector

COLD START INJECTOR INSTALLATION

(See Components for Removal and Installation)
1. INSTALL COLD START INJECTOR
(a) Apply sealant to 2 or 3 threads of the bolt end.
Sealant: Part No. 08833–00070, THREE BOND 1324 or equivalent
HINT: This adhesive will not harden while exposed to air.
It will act as a sealant or binding agent only when applied to threads, etc., where air is cut off.
(b) Place a new gasket and install the cold start injector with the two nuts.
Torque: 7.8 N–m (80 kgf–cm, 69 in.–lbf)





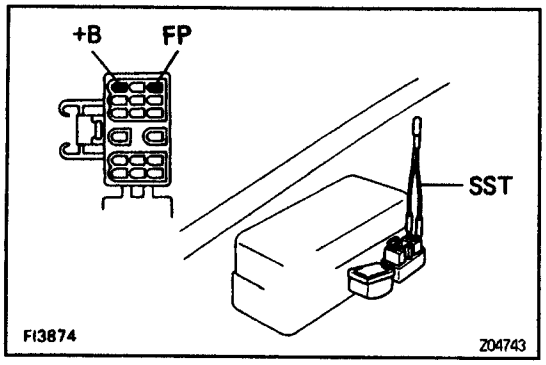
2. INSTALL COLD START INJECTOR TUBE

Using new gaskets, connect the cold start injector tube with the union bolts.

Torque: 15 N–m (150 kgf–cm, 11 ft–lbf)

3. CONNECT COLD START INJECTOR CONNECTOR

4. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY



5. CHECK FOR FUEL LEAKAGE

(a) With the ignition switch ON, use SST to connect terminals FP and +B of the DLC1.
SST 09843–18020

(b) Check for fuel leakage.

(c) Remove SST from the DLC1.

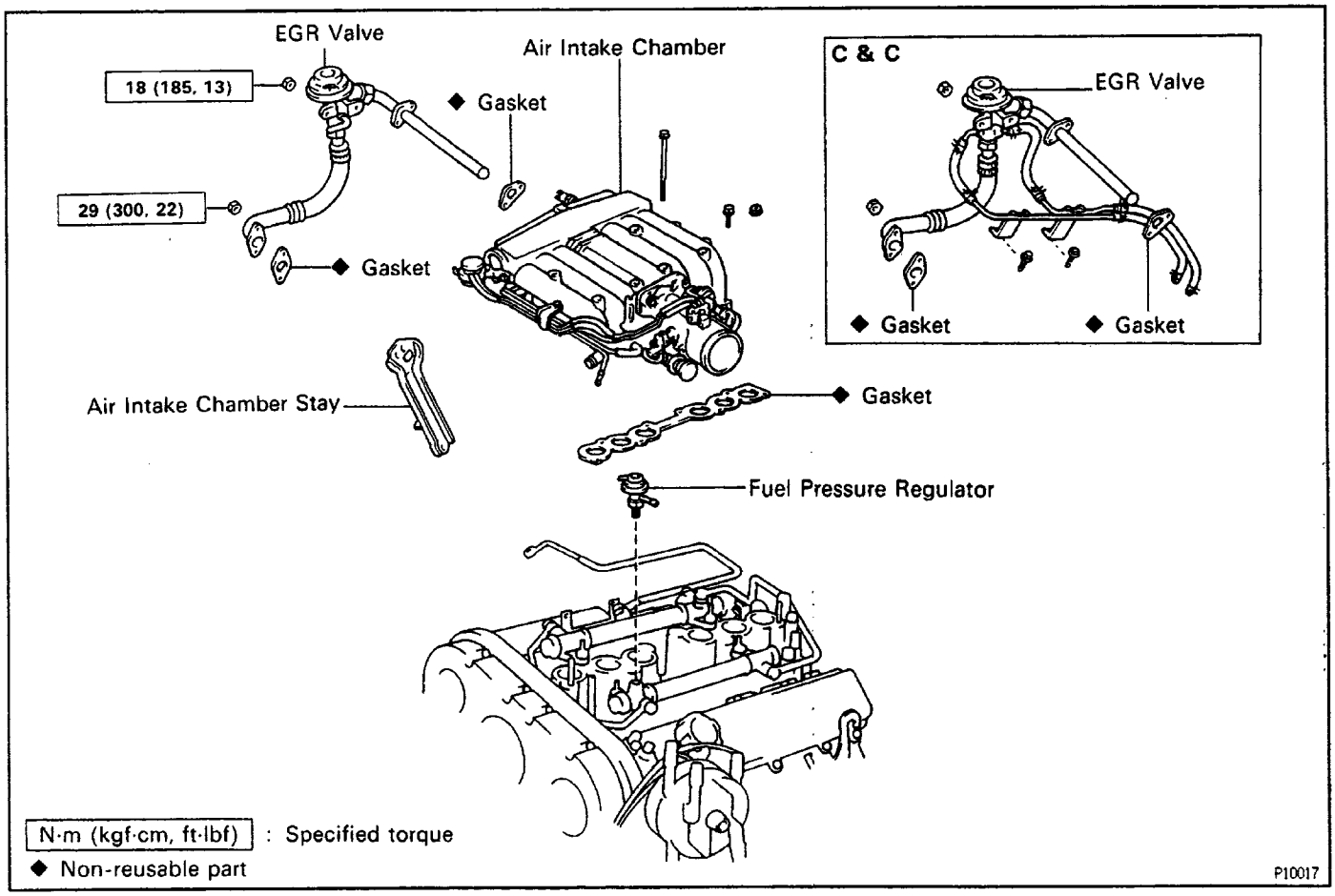
FUEL PRESSURE REGULATOR EG1TL–01

ON–VEHICLE INSPECTION

CHECK FUEL–PRESSURE

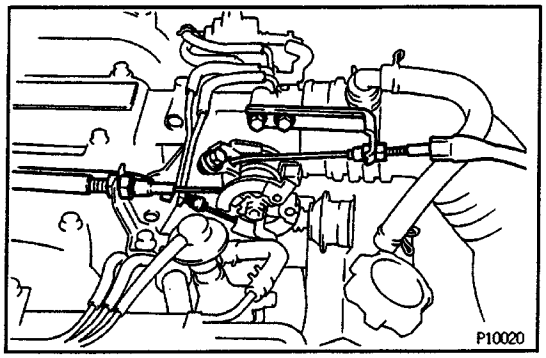
(See step 2 on page EG2–203)

COMPONENTS FOR REMOVAL AND INSTALLATION EG1TM–01



FUEL PRESSURE REGULATOR REMOVAL

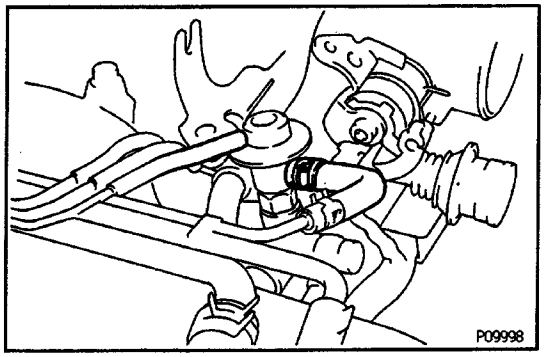
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. DRAIN ENGINE COOLANT



3. DISCONNECT FOLLOWING CABLES:

(a) (w/ Cruise control)
Actuator cable with bracket
(b) Accelerator cable
(c) (A/T)
Throttle cable

4. DISCONNECT AIR CLEANER HOSE



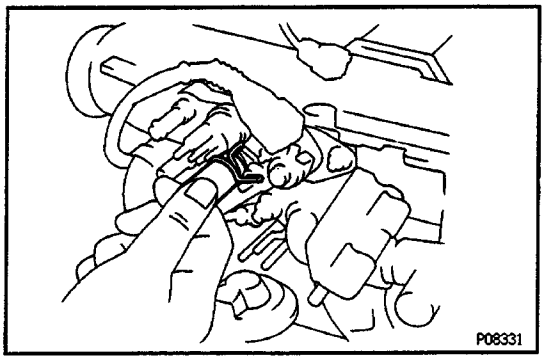
5. DISCONNECT VACUUM SENSING HOSE

6. DISCONNECT FUEL RETURN HOSE

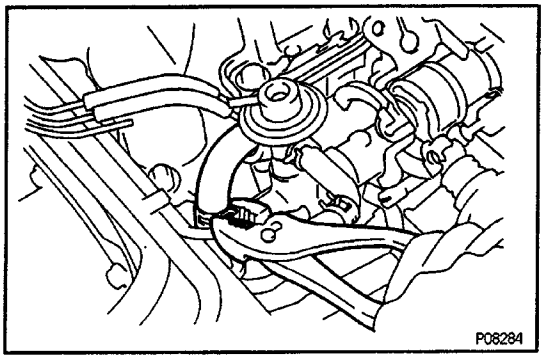
(a) Place a suitable container or shop towel under the fuel pressure regulator.
(b) Disconnect the fuel return hose from the fuel pressure regulator.

7. REMOVE AIR INTAKE CHAMBER

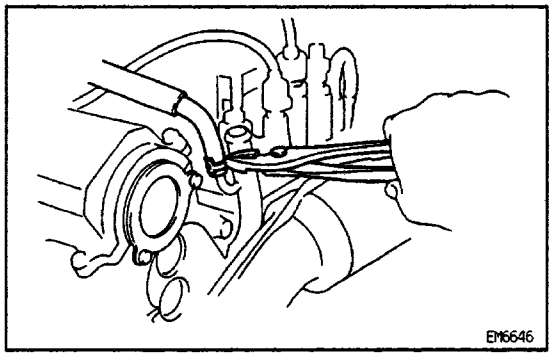
(a) Disconnect the throttle position sensor connector.
(b) Disconnect the canister vacuum hose from the throttle body.



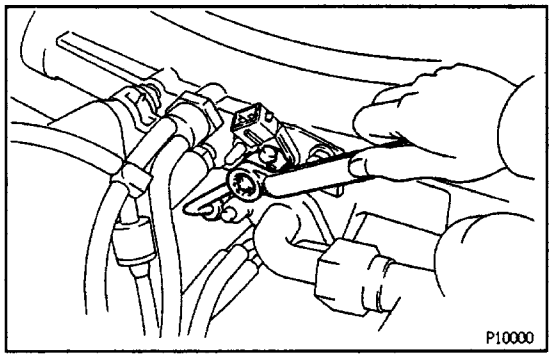
(c) Disconnect the PCV hose from the union.



(d) Disconnect the No.4 water by–pass hose from the union of the intake manifold.

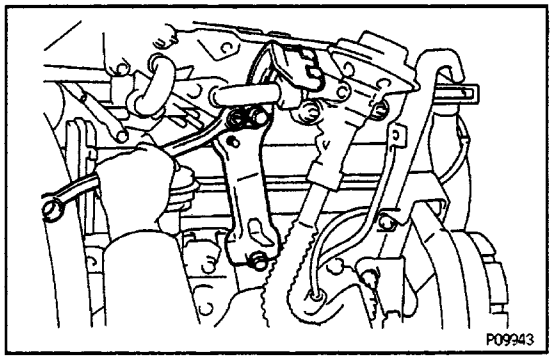


(e) Disconnect the No.5 water by–pass hose from the water by–pass pipe.

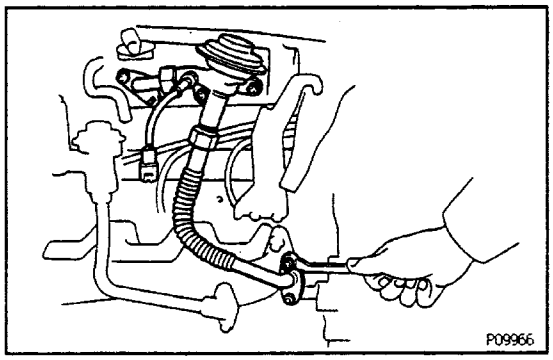


(f) Disconnect the cold start injector connector.
(g) Remove the union bolt, two gaskets and cold start injector tube.

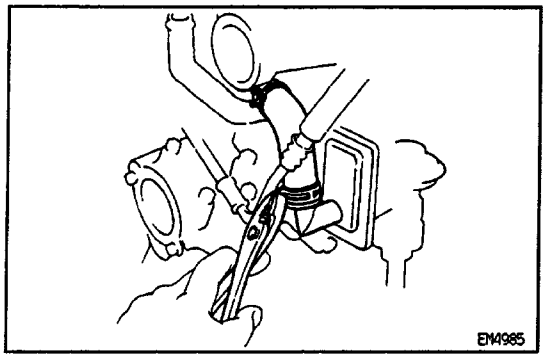
(h) Disconnect the vacuum hose from the gas filter.
(i) (California and C & C)
Disconnect the EGR gas temp. sensor connector.
(j) Disconnect the EGR vacuum hoses from the air pipe and EGR vacuum modulator.



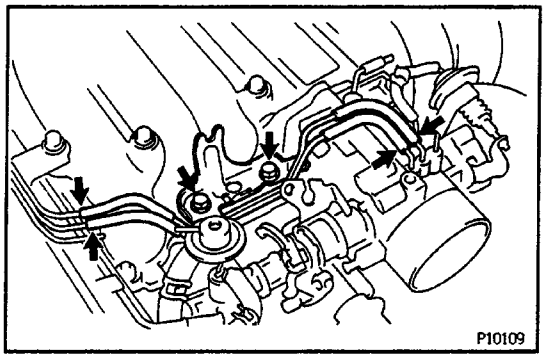
(k) Remove the nut, two bolts, intake chamber stay and throttle cable bracket.



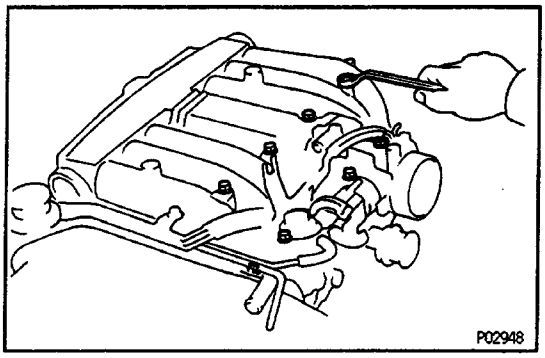
(l) (C & C only)
Disconnect the two water by–pass hoses from the EGR valve.
(m) Remove the five nuts, EGR valve with the pipes and two gaskets.



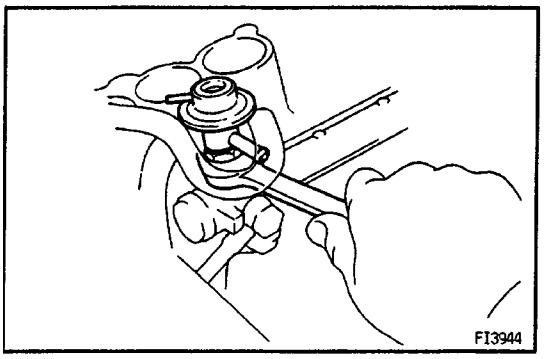
(n) Disconnect the No.1 air hose from the PAIR reed valve.



(o) Disconnect the four vacuum hoses from the air pipes.
(p) Remove the two bolts and accelerator cable bracket.

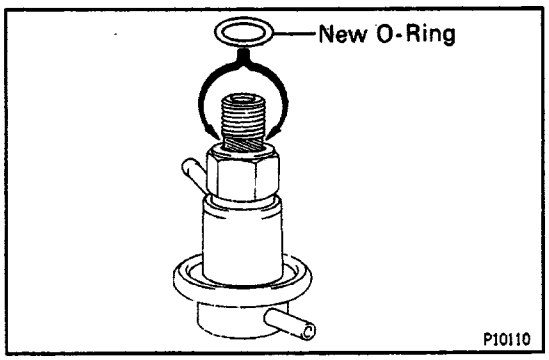


(q) Remove the six bolts, two nuts, intake chamber and gasket.



8. REMOVE FUEL PRESSURE REGULATOR

Loosen the lock nut, and remove the fuel pressure regulator.



FUEL PRESSURE REGULATOR INSTALLATION

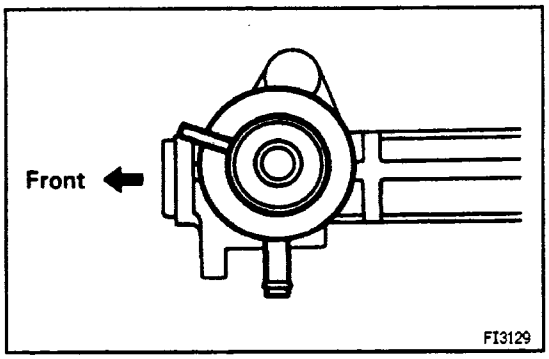
(See Components for Removal and Installation)

1. INSTALL FUEL PRESSURE REGULATOR

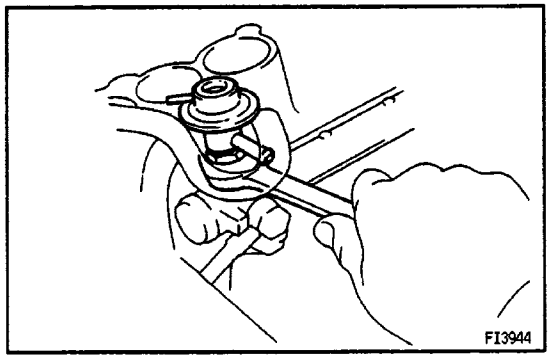
(a) Fully loosen the lock nut of the fuel pressure regula–tor.

(b) Apply a light coat of gasoline to a new 0–ring and install it to the fuel pressure regulator.

(c) Thrust the fuel pressure regulator completely into the delivery pipe by hand.

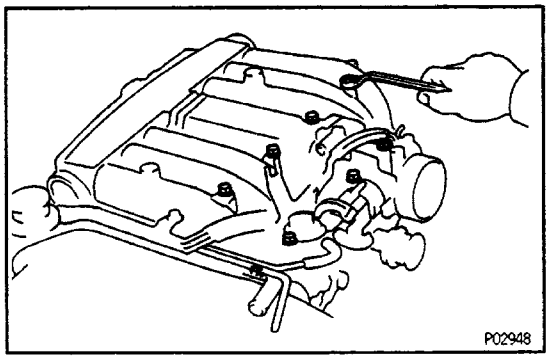


(d) Turn the fuel pressure regulator counterclockwise until the outlet faces in the direction indicated in the illustration.



(e) Torque the lock nut.

Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)

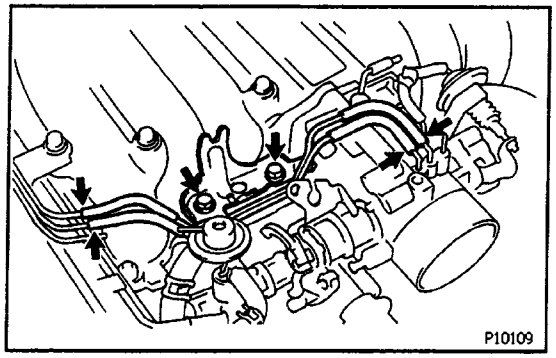


2. INSTALL AIR INTAKE CHAMBER

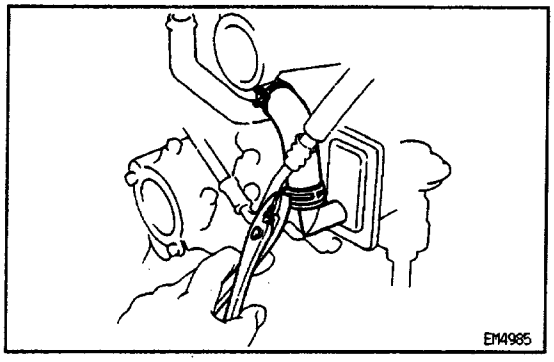
(a) Position a new gasket on the intake manifold.

(b) Install the intake chamber with the six bolts and two nuts.

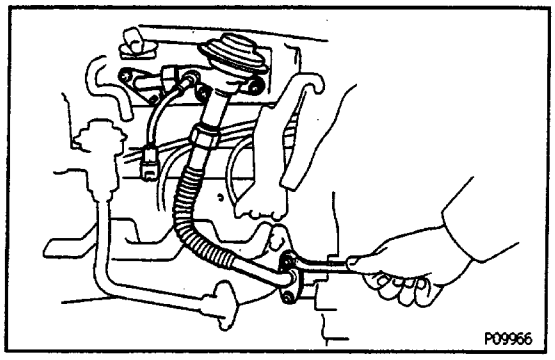
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



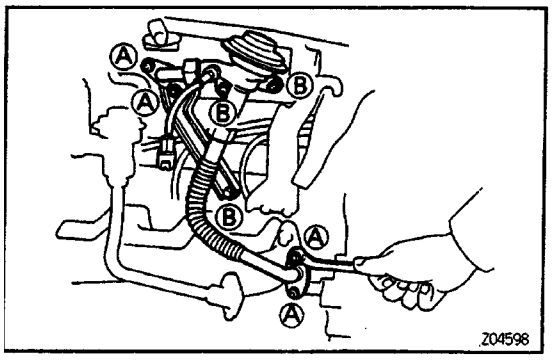
(c) Install the accelerator cable bracket with the two bolts.
(d) Connect the four vacuum hoses to the air pipes.



(e) Connect the No. 1 air hose to the reed valve.

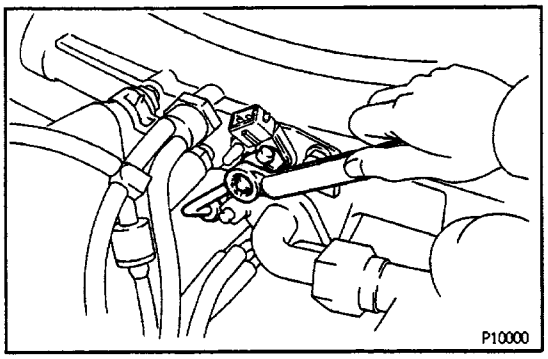


(f) Position two new gaskets to the intake chamber and RH exhaust manifold.
(g) Install the EGR valve with the pipes to the intake chamber and RH exhaust manifold.
(h) (C & C only)
Connect the two water by–pass hoses to the EGR valve.

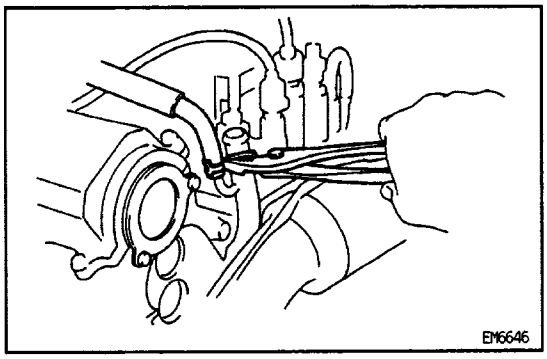


(i) Install the air intake chamber stay and throttle cable bracket. Install and torque the six nuts and two bolts.
Torque:
(A) 29 N–m (300 kgf–cm, 22 ft–lbf)
(B) 18 N–m (185 kgf–cm, 13 ft–lbf)

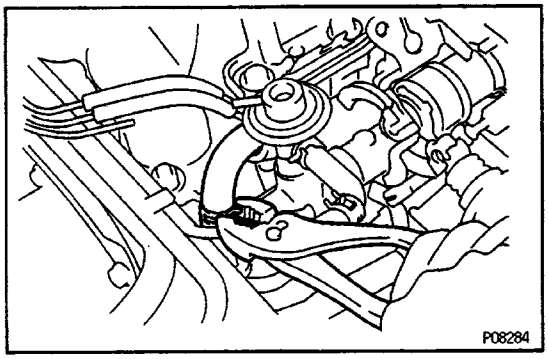
(j) Connect the EGR hoses to the air pipe and EGR vacuum modulator.
(k) (California and C & C)
Connect the EGR gas temp. sensor connector.
(l) Connect the vacuum hose to the gas filter.



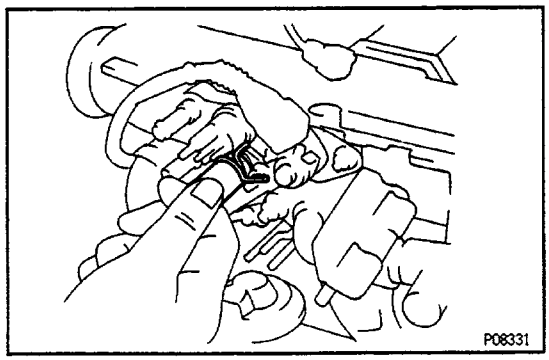
(m) Connect the cold start injector tube with new a gasket and the union bolt.
Torque: 15 N–m (150 kgf–cm, 13 ft–lbf)
(n) Connect the cold start injector connector.



(o) install the No.5 Water by–pass hose to the water by –pass pipe.

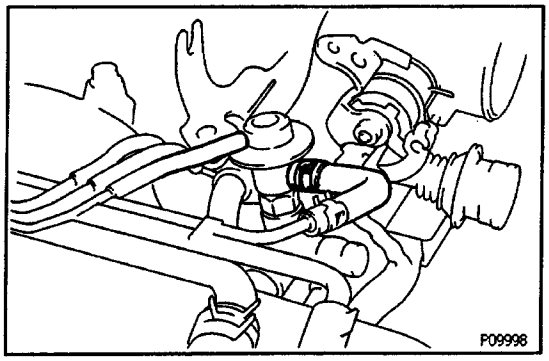


(p) Connect the No.4 water by–pass hose to the union of the intake manifold.

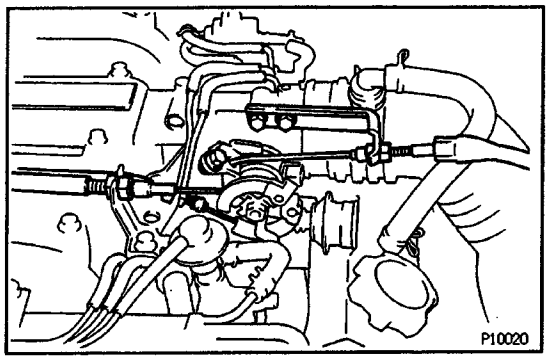


(q) Connect the PCV hose to the union.

(r) Connect the canister vacuum hose to the throttle body.
(s) Connect the throttle position sensor connector.

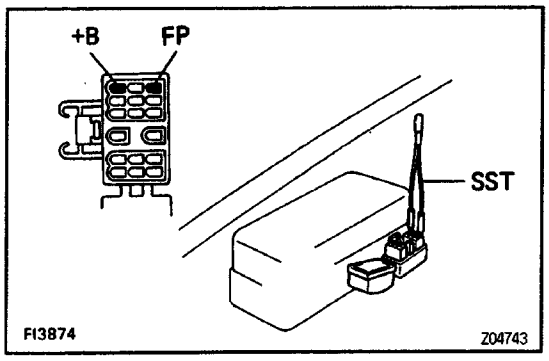


3. CONNECT FUEL RETURN HOSE
4. CONNECT VACUUM SENSING HOSE
5. CONNECT AIR CLEANER HOSE



6. CONNECT FOLLOWING CABLES:
(a) (A/T)
Throttle cable
(b) Accelerator cable
(c) (w/ Cruise control)
Actuator cable with bracket

7. REFILL WITH ENGINE COOLANT
8. CONNECT CABLE TO NEGATIVE TERMINAL CF BATTERY

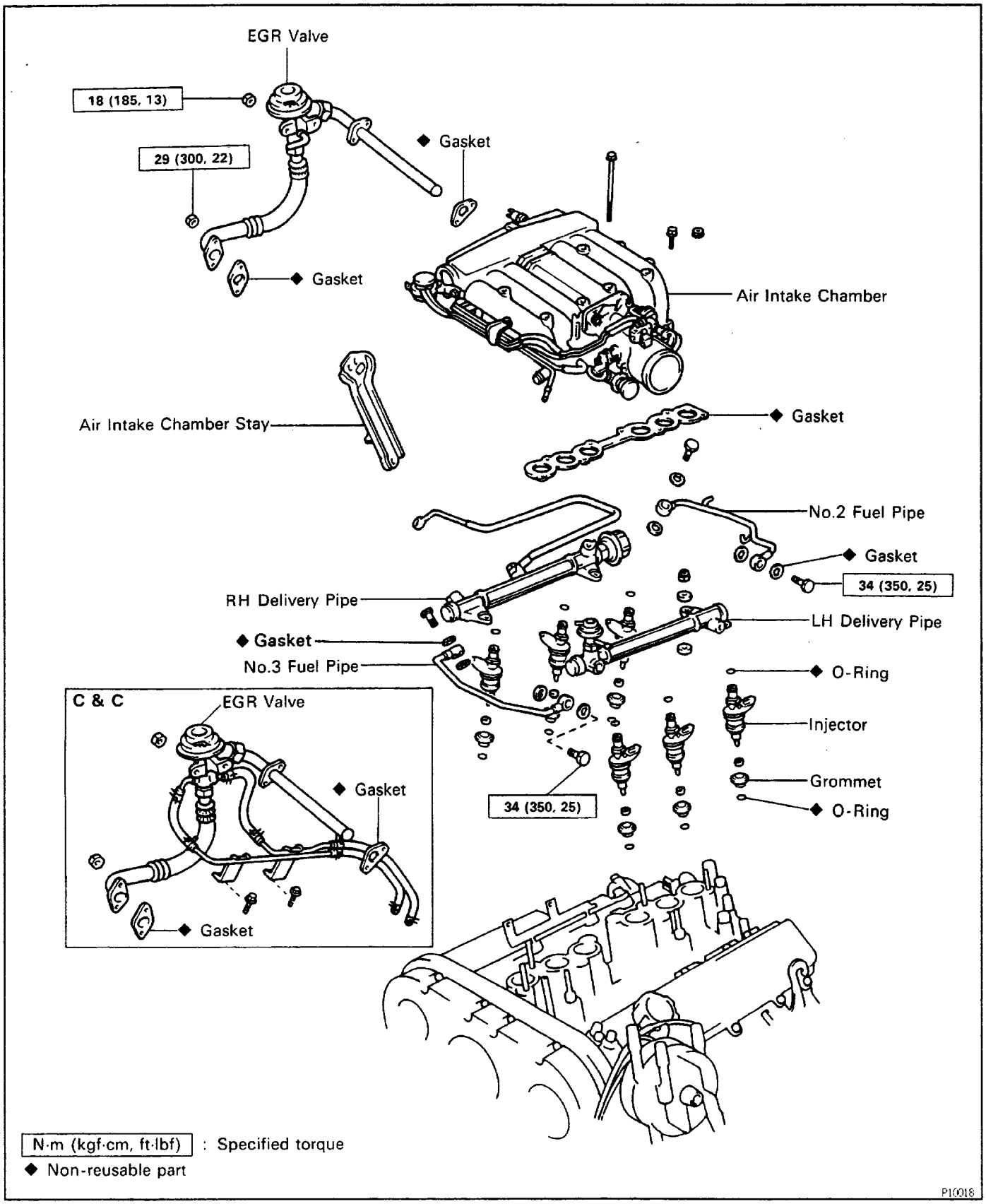


9. CHECK FOR FUEL LEAKAGE
(a) With the ignition switch ON, use SST to connect terminals FP and +B of the DLC1.
SST 09843–18020
(b) Check for fuel leakage.
(c) Remove SST from the DLC1.

INJECTOR

EG1TQ–01

COMPONENTS FOR REMOVAL AND INSTALLATION



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

P10018

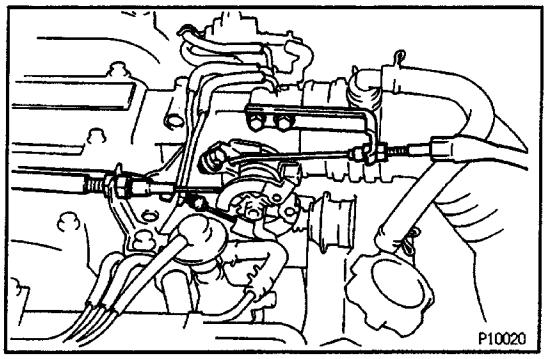
EG306–01

INJECTORS REMOVAL

(See Components for Removal and Installation)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DRAIN ENGINE COOLANT



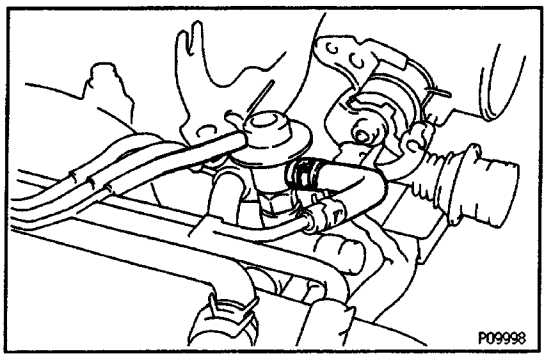
3. DISCONNECT FOLLOWING CABLES:

(a) (w/ Cruise control)
Actuator cable with bracket

(b) Accelerator cable

(c) (A/T)
Throttle cable

4. DISCONNECT AIR CLEANER HOSE



5. DISCONNECT VACUUM SENSING HOSE

6. DISCONNECT FUEL RETURN HOSE

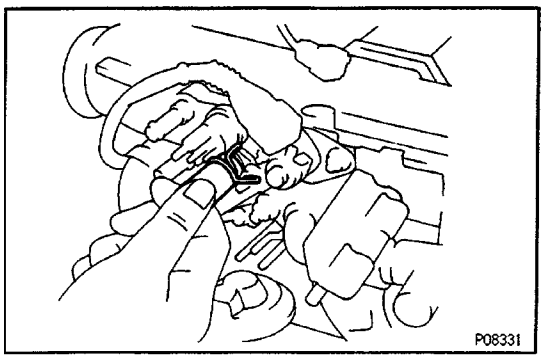
(a) Place a suitable container or shop towel under the fuel pressure regulator.

(b) Disconnect the fuel return hose from the fuel pressure regulator.

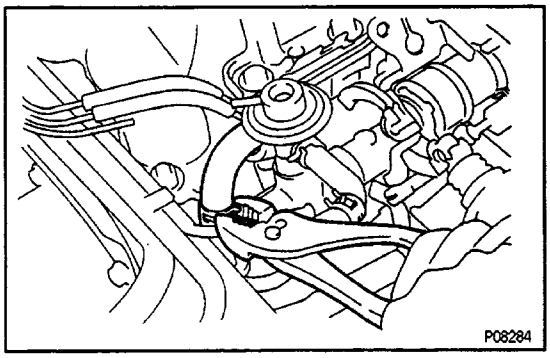
7. REMOVE AIR INTAKE CHAMBER

(a) Disconnect the throttle position sensor connector.

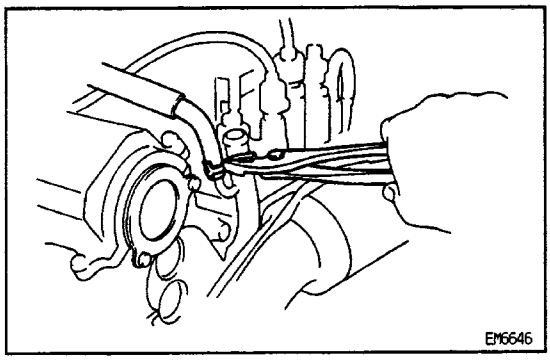
(b) Disconnect the canister vacuum hose from the throttle body.



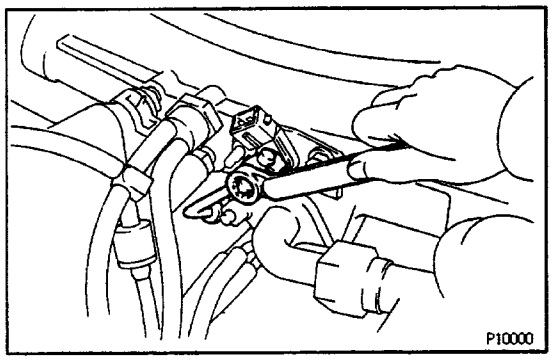
(c) Disconnect the PCV hose from the union.



(d) Disconnect the No.4 water by–pass hose from the union of the intake manifold.

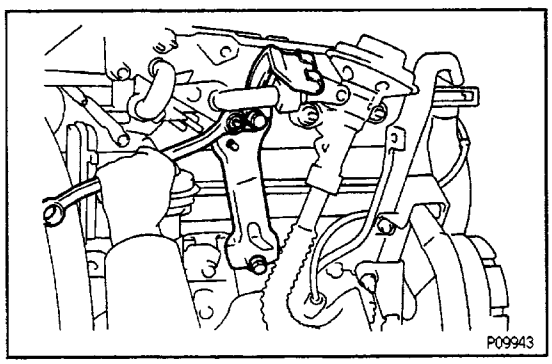


(e) Disconnect the No.5 water by–pass hose from the water by–pass pipe.

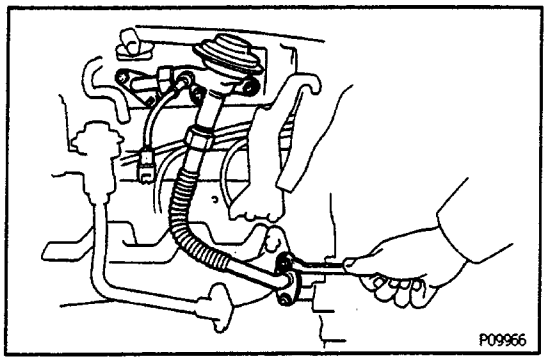


(f) Disconnect the cold start injector connector.
(g) Disconnect the vacuum hose from the gas filter.
(h) Remove the union bolt, two gaskets and cold start injector tube.

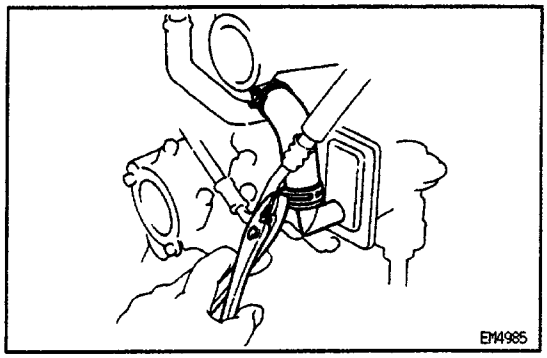
(i) (California and C & C)
Disconnect the EGR gas temp. sensor connector.
(j) Disconnect the EGR vacuum hoses from the air pipe and EGR vacuum modulator.



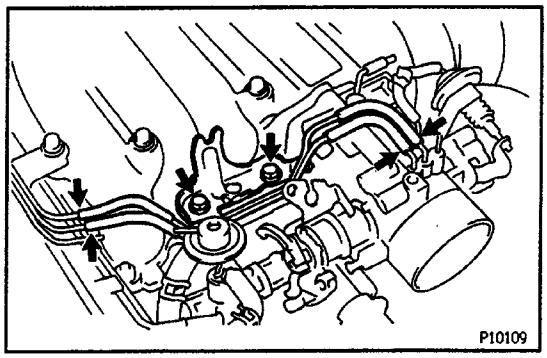
(k) Remove the nut, two bolts, intake chamber stay and throttle cable bracket.



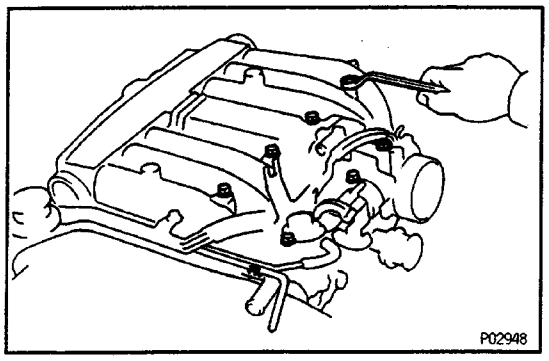
(l) (C & C only)
Disconnect the two water by–pass hoses from the EGR valve.
(m) Remove the five nuts, EGR valve with the pipes and two gaskets.



(n) Disconnect the No.1 air hose from the PAIR reed valve.



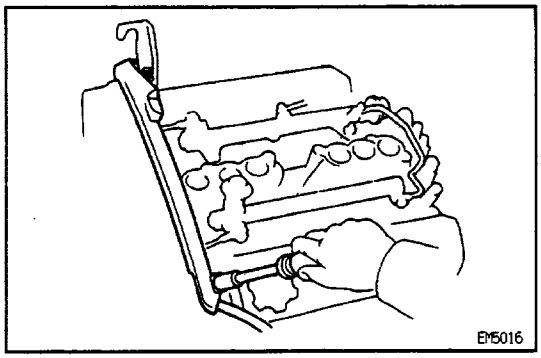
(o) Disconnect the four vacuum hoses from air pipes.
(p) Remove the two bolts and accelerator cable bracket.



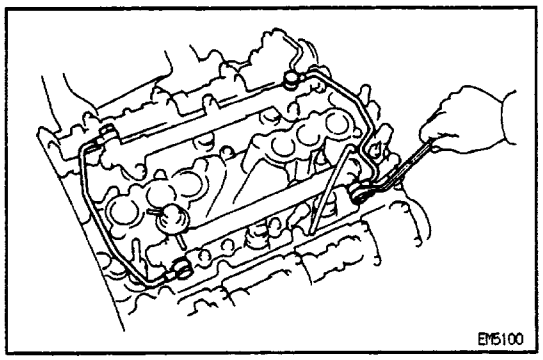
(q) Remove the six bolts, two nuts, intake chamber and gasket.

8. REMOVE ENGINE WIRE

(a) Disconnect–the following connectors:
- Knock sensor connector
- Cold start injector time switch connector
- Engine coolant temp. sensor connector
- Engine coolant temp. sender gauge connector
- RH ground strap from No.3 camshaft bearing cap
- Injector connectors

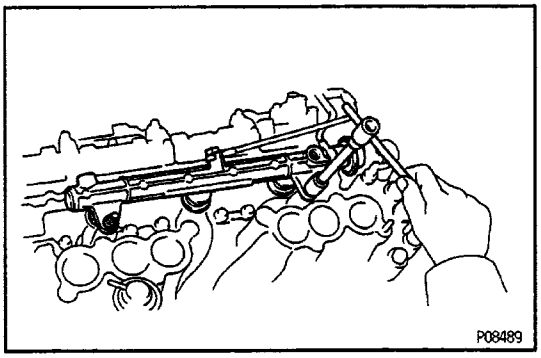


(b) Remove two bolts and engine wire.



9. REMOVE NO.2 AND NO.3 FUEL PIPES

Remove the four union bolts, No.2, No.3 fuel pipes and eight gaskets.



10. REMOVE DELIVERY PIPES AND INJECTORS

(a) Remove the four nuts holding the delivery pipes to the intake manifold.

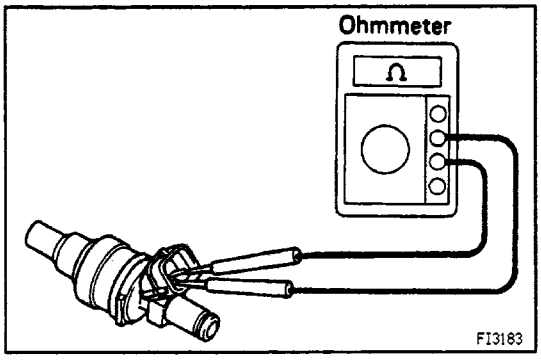
(b) Remove the the two delivery pipes and six injectors assemblies.

NOTICE: Be careful not to drop the injectors when rem–oving the delivery pipes.

(c) Remove the four insulators, ten spacers and four O–rings from the cylinder head.

(d) Pull out the six injectors from the delivery pipes.

(e) Remove the O–ring and grommet from each injector.



EG1T8–01

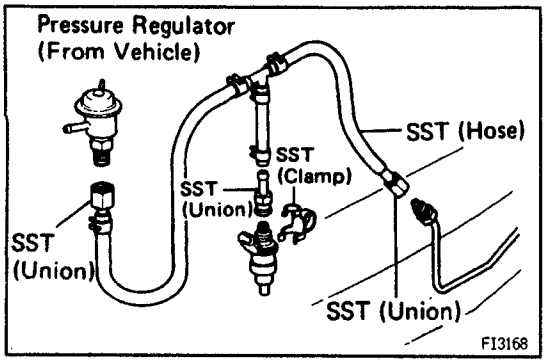
INJECTORS INSPECTION

1. MEASURE RESISTANCE OF INJECTOR

Using an ohmmeter, check the resistance of both terminals.

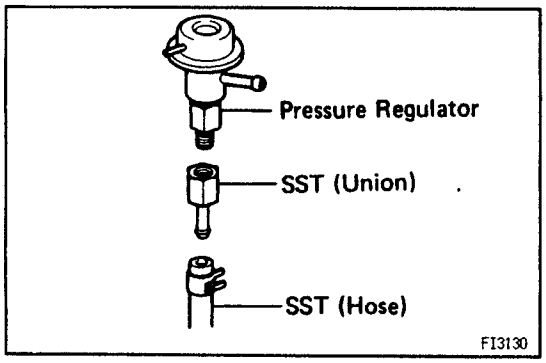
Resistance:

13.4–14.2 Ω

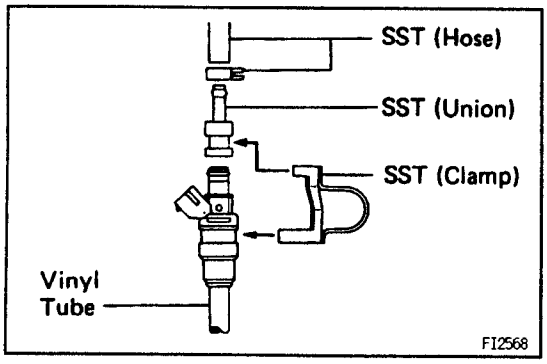


2. TEST INJECTION OF INJECTOR

CAUTION: Keep injectors clear of sparks during the test.

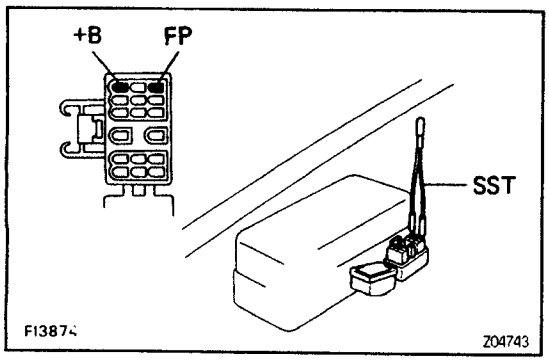


(a) Disconnect the No.1 fuel hose from the fuel tube.
(b) Connect SST (hose and union) to the fuel tube.
SST 09268–41045 (09268–52010)
(c) Remove the fuel pressure regulator.
(d) Connect SST (hose) to the fuel pressure regulator with SST (union).
SST 09268–41045 (09268–52010)

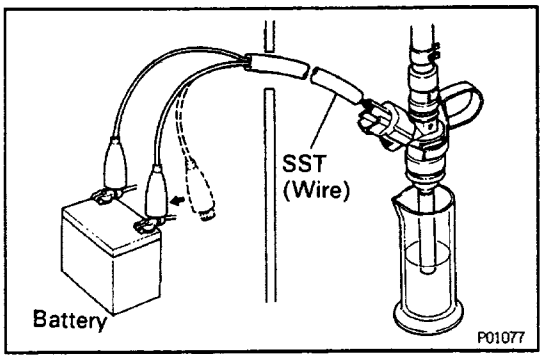


(e) Install SST (union) to the injector and hold the injector and union with SST (clamp).
SST 09268–41045
(f) Put the injector into the graduated cylinder.
HINT: Install a suitable vinyl tube onto the injector to prevent gasoline from splashing out.

(g) Connect the battery negative cable.
(h) Turn the ignition switch ON.
HINT: Do not start the engine.



(i) Using SST, connect terminals FP and +B of the DLC1.
SST 09843–18020
HINT: Fuel pump will operate.



(j) Connect SST (wire) to the injector and battery for 15 seconds and measure the injection volume with a graduated cylinder. Test each injector two or three times.
SST 09842–30070

Volume:
45 – 55 cm^3/15 sec. (2.7 – 3.4 cu in.)

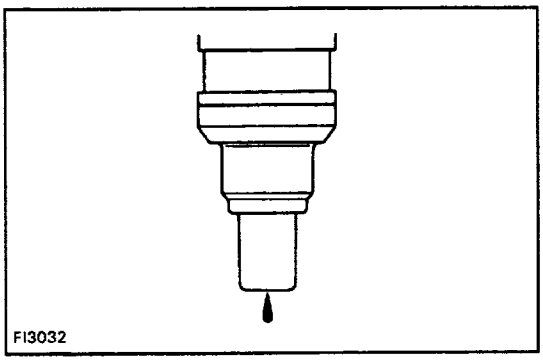
Difference between each injector:
6 cm^3 (0.4 cu in.) or less

If not within specified volume, replace the injector.

3. CHECK LEAKAGE

(a) In the condition above, disconnect SST from the battery and check for fuel leakage from the injector nozzle.
SST 09842–30070

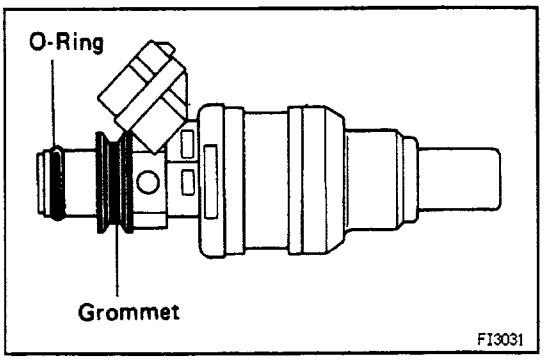
Fuel drop:
One drop or less per minute



(b) Disconnect the battery negative cable.
(c) Remove SST.
SST 09268–41045 and 09843–18020

INJECTORS INSTALLATION

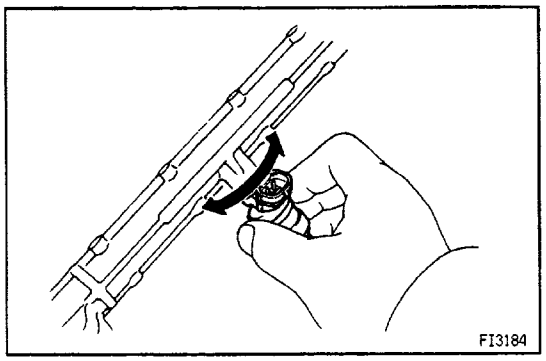
EG2O9–01



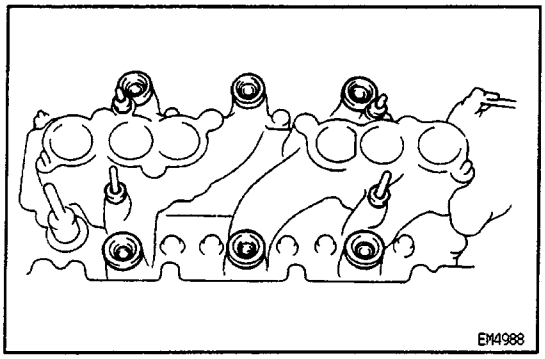
(See Components for Removal and Installation)

1. INSTALL INJECTORS AND DELIVERY PIPES

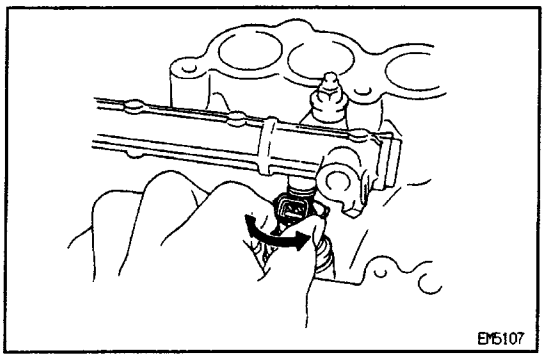
(a) Install a new grommet to the injector.
(b) Apply a light coat of gasoline to a new O–ring, and install it to the injector.



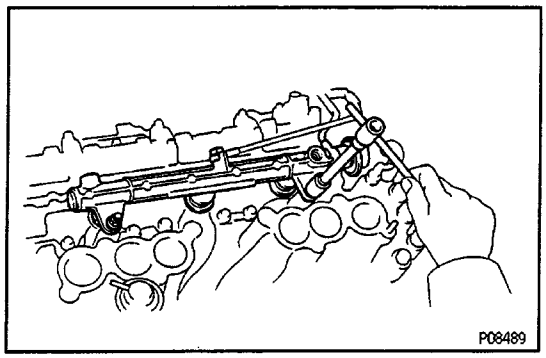
(c) While turning the injector clockwise and counter–clockwise, push it to the delivery pipe. Install the eight injectors.
(d) Position the injector connector outward.



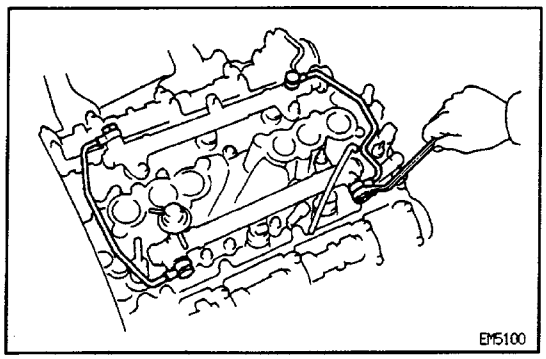
(e) Install a O–ring to the spacer.
(f) Place the six spacers and insulators into the injector holes.
(g) Place the four spacers on the stud bolts.



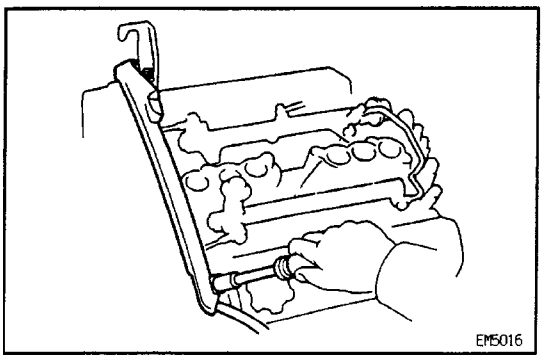
(h) Place the two delivery pipes together with the six injectors in position on the intake manifold.
(i) Temporarily install the four spacers and nuts.
(j) Check that the injectors rotate smoothly.
HINT: If injectors do not rotate smoothly, the probable cause is incorrect installation of 0– rings. Replace the O–rings.
(k) Position the injector connector upward.



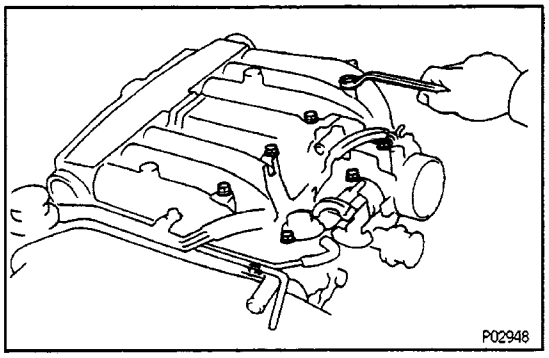
(l) Tighten the four nuts holding the delivery pipes to the intake manifold.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)
(m) Install the No. 1 fuel pipe to the No.3 bearing cap with the bolt.



2. INSTALL NO.2 AND NO.3 FUEL PIPES
(a) Install the No.2 fuel pipe with four new gaskets and two union bolts.
Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)
(b) Install the No.3 fuel pipe with four new gaskets and two union bolts.
Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)



3. INSTALL ENGINE WIRE
(a) Install the engine wire with the two bolts.
(b) Connect the following connectors:
- Injector connectors
- RH ground strap
- Engine coolant temp. sender gauge connector
- Engine coolant temp. sensor connector
- Cold start injector time switch connector
- Knock sensor connector

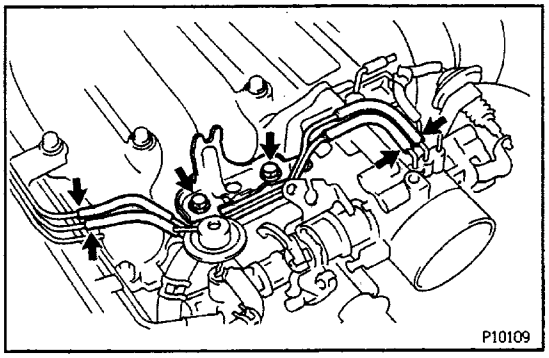


4. INSTALL AIR INTAKE CHAMBER

(a) Position a new gasket on the intake manifold.

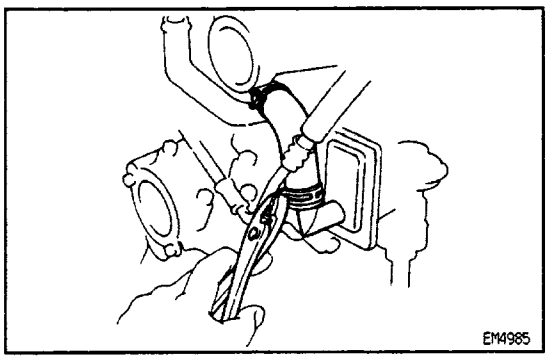
(b) Install the intake chamber with the six bolts and two nuts.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

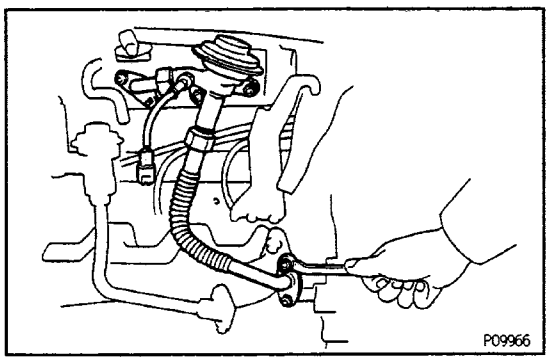


(c) Install the accelerator cable bracket with the two bolts.

(d) Connect the four vacuum hoses to the air pipes.



(e) Connect the No.1 air hose to the reed valve.

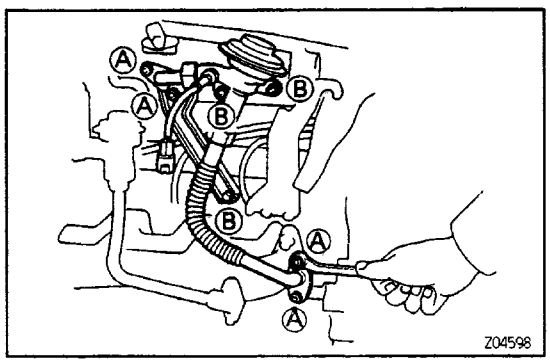


(f) Position two new gaskets to the intake chamber and RH exhaust manifold.

(g) Install the EGR valve with the pipes to the intake chamber and RH exhaust manifold.

(h) (C & C only)

Connect the two water by–pass hose to the EGR valve.



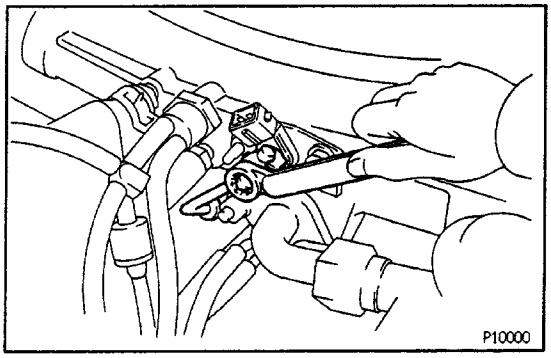
(i) Install the air intake chamber stay and throttle cable bracket. Install and torque the six nuts and two bolts.

Torque:

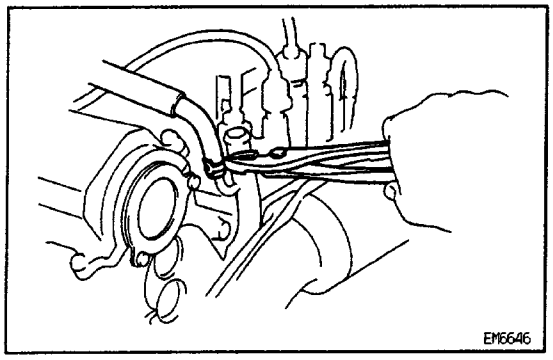
(A) 29 N–m (300 kgf–cm, 22 ft–lbf)

(B) 18 N–m (185 kgf–cm, 13 ft–lbf)

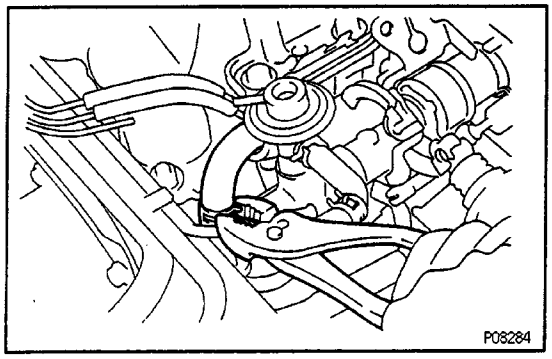
(j) Connect the EGR hoses to the air pipe and EGR vacuum modulator.
(k) (California and C & C)
Connect the EGR gas temp. sensor connector.
(l) Connect the vacuum hose to the gas filter.



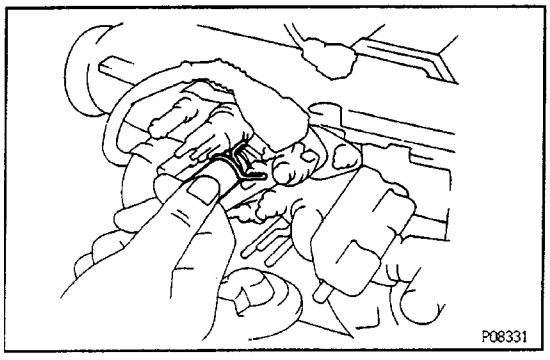
(m) Connect the cold start injector tube with a new gasket and the union bolt.
Torque: 15 N–m (150 kgf–cm, 13 ft–lbf)
(n) Connect the cold start injector connector.



(o) Install the No.5 water by–pass hose to the water by –pass pipe.

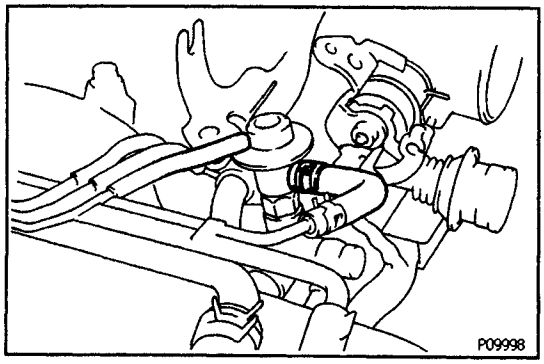


(p) Connect the No.4 water by–pass hose to the union of the intake manifold.

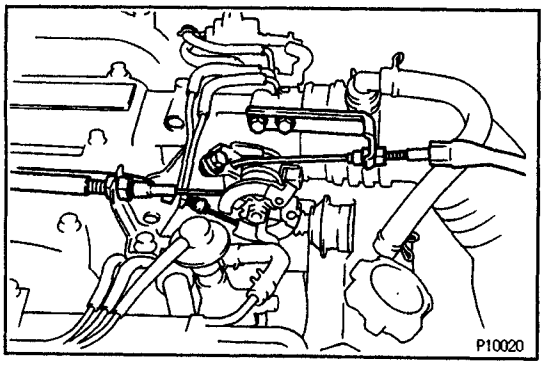


(q) Connect the PCV hose to the union.

(r) Connect the canister vacuum hose to the throttle body.
(s) Connect the throttle position sensor connector.

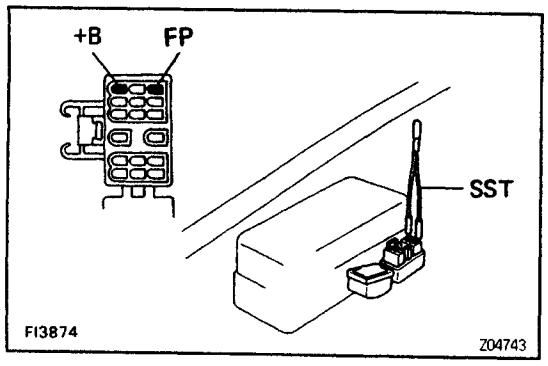


5. CONNECT FUEL RETURN HOSE
6. CONNECT VACUUM SENSING HOSE
7. CONNECT AIR CLEANER HOSE



8. CONNECT FOLLOWING CABLES:
(a) (A/T)
Throttle cable
(b) Accelerator cable
(c) (w/ Cruise control)
Actuator cable with bracket

9. REFILL WITH ENGINE COOLANT
10. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

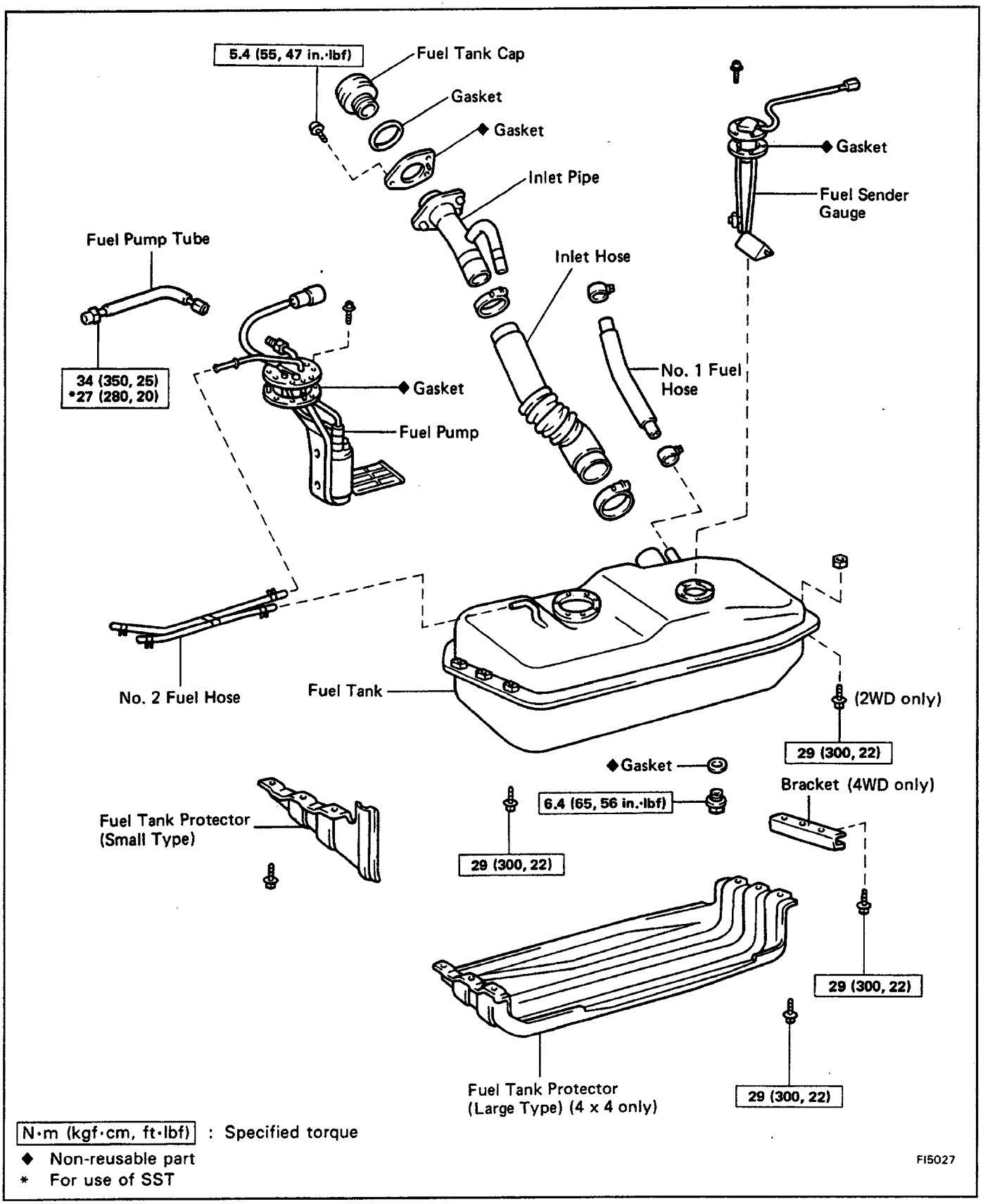


11. CHECK FOR FUEL LEAKAGE
(a) With the ignition switch ON, use SST to connect terminals FP and +B of the DLC1.
SST 09843–18020
(b) Check for fuel leakage.
(c) Remove SST from the DLC1.

FUEL TANK AND LINE

EG1H1–02

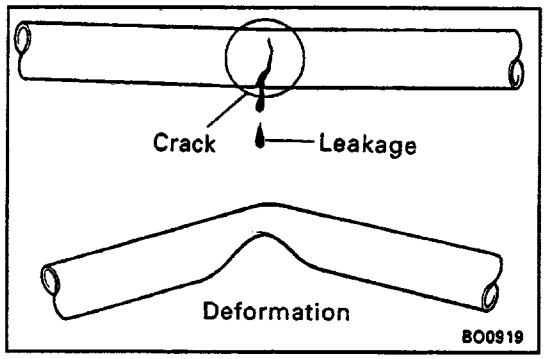
COMPONENTS

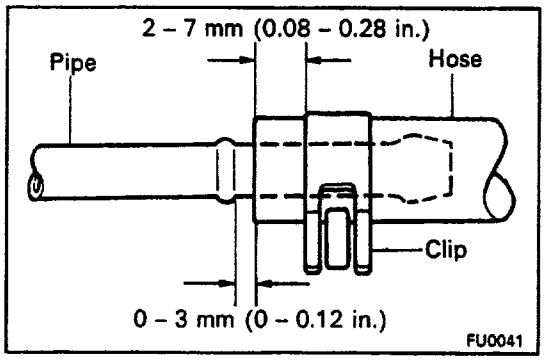


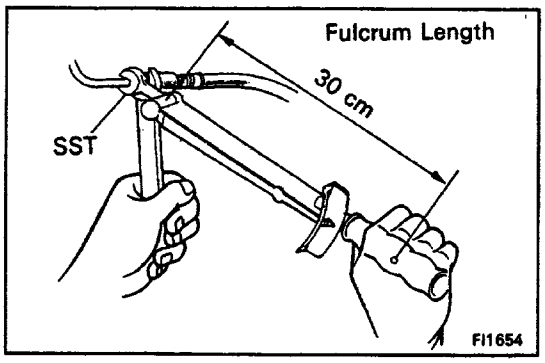
EG1H2–01

PRECAUTIONS

1.Always use new gaskets when replacing the fuel tank or component part.
2. Apply the proper torque to all parts to be tightened.



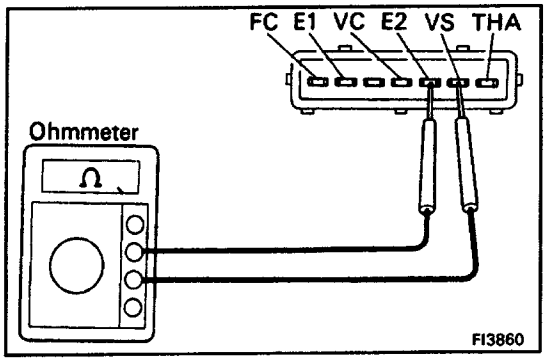


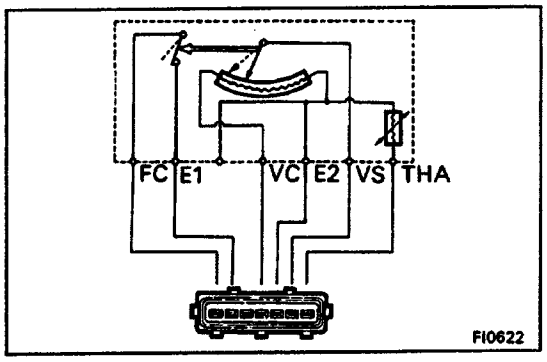


EG1H3–01

FUEL LINES AND CONNECTIONS INSPECTION

(a) Inspect the fuel lines for cracks or leakage, and all connections for deformations.
(b) Inspect the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage.
(c) Inspect the fuel tank for deformations, cracks or fuel leakage.
(d) Inspect the filler neck for damage or fuel leakage.
(e) Hose and tube connections are as shown in the il–lustration.
If a problem is found, repair or replace the parts as necessary.





VOLUME AIR FLOW (VAF) METER EG1TU–02

ON–VEHICLE INSPECTION

MEASURE RESISTANCE OF VOLUME AIR FLOW METER

(a) Disconnect the connector from the volume air flow meter.

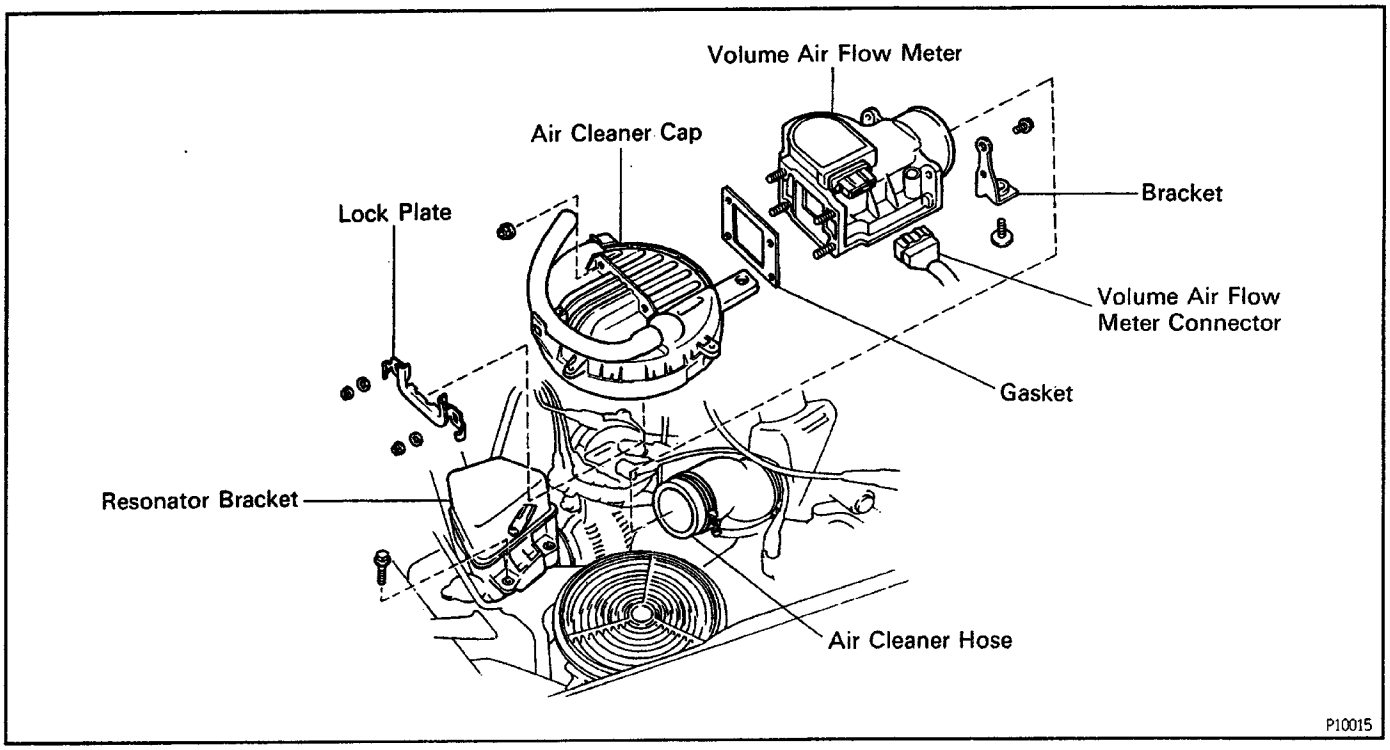
(b) Using an ohmmeter, measure the resistance between each terminal.

Between terminals	Resistance	Temperature
VS – e2	200–600C)	–
VC – e2	200–400C)	–
THA – E2	10–20kΩ	–20°C (4°F)
THA – E2	4 –7kΩ	O° C (32°F)
THA – E2	2 –3kΩ	20°C (68°F)
THA – E2	0.9 – 1.3 kΩ	46°C (104° F)
THA – E2	0.4–0.7kΩ	60°C (140°F)
FC–E1	Infinity	–

If not within specification, replace the volume air flow meter.

(c) Reconnect the volume air flow meter connector.

COMPONENTS FOR REMOVAL AND INSTALLATION EG1TV–01

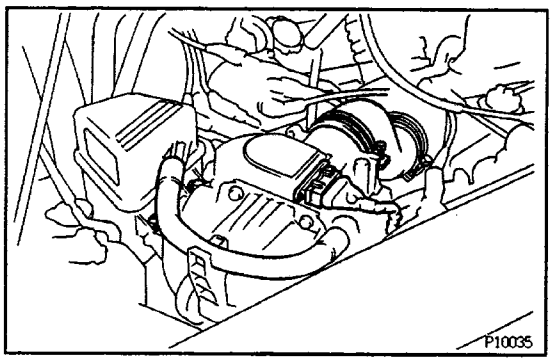


VOLUME AIR FLOW METER REMOVAL

EG1MS–02

(See Components for Removal Installation)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY



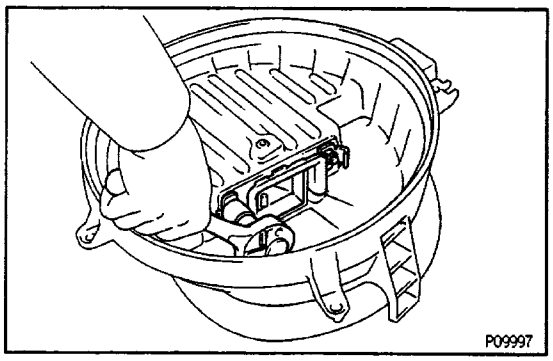
2. DISCONNECT RESONATOR BRACKET

(a) Disconnect the air hose.

(b) Remove the two bolts and resonator bracket.

3. DISCONNECT VOLUME AIR FLOW METER CONNECTOR

4. DISCONNECT AIR CLEANER HOSE

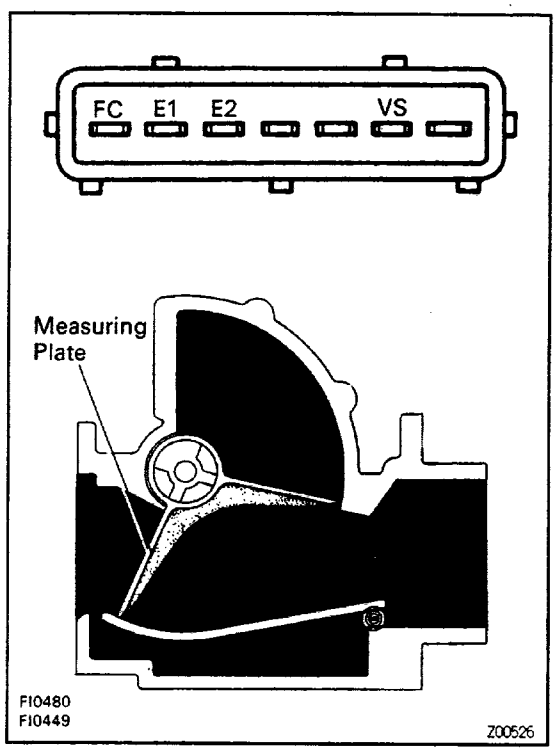


5. REMOVE AIR CLEANER CAP WITH VOLUME AIR FLOW METER ASSEMBLY

6. REMOVE VOLUME AIR FLOW METER FROM AIR CLEANER CAP

(a) Remove the bolt, two screws and bracket.

(b) Pry oft the lock plate, and remove the four nuts and washers, lock plate, volume air flow meter and gasket.



VOLUME AIR FLOW METER INSPECTION

MEASURE RESISTANCE OF VOLUME AIR FLOW METER

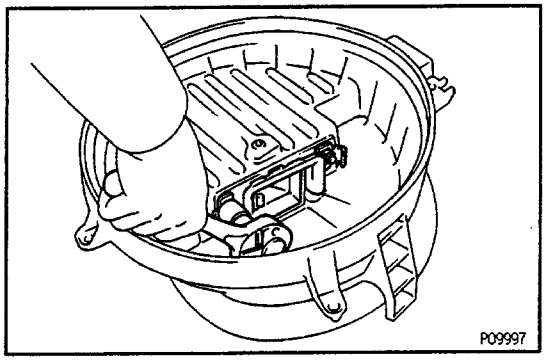
Using an ohmmeter, measure the resistance between each terminal by moving the measuring plate.

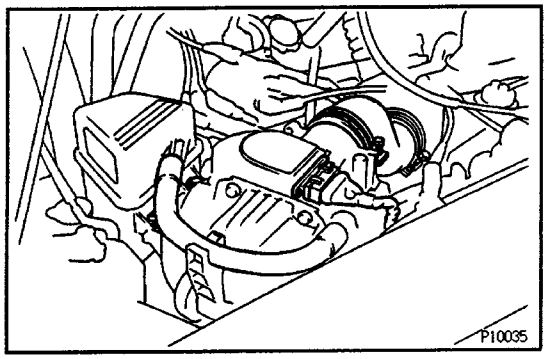
Between terminals	Resistance (Ω)	Measuring plate opening
E1 – FC	Infinity	Fully closed
E 1 – FC	Zero	Other than closed position
E2 – VS	200–600	Fully closed
E2 – VS	20– 1,200	Fully open

HINT: Resistance between terminals E2 and VS will change in a wave pattern as the measuring plate slowly opens.

If not within specification, replace the volume air flow meter.

EG1H7–02





VOLUME AIR FLOW METER INSTALLATION

(See Components for Removal and Installation)

1. INSTALL VOLUME AIR FLOW METER TO AIR CLEANER CAP

(a) Install the volume air flow meter with the gasket, lock plate, washers and four nuts. Pry the lock plate on the nut.

(b) Install the bracket with the bolt and two screws.

2. INSTALL AIR CLEANER CAP AND VOLUME AIR FLOW METER ASSEMBLY

3. INSTALL AIR CLEANER HOSE

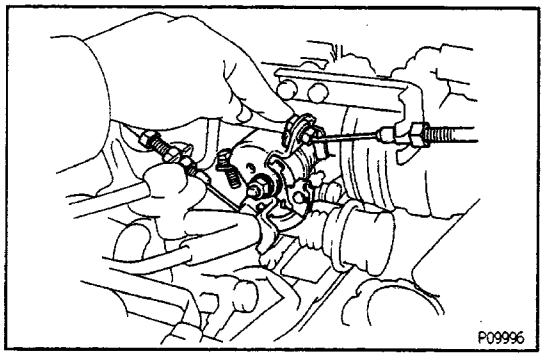
4. CONNECT VOLUME AIR FLOW METER CONNEC–TOR

5. INSTALL RESONATOR BRACKET

(a) Install the resonator bracket with the two bolts.

(b) Connect the air hose.

6. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY



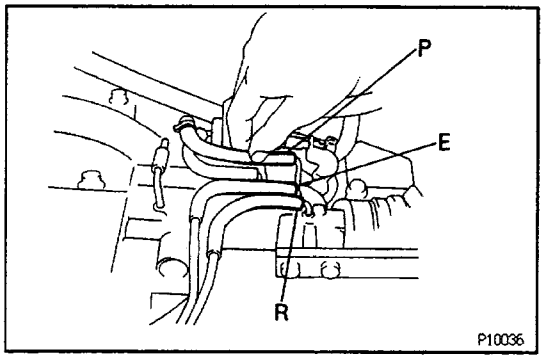
THROTTLE BODY

EG1TX–02

ON–VEHICLE INSPECTION

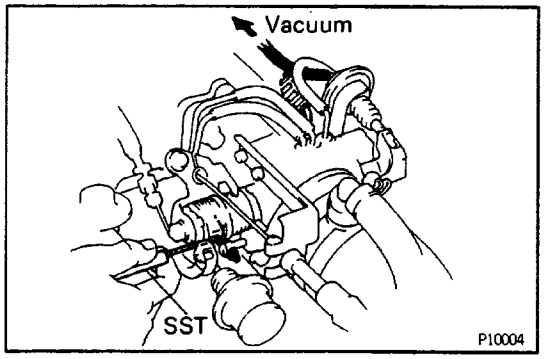
1. INSPECT THROTTLE BODY

(a) Check that the throttle linkage moves smoothly.



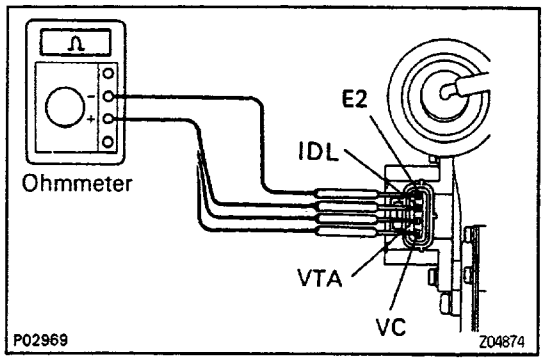
(b) Check the vacuum at each port.
- Start the engine.
- Check the vacuum with your finger.

Port name	At idling	At 3,500 rpm
E	No vacuum	Vacuum
R	No vacuum	Vacuum
P	No vacuum	Vacuum



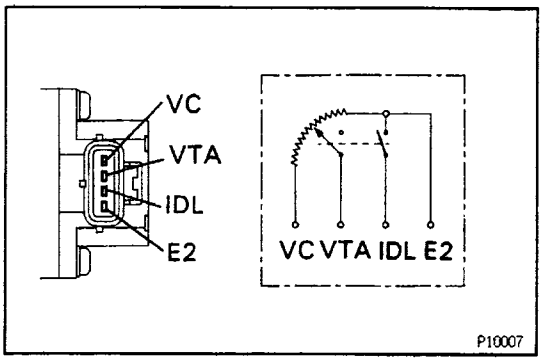
2. INSPECT THROTTLE POSITION SENSOR

(a) Apply vacuum to the throttle opener.
(b) Disconnect the sensor connector.
(c) Insert SST between the throttle stop screw and stop lever.
SST 09240–00020

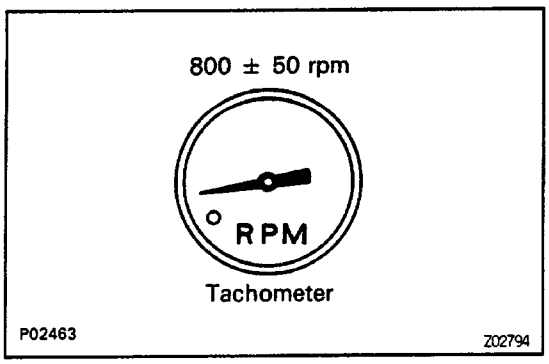


(d) Using an ohmmeter, measure the resistance between each terminal.

Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA – E2	0.47 – 6.1 k 0
0.50 mm (0.020 in.)	!DL – E2	2.3 kΩ or less
0.80 mm (0.031 in.)	IDL – E2	Infinity
Throttle valve fully open	VTA – E2	3.1 – 12.1 kΩ
–	VC – e2	3.9 – 9.0 kΩ



(e) Reconnect the sensor connector.



3. INSPECT DASHPOT (DP)

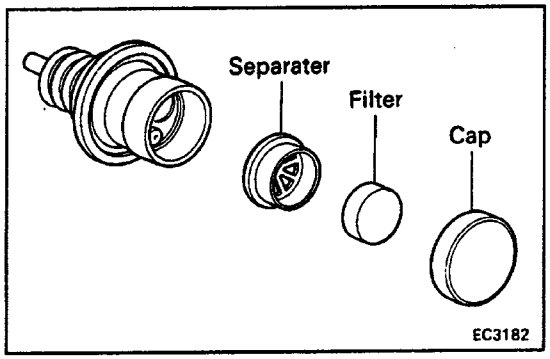
A. Warm up engine

Allow the engine to warm up to normal operating temperature.

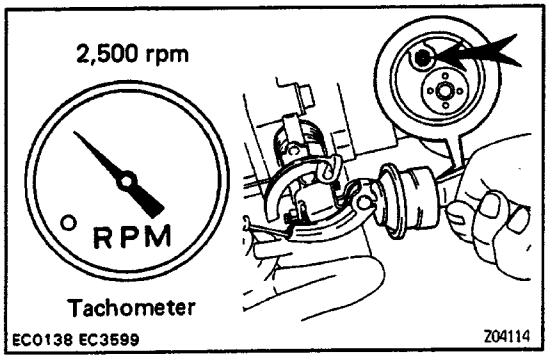
B. Check idle speed and adjust, if necessary (See page EG2–27)

Idle speed:

800 ± 50 rpm



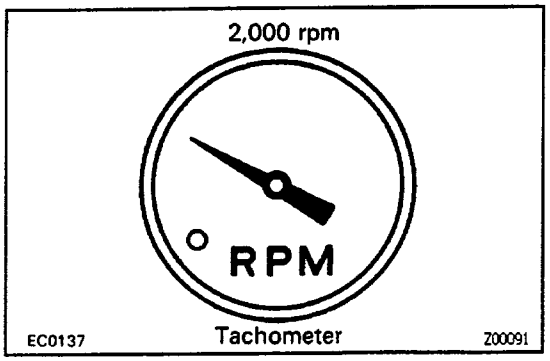
C. Remove cap, filter and separator from DP



D. Check and adjust DP setting speed

(a) Maintain engine speed at 2,500 rpm or more.

(b) Plug the VTV hole with your finger.

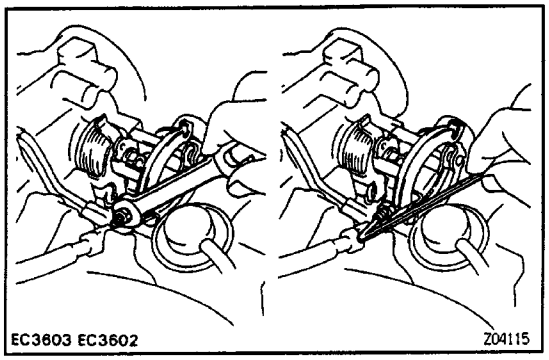


(c) Release the throttle valve.

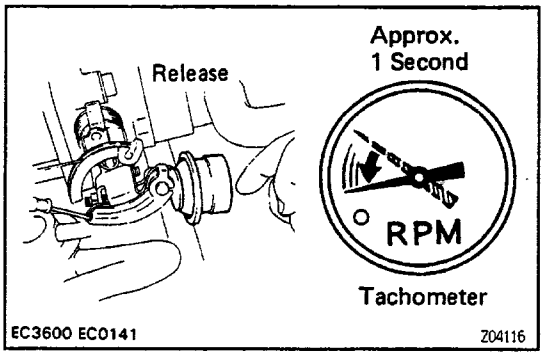
(d) Check the DP is set.

DP setting speed:

2,000 ± 200 rpm



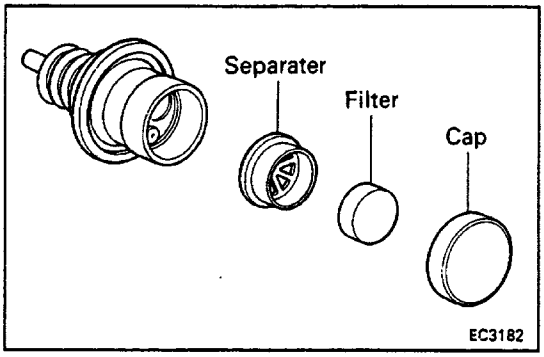
(e) If not as specified, adjust with the DP adjusting screw.



E. Check operation of VTV

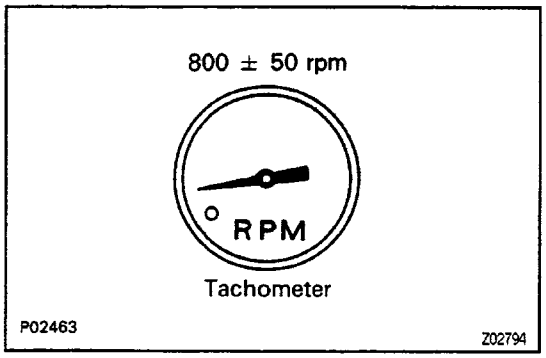
(a) Set the DP setting speed in the same procedure as above: (a) to (c).

(b) Remove your finger from the hole and check that the engine returns to idle speed in approx. 1 second.



F. Reinstall DP separator, filter and cap

HINT: Install the filter with the coarser surface facing the atmospheric side (outward).



4. INSPECT THROTTLE OPENER

A. Warm up engine

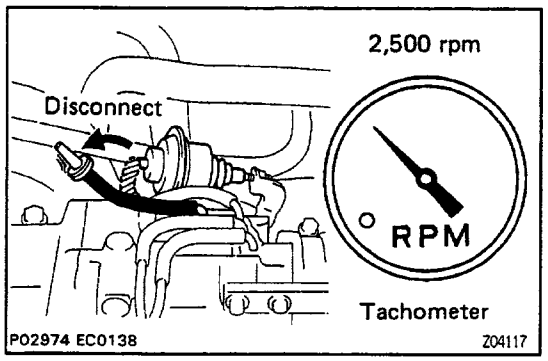
Allow the engine to warm up to normal operating temperature.

B. Check idle speed

(See page EG2–27)

Idle speed:

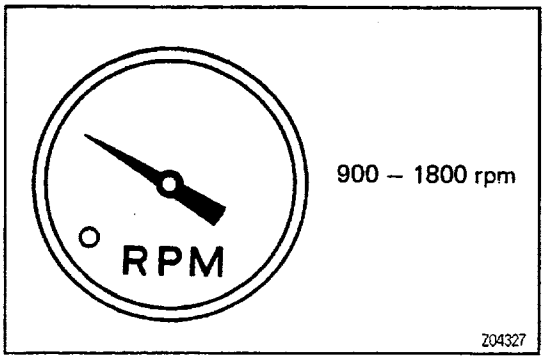
800 ± 50 rpm



C. Check throttle opener setting speed

(a) Disconnect the vacuum hose from the throttle opener, and plug the hose end.

(b) Maintain the engine at 2,500 rpm.



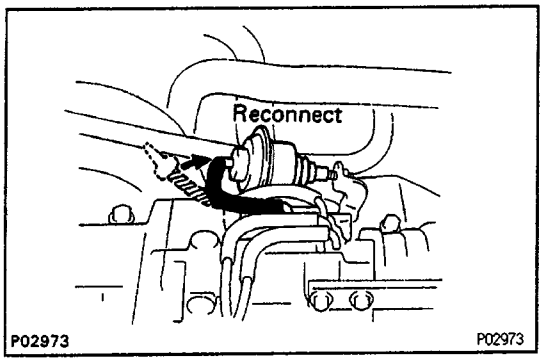
(c) Release the throttle valve.

(d) Check that the throttle opener is set.

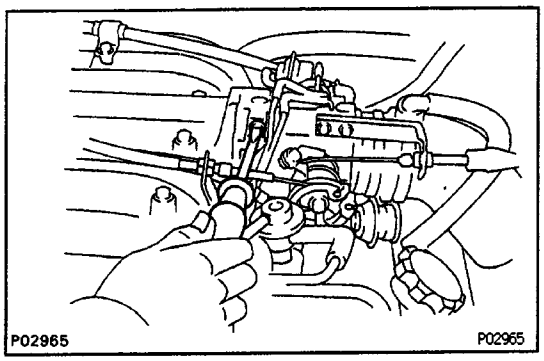
Throttle opener setting speed:

900 – 1,800 rpm

if not as specified, replace the throttle body assembly.



(e) Reconnect the vacuum hose to the throttle opener.



5. INSPECT AIR VALVE OPERATION

Check the engine speed by fully screwing in the idle speed adjusting screw.

At low temp.

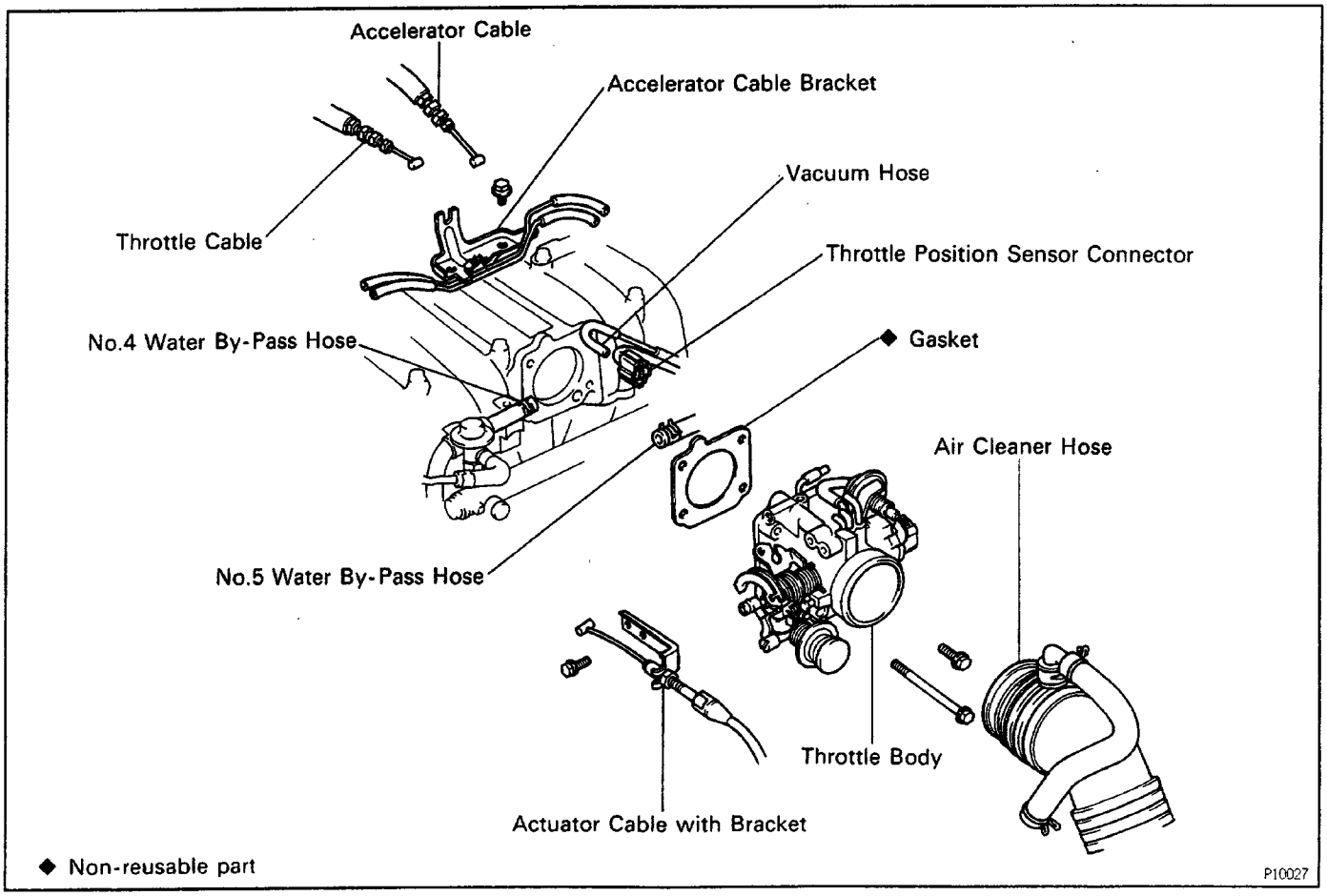
Engine coolant temp.: below 80•C (176•F)

When the idle speed adjusting screw is in, the engine speed should drop.

After warm –up

When the idle speed adjusting screw is in, the engine speed should drop below idle speed stop.

COMPONENTS FOR REMOVAL AND INSTALLATION



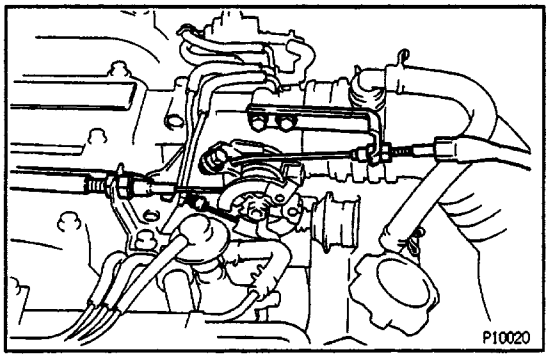
EG1TY–02

THROTTLE BODY REMOVAL

(See Components for Removal and Installation)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DRAIN ENGINE COOLANT FROM THROTTLE BODY

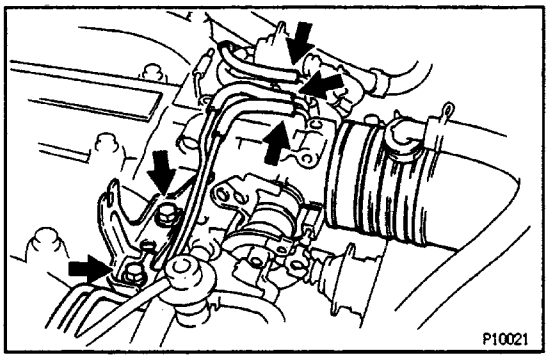


3. DISCONNECT FOLLOWING CABLES:

(a) (w/ Cruise control)
Actuator cable with bracket

(b) Accelerator cable

(c) (A/T)
Throttle cable

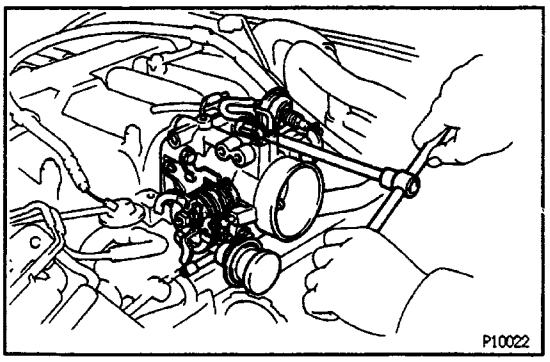


4. DISCONNECT AIR CLEANER HOSE

6. DISCONNECT VACUUM HOSES

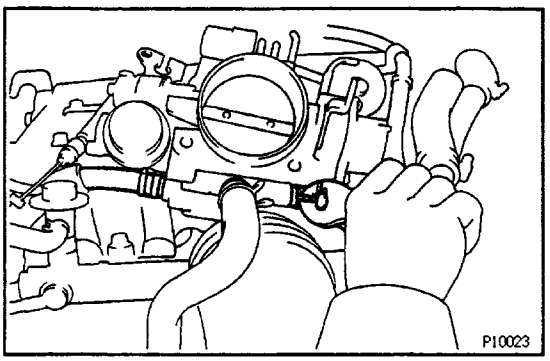
6. REMOVE ACCELERATOR CABLE BRACKET

7. DISCONNECT THROTTLE POSITION SENSOR CONNECTOR



8. REMOVE THROTTLE BODY

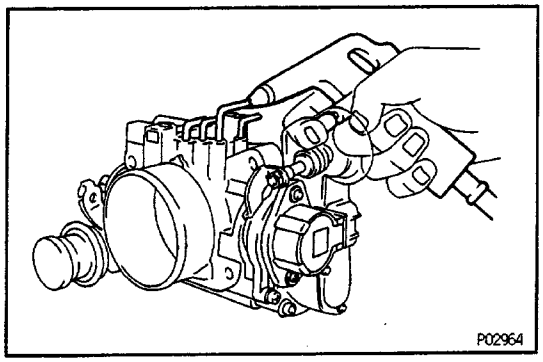
(a) Remove the four bolts, throttle body and the gasket.



(b) Disconnect the No.4 and No.5 water by–pass hoses from the throttle body.

EG20D–01

THROTTLE BODY INSPECTION

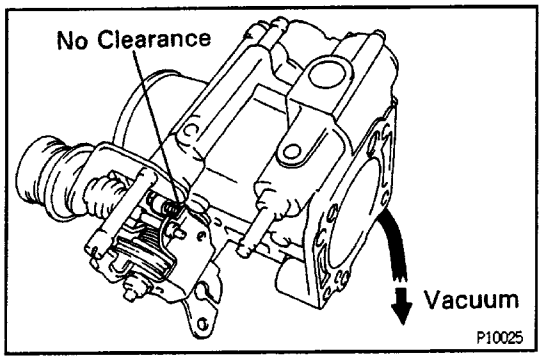


1. CLEAN THROTTLE BODY BEFORE INSPECTION

(a) Wash and clean the cast parts with a soft brush and carburetor cleaner.

(b) Using compressed air, clean all the passages and apertures in the throttle body.

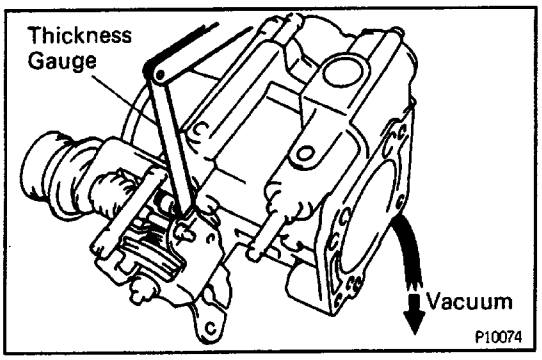
NOTICE: To prevent deterioration, do not clean the throttle position sensor and dash pot.



2. CHECK THROTTLE VALVE

(a) Apply vacuum to the throttle opener.

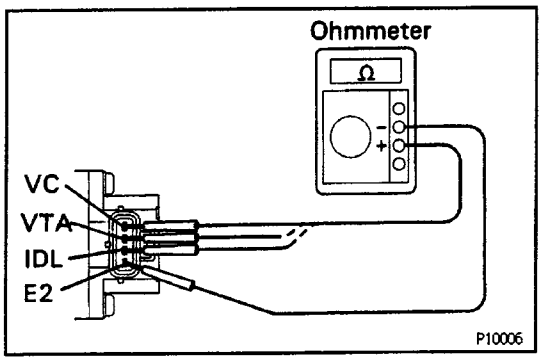
(6) Check that there is no clearance between the throttle stop screw and throttle lever when the throttle valve is fully closed.



3. INSPECT THROTTLE POSITION SENSOR

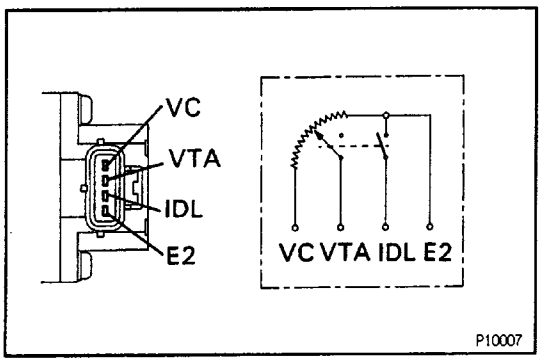
(a) Apply vacuum to the throttle opener.

(b) Insert a thickness gauge between the throttle stop screw and stop lever.

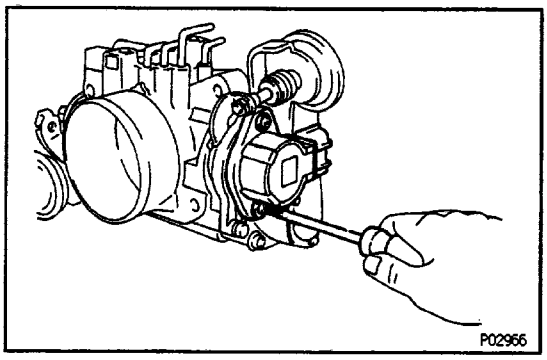


(c) Using an ohmmeter, measure the resistance between each terminal.

Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA – E2	0.47–6.1 kΩ
0.50 mm (0.020 in.)	IDL – E2	2.3 kΩ or less
0.80 mm (0.031 in.)	IDL – E2	Infinity
Throttle valve fully open	VTA – E2	3.1 – 12.1 kΩ
–	VC – E2	3.9 – 9.0 kΩ

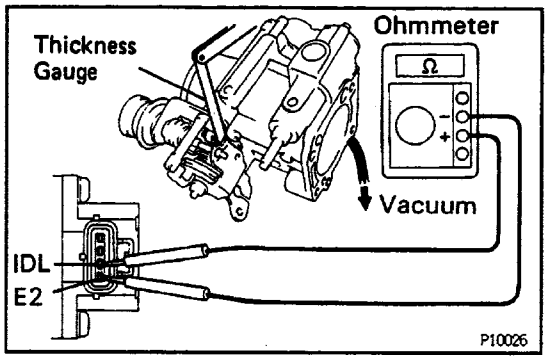


(d) Reconnect the sensor connector.



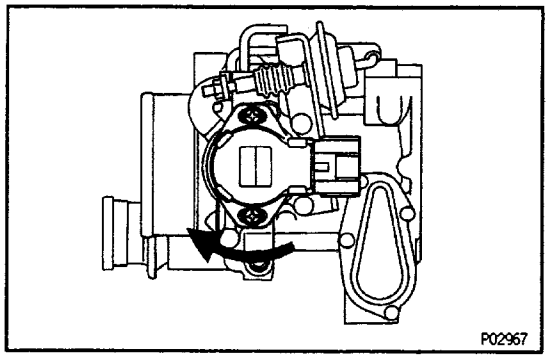
4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

(a) Loosen the two screws of the sensor.

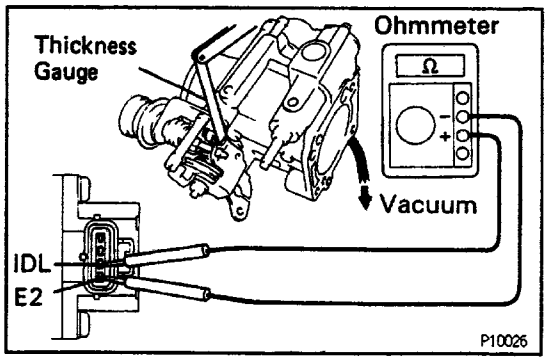


(b) Apply vacuum to the throttle opener.

(c) Insert a thickness gauge (0.60 mm or 0.024 in.) between the throttle stop screw and lever, and connect the ohmmeter to terminals IDL and E2.



(d) Gradually turn the sensor clockwise until the ohmmeter deflects, and secure the sensor with the two screws.



(e) Using a thickness gauge, recheck the continuity between terminals IDL and E2.

Clearance between lever and stop screw	Continuity (IDL–E2)
0.50 mm (0.020 in.)	Continuity
0.80 mm (0.031 in.)	No continuity

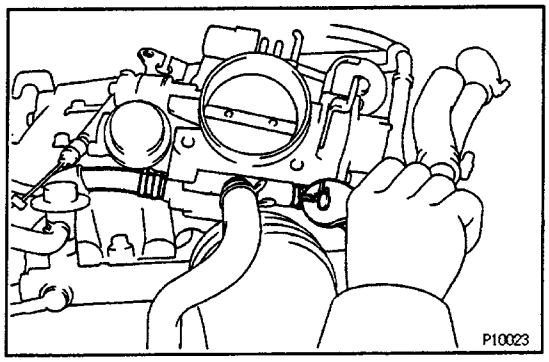
EG1TZ–02

THROTTLE BODY INSTALLATION

(See Components for Removal and Installation)

1. INSTALL THROTTLE BODY

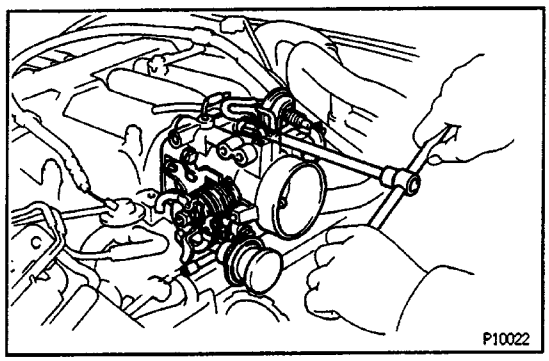
(a) Connect the No.4 and No.5 water by–pass hoses to throttle body.



(b) Place anew gasket and install the throttle body with the four bolts.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

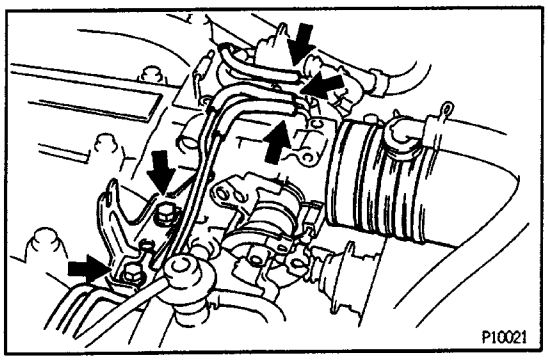
2. CONNECT THROTTLE POSITION SENSOR CONNECTOR



3. INSTALL ACCELERATOR CABLE BRACKET

4. CONNECT VACUUM HOSES

5. CONNECT AIR CLEANER HOSE

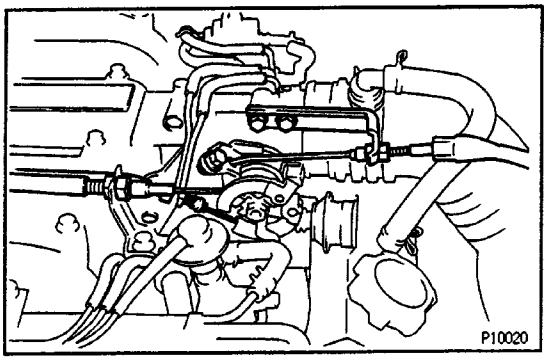


6. CONNECT FOLLOWING CABLES:

(a) (A/T)
Throttle cable

(b) Accelerator cable

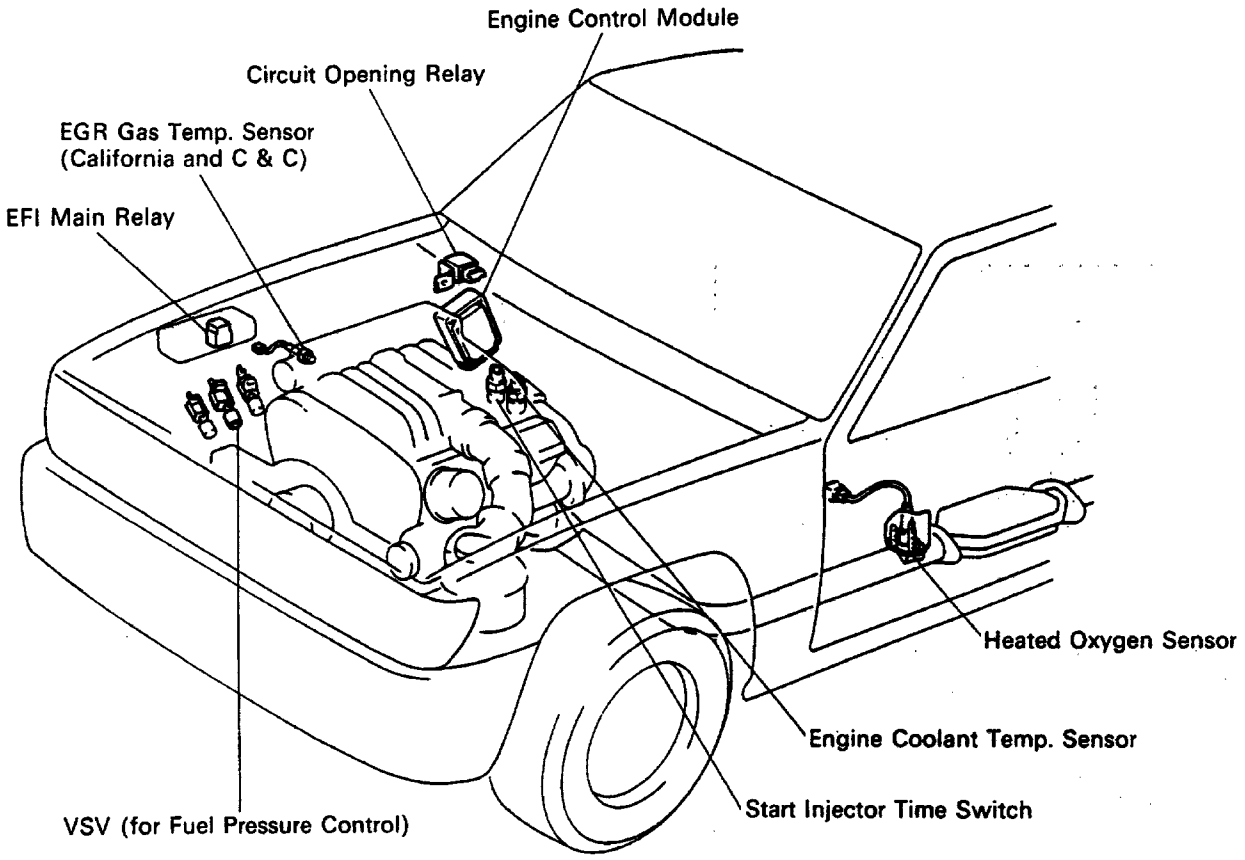
(c) (w/ Cruise control)
Actuator cable with bracket



7. REFILL WITH ENGINE COOLANT

8. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

ELECTRONIC PARTS LOCATION



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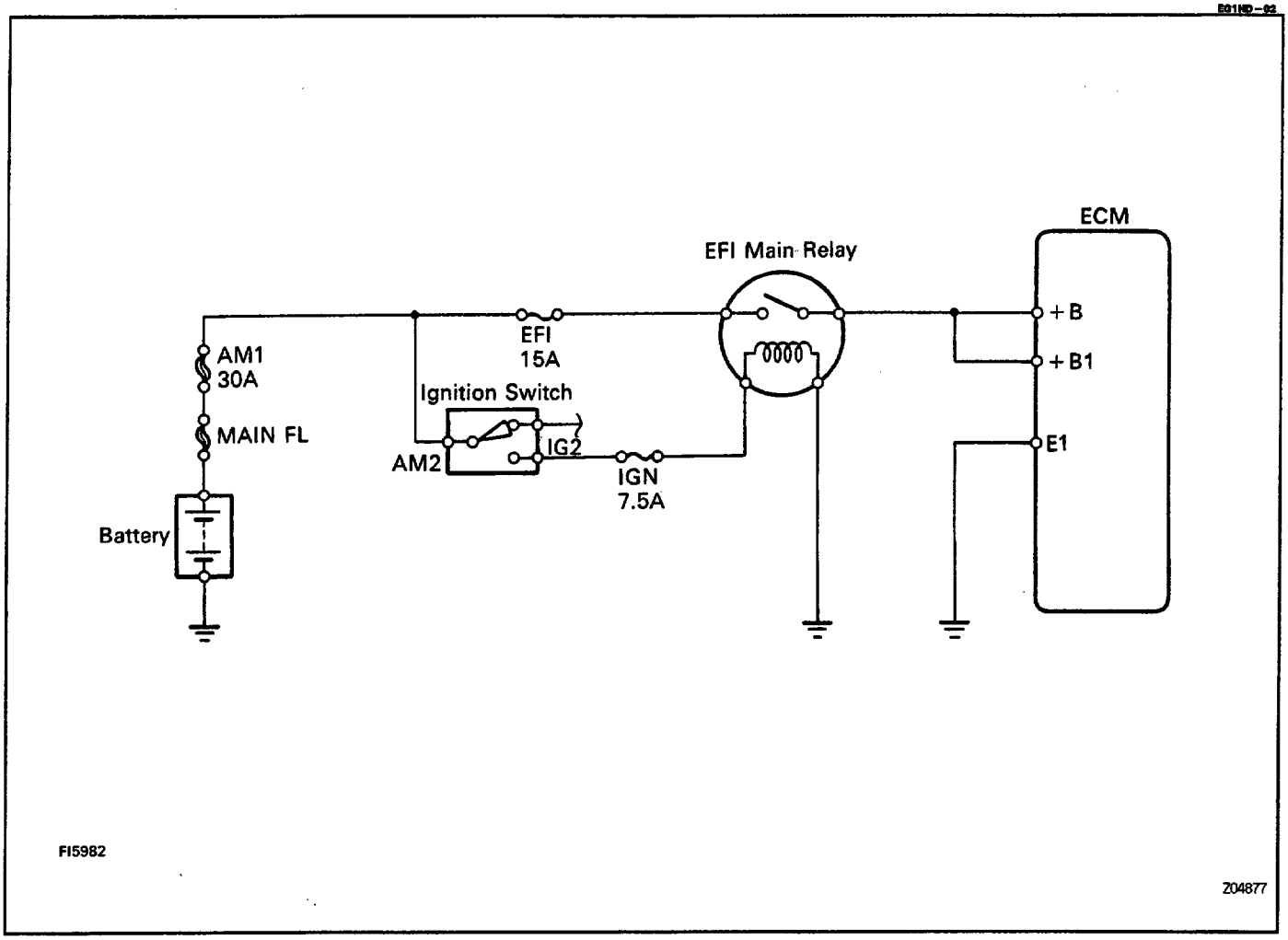
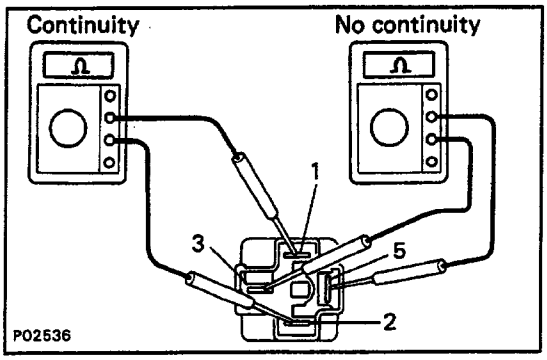
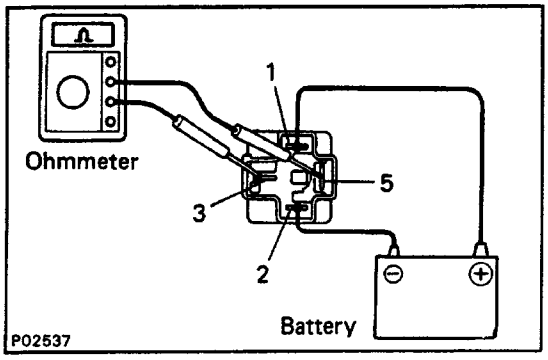
EFI MAIN RELAY







EFI MAIN RELAY INSPECTION

1. INSPECT RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

(b) Check that there is no continuity between terminals 3 and 5.

(c) Check that there is no continuity between terminals 2 and 5.

If continuity is not as specified, replace the relay.

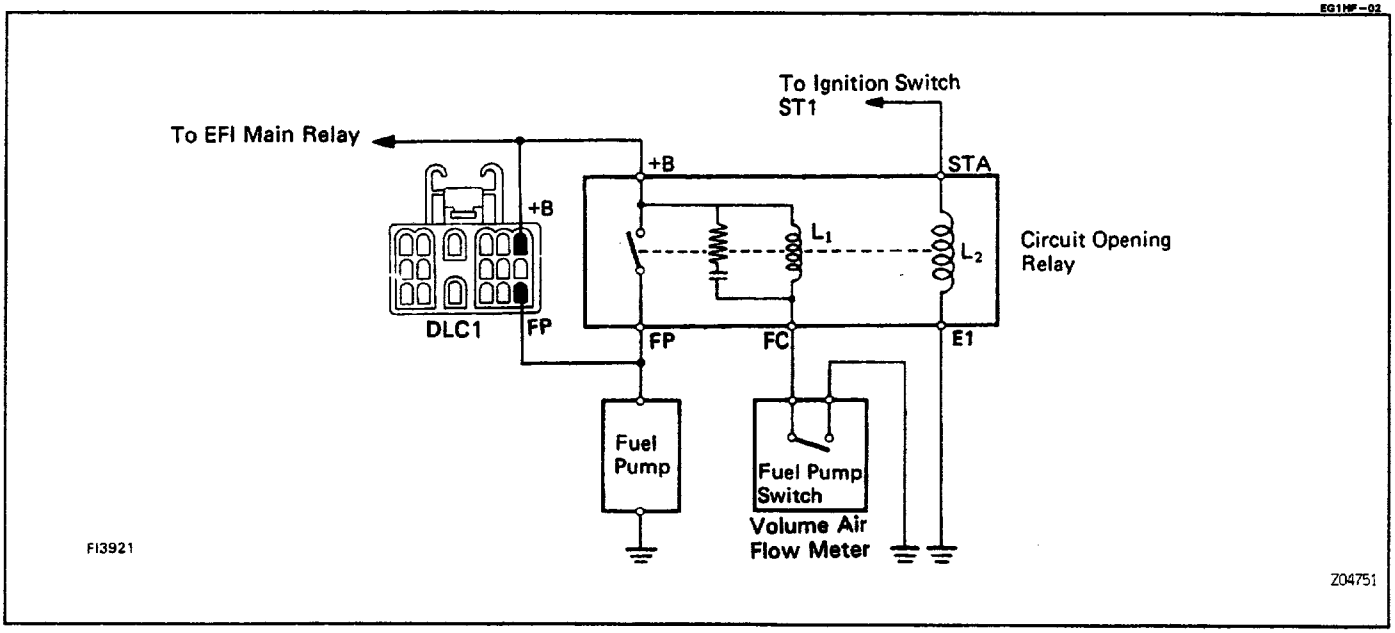
2. INSPECT RELAY OPERATION

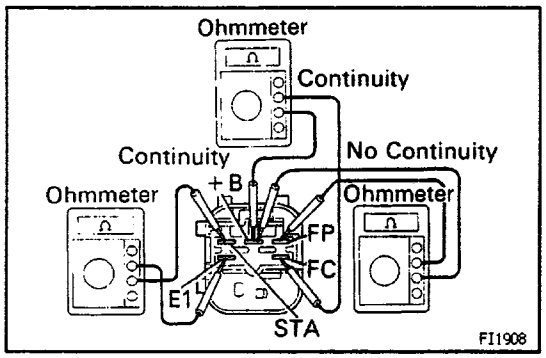
(a) Apply battery voltage across terminals 1 and 2.

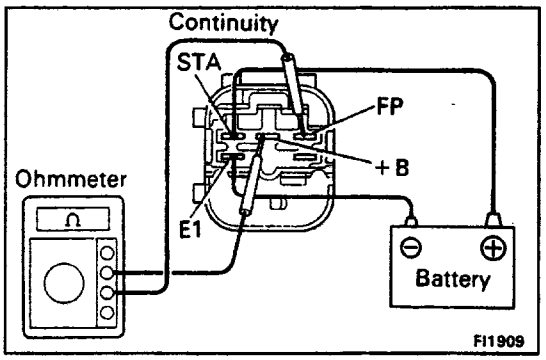
(b) Using an ohmmeter, check that there is continuity between terminals 3 and 5.

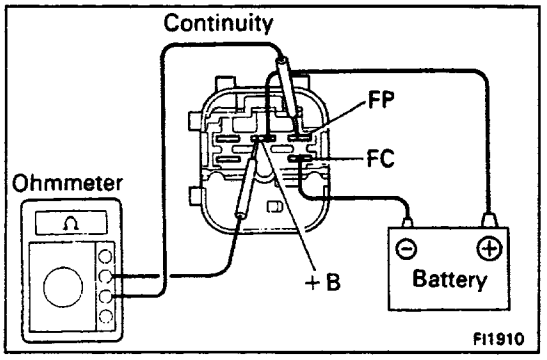
If operation is not as specified, replace the relay.

CIRCUIT OPENING RELAY









CIRCUIT OPENING RELAY INSPECTION

1. INSPECT RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals STA and E1.

(b) Check that there is continuity between terminals +B and FC.

(c) Check that there is no continuity between terminals +B and FP.

If continuity is not as specified, replace the relay.

2. INSPECT RELAY OPERATION

(a) Apply battery voltage across terminals STA and E1.

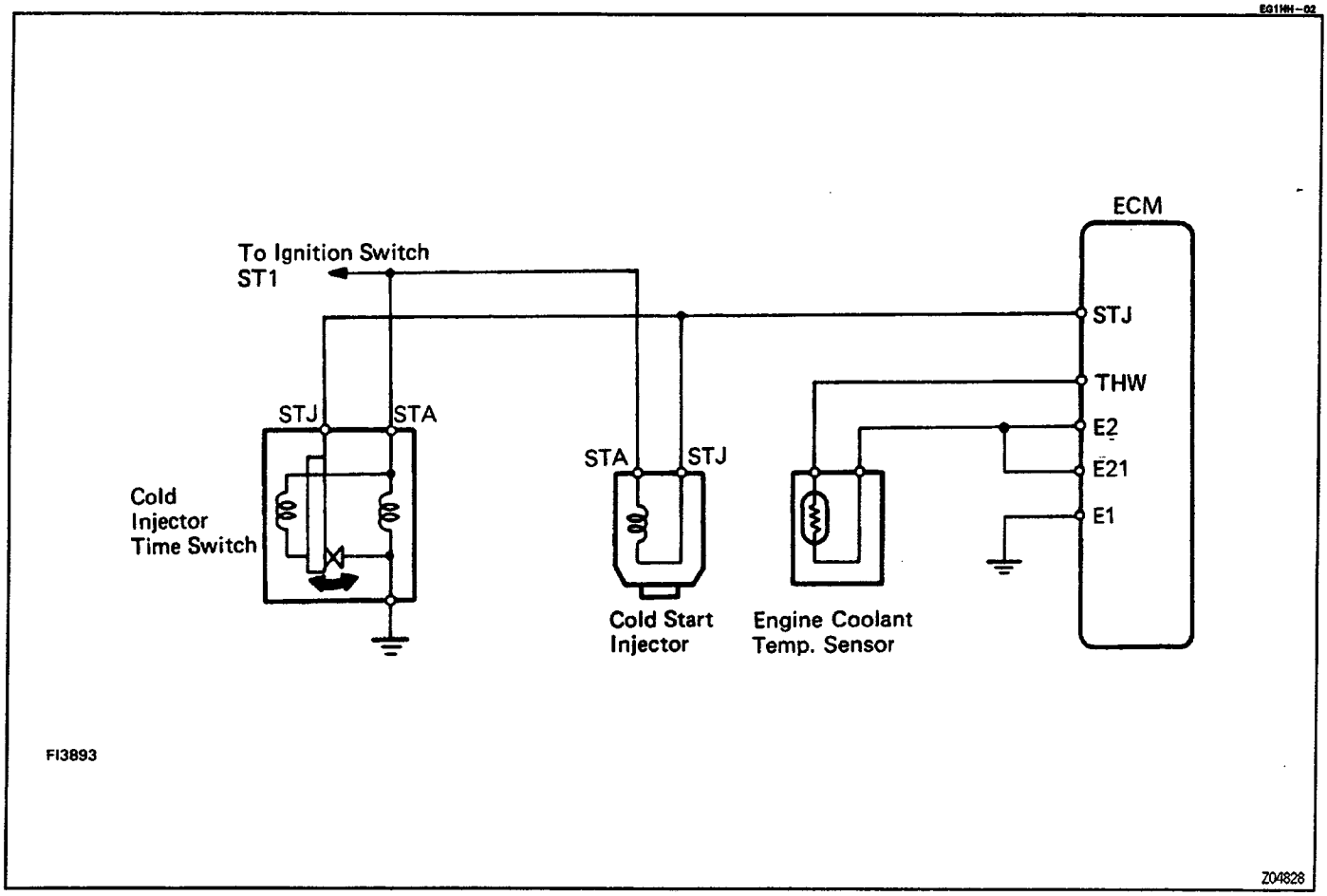
(b) Using an ohmmeter, check that there is continuity between terminals +B and FP.

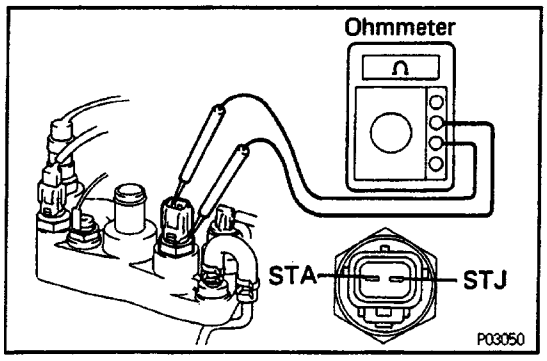
(c) Apply battery voltage across terminals +B and FC.

(d) Check that there is continuity between terminals +13 and FP.

If operation is not as specified, replace the relay.

COLD START INJECTOR TIME SWITCH





COLD START INJECTOR TIME SWITCH INSPECTION

MEASURE RESISTANCE OF COLD START INJECTOR TIME SWITCH

(a) Disconnect the connector.

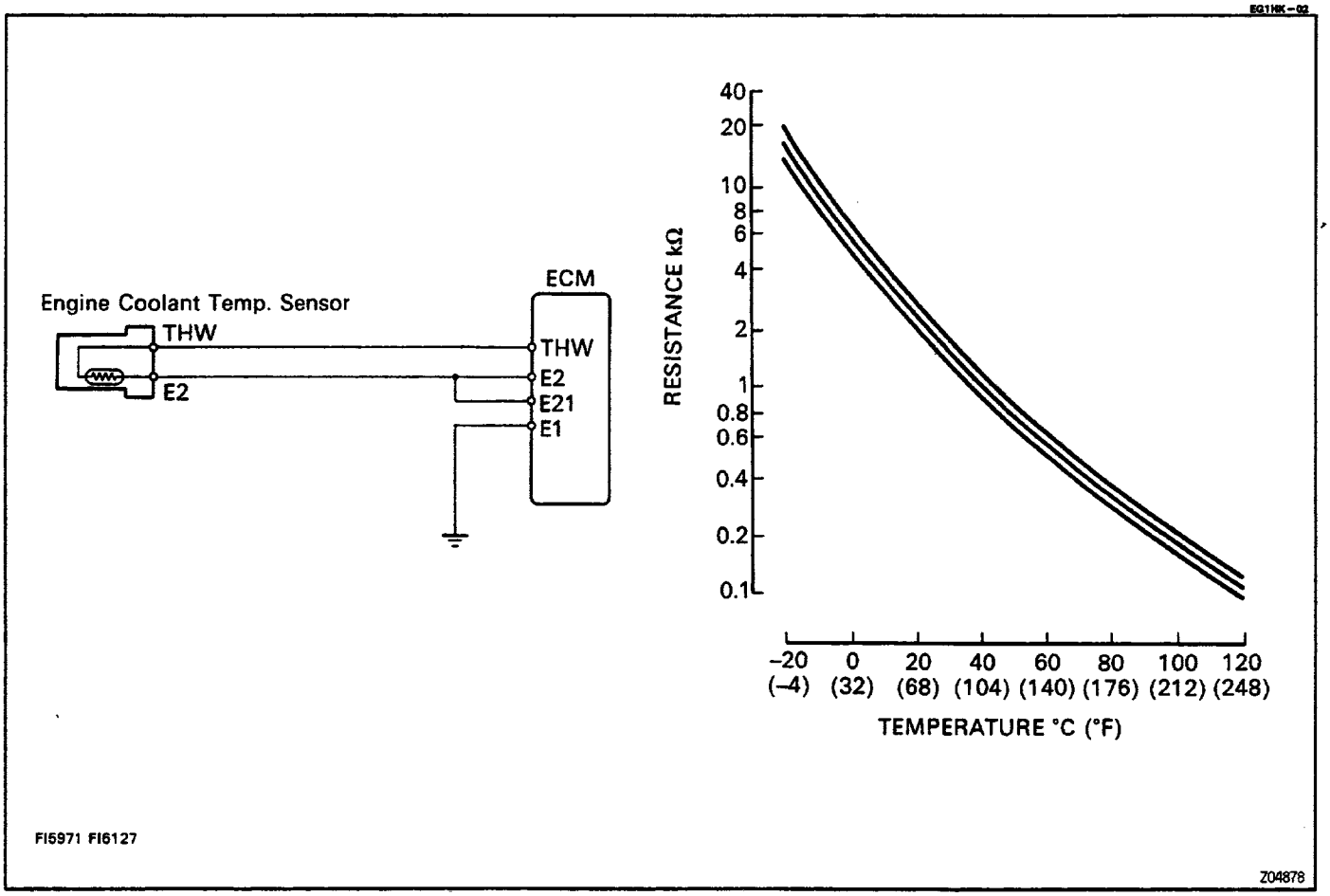
(b) Using an ohmmeter, measure the resistance between terminals.

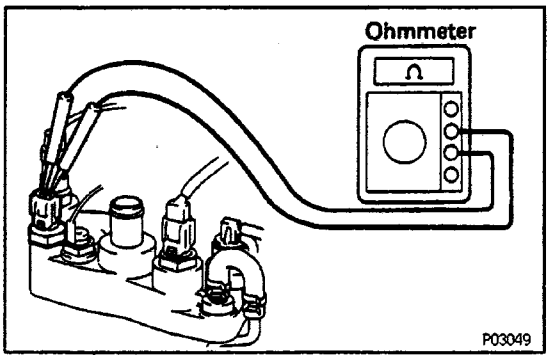
Between terminals	Resistance (Ω)	Engine coolant temperature
STA–STJ	30–50	Below 10• C (50• F)
STA–STJ	70–90	Above 25• C (77• F)
STA–Ground	30–90	–

If the resistance is not as specified, replace the switch.

(c) Reconnect the connector.

ENGINE COOLANT TEMPERATURE (ECT) SENSOR





ENGINE COOLANT TEMP. SENSOR INSPECTION

MEASURE RESISTANCE OF ENGINE COOLANT TEMP. SENSOR

(a) Disconnect the connector.

(b) Using an ohmmeter, measure the resistance between terminals.

Resistance:

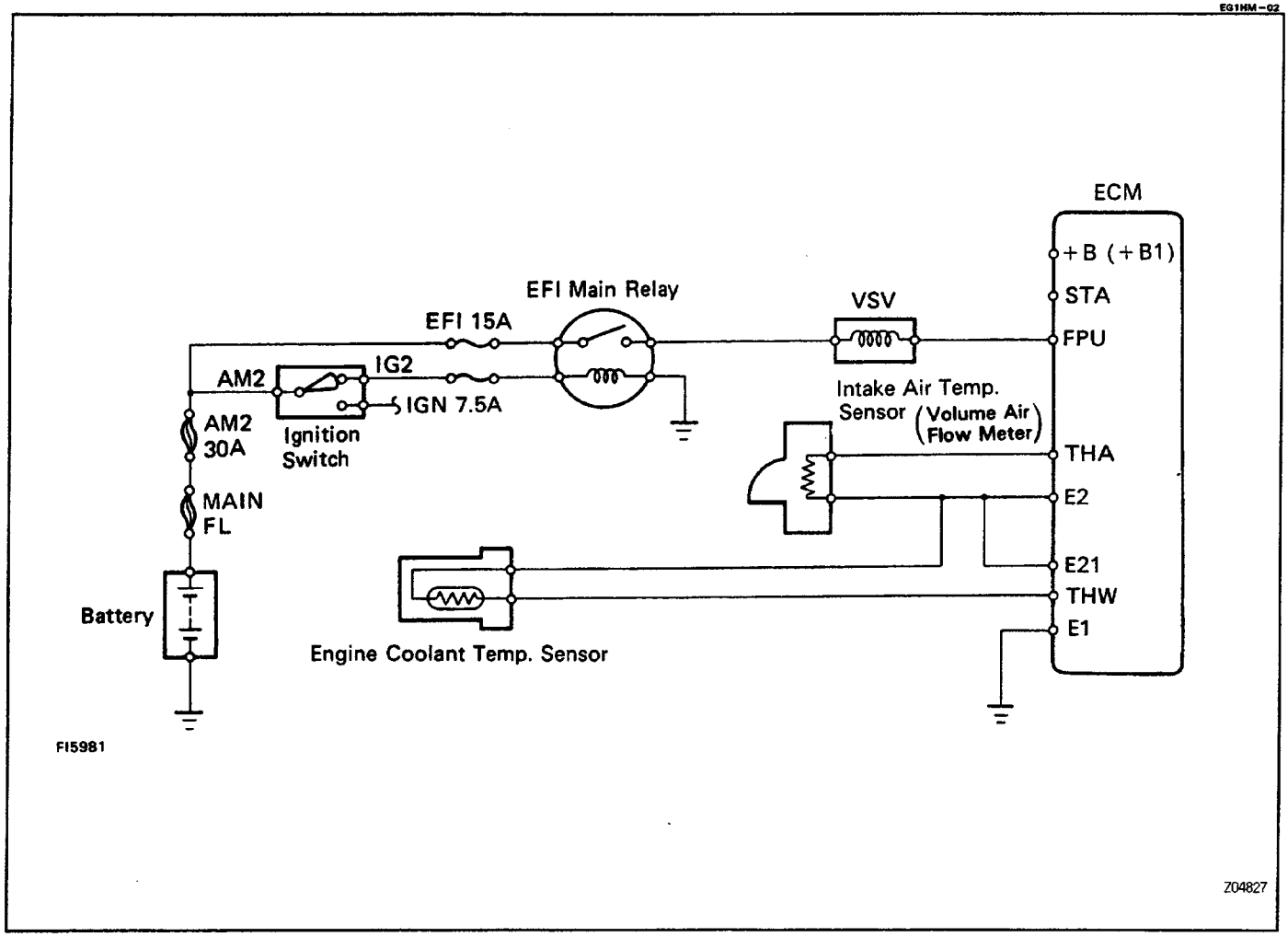
Refer to the chart above.

If the resistance is not as specified, replace the sensor.

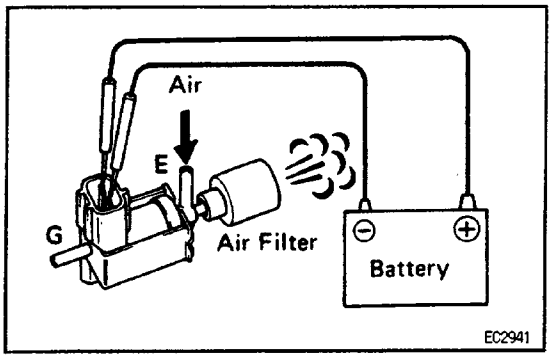
(c) Reconnect the connector.

FUEL PRESSURE CONTROL SYSTEM

EG1HM–02



EG1HN–03

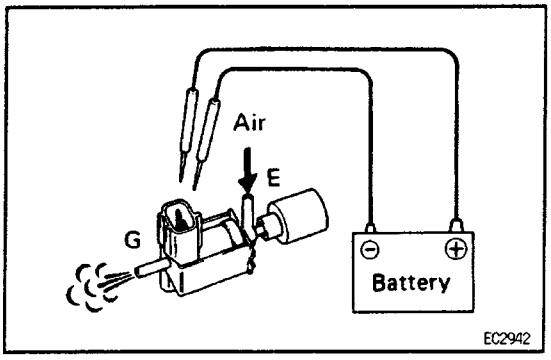


FUEL PRESSURE VSV INSPECTION

1. CHECK VSV OPERATION

(a) Connect the VSV terminals to the battery terminals as illustrated.

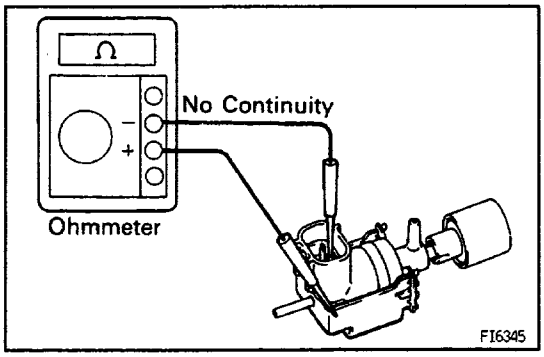
(b) Blow into pipe E and check that air comes out of air filter.



(c) Disconnect the battery.

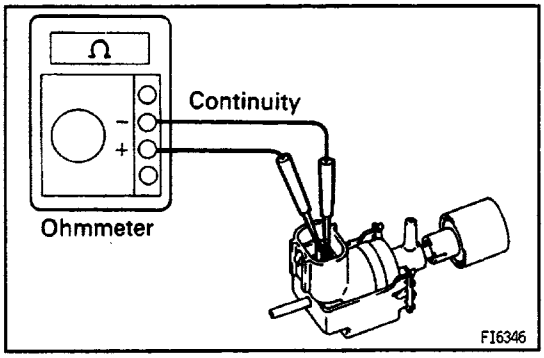
(d) Blow into pipe E and check that air comes out of pipe G.

If a problem is found, repair or replace the VSV.



2. CHECK FOR SHORT CIRCUIT

Using an ohmmeter, check that there is no continuity between each terminal and the VSV body.
If there is continuity, replace the VSV.



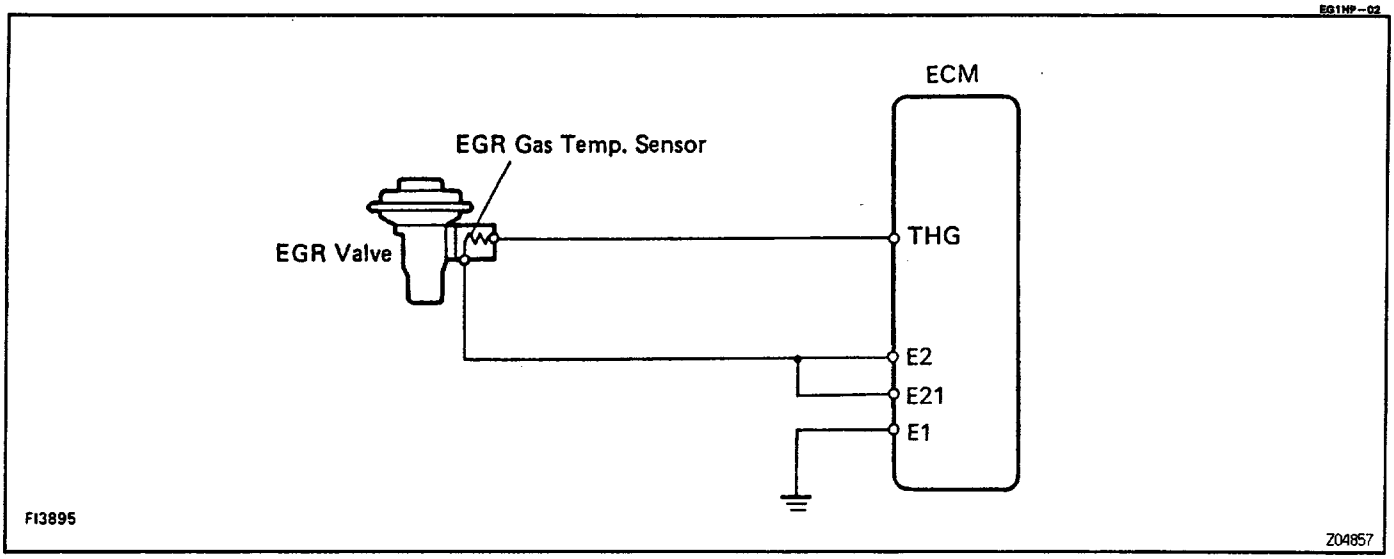
3. CHECK FOR OPEN CIRCUIT

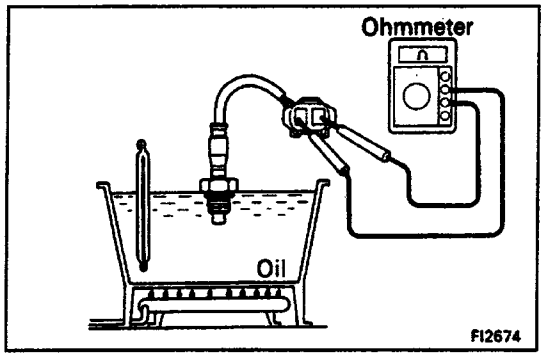
Using an ohmmeter, measure the resistance between both terminals as illustrated.

Specified resistance:

30 – 50 Ω at 20• C (68• F)

EGR GAS TEMPERATURE SENSOR (California and C & C)





EGR GAS TEMP. SENSOR INSPECTION

EG1HQ–02

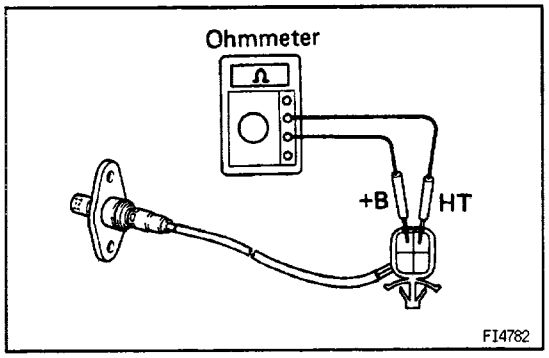
MEASURE RESISTANCE OF EGR GAS TEMP. SENSOR

Using an ohmmeter, measure the resistance between both terminals.

Resistance:

69 – 89 kΩ 50•C (122•F)
11 – 15 kΩ 100•C (212•F)
2 – 4 kΩ 150•C (302•F)

If the resistance is not as specified, replace the sensor.



HEATED OXYGEN SENSOR

HEATED OXYGEN SENSOR INSPECTION

1. INSPECT HEATER RESISTANCE OF HEATED OXYGEN SENSOR

Using an ohmmeter, measure the resistance between the terminals +B and HT.

Resistance:

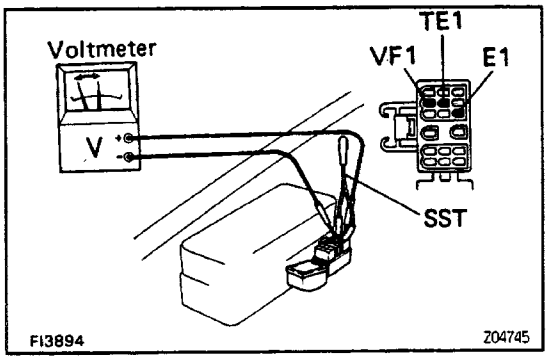
California 2WD only

4.5 – 6.0 Ω at 23•C (73•F)

Others

5.1 – 6.3 Ω at 20•C (68• F)

If the resistance is not as specified, replace the heated oxygen sensor.



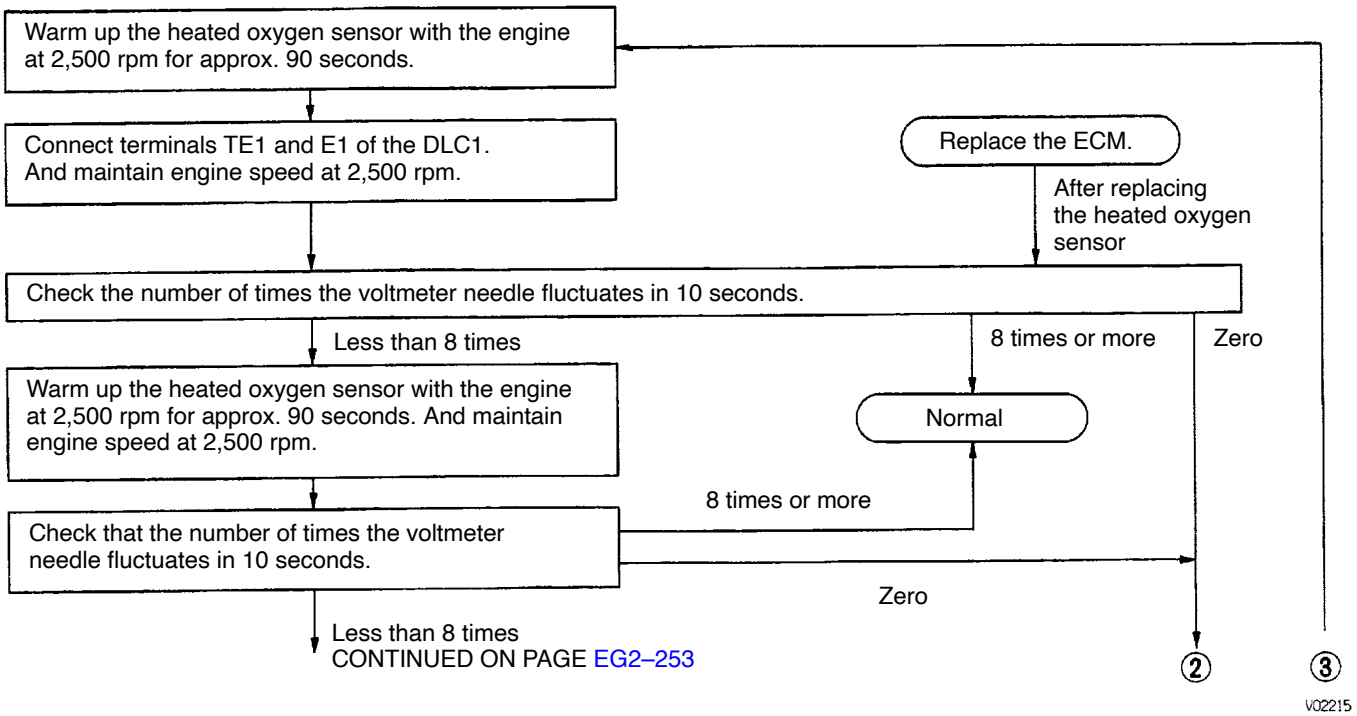
2. INSPECTION OF FEEDBACK VOLTAGE (VF1)

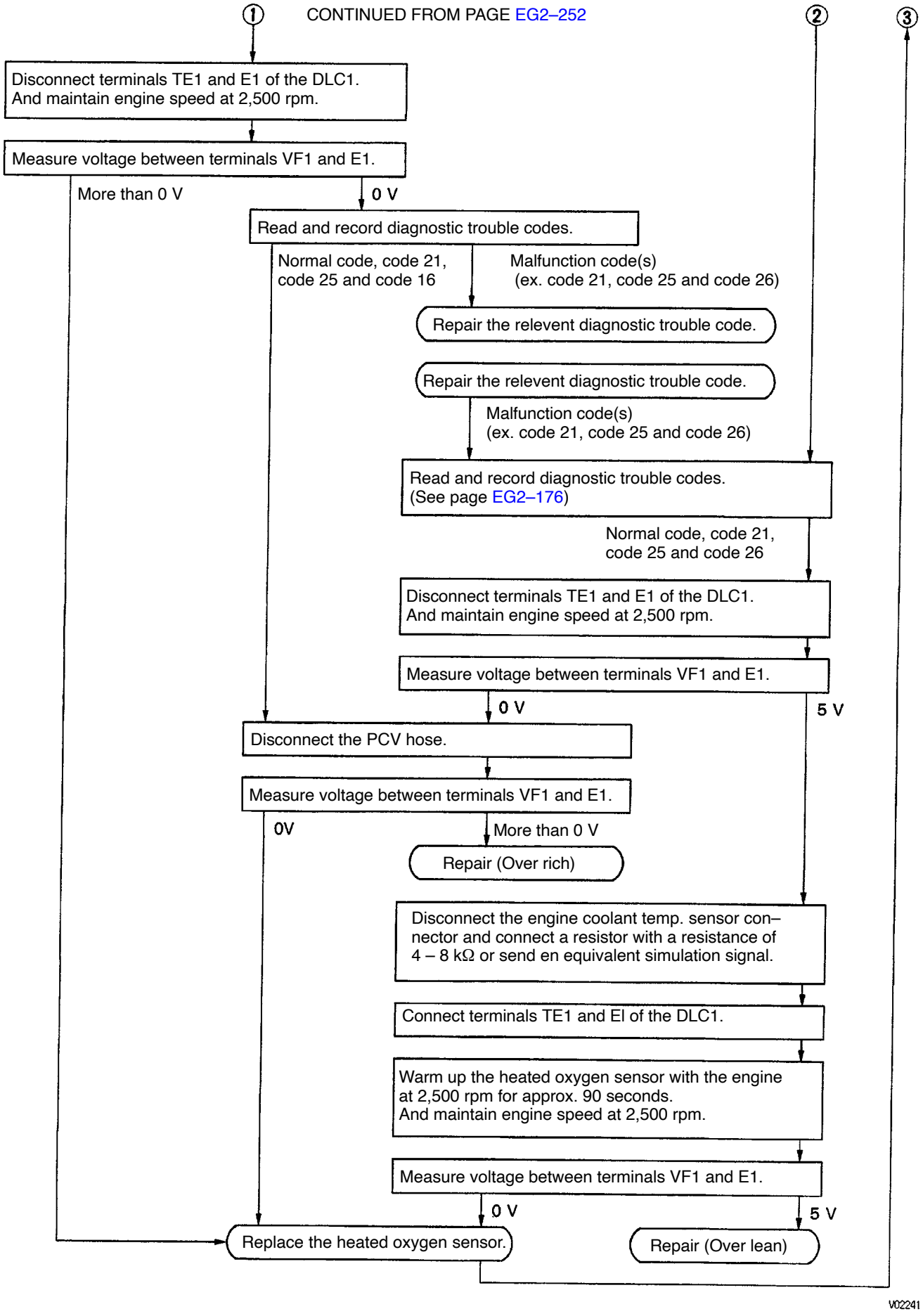
(a) Warm up the engine.

(b) Connect the voltmeter to the DLC1 terminals VF1 and E1.

HINT: Use SST when connecting between terminals TE1 and E1 of the DLC1.

SST 09843–18020

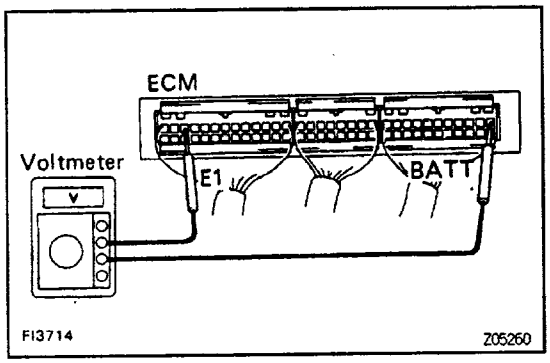



①
CONTINUED FROM PAGE EG2–252
②
③
Disconnect terminals TE1 and E1 of the DLC1.
And maintain engine speed at 2,500 rpm.
Measure voltage between terminals VF1 and E1.
More than 0 V
0 V
Read and record diagnostic trouble codes.
Normal code, code 21,
code 25 and code 16
Malfunction code(s)
(ex. code 21, code 25 and code 26)
Repair the relevent diagnostic trouble code.
Repair the relevent diagnostic trouble code.
Malfunction code(s)
(ex. code 21, code 25 and code 26)
Read and record diagnostic trouble codes.
(See page EG2–176)
Normal code, code 21,
code 25 and code 26
Disconnect terminals TE1 and E1 of the DLC1.
And maintain engine speed at 2,500 rpm.
Measure voltage between terminals VF1 and E1.
0 V
5 V
Disconnect the PCV hose.
Measure voltage between terminals VF1 and E1.
0V
More than 0 V
Repair (Over rich)
Disconnect the engine coolant temp. sensor con–
nector and connect a resistor with a resistance of
4 – 8 kΩ or send en equivalent simulation signal.
Connect terminals TE1 and El of the DLC1.
Warm up the heated oxygen sensor with the engine
at 2,500 rpm for approx. 90 seconds.
And maintain engine speed at 2,500 rpm.
Measure voltage between terminals VF1 and E1.
0 V
5 V
Replace the heated oxygen sensor.
Repair (Over lean)
V02241

ENGINE CONTROL MODULE (ECM)

ENGINE CONTROL MODULE (ECM) INSPECTION

HINT: The MFI circuit can be checked by measuring the voltage and resistance at the wiring connectors of the engine control module (ECM).



1. INSPECT VOLTAGE OF ENGINE CONTROL MODULE (ECM)

Check the voltage between each terminal of the wiring connectors.

- Turn the ignition switch ON.
- Measure the voltage at each terminal.

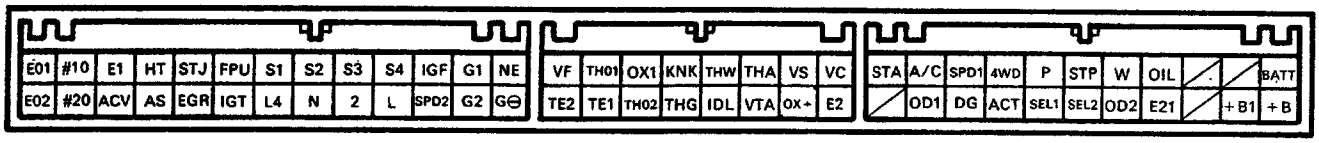
HINT:

- Perform all voltage measurements with the connectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is ON.

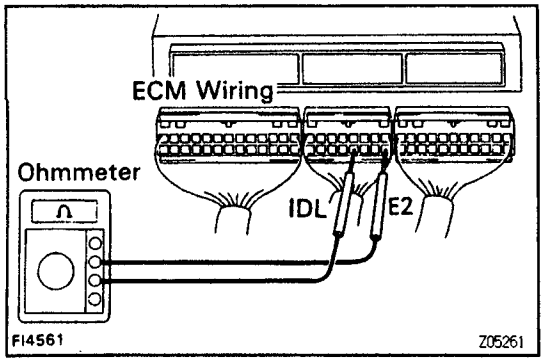
Engine Control Module (ECM) Wiring Connectors Voltage

Terminals	Condition		STD voltage
BATT – E1	–		9 – 14
+B – E1	Ignition SW ON		
+B1 – E1			
IDL – E2 (E21)	Ignition SW ON	Throttle valve open	9 – 14
VC – E2 (E21)		–	4.5 – 5.5
VTA – E2 (E21)		Throttle vaive¿fully closed (Throttle opener must be cancelled first)	0.3 – 0.8
		Throttle valve fully open	3.2 – 4.9
VC – E2 (E21)	Ignition SW ON	–	4.5 – 5.5
VS – E2 (E21)		Measuring plate fully closed	4.0 – 5.5
		Measuring plate fully open	0.2 – 0.5
	Idling		2.3 – 2.8
	3,000 rpm		0.3 – 1.0
THA – E2 (E21)	Ignition SW ON	Intake air temperature 20°C (68°F)	0.5 – 3.4
THW – E2 (E21)	Ignition SW ON	Engine coolant temperature 80°C (176°F)	0.2 – 1.0
STA – E1	Cranking		6 V or more
#10 – E01 #20 – E02	Ignition SW ON		9 – 14
IGT – E1	Idling		Pulse generation
W – E1	No trouble (malfunction indicator lamp off) and engine running)		9 – 14
STJ – E1	Cranking	Engine coolant temperature 80°C (176°F)	6 V or more
STP – E1	Stop light switch ON		7.5 – 14

Engine Control Module (ECM) Terminals



FI2796



2. INSPECT RESISTANCE OF ENGINE CONTROL MODULE (ECM)

NOTICE:

- **Do not touch the engine control module (ECM) terminals.**
- **The tester probe should be inserted into the wiring connector from the wiring side.**

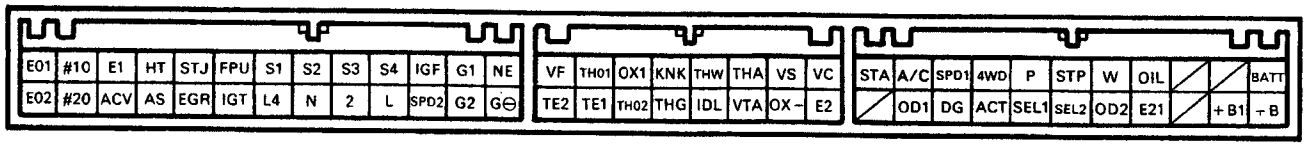
Check the resistance between each terminal of the wiring connectors.

- Disconnect the connectors from the engine control module (ECM).
- Measure the resistance at each terminal.

Engine Control Module (ECM) Wiring Connectors Resistance

Terminals	Condition	Resistance (kΩ)
IDL – E2 (E21)	Throttle valve open	Infinity
	Throttle valve fully closed (Throttle opener must be cancelled first)	2.3 or less
VTA – E2 (E21)	Throttle valve fully open	3.1 – 12.1
	Throttle valve fully closed (Throttle opener must be cancelled first)	0.47 – 6.1
VC – E2 (E21)	Intake air temperature 20°C (68°F)	3.9 – 9.0
THA – E2 (E21)	Volume air flow meter connector disconnected	2 – 3
THW – E2 (E21)	Engine coolant temperature 80°C (176°F)	0.2 – 0.4
+B – E1	–	0.2 – 0.4
VC – E2 (E21)	Throttle position sensor connector disconnected	0.2 – 0.4
VS – E2 (E21)	Measuring plate fully closed	0.2 – 0.6
	Measuring plate fully open	0.02 – 1.20
G1, G2 – G⊖	Cold (–10 ~ 50°C, 14 ~122°F)	0.125 – 0.200
	Hot (50~100°C, 122~212°F)	0.160 – 0.235
NE – G⊖	Cold (–10 ~ 50°C, 14 ~122°F)	0.155 – 0.250
	Hot (50~100°C, 122~212T)	0.190 – 0.290

Engine Control Module (ECM) Terminals



V02237

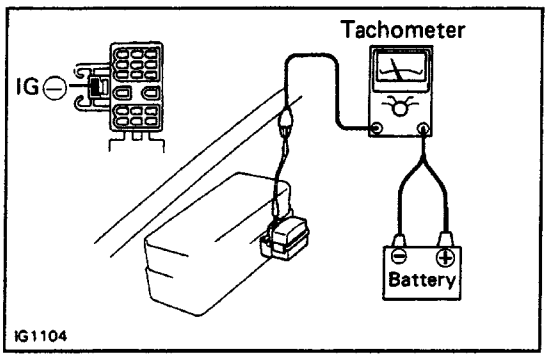
FUEL CUT RPM

EG1HU–02

FUEL CUT RPM INSPECTION

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.



2. CONNECT TACHOMETER

Connect the test probe of a tachometer to terminal IG (–) of the DLC1.

NOTICE:

- **Never allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of yours before use.**

3. INSPECT FUEL CUT OPERATION

(a) Increase the engine speed to at least 2,500 rpm.

(b) Check for injector operating sound.

(c) Check that when the throttle lever is released, injector operation sound stops momentarily and then res–umes.

HINT:

- The vehicle should be stopped.
- Accessories switched OFF.

Fuel return rpm:

M/T 1.300 rpm

A/T 1,500 rpm

4. DISCONNECT TACHOMETER

SERVICE SPECIFICATIONS

EG1U6-02

SERVICE DATA

Fuel pressure regulator	Fuel pressure	at no vacuum	265 – 304 kPa (2.7 – 3.1 kgf/cm², 38 – 44 psi)
Cold start injector	Resistance Fuel leakage		2 – 4 Ω One drop or less per minute
Injector	Resistance Injection volume Difference between each cylinder Fuel leakage		13.4 – 14.2 Ω 45 – 55 cm³ (2.7 – 3.4 cu in.) per 15 sec. 6 cm³ (0.4 cu in.) or less One drop or less per minute
Volume air flow meter	Resistance	Terminals	Resistance
		VS – E2	200 – 600 Ω (Measuring plate fully closed)
		VS – E2	20 – 1,200 Ω (Measuring plate fully open)
		VC – E2	200 – 400 Ω
		FC – E1	Infinity
		THA – E2	10 – 20 kΩ at −20°C (−4°F)
		THA – E2	4 – 7 kΩ at 0°C (32°F)
		THA – E2	2 – 3 kΩ at 20°C (68°F)
		THA – E2	0.9 – 1.3 kΩ at 40°C (104°F)
		THA – E2	0.4 – 0.7 kΩ at 60°C (140°F)
Throttle body	Throttle body fully closed angle Dashpot setting speed Throttle opener setting speed		6° 2,000 ± 200 rpm 900 – 1,800 rpm
Throttle position sensor	Clearance between stop screw and lever	Terminals	Resistance
	0 mm (0 in.)	VTA – E2	0.47 – 6.1 kΩ
	0.50 mm (0.020 in.)	IDL – E2	2.3 kΩ or less
	0.80 mm (0.031 in.)	IDL – E2	Infinity
	Throttle valve fully open	VTA – E2	3.1 – 12.1 kΩ
		VC – E2	3.9 – 9.0 kΩ
Cold start injector time switch	Resistance	STA – STJ	30 – 50 Ω below 10°C (50°F)
		STA – STJ	70 – 90 Ω above 25°C (77°F)
		STA – Ground	30 – 90 Ω
Engine coolant temp. sensor	Resistance		10 – 20 kΩ at −20°C (−4°F) 4 – 7 kΩ at 0°C (32°F) 2 – 3 kΩ at 20°C (68°F) 0.9 – 1.3 kΩ at 40°C (104°F) 0.4 – 0.7 kΩ at 60°C (140°F) 0.2 – 0.4 kΩ at 80°C (176°F)
VSV (Fuel pressure control)	Resistance		30 – 50 Ω at 20°C (68°F)
EGR gas temp. sensor (Calif. and C&C)	Resistance		69 – 89 kΩ at 50°C (122°F) 11 – 15 kΩ at 100°C (212°F) 2 – 4 kΩ at 150°C (302°F)
Heated oxygen sensor	Heater coil resistance	California 2WD only Others	4.5 – 6.0 Ω at 23°C (73°F) 5.1 – 6.3 Ω at 20°C (68°F)

ECM	Condition	Terminals	Voltage
	IG SW ON	+B–E1	9 – 14 V
	IG SW ON	+B1 – E1	9 – 14 V
	–	BATT – E1	9 – 14 V
	IG SW ON – Throttle valve open	IDL – E2 (E21)	9 – 14 V
	IG SW ON – Throttle valve fully closed (Throttle opener must be cancelled first)	VTA – E2 (E21)	0.3 – 0.8 V
	IG SW ON – Throttle valve fully open	VTA – E2 (E21)	3.2 – 4.9 V
	IG SW ON	VC – E2 (E21)	4.5 – 5.5 V
	IG SW ON – Measuring plate fully closed	VS – E2 (E21)	4.0 – 5.5 V
	IG SW ON – Measuring plate fully open	VS – E2 (E21)	0.2 – 0.5 V
	Idling	VS – E2 (E21)	2.3 – 2.8 V
	3,000 rpm	VS – E2 (E21)	0.3 – 1.0 V
	IG SW ON	#10 or #20 – E01	9 – 14 V
	IG SW ON	#10 or #20 – E02	9 – 14 V
	IG SW ON – Intake air temp. 20•C (68*F)	THA – E2 (E21)	0.5 – 3.4 V
	IG SW ON – Engine coolant temp. 80• C (176• F)	THW – E2 (E21)	0.2 – 1.0 V
	Cranking	STA – E1	6 V or more
	Idling	IGT – E1	Pulse generation
	No trouble (malfunction indicator lamp off) and engine running	W – E1	9 – 14 V
	Cranking – Engine coolant temp. 80• C (176• F)	STJ – E1	6 V or more
	Stop light switch ON	STP	7.5 – 14 V

ECM	Condition	Terminals	Resistance
	Throttle valve open Throttle valve fully closed (Throttle opener– must be cancelled first)	IDL – E2 (E21)	Infinity
		IDL – E2 (E21)	2,300 Ω or less
	Throttle valve fully open Throttle valve fully closed (Throttle opener must be cancelled first)	VTA – E2 (E21)	3,100 – 12,100 Ω
		VTA – E2 (E21)	470 – 6,100 Ω
	Measuring plate fully closed	VC – E2 (E21)	3,900 – 9,000 Ω
	Measuring plate fully open	VS – E2 (E21)	200 – 600 Ω
	Intake air temp. 20•C (68•F) Coolant temp. 80• C (176• F)	VS – E2 (E21)	20 – 1,200 Ω
		THA – E2 (E21)	2,000 – 3,000 Ω
		THW – E2 (E21)	200 – 400 Ω
	Cold (–10°C (14°F) to 50°C (122°F))		
		G1 or G2 – G⊖	125 – 200 Ω
	Hot (50°C (122°F) to 100°C (212°F))		
		G1 or G2 – G⊖	160 – 235 Ω
	Cold (–10°C (14°F) to 50°C (122°F))	NE – G⊖	155 – 250 Ω
	Hot (50°C (122°F) to 100°C (212°F))	NE – G⊖	190 – 290 Ω
Fuel cut rpm	Fuel return rpm	M/T	1,300 rpm
		A/T	1,500 rpm

TORQUE SPECIFICATIONS

EG1HW–02

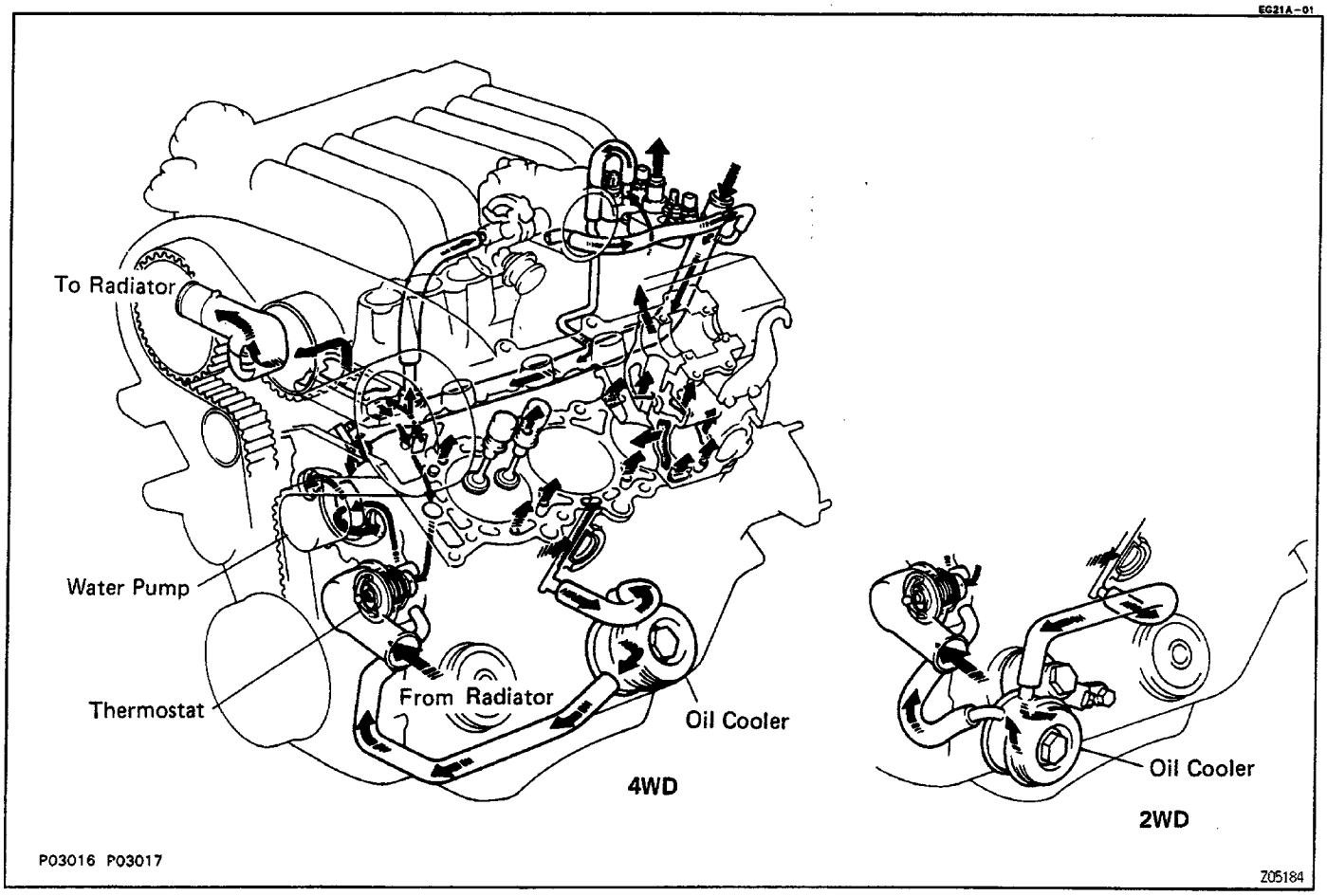
Part tightened	N·m	kgf·cm	ft·lbf
Cold start injector x Air intake chamber	7.8	80	69 in.·lbf
Delivery pipe x Pulsation damper	29	300	22
Delivery pipe x Fuel pressure regulator	29	300	22
Delivery pipe x Cold start injector tube	15	150	11
Delivery pipe x No.3 fuel pipe	34	350	25
Delivery pipe x No.2 fuel pipe	34	350	25
Delivery pipe x Intake manifold	13	130	9
Fuel line	30	310	22
Fuel pump	3.9	40	35 in.·lbf
Fuel drain plug	6.4	65	56 in.·lbf

COOLING SYSTEM

DESCRIPTION

This engine is cooled by a pressurized water forced circulation cooling system equipped with a thermostatically controlled by – pass valve mounted on the inlet side.

OPERATION



The cooling system is composed of the water jacket (inside the cylinder block and cylinder head), radiator, water pump, thermostat, cooling fan, fluid coupling, hoses and other components.
Engine coolant, which has been heated in the water jacket, is drawn into the radiator by the water pump. The radiator is cooled by air drawn in by the cooling fan and by the air flow from the vehicle's forward motion. This in turn cools the coolant in the radiator. The coolant is then drawn into the water pump and then discharged back to the cylinder block.
The water jacket is a network of channels in the outer area of the cylinder block and cylinder head. It is designed so that the engine coolant flowing through it can provide adequate cooling to the areas subjected to the highest thermal stresses, in particular, the cylinders and combustion chambers, during engine operation.

RADIATOR

The radiator, mounted at the front of vehicle, consists of an upper and lower tank and a core connecting the two tanks.
The core contains many tubes through which engine coolant flows from the upper tank to the

lower tank. Air passing over the radiator fins cools the heated engine coolant flowing through the radiator.
The upper tank has an inlet for engine coolant from the water jacket and it has a filler inlet. It also has a hose attached through which excess engine coolant or steam can flow. The lower tank has an outlet for the engine coolant and a drain cock. Automatic transmission models include an automatic transmission fluid cooler.

RADIATOR CAP

The radiator cap is a pressure type cap which seals the radiator, resulting in pressurization of the radiator as the coolant expands. The pressurization prevents the engine coolant from boiling even when the engine coolant temperature exceeds 100* C (212. • F).
A relief valve (pressurization valve) and a vacuum valve (negative pressure valve) are built into the radiator cap. The relief valve opens and lets steam escape out of the overflow pipe when the pressure generated in the cooling system exceeds the limit (engine coolant temperature: 110 – 120 • C 230 – 248 ”F, pressure: 58.8 – 103.0 kPa, 0.6 – 1.05 kgf/cm2, 8.5 – 14.9 psi). The vacuum valve opens to allow engine coolant to enter in order to alleviate the vacuum which develops in the engine coolant system after the engine has stopped and the engine coolant temperature drops.

RESERVOIR TANK

The reservoir tank is used to catch engine coolant which–overflows the cooling system as a result of volumetric expansion when the engine coolant is heated. When the engine coolant temper–ature drops, engine coolant in the reservoir tank returns to the radiator, thus keeping the radiator full at all times and avoiding needless engine coolant loss. To find out if the engine coolant needs to be replenished, check the reservoir tank level.

WATER PUMP

The water pump is used for forced circulation of engine coolant through the cooling system. It is mounted on the front of the engine block and driven by the timing belt.

THERMOSTAT

The thermostat has a wax type by–pass valve and is mounted in the water inlet housing. The thermostat includes a type of automatic valve operated by fluctuations in the engine coolant temperature. When the engine coolant temperature is low, the valve closes to prevent the engine coolant flowing to the radiator, thus permitting the engine to warm up rapidly. When the by–pass valve opens the by–pass circuit, the engine coolant continues to circulate inside the engine, quickly and uniformly warming up to the operating temperature.
When the engine coolant temperature is high, the valve opens and the engine coolant flows to the radiator where it is cooled. When the wax inside the thermostat is heated, it expands and thus creates pressure which overpowers the force of the spring which keeps the valve closed. When the wax cools, its contraction allows the force of the spring to take effect once more, closing the valve. The thermostat in this engine operates at a temperature of 82 •C (180 •F).

PREPARATION

EG1D3–01

EQUIPMENT

Heater	
Radiator cap tester	
Thermometer	
Torque wrench	

EG1D4–02

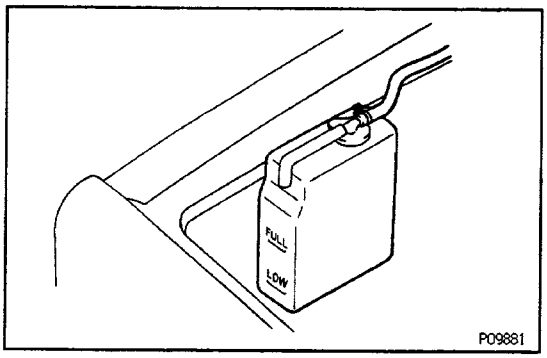
ENGINE COOLANT

Item	Capacity	Classification
2WD M /T A/T 4WD M/T A/T	9.9 liters (110.5 US qts, 8.7 Imp. qts) 9.7 liters (10.3 US qts, 8.5 Imp. qts) 10.0 liters (10.6 US qts, 8.8 Imp. qts) 9.8 liters (10.4 US qts, 8.6 Imp. qts)	Ethylene–glycol base

EG1D5–01

SSM (SPECIAL SERVICE MATERIALS)

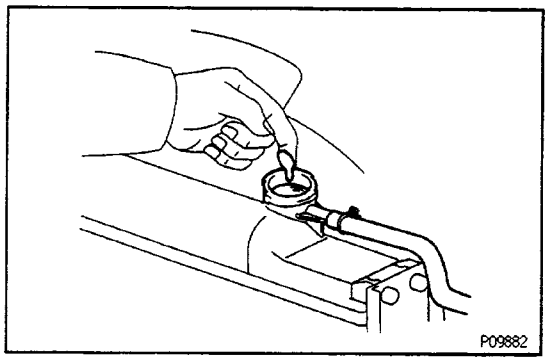
08826–00100 Seal Packing 1282B, Three Bond 1282B or equivalent	Water pump



COOLANT CHECK AND REPLACEMENT

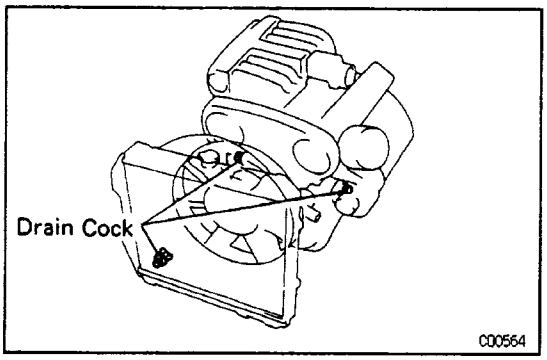
1. CHECK ENGINE COOLANT LEVEL IN RESERVOIR TANK

The engine coolant level should be between the "LOW" and "FULL" lines.
If low, check for leakage and add engine coolant up to the "FULL" line.



2. CHECK ENGINE COOLANT QUALITY

There should not be any excessive deposits of rust or scale around the radiator cap or radiator filler hole, and the engine coolant should be free from oil.
If excessively dirty, replace the engine coolant.



3. REPLACE ENGINE COOLANT

(a) Remove the radiator cap.
(b) . Drain the engine coolant from the radiator and engine drain cocks.
(c) Close the drain cocks.
(d) Fill the system with engine coolant.
HINT:

- Use a good brand of ethylene – glycol base engine coolant, mixed according to the manufacturer's instructions.
- Using engine coolant which has more than 50% ethylene–glycol (but not more than 70%) is recommended.

NOTICE:

- **Do not use an alcohol type engine coolant.**
- **The engine coolant should be mixed with deminer–alized water or distilled water.**

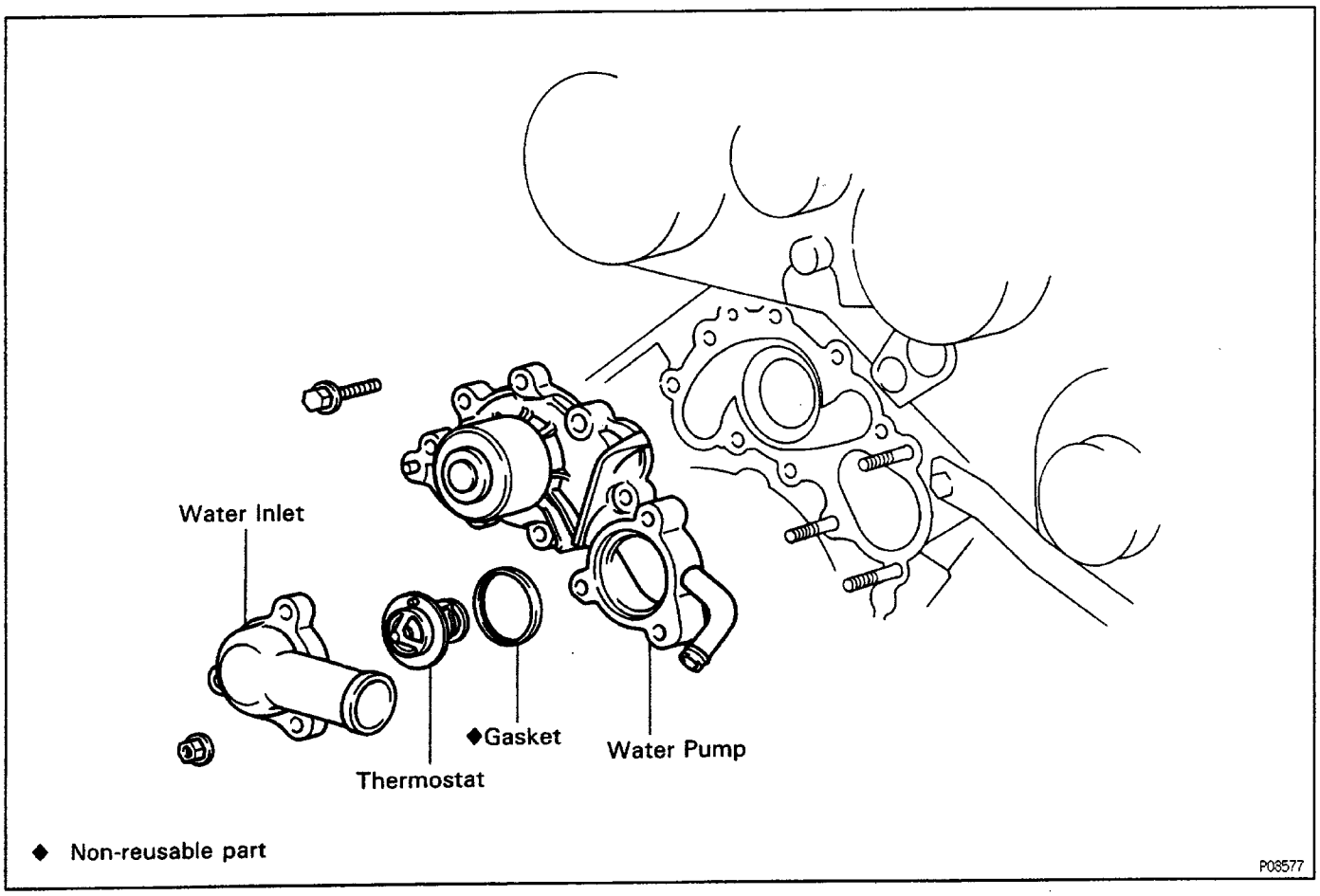
Engine coolant capacity (w/ heater or air conditioner):
2WD
M/T 9.9 liters (10.5 US qts, 8.7 Imp. qts)
A/T 9.7 liters (10.3 US qts, 8.5 Imp. qts)
4WD
M/T 10.0 liters (10.6 US qts, 8.8 Imp. qts)
A/T 9.8 liters (10.4 US qts, 8.6 Imp. qts)

(e) Install the radiator cap.
(f) Start the engine and check for leaks.
(g) Recheck the engine coolant level and refill as neces–sary.

WATER PUMP

EG1D7–01

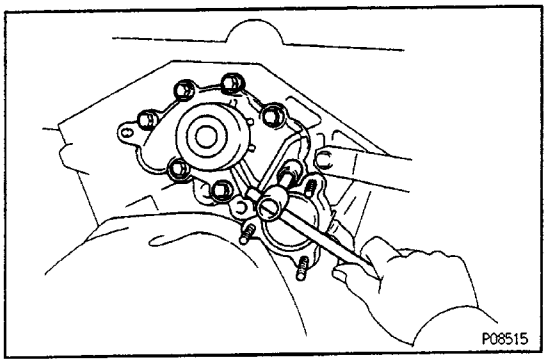
COMPONENTS



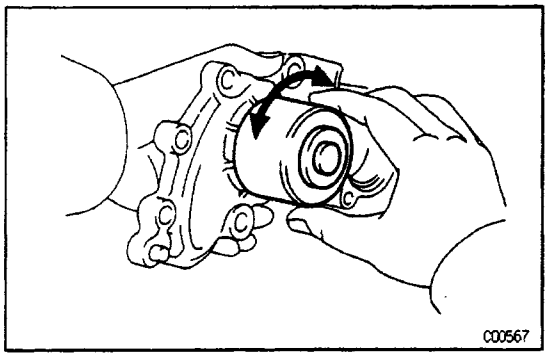
EG1D8–01

WATER PUMP REMOVAL

1. REMOVE TIMING BELT
(See page EG2–32)
2. REMOVE THERMOSTAT
3. DISCONNECT NO. 2 OIL COOLER HOSE FROM WATER PUMP



4. REMOVE WATER PUMP
Remove the seven bolts and water– pump.

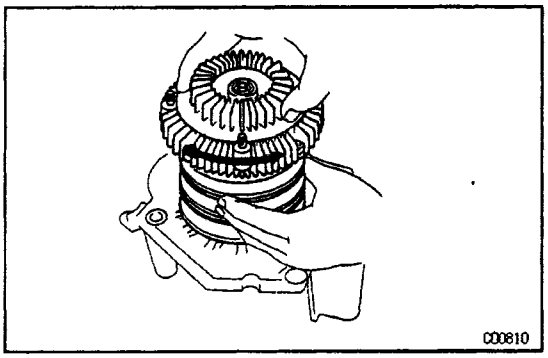


EG1D9–01

WATER PUMP INSPECTION

1. INSPECT WATER PUMP BEARING

Check that the water pump bearing moves smoothly and quietly.

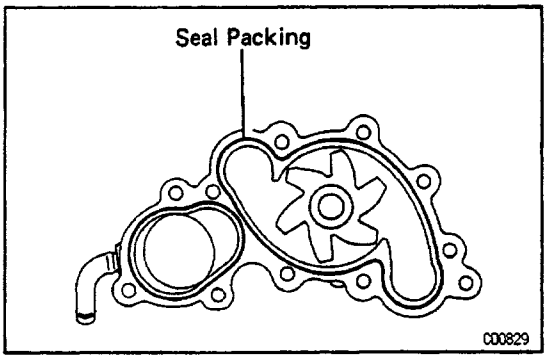


2. INSPECT FLUID COUPLING

Check the fluid coupling for damage and silicone oil leakage.

3. INSPECT FAN PULLEY BRACKET

Check the turning smoothness of the fan pulley. If necessary, replace the pulley bracket.



EG20X–01

WATER PUMP INSTALLATION

(See components)

1. INSTALL WATER PUMP

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the water pump and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

(b) Apply seal packing to the water pump groove.

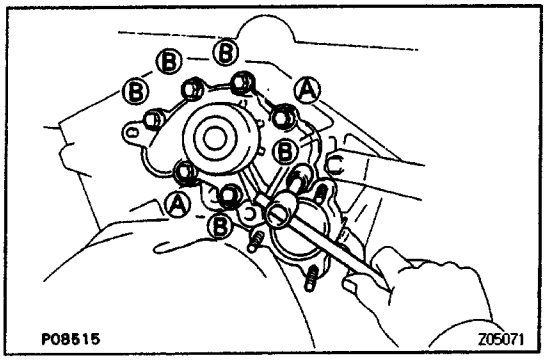
Seal packing:

Part No.08826–00100 or equivalent

- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.

HINT: Avoid applying an excessive amount to the surface.

- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(c) Install the water pump with the seven bolts.

Torque:

Bolt (A) 18 N–m (185 kgf–cm. 13 ft–lbf)

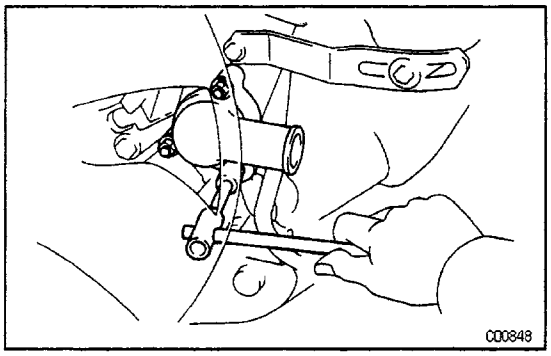
Bolt (B) 20 N–m (200 kgf–cm, 14 ft–lbf)

2. CONNECT NO.2 OIL COOLER HOSE

3. INSTALL THERMOSTAT

4. INSTALL TIMING BELT

(See page EG2–41)



THERMOSTAT

EG1DB–01

THERMOSTAT REMOVAL

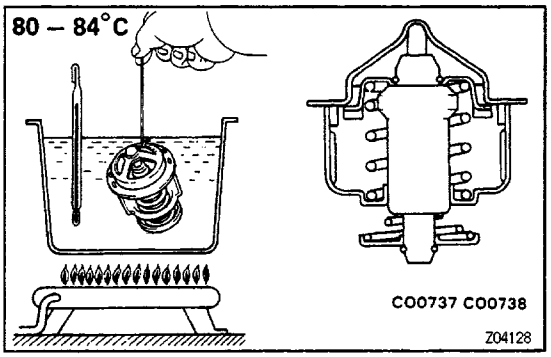
1. DRAIN ENGINE COOLANT

2. DISCONNECT RADIATOR OUTLET HOSE

3. REMOVE THERMOSTAT

(a) Remove the three nuts, water inlet and thermostat with gasket from the water pump.

(b) Remove the gasket from the thermostat.



EG1DC–01

THERMOSTAT INSPECTION

HINT: Thermostat is numbered according to the valve opening temperature.

(a) Immerse the thermostat in water and heat the water gradually.

(b) Check the valve opening temperature and valve lift.

Valve opening temperature:

80 – 84 •C (176 – 183 •F)

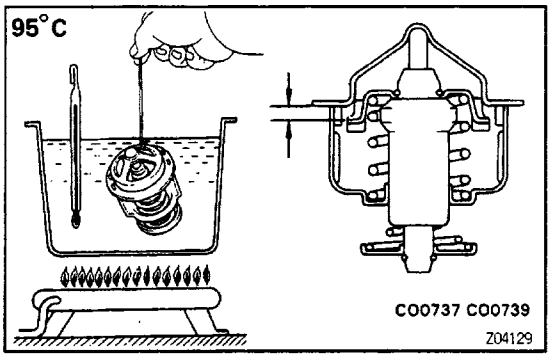
Valve lift:

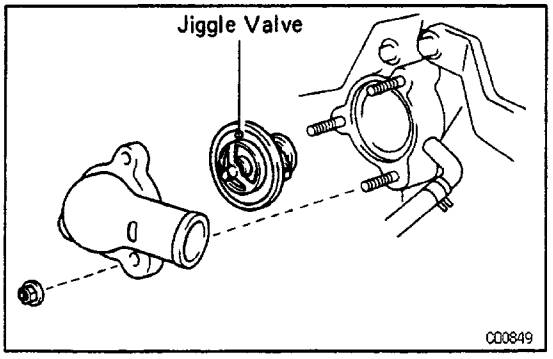
8 mm (0.31 in.) or more at 95 •C (203 •F)

If the valve opening temperature and valve lift are not within specifications, replace the thermostat.

(c) Check that the valve spring is tight when the thermostat is fully closed.

If not tight, replace the thermostat.





EG20Y–01

THERMOSTAT INSTALLATION

1. INSTALL THERMOSTAT

(a) Place a new gasket to the thermostat.

(b) Install the thermostat with the jiggle valve upward.

2. INSTALL WATER INLET

Install the water inlet with the three nuts.

Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)

3. CONNECT RADIATOR OUTLET HOSE

4. FILL WITH ENGINE COOLANT

5. START ENGINE AND CHECK FOR LEAKS

RADIATOR

EG1DE–01

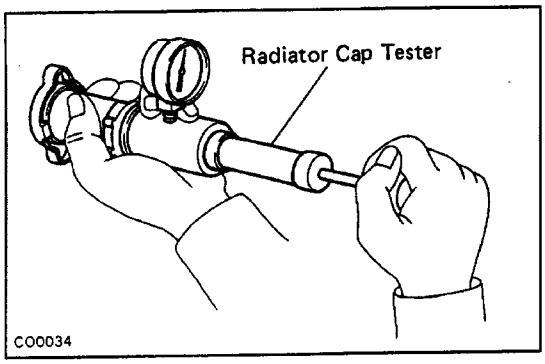
RADIATOR CLEANING

Using water or a steam cleaner, remove mud and dirt from the radiator core.

NOTICE: If using a high–pressure type cleaner, be careful not to deform the fins of the radiator core. For example, keep a distance of more than 40 – 50 cm (15.75 – 19.69 in.) between the radiator core and cleaner nozzle when the cleaner nozzle pressure is 2,942 – 3,432 kPa (30 – 35 kgf/cm^2, 427 – 498 psi).

EG1DF–01

RADIATOR INSPECTION

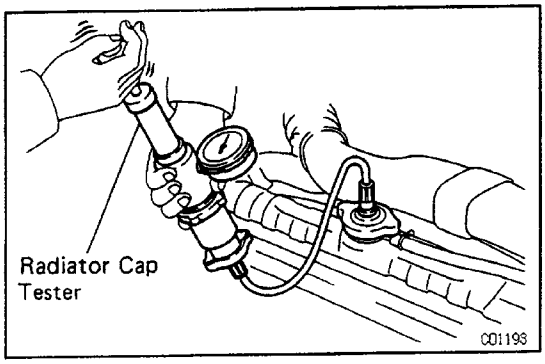


1. CHECK RADIATOR CAP

(a) Using radiator cap tester, pump the tester until relief valve opens. Check that the valve opens between 74 kPa (0.75 kgf/cm^2, 10.7 psi) and 103 kPa (1.05 kgf/cm^2, 14.9 psi).

(b) Check that pressure gauge does not drop rapidly when pressure on cap is below 59 kPa (0.6 kgf/cm^2, 8.5 psi).

If either check is not within limit, replace the radiator cap.



2. CHECK COOLING SYSTEM FOR LEAKS

(a) Fill the radiator with engine coolant and attach a radiator cap tester.

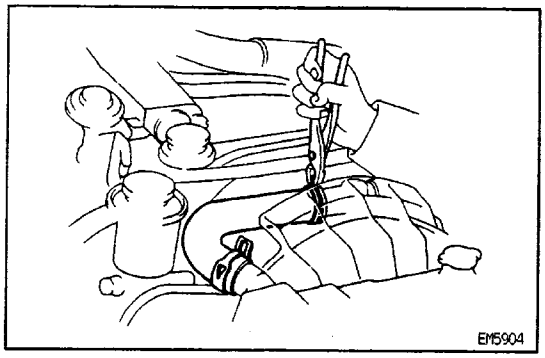
(b) Warm up the engine.

(c) Pump it to 118 kPa (1.2 kgf/cm^2, 17.1 psi), and check that the pressure does not drop.

If the pressure drops, check for leaks from the hoses, radiator or water pump. If no external leaks are found, check the heater core, block and intake manifold.

EG1DG–01

RADIATOR REMOVAL



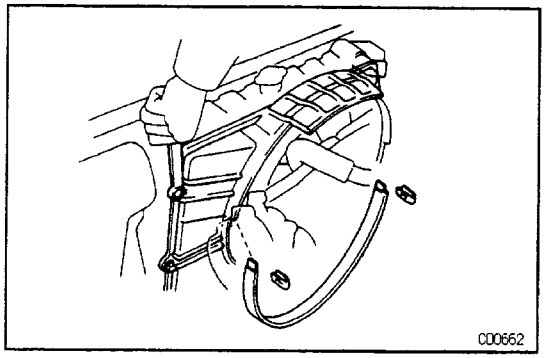
1. DRAIN ENGINE COOLANT

2. REMOVE ENGINE UNDER COVER

3. REMOVE RADIATOR

(a) Disconnect the reservoir hose.

(b) Remove the radiator hoses.



(c) Remove the No.2 fan shroud.

(d) Remove the No.1 fan shroud.

(e) Disconnect the oil cooler hoses.

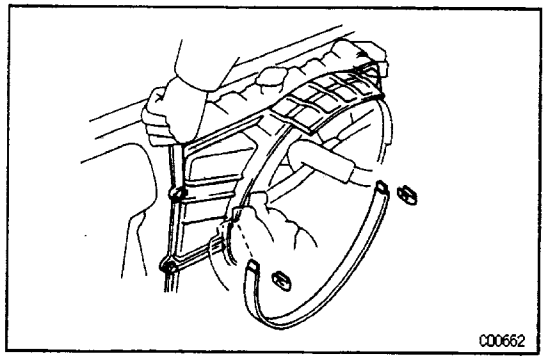
HINT:

- Be careful as some oil will leak out. Catch it in a suitable container.
- Plug the hose to prevent oil from escaping.

(f) Remove the four bolts and radiator.

EG30Z–01

RADIATOR INSTALLATION



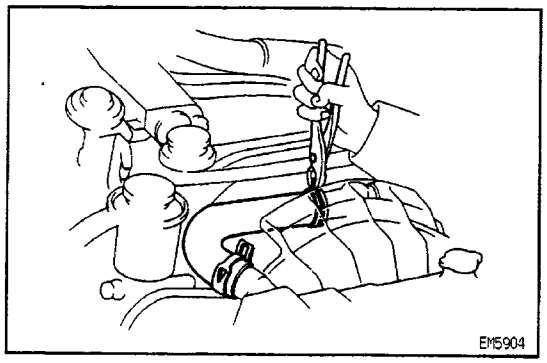
1. INSTALL RADIATOR

(a) Install the radiator with the four bolts.

(b) Connect the oil cooler hoses.

(c) Install the No.1 fan shroud

(d) Install the No.2 fan shroud



(e) Install the radiator hoses.

(d) Connect the reservoir hoses.

2. INSTALL ENGINE UNDER COVER

3. FILL WITH ENGINE COOLANT

4. START ENGINE AND CHECK FOR LEAKS

SERVICE SPECIFICATIONS

EG1DJ–01

SERVICE DATA

Radiator cap	Relief valve opening pressure	STD Limit	74 – 103 kPa (0.75 – 1.05 kgf/cm², 10.7 – 14.9 psi) 59 kPa (0.6 kgf/cm², 8.5 psi)
Thermostat	Valve opening temperature	Start to open Fully open	82 °C (180 °F) 95 °C (203 °F)
	Valve lift		8 mm (0.31 in.) or more

EG1DK–01

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Cylinder block x Drain plug	29	300	22
Water pump x Cylinder block – Short bolt	20	200	14
Water pump x Cylinder block – Long bolt	18	185	13
Water inlet x Water pump	20	200	14

LUBRICATION SYSTEM

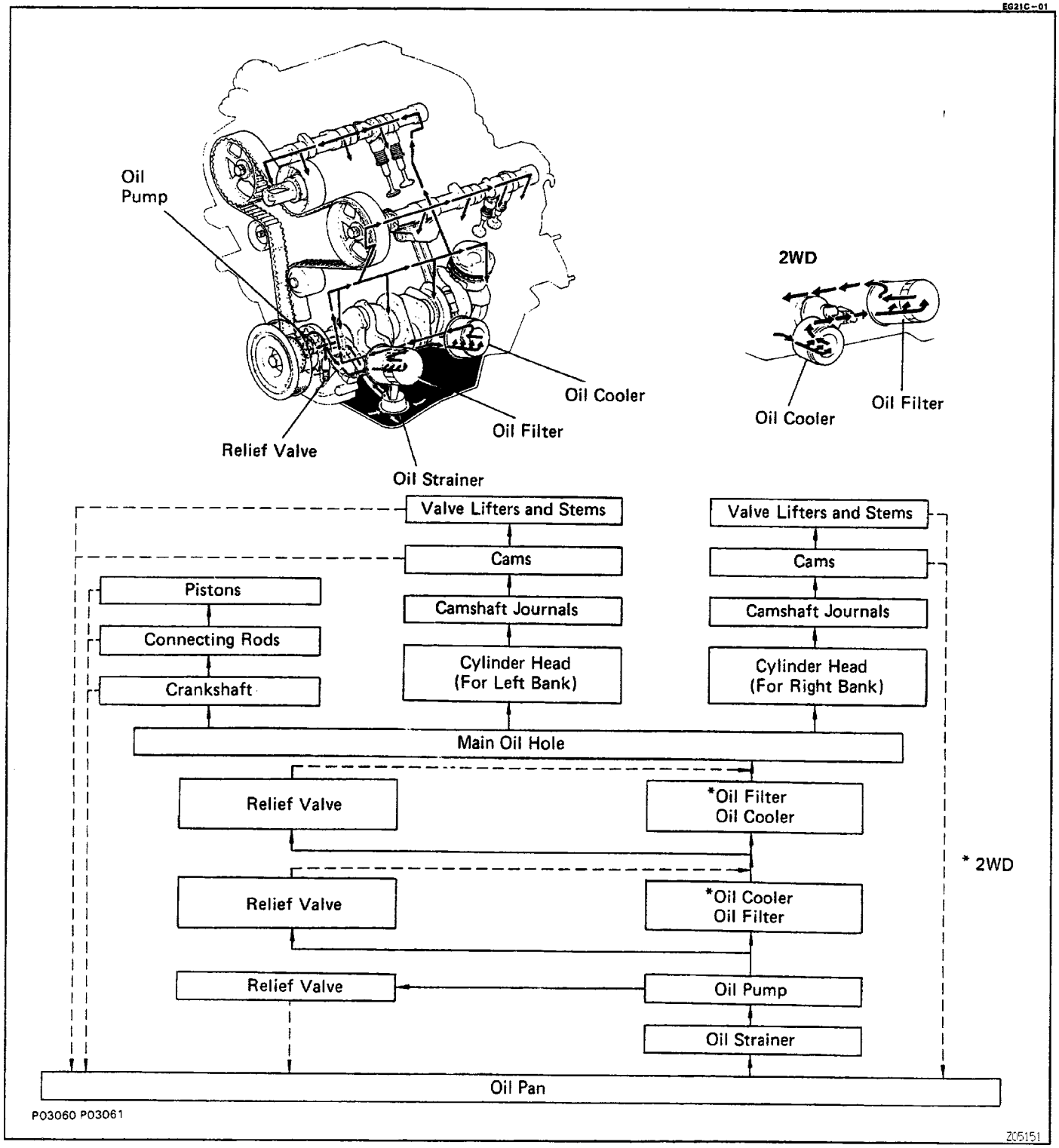
DESCRIPTION

EG21B–01

A fully pressurized, fully filtered lubrication system is used in this engine.

OPERATION

EG21C–01



A pressure feeding lubrication system has been adopted to supply oil to the moving parts of this engine. The lubrication system consists of an oil pan, oil pump, oil filter and other external parts which supply oil to the moving parts in the engine block. The oil circuit is shown in the illustration at the top of the previous page. Oil from the oil pan is pumped up by the oil pump. After it passes through the oil filter, it is fed through the various oil holes in the crankshaft, cylinder block and cylinder head. After passing through the cylinder block and performing its lubricating function, the oil is returned by gravity to the oil pan. A dipstick on the side of the oil pump body is provided to check the oil level.

OIL PUMP

The oil pump pumps up oil from the oil pan and sends it under pressure to the various parts of the engine. An oil strainer is mounted in the front of the inlet to the oil pump. The oil pump itself is a trochoid type pump, inside of which is a drive rotor and a driven rotor. When the crankshaft causes the drive rotor to rotate, the driven rotor rotates in the same direction, and since the axis of the drive rotor shaft is different from the center of the driven rotor, the space between the two rotors is changed as they rotate. Oil is drawn in when the space widens, and is discharged when the space becomes narrow.

OIL PRESSURE REGULATOR (RELIEF VALVE)

At high engine speeds, the oil pump supplies more oil to each part than it is necessary. For this reason, an oil pressure regulator which works to prevent an oversupply of oil is installed on the oil pump. During normal oil supply, a coil spring and valve keep the by–pass closed, but when too much oil is being supplied, the pressures become extremely high, overpowering the force of the spring and opening the valve. This allows the excess oil to flow through the relief valve and return to the oil pan.

OIL FILTER

The oil filter is a full flow type filter with a paper filter element and built–in relief valve. Particles of metal from wear, airborne dirt, carbon and other impurities can get in the oil during use and could cause accelerated wear or seizing if allowed to circulate through the engine. The oil filter, integrated into the oil line, removes these impurities as the oil passes through it.

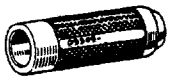
The filter is mounted outside the engine to simplify replacement of the filter element.

A relief valve is included in front of the filter element to relieve the high oil pressure in case the filter element becomes clogged with impurities. The by–pass valve opens when the difference in the oil pressure of the inlet and outlet ports exceeds a specified value. Oil passing through the relief valve by–passes the oil filter and flows directly into the main oil hole in the engine.

PREPARATION

EG1CR–01

SST (SPECIAL SERVICE TOOLS)

	09032–00100 Oil Pan Seal Cutter	
	09228–07500 Oil Filter Wrench	
	09309–37010 Transmission Bearing Replacer	Camshaft front oil seal
	09816–30010 Oil Pressure Switch Socket	

EG1CS–01

RECOMMENDED TOOLS

	09200–00010 Engine Adjust Kit	

EG1CT–01

EQUIPMENT

Oil pressure gauge	
Precision straight edge	Oil pump
Torque wrench	

EG1CU–02

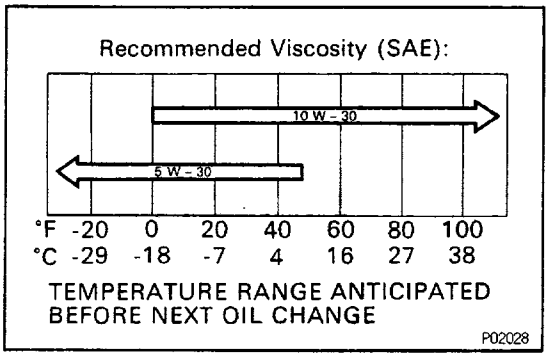
LUBRICANT

Item	Capacity	Classification
Engine oil Dry fill 2WD 4WD Drain and refill w/o Oil filter change 2WD 4WD w/ Oil filter change 2WD 4WD	 5.3 liters (5.6 US qts, 4.7 Imp. qts) 5.4 liters (5.7 US qts, 4.8 Imp. qts) 4.0 liters (4.2 US qts, 3.5 Imp. qts) 4.2 liters (4.4 US qts, 3.7 Imp. qts) 4.3 liters (4.5 US qts, 3.8 Imp. qts) 4.5 liters (4.8 US qts, 4.0 Imp. qts)	API grade SG Energy – Conserving II multigrade and recommended viscosity oil.

EG1CV–01

SSM (SPECIAL SERVICE MATERIALS)

08826–00080 Seal packing or equivalent	Oil pump, Oil pan baffle plate, Oil pan
08833–00080 Adhesive 1344, THREE BOND 1344, LOCTITE 242 or equivalent	Oil pressure sender gauge



OIL PRESSURE CHECK

1. CHECK OIL QUALITY EG20G–01

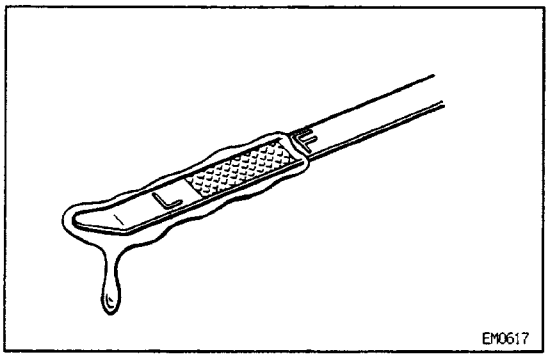
Check the oil for deterioration, entry of water, discoloring or thinning.

If oil quality is poor, replace.

Oil grade:

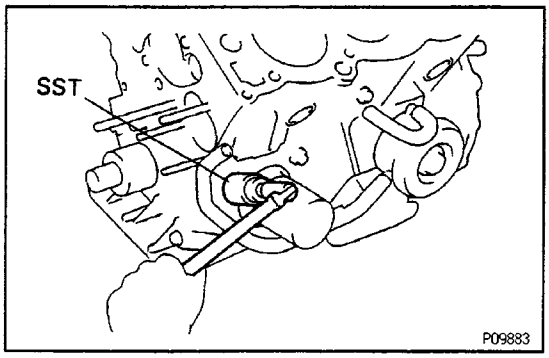
API grade SG Energy – Conserving 11 multigrade engine oil.

Recommended viscosity is as shown.



2. CHECK OIL LEVEL

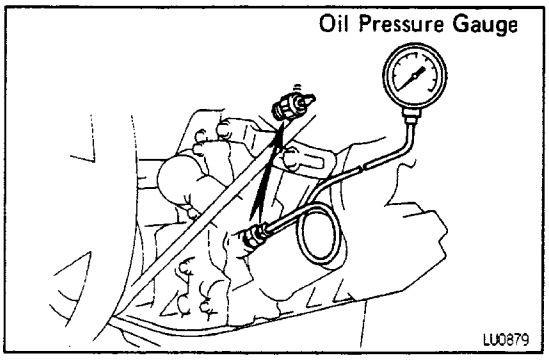
The oil level should be between the ”L” and ”F” marks on the level gauge. If low, check for leakage and add oil up to the ”F” mark.



3. REMOVE OIL PRESSURE SENDER GAUGE

Using SST, remove the oil pressure sender gauge.

SST 09816 – 30010



4. INSTALL OIL PRESSURE GAUGE

5. START ENGINE

Start the engine and warm it up to normal operating temperature.

6. MEASURE OIL PRESSURE

Oil pressure:

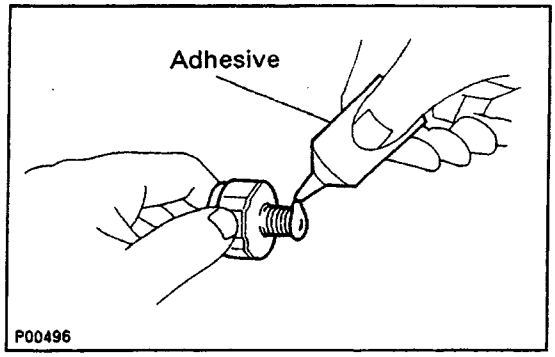
At idle speed

29 kPa (0.3 kgf/cm^2, 4.3 psi) or more

At 3,000 rpm

245 – 520 kPa (2.5 – 5.3 kgf/cm^2, 36 – 75 psi)

7. REMOVE 41L PRESSURE GAUGE

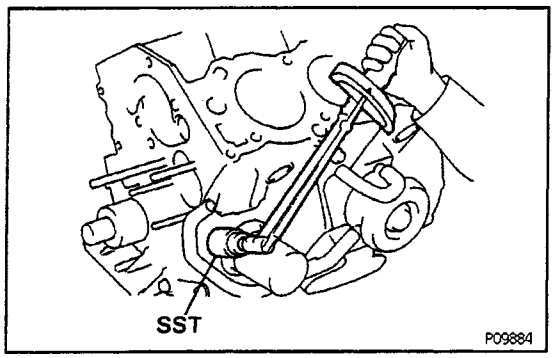


8. INSTALL OIL PRESSURE SENDER GAUGE

(a) Apply adhesive to two or three threads.

Adhesive:

Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent



(b) Using SST, install the oil pressure sender gauge.

SST 09818 – 30010

Torque: 15 N–m (150 kgf–cm, 11 ft–lbf)

9. START ENGINE AND CHECK FOR LEAKS

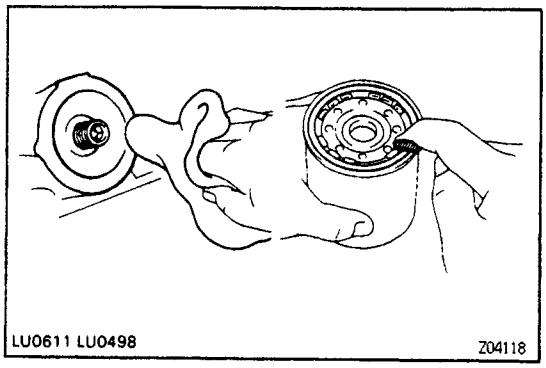
OIL AND FILTER REPLACEMENT

NOTICE: EG1CX–02

- **Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities should be provided.**
- **Care should be taken, therefore, when changing engine oil, to minimize the frequency and length of time your skin is exposed to used engine oil. Protective clothing and gloves, that cannot be penetrated by oil, should be worn. The skin should be thoroughly washed with soap and water, or use waterless hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.**
- **In order to preserve the environment, used oil and used oil filters must be disposed of only at designated disposal sites.**

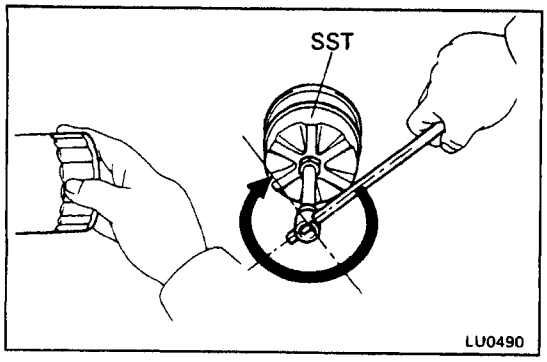
1. DRAIN ENGINE OIL

(a) Remove the oil filler cap.
(b) Remove the oil dipstick.
(c) Remove the oil drain plug and drain the oil into a container.



2. REPLACE OIL FILTER

(a) Using SST, remove the oil filter (located on left side of the cylinder block).
SST 09228–07500
(b) Clean the filter contact surface on the filter mounting.
(c) Apply clean engine oil to the gasket of a new oil filter.

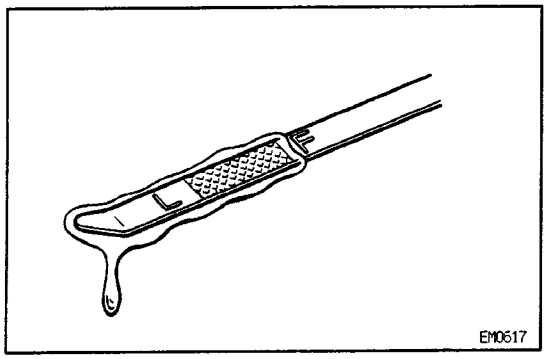


(d) Tighten the filter by hand until the gasket contacts the seat of the filter mounting. Then using SST, give it an additional 3/4 turn to seat the filter.
SST 09228–07500

3. FILL WITH ENGINE OIL

(a) Clean and install the oil drain plug with a new gasket.
(b) Fill the engine with new oil, API grade SG Energy – Conserving II multigrade and recommended viscosity oil.

Oil capacity (2WD):
Drain and refill
w/o Oil filter change
4.0 liters (4.2 U S qts, 3.5 Imp. qts)
w/ Oil filter change
4.3 liters (4.5 US qts, 3.8 Imp. qts)
Dry fill
5.3 liters (5.6 US qts, 4.7 Imp. qts)
Oil capacity (4WD):
Drain and refill
w/o Oil filter change
4.2 liters (4.4 US qts, 3.7 Imp. qts)
w/ Oil filter change .
4.5 liters (4.8 US qts, 4.0 Imp. qts)
Dry fill
5.4 liters (5.7 US qts, 4.8 Imp. qts)

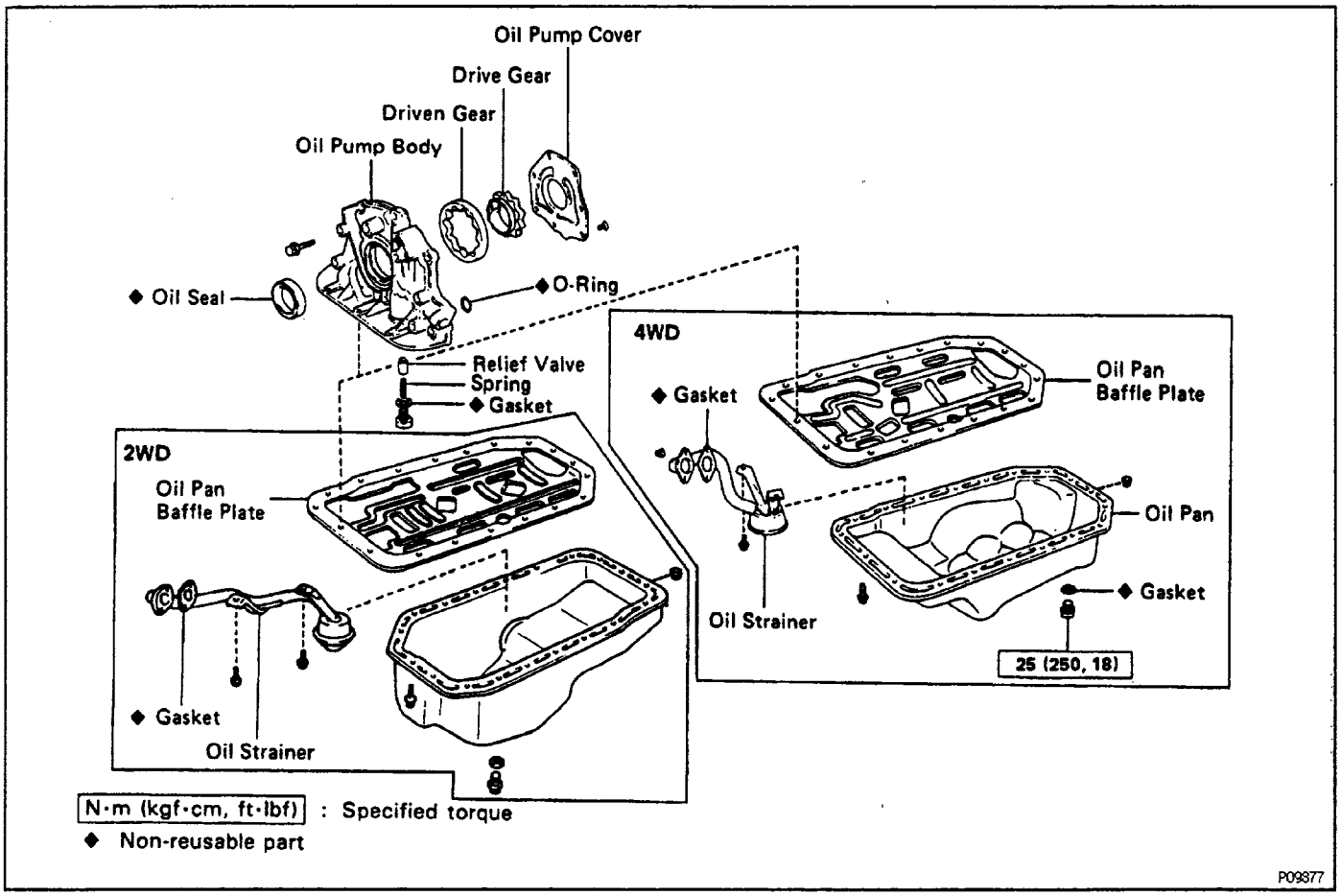


4. START ENGINE AND CHECK FOR LEAKS
5. RECHECK ENGINE LEVEL
Recheck the engine oil level and refill as necessary.

OIL PUMP

EG20H–01

COMPONENTS



EG20J–01

OIL PUMP REMOVAL

1. REMOVE ENGINE UNDER COVER

2. (4WD)

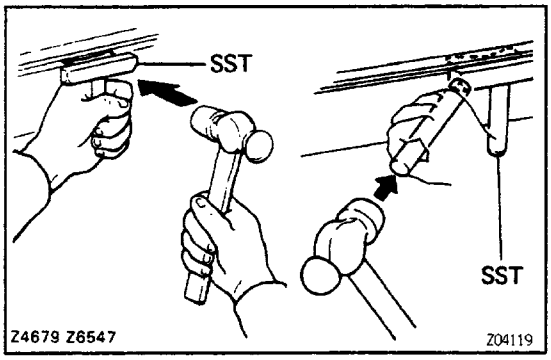
REMOVE FRONT DIFFERENTIAL

(See page SA–57)

3. DRAIN ENGINE OIL

4. REMOVE TIMING BELT

(See page EG2–32)



5. REMOVE CRANKSHAFT TIMING PULLEY

(See step 21 on page EG2–36)

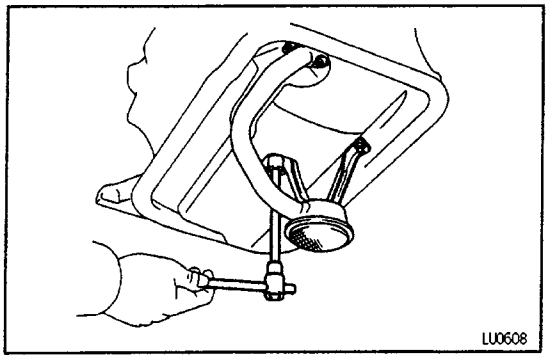
6. REMOVE OIL PAN

(a) Remove the seventeen bolts and two nuts.

(b) Using SST and a brass bar, separate the oil pan from the baffle plate.

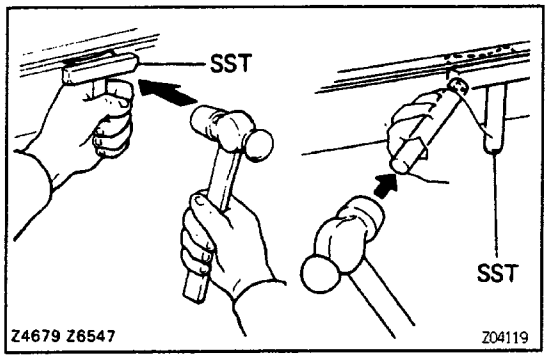
SST 09032–00100

HINT: When removing the oil pan, be careful not to damage the oil pan flange.



7. REMOVE OIL STRAINER

Remove the two bolts, two nuts, oil strainer and gasket.

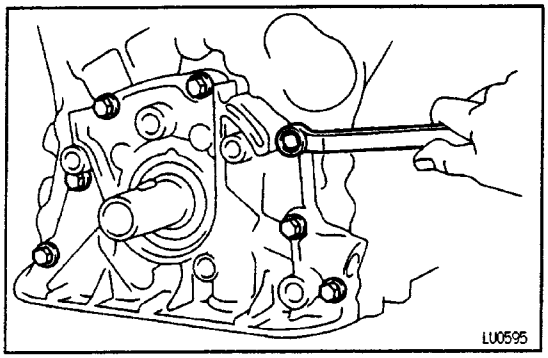


8. REMOVE OIL PAN BAFFLE PLATE

Insert the blade of SST between the cylinder block and baffle plate, cut off applied sealer and remove the baffle plate.

SST 09032 – 00100

HINT: When removing the baffle plate, be careful not to damage the baffle plate flange.



9. REMOVE OIL PUMP

(a) Remove the seven bolts and oil pump.

(b) Using a plastic–faced hammer, carefully tap the oil pump body.

(c) Remove the O–ring from the cylinder block.

EG20K–01

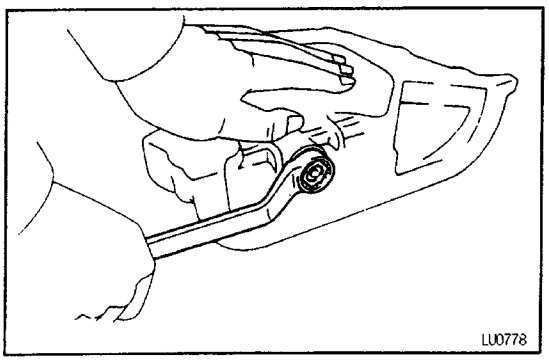
OIL PUMP DISASSEMBLY

(See components)

1. REMOVE DRIVEN AND DRIVE ROTORS

(a) Remove the seven screws and pump body cover.

(b) Remove the drive and driven rotors.



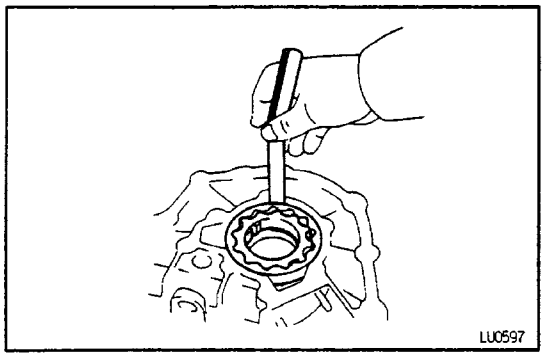
2. REMOVE RELIEF VALVE

(a) Unscrew the relief valve plug and gasket.

(b) Remove the spring and relief valve.

EG1CL–01

OIL PUMP INSPECTION



1. INSPECT BODY CLEARANCE

Using a thickness gauge, measure the clearance between the driven rotor and pump body.

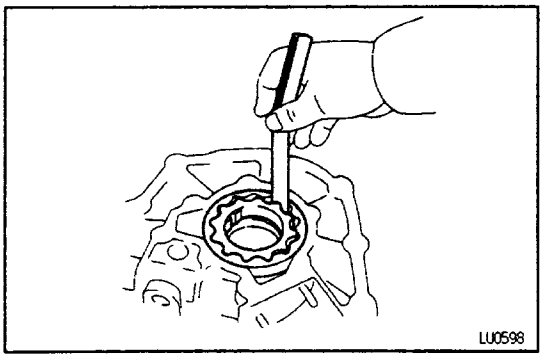
Standard clearance:

0.10 –0.13 mm (0.0039 – 0.0051 in.)

Maximum clearance:

0.30 mm (0.0118 in.)

If the clearance is greater than maximum, replace the oil pump rotor set and/or pump body.



2. INSPECT TIP CLEARANCE

Using a thickness gauge, measure the clearance between the drive and driven rotors.

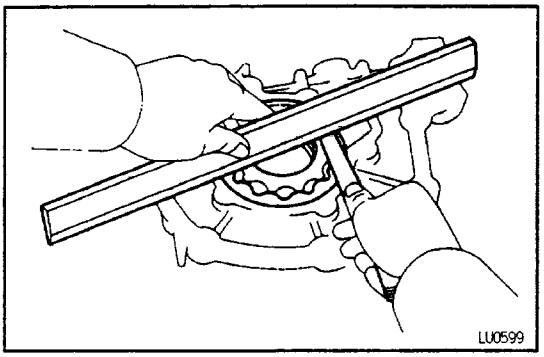
Standard clearance:

0.11 – 0.24 mm (0.0043 – 0.0094 in.)

Maximum clearance:

0.35 mm (0.0138 in.)

If the clearance is greater than maximum, replace the oil pump rotor set.



3. INSPECT SIDE CLEARANCE

Using a thickness gauge and precision straight edge, measure the side clearance as shown.

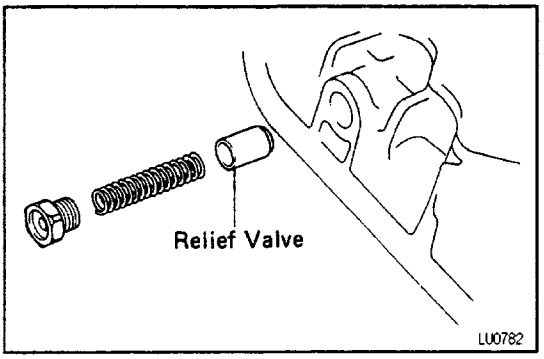
Standard clearance:

0.03 – 0.09 mm (0.0012 – 0.0035 in.) .

Maximum clearance:

0.15 mm (0.0059 in.)

If the clearance is greater than maximum, replace the oil pump rotor set and/or pump body.



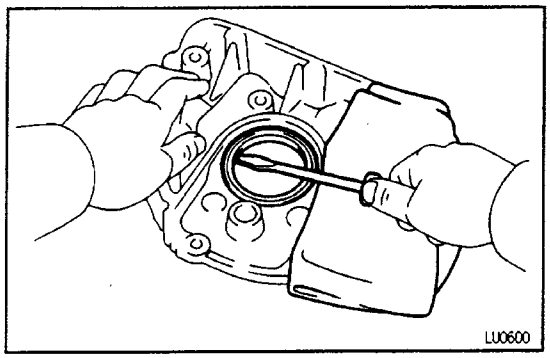
4. INSPECT RELIEF VALVE

Coat the relief valve with engine oil and check that it falls smoothly into the valve hole by its own weight. If the valve does not fall smoothly, replace the valve and/or oil pump assembly.

EG20L–01

CRANKSHAFT FRONT OIL SEAL REPLACEMENT

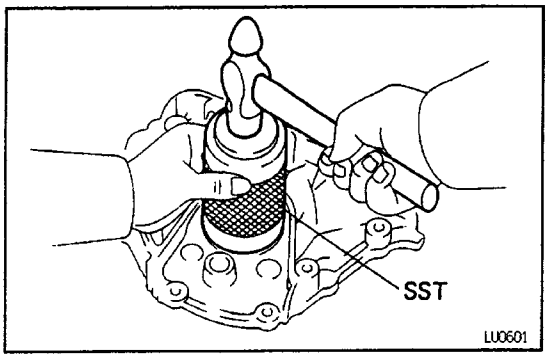
HINT: There are two methods (A and B) to replace the oil seal which are as follows:



REPLACE CRANKSHAFT FRONT OIL SEAL

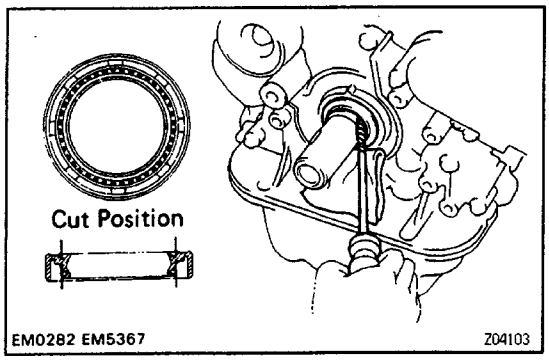
A. If oil pump is removed from cylinder block:

(a) Using a screwdriver, pry out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump body edge.
SST 09309–37010

(c) Apply MP grease to the oil seal lip.

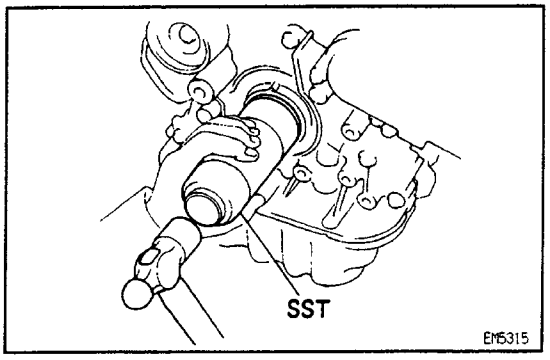


B. If oil pump is installed to the cylinder block:

(a) Using a knife, cut off the oil seal lip.

(b) Using a screwdriver, pry out the oil seal.

NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.

(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump body edge.
SST 09306–37010

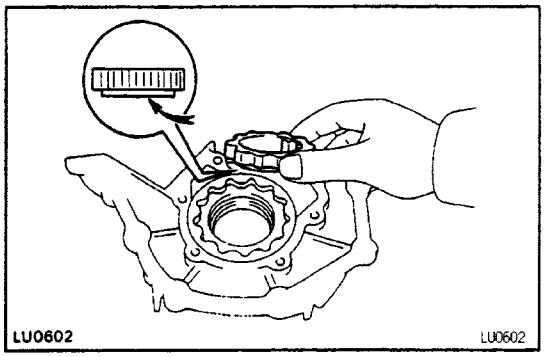
EG1CN–02

OIL PUMP ASSEMBLY

(See components)

1. INSTALL DRIVE AND DRIVEN ROTORS

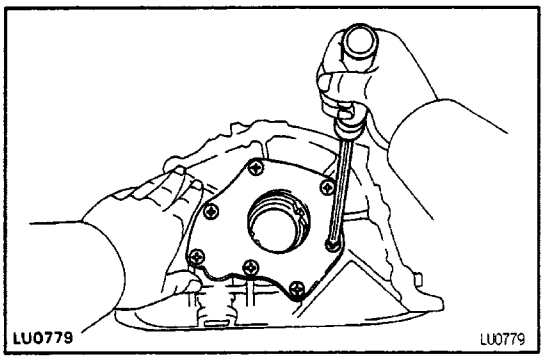
Put the drive and driven rotors in the pump body.



2. INSTALL PUMP BODY COVER

Install the pump body cover with the seven screws.

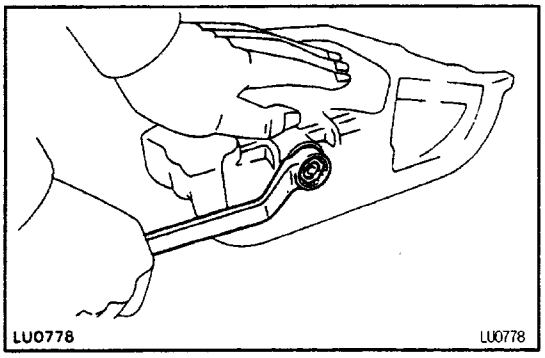
Torque: 10 N–m (105 kgf–cm, 8 ft–lbf)



3. INSTALL RELIEF VALVE

Install relief valve and the spring in the body, and screw on the relief valve plug with a new gasket.

Torque: 37 N–m (375 kgf–cm, 37 ft–lbf)



EG1CP–02

OIL PUMP INSTALLATION

(See components)

1. INSTALL OIL PUMP

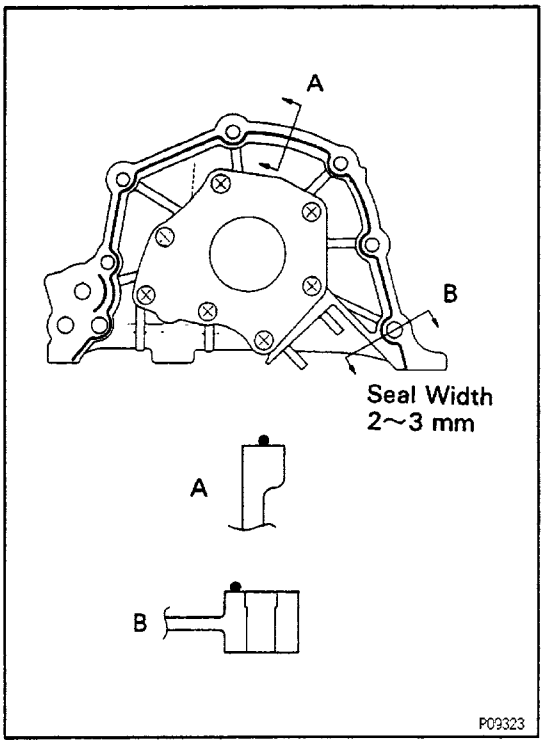
(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the oil pump and cylinder block.

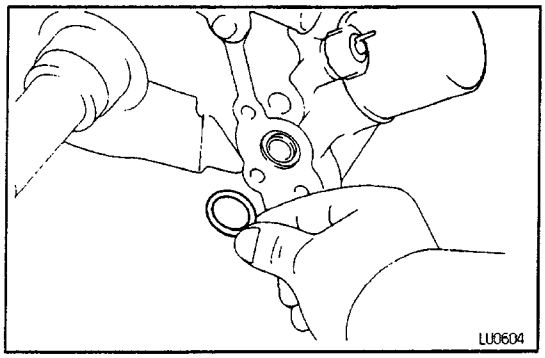
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
- Throughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

(b) Apply seal packing to the oil pump as shown in the illustration.

Seal packing:

Part No. 08826–00080 or equivalent





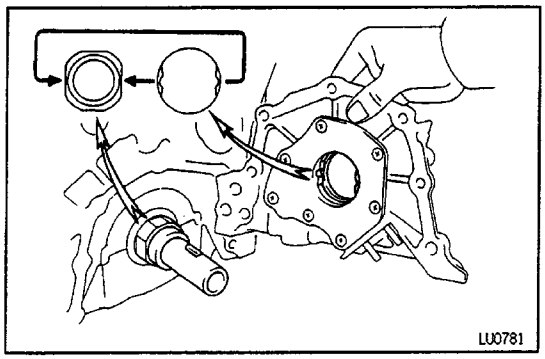
- Install nozzle that has been cut out to a 2–3 mm (0.08–0.12 in.) opening.

HINT: Avoid applying an excessive amount to the surface.

- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

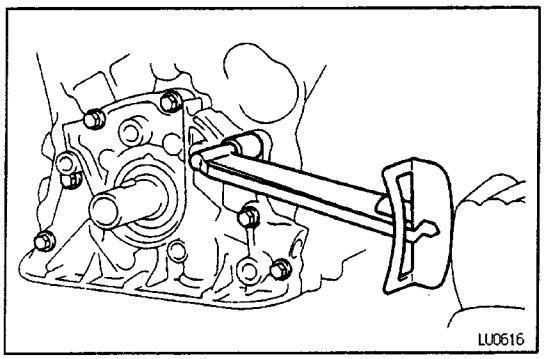
(c) Place a new O–ring into the groove of cylinder block.

(d) Install the oil pump to the crankshaft with the spline teeth of the drive rotor engaged with the large teeth of the crankshaft.



(e) Install the oil pump with the seven bolts.

Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)

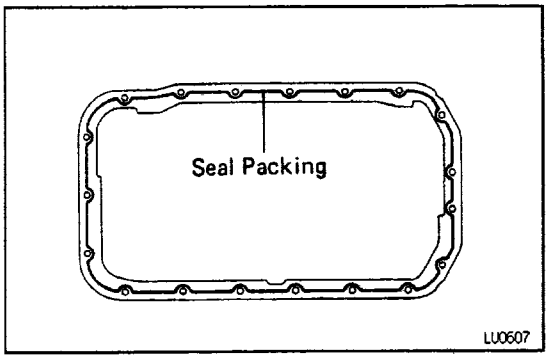


2. CLEAN OIL PAN BAFFLE PLATE AND OIL PAN

Remove any old packing (FIPG) material and be careful not to drop any oil on the contacting surfaces of the oil pan baffle plate, oil pan, cylinder block and sealing grooves.

- Using a razor blade and gasket scraper, remove all the remaining seal packing (FIPG) material from the gasket surfaces.
- Thoroughly clean all components to remove all the loose material.
- Clean both sealing surfaces with a non–residue solvent.

NOTICE: Do not use a solvent which will affect the painted surfaces.



3. INSTALL OIL PAN BAFFLE PLATE

Apply seal packing to the baffle plate as shown in the illustration.

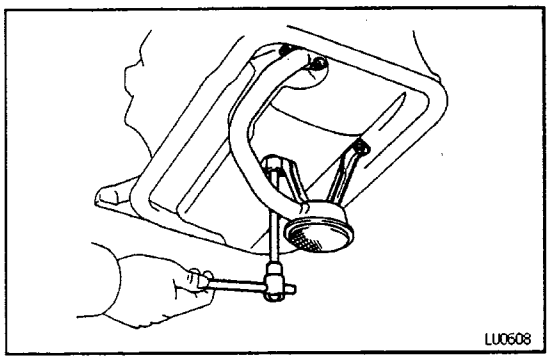
Seal packing:

Part No. 08826–00080 or equivalent

- Install a nozzle that has been cut to a 3 – 4 m m A 12 – 0.16 in.) opening.

HINT: Avoid applying an excess amount to the sur–face.

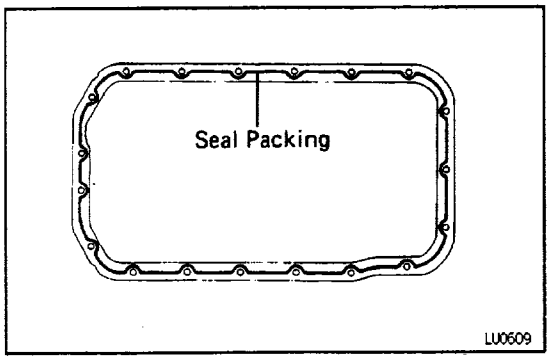
- If parts are not assembled within 5 minutes of applying the seal packing, the effectiveness of the seal packing is lost and the seal packing must be removed and reapplied.
- Immediately remove the nozzle from the tube and reinstall the cap after using the seal packing.



4. INSTALL OIL STRAINER

Place a new gasket and install the oil strainer with the two nuts and two bolts.

Torque: 6.9 N–m (70 kgf–cm, 61 in.–lbf)



5. INSTALL OIL PAN

(a) Apply seal packing to the oil pan as shown in the illustration.

Seal packing:

Part No. 08826–00080 or equivalent

- Install a nozzle that has been cut to a 3 – 4 mm (0.12 – 0.16 in.) opening.

HINT: Avoid applying an excess amount to the sur–face.

- If parts are not assembled within 5 minutes of applying the seal packing, the effectiveness of the seal packing is lost and the seal packing must be removed and reapplied.
- Immediately remove the nozzle from the tube and reinstall the cap after using the seal packing.

(b) Install the oil pan with the two nuts and seventeen bolts.

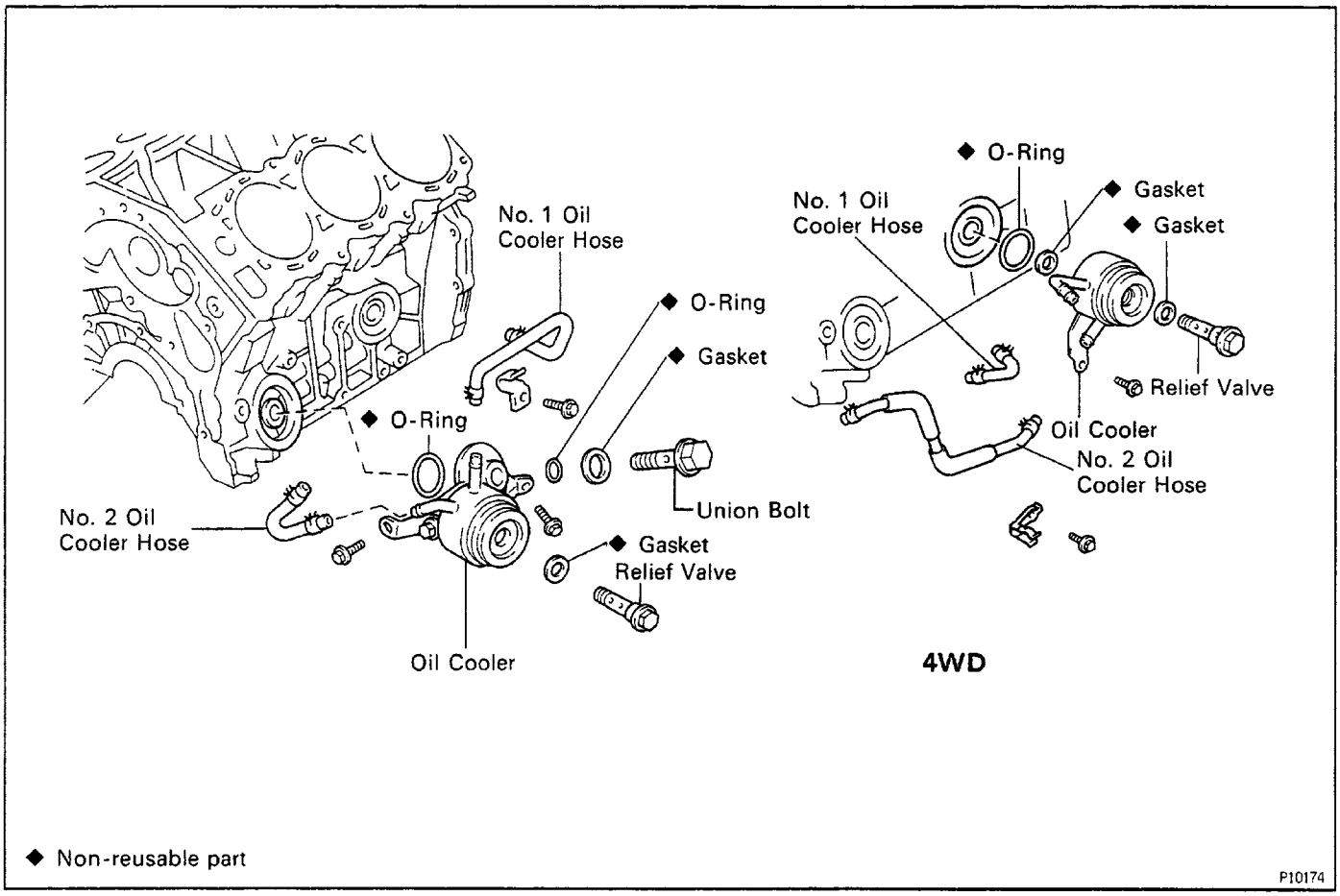
Torque: 5.9 N–m (60 kgf–cm, 52 in.–M)

6. INSTALL CRANKSHAFT TIMING PULLEY
(See step 6 on page EG2–42)
7. INSTALL TIMING BELT
(See page EG2–41)
8. (4WD)
INSTALL FRONT DIFFERENTIAL
(See page SA–106)
9. ENGINE UNDER COVER
10. FILL WITH ENGINE OIL
11. START ENGINE AND CHECK FOR LEAKS
12. RECHECK ENGINE OIL LEVEL

OIL COOLER

EG20M–03

COMPONENTS



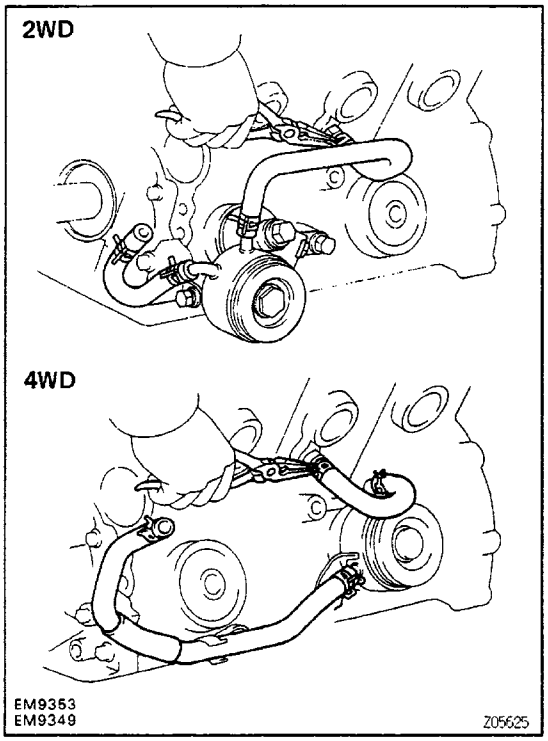
EG20N–03

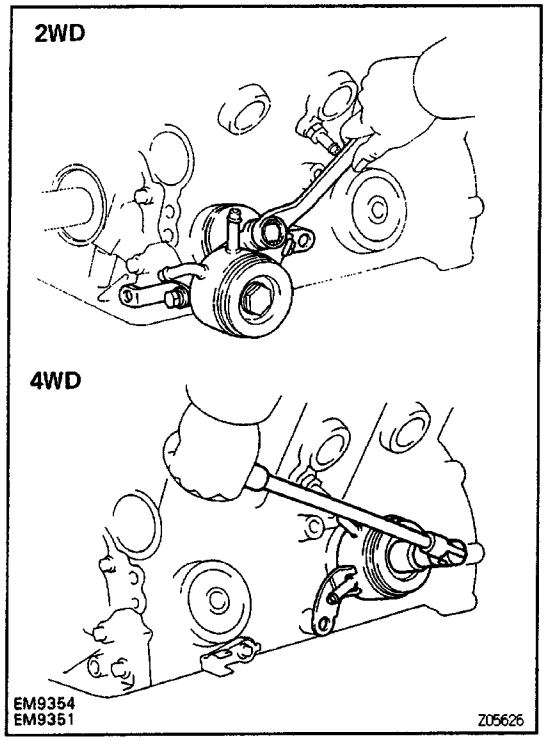
OIL COOLER REMOVAL

1. DRAIN ENGINE COOLANT

2. DISCONNECT OIL COOLER HOSES

Disconnect the No.1 and No.2 oil cooler hoses.





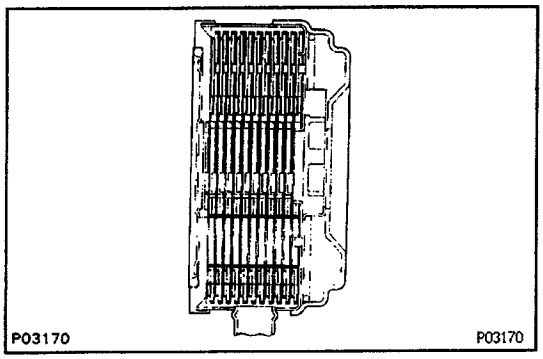
3. REMOVE OIL COOLER

(2WD)

Remove the two bolts, union bolt, relief valve, gaskets and oil cooler.

(4W D)

Remove the bolt, relief valve, gaskets and oil cooler.



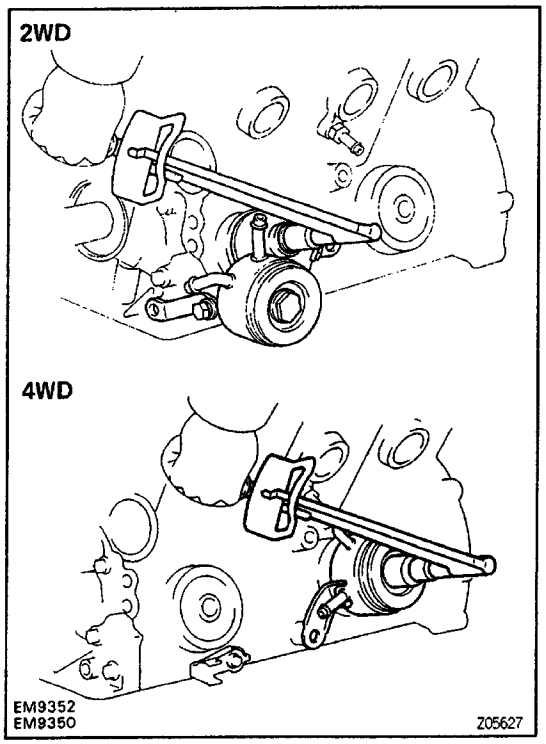
EG1CZ–01

OIL COOLER INSPECTION

INSPECT OIL COOLER

Check the oil cooler for damage or clogging.

If necessary, replace the oil cooler.



EG20P–03

OIL COOLER INSTALLATION

(See components)

1. INSTALL OIL COOLER

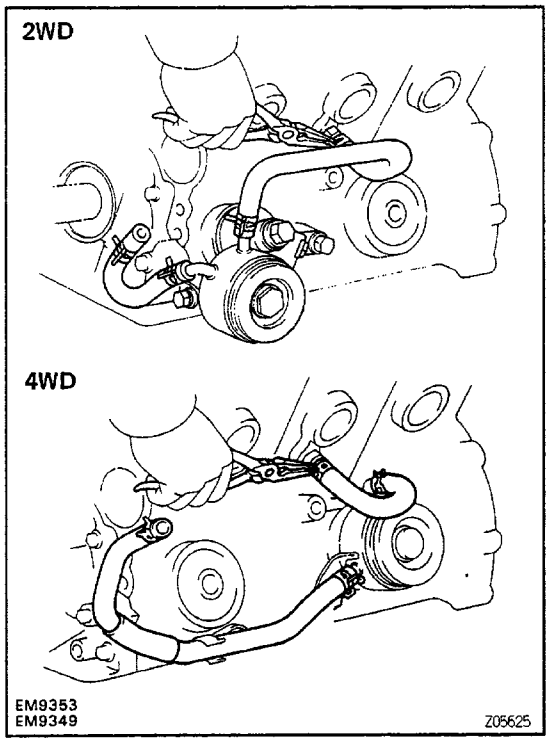
(a) Replace the O–ring(s) with a new part.

(b) (2WD)

- Install the oil cooler with the relief valve, union bolt and three new gaskets.
  Torque: 59 N–m (600 kgf–cm, 43 ft–lbf)
- Install and torque the two bolts.
  Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)

(4WD)

- Install the oil cooler with the relief valve and two new gaskets.
  Torque: 59 N–m (600 kgf–cm, 43 ft–lbf)
- Install and torque the two bolts.
  Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)



2. CONNECT OIL COOLER HOSES

Connect the No.1 and No.2 oil cooler hoses.

3. FILL WITH ENGINE COOLANT

4. START ENGINE AND CHECK FOR LEAKS

5. RECHECK ENGINE OIL LEVEL

SERVICE SPECIFICATIONS

SERVICE DATA

EG1D1–01

Oil pressure	At idle speed (normal operating temperature) At 3,000 rpm (normal operating temperature)		29 kPa (0.3 kgf/cm², 4.3 psi) or more 245 – 520 kPa (2.5 – 5.3 kgf/cm², 36 – 75 psi)
Oil pump	Body clearance	STD Limit	0.10 – 0.13 mm (0.0039 – 0.0051 in.) 0.30 mm (0.0118 in.)
	Tip clearance	STD Limit	0.11 – 0.24 mm (0.0043 – 0.0094 in.) 0.35 mm (0.0138 in.)
	Side clearance	STD Limit	0.03 – 0.09 mm (0.0012 – 0.0035 in.) 0.15 mm (0.0059 in.)
	Relief valve operating pressure		451 – 530 kPa (4.6 – 5.4 kgf/cm², 65 – 77 psi)

TORQUE SPECIFICATIONS

EG1D2–01

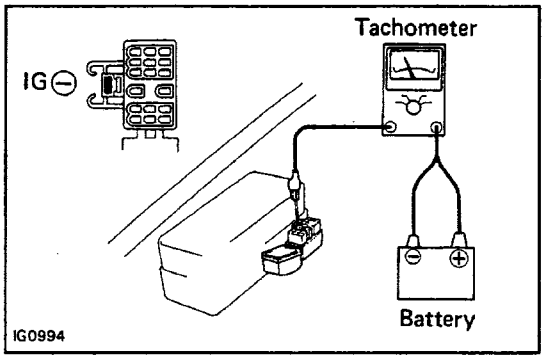
Part tightened	N·m	kgf·cm	ft·lbf
Oil pressure sender gauge x Cylinder block	15	150	11
Oil pump x Cylinder block	20	200	14
Oil pump x Relief valve	37	375	27
Oil pump x Oil pump body cover	10	105	8
Oil strainer x Cylinder block	6.9	70	61 in.·lbf
Oil pan x Cylinder block	5.9	60	52 in.·lbf
Oil cooler x Relief valve	59	600	43
Oil cooler x Cylinder block	39	400	29

IGNITION SYSTEM

(22R –E)

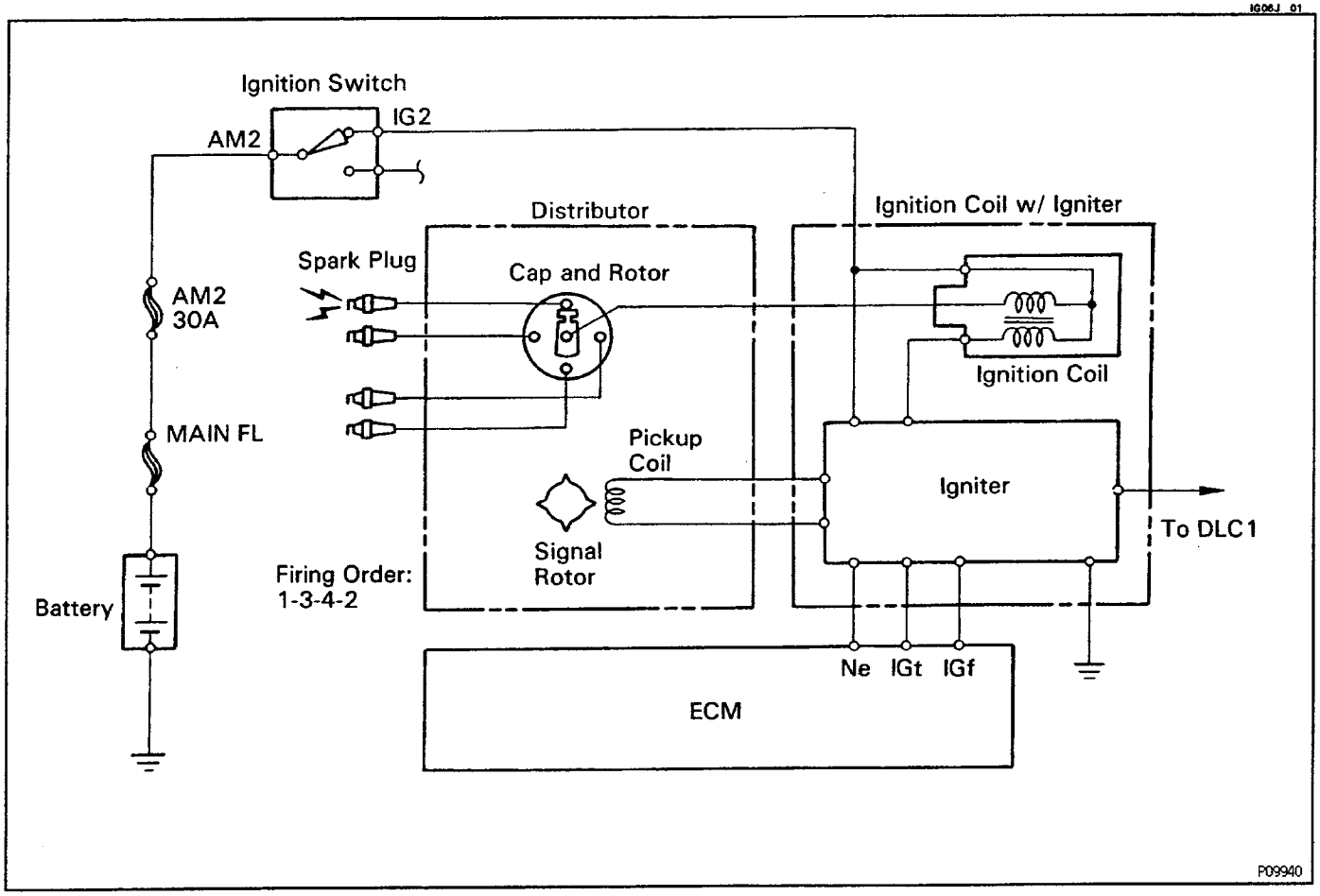
PRECAUTIONS

1. Do not allow the ignition switch to be ON for more than 10 minutes if the engine will not start.



2. When a tachometer is connected to the system, connect the tachometer test probe to the IG(–) terminal of the DLC 1.
3. As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.
4. Never allow the ignition coil terminals to touch ground as it could result in damage to the igniter and/or ignition coil.
5. Do not disconnect the battery when the engine is running.
6. Make sure that the igniter properly grounded to the body.

SYSTEM CIRCUIT



ELECTRONIC SPARK ADVANCE (ESA)

The ECM is programmed with data for optimum ignition timing under any and all operating conditions. Using data provided by sensors which monitor various engine functions (rpm, intake air volume, engine temperature, etc.) the microcomputer (ECM) triggers the spark at precisely the right instant.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

IG00R–04

	09843–18020 Diagnosis Check Wire	

RECOMMENDED TOOLS

IG00S–02

	09082–00015 TOYOTA Electrical Tester	
	09200–00010 Engine Adjust Kit	

EQUIPMENT

IG00T–01

Megger insulation resistancenneter	Insulation resistance meter
Spark plug cleaner	
Tachometer	
Timing light	Ignition timing

SSM (SPECIAL SERVICE MATERIALS)

IG00U–02

08826–00080 Seal packing or equivalent	Ignition coil

ON–VEHICLE INSPECTION

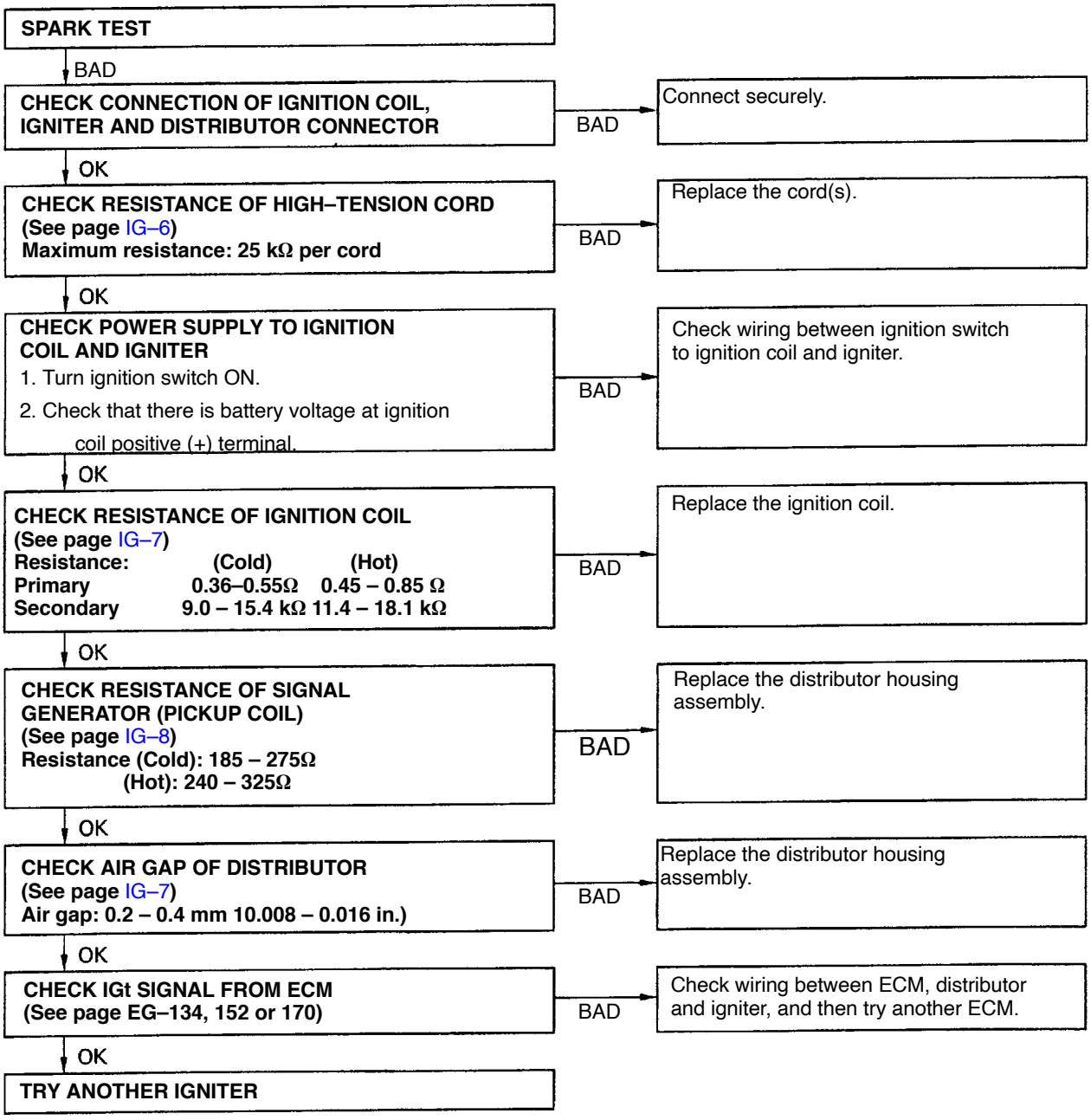
IG06L–01

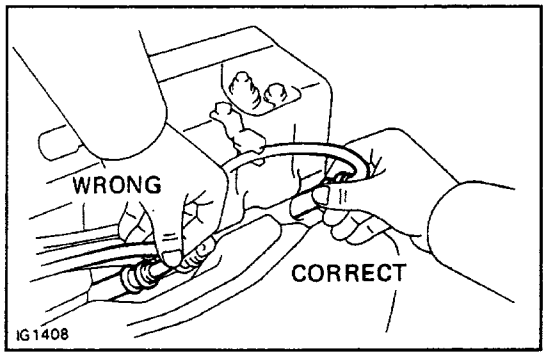
SPARK TEST

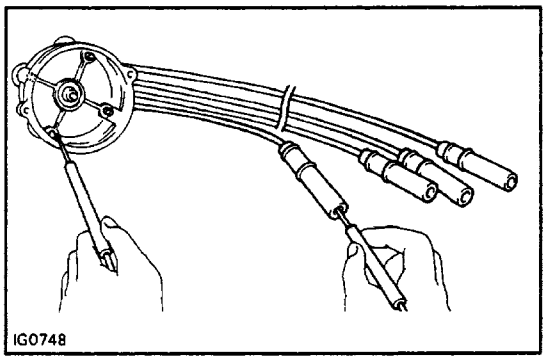
(a) Disconnect high–tension cord from the distributor.
(b) Hold the cord end approx. 12.5 mm (0.50 in.) from engine ground of vehicle.
(c) Check if spark occurs while engine is being cranked.

HINT: To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1 – 2 seconds at a time.

If the spark does not occur, perform the test as follows.







HIGH–TENSION CORD INSPECTION

IG06M–01

1. CAREFULLY REMOVE HIGH–TENSION CORDS BY THEIR RUBBER BOOTS FROM SPARK PLUGS

CAUTION: Do not pull on or bend the cords to avoid damaging the conductor inside.

2. INSPECT HIGH–TENSION CORD TERMINALS

Check the terminals for corrosion, breaks or distor–tion.

Replace cords as required.

3. INSPECT HIGH–TENSION CORD RESISTANCE

Using an ohmmeter, check that the resistance does not exceed the maximum.

Maximum resistance:

25 kΩ per cord

If the resistance exceeds maximum, check the termi–nals. If any defect has been found, replace the high–tension cord and/or distributor cap.

SPARK PLUGS INSPECTION

IG06N–01

1. REMOVE SPARK PLUGS

2. CLEAN AND INSPECT SPARK PLUGS

(a) Clean the spark plugs with a spark plug cleaner or wire brush.

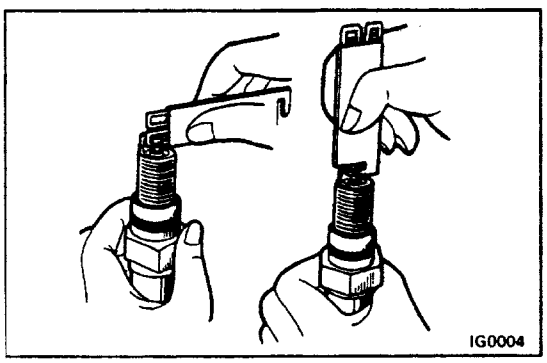
(b) Inspect the spark plugs for electrode wear, thread damage and insulator damage.

If a problem is found, replace the plugs.

Spark plug:

ND W16EXR–U

NGK BPR5EY



3. ADJUST ELECTRODE GAP

Carefully bend the outer electrode to obtain the cor–rect electrode gap.

Correct electrode gap:

0.8 mm (0.031 in.)

4. INSTALL SPARK PLUGS

Torque: 18 N–m (180 kgf–cm, 13 ft–lbf)

IG08P–01

IGNITION COIL INSPECTION

NOTICE: ”Cold” and ’Hot” in the following sentences express the temperature of the coils themselves. ”Cold’ is from –10 •C (14 •F) to 50 •C (104 •F) and ”Hot’ is from 50 •C (104 OF) to 100 •C (212 OF).

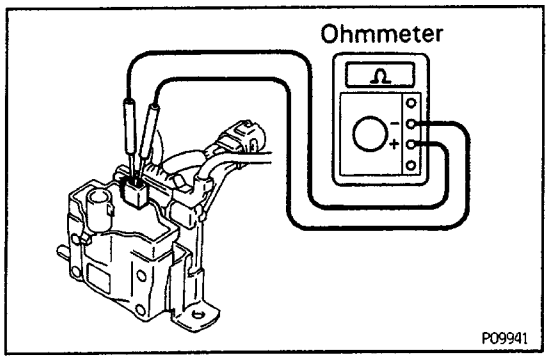
1. DISCONNECT HIGH–TENSION CORD

2. CLEAN COIL AND CHECK FOLLOWING:

(a) Check for cracks or damage.

(b) Check the terminals for carbon tracks.

(c) Check the high–tension cord hole for carbon deposits and corrosion.

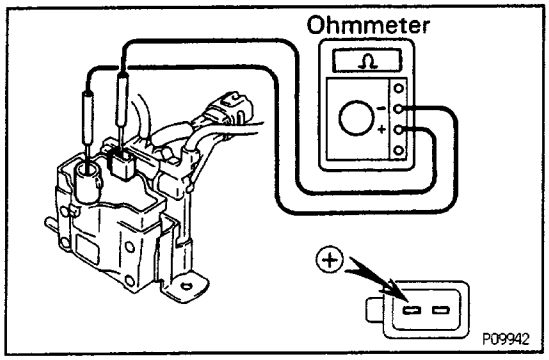


3. MEASURE PRIMARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between the positive (+) and negative (–) terminals.

Primary coil resistance (Cold):0.36–0.55Ω

Primary coil resistance (Hot) :0.45–0.65Ω



4. MEASURE SECONDARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between the positive (+) terminal and high–tension terminal.

Secondary coil resistance (Cold):9.0 –15.4kΩ

Secondary coil resistance (Hot) :11.4–18.1 kΩ

5. CONNECT HIGH–TENSION CORD

IG05Q–01

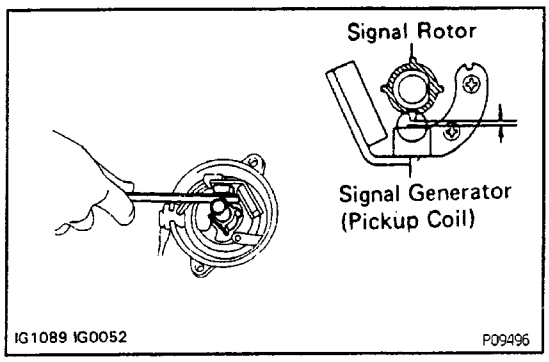
DISTRIBUTOR INSPECTION

1. INSPECT AIR GAP

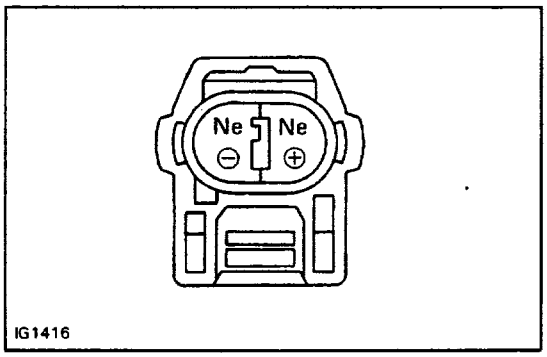
Using a thickness gauge, measure the gap between the signal rotor and the signal generator (pickup coil) projection.

Air gap:

0.2–0.4mm(0.008–0.015in.)



If the air gap is not as specified, replace the housing distributor assembly



2. CHECK SIGNAL GENERATOR (PICKUP COIL)

Using an ohmmeter, check the resistance of the signal generator (pickup coil).

Generator resistance (Cold): 185–2750

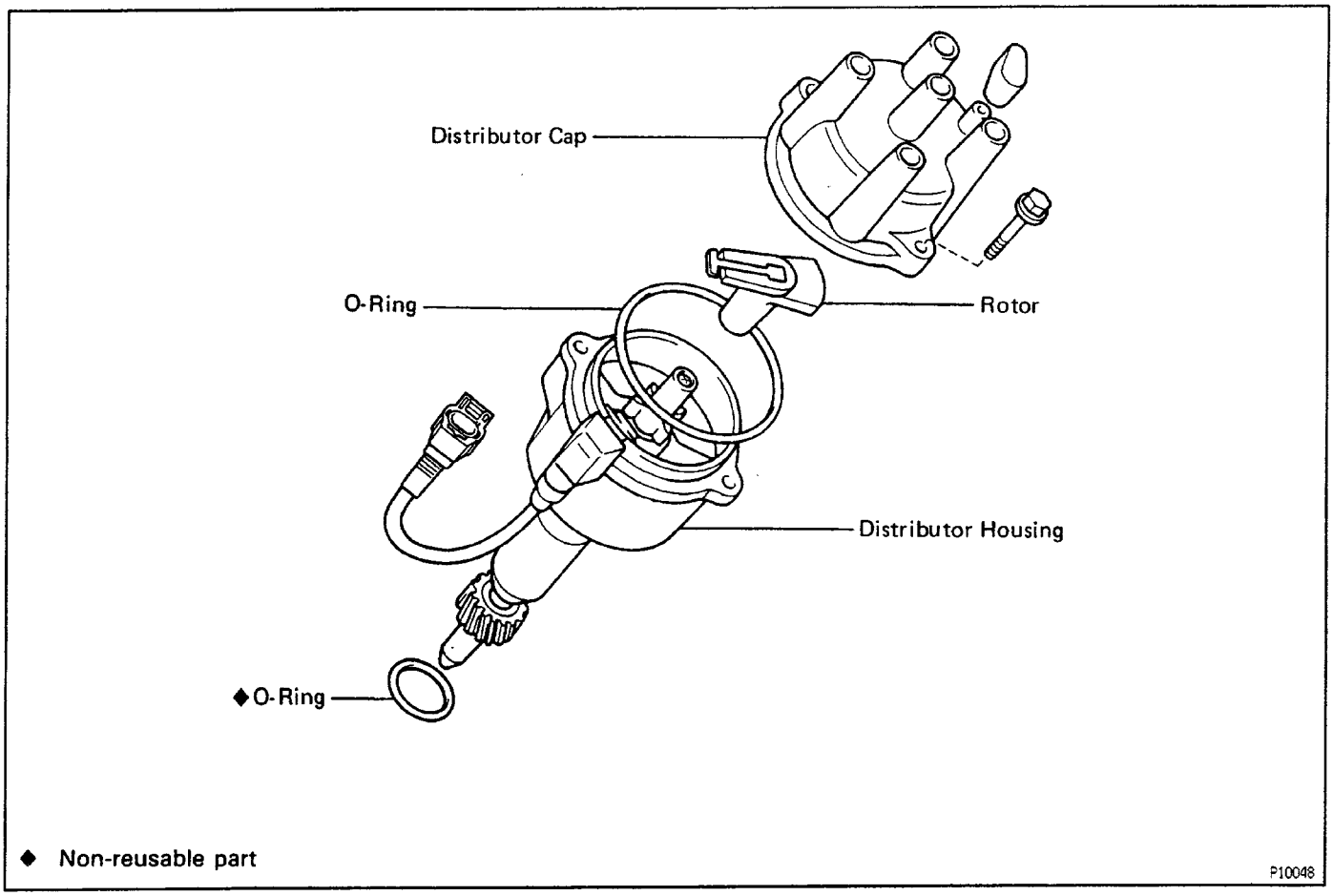
Generator resistance (Hot): 240–325Ω

If the resistance is not as specified, replace the dis– tributor housing assembly.

DISTRIBUTOR

IG06R–01

COMPONENTS



IG06S–01

DISTRIBUTOR REMOVAL

1. DISCONNECT HIGH – TENSION CORDS AND WIRING CONNECTOR

2. REMOVE TWO SCREWS AND PULL OFF DISTRIB– UTOR CAP

3. REMOVE HOLD – DOWN BOLT AND PULL OUT DISTRIBUTOR

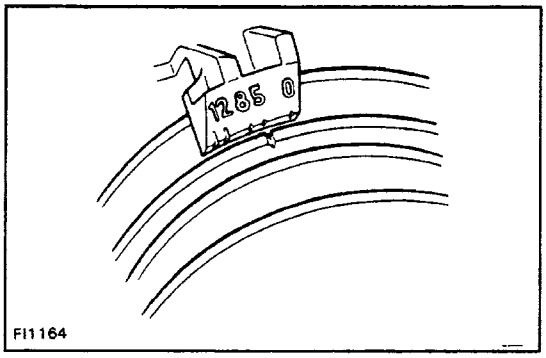
IG06T–01

DISTRIBUTOR INSTALLATION

1. INSTALL DISTRIBUTOR AND SET TIMING

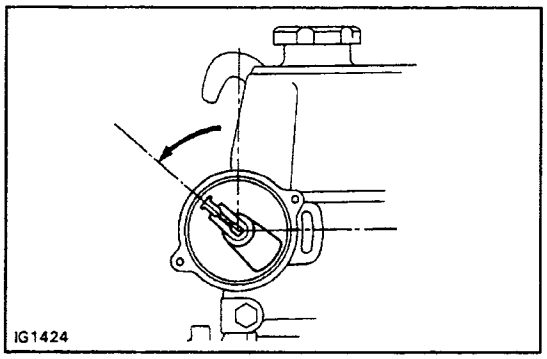
(a) Install a new O–ring to the distributor.

HINT: Always use a new 0–ring when installing the distributor.

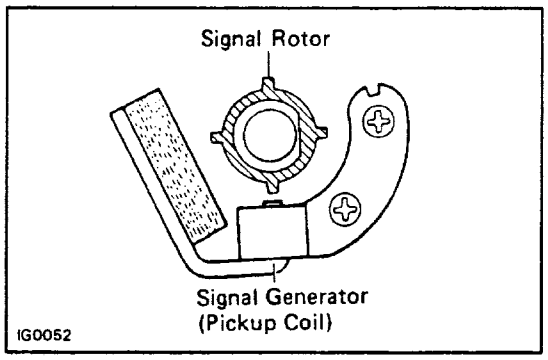


(b) Turn the crankshaft pulley until No. 1 cylinder is in compression stroke and the timing mark is aligned with 5 •6TDC mark.

HINT: Check that the rocker arms on the No. 1 cylinder are loose. If not, turn the crankshaft one full turn.



(c) Temporarily install the rotor.
(d) Begin insertion of the distributor with the rotor pointing upward and the distributor mounting hole approximately at center position of the bolt hole.
When fully installed, the rotor will rotate to the position shown.



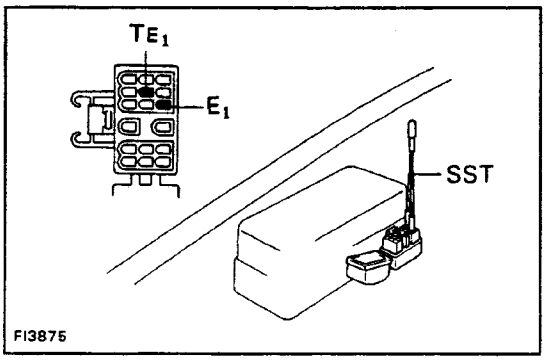
(e) Align the rotor tooth with the signal generator (pickup coil) projection.
Install and torque the distributor mounting bolt.
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)
(f) Install the rotor and distributor cap with wires.

2. CONNECT HIGH–TENSION CORDS AND WIRING CONNECTOR

3. WARM UP ENGINE TO NORMAL OPERATING TEMPERATURE

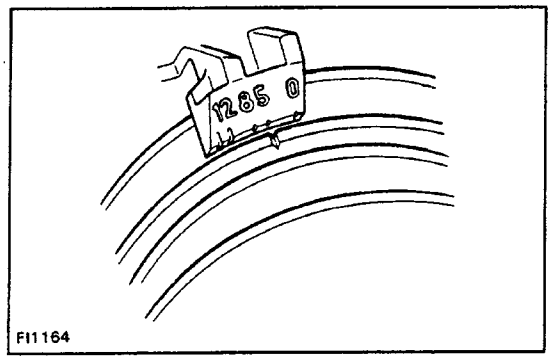
4. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE

(See page IG–2)



5. ADJUST IGNITION TIMING

(a) Using SST, connect terminals TE1 and E1 of the DLC 1.
SST 09843–18020
(b) Check the idle speed.
Idle speed:
750 rpm



(c) Using a timing light, check the ignition timing.

Ignition timing:

5 • BTDC @ idle

(Transmission in neutral range)

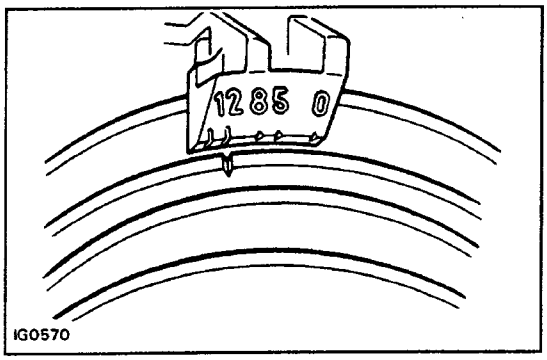
(d) Loosen the hold–down bolt, and adjust by turning the distributor.

(e) Tighten the hold–down bolt, and recheck the ignition timing.

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)

(f) Remove the SST.

SST 09843–18020



6. FURTHER CHECK IGNITION TIMING

Check that the ignition timing advances.

Ignition timing:

10 – 14 • BTDC @ idle

7. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

SERVICE SPECIFICATIONS

IG06U–01

SERVICE DATA

Spark plug	Type	ND NGK	W16EXR–U BPR5EY
	Gap		0.8 mm 0.031 in.
High–tension cord	Resistance	Limit	25 kΩ per cord
Ignition coil	Primary coil resistance (Cold) Primary coil resistance (Hot) Secondary coil resistance (Cold) Secondary coil resistance (Hot)		0.36 – 0.55 Ω 0.45 – 0.65 Ω 9.0 – 15.4 kΩ 11.4 – 18.1 kΩ
Distributor	Air gap Pickup coil resistance (Cold) Pickup coil resistance (Hot)		0.2 – 0.4 mm (0.008 – 0.016 in.) 185 – 275 Ω 240 – 325 Ω

IG06V–01

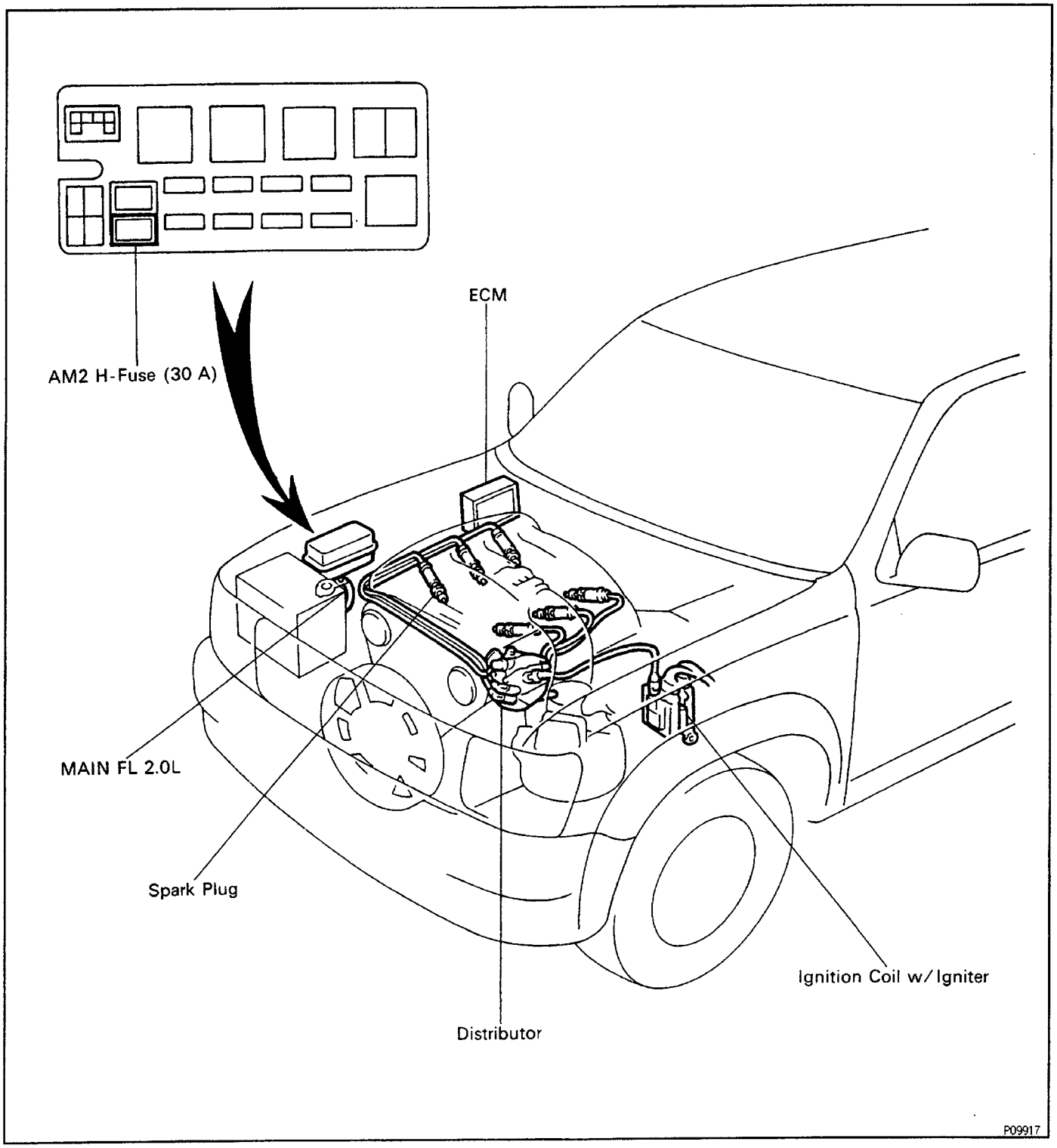
TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Spark plug x Cylinder head	18	180	13
Distributor x Cylinder head	19	195	14

(3VZ–E)

DESCRIPTION

The ECM is programmed with data for optimum ignition timing under ail operating conditions. Using data provided by sensors which monitor various engine functions (RPM, intake air volume, engine coolant temperature, etc.), the microcomputer (ECM) triggers the spark at precisely the right instant.



The ECM monitors the engine condition by signals from each sensor, calculates the ignition timing and sends an ignition signal to the igniter. High voltage from the ignition is distributed to each spark plug in the appropriate order to generate a spark between the electrodes, which ignites the air–fuel mixture.

IGNITER

The igniter temporarily interrupts the primary current with the ignition signal (IGT signal) from the ECM and generates sparks at the spark plug. Also, as a fail–safe measure, when ignition occurs an ignition confirmation signal (IGF signal) is sent to the ECM.

IGNITION COIL

The ignition coil uses a closed core coil with the primary coil wrapped around the core and the secondary coil wrapped around the primary coil. This allows the generation of a high voltage sufficient to cause a spark to jump across the spark plug gap.

DISTRIBUTOR

This correctly distributes high voltage to the spark plug of each cylinder in the specified ignition order.

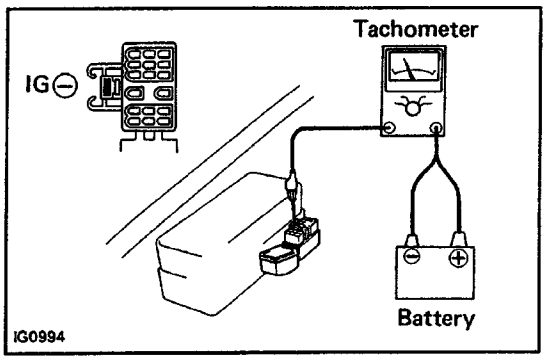
PICKUP COILS

The NE coil detects the crankshaft position, and the G 1 and G2 coils detect the camshaft position.

PRECAUTIONS

IG051-02

1. Do not leave the ignition switch on for more than 10 minutes if the engine does not start.



2. With a tachometer is connected to the system, connect the tachometer positive terminal to the IG (–) terminal of the DLC1.

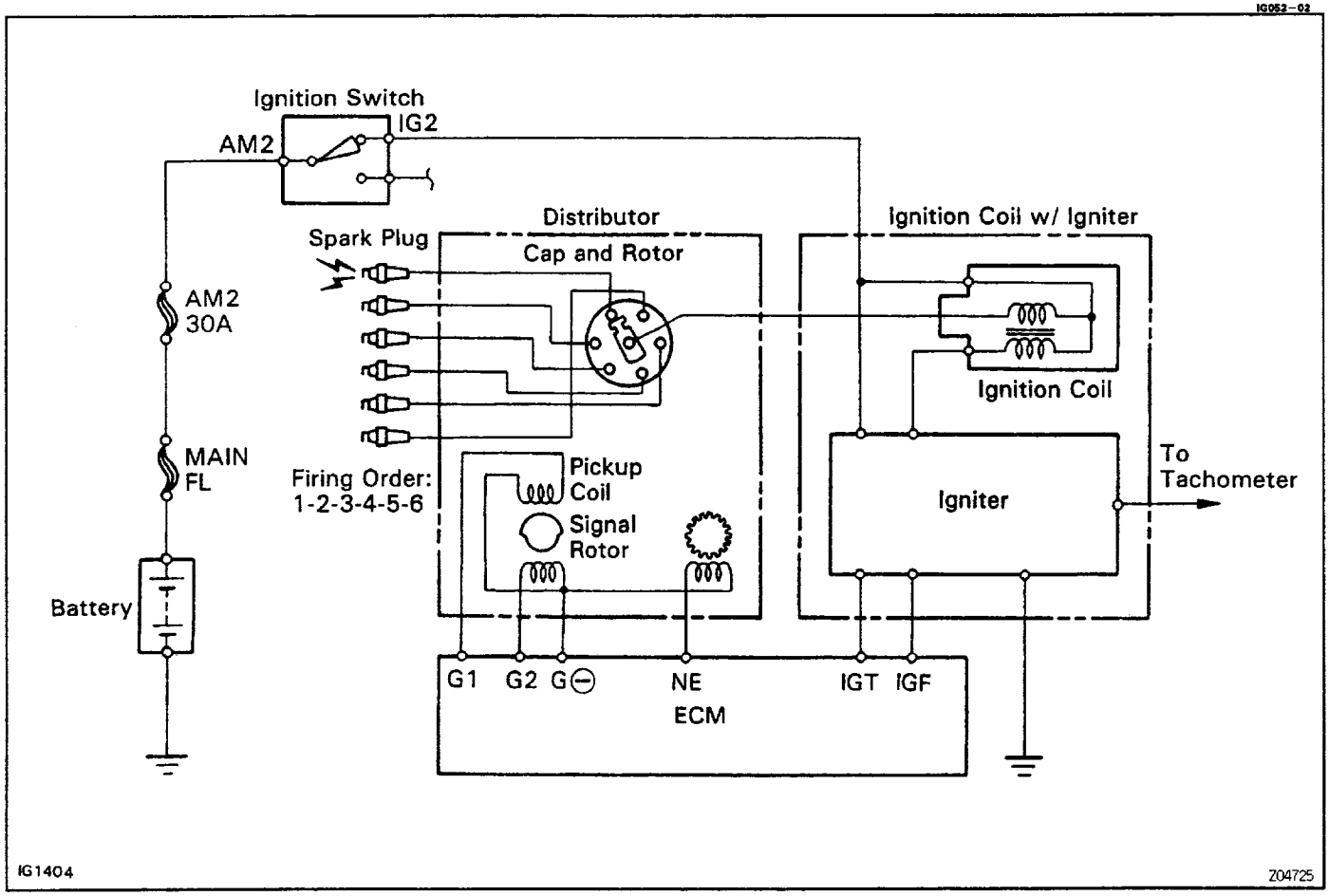
3. As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.

4. NEVER allow the tachometer terminals to touch ground as it could result in damage to the igniter and/or ignition coil.

5. Do not disconnect the battery while the engine is running.

6. Make sure that the igniter is properly grounded to the body.

SYSTEM CIRCUIT



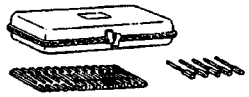
OPERATION

To maintain the most appropriate ignition timing, the ECM sends a control signal so that the igniter sends current to the ignition coil and the spark plugs produce a spark.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

IG054–01

	09240–00020 Wire Gauge Set	Air gaps of G 1 and G2 pickups
	09843–18020 Diagnosis Check Wire	

IG055–01

RECOMMENDED TOOLS

	09082–00015 TOYOTA Electrical Tester	
	09200–00010 Engine Adjust Kit	

IG056–01

EQUIPMENT

Spark plug cleaner	
Tachometer	
Timing light	Ignition timing

ON–VEHICLE INSPECTION

I0057–08

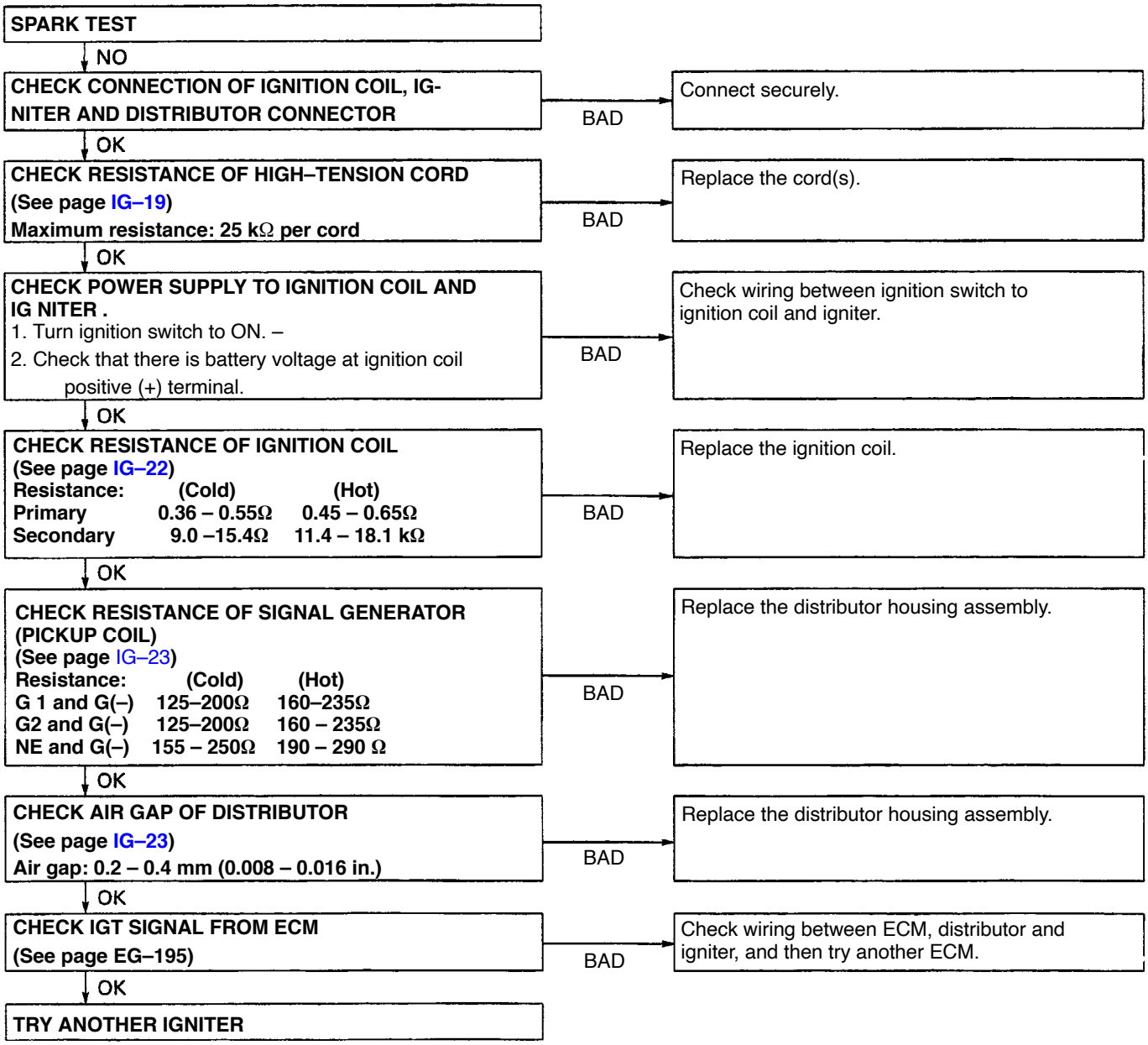
SPARK TEST

CHECK THAT SPARK OCCURS

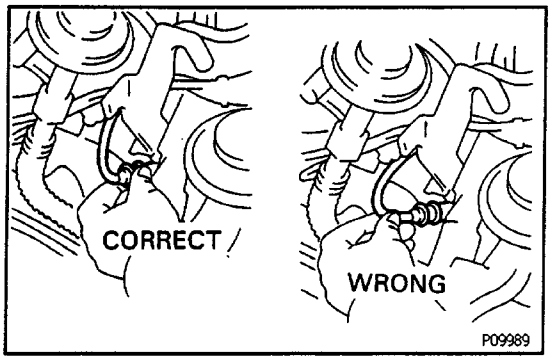
(a) Disconnect high–tension cord from the distributor.
(b) Hold the end approx. 12.5 mm (0.50 in.) from engine ground of vehicle.
(c) See if spark occurs while engine is being cranked.

HINT: 1'o prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1 – 2 seconds at a time.

If the spark does not occur, perform the test as fol–lows:



V07476



HIGH–TENSION CORDS INSPECTION

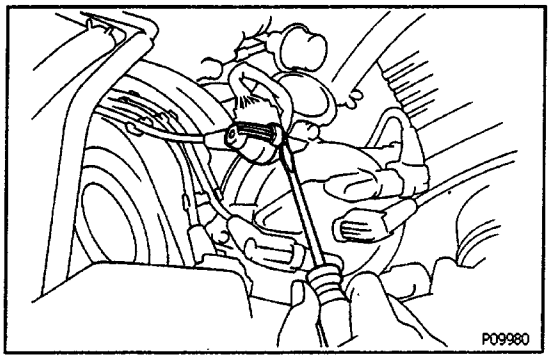
IG08X–01

1. DISCONNECT HIGH –TENSION CORDS FROM SPARK PLUGS

Disconnect the high – tension cords at the rubber boot.

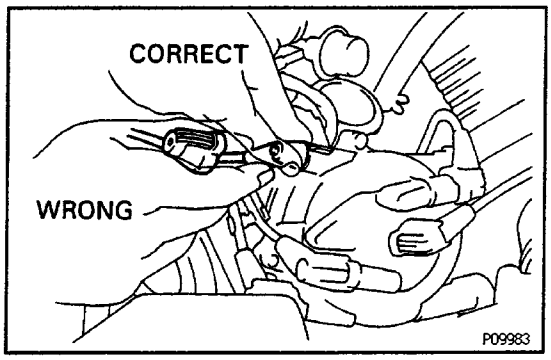
DO NOT pull on the cords.

NOTICE: Pulling on or bending the cords may damage the conductor inside.



2. DISCONNECT HIGH–TENSION CORDS FROM DISTRIBUTOR CAP AND IGNITION COIL

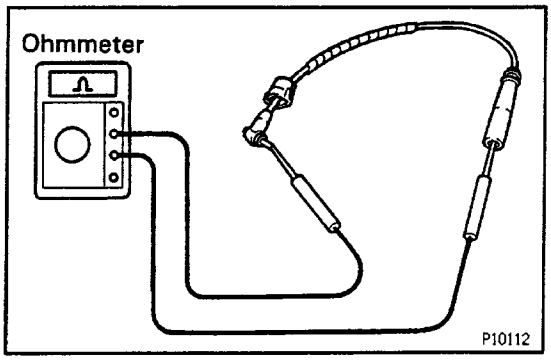
(a) Using a screwdriver, lift up the lock claw and dis–connect the holder from the distributor cap (ignition coil).



(b) Disconnect the high–tension cord at the grommet. DO NOT pull on the cord.

NOTICE:

- Pulling on or bending the cords may damage the conductor inside.
- Do not wipe any of the oil from the grommet after the high–tension cord is disconnected.



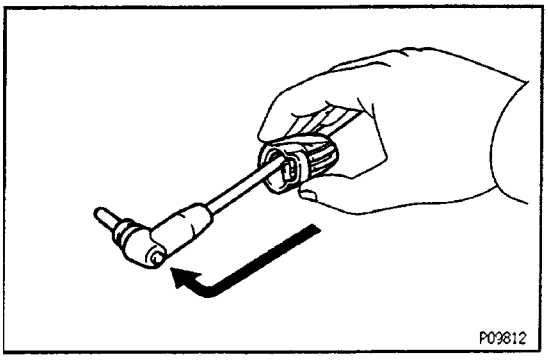
3. INSPECT HIGH–TENSION CORD RESISTANCE

Using an ohmmeter, measure the resistance.

Maximum resistance:

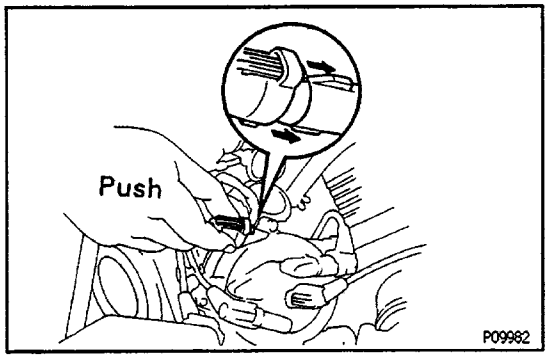
25 kΩ per cord

If the resistance is greater than maximum, check the terminals. If necessary, replace the high – tension cord.

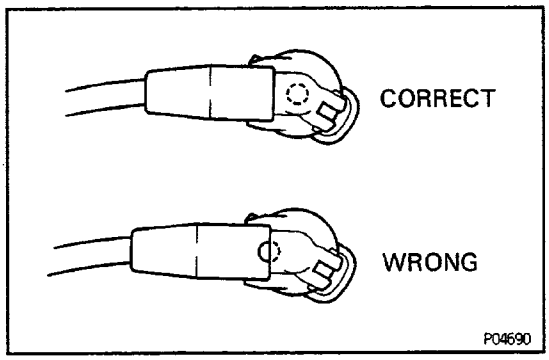


4. RECONNECT HIGH–TENSION CORDS TO DISTRIBUTOR CAP AND IGNITION COIL

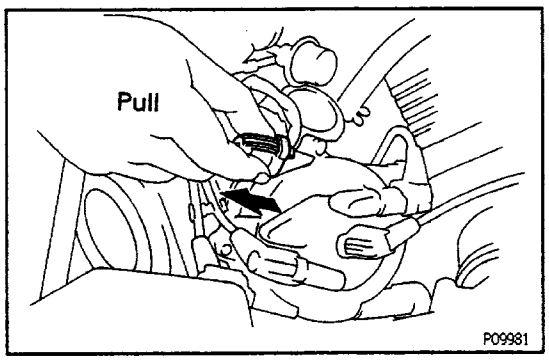
(a) Assemble the holder and grommet.



(b) Align the spline of the distributor (ignition coil) with the spline of the holder, and push in the cord.



NOTICE: Check that the holder is correctly installed to the grommet and distributor cap as shown in the illus–tration.



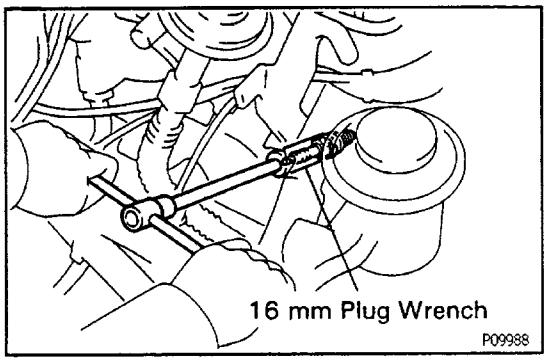
(c) Check that the lock claw of the holder is engaged by lightly pulling the holder.

5. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS

IG0SB–01

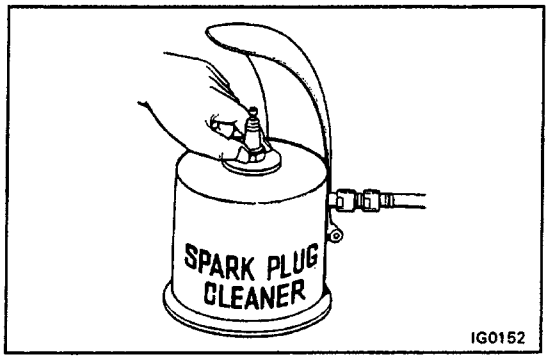
SPARK PLUGS INSPECTION

1. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS



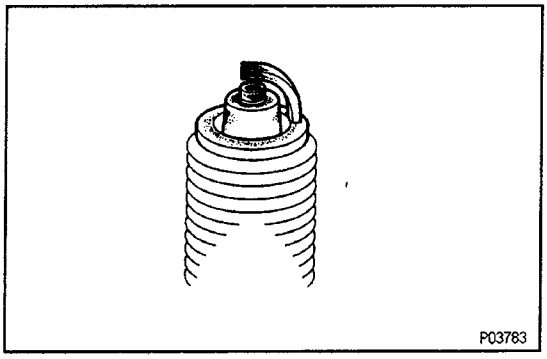
2. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the spark plug.



3. CLEAN SPARK PLUGS

Using a spark plug cleaner or wire brush, clean the spark plug. .



4. VISUALLY INSPECT SPARK PLUGS

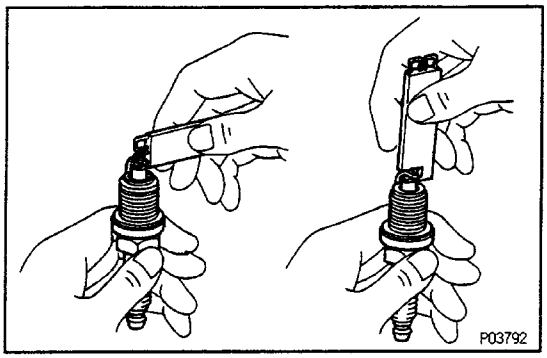
Check the spark plug for electrode wear, thread damage and insulator damage.

If abnormal, replace the spark plug.

Recommended spark plug:

ND K16R– U

NGK BKR5EYA

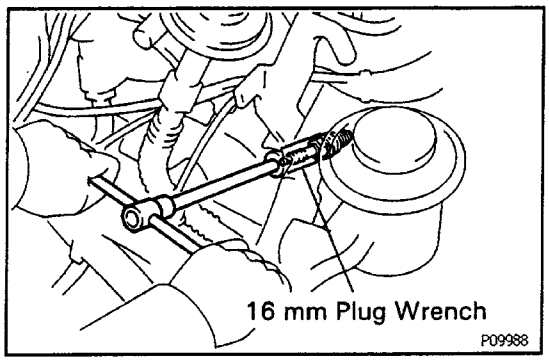


5. ADJUST ELECTRODE GAP

Carefully bend the outer electrode to obtain the cor– rect electrode gap.

Correct electrode gap:

0.8 mm (0.031 in.)



6. INSTALL SPARK PLUGS

Using a 16 mm plug wrench, install and torque the spark plug.

Torque: 18 N–m (180 kgf–cm, 13 ft–lbf)

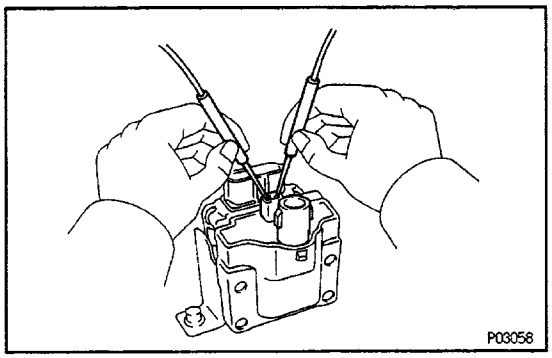
7. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS

IG06C–01

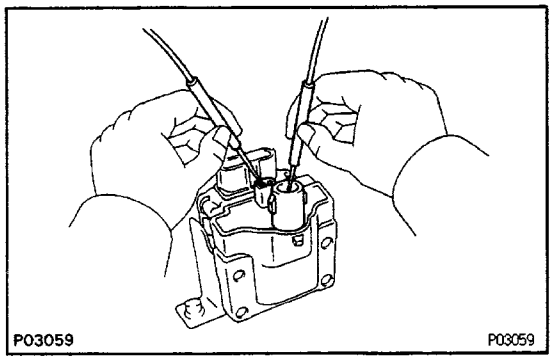
IGNITION COIL INSPECTION

NOTICE: 'Cold' and "Hot" in the following sentences express the temperature of the coils themselves. "Cold' is from –10• C (14• F) to 50• C (122• F) and "Hot' is from 50• C 0 22• F) to 100• C (212• F).

1. DISCONNECT IGNITION COIL CONNECTOR
2. DISCONNECT HIGH–TENSION CORD
3. CLEAN COIL AND CHECK FOLLOWING:
(a) Check for cracks or damage.
(b) Check the terminals far carbon tracks.
(c) Check the high–tension cord hole for carbon deposits and corrosion.

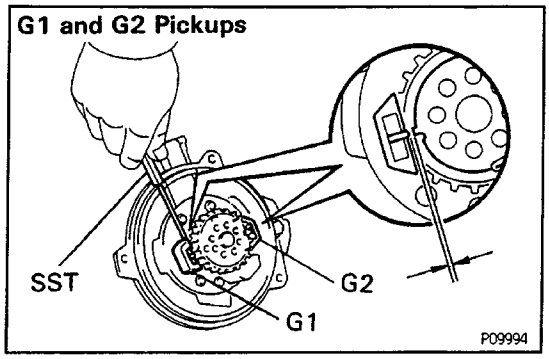


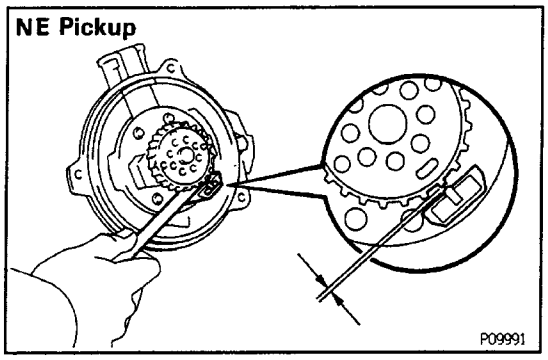
4. INSPECT PRIMARY COIL RESISTANCE
Using an ohmmeter, measure the resistance between **the positive (+) and negative (–) terminals.**
Primary coil resistance (Cold):
0.36–0.55Ω
Primary coil resistance (Hot):
0.45–0.660
If the resistance is not as specified, replace the igni–tion coil.

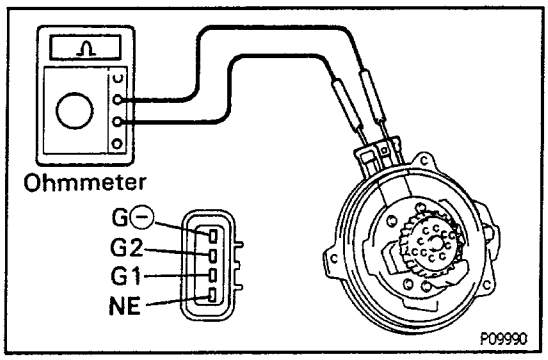


5. INSPECT SECONDARY COIL RESISTANCE
Using an ohmmeter, measure the resistance between the positive (+) terminal and high–tension terminal.
Secondary coil resistance (Cold):
9.0 – 15.4 kΩ
Secondary coil resistance (Hot):
11.4 – 18.1 kΩ
If the resistance is not as specified, replace the igni–tion coil.

6. RECONNECT HIGH–TENSION CORD
7. RECONNECT IGNITION COIL CONNECTOR







IG06D–01

DISTRIBUTOR INSPECTION

NOTICE: ”Cold” and ’Hot’ in the following sentences express the temperature of the coils themselves ”Cold’ is from –10• C (14• F) to 50• C (122• F) and ’Hot’ is from 50• C (122• F) to 100• C (212• F).

1. DISCONNECT DISTRIBUTOR CONNECTOR
2. REMOVE DISTRIBUTOR CAP WITHOUT DISCONNECTING HIGH–TENSION CORDS
3. REMOVE ROTOR
4. INSPECT AIR GAPS

Using SST (G1 and G2 pickups) and a thickness gauge (NE pickup), measure the gap between the signal rotor and pickup coil projection.

SST 09240–00020 for G1 and G2 pickups

Air gap:

0.2 – 0.5 mm (0.008 – 0.020 in.)

If the gap is not as specified, replace the distributor housing assembly.

5. INSPECT SIGNAL GENERATOR (PICKUP COIL) RESISTANCE

Using an ohmmeter, check resistance of the pickup coil.

Pickup coil resistance	Cold (–10 – 50–C)	Hot (50 ^– 100• C)
G1 – G⊖	125 – 200 Ω	160 – 235 Ω
G2 – G⊖	125 – 200 Ω	160 – 235 Ω
NE – G⊖	155 – 250 Ω	190 – 290 Ω

If the resistance is not as specified, replace the dis–tributor housing assembly.

6. REINSTALL ROTOR
7. REINSTALL DISTRIBUTOR CAP
8. RECONNECT DISTRIBUTOR CONNECTOR

IG06E–01

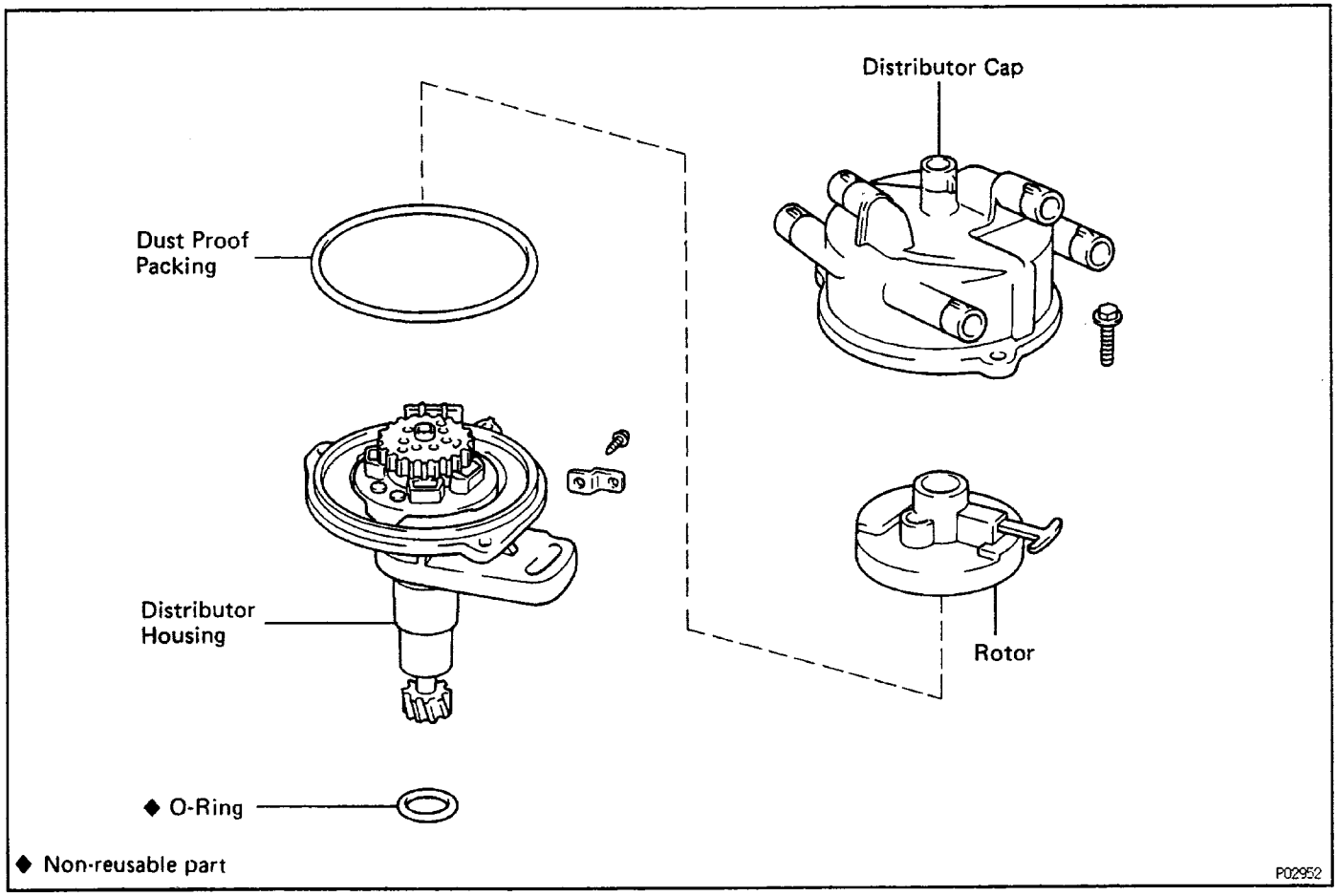
IGNITER INSPECTION

(See procedure Spark Test on page IG–18)

DISTRIBUTOR

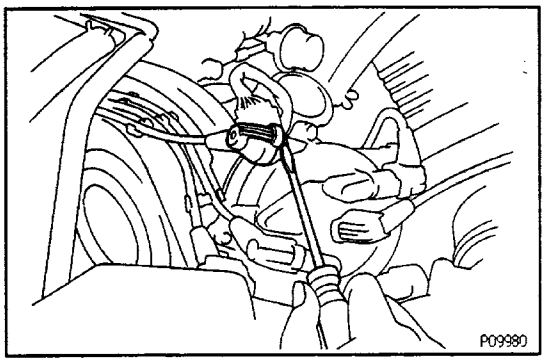
IG08F–01

COMPONENTS



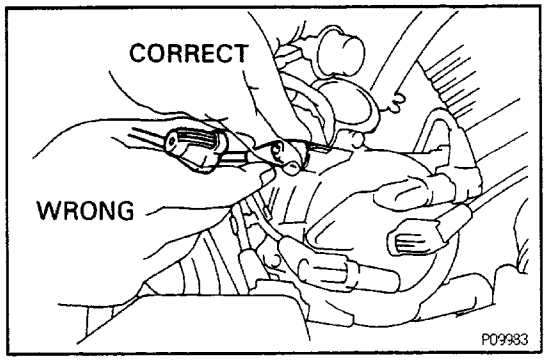
IG08G–01

DISTRIBUTOR REMOVAL



1. DISCONNECT HIGH–TENSION CORDS FROM DISTRIBUTOR CAP

(a) Using a screwdriver, lift up the lock claw and disconnect the holder from the distributor cap.

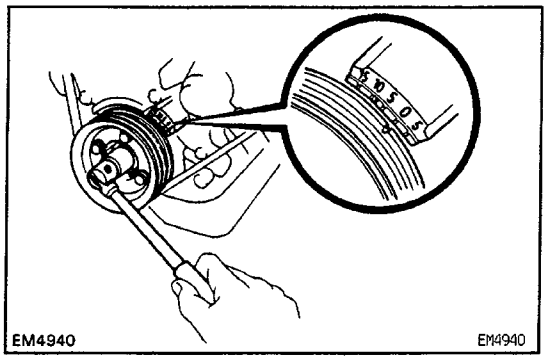


(b) Disconnect the high–tension cord at the grommet. DO NOT pull on the cord.

NOTICE:

- Pulling on or bending the cords may damage the conductor inside.
- Do not wipe any of the oil from the grommet after the high–tension cord is disconnected.

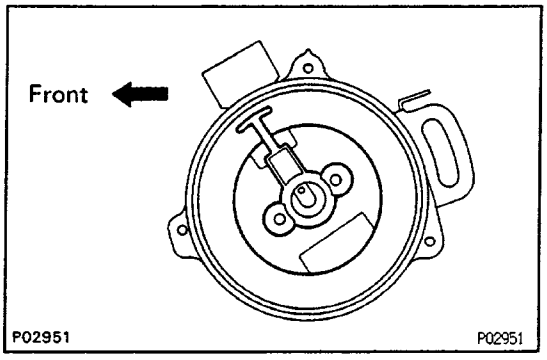
2. DISCONNECT DISTRIBUTOR CONNECTOR



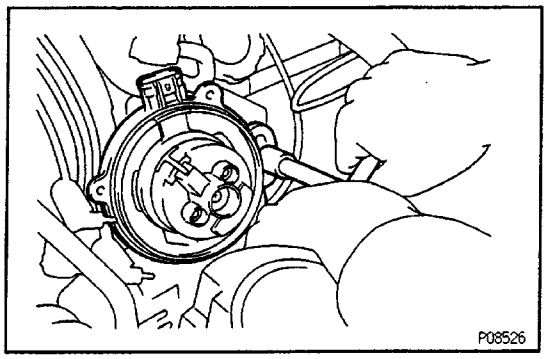
3. REMOVE DISTRIBUTOR CAP AND DUST PROOF PACKING

4. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley until the timing mark is aligned with the ”0” mark on the No.1 timing belt cover.



(b) Check that the distributor rotor direction is as shown. If not, turn the crankshaft pulley one complete revolution.



5. REMOVE DISTRIBUTOR

(a) Remove the hold–down bolt.

(b) Pull out the distributor from the cylinder head.

6. REMOVE O–RING

DISTRIBUTOR INSTALLATION

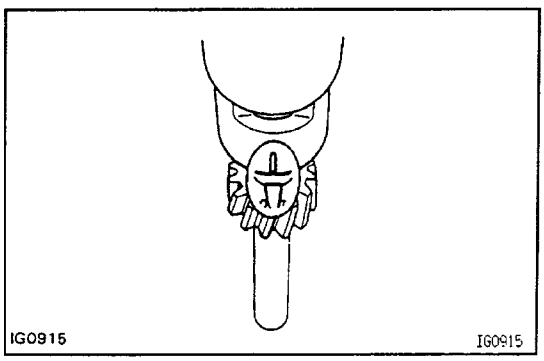
IG05D–02

1. CHECK NO.1 CYLINDER TO TDC/COMPRESSION

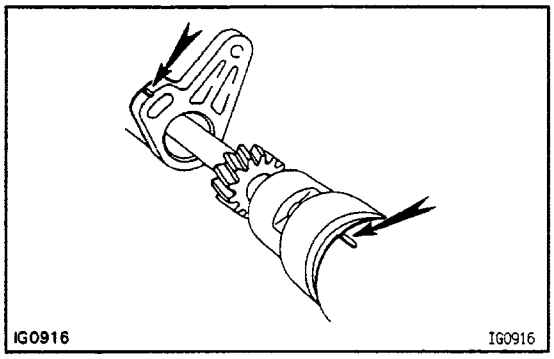
2. INSTALL DISTRIBUTOR

(a) Install a new O–ring to the distributor.

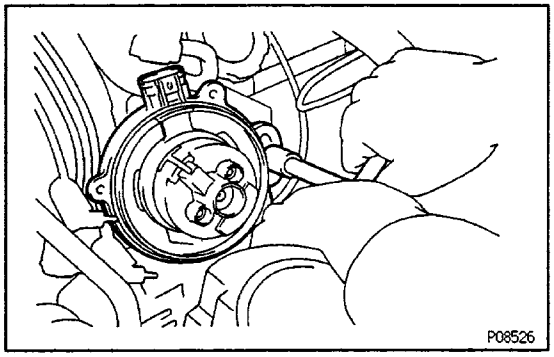
HINT: Always use a new 0–ring when installing the distributor.



(b) Align the protrusion on the driven gear with the groove of the distributor housing.

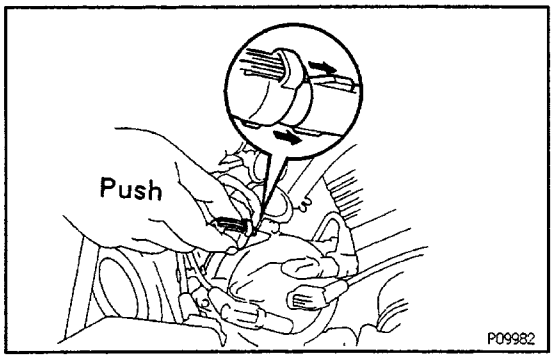


(c) Insert the distributor, aligning the groove of the distributor housing with the groove on the No.4 camshaft bearing cap.



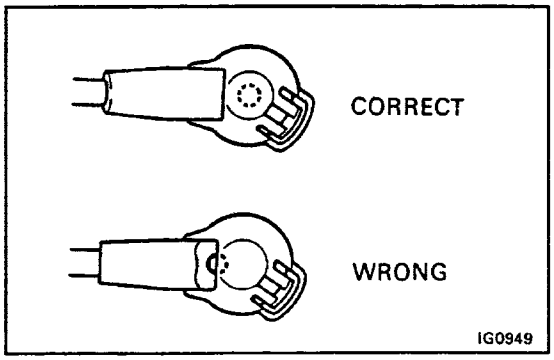
(d) Lightly tighten the hold–down bolt.

3. INSTALL DUST PROOF PACKING AND DISTRIBUTOR CAP

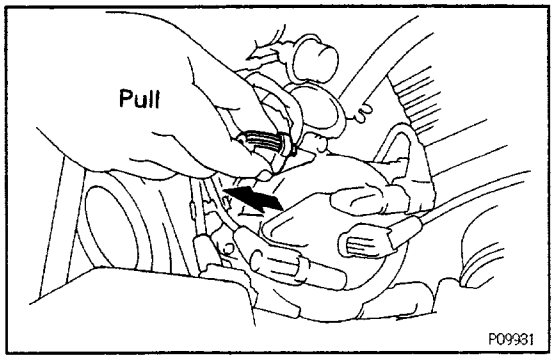


4. CONNECT HIGH–TENSION CORDS TO DISTRIBUTOR CAP

(a) Aline the spline of the distributor cap with the spline groove of the holder, then slide the holder with the grommet onto the distributor cap.

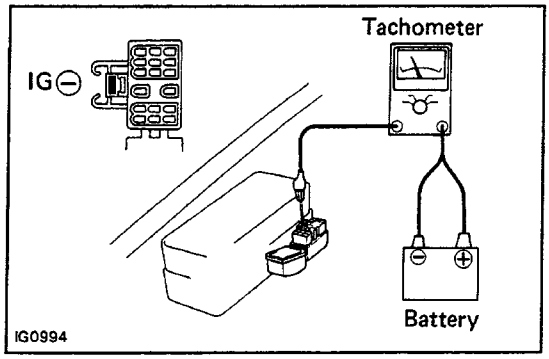


NOTICE: Check that the holder is correctly installed to the grommet and distributor cap as shown in the illustration.



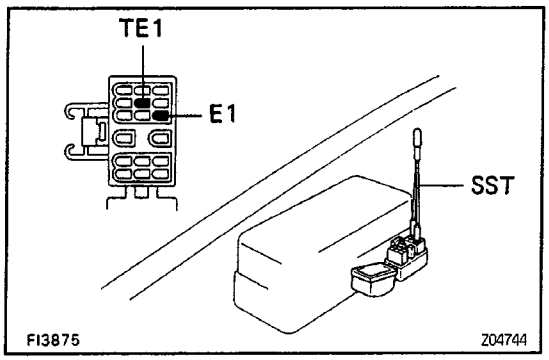
(b) Check that the lock claw of the holder is engaged by lightly pulling the holder.

5. CONNECT DISTRIBUTOR CONNECTOR



6. WARM UP ENGINE TO NORMAL OPERATING TEMPERATURE

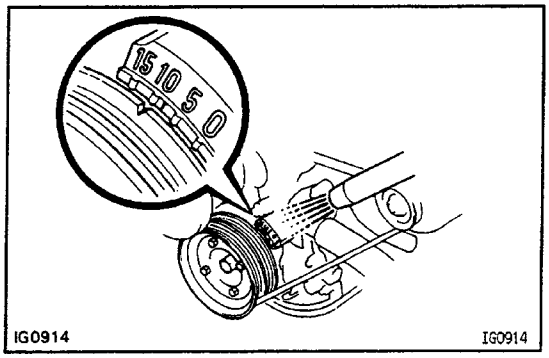
7. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE



8. ADJUST IGNITION TIMING

(a) Using SST, connect terminals TE1 and E1 of the DLC 1.
SST 09843–18020

(b) Check the idle speed.
Idle speed:
800 ± 50 rpm

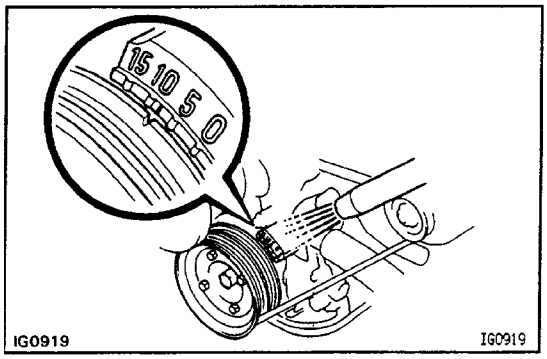


(c) Using a timing light, check the ignition timing.
Ignition timing:
10 • BTDC @ idle
(Transmission in neutral position)

(d) Loosen the hold–down bolt, and adjust by turning the distributor.

(e) Tighten the hold–down bolt, and recheck the ignition timing.
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

(f) Remove the SST from the DLC1.
SST 09843–18020



9. FURTHER CHECK IGNITION TIMING

Check that the ignition timing advances.
Ignition timing:
8• BTDC @ idle

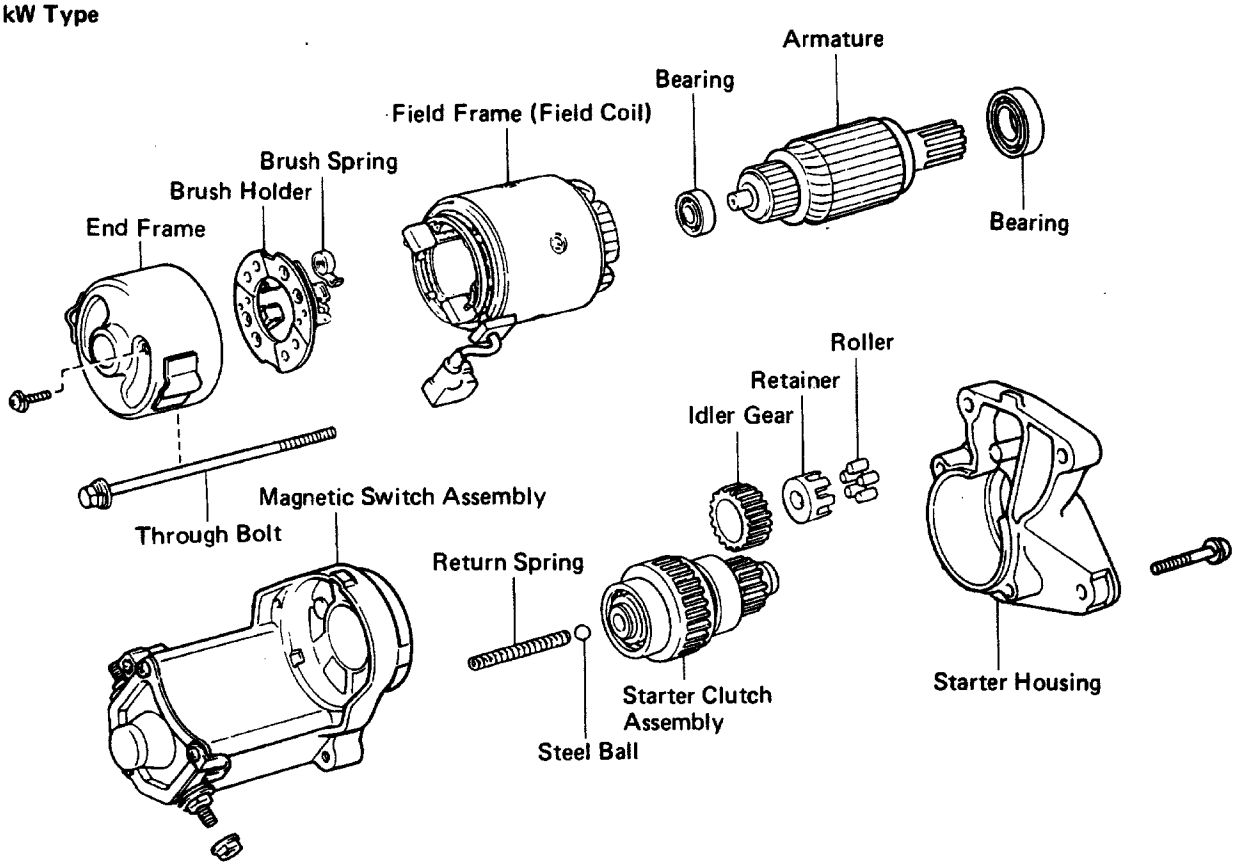
10. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

STARTING SYSTEM

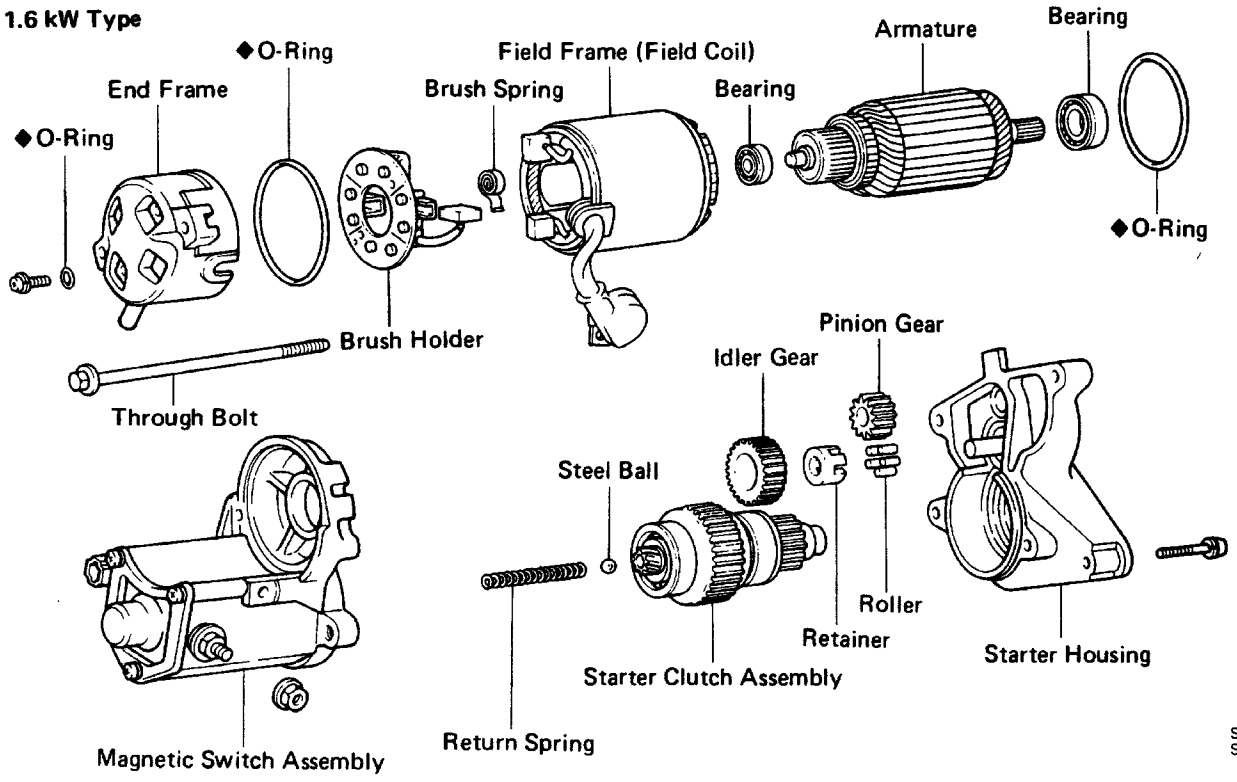
STARTER

COMPONENTS

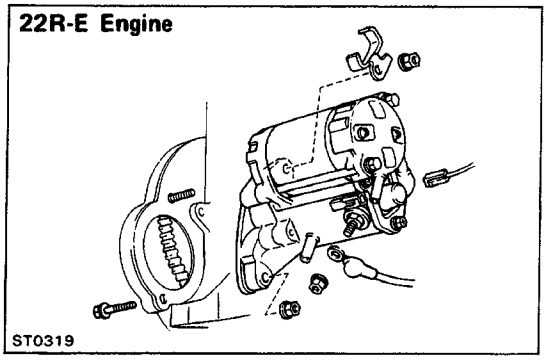
1.0 kW Type



1.4, 1.6 kW Type



◆ Non-reusable part



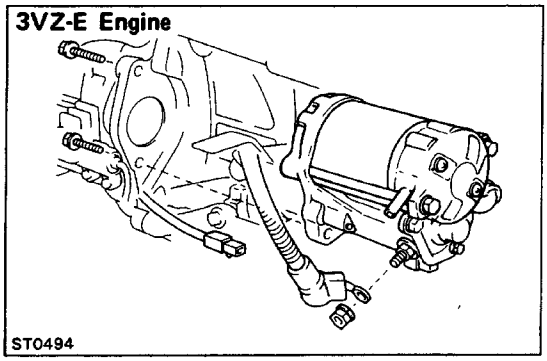
REMOVAL OF STARTER

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DISCONNECT TWO WIRES FROM STARTER

(a) Remove the nut and disconnect the battery cable from the magnetic switch on the starter motor.

(b) Disconnect the other wire from terminal 50.



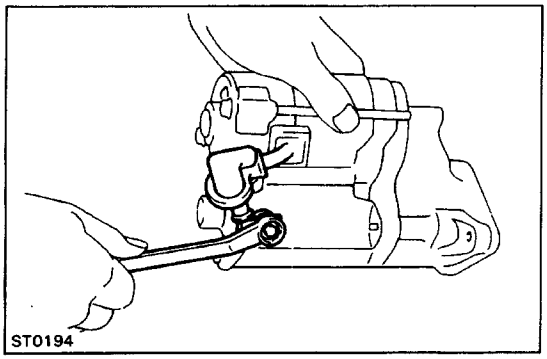
3. REMOVE STARTER MOTOR

(22R–E Engine)

Remove the nut and bolt, and remove the starter motor from the flywheel bellhousing.

(3VZ–E Engine)

Remove the two mounting bolts, and remove the starter motor from flywheel bellhousing.

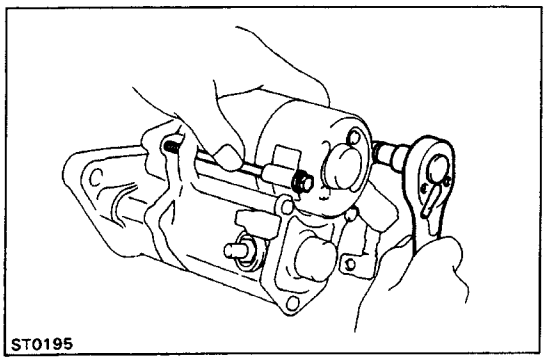


DISASSEMBLY OF STARTER

(See page ST–2)

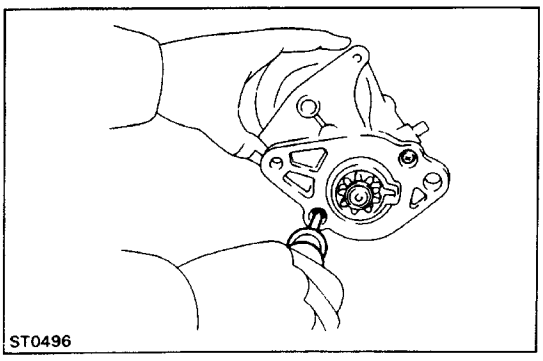
1. REMOVE FIELD FRAME WITH ARMATURE FROM MAGNETIC SWITCH ASSEMBLY

(a) Remove the nut and disconnect the lead wire from the magnetic switch terminal.



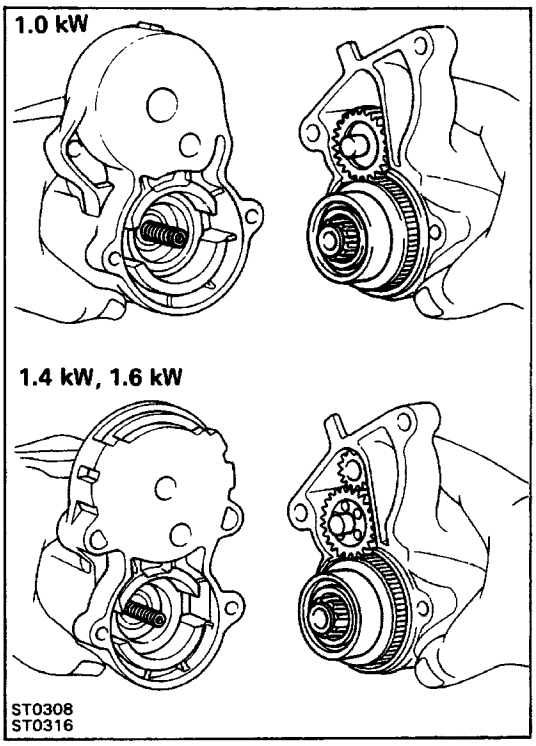
(b) Remove the two through bolts. Pullout the field frame
with the armature from the magnetic switch assembly.

(c) (1.4,
1. 6 kW)
Remove the O–ring.

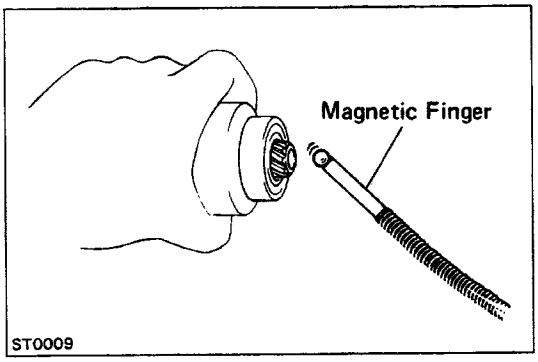


2. REMOVE STARTER HOUSING FROM MAGNETIC SWITCH ASSEMBLY

(a) Remove the two screws.



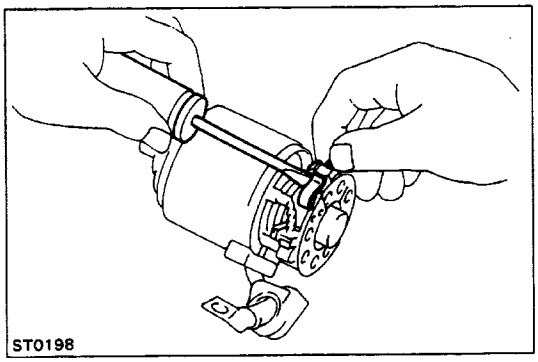
(b) Remove the starter housing with the pinion gear (1.4, 1.6 kW), idler gear, bearing and clutch assembly.



3. REMOVE CLUTCH ASSEMBLY AND GEARS FROM STARTER HOUSING

4. REMOVE STEEL BALL AND SPRING

Using a magnetic finger, remove the spring and steel ball from the clutch shaft hole.

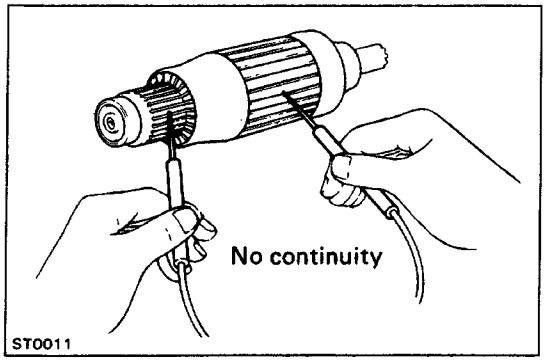


5. REMOVE BRUSHES AND BRUSH HOLDER

(a) Remove the two screws and pull the end cover with 0–ring (1.4, 1.6 kW) off the field frame.

(b) Using a screwdriver, hold the spring back and disconnect the brush from the brush holder. Disconnect the four brushes and remove the brush holder.

6. REMOVE ARMATURE FROM FIELD FRAME

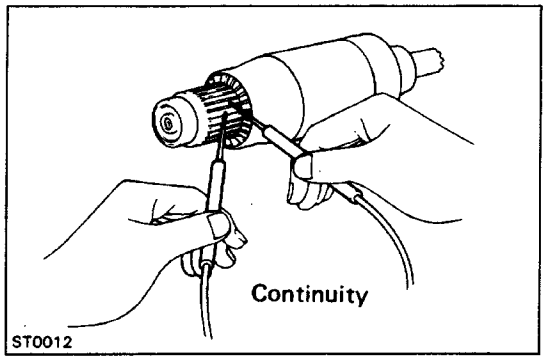


INSPECTION OF STARTER

Armature Coil

1. INSPECT THAT COMMUTATOR IS NOT GROUNDED

Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.
If there is continuity, replace the armature.



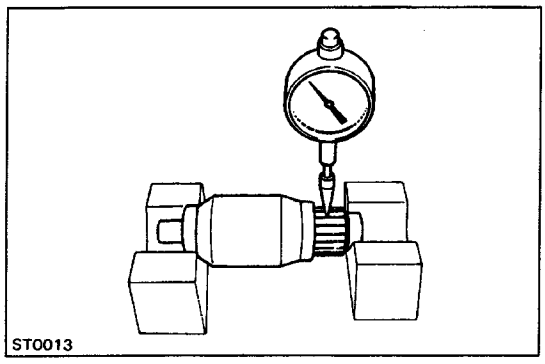
2. INSPECT COMMUTATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the segments of the comrnutator.
If there is no continuity between any segment, replace the armature.

Commutator

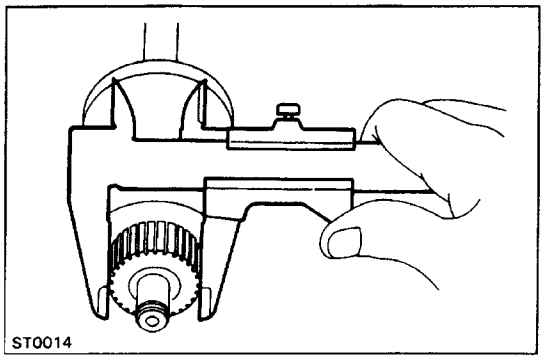
1. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES

If the surface is dirty or burnt, correct it with sandpaper (No.400) or on a lathe.



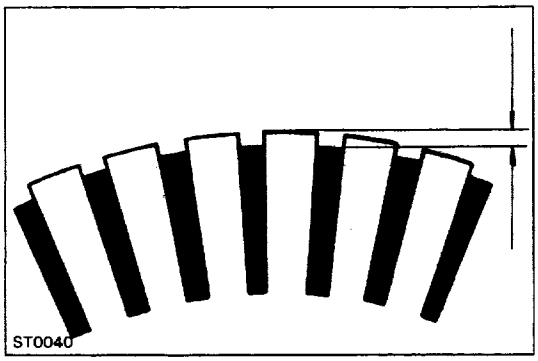
2. INSPECT COMMUTATOR CIRCLE RUNOUT

(a) Place the commutator on V–blocks.
(b) Using a dial indicator, measure the circle runout.
Maximum circle runout: 0.05 mm (0.0020 in.)
If the circle runout is greater than maximum, correct it on a lathe.



3. INSPECT COMMUTATOR DIAMETER

Using vernier calipers, measure the commutator diameter.
Standard diameter: 30 mm (1.18 in.)
Minimum diameter: 29 mm (11.14 in.)
If the diameter is less than minimum, replace the armature.



4. INSPECT UNDERCUT DEPTH OF SEGMENT

Check that the undercut depth is clean and free of foreign material. Smooth out the edge.

Standard undercut depth: 0.6 mm (0.024 in.)

Minimum undercut depth: 0.2 mm (0.008 in.)

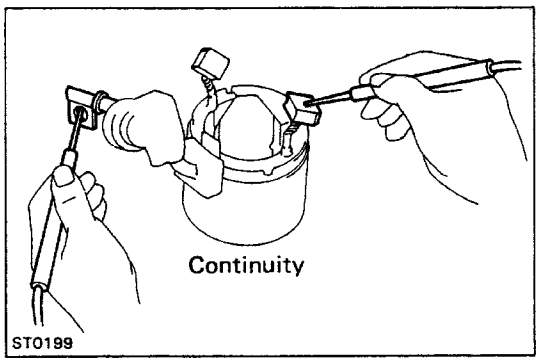
If the undercut depth is less than minimum, correct it with a hacksaw blade.

Field Frame (Field Coil)

1. INSPECT FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.

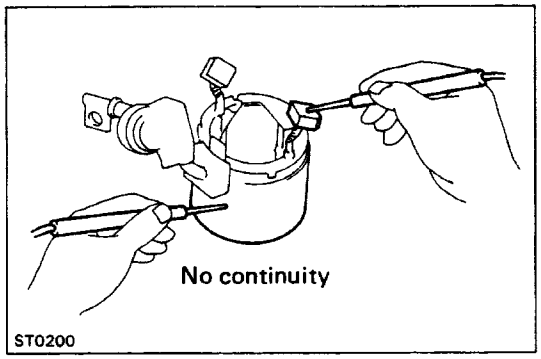
If there is no continuity, replace the field frame.



2. INSPECT THAT FIELD COIL IS NOT GROUNDED

Using an ohmmeter, check that there is no continuity be–tween the field coil end and field frame.

If there is continuity, repair or replace the field frame.



Brushes

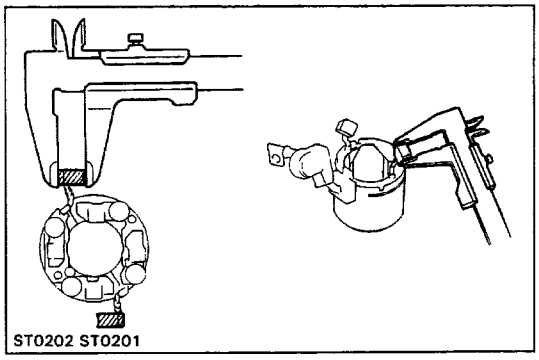
INSPECT BRUSH LENGTH

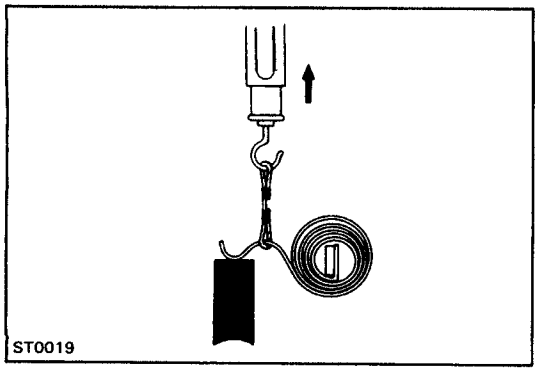
Using vernier calipers, measure the brush length.

Standard length: 1.0 kW 13.5 mm (0.531 in.)
1.4 kW 15.5 mm (0.610 in.)
1.6 kW 15.5 mm (0.610 in.)

Minimum length: 1.0 kW 8.5 mm (0.335 in.)
1.4 kW 10.0 mm (0.394 in.)
1.6 kW 10.0 mm (0.394 in.)

If the length is less than minimum, replace the brush holder and field frame.





Brush Springs

INSPECT BRUSH SPRING LOAD

Take the pull scale reading the instant the brush spring separates from the brush.

Standard installed load:

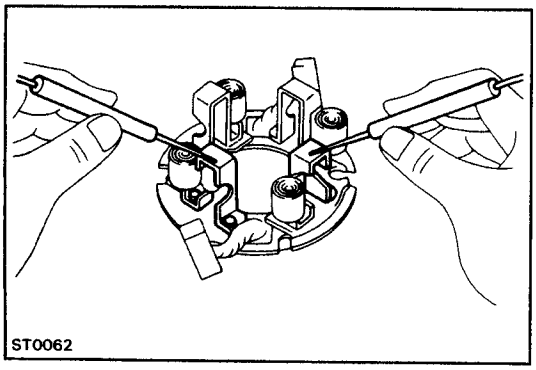
18 – 24 N (1.785 – 2.415 kgf, 3.9 – 5.3 1bf)

Minimum installed load:

12 N (1.2 kgf, 2.6 lbf)

If the installed load is less than minimum, replace the brush springs.

HINT: Take the pull scale reading the instant the brush spring separates from the brush.



Brush Holder

INSPECT INSULATION OF BRUSH HOLDER

Using an ohmmeter, check that there is no continuity between the positive (+) and negative (–) brush holders.

If there is continuity, repair or replace the brush holder.

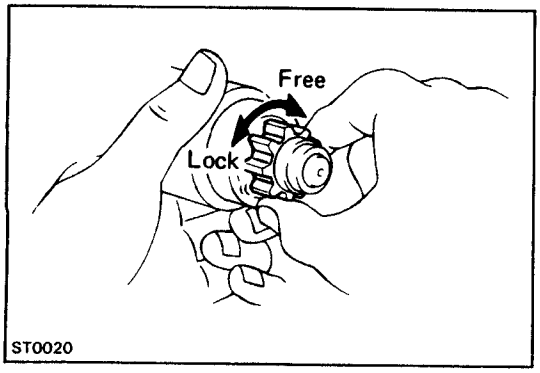
Clutch and Gears

1. INSPECT GEAR TEETH

Check the gear teeth on the pinion gear, idler gear and clutch assembly for wear or damage.

If damaged, replace the gear or clutch assembly.

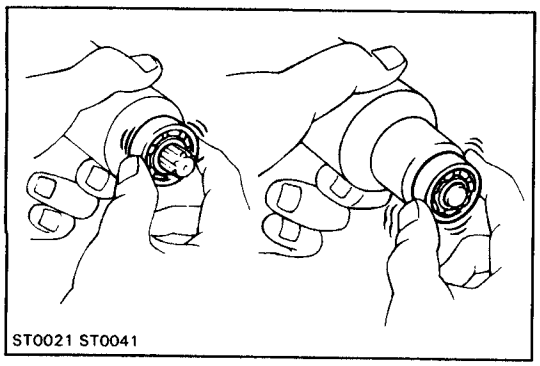
If damaged, also check the flywheel ring gear for wear or damage.



2. INSPECT CLUTCH

Rotate the clutch pinion gear clockwise and check that it turns freely. Try to rotate the clutch pinion counterclockwise and check that it locks.

If necessary, replace the clutch assembly.

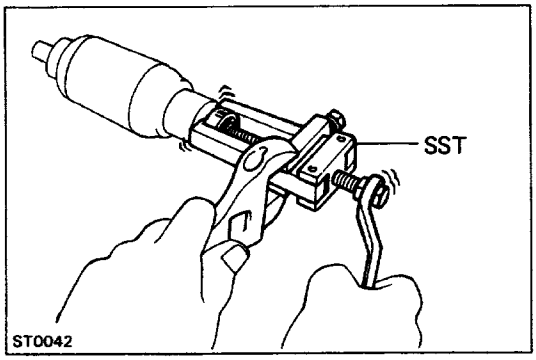


Bearings

1. INSPECT BEARINGS

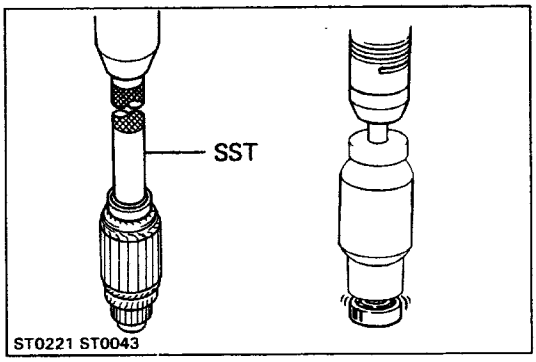
Turn each bearing by hand while applying inward force.

If the resistance is felt or if the bearing sticks, replace the bearing.



2. IF NECESSARY, REPLACE BEARINGS

(a) Using SST, remove the bearing.
SST 09286–46011

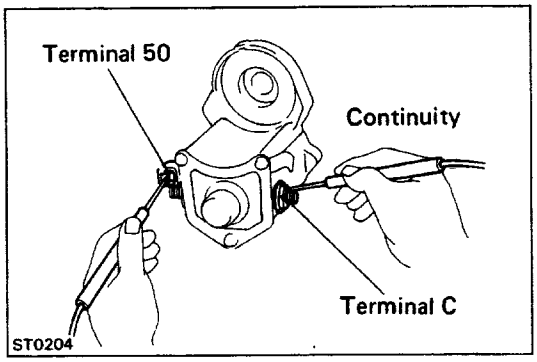


(b) Using SST and a press, press in a new bearing.
SST 1.0 kW 09285–76010
1.4 kW, 1.6 kW 09201–41020

Magnetic Switch

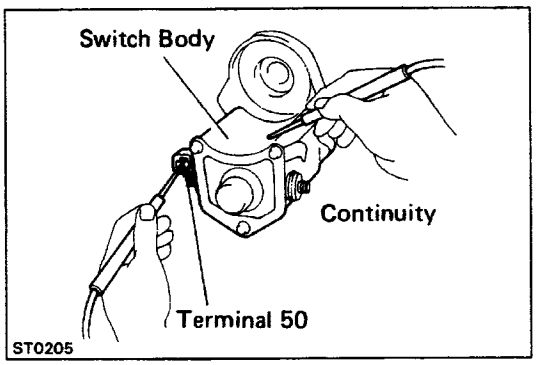
1. PERFORM PULL–IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminals 50 and C.
Ifthere is no continuity, replace the magnetic switch as–sembly.



2. PERFORM HOLD–IN COIL CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.
If there is no continuity, replace the magnetic switch as–sembly.



ASSEMBLY OF STARTER

(See page ST–2)

HINT: Use high–temperature grease to lubricate the bearings and gears when assembling the starter.

1. PLACE ARMATURE INTO FIELD FRAME

Apply grease to the armature bearings and insert the armature into the field frame.

2. INSTALL BRUSH HOLDER

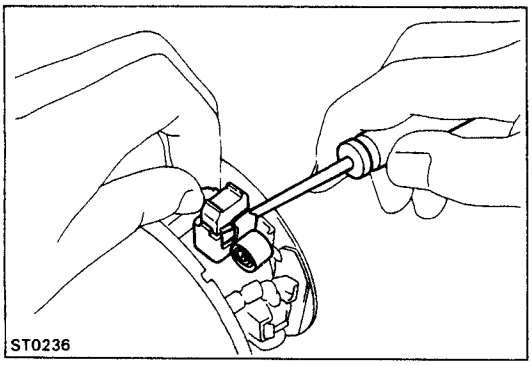
(a) Place the brush holder over the frame.

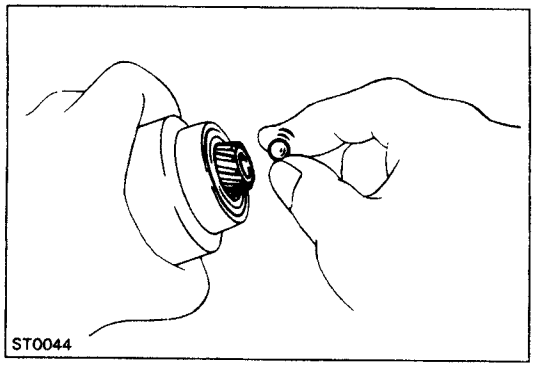
(b) Using a screwdriver, hold the brush spring back, and connect the brush into the brush holder. Connect the four brushes.

HINT: Check that the positive (+) lead wires are not grounded.

(c) (1.4 kW, 1.6 kW)
Place the 0–ring on the field frame.

(d) Install the end cover to the field frame with the two screws.

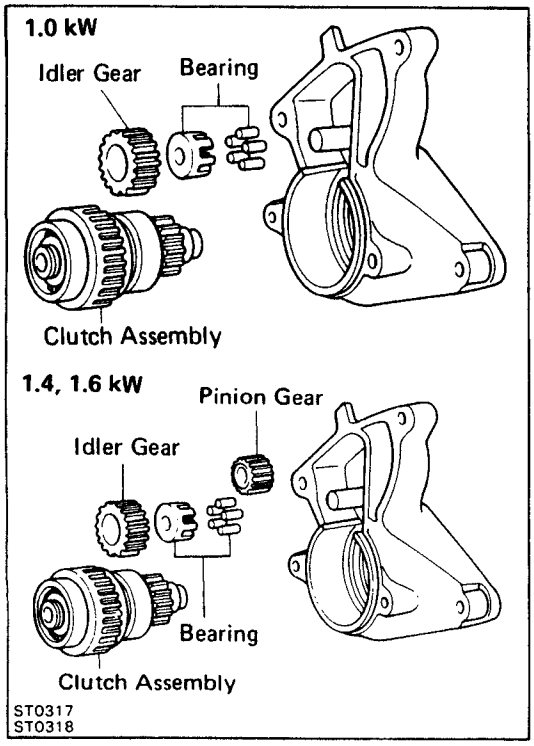

ST0236


ST0044

3. INSERT STEEL BALL INTO CLUTCH SHAFT HOLE

(a) Apply grease to the steel ball.

(b) Insert the steel ball into the clutch shaft hole.

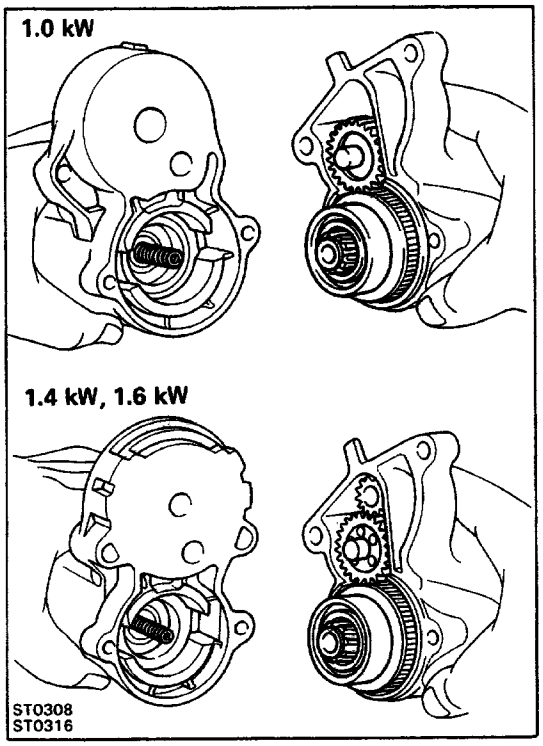


ST0317
ST0318

4. INSTALL GEARS AND CLUTCH ASSEMBLY

(a) Apply grease to the gears and clutch assembly.

(b) Place the clutch assembly, idler gear, bearing and pinion gear 11.4, 1.6 kW) in the starter housing.

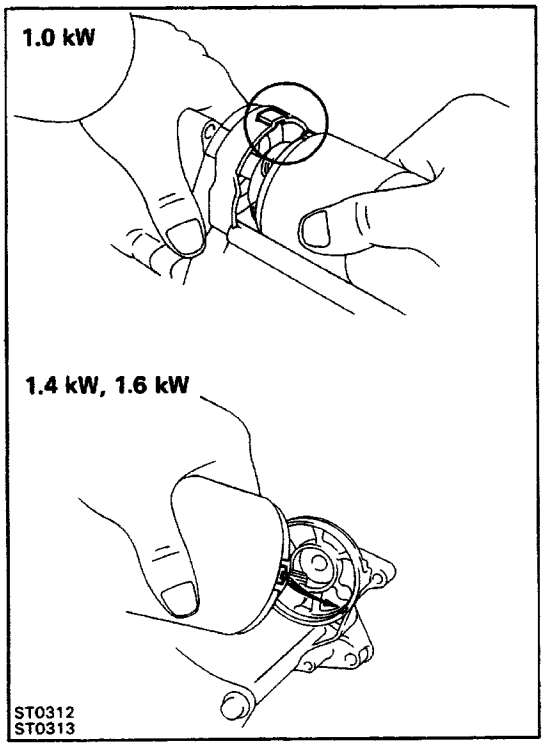


5. INSTALL STARTER HOUSING

(a) Apply grease to the return spring.

(b) Insert the return spring into the magnetic hole.

(e) Place the starter housing on the magnetic switch and install the two screws.

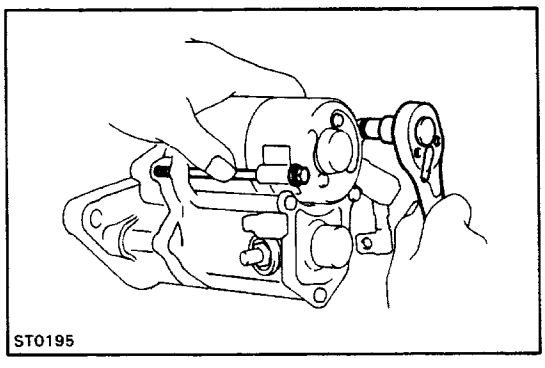


6. INSTALL FIELD FRAME WITH ARMATURE TO MAGNETIC SWITCH ASSEMBLY

(a) (1.4, 1. 6 kW)

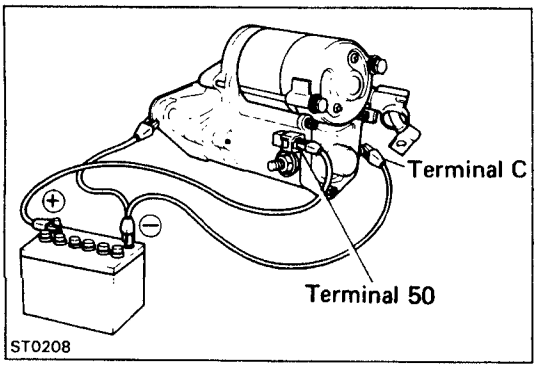
Place the O–ring on the field frame.

(b) Align the protrusion of the field frame with the cutout of the magnetic switch.



(c) Install the two through bolts.

(d) Connect the lead wire to the magnetic switch ter-mi¿na1 C, and install the nut.



PERFORMANCE TEST OF STARTER

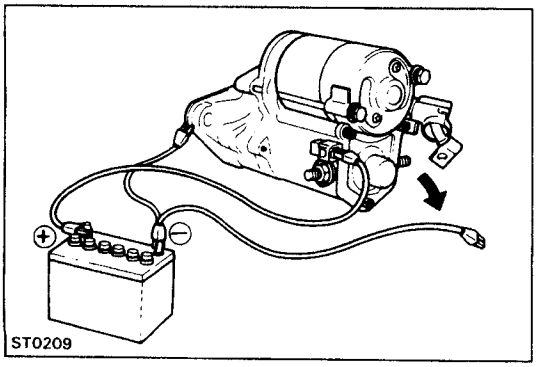
NOTICE: These tests must be performed within 3 to 5 seconds to avoid burning out the coil.

1. PERFORM PULL–IN TEST

(a) Disconnect the field coil lead wire from terminal C.

(b) Connect the battery to the magnetic switch as shown. Check that the clutch pinion gear moves outward.

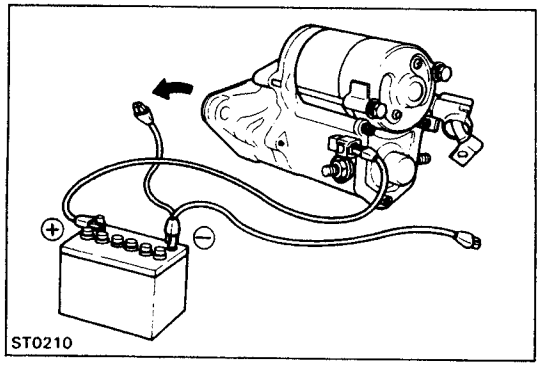
If the clutch pinion gear does not move, replace the magnetic switch assembly.



2. PERFORM HOLD–IN TEST

With battery connected as above with the clutch pinion gear out, disconnect the negative (–) lead from terminal C. Check that the pinion gear remains out.

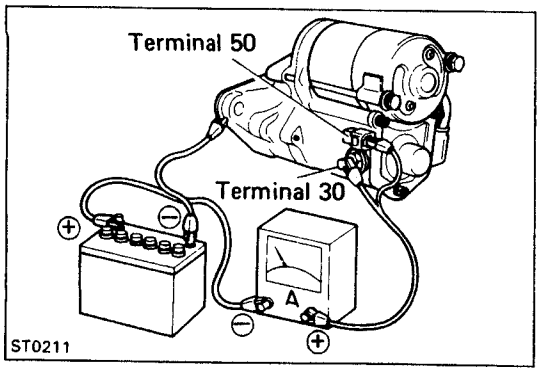
If the clutch pinion gear returns inward, replace the magnetic switch assembly.



3. INSPECT CLUTCH PINION GEAR RETURN

Disconnect the negative (–) lead from the switch body. Check that the clutch pinion gear returns inward.

If the clutch pinion gear does not return, replace the magnetic switch assembly.



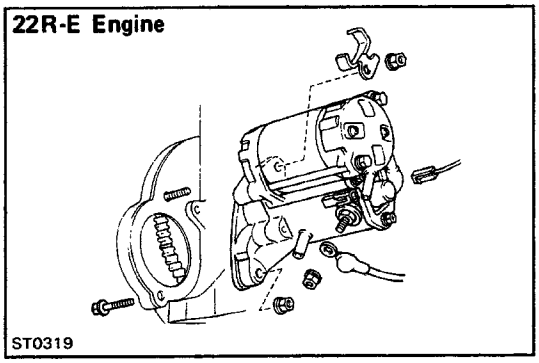
4. PERFORM NO–LOAD PERFORMANCE TEST

(a) Connect the battery and ammeter to the starter as shown. .

(b) Check that the starter rotates smoothly and steadily with the pinion gear moving out. Check that the ammeter reads the specified current.

Specified current:

90 A or less at 11.5 V



INSTALLATION OF STARTER

1. INSTALL STARTER MOTOR ON TRANSAXLE

(22R–E Engine)

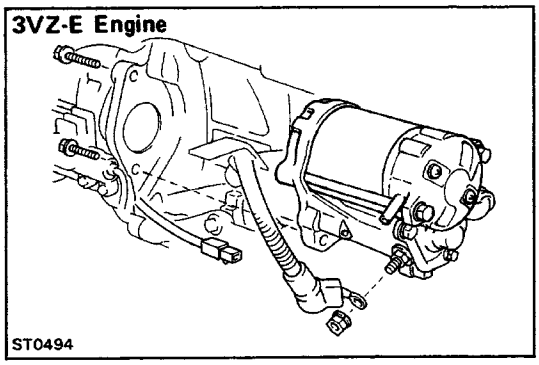
Place the starter motor in the flywheel bellhousing.

Install and torque the bolt and nut.

(3VZ–E Engine)

Place the starter motor in the flywheel bellhousing, and install and torque the starter mounting bolts.

Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)

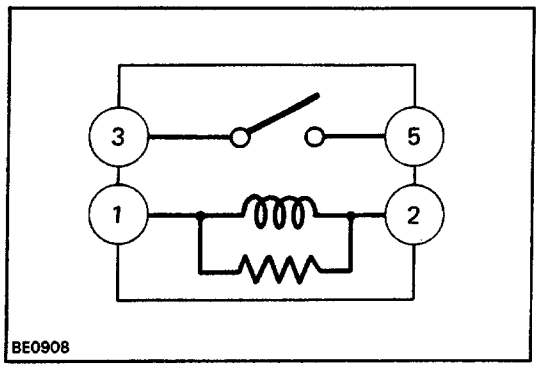


2. CONNECT TWO WIRES TO STARTER

Connect the connector to the terminal on the magnetic switch. Connect the cable from the battery to the terminal on the switch, and install the nut.

3. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

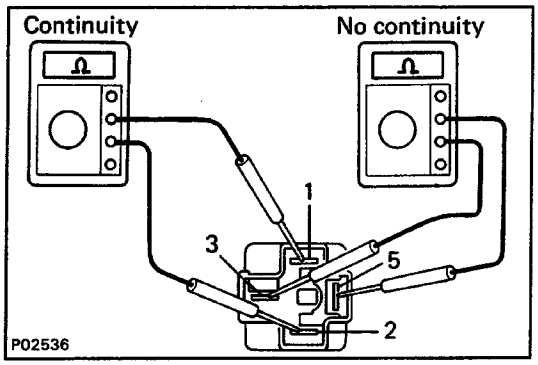
Check that the engine starts.



STARTER RELAY

INSPECTION OF STARTER RELAY

LOCATION: The relay is located in the No. 1 junction block on the driver's side.

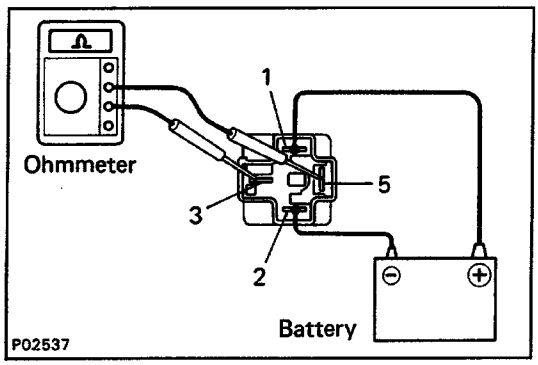


1. INSPECT RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

(b) Check that there is no continuity between terminals 3 and 5.

If continuity is not as specified, replace the relay.



2. INSPECT RELAY OPERATION

(a) Apply battery voltage across terminals 1 and 2.

(b) Check that there is continuity between terminals 3 and* 5.

If operation is not as described, replace the relay.

CLUTCH START SWITCH (M/T only)

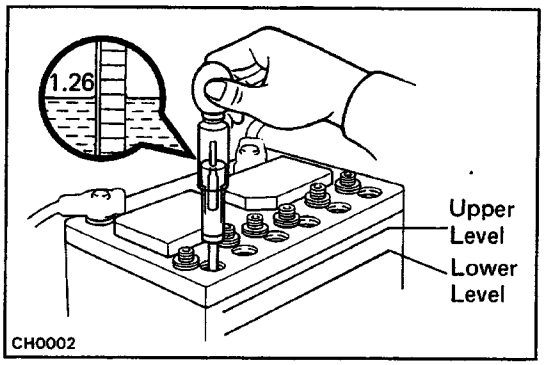
(See page CL–4)

CHARGING SYSTEM

PRECAUTIONS

1. Check that the battery cables are connected to the correct terminals.
2. Disconnect the battery cables when the battery is given a quick charge.
3. Do not perform tests with a high voltage insulation resistance tester.
4. Never disconnect the battery while the engine is running.

ON–VEHICLE INSPECTION



1. INSPECT BATTERY SPECIFIC GRAVITY AND ELECTROLYTE LEVEL

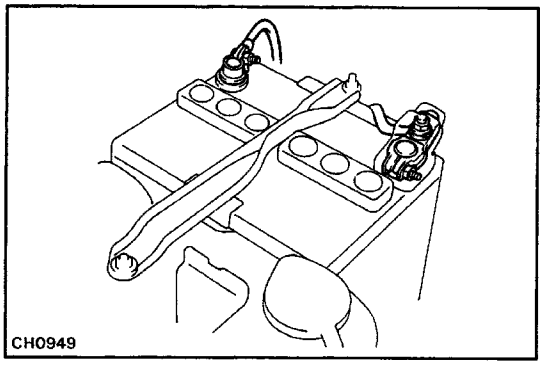
(a) Check the specific gravity of each cell.

Standard specific gravity

When fully charged at 20•C (68•F):
22R–E 1.25 – 1.27
3VZ–E 55D 23R 1.25 – 1.27
80D 26R 1.27 – 1.29

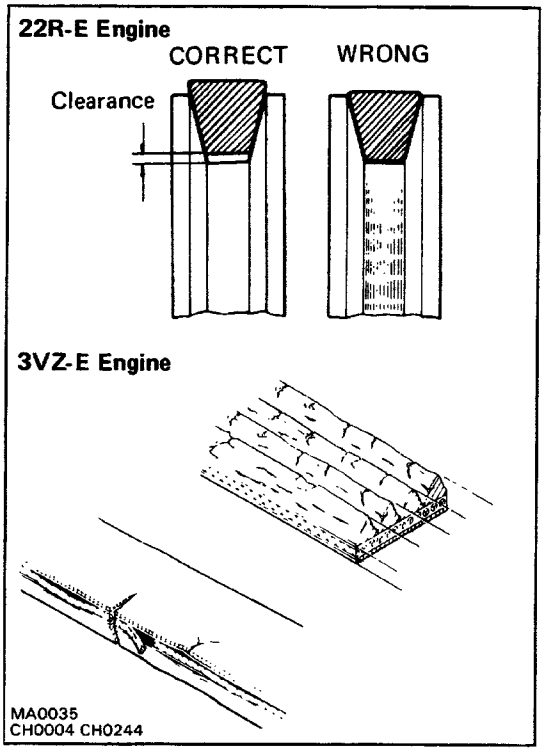
If not within specifications, charge the battery.

(b) Check the electrolyte quantity of each cell.
If insufficient, refill with distilled (or purified) water.



2. CHECK BATTERY TERMINALS AND FUSIBLE LINKS

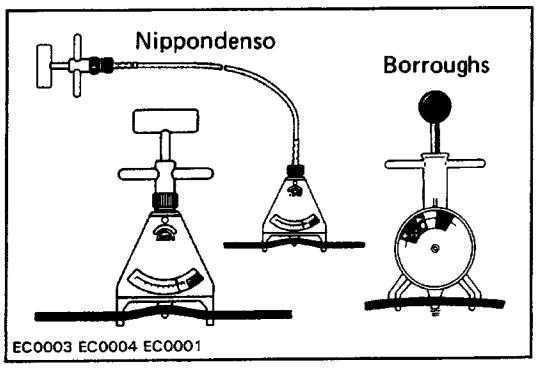
(a) Check that the battery terminals are not loose or corroded.
(b) Check the fusible links for continuity.

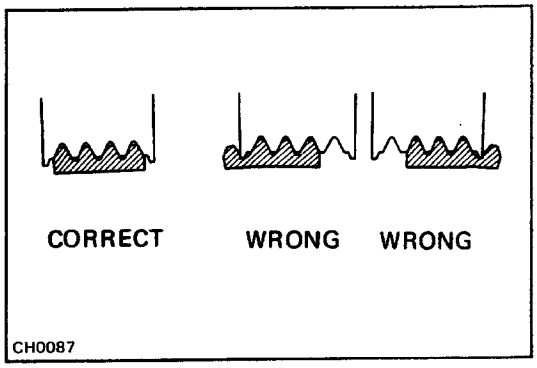


3. INSPECT DRIVE BELT

(a) Visually check the belt for excessive wear, frayed cords etc.

HINT:
22R–E: Check that the belt does not touch the bottom of the pulley groove.
If any defect has been found, replace the drive belt.
3VZ–E: Cracks on the ribbed side of the belt are considered acceptable.
If the belt has chunks missing from the ribs, it should be replaced.





(b) Using a belt tension gauge, check the drive belt tension .

Belt tension gauge:

Nippondenso BTG–20 (95506–00020) or Borroughs No. BT–33–73F

Drive belt tension:

22R–E New belt 125 ± 25 lbf

Used belt 80 ± 20 lbf

3VZ–E New belt 160 ± 20 lbf

Used belt 100 ± 20 lbf ,

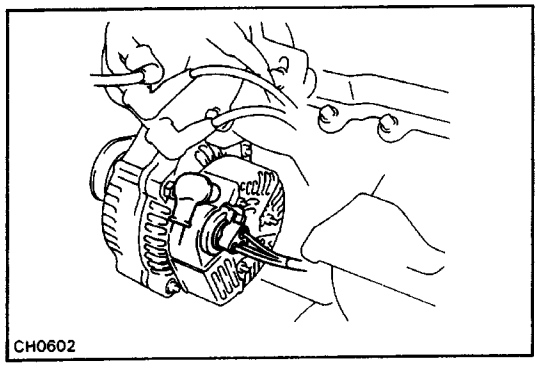
If necessary, adjust the drive belt tension.

HINT:

- ”New belt” refers to a belt which has been used less than 5 minutes on a running engine.
- ”Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing the drive belt, check that it fits properly in the ribbed grooves. Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the crank pulley.
- After installing a new belt, run the engine for approx. 5 minutes and then recheck the tension.

4. INSPECT FUSES FOR CONTINUITY

- ENGINE 10A
- CHARGE 7–5A
- IGN 7.5A



5. VISUALLY CHECK GENERATOR WIRING AND LISTEN FOR ABNORMAL NOISES

(a) Check that the wiring is in good condition.

(b) Check that there is no abnormal noise from the gener–ator while the engine is running.

6. INSPECT DISCHARGE WARNING LIGHT CIRCUIT

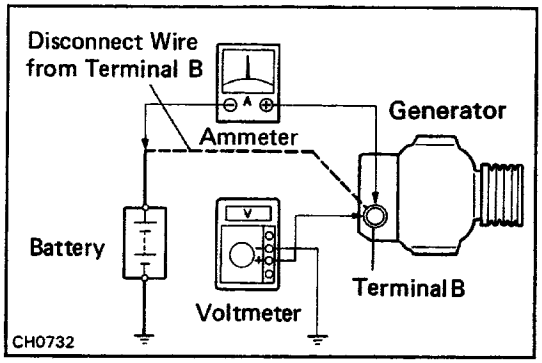
(a) Turn the ignition switch ON. Check that the discharge warning light is lit.

(b) Start the engine. Check that the light goes off.

If the light does not operate as specified, troubleshoot the warning light circuit.

7. CHECK CHARGING CIRCUIT WITHOUT LOAD

HINT: If a battery/generator tester is available, connect the tester to the charging circuit according to the manufac–turer's instructions.



(a) If a tester is not available, connect a voltmeter and ammeter to the charging circuit as follows:

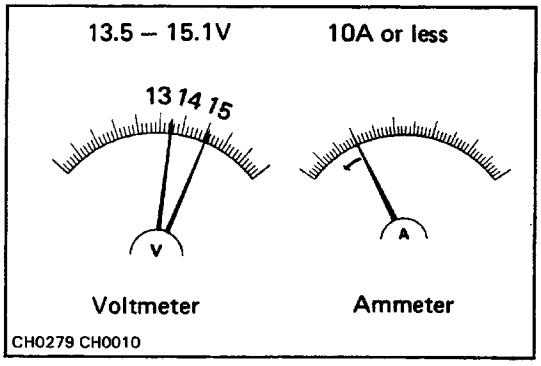
- Disconnect the wire from terminal B of the gener–ator and connect the wire to the negative (–) ter–minal of the ammeter.
- Connect the test lead from the positive (+) termi–nal of the ammeter to terminal B of the generator.
- Connect the positive (+) lead of the voltmeter to terminal B of the generator.
- Ground the negative (–) lead of the voltmeter.

(b) Check the charging circuit as follows:

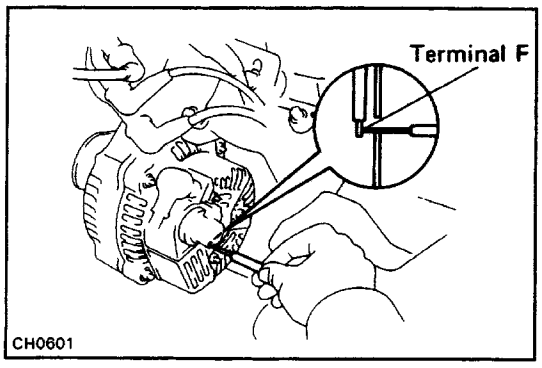
With the engine running from idling to 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage: 10 A or less

Standard voltage: 13.9 – 15.1 V at 250C (770F)
13.5 – 14.3 V at 1150C (239•F)

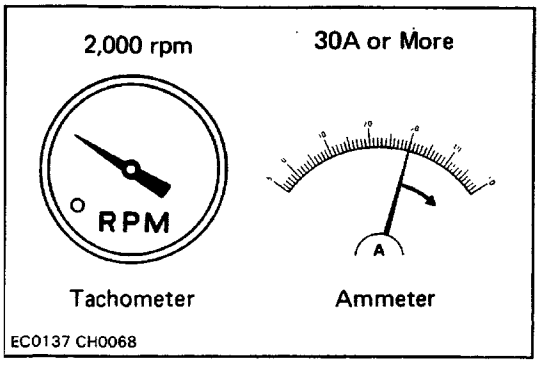


If the voltage reading is greater than standard voltage, replace the IC regulator.



If the voltage reading is less than standard voltage, check the IC regulator and generator as follows:

- With terminal F grounded, start the engine and check the voltage reading of terminal B.
- If the voltage reading is higher than standard voltage, replace the IC regulator.
- If the voltage reading is less than standard voltage, repair the generator.



8. INSPECT CHARGING CIRCUIT WITH LOAD

(a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater fan control switch at HI.

(b) Check the reading on the ammeter.

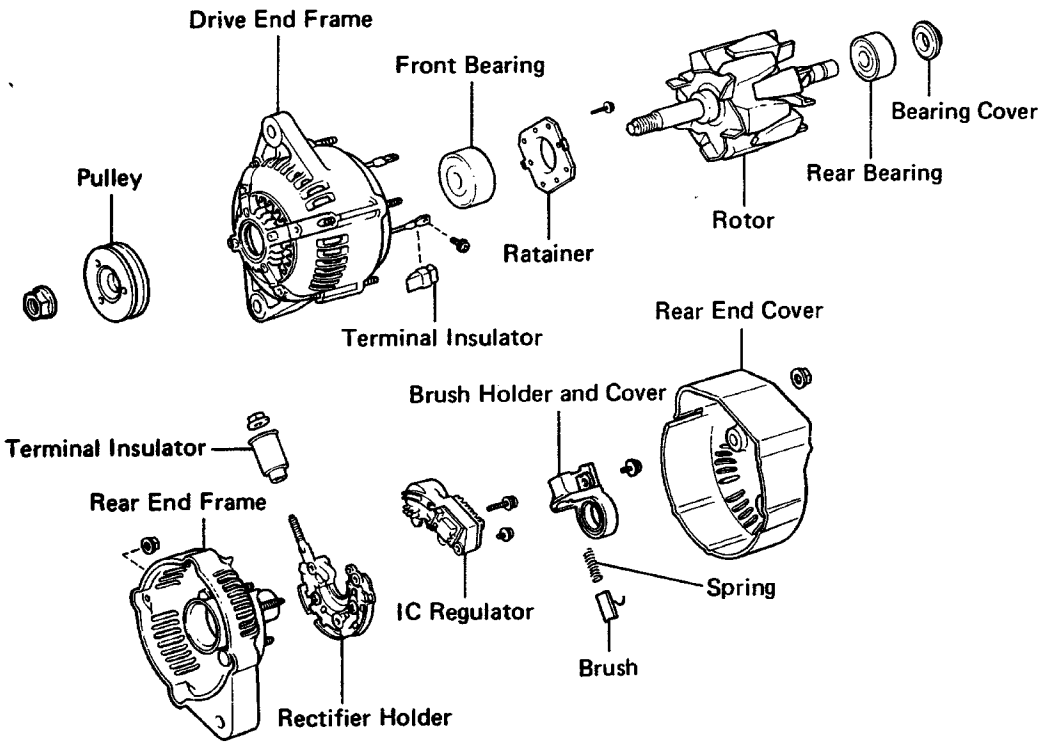
Standard amperage: 30 A or more

If the ammeter reading is less than 30 A, repair the gener–ator. (See page CH–5)

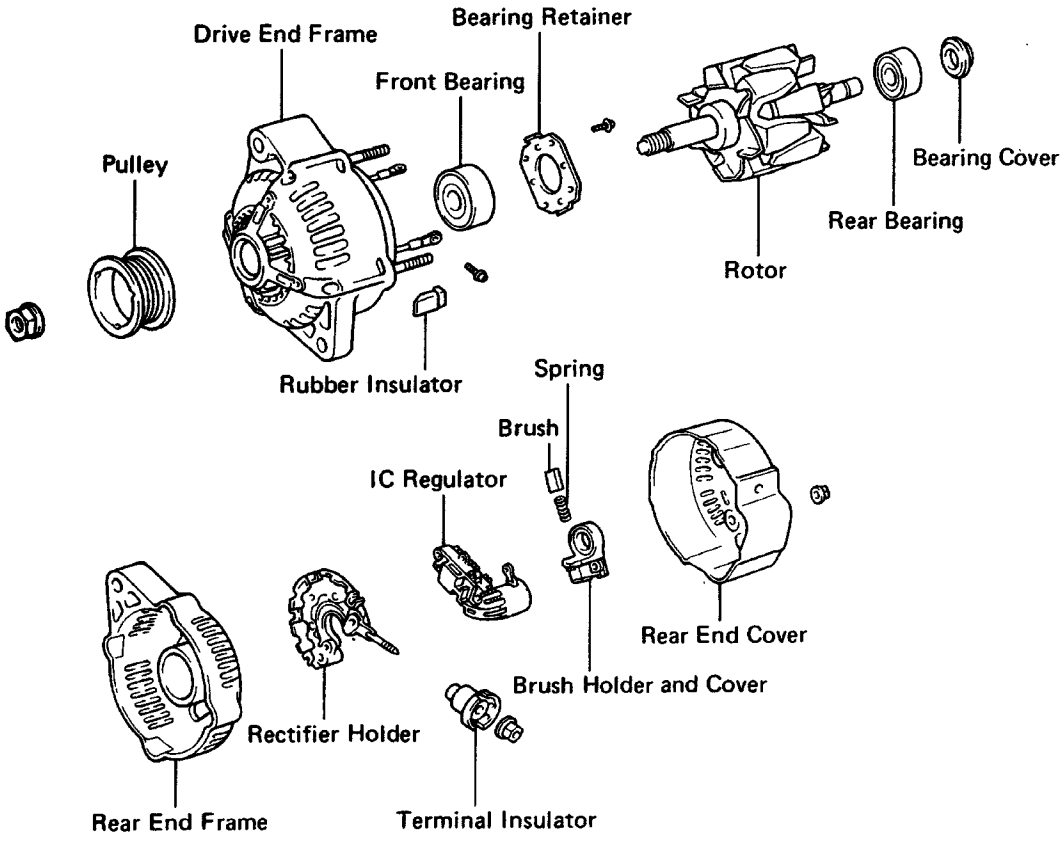
HINT: If the battery is fully charged, the indication will sometimes be less than 30 A.

GENERATOR
COMPONENTS

22R-E Engine



3VZ-E Engine

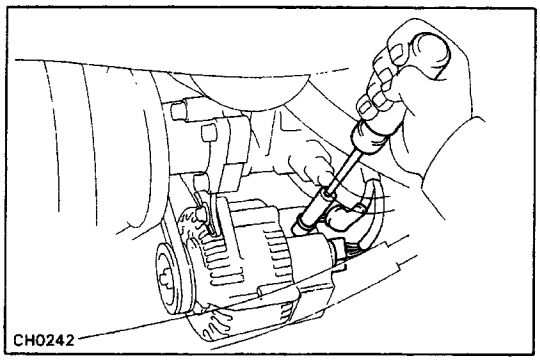


CH0238
CH0603

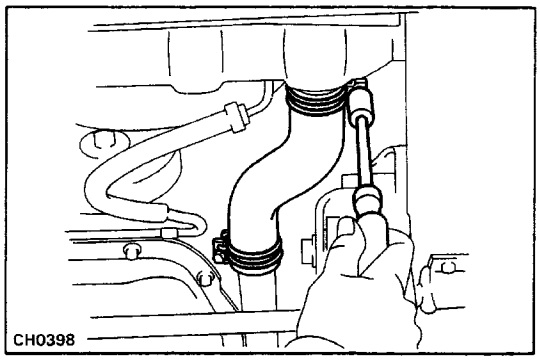
REMOVAL OF GENERATOR (22R–E)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

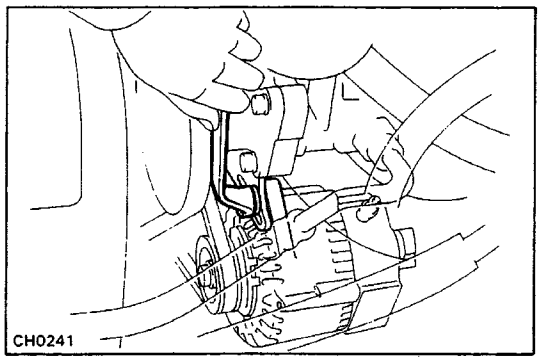
2. (w/ PS)
DRAIN COOLANT



3. DISCONNECT WIRING FROM GENERATOR
(a) Disconnect the connector from the generator.
(b) Remove the nut and wire from the generator.



4. (w/ PS)
REMOVE WATER INLET HOSE
(a) Remove the engine under cover.
(b) Remove the water inlet hose.
(c) (with A/C)
Remove the No. 2 fan shroud.



5. REMOVE GENERATOR DRIVE BELT
(a) Loosen the generator pivot and remove the adjusting bolt.
(b) Remove the drive belt.

6. REMOVE GENERATOR
(a) Hold the generator and remove the pivot.
(b) Remove the generator.

REMOVAL OF GENERATOR (3VZ–E)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DISCONNECT WIRING FROM GENERATOR

(a) Disconnect the connector from the generator.

(b) Remove the nut and disconnect the wire from the generator.

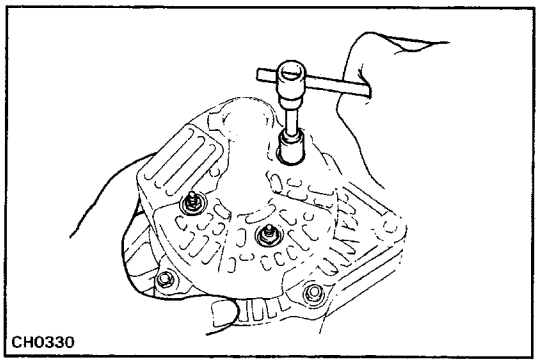
3. REMOVE GENERATOR DRIVE BELT

Loosen the generator pivot bolts, adjusting nut and lock bolt and remove the generator drive belt.

4. REMOVE GENERATOR

(a) Remove the pivot bolt and adjusting lock bolts.

(b) Remove the generator.



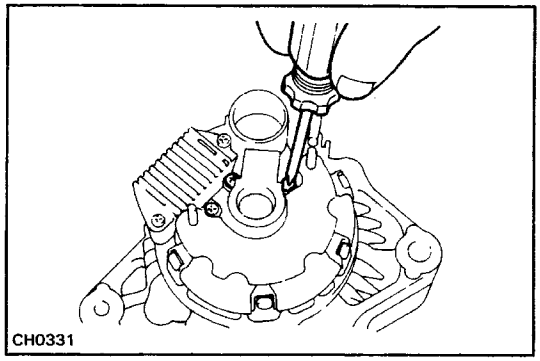
DISASSEMBLY OF GENERATOR

(See page CH–5)

1. REMOVE REAR END COVER

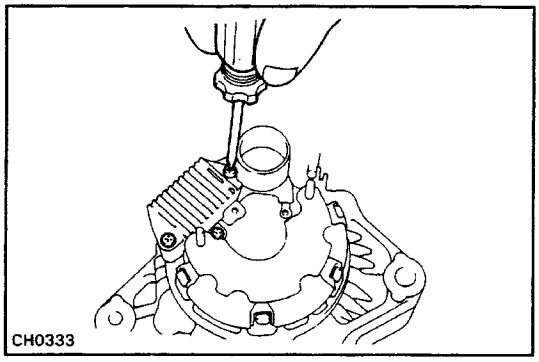
(a) Remove the nut and terminal insulator.

(b) Remove the three nuts and end cover.



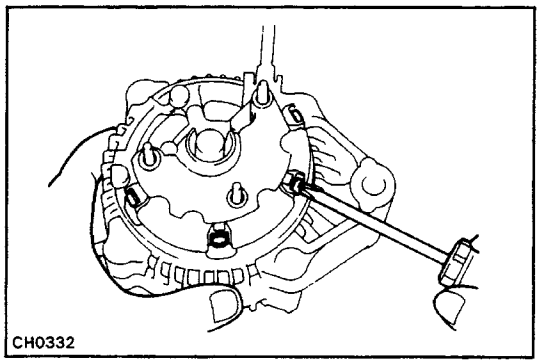
2. REMOVE BRUSH HOLDER

Remove the two screws, brush holder and cover.



3. REMOVE IC REGULATOR

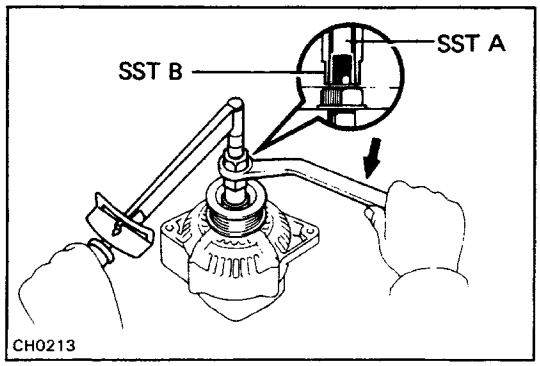
Remove the three screws and IC regulator.



4. REMOVE RECTIFIER HOLDER

(a) Remove the four screws and rectifier holder.

(b) Remove the four rubber insulators.



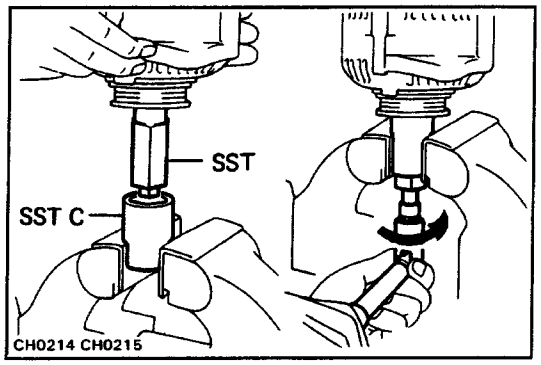
5. REMOVE PULLEY

(a) Hold SST A with a torque wrench, and tighten SST B clockwise to the specified torque.

SST 09820–63010

Torque: 39 N – m(400 kgf – cm, 29 ft – lbf)

(b) Check that SST A is secured to the rotor shaft.



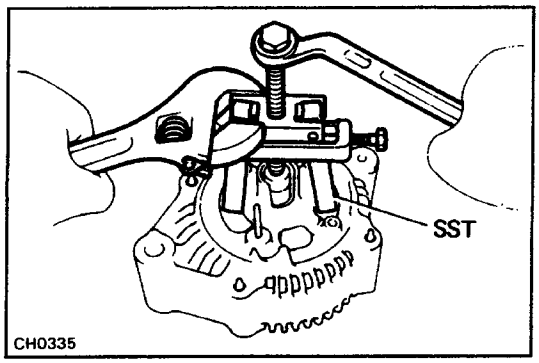
(c) As shown in the illustration, mount SST C in a vise, and install the generator with SST (A and B) to SST C.
(d) To loosen the pulley nut, turn SST A in the direction shown in the illustration.

NOTICE: To prevent damage to the rotor shaft, do not loosen the pulley nut more than one–half of a turn.

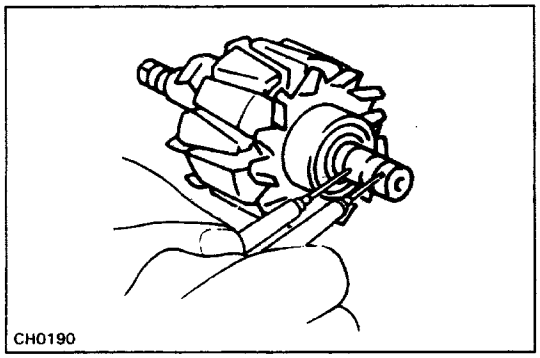
(e) Remove the generator with SST (A and B) from SST C.
(f) Turn SST B and remove SSTs A and B.
(g) Remove the pulley nut and pulley.

6. REMOVE REAR END FRAME

(a) Remove the four nuts.
(b) Using SST, remove the¿ rear end frame.
SST 09286–46011



7. REMOVE ROTOR FROM DRIVE END FRAME


CH0190

INSPECTION AND REPAIR OF GENERATOR

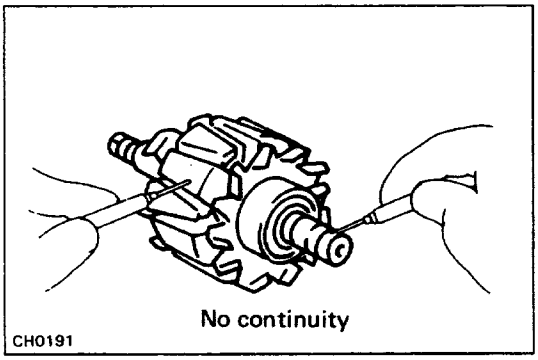
Rotor

1. INSPECT ROTOR FOR OPEN CIRCUIT –

Using an ohmmeter, check that there is continuity between the slip rings.

Standard resistance (Cold): 2.8 – 3.0

If there is no continuity, replace the rotor.

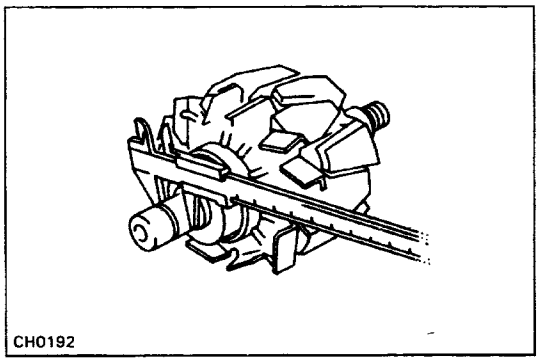


CH0191

2. INSPECT ROTOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the slip ring and the rotor.

If there is continuity, replace the rotor.


CH0192

3. INSPECT SLIP RINGS

(a) Check that the slip rings are not rough or scored.
If rough or scored, replace the rotor.

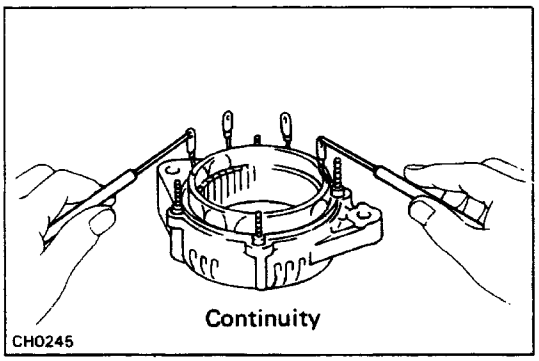
(b) Using vernier calipers, measure the slip ring diameters.
Standard diameter: 14.2 – 14.4 mm (0.559 – 0.567 in.)
Minimum diameter: 12.8 mm (0.504 in.)
If the diameter is less than minimum, replace the rotor.

Stator

1. INSPECT STATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the coil leads.

If there is no continuity, replace the drive end frame assembly.

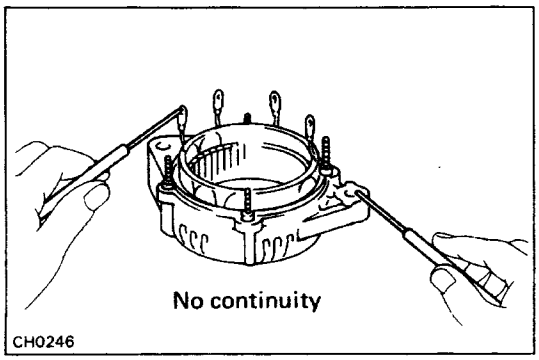


CH0245

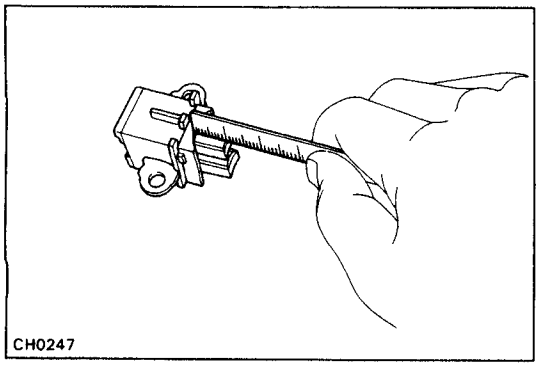
2. INSPECT STATOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the coil leads and drive end frame.

If there is continuity, replace the drive end frame assembly.



CH0246



Brushes

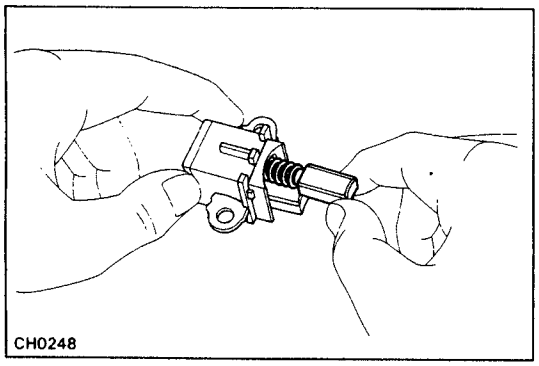
1. INSPECT EXPOSED BRUSH LENGTH

Using a scale, measure the exposed brush length.

Standard exposed length: 10.5 mm (0.413 in.)

Minimum exposed length: 1.5 mm l0.059 in.)

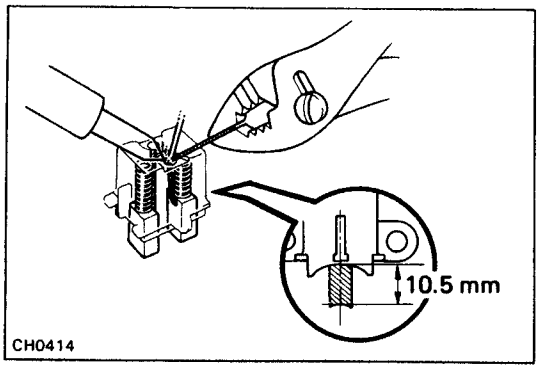
If the exposed length is less than minimum, replace the brushes.



2. IF NECESSARY, REPLACE BRUSHES

(a) Unsolder and remove the brush and spring.

(b) Run the wire of the brush through the hole in the brush holder, and insert the spring and brush into the brush holder.



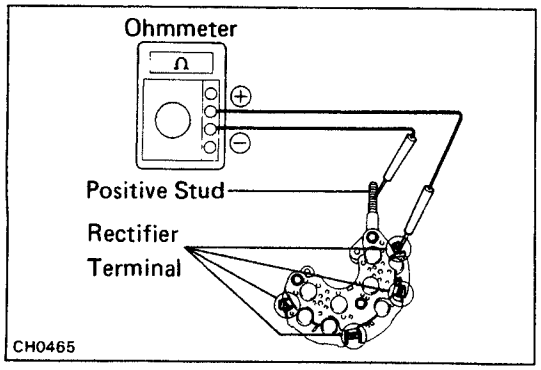
(c) Solder the brush wire to the brush holder at the exposed length.

Exposed length: 10.5 mm (0.413 in.)

(d) Check that the brush moves smoothly in the brush holder.

(e) Cut off the excess wire.

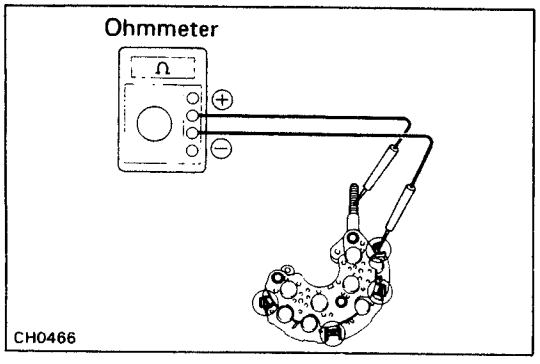
(f) Apply insulation paint to the soldered point.



Rectifier

1. INSPECT POSITIVE SIDE RECTIFIER

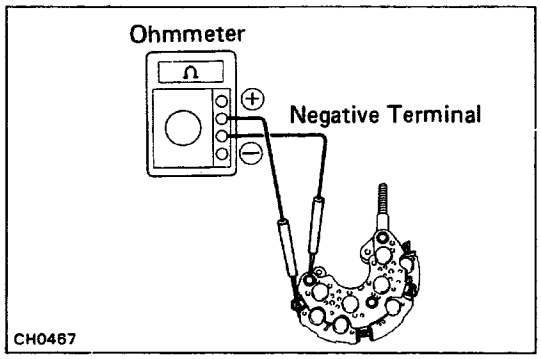
(a) Using an ohmmeter, connect one tester probe to the positive stud and the other to each rectifier terminal.



(b) Reverse the polarity of the tester probes.

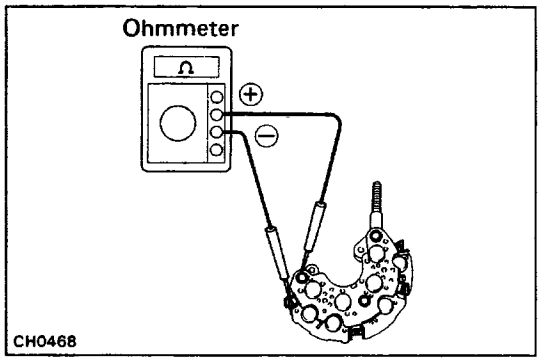
(c) Check that one shows continuity and the other shows no continuity.

If not, replace the rectifier holder.



2. INSPECT NEGATIVE SIDE RECTIFIER

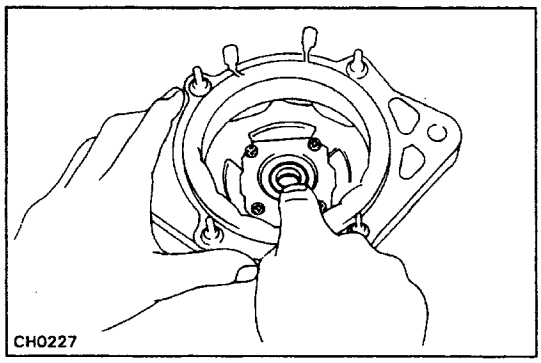
(a) Connect one tester probe to each rectifier terminal and the other to each rectifier negative terminal.



(b) Reverse the polarity of the tester probes.

(c) Check that one shows continuity and the other shows no continuity.

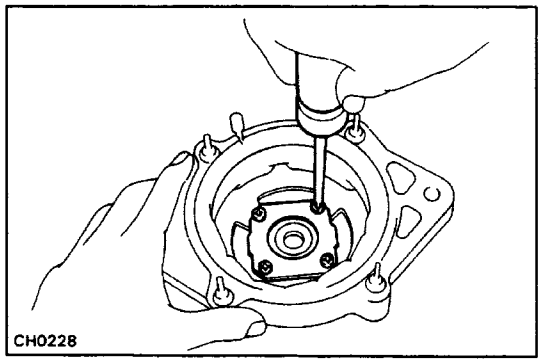
If not, replace the rectifier holder.



Bearings

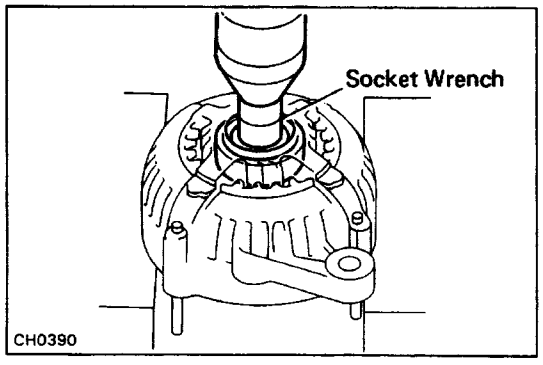
1. INSPECT FRONT BEARING

Check that the bearing is not rough or worn.

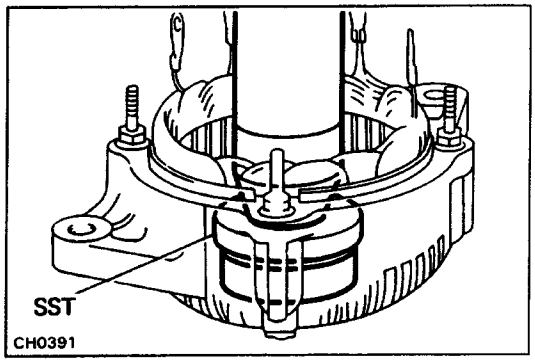


2. IF NECESSARY, REPLACE FRONT BEARING

(a) Remove the four screws and bearing retainer.



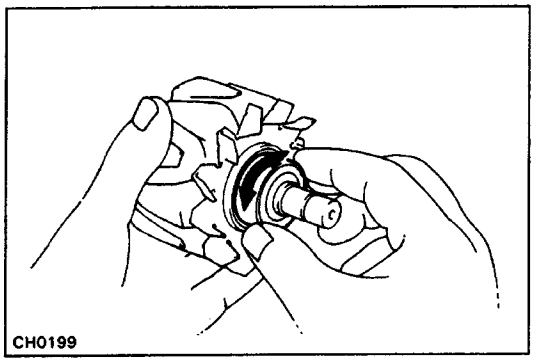
(b) Using a press and socket wrench, press out the front bearing.



(c) Using SST and a press, press the front bearing into the drive end frame.
SST 09608–20012 (09608–00030)
(d) Install the bearing retainer with the four screws.

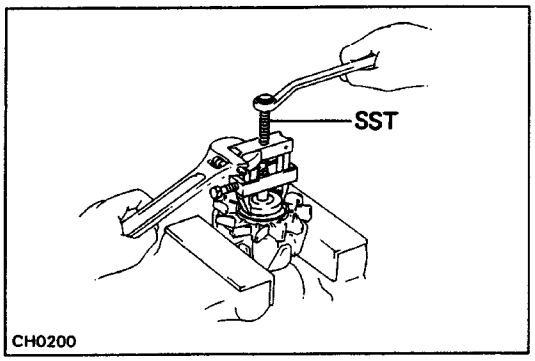
3. INSPECT REAR BEARING

Check that the bearing is not rough or worn.

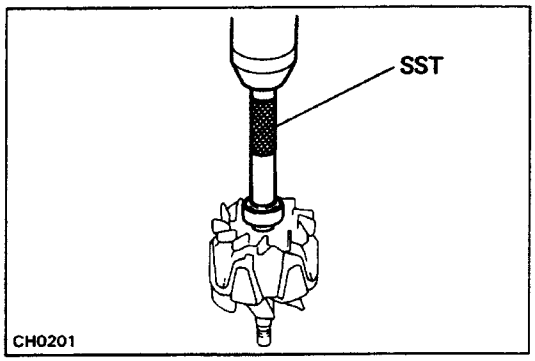


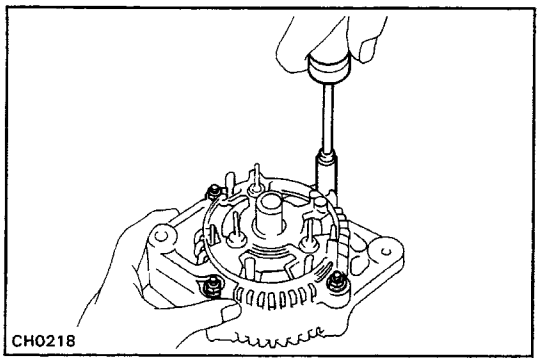
4. IF NECESSARY, REPLACE REAR BEARING

(a) Using SST, remove the bearing cover and bearing.
SST 09820–00021



(b) Using SST and a press, press in a new bearing and the bearing cover.
SST 09285–76010





ASSEMBLY OF GENERATOR

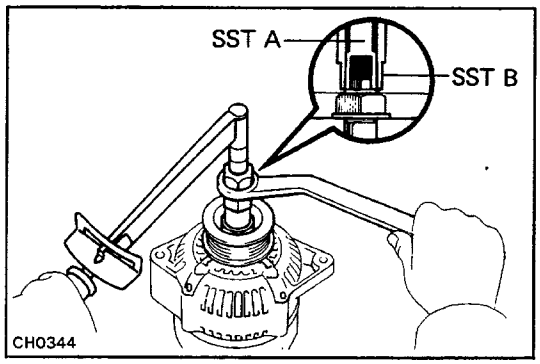
(See page CH–5)

1. INSTALL ROTOR TO DRIVE END FRAME

2. INSTALL REAR END FRAME

(a) Using a plastic–faced hammer, lightly tap in the rear end frame.

(b) Install the four nuts.



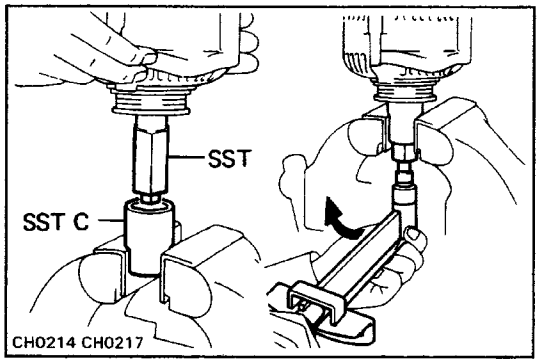
3. INSTALL PULLEY

(a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.

(b) Hold SST A with a torque wrench, and tighten SST B clockwise to the specified torque.
SST 09820–63010

Torque: 39 N–m (400 kgf –cm, 29 ft–lbf)

(c) Check that SST A is secured to the pulley shaft.



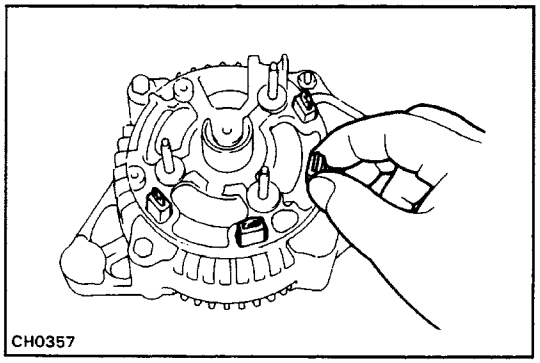
(d) As shown in the illustration, mount SST C in a vise, and install the generator with SST (A and B) to SST C.

(e) To torque the pulley nut, turn SST A in the direction shown in the illustration.

Torque: 110 N–m (1,125 kgf –cm, 81 ft–lbf)

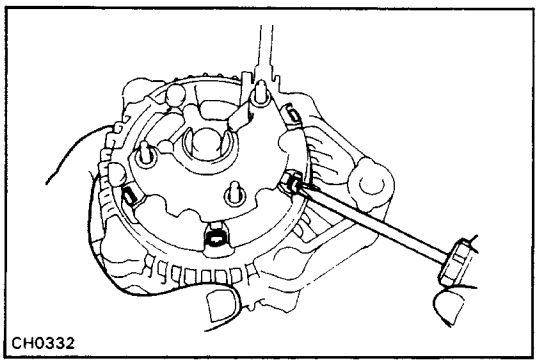
(f) Remove the generator with SST (A and B) from SST C.

(g) Turn SST B and remove SSTs A and B.

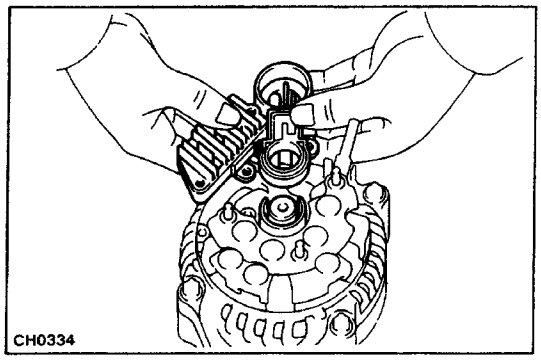


4. INSTALL RECTIFIER HOLDER

(a) Install the four rubber insulators on the lead wires.



(b) Install the rectifier with the four screws.

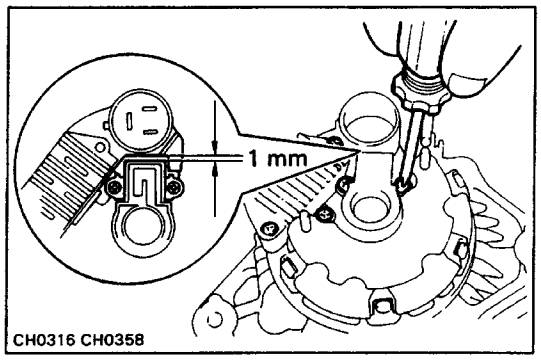


5. INSTALL BRUSH HOLDER AND IC REGULATOR

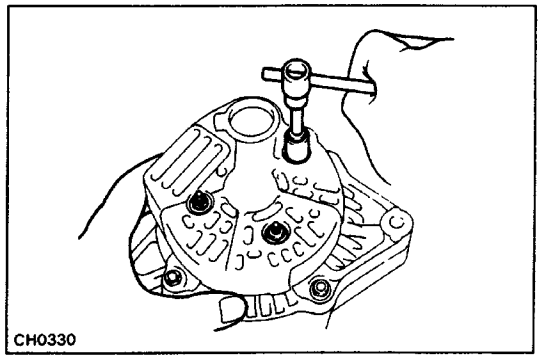
(a) Place the brush holder cover to the brush holder.

(b) Install the IC regulator and brush holder to the rear end frame horizontally as shown in the illustration.

HINT: Check that the brush holder's cover doesn't slip to one side during installation.



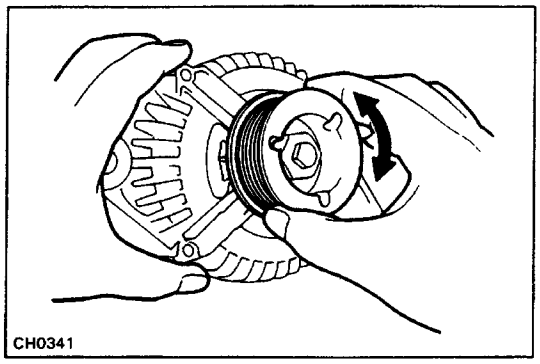
(c) Tighten the five screws until there is a clearance of at least 1 mm (0.04 in.) between the brush holder cover and connector.



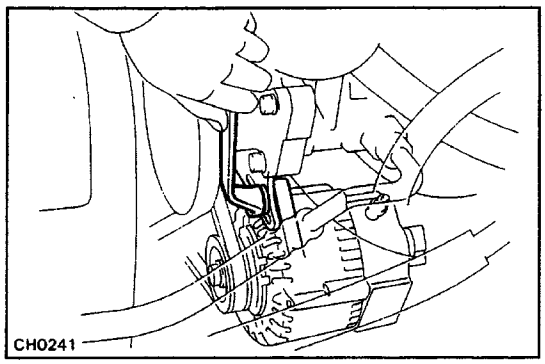
6. INSTALL REAR END COVER

(a) Install the end cover with the three nuts.

(b) Install the terminal insulator with the nut.



7. MAKE SURE ROTOR ROTATES SMOOTHLY



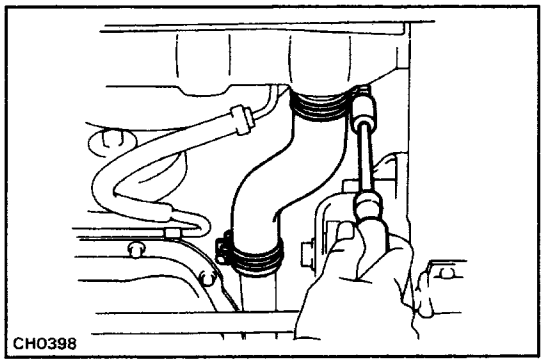
INSTALLATION OF GENERATOR (22R–E)

1. INSTALL GENERATOR

Mount the generator on the bracket with the pivot and adjusting bolt.

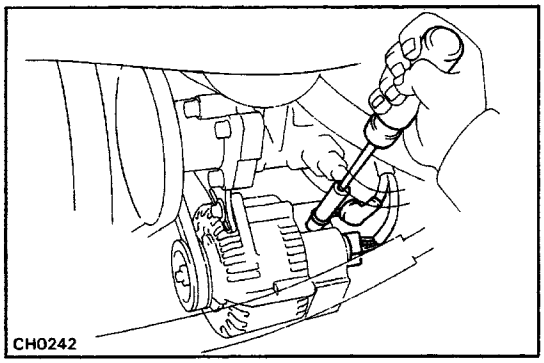
2. INSTALL AND ADJUST DRIVE BELT

(See page MA–6)



3. INSTALL WATER INLET HOSE

(a) Install the water inlet hose.
(b) Install the engine under cover.
(c) (with A/C)
Install the No.2 fan shroud.



4. CONNECT WIRING TO GENERATOR

(a) Connect the wire to the generator and install the nut.
(b) Connect the connector to the generator.

5. FILL WITH COOLANT

Close the radiator drain cock and fill with coolant.

6. CONNECT NEGATIVE CABLE TO BATTERY

7. PERFORM ON–VEHICLE INSPECTION

(See page CH–2)

INSTALLATION OF GENERATOR (3VZ–E)

1. INSTALL GENERATOR

Mount the generator on the generator bracket with pivot bolt and adjusting lock bolts.
Do not tighten the bolts.

2. INSTALL DRIVE BELT

(See step 3 on page CH–2)

3. CONNECT WIRING TO GENERATOR

(a) Connect the wire to the generator with the nut.
(b) Connect the connector to the generator.

4. CONNECT NEGATIVE CABLE TO BATTERY

5. PERFORM ON–VEHICLE INSPECTION

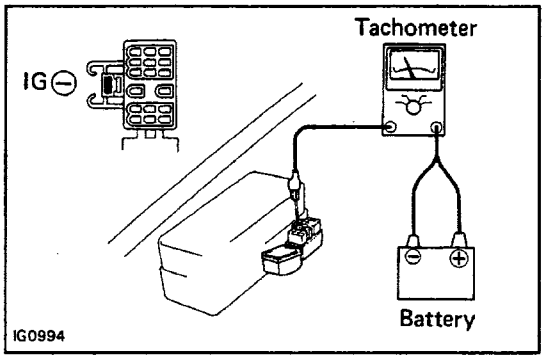
(See pages CH–2 to 3)

IGNITION SYSTEM

(22R –E)

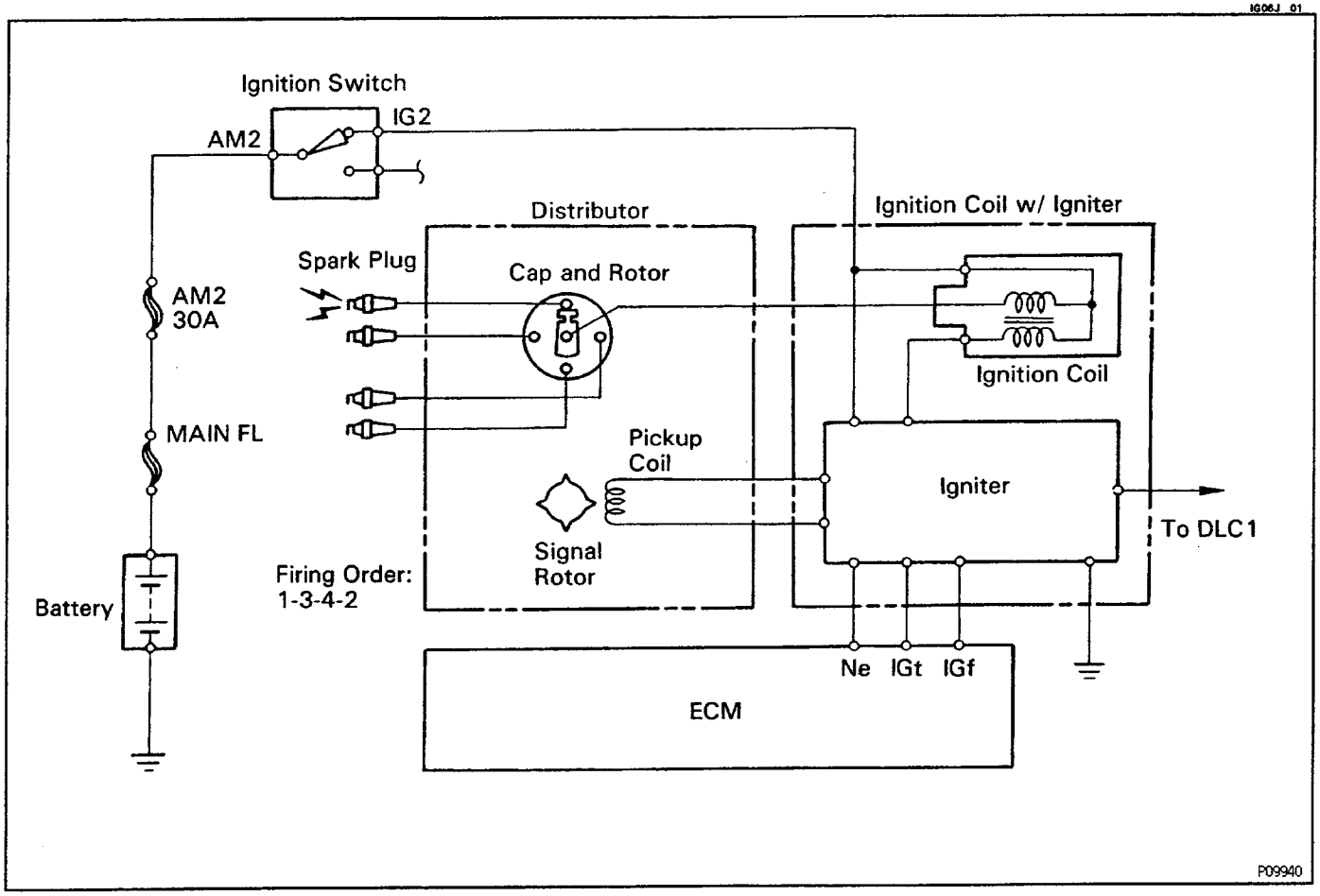
PRECAUTIONS

1. Do not allow the ignition switch to be ON for more than 10 minutes if the engine will not start.



2. When a tachometer is connected to the system, connect the tachometer test probe to the IG(–) terminal of the DLC 1.
3. As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.
4. Never allow the ignition coil terminals to touch ground as it could result in damage to the igniter and/or ignition coil.
5. Do not disconnect the battery when the engine is running.
6. Make sure that the igniter properly grounded to the body.

SYSTEM CIRCUIT



ELECTRONIC SPARK ADVANCE (ESA)

The ECM is programmed with data for optimum ignition timing under any and all operating conditions. Using data provided by sensors which monitor various engine functions (rpm, intake air volume, engine temperature, etc.) the microcomputer (ECM) triggers the spark at precisely the right instant.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

IG00R–04

	09843–18020 Diagnosis Check Wire	

RECOMMENDED TOOLS

IG00S–02

	09082–00015 TOYOTA Electrical Tester	
	09200–00010 Engine Adjust Kit	

EQUIPMENT

IG00T–01

Megger insulation resistancenneter	Insulation resistance meter
Spark plug cleaner	
Tachometer	
Timing light	Ignition timing

SSM (SPECIAL SERVICE MATERIALS)

IG00U–02

08826–00080 Seal packing or equivalent	Ignition coil

PREPARATION

SST (SPECIAL SERVICE TOOLS)

IG00R–04

	09843–18020 Diagnosis Check Wire	

RECOMMENDED TOOLS

IG00S–02

	09082–00015 TOYOTA Electrical Tester	
	09200–00010 Engine Adjust Kit	

EQUIPMENT

IG00T–01

Megger insulation resistancenneter	Insulation resistance meter
Spark plug cleaner	
Tachometer	
Timing light	Ignition timing

SSM (SPECIAL SERVICE MATERIALS)

IG00U–02

08826–00080 Seal packing or equivalent	Ignition coil

ON–VEHICLE INSPECTION

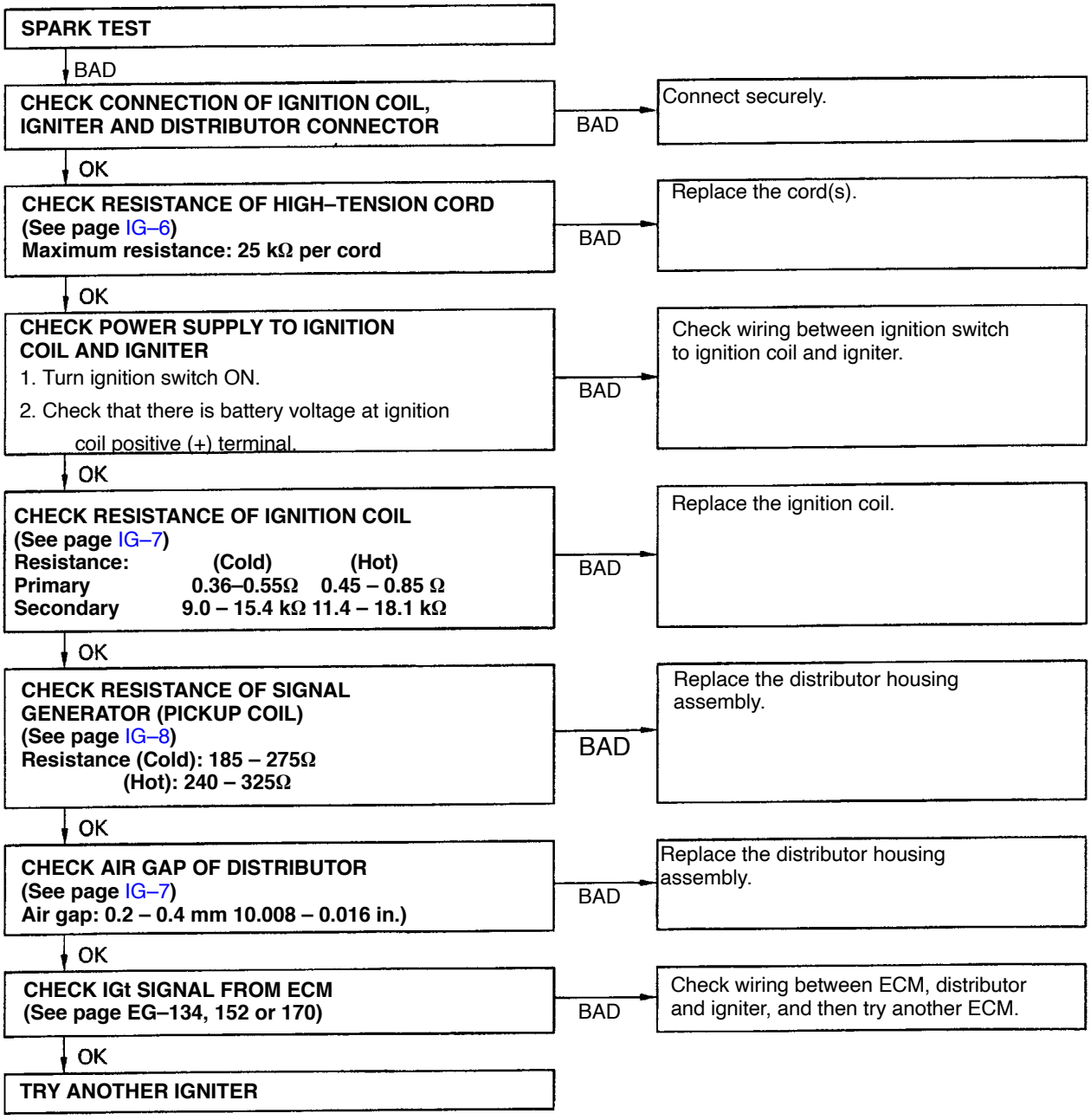
IG06L–01

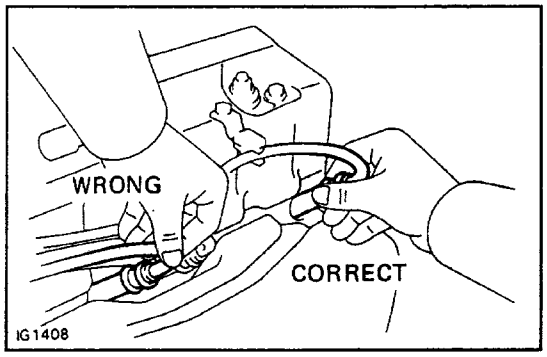
SPARK TEST

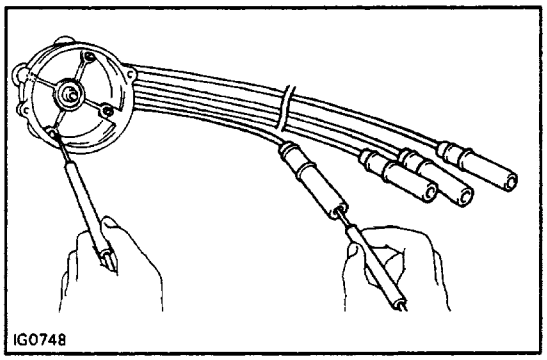
(a) Disconnect high–tension cord from the distributor.
(b) Hold the cord end approx. 12.5 mm (0.50 in.) from engine ground of vehicle.
(c) Check if spark occurs while engine is being cranked.

HINT: To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1 – 2 seconds at a time.

If the spark does not occur, perform the test as follows.







HIGH–TENSION CORD INSPECTION

IG06M–01

1. CAREFULLY REMOVE HIGH–TENSION CORDS BY THEIR RUBBER BOOTS FROM SPARK PLUGS

CAUTION: Do not pull on or bend the cords to avoid damaging the conductor inside.

2. INSPECT HIGH–TENSION CORD TERMINALS

Check the terminals for corrosion, breaks or distor–tion.

Replace cords as required.

3. INSPECT HIGH–TENSION CORD RESISTANCE

Using an ohmmeter, check that the resistance does not exceed the maximum.

Maximum resistance:

25 kΩ per cord

If the resistance exceeds maximum, check the termi–nals. If any defect has been found, replace the high–tension cord and/or distributor cap.

SPARK PLUGS INSPECTION

IG06N–01

1. REMOVE SPARK PLUGS

2. CLEAN AND INSPECT SPARK PLUGS

(a) Clean the spark plugs with a spark plug cleaner or wire brush.

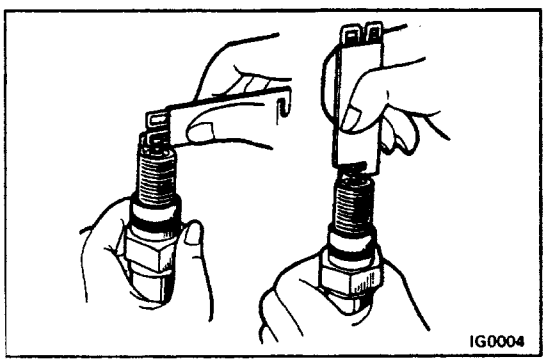
(b) Inspect the spark plugs for electrode wear, thread damage and insulator damage.

If a problem is found, replace the plugs.

Spark plug:

ND W16EXR–U

NGK BPR5EY



3. ADJUST ELECTRODE GAP

Carefully bend the outer electrode to obtain the cor–rect electrode gap.

Correct electrode gap:

0.8 mm (0.031 in.)

4. INSTALL SPARK PLUGS

Torque: 18 N–m (180 kgf–cm, 13 ft–lbf)

IG08P–01

IGNITION COIL INSPECTION

NOTICE: ”Cold” and ’Hot” in the following sentences express the temperature of the coils themselves. ”Cold’ is from –10 °C (14 °F) to 50 °C (104 °F) and ”Hot’ is from 50 °C (104 OF) to 100 °C (212 OF).

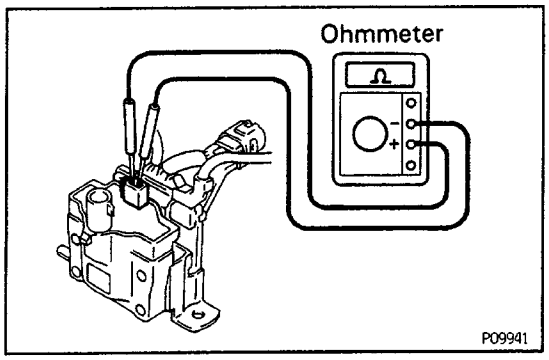
1. DISCONNECT HIGH–TENSION CORD

2. CLEAN COIL AND CHECK FOLLOWING:

(a) Check for cracks or damage.

(b) Check the terminals for carbon tracks.

(c) Check the high–tension cord hole for carbon deposits and corrosion.

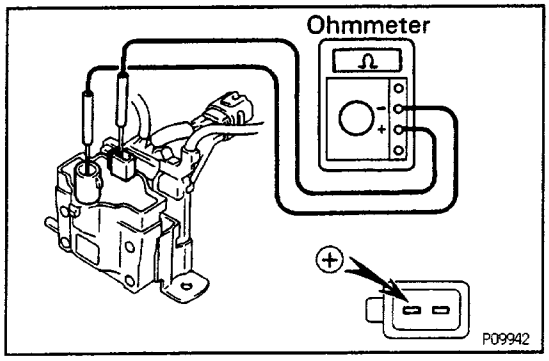


3. MEASURE PRIMARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between the positive (+) and negative (–) terminals.

Primary coil resistance (Cold):0.36–0.55Ω

Primary coil resistance (Hot) :0.45–0.65Ω



4. MEASURE SECONDARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between the positive (+) terminal and high–tension terminal.

Secondary coil resistance (Cold):9.0 –15.4kΩ

Secondary coil resistance (Hot) :11.4–18.1 kΩ

5. CONNECT HIGH–TENSION CORD

IG05Q–01

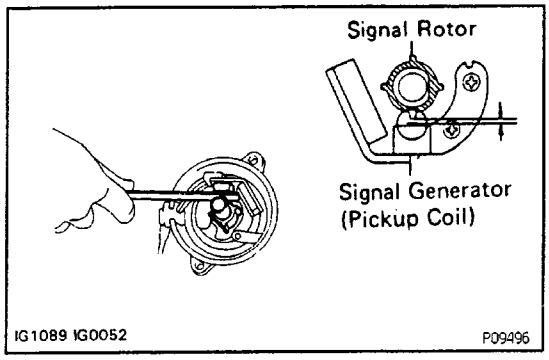
DISTRIBUTOR INSPECTION

1. INSPECT AIR GAP

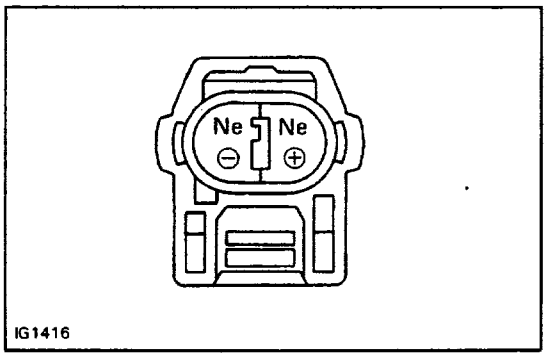
Using a thickness gauge, measure the gap between the signal rotor and the signal generator (pickup coil) projection.

Air gap:

0.2–0.4mm(0.008–0.015in.)



If the air gap is not as specified, replace the housing distributor assembly



2. CHECK SIGNAL GENERATOR (PICKUP COIL)

Using an ohmmeter, check the resistance of the signal generator (pickup coil).

Generator resistance (Cold): 185–2750

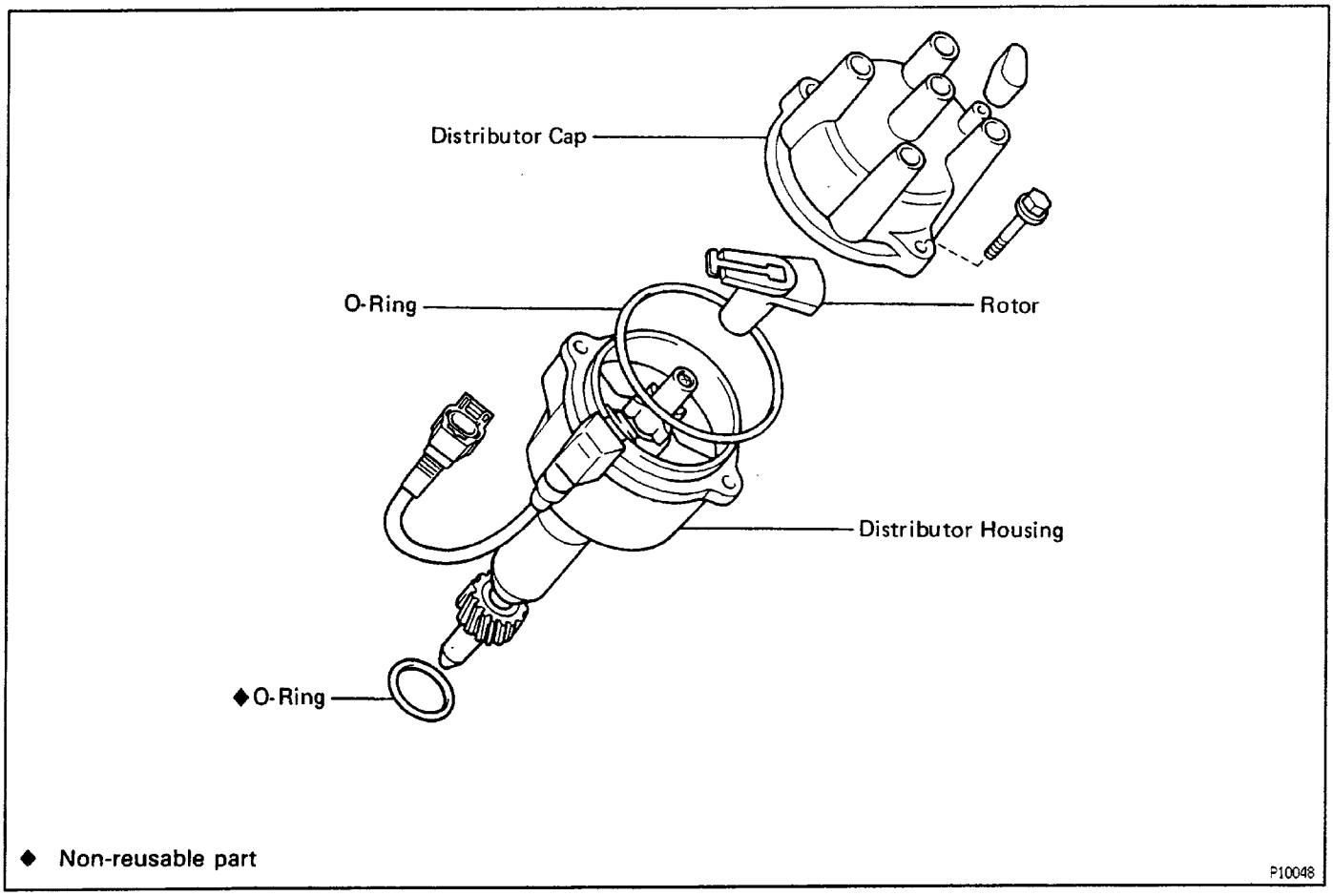
Generator resistance (Hot): 240–325Ω

If the resistance is not as specified, replace the dis– tributor housing assembly.

DISTRIBUTOR

IG06R–01

COMPONENTS



IG06S–01

DISTRIBUTOR REMOVAL

1. DISCONNECT HIGH – TENSION CORDS AND WIRING CONNECTOR

2. REMOVE TWO SCREWS AND PULL OFF DISTRIB– UTOR CAP

3. REMOVE HOLD – DOWN BOLT AND PULL OUT DISTRIBUTOR

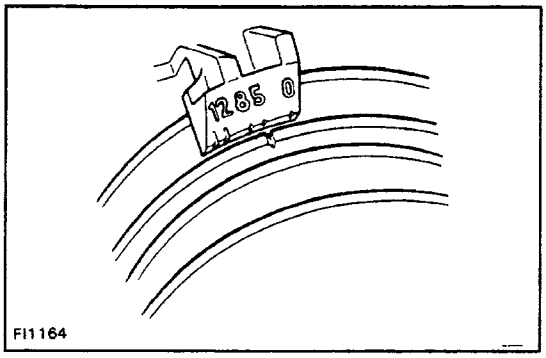
IG06T–01

DISTRIBUTOR INSTALLATION

1. INSTALL DISTRIBUTOR AND SET TIMING

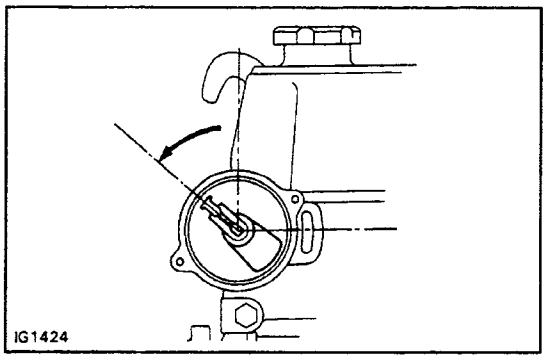
(a) Install a new O–ring to the distributor.

HINT: Always use a new 0–ring when installing the distributor.

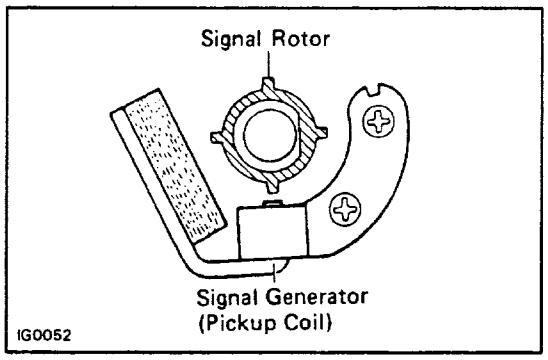


(b) Turn the crankshaft pulley until No. 1 cylinder is in compression stroke and the timing mark is aligned with 5 °6TDC mark.

HINT: Check that the rocker arms on the No. 1 cylinder are loose. If not, turn the crankshaft one full turn.



(c) Temporarily install the rotor.
(d) Begin insertion of the distributor with the rotor pointing upward and the distributor mounting hole approximately at center position of the bolt hole.
When fully installed, the rotor will rotate to the position shown.



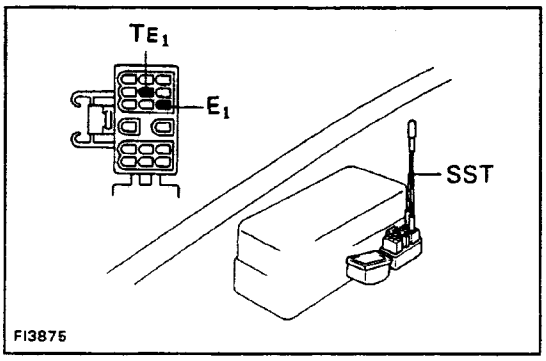
(e) Align the rotor tooth with the signal generator (pickup coil) projection.
Install and torque the distributor mounting bolt.
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)
(f) Install the rotor and distributor cap with wires.

2. CONNECT HIGH–TENSION CORDS AND WIRING CONNECTOR

3. WARM UP ENGINE TO NORMAL OPERATING TEMPERATURE

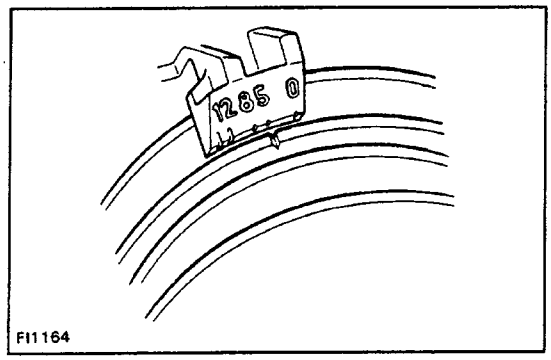
4. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE

(See page IG–2)



5. ADJUST IGNITION TIMING

(a) Using SST, connect terminals TE1 and E1 of the DLC 1.
SST 09843–18020
(b) Check the idle speed.
Idle speed:
750 rpm



(c) Using a timing light, check the ignition timing.

Ignition timing:

5 ° BTDC @ idle

(Transmission in neutral range)

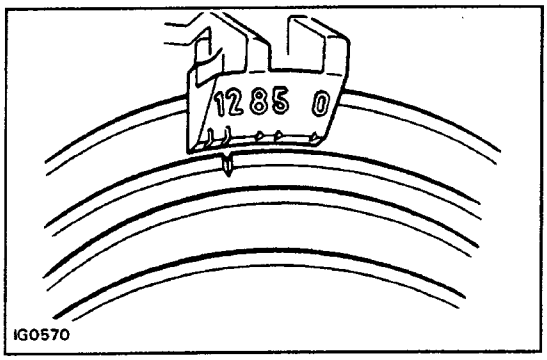
(d) Loosen the hold–down bolt, and adjust by turning the distributor.

(e) Tighten the hold–down bolt, and recheck the ignition timing.

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)

(f) Remove the SST.

SST 09843–18020



6. FURTHER CHECK IGNITION TIMING

Check that the ignition timing advances.

Ignition timing:

10 – 14 ° BTDC @ idle

7. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

SERVICE SPECIFICATIONS

IG06U–01

SERVICE DATA

Spark plug	Type	ND NGK	W16EXR–U BPR5EY
	Gap		0.8 mm 0.031 in.
High–tension cord	Resistance	Limit	25 kΩ per cord
Ignition coil	Primary coil resistance (Cold) Primary coil resistance (Hot) Secondary coil resistance (Cold) Secondary coil resistance (Hot)		0.36 – 0.55 Ω 0.45 – 0.65 Ω 9.0 – 15.4 kΩ 11.4 – 18.1 kΩ
Distributor	Air gap Pickup coil resistance (Cold) Pickup coil resistance (Hot)		0.2 – 0.4 mm (0.008 – 0.016 in.) 185 – 275 Ω 240 – 325 Ω

IG06V–01

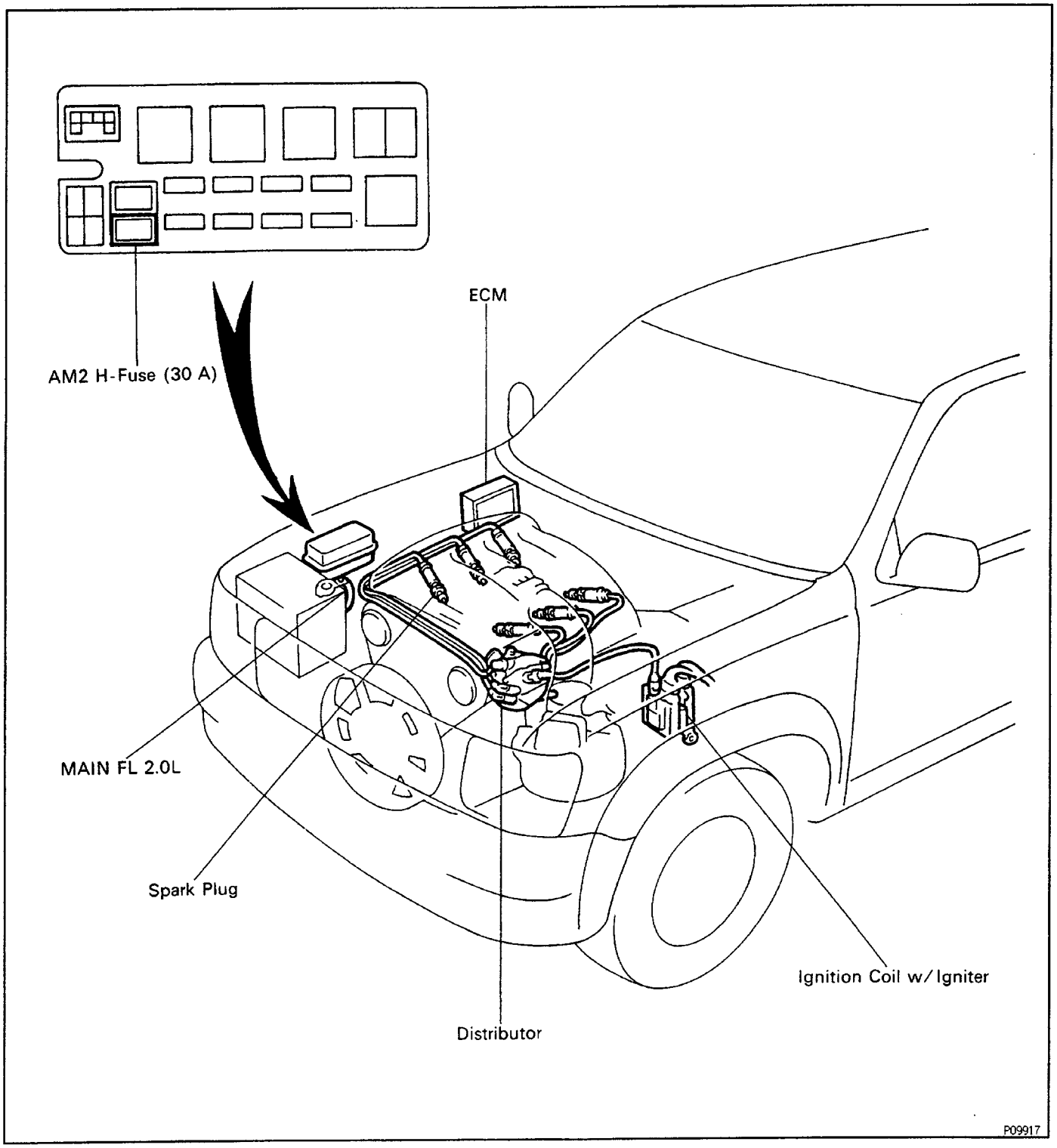
TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Spark plug x Cylinder head	18	180	13
Distributor x Cylinder head	19	195	14

(3VZ–E)

DESCRIPTION

The ECM is programmed with data for optimum ignition timing under ail operating conditions. Using data provided by sensors which monitor various engine functions (RPM, intake air volume, engine coolant temperature, etc.), the microcomputer (ECM) triggers the spark at precisely the right instant.



The ECM monitors the engine condition by signals from each sensor, calculates the ignition timing and sends an ignition signal to the igniter. High voltage from the ignition is distributed to each spark plug in the appropriate order to generate a spark between the electrodes, which ignites the air–fuel mixture.

IGNITER

The igniter temporarily interrupts the primary current with the ignition signal (IGT signal) from the ECM and generates sparks at the spark plug. Also, as a fail–safe measure, when ignition occurs an ignition confirmation signal (IGF signal) is sent to the ECM.

IGNITION COIL

The ignition coil uses a closed core coil with the primary coil wrapped around the core and the secondary coil wrapped around the primary coil. This allows the generation of a high voltage sufficient to cause a spark to jump across the spark plug gap.

DISTRIBUTOR

This correctly distributes high voltage to the spark plug of each cylinder in the specified ignition order.

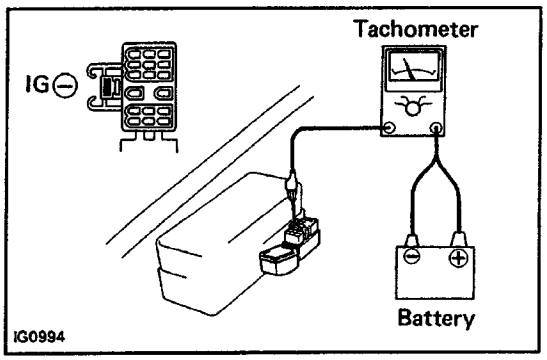
PICKUP COILS

The NE coil detects the crankshaft position, and the G 1 and G2 coils detect the camshaft position.

PRECAUTIONS

IG051-02

1. Do not leave the ignition switch on for more than 10 minutes if the engine does not start.



2. With a tachometer is connected to the system, connect the tachometer positive terminal to the IG (–) terminal of the DLC1.

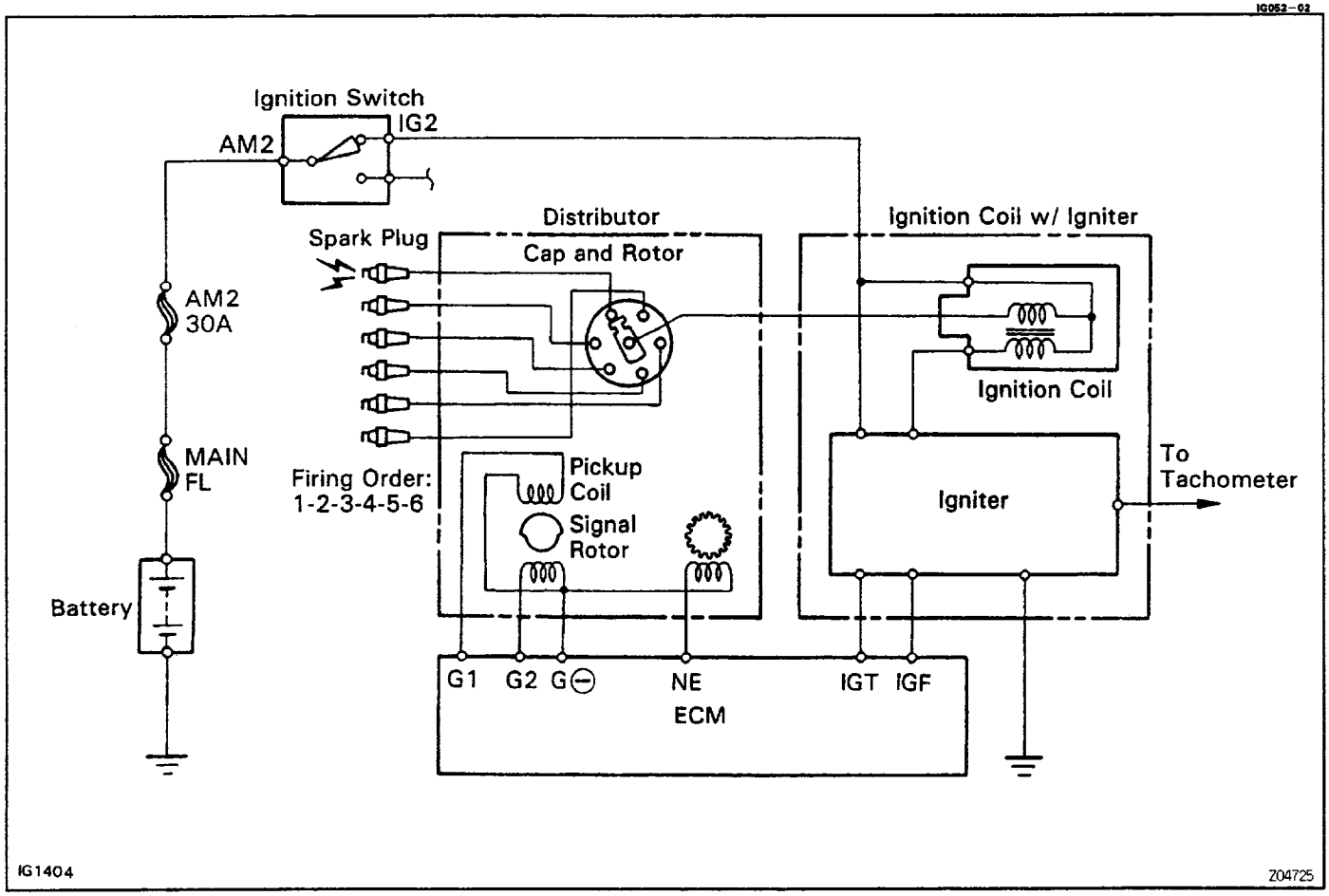
3. As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.

4. NEVER allow the tachometer terminals to touch ground as it could result in damage to the igniter and/or ignition coil.

5. Do not disconnect the battery while the engine is running.

6. Make sure that the igniter is properly grounded to the body.

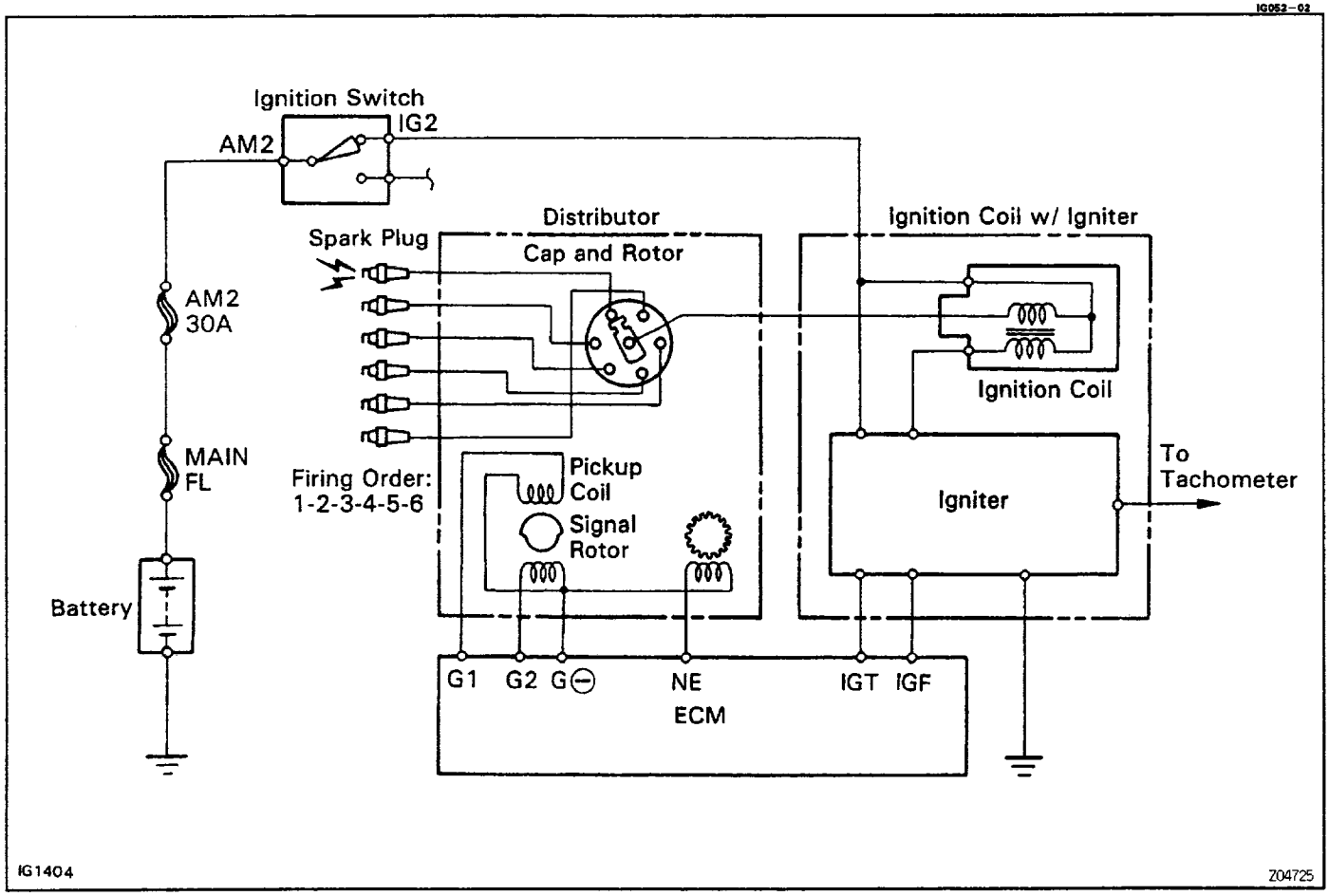
SYSTEM CIRCUIT



OPERATION

To maintain the most appropriate ignition timing, the ECM sends a control signal so that the igniter sends current to the ignition coil and the spark plugs produce a spark.

SYSTEM CIRCUIT



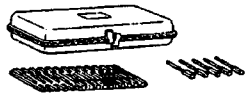
OPERATION

To maintain the most appropriate ignition timing, the ECM sends a control signal so that the igniter sends current to the ignition coil and the spark plugs produce a spark.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

IG054–01

	09240–00020 Wire Gauge Set	Air gaps of G 1 and G2 pickups
	09843–18020 Diagnosis Check Wire	

IG055–01

RECOMMENDED TOOLS

	09082–00015 TOYOTA Electrical Tester	
	09200–00010 Engine Adjust Kit	

IG056–01

EQUIPMENT

Spark plug cleaner	
Tachometer	
Timing light	Ignition timing

ON–VEHICLE INSPECTION

I0057–08

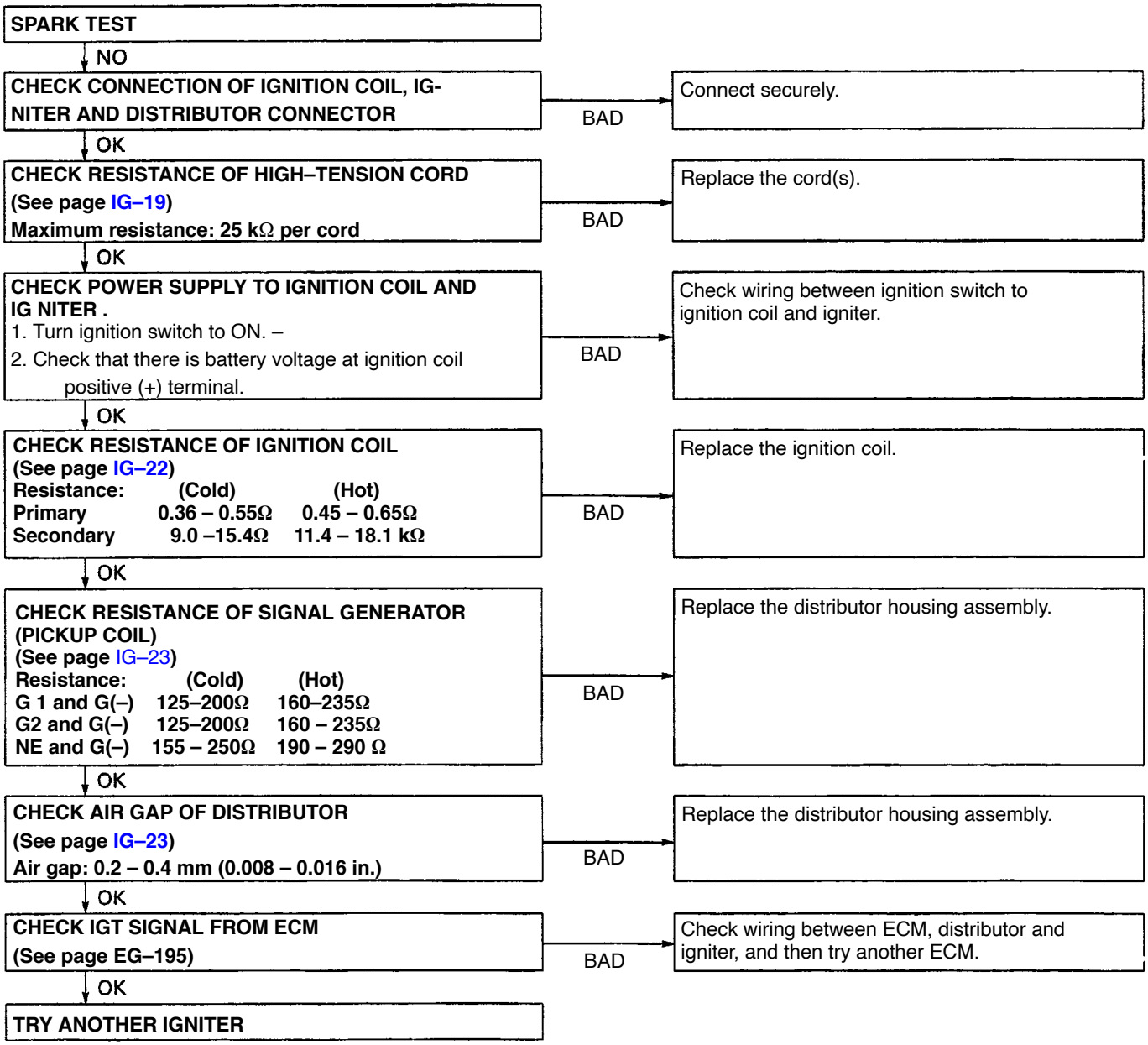
SPARK TEST

CHECK THAT SPARK OCCURS

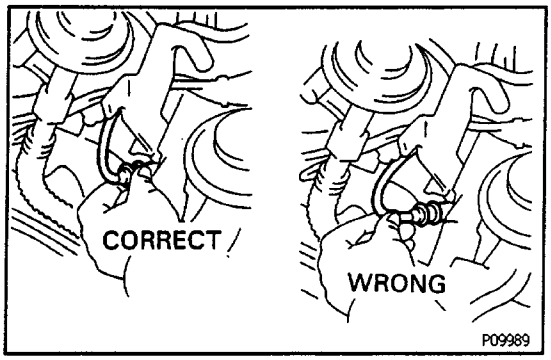
(a) Disconnect high–tension cord from the distributor.
(b) Hold the end approx. 12.5 mm (0.50 in.) from engine ground of vehicle.
(c) See if spark occurs while engine is being cranked.

HINT: 1'o prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1 – 2 seconds at a time.

If the spark does not occur, perform the test as fol–lows:



V07476



HIGH–TENSION CORDS INSPECTION

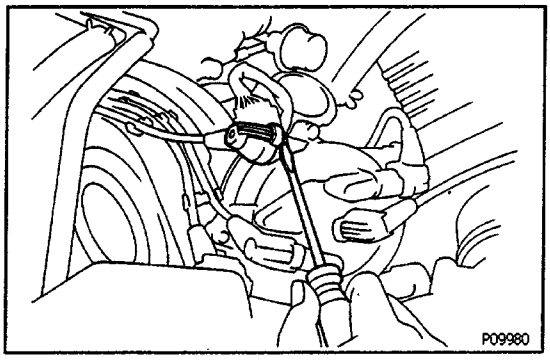
IG08X–01

1. DISCONNECT HIGH –TENSION CORDS FROM SPARK PLUGS

Disconnect the high – tension cords at the rubber boot.

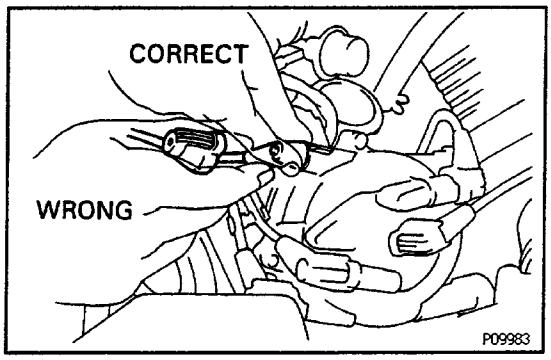
DO NOT pull on the cords.

NOTICE: Pulling on or bending the cords may damage the conductor inside.



2. DISCONNECT HIGH–TENSION CORDS FROM DISTRIBUTOR CAP AND IGNITION COIL

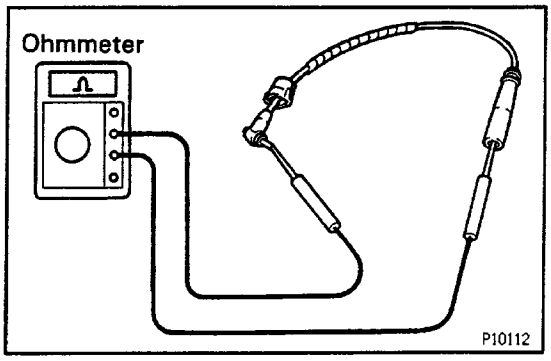
(a) Using a screwdriver, lift up the lock claw and dis–connect the holder from the distributor cap (ignition coil).



(b) Disconnect the high–tension cord at the grommet. DO NOT pull on the cord.

NOTICE:

- Pulling on or bending the cords may damage the conductor inside.
- Do not wipe any of the oil from the grommet after the high–tension cord is disconnected.



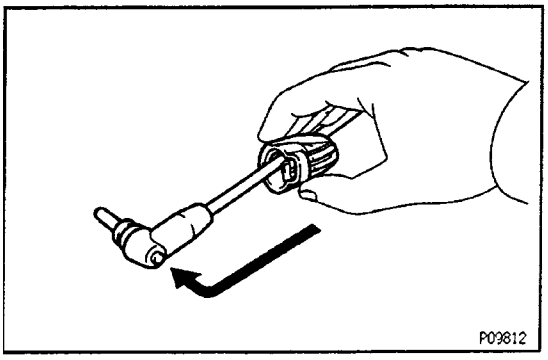
3. INSPECT HIGH–TENSION CORD RESISTANCE

Using an ohmmeter, measure the resistance.

Maximum resistance:

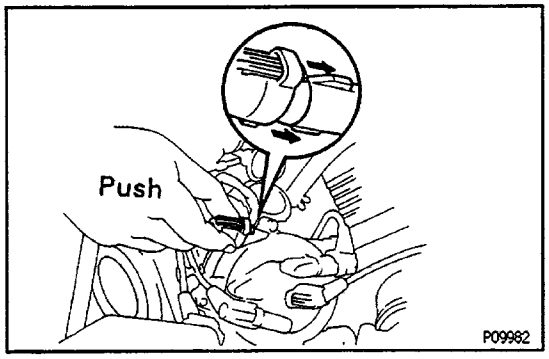
25 kΩ per cord

If the resistance is greater than maximum, check the terminals. If necessary, replace the high – tension cord.

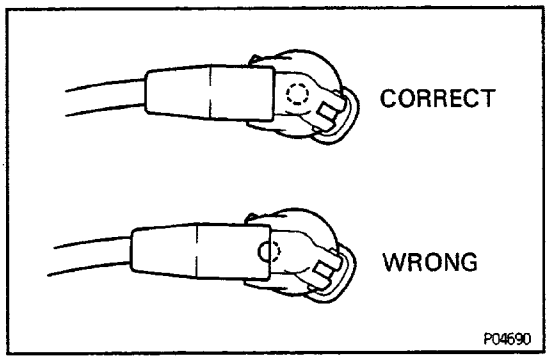


4. RECONNECT HIGH–TENSION CORDS TO DISTRIBUTOR CAP AND IGNITION COIL

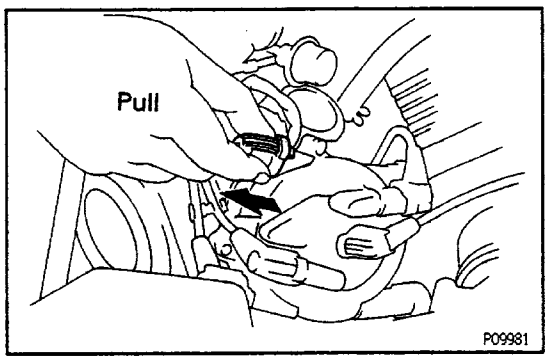
(a) Assemble the holder and grommet.



(b) Align the spline of the distributor (ignition coil) with the spline of the holder, and push in the cord.



NOTICE: Check that the holder is correctly installed to the grommet and distributor cap as shown in the illus–tration.



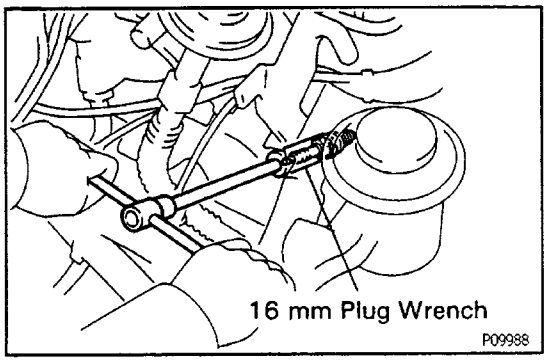
(c) Check that the lock claw of the holder is engaged by lightly pulling the holder.

5. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS

IG0SB–01

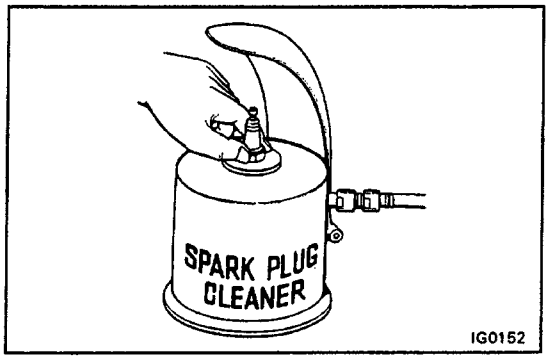
SPARK PLUGS INSPECTION

1. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS



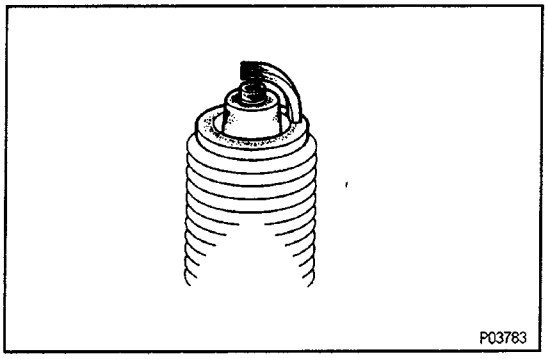
2. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the spark plug.



3. CLEAN SPARK PLUGS

Using a spark plug cleaner or wire brush, clean the spark plug. .



4. VISUALLY INSPECT SPARK PLUGS

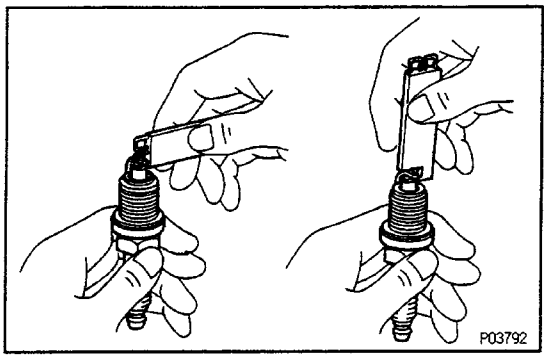
Check the spark plug for electrode wear, thread damage and insulator damage.

If abnormal, replace the spark plug.

Recommended spark plug:

ND K16R– U

NGK BKR5EYA

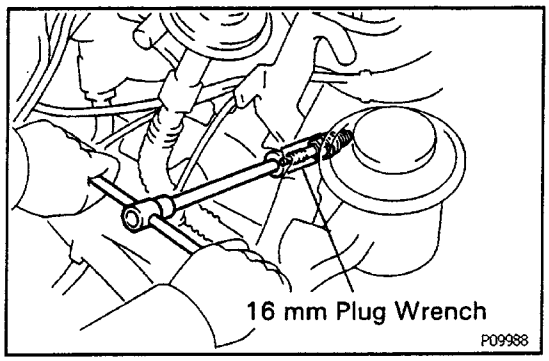


5. ADJUST ELECTRODE GAP

Carefully bend the outer electrode to obtain the cor– rect electrode gap.

Correct electrode gap:

0.8 mm (0.031 in.)



6. INSTALL SPARK PLUGS

Using a 16 mm plug wrench, install and torque the spark plug.

Torque: 18 N–m (180 kgf–cm, 13 ft–lbf)

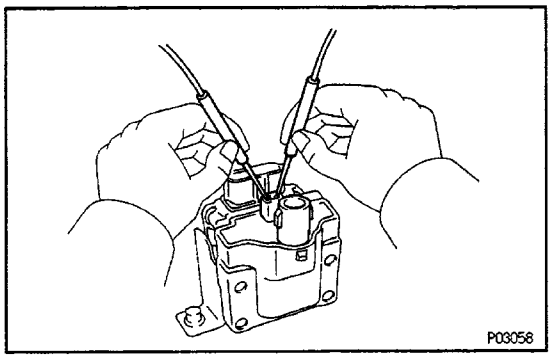
7. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS

IG06C–01

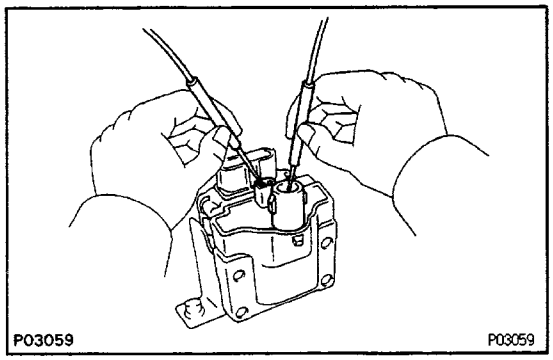
IGNITION COIL INSPECTION

NOTICE: 'Cold' and "Hot" in the following sentences express the temperature of the coils themselves. "Cold' is from –10°C (14°F) to 50°C (122°F) and "Hot' is from 50° C 0 22°F) to 100°C (212°F).

1. DISCONNECT IGNITION COIL CONNECTOR
2. DISCONNECT HIGH–TENSION CORD
3. CLEAN COIL AND CHECK FOLLOWING:
(a) Check for cracks or damage.
(b) Check the terminals far carbon tracks.
(c) Check the high–tension cord hole for carbon deposits and corrosion.

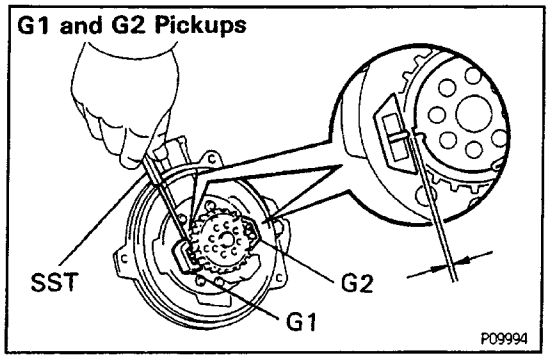


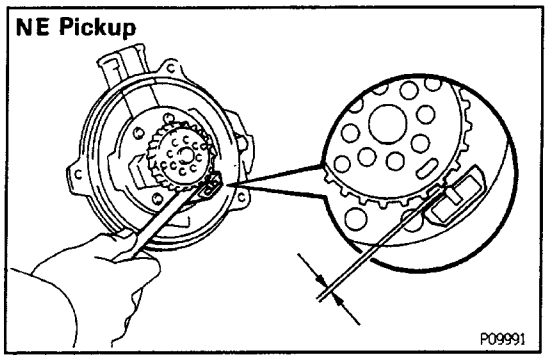
4. INSPECT PRIMARY COIL RESISTANCE
Using an ohmmeter, measure the resistance between **the positive (+) and negative (–) terminals.**
Primary coil resistance (Cold):
0.36–0.55Ω
Primary coil resistance (Hot):
0.45–0.660
If the resistance is not as specified, replace the igni–tion coil.

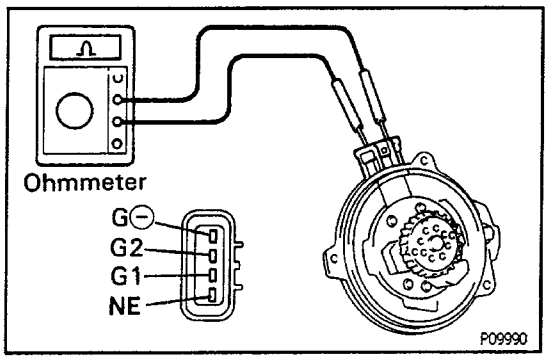


5. INSPECT SECONDARY COIL RESISTANCE
Using an ohmmeter, measure the resistance between the positive (+) terminal and high–tension terminal.
Secondary coil resistance (Cold):
9.0 – 15.4 kΩ
Secondary coil resistance (Hot):
11.4 – 18.1 kΩ
If the resistance is not as specified, replace the igni–tion coil.

6. RECONNECT HIGH–TENSION CORD
7. RECONNECT IGNITION COIL CONNECTOR







IG06D–01

DISTRIBUTOR INSPECTION

NOTICE: ”Cold” and ’Hot’ in the following sentences express the temperature of the coils themselves ”Cold’ is from –10°C (14°F) to 50°C (122°F) and ’Hot’ is from 50° C (122°F) to 100°C (212°F).

1. DISCONNECT DISTRIBUTOR CONNECTOR

2. REMOVE DISTRIBUTOR CAP WITHOUT DISCONNECTING HIGH–TENSION CORDS

3. REMOVE ROTOR

4. INSPECT AIR GAPS

Using SST (G1 and G2 pickups) and a thickness gauge (NE pickup), measure the gap between the signal rotor and pickup coil projection.

SST 09240–00020 for G1 and G2 pickups

Air gap:

0.2 – 0.5 mm (0.008 – 0.020 in.)

If the gap is not as specified, replace the distributor housing assembly.

5. INSPECT SIGNAL GENERATOR (PICKUP COIL) RESISTANCE

Using an ohmmeter, check resistance of the pickup coil.

Pickup coil resistance	Cold (–10 – 50–C)	Hot (50 ^– 100° C)
G1 – G⊖	125 – 200 Ω	160 – 235 Ω
G2 – G⊖	125 – 200 Ω	160 – 235 Ω
NE – G⊖	155 – 250 Ω	190 – 290 Ω

If the resistance is not as specified, replace the dis–tributor housing assembly.

6. REINSTALL ROTOR

7. REINSTALL DISTRIBUTOR CAP

8. RECONNECT DISTRIBUTOR CONNECTOR

IG06E–01

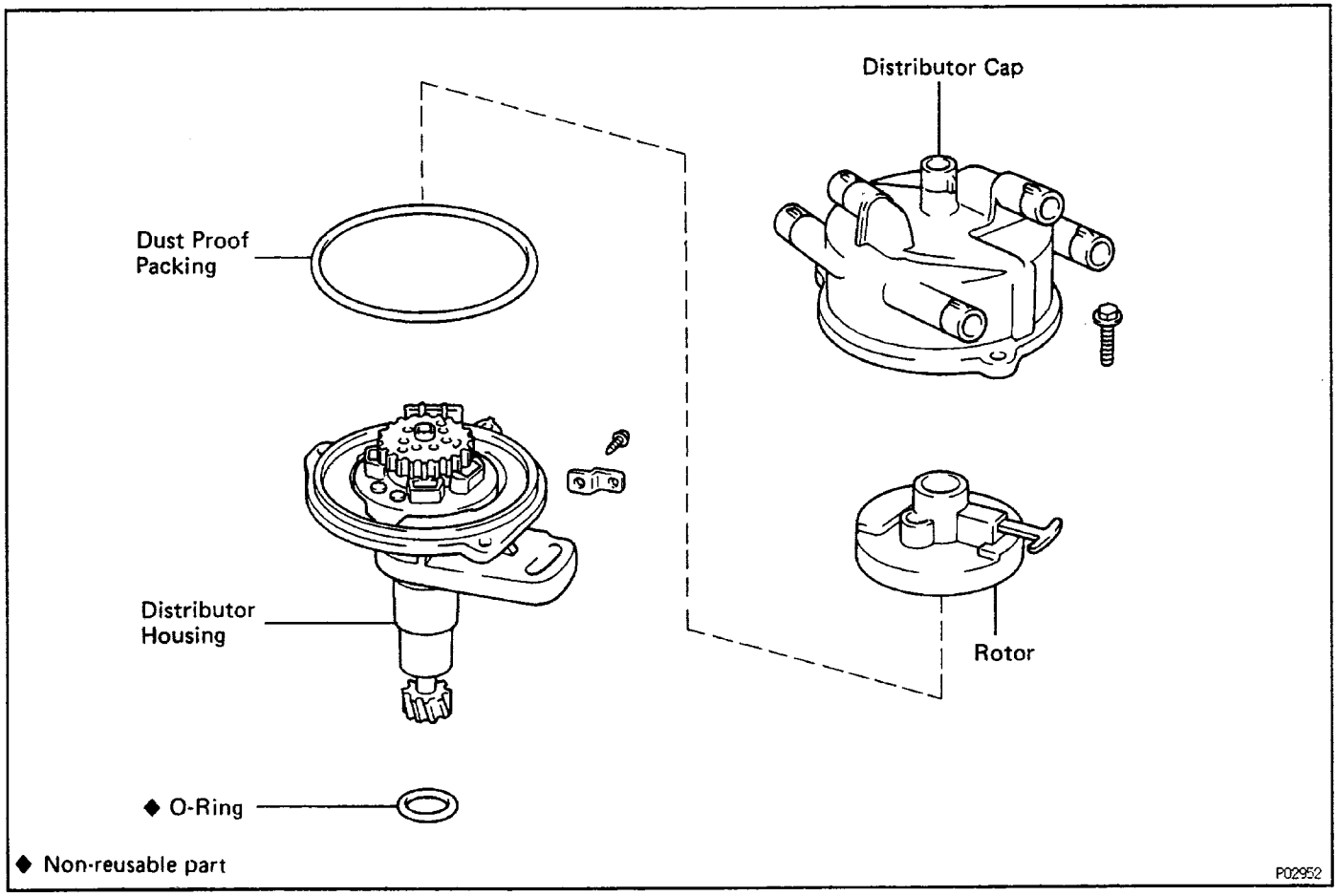
IGNITER INSPECTION

(See procedure Spark Test on page IG–18)

DISTRIBUTOR

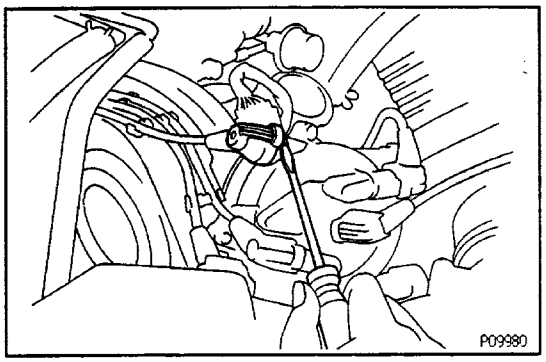
IG08F–01

COMPONENTS



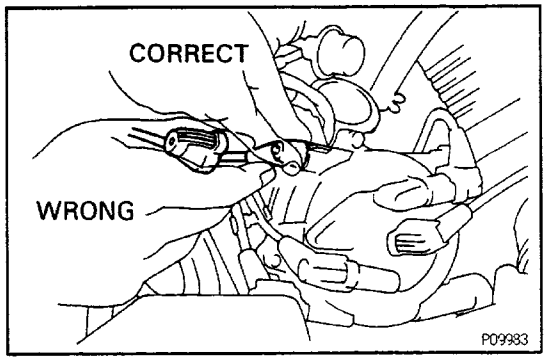
IG08G–01

DISTRIBUTOR REMOVAL



1. DISCONNECT HIGH–TENSION CORDS FROM DISTRIBUTOR CAP

(a) Using a screwdriver, lift up the lock claw and disconnect the holder from the distributor cap.

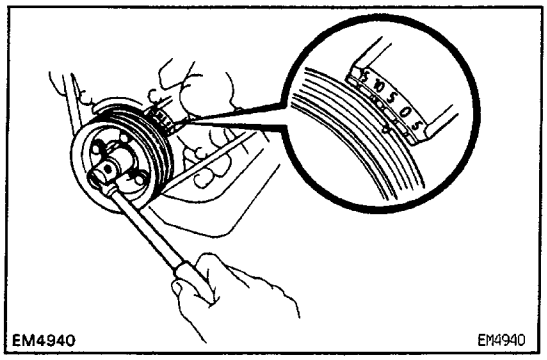


(b) Disconnect the high–tension cord at the grommet. DO NOT pull on the cord.

NOTICE:

- Pulling on or bending the cords may damage the conductor inside.
- Do not wipe any of the oil from the grommet after the high–tension cord is disconnected.

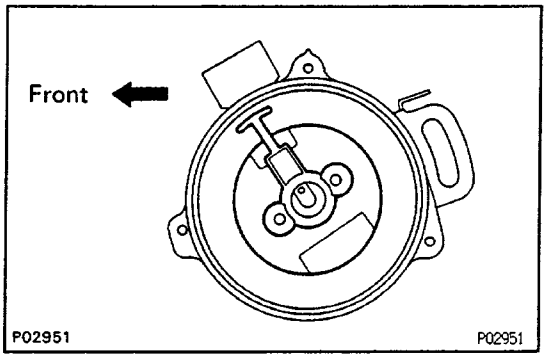
2. DISCONNECT DISTRIBUTOR CONNECTOR



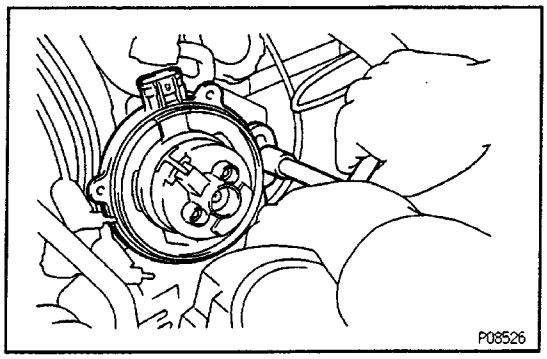
3. REMOVE DISTRIBUTOR CAP AND DUST PROOF PACKING

4. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley until the timing mark is aligned with the ”0” mark on the No.1 timing belt cover.



(b) Check that the distributor rotor direction is as shown. If not, turn the crankshaft pulley one complete revolution.



5. REMOVE DISTRIBUTOR

(a) Remove the hold–down bolt.

(b) Pull out the distributor from the cylinder head.

6. REMOVE O–RING

DISTRIBUTOR INSTALLATION

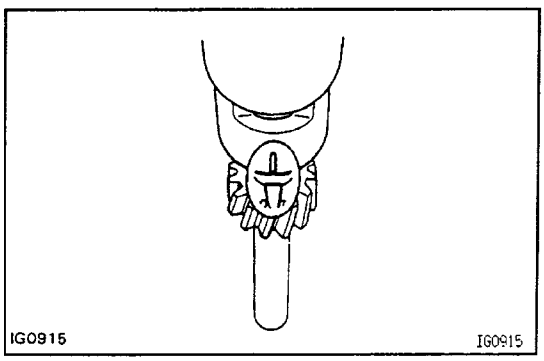
IG05D–02

1. CHECK NO.1 CYLINDER TO TDC/COMPRESSION

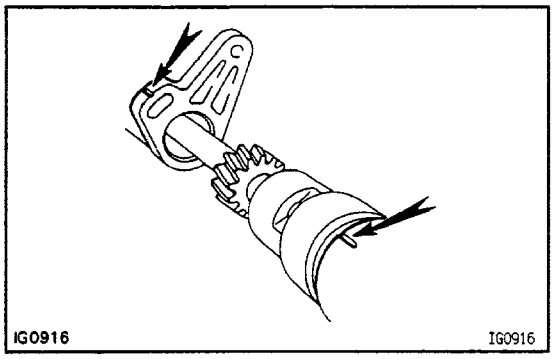
2. INSTALL DISTRIBUTOR

(a) Install a new O–ring to the distributor.

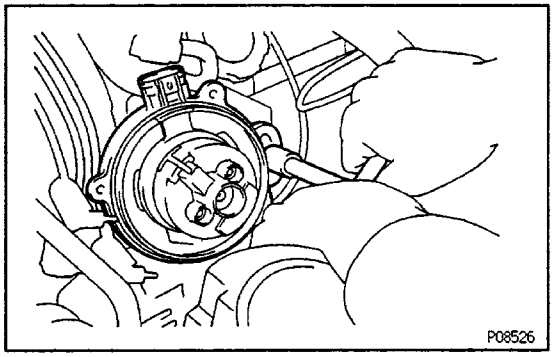
HINT: Always use a new 0–ring when installing the distributor.



(b) Align the protrusion on the driven gear with the groove of the distributor housing.

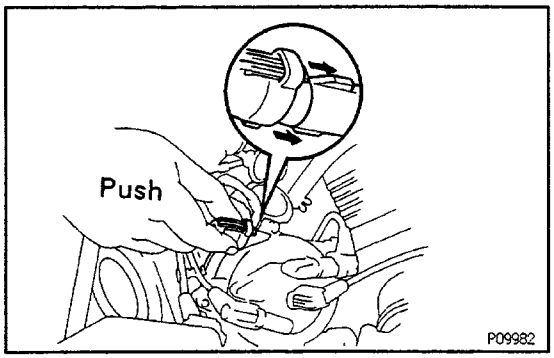


(c) Insert the distributor, aligning the groove of the distributor housing with the groove on the No.4 camshaft bearing cap.



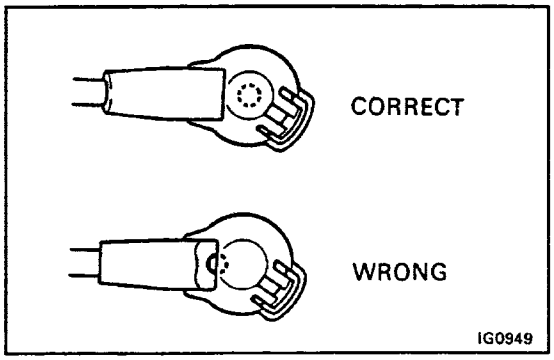
(d) Lightly tighten the hold–down bolt.

3. INSTALL DUST PROOF PACKING AND DISTRIBUTOR CAP

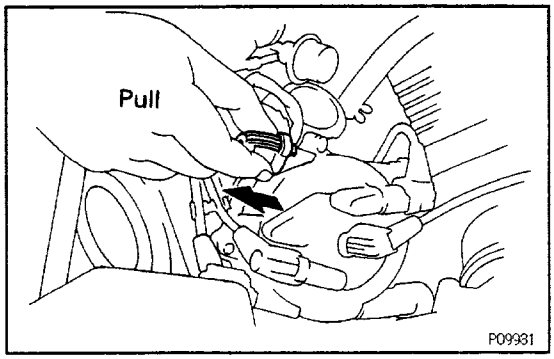


4. CONNECT HIGH–TENSION CORDS TO DISTRIBUTOR CAP

(a) Aline the spline of the distributor cap with the spline groove of the holder, then slide the holder with the grommet onto the distributor cap.

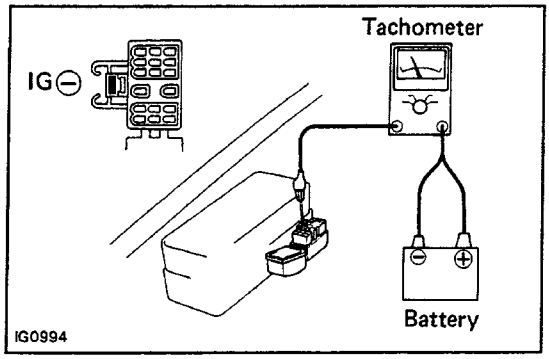


NOTICE: Check that the holder is correctly installed to the grommet and distributor cap as shown in the illustration.



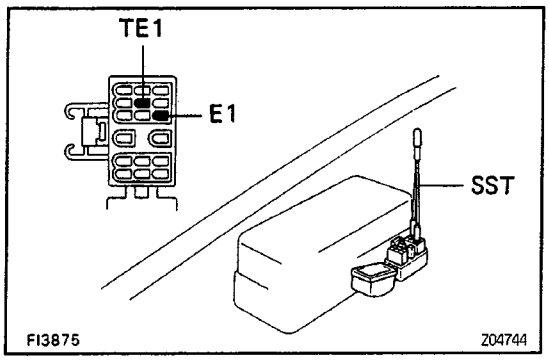
(b) Check that the lock claw of the holder is engaged by lightly pulling the holder.

5. CONNECT DISTRIBUTOR CONNECTOR



6. WARM UP ENGINE TO NORMAL OPERATING TEMPERATURE

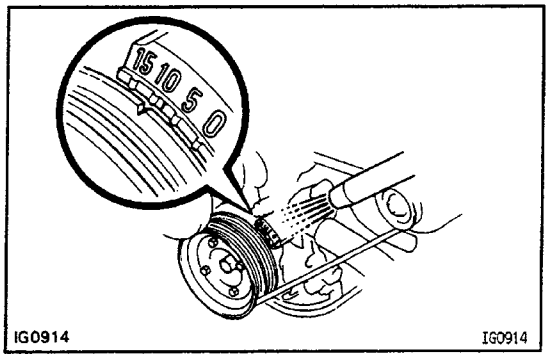
7. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE



8. ADJUST IGNITION TIMING

(a) Using SST, connect terminals TE1 and E1 of the DLC 1.
SST 09843–18020

(b) Check the idle speed.
Idle speed:
800 ± 50 rpm

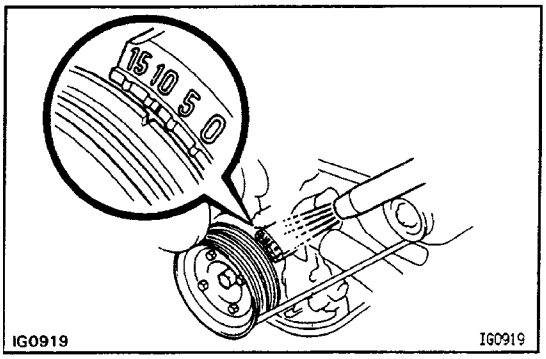


(c) Using a timing light, check the ignition timing.
Ignition timing:
10 ° BTDC @ idle
(Transmission in neutral position)

(d) Loosen the hold–down bolt, and adjust by turning the distributor.

(e) Tighten the hold–down bolt, and recheck the ignition timing.
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

(f) Remove the SST from the DLC1.
SST 09843–18020



9. FURTHER CHECK IGNITION TIMING

Check that the ignition timing advances.
Ignition timing:
8° BTDC @ idle

10. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

SERVICE SPECIFICATIONS

IG05E–02

SERVICE DATA

Ignition timing	w/ Terminals TE1 and E1 connected	10° BTDC @ idle
Firing order	–	1 – 2 – 3 – 4 – 5 – 6
High–tension cord	Resistance (Maximum)	25 kΩ per cord
Spark plug	Recommended spark plug ND Recommended spark plug NGK Correct electrode gap	K16R–U BKR5EYA 0.8 mm (0.031 in.)
Ignition coil	Primary coil resistance (Cold) Primary coil resistance (Hot) Secondary coil resistance (Cold) Secondary coil resistance (Hot)	0.36 – 0.55 Ω 0.45 – 0.65 Ω 9.0 – 15.4 kΩ 11.4 – 18.1 kΩ
Distributor	Air gap Signal generator (pickup coil) resistance (Cold) G1 – G⊖ G2 – G⊖ NE – G⊖ Signal generator (pickup coil) resistance (Hot) G1 – G⊖ G2 – G⊖ NE – G⊖	0.2 – 0.5 mm (0.008 – 0.020 in.) 125 – 200 Ω 125 – 200 Ω 155 – 250 Ω 160 – 235 Ω 160 – 235 Ω 190 – 290 Ω

IG05F–01

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Spark plug x Cylinder head	18	180	13
Distributor x Cylinder head	18	185	13

MAINTENANCE

MAINTENANCE SCHEDULE

Maintenance operation: A = Check and adjust if necessary;
R = Replace, change or lubricate;
I = Inspect and correct or replace if necessary

SCHEDULE A

CONDITIONS:

- Towing a trailer, using a camper or car top carrier.
- Repeated short trips less than 5 miles (8 km) and outside temperature remains below freezing.
- Extensive idling and/or low speed driving for long distances such as police, taxi or door–to–door delivery use.
- Operating on dusty, rough, muddy or salt spread roads.

System	Service interval (Odometer reading or months, whichever comes first) / Maintenance items		Maintenance services beyond 60,000 miles (96,000 km) should be continue to performed at the sarne intervals shown in each maintenance schedule.																See Page (item No.)
		Miles x 1,000	3.75	7.5	11.25	15	11.25	22.5	26.25	30	33.75	37.5	41.25	45	48.75	52.5	56.25	60	Months
		k m x 1,000	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	
ENGINE	Timing belt (1)	3VZ–E engine																R	—	MA–6 (item 1)
	Valve clearance*	22R–E engine								A								A	A: Every 36 months	MA–11 (item 14)
	Valve clearance	3VZ–E engine																A	A: Every 72 months	MA–10 (item 12)
	Drive belts		I: First period. 30,000 miles (48,000 km) or 36 months, second period, 60,000 miles (96,000 km) or 72 months I: After that, every 7,500 miles (12,000 kmmiles (12,000 km																	MA–6 (item 2)
	Engine oil and oil filter*		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R: Every 6 months	MA–7 (item 6)
	Engine coolant		R: First period 45,000 miles (72,000 km) or 36 months R: After that every 30,000 miles (48,000 krn) or 24 months																	MA–8 (item 7)
	Exhaust pipes and mounting					I				I				I				I	I: Every 24 months	MA–10 (item 11)
FUEL	Idle speed		A: First period. 7,500 miles (12,000 km) or 12 months, second period, 15,000 miles (24,000 km) or 24 months A: After that, every 15,000 miles (24,000 km) or 24 months																	MA–11 (item 15)
	Air filter* (2)		I	I	I	I	I	I	I	R	I	I	I	I	I	I	I	R	I: Every 6 months R: Every 36 months	MA–7 (item 4, 5)
	Fuel lines and connection (3)									I								I	I: Every 36 months	MA–9 (item 10)
	Fuel tank cap gasket																	R	R: Every 72 months	MA–9 (item 9)
IGNITION	Spark plugs*									R								R	R: Every 36 months	MA–7 (item 3)
EVAP	Charcoal canister	Calif. only																I	I: Every 72 months	MA–9 (item 8)
EXHAUST	Oxygen sensor	Fed. and Canada only	R: 80,000 miles (129,000 km) only																	MA–10 (item 13)
BRAKES	Brake linings and drums			I		I		I		I		I		I		I		I	I: Every 12 months	MA–14 (item 18)
	Brake pads and discs			I		I		I		I		I		I		I		I	I: Every 12 months	MA–13 (item 17)
	Brake line pipes and hoses					I				I				I				I	I: Every 24 months	MA–12 (item 16)

SCHEDULE A (Cont'd)

System	Service interval (Odometer reading or months, which–ever comes first) / Maintenance items		Maintenance services beyond 60,000 miles (96,000 km) should continue to be performed at the same intervals shown in each i maintenance schedule.																Months	See Page (item No.)
		Miles x 1,000	3.75	7.5	11.25	15	18.75	22.5	Zs.zs	30	33.75	37.5	41.25	45	48.75	52.5	56.25	60		
		km x 1, 000	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96		
CHASSIS	Steering linkage			I		I		I		I		I		I		I		I	I: Every 12 months	MA–14 (item 19)
	Ball joints and dust covers			I		I		I		I		I		I		I		I	I: Every 12 months	MA–15 (item 22)
	Drive shaft boots	4WD		I		I		I		I		I		I		I		I	I: Every 12 months	MA–15 (item 21)
	Automatic transmission, manual transmission, transfer (4WD) and differential					R				R				R				R	R: Every 24 months	MA–16 (item 23) MA–17 (item 24) MA–18 (item 25) MA–20 (item 26)
	Steering gear housing oil (4)					I				I				I				I	I: Every 24 months	MA–15 (item 20)
	Front wheel bearing and thrust bush grease (4WD)	2WD								R								R	R: Every 48 months	MA–21 (item 27)
		4WD								R								R	R: Every 36 months	
	Propeller shaft grease (5)	4WD		R		R		R		R		R		R		R		R	R: Every 12 months	MA–21 (item 28)
	Bolts and nuts on chassis and body (6)			I		I		I		I		I		I		I		I	I: Every 12 months	MA–22 (item 29)

★ or * mark indicates maintenance which is part of the warranty conditions for the Emission Control System. The warranty period is in accordance with the owner's guide or the warranty booklet.
★ : California specification vehicles.
* : Vehicles other than California specification vehicles.

HINT:

(1) Applicable to vehicles operated under conditions of extensive idling and / or low speed driving for long distances such as police, taxi or door–to–door delivery use.
(2) Applicable when operating mainly on dusty roads. If not, apply SCHEDULE B.
(3) Includes inspection of vapor vent system.
(4) Check for oil leaks from steering gear box.
(5) If the propeller shaft has been immersed in water, it should be re–greased daily.
(6) Applicable only when operating mainly on rough, muddy roads. The applicable parts are listed below. For other usage conditions, refer to SCHEDULE B.
- Front and rear suspension member to cross body.
- Bolts for sheet installation.

V02148

SCHEDULE B

CONDITIONS:

Conditions other than those listed for SCHEDULE A.

System	Service interval (Use odometer reading or months, whichever comes first) / Maintenance items		Maintenance services beyond 60,000 miles (96,000 km) should continue to be performed at the same intervals shown in each maintenance schedule.									See Page (item No.)
		Miles x 1,000	7.5	15	22.5	30	37.5	45	52.5	60	Months	
		km x 1,000	12	24	36	48	60	72	84	96		
ENGINE	Valve clearance	22R–E engine				A				A	A: Every 36 months	MA–11 (item 14)
	Valve clearance	3VZ–E engine								A	A: Every 72 months	MA–10 (item 12)
	Drive belts		I: First period. 30,000 miles (48,000 km) or 36 months, second period, 60,000 miles (96,000 km) or 72 months I: After that, every 7,500 miles (12,000 km) or 12 months									MA–6 (item 2)
	Engine oil and oil filter*		R	R	R	R	R	R	R	R	R: Every 12 months	MA–7 (item 6)
	Engine coolant		R: First period. 45,000 miles (72,000 km) or 36 months R: After that, every 30,000 miles (48,000 km) or 24 months									MA–8 (item 7)
	Exhaust pipes and mountings					I				I	I: Every 36 months	MA–10 (item 11)
FUEL	Idle speed		A: First period. 7,500 miles (12,000 km) or 12 months, second period, 15,000 miles (24,000 km) or 24 months A: After that, every 15,000 miles (24,000 km) or 24 months									MA–11 (item 15)
	Air filter*					R				R	R: Every 36 months	MA–7 (item 5)
	Fuel lines and connections (1)					I				I	I: Every 36 months	MA–9 (item 10)
	Fuel tank cap gasket									R	R: Every 72 months	MA–9 (item 9)
IGNITION	Spark plugs					R				R	R: Every 36 months	MA–7 (item 3)
	Charcoal canister	Calif. only								I	1: Every 72 months	MA–9 (item 8)
EVAP	Oxygen sensor	Fed. and Canada only	R: 80,000 miles (129,000 km) Orgy									MA–10 (item 13)
EXHAUST	Brake lining and drums			I		I		I		I	I: Every 24 months	MA–14 (item 18)
BRAKES	Brake pads and discs			I		I		I		I	I: Every 24 months	MA–13 (item 17)
	Brake line pipes and hoses			I		I		I		I	I: Every 24 months	MA–12 (item 16)

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SCHEDULE B (Cont'd)

System	Service interval (Use odometer reading or months, whichever comes first) / Maintenance items		Maintenance services beyond 60,000 miles (96,000 km) should continue to be performed at the same intervals shown in each maintenance schedule.									See Page (item No.)
		Miles x 1,000	7.5	15	22.5	30	37.5	45	52.5	60	Months	
		km x 1,000	12	24	36	48	60	72	84	96		
CHASSIS	Steering linkage			I		I		I		I	I: Every 24 months	MA–14 (item 19)
	Ball joints and dust covers			I		I		I		I	I: Every 24 months	MA–15 (item 22)
	Drive shaft boots	4WD		I		I		I		I	I: Every 24 months	MA–15 (item 21)
	Automatic transmission, manual transmission, transfer (4WDj and differential (2)			I		I		I		I	I: Every 24 months	MA–16 (item 23) MA–17 (item 24)
	Steering gear housing oil (3)			I		I		I		I	I: Every 24 months	MA–15 (item 20)
	Front wheel bearing and thrust bush grease (4WD)	2WD				R				R	R: Every 48 months	MA–21 (item 27)
		4WD				R				R	R: Every 36 months	
	Propeller shaft grease (4)	4WD		R		R		R		R	R: Every 24 months	MA–21 (item 28)
	Bolts and nuts on chassis and body (5)			I		I		I		I	I: Every 24 months	MA–22 (item 29)

★ or * mark indicates maintenance which is part of the warranty conditions for the Emission Control System. The warranty period is in accordance with the owner's guide or the warranty booklet.
★ : California specification vehicles.
★ : Vehicles other than California specification vehicles.

HINT:

(1) Includes inspection of vapor vent system.
(2) Check for oil level.
(3) Check for oil leaks from steering gear box.
(4) If the propeller shaft has been immersed in water, it should be re–greased daily.
(5) The applicable parts are listed below.
- Front and rear suspension member to cross body.
- Bolts for sheet installation.

V02150

MAINTENANCE OPERATIONS

MA02S–05

ENGINE

Cold Engine Operations

1. (3VZ–E ENGINE)

REPLACE TIMING BELT

(a) Remove the timing belt.

(See pages EG–32)

(b) Install the timing belt.

(See pages EG–41)

2. INSPECT DRIVE BELTS

(a) Visually check the belt for excessive wear, frayed cords etc.

HINT:

Conventional type:

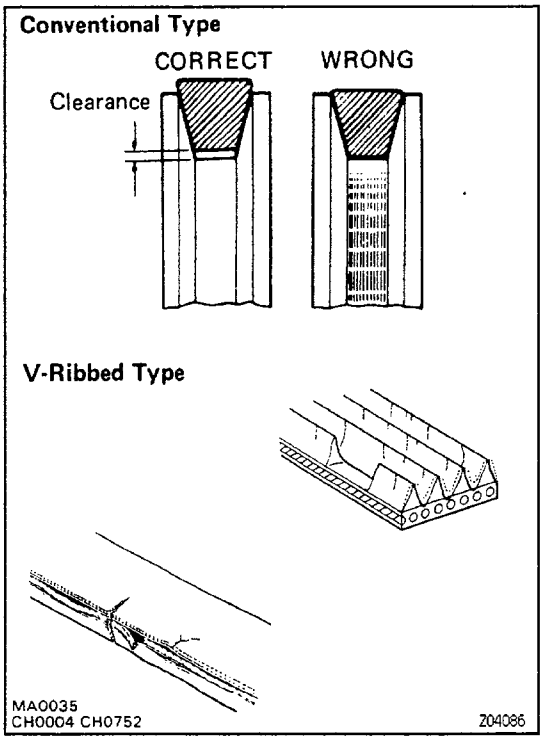
Check that the belt does not touch the bottom of the pulley groove.

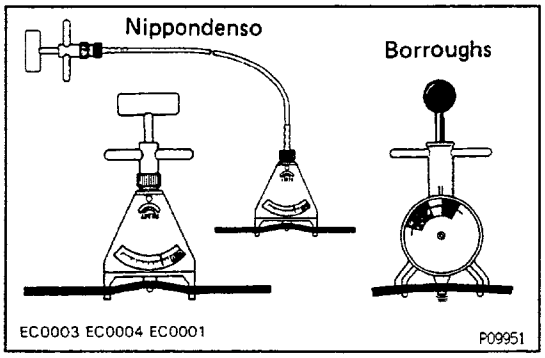
If necessary, replace the drive belt.

V–Ribbed type:

Cracks on the ribbed side of the belt are considered acceptable.

If the belt has chunks missing from the ribs, it should be replaced.





(b) Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:

Nippondenso BTG – 20 (95506–00020) or Borroughs No. BT–33–73F

Drive belt tension:

22R–E Used belt 80 ± 20 lbf

New belt 125± 25 lbf

3VZ – E

Generator Used belt 100 ± 20 lbf

New belt 160 ± 20 lbf

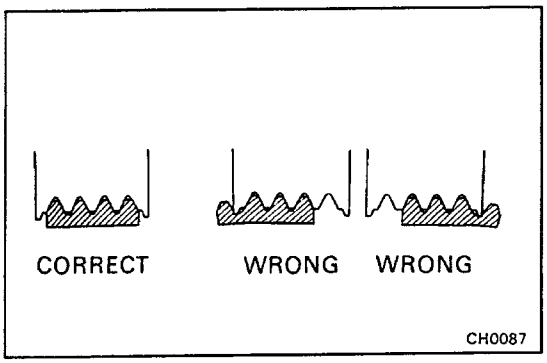
PS Used belt 80 ± 20 lbf

New belt 125 ± 25 lbf

A/C Used belt 80 20 lbf

New belt 125 ± 25 lbf

If necessary, adjust the drive belt tension.

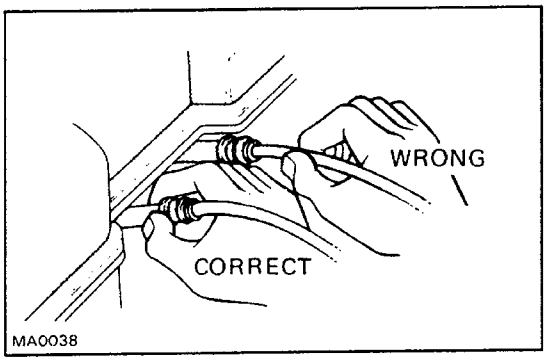


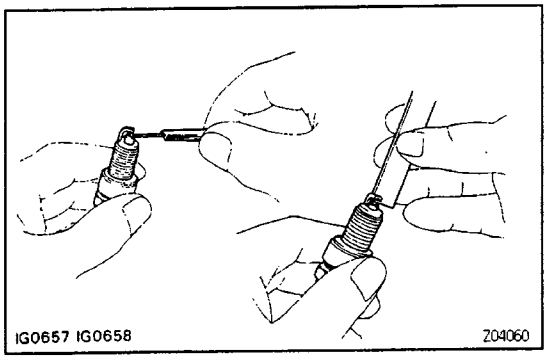
HINT:
- ”New belt” refers to a belt which has been used less than 5 minutes on a running engine.
- ”Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.
- After replacing the drive belt, check that it fits properly in the ribbed grooves, especially in the places difficult to see.
- After installing a new belt, run the engine for approx. 5 minutes and then recheck the tension.

3. REPLACE SPARK PLUGS

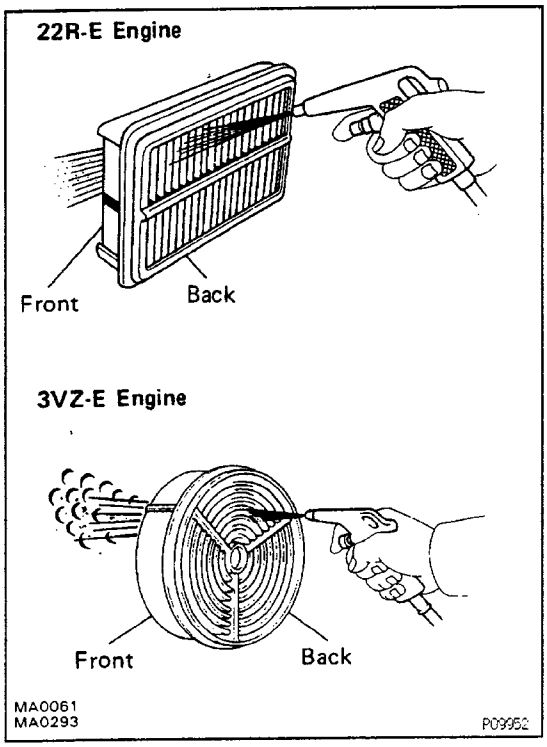
(a) Disconnect the high–tension cords at the boot.
Do not pull on the cords.

(b) (2213 – E)
Remove the spark plugs.
(3VZ – E)
Using plug wrench (16 mm), remove the spark plugs.





(c) Check the electrode gap of new spark plugs.
Correct electrode gap:
0.8 mm (0.031 in.)
Recommended spark plugs:
22R–E ND W16EXR–U
NGK BPRSEY
3VZ–E ND K76R–U
NGK BKR5EYA



4. INSPECT AIR FILTER

(a) Visually check that the air cleaner element is not excessively dirty, damaged or oily.

HINT: Oiliness may indicate a stuck PCV valve.
If necessary, replace the air cleaner element.

(b) Clean the element with compressed air.
First blow from back side thoroughly, then blow off the front side of the element.

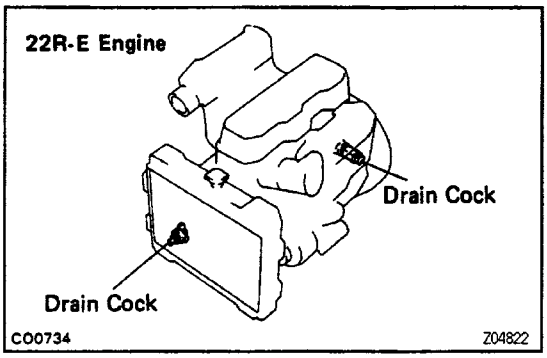
5. REPLACE AIR FILTER

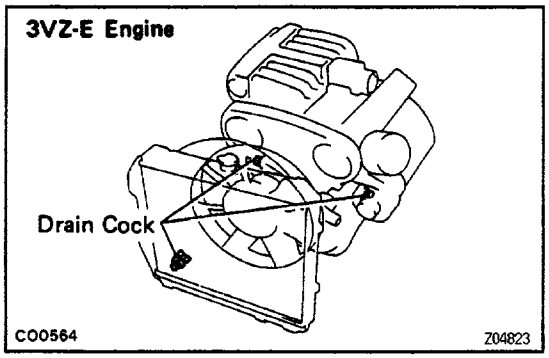
Replace the used air cleaner element with a new one.

6. REPLACE ENGINE OIL AND OIL FILTER

22R – E (See page EG–236)
3VZ– E (See page EG–278)
Oil grade:
API grade SG Energy – Conserving II multigrade and recommended viscosity oil
Engine oil capacity:
Drain and refill

22 R – E
w/o Oil filter change
3.8 liters (4.0 US qts, 3.3 Imp. qts)
w/ Oil filter change
4.3 liters (4.5 US qts, 3.8 Imp. qts)
3VZ–E
w/o Oil filter change
2WD 4.0 liters (4.2 US qts, 3.5 Imp. qts)
4WD 4.2 liters (4.4 US qts, 3.7 Imp. qts)
w/ Oil filter change
2WD 4.3 liters (4.5 US qts, 3.8 Imp. qts)
4WD 4.5 liters (4.8 US qts, 4.0 Imp. qts)





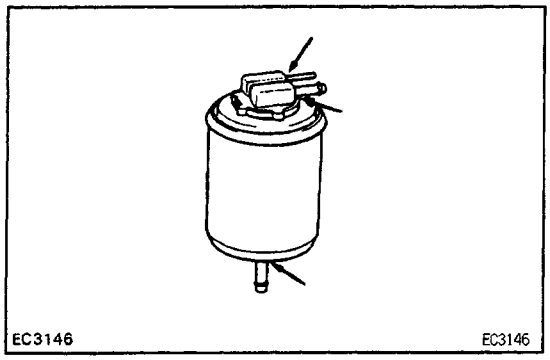
7. REPLACE ENGINE COOLANT

(a) Drain the coolant from the radiator and engine drain cocks.
(b) Close the drain cocks.
(c) Fill system with coolant.

Coolant capacity (w/ Heater or air conditioner):
22R–E
Ex. 4WD A/T 8.4 liters (8.8 US qts, 7.4 Imp. qts)
4WD A/T 9.1 liters 0.6 US qts, 8.0 Imp. qts)
3VZ–E
2WD M/T 10.4 liters (11.O US qts, 9.2 Imp. qts)
A/T 10.2 liters (10.8 US qts, 9.5 Imp. qts)
4WD M/T 10.5 liters (11.1 US qts, 9.2 Imp. qts)
A/T 10.3 liters (10.9 US qts, 9.1 Imp. qta)

HINT:
Use a good brand of ethylene–glycol base coo–lant, mixed according to the manufacturer's in–structions.
Using coolant which has more than 50% ethyl–ene–glycol (but not more than 70%) is recom–mended.

NOTICE:
- Do not use an alcohol type coolant.
- The coolant should be mixed with demineralized water or distilled water.

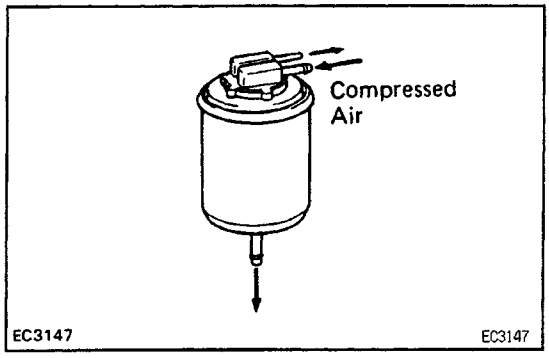


8. INSPECT CHARCOAL CANISTER

(a) Remove charcoal canister.

HINT:Label hoses for correct installation.

(b) Visually inspect canister case.

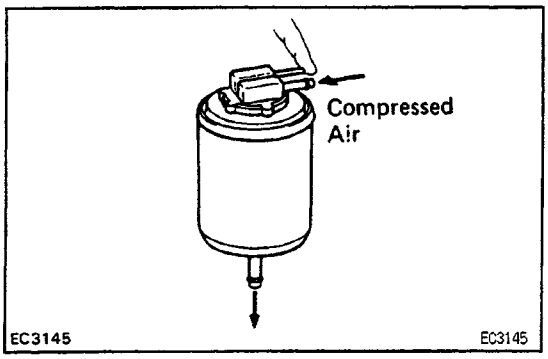


(c) Check for clogged filter and stuck check valve.

(1) Using low compressed air (4.71 kPa (48 gf/cm2, 0.68 psi), blow into the tank pipe and check that air flows without resistance from the other pipes.

(2) Blow air (4.71 kPa (48 gf/cm2, 0.68 psi) into the purge pipe and check that air does not flow from the other pipes.

If a problem is found, replace the charcoal canister.



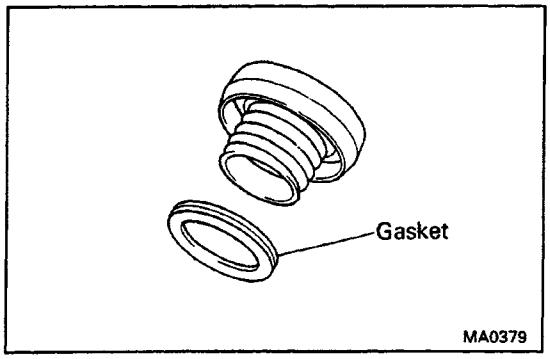
(d) Clean filter in canister.

(1) Clean the filter by blowing 294kPa (3 kgf/cm^2,43 psi) of compressed air into the tank pipe while holding the purge pipe closed.

NOTICE:

- **Do not attempt to wash the canister.**
- **No activated carbon should come out.**

(e) Install charcoal canister.



9. REPLACE GASKET IN FUEL TANK CAP

(a) Remove the old gasket (0–ring) from the tank cap. Do not damage the cap.

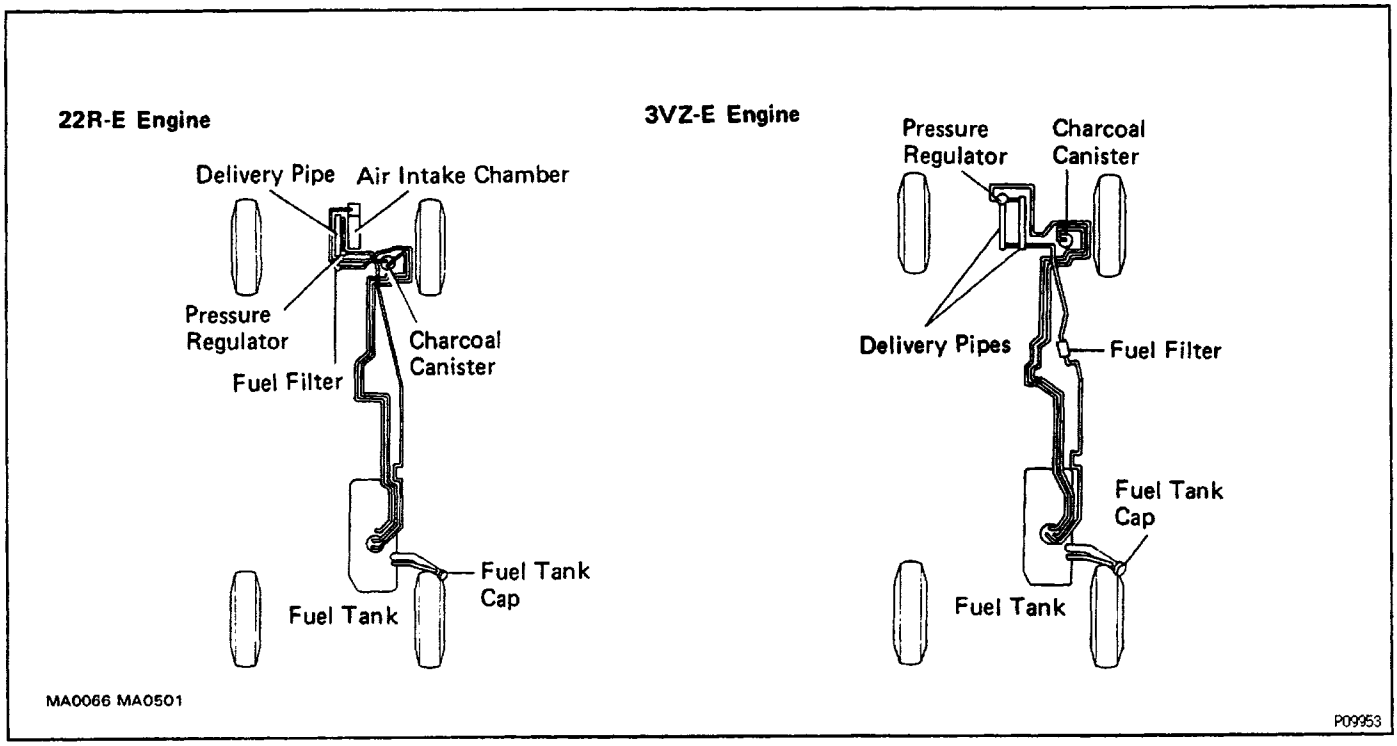
(b) Install a new gasket by hand.

(c) Inspect the cap for damage or cracks.

(d) Install the cap and check the torque limiter.

10. INSPECT FUEL LINES AND CONNECTIONS

Visually inspect the fuel lines for cracks, leakage loose connections, deformation or tank band looseness.



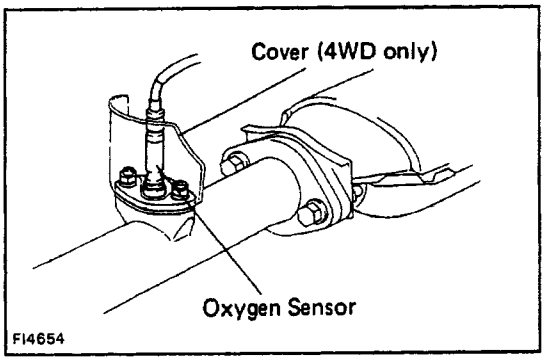
11. INSPECT EXHAUST PIPES AND MOUNTINGS

Visually inspect the pipes, hangers and connections for severe corrosion, leaks or damage.

12. (3VZ–E ENGINE)

ADJUST VALVE CLEARANCE

(See page EG–18)



13. (FEDERAL AND CANADA)

REPLACE OXYGEN SENSOR

(a) Disconnect the oxygen sensor wiring connector.

(b) Remove the cover (4WD), oxygen sensor and gasket from the exhaust pipe.

(c) Install a new gasket, oxygen sensor and cover (4WD) to the exhaust pipe.

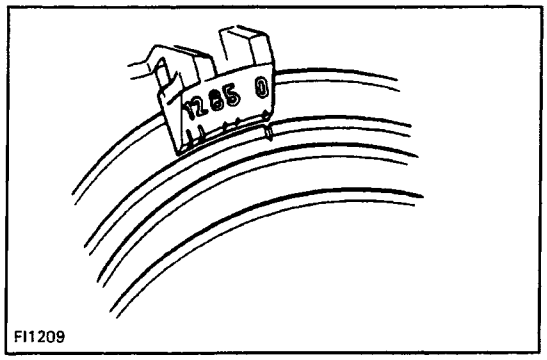
Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)

(d) Inspect oxygen sensor operation.

Inspect feedback control.

22R–E (See page EG–212)

3VZ–E (See page EG–252)



Hot Engine Operations

14. (22R–E ENGINE)

ADJUST VALVE CLEARANCE

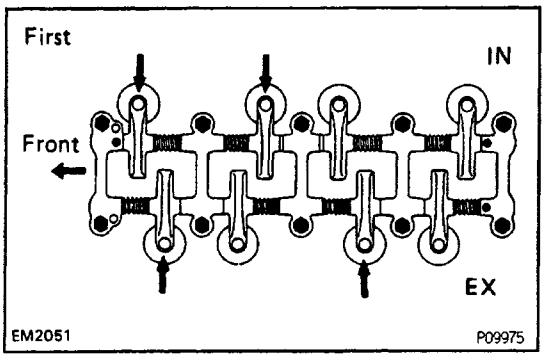
(a) Warm up the engine to normal operating temperature.

(b) Stop the engine and remove the cylinder head cover.

(c) Set No.1 cylinder to TDC/compression.

- Turn the crankshaft with a wrench to align the timing marks at TDC. Set the groove on the pulley to the "O" position.
- Check that the rocker arms on No.1 cylinder are loose and rocker arms on No.4 cylinder are tight.

If not, turn the crankshaft one complete revolution and align marks as above.

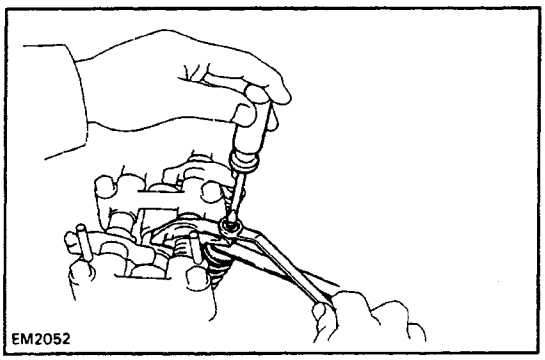


(d) Adjust the clearance of half of the valves.

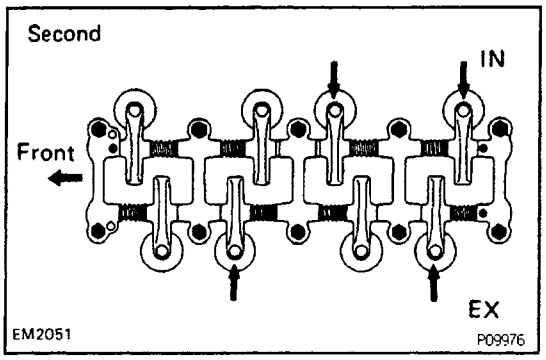
- Adjust only the valves indicated by arrows.

Valve clearance:

Intake 0.20 mm (0.008 in.)
Exhaust 0.30 mm (0.012 in.)



- Use a thickness gauge to measure between the valve stem and rocker arm. Loosen the lock nut and turn the adjusting screw to set the proper clearance. Hold the adjusting screw in position, and tighten the lock nut.
- Recheck the clearance. The thickness– gauge should move with a very slight drag.



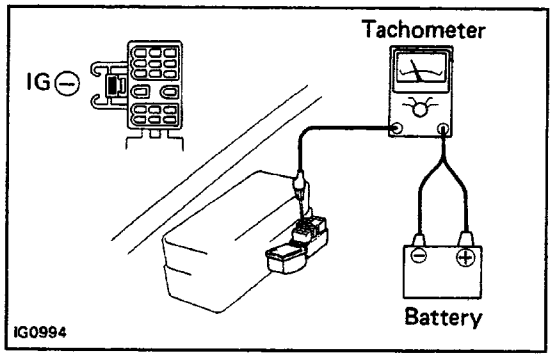
(e) Turn the crankshaft one complete revolution (360 °) and align timing marks in the manner mentioned above. Adjust only the valves indicated by arrows.

(f) Reinstall the cylinder head cover.

16. ADJUST IDLE SPEED

(a) Preparation

- Install air cleaner
- Connect all pipes and hoses of air intake system

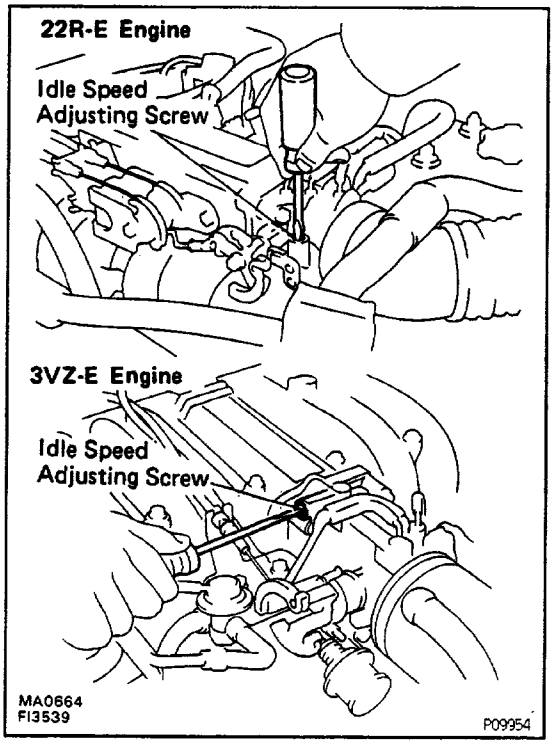


- Connect all vacuum lines (i.e., EVAP, EGR system, etc.)
- Make sure all MFI system wiring connectors are fully connected
- Engine should be at normal operating tempera– ture
- Switch off accessories
- Set transmission in neutral

(b) Connect a tachometer– to the engine
Connect the tachometer– test probe to the iG E) ter– .rninal of the DLC1.

NOTICE:

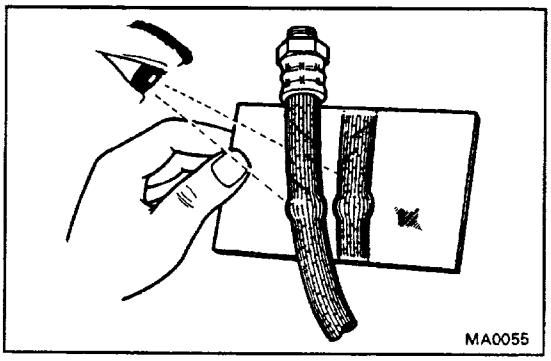
- **NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.**



(c) Race the engine at 2,500 rpm for approx. 2 minutes.
(d) Set the idle speed by turning the idle speed adjusting screws.

Idle speed:
22R–E 4WD A/T 850 rpm
Ex. 4WD A/T 750 rpm
3VZ–E 800 rpm

(e) Remove the tachometer.



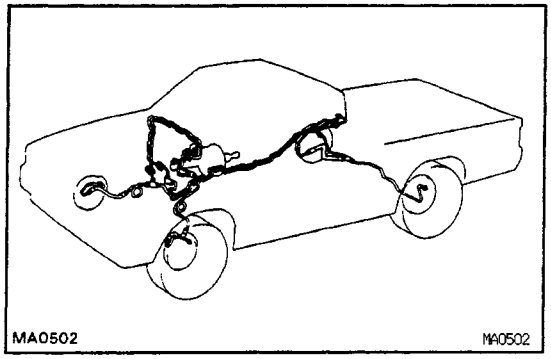
BRAKES

16. INSPECT BRAKE LINE PIPES AND HOSES

HINT: Inspect in a well – lighted area. Inspect the entire circumference and length of the brake hoses using a mirror as required. Turn the front wheels fully right or left before inspecting the front brake.

(a) Check all brake lines and hoses for:

- Damage

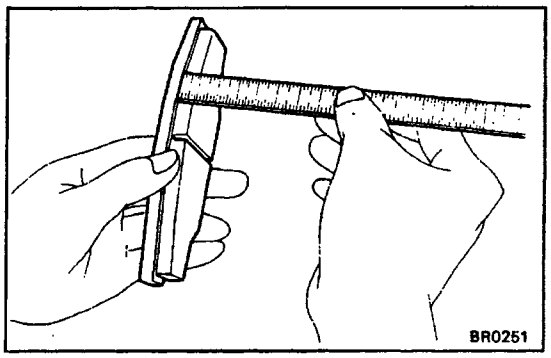


- Wear
- Deformation
- Cracks
- Corrosion
- Leaks
- Bends
- Twists

(b) Check all clamps for tightness and connections for leakage. .

(c) Check that the hoses and lines are clear of sharp edges, moving parts and the exhaust system.

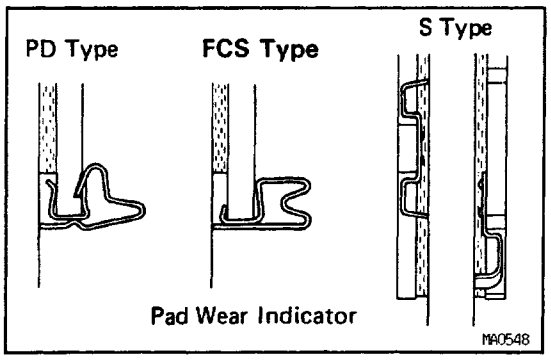
(d) Check that the lines installed in grommets pass thr–ough the center of the grommets.



17. INSPECT FRONT BRAKE PADS AND DISCS (See BR section)

(a) Check the thickness of the disc brake pad and check for irregular wear.

Minimum lining thickness:
1.0 mm (0.039 in.)



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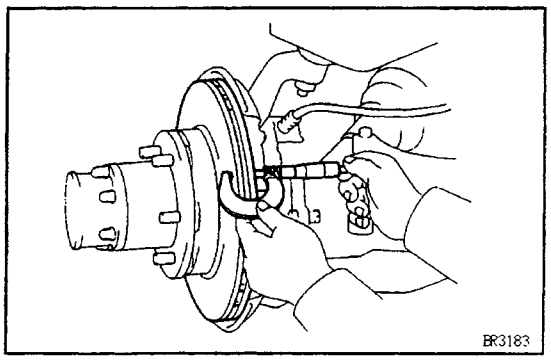
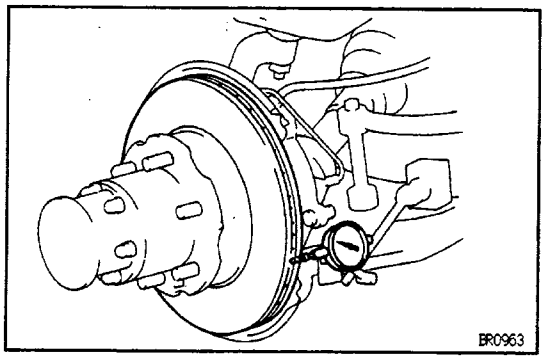
HINT: If a squealing or scraping noise occurs from the brake during driving, check the pad wear indicator. If there are traces of the indicator contacting the disc rotor, the disc pad should be replaced.



(b) Check the disc for wear.

Minimum disc thickness:
2WD FS17 type 21.0 mm (0.827 in.)
FS18 type 20.0 mm (0.787 in.)
PD60 type 23.0 mm (0.906 in.)
PD66 type 28.0 m m (1.102 in.)
4WD S 12 + 12 Type 18.0 mm (0.790 in.)

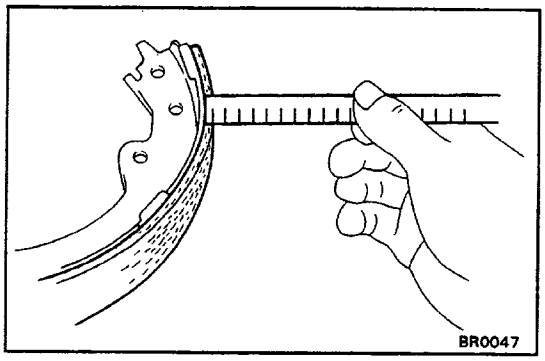


(c) Check the disc for runout.

Minimum disc runout:

Ex. C & C 0.09 mm (0.0035 in.)

C & C 0.12 mm (0.0047 in.)

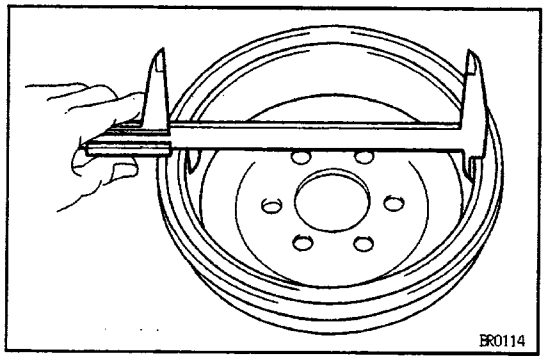


18. INSPECT REAR BRAKE LININGS AND DRUMS (See BR section)

(a) Check the lining – to – drum contact condition and lining wear.

Minimum lining thickness:

1.0 mm (0.0039 in.)



(b) Check the brake drum for scoring or wear.

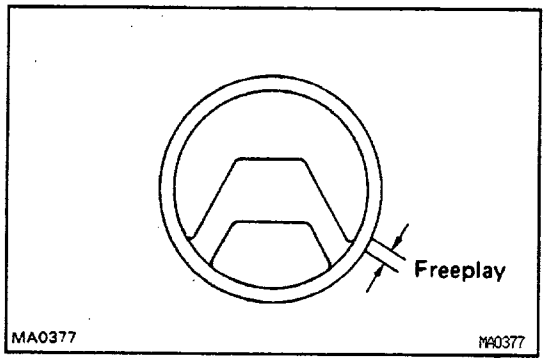
Maximum drum inside diameter:

2WD 256.0 mm (10.079 in.)

4WD 297.0 mm (11.693 in.)

(c) Clean the brake parts with a damp cloth.

NOTICE: Do not use compressed air to clean the brake parts.



CHASSIS

19. INSPECT STEERING LINKAGE

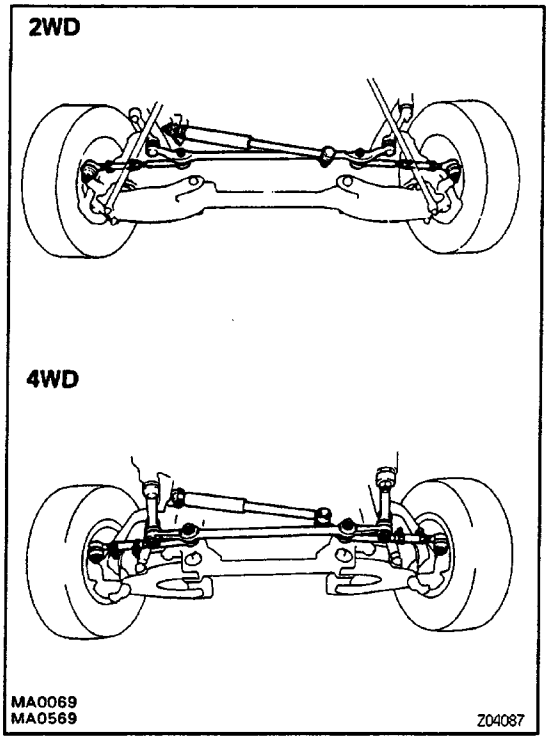
(a) Check the steering wheel freeplay.

Maximum:

30 mm (1.18 in.)

With the vehicle stopped and pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure.

If incorrect, adjust or repair.

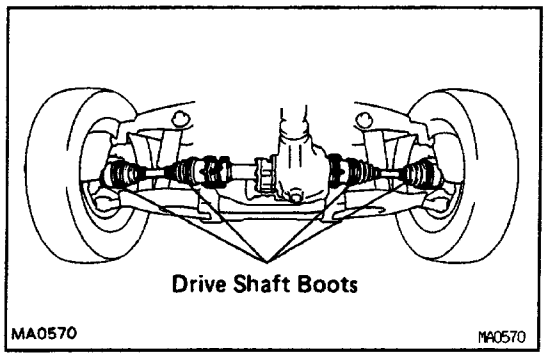


(b) Check the steering linkage for looseness or damage.
Check that:

- Tie rod ends and relay rod ends do not have excessive play.
- Dust seals are not damaged.

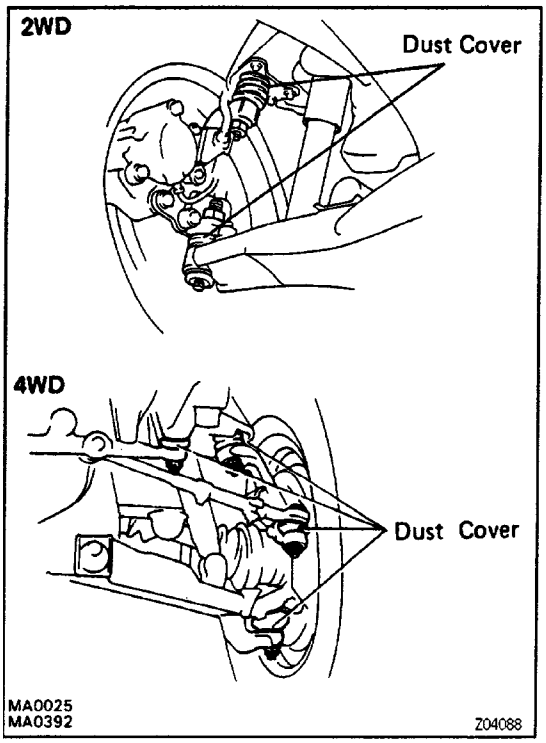
20. INSPECT STEERING GEAR HOUSING

Check the steering gear housing for oil leaks.
If leakage is found, check for cause and repair.



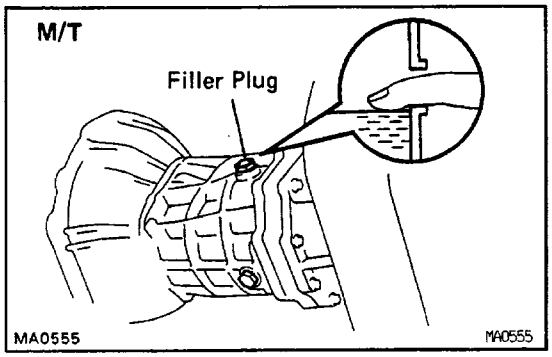
21. (4WD)
INSPECT DRIVE SHAFT BOOTS

Inspect the drive shaft boots for clamp looseness, grease leakage or damage.



22. INSPECT BALL JOINTS AND DUST COVERS

(a) Inspect the ball joints for excessive looseness. (See SA section)
(b) Inspect the dust cover for damage.



23. (2WD)

CHECK OIL LEVEL IN MANUAL TRANSMISSION, AUTOMATIC TRANSMISSION AND DIFFERENTIAL

Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

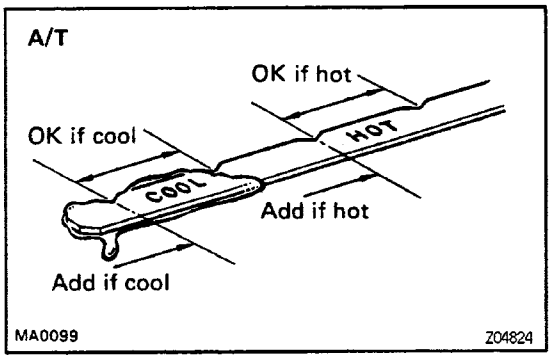
Transmission oil (M/T) –

Oil grade:

API GL–4 or GL–5

Viscosity:

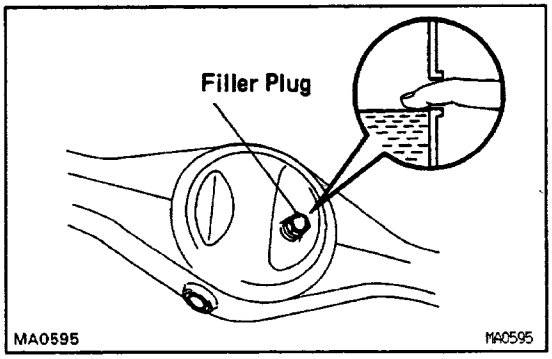
SAE 75W–90



Check the automatic transmission for oil leakage. If leakage is found, check for cause .and repair.

Transmission fluid (A/T):

ATF DEXRON® II



Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

Differential oil – –

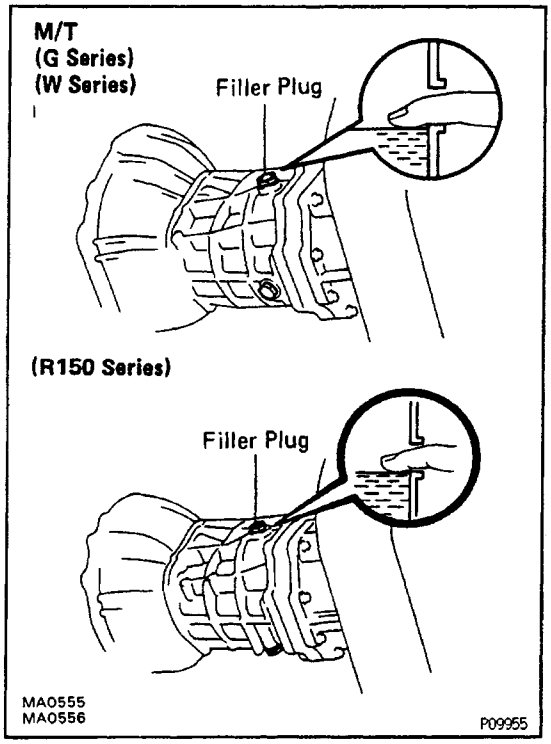
Oil grade:

AN GL–5 hypoid gear oil

Viscosity:

Above –18 ° C (0 ° F) SAE 90

Below –18 ° C (0° F) SAE 80W–90 or 80W

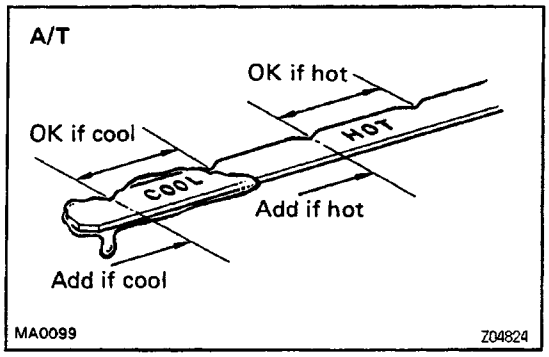


24. (4WD)

CHECK OIL LEVEL IN MANUAL TRANSMISSION, AUTOMATIC TRANSMISSION, TRANSFER AND DIFFERENTIAL

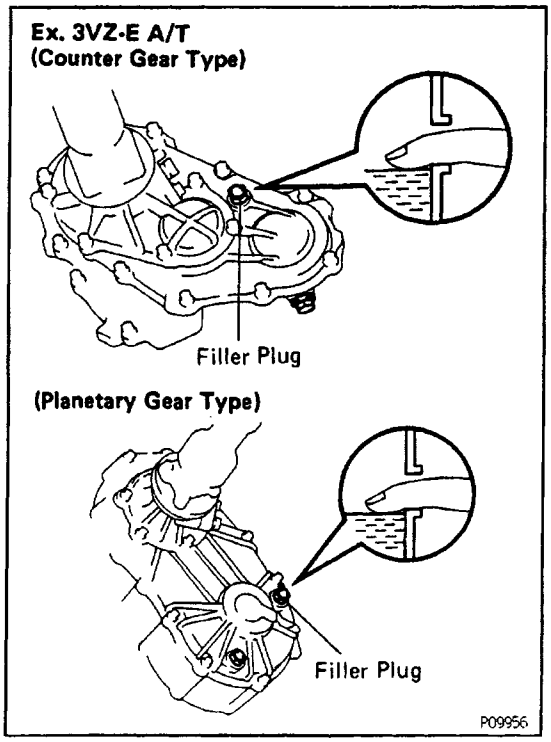
Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

Transmission oil (M/T) –
Oil grade:
API GL–4 or GL–5
Viscosity:
SAE 75W–90



Check the automatic transmission for oil leakage. If leakage is found, check for cause and repair.

Transmission fluid (A/T):
ATF DEXRON ® II



Remove the filler– plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

Transfer oil (Ex. 3vZ – E A/T) –
Oil grade: AN GL–4 or GL–5
Viscosity: SAE 75W–90
Transfer fluid (3VZ– E A/T):
ATF DEXRON ® II

MAINTENANCE OPERATIONS

MA02S–05

ENGINE

Cold Engine Operations

1. (3VZ–E ENGINE)

REPLACE TIMING BELT

(a) Remove the timing belt.

(See pages EG–32)

(b) Install the timing belt.

(See pages EG–41)

2. INSPECT DRIVE BELTS

(a) Visually check the belt for excessive wear, frayed cords etc.

HINT:

Conventional type:

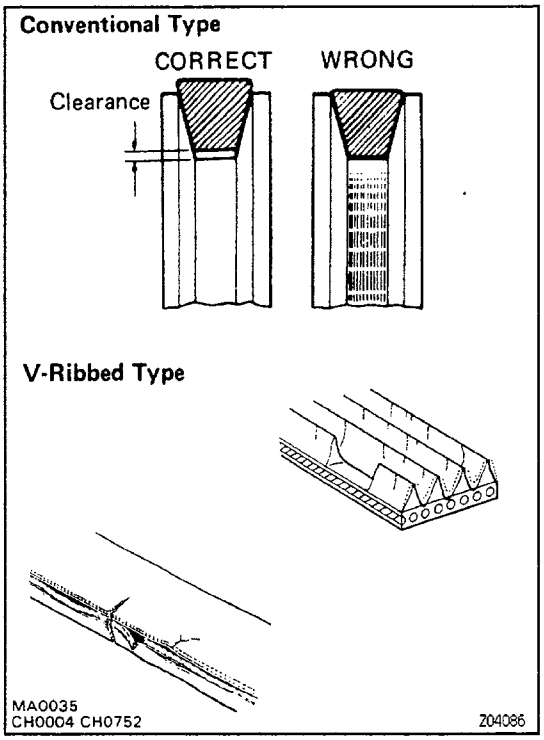
Check that the belt does not touch the bottom of the pulley groove.

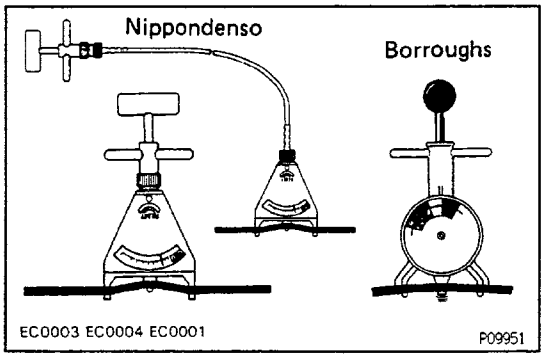
If necessary, replace the drive belt.

V–Ribbed type:

Cracks on the ribbed side of the belt are considered acceptable.

If the belt has chunks missing from the ribs, it should be replaced.





(b) Using a belt tension gauge, check the drive belt tension.

Belt tension gauge:

Nippondenso BTG – 20 (95506–00020) or Borroughs No. BT–33–73F

Drive belt tension:

22R–E Used belt 80 ± 20 lbf

New belt 125± 25 lbf

3VZ – E

Generator Used belt 100 ± 20 lbf

New belt 160 ± 20 lbf

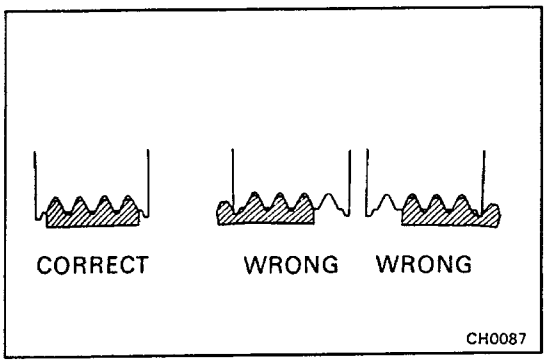
PS Used belt 80 ± 20 lbf

New belt 125 ± 25 lbf

A/C Used belt 80 20 lbf

New belt 125 ± 25 lbf

If necessary, adjust the drive belt tension.

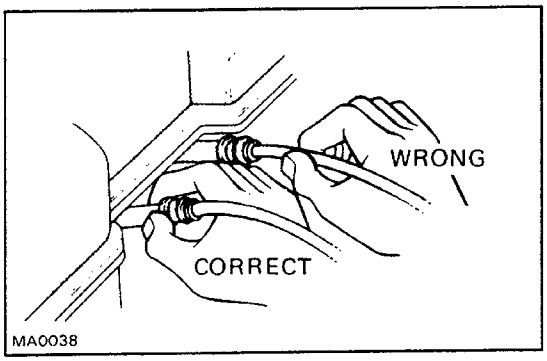


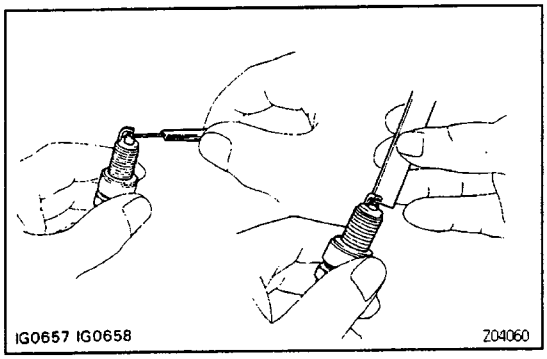
HINT:
- ”New belt” refers to a belt which has been used less than 5 minutes on a running engine.
- ”Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.
- After replacing the drive belt, check that it fits properly in the ribbed grooves, especially in the places difficult to see.
- After installing a new belt, run the engine for approx. 5 minutes and then recheck the tension.

3. REPLACE SPARK PLUGS

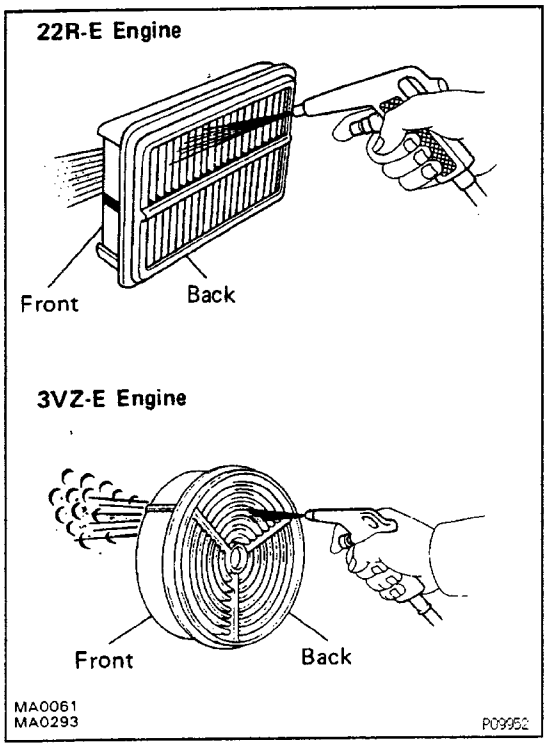
(a) Disconnect the high–tension cords at the boot.
Do not pull on the cords.

(b) (2213 – E)
Remove the spark plugs.
(3VZ – E)
Using plug wrench (16 mm), remove the spark plugs.





(c) Check the electrode gap of new spark plugs.
Correct electrode gap:
0.8 mm (0.031 in.)
Recommended spark plugs:
22R–E ND W16EXR–U
NGK BPRSEY
3VZ–E ND K76R–U
NGK BKR5EYA



4. INSPECT AIR FILTER

(a) Visually check that the air cleaner element is not excessively dirty, damaged or oily.

HINT: Oiliness may indicate a stuck PCV valve.
If necessary, replace the air cleaner element.

(b) Clean the element with compressed air.
First blow from back side thoroughly, then blow off the front side of the element.

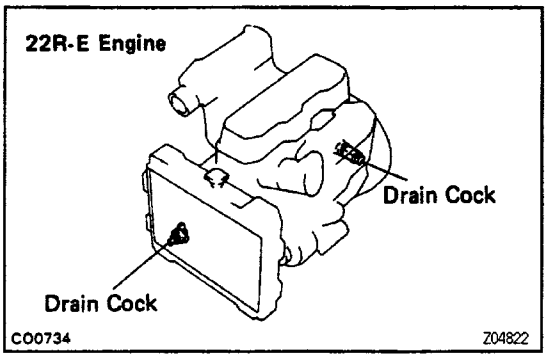
5. REPLACE AIR FILTER

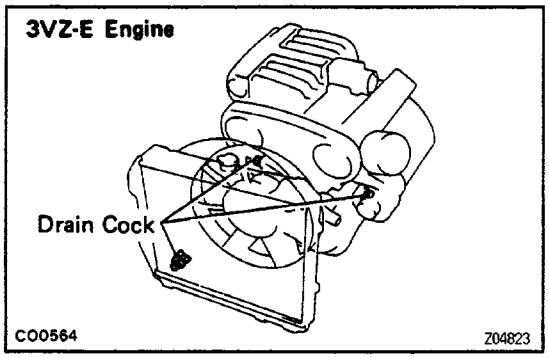
Replace the used air cleaner element with a new one.

6. REPLACE ENGINE OIL AND OIL FILTER

22R – E (See page EG–236)
3VZ– E (See page EG–278)
Oil grade:
API grade SG Energy – Conserving II multigrade and recommended viscosity oil
Engine oil capacity:
Drain and refill

22 R – E
w/o Oil filter change
3.8 liters (4.0 US qts, 3.3 Imp. qts)
w/ Oil filter change
4.3 liters (4.5 US qts, 3.8 Imp. qts)
3VZ–E
w/o Oil filter change
2WD 4.0 liters (4.2 US qts, 3.5 Imp. qts)
4WD 4.2 liters (4.4 US qts, 3.7 Imp. qts)
w/ Oil filter change
2WD 4.3 liters (4.5 US qts, 3.8 Imp. qts)
4WD 4.5 liters (4.8 US qts, 4.0 Imp. qts)





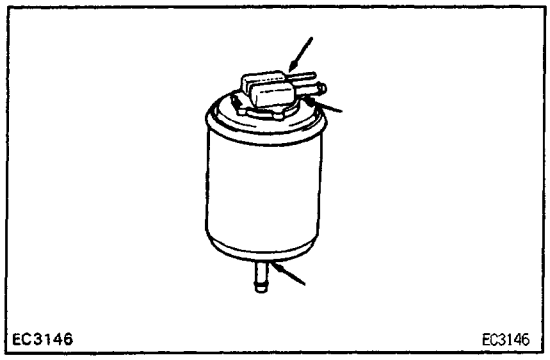
7. REPLACE ENGINE COOLANT

(a) Drain the coolant from the radiator and engine drain cocks.
(b) Close the drain cocks.
(c) Fill system with coolant.

Coolant capacity (w/ Heater or air conditioner):
22R–E
Ex. 4WD A/T 8.4 liters (8.8 US qts, 7.4 Imp. qts)
4WD A/T 9.1 liters 0.6 US qts, 8.0 Imp. qts)
3VZ–E
2WD M/T 10.4 liters (11.O US qts, 9.2 Imp. qts)
A/T 10.2 liters (10.8 US qts, 9.5 Imp. qts)
4WD M/T 10.5 liters (11.1 US qts, 9.2 Imp. qts)
A/T 10.3 liters (10.9 US qts, 9.1 Imp. qta)

HINT:
Use a good brand of ethylene–glycol base coo–lant, mixed according to the manufacturer's in–structions.
Using coolant which has more than 50% ethyl–ene–glycol (but not more than 70%) is recom–mended.

NOTICE:
- Do not use an alcohol type coolant.
- The coolant should be mixed with demineralized water or distilled water.

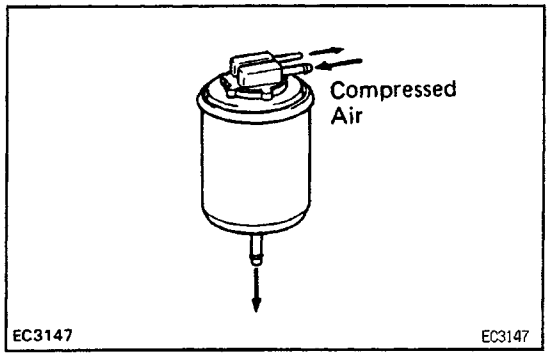


8. INSPECT CHARCOAL CANISTER

(a) Remove charcoal canister.

HINT:Label hoses for correct installation.

(b) Visually inspect canister case.

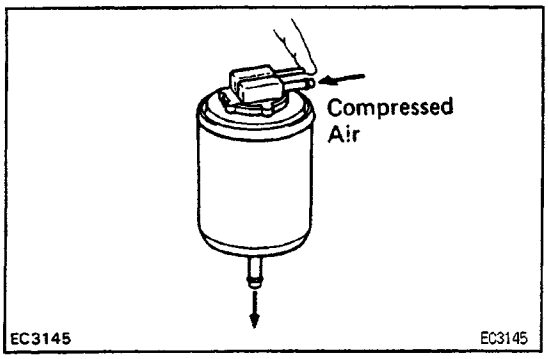


(c) Check for clogged filter and stuck check valve.

(1) Using low compressed air (4.71 kPa (48 gf/cm2, 0.68 psi), blow into the tank pipe and check that air flows without resistance from the other pipes.

(2) Blow air (4.71 kPa (48 gf/cm2, 0.68 psi) into the purge pipe and check that air does not flow from the other pipes.

If a problem is found, replace the charcoal canister.



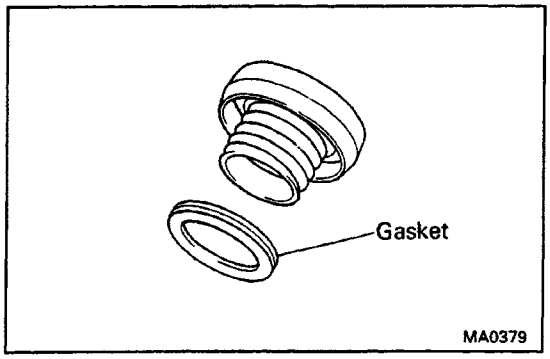
(d) Clean filter in canister.

(1) Clean the filter by blowing 294kPa (3 kgf/cm^2,43 psi) of compressed air into the tank pipe while holding the purge pipe closed.

NOTICE:

- **Do not attempt to wash the canister.**
- **No activated carbon should come out.**

(e) Install charcoal canister.



9. REPLACE GASKET IN FUEL TANK CAP

(a) Remove the old gasket (0–ring) from the tank cap. Do not damage the cap.

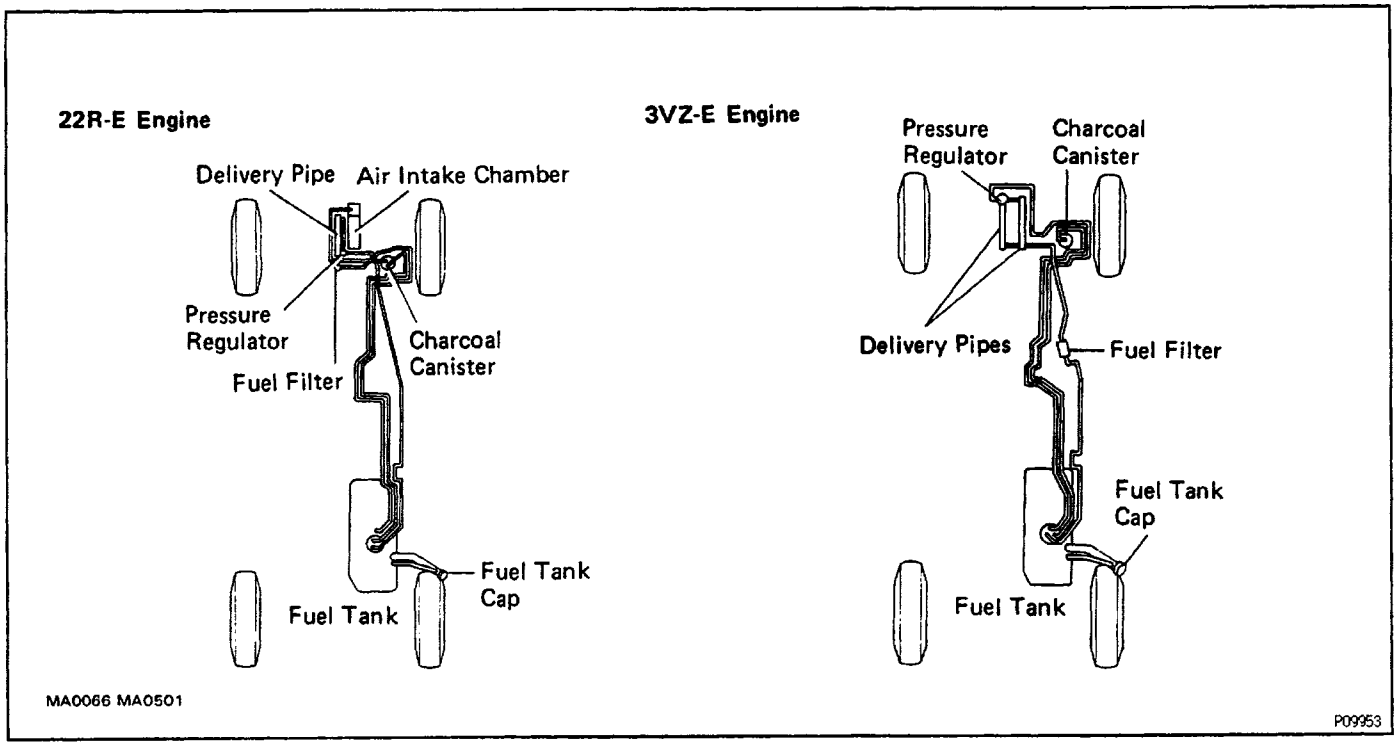
(b) Install a new gasket by hand.

(c) Inspect the cap for damage or cracks.

(d) Install the cap and check the torque limiter.

10. INSPECT FUEL LINES AND CONNECTIONS

Visually inspect the fuel lines for cracks, leakage loose connections, deformation or tank band looseness.



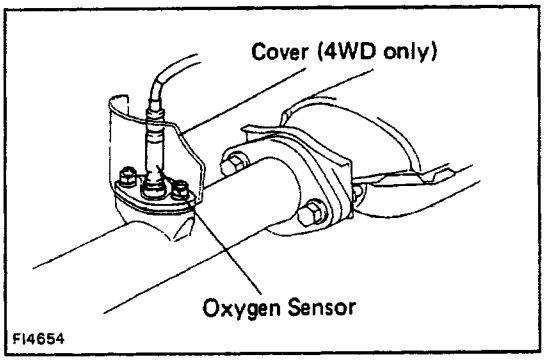
11. INSPECT EXHAUST PIPES AND MOUNTINGS

Visually inspect the pipes, hangers and connections for severe corrosion, leaks or damage.

12. (3VZ–E ENGINE)

ADJUST VALVE CLEARANCE

(See page EG–18)



13. (FEDERAL AND CANADA)

REPLACE OXYGEN SENSOR

(a) Disconnect the oxygen sensor wiring connector.

(b) Remove the cover (4WD), oxygen sensor and gasket from the exhaust pipe.

(c) Install a new gasket, oxygen sensor and cover (4WD) to the exhaust pipe.

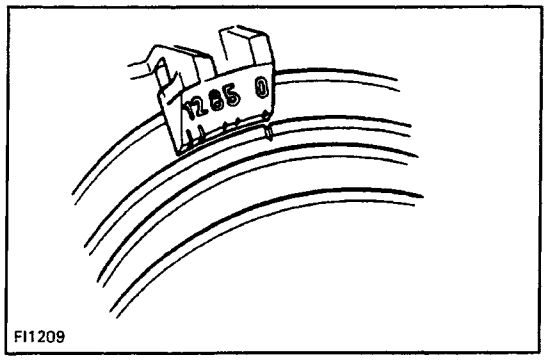
Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)

(d) Inspect oxygen sensor operation.

Inspect feedback control.

22R–E (See page EG–212)

3VZ–E (See page EG–252)



Hot Engine Operations

14. (22R–E ENGINE)

ADJUST VALVE CLEARANCE

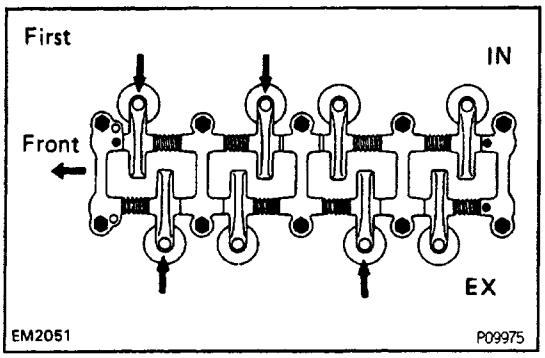
(a) Warm up the engine to normal operating temperature.

(b) Stop the engine and remove the cylinder head cover.

(c) Set No.1 cylinder to TDC/compression.

- Turn the crankshaft with a wrench to align the timing marks at TDC. Set the groove on the pulley to the "O" position.
- Check that the rocker arms on No.1 cylinder are loose and rocker arms on No.4 cylinder are tight.

If not, turn the crankshaft one complete revolution and align marks as above.

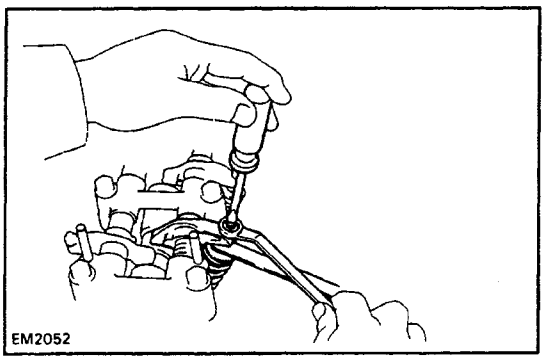


(d) Adjust the clearance of half of the valves.

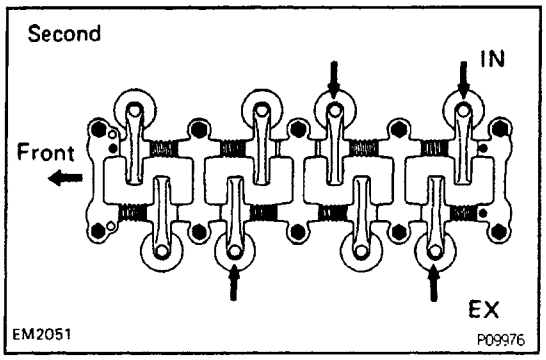
- Adjust only the valves indicated by arrows.

Valve clearance:

Intake 0.20 mm (0.008 in.)
Exhaust 0.30 mm (0.012 in.)



- Use a thickness gauge to measure between the valve stem and rocker arm. Loosen the lock nut and turn the adjusting screw to set the proper clearance. Hold the adjusting screw in position, and tighten the lock nut.
- Recheck the clearance. The thickness– gauge should move with a very slight drag.



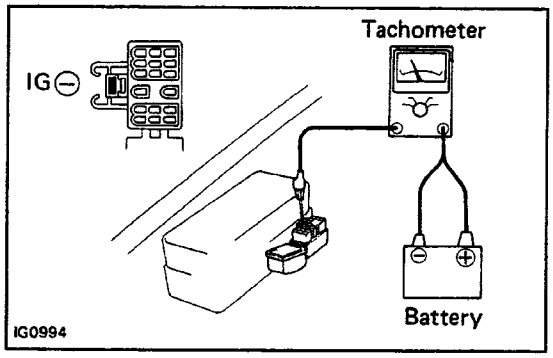
(e) Turn the crankshaft one complete revolution (360 °) and align timing marks in the manner mentioned above. Adjust only the valves indicated by arrows.

(f) Reinstall the cylinder head cover.

16. ADJUST IDLE SPEED

(a) Preparation

- Install air cleaner
- Connect all pipes and hoses of air intake system

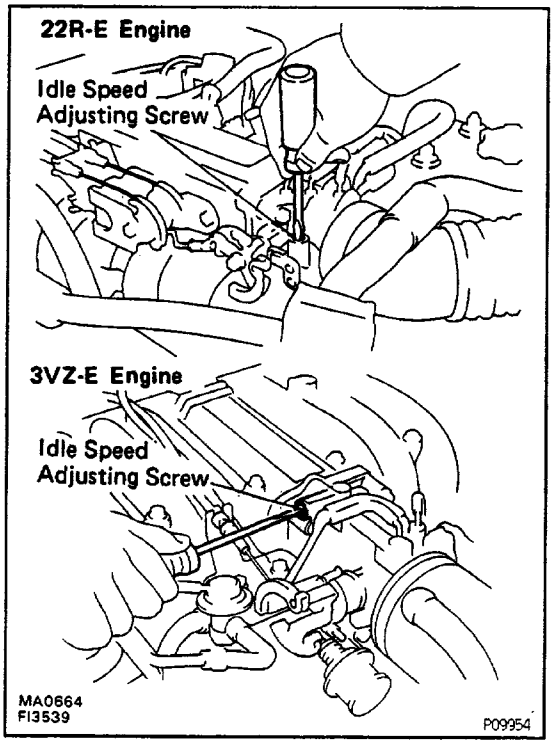


- Connect all vacuum lines (i.e., EVAP, EGR system, etc.)
- Make sure all MFI system wiring connectors are fully connected
- Engine should be at normal operating tempera– ture
- Switch off accessories
- Set transmission in neutral

(b) Connect a tachometer– to the engine
Connect the tachometer– test probe to the iG E) ter– .rninal of the DLC1.

NOTICE:

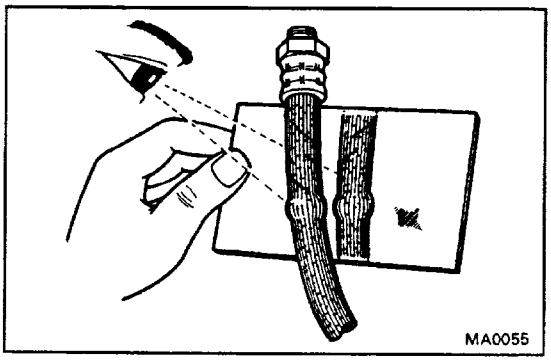
- **NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.**



(c) Race the engine at 2,500 rpm for approx. 2 minutes.
(d) Set the idle speed by turning the idle speed adjusting screws.

Idle speed:
22R–E 4WD A/T 850 rpm
Ex. 4WD A/T 750 rpm
3VZ–E 800 rpm

(e) Remove the tachometer.



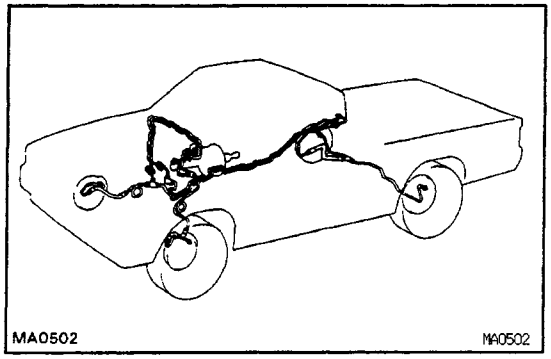
BRAKES

16. INSPECT BRAKE LINE PIPES AND HOSES

HINT: Inspect in a well – lighted area. Inspect the entire circumference and length of the brake hoses using a mirror as required. Turn the front wheels fully right or left before inspecting the front brake.

(a) Check all brake lines and hoses for:

- Damage

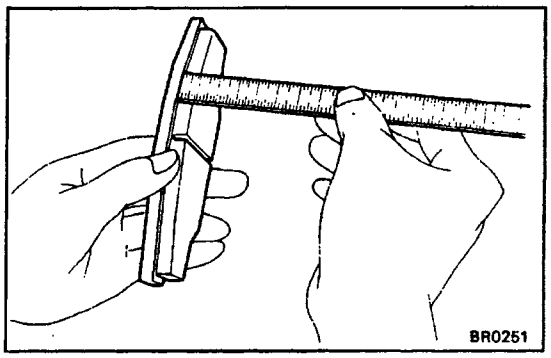


- Wear
- Deformation
- Cracks
- Corrosion
- Leaks
- Bends
- Twists

(b) Check all clamps for tightness and connections for leakage. .

(c) Check that the hoses and lines are clear of sharp edges, moving parts and the exhaust system.

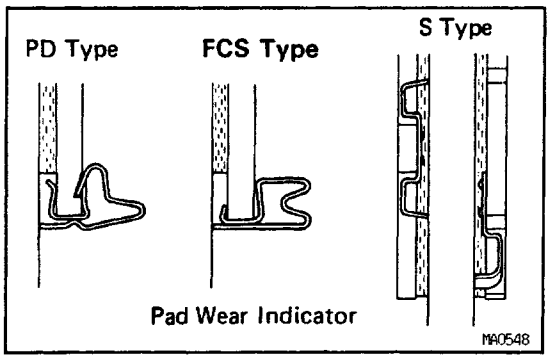
(d) Check that the lines installed in grommets pass thr–ough the center of the grommets.



17. INSPECT FRONT BRAKE PADS AND DISCS (See BR section)

(a) Check the thickness of the disc brake pad and check for irregular wear.

Minimum lining thickness:
1.0 mm (0.039 in.)



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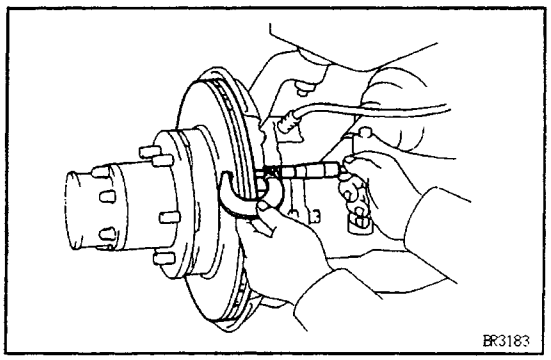
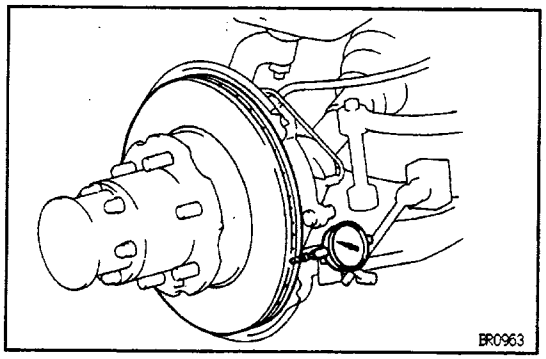
HINT: If a squealing or scraping noise occurs from the brake during driving, check the pad wear indicator. If there are traces of the indicator contacting the disc rotor, the disc pad should be replaced.



(b) Check the disc for wear.

Minimum disc thickness:
2WD FS17 type 21.0 mm (0.827 in.)
FS18 type 20.0 mm (0.787 in.)
PD60 type 23.0 mm (0.906 in.)
PD66 type 28.0 m m (1.102 in.)
4WD S 12 + 12 Type 18.0 mm (0.790 in.)

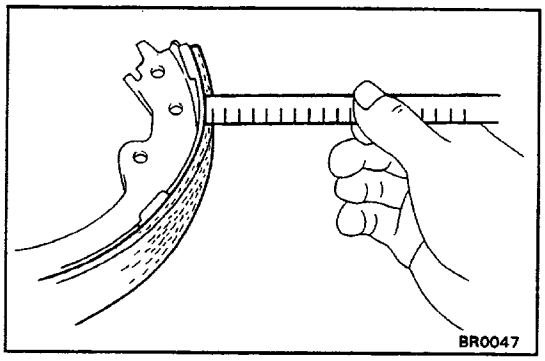


(c) Check the disc for runout.

Minimum disc runout:

Ex. C & C 0.09 mm (0.0035 in.)

C & C 0.12 mm (0.0047 in.)

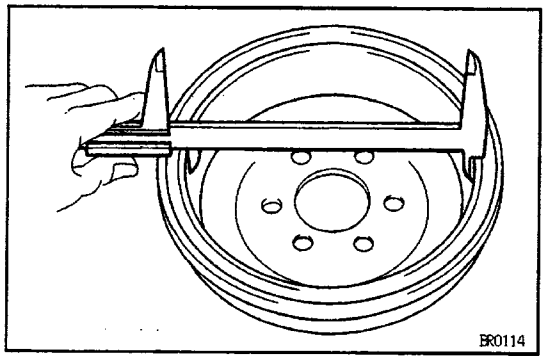


18. INSPECT REAR BRAKE LININGS AND DRUMS (See BR section)

(a) Check the lining – to – drum contact condition and lining wear.

Minimum lining thickness:

1.0 mm (0.0039 in.)



(b) Check the brake drum for scoring or wear.

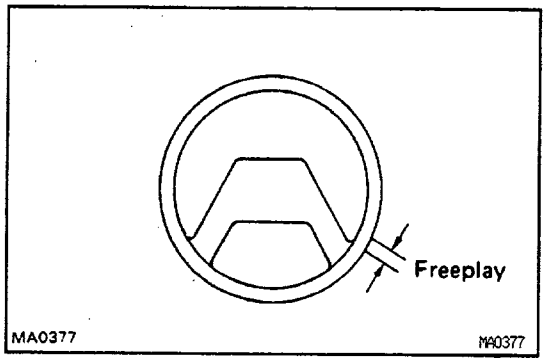
Maximum drum inside diameter:

2WD 256.0 mm (10.079 in.)

4WD 297.0 mm (11.693 in.)

(c) Clean the brake parts with a damp cloth.

NOTICE: Do not use compressed air to clean the brake parts.



CHASSIS

19. INSPECT STEERING LINKAGE

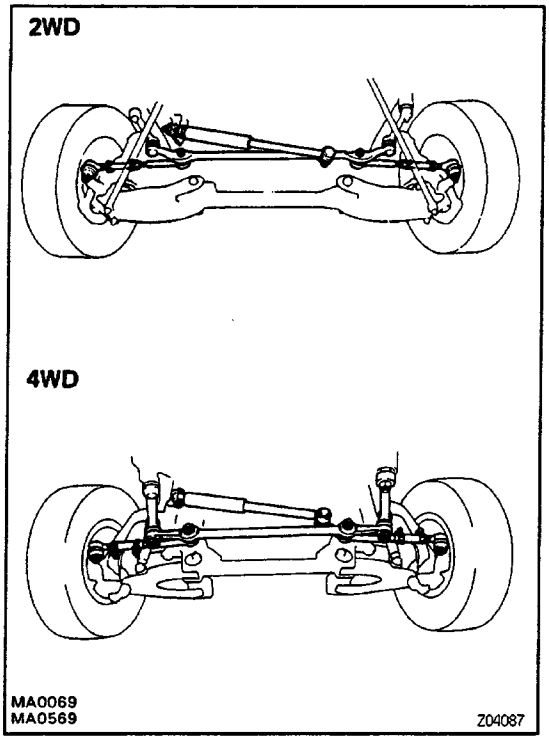
(a) Check the steering wheel freeplay.

Maximum:

30 mm (1.18 in.)

With the vehicle stopped and pointed straight ahead, rock the steering wheel gently back and forth with light finger pressure.

If incorrect, adjust or repair.

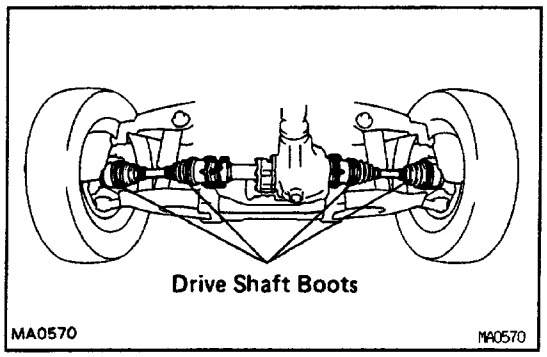


(b) Check the steering linkage for looseness or damage.
Check that:

- Tie rod ends and relay rod ends do not have excessive play.
- Dust seals are not damaged.

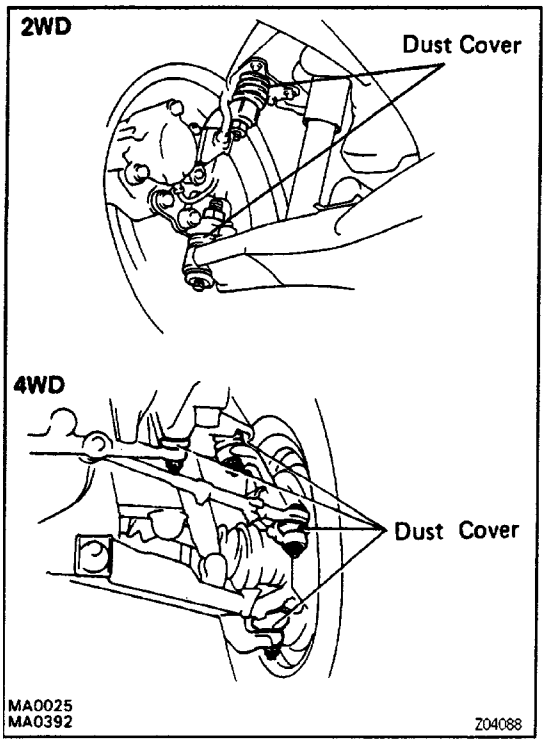
20. INSPECT STEERING GEAR HOUSING

Check the steering gear housing for oil leaks.
If leakage is found, check for cause and repair.



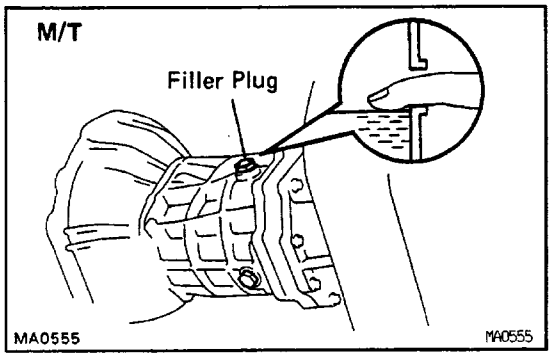
21. (4WD)
INSPECT DRIVE SHAFT BOOTS

Inspect the drive shaft boots for clamp looseness, grease leakage or damage.



22. INSPECT BALL JOINTS AND DUST COVERS

(a) Inspect the ball joints for excessive looseness. (See SA section)
(b) Inspect the dust cover for damage.



23. (2WD)

CHECK OIL LEVEL IN MANUAL TRANSMISSION, AUTOMATIC TRANSMISSION AND DIFFERENTIAL

Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

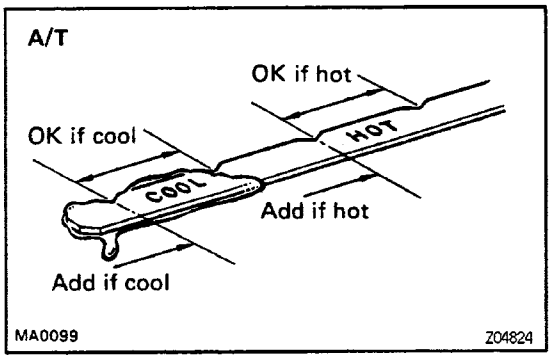
Transmission oil (M/T) –

Oil grade:

API GL–4 or GL–5

Viscosity:

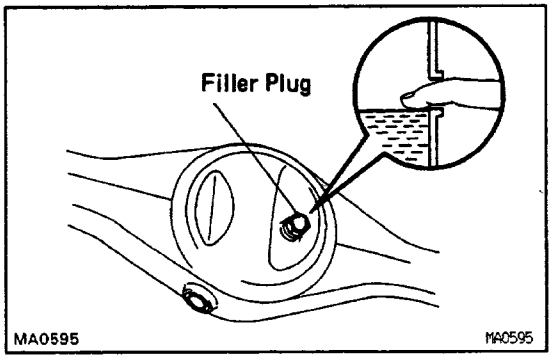
SAE 75W–90



Check the automatic transmission for oil leakage. If leakage is found, check for cause .and repair.

Transmission fluid (A/T):

ATF DEXRON® II



Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

Differential oil – –

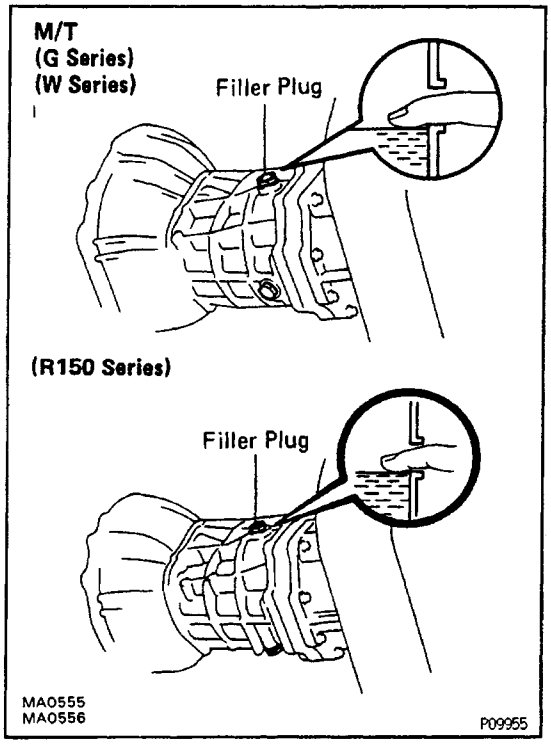
Oil grade:

AN GL–5 hypoid gear oil

Viscosity:

Above –18 ° C (0 ° F) SAE 90

Below –18 ° C (0° F) SAE 80W–90 or 80W

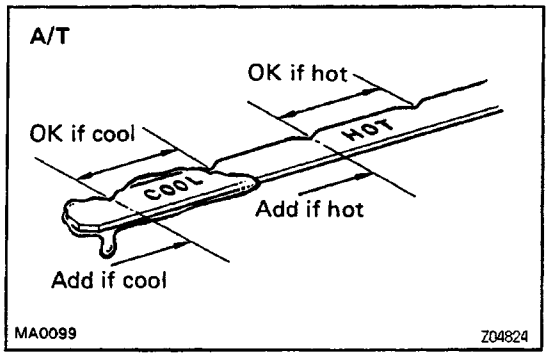


24. (4WD)

CHECK OIL LEVEL IN MANUAL TRANSMISSION, AUTOMATIC TRANSMISSION, TRANSFER AND DIFFERENTIAL

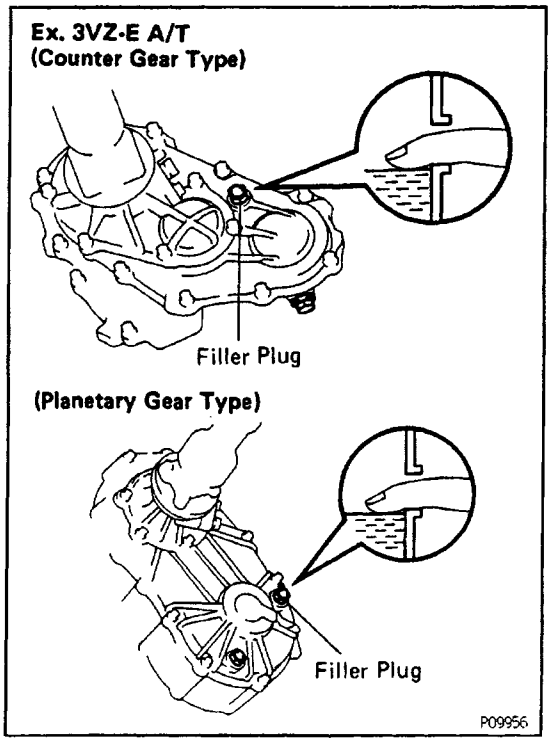
Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

Transmission oil (M/T) –
Oil grade:
API GL–4 or GL–5
Viscosity:
SAE 75W–90



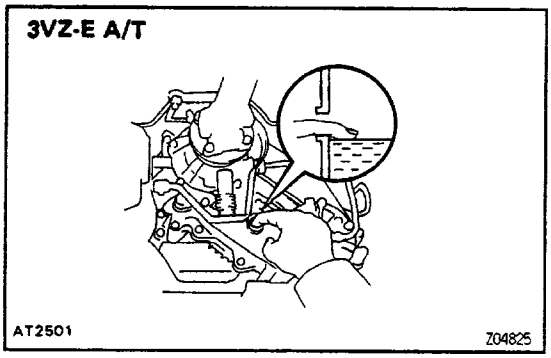
Check the automatic transmission for oil leakage. If leakage is found, check for cause and repair.

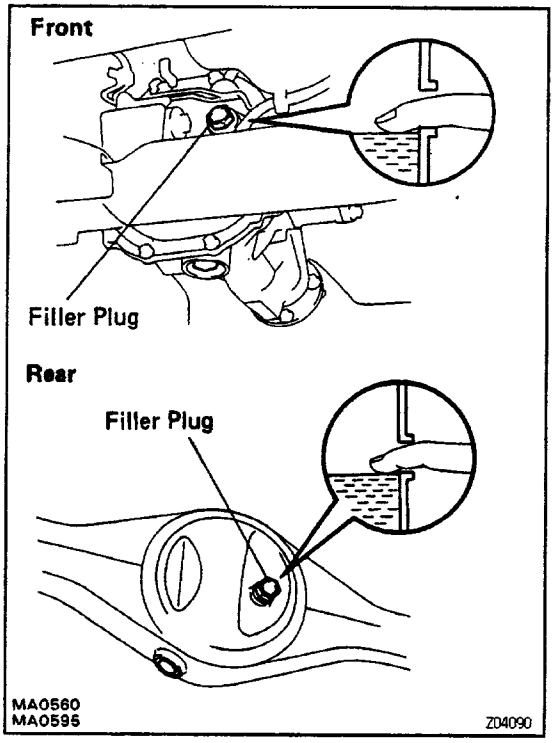
Transmission fluid (A/T):
ATF DEXRON ® II



Remove the filler– plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

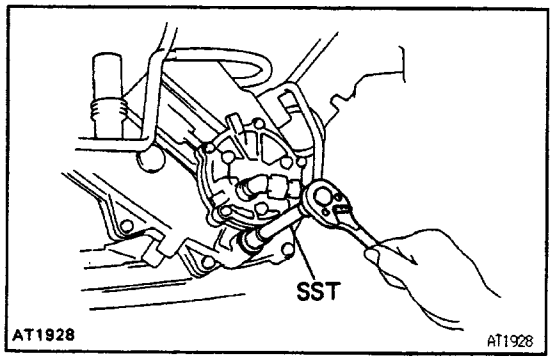
Transfer oil (Ex. 3vZ – E A/T) –
Oil grade: AN GL–4 or GL–5
Viscosity: SAE 75W–90
Transfer fluid (3VZ– E A/T):
ATF DEXRON ® II





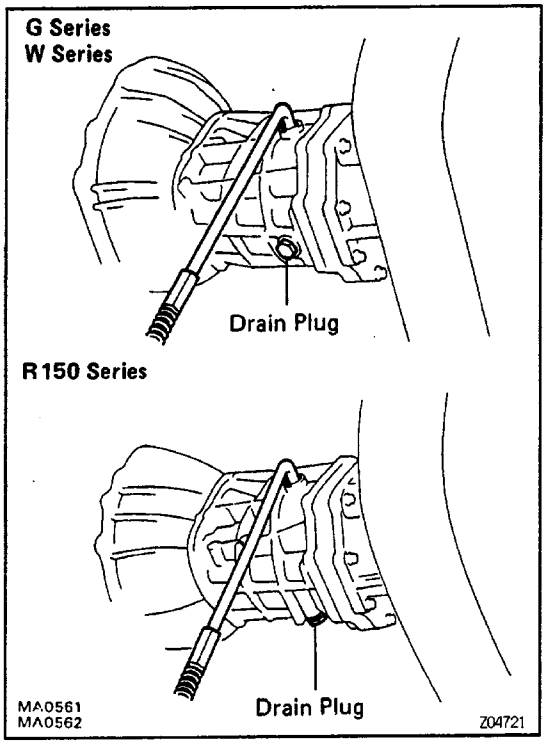
Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

Differential oil –
Standard differential
Oil grade:
API GL–5 hypoid gear oil
Viscosity:
Above –18 ° C (0°F) SAE 90
Below –18 ° C (0 ° F) SAE 80W – 90 or 80W
A.D.D.
Oil grade:
Toyota 'GEAR OIL SUPER' oil or hypoid gear oil API GL–5
Viscosity:
SAE 75W–90

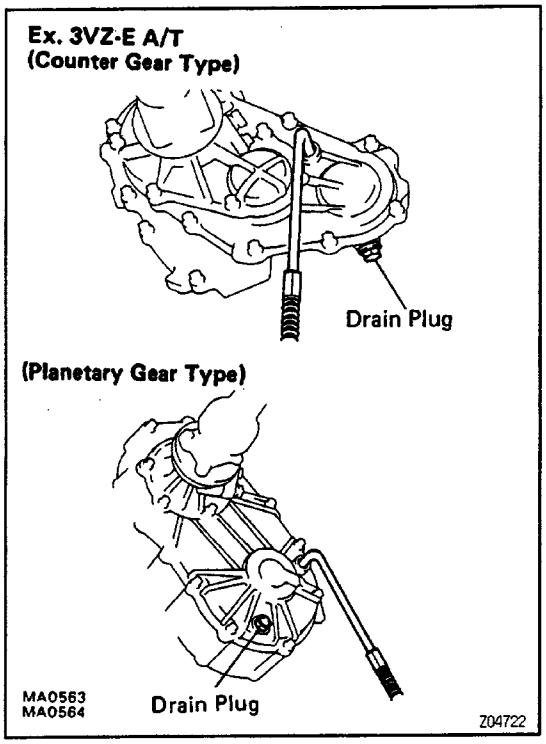


25. REPLACE MANUAL TRANSMISSION. TRANSFER (4 WD) AND DIFFERENTIAL OIL

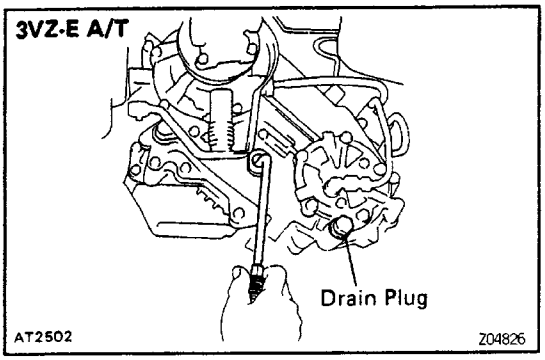
(a) (Transfer)
Remove the transfer cover.
(b) Using SST (A340H Transfer), remove the drain plug and drain the oil.
SST 09043–38100
(c) Reinstall drain plug securely.
(d) Add new oil until it begins to run out of the filler hole.
Oil grade and viscosity:
See pages MA –16 to 18

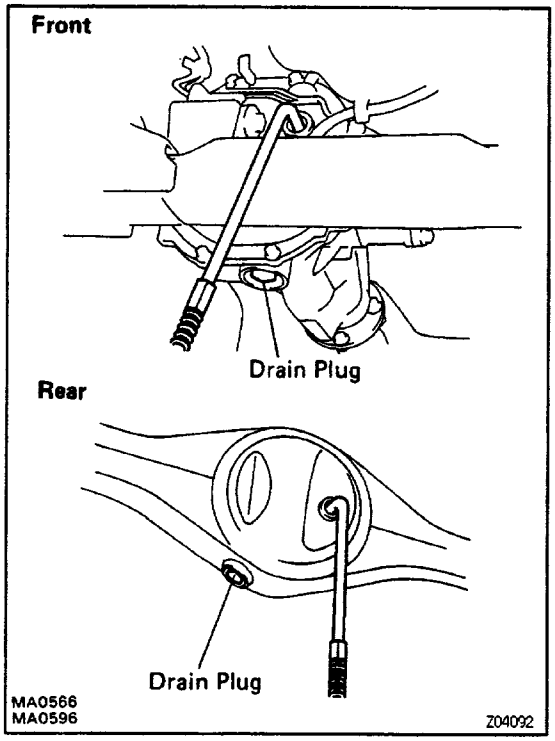


Oil capacity:
Transmission –
2WD
W55 2.6 liters (2.7 US qts, 2.3 Imp. qts)
R150 3.0 liters (3.2 US qts, 2.6 Imp. qts)
4WD
G58 3.9 liters (4.1 US qts, 3.4 Imp. qts)
W56 2.9 liters (3.1 US qts, 2.5 Imp. qts)
RI 50F 3.0 liters (3.2 US qts, 2.6 Imp. qts)

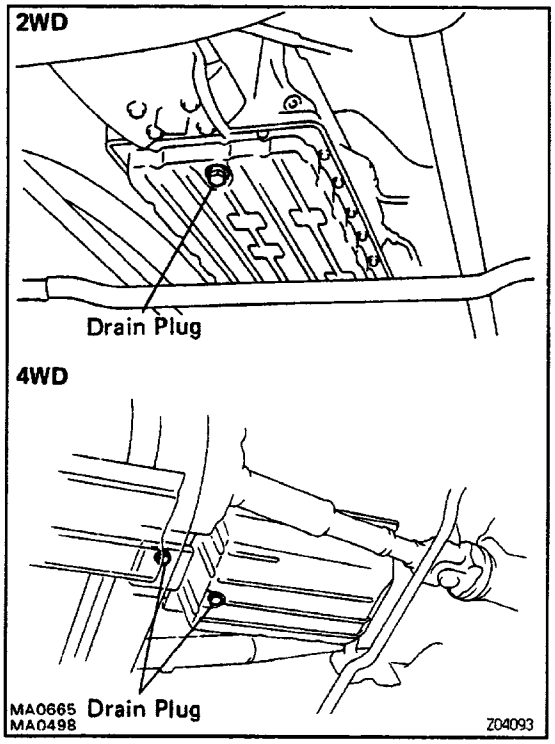


Transfer –
Counter Gear Type
1.6 liters (1.7 US qts, 1.4 Imp. qts)
Planetary Gear Type
1.1 liters (1.2 US qts, 1.0 Imp. qts)
A340H
0.8 liters (0.8 US qts, 0.7 Imp. qts)



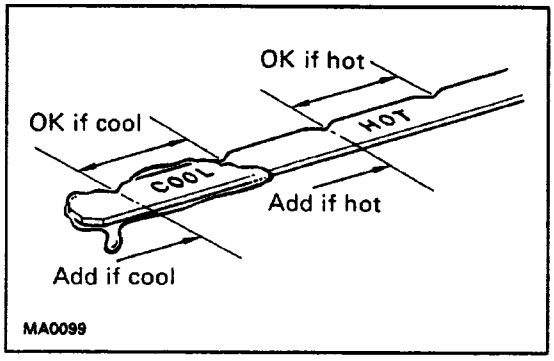


Differential –
2WD
7.5 in. 1.35 liters (1.4 US qts, 1.2 Imp. qts)
8.0 in. 1.8 liters (1.9 US qts, 1.6 Imp. qts)
4WD
Front Standard differential
1.6 liters (1.7 US qts, 1.4 Imp. qts)
A.D.D.
1.86 liters (2.0 US qts, 1.6 Imp. qts)
Rear
2.2 liters 2.3 US qts, 1.9 Imp. qts)



26. REPLACE AUTOMATIC TRANSMISSION FLUID

(a) Remove the drain plug(s) and drain the fluid.
(b) Reinstall the drain plug(s) securely.
(c) With the engine OFF, add new fluid through the dip–stick tube.
Fluid:
ATP DEXRON ® II
Drain and refill capacity:
2WD
A43D 2.4 liters (2.5 US qts, 2.1 Imp. qts)
A340E 1.6 liters (1.7 US qts, 1.4 Imp. qts)
4WD
A340H 4.5 liters (4.8 US qts, 4.0 Imp. qts)
A340F 2.0 liters (2.1 US qts, 1.8 Imp. qts)



(d) Start the engine and shift the selector into ail posi–tions from ”P” through ”L” and then shift into ”P”.
(e) (A340H)
Shift the transfer lever position: H2→H4→L4 and L4 →H4→H2.
(f) With the engine idling, check the fluid level.
Add fluid up to the cool level on the dipstick.

(g) Check that the fluid level is in the ”HOT” range at the normal operating temperature (70 – 80 ° C or 158 – 176 *F) and add as necessary.

NOTICE: Do not overfill.

27. REPACK FRONT WHEEL BEARINGS AND THRUST BUSH

(a) Change the front wheel bearing grease.
(See SA section)

2WD –

Grease grade:
Lithium base multipurpose grease (NLGI No.2)
Wheel bearing friction preload (at starting):
5.9–18N(0.6–1.8kgf,1.3–4.Olbf)

4WD –

Grease grade:
Lithium base multipurpose grease (NLGI No.2)
Wheel bearing friction preload (at starting):
27 – 55 N (2.8 – 5.6 kgf, 6.2 – 12.3 lbf)

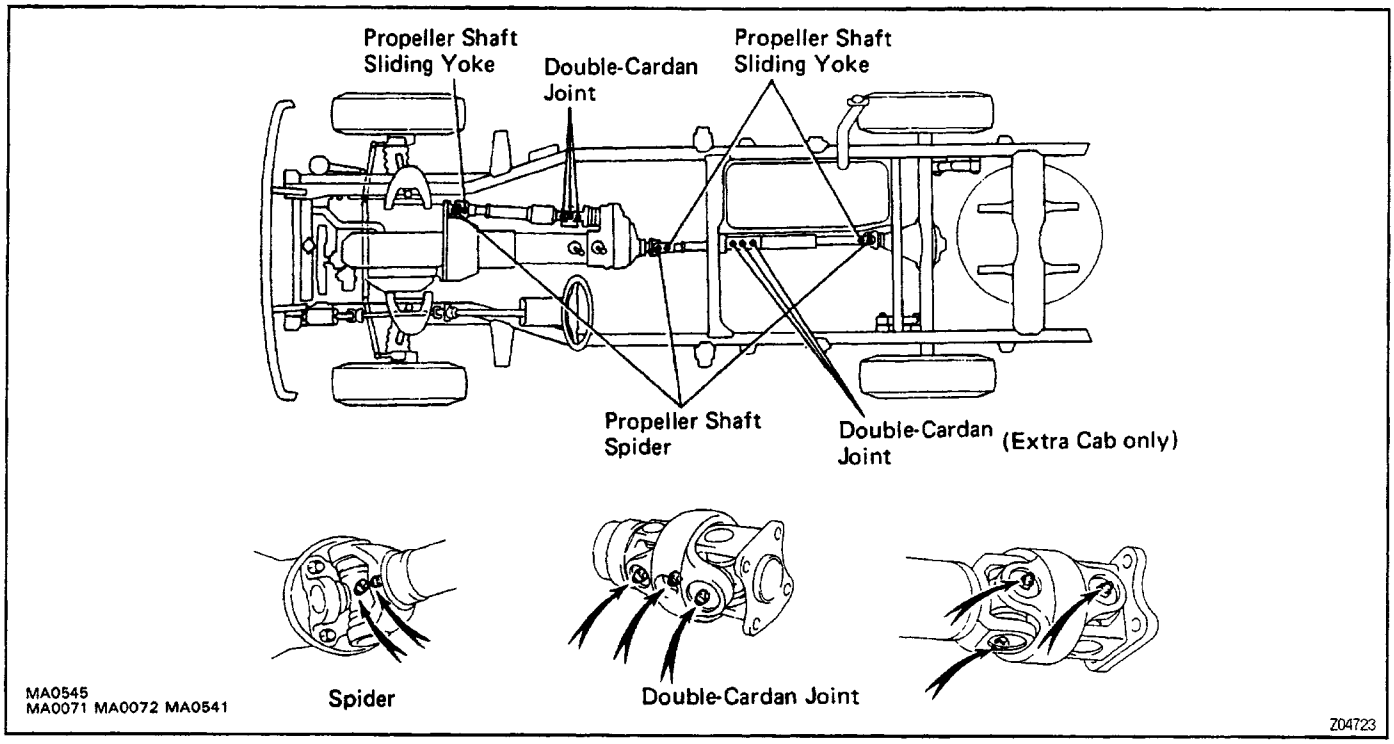
(b) Repack the drive shaft thrust bush grease.
(See SA section)

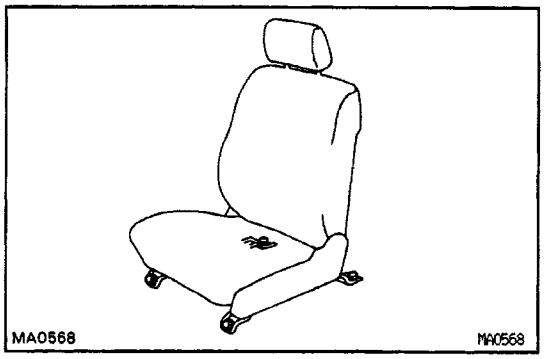
28. (4WD)

LUBRICATE PROPELLER SHAFT

Lubricate propeller shaft, referring to the lubrication chart. Before pumping in grease, wipe off any mud and dust on the grease fitting.

Grease grade:
Propeller shaft (ex. Double–cardan joint) –
Lithium base chassis grease (NLGI No.2)
Double–cardan joint – Molybdenum disulphide
Lithium base chassis grease (NLGI No.2)



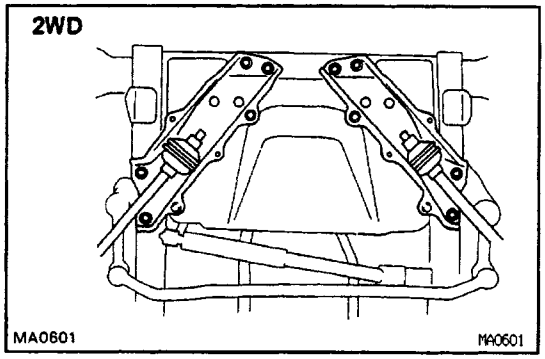


29. TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY

Tighten the following parts:

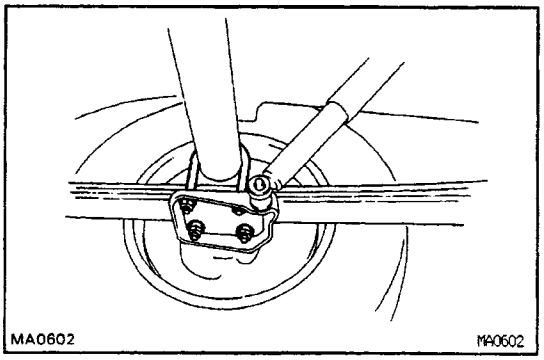
- Seat mounting bolts

Torque: 37 N–m (375 kgf–cm, 27 ft–lbf)



- Strut bar bracket–to –frame mounting bolts (2 WD)

Torque: 52 N–m (530 kgf–cm, 38 ft–lbf)



- Leaf spring U – bolt mounting nuts

Torque:

2WD 0.5 ton 147 N–m (1,500 kgf–cm, 108 ft–lbf)

Others 123 N–m (1,250 kgf–cm, 90 ft–lbf)

Under Severe Conditions:

In addition to the above maintenance items, check for loose or missing bolts and nuts on the following.

- Steering system
- Drive train

- Suspension system
- Fuel tank mounts
- Engine mounts, etc.

30. FINAL INSPECTION

(a) Check operation of body parts:

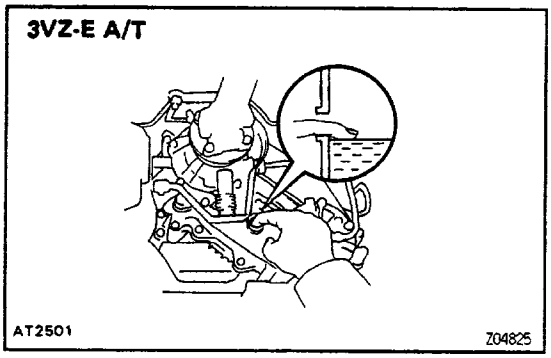
- Hood
  Auxiliary catch operates properly
- Hood locks securely when closed
  Doors
  Door locks operate properly
- Doors close properly
  Seats
- Seat adjusts easily and locks securely in any positions
  Seat backs lock securely at any angle
  Fold–down seat backs lock securely

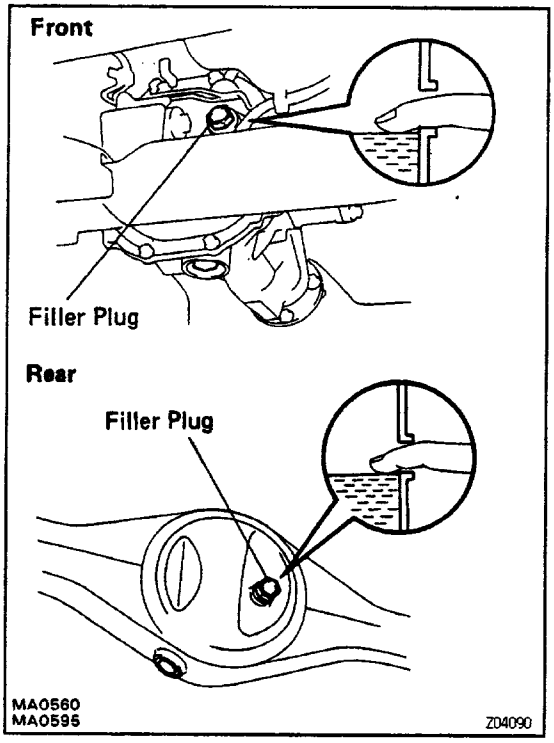
(b) Road test

- Engine and chassis parts do not have abnormal noises.
- Vehicle does not wander or pull to one side.
- Brakes work properly and do not drag.

(c) Be sure to deliver a clean vehicle and especially check:

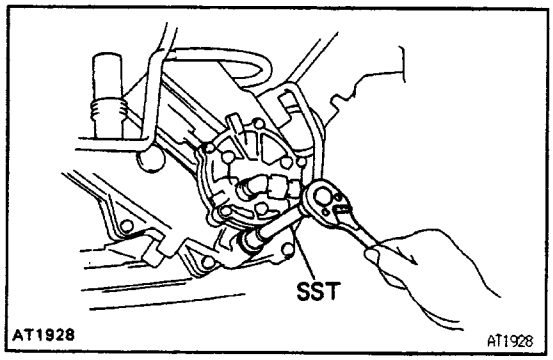
- Steering wheel
- Shift lever knob
- All switch knobs
- Door handles
- Seats





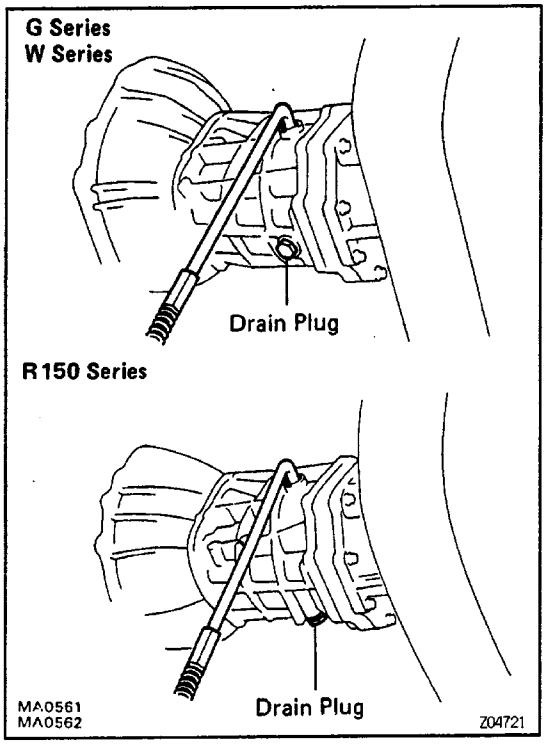
Remove the filler plug and feel inside the hole with your finger. Check that the oil comes to within 5 mm (0.20 in.) of the bottom edge of the hole. If the level is low, add oil until it begins to run out of the filler hole.

Differential oil –
Standard differential
Oil grade:
API GL–5 hypoid gear oil
Viscosity:
Above –18 ° C (0°F) SAE 90
Below –18 ° C (0 ° F) SAE 80W – 90 or 80W
A.D.D.
Oil grade:
Toyota 'GEAR OIL SUPER' oil or hypoid gear oil API GL–5
Viscosity:
SAE 75W–90

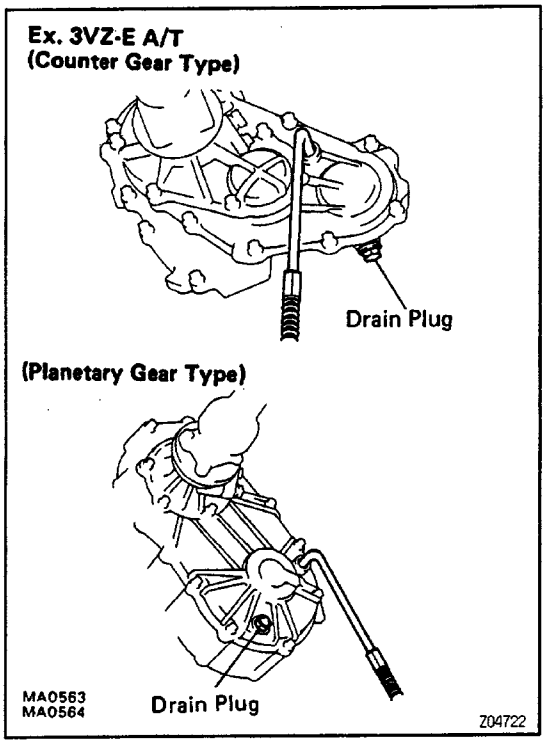


25. REPLACE MANUAL TRANSMISSION. TRANSFER (4 WD) AND DIFFERENTIAL OIL

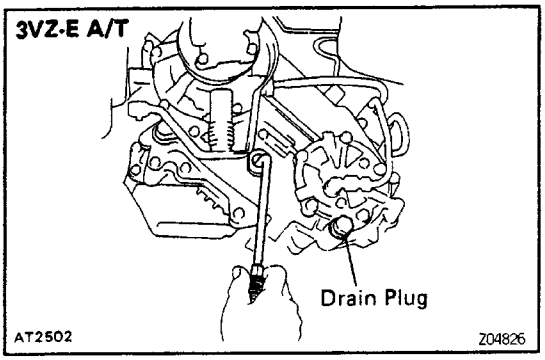
(a) (Transfer)
Remove the transfer cover.
(b) Using SST (A340H Transfer), remove the drain plug and drain the oil.
SST 09043–38100
(c) Reinstall drain plug securely.
(d) Add new oil until it begins to run out of the filler hole.
Oil grade and viscosity:
See pages MA –16 to 18

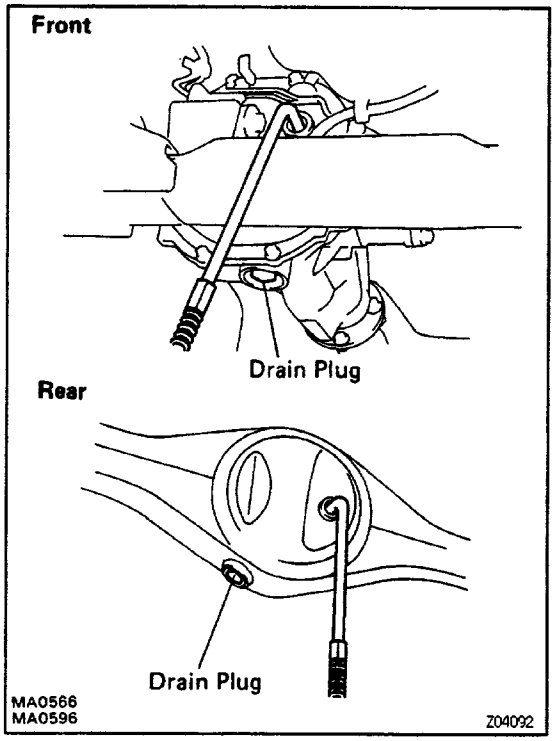


Oil capacity:
Transmission –
2WD
W55 2.6 liters (2.7 US qts, 2.3 Imp. qts)
R150 3.0 liters (3.2 US qts, 2.6 Imp. qts)
4WD
G58 3.9 liters (4.1 US qts, 3.4 Imp. qts)
W56 2.9 liters (3.1 US qts, 2.5 Imp. qts)
RI 50F 3.0 liters (3.2 US qts, 2.6 Imp. qts)

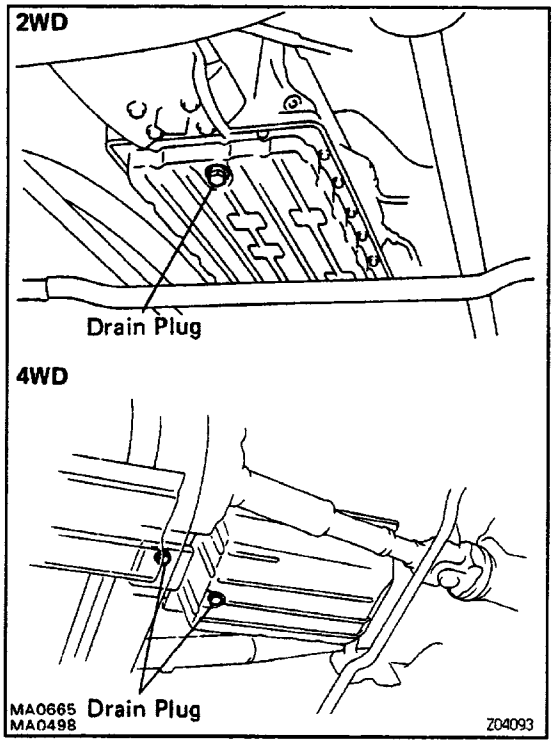


Transfer –
Counter Gear Type
1.6 liters (1.7 US qts, 1.4 Imp. qts)
Planetary Gear Type
1.1 liters (1.2 US qts, 1.0 Imp. qts)
A340H
0.8 liters (0.8 US qts, 0.7 Imp. qts)



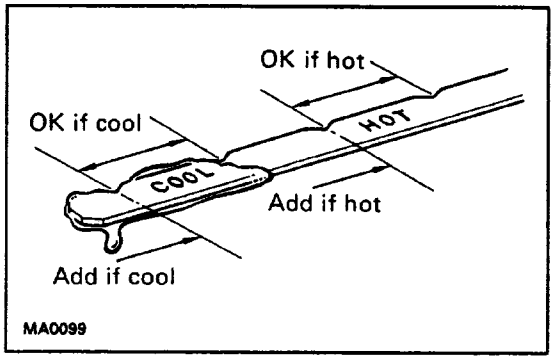


Differential –
2WD
7.5 in. 1.35 liters (1.4 US qts, 1.2 Imp. qts)
8.0 in. 1.8 liters (1.9 US qts, 1.6 Imp. qts)
4WD
Front Standard differential
1.6 liters (1.7 US qts, 1.4 Imp. qts)
A.D.D.
1.86 liters (2.0 US qts, 1.6 Imp. qts)
Rear
2.2 liters 2.3 US qts, 1.9 Imp. qts)



26. REPLACE AUTOMATIC TRANSMISSION FLUID

(a) Remove the drain plug(s) and drain the fluid.
(b) Reinstall the drain plug(s) securely.
(c) With the engine OFF, add new fluid through the dip–stick tube.
Fluid:
ATP DEXRON ® II
Drain and refill capacity:
2WD
A43D 2.4 liters (2.5 US qts, 2.1 Imp. qts)
A340E 1.6 liters (1.7 US qts, 1.4 Imp. qts)
4WD
A340H 4.5 liters (4.8 US qts, 4.0 Imp. qts)
A340F 2.0 liters (2.1 US qts, 1.8 Imp. qts)



(d) Start the engine and shift the selector into ail posi–tions from ”P” through ”L” and then shift into ”P”.
(e) (A340H)
Shift the transfer lever position: H2→H4→L4 and L4 →H4→H2.
(f) With the engine idling, check the fluid level.
Add fluid up to the cool level on the dipstick.

(g) Check that the fluid level is in the ”HOT” range at the normal operating temperature (70 – 80 ° C or 158 – 176 *F) and add as necessary.

NOTICE: Do not overfill.

27. REPACK FRONT WHEEL BEARINGS AND THRUST BUSH

(a) Change the front wheel bearing grease.
(See SA section)

2WD –

Grease grade:
Lithium base multipurpose grease (NLGI No.2)
Wheel bearing friction preload (at starting):
5.9–18N(0.6–1.8kgf,1.3–4.Olbf)

4WD –

Grease grade:
Lithium base multipurpose grease (NLGI No.2)
Wheel bearing friction preload (at starting):
27 – 55 N (2.8 – 5.6 kgf, 6.2 – 12.3 lbf)

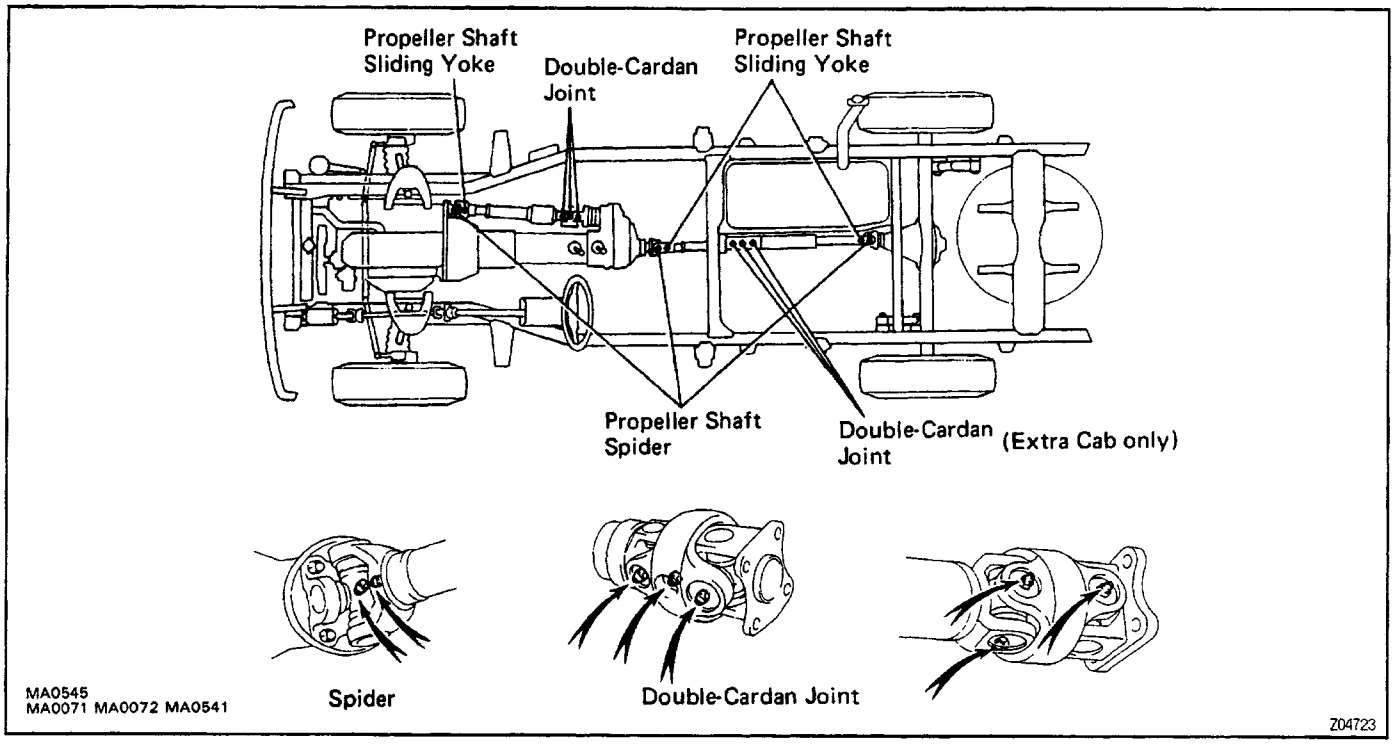
(b) Repack the drive shaft thrust bush grease.
(See SA section)

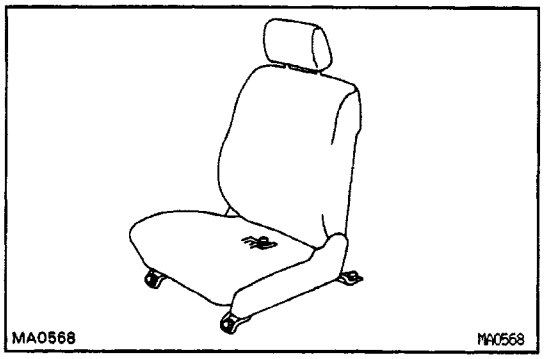
28. (4WD)

LUBRICATE PROPELLER SHAFT

Lubricate propeller shaft, referring to the lubrication chart. Before pumping in grease, wipe off any mud and dust on the grease fitting.

Grease grade:
Propeller shaft (ex. Double–cardan joint) –
Lithium base chassis grease (NLGI No.2)
Double–cardan joint – Molybdenum disulphide
Lithium base chassis grease (NLGI No.2)



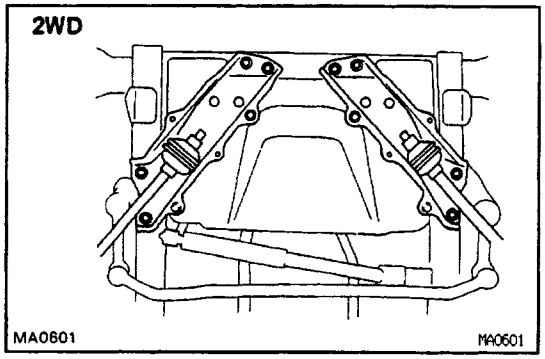


29. TIGHTEN BOLTS AND NUTS ON CHASSIS AND BODY

Tighten the following parts:

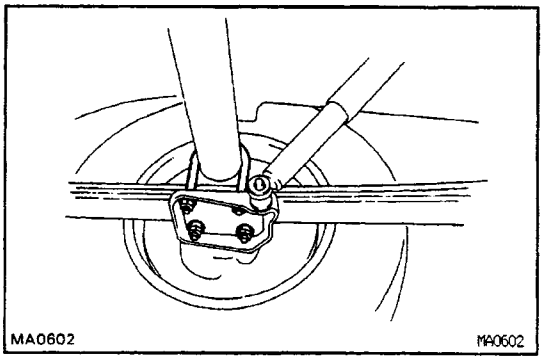
- Seat mounting bolts

Torque: 37 N–m (375 kgf–cm, 27 ft–lbf)



- Strut bar bracket–to –frame mounting bolts (2 WD)

Torque: 52 N–m (530 kgf–cm, 38 ft–lbf)



- Leaf spring U – bolt mounting nuts

Torque:

2WD 0.5 ton 147 N–m (1,500 kgf–cm, 108 ft–lbf)

Others 123 N–m (1,250 kgf–cm, 90 ft–lbf)

Under Severe Conditions:

In addition to the above maintenance items, check for loose or missing bolts and nuts on the following.

- Steering system
- Drive train

- Suspension system
- Fuel tank mounts
- Engine mounts, etc.

30. FINAL INSPECTION

(a) Check operation of body parts:

- Hood
  Auxiliary catch operates properly
- Hood locks securely when closed
  Doors
  Door locks operate properly
- Doors close properly
  Seats
- Seat adjusts easily and locks securely in any positions
  Seat backs lock securely at any angle
  Fold–down seat backs lock securely

(b) Road test

- Engine and chassis parts do not have abnormal noises.
- Vehicle does not wander or pull to one side.
- Brakes work properly and do not drag.

(c) Be sure to deliver a clean vehicle and especially check:

- Steering wheel
- Shift lever knob
- All switch knobs
- Door handles
- Seats

GENERAL MAINTENANCE

These are maintenance and inspection items which are considered to be the owner's responsibility. They can be perfo–rmed by the owner or he can have them done at a service shop. These items in–clude those which should be checked on a daily basis, those which, in most cases, do not require (special) tools and those which are considered to be reasonable for the owner to perform.
Items and procedures for general mainte–nance are as follows.

OUTSIDE VEHICLE

1. TIRES

(a) Check the pressure with a gauge. If nec–essary, adjust.

(b) Check for cuts, damage or excessive wear.

2. WHEEL NUTS

When checking the tires, check the nuts for looseness or for missing nuts. If nec–essary, tighten them.

3. TIRE ROTATION

It is recommended that the tires be rotated every 7,500 miles (12,000 km).

4. WINDSHIELD WIPER BLADES

Check for wear or cracks whenever they do not wipe clean. If necessary, replace.

5. FLUID LEAKS

(a) Check underneath for leaking fuel, oil, water or other fluid.

(b) If you smell gasoline fumes or notice any leak, have the cause found and corrected.

6. DOORS AND ENGINE HOOD

(a) Check that all doors and the tailgate op–erate smoothly, and that all latches lock securely.

(b) Check that the engine hood secondary latch secures the hood from opening when the primary latch is released.

INSIDE VEHICLE

7. LIGHTS

a) Check that the headlights, stop lights, tai–llights, turn signal lights, and other lights are all working.

(b) Check the headlight aim.

8. WARNING LIGHTS AND BUZZERS

Check that all warning lights and buzzers function properly.

9. HORN

Check that it is working.

10. WINDSHIELD GLASS

Check for scratches, pits or abrasions.

11. WINDSHIELD WIPER AND WASHER

(a) Check operation of the wipers and washer.

(b) Check that the wipers do not streak.

12. WINDSHIELD DEFROSTER

Check that air comes out from the de–froster outlet when operating the heater or air conditioner.

13. REAR VIEW MIRROR

Check that it is mounted securely.

14. SUN VISORS

Check that they move freely and are mounted securely.

15. STEERING WHEEL

Check that it has specified freeplay. Be alert for changes in steering condition, such as hard steering, excessive freeplay or strange noise.

16. SEATS

(a) Check that the seat adjusters operate smoothly.

(b) Check that all latches lock securely in any position.

(c) Check that the head restraints move up and down smoothly and that the locks hold securely in any latched position.

(d) For fold–down seat backs, check that the latches lock securely.

17. SEAT BELTS

(a) Check that the seat belt system such as the buckles, retractors and anchors oper–ate properly and smoothly.

(b) Check that the belt webbing is not cut, frayed, worn or damaged.

18. ACCELERATOR PEDAL

Check the pedal for smooth operation and uneven pedal effort or catching.

19. CLUTCH PEDAL (See CL section)

Check the pedal for smooth operation.
Check that the pedal has the proper freeplay.

20. BRAKE PEDAL (See BR section)
    (a) Check the pedal for smooth operation.
    (b) Check that the pedal has the proper re–serve distance and freepla^.
    (c) Check the brake booster function.

21. BRAKES

At a safe place, check that the brakes do not pull to one side when applied.

22. PARKING BRAKE (See BR section)
    (a) Check that the lever has the proper travel.
    (b) On a safe incline, check that the vehicle is held securely with only the parking brake applied.

23. AUTOMATIC TRANSMISSION ”PARK” MECHANISM

    (a) Check the lock release button of the se–lector lever for proper and smooth opera–tion.
    (b) On a safe incline, check that the vehicle is held securely with the selector lever in ”P” position and all brakes released.

UNDER HOOD

24. WINDSHIELD WASHER FLUID

Check that there is sufficient fluid in the tank.

25. ENGINE COOLANT LEVEL

Check that the coolant level is between the ”FULL” and ”LOW” lines on the see–through reservoir:

26. RADIATOR AND HOSES

    (a) Check that the front of the radiator is clean and not blocked with leaves, dirt or bugs.
    (b) Check the hoses for cracks, kinks, rot or loose connections.

27. BATTERY ELECTROLYTE LEVEL

Check that the electrolyte level of all bat–tery cells is between the upper and lower level lines on the case. If level is low, add distilled water only.

28. BRAKE AND CLUTCH FLUID LEVELS

Check that the brake and clutch fluid levels are near the upper level line on the see–through reservoirs.

29. ENGINE DRIVE BELTS

Check all drive belts for fraying, cracks, wear or oiliness.

30. ENGINE OIL LEVEL

Check the level on the dipstick with the engine turned off.

31. POWER STEERING FLUID LEVEL

Check the level on the dipstick.
The level should be in the ”HOT” or ”COLD” range depending on the fluid temperature.

32. AUTOMATIC TRANSMISSION FLUID LEVEL

    (a) Park the vehicle on a level surface.
    (b) With the engine idling and the parking brake applied, shift the selector into all positions from ”P” to ”L”, and then shift into ”P”.
    (c) Pull out the dipstick and wipe off the fluid with a clean rag. Re–insert the dipstick and check that the fluid level is in the HOT range.
    (d) Perform this check with the fluid at normal driving temperature (70 – 80 ° C or 158 – 176 ° F).

HINT: Wait until the engine cools down (approx. 30 min.) before checking the fluid level after extended driving at high speeds, in hot weather, in heavy traffic or pulling a trailer.

33. EXHAUST SYSTEM

Visually inspect for cracks, holes or loose supports.
If any change in the sound of the exhaust or smell of the exhaust fumes is noticed, have the cause located and corrected.

PROPELLER SHAFT

PRECAUTIONS

Be careful not to grip the propeller shaft tube too tightly in the vise as this will cause deformation.

TROUBLESHOOTING

You will find the cause of trouble more easily by properly using the table shown below. In this table, the numbers indicate the priority of the probable cause of trouble. Check each part in the order shown. If necessary, repair or replace the part.

See Page / Parts Name / Trouble	Sleeve yoke spline worn	Center bearing worn	Propeller shaft runout	Propeller shaft imbalance	Sleeve yoke spline stuck	Spider bearing worn or stuck	Transmission extension housing rear bushing worn
See Page	PR–7 PR–9	PR–8	PR–8	PR–8	PR–7 PR–9	PR–9	(G 58, R 150, R150F) MT–91 (W55, W56) MT–40
Noise	2	1				3	
Vibration			3	4	2		1

V00647

PRECAUTIONS

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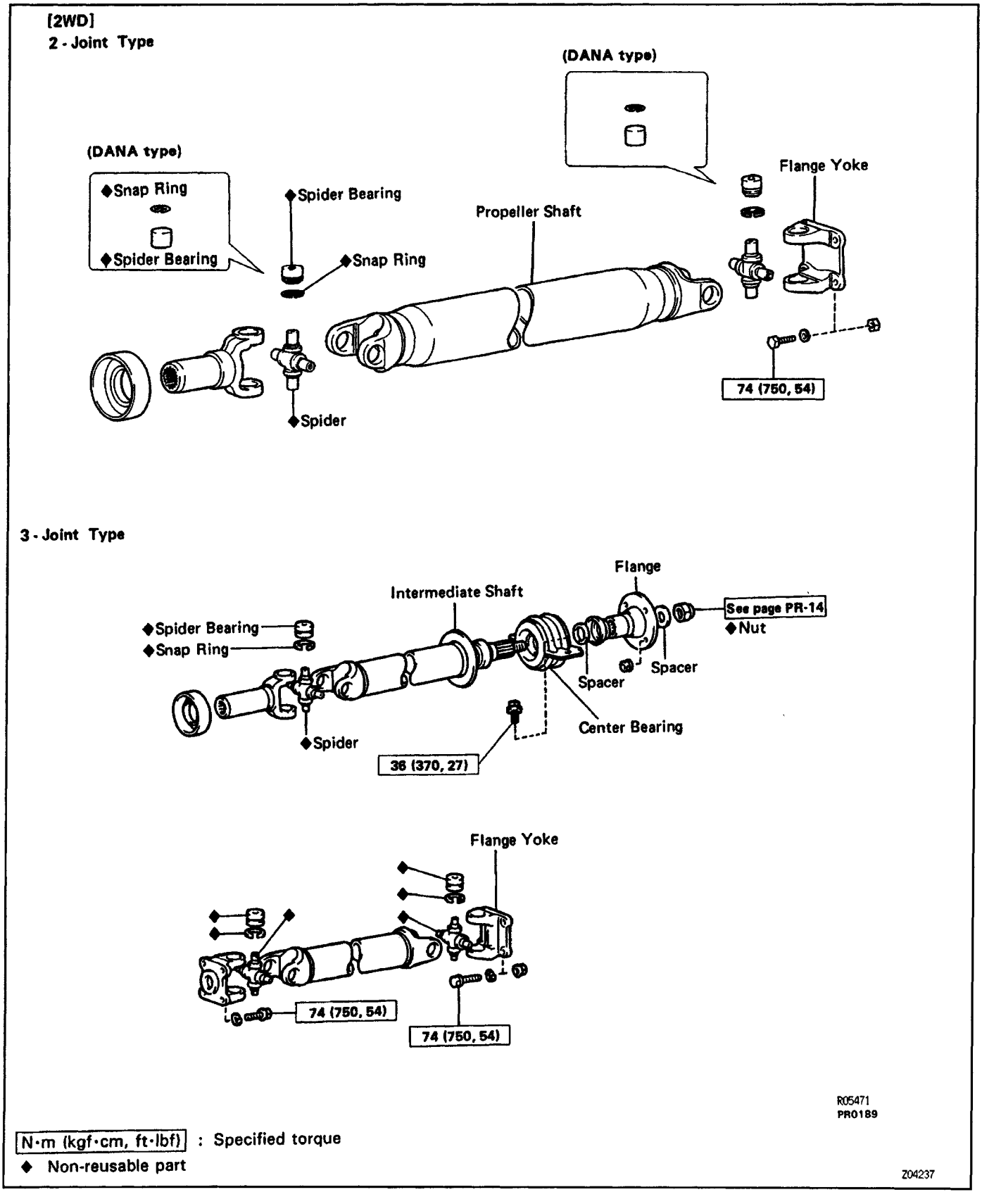
Noise	2	1				3	
Vibration			3	4	2		1

V00647

PROPELLER SHAFT

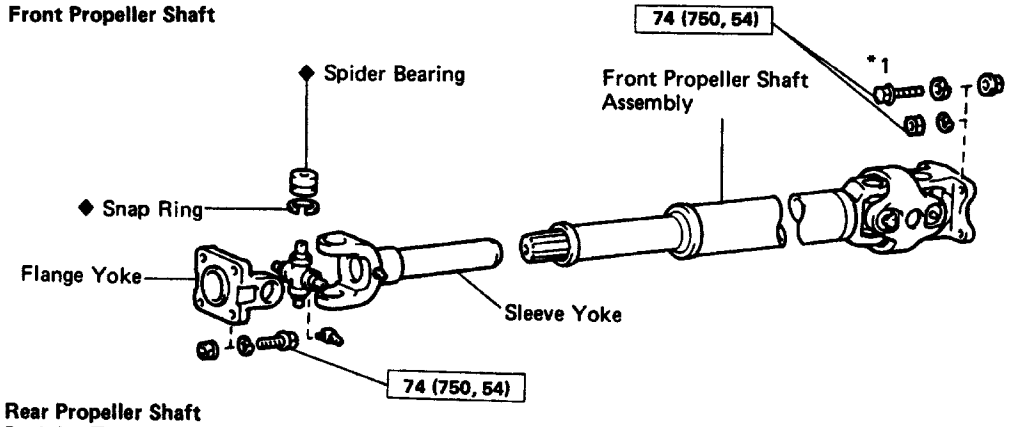
PR020–01

COMPONENTS

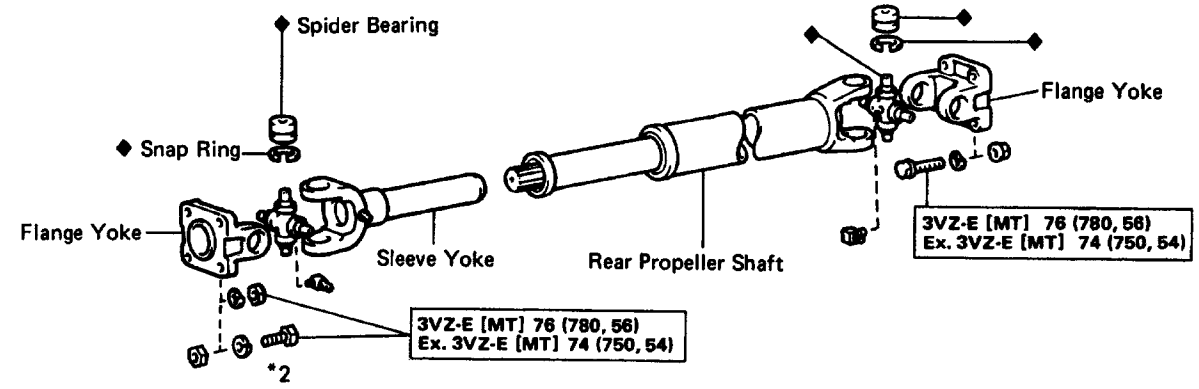


[4WD]

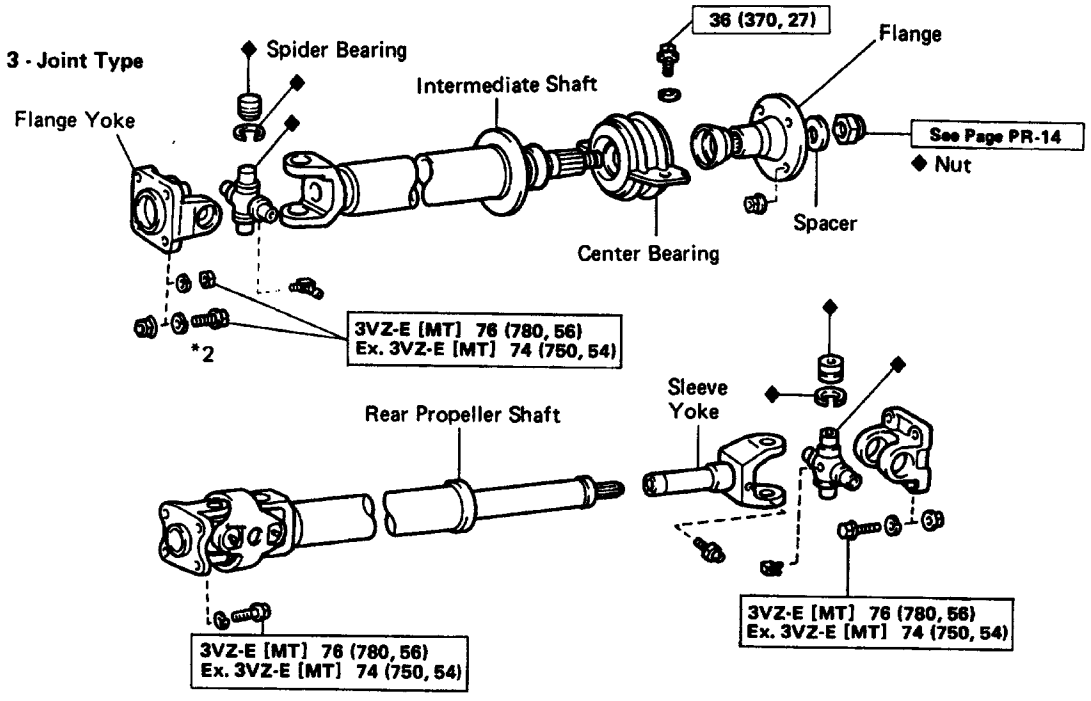
Front Propeller Shaft



Rear Propeller Shaft
2 - Joint Type



3 - Joint Type



PR0275
PR0276
PR0277

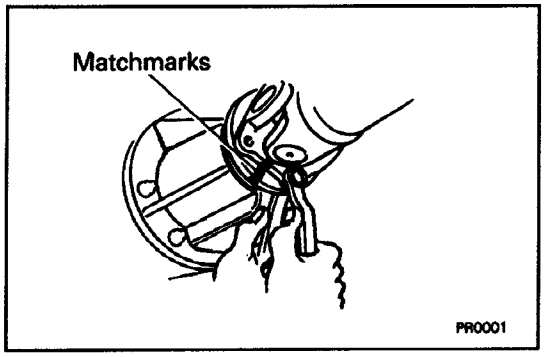
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

*1: w/ RF1A Type Transfer
*2: w/ RF1A Type Transfer and A340H Automatic Transmission

Z04238

PR021–01

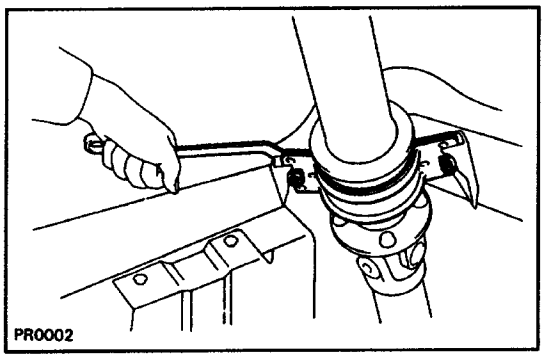
PROPELLER SHAFT REMOVAL (2WD)



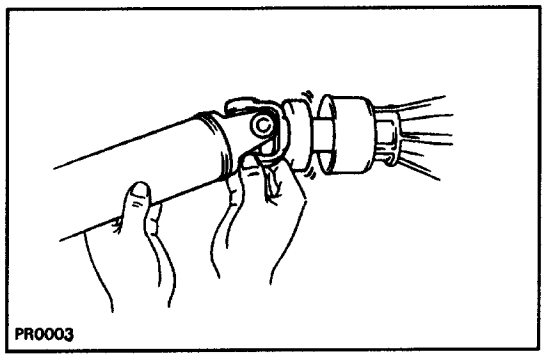
1. DISCONNECT PROPELLER SHAFT FLANGE FROM COMPANION FLANGE ON DIFFERENTIAL

(a) Put matchmarks on the flanges.

(b) Remove the four and nuts.

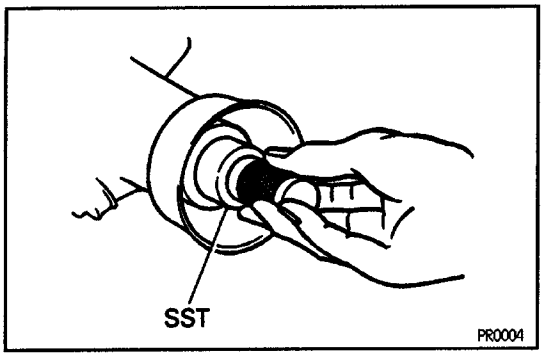


2. REMOVE CENTER SUPPORT BEARING FROM FRAME CROSSMEMBER (3–JOINT TYPE)



3. REMOVE PROPELLER SHAFT FROM TRANSMIS–SION

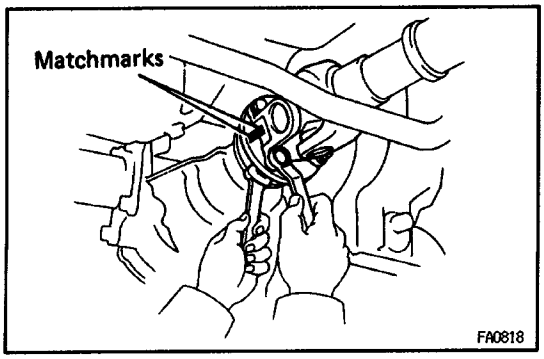
(a) Pull the yoke from the transmission.



(b) Insert SST in the transmission to prevent oil leakage.
SST 09325–20010 (22R–E engine)
09325–40010 (3VZ–E engine)

PR022–01

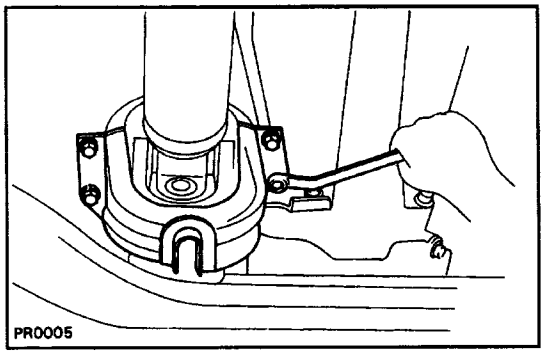
PROPELLER SHAFT REMOVAL (4WD)



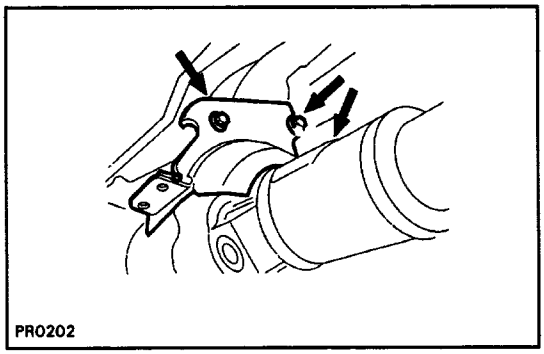
1. DISCONNECT PROPELLER SHAFT FLANGE FROM COMPANION FLANGE ON FRONT DIFFERENTIAL

(a) Put matchmarks on the flanges.

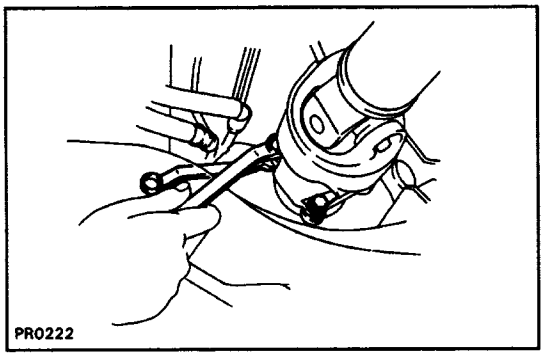
(b) Remove the four bolts and nuts.



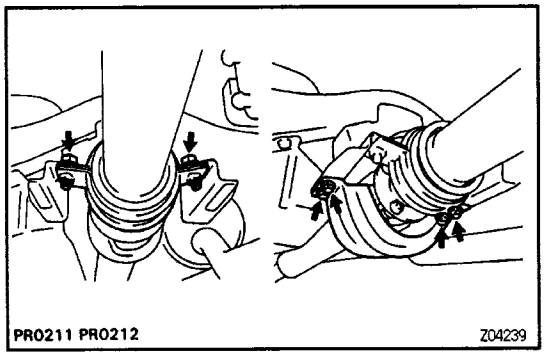
2. REMOVE FRONT PROPELLER SHAFT NO.2 DUST COVER
(W/RF1 A Type Transfer)
Remove the two bolts and two nuts and cover.
(w/VF1 A Type Transfer and A340H)
Remove the four bolts and cover.



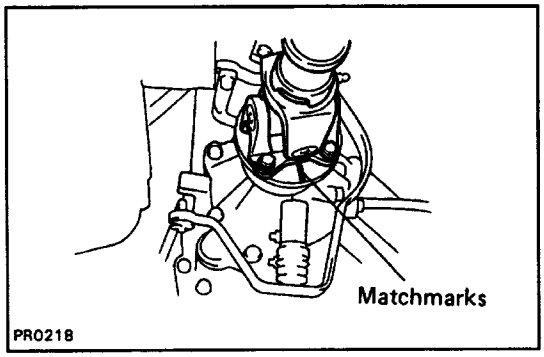
3. REMOVE FRONT PROPELLER SHAFT DUST COVER SUBASSEMBLY
(w/VF1 a Type Transfer and A340H)
Remove the three bolts and cover.



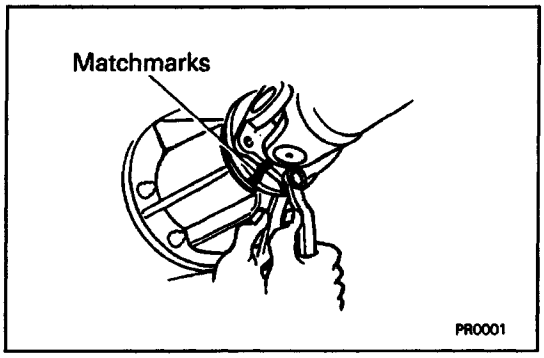
4. REMOVE FRONT PROPELLER SHAFT
(a) Suspend the front side of the propeller shaft.
(b) Put matchmarks on the flanges.
(c) Remove the four nuts or four bolts and nuts.
(d) Remove the front propeller shaft.



5. REMOVE CENTER SUPPORT BEARING FROM FRAME CROSSMEMBER
(3–JOINT TYPE)
(a) Remove propeller shaft protector set bolts and propeller shaft protector.
(b) Remove center support bearing mount bolts.

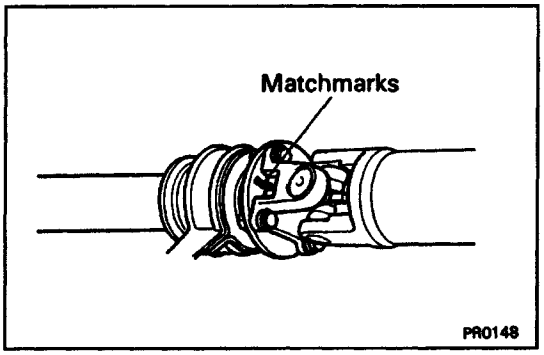


6. DISCONNECT PROPELLER SHAFT FLANGE FROM COMPANION FLANGE ON TRANSFER
(a) Put matchmarks on the flanges.
(b) Remove the four bolts and nuts or four nuts.



7. REMOVE REAR PROPELLER SHAFT

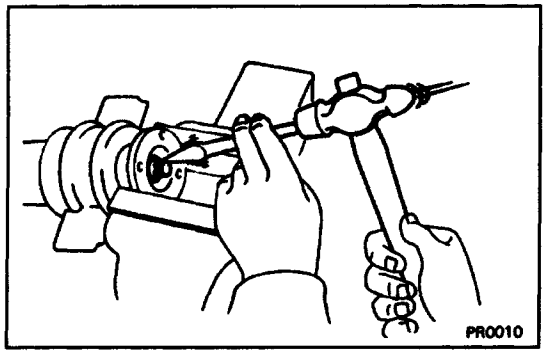
(a) Put matchmarks on the flanges.
(b) Remove the four and nuts.
(c) Remove the rear propeller shaft.



PROPELLER SHAFT DISASSEMBLY PR023-01

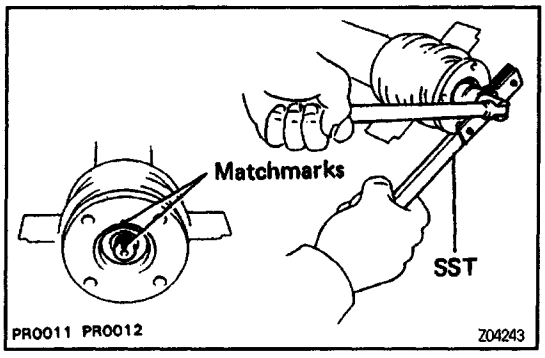
1. SEPARATE PROPELLER SHAFT AND INTERMEDIATE SHAFT

(a) Put matchmarks on the flanges.
(b) Remove the four bolts and nuts.

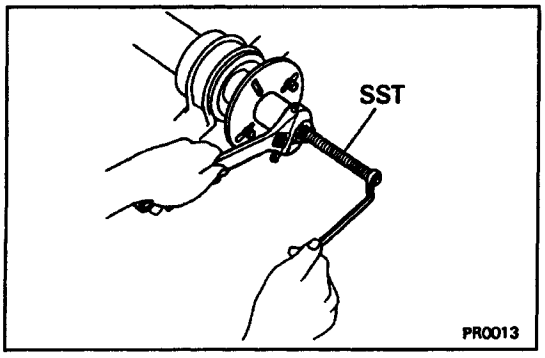


2. REMOVE CENTER SUPPORT BEARING FROM INTERMEDIATE SHAFT

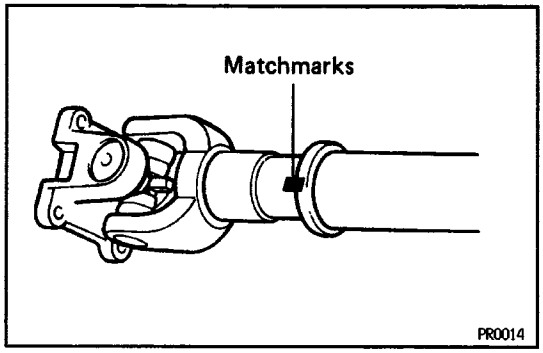
(a) Using a hammer and chisel, loosen the staked part of the nut.



(b) Using SST to hold the flange, remove the nut.
SST 09930–00021
(c) Put matchmarks on the flange and shaft.

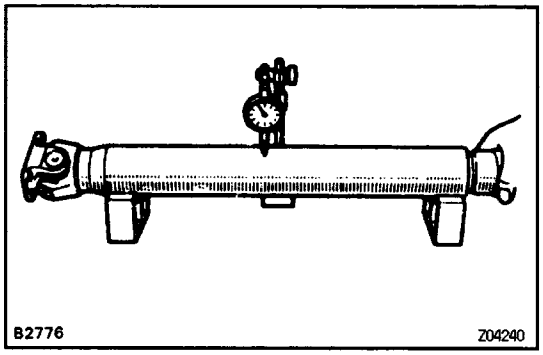


(d) Using SST, remove the flange from the intermediate shaft.
SST 09557–22022 (09557–22030)



3. REMOVE SLEEVE YOKE FROM PROPELLER SHAFT (4WD)

(a) Place matchmarks on the sleeve yoke and shaft.
(b) Pull out the sleeve yoke from the shaft.



PROPELLER SHAFT INSPECTION COMPONENTS

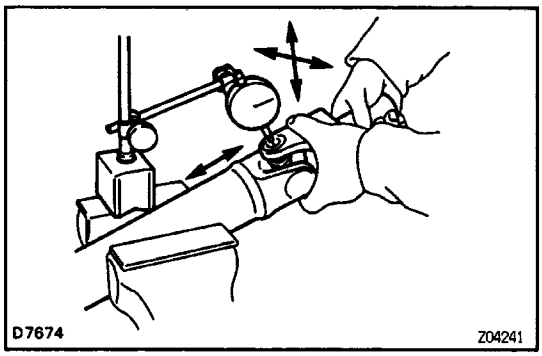
PR624–01

1. INSPECT PROPELLER AND INTERMEDIATE SHAFTS FOR DAMAGE OR RUNOUT

If shaft runout is greater than maximum, replace the shaft.

Maximum runout:

0.8 mm (0.031 in.)



2. INSPECT SPIDER BEARINGS

(a) Inspect the spider bearings for wear or damage.
(b) Check the spider bearing axial play by turning the yoke while holding the shaft tightly.

Bearing axial play:

w/o double cardan joint propeller shaft

Less than 0.05 mm (0.0020 in.)

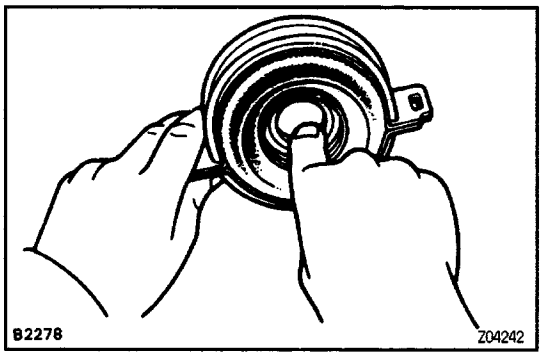
If necessary, replace the spider bearing.

Bearing axial play:

w/ double cardan joint propeller shaft

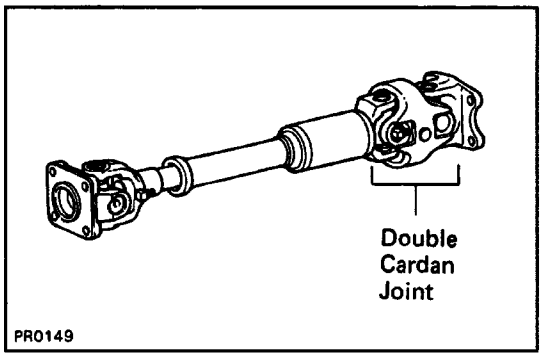
Less than 0.05 mm (0.0020 in.)

If necessary, replace the propeller shaft.



3. INSPECT CENTER SUPPORT BEARING FOR WEAR OR DAMAGE

Check that the bearing turns freely.
If the bearing is damaged, worn, or does not turn freely, replace it.



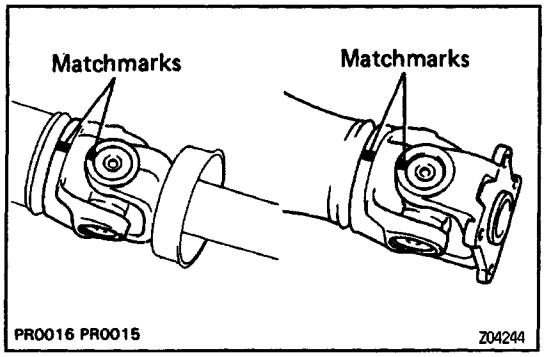
4. INSPECT WITH DOUBLE CARDAN JOINT PROPEL–LER SHAFT

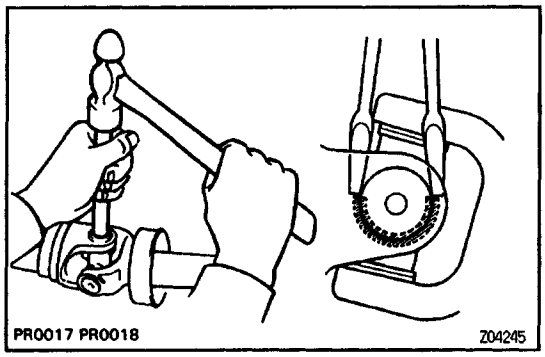
(a) Inspect the shaft for wear or damage.
(b) Inspect the double cardan joint for wear or damage.
If any problem is found replace the propeller shaft assembly.
HINT: Front propeller shaft and 4WD three joint type rear propeller shafts.

PR025–01

SPIDER BEARING REPLACEMENT

1. PLACE MATCHMARKS ON SHAFT AND YOKE



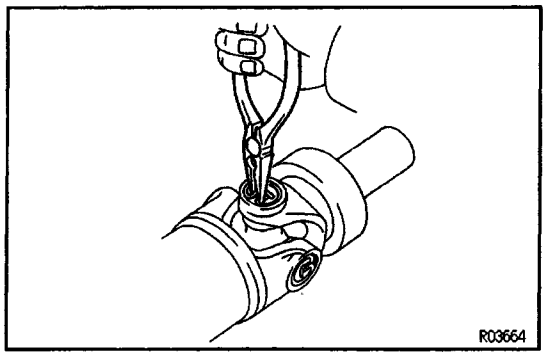


2. REMOVE SNAP RINGS

(TOYOTA type)

(a) Slightly tap in the bearing outer races.

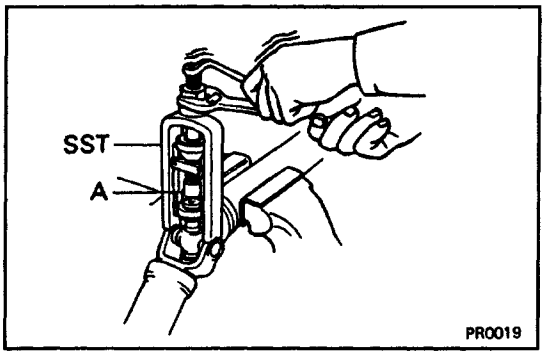
(b) Using two screwdrivers, remove the four snap rings from the grooves.



(DANA type)

(a) Slightly tap in the bearing outer races.

(b) Using snap ring pliers, remove the four snap rings from the grooves.

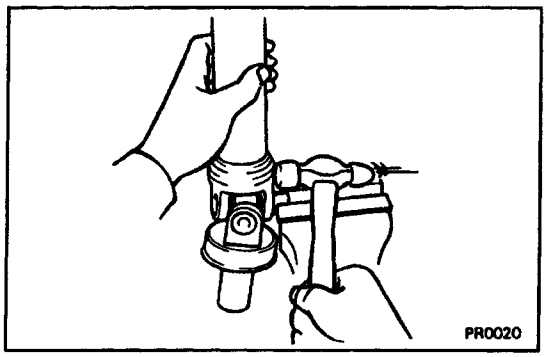


3. REMOVE SPIDER BEARINGS

(a) Using SST, push out the bearing from the propeller shaft.

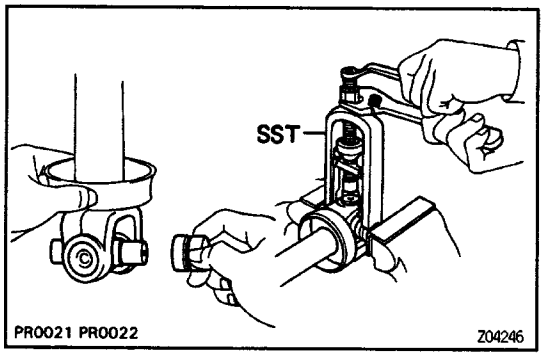
SST 09332–25010

HINT: Sufficiently raise the part indicated by A so that it does not come into contact with the bearing.

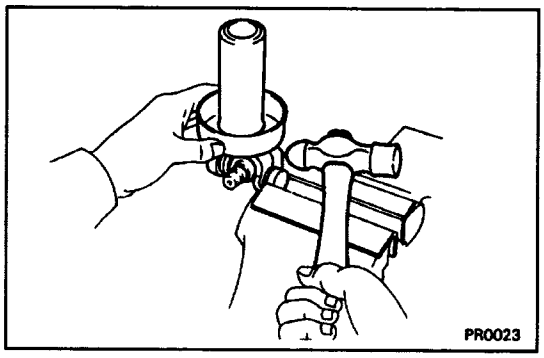


(b) Clamp the bearing outer race in a vise and tap off the propeller shaft with a hammer.

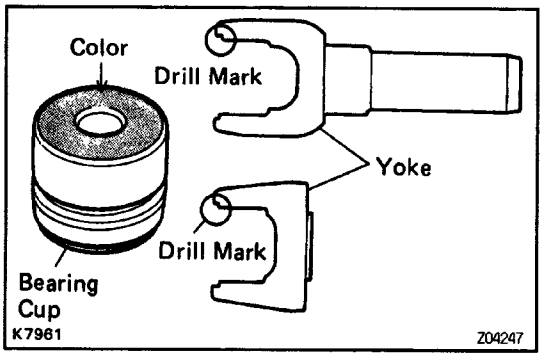
HINT: Remove the bearing on opposite side in the same procedure.



(c) Install the two removed bearing outer races to the spider.
(d) Using SST, push out the bearing from the yoke.
SST 09332 – 25010

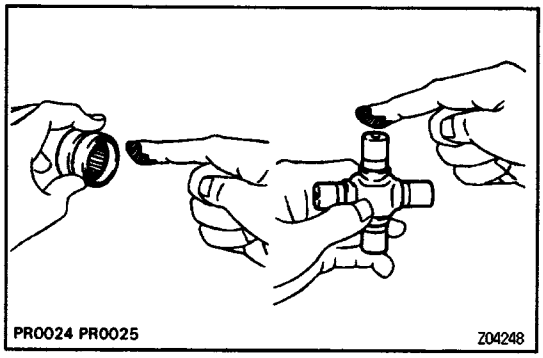


(e) Clamp the outer bearing race in a vise and tap off the yoke with a hammer.
HINT: Remove the bearing on the opposite side in the same procedure.

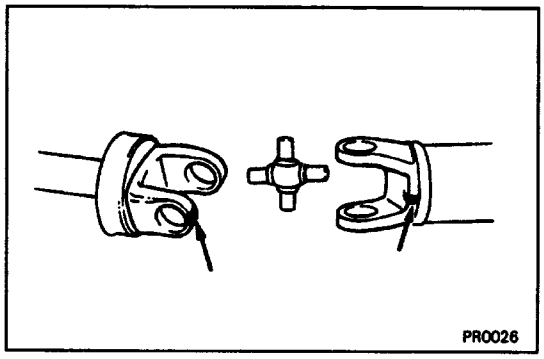


4. SELECT THE SPIDER BEARING
Select the bearing according to whether or not there is a drill mark on the yoke section.

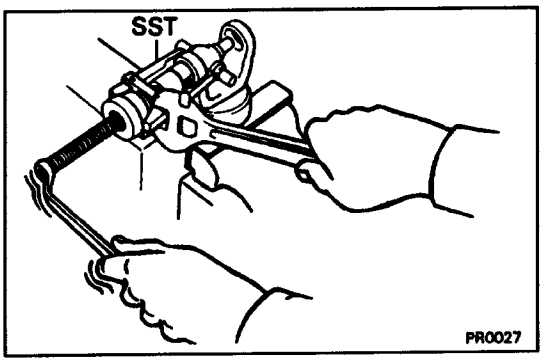
Yoke	Bearing
With drill mark	With color mark (Red)
No drill mark	No color mark



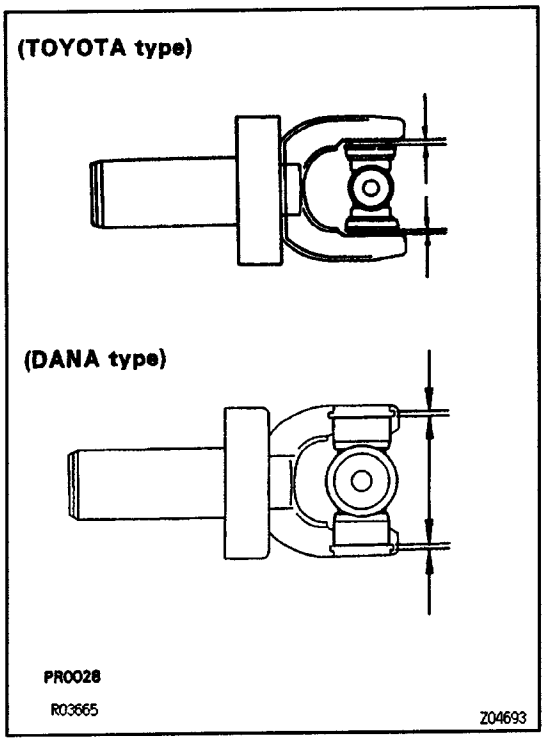
5. INSTALL SPIDER BEARINGS
(a) Apply MP grease to the spider and bearings.
HINT: Be careful not to apply too much grease.



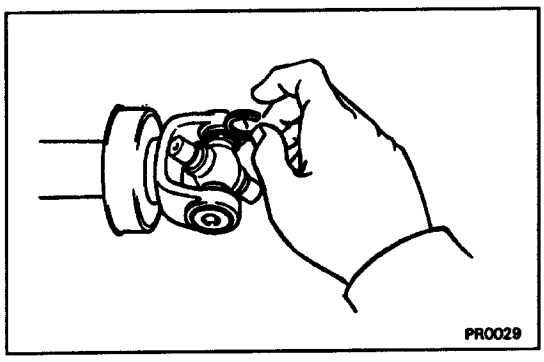
(b) Align the matchmarks on the yoke and shaft.



(c) Fit the new spider into the yoke.
(d) Using SST, install the new bearings on the spider.
SST 09332–25010



(e) Using SST, adjust both bearings so that the snap ring grooves are at maximum and equal widths.



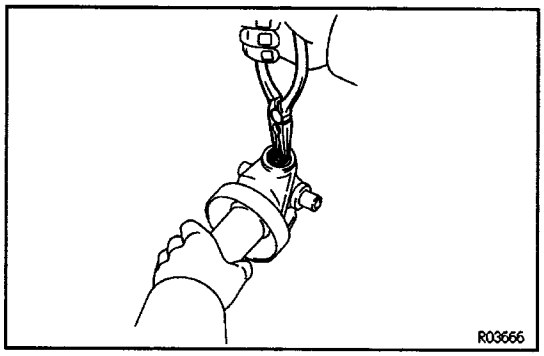
6. INSTALL SNAP RINGS

(a) Install two snap rings of equal thickness which will allow 0–0.05 mm (0–0.0020 in.) axial play.
HINT: Do not reuse the snap rings.

(TOYOTA type)

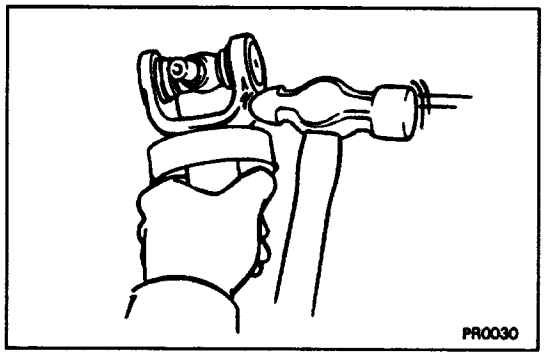
Color	Mark	Thickness mm (in.)
–	1	2.100 – 2.150 (0.0827 – 0.0846)
–	2	2.150 – 2.200 (0.0846 – 0.0866)
–	3	2.200 – 2.250 (0.0866 – 0.0886)
Brown	–	2.250 – 2.300 (0.0886 – 0.0906)
Blue	–	2.300 – 2.350 (0.0906 – 0.0925)
–	6	2.350 – 2.400 (0.0925 – 0.0945)
–	7	2.400 – 2.450 (0.0945 – 0.0965)
–	8	2.450 – 2.500 (0.0965 – 0.0984)

V01997

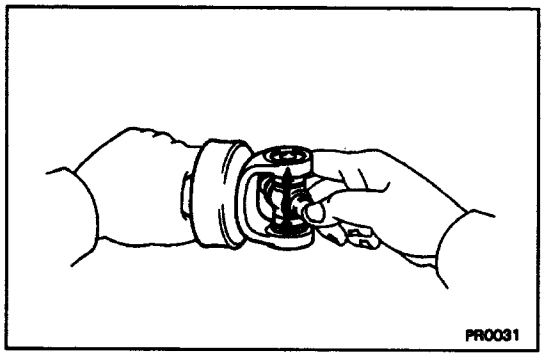


(DANA type)

Color	Thickness mm (in.)
Blue	**1.638 (0.0645)**
Yellow	**1.588 (0.0625)**
Silver	**1.537 (0.0605)**
Copper	**1.511 (0.0595)**
Black	**1.486 (0.0585)**
Red	**1.435 (0.0565)**
Green	**1.384 (0.0545)**



(b) Using a hammer, tap the yoke until there is no clearance between the bearing outer race and snap ring.



7. CHECK SPIDER BEARING

(a) Check that the spider bearing moves smoothly.

(b) Check the spider bearing axial play.

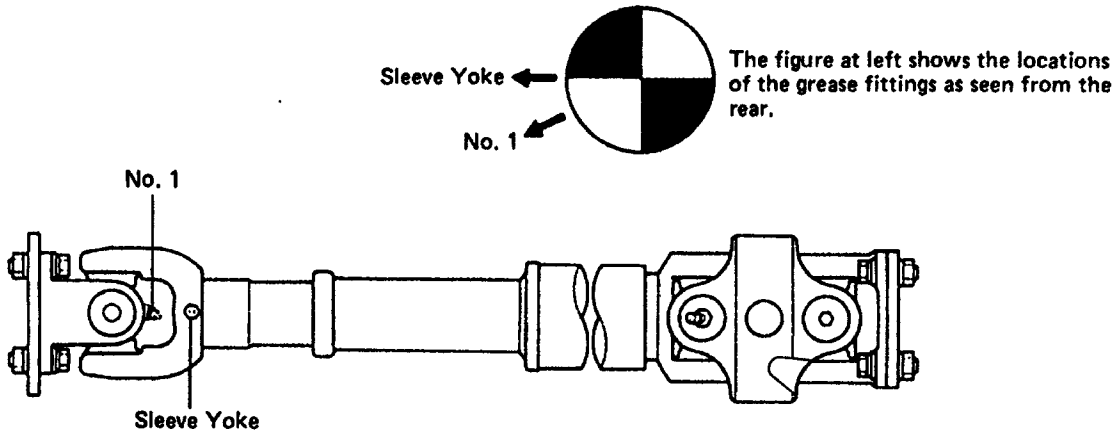
Bearing axial play:

Less than 0.05 mm (0.020 in.)

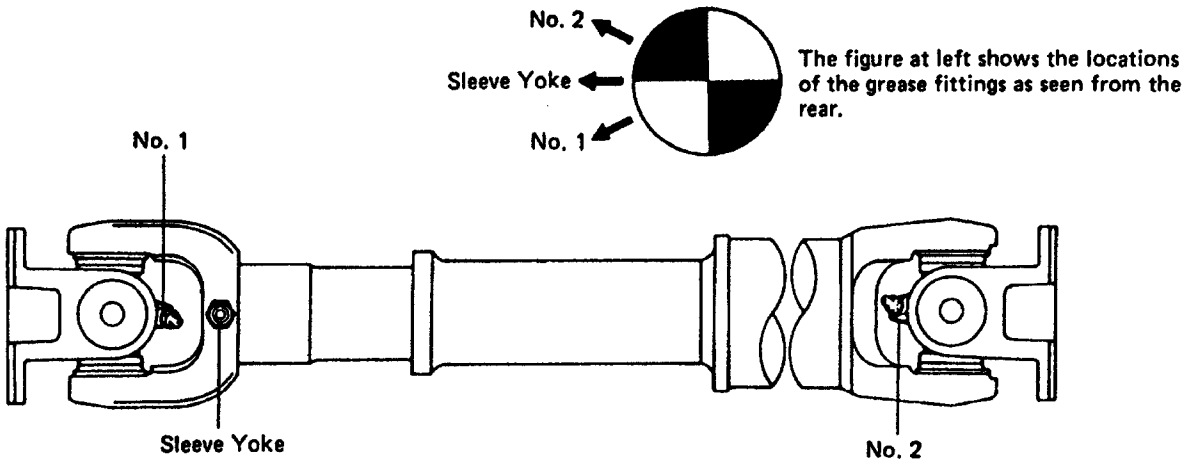
HINT: Install new spider bearings on the shaft side in the procedure described above.

HINT: When replacing the rear propeller shaft spider on 4WD vehicles, be sure that the grease fitting assembly hole is facing in the direction shown in the figure.

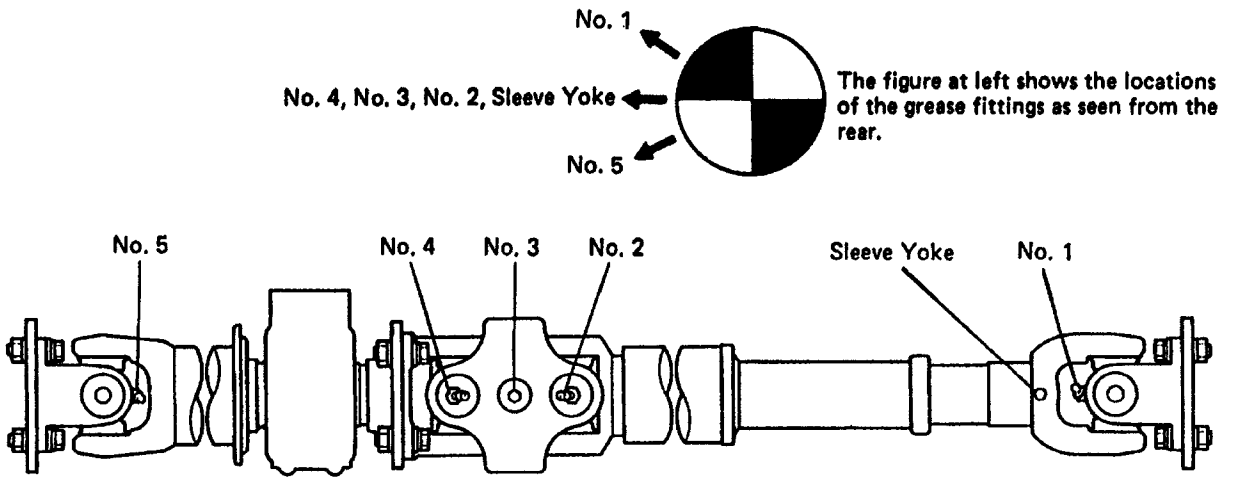
SPIDER GREASE FITTING ASSEMBLY DIRECTION FOR 4WD FRONT PROPELLER SHAFT



SPIDER GREASE FITTING ASSEMBLY DIRECTION FOR 4WD REAR PROPELLER SHAFT (2-JOINT TYPE)



SPIDER GREASE FITTING ASSEMBLY DIRECTION FOR 4WD REAR PROPELLER SHAFT (3-JOINT TYPE)



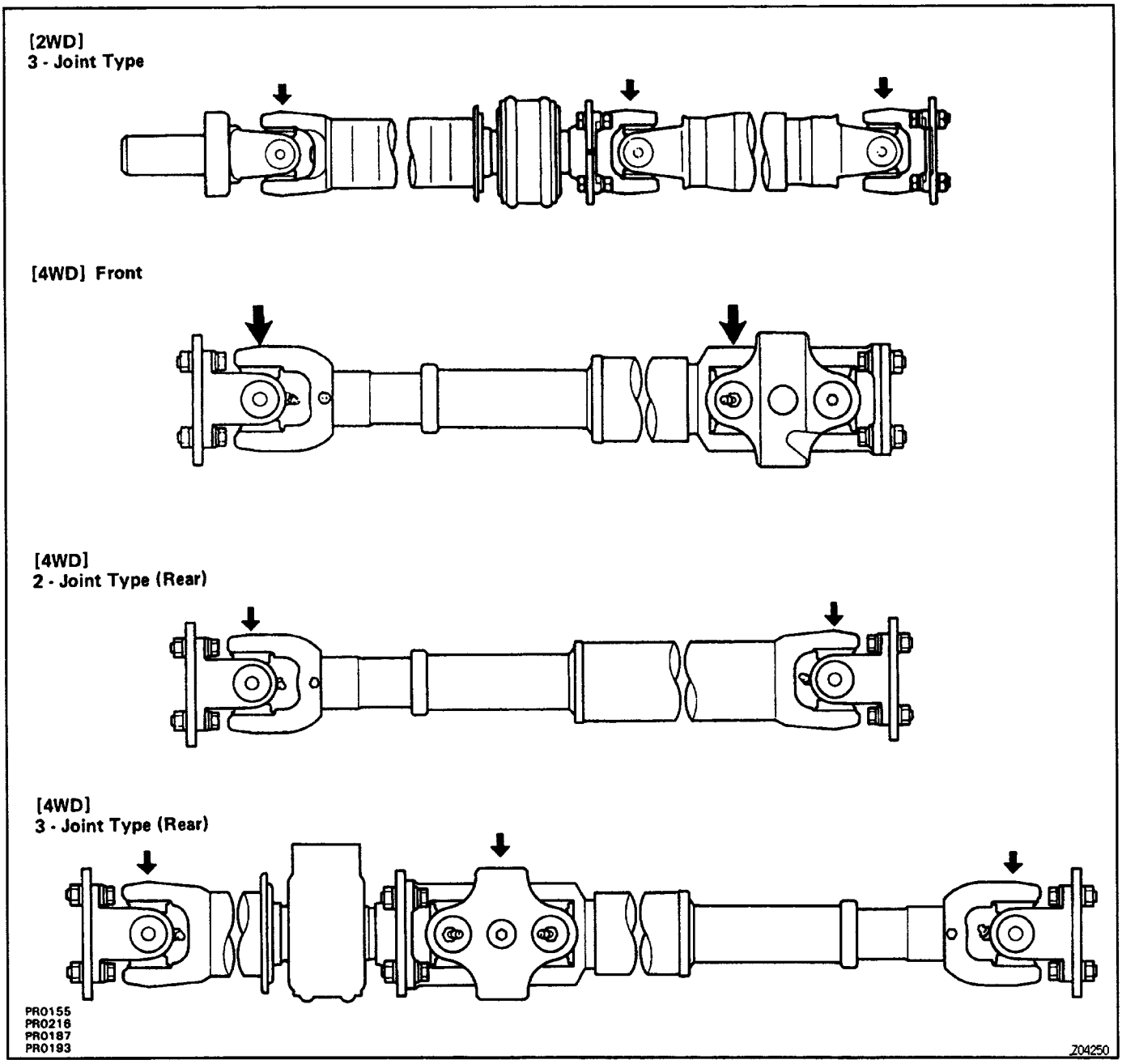
PR0216
PR0194
PR0193

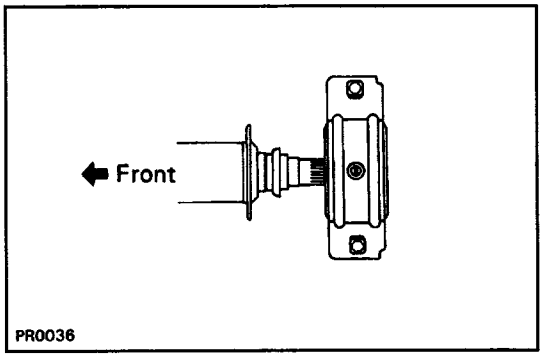
Z04249

PR026–01

PROPELLER SHAFT ASSEMBLY

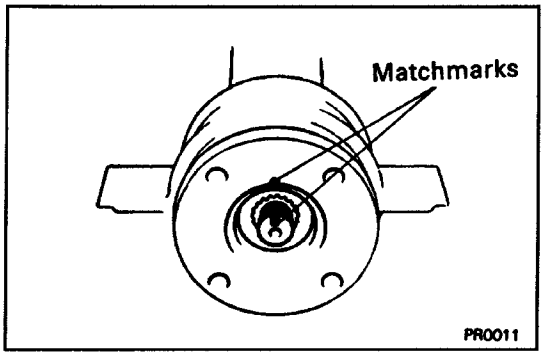
HINT: When replacing the propeller shaft, install the new parts facing as shown in the illustration.





1. INSTALL CENTER SUPPORT BEARING ON INTER–MEDIATE SHAFT

HINT: Install the center support bearing with the cutout toward the rear.



2. INSTALL FLANGE ON INTERMEDIATE SHAFT

(a) Coat the splines of the intermediate shaft with MP grease.

(b) Place the flange on the shaft and align the match–marks.

HINT: If replacing either the center flange or inter–mediate shaft, reassemble them so that the front yoke of the intermediate shaft and the rear yoke of the propeller shaft are facing in the same direction.

(c) Using SST to hold the flange, press the bearing into position by tightening down a new nut.

SST 09930–00021

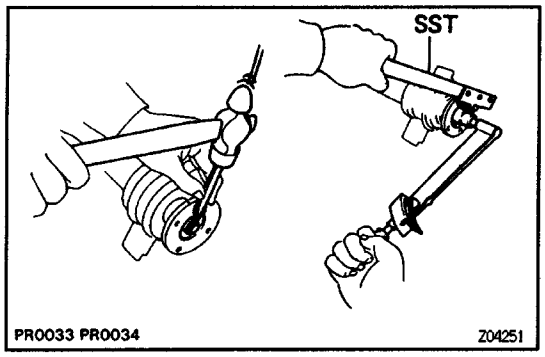
Torque: 181 N–m (1,850 kgf–cm. 134 ft–lbf)

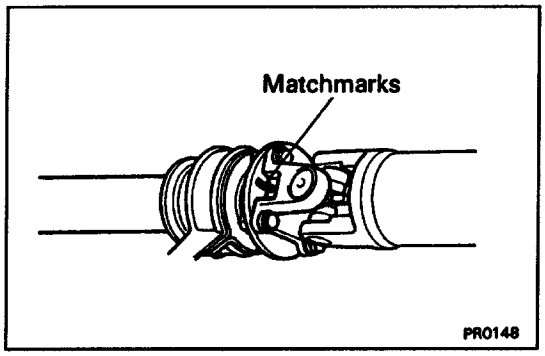
(d) Loosen the nut.

(e) Torque the nut again.

Torque: 69 N–m (700 kgf–cm, 51 ft–lbf)

(f) Using a hammer and punch, stake the nut.





3. INSTALL PROPELLER SHAFT

(a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.

HINT: If replacing either the center flange or inter–mediate shaft, reassemble them so that the front yoke of the intermediate shaft and the rear yoke of the propeller shaft are facing in the same direction.

(d) Torque the bolts and nuts.

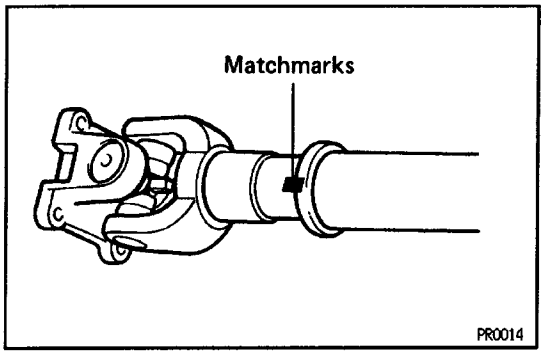
Torque:

4WD 3–joint Type 3VZ–E [MT]

76 N–m (780 kgf–cm, 56 ft–lbf)

Others

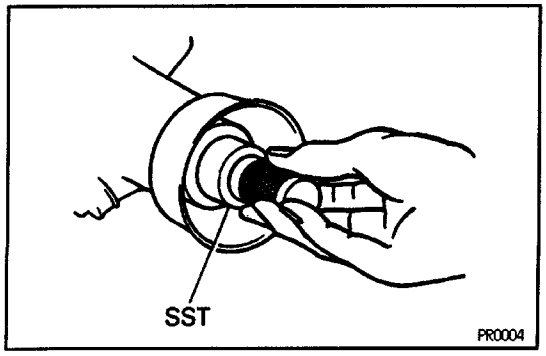
74 N–m (750 kgf–cm, 54 ft–lbf)



4. INSERT SLEEVE YOKE INTO PROPELLER SHAFT (4 WD)

(a) Apply Mp grease to the propeller shaft spline and sleeve yoke sliding surface.

(b) Align the matchmarks on the yoke and propeller shaft.

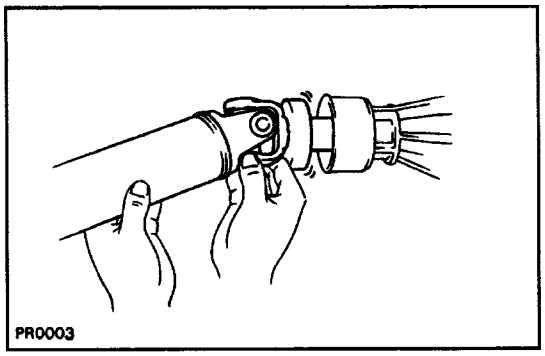


PROPELLER SHAFT INSTALLATION (2WD) PR027–01

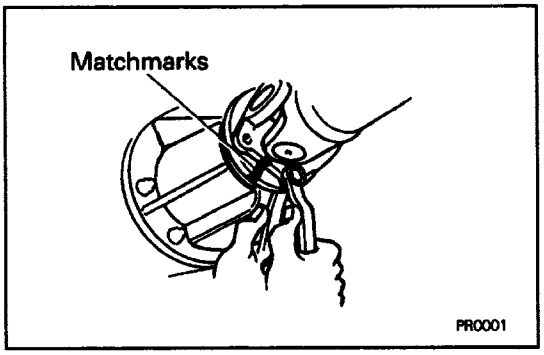
1. INSERT YOKE IN TRANSMISSION

(a) Remove SST.

SST 09325–20010 or 09325–40010


PR0003

(b) Push the yoke into the transmission.



PR0001

2. CONNECT PROPELLER SHAFT FLANGE TO CON–PANION FLANGE ON DIFFERENTIAL

(a) Align the matchmarks on the flanges with four bolts and nuts.

(b) Torque the bolts and nuts.

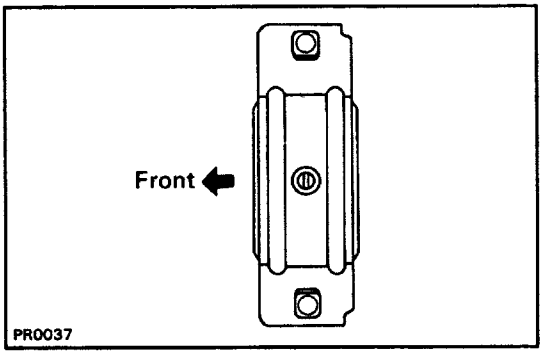
Torque:

4WD 3VZ–E [MT]

76 N–m (780 kgf–cm, 56 ft–lbf)

Ex. 4WD 3VZ–E [MT]

74 N–m (750 kgf–cm, 54 ft–lbf)



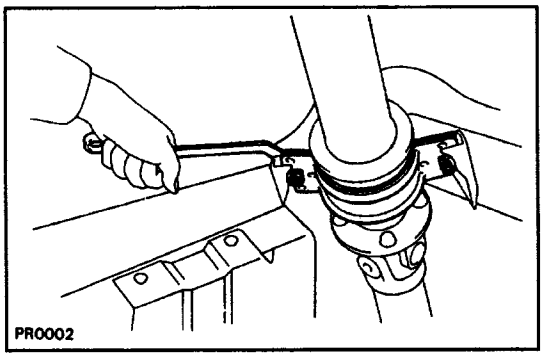
PR0037

3. INSTALL CENTER SUPPORT BEARING TO FRAME CROSSMEMBER (3–JOINT TYPE)

(a) Install the center support bearing to the frame cro–ssmember with two mount bolts finger tight.

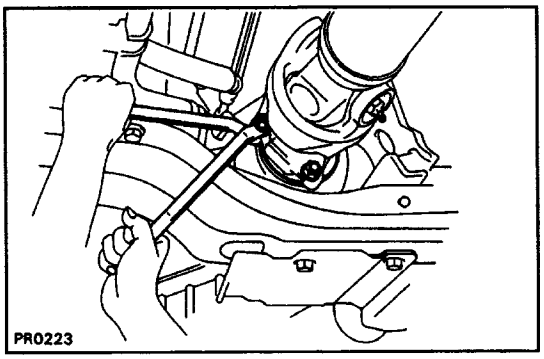
(b) Check that the bearing bracket is at right angle to the propeller shaft. Adjust the bracket if necessary.

(c) Check that the center line of the center bearing is set to the center line of the bracket when the vehicle is in a no–load condition. Adjust the bracket if necessary.


PR0002

(d) Torque the mount bolts.

Torque: 36 N–m (370 kgf–cm, 27 ft–lbf)


PR0223

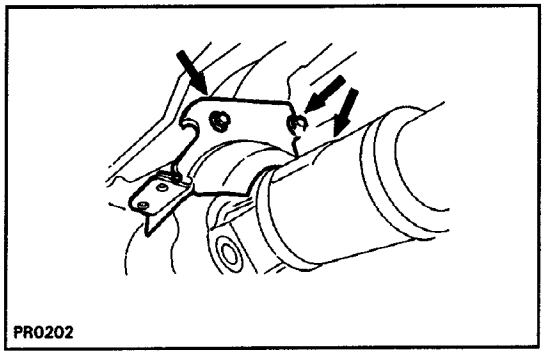
PROPELLER SHAFT INSTALLATION (4WD) PR028–01

1. CONNECT FRONT PROPELLER SHAFT FLANGE TO COMPANION FLANGE ON TRANSFER

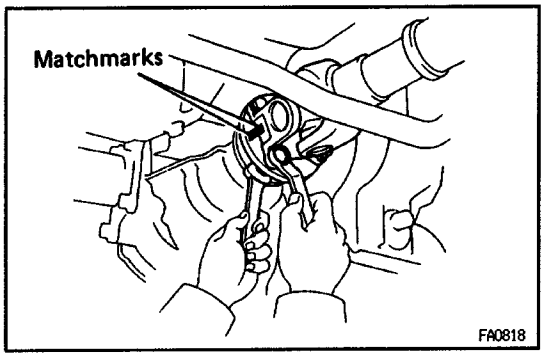
(a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.

(b) Torque the bolts and nuts.

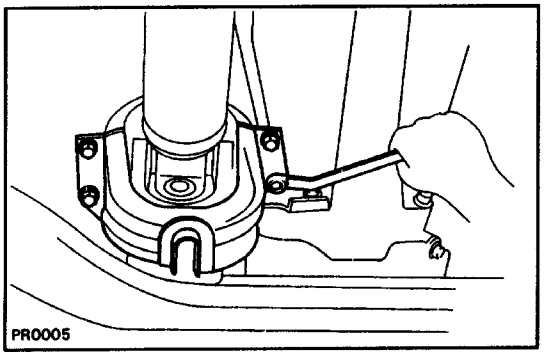
Torque: 41 N–m (750 kgf–cm, 54 ft–lbf)



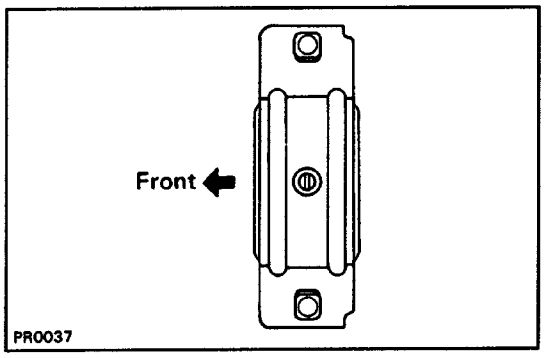
2. INSTALL FRONT PROPELLER SHAFT DUST COVER SUBASSEMBLY
(W/VF1 A Type Transfer and A340H)
(a) Install the cover.
(b) Install and torque the three bolts.
Torque:
A bolts 36 N–m (370 kgf–cm, 27 ft–lbf)
B bolts 23 N–m (230 kgf–cm, 17 ft–lbf)



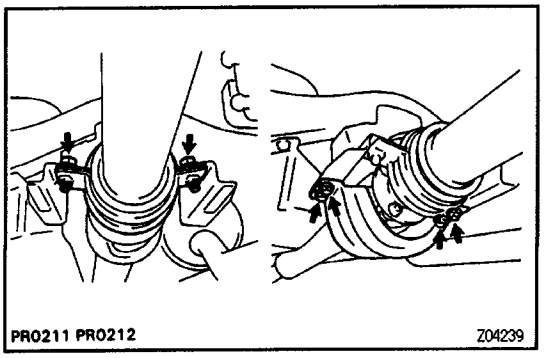
3. CONNECT PROPELLER SHAFT FLANGE TO COM–PANION FLANGE ON FRONT DIFFERENTIAL
(a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.
(b) Torque the bolts and nuts.
Torque: 74 N–m (750 kgf–cm, 54 ft–lbf)



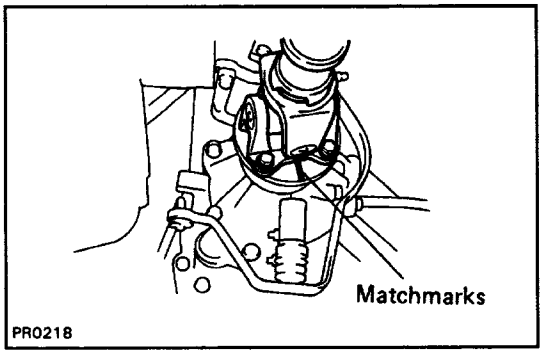
4. INSTALL FRONT PROPELLER SHAFT NO. 2 DUST COVER
(a) Install the cover.
(6) Install and torque the bolts and nuts.
Torque:
Bolt 17 N–m (175 kgf–cm, 13 ft–lbf)
Nut 13 N–m (135 kgf–cm, 10 ft–lbf)

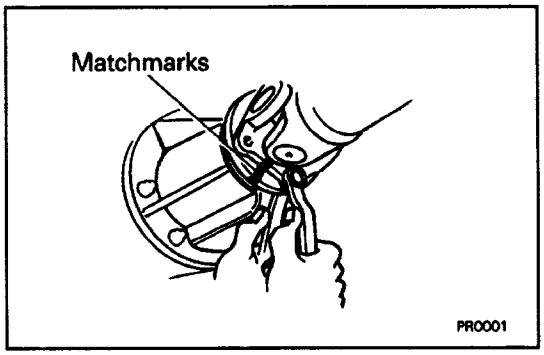


5. INSTALL CENTER SUPPORT BEARING TO FRAME CROSSMEMBER (3–JOINT TYPE)
(a) Install the center support bearing to the frame cro–ssmember with two mount bolts finger tight.
(b) Check that the bearing bracket is at right angle to the propeller shaft. Adjust the the bracket if necessary.
(c) Check that the center line of the center bearing is set to the center line of the bracket when the vehicle is in a no–load condition. Adjust the bracket if necessary.



(d) Torque the mount bolts.
Torque: 36 N–m (370 kgf–cm, 27 ft–lbf)
(e) Install propeller shaft protector and four set bolts.
(f) Torque the set bolts.
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)





6. CONNECT REAR PROPELLER SHAFT FLANGE TO COMPANION FLANGE ON TRANSFER

(a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.

(b) Torque the bolts and nuts.

Torque:

3VZ–E [MT]

76 N–m (780 kgf–cm, 56 ft–lbf)

Ex. 3VZ–E [MT]

74 N–m (760 kgf–cm, 54 ft–lbf)

7. CONNECT PROPELLER SHAFT FLANGE TO COMPANION FLANGE ON REAR DIFFERENTIAL

(a) Align the matchmarks on the flanges and connect the flanges with bolts and nuts.

(b) Torque the bolts and nuts.

Torque:

3VZ–E [MT]

76 N–m (780 kgf–cm, 56 ft–lbf)

Ex. 3VZ–E [MT]

74 N–m (760 kgf–cm, 54 ft–lbf)

SERVICE SPECIFICATIONS
SERVICE DATA

PR013–04

Propeller shaft runout		Limit	0.8 mm (0.031 in.)
Spider bearing axial play			0.05 mm (0.0020 in.)
Spider bearing selection		Mark	
Bearing cup outer diameter		None	29.008 – 29.021 mm (1.1420 – 1.1426 in.)
		Red	29.028 – 29.041 mm (1.1428 – 1.1433 in.)
Bearing hole inner diameter		None	29.000 – 29.020 mm (1.1417 – 1.1425 in.)
		Drill	29.021 – 29.042 mm (1.1426 – 1.1434 in.)
Snap ring thickness	TMC – made	mark color	
		1 –	2.100 – 2.150 mm (0.0827 – 0.0846 in.)
		2 –	2.150 – 2.200 mm (0.0846 – 0.0866 in.)
		3 –	2.200 – 2.250 mm (0.0866 – 0.0886 in.)
		– Brown	2.250 – 2.300 mm (0.0886 – 0.0906 in.)
		– Blue	2.300 – 2.350 mm (0.0906 – 0.0925 in.)
		6 –	2.350 – 2.400 mm (0.0925 – 0.0945 in.)
		7 –	2.400 – 2.450 mm (0.0945 – 0.0965 in.)
		8 –	2.450 – 2.500 mm (0.0965 – 0.0984 in.)
	DANA–made	color	
		Blue	1.638 mm (0.0645 in.)
		Yellow	1.588 mm (0.0625 in.)
		Silver	1.537 mm (0.0605 in.)
		Copper	1.511 mm (0.0595 in.)
		Black	1.486 mm (0.0585 in.)
		Red	1.435 mm (0.0565 in.)
		Green	1.384 mm (0.0545 in.)

TORQUE SPECIFICATIONS

PR014–04

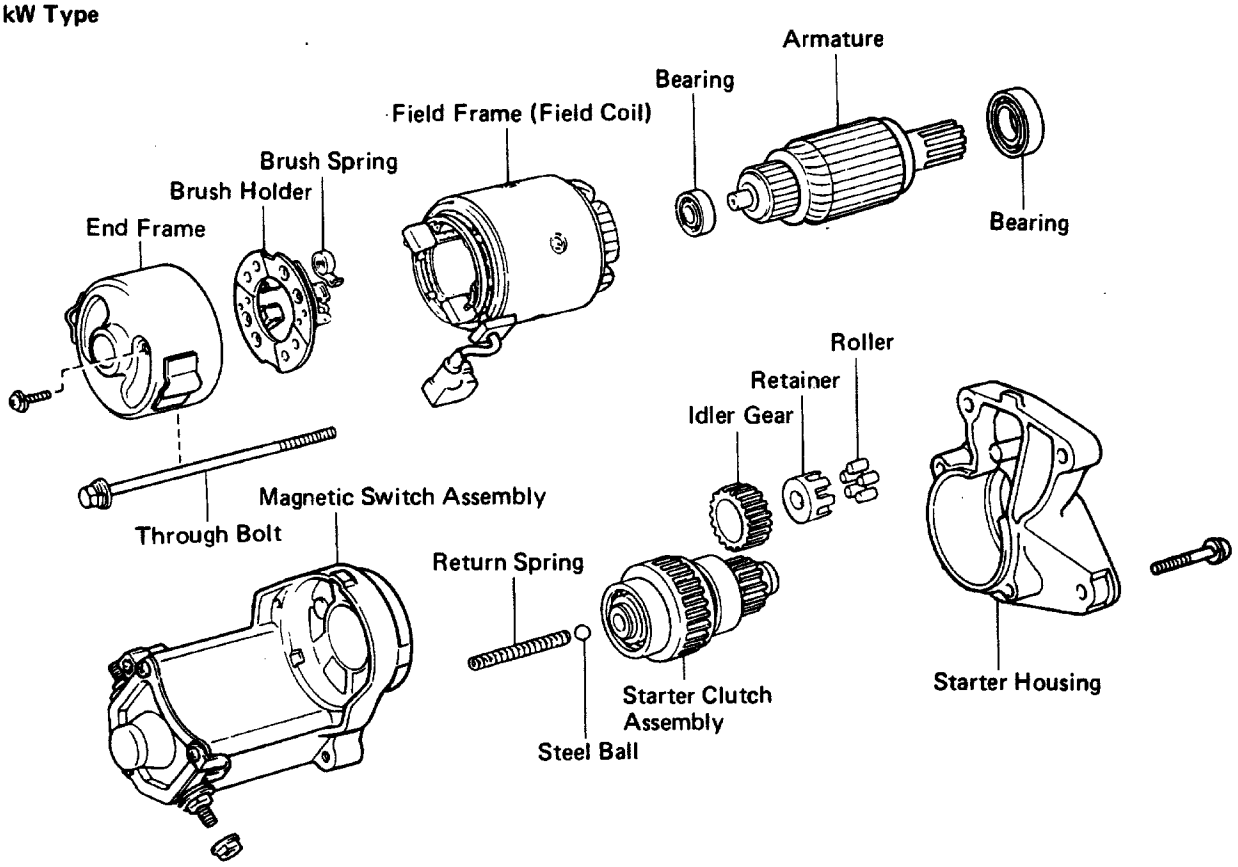
Part tightened	N·m	kgf·cm	ft·lbf
Front differential x Front propeller shaft (4WD)	74	750	54
Front propeller shaft x Transfer (4WD)	74	750	54
Propeller shaft x Rear differential 3VZ–E (M/T)	76	780	56
Ex. 3VZ–E (M/T)	74	750	54
Propeller shaft x Transfer 3VZ–E (M/T)	76	780	56
Ex. 3VZ–E (M/T)	74	750	54
Intermediate shaft x Propeller shaft (4WD)			
3VZ–E (M/T)	76	780	56
Ex. 3VZ–E (M/T)	74	750	54
Propeller shaft x Differential (2WD)	74	750	54
Intermediate shaft x Propeller shaft (2WD)	74	750	54
Center support bearing x Frame	36	370	27
Intermediate shaft x Center bearing x Joint flange			
1st	181	1,850	134
2nd		Loosen nut	
3rd	69	700	51
Front propeller shaft No.2 dust cover set bolts	17	175	13
Front propeller shaft No.2 dust cover set nut (w/VF1 A type transfer and A340H)	13	135	10
Front propeller shaft dust cover subassembly x Bracket	23	230	17
Front propeller shaft dust cover subassembly x Transfer	37	370	27
Propeller shaft protector x Frame	29	300	22

STARTING SYSTEM

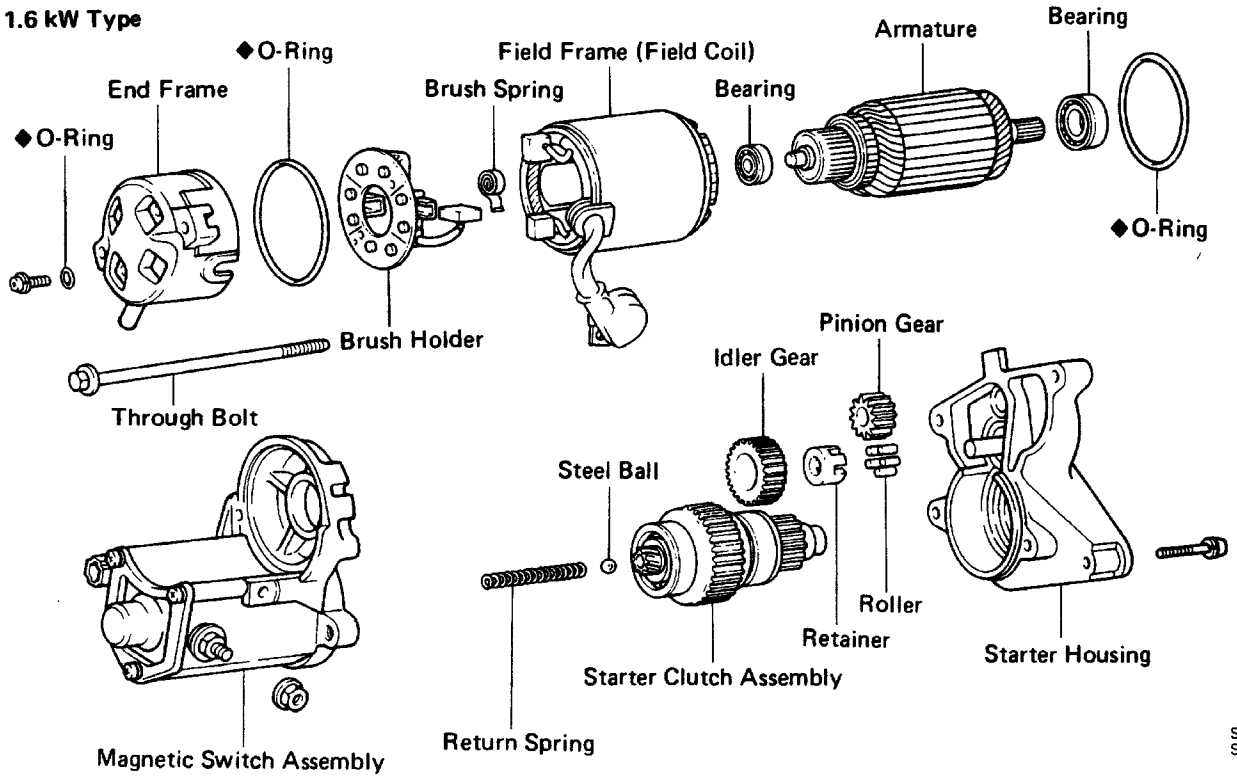
STARTER

COMPONENTS

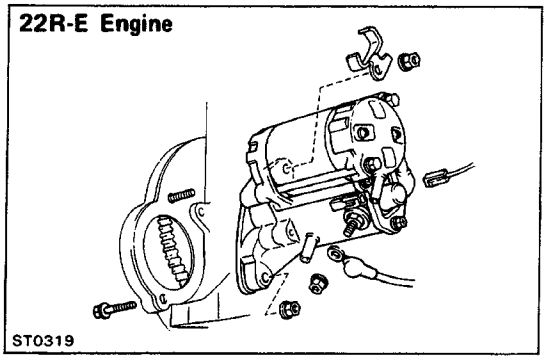
1.0 kW Type



1.4, 1.6 kW Type



◆ Non-reusable part



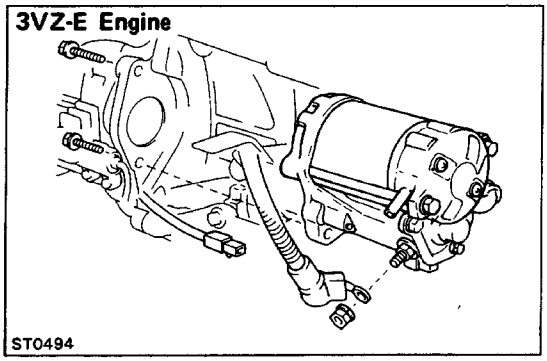
REMOVAL OF STARTER

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DISCONNECT TWO WIRES FROM STARTER

(a) Remove the nut and disconnect the battery cable from the magnetic switch on the starter motor.

(b) Disconnect the other wire from terminal 50.



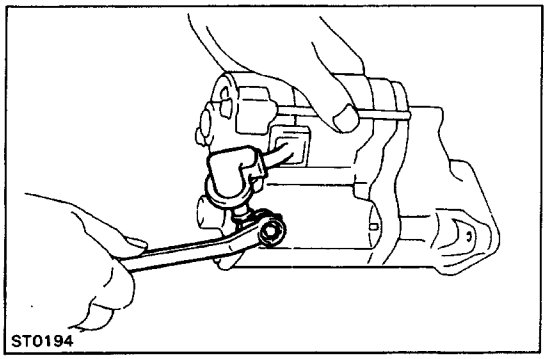
3. REMOVE STARTER MOTOR

(22R–E Engine)

Remove the nut and bolt, and remove the starter motor from the flywheel bellhousing.

(3VZ–E Engine)

Remove the two mounting bolts, and remove the starter motor from flywheel bellhousing.

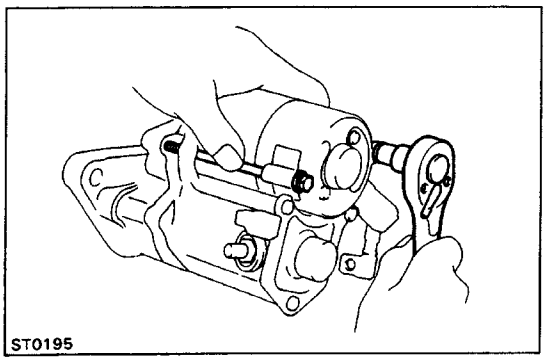


DISASSEMBLY OF STARTER

(See page ST–2)

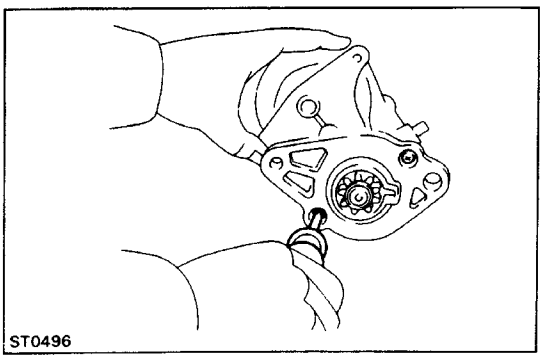
1. REMOVE FIELD FRAME WITH ARMATURE FROM MAGNETIC SWITCH ASSEMBLY

(a) Remove the nut and disconnect the lead wire from the magnetic switch terminal.



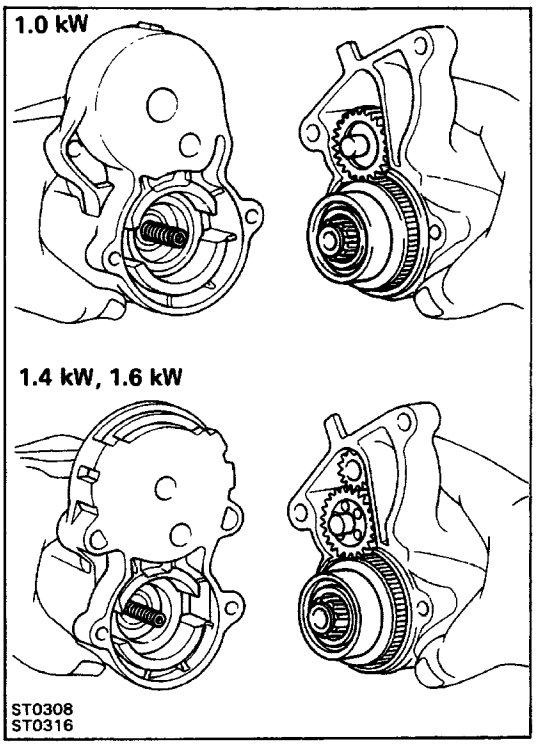
(b) Remove the two through bolts. Pullout the field frame
with the armature from the magnetic switch assembly.

(c) (1.4,
1. 6 kW)
Remove the O–ring.

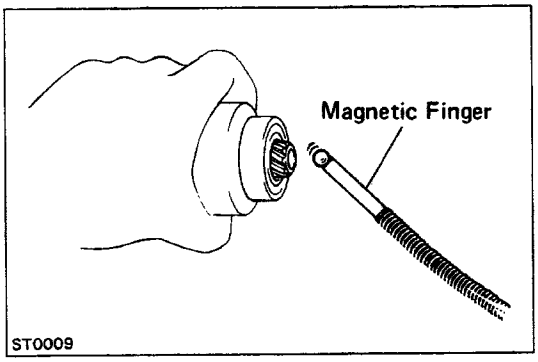


2. REMOVE STARTER HOUSING FROM MAGNETIC SWITCH ASSEMBLY

(a) Remove the two screws.



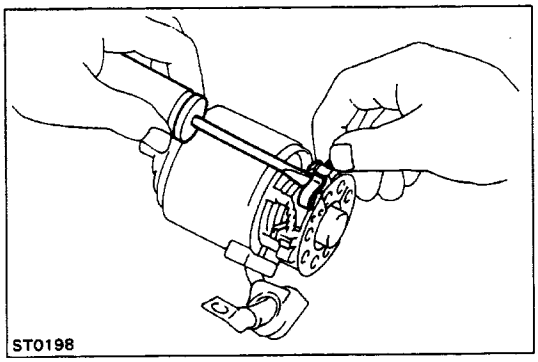
(b) Remove the starter housing with the pinion gear (1.4, 1.6 kW), idler gear, bearing and clutch assembly.



3. REMOVE CLUTCH ASSEMBLY AND GEARS FROM STARTER HOUSING

4. REMOVE STEEL BALL AND SPRING

Using a magnetic finger, remove the spring and steel ball from the clutch shaft hole.

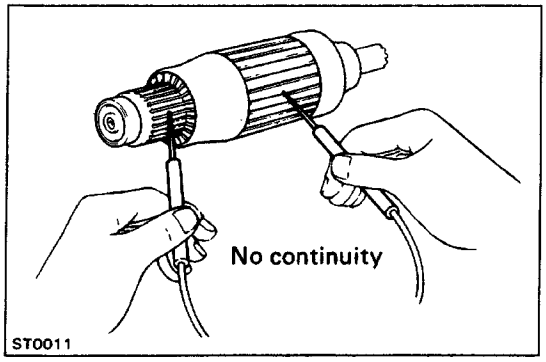


5. REMOVE BRUSHES AND BRUSH HOLDER

(a) Remove the two screws and pull the end cover with 0–ring (1.4, 1.6 kW) off the field frame.

(b) Using a screwdriver, hold the spring back and disconnect the brush from the brush holder. Disconnect the four brushes and remove the brush holder.

6. REMOVE ARMATURE FROM FIELD FRAME

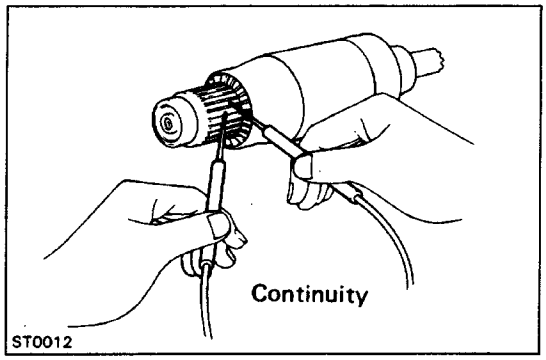


INSPECTION OF STARTER

Armature Coil

1. INSPECT THAT COMMUTATOR IS NOT GROUNDED

Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.
If there is continuity, replace the armature.



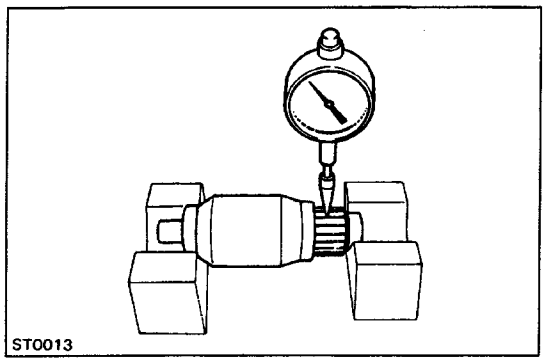
2. INSPECT COMMUTATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the segments of the comrnutator.
If there is no continuity between any segment, replace the armature.

Commutator

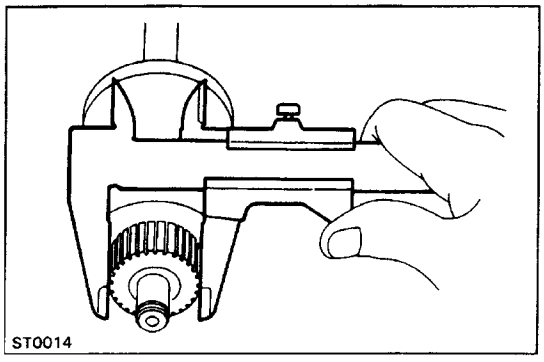
1. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES

If the surface is dirty or burnt, correct it with sandpaper (No.400) or on a lathe.



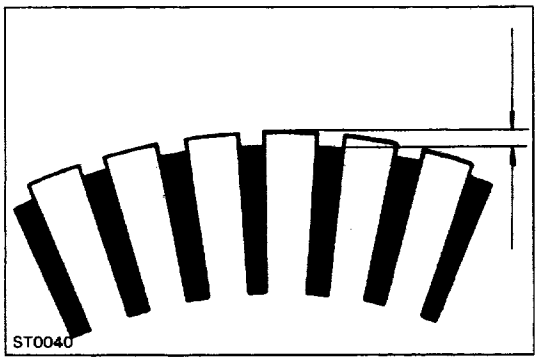
2. INSPECT COMMUTATOR CIRCLE RUNOUT

(a) Place the commutator on V–blocks.
(b) Using a dial indicator, measure the circle runout.
Maximum circle runout: 0.05 mm (0.0020 in.)
If the circle runout is greater than maximum, correct it on a lathe.



3. INSPECT COMMUTATOR DIAMETER

Using vernier calipers, measure the commutator diameter.
Standard diameter: 30 mm (1.18 in.)
Minimum diameter: 29 mm (11.14 in.)
If the diameter is less than minimum, replace the armature.



4. INSPECT UNDERCUT DEPTH OF SEGMENT

Check that the undercut depth is clean and free of foreign material. Smooth out the edge.

Standard undercut depth: 0.6 mm (0.024 in.)

Minimum undercut depth: 0.2 mm (0.008 in.)

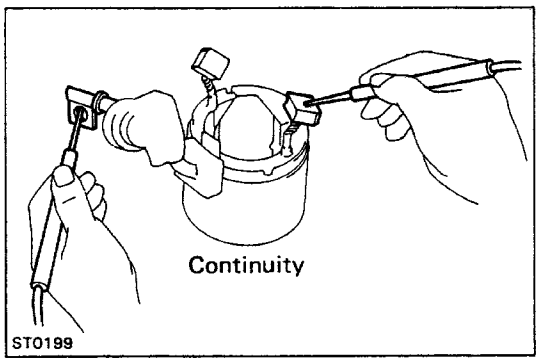
If the undercut depth is less than minimum, correct it with a hacksaw blade.

Field Frame (Field Coil)

1. INSPECT FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.

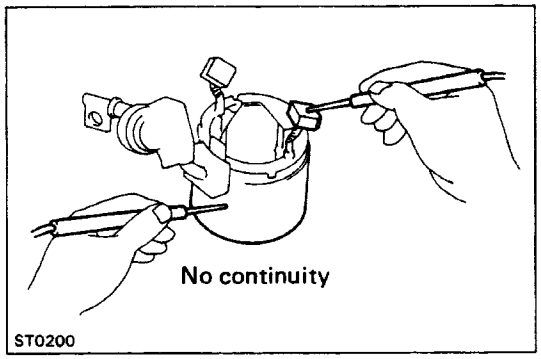
If there is no continuity, replace the field frame.



2. INSPECT THAT FIELD COIL IS NOT GROUNDED

Using an ohmmeter, check that there is no continuity be–tween the field coil end and field frame.

If there is continuity, repair or replace the field frame.



Brushes

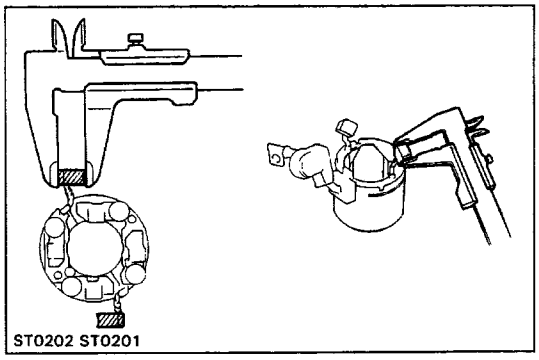
INSPECT BRUSH LENGTH

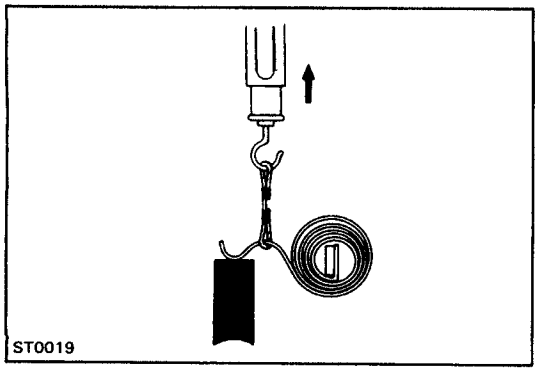
Using vernier calipers, measure the brush length.

Standard length: 1.0 kW 13.5 mm (0.531 in.)
1.4 kW 15.5 mm (0.610 in.)
1.6 kW 15.5 mm (0.610 in.)

Minimum length: 1.0 kW 8.5 mm (0.335 in.)
1.4 kW 10.0 mm (0.394 in.)
1.6 kW 10.0 mm (0.394 in.)

If the length is less than minimum, replace the brush holder and field frame.





Brush Springs

INSPECT BRUSH SPRING LOAD

Take the pull scale reading the instant the brush spring separates from the brush.

Standard installed load:

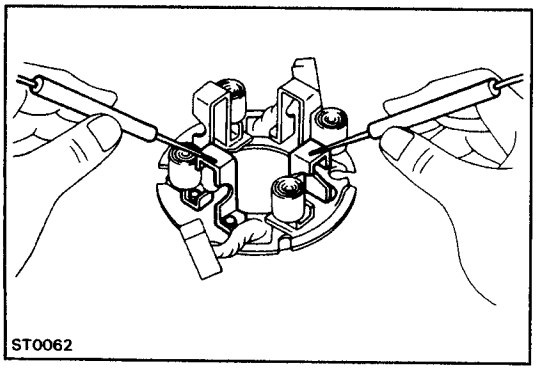
18 – 24 N (1.785 – 2.415 kgf, 3.9 – 5.3 1bf)

Minimum installed load:

12 N (1.2 kgf, 2.6 lbf)

If the installed load is less than minimum, replace the brush springs.

HINT: Take the pull scale reading the instant the brush spring separates from the brush.



Brush Holder

INSPECT INSULATION OF BRUSH HOLDER

Using an ohmmeter, check that there is no continuity between the positive (+) and negative (–) brush holders.

If there is continuity, repair or replace the brush holder.

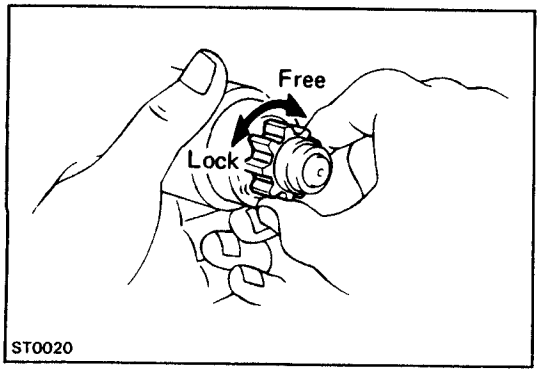
Clutch and Gears

1. INSPECT GEAR TEETH

Check the gear teeth on the pinion gear, idler gear and clutch assembly for wear or damage.

If damaged, replace the gear or clutch assembly.

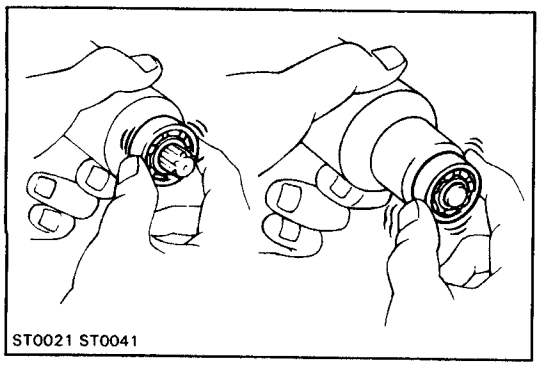
If damaged, also check the flywheel ring gear for wear or damage.



2. INSPECT CLUTCH

Rotate the clutch pinion gear clockwise and check that it turns freely. Try to rotate the clutch pinion counterclockwise and check that it locks.

If necessary, replace the clutch assembly.

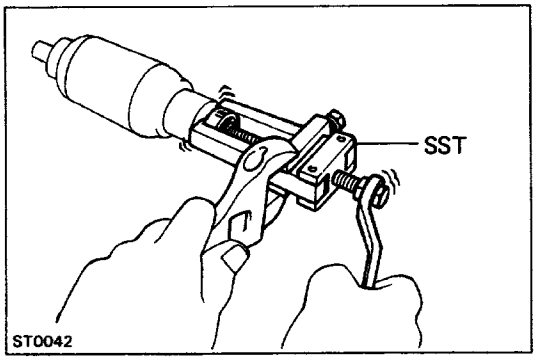


Bearings

1. INSPECT BEARINGS

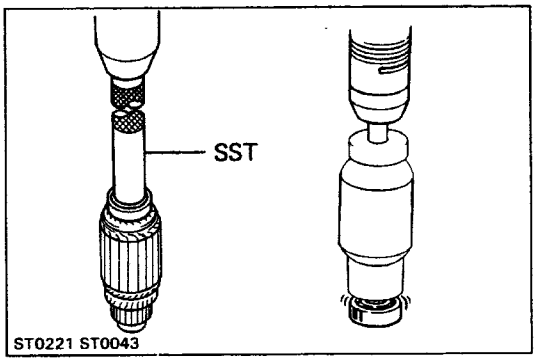
Turn each bearing by hand while applying inward force.

If the resistance is felt or if the bearing sticks, replace the bearing.



2. IF NECESSARY, REPLACE BEARINGS

(a) Using SST, remove the bearing.
SST 09286–46011

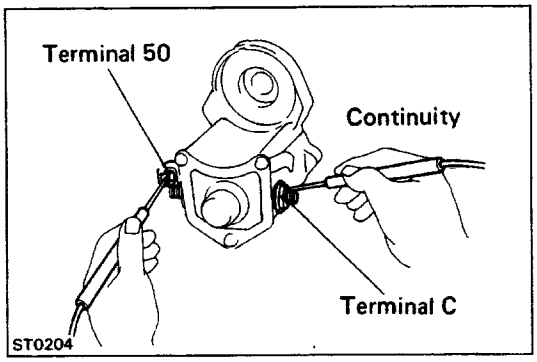


(b) Using SST and a press, press in a new bearing.
SST 1.0 kW 09285–76010
1.4 kW, 1.6 kW 09201–41020

Magnetic Switch

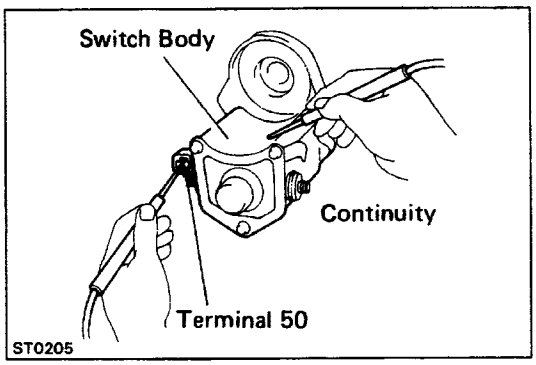
1. PERFORM PULL–IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminals 50 and C.
Ifthere is no continuity, replace the magnetic switch as–sembly.



2. PERFORM HOLD–IN COIL CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.
If there is no continuity, replace the magnetic switch as–sembly.



ASSEMBLY OF STARTER

(See page ST–2)

HINT: Use high–temperature grease to lubricate the bearings and gears when assembling the starter.

1. PLACE ARMATURE INTO FIELD FRAME

Apply grease to the armature bearings and insert the armature into the field frame.

2. INSTALL BRUSH HOLDER

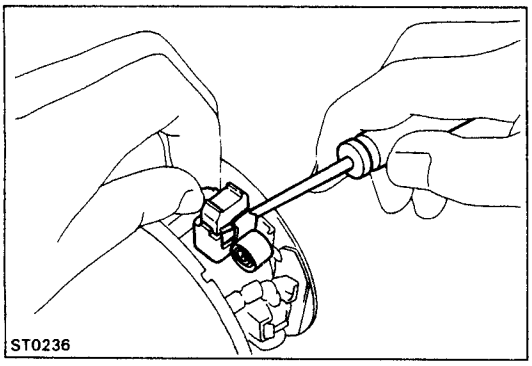
(a) Place the brush holder over the frame.

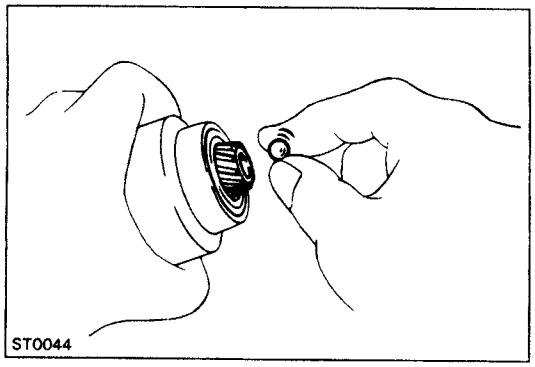
(b) Using a screwdriver, hold the brush spring back, and connect the brush into the brush holder. Connect the four brushes.

HINT: Check that the positive (+) lead wires are not grounded.

(c) (1.4 kW, 1.6 kW)
Place the 0–ring on the field frame.

(d) Install the end cover to the field frame with the two screws.

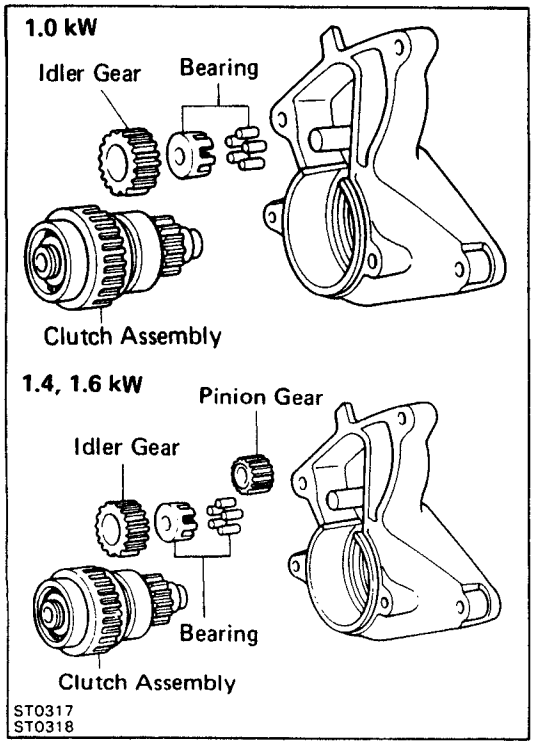

ST0236


ST0044

3. INSERT STEEL BALL INTO CLUTCH SHAFT HOLE

(a) Apply grease to the steel ball.

(b) Insert the steel ball into the clutch shaft hole.

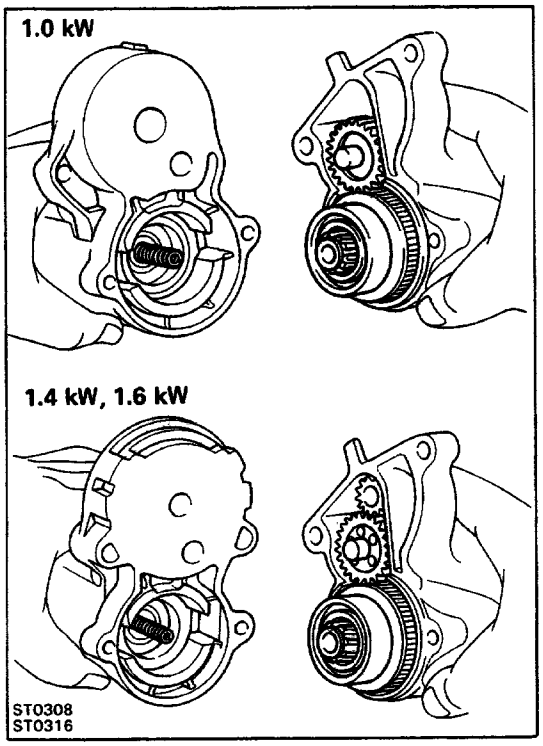


ST0317
ST0318

4. INSTALL GEARS AND CLUTCH ASSEMBLY

(a) Apply grease to the gears and clutch assembly.

(b) Place the clutch assembly, idler gear, bearing and pinion gear 11.4, 1.6 kW) in the starter housing.

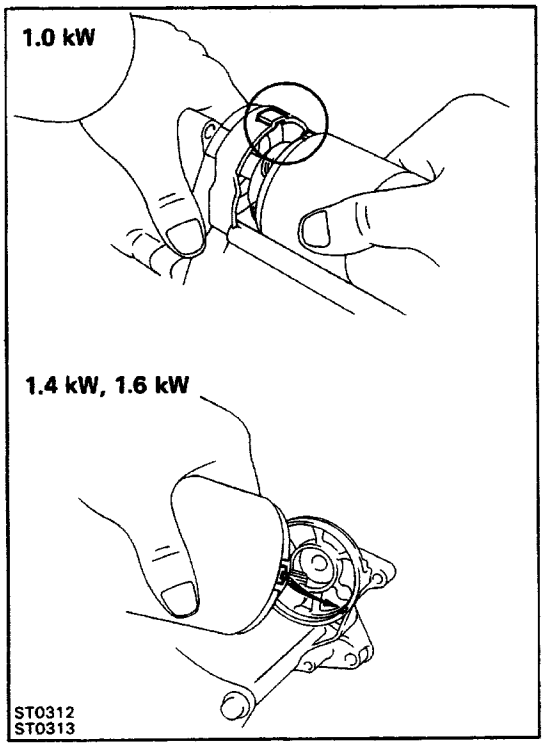


5. INSTALL STARTER HOUSING

(a) Apply grease to the return spring.

(b) Insert the return spring into the magnetic hole.

(e) Place the starter housing on the magnetic switch and install the two screws.

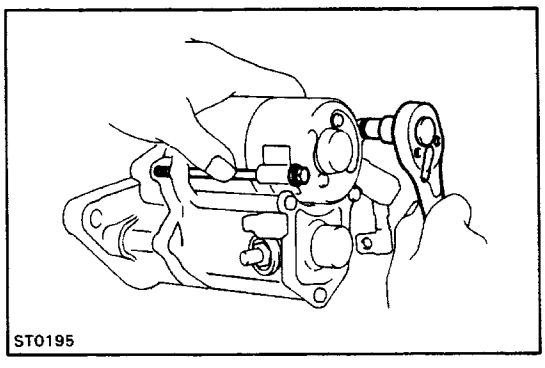


6. INSTALL FIELD FRAME WITH ARMATURE TO MAGNETIC SWITCH ASSEMBLY

(a) (1.4, 1. 6 kW)

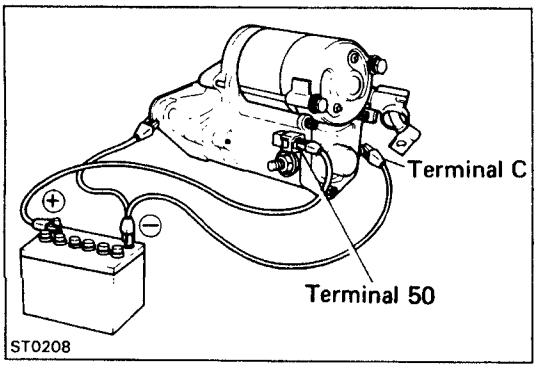
Place the O–ring on the field frame.

(b) Align the protrusion of the field frame with the cutout of the magnetic switch.



(c) Install the two through bolts.

(d) Connect the lead wire to the magnetic switch ter-mi¿na1 C, and install the nut.



PERFORMANCE TEST OF STARTER

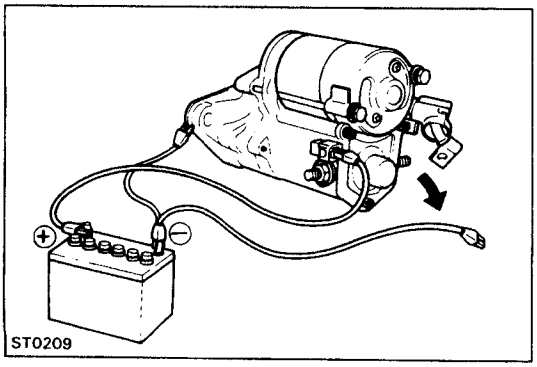
NOTICE: These tests must be performed within 3 to 5 seconds to avoid burning out the coil.

1. PERFORM PULL–IN TEST

(a) Disconnect the field coil lead wire from terminal C.

(b) Connect the battery to the magnetic switch as shown. Check that the clutch pinion gear moves outward.

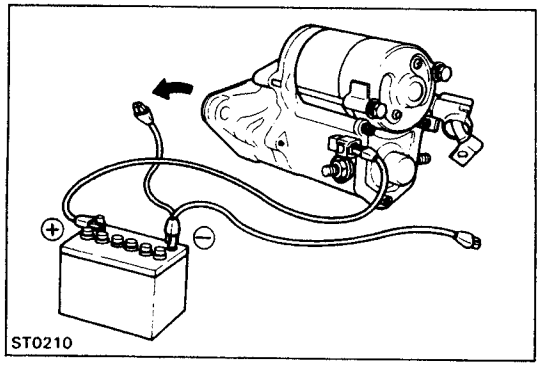
If the clutch pinion gear does not move, replace the magnetic switch assembly.



2. PERFORM HOLD–IN TEST

With battery connected as above with the clutch pinion gear out, disconnect the negative (–) lead from terminal C. Check that the pinion gear remains out.

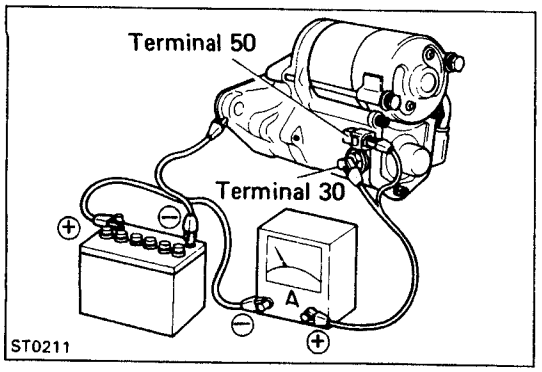
If the clutch pinion gear returns inward, replace the magnetic switch assembly.



3. INSPECT CLUTCH PINION GEAR RETURN

Disconnect the negative (–) lead from the switch body. Check that the clutch pinion gear returns inward.

If the clutch pinion gear does not return, replace the magnetic switch assembly.



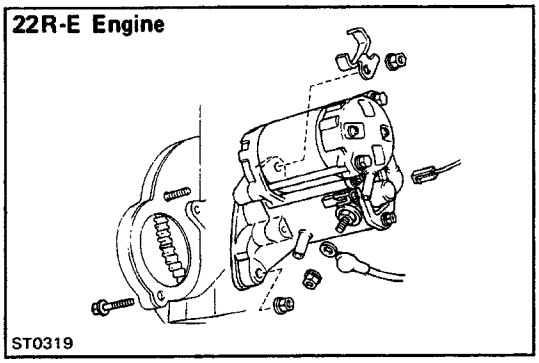
4. PERFORM NO–LOAD PERFORMANCE TEST

(a) Connect the battery and ammeter to the starter as shown. .

(b) Check that the starter rotates smoothly and steadily with the pinion gear moving out. Check that the ammeter reads the specified current.

Specified current:

90 A or less at 11.5 V



INSTALLATION OF STARTER

1. INSTALL STARTER MOTOR ON TRANSAXLE

(22R–E Engine)

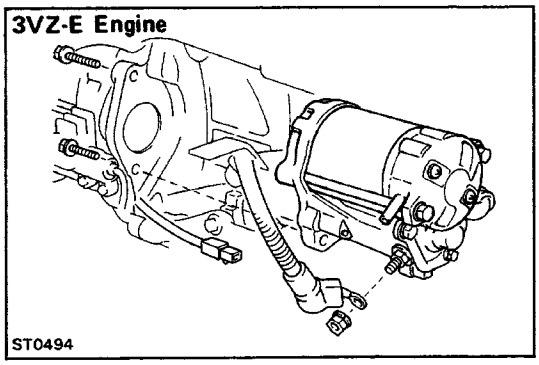
Place the starter motor in the flywheel bellhousing.

Install and torque the bolt and nut.

(3VZ–E Engine)

Place the starter motor in the flywheel bellhousing, and install and torque the starter mounting bolts.

Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)

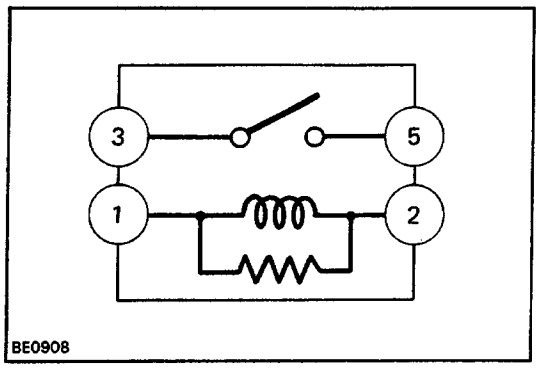


2. CONNECT TWO WIRES TO STARTER

Connect the connector to the terminal on the magnetic switch. Connect the cable from the battery to the terminal on the switch, and install the nut.

3. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

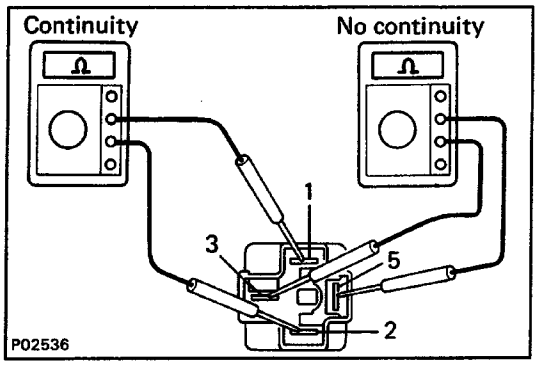
Check that the engine starts.



STARTER RELAY

INSPECTION OF STARTER RELAY

LOCATION: The relay is located in the No. 1 junction block on the driver's side.

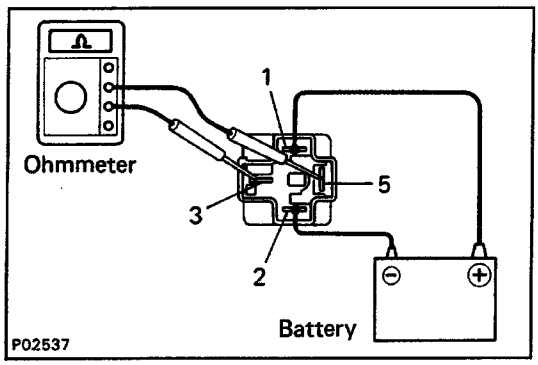


1. INSPECT RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.

(b) Check that there is no continuity between terminals 3 and 5.

If continuity is not as specified, replace the relay.



2. INSPECT RELAY OPERATION

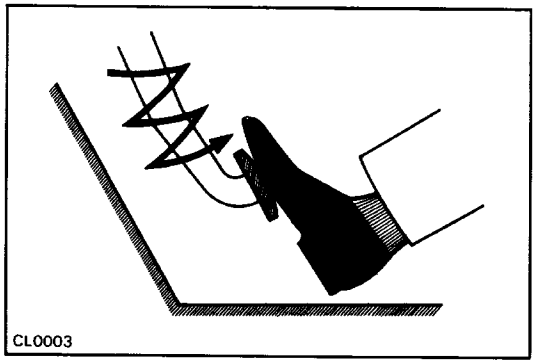
(a) Apply battery voltage across terminals 1 and 2.

(b) Check that there is continuity between terminals 3 and* 5.

If operation is not as described, replace the relay.

CLUTCH START SWITCH (M/T only)

(See page CL–4)


CL0003

BLEEDING OF CLUTCH SYSTEM

HINT: If any work is done on the clutch system or if air is suspected in the clutch lines, bleed the system of air.

NOTICE: Do not let brake fluid remain on a painted surface. Wash it off immediately.

1. FILL CLUTCH RESERVOIR WITH BRAKE FLUID

Check the reservoir frequently. Add fluid if necessary.

2. CONNECT VINYL TUBE TO BLEEDER PLUG

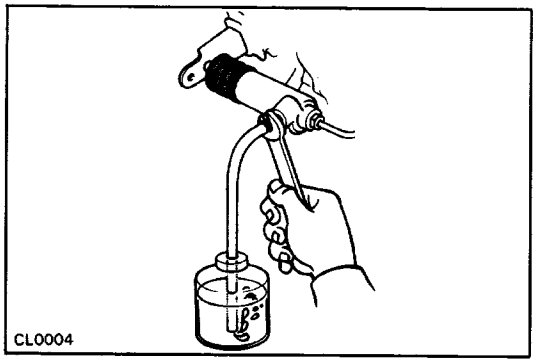
Insert the other end of the tube in a half–full container of brake fluid.

3. BLEED CLUTCH LINE

(a) Slowly pump the clutch pedal several times.

(b) While pressing on the pedal, loosen the bleeder plug until the fluid starts to run out. Then close the bleeder plug.

(c) Repeat this procedure until there are no more air bubbles in the fluid.


CL0004

INSPECTION OF CLUTCH START SYSTEM

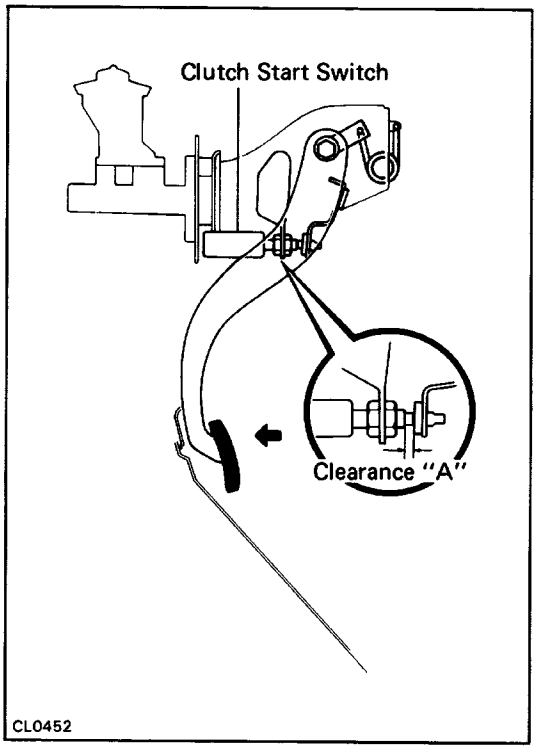
CHECK CLUTCH PEDAL

1. CHECK THAT PEDAL HEIGHT IS CORRECT

(See page CL–3)

2. CHECK THAT PEDAL FREEPLAY AND PUSH ROD PLAY ARE CORRECT

(See page CL–3)



CL0452

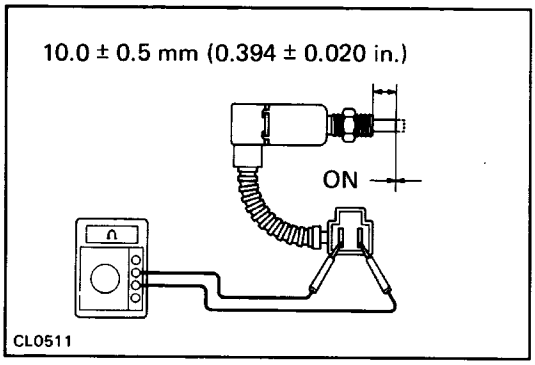
CHECK CLUTCH START SYSTEM

CHECK CLUTCH START SYSTEM

(a) Check that the engine does not start when the clutch pedal is released.

(b) Check that the engine starts when the clutch pedal is fully depressed.

(c) Check that clearance "A" is greater than 1 mm (0.04 in.) when the clutch is fully depressed.
If necessary, adjust or replace the clutch start switch.



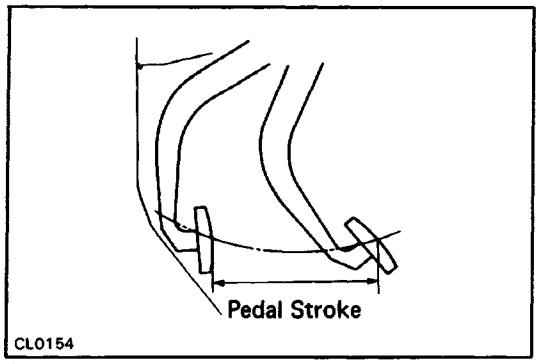
CL0511

INSPECTION AND ADJUSTMENT OF CLUTCH START SWITCH

1. INSPECT CONTINUITY OF CLUTCH START SWITCH

(a) Check that there is continuity between terminals when the switch is ON (pushed).

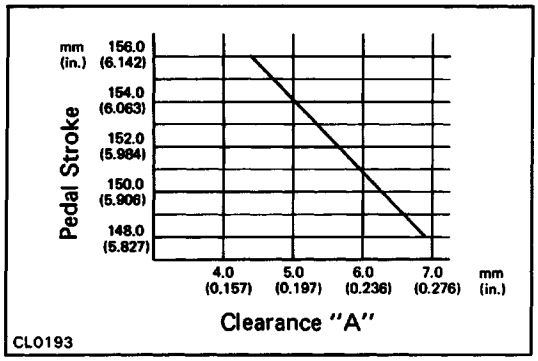
(b) Check that there is no continuity between terminals when the switch is OFF (free).
If continuity is not as specified, replace the switch.



2. ADJUST CLUTCH START SWITCH

(a) Measure the pedal stroke, and check the switch clearance "A" using the chart left.

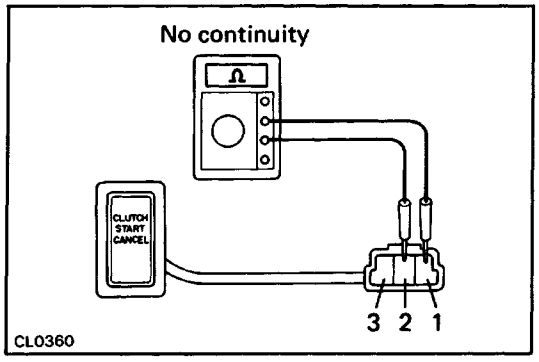
(b) Loosen and adjust the switch position.



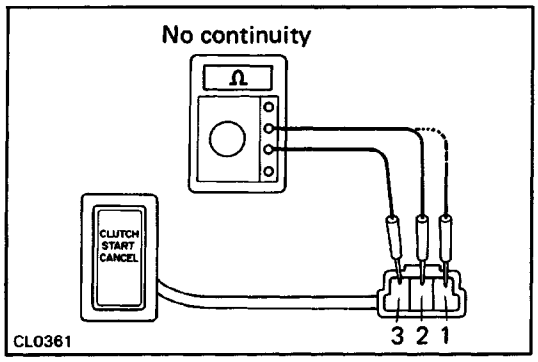
(c) Recheck that the engine does not start when the clutch pedal is released.

INSPECTION OF CLUTCH START CANCEL SWITCH

1. INSPECT CONTINUITY OF CLUTCH START CANCEL SWITCH



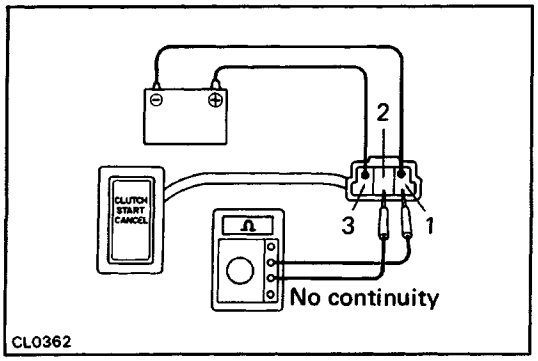
(a) Check that there is no continuity when connect the positive (+) lead from the ohmmeter to terminal 2 and the negative (–) lead to terminal 1.



(b) Check that there is no continuity when connect the positive (+) lead from the ohmmeter to terminal 3 and the negative (–) lead to terminal 1.

(c) Check that there is no continuity between terminals 2 and 3.

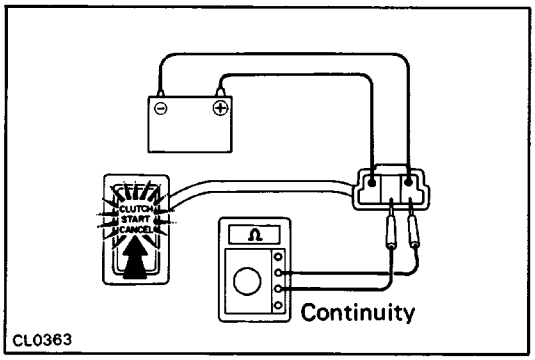
If continuity is not as specified, replace the clutch start cancel switch.



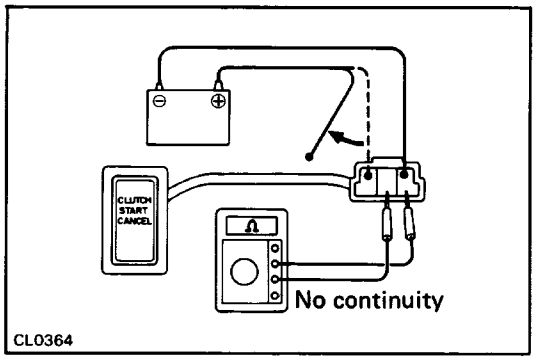
2. INSPECT OPERATION OF CLUTCH START CANCEL SWITCH

(a) Connect positive (+) lead from the battery to terminal 3 and connect negative (–) lead to terminal 1.

(b) Check that there is no continuity when connect the positive (+) lead from the ohmmeter to terminal 2 and the negative (–) lead to terminal 1.



(c) When pushing the switch, check that the indicator light comes on and there is continuity between terminals 1 and 2.

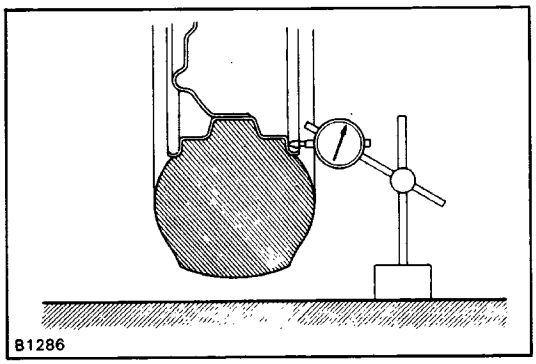


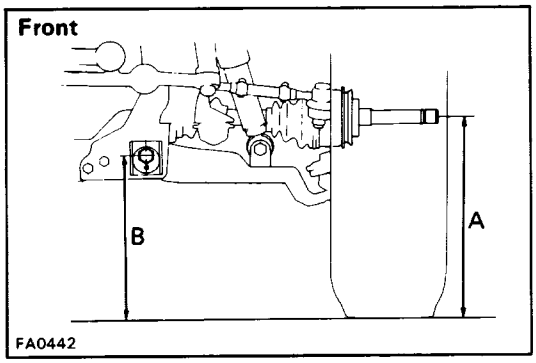
(d) Check that there is no continuity between terminals 1 and 2 when disconnect the battery lead.
If operation is not as specified, replace the clutch start cancel switch.

SUSPENSION AND AXLE

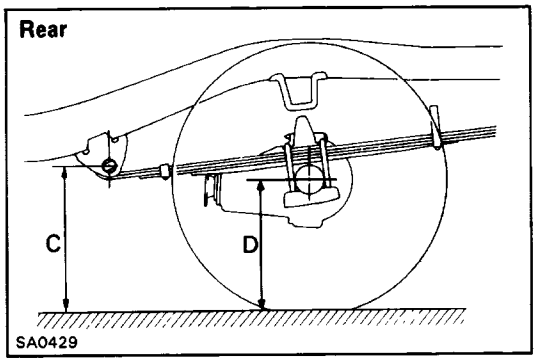
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page	
			2WD	4WD
Wanders/pulls	Tires worn or improperly inflated Alignment incorrect Wheel bearing adjusted too tight Front or rear suspension parts loose or broken Steering linkage loose or worn Steering gear out of adjustment or broken	Inflate tires to proper pressure or replace tires Check front alignment Adjust wheel bearing Tighten or replace suspension parts Tighten or replace steering linkage Adjust or repair steering gear	SA–3 SA–13 SA–17, 153	SA–6 SA–39 SA–111, 153
Bottoming	Vehicle overloaded Shock absorber worn out Springs weak	Check loading Replace shock absorber Replace spring	SA–22, 153 SA–20, 153	SA–116, 153 SA–114, 153
Sways/pitches	Tires improperly inflated Stabilizer bar bent or broken Shock absorber worn out	Inflate tires to proper pressure Inspect stabilizer bar Replace shock absorber	SA–28, 157 SA–22, 153	SA–122 SA–1 16, 153
Front wheel shimmy	Tires worn or improperly inflated Wheels out of balance Shimmy damper worn out Shock absorber worn out Alignment incorrect Wheel bearings worn or improperly adjusted Ball joints or bushings worn Steering linkage loose or worn Steering gear out of adjustment or broken	Replace tire or inflate tires to proper pressure Balance wheels Replace steering damper Replace shock absorber Check front alignment Replace or adjust wheel bearings Inspect ball joints and bushings Tighten or replace steering linkage Adjust or repair steering gear	SA–22, 153 SA–3 SA–12 SA–18	SA–116, 153 SA–6 SA–36 SA–112
Abnormal tire wear	Tires improperly inflated Shock absorbers worn out Alignment incorrect Suspension parts worn	Inflate tires to proper pressure Replace shock absorber Check toe–in Replace suspension parts	SA–22, 153 SA–5 SA–17, 153	SA–116, 153 SA–9 SA–111, 153
Oil leak from differen–tial	Oil level too high or wrong grade Oil seal worn or damaged Companion flange loose or dam–aged	Drain and replace oil Replace oil seal Tighten or replace flange	SA–136 SA–135 SA–149	SA–57, 136 SA–54, 135 SA–56, 149
Noises in axle	Oil level low or wrong grade Excessive backlash between pinion and ring or side gear Ring, pinion or side gears worn or chipped Pinion shaft bearing worn Axle shaft bearing worn Differential bearing loose or worn	Drain and replace oil Check backlash Inspect gears Replace bearing Replace bearing Tighten or replace bearings	SA–136 SA–137 SA–137 SA–137 SA–124 SA–137	SA–57, 136 SA–68, 85 137 SA–66, 82, 137 SA–66, 82, 137 SA–124 SA–66, 82, 137

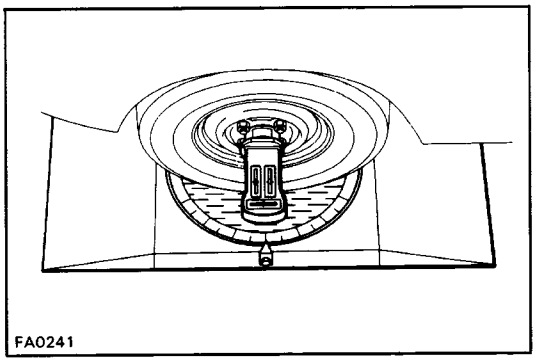

B1286

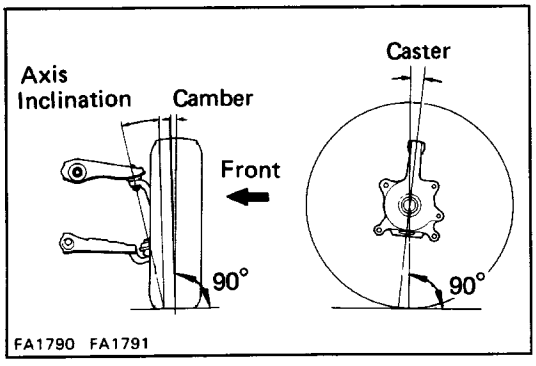


FA0442



SA0429


FA0241



FA1790 FA1791

WHEEL ALIGNMENT
4WD

1. MAKE FOLLOWING CHECKS AND CORRECT ANY PROBLEMS

(a) Check the tires for wear and proper inflation.
Cold tire inflation pressure: See page A–25

(b) Check the wheel runout.
Lateral runout: 1.2 mm (0.047 in.) or less

(c) Check the front wheel bearings for looseness.

(d) Check the front suspension for looseness.

(e) Check the steering linkage for looseness.

(f) Check that the front absorbers work properly by using the standard bounce test.

2. ADJUST VEHICLE HEIGHT

Adjust the vehicle height to the standard vehicle height for wheel alignment inspection.

HINT: With non–loaded vehicles, there is a difference in the vehicle height according to the model.

Although the wheel alignment standard value changes according to the vehicle height, by setting the vehicle height to the standard height the standard alignment value becomes the same for all models.

Front: A – B = 58.5 mm (2.303 in.)

A: Height at center of tip of drive shaft

B: Height at center of tip of front side adjusting cam bolt

Rear: C – D = 61.0 mm (2.402 in.)

C: Height of center of rear leaf spring front bush 1

D: Height of center of rear axle shaft

HINT: For the vehicle height of non–loaded vehicles for each model and the alignment standard values, refer to page A–25.

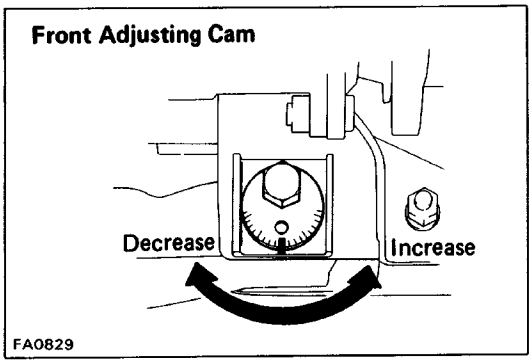
3. INSTALL WHEEL ALIGNMENT EQUIPMENT

Follow the specific instructions of the equipment manufacturer.

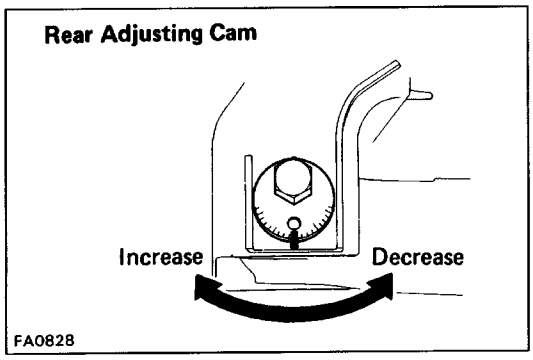
4. ADJUST CAMBER, STEERING AXIS INCLINATION AND CASTER

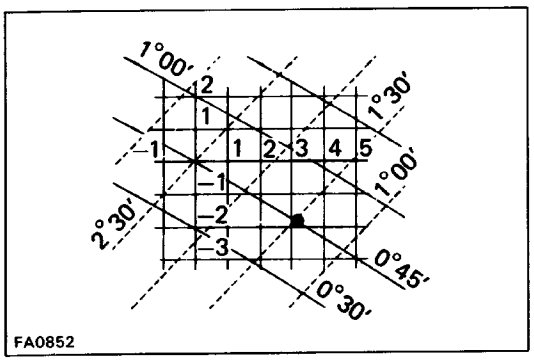
Camber, Steering axis inclination, Caster: See page A–25, 26

If the steering axis inclination is not as specified after camber and caster have been correctly adjusted, recheck the steering knuckle and front wheel for bending or looseness.



If camber and/or caster are not within specification, adjust by front and/or rear adjusting cams.
(See Adjustment Chart)

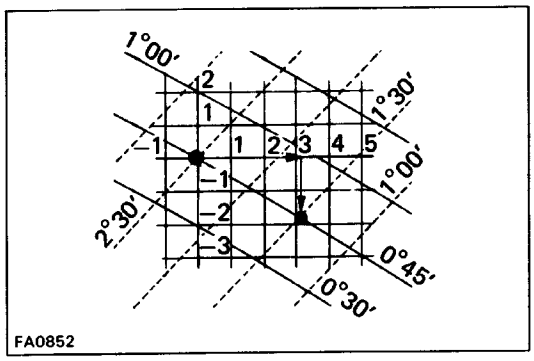




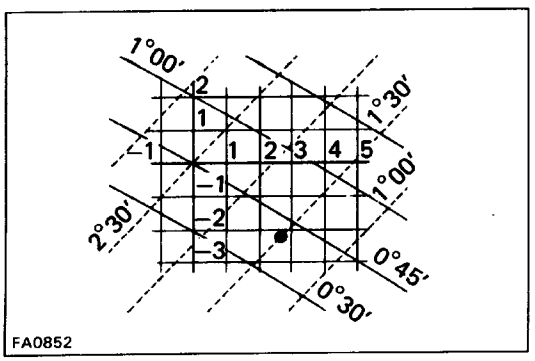
How to Read the Chart
(Alignment measured with vehicle height set to standard
height for wheel alignment inspection)

(a) Mark on the adjustment chart the alignment values measured with the vehicle at standard height.
Example: Camber 0°45'
Caster 1 ° 30'

(b) To calculate the amounts by which the front and/or rear cams are to be adjusted, read from the adjustment chart the distance from the center of the chart to the mark you have made, as shown in the illustration.
Example: Front cam –1.8
Rear cam + 3.1



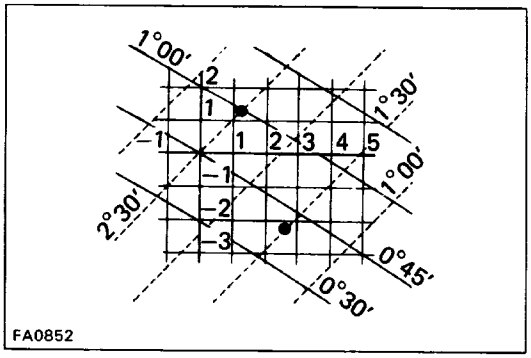
(c) Torque the front and/or rear cam nuts.
Torque: 196 N–m (2,000 kgf–cm, 145 ft–lbf)



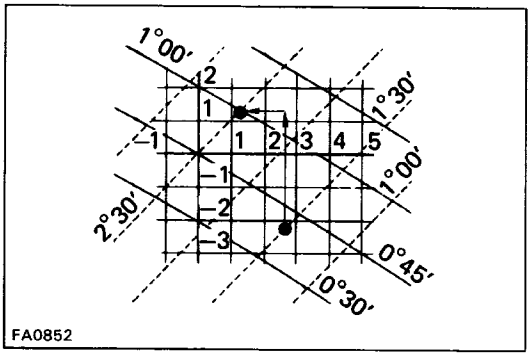
How to Read the Chart
(Wheel alignment measured at vehicle height of non–loaded vehicle)

(a) Find the wheel alignment standard value applicable for the particular model in non–loaded condition.
(See page A–33)

(b) Mark the selected standard value on the adjustment chart.
Example: Camber 0°40'
Caster 1 ° 30'

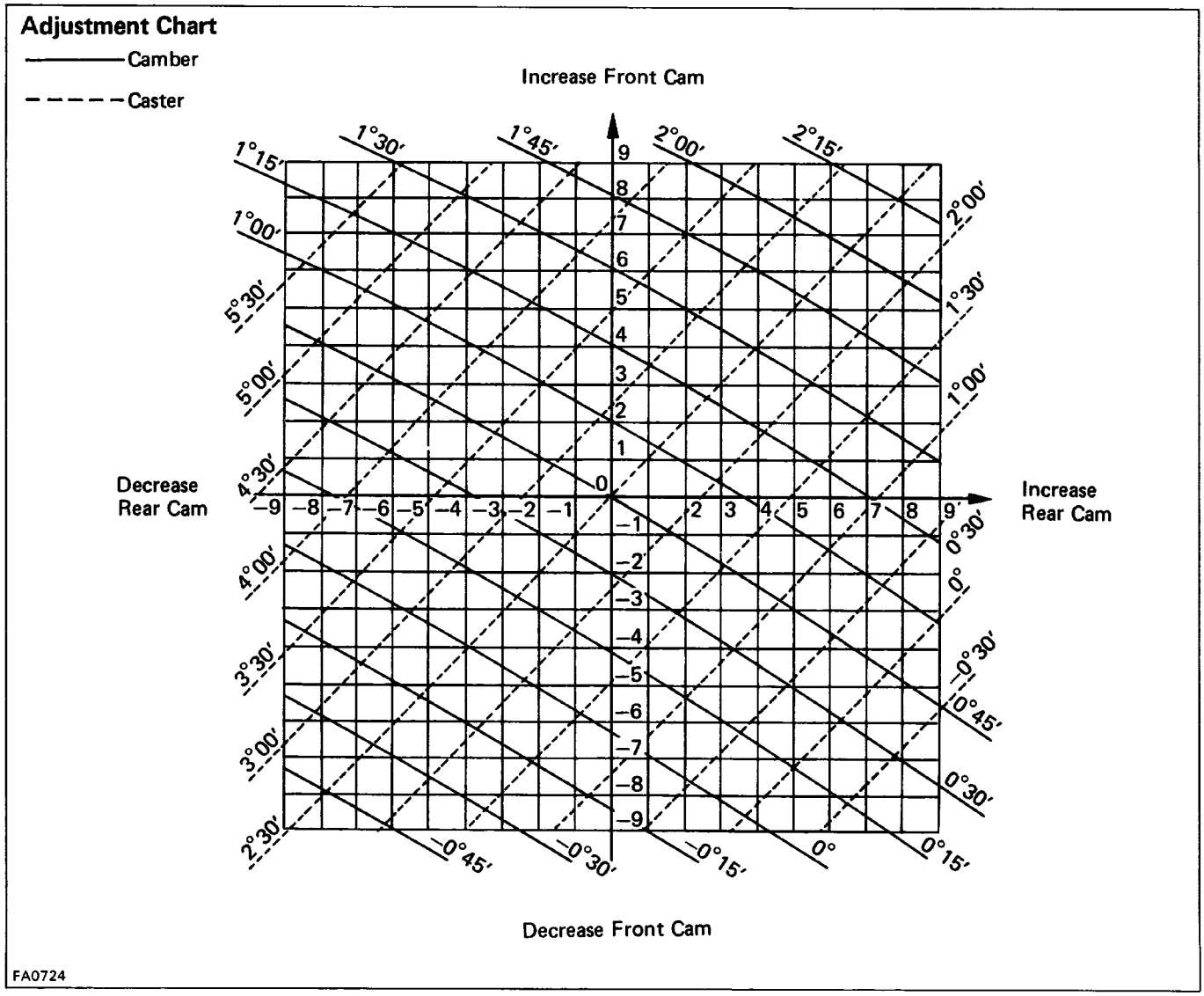


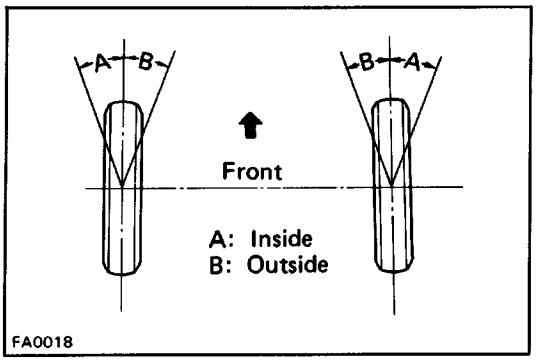
(c) Mark on the adjustment chart the alignment values measured at the non–loaded vehicle height.
Example: Camber 1°00'
Caster 2°30'



(d) As shown in the illustration, read the distance from the standard value to the measured value, and adjust the front and/or rear adjusting cams accordingly.
Example: Front cam + 3.4
Rear cam –1.6

(e) Torque the front and/or rear cam nuts.
Torque: 196 N–m (2,000 kgf–cm, 145 ft–lbf)

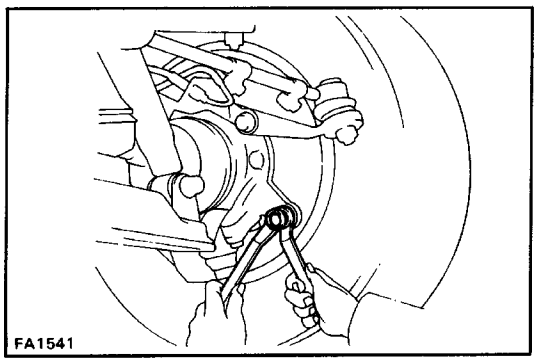




5. ADJUST WHEEL ANGLE

Remove the caps of the knuckle stopper bolts and check the steering angles.

Wheel angle		
Max.	Inside wheel	32°00' +1° –2°
	Outside wheel	31°
at 200 (outside wheel)	Inside wheel	21 ° 10'

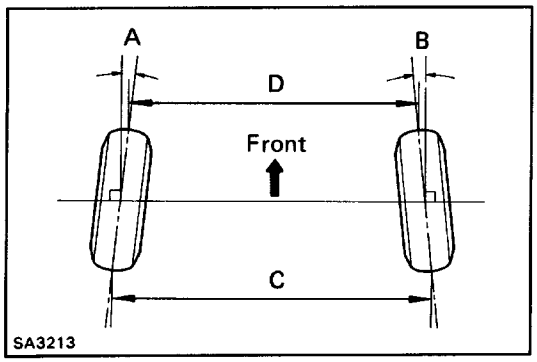


HINT: When the steering wheel is fully turned, make sure that the wheel is not touching the body or brake flexible hose.

If maximum steering angles differ from standard value, adjust the wheel angle with the knuckle stopper bolts.

Torque: 47 N–m (480 kgf–cm, 35 ft–lbf)

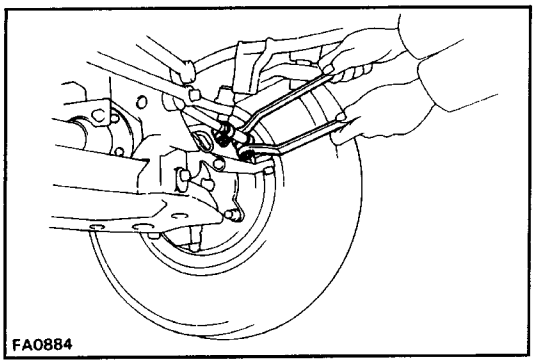
If the wheel angle still cannot be adjusted within limits, inspect and replace damaged or worn steering parts.



6. INSPECT TOE–IN

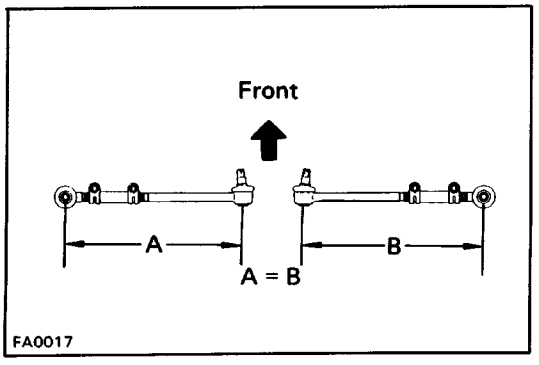
Toe–in: See page A–26

If toe–in is not within specification adjust by the tie rod end.



7. ADJUST TOE–IN

(a) Loosen the clamp bolts and nuts.

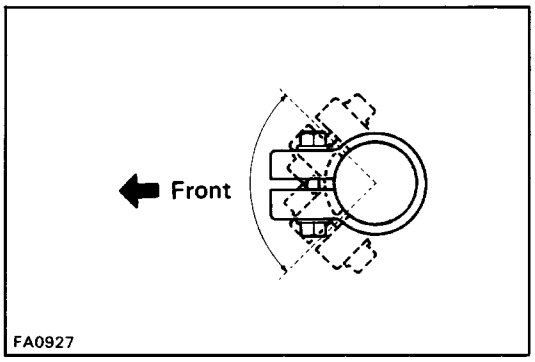


(b) Adjust toe–in by turning the left and right tie rod tubes an equal amount.

Toe–in: See page A–26

(c) Insure that the lengths of the left and right tie rods are equal.

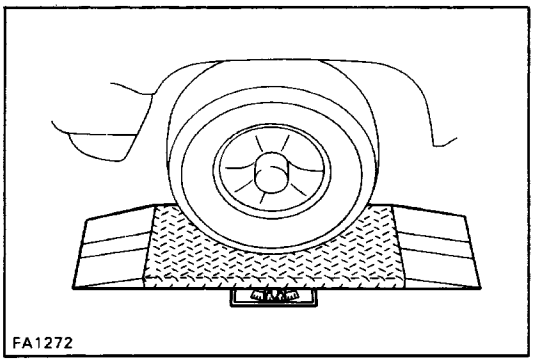
NOTICE: Check that the steering wheel is straightened.



(d) Torque the tie rod.

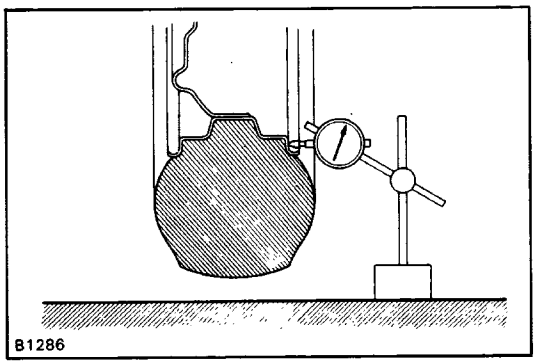
Torque: 22 N–m (225 kgf–cm, 16 ft–lbf)

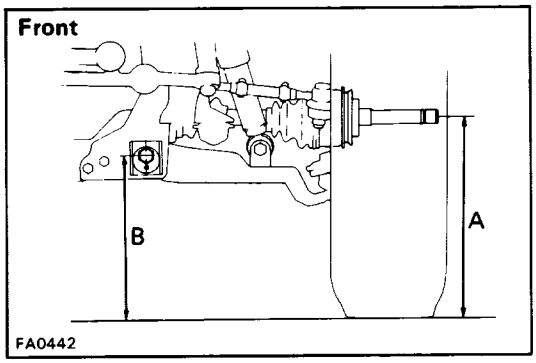
HINT: Face the clamp bolt toward the front of the vehicle.



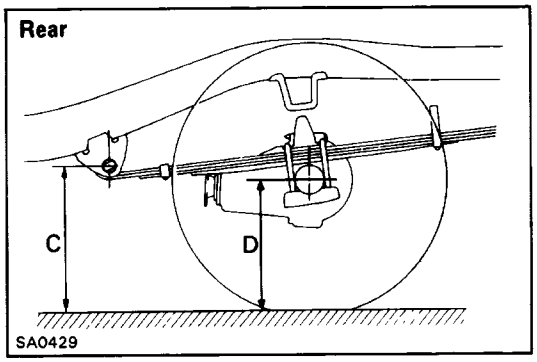
8. INSPECT SIDE SLIP (REFERENCE ONLY)

Side slip: 3.0 mm/m (0.118 in./3.3 ft) or less


B1286



FA0442



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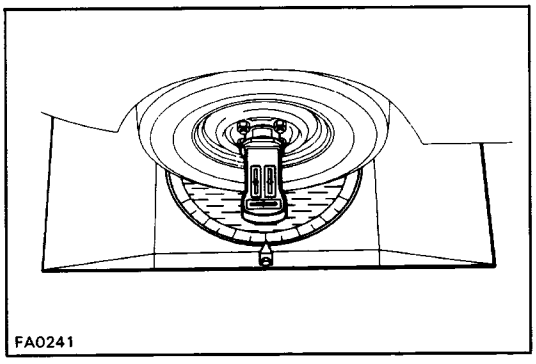
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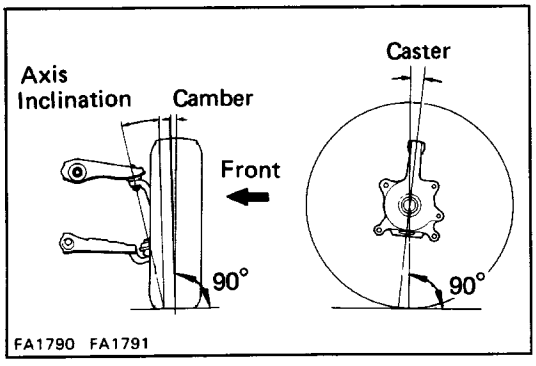

FA1790 FA1791

WHEEL ALIGNMENT
4WD

1. MAKE FOLLOWING CHECKS AND CORRECT ANY PROBLEMS

(a) Check the tires for wear and proper inflation.
Cold tire inflation pressure: See page A–25

(b) Check the wheel runout.
Lateral runout: 1.2 mm (0.047 in.) or less

(c) Check the front wheel bearings for looseness.

(d) Check the front suspension for looseness.

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B: Height at center of tip of front side adjusting cam bolt

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C: Height of center of rear leaf spring front bush 1

D: Height of center of rear axle shaft

HINT: For the vehicle height of non–loaded vehicles for each model and the alignment standard values, refer to page A–25.

3. INSTALL WHEEL ALIGNMENT EQUIPMENT

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4. ADJUST CAMBER, STEERING AXIS INCLINATION AND CASTER

Camber, Steering axis inclination, Caster: See page A–25, 26

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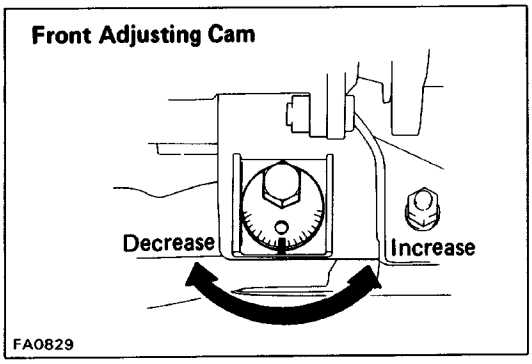
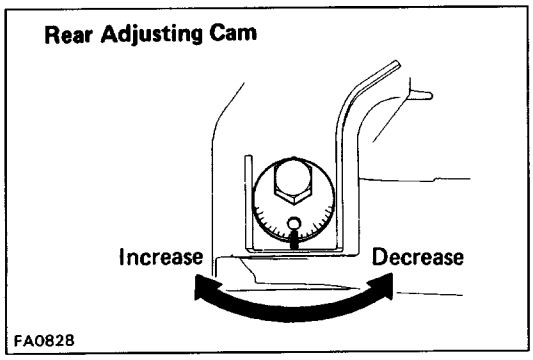
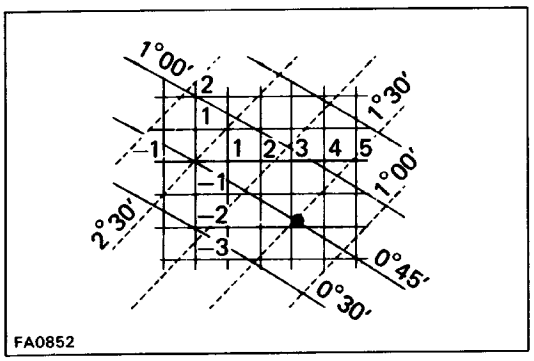


If camber and/or caster are not within specification, adjust by front and/or rear adjusting cams.
(See Adjustment Chart)

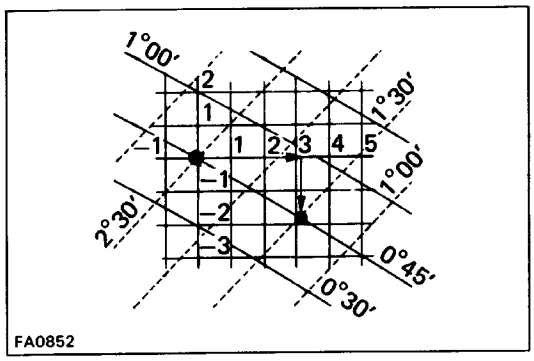




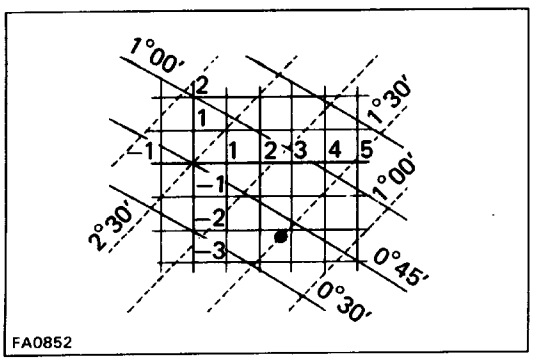
How to Read the Chart
(Alignment measured with vehicle height set to standard
height for wheel alignment inspection)

(a) Mark on the adjustment chart the alignment values measured with the vehicle at standard height.
Example: Camber 0°45'
Caster 1 ° 30'

(b) To calculate the amounts by which the front and/or rear cams are to be adjusted, read from the adjustment chart the distance from the center of the chart to the mark you have made, as shown in the illustration.
Example: Front cam –1.8
Rear cam + 3.1



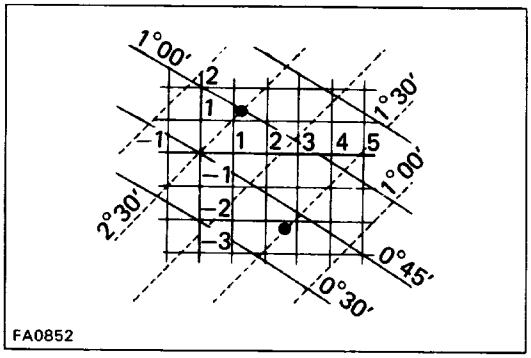
(c) Torque the front and/or rear cam nuts.
Torque: 196 N–m (2,000 kgf–cm, 145 ft–lbf)



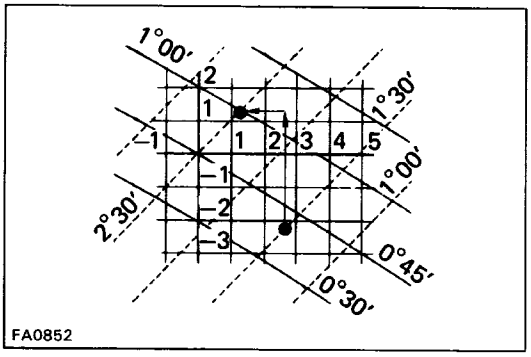
How to Read the Chart
(Wheel alignment measured at vehicle height of non–loaded vehicle)

(a) Find the wheel alignment standard value applicable for the particular model in non–loaded condition.
(See page A–33)

(b) Mark the selected standard value on the adjustment chart.
Example: Camber 0°40'
Caster 1 ° 30'

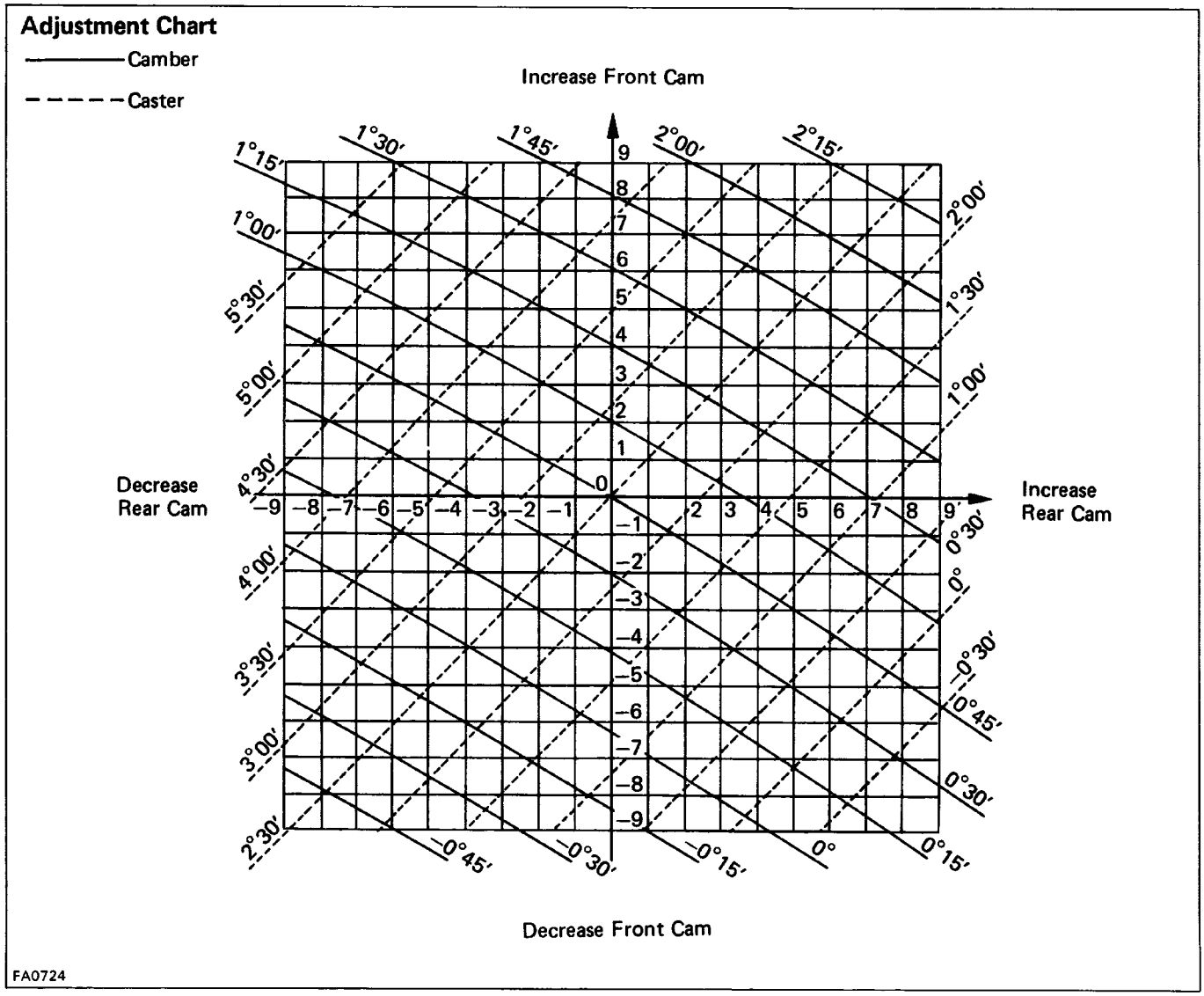


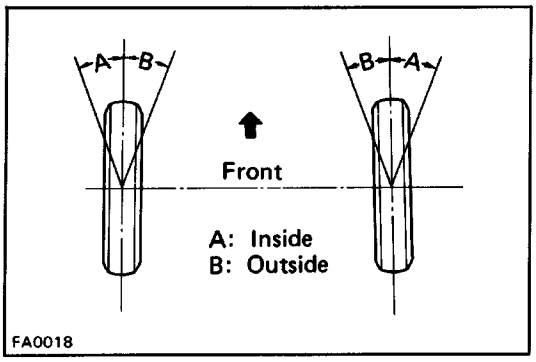
(c) Mark on the adjustment chart the alignment values measured at the non–loaded vehicle height.
Example: Camber 1°00'
Caster 2°30'



(d) As shown in the illustration, read the distance from the standard value to the measured value, and adjust the front and/or rear adjusting cams accordingly.
Example: Front cam + 3.4
Rear cam –1.6

(e) Torque the front and/or rear cam nuts.
Torque: 196 N–m (2,000 kgf–cm, 145 ft–lbf)

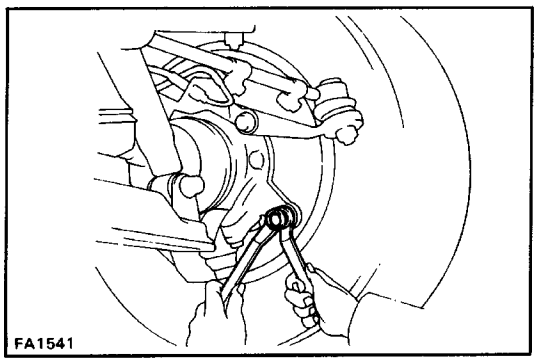




5. ADJUST WHEEL ANGLE

Remove the caps of the knuckle stopper bolts and check the steering angles.

Wheel angle		
Max.	Inside wheel	32°00' +1° –2°
	Outside wheel	31°
at 200 (outside wheel)	Inside wheel	21 ° 10'

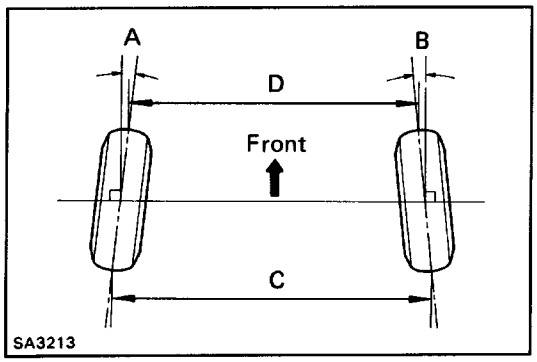


HINT: When the steering wheel is fully turned, make sure that the wheel is not touching the body or brake flexible hose.

If maximum steering angles differ from standard value, adjust the wheel angle with the knuckle stopper bolts.

Torque: 47 N–m (480 kgf–cm, 35 ft–lbf)

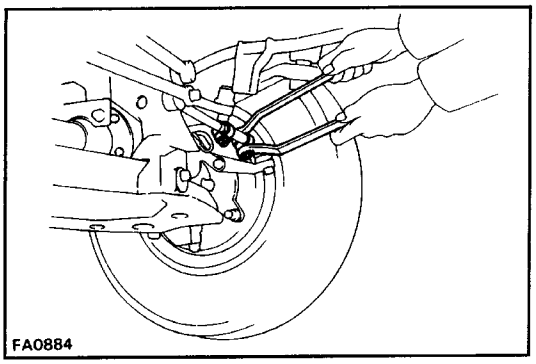
If the wheel angle still cannot be adjusted within limits, inspect and replace damaged or worn steering parts.



6. INSPECT TOE–IN

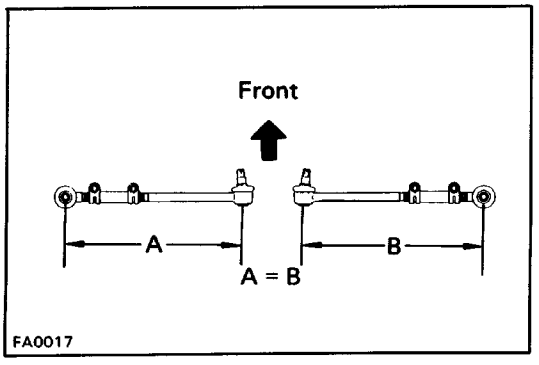
Toe–in: See page A–26

If toe–in is not within specification adjust by the tie rod end.



7. ADJUST TOE–IN

(a) Loosen the clamp bolts and nuts.

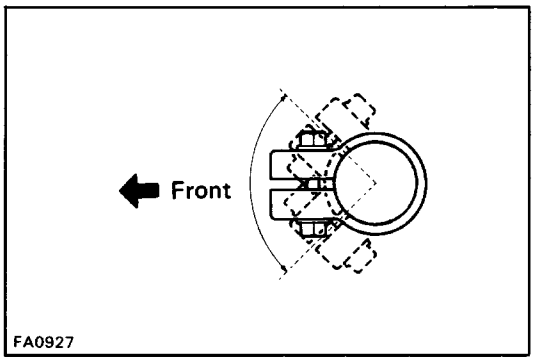


(b) Adjust toe–in by turning the left and right tie rod tubes an equal amount.

Toe–in: See page A–26

(c) Insure that the lengths of the left and right tie rods are equal.

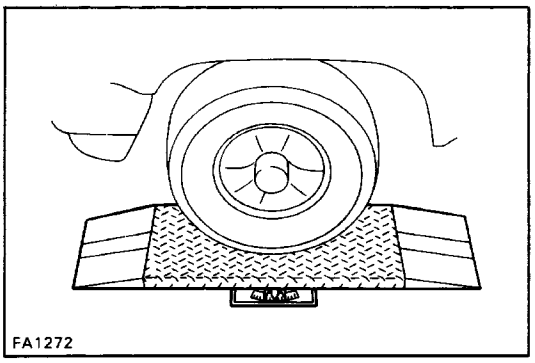
NOTICE: Check that the steering wheel is straightened.



(d) Torque the tie rod.

Torque: 22 N–m (225 kgf–cm, 16 ft–lbf)

HINT: Face the clamp bolt toward the front of the vehicle.



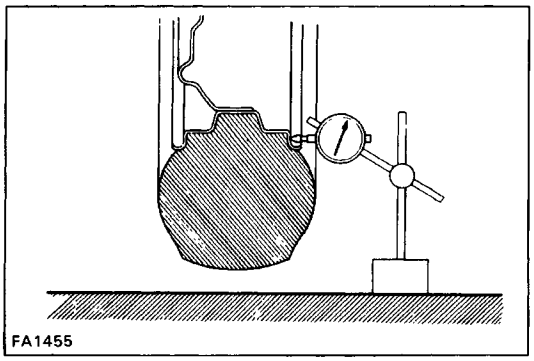
8. INSPECT SIDE SLIP (REFERENCE ONLY)

Side slip: 3.0 mm/m (0.118 in./3.3 ft) or less

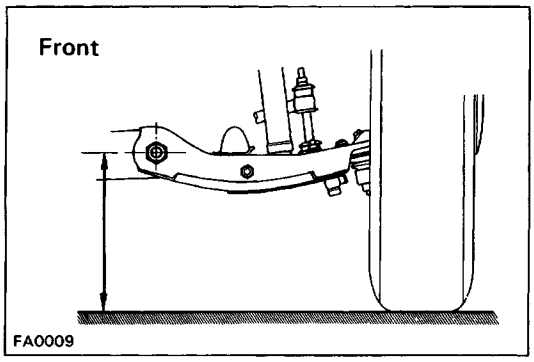
WHEEL ALIGNMENT
2WD

1. MAKE FOLLOWING CHECKS AND CORRECT ANY PROBLEMS

(a) Check the tires for wear and proper inflation.
Cold tire inflation pressure: See page A–23


FA1455

(b) Check the wheel runout.
Lateral runout: 1.2 mm (0.047 in.) or less
(c) Check the front wheel bearings for looseness.
(d) Check the front suspension for looseness.
(e) Check the steering linkage for looseness.
(f) Use the standard bounce test to check that the front absorbers work properly.



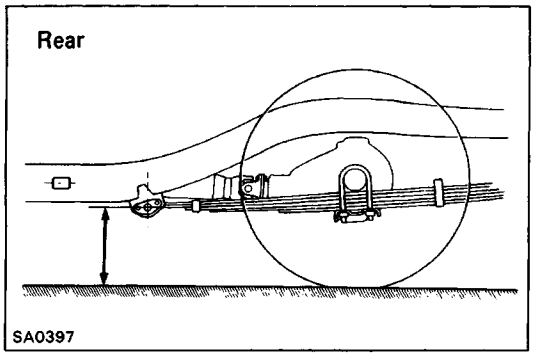
FA0009

2. MEASURE CHASSIS GROUND CLEARANCE

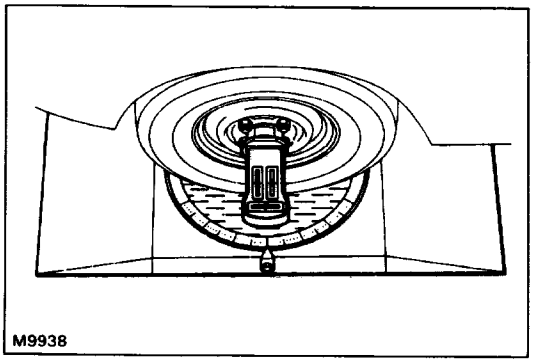
Chassis ground clearance: See page A–23

If the clearance of the vehicle is not standard, try to adjust it by pushing down on the body or by lifting the body. If still not correct, check for bad springs or suspension parts.

HINT: Before inspecting wheel alignment, adjust chassis ground clearance to specification.

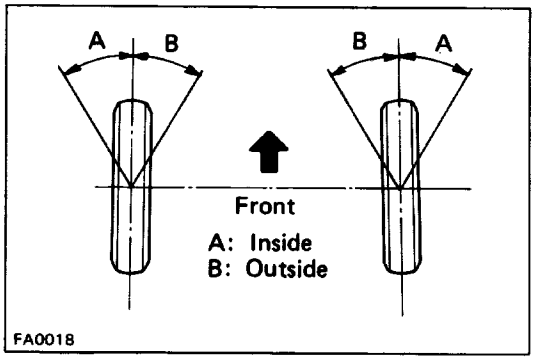


SA0397



3. INSTALL WHEEL ALIGNMENT EQUIPMENT

Follow the specific instructions of the equipment manufacturer.

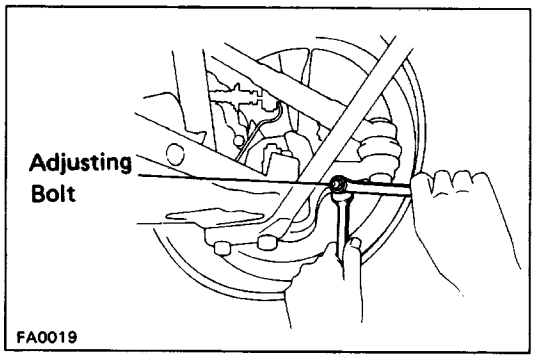


4. ADJUST WHEEL ANGLE

Remove the caps of the knuckle stopper bolts and check the steering angles.

Steering angles: See page A–24

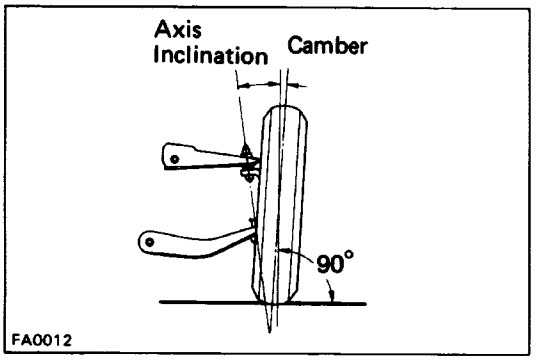
HINT: When the steering wheel is fully turned, make sure that the wheel is not touching the body or brake flexible hose.



If maximum steering angles differ from standard value, adjust the wheel angle with the knuckle stopper bolts.

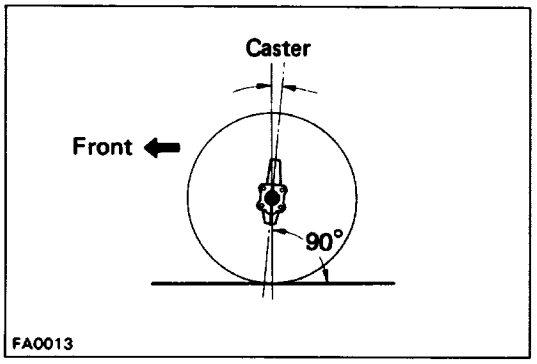
Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)

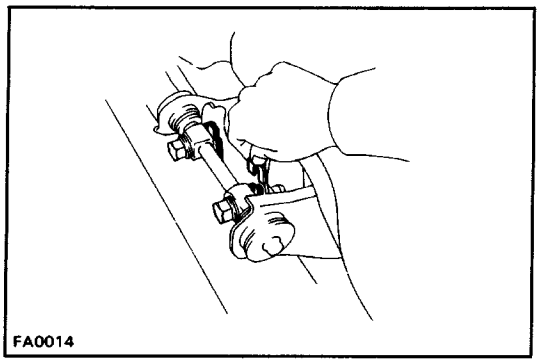
If the wheel angle still cannot be adjusted within limits, inspect and replace damaged or worn steering parts.



5. ADJUST CAMBER, STEERING AXIS INCLINATION AND CASTER

Specifications: See page A–23, 24

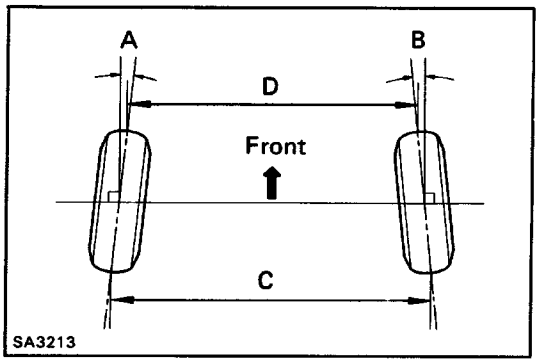



FA0014

If camber caster is not within specification, adjust by adding or removing shims on the upper arm.
Shim thickness mm (in.)

Thickness	
4.0	(0.157)
1.6	(0.063)
1.2	(0.047)

If the steering axis inclination is not as specified after camber and caster have been correctly adjusted, recheck the steering knuckle and front wheel for bending or looseness.

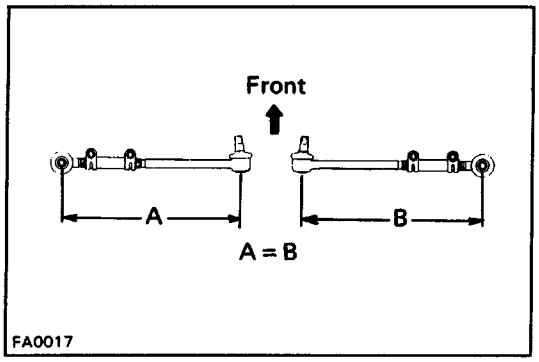


SA3213

6. INSPECT TOE–IN

Toe–in: See page A–23

If toe–in is not within specification adjust by the tie rod end.



FA0017

7. ADJUST TOE–IN

(a) Loosen the clamp bolts.

(b) Adjust toe–in by turning the left and right tie rod tubes an equal amount.

Toe–in: See page A–23

HINT: Make sure that the tie rods are the same length.

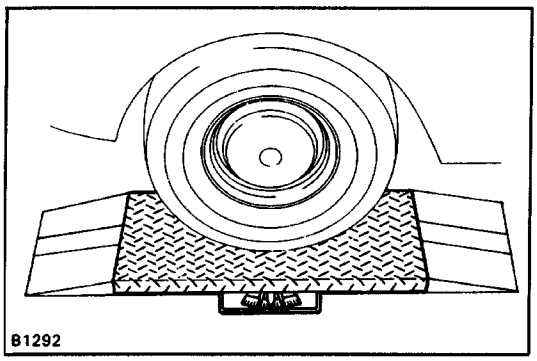
Left–right error: 3.0 mm (0.118 in.) or less

(g) Tighten the clamp bolts and torque them.

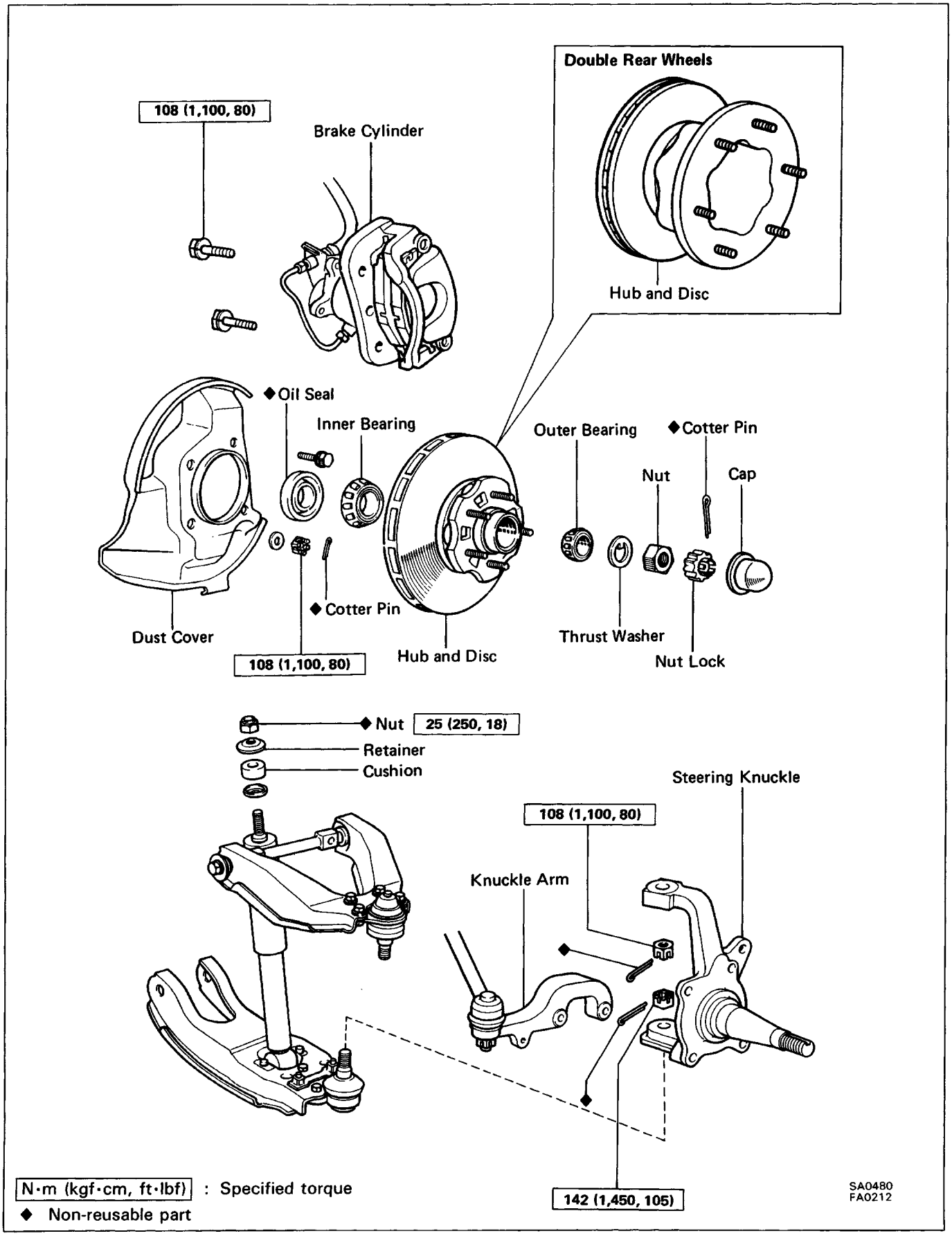
Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)

8. INSPECT SIDE SLIP (REFERENCE ONLY)

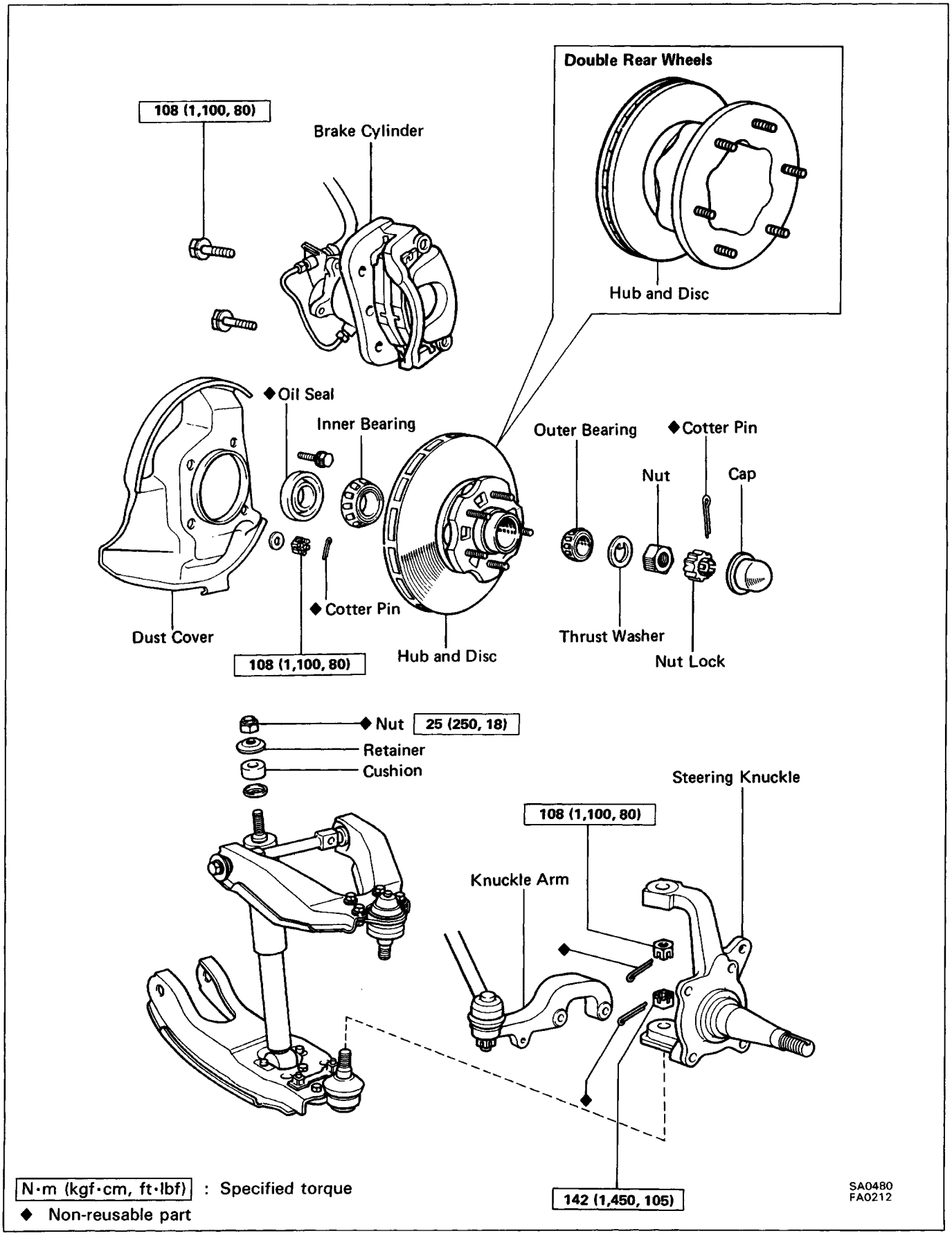
Side slip: 3.0 mm/m (0.118 in. l3.3 ft) or less

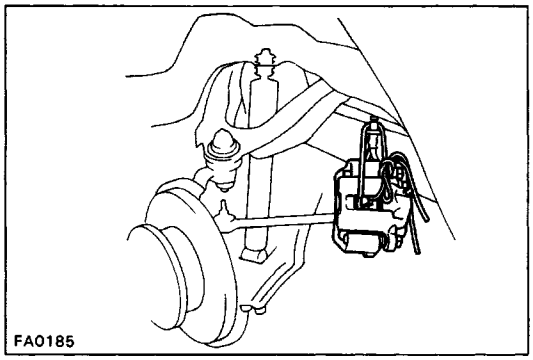

B1292

FRONT AXLE HUB AND STEERING KNUCKLE COMPONENTS



FRONT AXLE HUB AND STEERING KNUCKLE COMPONENTS





Front Axle Hub

(See page SA–11)

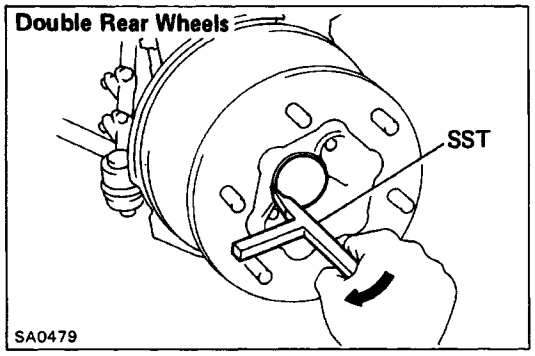
DISASSEMBLY OF FRONT AXLE HUB

1. REMOVE DISC BRAKE CYLINDER AND TORQUE PLATE

(a) Remove the brake cylinder and suspend it with wire.

(b) Remove the torque plate.

HINT: Do not disconnect the brake tube and hose.



2. REMOVE AXLE HUB WITH DISC

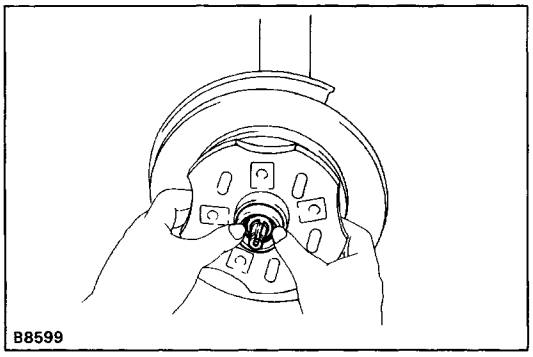
(a) (Single rear wheel)

Remove the cap.

(Double rear wheels)

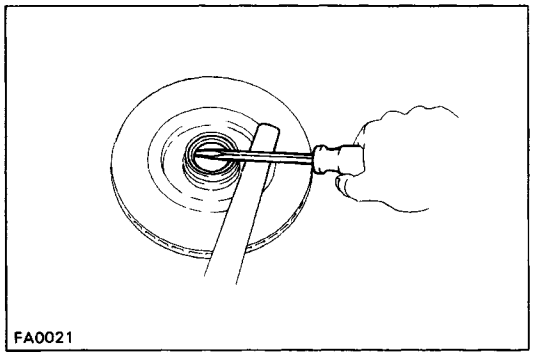
Using SST, pry off the cap.

SST 09504–22011



(b) Remove the hub and disc together with the outer bearing and thrust washer.

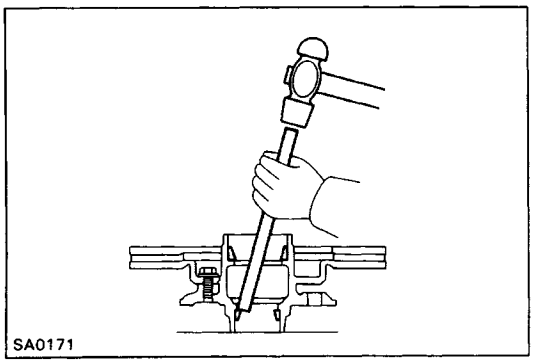
HINT: Be careful not to drop the outer bearing.



3. REMOVE INNER BEARING AND OIL SEAL

(a) Using a screwdriver, pry out the oil seal.

(b) Remove the inner bearing from the hub.



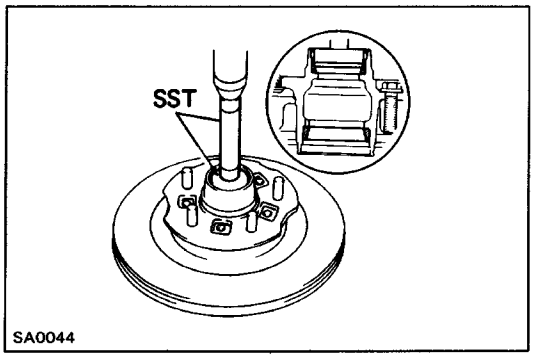
INSPECTION AND REPAIR OF FRONT AXLE HUB

1. INSPECT BEARING

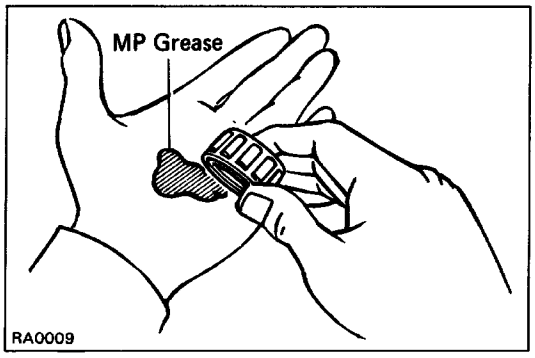
Clean the bearings and outer races and inspect them for wear or damage.

2. REPLACE BEARING OUTER RACE

(a) Using a brass bar and hammer, drive out the bearing outer race.



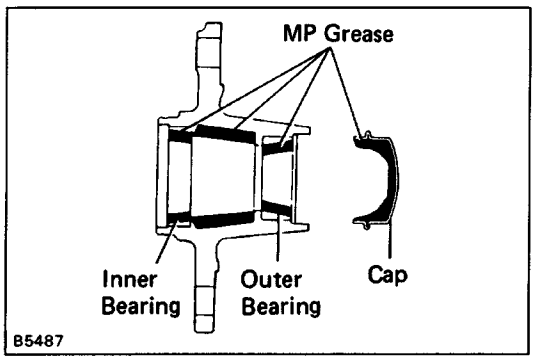
(b) Using SST, carefully drive in a new bearing outer race.
SST 09608–30012
(Inside race 09608–04020, 09608–04100)
(Outside race 09608–04020, 09608–04060)



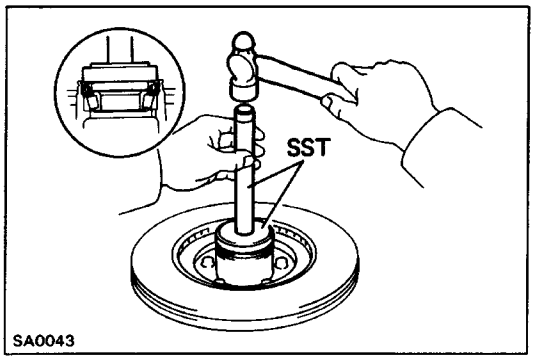
ASSEMBLY OF FRONT AXLE HUB

1. PACK BEARINGS WITH MP GREASE

(a) Place MP grease in the palm of your hand.
(b) Pack grease into the bearing, continuing until the grease oozes out from the other side.
(c) Do the same around the bearing circumference.



2. COAT INSIDE OF HUB AND CAP WITH MP GREASE

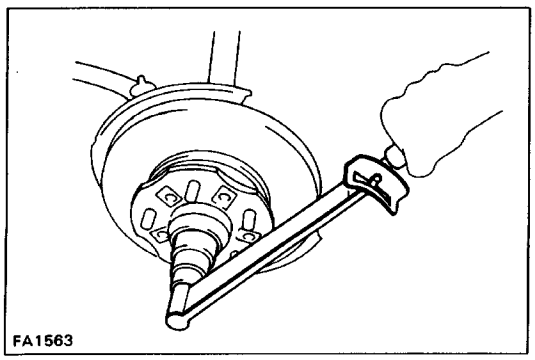


3. INSTALL INNER BEARING AND OIL SEAL

Place inner bearing into the hub. Using SST, drive the oil seal into the hub. Coat the oil seal with MP grease.
SST 09608–30012 (09608–04020, 09608–04100)

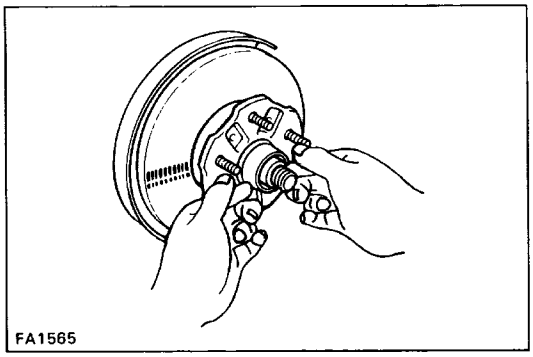
4. INSTALL AXLE HUB ON SPINDLE

(a) Place the axle hub on the spindle.
(b) Install the outer bearing and thrust washer.

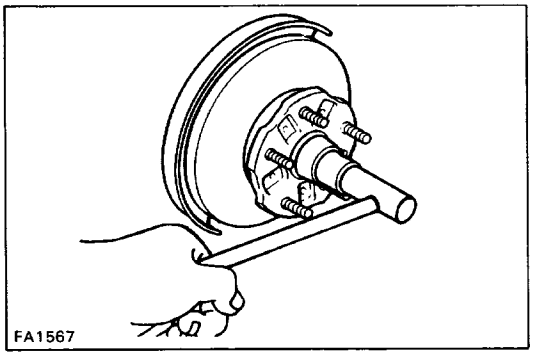


5. ADJUST PRELOAD

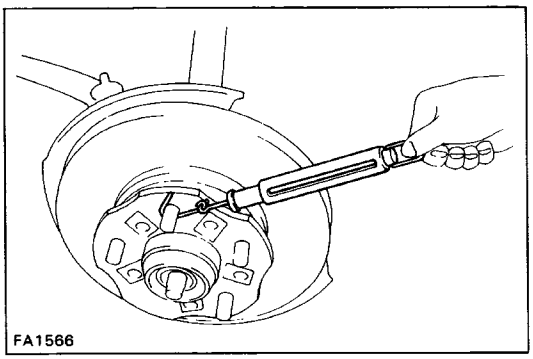
(a) Install and torque the nut.
Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)


FA1565

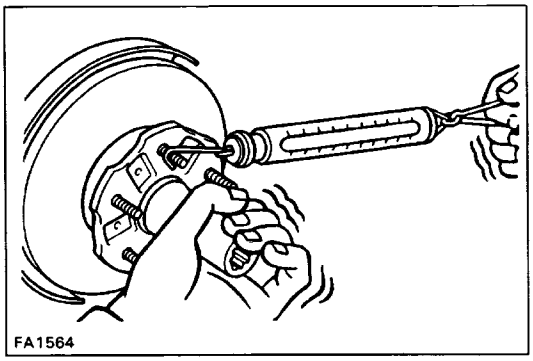
(b) Snug down the bearing by turning the hub several times.


FA1567

(c) Loosen the nut until it can be turned by hand.


FA1566

(d) Using a spring tension gauge, measure and make a note of the frictional force of the oil seal.


FA1564

(e) Tighten the nut until the preload is within specifica–tion.

Preload (starting):

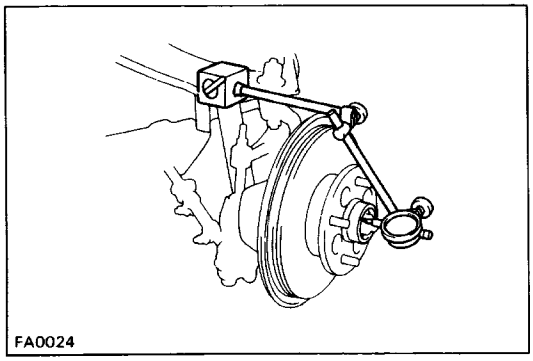
Add oil seal frictional force

Single rear wheel

5.9– 17.7N(0.6– 1.8kgf, 1.3–4.–lbf)

Double rear wheels

3.9–9.8N(0.4– 1.Okgf,0.9–2.21bf)


FA0024

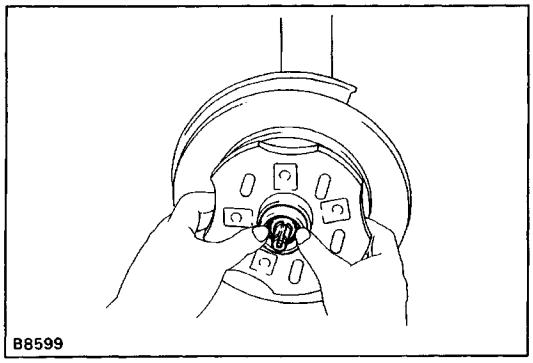
(f) Measure the hub axial play.

Axial play: 0.05 mm (0.0020 in.) or less

6. INSTALL LOCK NUT, COTTER PIN AND GREASE CAP

7. INSTALL BRAKE CYLINDER AND TORQUE PLATE ONTO STEERING KNUCKLE

Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)



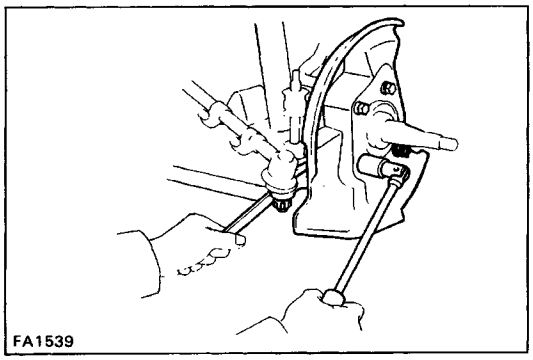
Steering Knuckle

(See page SA–11)

REMOVAL OF STEERING KNUCKLE

1. REMOVE FRONT AXLE HUB AND BRAKE CALIPER

(See page SA–12)

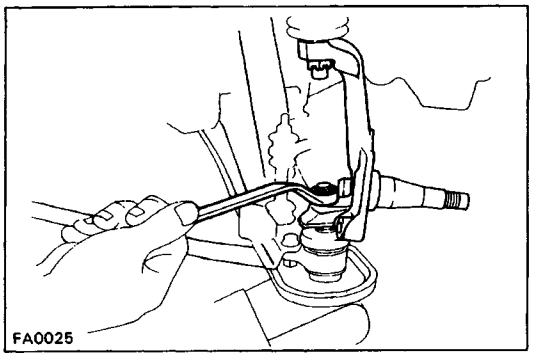


2. REMOVE DUST COVER

(a) Remove the two bolts.

(b) Remove the two cotter pins, nuts and bolts and remove the dust cover.

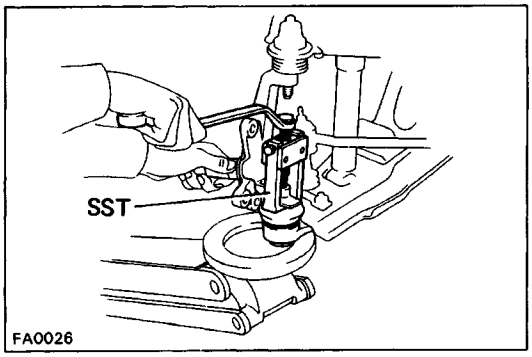
(c) Remove the knuckle arm from the steering knuckle.



3. REMOVE STEERING KNUCKLE

(a) Support the lower arm with a jack.

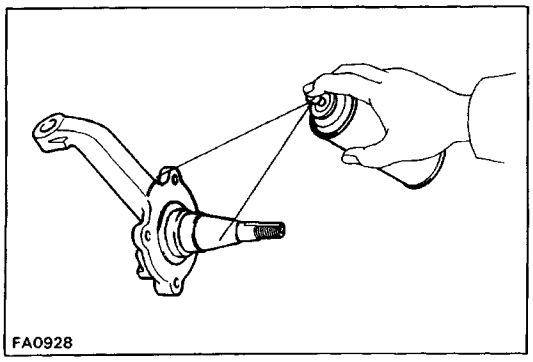
(b) Remove the two cotter pins and two nuts.



(c) Using SST, disconnect the steering knuckle from the lower ball joint.
SST 09628–62011

(d) Using SST, disconnect the steering knuckle from the upper ball joint.
SST 09628–62011

(e) Remove the steering knuckle.

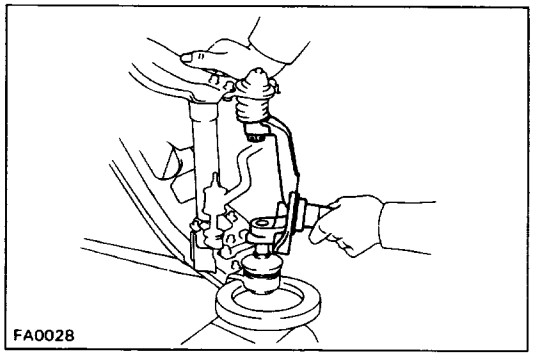


INSPECTION OF STEERING KNUCKLE

INSPECT STEERING KNUCKLE

Using a dye penetrant, check the steering knuckle for cracks.

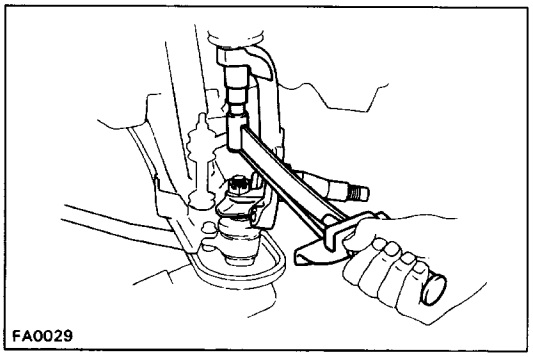
If a crack is found, replace the steering knuckle.



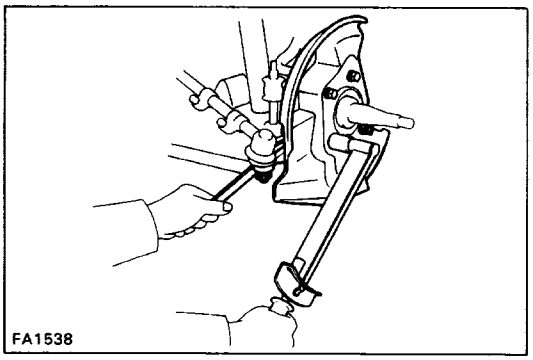
INSTALLATION OF STEERING KNUCKLE

1. INSTALL STEERING KNUCKLE

(a) Support the lower arm with a jack.
(b) Install the steering knuckle to the upper ball joint and install the nut.
(c) Push the upper arm and steering knuckle down and install the steering knuckle to the lower ball joint and install the nut.

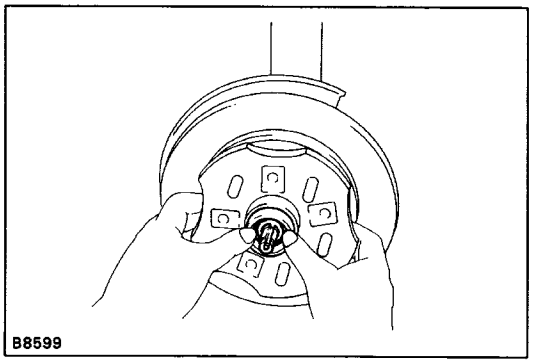


(d) Torque the upper ball joint nut.
Torque: 108 N– m (1,100 kgf–cm, 80 ft–lbf)
(e) Torque the lower ball joint nut.
Torque: 142 N–m (1,450 kgf–cm, 105 ft–lbf)
(f) Install new cotter pins.



2. INSTALL KNUCKLE ARM AND DUST COVER

(a) Install the knuckle arm and the dust cover.
(b) Torque the bolts and nuts.
Torque: 108 N–m (1,100 kgf–cm, 80 ft–lbf)
(c) Secure the nuts with new cotter pins.



3. INSTALL FRONT AXLE HUB AND BRAKE CALIPER

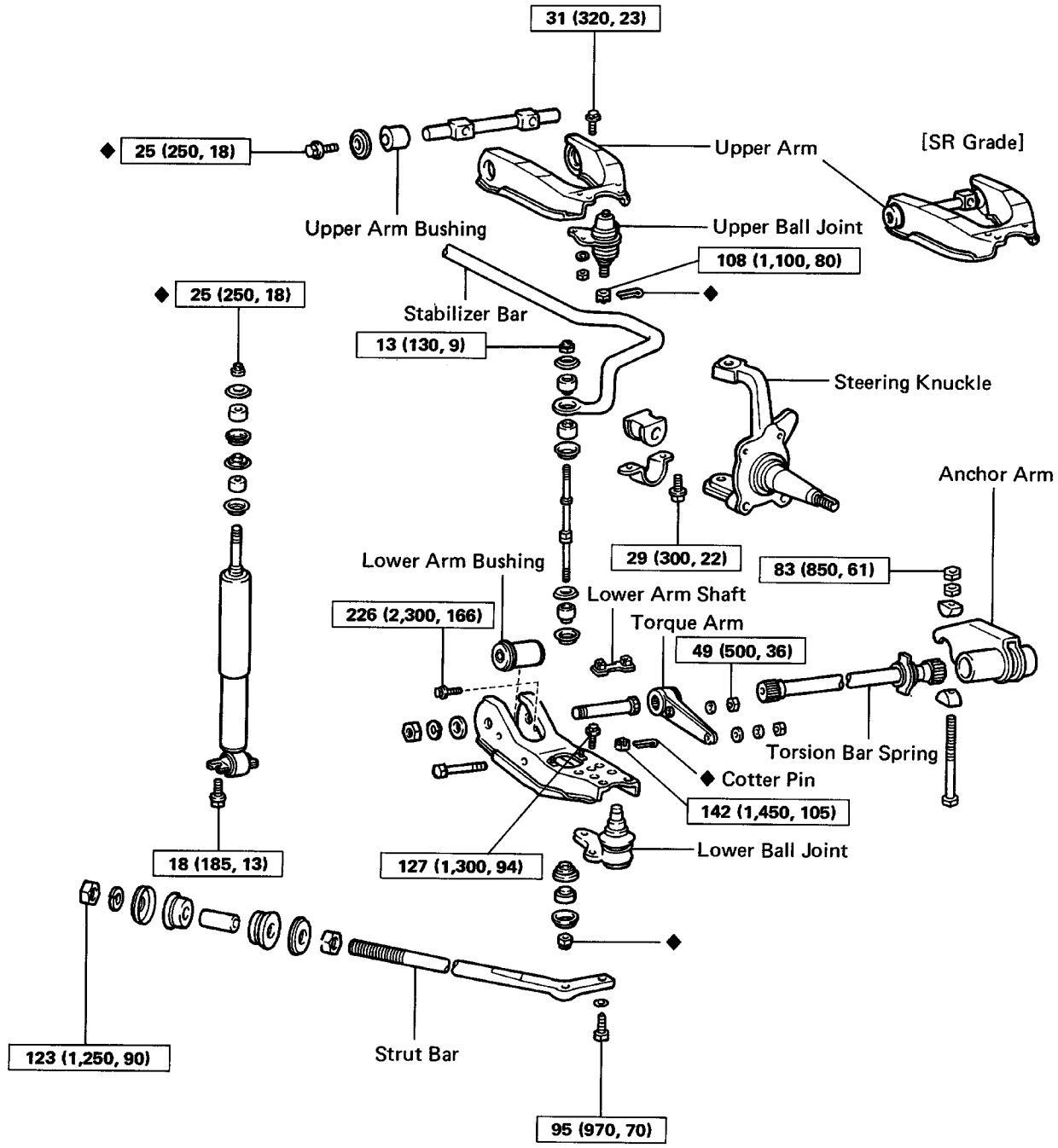
(See page SA–13)

4. CHECK FRONT WHEEL ALIGNMENT

(See page SA–3)

FRONT SUSPENSION

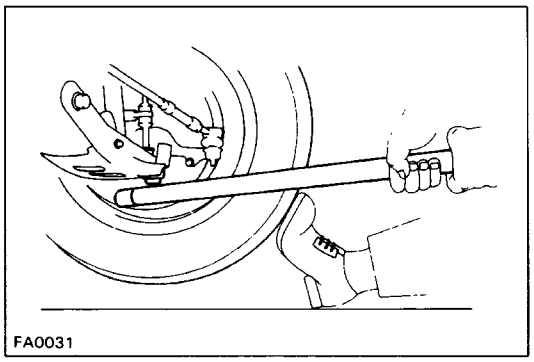
COMPONENTS

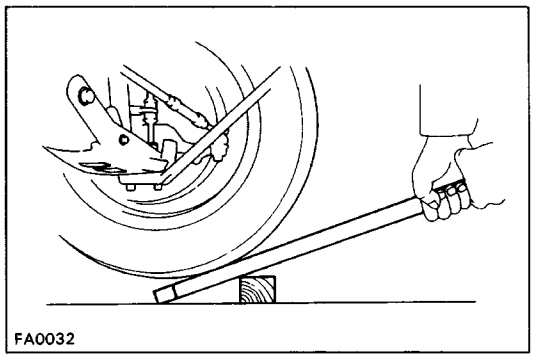


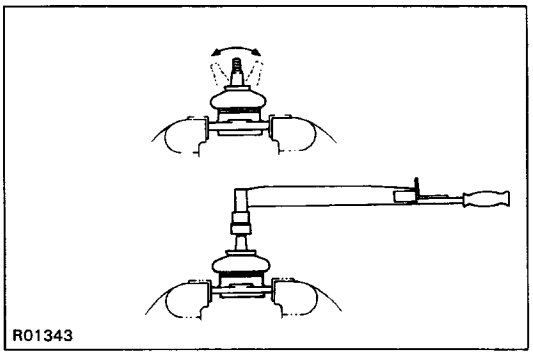
N·m (kgf·cm, ft·lbf) : Specified torque

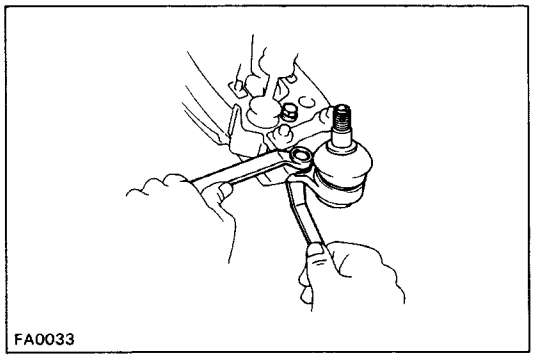
◆ Non-reusable part

R01344


FA0031


FA0032


R01343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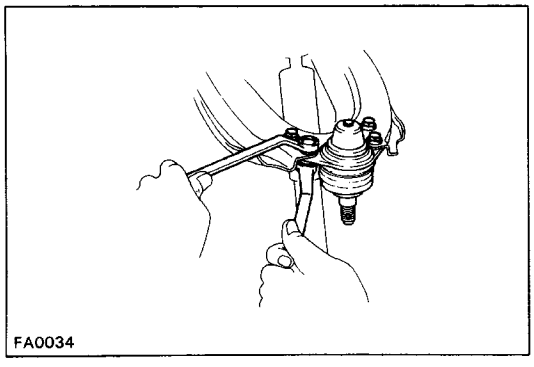

FA0034

Ball Joint

(See page SA–17)

INSPECTION OF BALL JOINTS

1. INSPECT LOWER BALL JOINT FOR EXCESSIVE LOOSENESS

(a) Jack up the front of the vehicle and support it with stands.

(b) Make sure the front wheels are in a straight forward position, and depress the brake pedal.

(c) Move the lower arm up and down and check that the lower ball joint has no excessive play.

Maximum vertical play: 0 mm (0 in.)

2. INSPECT UPPER BALL JOINT FOR EXCESSIVE LOOSENESS

Move the wheel up and down and check that the upper ball joint has no excessive play.

Maximum vertical play: 2.3 mm (0.091 in.)

3. INSPECT BALL JOINT ROTATION CONDITION

(a) Remove the ball joint.

(b) As shown in the figure, flip the ball joint stud back and forth 5 times before installing the nut.

(c) Using a torque gauge, turn the nut continuously one turn every 2–4 seconds and take the torque reading on the 5th turn.

Torque (turning):

Lower ball joint	**0.1 – 4.9 N–m**
	(1– 50 kgf –cm, 1 – 43 in.–lbf)

Upper ball joint 2.0 – 3.9 N–m
(20– 40 kgf –cm, 17 – 35 in.–lbf)

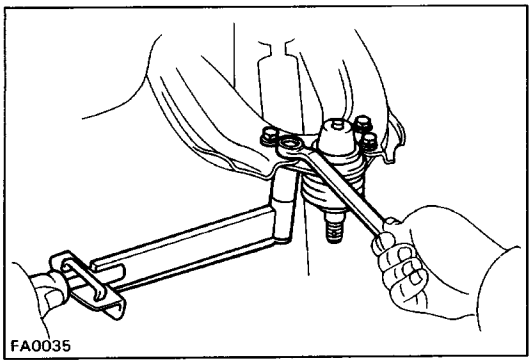
REMOVAL OF BALL JOINTS

1. REMOVE STEERING KNUCKLE

(See page SA–15)

2. REMOVE LOWER BALL JOINT FROM LOWER ARM

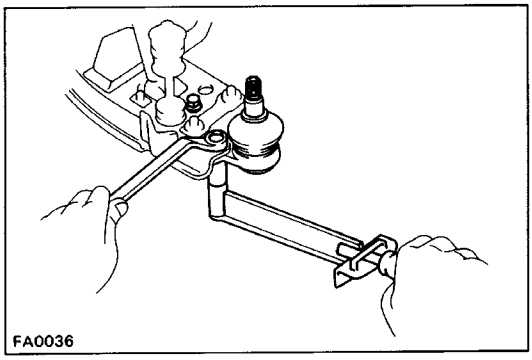
3. REMOVE UPPER BALL JOINT FROM UPPER ARM



INSTALLATION OF BALL JOINTS

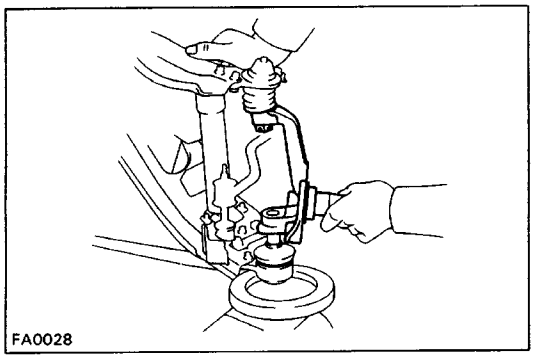
1. INSTALL UPPER BALL JOINT TO UPPER ARM

Torque: 31 N–m (320 kgf–cm, 23 ft–lbf)



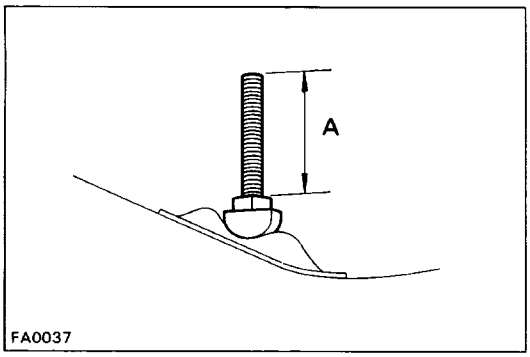
2. INSTALL LOWER BALL JOINT TO LOWER ARM

Torque: 127 N–m (1,300 kgf–cm, 94 ft–lbf)



3. INSTALL STEERING KNUCKLE

(See page SA–16)



Torsion Bar Spring

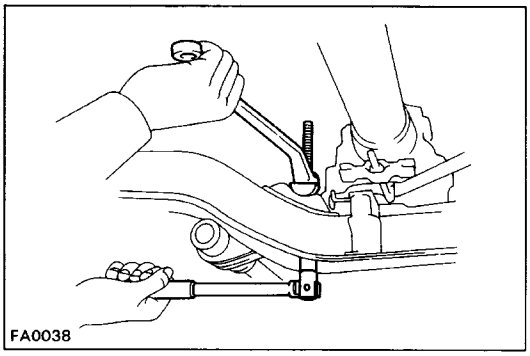
(See page SA–17)

REMOVAL OF TORSION BAR SPRING

1. JACK UP AND SUPPORT FRAME ON STANDS

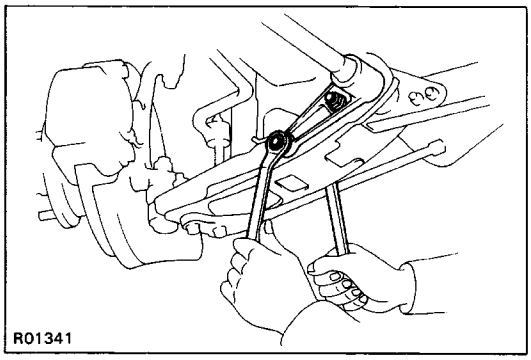
2. REMOVE LOCK NUT AND MEASURE PROTRUDING BOLT END "A", AS SHOWN

HINT: Use this measurement for reference when adjusting the chassis ground clearance.



3. REMOVE DUST COVER

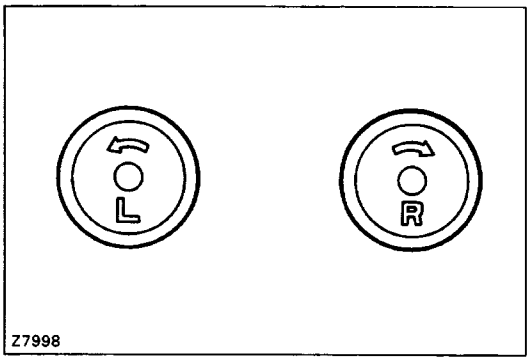
4. LOOSEN ADJUSTING NUT UNTIL NO TENSION ON TORSION BAR



5. REMOVE TORQUE ARM, TORSION BAR SPRING AND ANCHOR ARM

(a) Remove the torque arm mounting nuts.

(b) Remove the anchor arm from the adjusting bolt and then remove the torsion bar together with the torque arm and anchor arm.



INSTALLATION OF TORSION BAR SPRING

HINT: There are left and right identification marks on the rear end of the torsion bar springs.

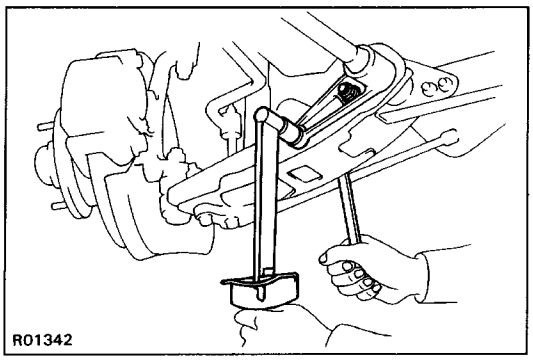
Be careful not to interchange the torsion bar springs.

1. INSTALL TORSION BAR SPRING AND ANCHOR ARM AND TORQUE ARM

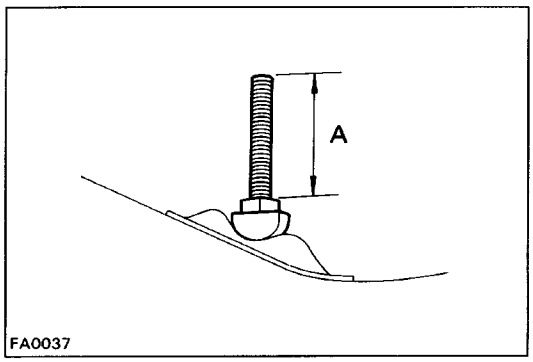
(a) Apply a light coat of MP grease to the spline of the torsion bar spring.

(b) Align the toothless portion and install the anchor arm to the torsion bar spring.

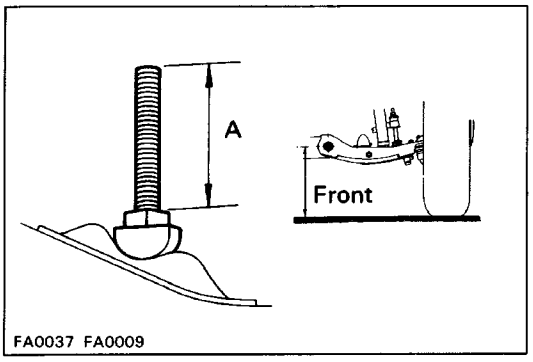
(c) Align the toothless portion and install the torque arm to the torsion bar spring.



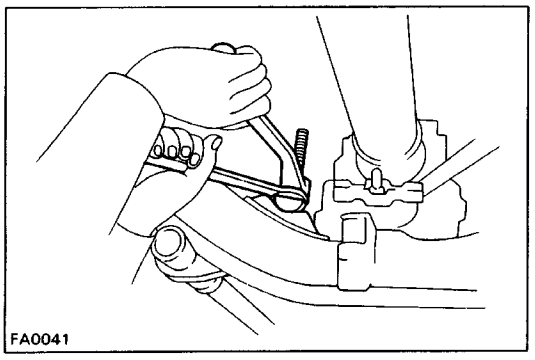
(d) Install the torsion bar spring torque arm side and install the anchor arm to the adjusting bolt.
(e) Torque the torque arm nuts.
Torque: 49 N–m (500 kgf–cm, 36 ft–lbf)



(f) Tighten the adjusting nut so that the bolt protrusion is equal to that before removal.

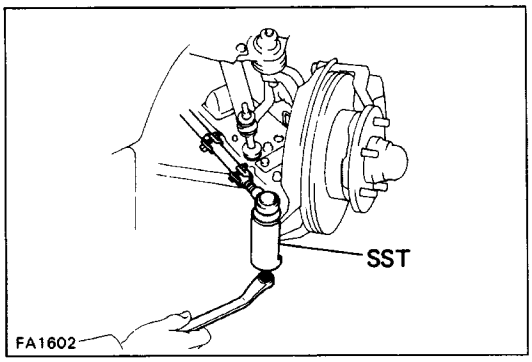


(g) Install the wheel and remove the stands. Bounce the
vehicle to settle the suspension.
(h) Adjust the chassis ground clearance by turning the adjusting nut.
Chassis ground clearance: See page A–23



2. TORQUE LOCK NUT
Torque: 83 N–m (850 kgf–cm, 61 ft–lbf)

3. INSTALL DUST COVER



Lower Suspension Arm and Shock Absorber

(See page SA–17)

REMOVAL OF LOWER SUSPENSION ARM AND SHOCK ABSORBER

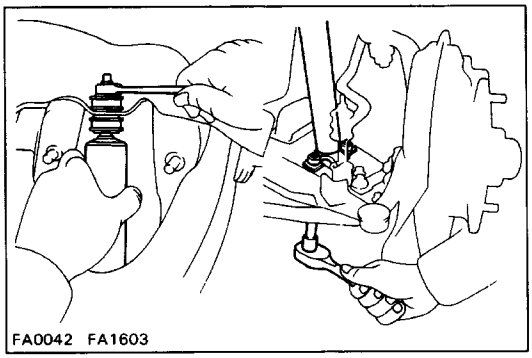
1. REMOVE TORSION BAR SPRING (See page SA–20)

2. DISCONNECT TIE ROD END

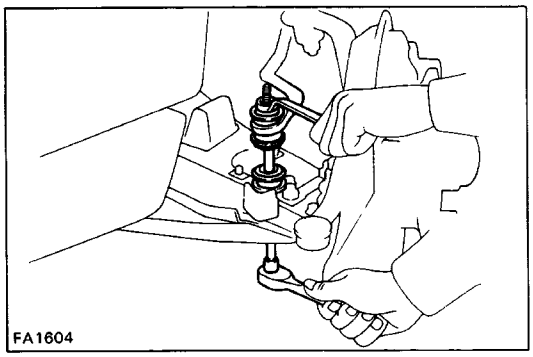
(a) Remove the cotter pin and nut.

(b) Using SST, disconnect the tie rod end.

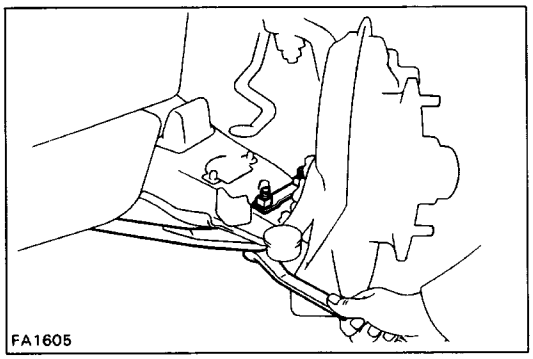
SST 09610–20012



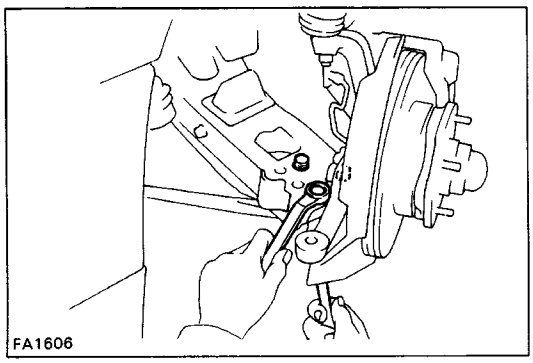
3. REMOVE SHOCK ABSORBER



4. DISCONNECT STABILIZER BAR FROM LOWER ARM

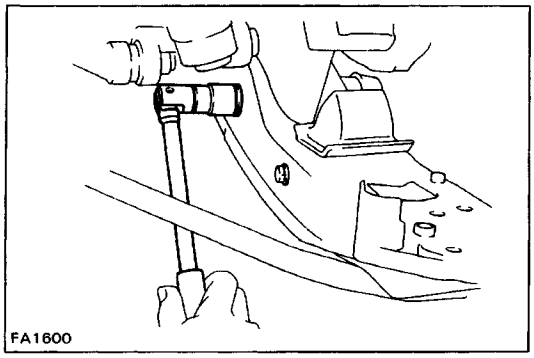


5. DISCONNECT STRUT BAR FROM LOWER ARM



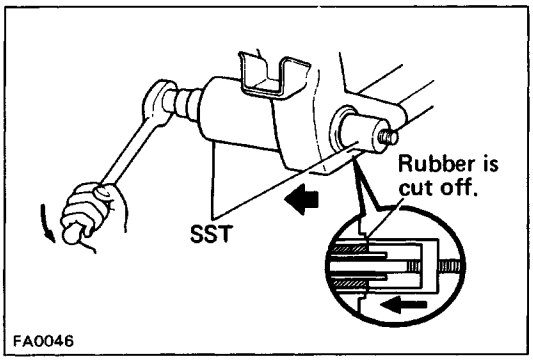
6. DISCONNECT LOWER BALL JOINT

Remove the three bolts and disconnect the lower bal joint.



7. REMOVE LOWER SUSPENSION ARM

Remove the nut and lower suspension arm.



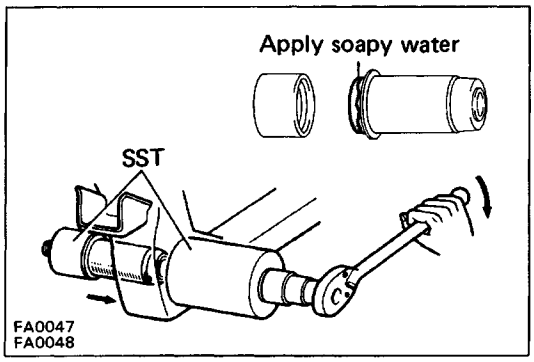
REPLACEMENT OF LOWER ARM BUSHING

1. REMOVE BUSHING

(a) Cut off the bushing rubber as shown in the figure.

(b) Using SST, remove the bushing.

SST 09726–35010



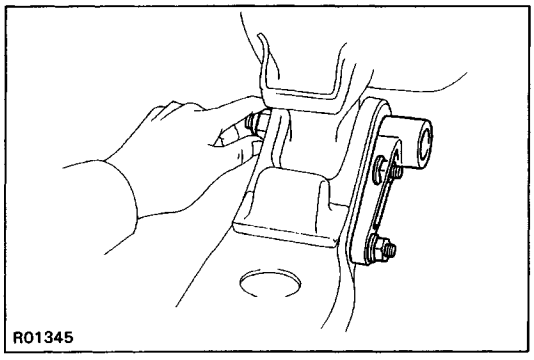
2. INSTALL BUSHING

(a) Apply soapy water on the front rubber part of the bushing and fit SST on the new bushing.

SST 09726–35010

(b) Using SST, install the new bushing.

SST 09726–35010



INSTALLATION OF LOWER SUSPENSION ARM AND SHOCK ABSORBER

1. INSTALL LOWER SUSPENSION ARM

(a) Install the torque arm mounting bolts to the lower arm.

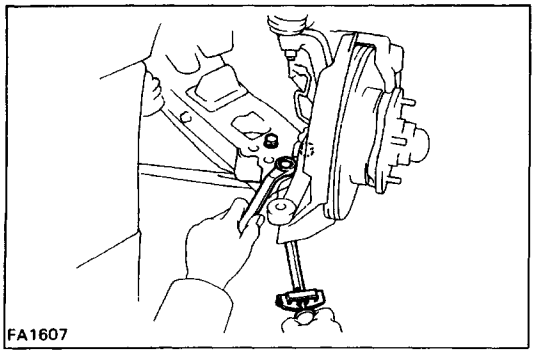
(b) Place the torque arm on the lower arm shaft.

Set the lower arm in installation position, and install the lower arm shaft and torque arm.

(c) Temporarily install the torque arm.

(d) Finger tighten the lower arm, and remove the torque arm.

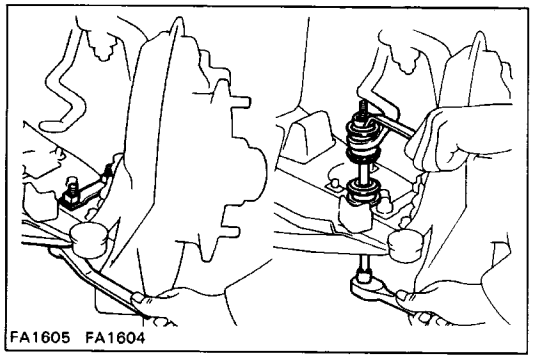
HINT: Do not torque the nut.



2. CONNECT LOWER BALL JOINT

Connect the lower ball joint to the lower suspension arm with the three bolts.

Torque: 127 N–m (1,300 kgf–cm, 94 ft–lbf)

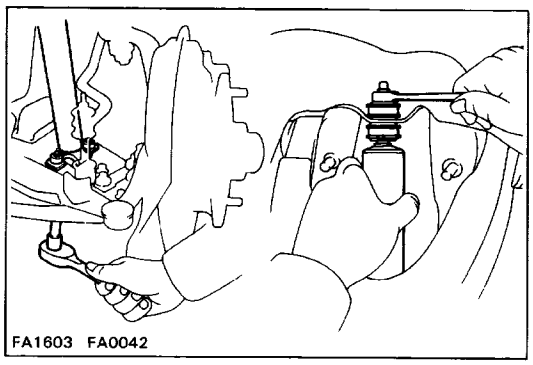


3. CONNECT STRUT BAR TO LOWER ARM

Torque: 95 N–m (970 kgf–cm, 70 ft–lbf)

4. CONNECT STABILIZER BAR TO LOWER SUSPENSION ARM

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



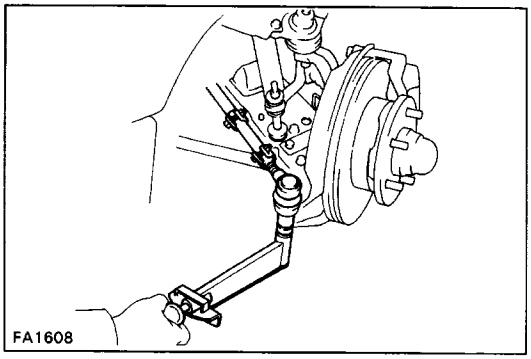
5. INSTALL SHOCK ABSORBER

(a) Install the shock absorber to the lower suspension arm.

Torque: 18 N–m (185 kgf –cm, 13 ft–lbf)

(b) Install the shock absorber to the upper bracket.

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)



6. CONNECT TIE ROD END

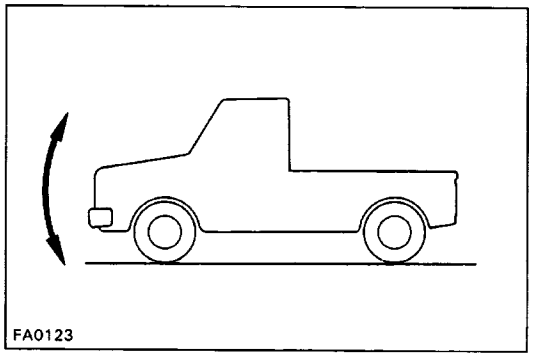
(a) Connect the tie rod end to the steering knuckle arm and install and torque the nut.

Torque: 90 N–m (920 kgf–cm, 67 ft–lbf)

(b) Secure the nut with a new cotter pin.

7. INSTALL TORSION BAR SPRING

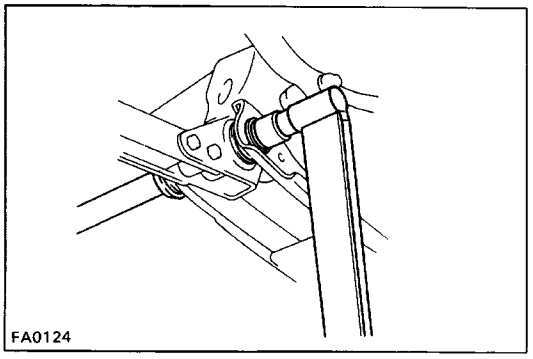
(See page SA–20)



8. TORQUE LOWER SUSPENSION ARM SHAFT NUT

(a) Install the wheel.

(b) Remove the stands and bounce the vehicle up and down to stabilize the suspension.

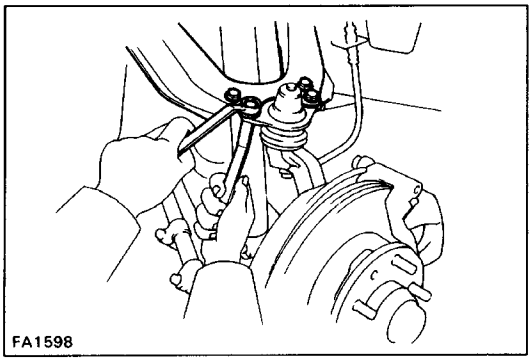


(c) Torque the nut.

Torque: 226 N–m (2,300 kgf–cm, 166 ft–lbf)

9. CHECK FRONT WHEEL ALIGNMENT

(See page SA–3)


FA1598

Upper Suspension Arm

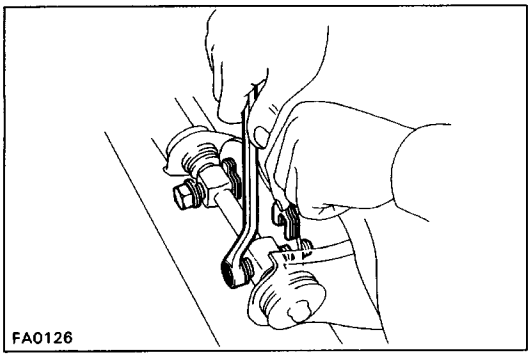
(See page SA–17)

REMOVAL OF UPPER SUSPENSION ARM

1. DISCONNECT UPPER BALL JOINT FROM UPPER ARM

(a) Support the lower arm with a jack.

(b) Remove the four bolts and nuts, and disconnect the upper arm.


FA0126

2. REMOVE UPPER SUSPENSION ARM

(a) Remove the bolts and camber adjusting shims.

(b) Remove the upper arm.

HINT: Do not loose the camber adjusting shims. Record the position, and the thickness of camber adjusting shims so that these can be reinstalled to their original location.

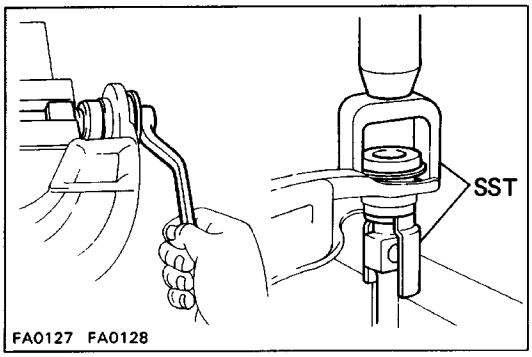
REPLACEMENT OF UPPER ARM BUSHING

1. REMOVE BUSHING

(a) Remove the bolts and washers.

(b) Using SST, push out the bushings.

SST 09710–30020 (09710–03030, 09710–03040)



FA0127 FA0128

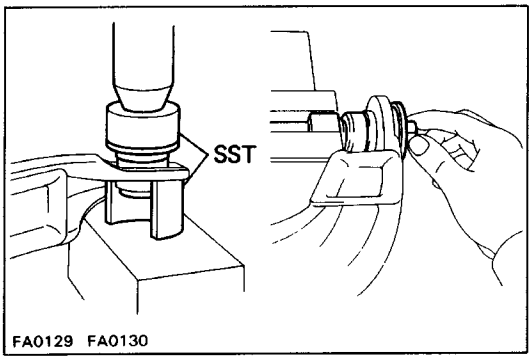
2. INSTAL BUSHING

(a) Using SST, push in the bushings.

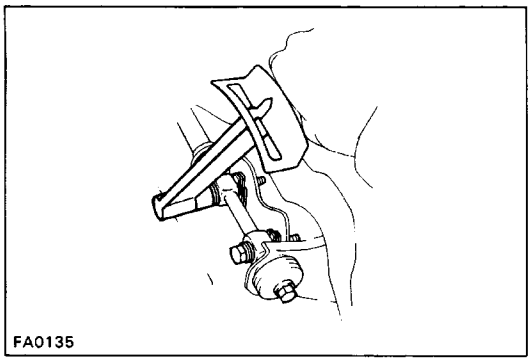
SST 09710–30020 (09710–03060, 09710–03050)

(b) Install the washers, and finger tighten the bolts.

HINT: Do not torque the bolts.



FA0129 FA0130


FA0135

INSTALLATION OF UPPER SUSPENSION ARM

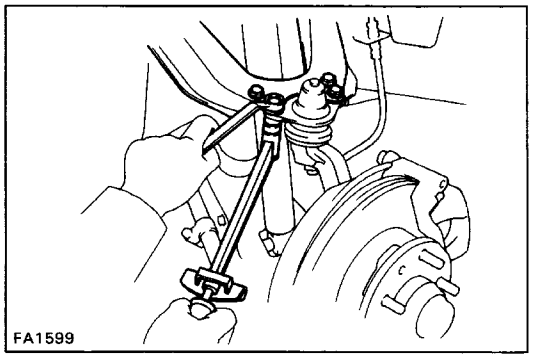
1. INSTALL UPPER ARM

(a) Install the upper arm together with the camber adjusting shims.

(b) Torque the bolts.

Torque: 96 N–m (980 kgf–cm, 71 ft–lbf)

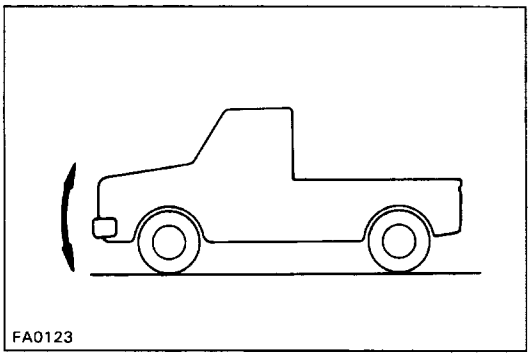
HINT: Install an equal number and thickness of shims in their original position.


FA1599

2. CONNECT UPPER ARM

Connect the upper arm with the four bolts and nuts.

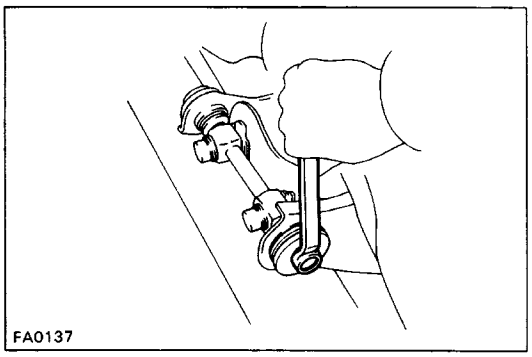
Torque: 31 N–m (320 kgf–cm, 23 ft–lbf)


FA0123

3. TORQUE UPPER ARM SHAFT BOLTS

(a) Install the wheel.

(b) Remove the stands and bounce the vehicle up and down to stabilize the suspension.

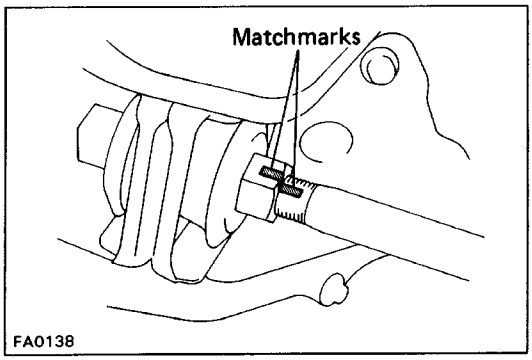

FA0137

(c) Torque the upper arm shaft bolts.

Torque: 126 N–m (1,280 kgf–cm, 93 ft–lbf)

4. CHECK FRONT WHEEL ALIGNMENT

(See page SA–3)

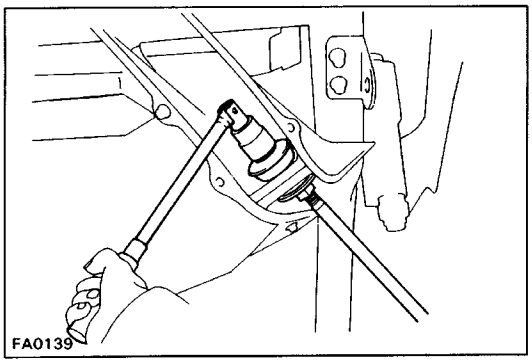


Strut Bar

(See page SA–17)

REMOVAL OF STRUT BAR

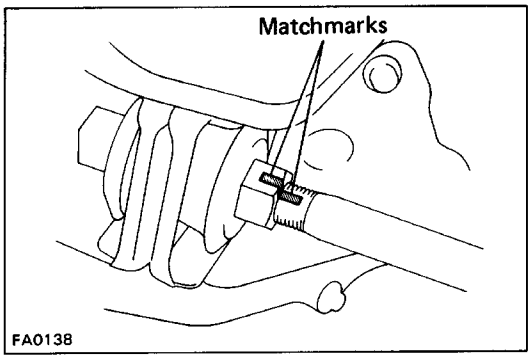
1. PLACE MATCHMARKS ON STRUT BAR



2. REMOVE FRONT NUT FROM STRUT BAR

3. REMOVE STRUT BAR FROM LOWER ARM

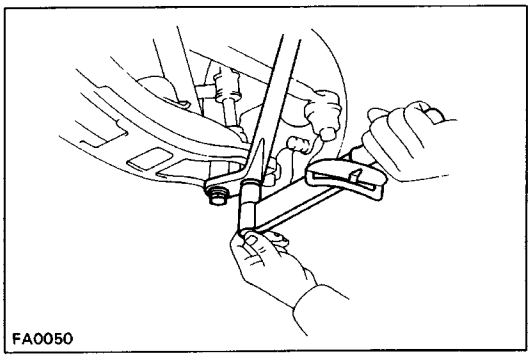
Remove the nuts holding the strut bar to the lower arm, and remove the strut bar.



INSTALLATION OF STRUT BAR

1. INSTALL FRONT NUT

Install the front nut and align the matchmarks on the strut bar.



2. INSTALL STRUT BAR TO BRACKET

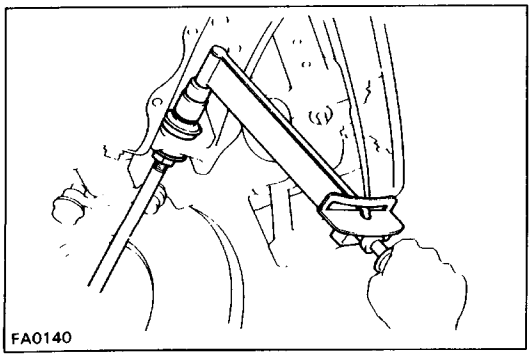
(a) Install the washer and bushing to the strut bar and install it to the bracket.

(b) Install the collar, bushing and washer to the strut bar.

(c) Finger tighten the front nut.

3. CONNECT STRUT BAR TO LOWER ARM

Torque: 95 N–m (970 kgf–cm, 70 ft–lbf)



4. TORQUE FRONT NUT

(a) Remove the stands and the vehicle to stabilize the suspension.

(b) Torque the front nut.

Torque: 123 N–m (1,250 kgf–cm, 90 ft–lbf)

5. CHECK FRONT WHEEL ALIGNMENT

(See page SA–3)

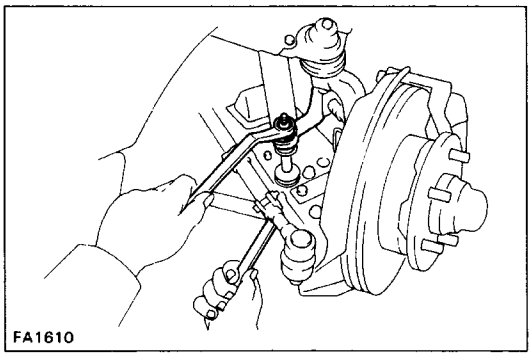
Stabilizer Bar

(See page SA–17)

REMOVAL OF STABILIZER BAR

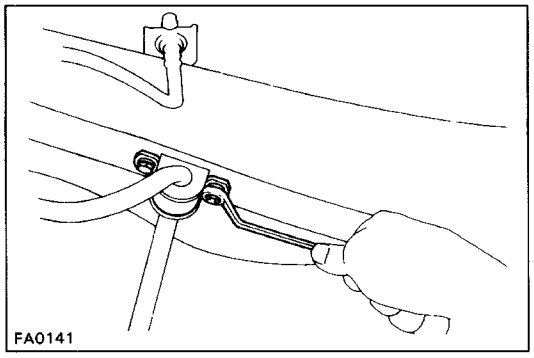
1. REMOVE ONE TORSION BAR SPRING

(See page SA–20)



2. REMOVE STABILIZER BAR FROM LOWER ARMS

(a) Remove the nuts and cushions holding both sides of the stabilizer bar from the lower arms, and disconnect the stabilizer bar.

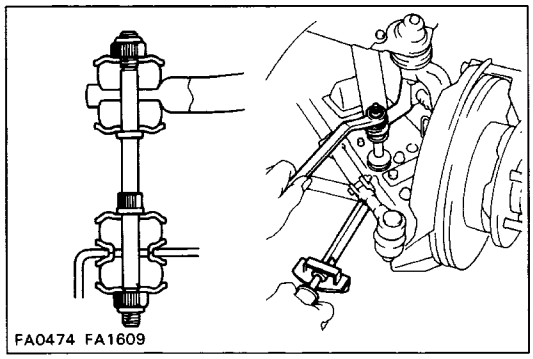


(b) Remove both stabilizer bar bushings and brackets, and remove the stabilizer bar.

INSTALLATION OF STABILIZER BAR

1. PLACE STABILIZER BAR TO FRAME

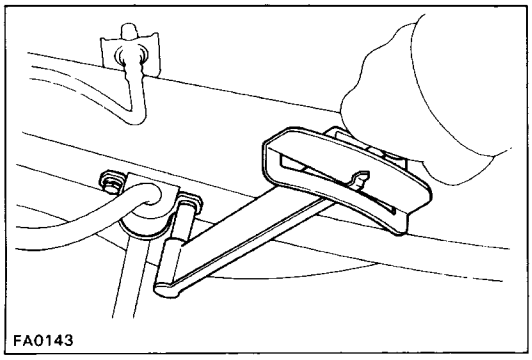
Place the stabilizer bar in position and install both stabilizer bar bushings and brackets to the frame.
Finger tighten the bolts.



2. CONNECT STABILIZER BAR TO LOWER ARMS

Connect the stabilizer bar on both sides to the lower arms with bolts, cushions and new nuts as shown. Torque the nuts.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



3. TORQUE BRACKET SET BOLTS

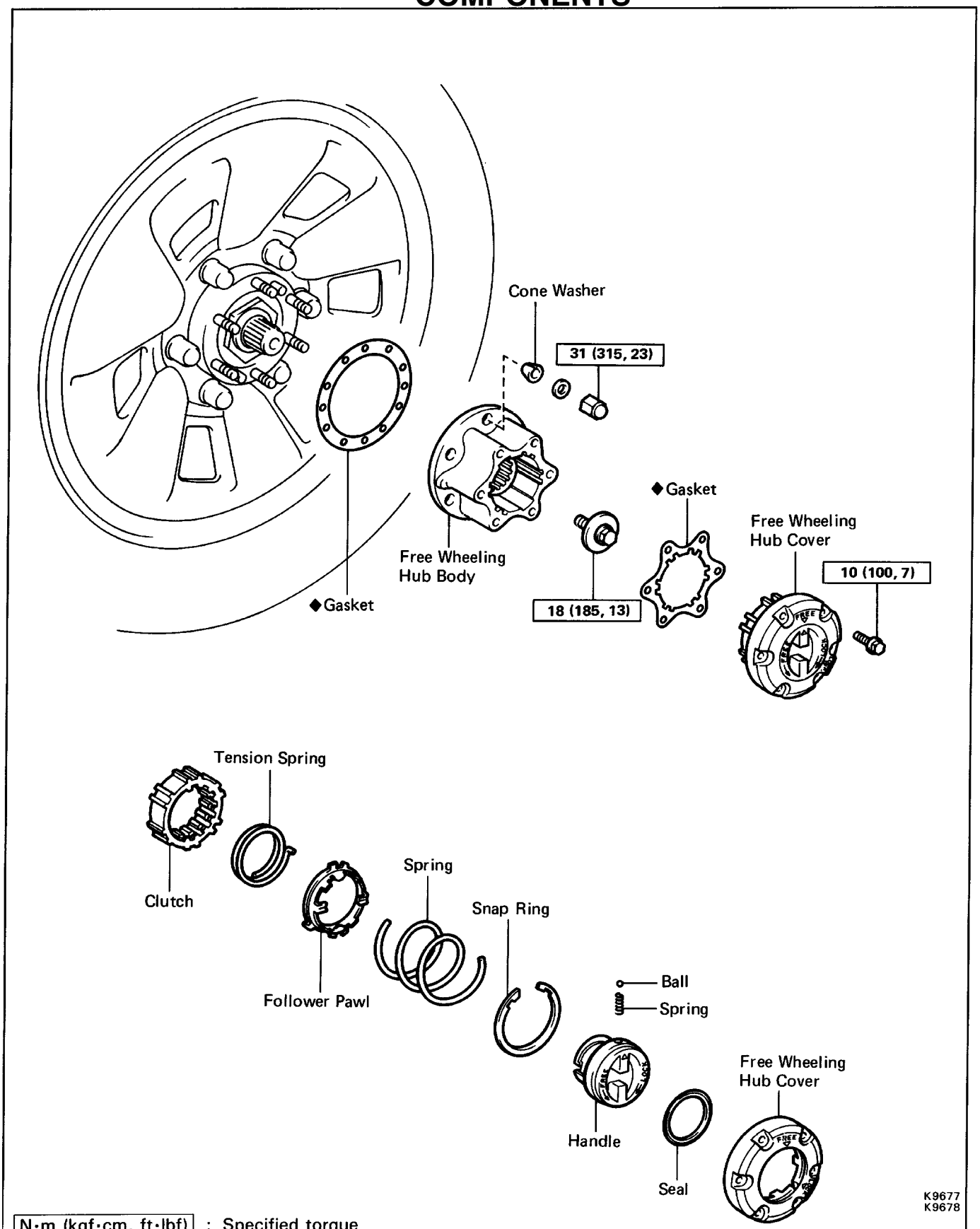
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)

4. INSTALL TORSION BAR SPRING

(See page SA–20)

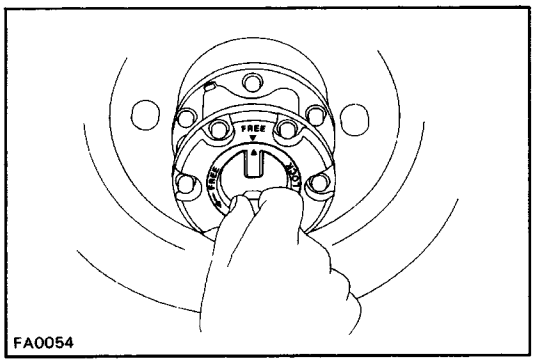
FREE WHEELING HUB

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

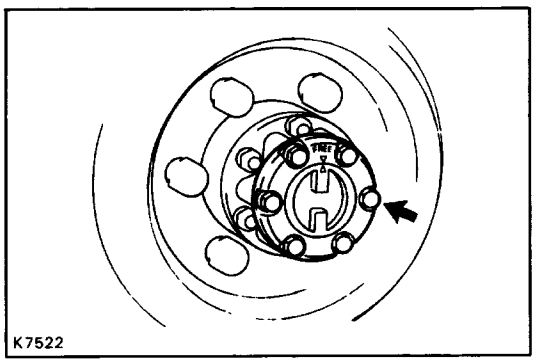
◆ Non-reusable part



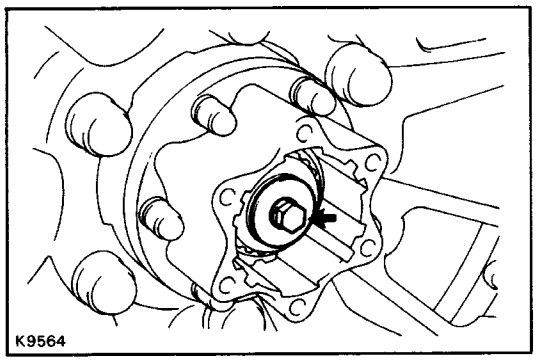
REMOVAL OF FREE WHEELING HUB

1. REMOVE FREE WHEELING HUB COVER

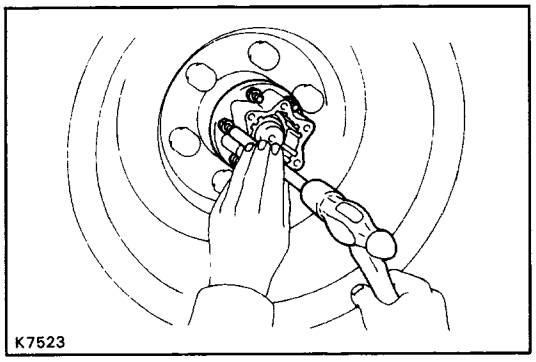
(a) Set the control handle to FREE.



(b) Remove the cover mounting bolts and pull off the cover.

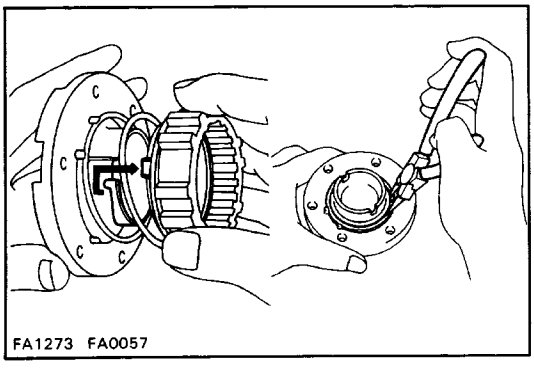


2. REMOVE BOLT WITH WASHER



3. REMOVE FREE WHEELING HUB BODY

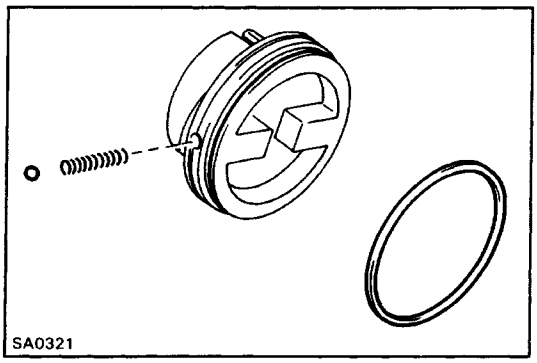
(a) Remove the mounting nuts and washers.
(b) Using a brass bar and hammer, tap on the bolts head and remove the cone washers.
(c) Pull off the free wheeling hub body.



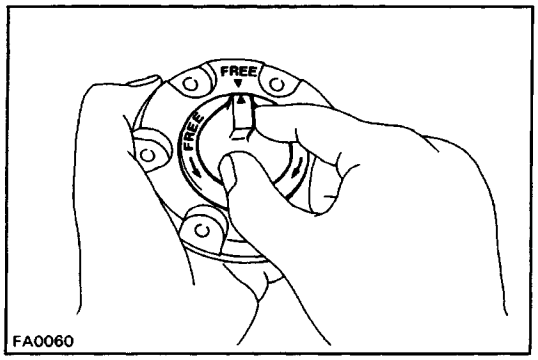
DISASSEMBLY OF FREE WHEELING HUB

1. REMOVE CONTROL HANDLE FROM FREE WHEELING HUB COVER

(a) Compressing the spring, remove the pawl tab from the handle cam, and remove the clutch.
(b) Using snap ring pliers, remove the snap ring.
(c) Remove the control handle.



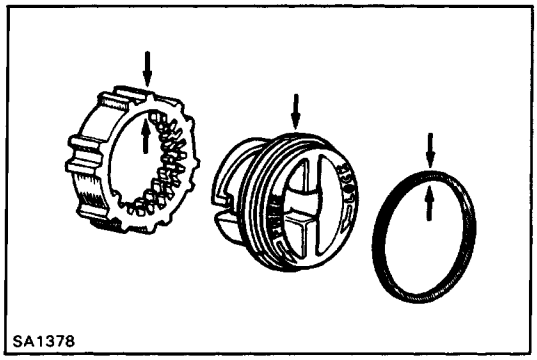
(d) Remove the steel ball, spring and seal from the con–trol handle.



INSPECTION OF FREE WHEELING HUB

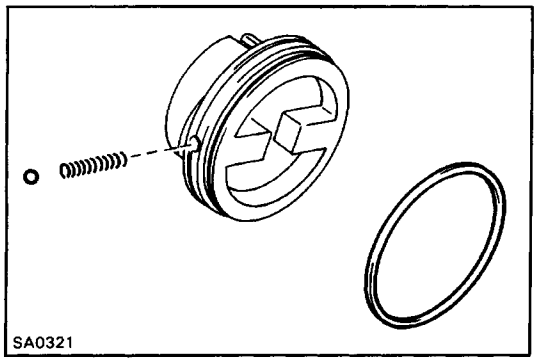
1. INSPECT COVER, HANDLE AND SEAL

Temporarily install the handle in the cover and check that the handle moves smoothly and freely.



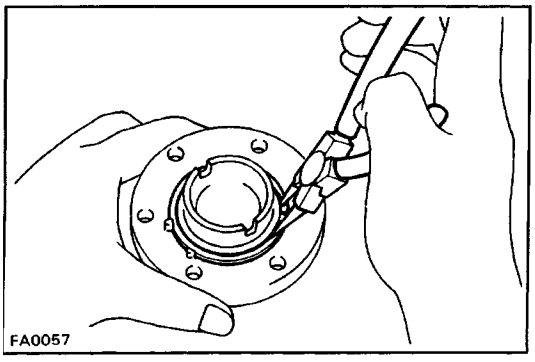
ASSEMBLY OF FREE WHEELING HUB

1. APPLY MP GREASE TO SLIDING SURFACE OF PARTS

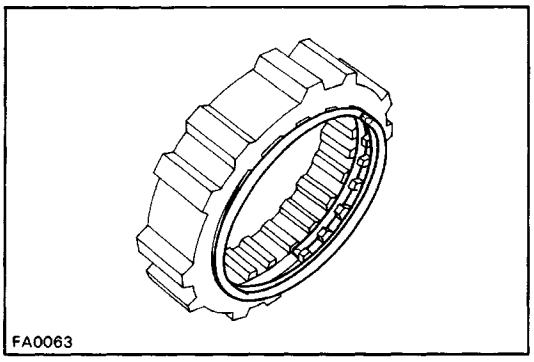


2. INSTALL CONTROL HANDLE TO COVER

(a) Install the seal, spring and steel ball to the handle.

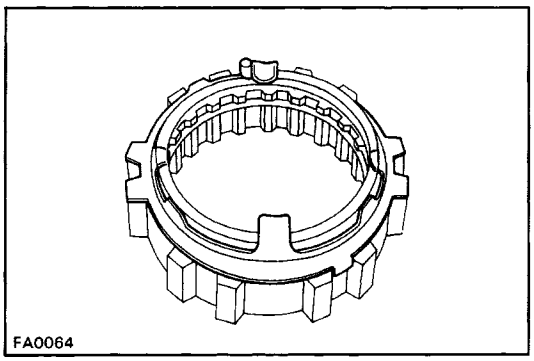


(b) Install the handle in the cover and install the snap ring with snap ring pliers.


FA0063

3. INSTALL TENSION SPRING IN CLUTCH

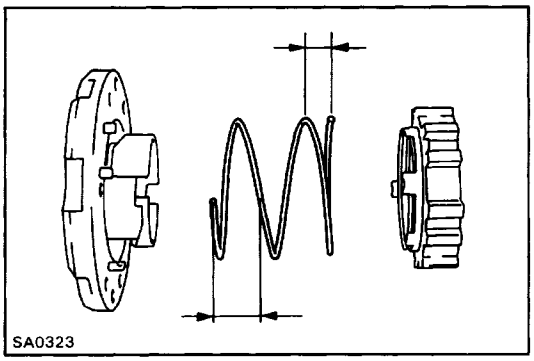
Install the tension spring in the clutch with the spring end aligned with the initial groove.


FA0064

4. INSTALL FOLLOWER PAWL TO CLUTCH

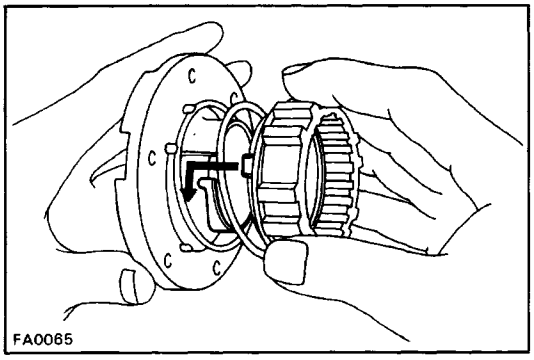
(a) Place the follower pawl on the tension spring with one of the large tabs against the bent spring end.

(b) Place the top ring of the spring on the small tabs.

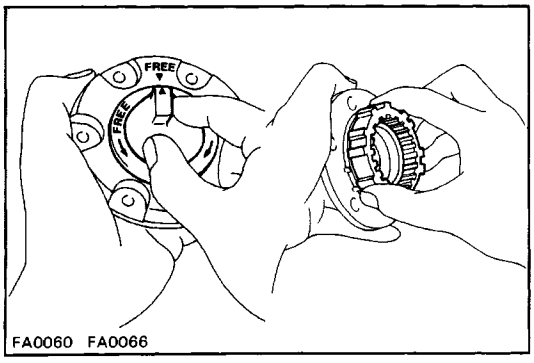

SA0323

5. INSTALL CLUTCH AND SPRING INTO COVER

(a) Place the spring between the cover and clutch with the large spring end toward the cover.


FA0065

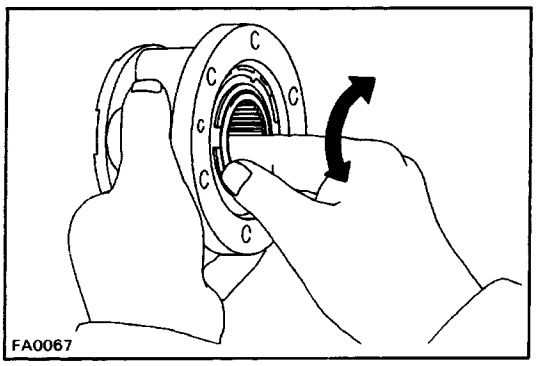
(b) Compress the spring and install the clutch with the pawl tab fit to the handle cam.



FA0060 FA0066

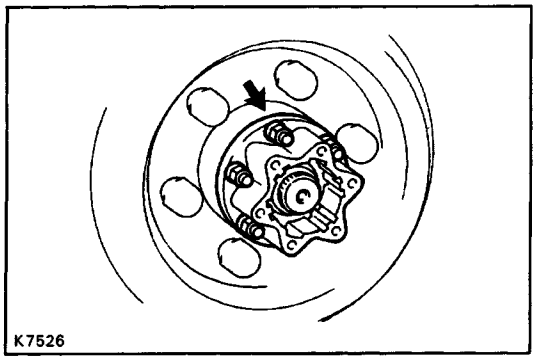
6. TEMPORARILY INSTALL COVER TO BODY AND CHECK FREE WHEELING HUB

(a) Set the control handle and clutch to the FREE posi–tion.



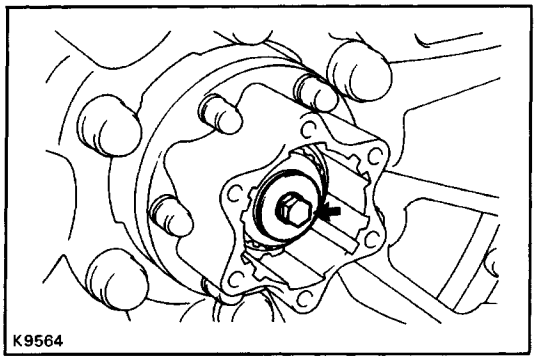
(b) Insert the cover in the body and verify that the inner hub turns smoothly.
(c) Remove the cover from the body.

INSTALLATION OF FREE WHEELING HUB

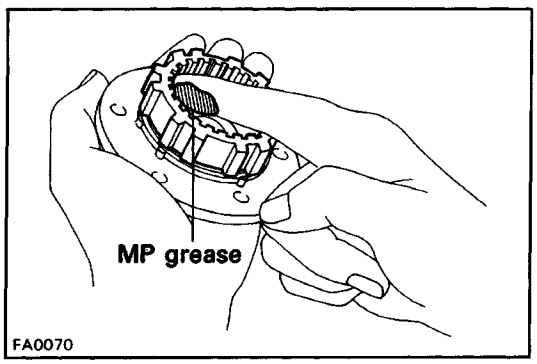


1. INSTALL FREE WHEELING HUB BODY

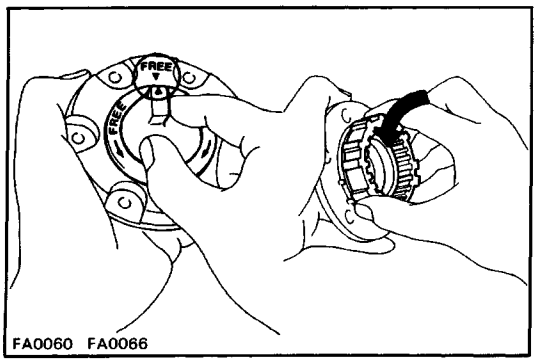
(a) Place a new gasket in position on the front axle hub.
(b) Install the free wheeling hub body with six cone washers and nuts. Tighten the nuts.
Torque: 31 N–m (315 kgf–cm. 23 ft–lbf)



2. INSTALL BOLT WITH WASHER
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

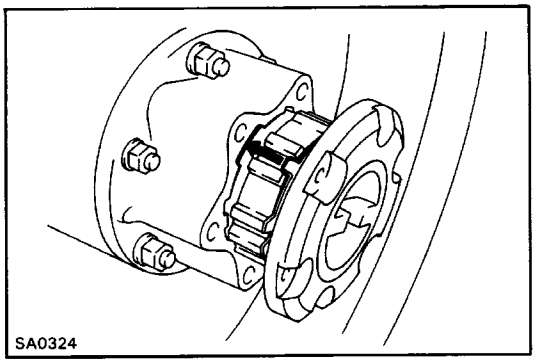


3. APPLY MP GREASE TO INNER HUB SPLINES

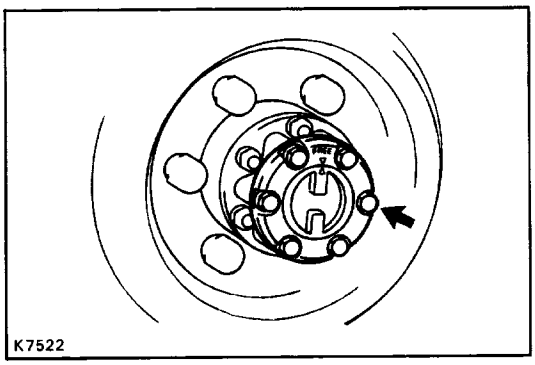


4. INSTALL FREE WHEELING HUB COVER WITH NEW GASKET

(a) Set the control handle and clutch to the FREE position.
(b) Place a new gasket in position on the cover.



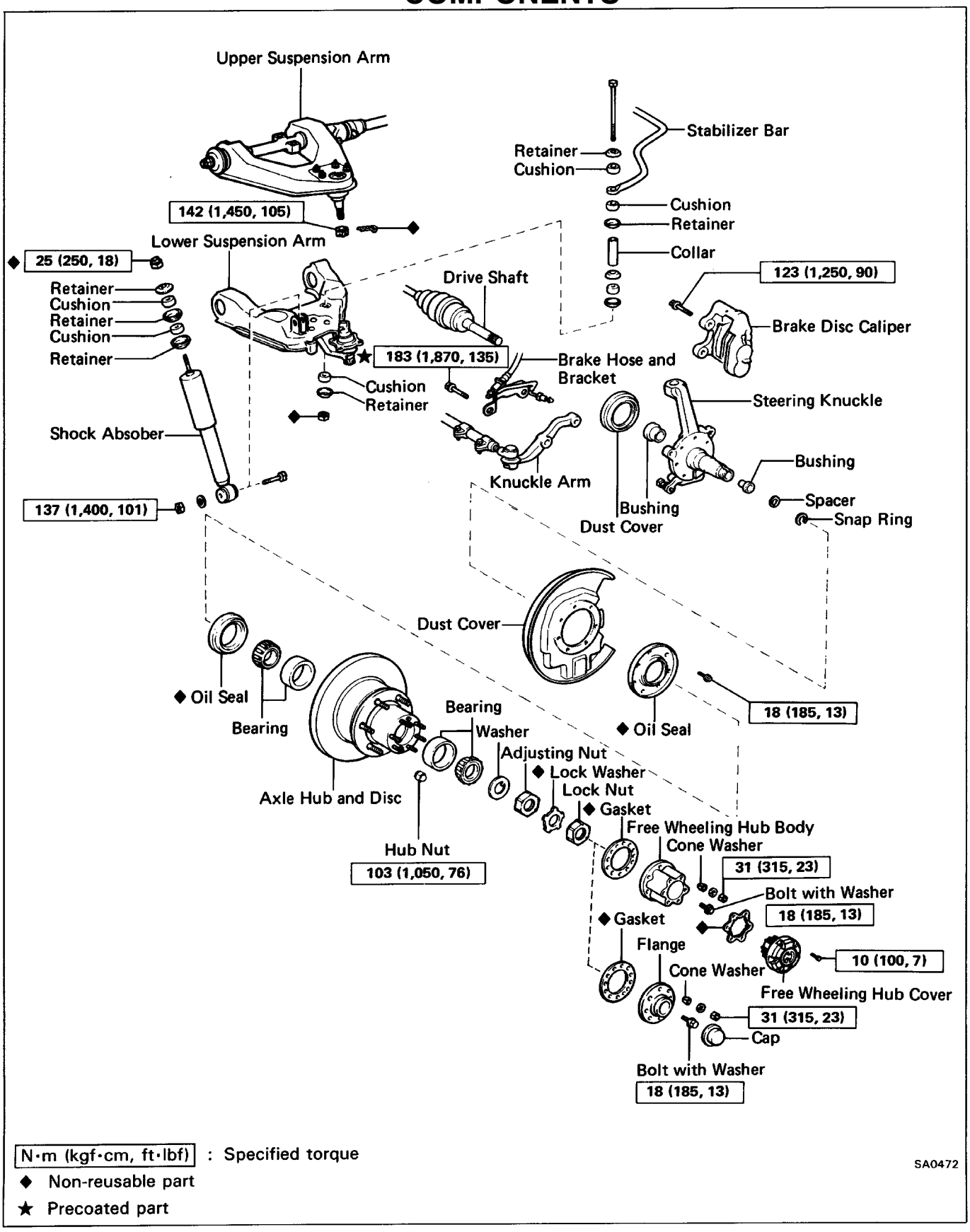
(c) Install the cover to the body with the follower pawl tabs aligned with the non–toothed portions of the body.



(d) Tighten the cover mounting bolts.
Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)

FRONT AXLE HUB AND STEERING KNUCKLE

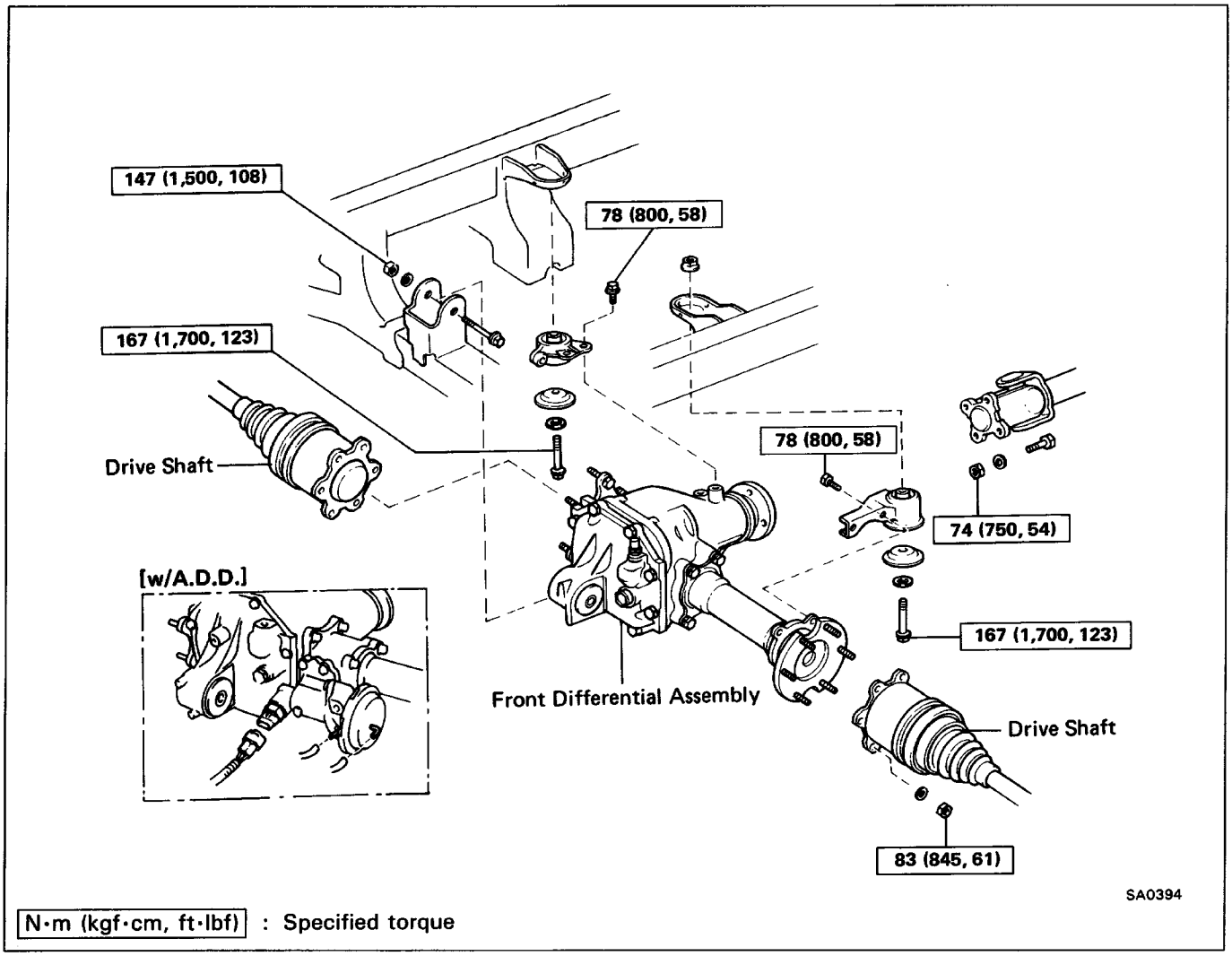
COMPONENTS

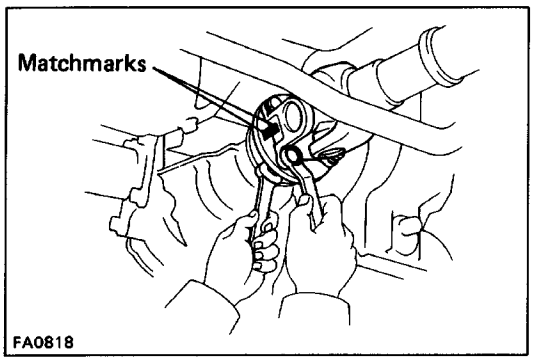


N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
★ Precoated part

SA0472

Removal of Front Differential

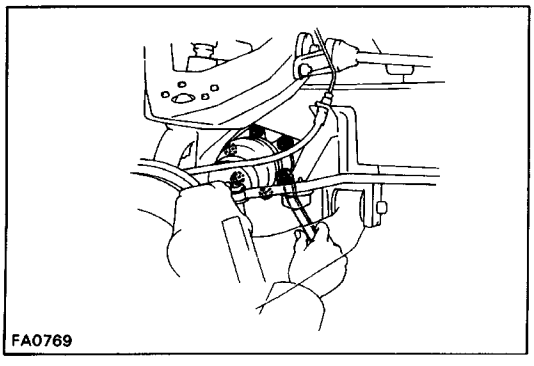




1. DRAIN DIFFERENTIAL OIL

2. DISCONNECT PROPELLER SHAFT

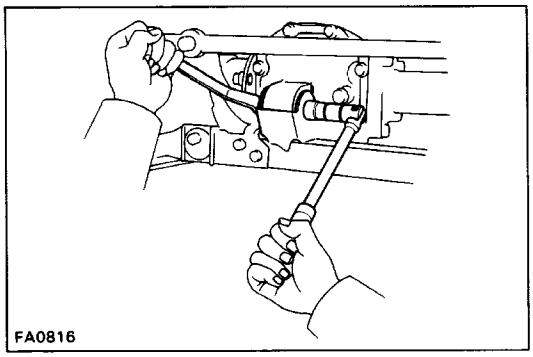
Before disconnecting the propeller shaft, place match–marks.



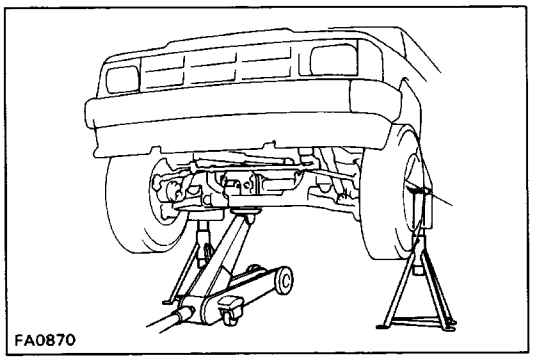
3. DISCONNECT DRIVE SHAFTS FROM SIDE GEAR SHAFT

Loosen the six nuts, while depressing the brake pedal, and disconnect the drive shafts from the side gear shaft.

4. (w/ A.D.D.)
DISCONNECT VACUUM HOSES AND 4WD INDICATOR SWITCH CONNECTOR

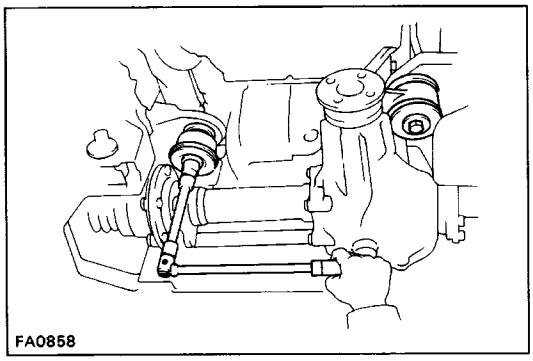


5. REMOVE FRONT DIFFERENTIAL FRONT MOUNTING BOLT AND NUT



6. REMOVE FRONT DIFFERENTIAL

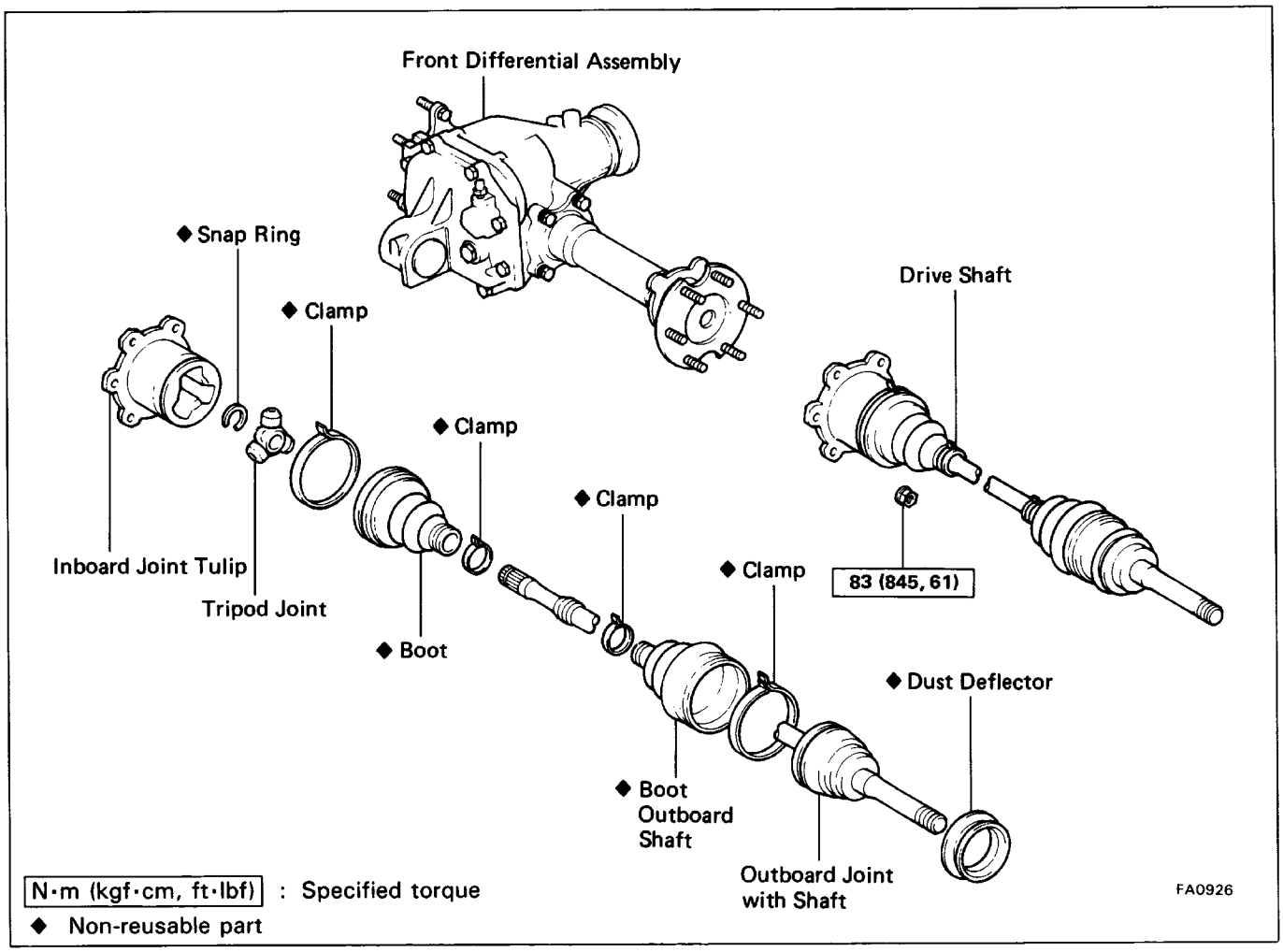
(a) Hold the front differential with a jack.

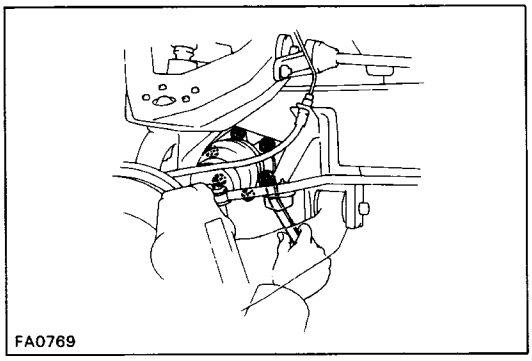


(b) Remove the left and right rear mounting bolts, and remove the front differential.

FRONT DRIVE SHAFT

COMPONENTS

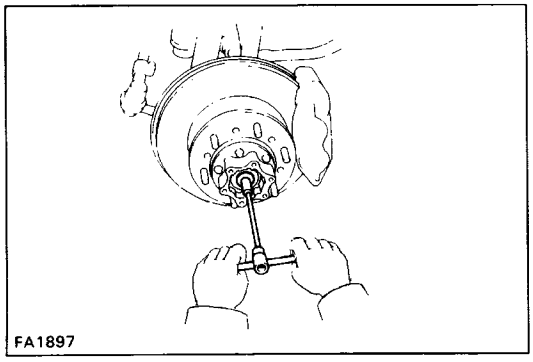




REMOVAL OF FRONT DRIVE SHAFT

1. LOOSEN NUTS HOLDING FRONT DRIVE SHAFT

Loosen the six nuts, while depressing the brake pedal.

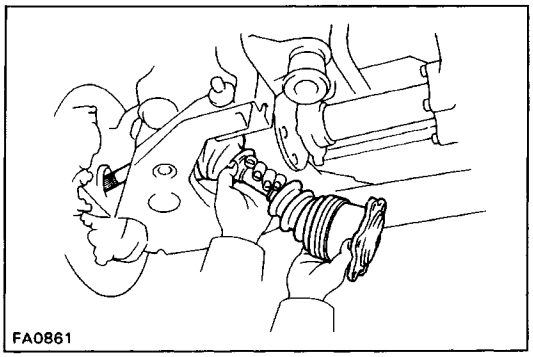


2. REMOVE FREE WHEELING HUB OR FLANGE

(Free wheeling hub See page SA–29)
(Flange See page SA–36)

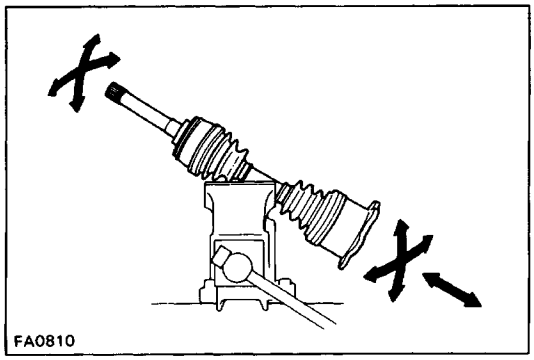
3. REMOVE SNAP RING AND SPACER

Using a snap ring expander, remove the snap ring from the drive shaft.



4. REMOVE FRONT DRIVE SHAFT

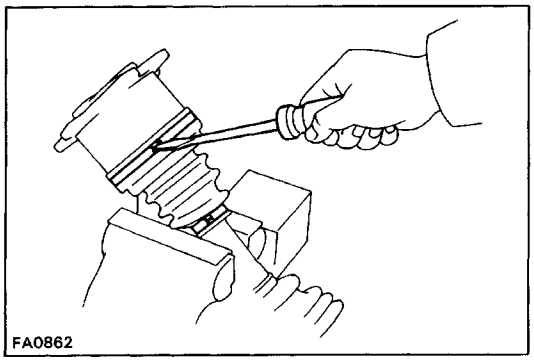
First pull the front drive shaft inboard joint tulip from the side gear shaft, and then pull it out from the steering knuckle.



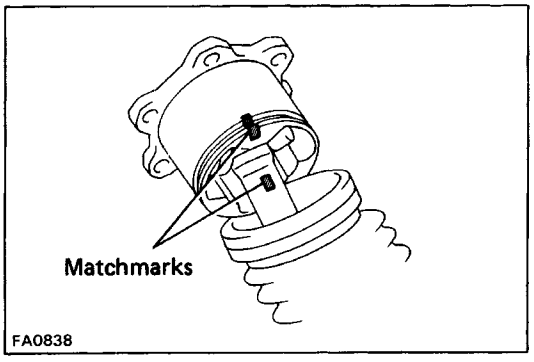
DISASSEMBLY OF FRONT DRIVE SHAFT

1. CHECK DRIVE SHAFT

(a) Check to see there is no play in the inboard and outboard joints.
(b) Check to see that the inboard joint slides smoothly in the thrust direction.
(c) Check to see that there is no noticeable play in the radial direction of the universal joints.
(d) Check for damage to the boots.

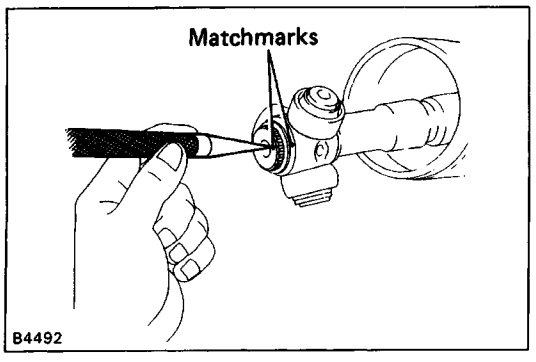


2. REMOVE INBOARD JOINT BOOT CLAMPS



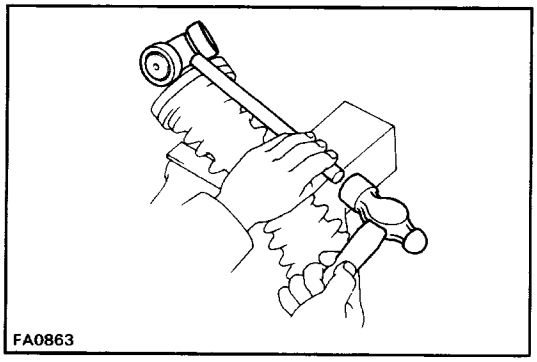
3. DISASSEMBLE INBOARD JOINT TULIP

(a) Place matchmarks on the inboard joint tulip and shaft.
NOTICE: Do not punch the marks.
(b) Remove the inboard joint tulip from the drive shaft.

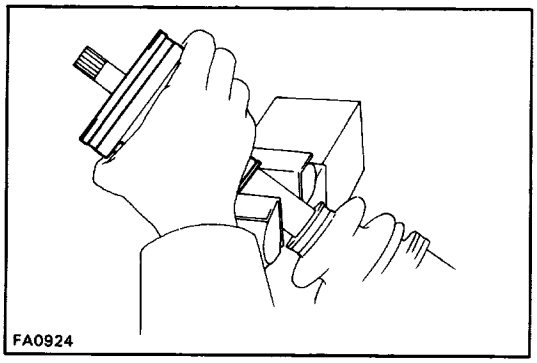


4. DISASSEMBLE TRIPOD JOINT

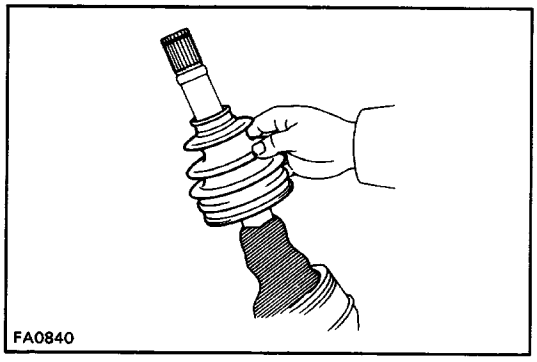
(a) Using a snap ring expander, remove the snap ring.
(b) Using a punch and hammer, place matchmarks on the shaft and tripod.



(c) Using a brass bar and hammer, remove the tripod joint from the drive shaft.

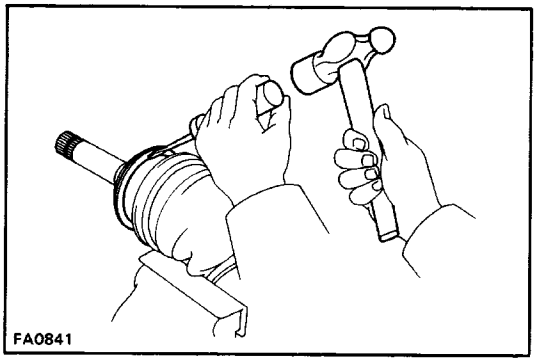


5. REMOVE INBOARD JOINT BOOT



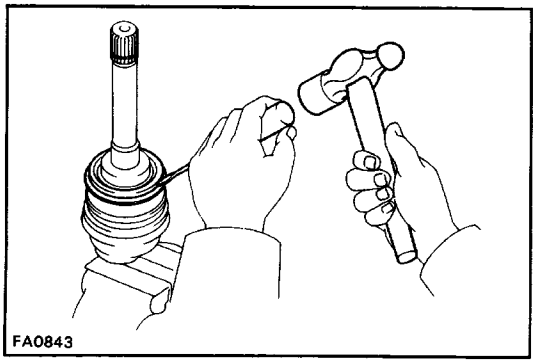
6. REMOVE OUTBOARD JOINT BOOT CLAMPS AND BOOT

NOTICE: Do not disassemble the outboard joint.



7. REMOVE DUST DEFLECTOR

Using a screwdriver and hammer, remove the dust de–flector.

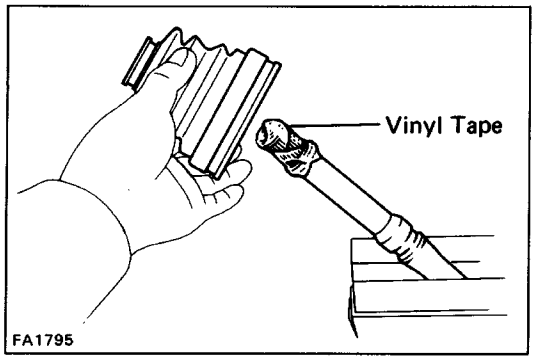


ASSEMBLY OF FRONT DRIVE SHAFT

(See page SA–46)

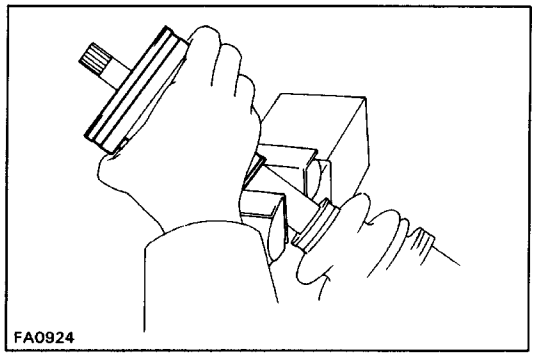
1. INSTALL DUST DEFLECTOR

Using a hammer and screwdriver, install a new dust de–flector.

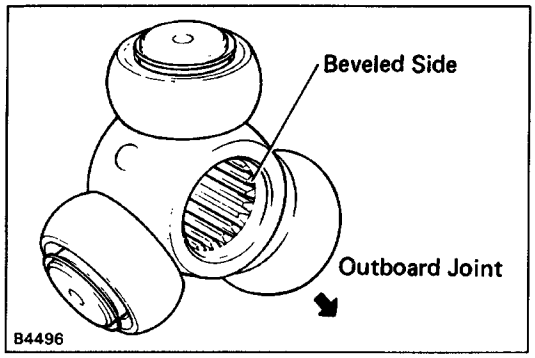


2. TEMPORARILY INSTALL BOOT AND NEW BOOT CLAMPS TO OUTBOARD JOINT

HINT: Before installing the boot, wrap vinyl tape around the spline of the shaft to prevent damaging the boot.

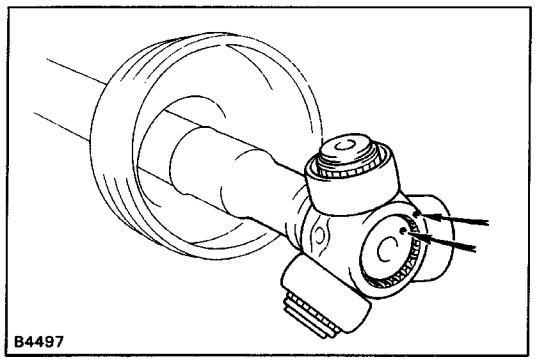


3. TEMPORARILY INSTALL BOOT AND NEW BOOT CLAMPS FOR INBOARD JOINT TO DRIVE SHAFT

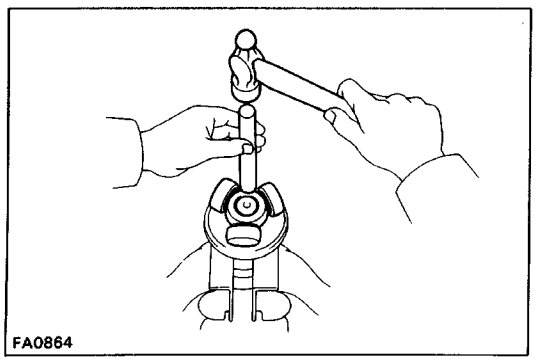


4. ASSEMBLE TRIPOD JOINT

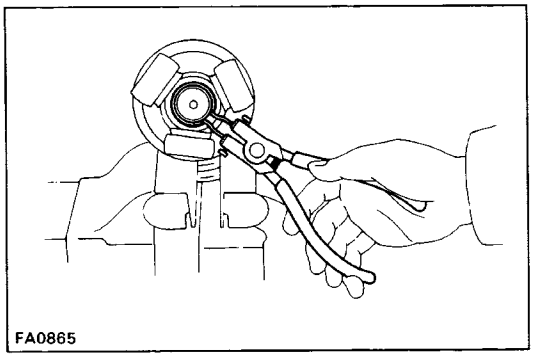
(a) Place the beveled side of the tripod axial spline toward the outboard joint.



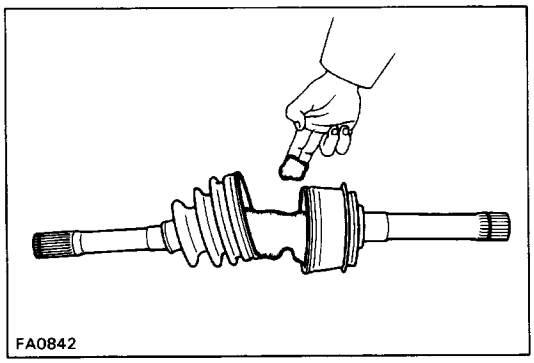
(b) Align the matchmarks placed before disassembly.



(e) Using a brass bar and hammer, tap in the tripod joint to the drive shaft.



(d) Using a snap ring expander, install a new snap ring.

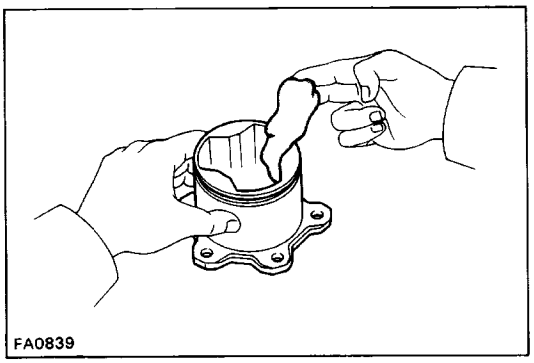


5. ASSEMBLE BOOT TO OUTBOARD JOINT

Before assembling the boot, pack in grease.

HINT: Use the grease (black) supplied in the boot kit.

Grease capacity: 195 – 205 g (0.43 – 0.45 lb)

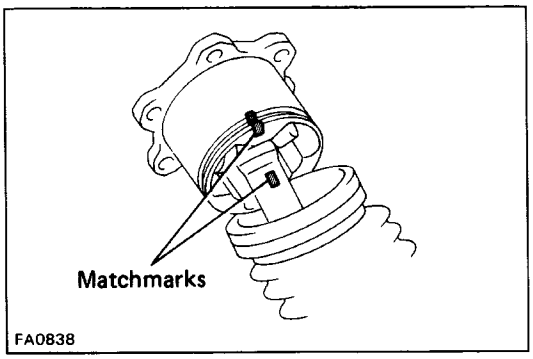


6. ASSEMBLE INBOARD JOINT TO INBOARD JOINT TULIP

(a) Pack in grease to the inboard tulip and boot.

HINT: Use the grease (brown) supplied in the boot kit.

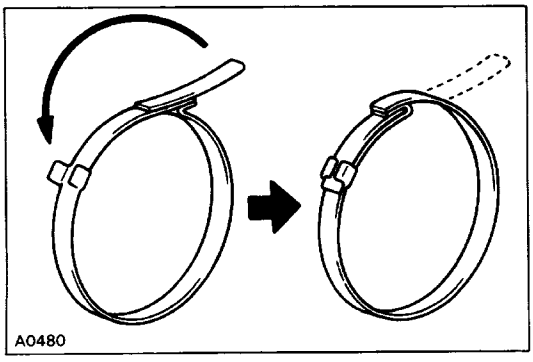
Grease capacity: 270 – 280 g (0.60 – 0.62 lb)



(b) Align the matchmarks placed before disassembly.

(c) Install the inboard tulip to the drive shaft.

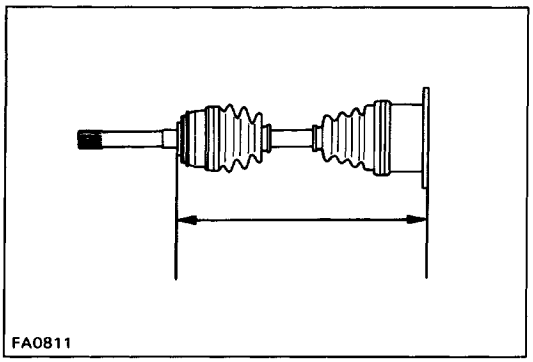
(d) Temporarily install the boot to the inboard tulip.



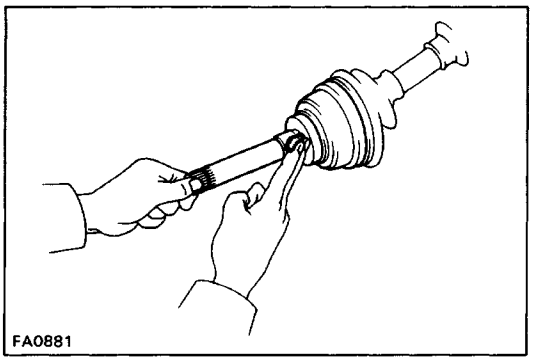
7. ASSEMBLE NEW BOOT CLAMPS TO BOTH BOOTS

(a) Be sure the boot is on the shaft groove.

(b) Bend the band and lock it as shown in the figure.



(c) Insure that the boot is not stretched or contracted when the drive shaft is at standard length.
Standard length:
393.9 – 403.9 mm (15.508 – 15.902 in.)

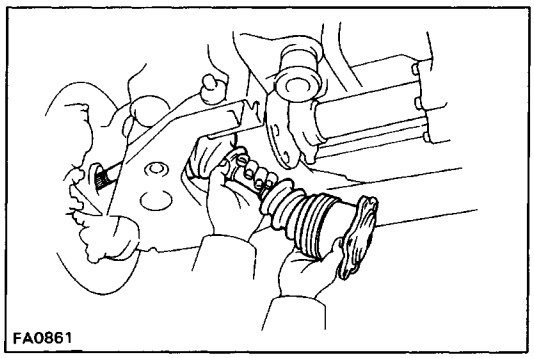


INSTALLATION OF FRONT DRIVE SHAFT

(See page SA–46)

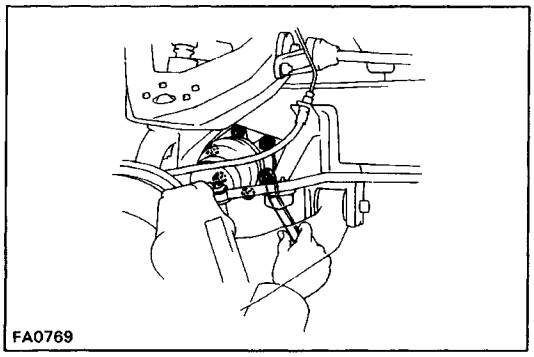
1. APPLY MOLYBDENUM DISULPHIDE LITHIUM BASE GREASE

Apply molibdenum disulphide lithium base grease to the outboard joint shaft.

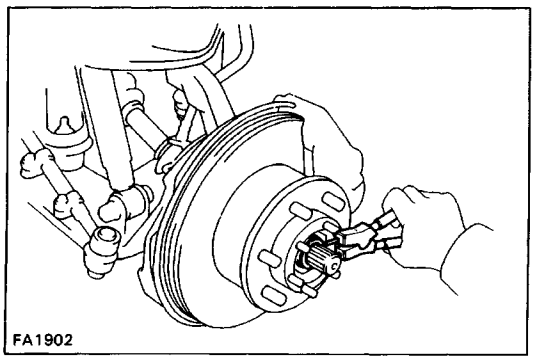


2. INSTALL FRONT DRIVE SHAFT

(a) First insert the outboard joint shaft to the steering knuckle, and then install it to the side gear shaft.
HINT: Do not damage the boots.

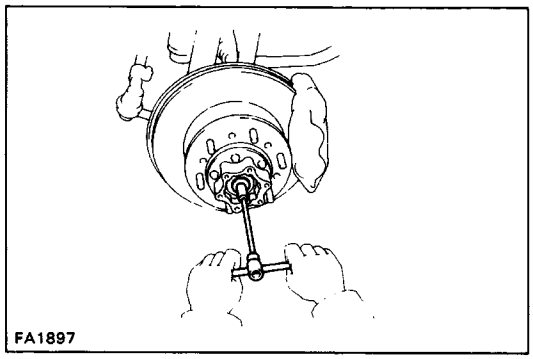


(b) Temporarily install the six nuts.



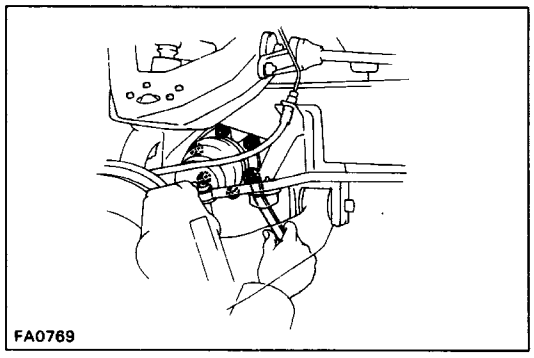
3. INSTALL SPACER AND SNAP RING

Install the spacer, and using a snap ring expander, install the snap ring to the outboard joint shaft.



4. INSTALL FREE WHEELING HUB OR FLANGE

(Free wheeling hub See page SA–33)
(Flange See page SA–39)

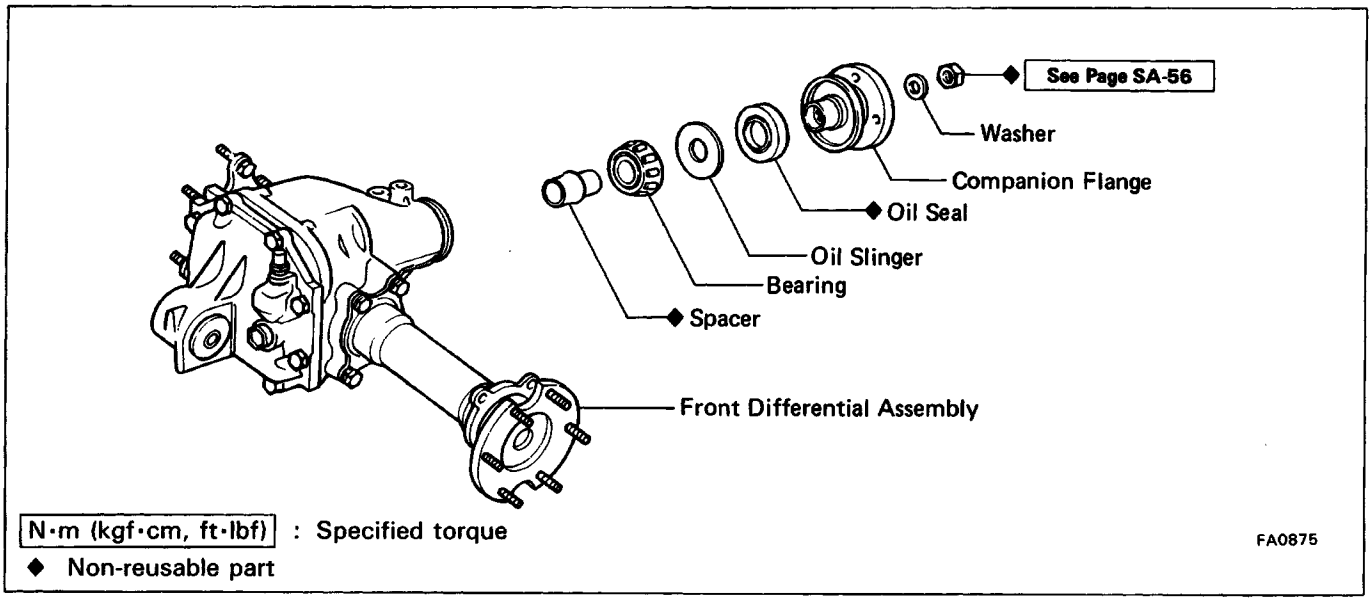


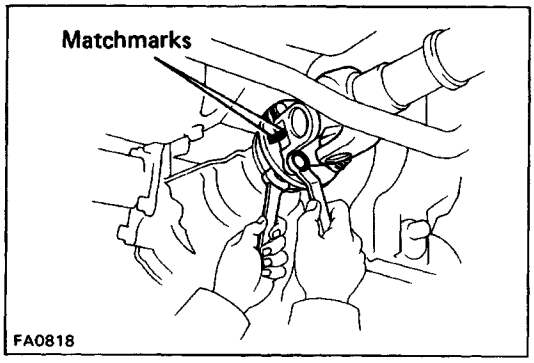
5. TORQUE FRONT DRIVE SHAFT INSTALLATION NUTS

Torque the six nuts, while depressing the brake pedal.
Torque: 83 N–m (845 kgf–cm, 61 ft–lbf)

FRONT DIFFERENTIAL

On–Vehicle Replacement of Rear Oil Seal

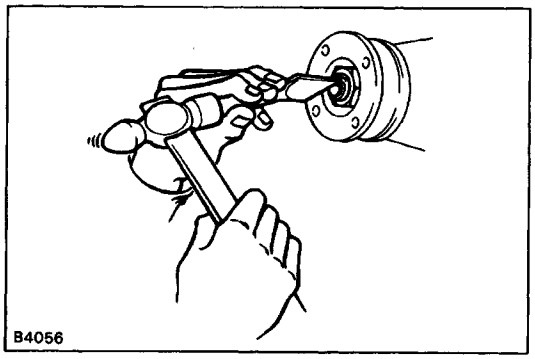




1. DRAIN DIFFERENTIAL OIL

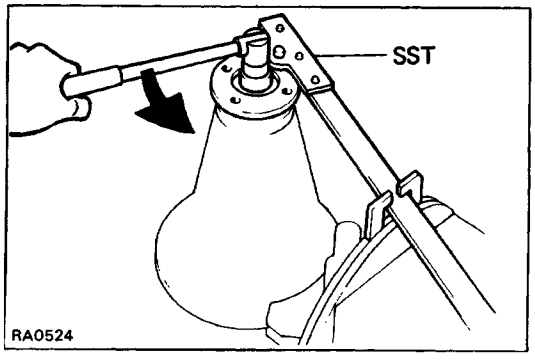
2. DISCONNECT PROPELLER SHAFT

Before disconnecting the propeller shaft from the front differential, place matchmarks on them.

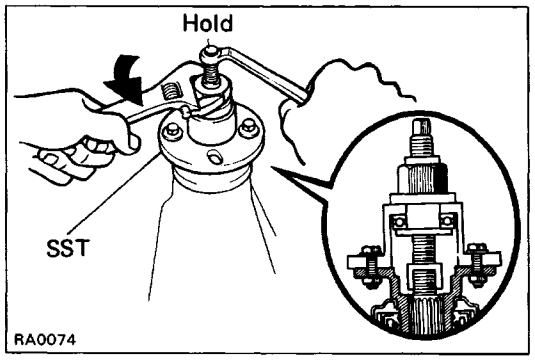


3. REMOVE COMPANION FLANGE

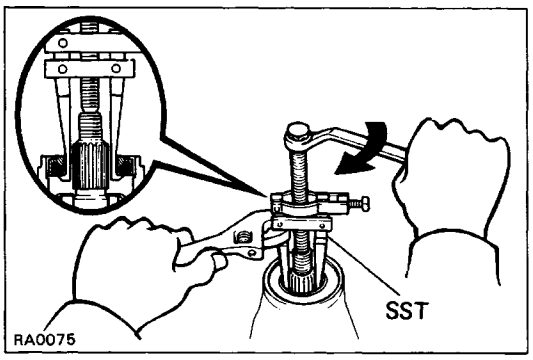
(a) Using a hammer and chisel, loosen the staked part of the nut.



(b) Using SST to hold the flange, remove the nut and washer.
SST 09330–00021



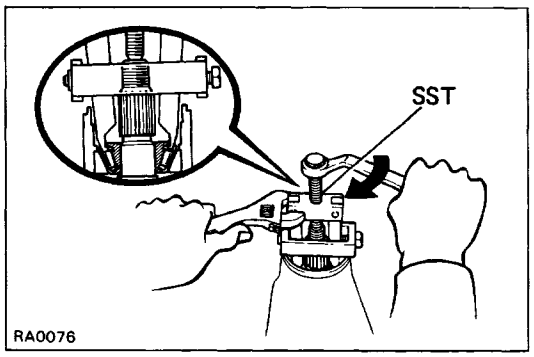
(c) Using SST, remove the companion flange.
SST 09557–22022 (09557–22030)



4. REMOVE OIL SEAL AND OIL SLINGER

(a) Using SST, remove the oil seal.
SST 09308–10010

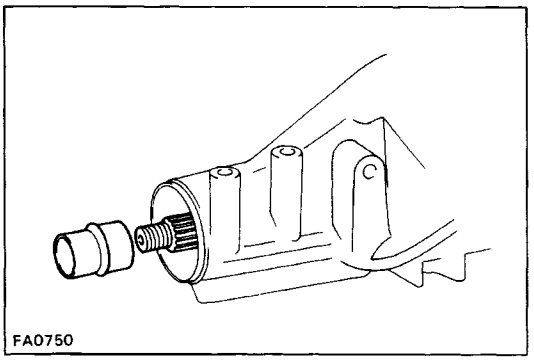
(b) Remove the oil slinger.



5. REMOVE REAR BEARING AND BEARING SPACER

(a) Using SST, remove the rear bearing from the drive pinion.
SST 09556–30010

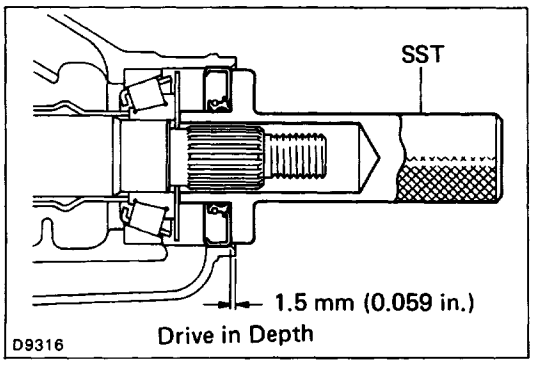
(b) Remove the bearing spacer.



6. INSTALL NEW BEARING SPACER AND REAR BEARING

(a) Install a new bearing spacer on the drive pinion.

(b) Install the rear bearing on the drive pinion.

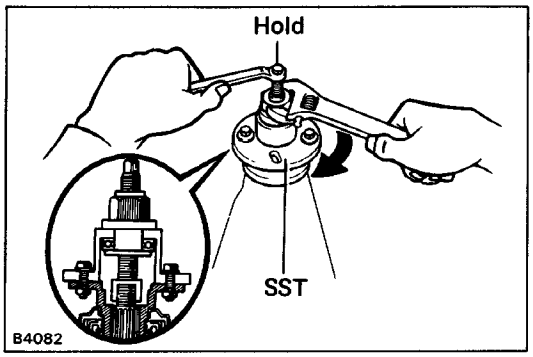


7. INSTALL OIL SLINGER AND NEW OIL SEAL

(a) Install the oil slinger.

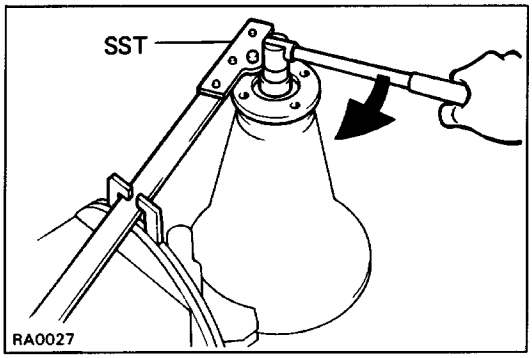
(b) Using SST, drive in a new oil seal.
SST 09554–30011
Oil seal drive in depth: 1.5 mm (0.059 in.)

(c) Apply MP grease to the oil seal lip.

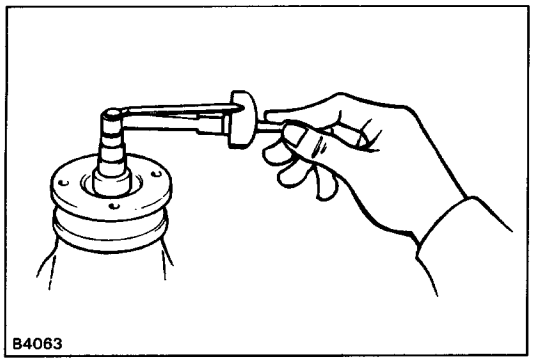


8. INSTALL COMPANION FLANGE

(a) Using SST, install the companion flange on the drive pinion.
SST 09557–22022 (09557–22030)



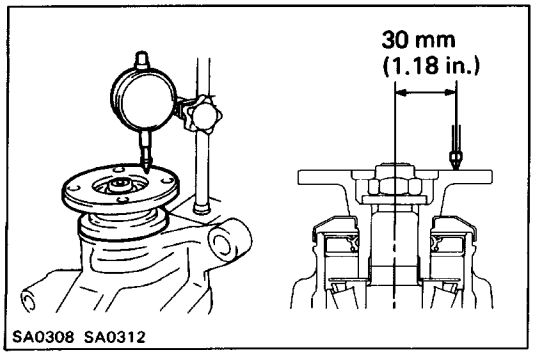
(b) Coat the threads of the new nut with MP grease.
(c) Using SST to hold the flange, torque the nut.
SST 09330–00021
Torque: 120 N–m (1,225 kgf–cm, 89 ft–lbf)



9. ADJUST DRIVE PINION BEARING PRELOAD

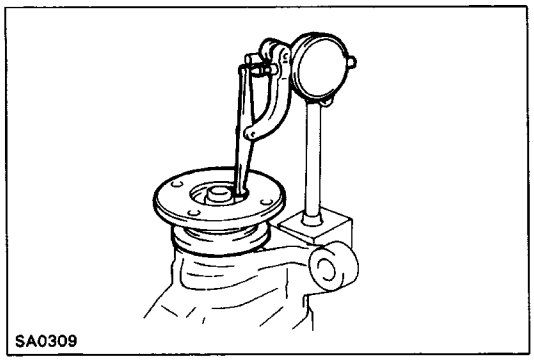
Using a torque meter, measure the preload of the back–lash between the drive pinion and ring gear.
Preload (starting):
New bearing
1.2 – 1.9 N–m
(12 – 19 kgf–cm, 10.4 – 16.5 in.–lbf)
Reused bearing
0.6 – 1.0 N–m
(6 – 10 kgf–cm, 5.2 – 8.7 in.–lbf)

(a) If the preload is greater than specification, replace the bearing spacer.
(b) If the preload is less than specification, retighten the nut 13 N–m (130 kgf–cm, 9 ft–lbf) a little at a time until the specified preload is reached.
Maximum torque: 223 N–m (2,275 kgf–cm, 165 ft–lbf)
If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.



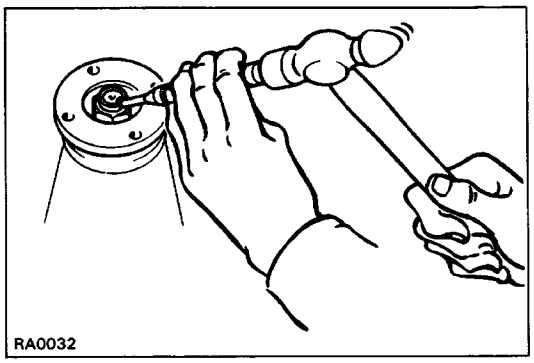
10. CHECK RUNOUT OF COMPANION FLANGE

Using a dial indicator, measure the vertical and lateral runout of the companion flange.
Maximum vertical runout: 0.10 mm (0.0039 in.)



Maximum lateral runout: 0.10 mm(0.0039 in.)

If the runout is greater than maximum, inspect the bearings.



11. STAKE DRIVE PINION NUT

12. INSTALL DRAIN PLUG AND FILL DIFFERENTIAL WITH GEAR OIL

(w/ A.D.D.)

Oil type: Toyota "GEAR OIL SUPER" oil (Part No. 08885 – 02106) or hypoid gear oil API GL–5

Recommended oil viscosity: SAE 75W–90

Capacity: 1.86 liters (1.97 US qts, 1.64 Imp. qts)

(w/o A.D.D.)

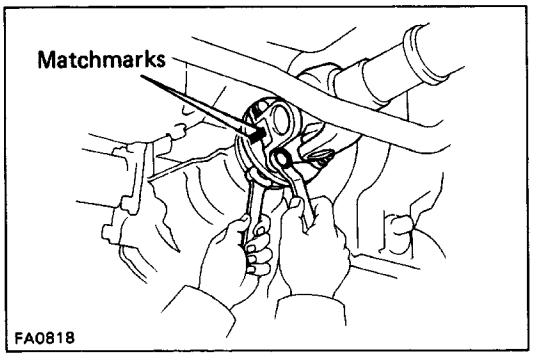
Oil type: Hypoid gear oil API GL–5

Recommended oil viscosity:

Above – 18°C (O°F) SAE 90

Below – 18 ° C (0 ° F) SAE 80W or 80W–90

Capacity: 1.6 liters (1.7 US qts, 1.4 Imp. qts)



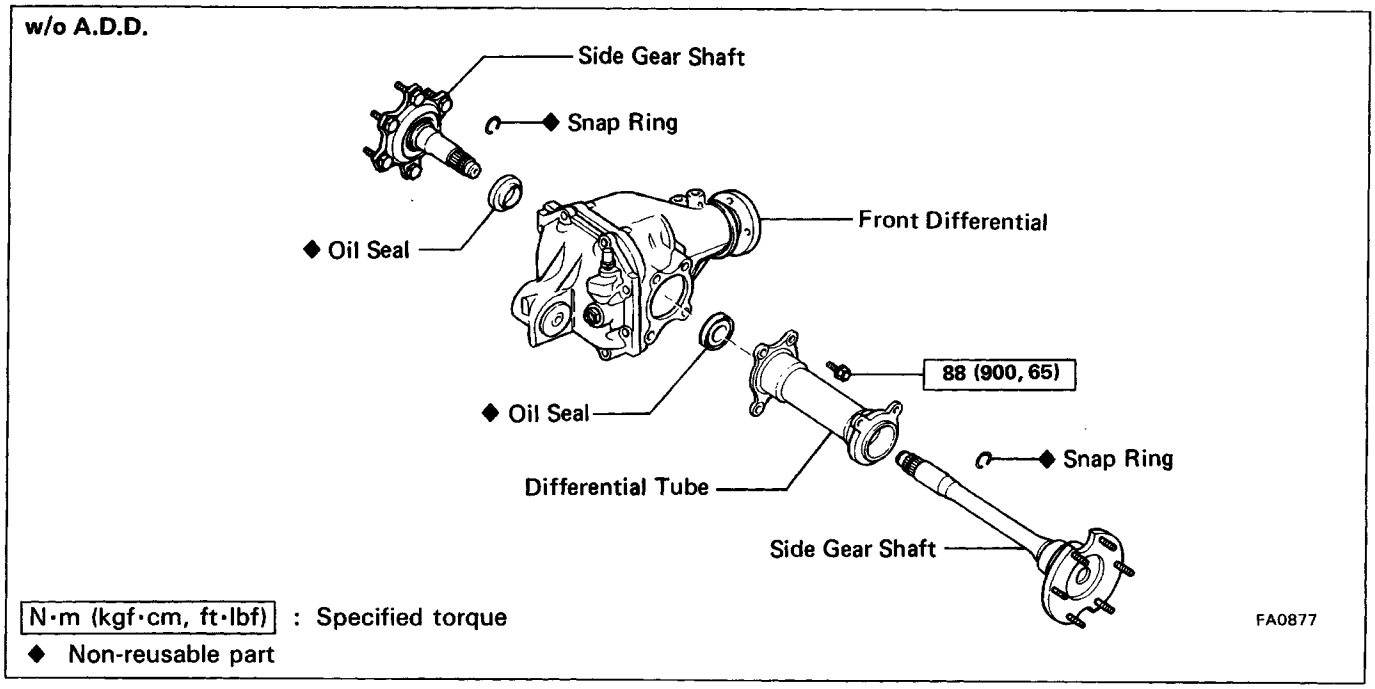
13. CONNECT PROPELLER SHAFT TO COMPANION FLANGE

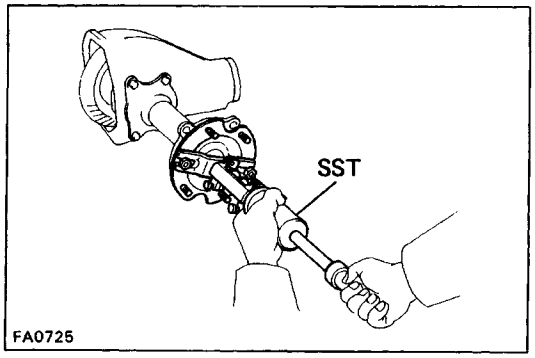
(a) Align the matchmarks and connect the propeller shaft to the companion flange with four bolts anc nuts.

(b) Torque the nuts.

Torque: 74 N–m (750 kgf–cm, 54 ft–lbf)

Replacement of Side Oil Seal (without A.D.D.)

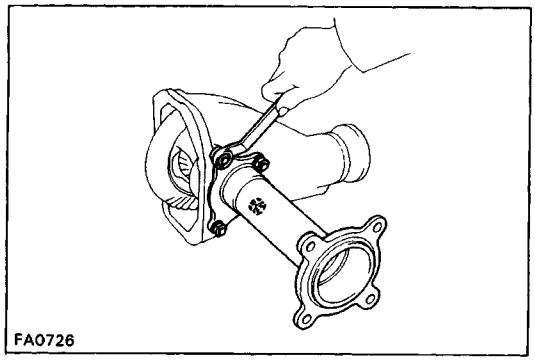




1. REMOVE SIDE GEAR SHAFT

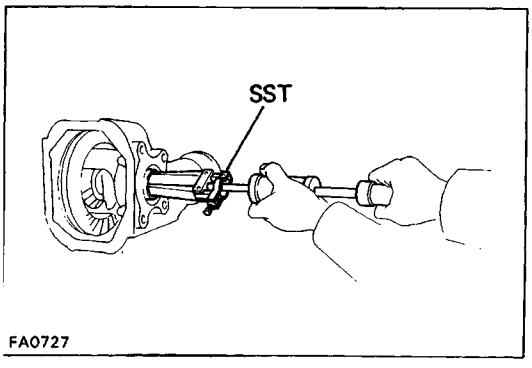
Using SST, pull off the side gear shaft from the front differential.

SST 09910–00015
(09911–00011, 09912–00010, 09914–00011)



2. REMOVE FRONT DIFFERENTIAL TUBE

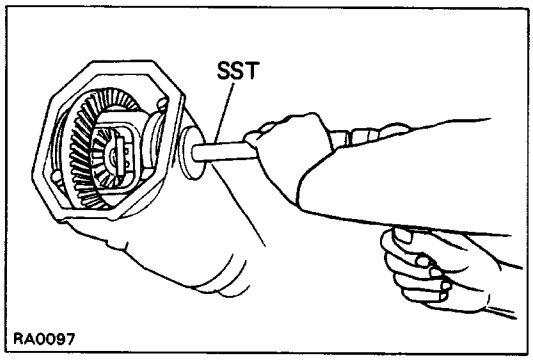
Remove the four bolts, and using a plastic–faced hammer, remove the differential tube.



3. REMOVE SIDE GEAR SHAFT OIL SEAL

Using SST, remove the side gear shaft oil seal.

SST 09308–00010



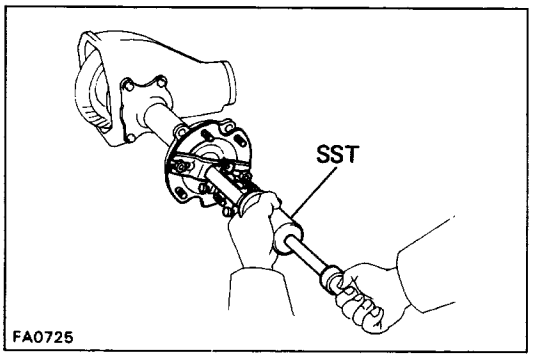
4. INSTALL NEW SIDE GEAR SHAFT OIL SEAL

(a) Using SST, drive in the oil seal until it is flush with the carrier end surface.
SST 09550–22011 (09550–00020, 09550–00031)

(b) Coat the lip of oil seal with MP grease.

5. INSTALL DIFFERENTIAL TUBE

Torque: 88 N–m (900 kgf–cm, 65 ft–lbf)



6. INSTALL SIDE GEAR SHAFT

(a) Install a new snap ring to the side gear shaft.

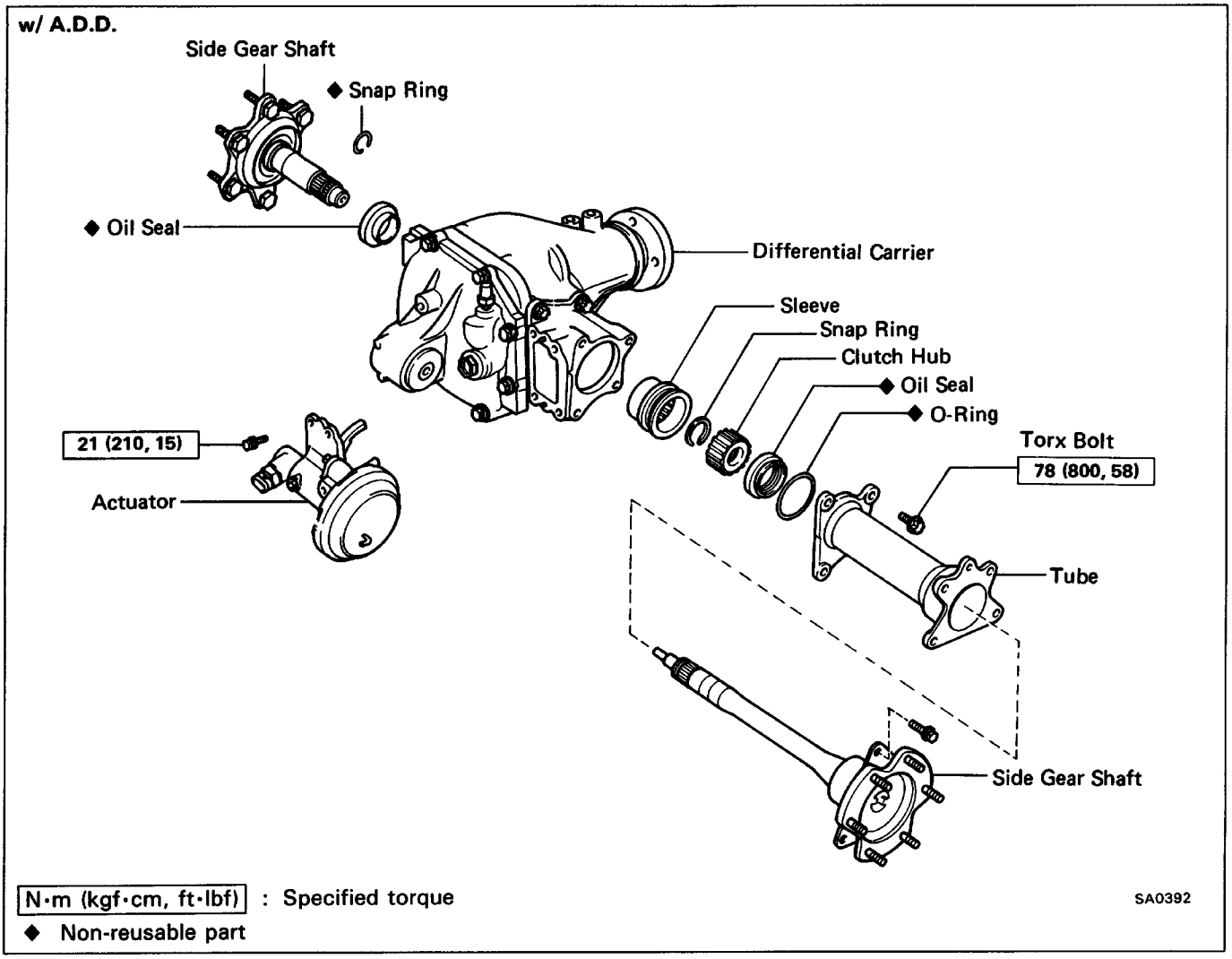
(b) Using SST, install the side gear shaft until it contacts the pinion shaft.
SST 09910–00015
(09911–00011, 09912–00010, 09914–00011)

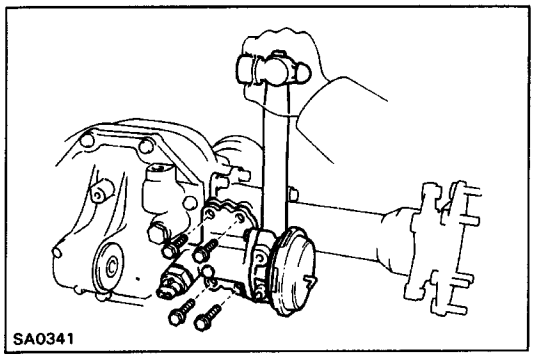
7. CHECK INSTALLATION OF SIDE GEAR SHAFT

(a) Check that there is 2 – 3 mm (0.08 – 0.12 in.) of play in axial direction.

(b) Check that the side gear shaft will not come out by trying to pull it completely out by hand.

Replacement of Side Oil Seal (with A.D.D.)



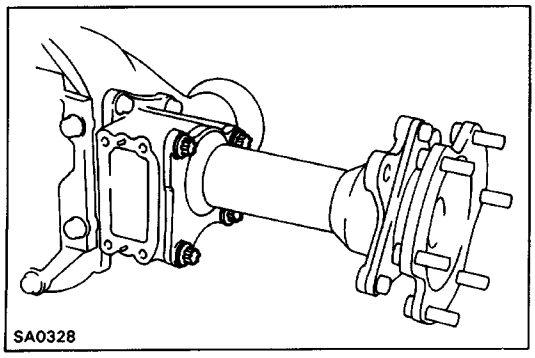


REPLACEMENT OF LH SIDE OIL SEAL

1. REMOVE ACTUATOR

(a) Remove the four bolts.

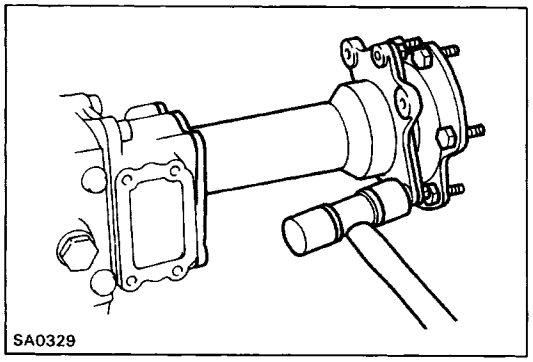
(b) Using a hammer, remove the actuator.



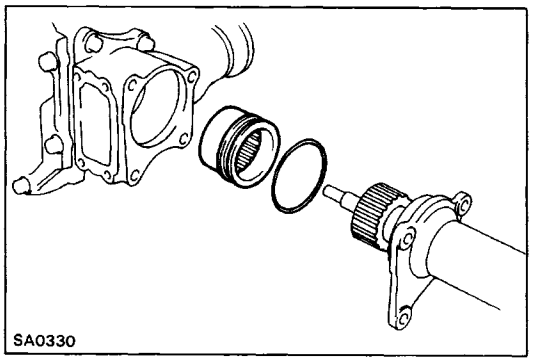
2. REMOVE LH SIDE GEAR SHAFT WITH TUBE

(a) Remove the four torx bolts.

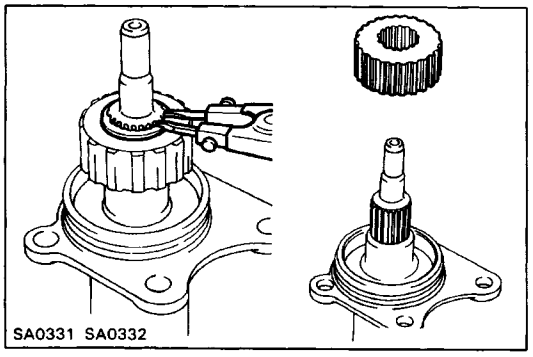
Torx wrench: E 14 (part No. 09044–00010 or locally manufactured tool)


SA0329

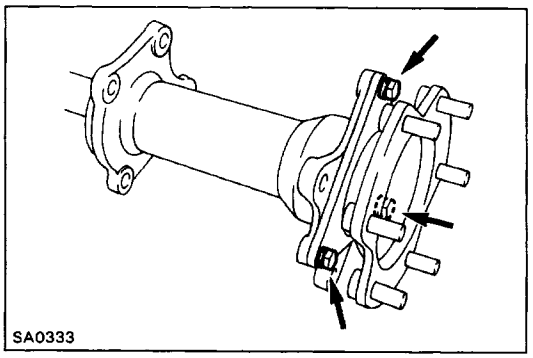
(b) Using a plastic–faced hammer, tap on the tube to remove it.


SA0330

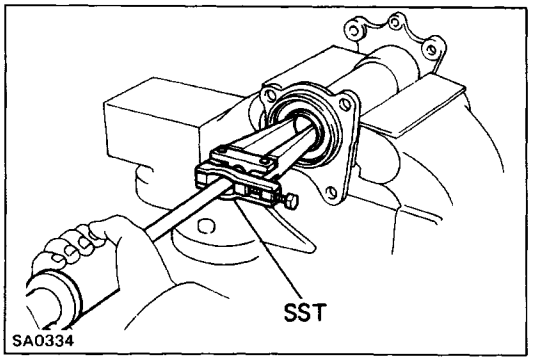
(c) Remove the sleeve.
(d) Remove the O–ring from the tube.


SA0331 SA0332

3. REMOVE CLUTCH HUB
(a) Using a snap ring expander, remove the snap ring.
(b) Remove the clutch hub from the side gear shaft.

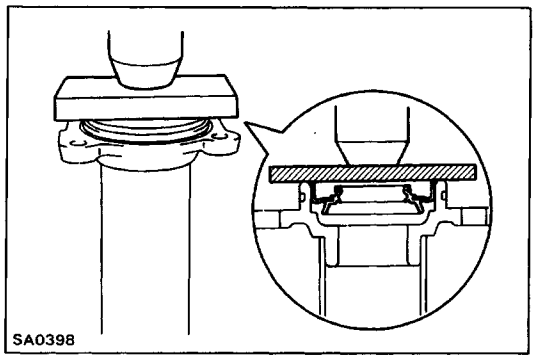

SA0333

4. REMOVE SIDE GEAR SHAFT FROM TUBE
(a) Remove the three bearing retainer bolts.
(b) Remove the side gear shaft from the tube.

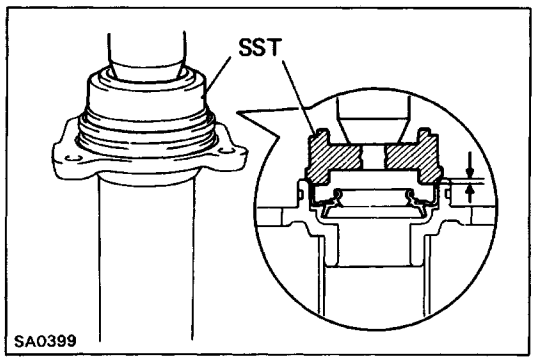


SA0334

5. REPLACE SIDE OIL SEAL
(a) Using SST, remove the side oil seal.
SST 09308–00010

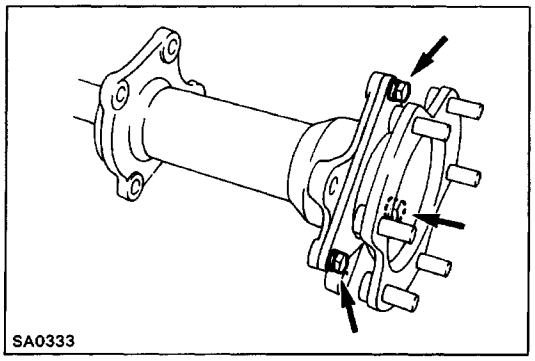


(b) With the oil seal lip facing upward, use press and plate to press in a new side oil seal until its end is flush with the surface of the tube.



(c) Using SST, press in the oil seal.
SST 09554–14010
Press in depth: 2.5 mm (0.098 in.)

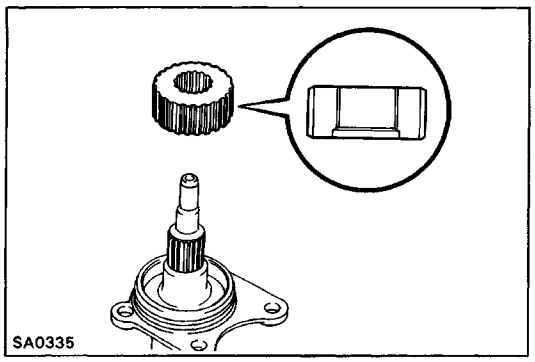
(d) Coat the lip of oil seal with IMP grease.



6. INSTALL SIDE GEAR SHAFT

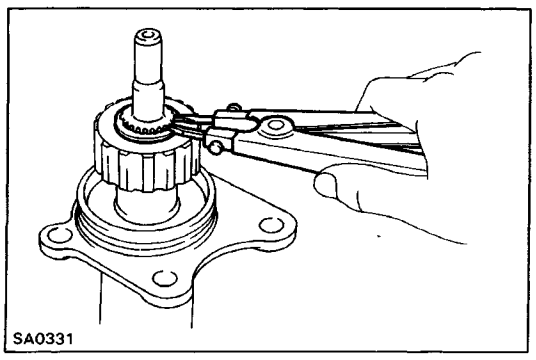
(a) Install the side gear shaft to the tube.

(b) Tighten the three bearing retainer bolts.

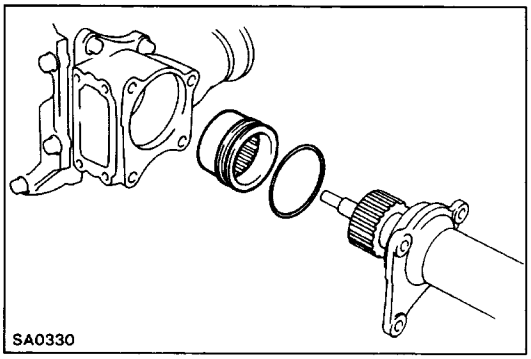


7. INSTALL CLUTCH HUB

(a) Install the clutch hub to the shaft.



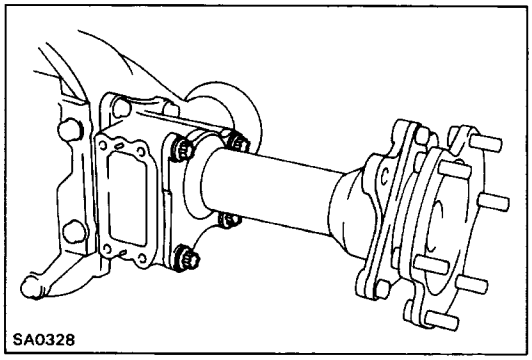
(b) Using a snap ring expander, install the snap ring.



8. INSTALL SIDE GEAR SHAFT WITH TUBE TO DIFFERENTIAL CARRIER

(a) Install a new 4–ring to the tube.

(b) Install the sleeve onto the clutch hub.

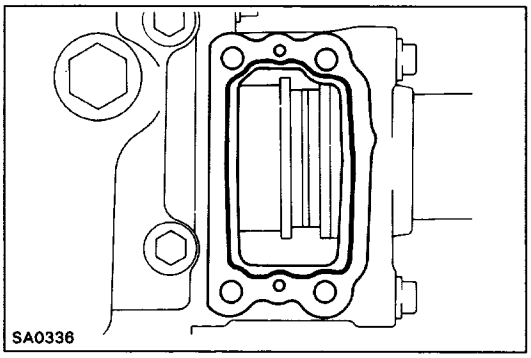


(c) Install the side gear shaft with tube.

(d) Tighten the four torx bolts.

Torque: 78 N–m (800 kgf–cm, 58 ft–lbf)

Torx wrench: E14 (Part No. 09044–00010 or locally manufactured tool)



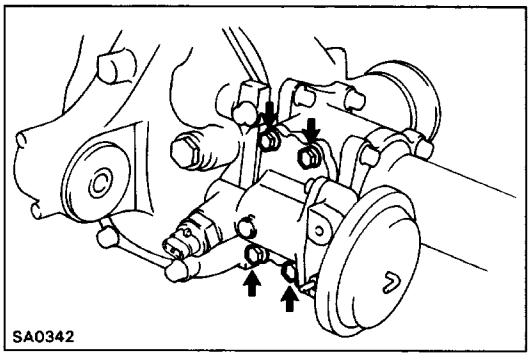
9. INSTALL ACTUATOR

(a) Remove any packing material and be careful not to get oil on the contacting surfaces of the actuator and clutch case.

(b) Apply seal packing to the clutch case as shown.

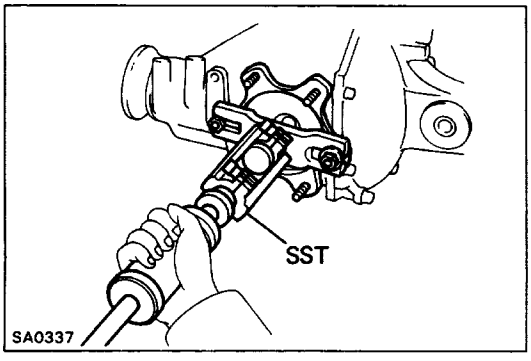
Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

HINT: Install the actuator within ten minutes after applying seal packing.



(c) Tighten the four bolts.

Torque: 21 N–m (210 kgf–cm, 15 ft–lbf)



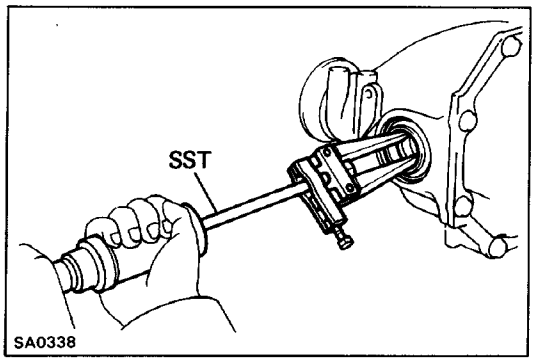
REPLACEMENT OF RH SIDE OIL SEAL

1. REMOVE RH SIDE GEAR SHAFT

Using SST, pull off the RH side gear shaft from differential carrier.

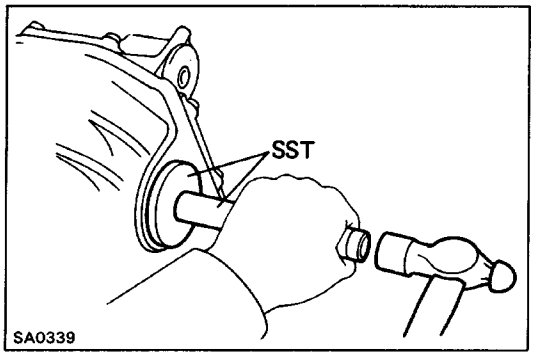
SST 09910–00015

(09911–00011, 09912–00010, 09914–00011)

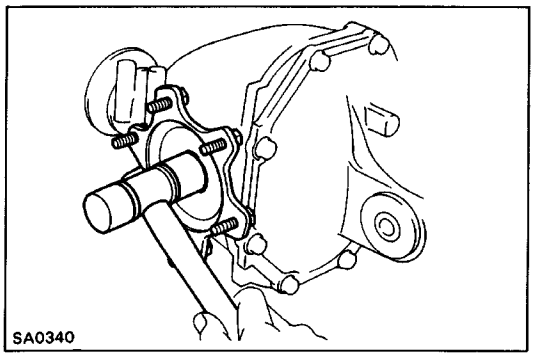


2. REPLACE SIDE OIL SEAL

(a) Using SST, remove the oil seal.
SST 09308–00010



(b) Using SST, install the new oil seal.
SST 09550–22011 (09550–00020, 09550–0003)
(c) Coat the lip of oil seal with MP grease.



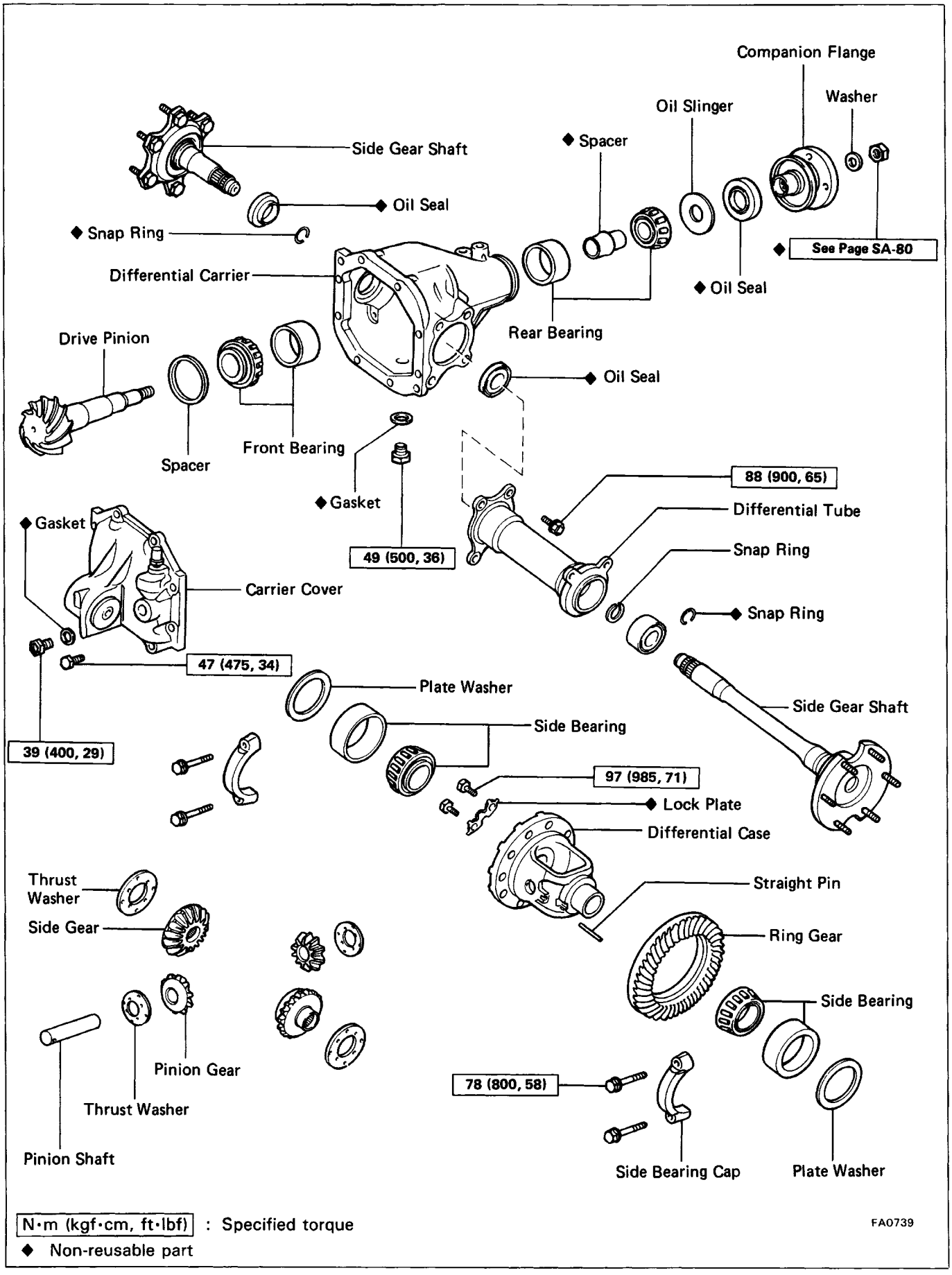
3. INSTALL RH SIDE GEAR SHAFT

(a) Install a new snap ring to the side gear shaft.
(b) Using a plastic–faced hammer, tap on the side gear shaft to install it.

4. CHECK INSTALLATION OF SIDE GEAR SHAFT

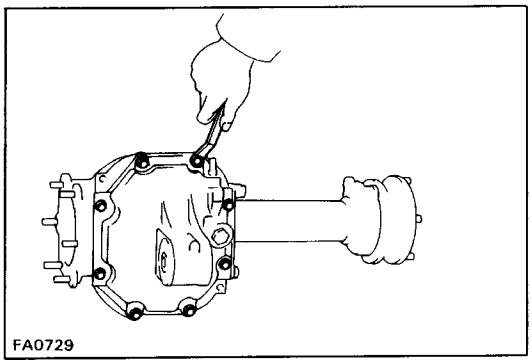
(a) Check that there is 2 – 3 mm (0.08 – 0.12 in.) of play in axial direction.
(b) Check that the side gear shaft will not come out by trying to pull it completely out by hand.

Disassembly and Assembly of Differential (with out A.D.D.)



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

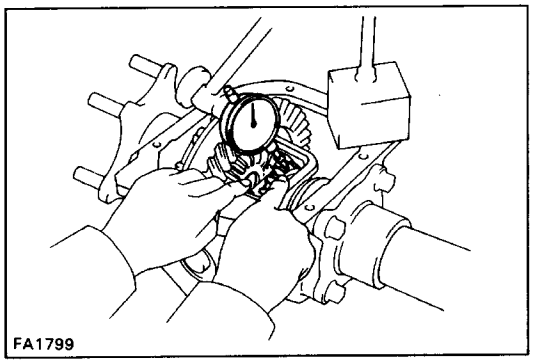
FA0739



DISASSEMBLY OF DIFFERENTIAL

1. REMOVE DIFFERENTIAL COVER

Remove the eight bolts and tap off the cover with a plastic–faced hammer.

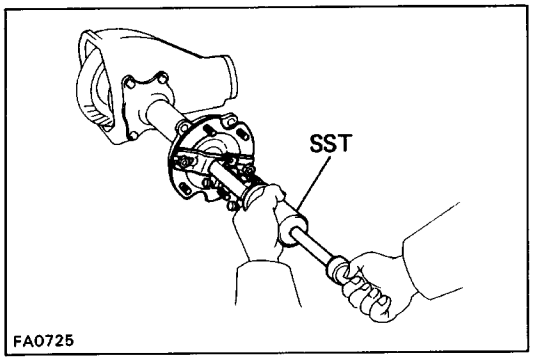


2. CHECK SIDE GEAR BACKLASH

Measure the side gear backlash while holding one pinion gear toward the case.

Standard backlash: 0.05 – 0.20 mm
(0.0020 – 0.0079 in.)

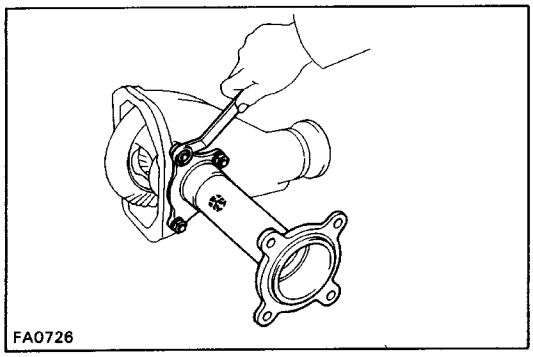
If the backlash is out of specification, install the correct thrust washers. (See page SA–71)



3. REMOVE SIDE GEAR SHAFTS

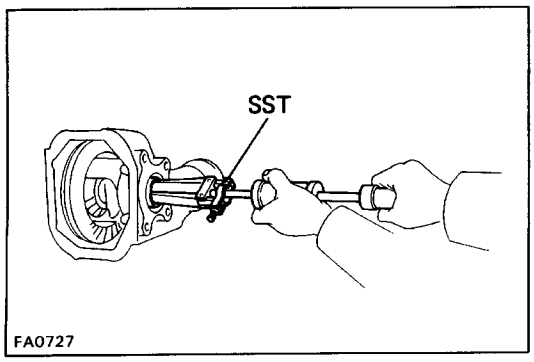
Using SST, remove the side gear shafts from the differential.

SST 09910–00015 .
(09911–00011, 09912–00010, 09914–00011)



4. REMOVE DIFFERENTIAL TUBE

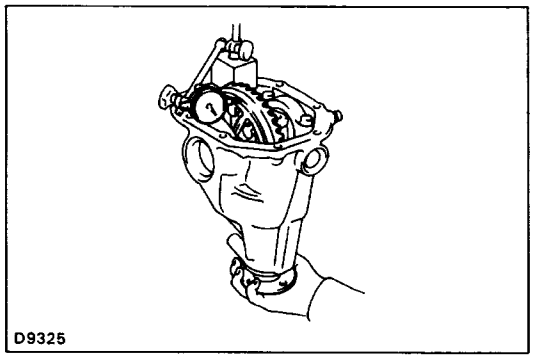
Remove the four bolts and tap off the cover with a plastic–faced hammer.



5. REMOVE SIDE GEAR SHAFT OIL SEALS

Using SST, remove the oil seals.

SST 09308–00010

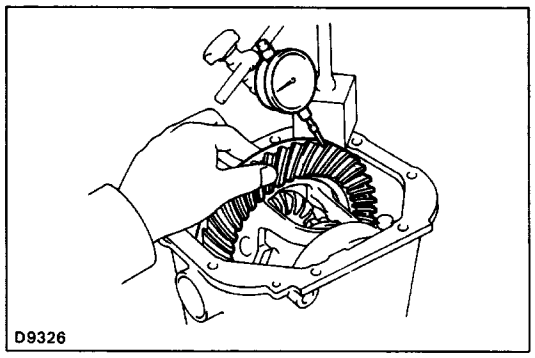


6. CHECK RING GEAR RUNOUT

Using a dial indicator, measure the ring gear runout.

Maximum runout: 0.07 mm (0.0028 in.)

If the runout is greater than maximum, replace the ring gear and drive pinion as a set.



7. CHECK RING GEAR BACKLASH

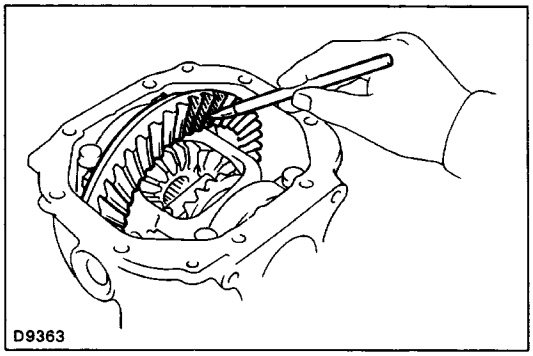
(a) Fix the dial indicator on the tooth surface at a 90° angle.

(b) Holding the drive pinion flange, measure the ring gear backlash.

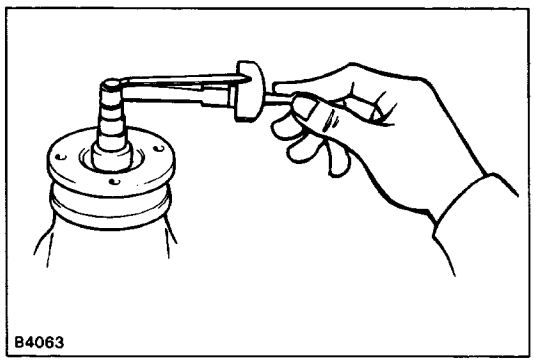
Ring gear backlash: 0.13 – 0.18 mm
(0.0051 – 0.0071 in.)

If the backlash is not within specification, adjust the ring gear backlash.

HINT: Measure from three or more places on the circumference of the ring gear.



8. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (SEE STEP 7 ON PAGE SA–78)



9. MEASURE DRIVE PINION PRELOAD

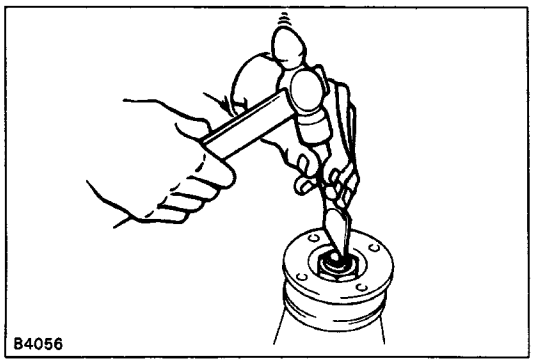
Using a torque gauge, measure the preload of the backlash between the drive pinion and ring gear.

Preload (starting):
0.6 – 1.0 N–m (6 – 10 kgf–cm, 5.2 – 8.7 in.–lbf)

10. CHECK TOTAL PRELOAD

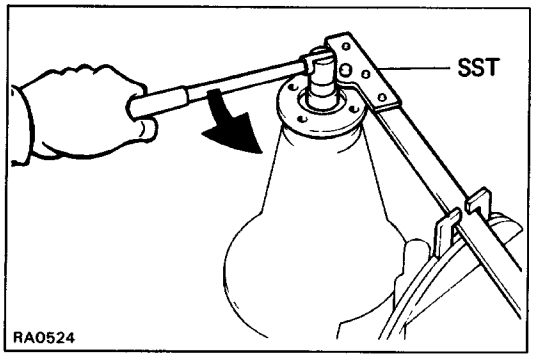
Using a torque gauge, measure the total preload.

Total preload (starting):
Add drive pinion preload
0.4 – 0.6 N–m
(4 – 6 kgf –cm, 3.5 – 5.2 in.–lbf)

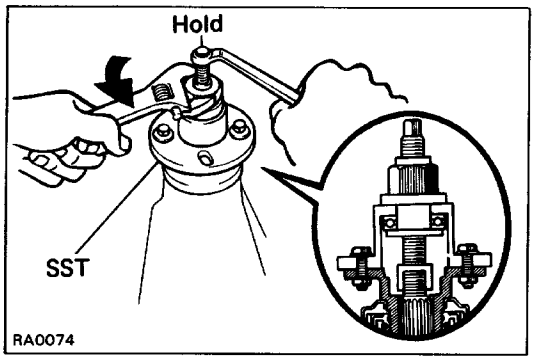


11. REMOVE COMPANION FLANGE

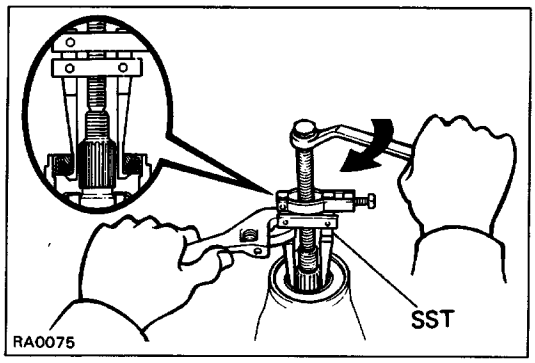
(a) Using a hammer and chisel, loosen the staked part of the nut.



(b) Using SST to hold the flange, remove the nut.
SST 09330–00021



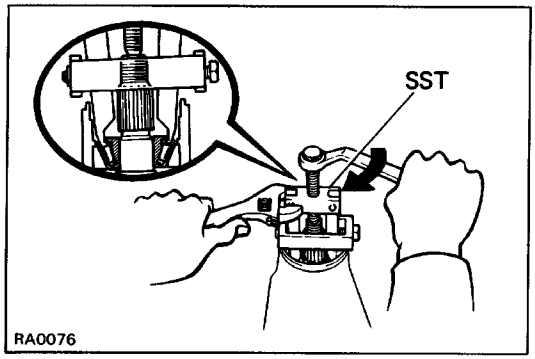
(c) Using SST, remove the companion flange.
SST 09557–22022 (09557–22030)



12. REMOVE OIL SEAL AND OIL SLINGER

(a) Using SST, remove the oil seal from the housing.
SST 09308–10010

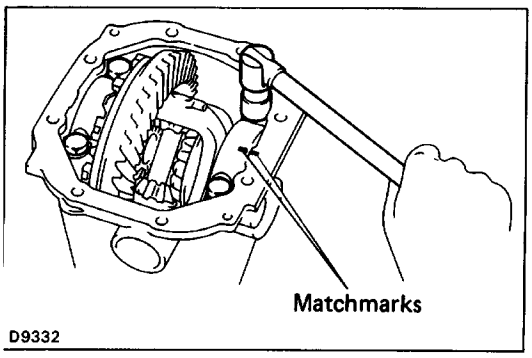
(b) Remove the oil slinger.



13. REMOVE REAR BEARING AND BEARING SPACER

(a) Using SST, remove the rear bearing from drive pinion.
SST 09556–30010

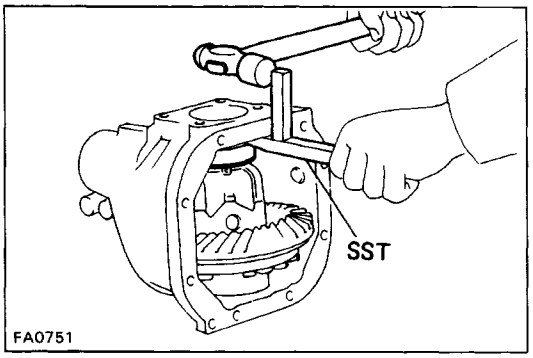
(b) Remove the bearing spacer.
If the rear bearing is damaged or worn, replace the bearing.



14. REMOVE DIFFERENTIAL CASE AND RING GEAR

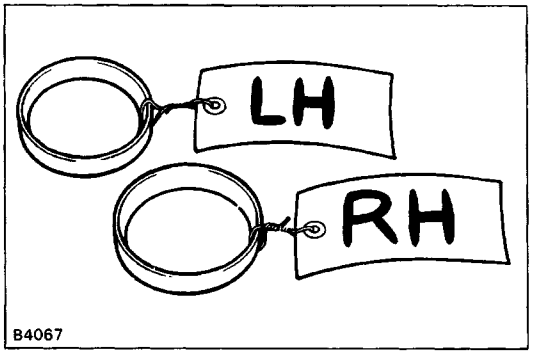
(a) Place matchmarks on the bearing cap and differential carrier.

(b) Remove the two bearing caps.



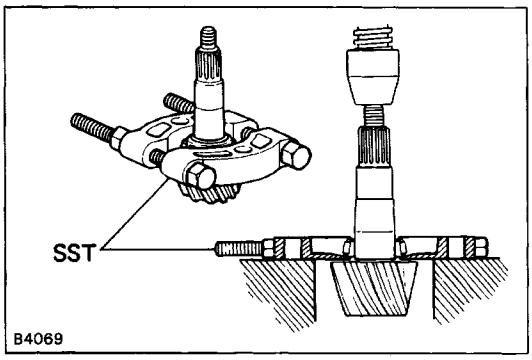
(c) Using SST and a hammer, remove the two side bearing preload adjusting plate washers.
SST 09504–22011

HINT: Measure the adjusting plate washer and note the thickness.



(d) Remove the differential case with bearing outer race from the carrier.
HINT: Tag the bearing outer races to show the location for reassembly.

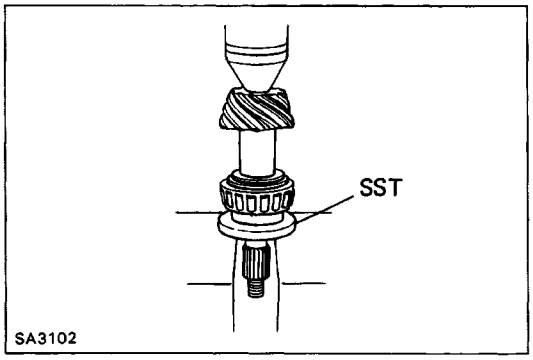
15. REMOVE DRIVE PINION FROM DIFFERENTIAL CARRIER



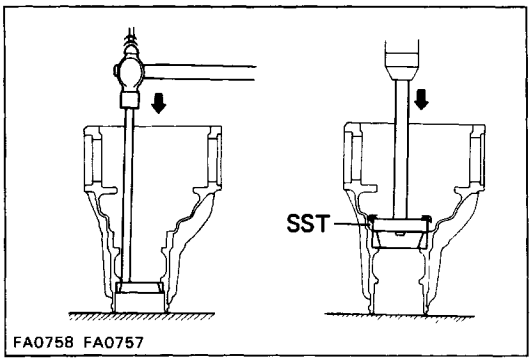
INSPECTION AND REPLACEMENT OF DIFFERENTIAL

1. REPLACE DRIVE PINION FRONT BEARING

4ay Using SST, press out the front bearing from the drive pinion.
SST 09950–00020
HINT: If the drive pinion or ring gear are damaged, replace them as a set.

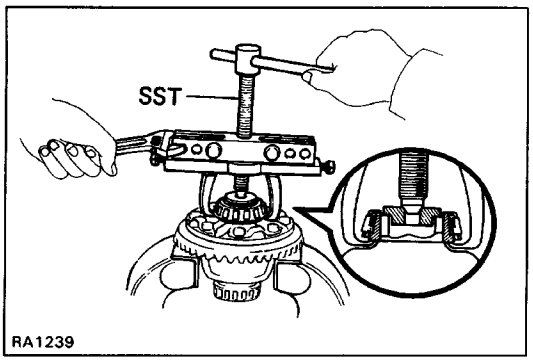


(b) Install the washer on the drive pinion.
(c) Using SST, press in the front bearing onto the drive pinion.
SST 09506–30012



2. REPLACE DRIVE PINION FRONT AND REAR BEARING OUTER RACES

(a) Using a brass bar and hammer, drive out the outer race.
(b) Using SST, drive in a new outer race.
SST 09608–35014
Front outer race (09608–06020, 09608–06120)
Rear outer race (09608–06020, 09608–06110)

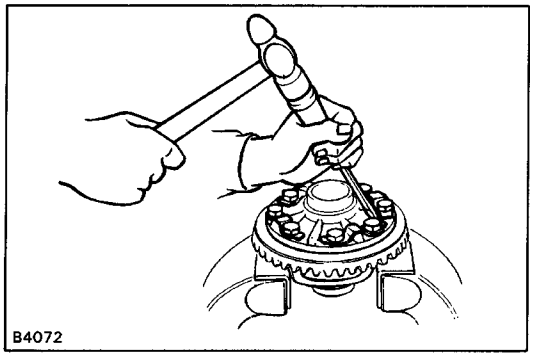


3. REMOVE SIDE BEARING FROM DIFFERENTIAL CASE

Using SST, remove the side bearing from the differential case.

SST 09950–20017

HINT: Fix the claws of SST to the notches in the differential case.

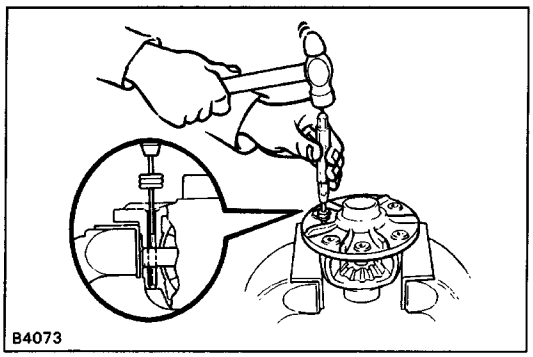


4. REMOVE RING GEAR

(a) Remove the ring gear set bolts and lock plates.

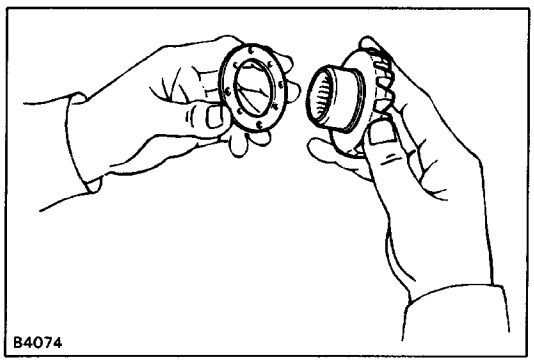
(b) Place matchmarks on the ring gear and differential case.

(c) Using a plastic–faced hammer, tap on the ring gear to separate it from the differential case.



5. DISASSEMBLE DIFFERENTIAL CASE

Using a hammer and punch, drive out the straight pin. Remove the pinion shaft, two pinion gears, two side gears and four thrust washers.



6. ASSEMBLE DIFFERENTIAL CASE

(a) Install the correct thrust washers and side gears.

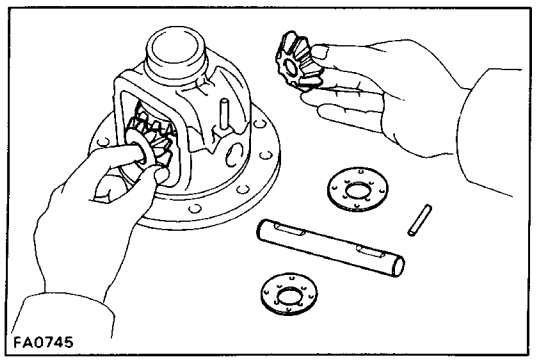
From the table below select thrust washers that will ensure the backlash is within specification. Try to select washers of the same thickness for both sides.

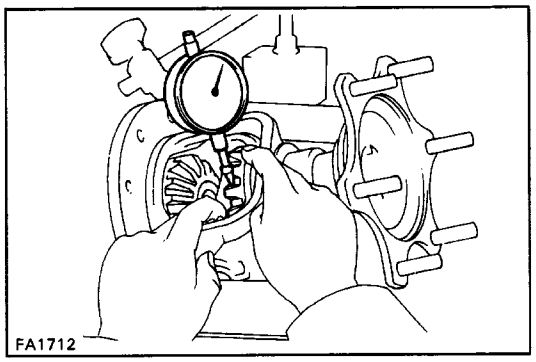
Standard backlash: 0.05 – 0.20 mm
(0.0020 – 0.0079 in.)

Thrust washer thickness

Thickness mm (in.)
0.96 – 1.04 (0.0378 – 0.0409)
1.06 – 1.14 (0.0417 – 0.0449)
1.16 – 1.24 (0.0457 – 0.0488)
1.26 – 1.34 (0.0496 – 0.0528)

Install the thrust washers and side gears in the differential case.

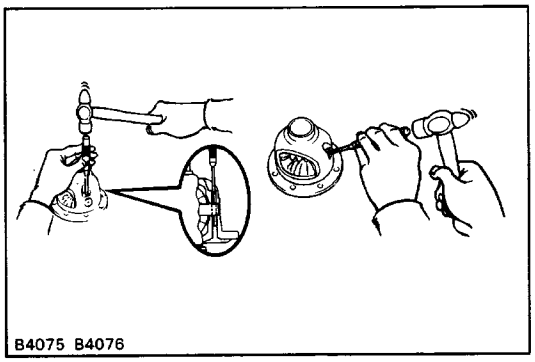




(b) Check the side gear backlash.
- Temporarily install the side gear shaft.
- Measure the side gear backlash while holding one pinion gear toward the case.

Side gear backlash: 0.05 – 0.20 mm
(0.0020 – 0.0079 in.)

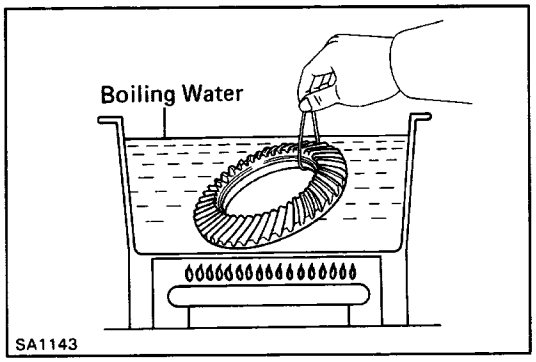
If the backlash is not within specification, replace the thrust washers.

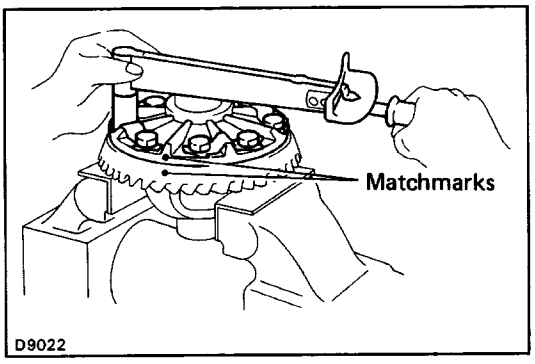


(c) Install straight pin.
- Using a hammer and punch, drive the straight pin through the case and hole in the pinion shaft.
- Stake the pin and differential case.

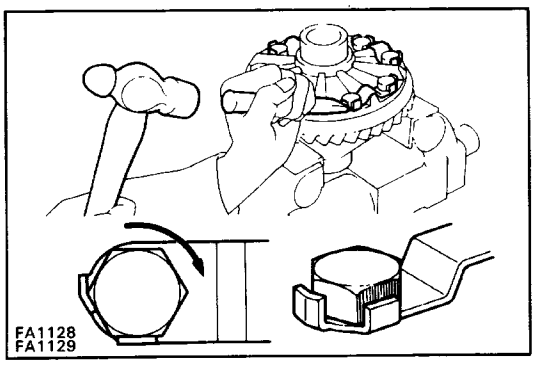
7. INSTALL RING GEAR ON DIFFERENTIAL CASE

(a) Clean the contact surfaces of the differential case and ring gear.
(b) Heat the ring gear in boiling water.
(c) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differ–ential case.

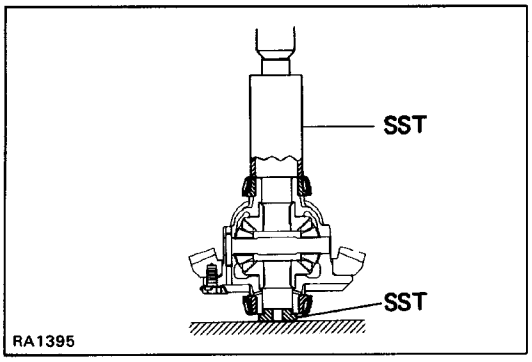




(d) Align the matchmarks on the ring gear and differen–tial case.
(e) Coat the ring gear set bolts with gear oil.
(f) Temporarily install the lock plates and set bolts.
(g) After the ring gear cools down enough, tighten the set bolts uniformly and a little at a time.
Torque: 97 N–m (985 kgf–cm, 71 ft–lbf)



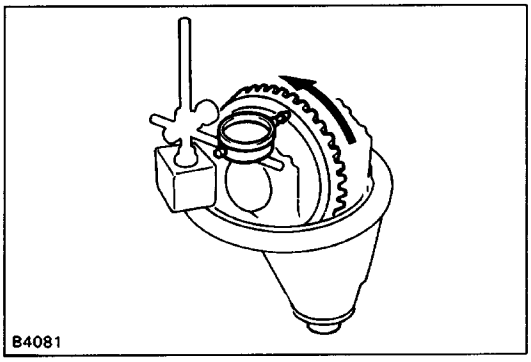
(h) Using a hammer and drift punch, stake the lick plates.
HINT: Stake one claw flush with the flat surface of the nut. For the claw contacting the protruding portion of the nut, stake only the half on the tightening side.



8. INSTALL SIDE BEARINGS

Using a press and SST, drive in the side bearings into the differential case.

SST 09226–10010, 09950–20017



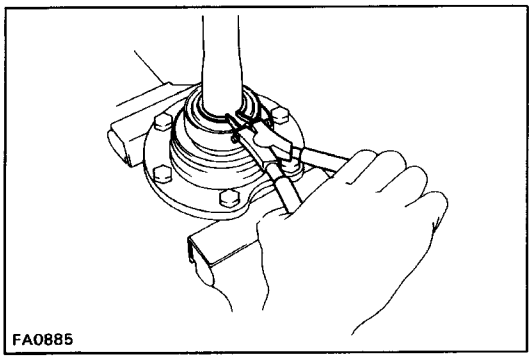
9. CHECK RING GEAR RUNOUT

(a) Install the differential case onto the carrier and install the plate washers to where there is no play in the bearing. (See page SA–75)

(b) Install bearing caps. (See page SA–77)

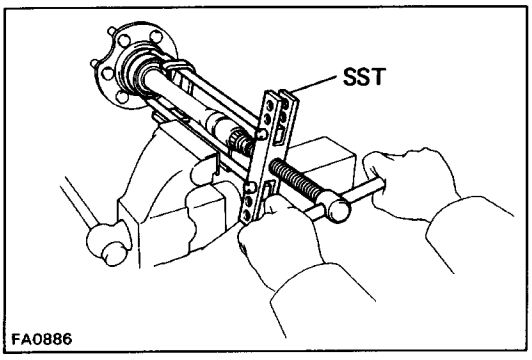
(e) Using a dial indicator, measure the runout of ring gear.

Maximum runout: 0.07 mm (0.0028 in.)



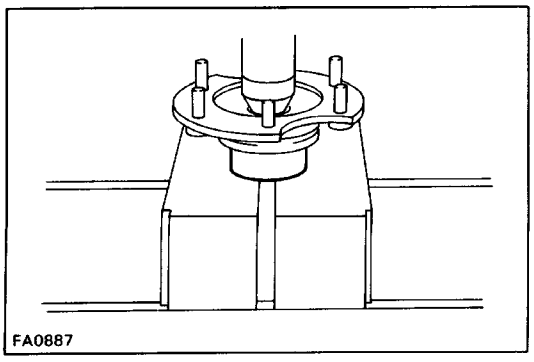
10. REPLACE LH SIDE GEAR SHAFT BEARING

(a) Using a snap ring expander, remove the snap ring.



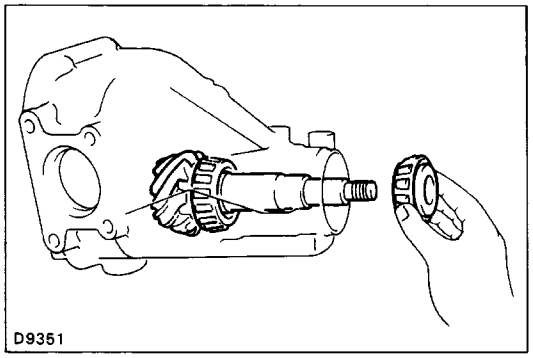
(b) Using SST, remove the bearing from the LH side gear shaft.

SST 09950–20017



(c) Install a new bearing to the LH side gear shaft.

(d) Using a snap ring expander, install the snap ring.



ASSEMBLY OF DIFFERENTIAL

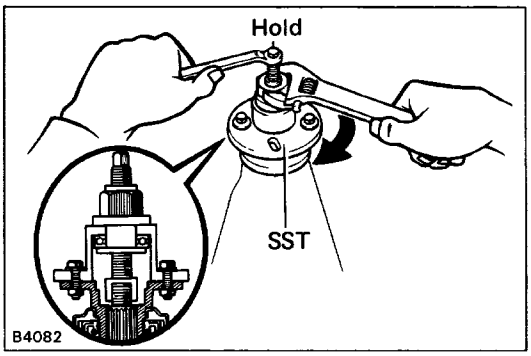
(See page SA–67)

1. TEMPORARILY ADJUST DRIVE PINION PRELOAD

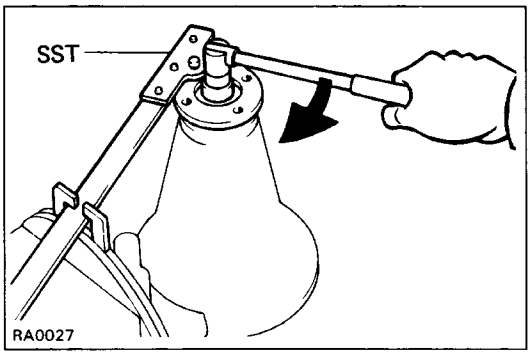
(a) Install the following parts.

- Drive pinion
- Front bearing

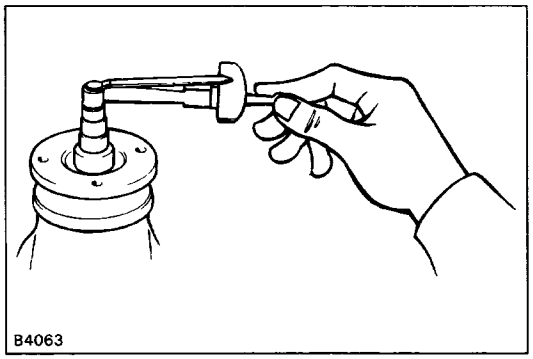
HINT: Assemble the spacer and oil seal after adjusting the gear contact pattern.



(b) Install the companion flange with SST.
Coat the threads of the nut with MP grease.
SST 09557–22022 (09557–22030)



(e) Adjust the drive pinion preload by tightening the companion flange nut.
Using SST to hold the flange, tighten the nut.
SST 09330–00021



(d) Using a torque meter, measure the preload.

Preload (starting):

New bearing

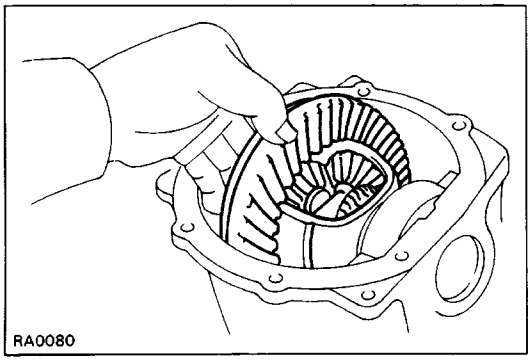
1.2 – 1.9 N–m

(12 – 19 kgf –cm, 10.4 – 16.5 in. –lbf)

Reused bearing

0.6 – 1.0 N–m

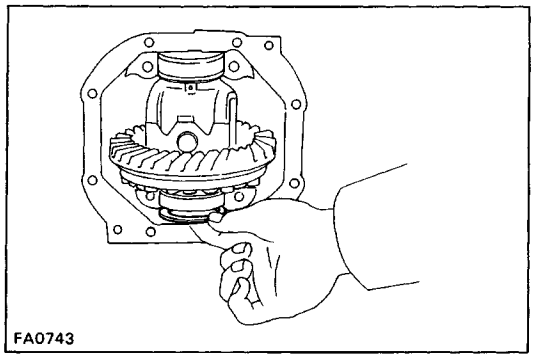
(6 – 10 kgf–cm, 5.2 – 8.7 in. –lbf)



2. INSTALL DIFFERENTIAL CASE IN CARRIER

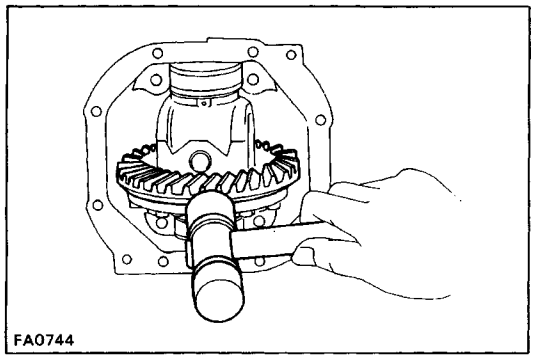
(a) Place the bearing outer races on their respective bearings. Make sure the left and right outer races are not interchanged.

(b) Install the differential case in the carrier.

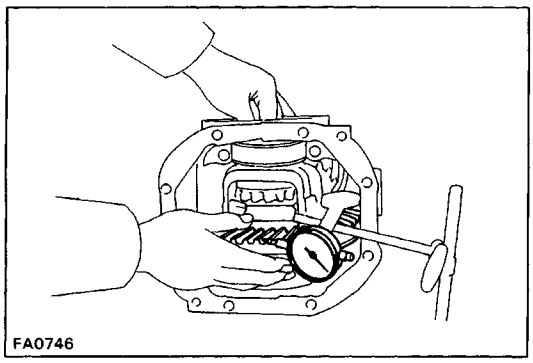


3. ADJUST RING GEAR BACKLASH

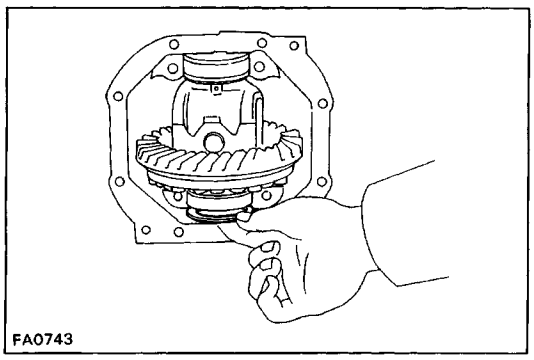
(a) Install only the plate washer on the ring gear back side.
HINT: Insure that the ring gear has backlash.



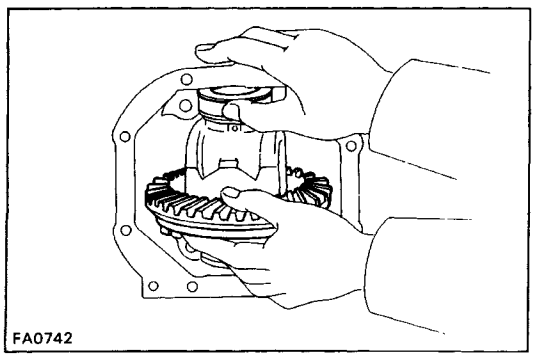
(b) Snug down the washer and bearing by tapping on the ring gear with a plastic–faced hammer.



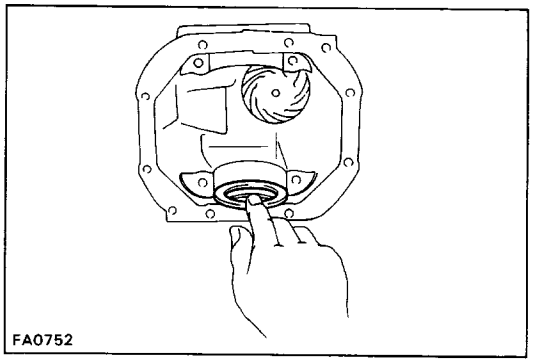
(c) Hold the side bearing boss on the teeth surface of the ring gear and measure the backlash.
Backlash (reference): 0.13 mm (0.0051 in.)



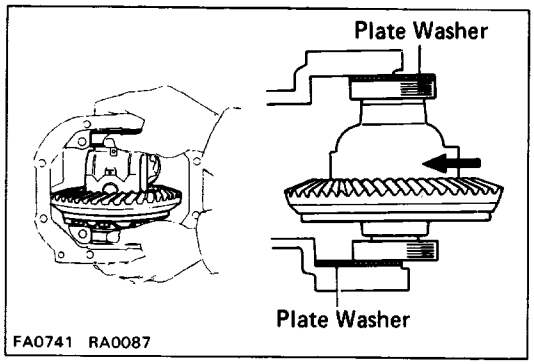
(d) Select a ring gear back plate washer, using the backlash as reference. (See page SA–77)



(e) Select a ring gear teeth side washer with a thickness which eliminates any clearance between the outer race and case.

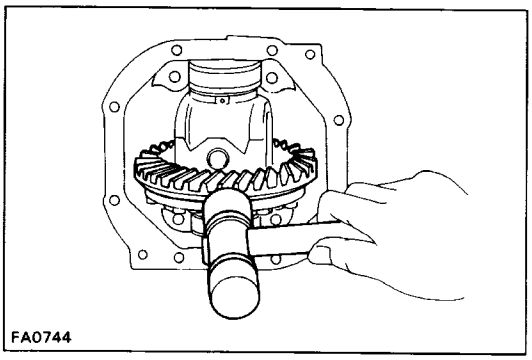

FA0752

(f) Remove the plate washers and differential case.
(g) Install the plate washer into the lower part of the carrier.

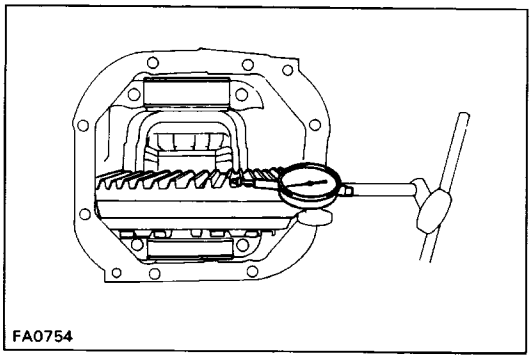


FA0741 RA0087

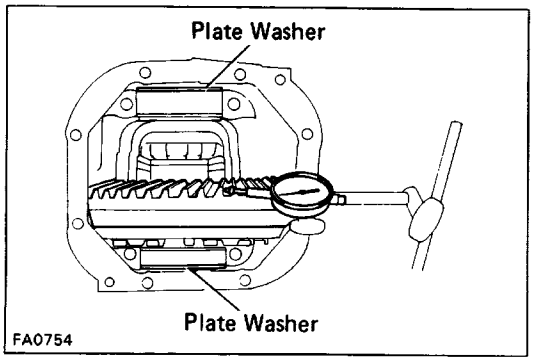
(h) Place the other plate washer onto the differential case together with the outer race, and install the dif–ferential case with the outer race into the carrier.


FA0744

(i) Using a plastic–faced hammer, snug down the washer and bearing by tapping the ring gear.

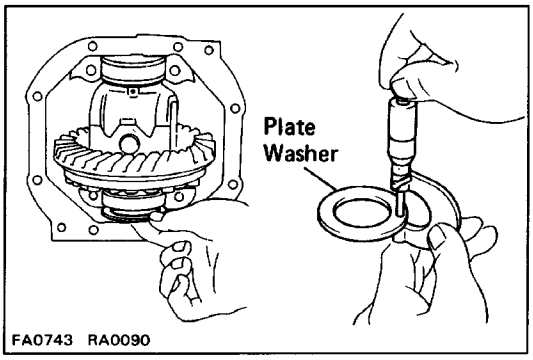

FA0754

(j) Using a dial indicator, measure the ring gear back–lash.
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)



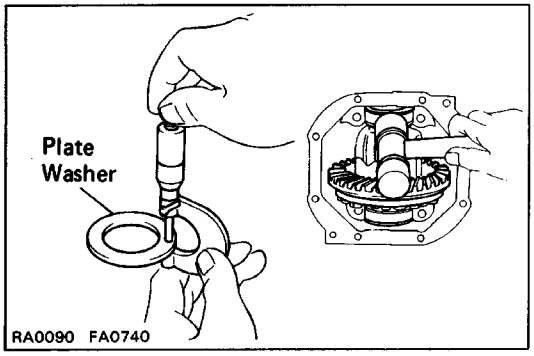
FA0754

(k) If not within specification, adjust by either increas–ing or decreasing the number of washers on both sides by an equal amount.
HINT: There should be no clearance between the plate washer and case.
Insure that there is ring gear backlash.



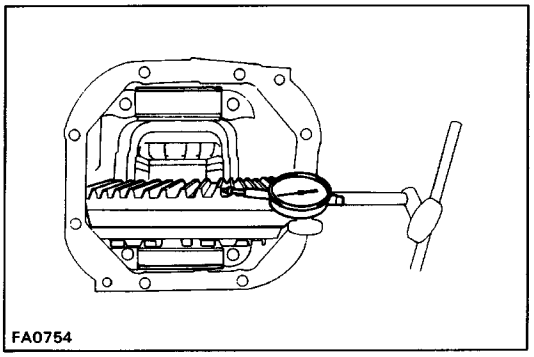
4. ADJUST SIDE BEARING PRELOAD

(a) Remove the ring gear teeth plate washer and mea–sure the thickness.



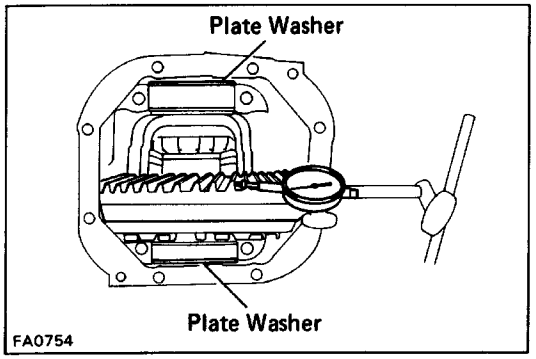
(b) Using the backlash as a reference, install a new washer of 0.06 – 0.09 mm (0.0024 – 0.0035 in.) thicker than the washer removed.
HINT: Select a washer which can be pressed in 2l3 of the way with your finger.

(c) Using a plastic–faced hammer, tap in the side washer.



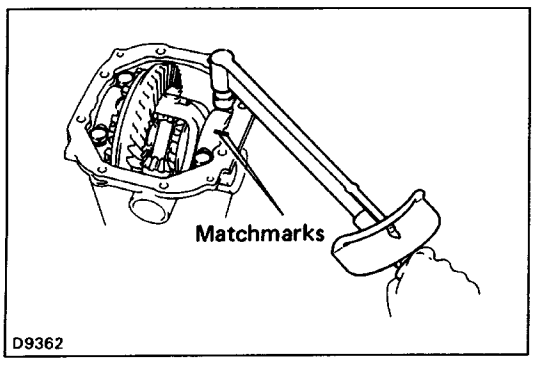
(d) Recheck the ring gear backlash.
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

(e) If not within standard, adjust by either increasing or decreasing the washers on both sides by an equal amount.
HINT: The backlash will change about 0.02 mm (0.0008 in.) with 0.03 mm (0.0012 in.) alteration of the side washer.



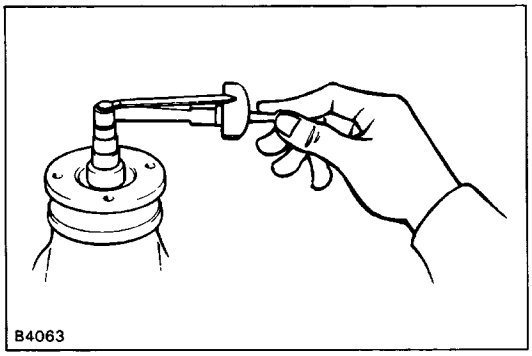
Washer thickness

Thickness mm (in.)	
2.57 – 2.59 (0.1012 – 0.1020)	2.93 – 2.95 (0.1154 – 0.1161)
2.60 – 2.62 (0.1024 – 0.1031)	2.96 – 2.98 (0.1165 – 0.1173)
2.63 – 2.65 (0.1035 – 0.1043)	2.99 – 3.01 (0.1177 – 0.1185)
2.66 – 2.68 (0.1047 – 0.1055)	3.02 – 3.04 (0.1189 – 0.1197)
2.69 – 2.71 (0.1059 – 0 .1067)	3.05 – 3.07 (0.1201 – 0.1209)
2.72 – 2.74 (0.1071 – 0.1079)	3.08 – 3.10 (0.1213 – 0.1220)
2.75 – 2.77 (0.1083 – 0.1091)	3.11 – 3.13 (0.1224 – 0.1232)
2.78 – 2.80 (0.1094 – 0.1102)	3.14 – 3.16 (0.1236 – 0.1244)
2.81 – 2.83 (0.1106 – 0.1114)	3.17 – 3.19 (0.1248 – 0.1256)
2.84 – 2.86 (0.1118 – 0.1126)	3.20 – 3.22 (0.1260 – 0.1268)
2.87 – 2.89 (0.1130 – 0.1138)	3.23 – 3.25 (0.1272 – 0.1280)
2.90 – 2.92 (0.1142 – 0.1150)	



5. INSTALL SIDE BEARING CAPS

Align the matchmarks on the cap and carrier.
Torque: 78 N–m (800 kgf–cm, 58 ft–lbf)


B4063

6. MEASURE TOTAL PRELOAD

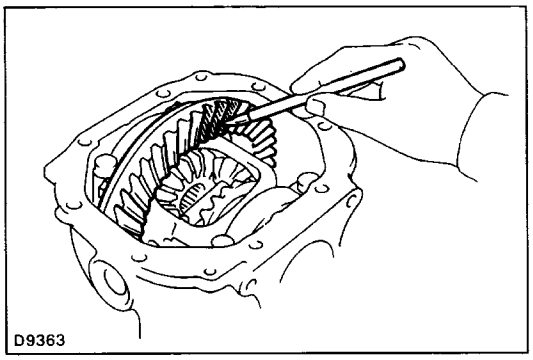
Using a torque wrench, measure the total preload.

Total preload (starting):

Add drive pinion preload

0.4 – 0.6 N–m

(4 – 6 kgf–cm, 3.5 – 5.2 in.–lbf)


D9363

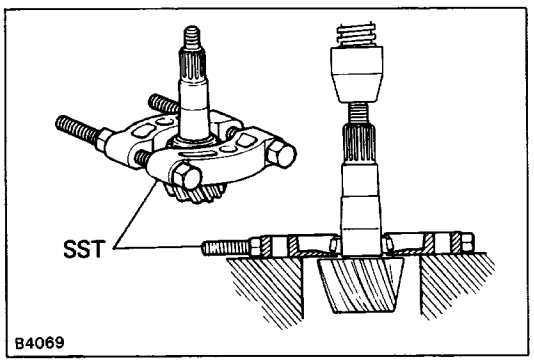
7. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

(a) Coat 3 or 4 teeth at three different positions on the ring gear with red lead .

(b) Hold the companion flange firmly and rotate the ring gear in both directions.

(c) Inspect the tooth pattern.

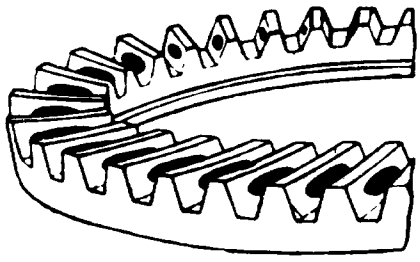
If the teeth are not contacting properly, use the following chart to select a proper washer for correction.



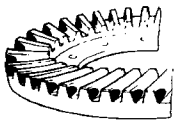
B4069

Washer thickness

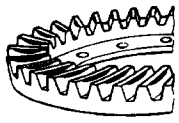
Thickness mm (in.)	
2.24 (0.0882)	2.51 (0.0988)
2.27 (0.0894)	2.54 (0.1000)
2.30 (0.0906)	2.57 (0.1012)
2.33 (0.0917)	2.60 (0.1024)
2.36 (0.0929)	2.63 (0.1035)
2.39 (0.0941)	2.66 (0.1047)
2.42 (0.0953)	2.69 (0.1059)
2.45 (0.0965)	2.72 (0.1071)
2.48 (0.0976)	

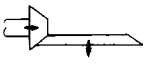

Proper Contact

Heel Contact



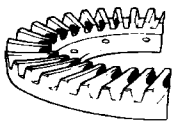
Face Contact



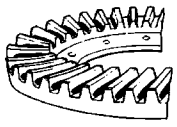


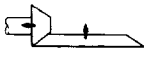
Select an adjusting shim that will bring the drive pinion closer to the ring gear.

Toe Contact



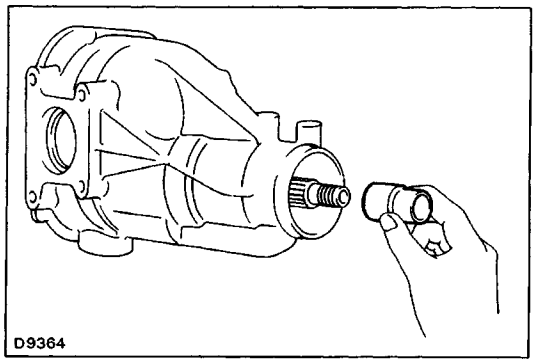
Flank Contact





Select an adjusting shim that will shift the drive pinion away from the ring gear.

MT0372
B4093 MT0373



8. REMOVE COMPANION FLANGE

(See step 11 on page SA–68)

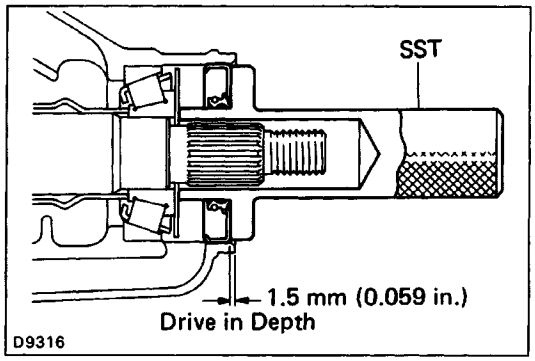
9. REMOVE FRONT BEARING

(See step 12 on page SA–69)

10. INSTALL NEW BEARING SPACER AND FRONT BEARING

(a) Install a new bearing spacer on the drive pinion.

(b) Install the front bearing on the drive pinion.



11. INSTALL OIL SLINGER AND NEW OIL SEAL

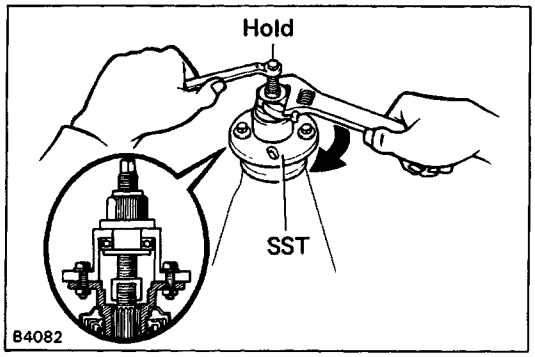
(a) Install the oil slinger.

(b) Using SST, drive in a new oil seal.

SST 09554–3001 1

Oil seal drive in depth: 1.5 mm (0.059 in.)

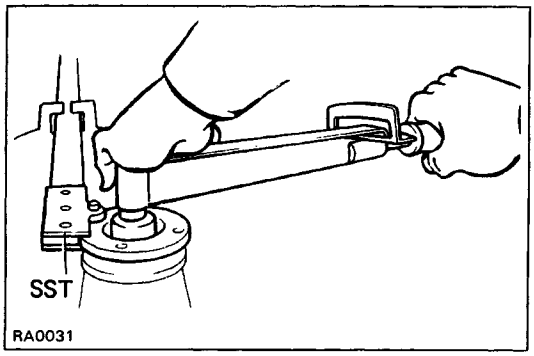
(c) Apply MP grease to the oil seal lip.



12. INSTALL COMPANION FLANGE

(a) Using SST, install the companion flange on the shaft.

SST 09557–22022 (09557–22030)



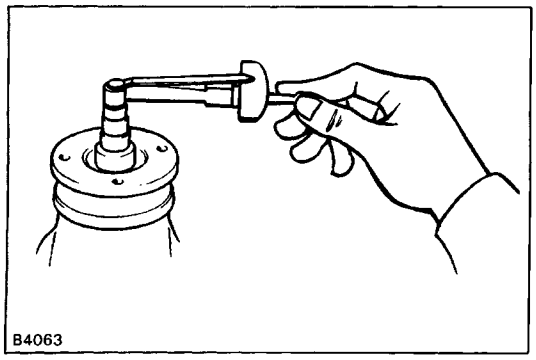
(b) Coat the threads of a new nut with MP grease.

(c) Using SST to hold the flange, tighten the nut.

Torque the nut.

SST 09330–00021

Torque: 120 N–m (1,225 kgf–cm, 89 ft–lbf)



13. CHECK FRONT BEARING PRELOAD

Using a torque meter, measure the preload of the back–lash between the drive pinion and ring gear.

Preload (starting):

New bearing

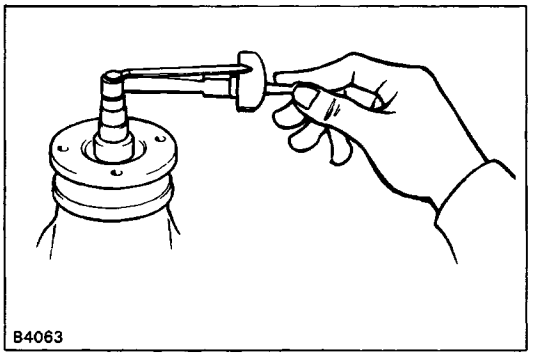
1.2 – 1.9 N–m

(12 – 19 kgf–cm, 10.4 – 16.5 in.–lbf)

Reused bearing

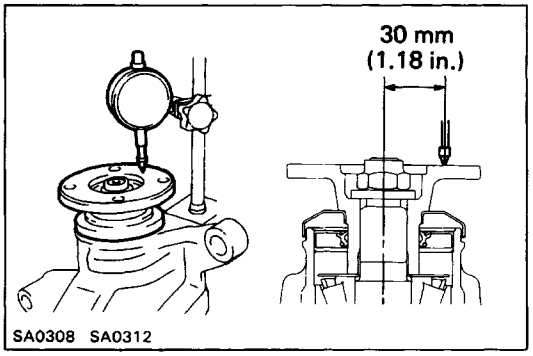
0.6 – 1.0 N–m

(6 – 10 kgf–cm, 5.2 – 8.7 in.–lbf)


B4063

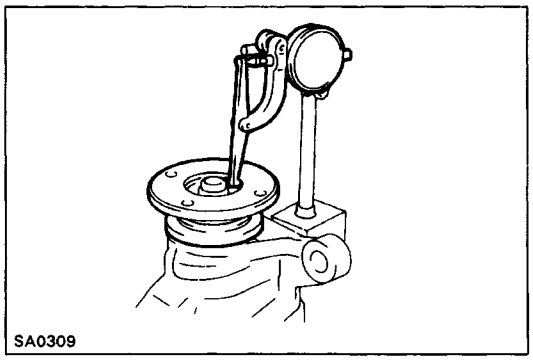
(a) If the preload is greater than specification, replace the bearing spacer.
(b) If the preload is less than specification, retighten the nut 13 N–m (130 kgf–cm, 9 ft–lbf) a little at a time until the specified preload is reached.
Maximum torque: 223 N–m (2,275 kgf–cm, 165 ft–lbf)
If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.

14. CHECK RUNOUT OF COMPANION FLANGE



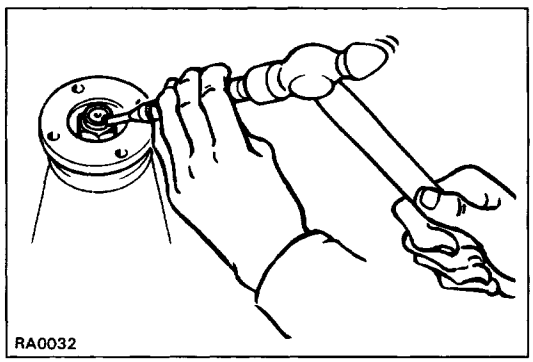
SA0308 SA0312

Using a dial indicator, measure the vertical and lateral runout of the companion flange.
Maximum vertical runout: 0.10 mm 10.0039 in.)

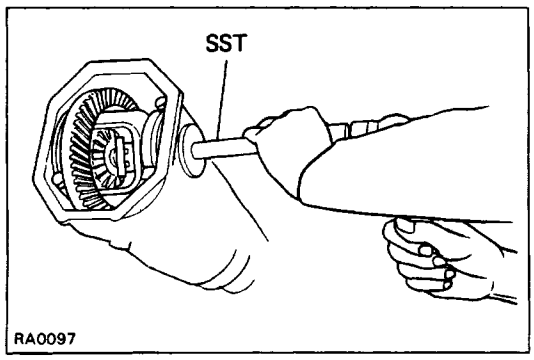

SA0309

Maximum lateral runout: 0.10 mm (0.0039 in.)
If the runout is greater than maximum, inspect the bearings.

15. STAKE DRIVE PINION NUT

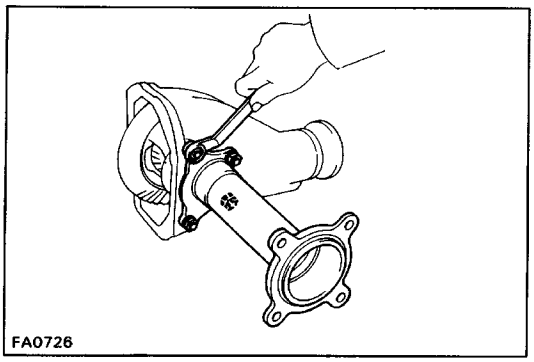

RA0032

16. INSTALL NEW SIDE GEAR SHAFT OIL SEAL



RA0097

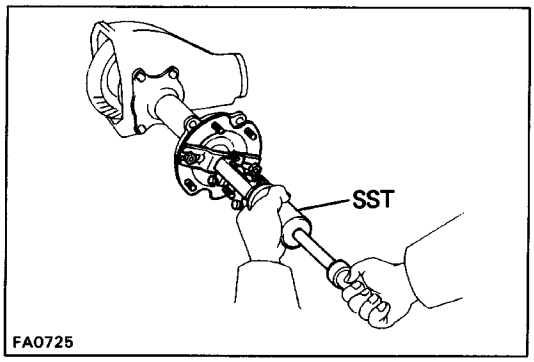
(a) Coat the oil seal lip with MP grease.
(b) Using SST, drive in the oil seal until it is flush with the carrier end surface.
SST 09550–22011 (09550–00020, 09550–00031)



17. INSTALL DIFFERENTIAL TUBE

Install the differential tube to the differential carrier with the four bolts.

Torque: 88 N–m (900 kgf–cm, 65 ft–lbf)



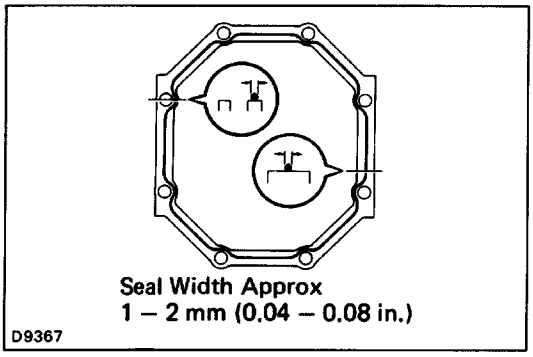
18. INSTALL SIDE GEAR SHAFTS

(a) Before installing the shafts, replace the snap ring.

(b) Using SST, install the side gear shafts to the differ–ential carrier.

SST 09910–00015

(09911–00011, 09912–00010, 09914–00011)



19. INSTALL DIFFERENTIAL CARRIER COVER

(a) Remove any packing material and be careful not to drop oil on the contacting surface of the differential carrier or carrier cover.

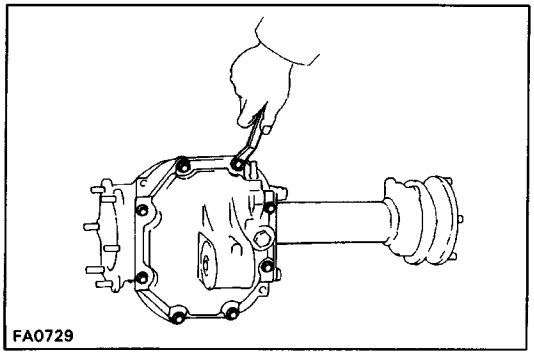
(b) Apply seal packing to the carrier cover.

Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

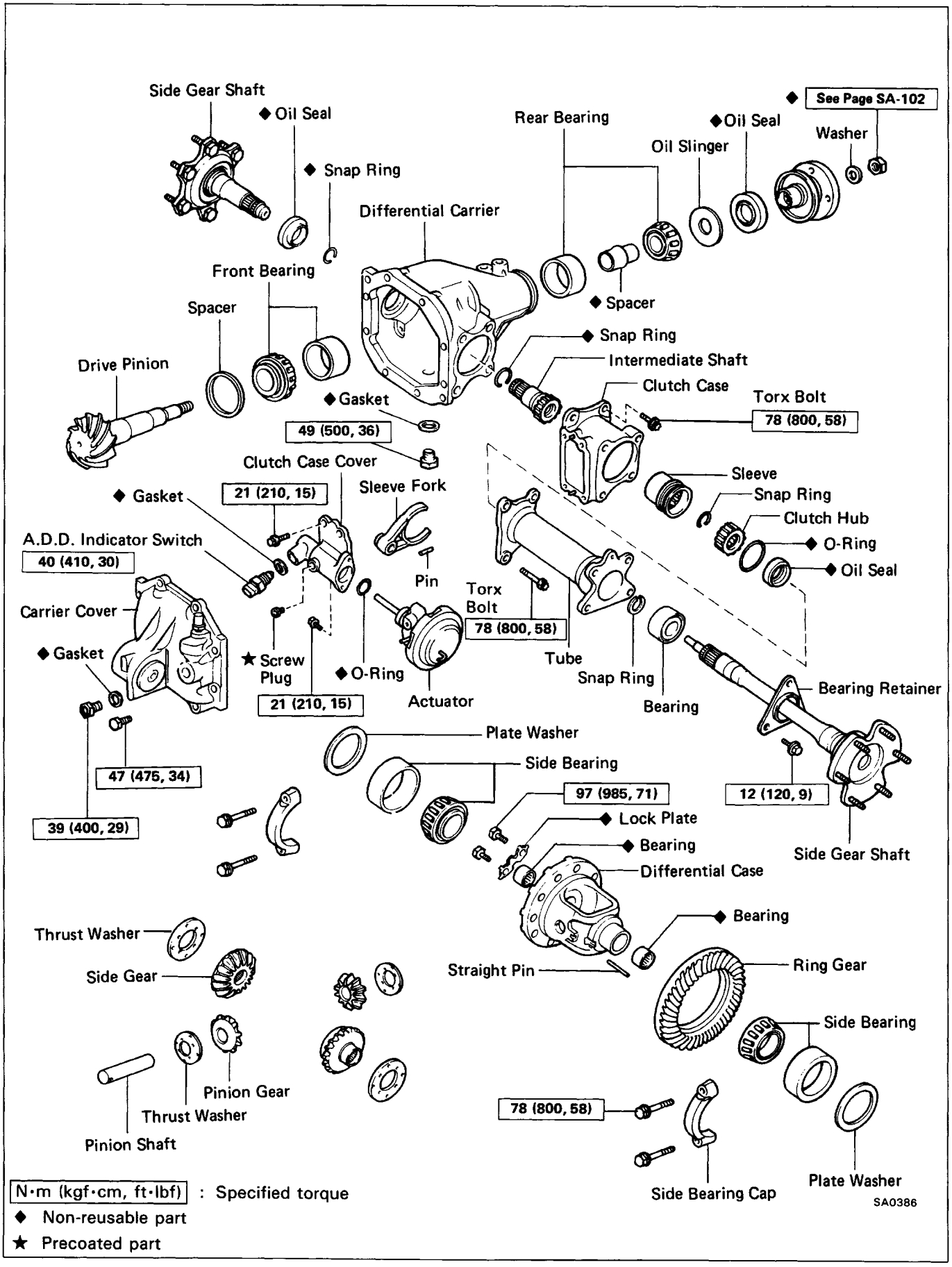
HINT: Install the carrier cover within ten minutes after applying seal packing.

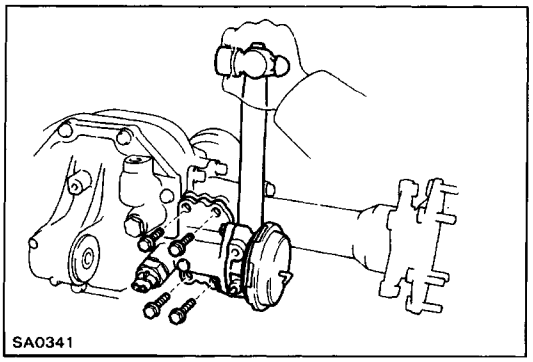
(c) Install and torque the bolts.

Torque: 47 N–m (475 kgf–cm, 34 ft–lbf)



Disassembly and Assembly of Differential (with A.D.D.)



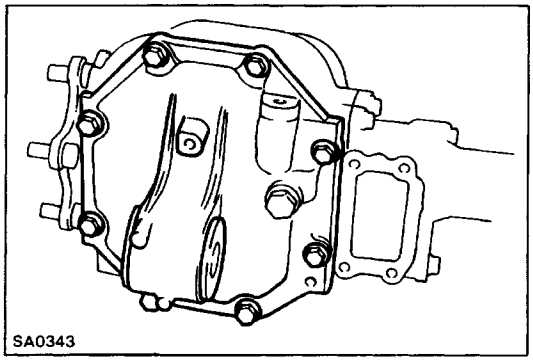


DISASSEMBLY OF DIFFERENTIAL

1. REMOVE ACTUATOR

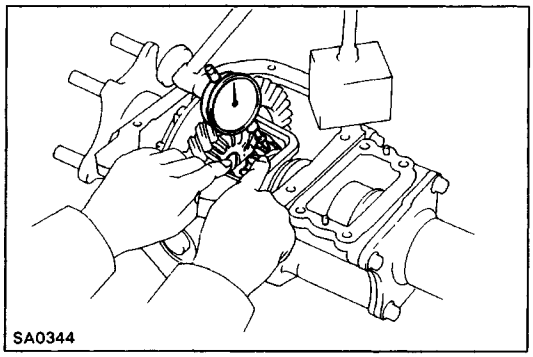
(a) Remove the four bolts.

(b) Using a hammer, remove the actuator.



2. REMOVE DIFFERENTIAL CARRIER COVER

Remove the eight bolts and tap off the cover with a plastic–faced hammer.



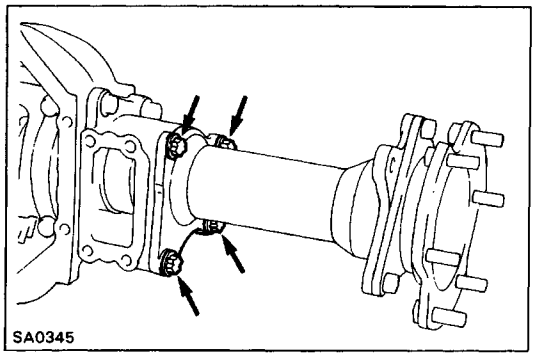
3. CHECK SIDE GEAR BACKLASH

Measure the side gear backlash while holding one pinion gear toward the case.

Standard backlash: 0.05 – 0.20 mm

(0.0020 – 0.0079 in.)

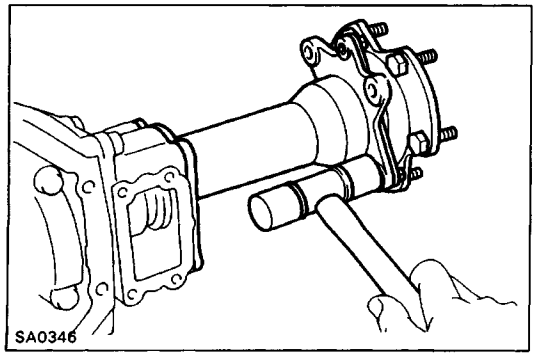
If the backlash is out of specification, install the correct thrust washers. (See page SA–90)



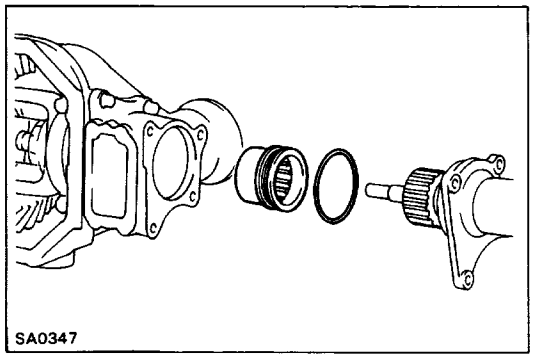
4. REMOVE LH SIDE GEAR SHAFT WITH TUBE

(a) Remove the four torx bolts.

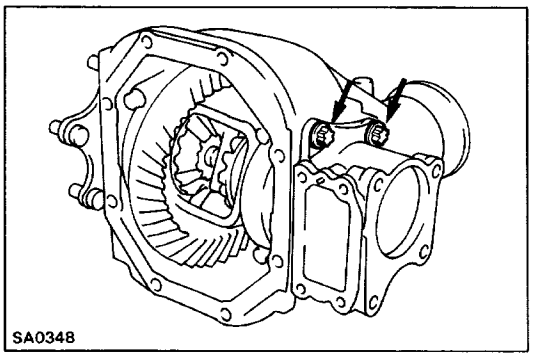
Torx wrench: E14 (Part No. 09044–00010 or locally manufactured tool)



(b) Using a plastic–faced hammer, tap on the tube to remove it.



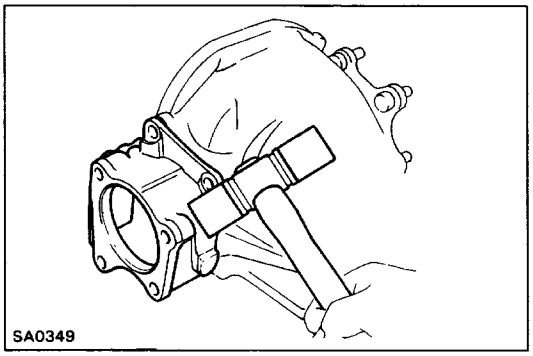
(c) Remove the sleeve.
(d) Remove the 0–ring from the tube.



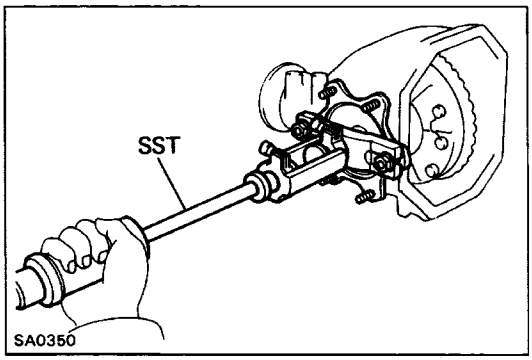
5. REMOVE CLUTCH CASE

(a) Remove the two torx bolts.

Torx wrench: E14 (Part No. 09044–00010 or locally manufactured tool)

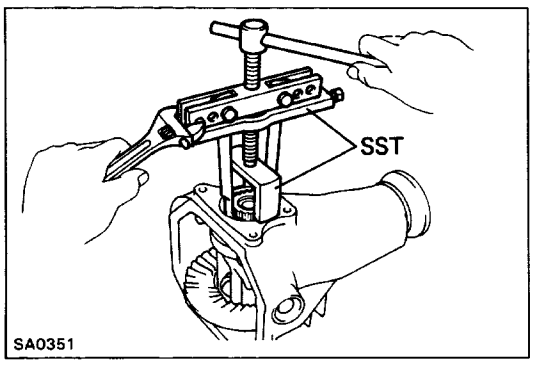


(b) Using a plastic–faced hammer, tap on the clutch case to remove it.



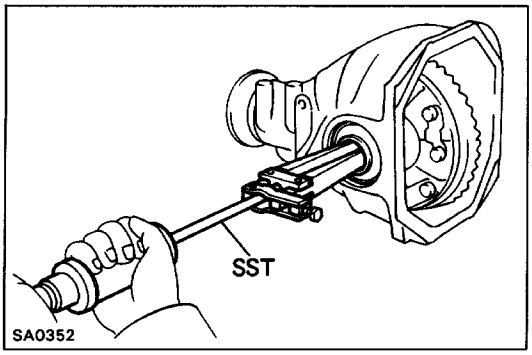
6. REMOVE RH SIDE GEAR SHAFT

Using SST, pull off the RH side gear shaft.
SST 09910–00015
(09911–00011, 09912–00010, 09914–00011)



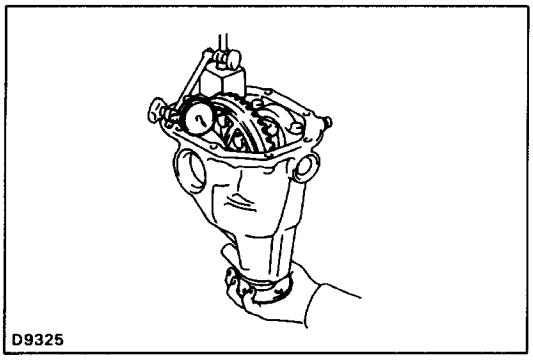
7. REMOVE INTERMEDIATE SHAFT

Using SST, pull off the intermediate shaft.
SST 09350–20015 (09369–20040), 09950–20017



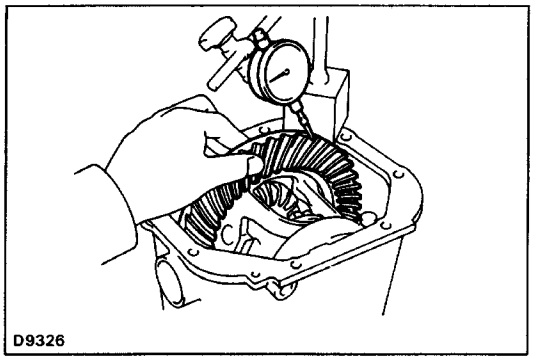
8. REMOVE RH SIDE OIL SEAL

Using SST, remove the oil seal.
SST 09308–00010



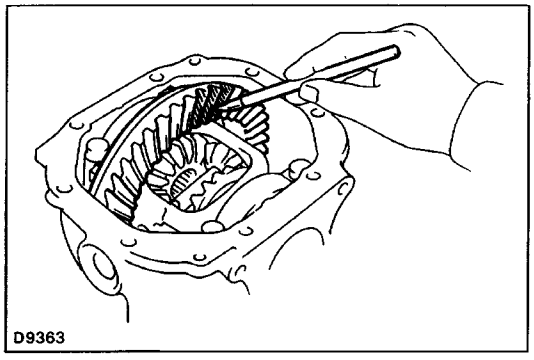
9. CHECK RING GEAR RUNOUT

Using a dial indicator, measure the ring gear runout.
Maximum runout: 0.07 mm (0.0028 in.)
If the runout is greater than maximum, replace the ring gear and drive pinion as a set.

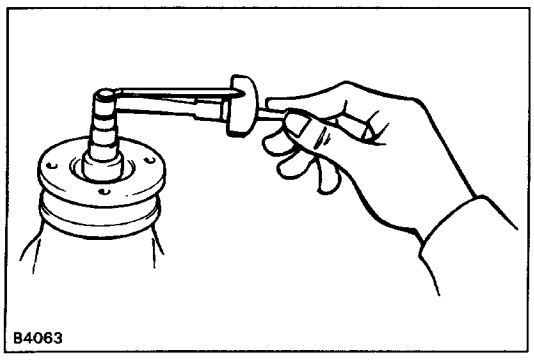


10. CHECK RING GEAR BACKLASH

(a) Fix the dial indicator on the tooth surface at a 90° angle.
(b) Holding the drive pinion flange, measure the ring gear backlash.
Ring gear backlash: 0.13 – 0.18 mm
(0.0051 – 0.0071 in.)
If the backlash is not within specification, adjust the ring gear backlash.
HINT: Measure from three or more places on the cir–cumference of the ring gear.



11. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (SEE STEP 7 ON PAGE SA–100)

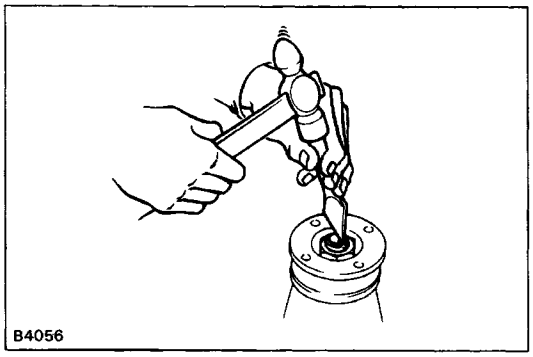


12. MEASURE DRIVE PINION PRELOAD

Using a torque gauge, measure the preload of the back–lash between the drive pinion and ring gear.
Preload (starting):
0.6 – 1.0 N–m (6 – 10 kgf–cm, 5.2 – 8.7 in.–lbf)

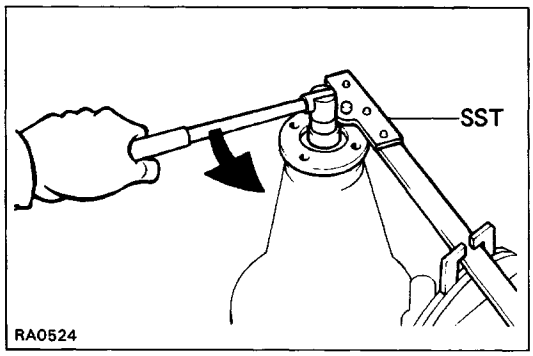
13. CHECK TOTAL PRELOAD

Using a torque gauge, measure the total preload.
Total preload (starting):
Add drive pinion preload
0.4 – 0.6 N–m
(4 – 6 kgf–cm, 3.5 – 5.2 in.–lbf)

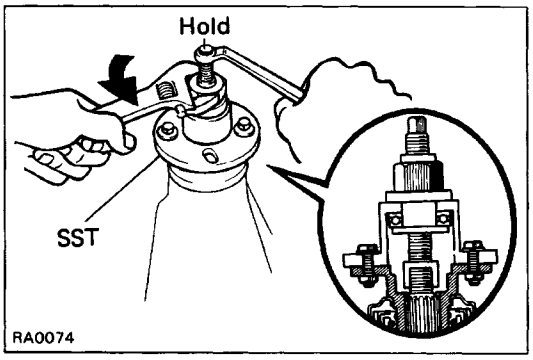


14. REMOVE COMPANION FLANGE

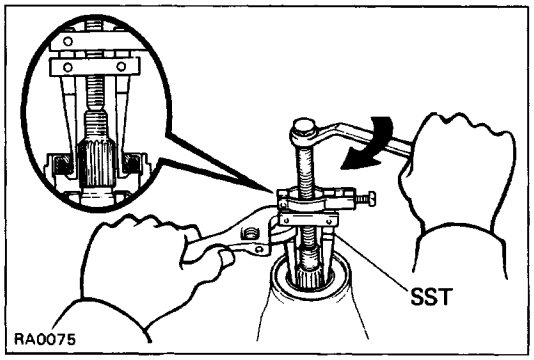
(a) Using a hammer and chisel, loosen the staked part of the nut.



(b) Using SST to hold the flange, remove the nut.
SST 09330–00021



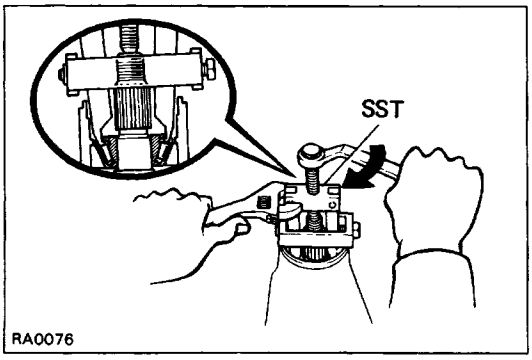
(c) Using SST, remove the companion flange.
SST 09557–22022 (09557–22030)



15. REMOVE OIL SEAL AND OIL SLINGER

(a) Using SST, remove the oil seal from the housing.
SST 09308–10010

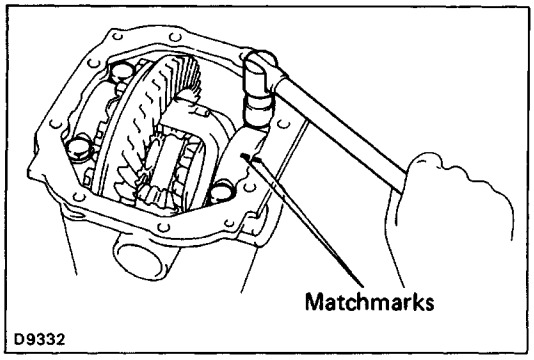
(b) Remove the oil slinger.



16. REMOVE REAR BEARING AND BEARING SPACER

(a) Using SST, remove the rear bearing from drive pinion.
SST 09556–30010

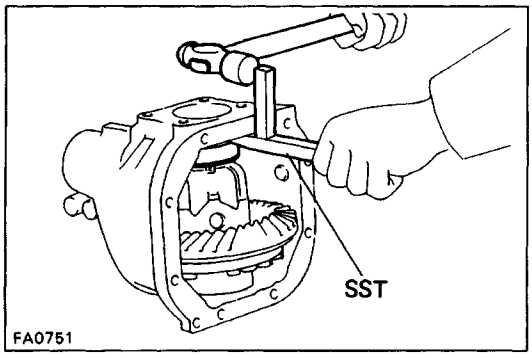
(b) Remove the bearing spacer.
If the rear bearing is damaged or worn, replace the bearing.



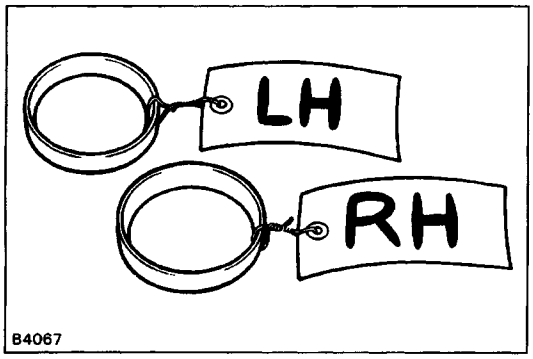
17. REMOVE DIFFERENTIAL CASE AND RING GEAR

(a) Place matchmarks on the bearing cap and differen–tial carrier.

(b) Remove the two bearing caps.

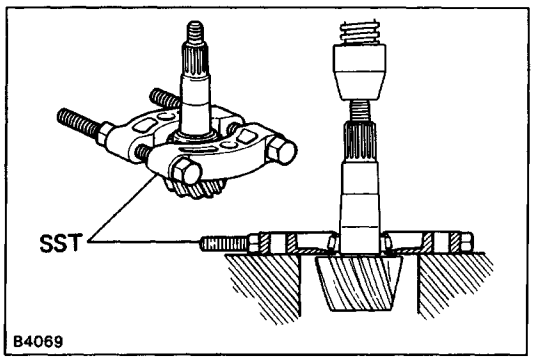


(c) Using SST and a hammer, remove the two side bearing preload adjusting plate washers.
SST 09504–22011
HINT: Measure the adjusting plate washer and note the thickness.



(d) Remove the differential case with bearing outer race from the carrier.
HINT: Tag the bearing outer races to show the location for reassembly.

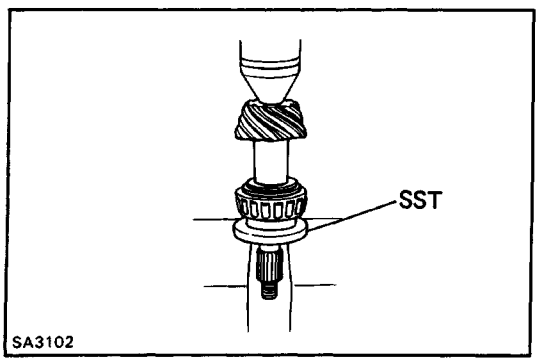
18. REMOVE DRIVE PINION FROM DIFFERENTIAL CARRIER



INSPECTION AND REPLACEMENT OF DIFFERENTIAL

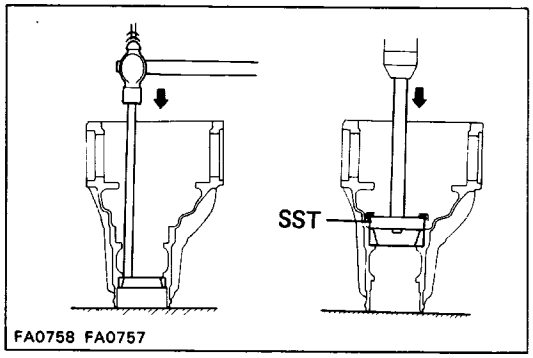
1. REPLACE DRIVE PINION FRONT BEARING

(a) Using SST, press out the front bearing from the drive pinion.
SST 09950–00020
HINT: If the drive pinion or ring gear are damaged, re–place them as a set.



(b) Install the washer on the drive pinion.

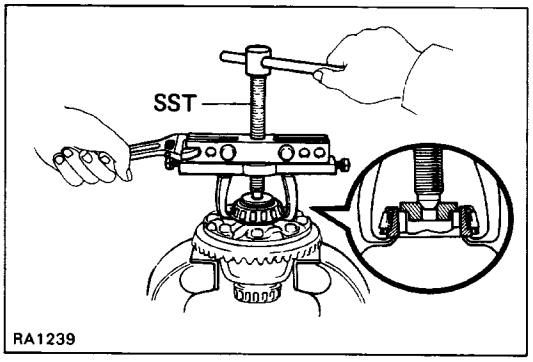
(c) Using SST, press in the front bearing onto the drive pinion.
SST 09506–30012



2. REPLACE DRIVE PINION FRONT AND REAR BEARING OUTER RACES

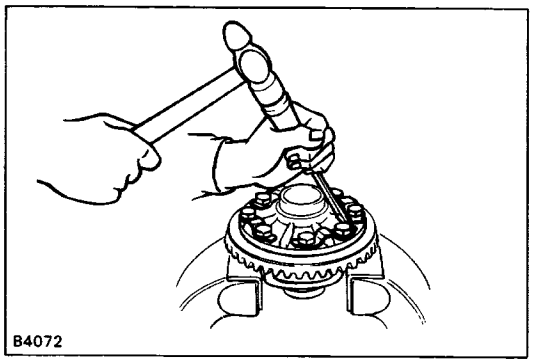
(a) Using a brass bar and hammer, drive out the outer race.

(b) Using SST, drive in a new outer race.
SST 09608–35014
Front outer race (09608–06020, 09608–06120)
Rear outer race (09608–06020, 09608–06110)



3. REMOVE SIDE BEARING FROM DIFFERENTIAL CASE

Using SST, remove the side bearing from the differential case.
SST 09950–20017
HINT: Fix the claws of SST to the notches in the differential case.

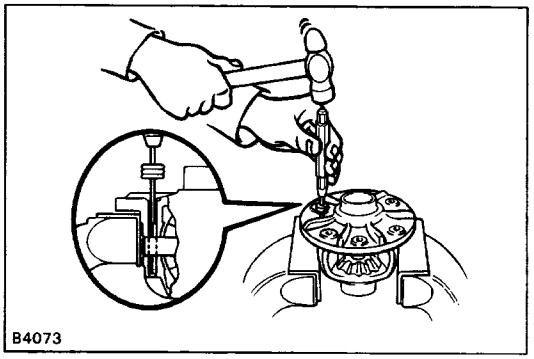


4. REMOVE RING GEAR

(a) Remove the ring gear set bolts and lock plates.

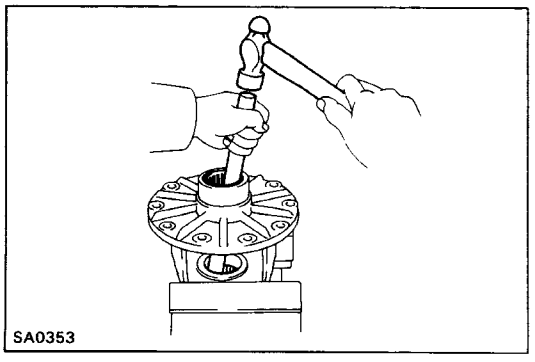
(b) Place matchmarks on the ring gear and differential case.

(c) Using a plastic–faced hammer, tap on the ring gear to separate it from the differential case.

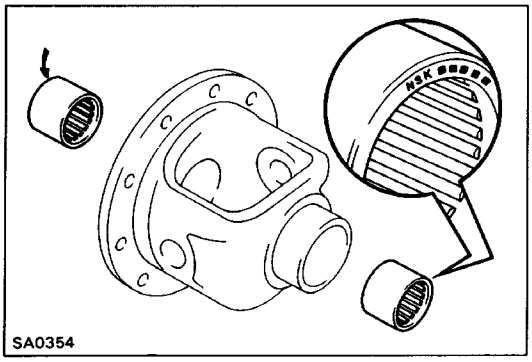


5. DISASSEMBLE DIFFERENTIAL CASE

(a) Using a hammer and punch, drive out the straight pin. Remove the pinion shaft, two pinion gears, two side gears and four thrust washers.



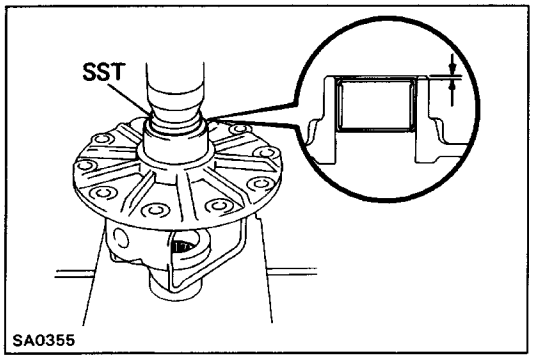
(b) Using a hammer and brass bar, drive out the needle bearings.



6. ASSEMBLE DIFFERENTIAL CASE

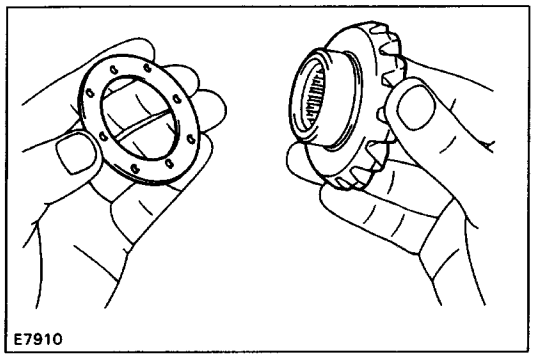
(a) Using SST, press the new needle bearing into the differential case.

NOTICE: Press in the bearings, with the engraved side of each bearing facing outward from the differential case.



Bearing press in depth: 2.0 mm 10.079 in.)

SST 09950–20017



(b) Install the thrust washers to the side gears.

(c) Install the side gears with thrust washers and pinion gears with thrust washers.

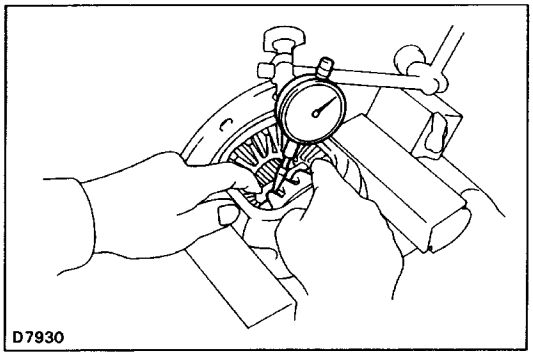
(d) Install the pinion shaft.

(e) Check the side gear backlash.

Measure the side gear backlash while holding one pinion gear toward the case.

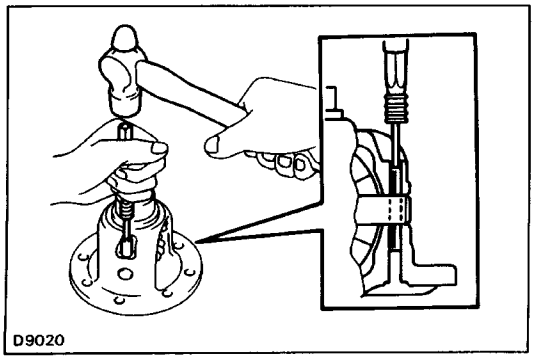
Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

If the backlash is not within specification, install the side gear thrust washers of different thickness.

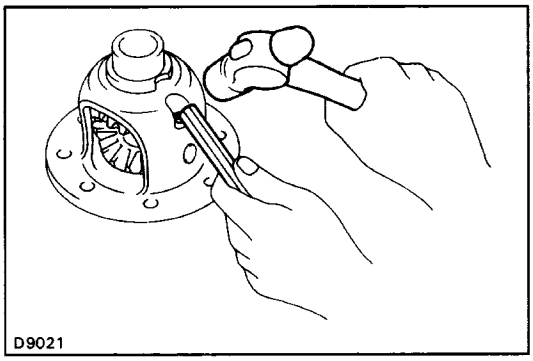


Thickness	mm (in.)
0.96 — 1.04	(0.0378 — 0.0409)
1.06 — 1.14	(0.0417 — 0.0449)
1.16 — 1.24	(0.0457 — 0.0488)
1.26 — 1.34	(0.0496 — 0.0528)

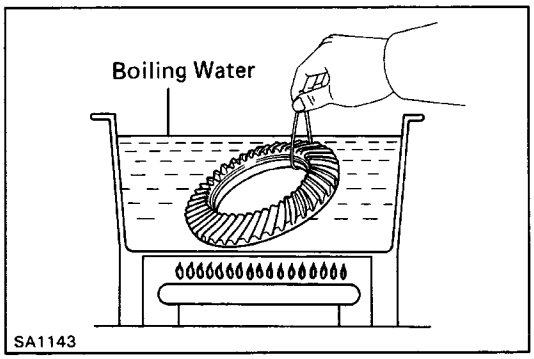
HINT: Use washers of same thickness on both the right and left sides.



(f) Using a hammer and punch, drive in the straight pin through the case and hole in the pinion shaft.

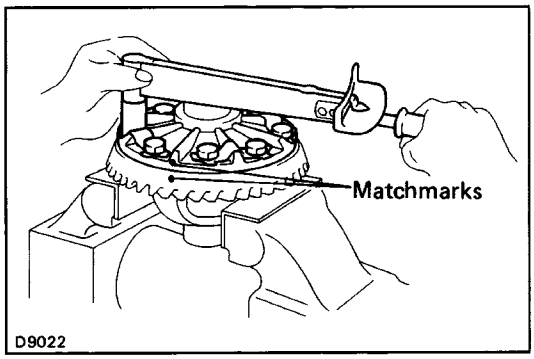


(g) Stake the case.

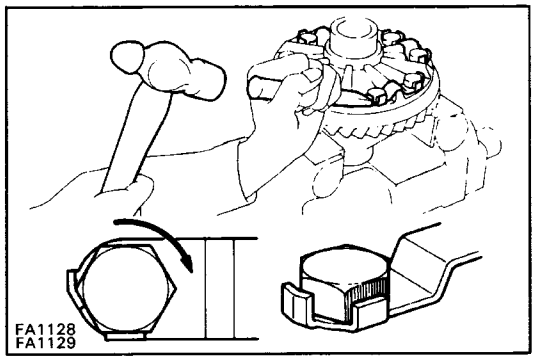


7. INSTALL RING GEAR ON DIFFERENTIAL CASE

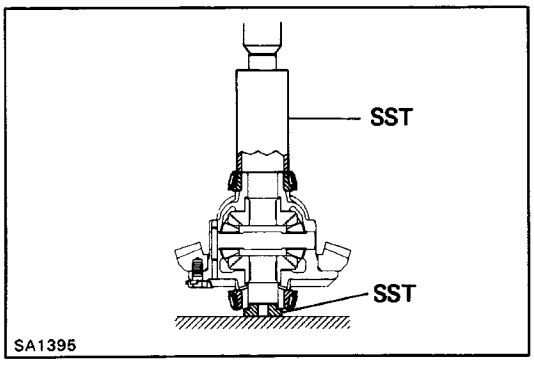
(a) Clean the contact surfaces of the differential case and ring gear.
(b) Heat the ring gear in boiling water.
(c) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differ–ential case.



(d) Align the matchmarks on the ring gear and differen–tial case.
(e) Coat the ring gear set bolts with gear oil.
(f) Temporarily install the lock plates and set bolts.
(g) After the ring gear cools down enough, tighten the set bolts uniformly and a little at a time.
Torque: 97 N–m(985 kgf–cm, 71 ft–lbf)

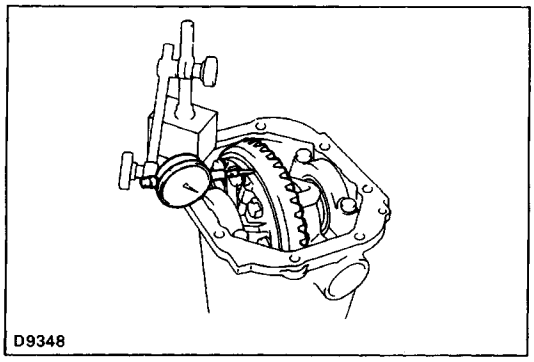


(h) Using a hammer and drift punch, stake the lick plates.
HINT: Stake one claw flush with the flat surface of the nut. For the claw contacting the protruding por–tion of the nut, stake only the half on the tightening side.



8. INSTALL SIDE BEARINGS

Using a press and SST, install the side bearings to the dif ferential case.
SST 09226–10010, 09950–20017



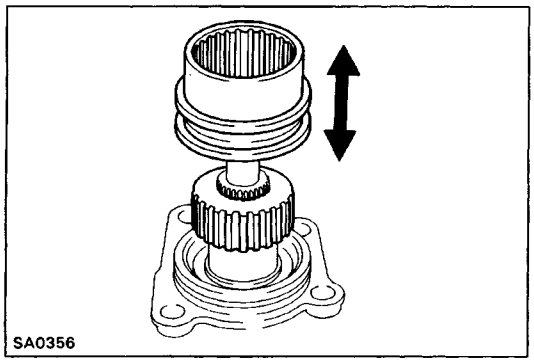
9. CHECK RING GEAR RUNOUT

(a) Install the differential case onto the carrier and install the plate washers to where there is no play in the bearing. (See page SA–97)

(b) Install bearing caps. (See page SA–99)

(c) Using a dial indicator, measure the runout of ring gear.

Maximum runout: 0.07 mm (0.0028 in.)



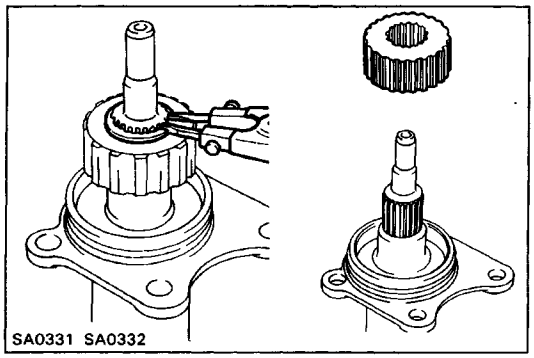
INSPECTION AND REPLACEMENT OF LH SIDE GEAR SHAFT

1. INSPECT CLUTCH HUB AND CLUTCH SLEEVE

(a) Check the wear and damage of the clutch hub and clutch sleeve.

If necessary, replace them.

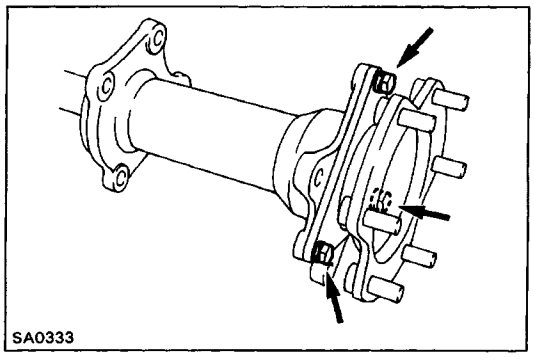
(b) Check that the clutch sleeve slides smoothly on the clutch hub.



2. REMOVE CLUTCH HUB

(a) Using a snap ring expander, remove the snap ring.

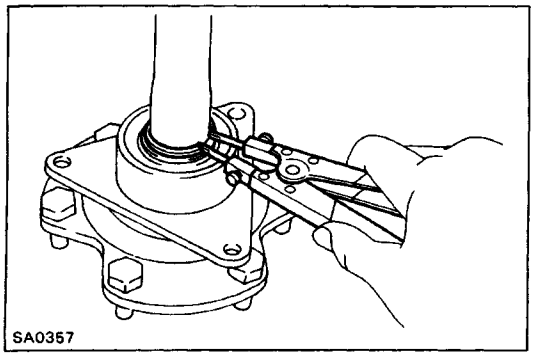
(b) Remove the clutch hub from the side gear shaft.



3. REMOVE SIDE GEAR SHAFT FROM TUBE

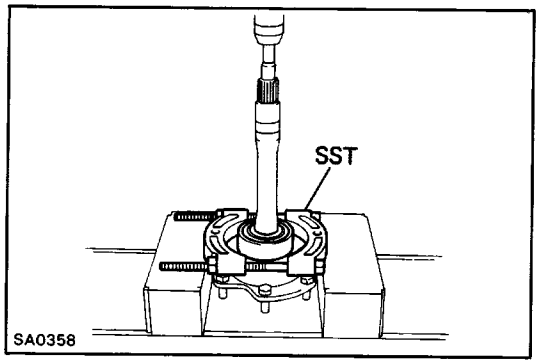
(a) Remove the three bearing retainer bolts.

(b) Remove the side gear shaft from the tube.

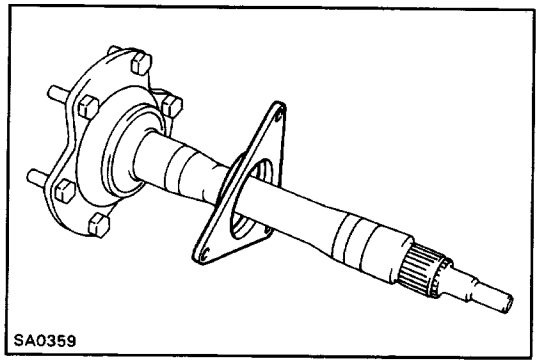


4. REPLACE LH SIDE GEAR SHAFT BEARING

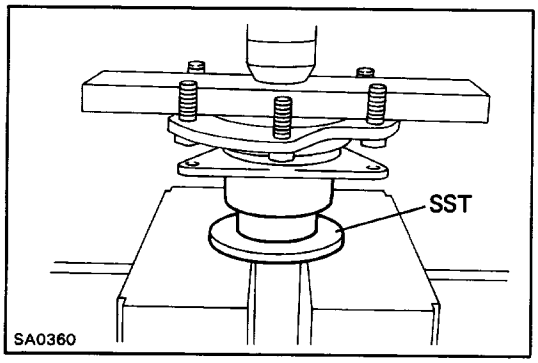
(a) Using a snap ring expander, remove the snap ring.



(b) Using a press and SST, remove the bearing.
SST 09950–00020

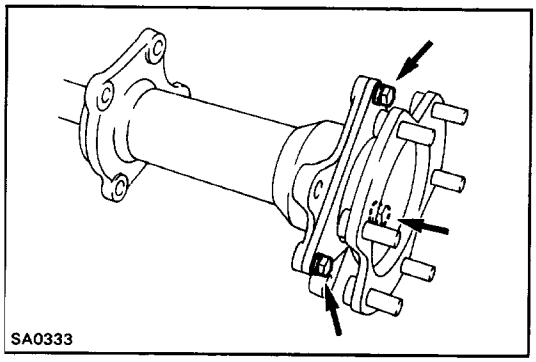


(c) Remove the bearing retainer.
(d) Install the bearing retainer.

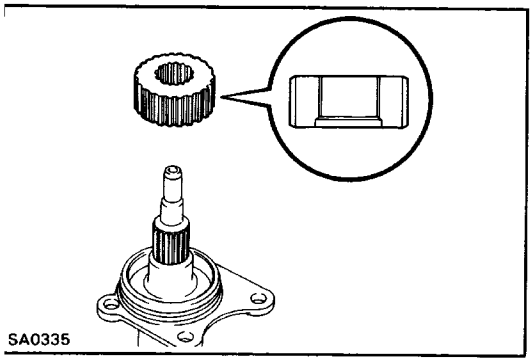


(e) Using a press and SST, install the new bearing.
SST 09316–60010 (09316–00040)
NOTICE: Be careful not to damage the bearing retainer.

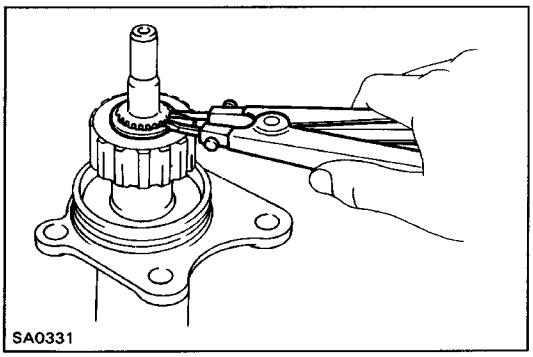
5. REPLACE SIDE OIL SEAL
(See page SA–62)



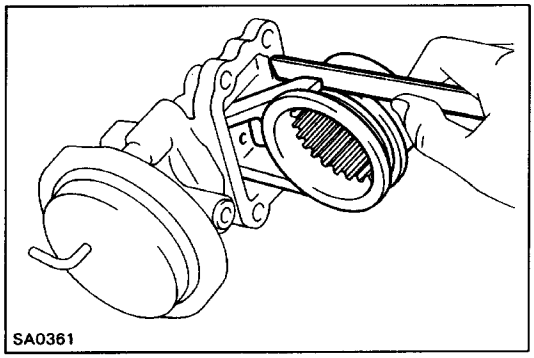
6. INSTALL SIDE GEAR SHAFT
(a) Install the side gear shaft into the tube.
(b) Tighten the three bearing retainer bolts.



7. INSTALL CLUTCH HUB
(a) Install the clutch hub to the shaft.


SA0331

(b) Using a snap ring expander, install the snap ring.


SA0361

INSPECTION AND REPLACEMENT OF ACTUATOR

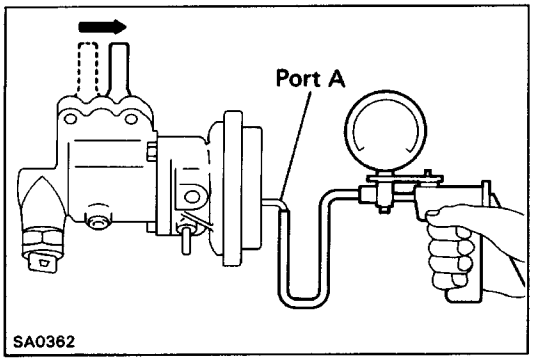
1. MEASURE CLEARANCE OF SLEEVE FORK AND CLUTCH SLEEVE

Using a feeler gauge, measure the clearance between the sleeve fork and clutch sleeve.

Maximum clearance: 0.35 mm (0.0138 in.)

If the clearance exceeds the limit, replace the fork or sleeve.

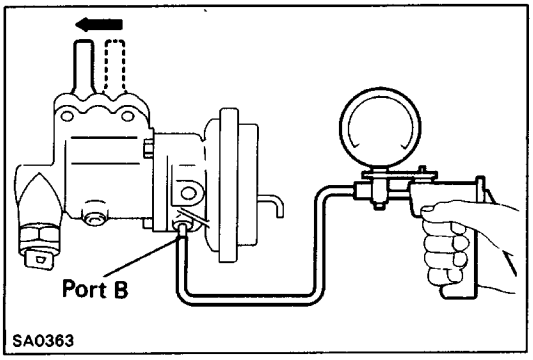
2. INSPECT A.D.D. ACTUATOR



SA0362

(a) Check that the sleeve fork moves to the actuator side when a vacuum of 500 mmHg (19.69 in.Hg, 66.7 kPa) is applied to port A. Also check that the vacuum does not leak.

If not, replace the actuator.

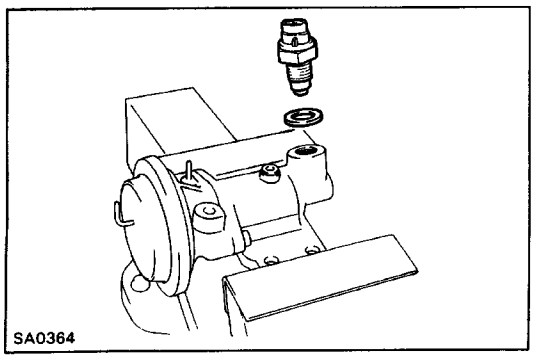


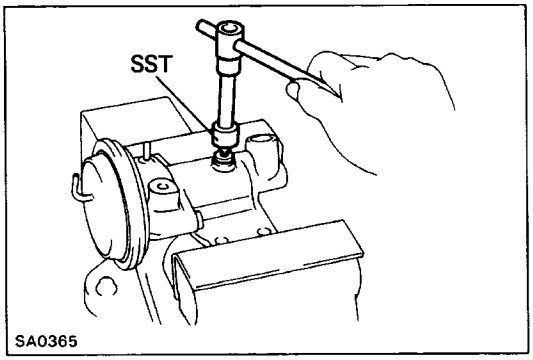
SA0363

(b) Check that the sleeve fork moves away from the actuator when a vacuum of 500 mmHg (19.69 in.Hg, 66.7 kPa) is applied to port B. Also check that the vacuum does not leak.

If not, replace the actuator.

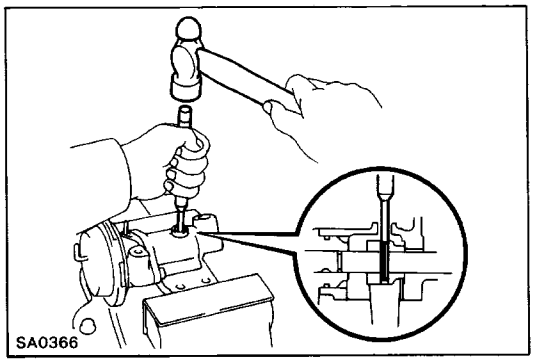
3. REMOVE A.D.D. INDICATOR SWITCH


SA0364

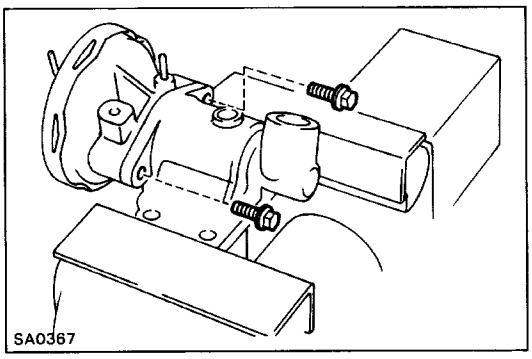


4. REMOVE SLEEVE FORK PIN

(a) Using SST, remove the screw plug.
SST 09313–30021

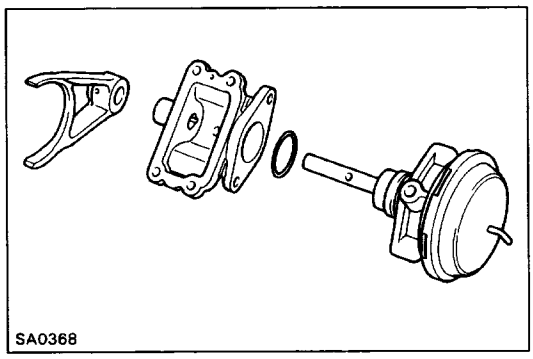


(b) Using a hammer and punch, drive out the pin through the hole of clutch case cover.

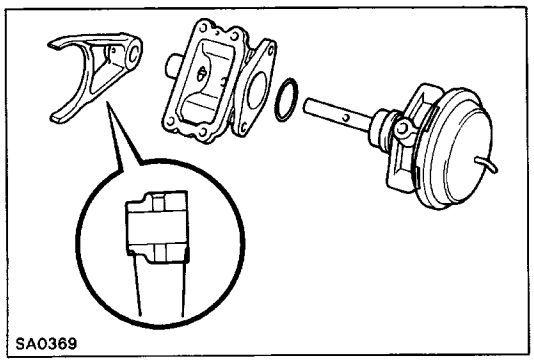


5. SEPARATE ACTUATOR FROM CLUTCH CASE COVER AND REMOVE SLEEVE FORK

(a) Remove the two bolts.

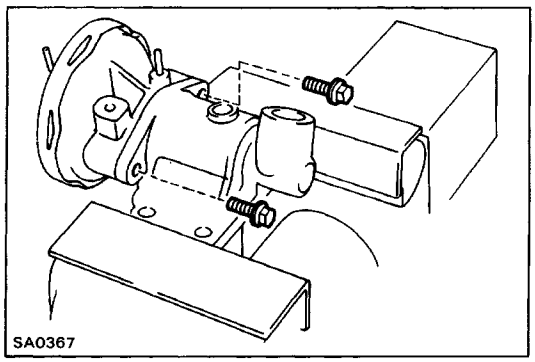


(b) Separate the actuator from clutch case cover anc remove the sleeve fork.
(c) Remove the O–ring from actuator.

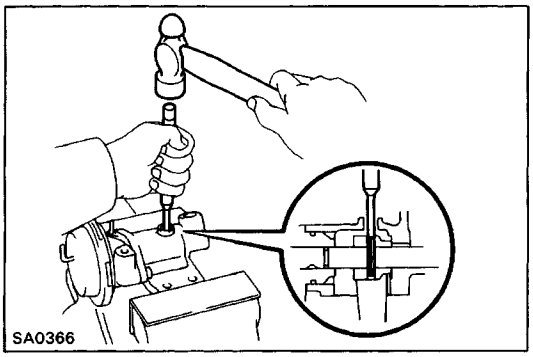


6. INSTALL SLEEVE FORK AND ACTUATOR INTO CLUTCH CASE COVER

(a) Install a new 0–ring to the actuator.
(b) Coat the 0–ring with MP grease.
(c) Place the sleeve fork and install the actuator to the clutch case cover.

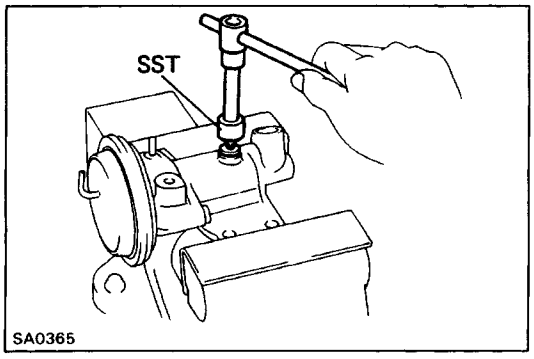


(d) Tighten the two bolts.
Torque: 21 N–m (210 kgf–cm, 15 ft–lbf)



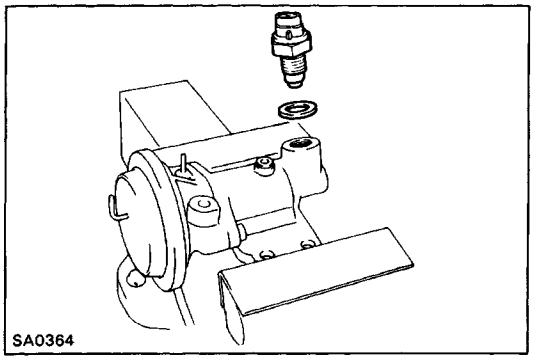
7. INSTALL SLEEVE FORK PIN

(a) Using a hammer and punch, drive in the pin through the hole of clutch case cover.



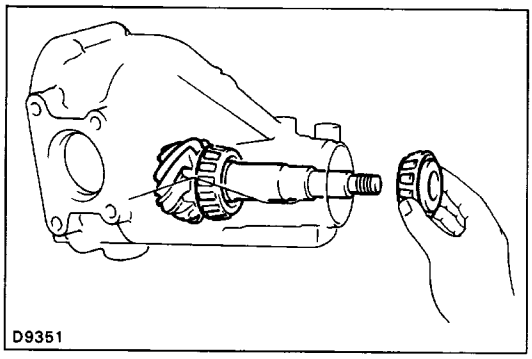
(b) Coat the threads of screw plug with sealer.
Sealer: Part No. 08826–00090, THREE BOND 1281 or equivalent

(c) Using SST, install the screw plug.
Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)
SST 09313–30021



8. INSTALL A.D.
D. INDICATOR SWITCH

Install a new gasket and indicator switch.
Torque: 40 N–m (410 kgf–cm, 30 ft–lbf)



ASSEMBLY OF DIFFERENTIAL

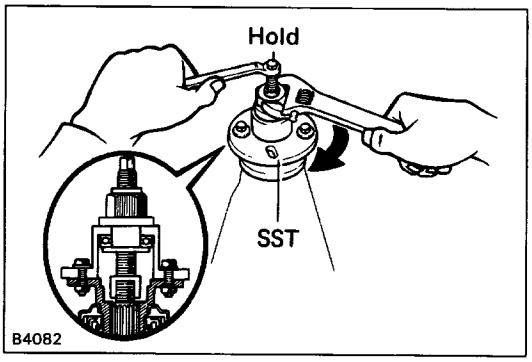
(See page SA–83)

1. TEMPORARILY ADJUST DRIVE PINION PRELOAD

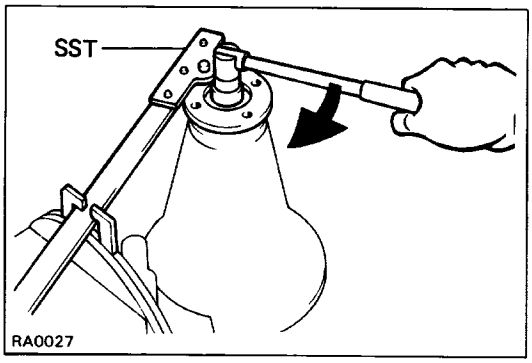
(a) Install the following parts.

- Drive pinion
- Front bearing

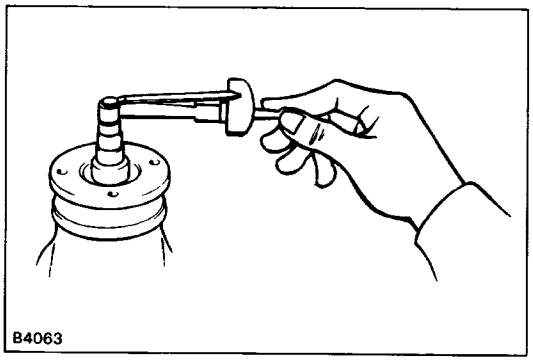
HINT: Assemble the spacer and oil seal after adjusting the gear contact pattern.



(b) Install the companion flange with SST.
Coat the threads of the nut with MP grease.
SST 09557–22022 (09557–22030)



(c) Adjust the drive pinion preload by tightening the companion flange nut.
Using SST to hold the flange, tighten the nut.
SST 09330–00021



(d) Using a torque meter, measure the preload.

Preload (starting):

New bearing

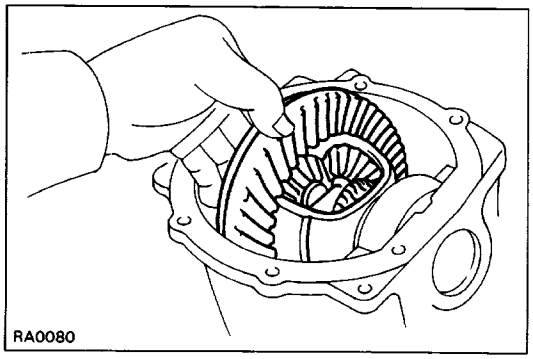
1.2 – 1.9 N–m

(12 – 19 kgf–cm, 10.4 – 16.5 in.–lbf)

Reused bearing

0.6 – 1.0 N–m

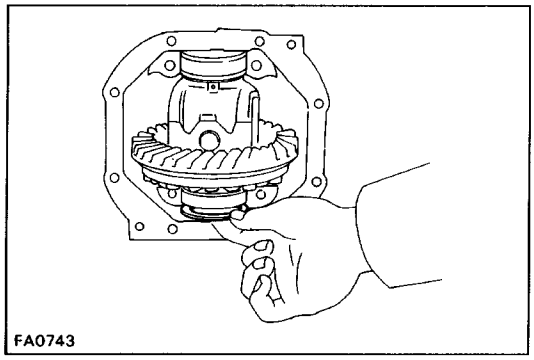
(6 – 10 kgf–cm, 5.2 – 8.7 in.–lbf)



2. INSTALL DIFFERENTIAL CASE IN CARRIER

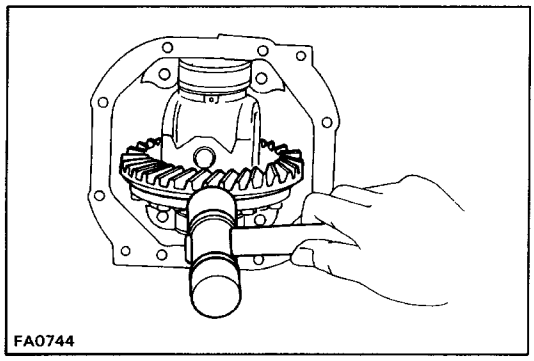
(a) Place the bearing outer races on their respective bearings. Make sure the left and right outer races are not interchanged.

(b) Install the differential case in the carrier.

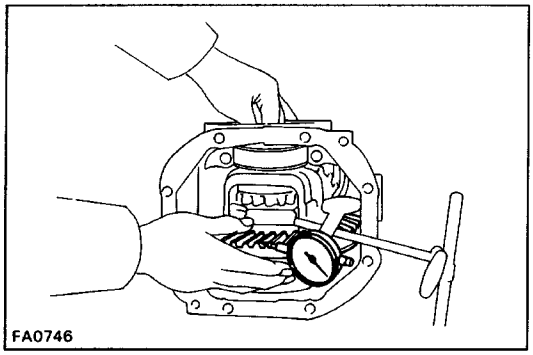


3. ADJUST RING GEAR BACKLASH

(a) Install only the plate washer on the ring gear back side.
HINT: Insure that the ring gear has backlash.

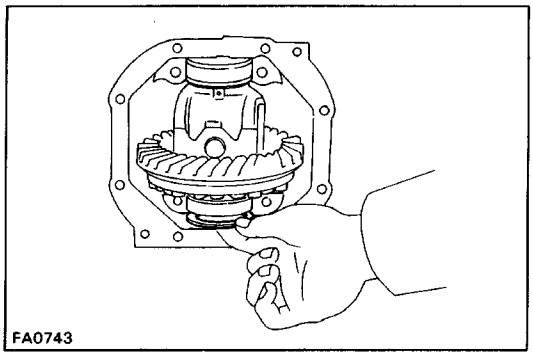


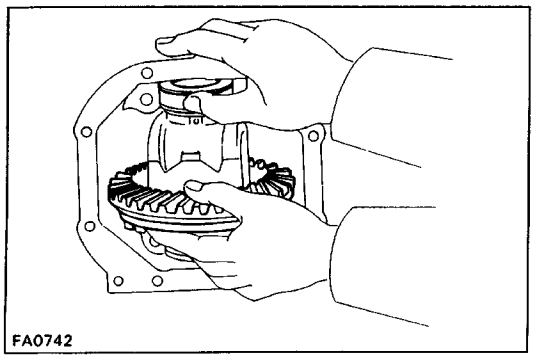
(b) Snug down the washer and bearing by tapping on the ring gear with a plastic–faced hammer.



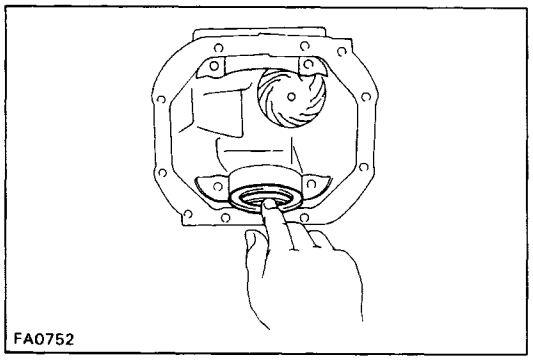
(c) Hold the side bearing boss on the teeth surface of the ring gear and measure the backlash.
Backlash (reference): 0.13 mm (0.0051 in.)

(d) Select a ring gear back plate washer, using the backlash as reference. (See page SA–99)

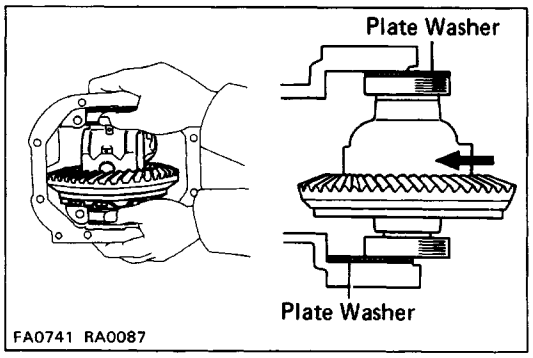




(e) Select a ring gear teeth side washer with a thickness which eliminates any clearance between the outer race and case.

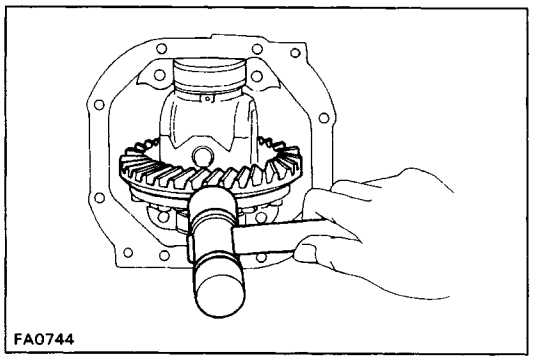

FA0752

(f) Remove the plate washers and differential case.
(g) Install the plate washer into the lower part of the carrier.

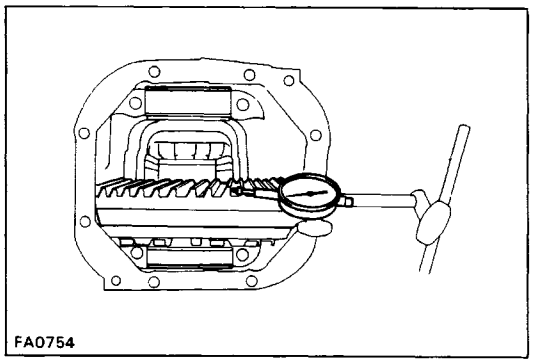


FA0741 RA0087

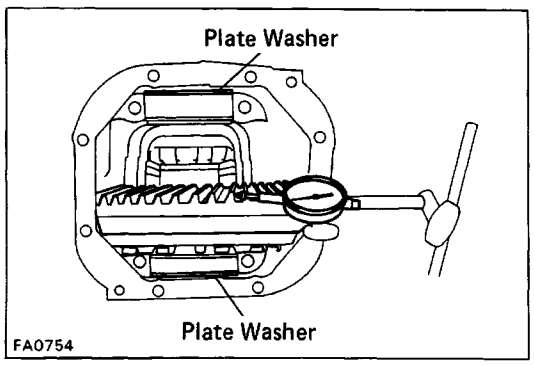
(h) Place the other plate washer onto the differential case together with the outer race, and install the differential case with the outer race into the carrier.


FA0744

(i) Using a plastic–faced hammer, snug down the washer and bearing by tapping the ring gear.

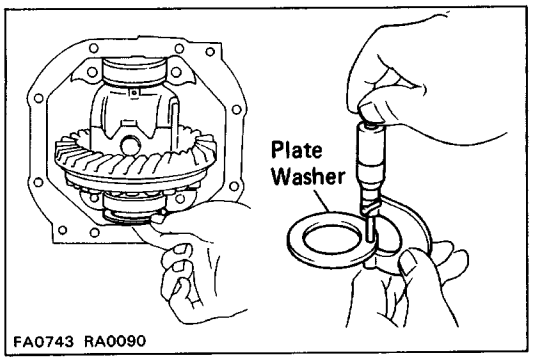

FA0754

(j) Using a dial indicator, measure the ring gear backlash.
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)



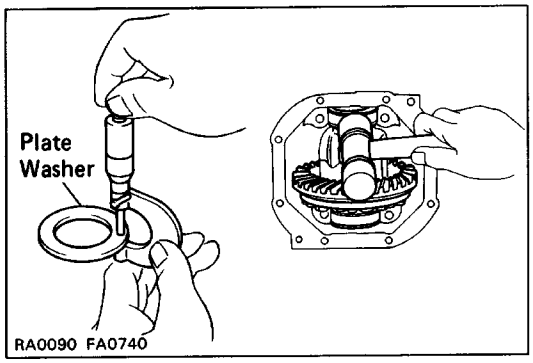
FA0754

(k) If not within specification, adjust by either increasing or decreasing the number of washers on both sides by an equal amount.
HINT: There should be no clearance between the plate washer and case.
Insure that there is ring gear backlash.



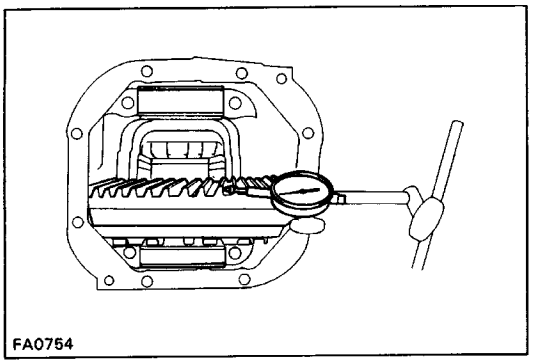
4. ADJUST SIDE BEARING PRELOAD

(a) Remove the ring gear teeth plate washer and measure the thickness.



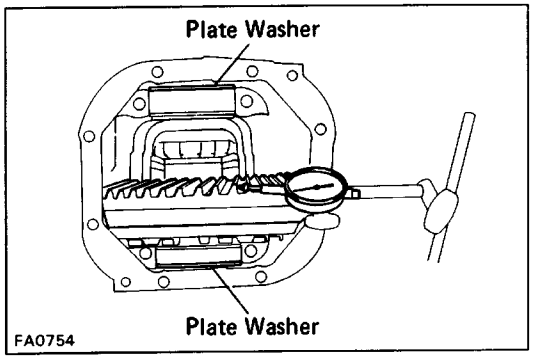
(b) Using the backlash as a reference, install a new washer of 0.06 – 0.09 mm (0.0024 – 0.0035 in.) thicker than the washer removed.
HINT: Select a washer which can be pressed in 2/3 of the way with your finger.

(c) Using a plastic–faced hammer, tap in the side washer.



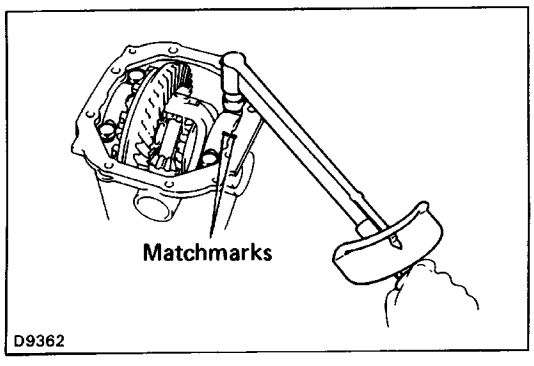
(d) Recheck the ring gear backlash.
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

(e) If not within standard, adjust by either increasing or decreasing the washers on both sides by an equal amount.
HINT: The backlash will change about 0.02 mm (0.0008 in.) with 0.03 mm (o.0012 in.) alteration of the side washer.



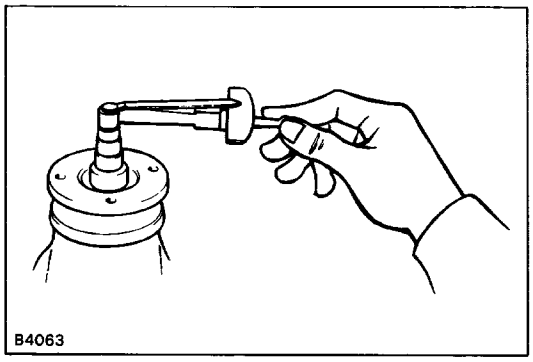
Washer thickness

Thickness mm (in.)	
2.57 – 2.59 (0.1012 – 0.1020)	2.93 – 2.95 (0.1154 – 0.1161)
2.60 – 2.62 (0.1024 – 0.1031)	2.96 – 2.98 (0.1165 – 0.1173)
2.63 – 2.65 (0.1035 – 0.1043)	2.99 – 3.01 (0.1177 – 0.1185)
2.66 – 2.68 (0.1047 – 0.1055)	3.02 – 3.04 (0.1189 – 0.1197)
2.69 – 2.71 (0.1059 – 0.1067)	3.05 – 3.07 (0.1201 – 0.1209)
2.72 – 2.74 (0.1071 – 0.1079)	3.08 – 3.10 (0.1213 – 0.1220)
2.75 – 2.77 (0.1083 – 0.1091)	3.11 – 3.13 (0.1224 – 0.1232)
2.78 – 2.80 (0.1094 – 0.1102)	3.14 – 3.16 (0.1236 – 0.1244)
2.81 – 2.83 (0.1106 – 0.1114)	3.17 – 3.19 (0.1248 – 0.1256)
2.84 – 2.86 (0.1118 – 0.1126)	3.20 – 3.22 (0.1260 – 0.1268)
2.87 – 2.89 (0.1130 – 0.1138)	3.23 – 3.25 (0.1272 – 0.1280)
2.90 – 2.92 (0.1142 – 0.1150)	



5. INSTALL SIDE BEARING CAPS

Align the matchmarks on the cap and carrier.
Torque: 78 N–m (800 kgf–cm, 58 ft–lbf)


B4063

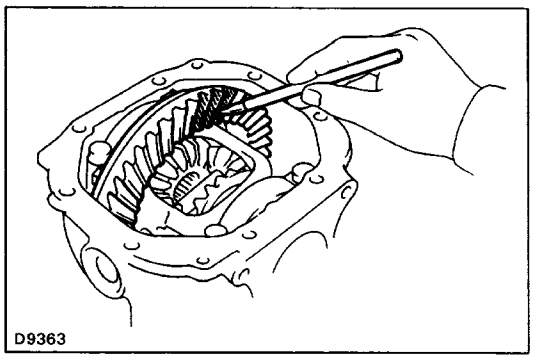
6. MEASURE TOTAL PRELOAD

Using a torque wrench, measure the total preload.

Total preload (starting):

Add drive pinion preload

0.4 – 0.6 N–m (4 – 6 kgf–cm, 3.5 – 5.2 in.–lbf)


D9363

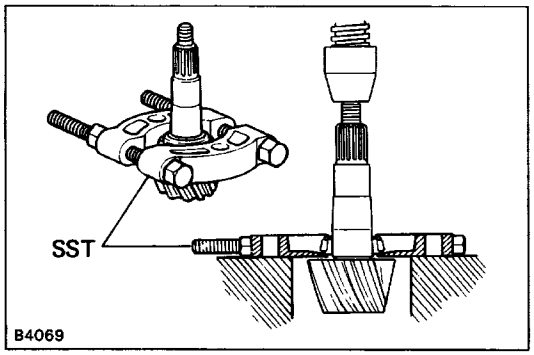
7. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

(a) Coat 3 or 4 teeth at three different positions on the ring gear with red lead.

(b) Hold the companion flange firmly and rotate the ring gear in both directions.

(c) Inspect the tooth pattern.

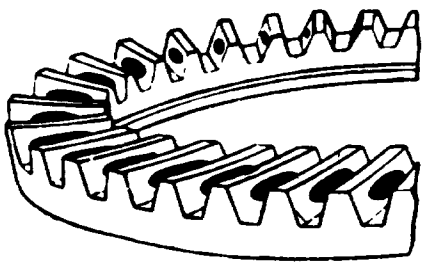
If the teeth are not contacting properly, use the following chart to select a proper washer for correction.



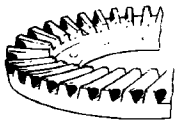
B4069

Washer thickness

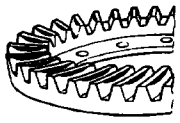
Thickness mm (in.)	
2.24 (0.0882)	2.51 (0.0988)
2.27 (0.0894)	2.54 (0.1000)
2.30 (0.0906)	2.57 (0.1012)
2.33 (0.0917)	2.60 (0.1024)
2.36 (0.0929)	2.63 (0.1035)
2.39 (0.0941)	2.66 (0.1047)
2.42 (0.0953)	2.69 (0.1059)
2.45 (0.0965)	2.72 (0.1071)
2.48 (0.0976)	

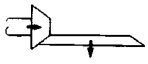

Proper Contact

Heel Contact



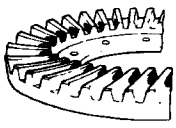
Face Contact



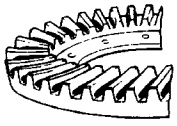


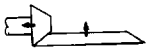
Select an adjusting shim taht will bring the drive pinion closer to the ring gear.

Toe Contact



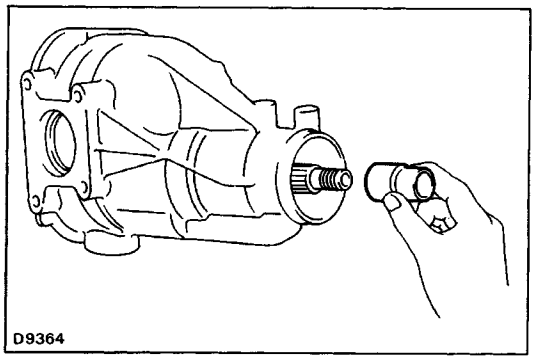
Flank Contact





Select an adjusting shim that will shift the drive pinion away from the ring gear.

MT0372
B4093 MT0373



8. REMOVE COMPANION FLANGE

(See step 14 on page SA–86)

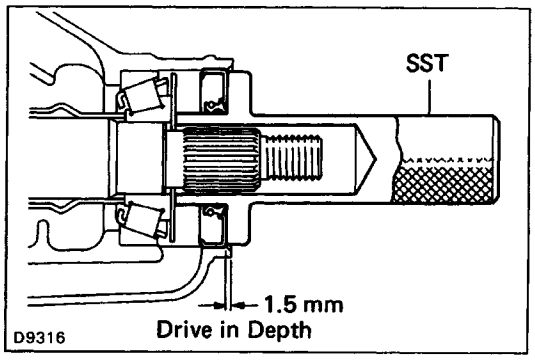
9. REMOVE FRONT BEARING

(See step 16 on page SA–86)

10. INSTALL NEW BEARING SPACER AND FRONT BEARING

(a) Install a new bearing spacer on the drive pinion.

(b) Install the front bearing on the drive pinion.



11. INSTALL OIL SLINGER AND NEW OIL SEAL

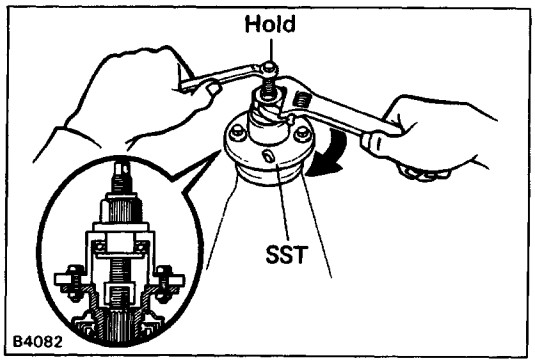
(a) Install the oil slinger.

(b) Using SST, drive in a new oil seal.

SST 09554–30011

Oil seal drive in depth: 1.5 mm (0.059 in.)

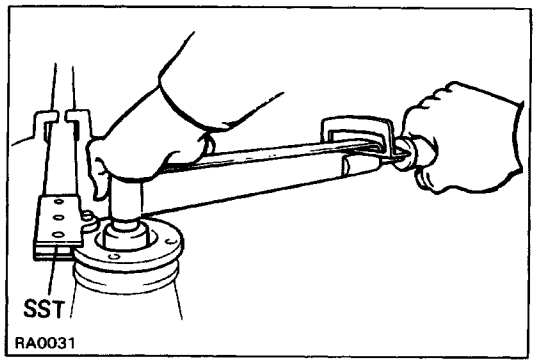
(c) Apply MP grease to the oil seal lip.



12. INSTALL COMPANION FLANGE

(a) Using SST, install the companion flange on the shaft.

SST 09557–22022 (09557–22030)



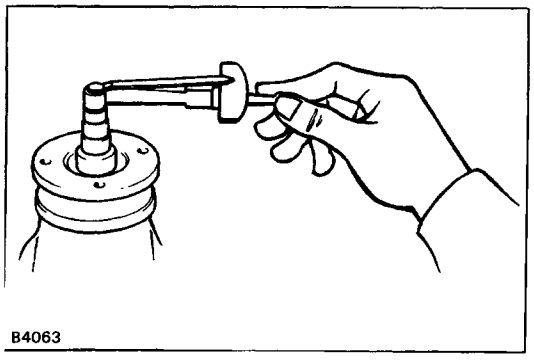
(b) Coat the threads of a new nut with MP grease.

(c) Using SST to hold the flange, tighten the nut.

Torque the nut.

SST 09330–00021

Torque: 120 N–m (1,225 kgf–cm, 89 ft–lbf)



13. CHECK FRONT BEARING PRELOAD

Using a torque meter, measure the preload of the back–lash between the drive pinion and ring gear.

Preload (starting):

New bearing

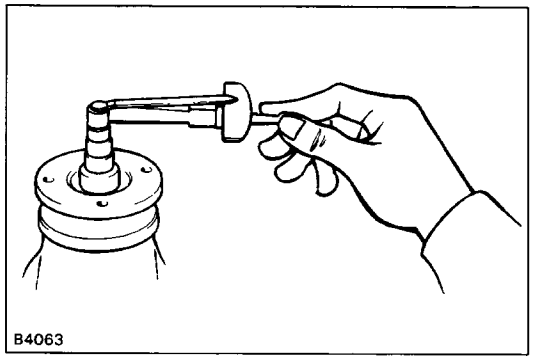
1.2 – 1.9 N–m

(12 – 19 kgf–cm, 10.4 – 16.5 ft–lbf)

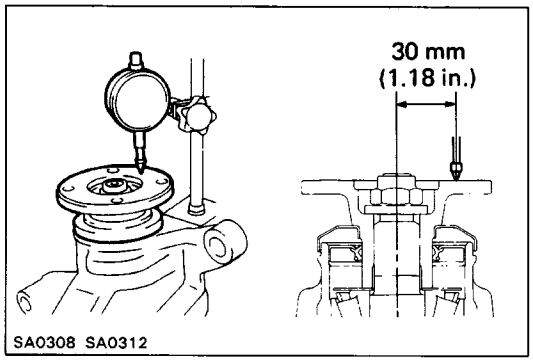
Reused bearing

0.6 – 1.0 N–m

(6 – 10 kgf–cm, 5.2 – 8.7 ft–lbf)

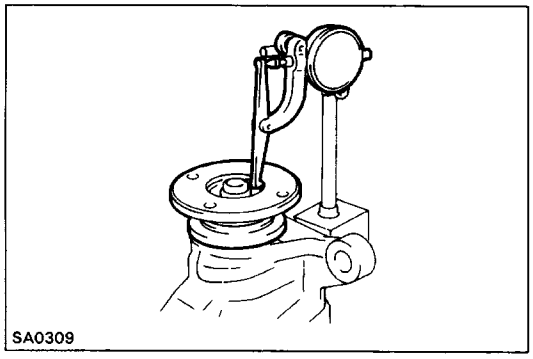

B4063

(a) If the preload is greater than specification, replace the bearing spacer.
(b) If the preload is less than specification, retighten the nut 13 N–m (130 kgf–cm,9 ft–lbf) a little at a time until the specified preload is reached.
Maximum torque: 223 N–m (2,275 kgf–cm, 165 ft–lbf)
If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.

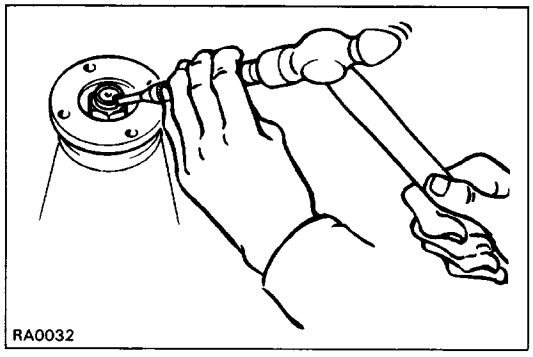


SA0308 SA0312

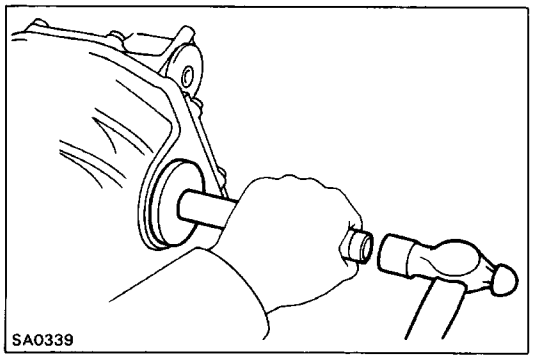
14. CHECK RUNOUT OF COMPANION FLANGE
Using a dial indicator, measure the vertical and lateral runout of the companion flange.
Maximum vertical runout: 0.10 mm (0.0039 in.)


SA0309

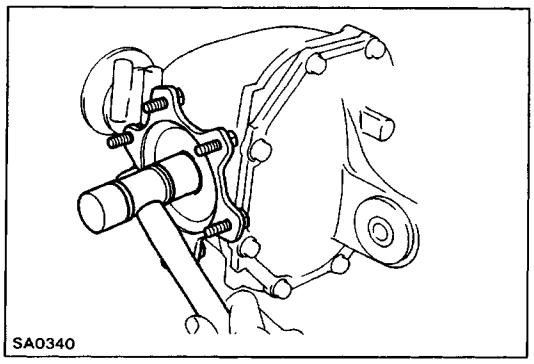
Maximum lateral runout: 0.10 mm (0.0039 in.)
If the runout is greater than maximum, inspect the bearings.


RA0032

15. STAKE DRIVE PINION NUT


SA0339

16. INSTALL NEW RH SIDE GEAR SHAFT OIL SEAL
(a) Coat the oil seal lip with MP grease.
(b) Using SST, drive in the oil seal until it is flush with the carrier end surface.
SST 09550–22011 (09550–00020, 09550–00031)



17. INSTALL RH SIDE GEAR SHAFT

(a) Install a new snap ring to the side gear shaft.

(b) Using a plastic–faced hammer, tap on the side gear shaft to install it.

18. CHECK INSTALLATION OF SIDE GEAR SHAFT

(a) Check that there is 2 – 3 mm (0.08 – 0.12 in.) of play in axial direction.

(b) Check that the side gear shaft will not come out by trying to pull it completely out by hand.

19. INSTALL INTERMEDIATE SHAFT

(a) Install a new snap ring to the shaft.

(b) Using a plastic–faced hammer, tap on the shaft to in–stall it.

20. CHECK INSTALLATION OF INTERMEDIATE SHAFT

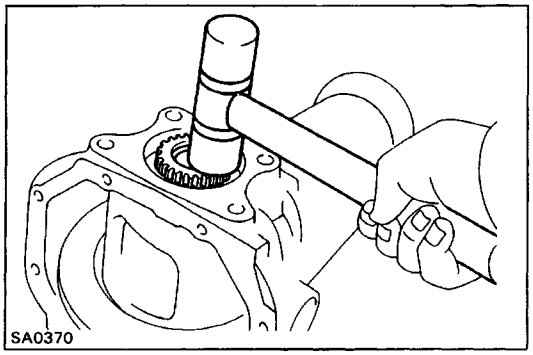
(a) Check that there is 2 – 3 mm (0.08 – 0.12 in.) of play in axial direction.

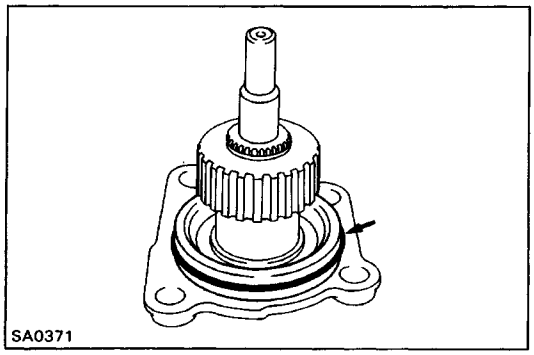
(b) Check that the shaft will not come out by trying to pull it completely out by hand.

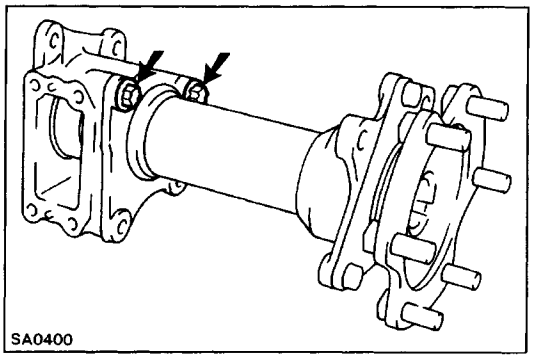
21. INSTALL CLUTCH CASE TO SIDE GEAR SHAFT TUBE

(a) Install a new O–ring to the tube.

(b) Coat the 0–ring with MP grease.





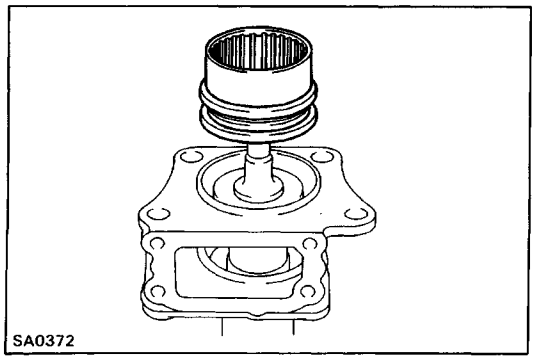


(c) Install the clutch case to the tube.

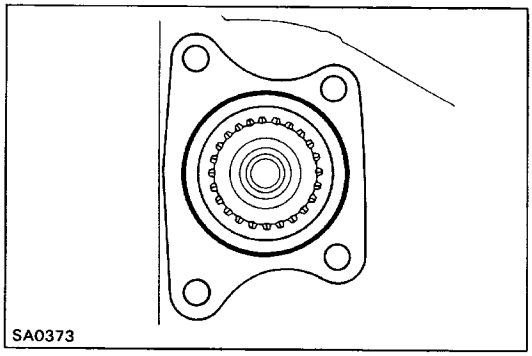
(d) Tighten the two torx bolts.

Torque: 78 N¿ m l800 kgf–cm, 58 ft¿ lbf j

Torx wrench: E14 (Part No. 09044–00010 or locally manufactured tool)



22. INSTALL CLUTCH SLEEVE


SA0373

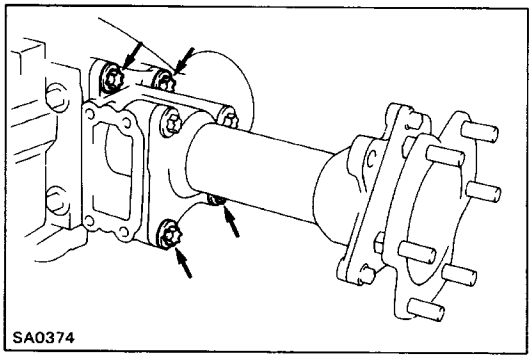
23. INSTAL LH SIDE GEAR SHAFT TO DIFFERENTIAL CARRIER

(a) Remove any packing material and be careful not to get oil on the contacting surfaces of the differential carrier and clutch case.

(b) Apply seal packing to the differential carrier as shown.

Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

HINT: Install the side gear shaft within ten minutes after applying seal packing.

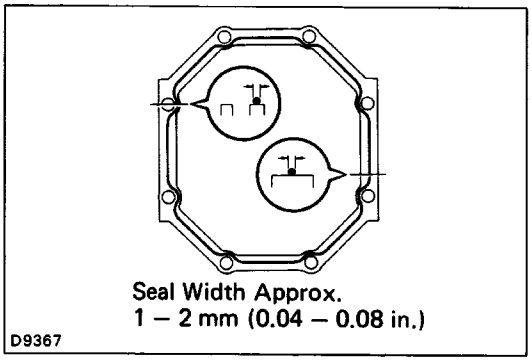

SA0374

(c) Install LH side gear shaft to the differential carrier.

W Tighten the four torx bolts.

Torque: 78 N–m (800 kgf–cm, 58 ft–lbf)

Torx wrench: E14 (Part No. 09044–00010 or locally manufactured tool)



D9367

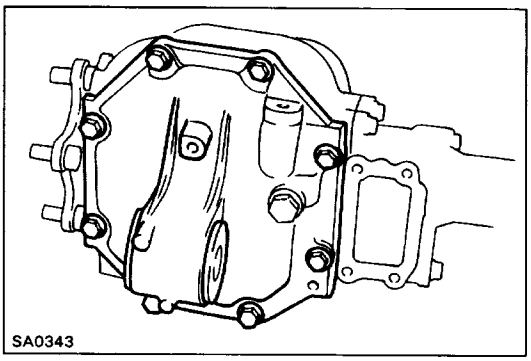
24. INSTALL DIFFERENTIAL CARRIER COVER

(a) Remove any packing material and be careful not to drop oil on the contacting surface of the differential carrier or carrier cover.

(b) Apply seal packing to the carrier cover.

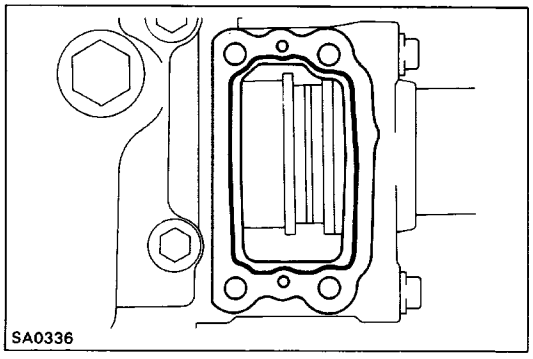
Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

HINT: Install the carrier cover within ten minutes after applying seal packing.


SA0343

(c) Install and torque the bolts.

Torque: 47 N–m (475 kgf–cm, 34 ft–lbf)


SA0336

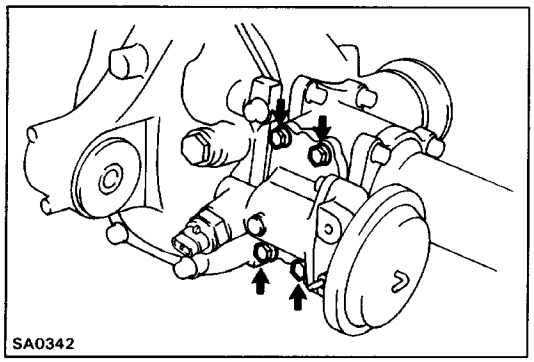
25. INSTALL ACTUATOR

(a) Remove any packing material and be careful not to get oil on the contacting surfaces of the actuator and clutch case.

(b) Apply seal packing to the clutch case as shown.

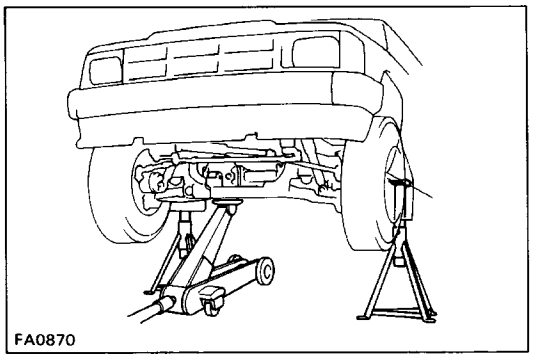
Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

HINT: Install the actuator within ten minutes after applying seal packing.



(c) Tighten the four bolts.

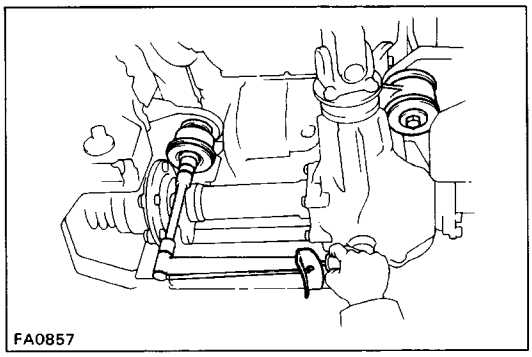
Torque: 21 N–m (210 kgf–cm, 15 ft–lbf)


FA0870

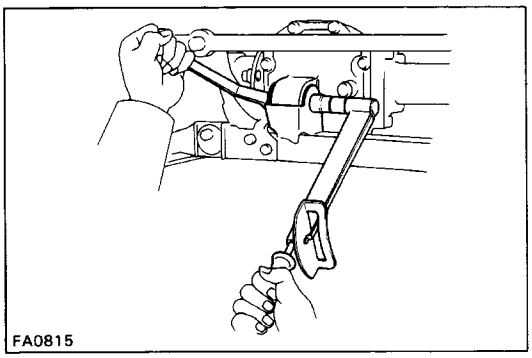
Installation of Front Differential

1. INSTALL FRONT DIFFERENTIAL

(a) Install the front differential to the frame, and support it with a jack.


FA0857

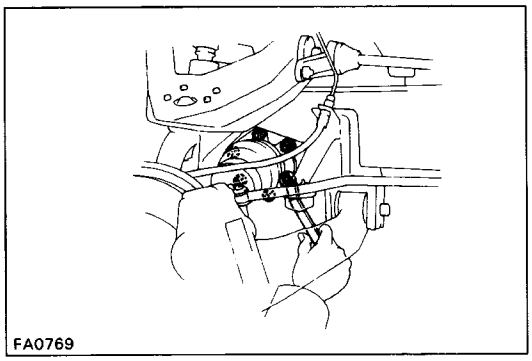
(b) Install and torque the left and right rear mounting bolts.
Torque: 167 N–m (1,700 kgf–cm, 123 ft–lbf)


FA0815

3. (wl A.D.D.)
CONNECT VACUUM HOSES AND 4WD INDICATOR SWITCH CONNECTOR

4. CONNECT DRIVE SHAFTS TO SIDE GEAR SHAFT

Connect the drive shafts to the side gear shaft, and install and torque the nuts while depressing the brake pedal.
Torque: 83 N–m (845 kgf –cm, 61 ft–lbf)


FA0769

5. CONNECT PROPELLER SHAFT TO COMPANION FLANGE

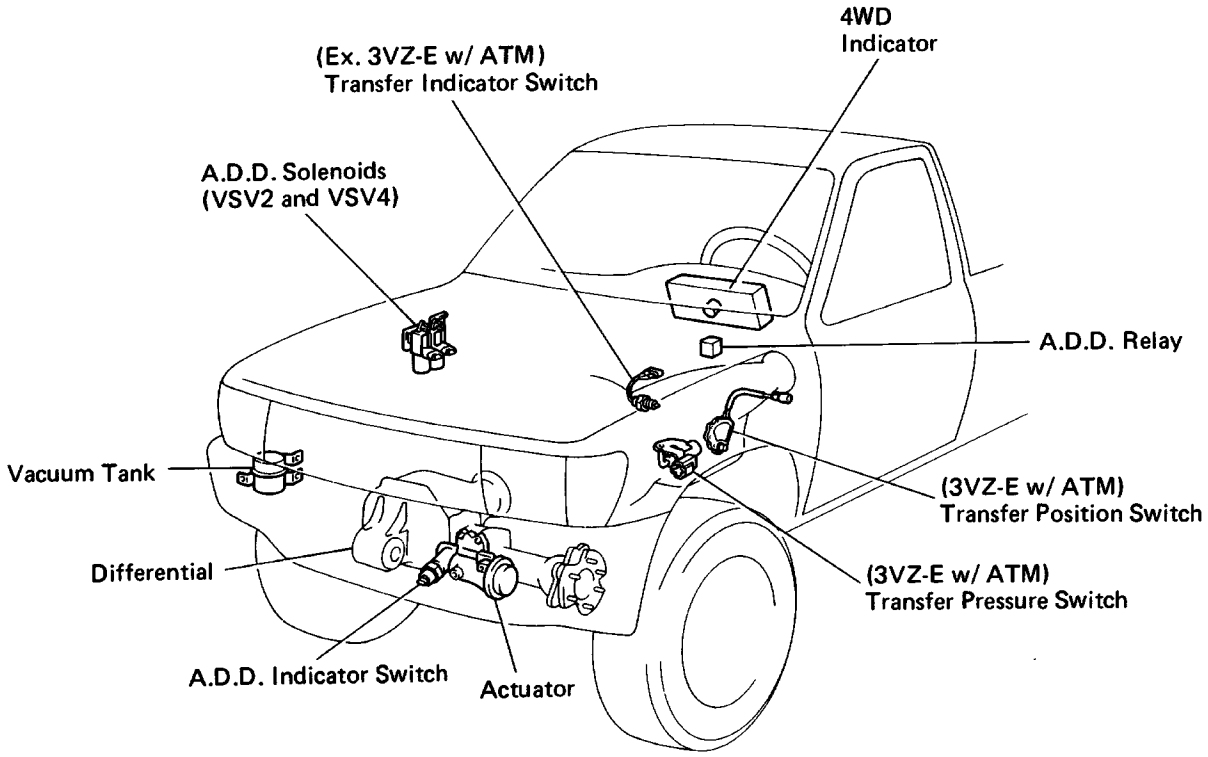
(a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.
(b) Torque the nuts.
Torque: 74 N–m (750 kgf–cm, 54 ft–lbf)

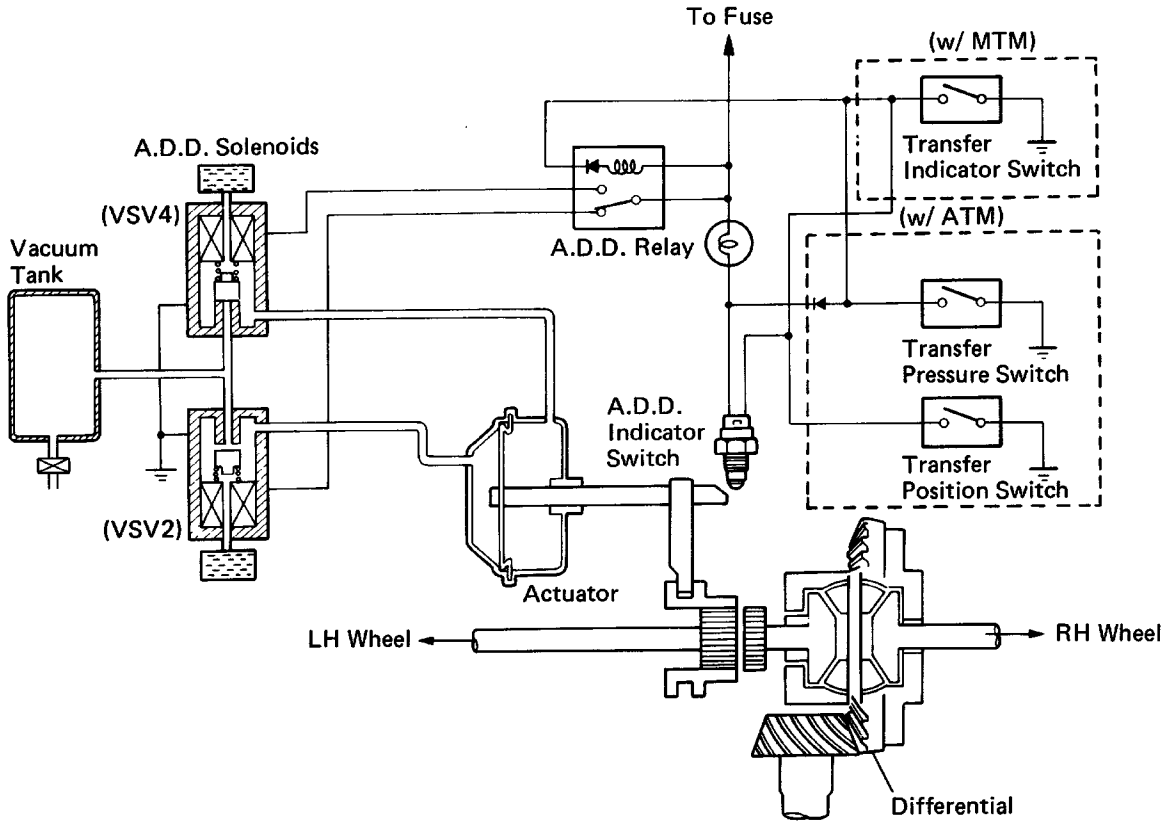
6. INSTALL DRAIN PLUG AND FILL DIFFERENTIAL WITH GEAR OIL

(wl A.D.D.)
Oil type: Toyota "GEAR OIL SUPER" oil (Part No. 08885 – 02106) or hypoid gear oil API GL–5
Recommended oil viscosity: SAE 75W–90
Capacity: 1.86 liters (1.97 US qts, 1.64 Imp. qts)
(w/o A.D.D.)
Oil type: Hypoid gear oil API GL–5
Recommended oil viscosity:
Above – 18°C (0°F) SAE 90
Below – 18°C (0°F) SAE 80W or 80W–90
Capacity: 1.6 liters (1.7 US qts, 1.4 Imp. qts)

A.D.D. Control System

COMPONENTS

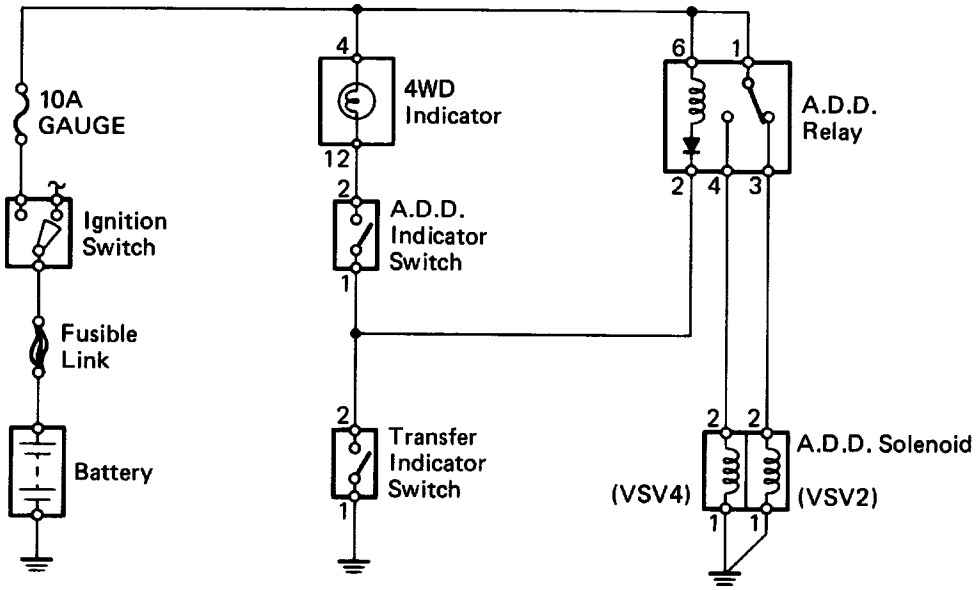




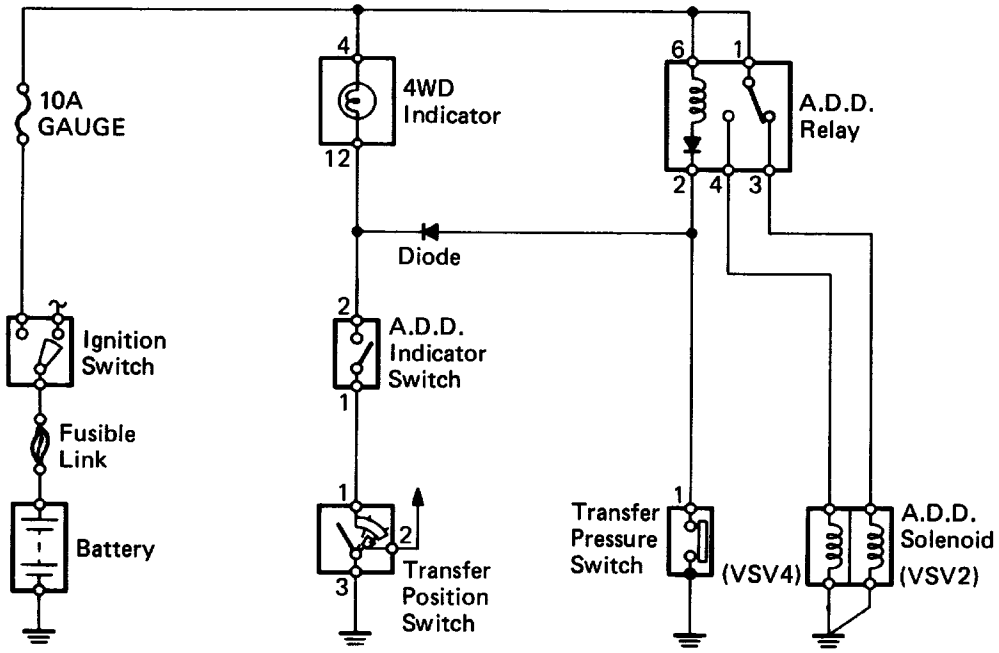
SA0376
SA0585

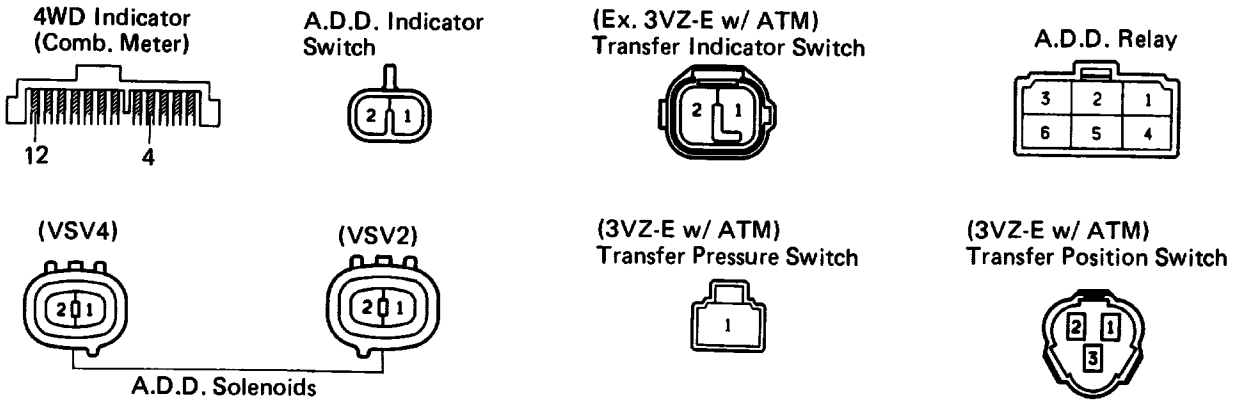
ELECTRICAL CIRCUIT

[Ex. 3VZ-E w/ ATM]

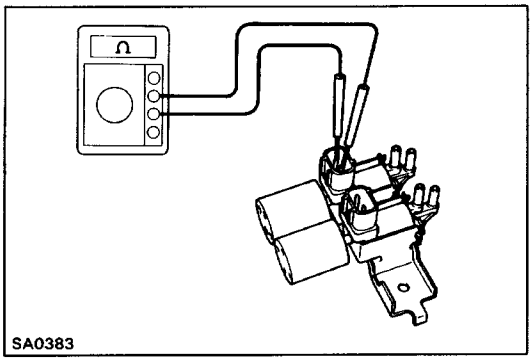


[3VZ-E w/ ATM]





SA3152
SA3153
BE1266 IS-2-2-E IS-2-2-G H-6-2
IS-2-2-P SA0379 Q-1-2 IS-3-2-A



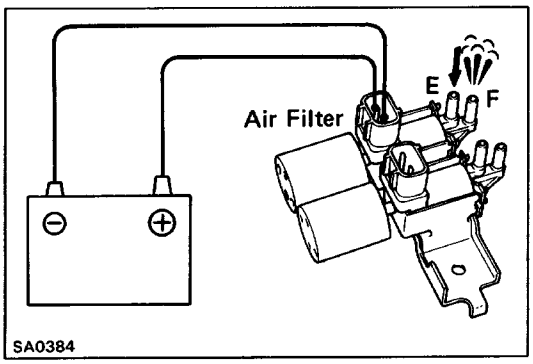
INSPECTION OF COMPONENTS

1. INSPECT A.D.

D. SOLENOIDS

(a) Measure the resistance of the solenoids.

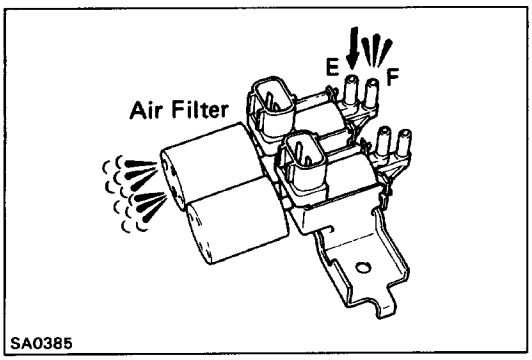
Resistance: 37 – 44Ω



(b) Apply the battery voltage to the solenoid.

Check that air flows from port E to port F.

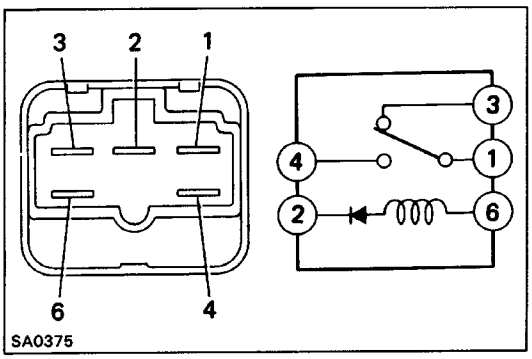
Check that air does not flow from port E to the air filter.



(c) Disconnect the battery voltage from the solenoid.

Check that air flows from port E to the air filter.

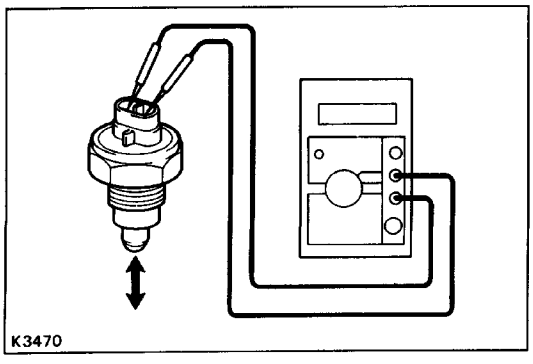
Check that air does not flows from port E to port F.



2. INSPECT A.D.D. RELAY

(Continuity)

Terminal / Condition	1	2	3	4	6
Constant	○	○	○		○
Apply battery voltage to terminals 6 and 2.	○			○	

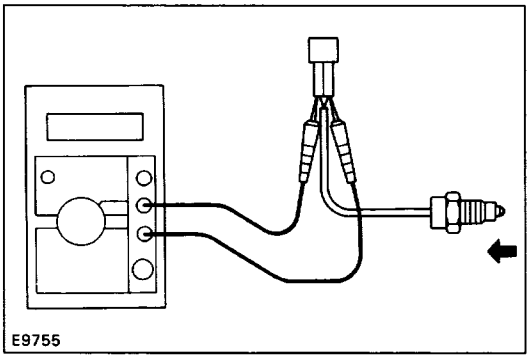


3. INSPECT A.D.

D. INDICATOR SWITCH

(a) Check that there is continuity between terminals when the switch is pushed (differential connected position).

(b) Check that there is no continuity when the switch is free (differential disconnected position).

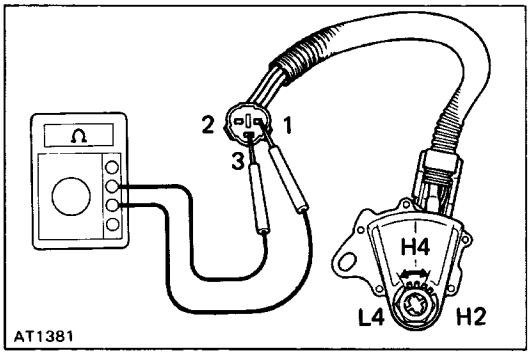


4. (Ex. 3VZ–E w/ATM)

INSPECT TRANSFER INDICATOR SWITCH

(a) Check that there is continuity between terminals when the switch is pushed (transfer 4WD position).

(b) Check that there is no continuity between terminals when the switch is free position (transfer H 2 posi–tion).

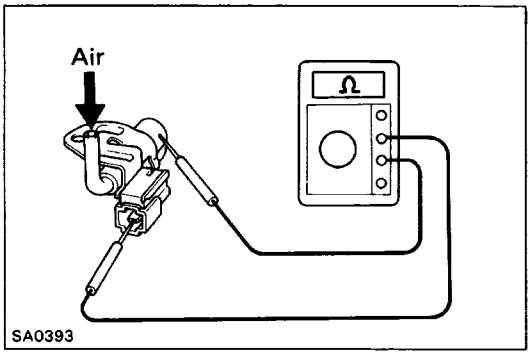


5. (3VZ–E w/ATM)

INSPECT TRANSFER POSITION SWITCH

Check that there is continuity between each terminal.

Terminal / Transfer position	1	2	3
H4	○		○
L4	○	○	○
H2			



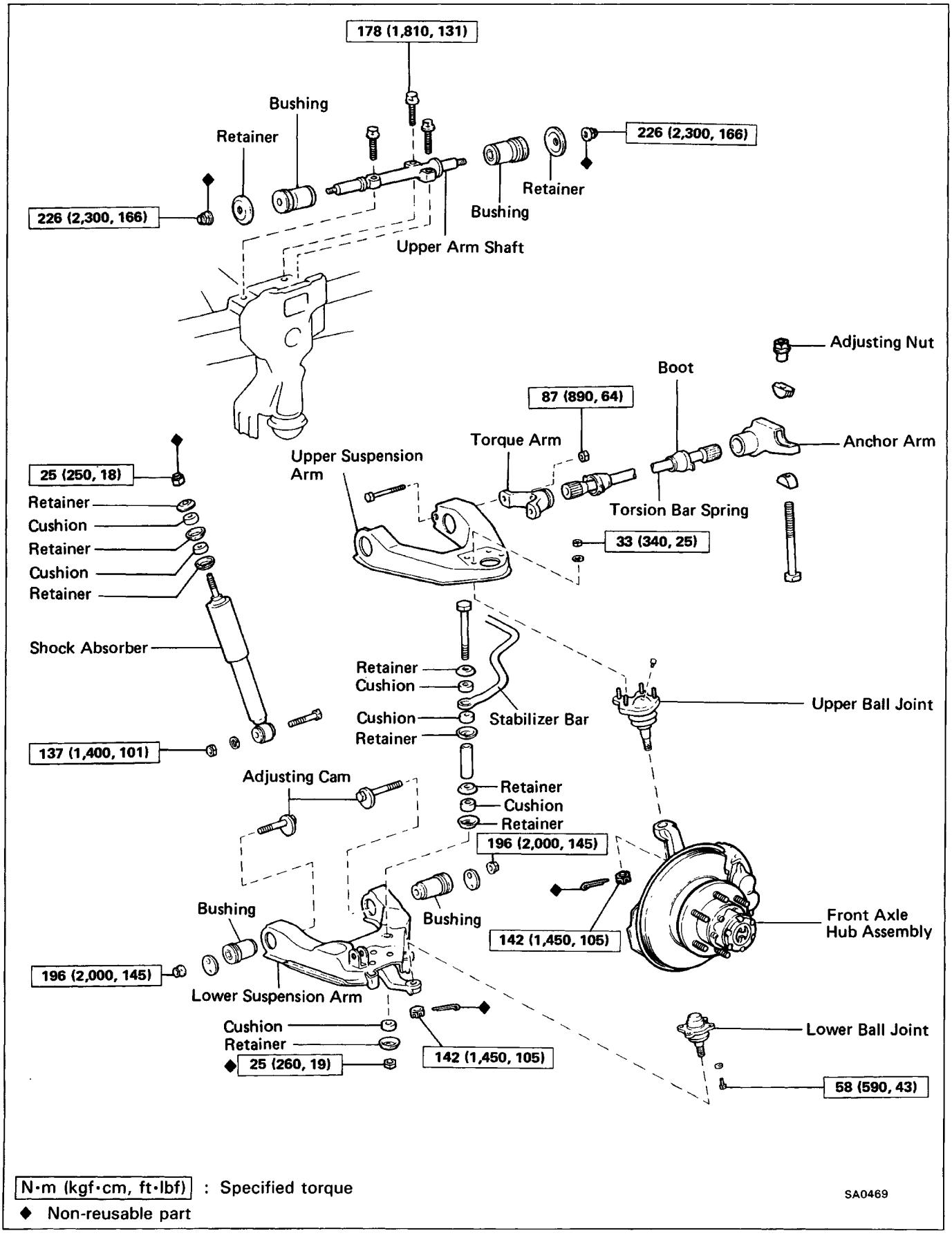
6. (3VZ–E w/ATM)

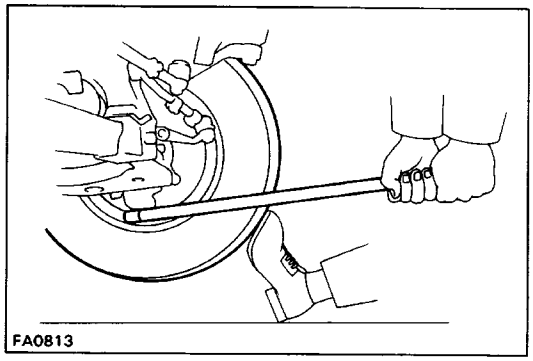
INSPECT TRANSFER PRESSURE SWITCH

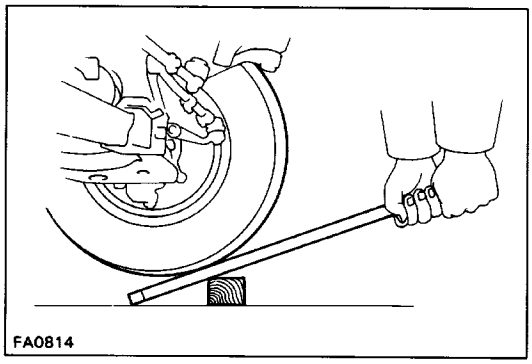
While blowing compressed air (3.0 kg/cm^2, 43 psi or 294 kPa) into the switch, check the continuity between the terminal and switch body.

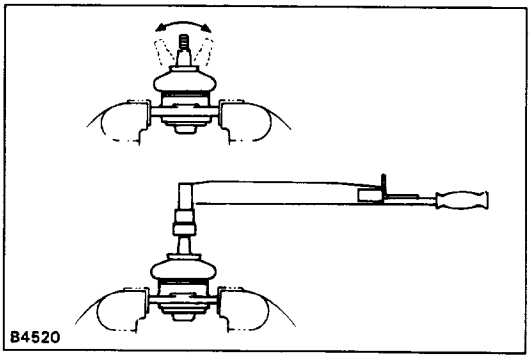
Resistance: 0 Ω

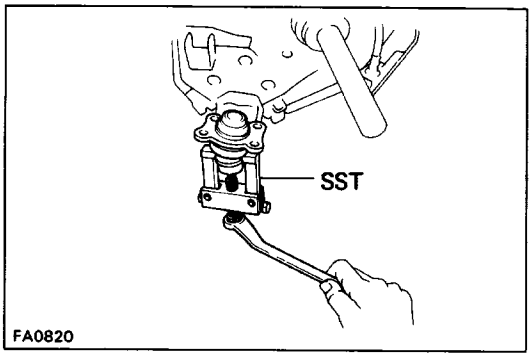
FRONT SUSPENSION
COMPONENTS



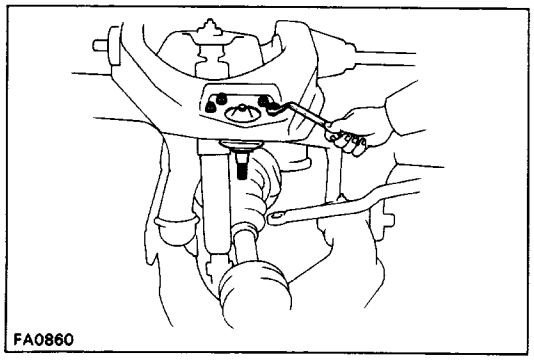

FA0813


FA0814


B4520



FA0820


FA0860

Ball Joint

(See page SA–111)

INSPECTION OF BALL JOINTS

1. INSPECT LOWER BALL JOINT FOR EXCESSIVE LOOSENESS

(a) Jack up the front of the vehicle and support it with stands.

(b) Make sure the front wheels are in a straight forward position, and depress the brake pedal.

(c) Move the lower suspension arm up and down and check that the lower ball joint has no excessive play.

Maximum vertical play: 2.3 mm (0.091 in.)

2. INSPECT UPPER BALL JOINT FOR EXCESSIVE LOOSENESS

Move the vehicle up and down and check that the upper ball joint has no excessive play.

Maximum vertical play: 0 mm (0 in.)

3. INSPECT BALL JOINT FOR ROTATION CONDITION

(a) Remove the ball joints.

(b) As shown in the figure, flip the ball joint stud back and forth 5 times before installing the nut.

(c) Using a torque gauge, turn the nut continuously one turn every 2 – 4 seconds and take the torque reading on the 5th turn.

Torque (turning):

Lower ball joint

3.0 – 5.9 N–m

(30 – 60 kgf–cm, 26 – 52 in.–lbf)

REMOVAL OF BALL JOINTS

1. REMOVE STEERING KNUCKLE

(See page SA–41)

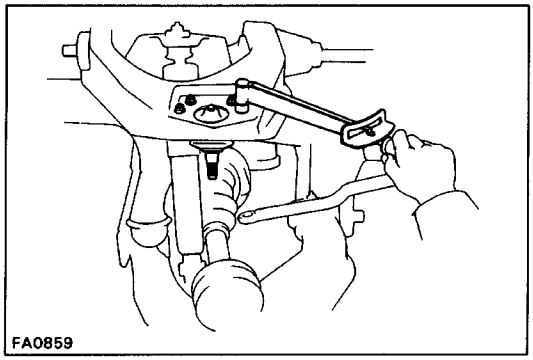
2. REMOVE LOWER BALL JOINT FROM LOWER SUSPENSION ARM

(a) Remove the cotter pin and nut.

(b) Using SST, remove the lower ball joint from the lower suspension arm.

SST 09628–62011

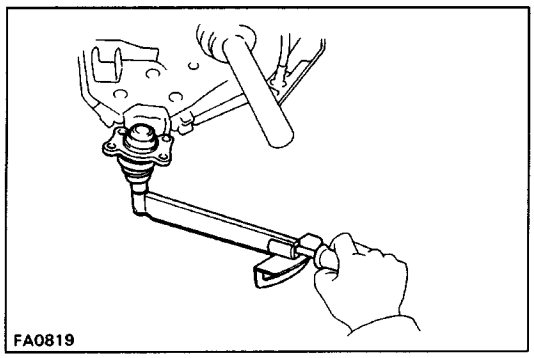
3. REMOVE UPPER BALL JOINT FROM UPPER SUSPENSION ARM



INSTALLATION OF BALL JOINTS

1. INSTALL UPPER BALL JOINT TO UPPER SUSPENSION ARM

Torque: 33 N–m (340 kgf–cm, 25 ft–lbf)

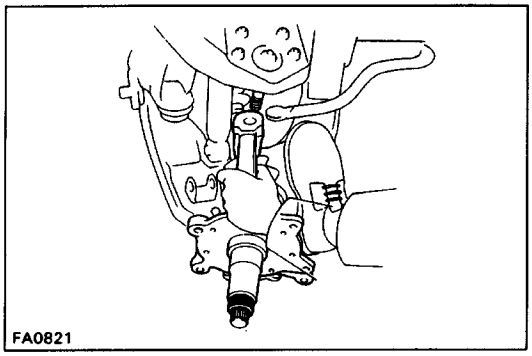


2. INSTALL LOWER BALL JOINT TO LOWER SUSPENSION ARM

(a) Install the lower ball joint to the lower suspension arm.

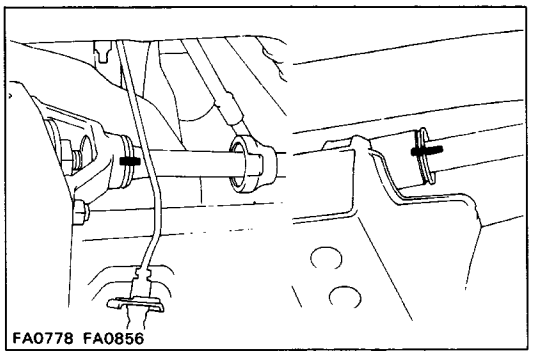
(b) Torque the nut and install a new cotter pin.

Torque: 142 N–m (1,450 kgf–cm, 105 ft–lbf)



3. INSTALL STEERING KNUCKLE

(See page SA–43)


FA0778 FA0856

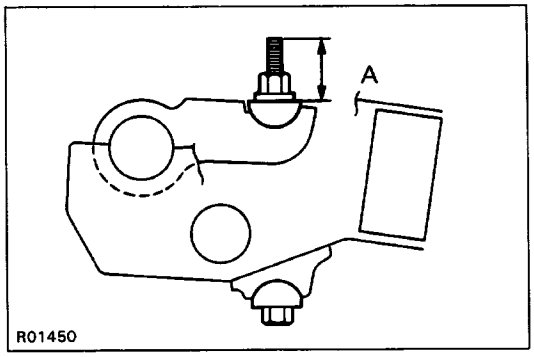
Torsion Bar Spring

(See page SA–111)

REMOVAL OF TORSION BAR SPRING

1. PLACE MATCHMARKS ON TORSION BAR SPRING, ANCHOR ARM AND TORQUE ARM

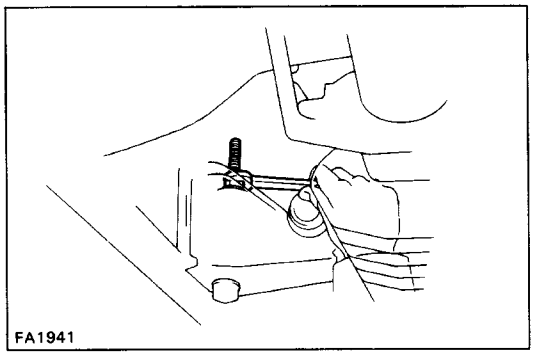
Remove the boots and place matchmarks on the torsion bar spring, anchor arm and torque arm.



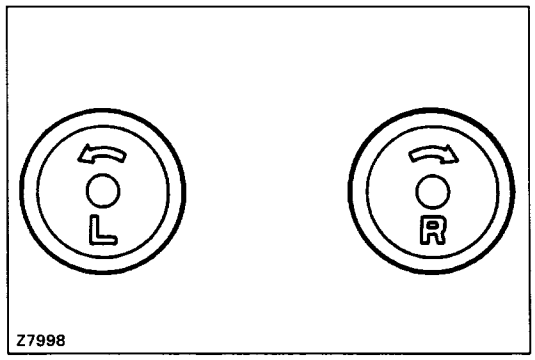
R01450

2. MEASURE PROTRUDING BOLT END "A", AS SHOWN

HINT: Use this measurement for reference when adjusting the chassis ground clearance.


FA1941

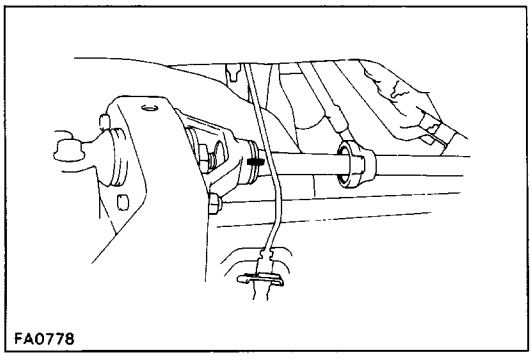
3. LOOSEN ADJUSTING NUT AND REMOVE ANCHOR ARM AND TORSION BAR SPRING



Z7998

INSTALLATION OF TORSION BAR SPRING

HINT: There are left and right indication marks on the rear end of the torsion bar spring. Be careful not to interchange them.


FA0778

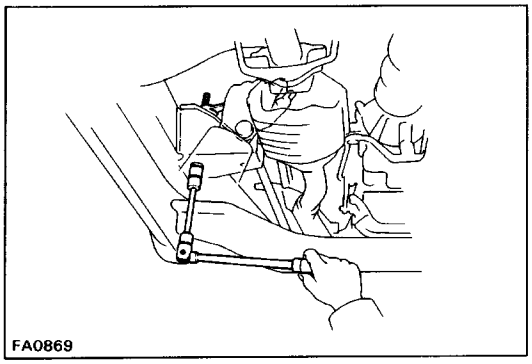
1. INSTALL TORSION BAR SPRING AND ANCHOR ARM

If Reusing Torsion Bar Spring

(a) Apply a light coat of molybdenum disulphide lithium base grease to the spline of the torsion bar spring.

(b) Align the matchmarks and install the torsion bar spring to the torque arm.

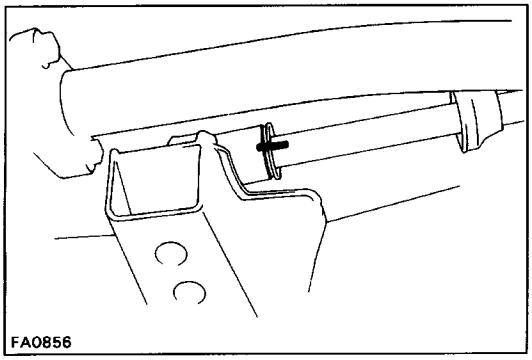
(c) Align the matchmarks and install the anchor arm tc the torsion bar spring.


FA0869

(d) Tighten the adjusting nut so that the bolt protrusion is equal to that before removal.

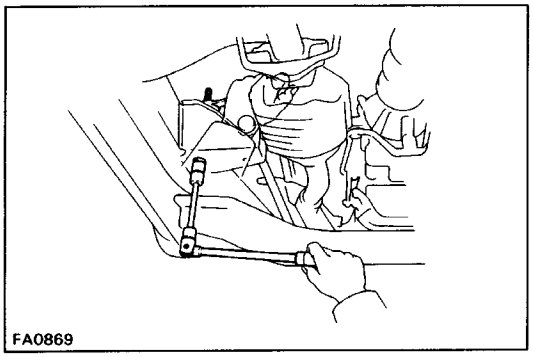
If Using a New Torsion Bar Spring

(a) Remove the wheel.
(b) Install the two boots to the torsion bar spring.
(c) Apply a light coat of the molybdenum disulphide lithium base grease to the spline of the torsion bar spring.
(d) Temporarily install the anchor arm to the small end of the torsion bar spring and place the matchmarks on the torsion bar spring and anchor arm.
HINT:


FA0856

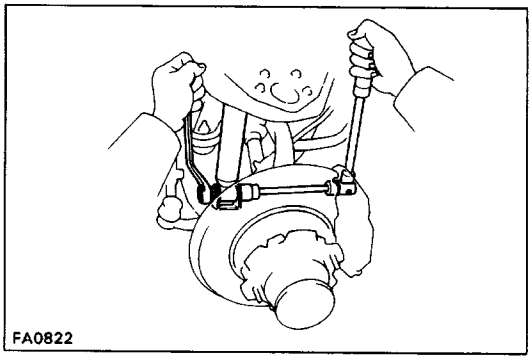
- There is one spline on the torsion bar spring that is larger than the others. Install the torsion bar spring into the anchor arm by slowly turning the anchor arm until you feel the large spline enter the matching point in the anchor arm.
- Place matchmarks on the torsion bar spring and anchor arm on the bottom of each.

(e) Remove the anchor arm from the torsion bar spring.
(f) Install the torsion bar spring into the torque arm.


FA0869

HINT: There is one spline on the torsion bar spring that is larger than the others. Install the torsion bar spring into the torque arm by slowly turning the torsion bar spring until you feel the large spline enter the matching point in the torque arm.
(g) Align the matchmarks and install the anchor arm to the torsion bar spring.
(h) Torque the adjusting nut.
Nut tightening limit: A = 70 mm (2.76 in.)
(i) Temporarily install the lock nut.
(j) Install the wheel and remove the stands, bounce the vehicle to settle the suspension.
(k1 Adjust the chassis ground clearance by turning the adjusting nut.
Chassis ground clearance: See pages A–25, 26

2. ASSEMBLE BOOTS

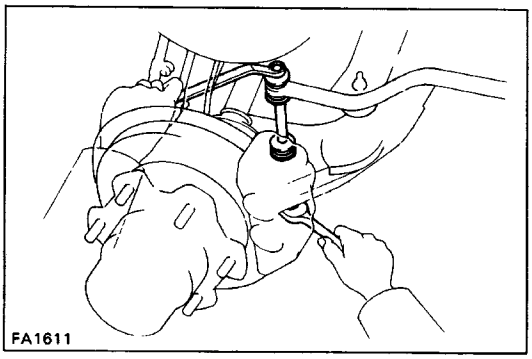

FA0822

Lower Suspension Arm and Shock Absorber

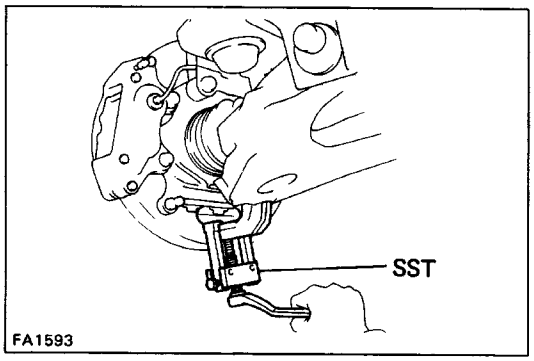
(See page SA–111)

REMOVAL OF LOWER SUSPENSION ARM AND SHOCK ABSORBER

1. REMOVE SHOCK ABSORBER


FA1611

2. DISCONNECT STABILIZER BAR FROM LOWER SUSPENSION ARM

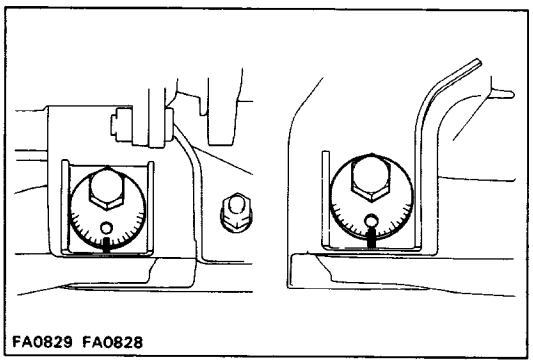


FA1593

3. DISCONNECT LOWER SUSPENSION ARM FROM LOWER BALL JOINT

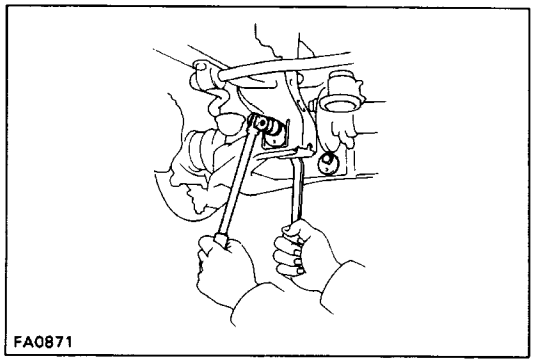
(a) Remove the cotter pin and loosen the nut.

(b) Using SST, disconnect the lower suspension arm from the lower ball joint.
SST 09628–62011

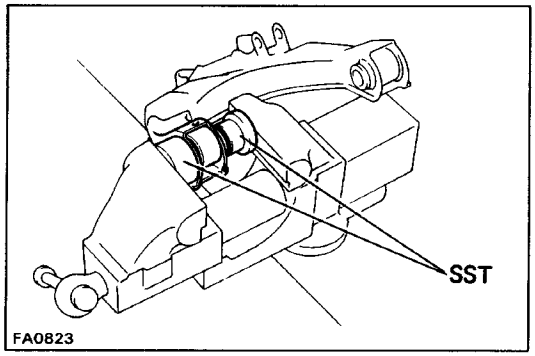

FA0829 FA0828

4. REMOVE LOWER SUSPENSION ARM

(a) Place matchmarks on the front and rear adjusting cams.


FA0871

(b) Remove the nuts and adjusting cams, and remove the lower suspension arm.

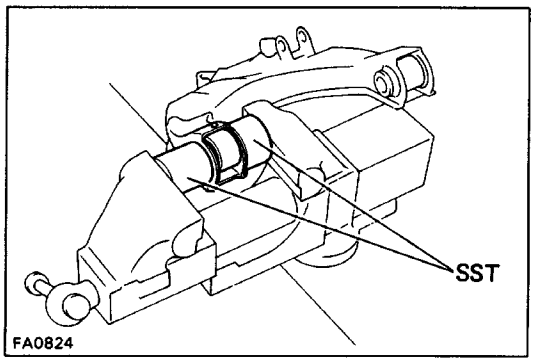


PLACEMENT OF LOWER SUSPENSION ARM BUSHING

1. REMOVE FRONT AND REAR BUSHINGS

Using SST, press out the bushings from the lower suspension arm.

SST 09726–27011 (09726–02050, 09726–02060)

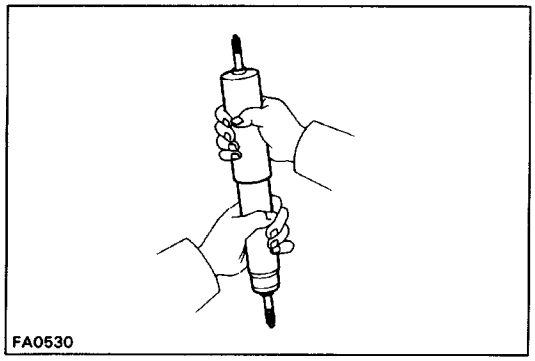


2. INSTALL FRONT AND REAR BUSHINGS

Using SST, press in new bushings to the lower suspension arm.

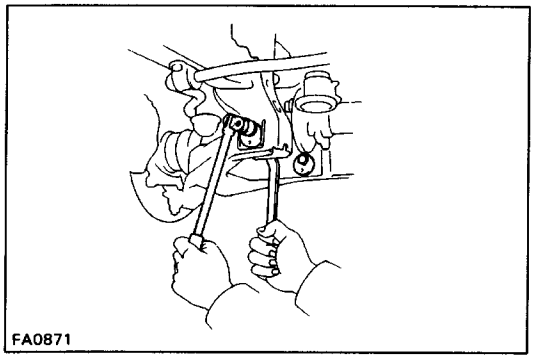
SST 09726–27011 (09726–02040, 09726–02060)

HINT: Do not apply grease or oil to the bushing.



INSPECTION OF SHOCK ABSORBER

INSPECT OPERATION OF SHOCK ABSORBER

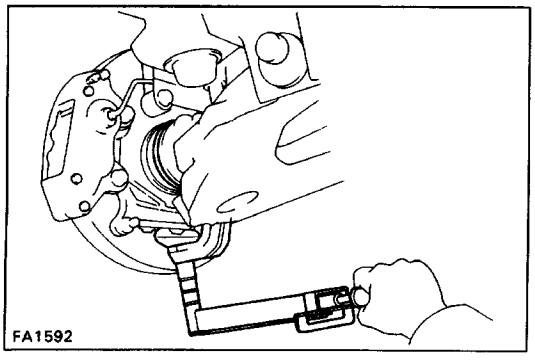


INSTALLATION OF LOWER SUSPENSION ARM AND SHOCK ABSORBER

1. INSTALL LOWER SUSPENSION ARM

(a) Install the lower suspension arm to the frame with adjusting cams.

(b) Temporarily install the two nuts to the front and rear adjusting cams.

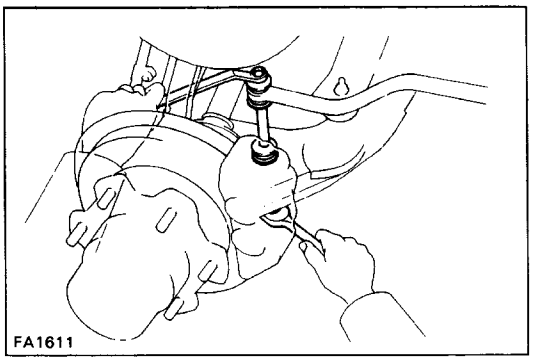


2. CONNECT LOWER SUSPENSION ARM TO LOWER BALL JOINT

(a) Connect the lower suspension arm to the lower ball joint and torque the nut.

Torque: 142 N–m (1,450 kgf –cm, 105 ft–lbf)

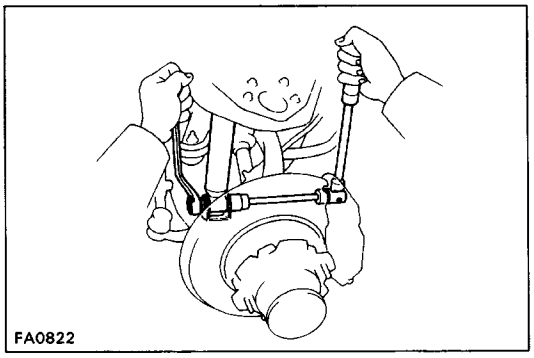
(b) Install a new cotter pin.



3. CONNECT STABILIZER BAR TO LOWER SUSPENSION ARM

Jack up the stabilizer bar and install the cushions, retainers, collar and bolt, and install and torque the nut.

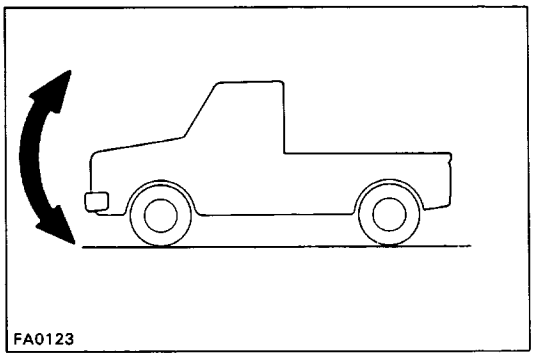
Torque: 25 N–m (250 kgf–cm, 19 ft–lbf)



4. INSTALL SHOCK ABSORBER TO LOWER SUSPENSION ARM

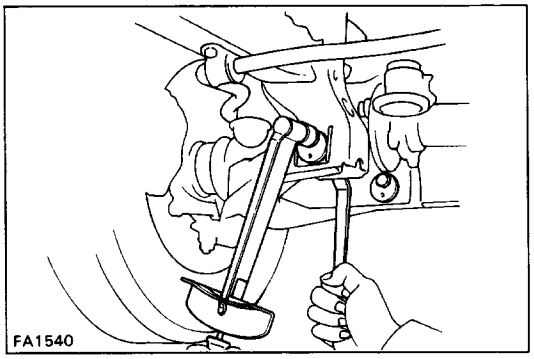
Install the shock absorber to lower suspension arm bracket.

Torque: 137 N–m (1,400 kgf–cm, 101 ft–lbf)



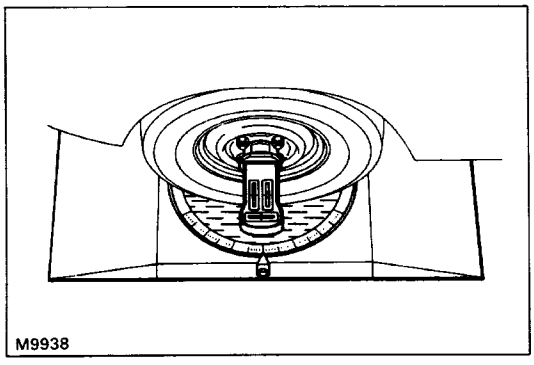
5. TORQUE ADJUSTING CAM NUTS

(a) Install the wheel, and remove the stands and bounce the vehicle up and down to stabilize the suspension.



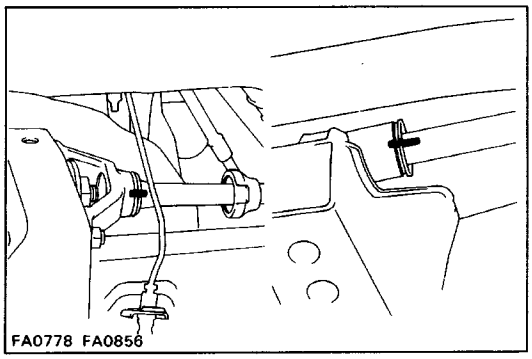
(b) Align the matchmarks and torque the nuts.

Torque: 196 N–m (2,000 kgf–cm, 145 ft–lbf)



6. CHECK FRONT WHEEL ALIGNMENT

(See page SA–6)



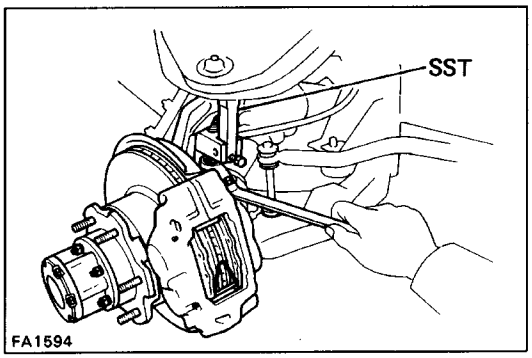
Upper Suspension Arm

(See page SA–111)

REMOVAL OF UPPER SUSPENSION ARM

1. REMOVE TORSION BAR SPRING

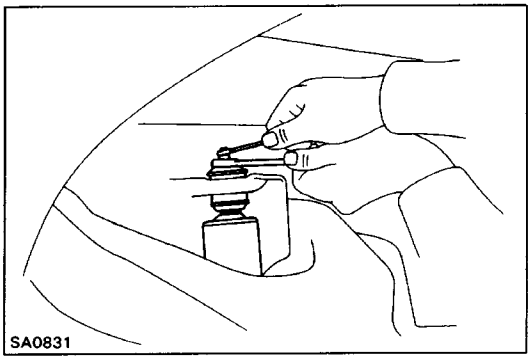
(See page SA–114)



2. DISCONNECT UPPER SUSPENSION ARM FROM UPPER BALL JOINT

Remove the cotter pin and nut, and using SST disconnect the upper ball joint from the steering knuckle.

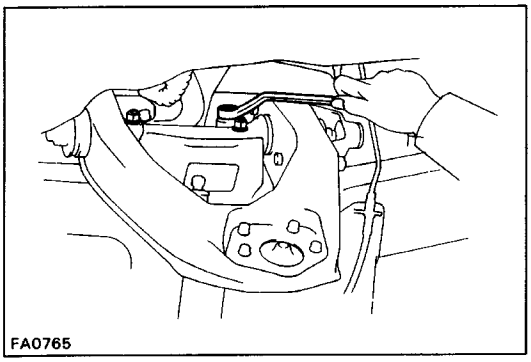
SST 09628–62011



3. DISCONNECT SHOCK ABSORBER FROM FRAME

Remove the nut, cushion and retainer, and disconnect the shock absorber from the frame.

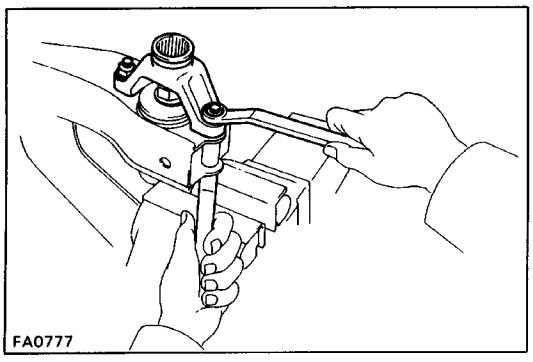
HINT: Do not disconnect the shock absorber from the lower suspension arm.



4. REMOVE UPPER SUSPENSION ARM

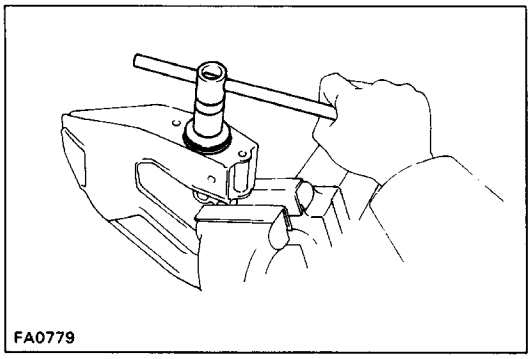
(a) Disconnect the intermediate shaft from the steering gear housing.

(b) Remove the three bolts, and remove the upper suspension arm from the frame.



REPLACEMENT OF UPPER ARM BUSHING

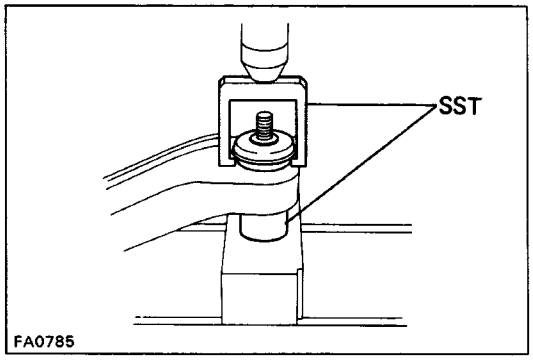
1. REMOVE TORQUE ARM



2. REMOVE FRONT BUSHING

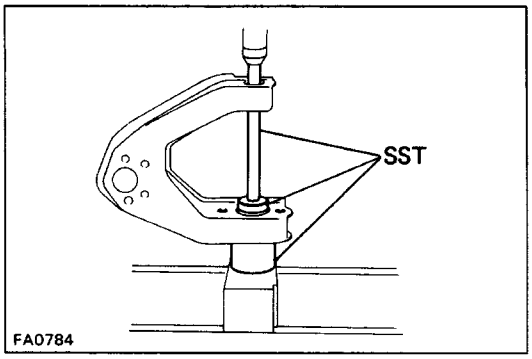
(a) Using a chisel and hammer, loosen the staked part of the nut.

(b) Remove the nut.



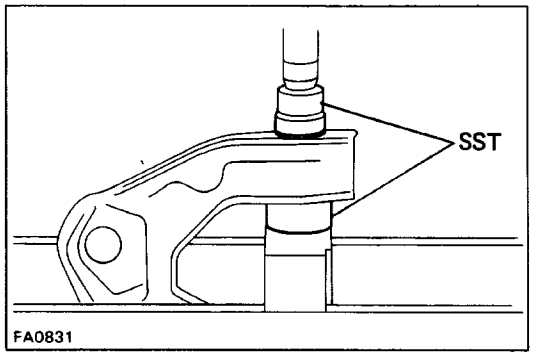
(c) Using SST, push out the front bushing.
SST 09710–26010 (09710–05040, 09710–05050)

3. REMOVE UPPER ARM SHAFT



4. REMOVE REAR BUSHING

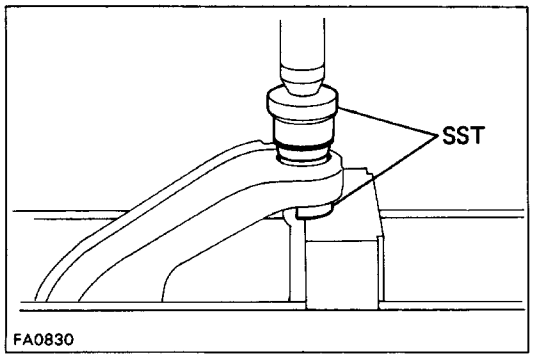
Using SST, push out the rear bushing.
SST 09710–26010
(09710–05020, 09710–05030, 09710–05080)



5. INSTALL REAR BUSHING

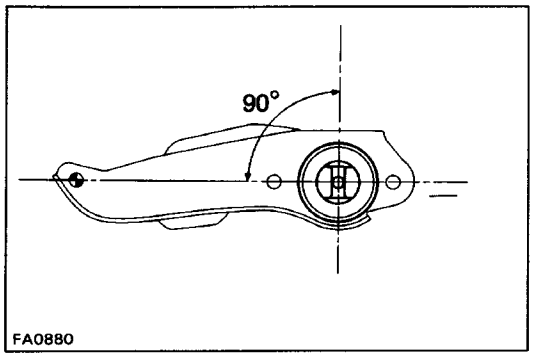
(a) Using SST, push in a new bushing.
SST 09710–26010 (09710–05060, 09710–05080)
HINT: Do not apply grease or oil to the bushing.

(b) Install the upper arm shaft.



6. INSTALL FRONT BUSHING

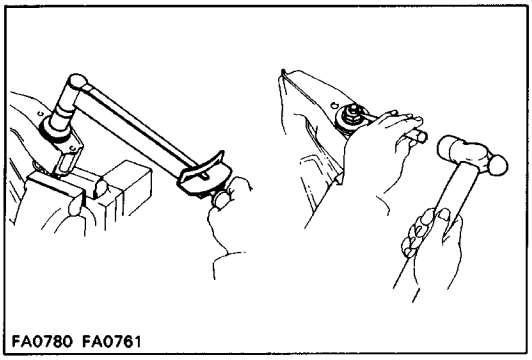
Using SST, push in a new front bushing.
SST 09710–26010 (09710–05060, 09710–05080)



7. TORQUE UPPER ARM SHAFT

(a) Install the retainers and new nuts.

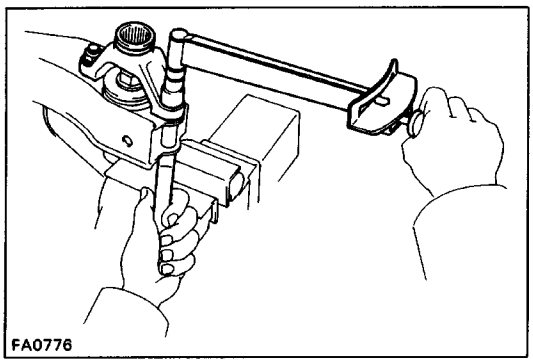
HINT: Position the upper arm shaft so that the frame installation surface is level with the arm.



(b) Torque the shaft nuts.

Torque: 226 N–m (2,300 kgf–cm, 166 ft–lbf)

(c) Stake the nuts with a hammer and chisel.



8. INSTALL TORQUE ARM TO UPPER ARM

Torque: 87 N–m (890 kgf–cm, 64 ft–lbf)

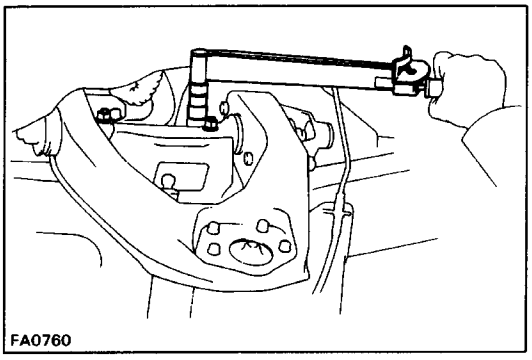
INSTALLATION OF UPPER SUSPENSION ARM

1. INSTALL UPPER SUSPENSION ARM TO FRAME

(a) Install the lower suspension arm to the frame and torque the mounting bolts.

Torque: 178 N–m (1,810 kgf–cm, 131 ft–lbf)

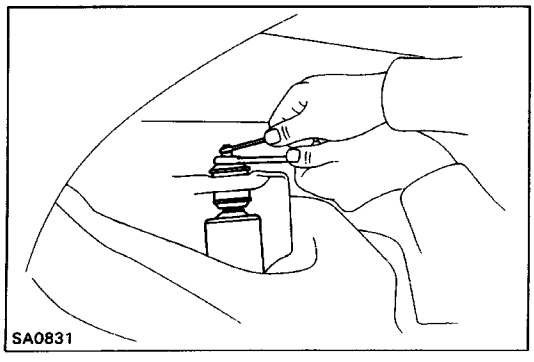
(b) Connect the intermediate shaft to the steering gear housing.

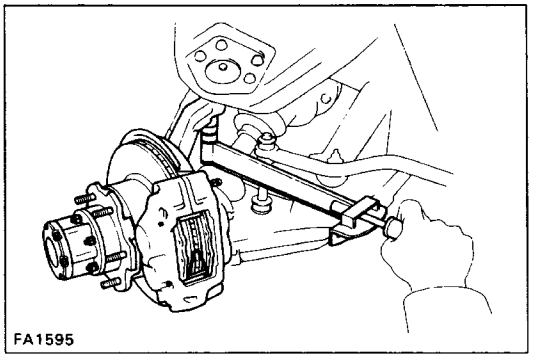


2. CONNECT SHOCK ABSORBER TO FRAME

Connect the shock absorber to frame with cushion and retainer and install and torque a new nut as shown in the figure.

Torque: 25 N–m (250 kgf–cm, 18 ft–lbf)





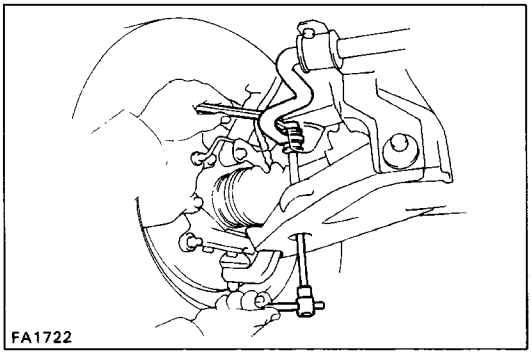
3. CONNECT UPPER SUSPENSION ARM TO UPPER BALL JOINT

(a) Connect the upper ball joint to the steering knuckle and install and torque the nut.
Torque: 142 N–m (1,450 kgf–cm, 105 ft–lbf)

(b) Install a new cotter pin.

4. INSTALL TORSION BAR SPRING
(See page SA–114)

5. CHECK FRONT WHEEL ALIGNMENT
(See page SA–6)



Stabilizer Bar

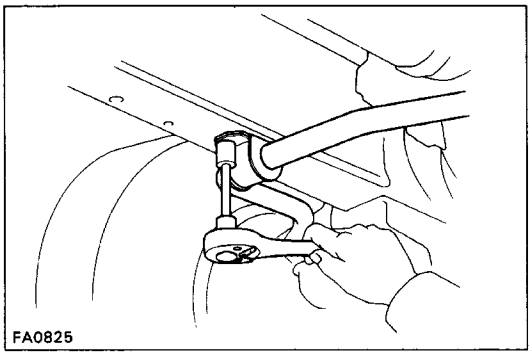
(See page SA–111)

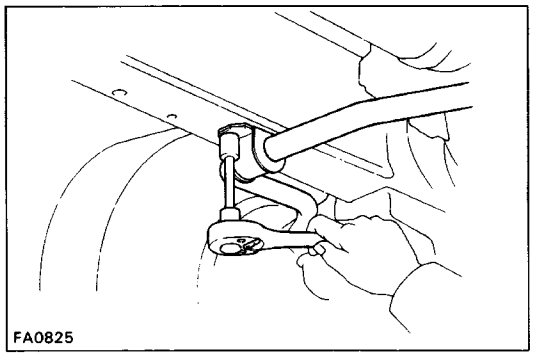
REMOVAL OF STABILIZER BAR

REMOVE STABILIZER BAR

(a) Remove the nut, cushions and retainers holding both sides of the stabilizer bar from the lower suspension arms, and disconnect the stabilizer bar.

(b) Remove both stabilizer bar brackets and cushions, and remove the stabilizer bar.





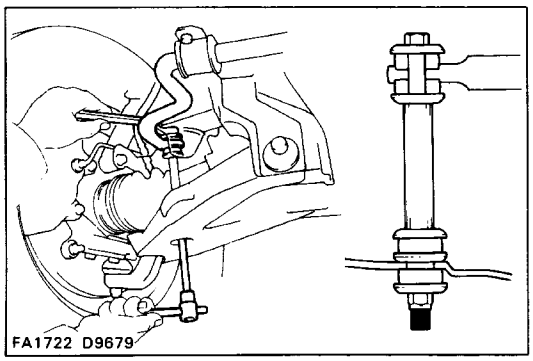
INSTALLATION OF STABILIZER BAR

1. PLACE STABILIZER BAR TO FRAME

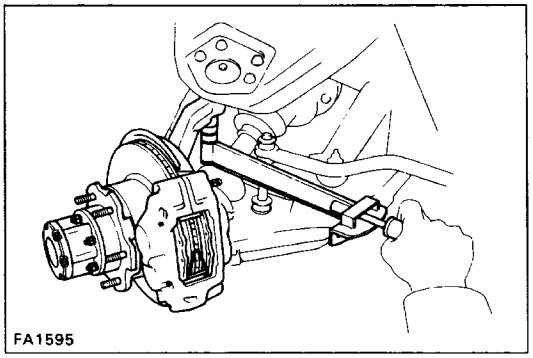
Place the stabilizer bar in position and install the both stabilizer bar cushion and brackets to the frame. Temporarily install the bolts.

2. CONNECT STABILIZER BAR TO LOWER SUSPENSION ARMS

Connect the stabilizer bar on both sides to the lower arms with bolts, cushion, retainers and a new nut as shown. Torque the nut.
Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)



3. TORQUE BRACKET SET BOLTS TO FRAME
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)



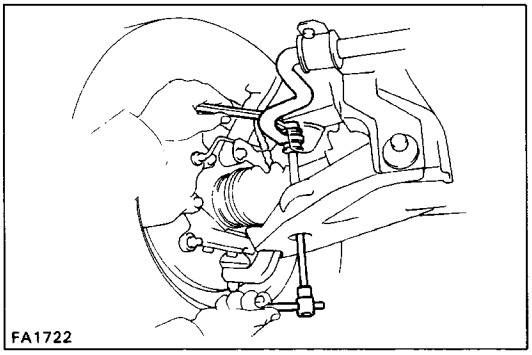
3. CONNECT UPPER SUSPENSION ARM TO UPPER BALL JOINT

(a) Connect the upper ball joint to the steering knuckle and install and torque the nut.
Torque: 142 N–m (1,450 kgf–cm, 105 ft–lbf)

(b) Install a new cotter pin.

4. INSTALL TORSION BAR SPRING
(See page SA–114)

5. CHECK FRONT WHEEL ALIGNMENT
(See page SA–6)



Stabilizer Bar

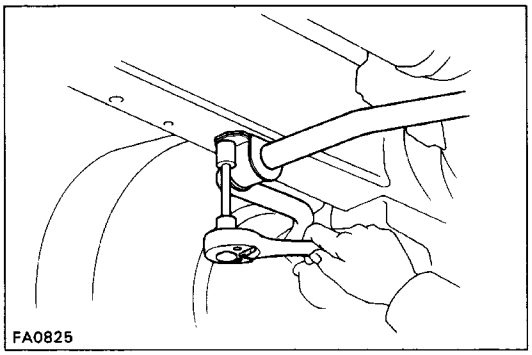
(See page SA–111)

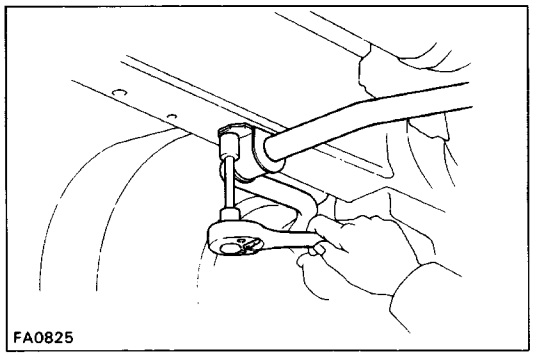
REMOVAL OF STABILIZER BAR

REMOVE STABILIZER BAR

(a) Remove the nut, cushions and retainers holding both sides of the stabilizer bar from the lower suspension arms, and disconnect the stabilizer bar.

(b) Remove both stabilizer bar brackets and cushions, and remove the stabilizer bar.





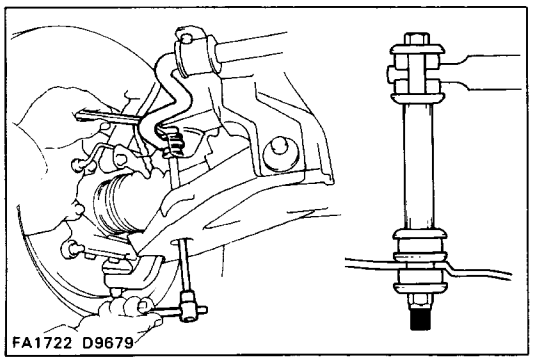
INSTALLATION OF STABILIZER BAR

1. PLACE STABILIZER BAR TO FRAME

Place the stabilizer bar in position and install the both stabilizer bar cushion and brackets to the frame. Temporarily install the bolts.

2. CONNECT STABILIZER BAR TO LOWER SUSPENSION ARMS

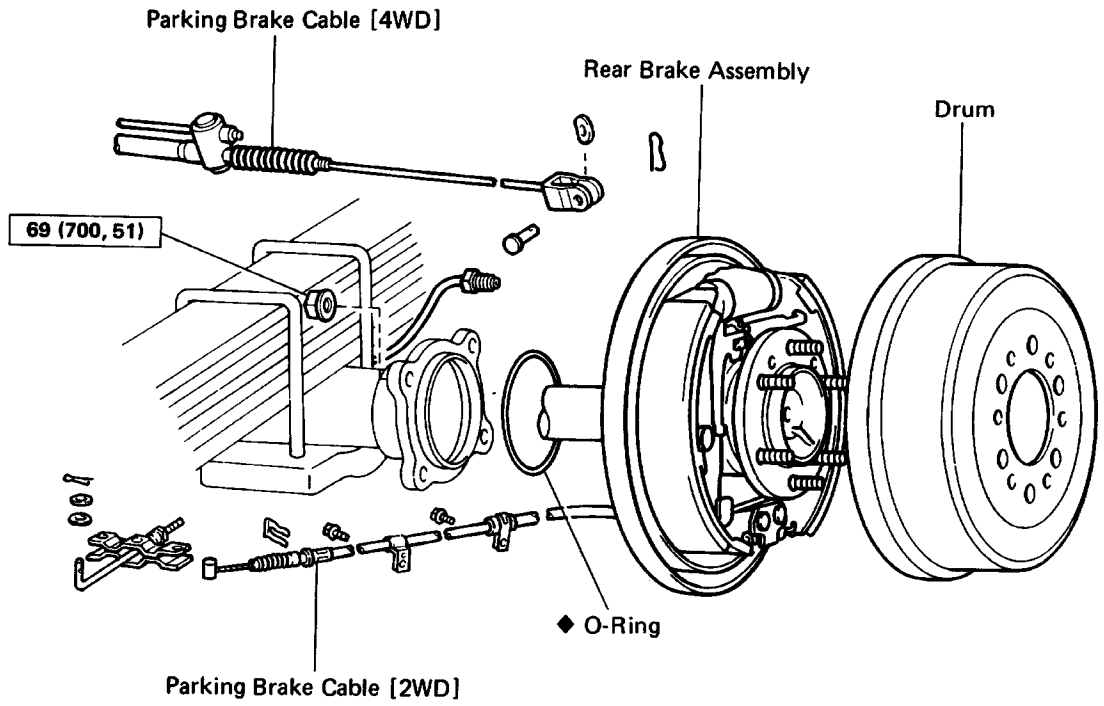
Connect the stabilizer bar on both sides to the lower arms with bolts, cushion, retainers and a new nut as shown. Torque the nut.
Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)

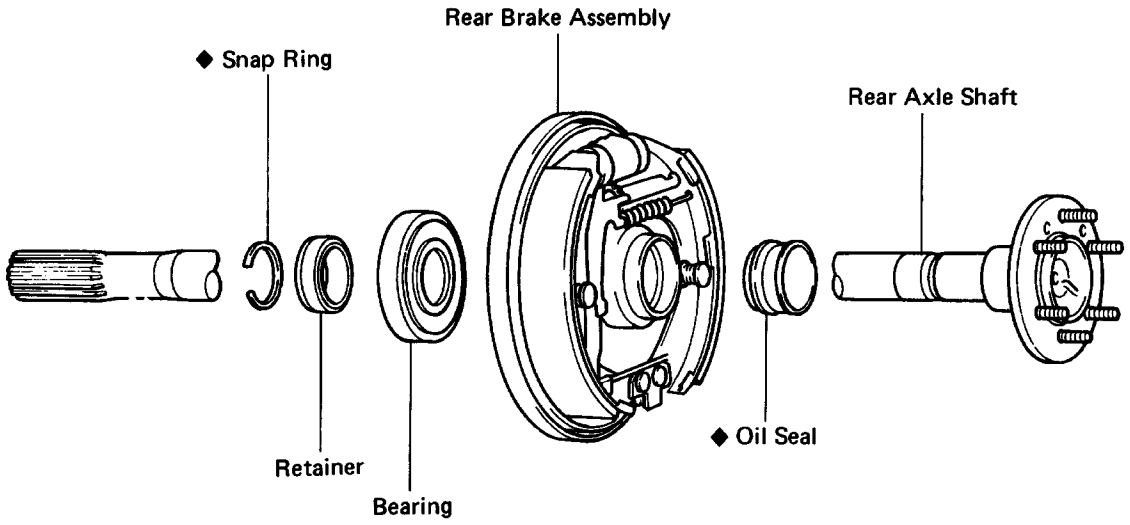


3. TORQUE BRACKET SET BOLTS TO FRAME
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)

REAR AXLE SHAFT (Single Tire)

COMPONENTS

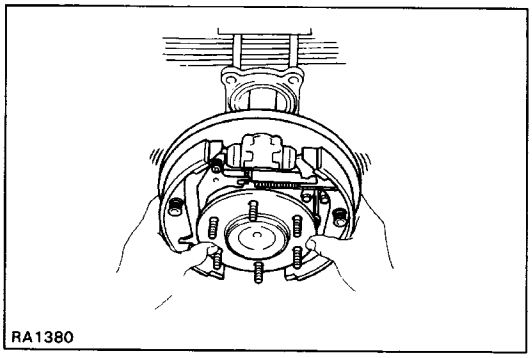




N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

SA0387
SA0388


RA1380

REMOVAL OF REAR AXLE SHAFT

1. REMOVE WHEEL AND BRAKE DRUM

2. DISCONNECT BRAKE TUBE AND PARKING BRAKE CABLE

3. REMOVE FOUR BACKING PLATE MOUNTING NUTS

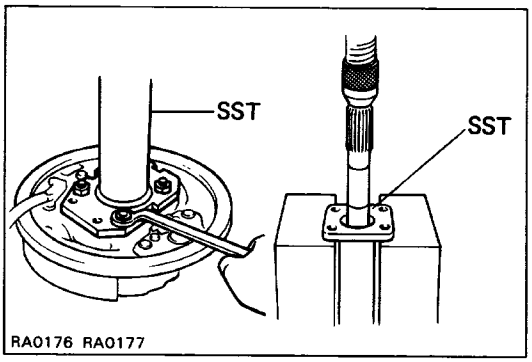
4. REMOVE REAR AXLE SHAFT FROM REAR AXLE HOUSING

5. REMOVE SNAP RING

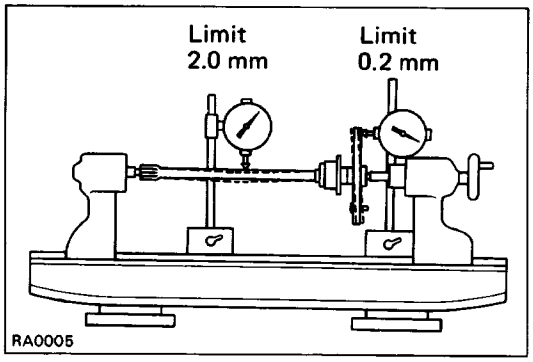
6. REMOVE REAR AXLE SHAFT FROM BACKING PLATE

(a) Attach SST to the backing plate.
SST 09521–25011

(b) Press out the rear axle shaft from the backing plate.
NOTICE: When pulling out the rear axle, be careful not to damage the oil seal.



RA0176 RA0177



RA0005

INSPECTION AND REPAIR OF REAR AXLE SHAFT COMPONENTS

1. INSPECT REAR AXLE SHAFT AND FLANGE FOR WEAR, DAMAGE OR RUNOUT

Maximum shaft runout: 2.0 mm (0.079 in.)

Maximum flange runout: 0.2 mm (0.008 in.)

If the rear axle shaft or flange is damaged or worn, or if runout is greater than maximum, replace the rear axle shaft.

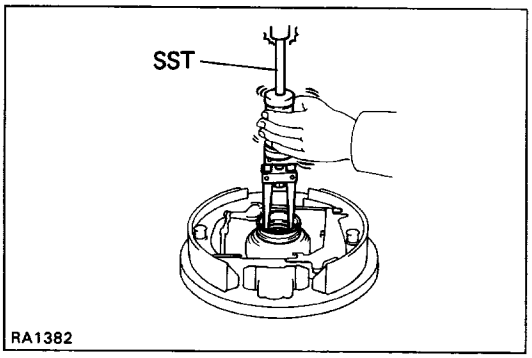
2. INSPECT OUTER OIL SEAL

(a) Check for damage.

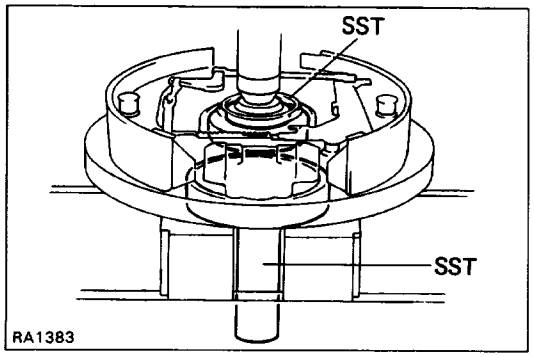
(b) Check the oil seal lip for wear or damage.
If necessary, replace the oil seal.

3. REMOVE OUTER OIL SEAL

Using SST, remove the oil seal.
SST 09308–00010



RA1382



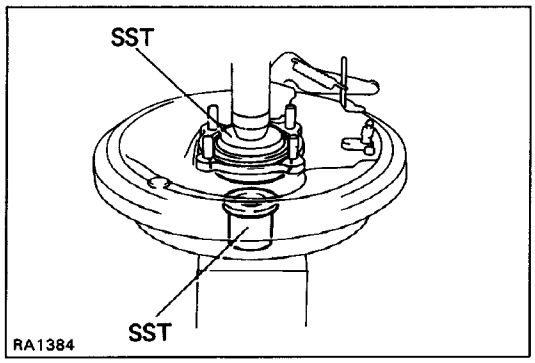
RA1383

4. INSPECT REAR AXLE BEARING

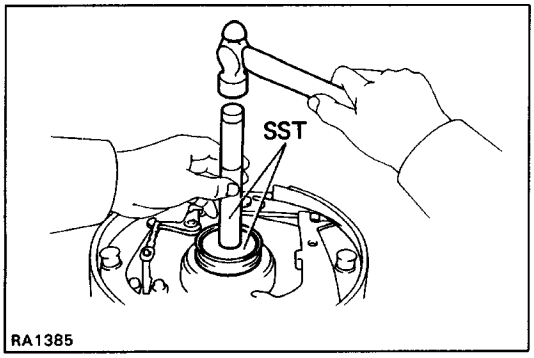
Check for wear or damage.

5. IF NECESSARY, REPLACE REAR AXLE BEARING

(a) Using SST, press out the bearing.
SST 09223–56010 and 09608–35014 (09608–06100)

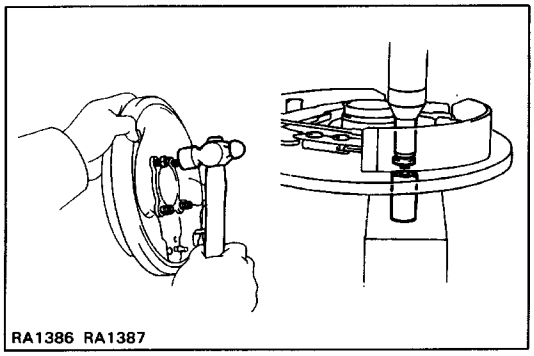


(b) Using SST, press in a new bearing.
SST 09515–30010 and 09608–35014 (09608–06180)



6. INSTALL NEW OUTER OIL SEAL

Using SST, tap in a new oil seal.
SST 09608–30012 (09608–04020, 09608–04070)

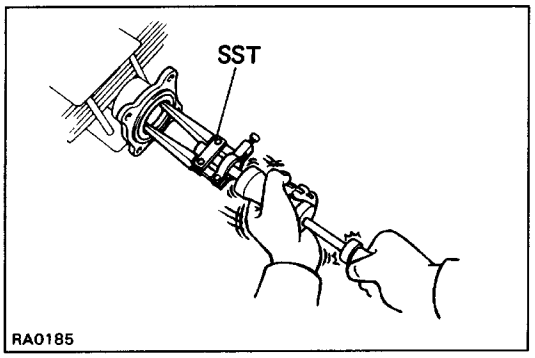


7. INSPECT BEARING CASE

Check for wear or damage.

8. IF NECESSARY, REPLACE BEARING CASE

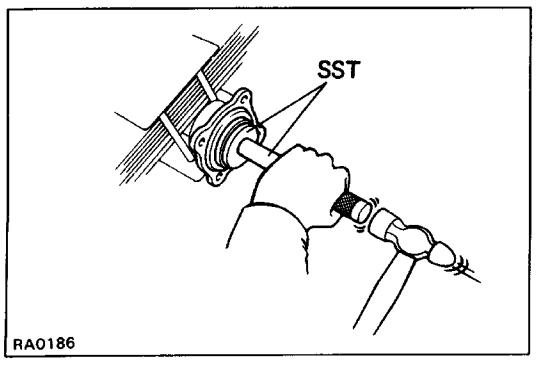
(a) Remove the oil seal and bearing.
(b) Install nuts to the serration bolts.
(c) Using a hammer, tap out the serration bolts and remove the bearing case.
(d) Position the backing plate on the new bearing case and, using two socket wrenches, press in the serration bolts.
(e) Install a new bearing and oil seal.



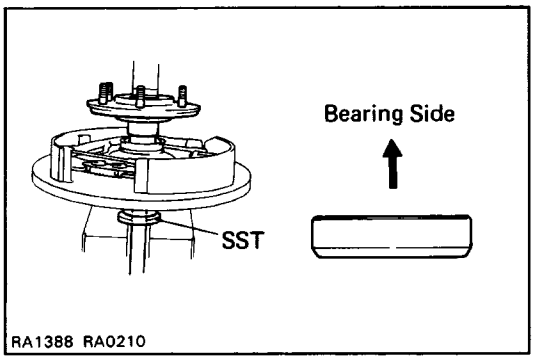
9. INSPECT OIL SEAL FOR WEAR OR DAMAGE

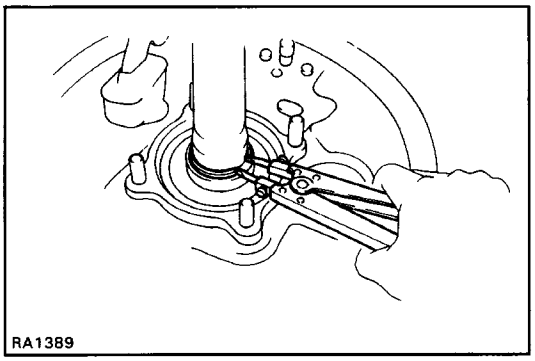
10. IF NECESSARY, REPLACE OIL SEAL

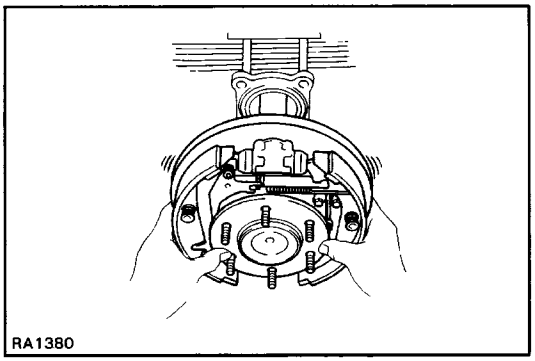
(a) Using SST, remove the oil seal.
SST 09308–00010



(b) Apply MP grease to the oil seal.
(c) Using SST, drive in a new oil seal.
SST 09608–30012 (09608–04020, 09608–04100)







INSTALLATION OF REAR AXLE SHAFT

(See page SA–123)

1. INSTALL REAR AXLE SHAFT IN BACKING PLATE

(a) Apply MP grease to the oil seal lip.

(b) Install the backing plate and bearing retainer on the rear axle shaft.

(c) Using SST, press the rear axle shaft into the backing plate.
SST 09515–30010

(d) Using snap ring pliers, install a new snap ring.

2. INSTALL REAR AXLE SHAFT INTO HOUSING

Install the rear axle with four nuts.
Torque: 59 N–m (700 kgf–cm, 51 ft–lbf)
HINT:

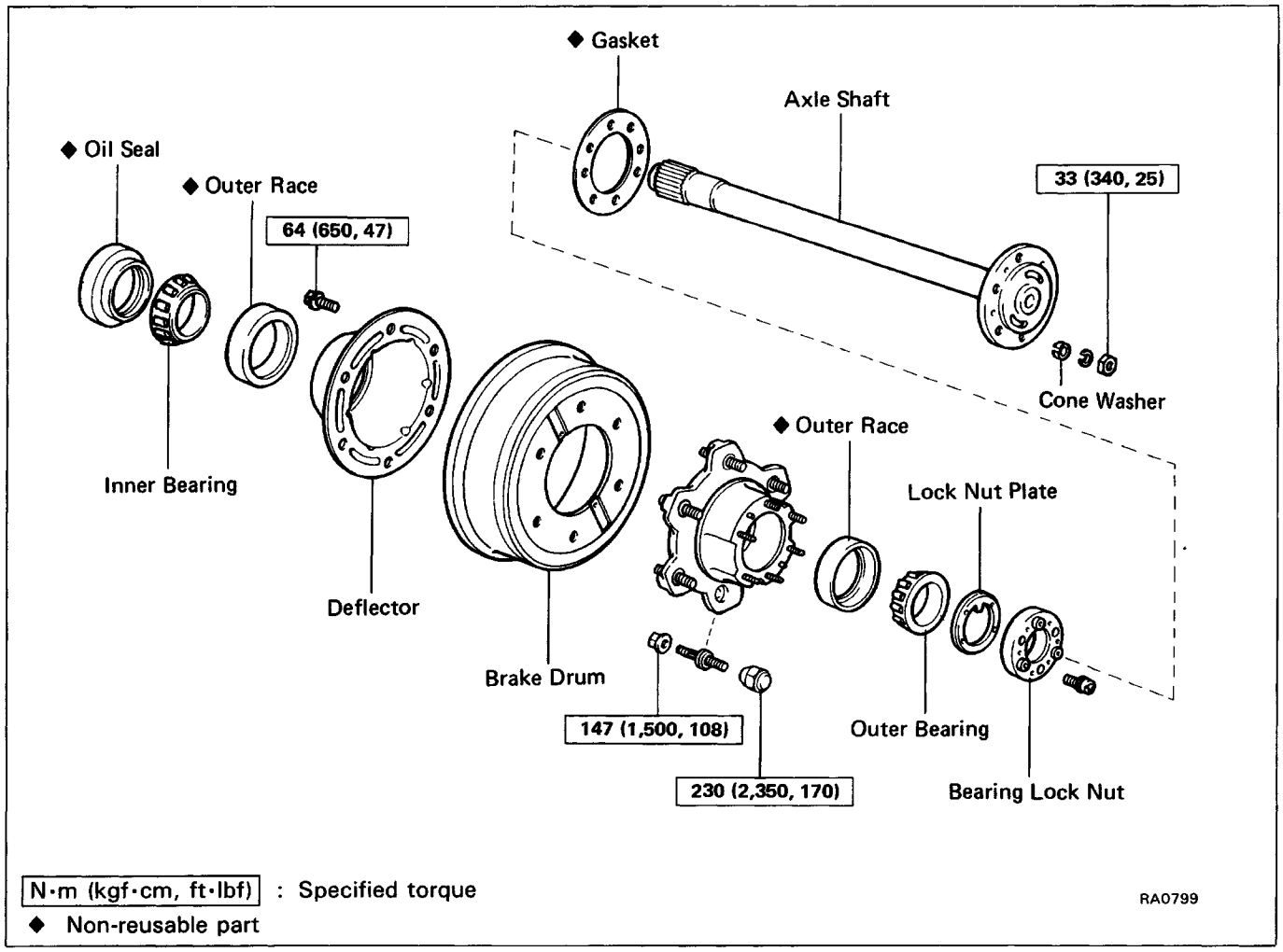
- Be careful not to damage the oil seal.
- When inserting the axle shaft, be careful not to hit or deform the oil deflector inside the axle housing.

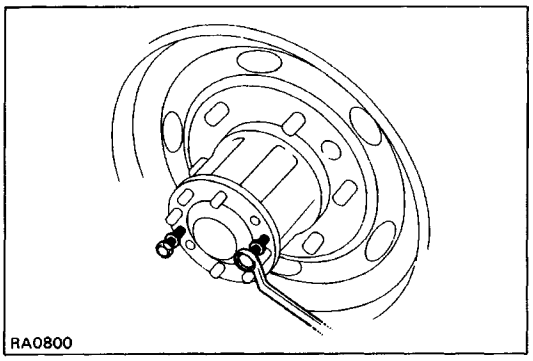
3. CONNECT BRAKE TUBE AND PARKING BRAKE CABLE

4. INSTALL BRAKE DRUM AND WHEEL

5. BLEED BRAKE SYSTEM

REAR AXLE SHAFT AND AXLE HUB (Double Tire)

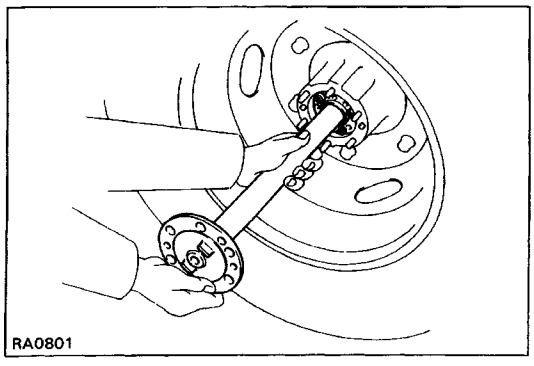




REMOVAL OF REAR AXLE SHAFT

1. REMOVE CONE WASHERS

(a) Remove the six nuts and washers.
(b) Install two service bolts and one turn.
(c) Tap on the shaft and remove the six cone washers.

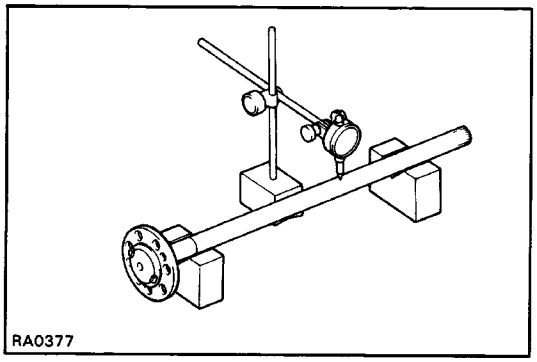


2. REMOVE REAR AXLE SHAFT

(a) Tighten the two service bolts and separate the axle shaft.
(b) Remove the axle shaft with the gasket.
(c) Remove the two service bolts.

HINT: Be careful not to damage the oil seal with the splines.

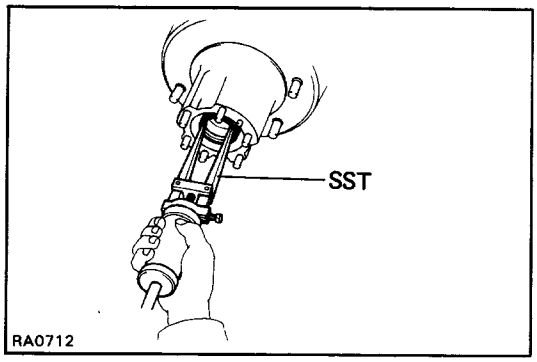
INSPECTION OF REAR AXLE SHAFT COMPONENTS



1. INSPECT REAR AXLE SHAFT

Check for wear, damage or runout.

Maximum runout: 2.0 mm (0.079 in.)



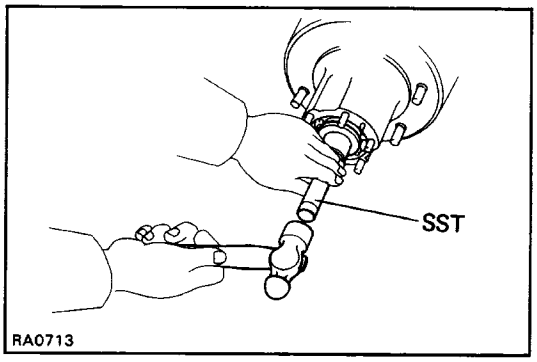
2. INSPECT OIL SEAL FOR WEAR OR DAMAGE

If the oil seal is damaged or worn, replace it.

3. REPLACE OIL SEAL

(a) Using SST, remove the oil seal.

SST 09308–00010



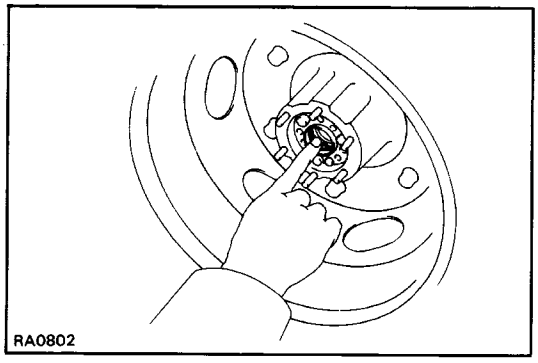
(b) Using SST, drive in the oil seal.

SST 09517–12010

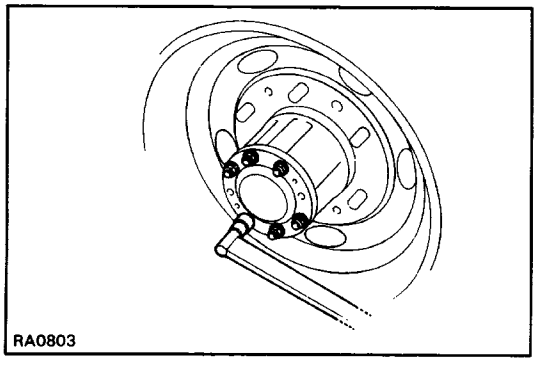
(c) Apply MP grease to the oil seal lip.

INSTALLATION OF REAR AXLE SHAFT

(See page SA–127)



1. APPLY MP GREASE TO OIL SEAL LIP

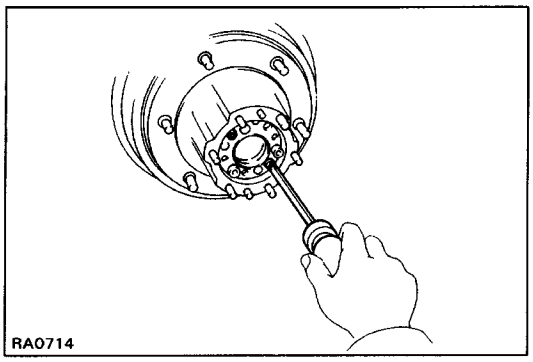


2. INSTALL REAR AXLE SHAFT

Install the rear axle shaft, six cone washers and spring washers with nuts.

Torque: 33 N–m (340 kgf–cm, 25 ft–lbf)

HINT: Be careful not to damage the oil seal with the splines.



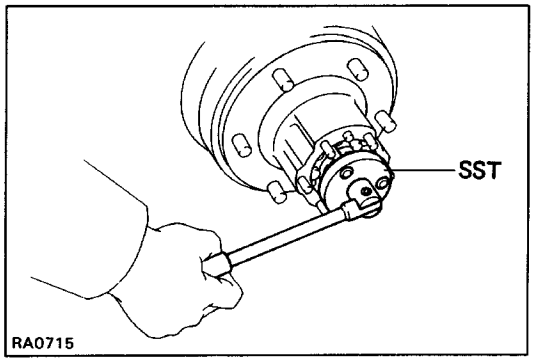
DISASSEMBLY OF REAR AXLE HUB

1. REMOVE REAR WHEEL AND REAR AXLE SHAFT

(See page SA–127)

2. REMOVE BEARING LOCK NUT

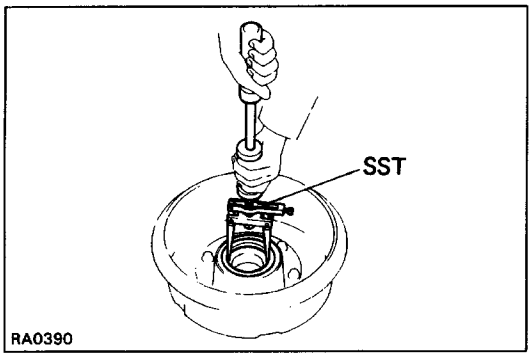
(a) Remove the two bolts from the bearing lock nut.



(b) Using SST, remove the bearing lock nut.
SST 09509–25011

(c) Remove the bearing lock plate.

3. REMOVE AXLE HUB FROM AXLE



4. REMOVE OIL SEAL AND INNER BEARING

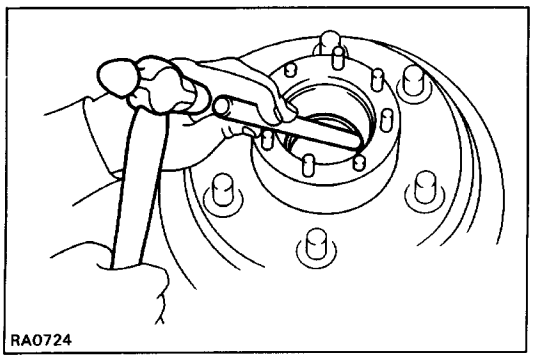
(a) Using SST, remove the oil seal from the axle hub.
SST 09308–00010

(b) Remove the inner bearing from the axle hub.

INSPECTION AND REPAIR OF REAR AXLE HUB

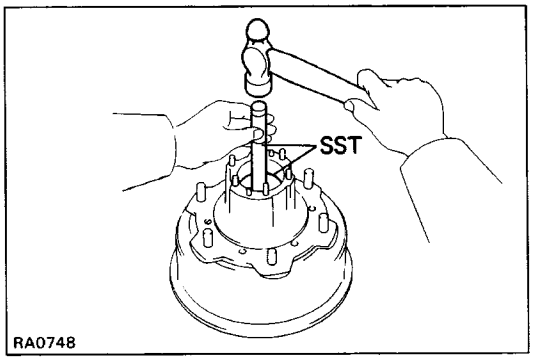
1. INSPECT AXLE HOUSING

Using a magnetic flaw detector or flaw detecting penetrant, check for damage or cracks.

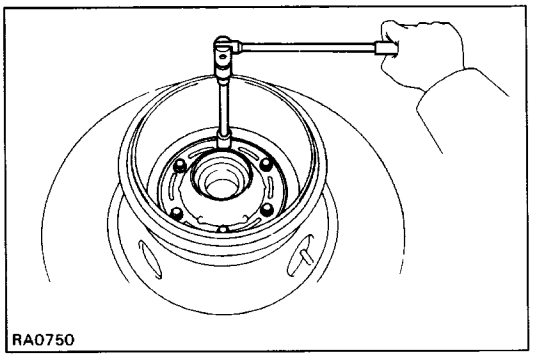


2. REPLACE BEARING OUTER RACE

(a) Using a hammer and brass bar, drive out the outer race.

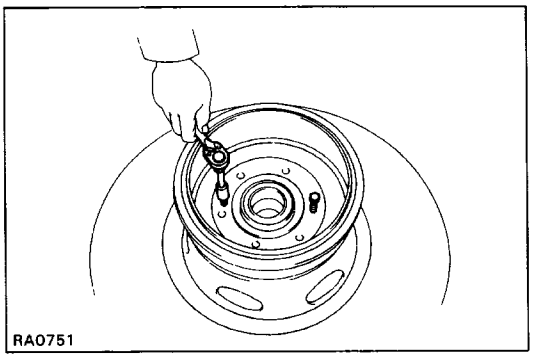


(b) Using SST, carefully tap in a new bearing outer race.
SST Inner side 09608–35014
(09608–06020, 09608–06210)
Outer side 09608–35014
(09608–06020, 09608–06200)

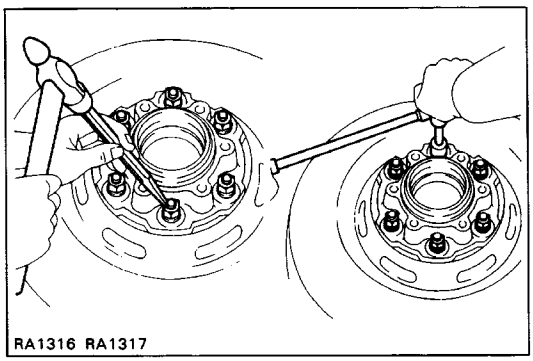


3. REPLACE HUB BOLT

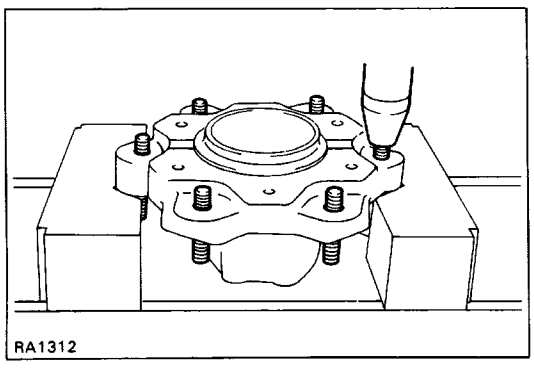
(a) Remove the six bolts and deflector.



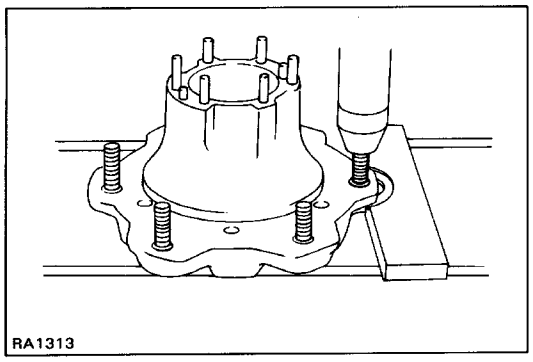
(b) Using the two service bolts, separate the hub and brake drum.



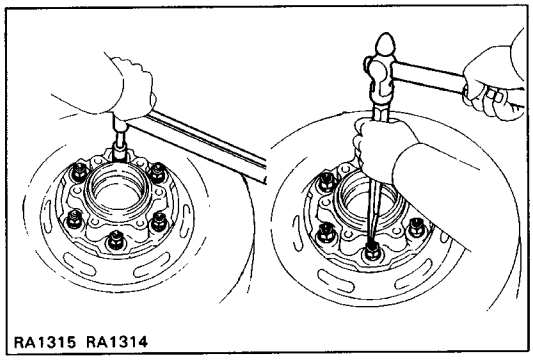
(c) Unstake the bolt and remove the nut.



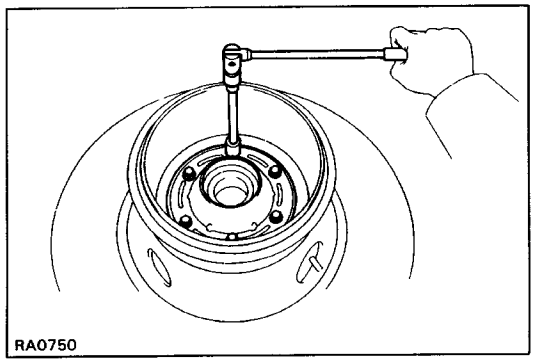
(d) Using a press, press out the hub bolt.


RA1313

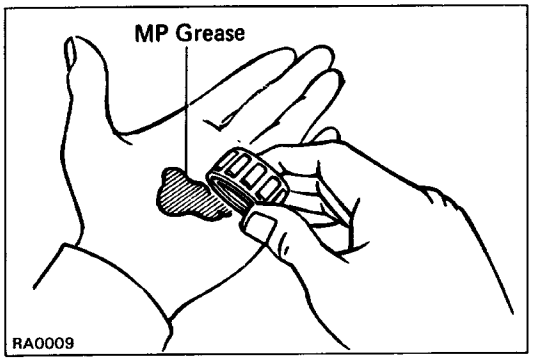
(e) Using a press, press in a new hub bolt.


RA1315 RA1314

(f) Install and tighten the nut and stake the bolt.
Torque: 147 N–m (1,500 kgf–cm, 108 ft–lbf)

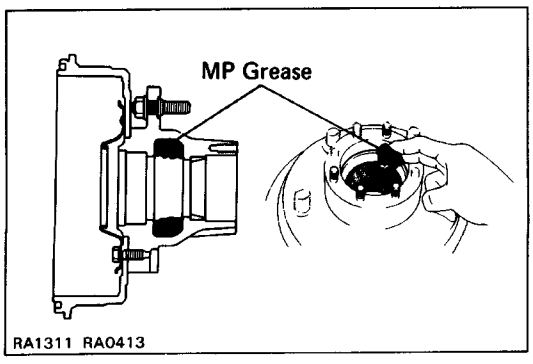

RA0750

(g) Install the deflector and torque the six bolts.
Torque: 64 N–m (650 kgf–cm, 47 ft–lbf)



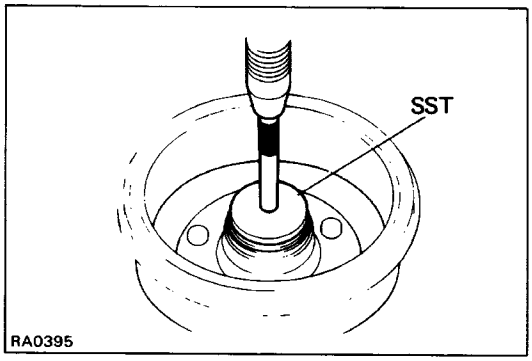
RA0009

ASSEMBLY OF REAR AXLE HUB
(See page SA–127)
1. PACK BEARING WITH MP GREASE
(a) Place MP grease in the palm of your hand.
(b) Pack grease into the bearing, and continuing until the grease oozes out from the other side.
(c) Do the same around the bearing circumference.



RA1311 RA0413

2. COAT SIDE HUB WITH MP GREASE

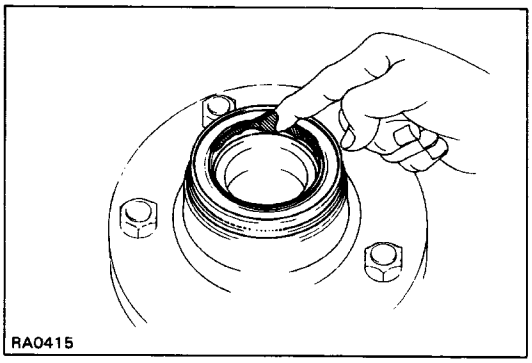


3. INSTALL INNER BEARING AND OIL SEAL

(a) Place inner bearing into the hub.

(b) Using SST, press in a new oil seal to the hub.

SST 09608–35014 (09608–06020 and 09608–06180)

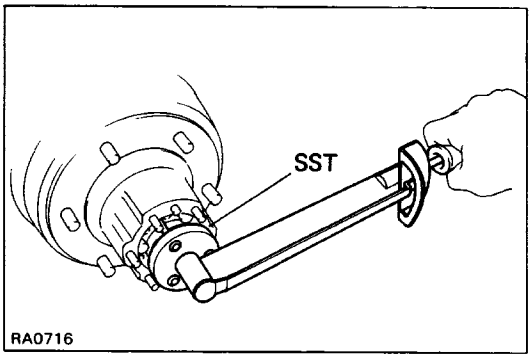


(c) Apply MP grease to the oil seal lip.

4. INSTALL AXLE HUB ON AXLE HOUSING

(a) Place the axle hub on the axle housing.

(b) Install the outer bearing into the axle hub.



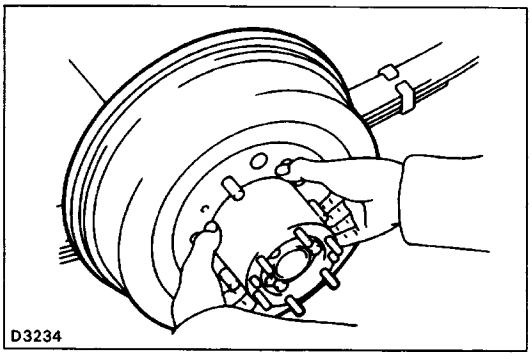
5. ADJUST PRELOAD

(a) Install the lock plate.

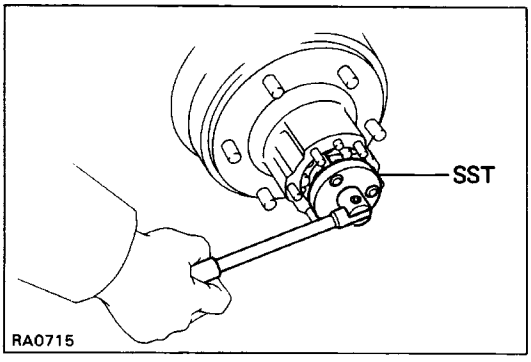
(b) Using SST, torque the bearing lock nut.

SST 09509–25011

Torque: 59 N–m (600 kgf–cm, 43 ft–lbf)



(c) Snug down the bearing by turning the hub several times.



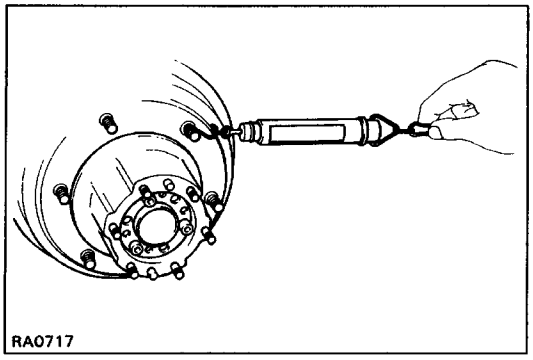
(d) Using SST, retighten the bearing lock nut.

SST 09509–25011

Torque: 59 N–m (600 kgf–cm, 43 ft–lbf)

(e) Using SST, loosen the bearing lock nut until you can rotate it by hand.

SST 09509–25011



(f) Using a spring tension gauge, measure and note friction force of the oil seal. (starting)

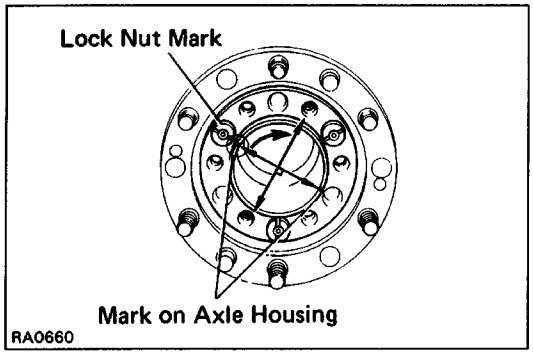
(g) Using SST, tighten the bearing lock nut until the preload is within the specification below.

SST 09 509–2 5011

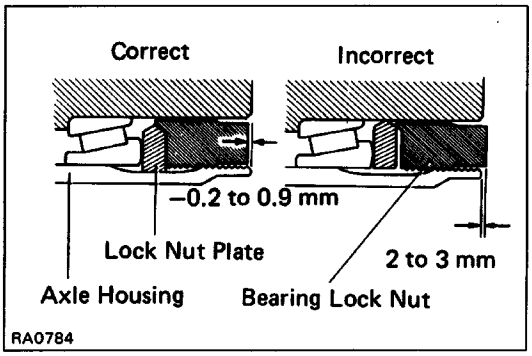
Preload (starting):

Add oil seal frictional force

1.0 –14.7 N (0.1 –1.5 kgf, 0.2 –3.3 lbf)



(h) Align the lock nut mark with one of the marks on the axle housing, and place lock bolts in the holes at right angles to the lock nut.

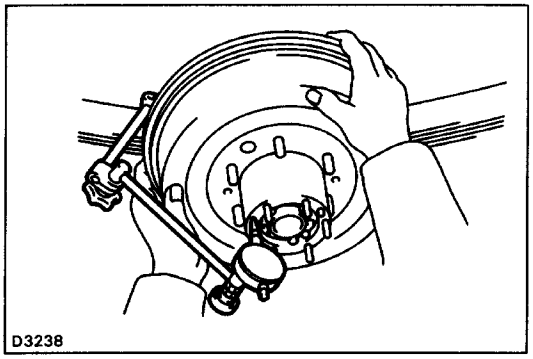


(i) Measure the distance between the top surface of axle housing and the lock nut.

Standard distance: – 0.2 to 0.9 mm

(– 0.008 to 0.035 in.)

If not within specification, reinstall the axle hub.



(j) Check the movement of the drum.

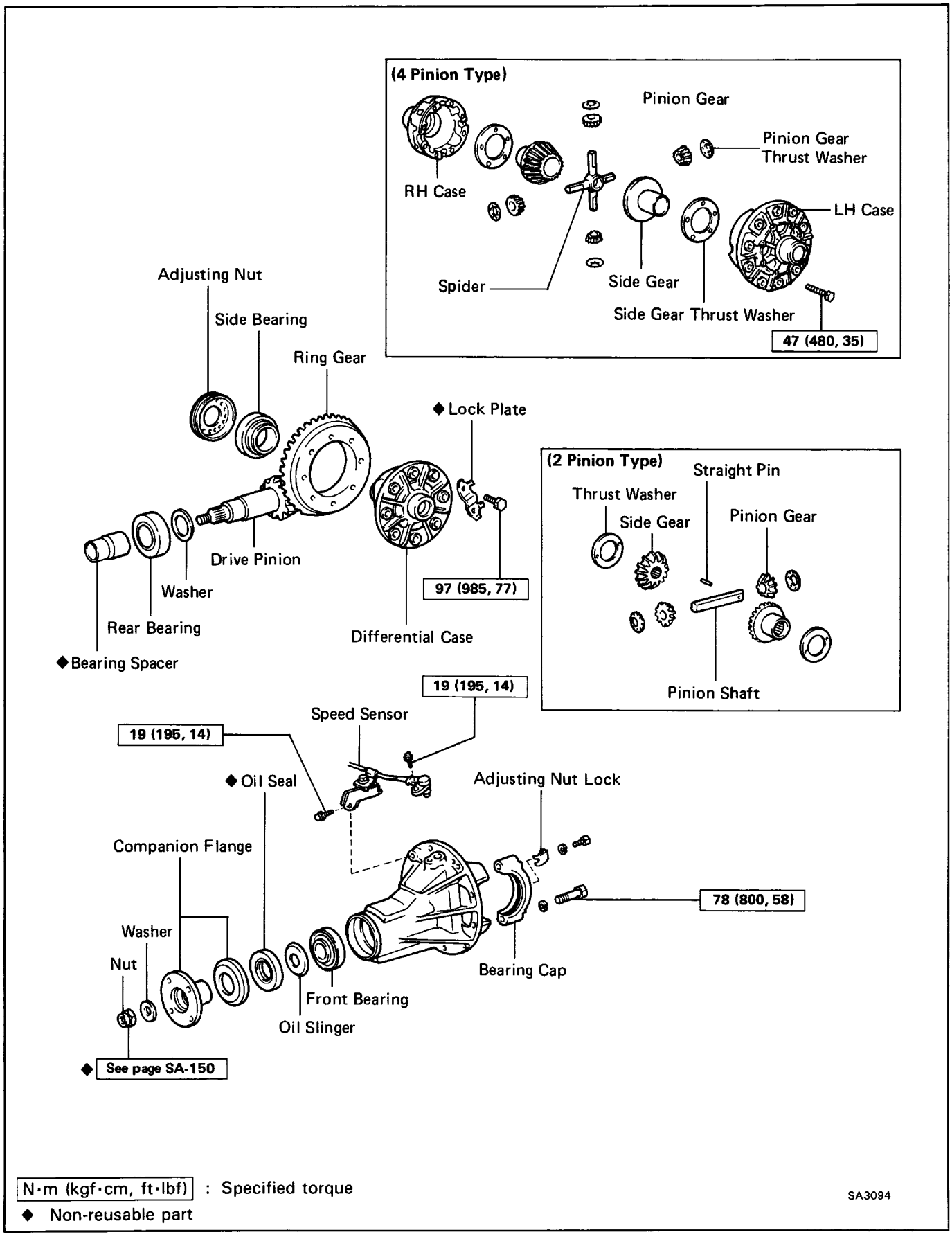
(k) Check that has no axle play.

6. INSTALL REAR AXLE SHAFT

(See page SA–128)

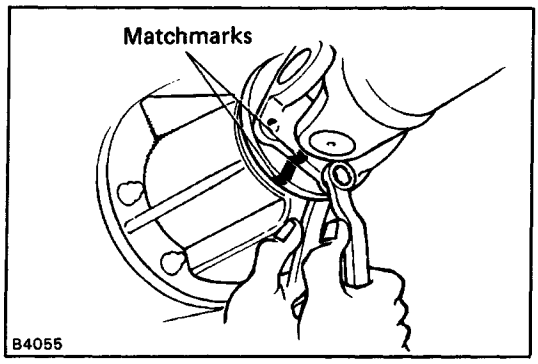
7. INSTALL WHEEL AND LOWER VEHICLE

DIFFERENTIAL
COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

SA3094



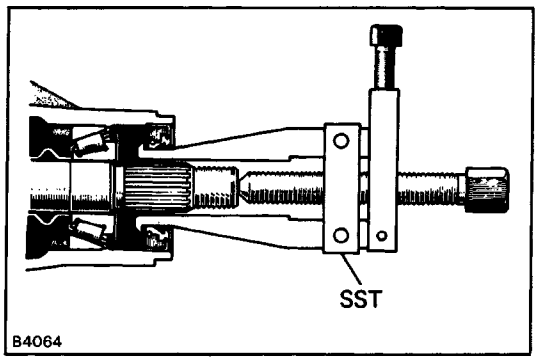
ON–VEHICLE REPLACEMENT OF OIL SEAL

1. DISCONNECT PROPELLER SHAFT FROM DIFFERENTIAL

(a) Place matchmarks on the flanges.
(b) Remove the four bolts and nuts.

2. REMOVE COMPANION FLANGE

(See step 7 on page SA–138)



3. REMOVE OIL SEAL AND OIL SLINGER

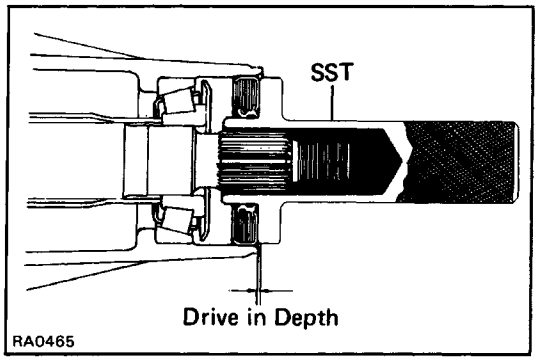
(a) Using SST, remove the oil sea! from the housing.
SST 09308–10010
(b) Remove the oil slinger.

4. REMOVE FRONT BEARING AND BEARING SPACER

(See step 9 on page SA–138)

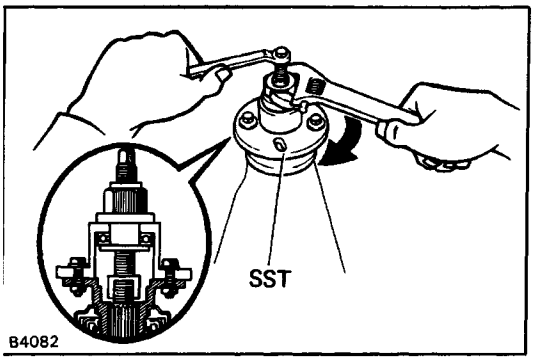
5. INSTALL NEW BEARING SPACER AND FRONT BEARING

(See step 12 on page SA–149)



6. INSTALL OIL SLINGER AND NEW OIL SEAL

(a) Install the oil slinger facing as shown.
(b) Using SST, drive in a new oil seal as shown.
SST 09554–30011
Oil seal drive in depth:
7.5 in. 1.5 mm (0.059 in.)
8 in. 1.0 mm (0.039 in.)
(c) Apply MP grease to the oil seal lip.



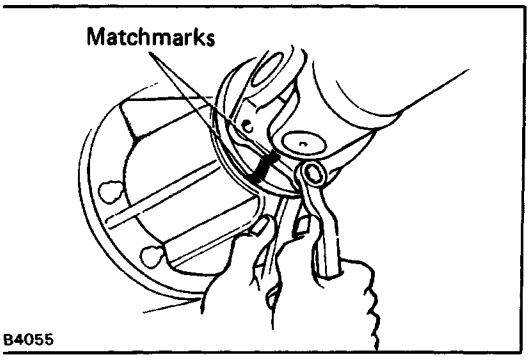
7. INSTALL COMPANION FLANGE

(See step 14 on page SA–149)

8. ADJUST DRIVE PINION BEARING PRELOAD

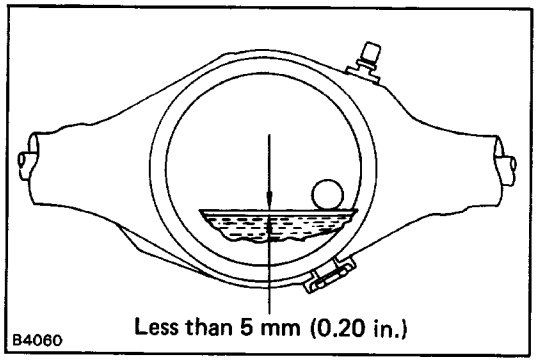
(See step 15 on page SA–150)

9. STAKE DRIVE PINION NUT



10. CONNECT PROPELLER SHAFT FLANGE TO COMPANION FLANGE

(a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.
(b) Torque the four bolts and nuts.
Torque: 4WD 3VZ–E [MT]
76 N–m (780 kgf–cm, 56 ft–lbf)
Ex. 4WD 3VZ–E [MT]
74 N–m (750 kgf–cm, 54 ft–lbf)



11. CHECK DIFFERENTIAL OIL LEVEL

Fill with hypoid gear oil if necessary.

Oil type: API GL–5 hypoid gear oil

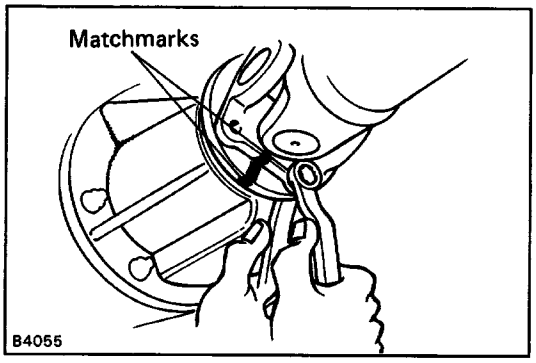
Viscosity: Above – 180C (0°F) SAE 90

Below – 180C (0°F) SAE 80V1r or 80w–90

Capacity:

liters (US qts, Imp. qts)

2W D	7.5 in.	2 pinion	1.35 (1.43, 1.19)
	8 in.	2 pinion	1.8 (1.9, 1.6)
		4 pinion	2.2 (2.3, 1.9)
4WD	8 in.	2 pinion	2.2 (2.3, 1.9)
		4 pinion	2.2 (2.3, 1.9)



REMOVAL OF DIFFERENTIAL

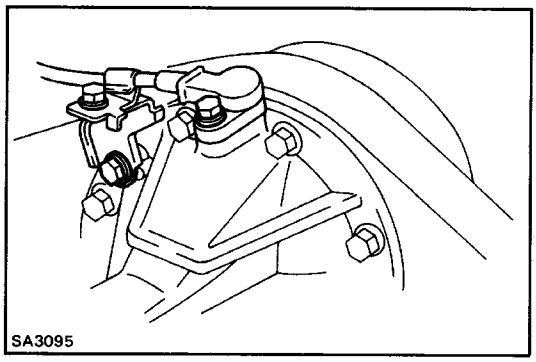
1. REMOVE DRAIN PLUG AND DRAIN DIFFERENTIAL OIL

2. REMOVE REAR AXLE SHAFTS

(See page SA–124 or SA–127)

3. DISCONNECT PROPELLER SHAFT FROM DIFFERENTIAL

(See page SA–135)



4. (wl REAR–WHEEL ANTI–LOCK BRAKE SYSTEM) DISCONNECT SPEED SENSOR

Remove the two bolts and the speed sensor.

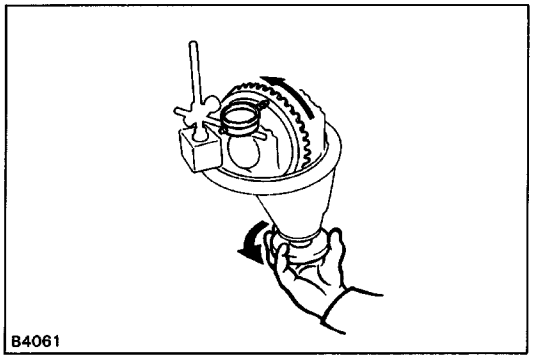
5. REMOVE DIFFERENTIAL CARRIER ASSEMBLY

DISASSEMBLY OF DIFFERENTIAL

(See page SA–134)

HINT: If the differential is noisy, perform the following preinspection before disassembly to determine the cause.

If the differential has severe problems, disassemble and repair it as necessary.



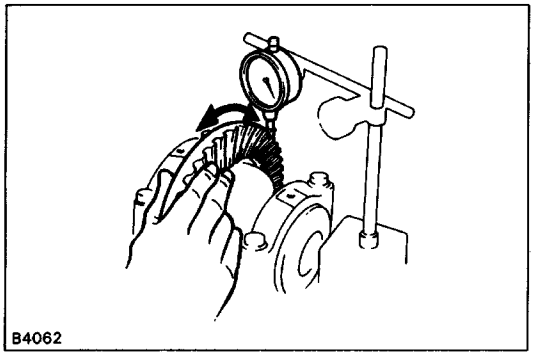
1. CHECK RING GEAR RUNOUT

If the runout is greater than maximum, install a new ring gear.

Maximum runout:

7.5 in. 0.07 mm (0.0028 in.)

8 in. 0.10 mm (0.0039 in.)



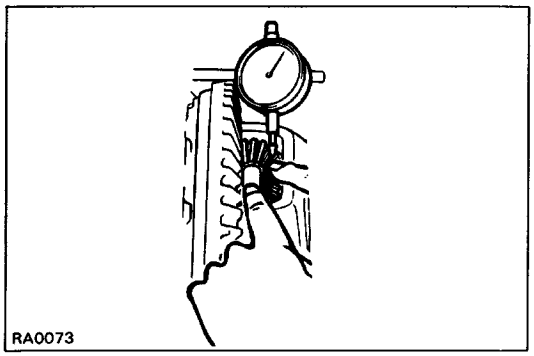
2. CHECK RING GEAR BACKLASH

If the backlash is not within specifications, adjust the side bearing preload or repair as necessary. (See step 8 on page SA–147)

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

3. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See step 9 on page SA–149)

Note the tooth contact position.



4. (2 PINION TYPE)

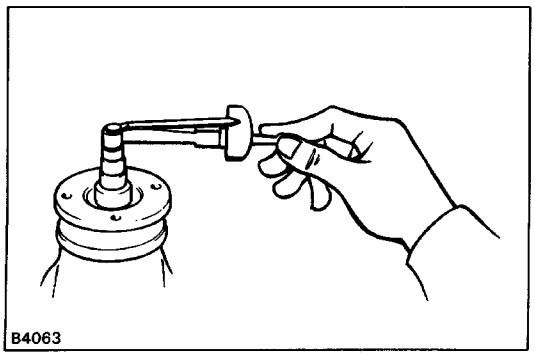
CHECK SIDE GEAR BACKLASH

Measure the side gear backlash while holding one pinion gear toward the case.

Standard backlash:

0.05 – 0.20 mm (0.0020 – 0.0079 in.)

If the backlash is not within specification, install the proper thrust washers.



5. MEASURE DRIVE PINION PRELOAD

Using a torque meter, measure the preload of backlash between the drive pinion and ring gear.

Preload (starting):

7.5 in.

0.6 – 1.0 N–m (6 – 10 kgf–cm, 5.2 – 8.7 in.–lbf)

8 in.

(2 pinion type)

0.9 – 1.3 N–m (9 – 13 kgf–cm, 7.8 – 11.3 in.–lbf)

(4 pinion type)

0.5 – 0.8 N–m (5 – 8 kgf–cm, 4.3 – 6.9 in.–lbf)

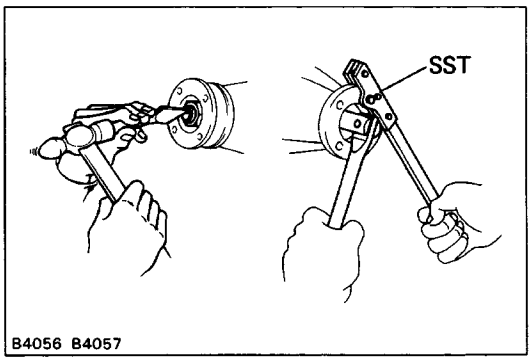
6. CHECK TOTAL PRELOAD

Using a torque meter, measure the total preload.

Total preload (starting):

Add drive pinion preload

0.4 – 0.6 N–m (4 – 6 kgf–cm, 3.5 – 5.2 in.–lbf)

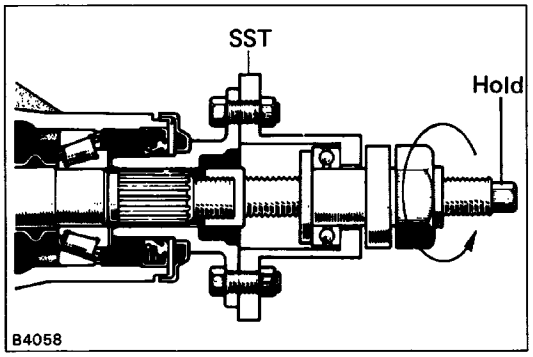


7. REMOVE COMPANION FLANGE

(a) Using a hammer and chisel, loosen the staked part of the nut.

(b) Using SST to hold the flange, remove the nut.

SST 09330–0002 1

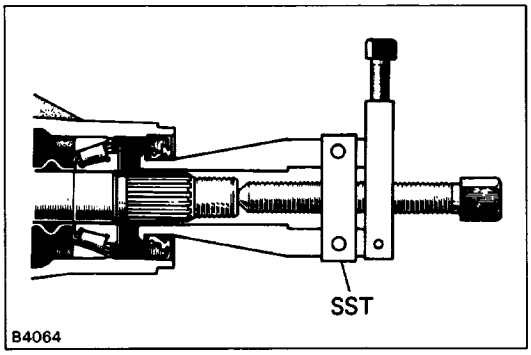


(c) Using SST, remove the companion flange.

SST 09557–22022

(7.5 in. 09557–22030)

(8 in. 09557–22050)

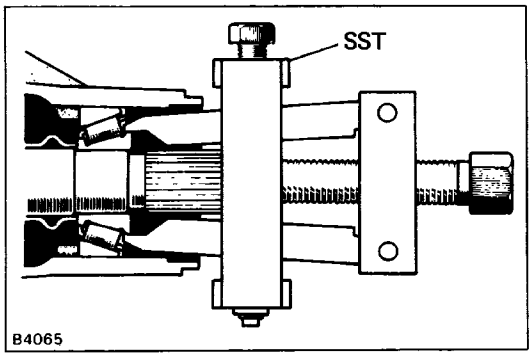


8. REMOVE OIL SEAL AND OIL SLINGER

(a) Using SST, remove the oil seal from the housing.

SST 09308–10010

(b) Remove the oil slinger.



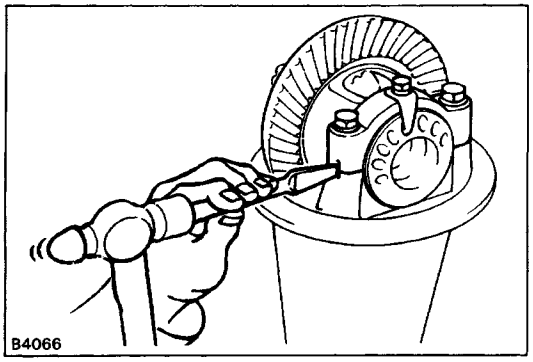
9. REMOVE FRONT BEARING AND BEARING SPACER

(a) Using SST, remove the front bearing from the drive pinion.

SST 09556–30010

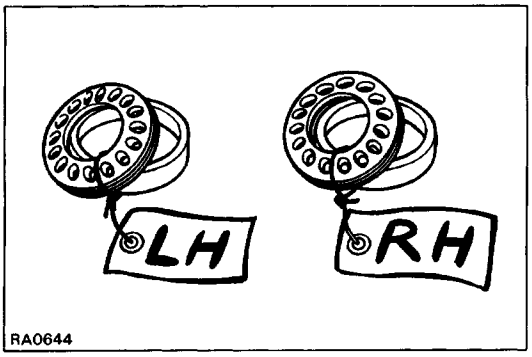
(b) Remove the bearing spacer.

If the front bearing is damaged or worn, replace the bearing.

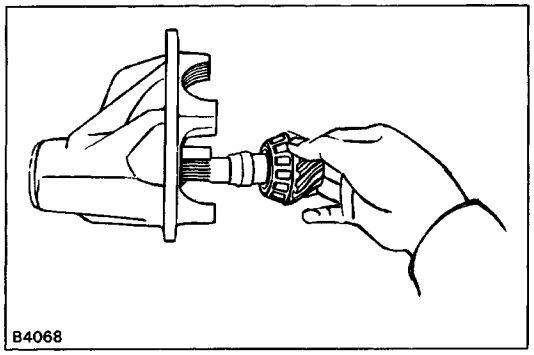


10. REMOVE DIFFERENTIAL CASE AND RING GEAR

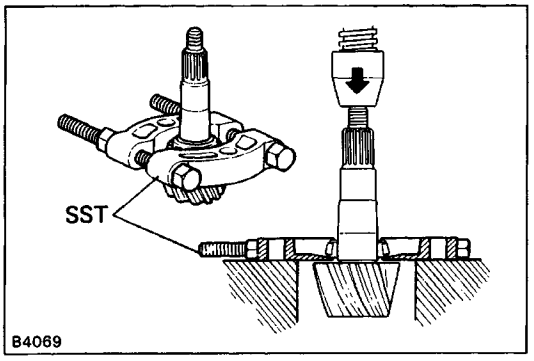
(a) Place matchmarks on the bearing cap and differen–tial carrier.
(b) Remove the two adjusting nut locks.
(c) Remove the two bearing caps and two adjusting nuts.
(d) Remove the bearing outer races.
(e) Remove the differential case from the carrier.



HINT: Tag the disassembled parts to show the location for reassembly.

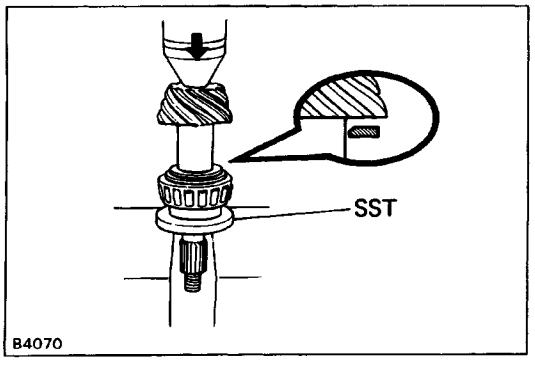


11. REMOVE DRIVE PINION FROM DIFFERENTIAL CARRIER

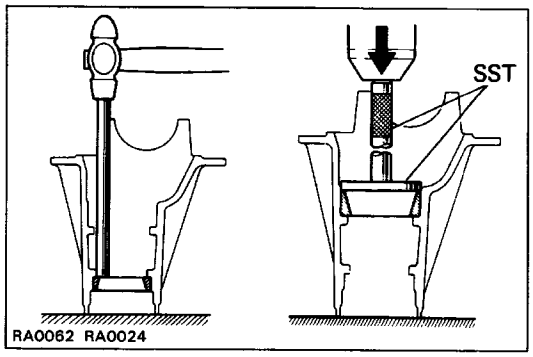


12. REPLACE DRIVE PINION REAR BEARING

(a) Using a press and SST, pull out the rear bearing from the drive pinion.
SST 09950–00020



(b) Install the washer on the drive pinion with the cham–fered end facing the pinion gear.
(c) Using a press and SST, press the reused washer and new rear bearing on the drive pinion.
SST 09506–30012



13. REPLACE DRIVE PINION FRONT AND REAR BEARING OUTER RACES

(a) Using a hammer and brass bar, drive out the outer race.

(b) Using a press and SST, drive in a new outer race.

SST

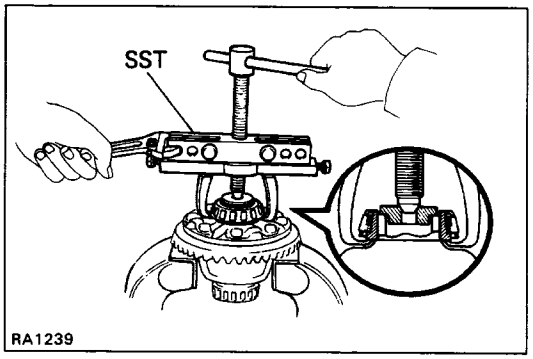
Front side 09608–35014 (09608–06020, 09608–06110)

Rear side

8 in. 4 pinion type

09608–35014 (09608–06020, 09608–06180)

Others 09608–35014 (09608–06020, 09608–06120)

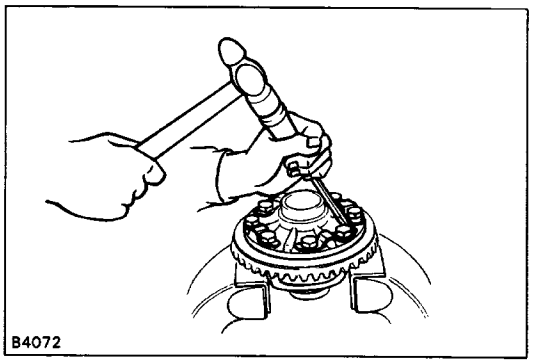


14. REMOVE SIDE BEARINGS FROM DIFFERENTIAL CASE

Using SST, pull the side bearing from the differential case.

SST 09950–20017

HINT: Fix the claws of SST to the notches in the differential case.

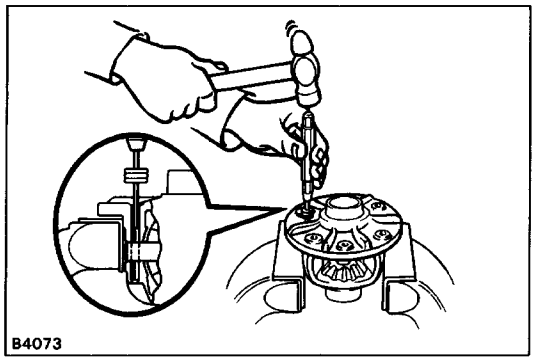


15. REMOVE RING GEAR

(a) Remove the ring gear set bolts and lock plates.

(b) Place alignment marks on the ring gear and differential case.

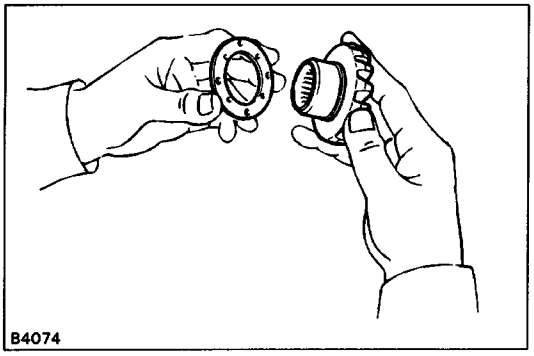
(c) Using plastic or copper hammer, tap on the ring gear to separate it from the differential case.


B4073

REPLACEMENT OF DIFFERENTIAL CASE COMPONENT PARTS
(2 Pinion Type)

1. DISASSEMBLE DIFFERENTIAL CASE

Using a hammer and punch, drive out the straight pin. Remove the pinion shaft, two pinion gears, two side gears and two thrust washers.


B4074

2. ASSEMBLE DIFFERENTIAL CASE

(a) Install the proper thrust washers and side gears.

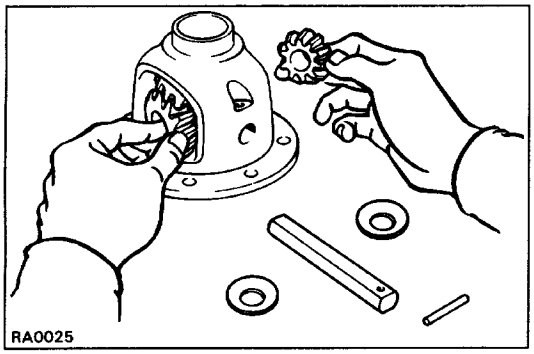
Using the table below, select thrust washers which will ensure that the backlash is within specification.

Try to select washers of the same size for both sides.

Standard backlash: 0.05 – 0.20 mm
(0.0020 – 0.0079 in.)

Thrust washer thickness

7.5 in.		8 in.	
Thickness	mm (in.)	Thickness	mm (in.)
1.0	(0.039)	1.6	(0.063)
1.1	(0.043)	1.7	(0.067)
1.2	(0.047)	1.8	(0.071)
1.3	(0.051)		

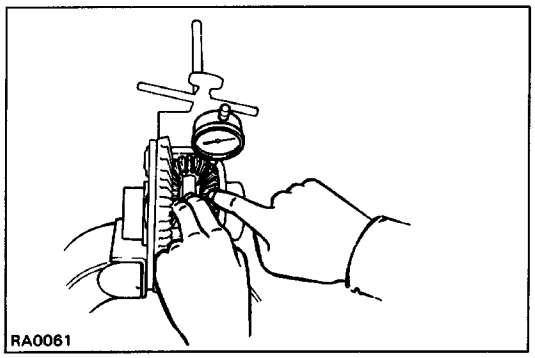

RA0025

Install thrust washers and side gears in the differential case.

(b) Check the side gear backlash.

Measure the side gear backlash while holding one pinion gear toward the case.

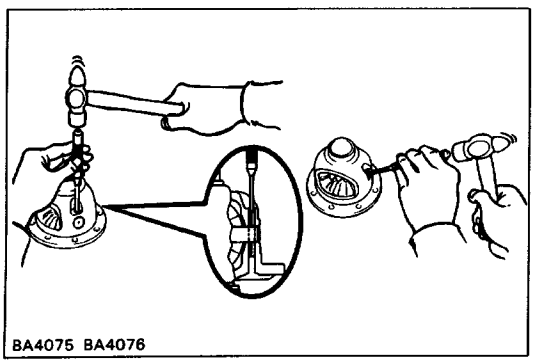
Standard backlash: 0.05 – 0.20 mm
(0.0020 – 0.0079 in.)

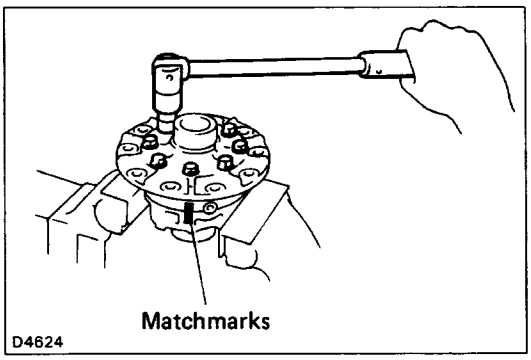

RA0061

If the backlash is not within specification, install a thrust washer of different thickness.

(c) Install the straight pin.

- Using the hammer and punch, drive the straight pin through the case and hole in the pinion shaft.
- Stake the pin and differential case.


BA4075 BA4076

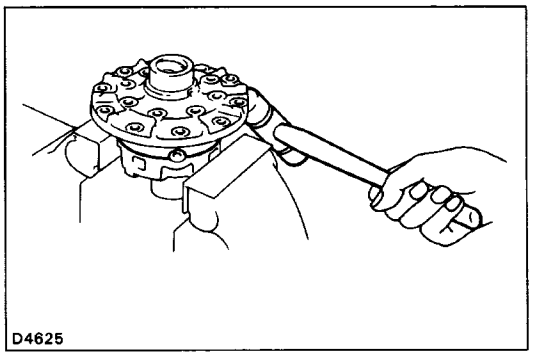


(4 Pinion Type)

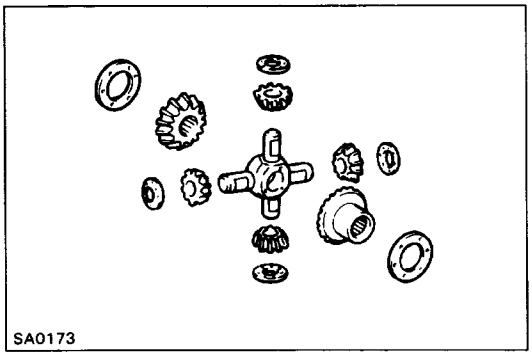
1. DISASSEMBLE DIFFERENTIAL CASE

(a) Place the matchmarks on the LH and RH cases.

(b) Remove the eight bolts.

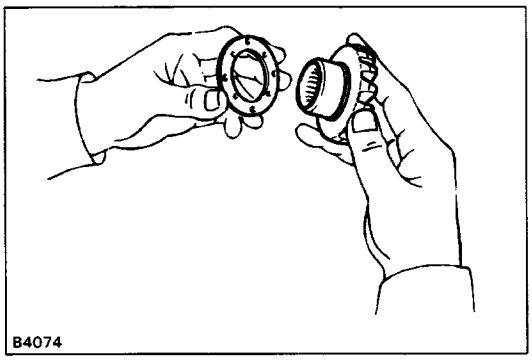


(c) Using a plastic hammer, separate the LH and RH cases.



2. REMOVE FOLLOWING PARTS FROM CASE:

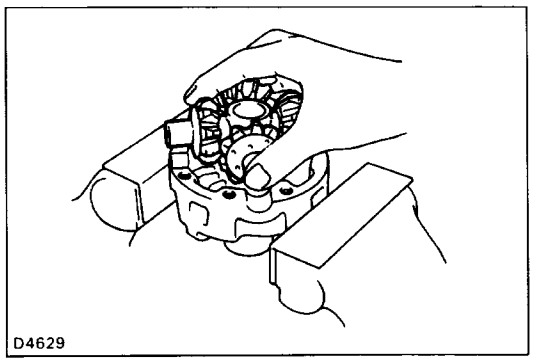
- Two side gears
- Two side gears thrust washers
- Spider
- Four pinion gears
- Four pinion gear thrust washers



3. MEASURE SIDE GEAR BACKLASH

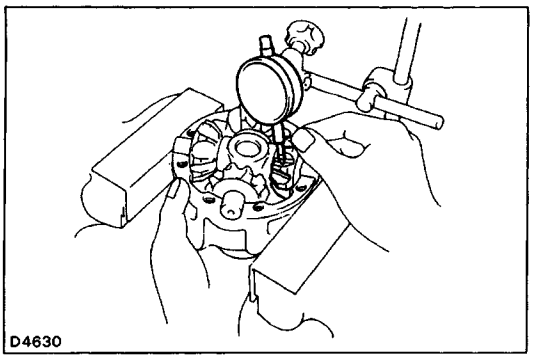
(a) Install the thrust washer to the side gear.

(b) Install the side gear to the RH case.



(c) Install the four pinion gears and thrust washers tc the spider.

(d) Install the pinion gear and spider to the RH case.



(e) Hold the side gear, measure the side gear backlash.
Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

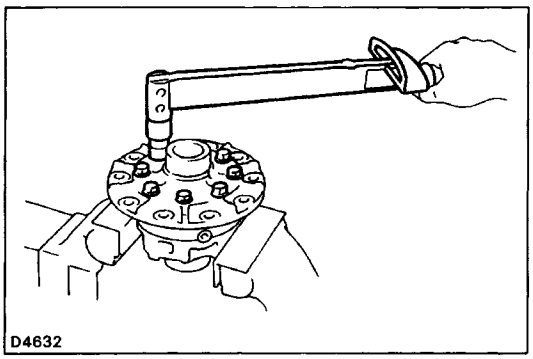
HINT: Measure the backlash at the RH case at the LH case.

(f) If the backlash is not within specification, install a thrust washer of a different thickness.
HINT: Use washer of the same thickness on both the right and left sides.

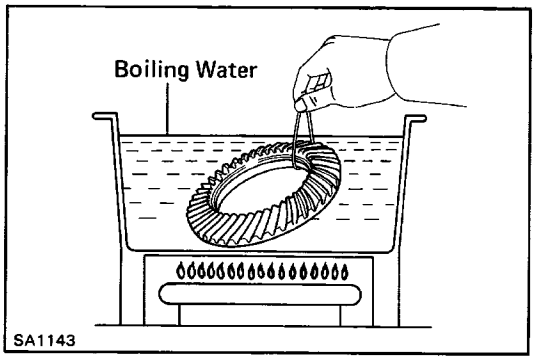
Thickness mm (in.)			
0.9	(0.035)	1.2	(0.047)
1.0	(0.039)	1.3	(0.051)
1.1	(0.043)		

4. ASSEMBLE DIFFERENTIAL CASE

(a) Install the side gear and thrust washer to the RH case.
(b) Install the pinion gears and spider to the RH case.
(c) Install the side gear and thrust washer to the LH case.
(d) Apply gear oil to the each parts.



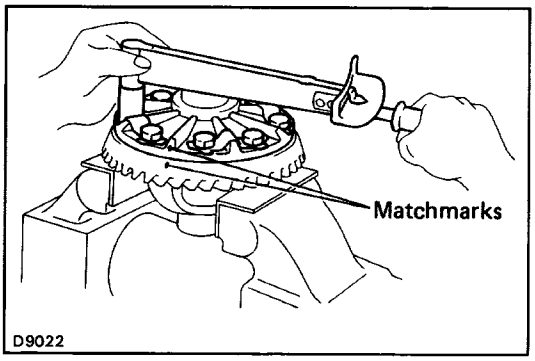
(e) Align the matchmarks on the LH and RH case.
(f) Torque the eight bolts.
Torque: 47 N–m (480 kgf–cm, 35 ft–lbf)



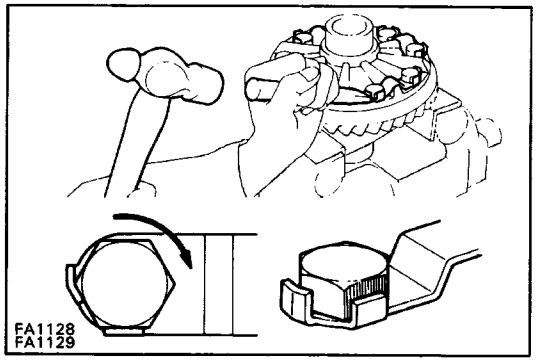
ASSEMBLY OF DIFFERENTIAL

1. INSTALL RING GEAR ON DIFFERENTIAL CASE

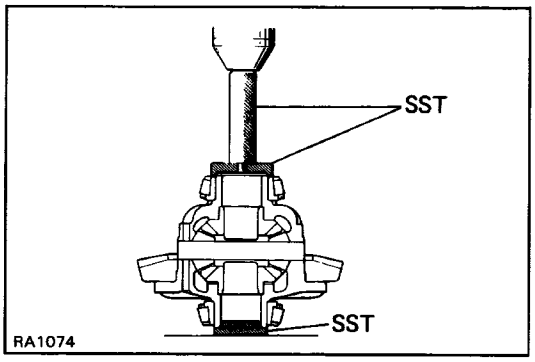
(a) Clean the contact surfaces of the differential case and ring gear.
(b) Heat the ring gear in boiling water.
(c) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differential case.



(d) Align the matchmarks on the ring gear and differential case.
(e) Coat the ring gear set bolts with gear oil.
(f) Temporarily install the lock plates and set bolts.
(g) After the ring gear cools down enough, tighten the set bolts uniformly and a little at a time.
Torque: 97 N–m (985 kgf–cm, 71 ft–lbf)

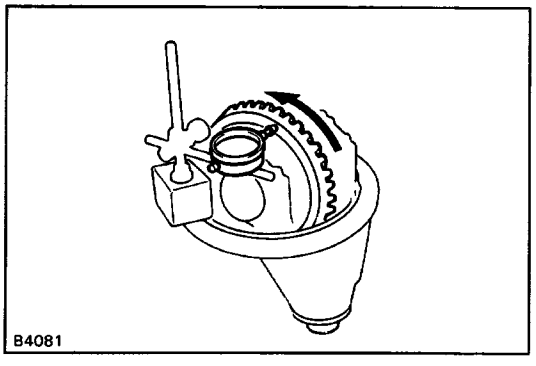


(h) Using a hammer and drift punch, stake the lock plates.
HINT: Stake one claw flush with the flat surface of the bolt. For the claw contacting the protruding portion of the bolt, stake only the half on the tightening side.



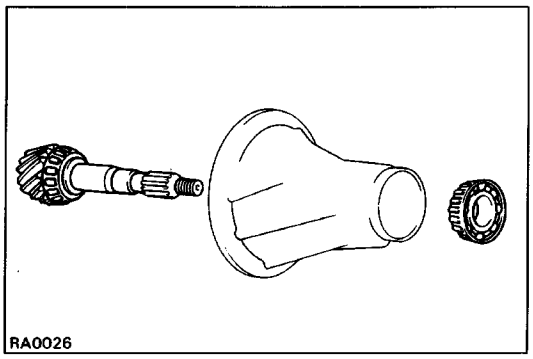
2. INSTALL SIDE BEARINGS

Using a press and SST, press the side bearings on the differential case.
SST 09550–10012
(09252–10010, 09557–10010, 09558–10010)



3. CHECK RING GEAR RUNOUT

(a) Install the differential case onto the carrier and tighten the adjusting nut just to where there is no play in the bearings.
(b) Check the ring gear runout.
Maximum runout:
7.5 in. 0.07 mm (0.0028 in.)
8 in. 0.10 mm (0.0039 in.)

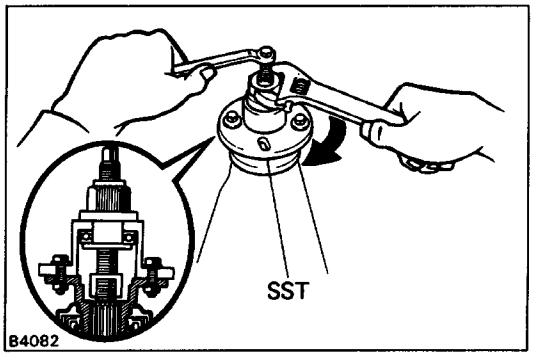


4. TEMPORARILY ADJUST DRIVE PINION PRELOAD

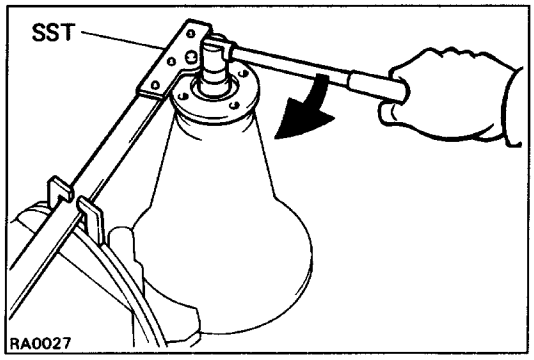
(a) Install the following parts.

- Drive pinion
- Front bearing

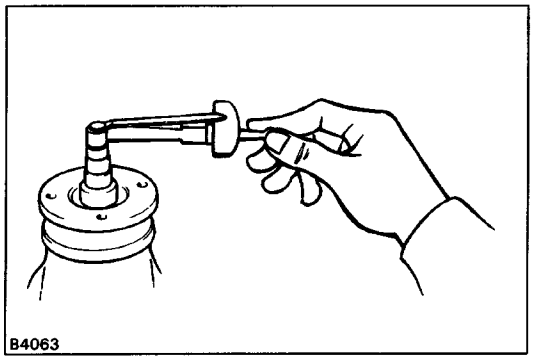
HINT: Assemble the spacer, oil slinger and oil seal after adjusting the gear contact pattern.



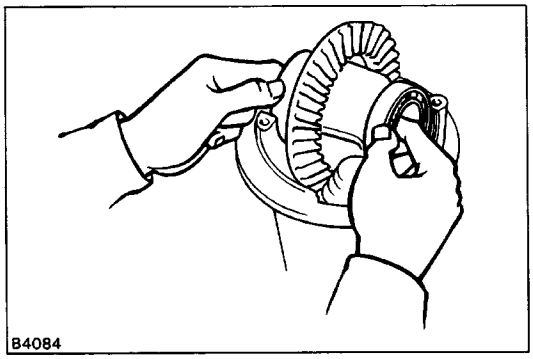
(b) Install the companion flange with SST.
SST 09557–22022
(7.5 in. 09557–22030)
(8 in. 09557–22050)



(c) Adjust the drive pinion preload by tightening the companion flange nut.
Using SST to hold the flange, tighten the nut.
SST 09330–00021
NOTICE: As there is no spacer, tighten a little at a time, being careful not to overtighten.



(d) Using a torque meter, measure the preload.
Preload (starting):
New bearing
7.5 in.
1.2 – 1.9 N –m
(12 – 19 kgf–cm, 10.4 – 16.5 in. –lbf)
8 in.
(2 pinion type)
1.9 – 2.5 N–m
(19 – 25 kgf–cm, 16.5 – 22.6 in. –lbf)
(4 pinion type)
1.0 – 1.6 W
(10 – 16 kgf–cm, 8.7 – 13.9in. –lbf)
Reused bearing
7.5 in.
0.6 – 1.0 N–m
(6 – 10 kgf–cm, 5.2 – 8.7 in. –lbf)
8 in.
(2 pinion type)
0.9 – 1.3 N –m
(9 – 13 kgf– cm, 7.8 – 11.3 in.–lbf)
(4 pinion type)
0.5 – 0.8 N–
(5 – 8 kgf –cm, 4.3 – 6.9 in. –lbf)

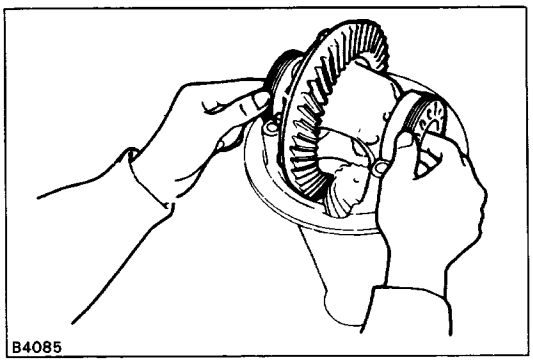


5. INSTALL DIFFERENTIAL CASE IN CARRIER

(a) Place the bearing outer races on their respective bearings. Make sure the left and right outer races are not interchanged.

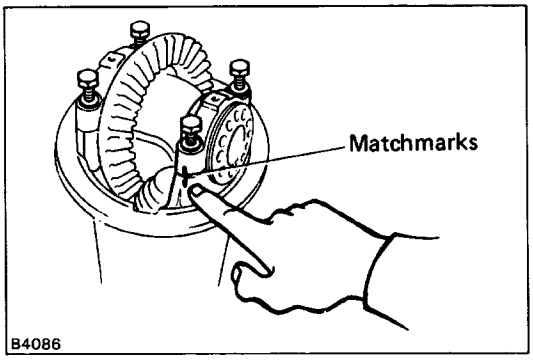
(b) Install the case in the carrier.

HINT: Make sure that there is backlash between the ring gear and drive pinion.



6. INSTALL ADJUSTING NUTS

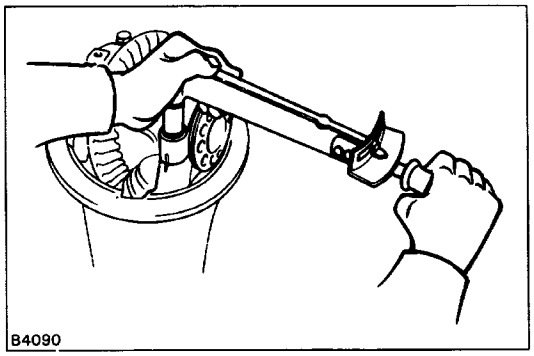
Install the adjusting nuts on the carrier, making sure the nuts are threaded properly.



7. INSTALL BEARING CAPS

Align the matchmarks on the cap and carrier. Screw in the two bearing cap bolts two or three turns and press down the bearing cap by hand.

HINT: If the bearing cap does not fit tightly on the carrier, the adjusting nuts are not threaded properly. Reinstall the adjusting nuts if necessary.

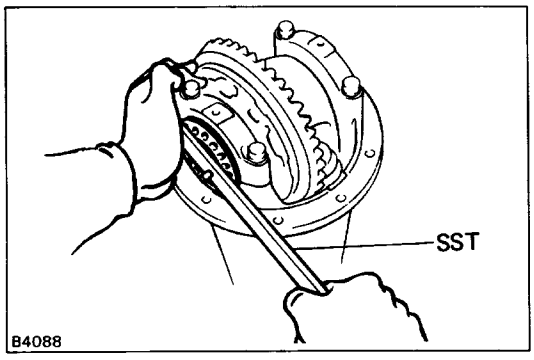


8. ADJUST SIDE BEARING PRELOAD

(a) Tighten the four bearing cap bolts to the specified torque, then loosen them to the point where they can be turned by hand.

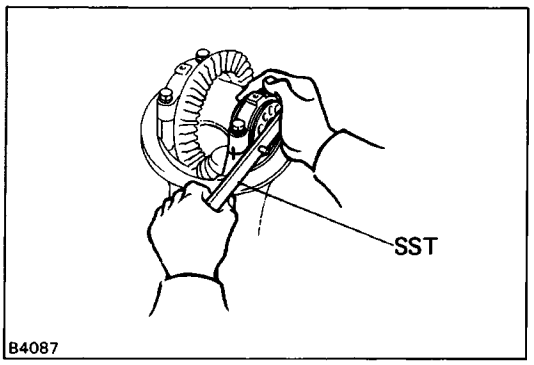
Torque: 78 N–m (800 kgf–cm, 58 ft–lbf)

(b) Fully tighten the four bearing cap bolts by hand.

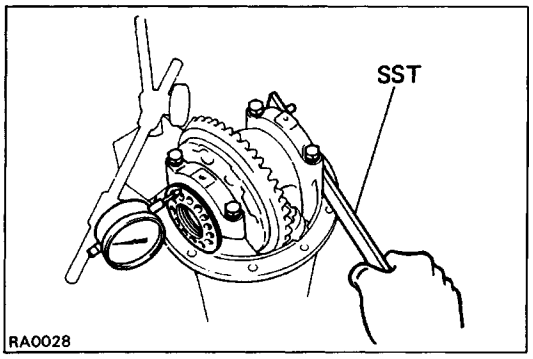


(c) Using SST, tighten the adjusting nut on the ring gear side until the ring gear has a backlash of about 0.2 mm (0.008 in.)

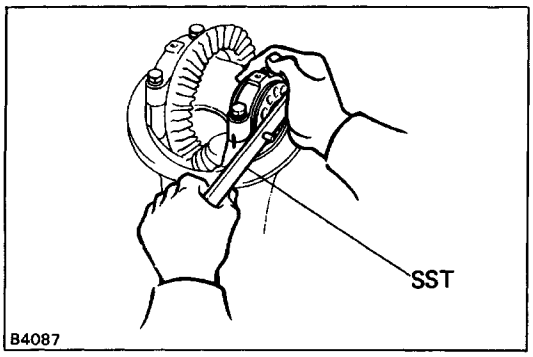
SST 09 504–00011



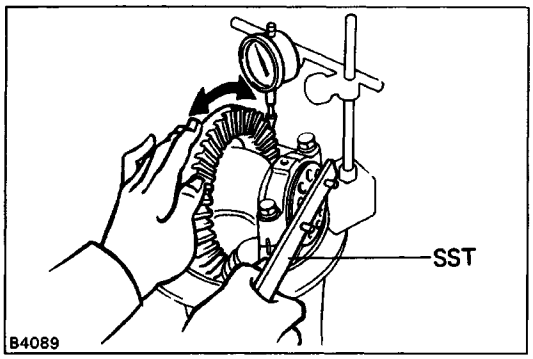
(d) While turning the ring gear, use SST to fully tighten the adjusting nut on the drive pinion side. After the bearings are settled, loosen the adjusting nut on the drive pinion side.
SST 09504–00011



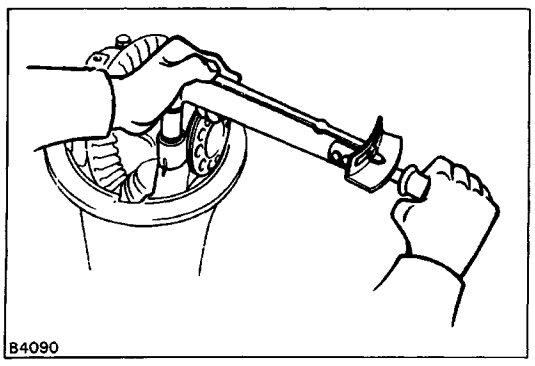
(e) Place a dial indicator on the top of the adjusting nut on the ring gear side.
(f) Adjust the side bearing for zero preload by tightening the other adjusting nut until the pointer on the indicator begins to move.



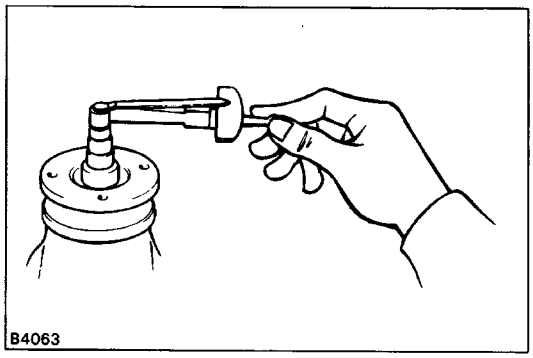
(g) Tighten the adjusting nut 1 – 1'l2 notches from the zero preload position.



(h) Using a dial indicator, adjust the ring gear backlash until it is within specification.
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)
HINT: The backlash is adjusted by turning the left and right adjusting nuts equal amounts. For example, loosen the nut on the left side one notch and tighten the nut on the right side one notch.



(i) Torque the bearing cap bolts.
Torque: 78 N–m (800 kgf–cm, 58 ft–lbf)
(j) Recheck the ring gear backlash.
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)


B4063

(k) Using a torque meter, measure the total preload.

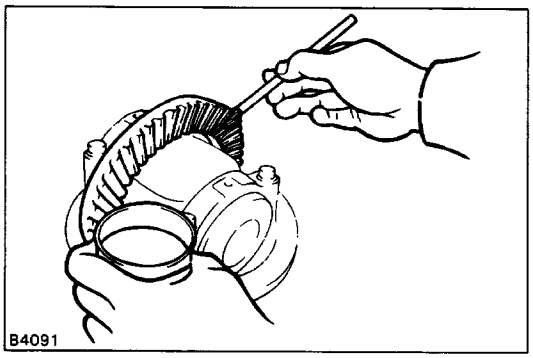
Total preload (starting):

Add drive pinion preload

0.4 – 0.6 N–m

(4 – 6 kgf –cm, 3.5 – 5.2 in.–lbf)

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

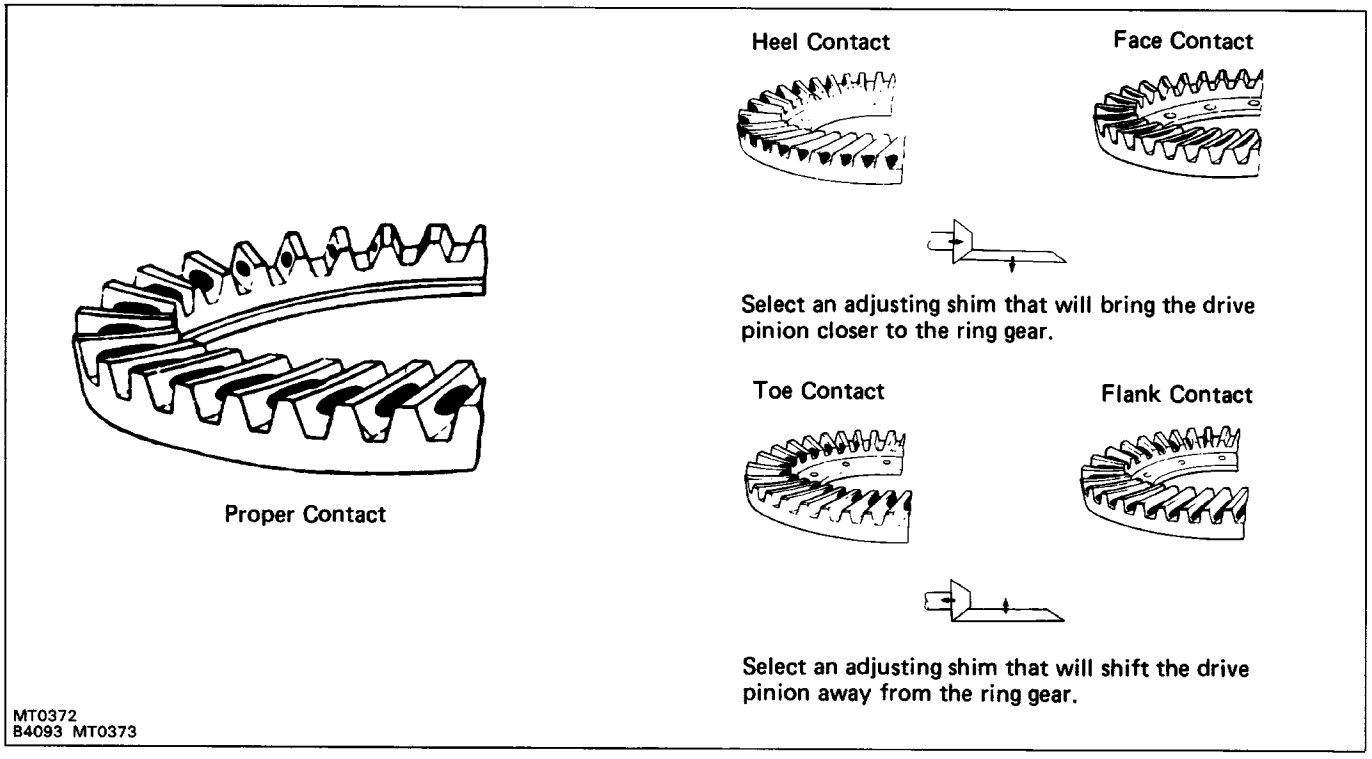

B4091

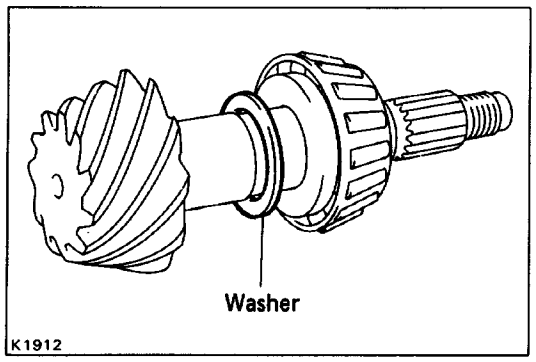
9. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

(a) Coat 3 or 4 teeth at three different positions on the ring gear with red lead.

(b) Hold the companion flange firmly and rotate the ring gear in both directions.

(c) Inspect the tooth pattern.

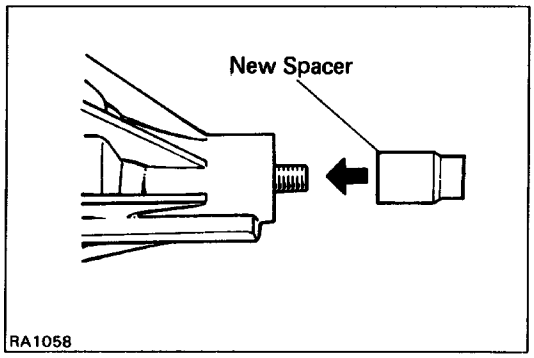




If the teeth are not contacting properly, use the following chart to select a proper washer for correction.

Washer thickness

7.5 in.		8 in.	
Thickness	mm (in.)	Thickness	mm (in.)
2.24	(0.0882)	1.70	(0.0669)
2.27	(0.0894)	1.73	(0.0681)
2.30	(0.0906)	1.76	(0.0693)
2.33	(0.0917)	1.79	(0.0705)
2.36	(0.0929)	1.82	(0.0717)
2.39	(0.0941)	1.85	(0.0728)
2.42	(0.0953)	1.88	(0.0740)
2.45	(0.0965)	1.91	(0.0752)
2.48	(0.0976)	1.94	(0.0764)
2.51	(0.0988)	1.97	(0.0776)
2.54	(0.1000)	2.00	(0.0787)
2.57	(0.1012)	2.03	(0.0799)
2.60	(0.1024)	2.06	(0.0811)
2.63	(0.1035)	2.09	(0.0823)
2.66	(0.1047)	2.12	(0.0835)
2.69	(0.1059)	2.15	(0.0846)
2.72	(0.1071)	2.18	(0.0858)
		2.21	(0.0870)
		2.24	(0.0882)
		2.27	(0.0894)
		2.30	(0.0906)
		2.33	(0.0917)



10. REMOVE COMPANION FLANGE

(See step 7 on page SA–138)

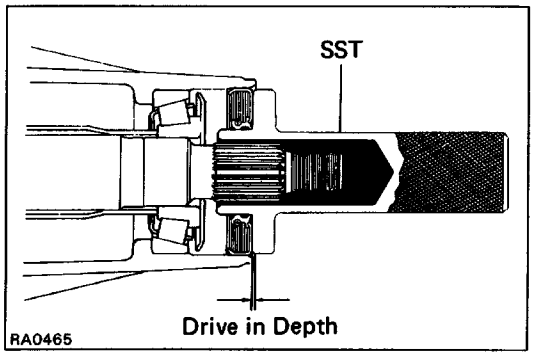
11 REMOVE FRONT BEARING

(See step 9 on page SA–138)

12. INSTALL NEW BEARING SPACER AND FRONT BEARING

(a) Install a new bearing spacer on the shaft.

(b) Install the front bearing on the shaft.



13. INSTALL OIL SLINGER AND NEW OIL SEAL

(a) Install the oil slinger facing as shown.

(b) Using SST, drive in a new oil seal as shown.

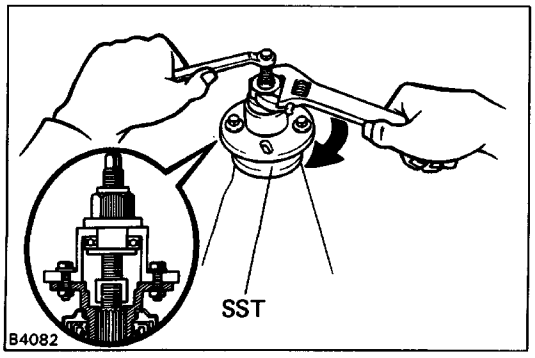
SST 09554–30011

Oil seal drive in depth:

7.5 in. 1.5 mm (0.059 in.)

8 in. 1.0 mm (0.039 in.)

(c) Apply MP grease to the oil seal lip.



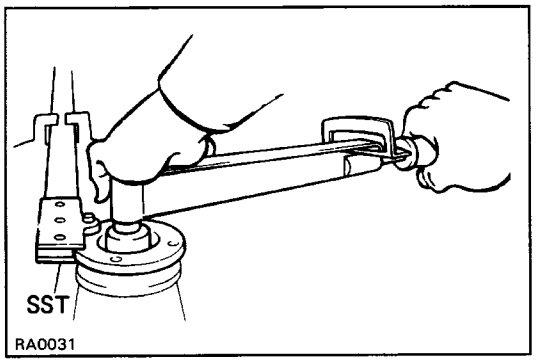
14. INSTALL COMPANION FLANGE

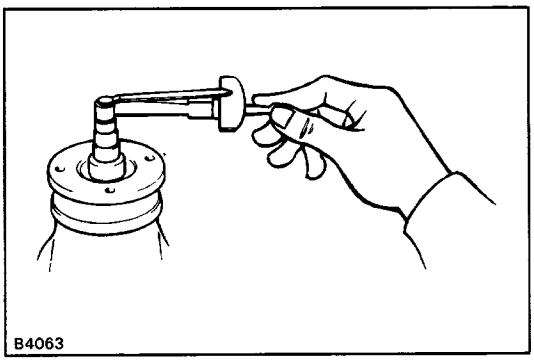
(a) Install the companion flange with SST.

SST 09557–22022

(7.5 in. 09557–22030)

(8 in. 09557–22050)





(b) Coat the threads of a new nut with MP grease.

(c) Using SST to hold the flange, tighten the nut.

SST 09330–00021

Torque:

7.5 in.

108 N–m (1,100 kgf–cm, 80 ft–lbf)

8 in.

196 N–m (2,000 kgf–cm, 145 ft–lbf)

15. ADJUST DRIVE PINION PRELOAD

Using a torque meter, measure the preload of the back–lash between the drive pinion and ring gear.

Preload (starting):

New bearing

7.5 in.

1.2 – 1.9 N–m

(12 – 19 kgf–cm, 10.4 – 16.5 in.–lbf)

8 in.

(2 pinion type)

1.9 – 2.5 N–m

(19 – 26 kgf–cm, 16.5 – 22.6–lbf)

(4 pinion type)

1.0 – 1.6 N–m

(10 – 16 kgf–cm, 8.7 – 13.9 in.–lbf)

Reused bearing

7.5 in.

0.6 – 1.0 N–m

(6 – 10 kgf–cm, 5.2 – 8.7 in.–lbf)

8 in.

(2 pinion type)

0.9 – 1.3 N–m

(9 – 13 kgf–cm, 7.8 – 11.3 in.–lbf)

(4 pinion type)

0.5 – 0.8 N–m

(5 – 8 kgf –cm, 4.3 – 6.9 in.–lbf)

(a) If preload is greater than specification, replace the bearing spacer.

(b) If preload is less than specification, retighten the nut 13 N–m (130 kgf–cm, 9 ft–lbf) a little at a time until the specified preload is reached.

Maximum torque:

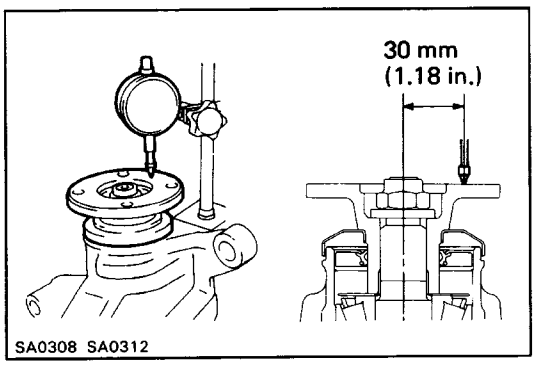
7.5 in.

235 N–m (2,400 kgf–cm, 174 ft–lbf)

8 in.

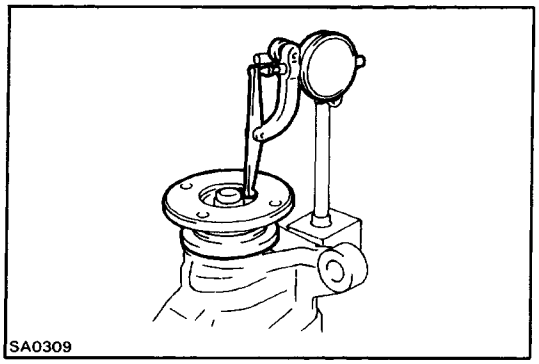
343 N–m (3,500 kgf–cm, 253 ft–lbf)

If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload procedure. Do not back off the pinion nut to reduce the preload.

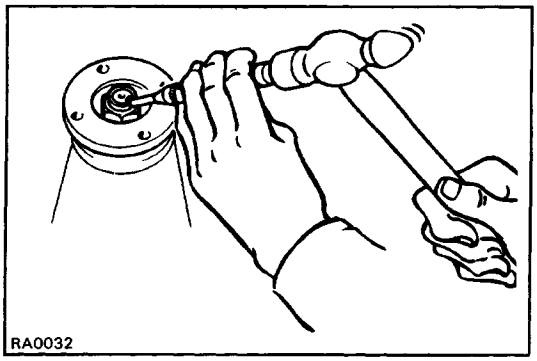


16. CHECK RUNOUT OF COMPANION FLANGE

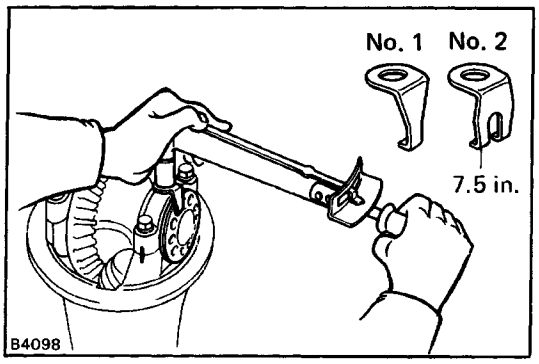
Maximum vertical runout: 0.10 mm (0.0039 in.)



Maximum lateral runout: 0.10 mm (0.0039 in.)



17. STAKE DRIVE PINION NUT



18. INSTALL ADJUSTING NUT LOCKS

(a) (7.5 in.)

Select either a lock No. 1 or No. 2, whichever will fit the adjusting nuts.

(b) Install the lock on the bearing caps.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

INSTALLATION OF DIFFERENTIAL

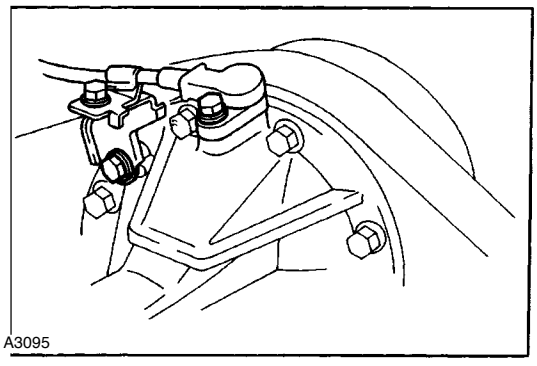
(See page SA–134)

1. INSTALL A NEW GASKET

2. INSTALL DIFFERENTIAL CARRIER ASSEMBLY

Install the differential carrier assembly in the axle and install the 10 nuts. Torque the nuts.

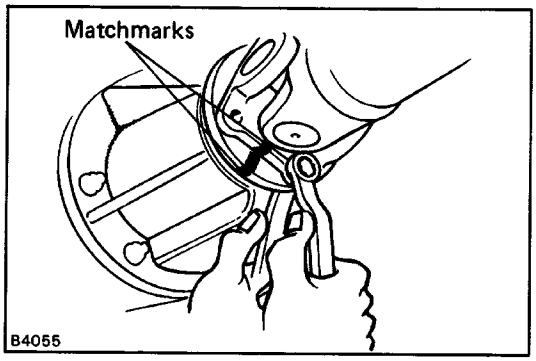
Torque: Single tire 25 N–m (250 kgf–cm, 18 ft–lbf)
Double tire 31 N–m (315 kgf–cm, 23 ft–lbf)

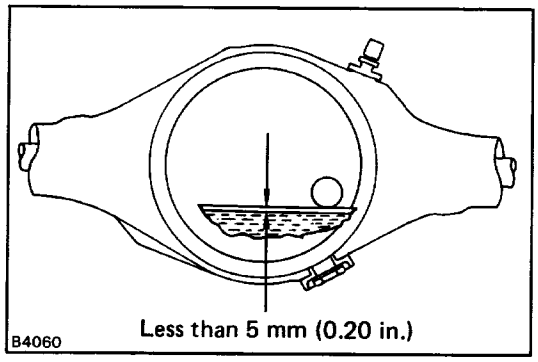


3. (w/ REAR–WHEEL ANTI–LOCK BRAKE SYSTEM) CONNECT SPEED SENSOR

Connect the speed sensor with the two bolts.

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)





4. CONNECT PROPELLER SHAFT FLANGE TO COMPANION FLANGE

(a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.

(b) Torque the bolts and nuts.

Torque: 4WD 3VZ–E [MT]
76 N–m (780 kgf–cm, 56 ft–lbf)
Ex. 4WD 3VZ–E [MT]
74 N–m (750 kgf–cm, 54 ft–lbf)

5. INSTALL DRAIN PLUG AND FILL DIFFERENTIAL WITH GEAR OIL

Oil type: APL GL–5 hypoid gear oil
Viscosity: Above – 180C (0°F) SAE 90
Below – 180C (0° F)
SAE 80w or 80W–90

Capacity:

liters (US qts, Imp. qts)

2W D	7.5 in.	2 pinion	1.35 (1.43, 1.19)
	8 in.	2 pinion	1.8 (1.9, 1.6)
		4 pinion	2.2 (2.3, 1.9)
4WD	8 in.	2 pinion	2.2 (2.3, 1.9)
		4 pinion	2.2 (2.3, 1.9)

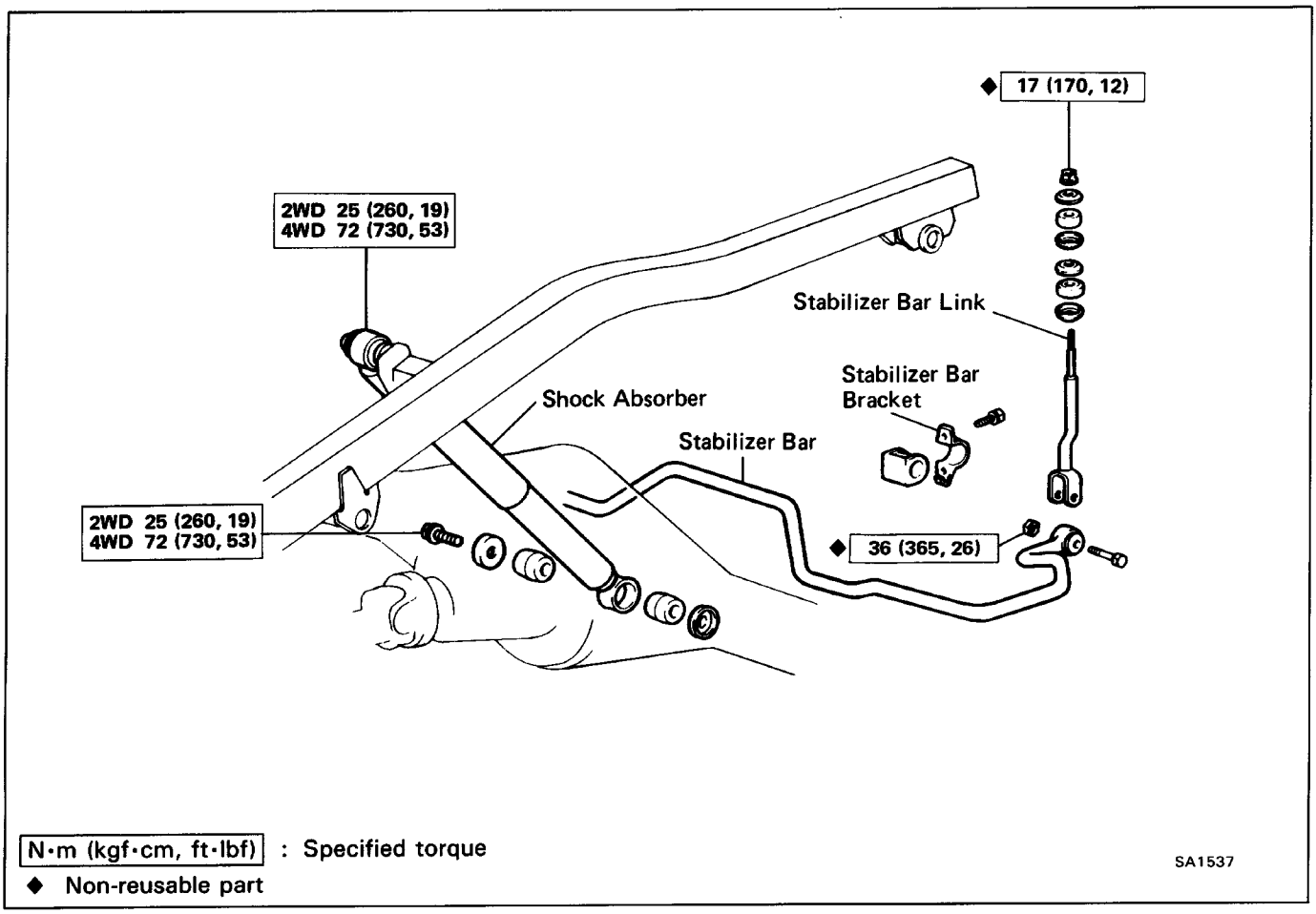
Torque the filler plug.

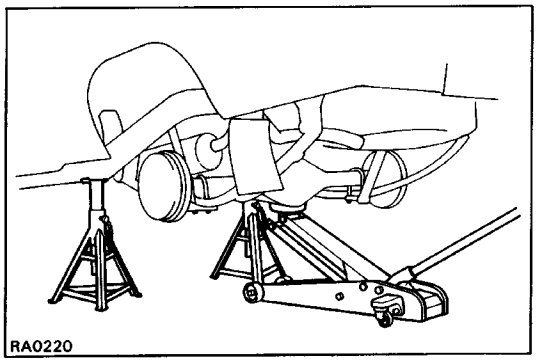
Torque: 49 N–m (500 kgf–cm, 36 ft–lbf)

REAR SUSPENSION

Shock Absorber

COMPONENTS



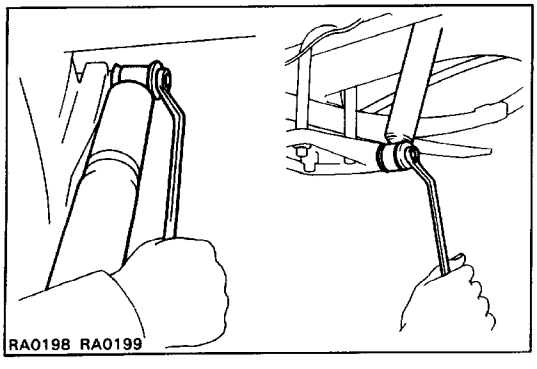


REMOVAL OF SHOCK ABSORBER

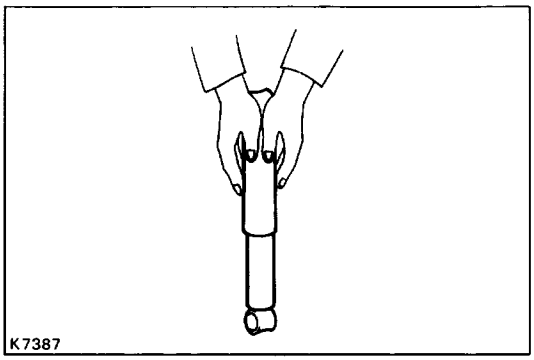
1. JACK UP AND SUPPORT BODY

(a) Jack up and support the body on stands.

(b) Lower the axle housing until the leaf spring tension is free, and keep it at this position.



2. REMOVE SHOCK ABSORBER



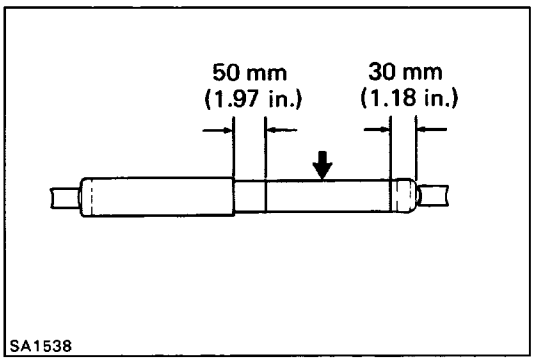
INSPECTION OF SHOCK ABSORBER

1. INSPECT SHOCK ABSORBER

Compress and extend the shock absorber and check that there is no abnormal resistance or unusual operation sounds.

If there is any abnormality, replace the shock absorber with new one.

NOTICE: When discarding the shock absorber, use the following procedure.



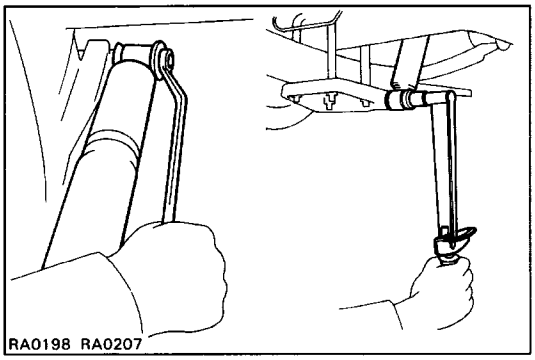
DISPOSAL OF SHOCK ABSORBER

1. FULLY EXTEND SHOCK ABSORBER

2. DRILL HOLE TO REMOVE GAS FROM CYLINDER

Using a drill, make a hole in the cylinder as shown to remove the gas inside.

CAUTION: The gas coming out is harmless, but be careful of chips which may fly up when drilling.



INSTALLATION OF SHOCK ABSORBER

INSTALL REAR SHOCK ABSORBER

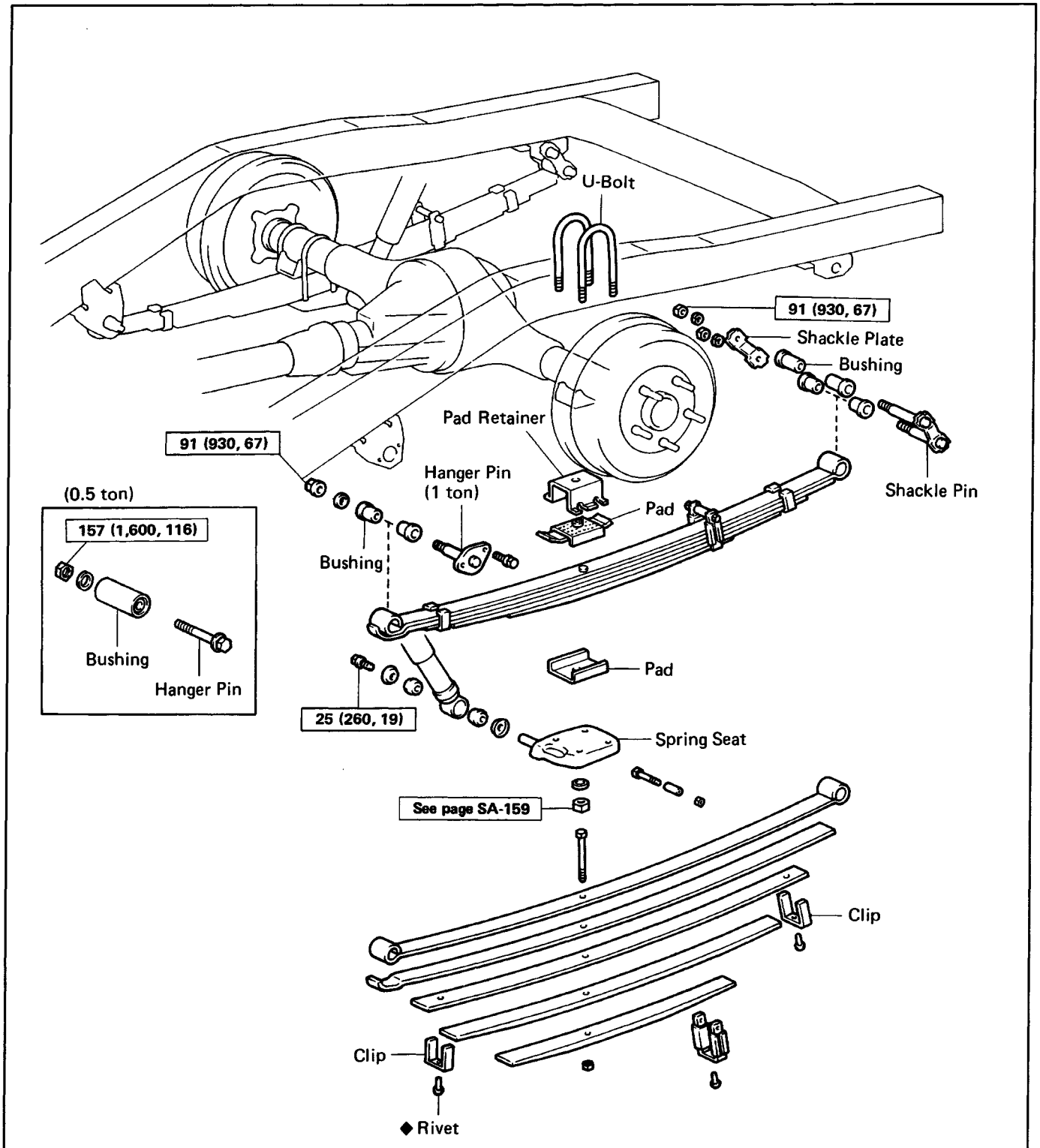
(a) Connect the shock absorber to the frame with the bolt. Tighten the bolt.

Torque: 2WD 25 N–m (260 kgf–cm, 19 ft–lbf)
4WD 72 N–m (730 kgf–cm, 53 ft–lbf)

(b) Connect the shock absorber to the spring seat with the bolt. Tighten the bolt.

Torque: 2WD 25 N–m (260 kgf–cm. 19 ft–lbf)
4WD 72 N–m (730 kgf–cm. 53 ft–lbf)

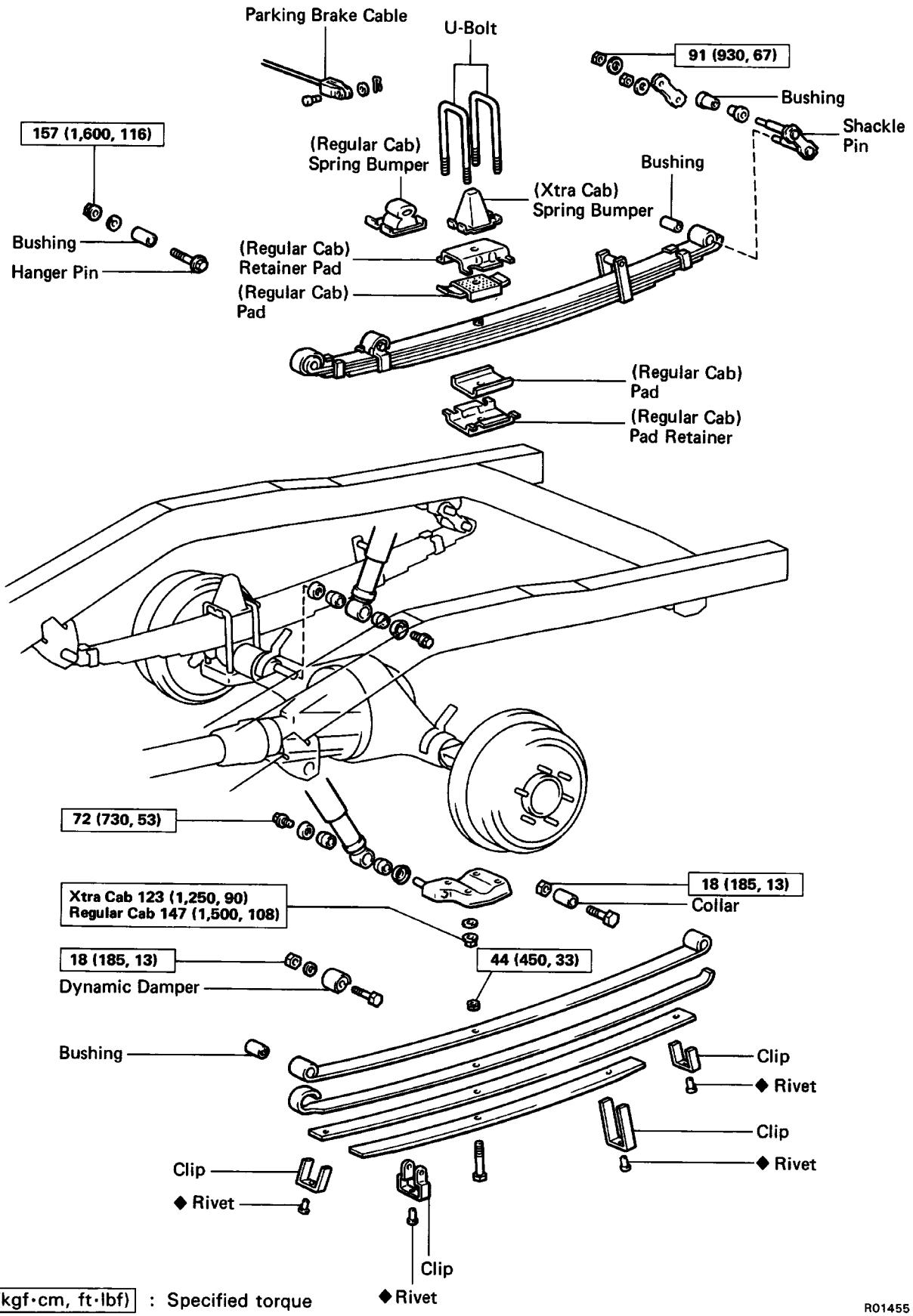
Leaf Spring
COMPONENTS

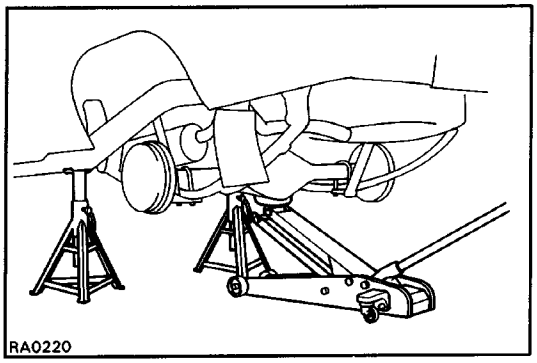


N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part

SA1542

COMPONENTS


Parking Brake Cable
U-Bolt
91 (930, 67)
Bushing
Shackle Pin
157 (1,600, 116)
(Regular Cab) Spring Bumper
Bushing
(Xtra Cab) Spring Bumper
Bushing
Hanger Pin
(Regular Cab) Retainer Pad
(Regular Cab) Pad
(Regular Cab) Pad
(Regular Cab) Pad Retainer
72 (730, 53)
18 (185, 13)
Collar
Xtra Cab 123 (1,250, 90)
Regular Cab 147 (1,500, 108)
44 (450, 33)
18 (185, 13)
Dynamic Damper
Bushing
Clip
◆ Rivet
Clip
◆ Rivet
Clip
◆ Rivet
Clip
◆ Rivet
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
R01455

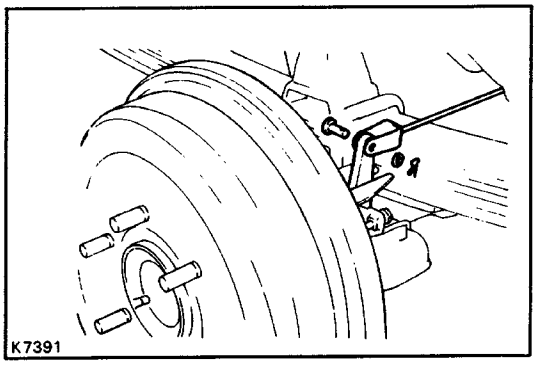

RA0220

REMOVAL OF LEAF SPRING

1. JACK UP AND SUPPORT BODY

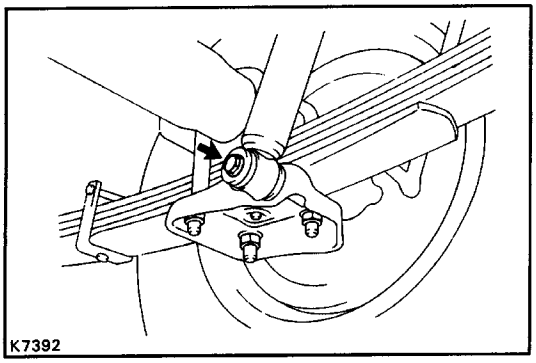
(a) Jack up and support the body on the stands.

(b) Lower the axle housing until the leaf spring tension is free, and keep it at this position.

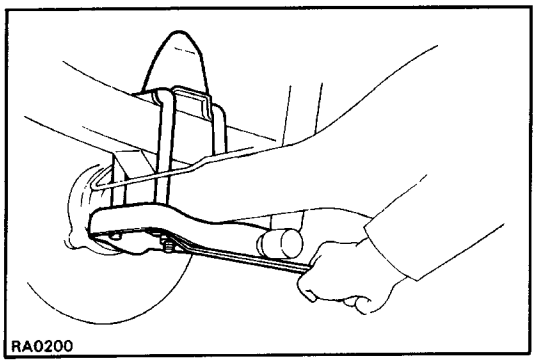

K7391

2. (4WD)

DISCONNECT PARKING CABLE


K7392

3. DISCONNECT SHOCK ABSORBER FROM SPRING SEAT


RA0200

4. REMOVE U–BOLTS

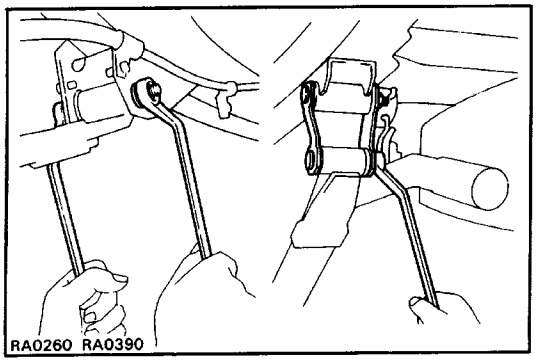
(a) Remove the U–bolt mounting nuts.

(b) Remove the spring seat, pads and pad retainer.

(c) Remove the U–bolts.

(d) (4WD)

Remove the spring bumper.


RA0260 RA0390

5. REMOVE LEAF SPRING

(a) Remove the hanger pin bolt.

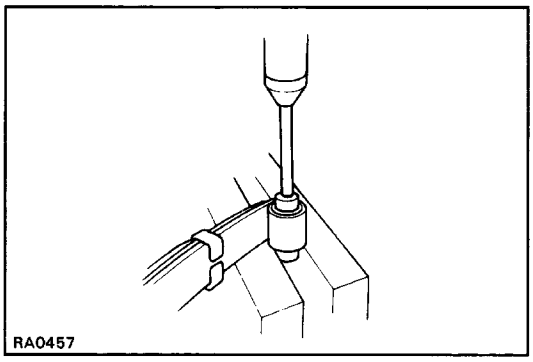
(b) (1 ton and C&C)

Remove the hanger pin lock bolt.

(c) Disconnect the leaf from the bracket.

(d) Remove the shackle pin mounting nuts.

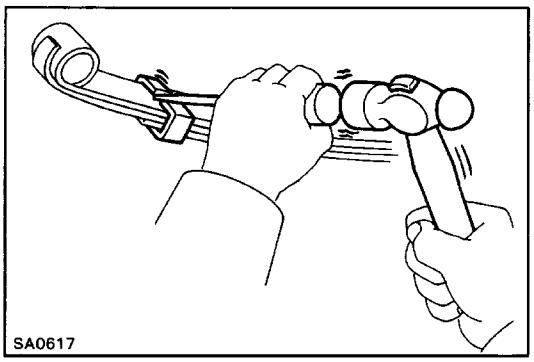
(e) Remove the shackle pin and plate and remove the leaf spring.



REPLACEMENT OF BUSHING

REPLACE BUSHINGS WITH PRESS

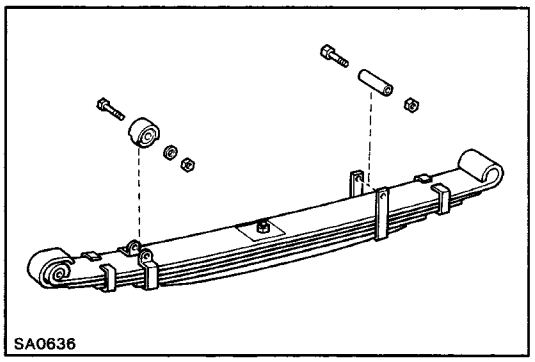
Using a press and socket wrench, replace the eye bushings.



REPLACEMENT OF LEAF SPRING

1. BEND OPEN SPRING CLIP

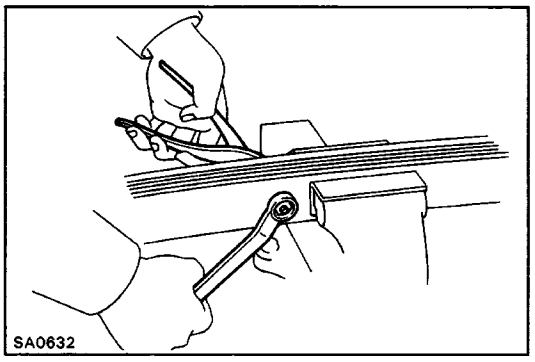
Using a chisel, pry up the spring clip.



2. REMOVE CLIP BOLT

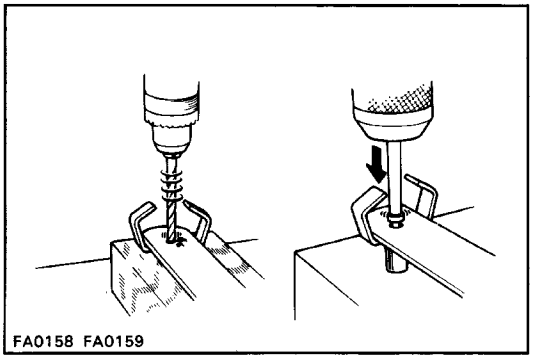
Remove the clip bolt, collar and nut from the clip.

3. REMOVE DYNAMIC DAMPER



4. REMOVE CENTER BOLT

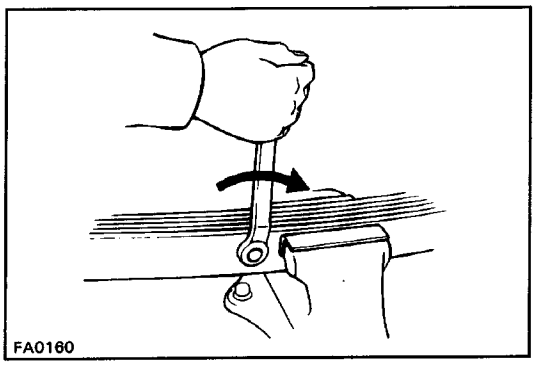
Hold the spring near the center bolt in a vise and remove the center bolt.



5. IF NECESSARY, REPLACE SPRING CLIP

(a) Drill off the head of the rivet, and drive it out.

(b) Install a new rivet into the holes of the spring leaf and clip. Then rivet with a press.

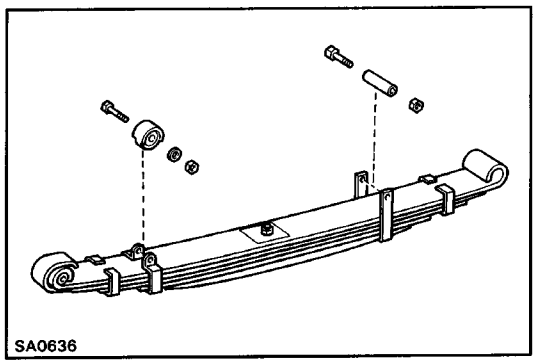


6. INSTALL SPRING CENTER BOLT

(a) Align the leaf holes and secure the leaves with a vise.

(b) Install and tighten the spring center bolt.

Torque: 44 N–m (450 kgf–cm, 33 ft–lbf)



7. INSTALL CLIP BOLT

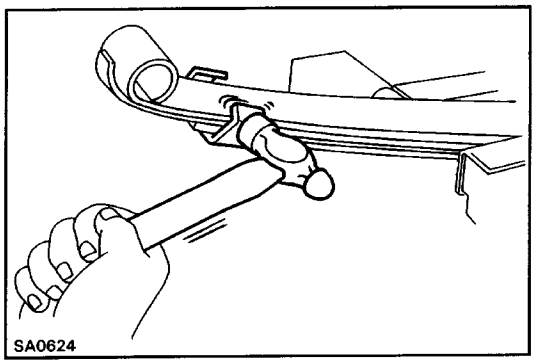
Position the collar and install the clip bolt and nut.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

8. INSTALL DYNAMIC DAMPER

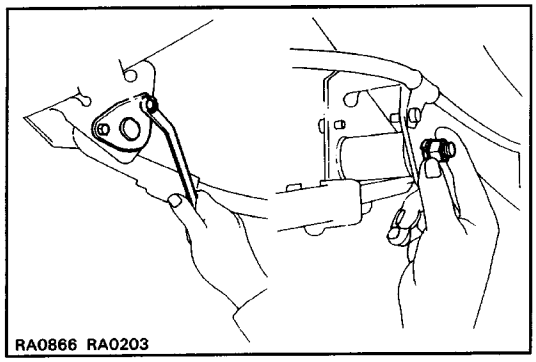
Position the dynamic damper and install the bolt and nut.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



9. BEND SPRING CLIP

Using a hammer, bend the spring clip into position.



INSTALLATION OF LEAF SPRING

1. INSTALL LEAF SPRING

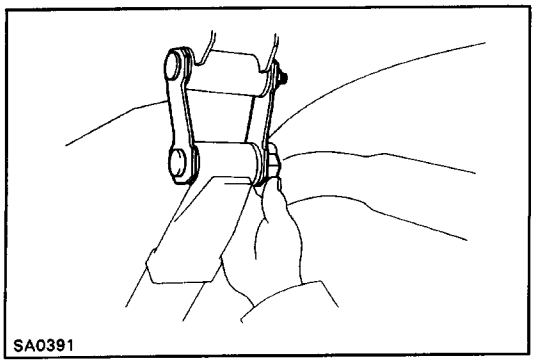
(a) Place the front end of leaf spring in the front bracket and install the hanger pin bolt.

(b) (1 ton and C&C)

Install and tighten the hanger pin lock bolt.

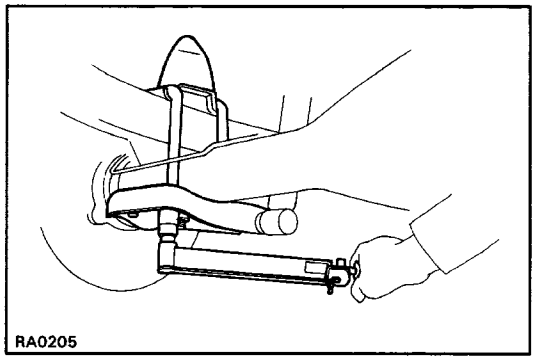
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

(c) Finger tighten the hanger pin nut.



(d) Place the rear end of leaf spring in the rear bracket, and install the shackle pin.

(e) Install the plate and finger tighten the nuts.


RA0205

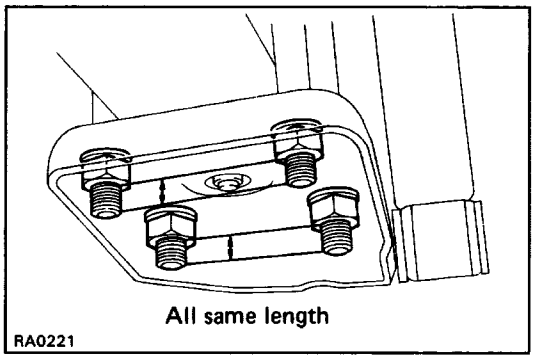
2. INSTALL U–BOLTS

(a) Install the pads and pad retainer on the leaf spring.
(b) (4WD)
Install the spring bumper.
M Install the spring seat, U–bolts, washers and nuts.
(d) Tighten the U–bolt mounting nuts.

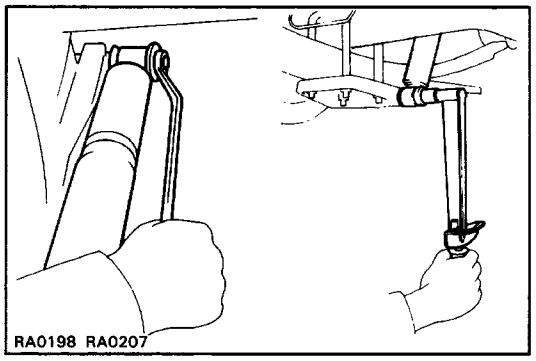
Torque:

2W D 0.5 ton	**147 N–m**
	(1,500 kgf–cm, 108 ft–lbf)
1 ton, C&C	**123 N–m**
	(1,250 kgf–cm, 90 ft–lbf)
4WD Xtra cab	**123 N–m**
(1,250 kgf–cm, 90 ft–lbf)	
Regular Cab	**147 N–m**
	(1,500 kgf–cm, 108 ft–lbf)

HINT: Tighten the U–bolts so that the length of all the U–bolts under the spring seat are the same.

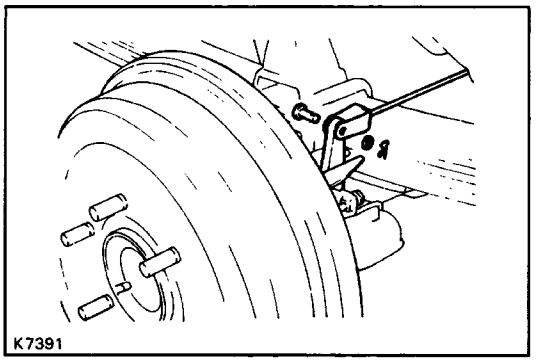


RA0221

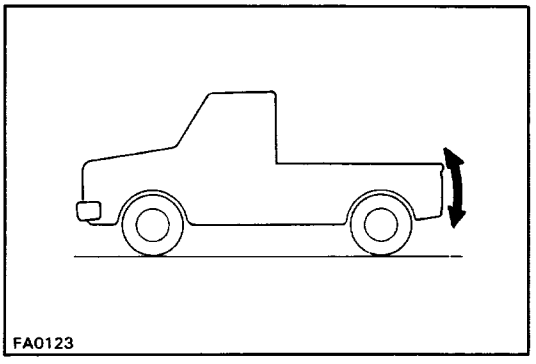

RA0198 RA0207

3. INSTALL REAR SHOCK ABSORBER

(a) Connect the shock absorber to the frame with the bolt. Tighten the bolt.
Torque: 2WD 25 N–m (260 kgf–cm, 19 ft–lbf)
4WD 72 N–m (730 kgf–cm, 53 ft–lbf)
(b) Connect the shock absorber to the spring seat with the bolt. Tighten the bolt.
Torque: 2WD 25 N–m (260 kgf–cm, 19 ft–lbf)
4WD 72 N–m (730 kgf–cm, 53 ft–lbf)

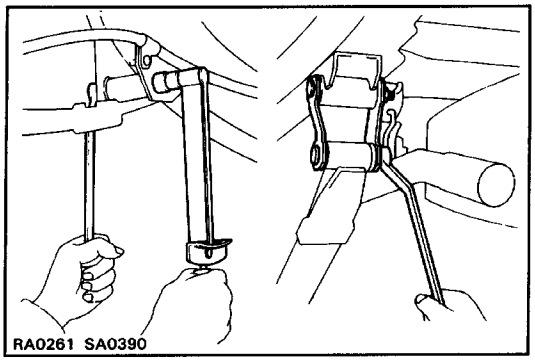

K7391

4. (4WD)
CONNECT PARKING BRAKE CABLE


FA0123

5. STABILIZE SUSPENSION

(a) Install the wheel.
(b) Remove the stands and bounce the vehicle up and down to stabilize the suspension.



6. TIGHTEN HANGER PIN AND SHACKLE PIN

Tighten the hanger pin nut.

Torque: 0.5 ton
157 N–m (1,600 kgf–cm, 116 ft–lbf)
1 ton and C&C
91 N–m (930 kgf –cm, 67 ft–lbf)

Tighten the shackle nuts.

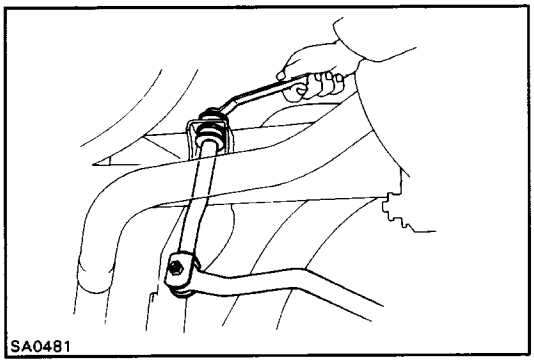
Torque: 91 N–m (930 kgf–cm, 67 ft–lbf)

Stabilizer Bar

(See page SA–153)

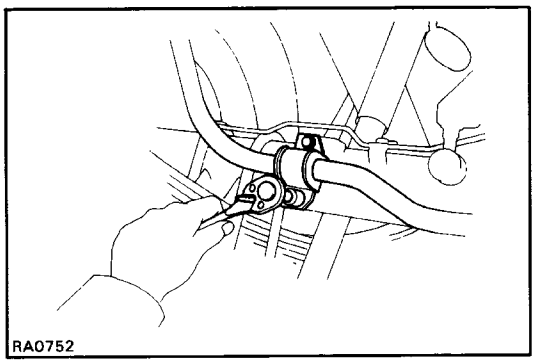
REMOVAL OF STABILIZER BAR

1. JACK UP AND SUPPORT VEHICLE



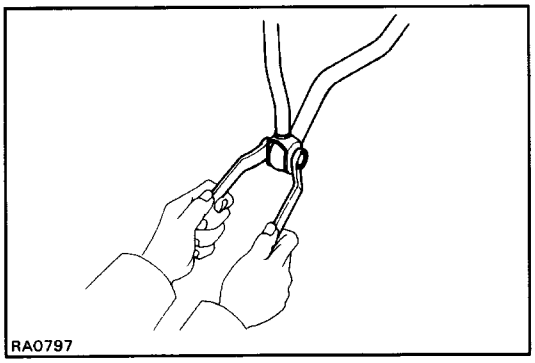
2. DISCONNECT STABILIZER BAR LINK FROM BODY

(a) Disconnect the stabilizer bar link from the body.
(b) Remove the retainers and cushion from the link.



3. REMOVE STABILIZER BAR

(a) Remove the stabilizer bar bracket with cushion from the rear axle housing.
(b) Remove the stabilizer bar.



4. REMOVE STABILIZER BAR LINK

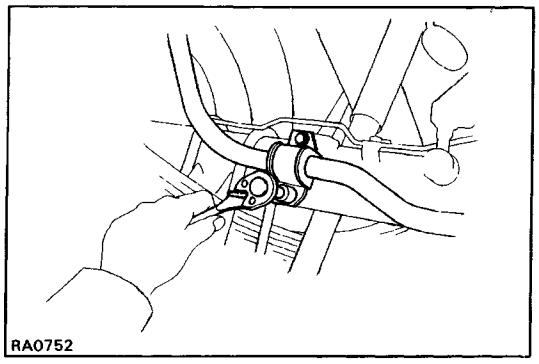
(a) Remove the retainers and cushion from the link.
(b) Remove the bolt and nut.
(c) Remove the stabilizer bar link from the stabilizer bar.

INSTALLATION OF STABILIZER BAR

(See page SA–153)

1. INSTALL STABILIZER BAR LINK

(a) Install the retainers and cushion to the link.
(b) Connect the link to the stabilizer bar and torque the bolt and nut.
Torque: 36 N–m (365 kgf–cm, 26 ft–lbf)

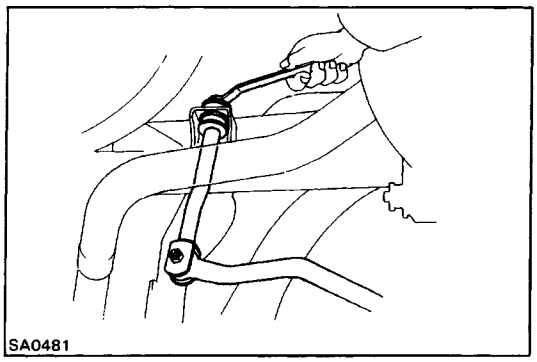


2. INSTALL STABILIZER BAR

(a) Place the stabilizer bar to the rear axle housing.

(b) Install the cushion and bracket.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)



3. CONNECT STABILIZER BAR LINK

(a) Position the link to the body.

(b) Install the retainers and cushion to the link.

(e) Install a new nut.

Torque: 17 N–m (170 kgf–cm, 12 ft–lbf)

4. LOWER VEHICLE

SERVICE SPECIFICATIONS

22R–E ENGINE

STARTING SYSTEM

Starter	Rated voltage and output power		12 V, 1.0 kW	12 V, 1.4 kW
	No–load characteristic Current		90 A or less	←
	rpm		3,000 rpm or more at 11.5 V	3,500 rpm or more at 11.5 V
	Brush length	STD	13.5 mm 0.531 in.	15.5 mm 0.610 in.
		Limit	8.5 mm 0.335 in.	10.0 mm 0.394 in.
	Commutator Outer diameter	STD	30 mm 1.18 in.	←
		Limit	29 mm 1.14 in.	←
	Undercut depth	STD	0.6 mm 0.024 in.	←
		Limit	0.2 mm 0.008 in.	←
	Circle runout		0.05 mm 0.0020 in.	←
	Spring installed load		18 – 24 N (1,785–2,415 gf, 3.9–5.3 lbf)	←
		Limit	12 N (1.2 kgf, 2.6 lbf)	←

CHARGING SYSTEM

Battery specific gravity When fully charged at 20°C 168°F)			1.25 – 1.27
Alternator	Rated output ampere		60 A
	Rotor coil resistance		2.8 – 3.0 Ω
	Brush exposed length	STD	10.5 mm 0.413 in.
		Limit	1.5 mm 0.059 in.
	Slip ring diameter	STD	14.2 – 14.4 mm 0.559 – 0.567 in.
		Limit	12.8 mm 0.504 in.
Alternator regulator	Regulator voltage	at 25°C (77°F)	13.9 – 15.1 V
		at 115°C (239°F)	13.5 – 14.3 V

22R–E ENGINE
STARTING SYSTEM

Starter	Rated voltage and output power		12 V, 1.0 kW	12 V, 1.4 kW
	No–load characteristic Current		90 A or less	←
	rpm		3,000 rpm or more at 11.5 V	3,500 rpm or more at 11.5 V
	Brush length	STD	13.5 mm 0.531 in.	15.5 mm 0.610 in.
		Limit	8.5 mm 0.335 in.	10.0 mm 0.394 in.
	Commutator Outer diameter	STD	30 mm 1.18 in.	←
		Limit	29 mm 1.14 in.	←
	Undercut depth	STD	0.6 mm 0.024 in.	←
		Limit	0.2 mm 0.008 in.	←
	Circle runout		0.05 mm 0.0020 in.	←
	Spring installed load		18 – 24 N (1,785–2,415 gf, 3.9–5.3 lbf)	←
		Limit	12 N (1.2 kgf, 2.6 lbf)	←

CHARGING SYSTEM

Battery specific gravity When fully charged at 20°C 168°F)			1.25 – 1.27
Alternator	Rated output ampere		60 A
	Rotor coil resistance		2.8 – 3.0 Ω
	Brush exposed length	STD	10.5 mm 0.413 in.
		Limit	1.5 mm 0.059 in.
	Slip ring diameter	STD	14.2 – 14.4 mm 0.559 – 0.567 in.
		Limit	12.8 mm 0.504 in.
Alternator regulator	Regulator voltage	at 25°C (77°F)	13.9 – 15.1 V
		at 115°C (239°F)	13.5 – 14.3 V

3VZ–E ENGINE
STARTING SYSTEM

Starter	Rated voltage and output power		12 V, 1.0 kW	12 V, 1.4 kW, 1.6 kW
	No–load characteristic Current rpm		90 A or less 3,000 rpm or more at 11.5 V	← 3,500 rpm or more at 11.5 V
	Brush length	STD Limit	13.5 mm 0.531 in. 8.5 mm 0.335 in.	15.5 mm 0.610 in. 10.0 mm 0.394 in.
	Commutator Outer diameter	STD Limit	30 mm 1.18 in. 29 mm 1.14 in.	← ←
	Undercut depth	STD Limit	0.6 mm 0.024 in. 0.2 mm 0.008 in.	← ←
	Circle runout		0.05 mm 0.0020 in.	←
	Spring installed load		18 – 24 N (1,785–2,415 gf, 3.9–5.3 lbf)	←
		Limit	12 N (1.2 kgf, 2.6 lbf)	←

CHARGING SYSTEM

Battery specific gravity When fully charged at 20°C (68°F)		5 5D 2 3R 80D26R	1.25 – 1.27 1.27 – 1.29	
Alternator	Rated output ampere		60 A	
	Brush exposed length	STD	10.5 mm	0.413 in.
	Rotor coil resistance	Limit	1.5 mm	0.059 in.
	Slip ring diameter		2.8 – 3.0 Ω	
		STD	14.2 – 14.4 mm	0.559 – 0.567 in.
		Limit	12.8 mm	0.504 in.
Alternator regulator	Regulator voltage	at 25°C (77°F) at 115°C (239°F)	13.9 – 15.1 V 13.5 – 14.3 V	

3VZ–E ENGINE
STARTING SYSTEM

Starter	Rated voltage and output power		12 V, 1.0 kW	12 V, 1.4 kW, 1.6 kW
	No–load characteristic Current		90 A or less	←
	rpm		3,000 rpm or more at 11.5 V	3,500 rpm or more at 11.5 V
	Brush length	STD	13.5 mm 0.531 in.	15.5 mm 0.610 in.
		Limit	8.5 mm 0.335 in.	10.0 mm 0.394 in.
	Commutator Outer diameter	STD	30 mm 1.18 in.	←
		Limit	29 mm 1.14 in.	←
	Undercut depth	STD	0.6 mm 0.024 in.	←
		Limit	0.2 mm 0.008 in.	←
	Circle runout		0.05 mm 0.0020 in.	←
	Spring installed load		18 – 24 N (1,785–2,415 gf, 3.9–5.3 lbf)	←
		Limit	12 N (1.2 kgf, 2.6 lbf)	←

CHARGING SYSTEM

Battery specific gravity When fully charged at 20°C (68°F)		5 5D 2 3R	1.25 – 1.27	
		80D26R	1.27 – 1.29	
Alternator	Rated output ampere		60 A	
	Brush exposed length	STD	10.5 mm	0.413 in.
		Limit	1.5 mm	0.059 in.
	Rotor coil resistance		2.8 – 3.0 Ω	
	Slip ring diameter	STD	14.2 – 14.4 mm	0.559 – 0.567 in.
		Limit	12.8 mm	0.504 in.
Alternator regulator	Regulator voltage	at 25°C (77°F)	13.9 – 15.1 V	
		at 115°C (239°F)	13.5 – 14.3 V	

SERVICE SPECIFICATIONS

CLUTCH

Specifications

Pedal height (from asphalt sheet)	2WD	154.5 mm	6.083 in.
	4WD	151.5 mm	5.965 in.
(from floor panel)		157.5 mm	6.201 in.
Push rod play at pedal top		1.0 – 5.0 mm	0.039 – 0.197 in.
Pedal freeplay		5 – 15 mm	0.20 – 0.59 in.
Clutch release point (from pedal full stroke end position)		25 mm (0.98 in.) or more	
Disc rivet head depth	Limit	0.3 mm	0.012 in
Disc runout	Limit	0.8 mm	0.031 in.
Diaphragm spring tip alignment	Limit	0.5 mm	0.020 in
Diaphragm spring finger wear Depth	Limit	0.6 mm	0.024 in.
Width	Limit	5.0 mm	0.197 in.
Flywheel runout	Limit	0.1 mm	0.004 in.
Master cylinder reservoir set pin protrusion		1.5 – 3.5 mm	0.059 – 0.138 in.

Torque Specifications

Part tightened		N·m	kgf·cm	ft·lbf
Master cylinder mounting nut		13	130	9
Release cylinder mounting bolt		12	120	9
Bleeder plug		11	110	8
Clutch cover x Flywheel		19	195	14
Clutch line union		15	155	11
Release fork support	22R–E	39	400	29
	3VZ–E	47	480	35

MANUAL TRANSMISSION (G57, G58)

Specifications (2WD and 4WD)

Output shaft			
2nd gear journal diameter	Limit	37.984 mm	1.4954 in.
3rd gear journal diameter	Limit	34.984 mm	1.3773 in.
Flange thickness	Limit	4.80 mm	0.1890 in.
Runout	Limit	0.05 mm	0.0020 in.
Inner race flange thickness	Limit	3.99 mm	0.1571 in.
Inner race outer diameter	Limit	38.985 mm	1.5348 in.
Gear thrust clearance			
1st, 2nd & 3rd	STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
	Limit	0.25 mm	0.0098 in.
Counter 5th	STD	0.10 – 0.30 mm	0.0039 – 0.0118 in.
	Limit	0.30 mm	0.0118 in.

CLUTCH

Specifications

Pedal height (from asphalt sheet)	2WD	154.5 mm	6.083 in.
	4WD	151.5 mm	5.965 in.
(from floor panel)		157.5 mm	6.201 in.
Push rod play at pedal top		1.0 – 5.0 mm	0.039 – 0.197 in.
Pedal freeplay		5 – 15 mm	0.20 – 0.59 in.
Clutch release point (from pedal full stroke end position)		25 mm (0.98 in.) or more	
Disc rivet head depth	Limit	0.3 mm	0.012 in
Disc runout	Limit	0.8 mm	0.031 in.
Diaphragm spring tip alignment	Limit	0.5 mm	0.020 in
Diaphragm spring finger wear Depth	Limit	0.6 mm	0.024 in.
Width	Limit	5.0 mm	0.197 in.
Flywheel runout	Limit	0.1 mm	0.004 in.
Master cylinder reservoir set pin protrusion		1.5 – 3.5 mm	0.059 – 0.138 in.

Torque Specifications

Part tightened		N·m	kgf·cm	ft·lbf
Master cylinder mounting nut		13	130	9
Release cylinder mounting bolt		12	120	9
Bleeder plug		11	110	8
Clutch cover x Flywheel		19	195	14
Clutch line union		15	155	11
Release fork support	22R–E	39	400	29
	3VZ–E	47	480	35

MANUAL TRANSMISSION (G57 G58)

Specifications (2WD and 4WD)

Output shaft			
2nd gear journal diameter	Limit	37.984 mm	1.4954 in.
3rd gear journal diameter	Limit	34.984 mm	1.3773 in.
Flange thickness	Limit	4.80 mm	0.1890 in.
Runout	Limit	0.05 mm	0.0020 in.
Inner race flange thickness	Limit	3.99 mm	0.1571 in.
Inner race outer diameter	Limit	38.985 mm	1.5348 in.
Gear thrust clearance			
1st, 2nd & 3rd	STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
	Limit	0.25 mm	0.0098 in.
Counter 5th	STD	0.10 – 0.30 mm	0.0039 – 0.0118 in.
	Limit	0.30 mm	0.0118 in.

Specifications (2WD and 4WD) (Cont'd)

Gear oil clearance			
1 st, 2nd & 3rd	STD	0.009 – 0.032 mm	0.0004 – 0.0013 in.
	Limit	0.032 mm	0.0013 in.
5th	STD	0.009 – 0.032 mm	0.0004 – 0.0013 in.
	Limit	0.032 mm	0.0013 in.
Reverse	STD	0.04 – 0.08 mm	0.0016 – 0.0031 in.
	Limit	0.13 mm	0.0051 in.
Shift fork to hub sleeve clearance	Limit	1.0 mm	0.039 in.
Synchronizer ring to gear clearance	STD	1.0 – 2.0 mm	0.039 – 0 .079 in.
	Limit	0.8 mm	0.031 in.
Front bearing retainer oil seal			
Drive in depth		12.2 – 13.2 mm	0.480 – 0.520 in.
Speedometer driven gear oil seal			
Oil seal depth		20 mm	0.79 in.
Input shaft synchronizer ring to gear clearance	STD	1.0 – 2.0 mm	0.039 – 0.079 in.
	Limit	0.8 mm	0.031 in.
Counter gear outer diameter of needle roller bearing race	STD	25.98 – 26.00 mm	1.0228 – 1.0236 in.
	Limit	25.86 mm	1.0181 in.
Reverse idler gear to shift arm shoe clearance	STD	0.05 – 0.27 mm	0.0020 – 0.0106 in.
	Limit	0.5 mm	0.197 in.
Input shaft snap ring thickness	Mark		
	0	2.05 – 2.10 mm	0.0807 – 0.0827 in.
	1	2.10 – 2.15 mm	0.0827 – 0.0846 in.
	2	2.15 – 2.20 mm	0.0846 – 0.0866 in.
	3	2.20 – 2.25 mm	0.0866 – 0.0886 in.
	4	2.25 – 2.30 mm	0.0886 – 0.0906 in.
	5	2.30 – 2.35 mm	0.0906 – 0.0925 in.
Output shaft snap ring thickness			
Front	Mark		
	C-1	1.75 – 1.80 mm	0.0689 – 0.0709 in.
	D	1.80 – 1.85 mm	0.0709 – 0.0728 in.
	D-1	1.85 – 1.90 mm	0.0728 – 0.0748 in.
	E	1.90 – 1.95 mm	0.0748 – 0.0768 in.
	E-1	1.95 – 2.00 mm	0.0768 – 0.0787 in.
	F	2.00 – 2.05 mm	0.0787 – 0.0807 in.
	F-1	2.05 – 2.10 mm	0.0807 – 0.0827 in.
Rear	Mark		
	A	2.67 – 2.72 mm	0.1051 – 0.1071 in.
	B	2.73 – 2.78 mm	0.1075 – 0.1094 in.
	C	2.79 – 2.84 mm	0.1098 – 0.1118 in.
	D	2.85 – 2.90 mm	0.1122 – 0.1142 in.
	E	2.91 – 2.96 mm	0.1146 – 0.1165 in.
	F	2.97 – 3.02 mm	0.1169 – 0.1189 in.

Specifications (2WD and 4WD) (Cont'd)

Output shaft snap ring thickness (cont'd)			
Rear	Mark		
	G	3.03 – 3.08 mm	0.1193 – 0.1213 in.
	H	3.09 – 3.14 mm	0.1217 – 0.1236 in.
	J	3.15 – 3.20 mm	0.1240 – 0.1260 in.
	K	3.21 – 3.26 mm	0.1264 – 0.1283 in.
	L	3.27 – 3.32 mm	0.1287 – 0.1307 in.
Counter gear snap ring			
Front bearing	Mark		
	1	2.05 – 2.10 mm	0.0807 – 0.0827 in.
	2	2.10 – 2.15 mm	0.0827 – 0.0846 in.
	3	2.15 – 2.20 mm	0.0846 – 0.0866 in.
	4	2.20 – 2.25 mm	0.0866 – 0.0886 in.
	5	2.25 – 2.30 mm	0.0886 – 0.0906 in.
	6	2.30 – 2.35 mm	0.0906 – 0.0925 in.
Gear spline piece No. 5 (5–speed) or oil separator (4–speed)			
	Mark		
	A	2.80 – 2.85 mm	0.1102 – 0.1122 in.
	B	2.85 – 2.90 mm	0.1122 – 0.1142 in.
	C	2.90 – 2.95 mm	0.1142 – 0.1161 in.
	D	2.95 – 3.00 mm	0.1161 – 0.1181 in.
	E	3.00 – 3.05 mm	0.1181 – 0.1201 in.
	F	3.05 – 3.10 mm	0.1201 – 0.1220 in.
	G	3.10 – 3.15 mm	0.1220 – 0.1240 in.

Torque Specifications (2WD and 4WD)

Part tightened	N·m	kgf·cm	ft·lbf
Straight screw plug	19	190	14
Extension housing or transfer adaptor x Transmission case	37	380	27
Restrict pin	27	280	20
Shift lever retainer x Extension housing	18	185	13
Back–up light switch	37	380	27
Front bearing retainer x Transmission case	17	170	12
Rear bearing retainer x Intermediate plate	18	185	13
Reverse shift arm bracket	18	185	13
Reverse idler gear shaft stopper bolt	17	175	13
Clutch housing x Transmission case	37	380	27
Shift lever housing bolt	38	390	28
Shift fork x Fork shaft	20	200	14
Speedometer driven gear lock plate (2WD)	11	115	8
Oil receiver x Extension housing (2WD)	11	115	8
Oil receiver x Transfer adaptor (4WD)	13	130	9

MANUAL TRANSMISSION (R150 R150F)

Specifications (2WD and 4WD)

Output shaft			
1 st gear journal diameter	Limit	38.860 mm	1.5299 in.
2nd gear journal diameter	Limit	46.860 mm	1.8449 in.
3rd gear journal diameter	Limit	37.860 mm	1.4905 in.
Flange thickness	Limit	4.70 mm	0.1850 in.
Runout	Limit	0.06 mm	0.0024 in.
Counter gear			
Roller bearing journal diameter	Limit	27.860 mm	1.0968 in.
Gear thrust clearance			
1 st	STD	0.10 – 0.45 mm	0.0039 – 0.0177 in.
	Limit	0.50 mm	0.0197 in.
2nd & 3rd	STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
	Limit	0.30 mm	0.0118 in.
Counter 5th	STD	0.10 – 0.35 mm	0.0039 – 0.0138 in.
	Limit	0.40 mm	0.0157 in.
Gear oil clearance			
1 st	STD	0.020 – 0.073 mm	0.0008 – 0.0029 in.
	Limit	0.16 mm	0.0063 in.
2nd, 3rd & Counter 5th	STD	0.015 – 0.068 mm	0.0006 – 0.0027 in.
	Limit	0.16 mm	0.0063 in.
Reverse	STD	0.040 – 0.082 mm	0.0016 – 0.0032 in.
	Limit	0.13 mm	0.0051 in.
Shift fork to hub sleeve clearance	Limit	1.0 mm	0.039 in.
Synchronizer ring to gear clearance	STD	0.8 – 1.6 mm	0.031 – 0.063 in.
	Limit	0.6 mm	0.024 in.
Oil seal drive in depth			
Front bearing retainer		10.5 – 11.5 mm	0.413 – 0.453 in.
Speedometer driven gear		25 mm	0.98 in.
Input shaft to synchronizer ring	STD	0.8 – 1.6 mm	0.031 – 0.063 in.
	Limit	0.6 mm	0.024 in.
Reverse idler gear to shift arm shoe	STD	0.05 – 0.25 mm	0.0020 – 0.098 in.
	Limit	0.5 mm	0.020 in.
Input shaft snap ring thickness	Mark		
	A	2.10 – 2.15 mm	0.0827 – 0.0846 in.
	B	2.15 – 2.20 mm	0.0846 – 0.0866 in.
	C	2.20 – 2.25 mm	0.0866 – 0.0886 in.
	D	2.25 – 2.30 mm	0.0886 – 0.0906 in.
	E	2.30 – 2.35 mm	0.0906 – 0.0925 in.
	F	2.35 – 2.40 mm	0.0925 – 0.0945 in.
	G	2.40 – 2.45 mm	0.0945 – 0.0965 in.

Specifications (2WD and 4WD) (Cont'd)

Counter gear snap ring (Front bearing)	Mark		
	A	2.00 – 2.05 mm	0.0787 – 0.0807 in.
	B	2.05 – 2.10 mm	0.0807 – 0.0827 in.
	C	2.10 – 2.15 mm	0.0827 – 0.0846 in.
	D	2.15 – 2.20 mm	0.0846 – 0.0866 in.
	E	2.20 – 2.25 mm	0.0866 – 0.0886 in.
Output shaft snap ring thickness			
Clutch hub No.2	Mark		
	A	1.80 – 1.85 mm	0.0709 – 0.0728 in.
	B	1.85 – 1.90 mm	0.0728 – 0.0748 in.
	C	1.90 – 1.95 mm	0.0748 – 0.0768 in.
	D	1.95 – 2.00 mm	0.0768 – 0.0787 in.
	E	2.00 – 2.05 mm	0.0787 – 0.0807 in.
	F	2.05 – 2.10 mm	0.0807 – 0.0827 in.
	G	2.10 – 2.15 mm	0.0827 – 0.0846 in.
Clutch hub No. 1	Mark		
	A	2.30 – 2.35 mm	0.0906 – 0.0925 in.
	B	2.35 – 2.40 mm	0.0925 – 0.0945 in.
	C	2.40 – 2.45 mm	0.0945 – 0.0965 in.
	D	2.45 – 2.50 mm	0.0965 – 0.0984 in.
	E	2.50 – 2.55 mm	0.0984 – 0.1004 in.
	F	2.55 – 2.60 mm	0.1004 – 0.1024 in.
	G	2.60 – 2.65 mm	0.1024 – 0.1043 in.
Rear	Mark		
	A	2.65 – 2.70 mm	0.1043 – 0.1063 in.
	B	2.70 – 2.75 mm	0.1063 – 0.1083 in.
	C	2.75 – 2.80 mm	0.1083 – 0.1102 in.
	D	2.80 – 2.85 mm	0.1102 – 0.1122 in.
	E	2.85 – 2.90 mm	0.1122 – 0.1142 in.
	F	2.90 – 2.95 mm	0.1142 – 0.1161 in.
	G	2.95 – 3.00 mm	0.1161 – 0.1181 in.
	H	3.00 – 3.05 mm	0.1181 – 0.1201 in.
	J	3.05 – 3.10 mm	0.1201 – 0.1220 in.
	K	3.10 – 3.15 mm	0.1220 – 0.1240 in.
	L	3.15 – 3.20 mm	0.1240 – 0.1260 in.
	M	3.20 – 3.25 mm	0.1260 – 0.1280 in.
	N	3.25 – 3.30 mm	0.1280 – 0.1299 in.
	P	3.30 – 3.35 mm	0.1299 – 0.1319 in.
	Q	3.35 – 3.40 mm	0.1319 – 0.1339 in.
	R	3.40 – 3.45 mm	0.1339 – 0.1358 in.
	S	3.45 – 3.50 mm	0.1358 – 0.1378 in.

Torque Specifications (2WD and 4WD)

Part tightened	N·m	kgf·cm	ft·lbf
Reverse shift arm bracket	18	185	13
Rear bearing retainer x Intermediate plate	18	185	13
Counter gear rear lock nut	127	1,300	94
Shift fork x Shift fork shaft	20	200	14
Straight screw plug	19	190	14
Front bearing retainer x Transmission case	17	170	12
Transmission case x Extension housing	37	380	27
Shift lever housing bolt	38	390	28
Clutch housing x Transmission case	36	370	27
Oil receiver x Extension housing	11	115	8
Back–up light switch	44	450	33
Restrict pin	37	380	27
Shift lever retainer x Extension housing or transfer adaptor	18	185	13

MANUAL TRANSMISSION (installation of Transmission)
Torque Specifications (2WD)

Part tightened	N·m	kgf·cm	ft·lbf
Transmission x Engine	72	730	53
Stiffener plate x Transmission	37	380	27
Starter	39	400	29
Engine rear mounting x Transmission	25	260	19
Clutch tube bracket x Transmission (22R–E)	72	730	53
Clutch release cylinder	12	120	9
Stabilizer bracket	29	300	22
Frame auxiliary crossmember	95	970	70
Engine rear mounting bracket x Support member	58	590	43
Engine rear mounting bracket x Engine rear mounting	29	300	22
Exhaust pipe x Exhaust manifold	62	630	46
Exhaust pipe bracket x Clutch housing			
(22R–E)			
Upper	19	195	14
Lower	69	700	51
(3VZ–E)	39	400	29
Exhaust pipe x Catalytic converter front side (3VZ–E)	39	400	29
Exhaust pipe clamp	19	195	14

Torque Specifications (2WD and 4WD)

Part tightened	N·m	kgf·cm	ft·lbf
Reverse shift arm bracket	18	185	13
Rear bearing retainer x Intermediate plate	18	185	13
Counter gear rear lock nut	127	1,300	94
Shift fork x Shift fork shaft	20	200	14
Straight screw plug	19	190	14
Front bearing retainer x Transmission case	17	170	12
Transmission case x Extension housing	37	380	27
Shift lever housing bolt	38	390	28
Clutch housing x Transmission case	36	370	27
Oil receiver x Extension housing	11	115	8
Back–up light switch	44	450	33
Restrict pin	37	380	27
Shift lever retainer x Extension housing or transfer adaptor	18	185	13

MANUAL TRANSMISSION (installation of Transmission)

Torque Specifications (2WD)

Part tightened	N·m	kgf·cm	ft·lbf
Transmission x Engine	72	730	53
Stiffener plate x Transmission	37	380	27
Starter	39	400	29
Engine rear mounting x Transmission	25	260	19
Clutch tube bracket x Transmission (22R–E)	72	730	53
Clutch release cylinder	12	120	9
Stabilizer bracket	29	300	22
Frame auxiliary crossmember	95	970	70
Engine rear mounting bracket x Support member	58	590	43
Engine rear mounting bracket x Engine rear mounting	29	300	22
Exhaust pipe x Exhaust manifold	62	630	46
Exhaust pipe bracket x Clutch housing			
(22R–E)			
Upper	19	195	14
Lower	69	700	51
(3VZ–E)	39	400	29
Exhaust pipe x Catalytic converter front side (3VZ–E)	39	400	29
Exhaust pipe clamp	19	195	14

Torque Specifications (4WD)

Part tightened		N·m	kgf·cm	ft·lbf
Transfer x Transfer adaptor	W56	39	400	29
	G58, R 150F	37	380	27
Engine rear mounting		25	260	19
Transfer x Dynamic damper (Regular cab w/ Planetary gear type transfer)		37	380	27
Transmission x Engine		72	730	53
Transmission x Stiffener plate		37	380	27
Starter		39	400	29
No. 2 crossmember x Frame		95	970	70
No. 2 crossmember x Engine rear mounting		13	130	9
Stabilizer bracket		29	300	22
Front differential carrier cover x Frame (3VZ–E)		147	1,500	168
Front differential carrier x Frame (3VZ–E)		167	1,700	123
Exhaust pipe x Exhaust manifold		62	630	46
Exhaust pipe bracket x Clutch housing				
Exhaust pipe bracket x Clutch housing	(22R–E)			
	Upper	19	195	14
	Lower	69	700	51
	(3VZ–E)	39	400	29
Exhaust pipe x Catalytic converter front side (3VZ–E)		39	400	29
Exhaust pipe clamp		19	195	14
Clutch release cylinder x Transmission		12	120	9
Propeller shaft dust cover subassembly (G 58, R 150F)				
	A–bolt	37	370	27
	B–bolt	23	230	17
Front propeller shaft x Front differential		74	750	54
Front propeller shaft x Transfer		74	750	54
Rear propeller shaft x Rear differential	3VZ–E	76	780	56
	22R–E	74	750	54
Rear propeller shaft x Transfer	3VZ–E	76	780	56
	22R–E	74	750	54
Rear propeller shaft center bearing x Frame		37	370	27

AUTOMATIC TRANSMISSION (A43D)

Specifications

Line pressure					
Engine idling		D range	427 – 481 kPa	4.3 – 4.9 kgf/cm^2	61 – 70 psi
		R range	510 – 608 kPa	5.2 – 6.2 kgf/cm^2	74 – 88 psi
At stall		D range	1,118 – 1,363 kPa	11.4 – 13.9 kgf/cm^2	162 – 198 psi
(Throttle valve fully opened)		R range	1,373 – 1,716 kPa	14.0 – 17.5 kgf/cm^2	199 – 249 psi
Engine stall revolution			1,900 ± 150 rpm		
Time lag	N range →	D range	Less than 1.2 seconds		
	N range →	R range	Less than 1.5 seconds		
Engine idle speed (A/C OFF)		N range	750 rpm		
Governor pressure (Vehicle speed reference)					
Output shaft rpm	Tire size				
	(P195/75R14)	(P205/75R14)			
1,000	32 km/h (20 mph)	32 km/h (20 mph)	88 – 147 kPa	0.9 – 1.5 kgf/cm^2	13 – 21 psi
1,800	57 km/h (35 mph)	58 km/h (36 mph)	157 – 216 kPa	1.6 – 2.2 kgf/cm^2	23 – 31 psi
3,500	111 km/h (69 mph)	113 km/h (70 mph)	402 – 520 kPa	4.1 – 5.3 kgf/cm^2	58 – 75 psi
Throttle cable adjustment					
Throttle valve fully opened			Between boot end face and inner cable stopper		
			0 – 1 mm	0 – 0.04 in.	
Torque converter sleeve runout		Limit	0.30 mm	0.0118 in.	
Torque converter installation distance			20.0 mm	0.787 in.	
Drive plate runout		Limit	0.20 mm	0.0079 in.	

Shift point km/h (mph)	Throttle valve fully open [ ] Fully closed						
	D range (2 range)						L range
	1 → 2	2 → 3	[3 → O/D]	O/D → 3	3 → 2	2 → 1	2 → 1
	57 – 73 (35 – 45)	106 – 124 (66 – 77)	38 – 52 (24 – 32)	*	95 – 112 (59 – 70)	36 – 49 (22 – 30)	46 – 62 (29 – 39)
	* O/D → 3 down-shift is possible up to maximum speed.						

Torque Specifications

Part tightened		N·m	kgf·cm	ft·lbf
Oil cooler pipe union nut		34	350	25
Torque converter x Drive plate		27	280	20
Drive plate x Crankshaft		83	850	61
Extension housing x Transmission case		34	345	25
Center support x Transmission case		25	260	19
Parking lock pawl bracket		7.4	75	65 in.·lbf
Valve body x Transmission case		10	100	7
Throttle cam		7.4	75	65 in.·lbf
Oil strainer		5.4	55	48 in.·lbf
Oil pan		4.4	45	39 in.·lbf
Governor body		3.9	40	35 in.·lbf
Overdrive solenoid		13	130	9
Control shaft lever		6.9	70	61 in.·lbf
Cooler union		34	350	25
Neutral start switch	Bolt	5.4	55	48 in.·lbf
	Nut	3.9	40	35 in.·lbf

AUTOMATIC TRANSMISSION (A340E)

Specifications

Line pressure					
Engine idling		D range	363 – 422 kPa	3.7 – 4.3 kgf/cm^2	53 – 61 psi
		R range	490 – 588 kPa	5.0 – 6.0 kgf/cm^2	71 – 85 psi
At stall		D range	932 – 1,178 kPa	9.5 – 12.0 kgf/cm^2	135 – 171 psi
(Throttle valve fully opened)		R range	1,294 – 1,638 kPa	13.2 – 16.7 kgf/cm^2	188 – 238 psi
Engine stall revolution		C&C	2,200 ± 150 rpm		
		Except C&C	2,450 ± 150 rpm		
Time lag	N range →	D range	Less than 1.2 seconds		
	N range →	R range	Less than 1.5 seconds		
Engine idling speed (A/C OFF)		N range	800 rpm		
Throttle cable adjustment					
Throttle valve fully opened			Between boot end face and inner cable stopper		
			0 – 1 mm	0 – 0.04 in.	
Torque converter sleeve runout		Limit	0.30 mm	0.0118 in.	
Torque converter installation distance			18.0 mm	0.709 in.	
Drive plate runout		Limit	0.20 mm	0.0079 in.	

Shift point

CBU
Tire size: P205/75R14 P215/65R15

km/h (mph)

		Throttle valve fully open [ ] Fully closed							
		1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
D range	NORM	61–66 (38–41)	108–117 (67–73)	143–152 (89–94)	43–48 (27–30)	26–30 (16–19)	136–145 (85–90)	100–105 (62–65)	44–49 (27–30)
	PWR	61–66 (38–41)	119–127 (74–79)	147–156 (91–97)	47–52 (29–32)	26–30 (16–19)	140–149 (87–93)	110–119 (68–74)	44–49 (27–30)
2 range	NORM PWR	53–57 (33–35)	126–135 (78–84)	–	–	–	–	119–128 (74–80)	47–52 (29–32)
L range	NORM PWR	–	–	–	–	–	–	101–110 (63–68)	57–62 (35–39)

Lock-up point

CBU
Tire size: P205/75R14 P215/65R15

km/h (mph)

		Throttle valve opening 5%					
		Lock-up ON			Lock-up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D range	NORM	–	79–83 (49–52)	79–83 (49–52)	–	71–76 (44–47)	68–73 (42–45)
	PWR	–	61–66 (38–41)	79–83 (49–52)	–	68–73 (42–45)	68–76 (42–47)

* O/D switch OFF

Shift point

CBU
Tire size: 185R14-8

km/h (mph)

		Throttle valve fully open [ ] Fully closed							
		1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
D range	NORM	52–56 (32–35)	73–100 (45–62)	135–142 (84–88)	37–41 (23–25)	22–26 (14–16)	130–136 (81–85)	86–90 (53–56)	43–47 (27–29)
	PWR	52–56 (32–35)	102–109 (63–68)	148–154 (92–96)	40–44 (25–27)	22–26 (14–16)	141–148 (88–92)	95–102 (59–63)	43–47 (27–29)
2 range	NORM PWR	45–49 (28–30)	108–115 (67–71)	–	–	–	–	102–109 (63–68)	40–44 (25–27)
L range	NORM PWR	–	–	–	–	–	–	87–94 (54–58)	49–53 (30–33)

Lock-up point

CBU
Tire size: 185R14-8

km/h (mph)

		Throttle valve opening 5%					
		Lock-up ON			Lock-up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D range	NORM	–	67–71 (42–44)	68–71 (42–44)	–	61–65 (38–40)	58–62 (36–39)
	PWR	–	58–62 (36–39)	68–71 (42–44)	–	52–56 (32–35)	61–65 (38–40)

* O/D switch OFF

Specifications (Cont'd)

Shift point C & C Tire size: 185R14-8 185R14-6 (Double tire) km/h (mph)			Throttle valve fully open [ ] Fully closed							
			1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
	D range	NORM	43–47 (27–29)	84–91 (52–57)	129–135 (80–84)	73–77 (45–48)	21–25 (13–16)	123–130 (76–81)	77–81 (48–50)	38–42 (24–26)
		PWR	51–55 (32–34)	97–103 (60–64)	132–138 (82–86)	73–77 (45–48)	21–25 (13–16)	126–132 (78–82)	90–97 (56–60)	45–48 (28–30)
	2 range	NORM PWR	43–47 (27–29)	103–110 (64–68)	–	–	–	–	97–104 (60–65)	38–42 (24–26)
	L range	NORM PWR	–	–	–	–	–	–	83–89 (52–55)	47–51 (29–32)

Lock-up point C & C Tire size: 185R14-8 185R14-6 (Double tire) km/h (mph)			Throttle valve opening 5%					
			Lock-up ON			Lock-up OFF		
			2nd	*3rd	O/D	2nd	*3rd	O/D
	D range	NORM	–	73–77 (45–48)	73–77 (45–48)	–	61–65 (38–40)	67–71 (42–44)
		PWR	–	73–77 (45–48)	73–77 (45–48)	–	67–71 (42–44)	67–71 (42–44)
	* O/D switch OFF							

Shift point C & C Tire size: 185R14-6 (Double tire) km/h (mph) (Differential gear ratio 4.300)			Throttle valve fully open [ ] Fully closed							
			1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
	D range	NORM	41–45 (25–28)	80–87 (50–54)	123–129 (76–80)	69–73 (43–45)	20–24 (12–15)	117–124 (73–77)	73–77 (45–48)	37–40 (23–25)
		PWR	49–53 (30–33)	92–99 (57–62)	126–132 (78–82)	69–73 (43–45)	20–24 (12–15)	120–126 (75–78)	86–92 (53–57)	42–46 (26–29)
	2 range	NORM PWR	41–45 (25–28)	98–105 (61–65)	–	–	–	–	93–99 (58–62)	37–40 (23–25)
	L range	NORM PWR	–	–	–	–	–	–	79–85 (49–53)	45–48 (28–30)

Lock-up point C & C Tire size: 185R14-6 (Double tire) km/h (mph) (Differential gear ratio 4.300)			Throttle valve opening 5%					
			Lock-up ON			Lock-up OFF		
			2nd	*3rd	O/D	2nd	*3rd	O/D
	D range	NORM	–	69–73 (43–45)	69–73 (43–45)	–	58–62 (36–39)	64–68 (40–42)
		PWR	–	69–73 (43–45)	69–73 (43–45)	–	64–68 (40–42)	64–68 (40–42)
	* O/D switch OFF							

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
Oil cooler pipe union nut	34	350	25
Torque converter x Drive plate	41	420	30
Drive plate x Crankshaft	83	850	61
Extension housing x Transmission case	36	370	27
Parking lock pawl bracket	7.4	75	65 in.·lbf
Valve body x Transmission case	10	100	7
Detent spring x Valve body	10	100	7
Solenoid x Valve body	10	100	7
Oil strainer	10	100	7
Oil pan	7.4	75	65 in.·lbf
Speed sensor	16	160	12
Speedometer driven gear lock plate	16	160	12

Torque Specifications (Cont'd)

Part tightened		N·m	kgf·cm	ft·lbf
Cooler union		29	300	22
Neutral start switch	Bolt	13	130	9
	Nut	6.9	70	61 in.·lbf
Control shaft lever		16	160	12

AUTOMATIC TRANSMISSION (A340H)
Specifications

Line pressure				
Engine idling	D range	422 – 481 kPa	4.3 – 4.9 kgf/cm^2	61 – 70 psi
	R range	520 – 618 kPa	5.3 – 6.3 kgf/cm^2	75 – 90 psi
At stall	D range	1,118 – 1,363 kPa	11.4 – 13.9 kgf/cm^2	162 – 198 psi
(Throttle valve fully opened)	R range	1,373 – 1,716 kPa	14.0 – 17.5 kgf/cm^2	199 – 249 psi
Engine stall revolution		2,850 ± 150 rpm		
Time lag	N range → D range	Less than 1.2 seconds		
	N range → R range	Less than 1.5 seconds		
Engine idling speed (A/C OFF)	N range	850 rpm		
Throttle cable adjustment				
Throttle valve fully opened		Between boot end face and inner cable stopper		
		0 – 1 mm	0 – 0.04 in.	
Torque converter sleeve runout	Limit	0.30 mm	0.0118 in.	
Torque converter installation distance		18.0 mm	0.709 in.	
Drive plate runout	Limit	0.20 mm	0.0079 in.	

Shift point km/h (mph)

Transfer shift position "H2" or "H4"		Throttle valve fully open [ ] Fully closed							
		1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
D range	NORM	50–53 (31–33)	90–96 (56–60)	131–138 (81–86)	35–39 (22–24)	21–25 (13–16)	125–132 (78–82)	84–91 (52–57)	40–44 (25–27)
	PWR	50–53 (31–33)	90–96 (56–60)	131–138 (81–86)	38–42 (24–26)	21–25 (13–16)	125–132 (78–82)	84–91 (52–57)	40–44 (25–27)
2 range	NORM PWR	43–46 (27–29)	103–109 (64–68)	–	–	–	–	97–103 (60–64)	38–42 (24–42)
L range	NORM PWR	–	–	–	–	–	–	82–89 (51–55)	47–51 (29–32)

Lock-up point km/h (mph)

Transfer shift position "H2" or "H4"		Throttle valve opening 5 %					
		Lock-up ON			Lock-up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D range	NORM	–	52–56 (32–35)	64–68 (40–42)	–	50–53 (31–33)	55–59 (34–37)
	PWR	–	52–56 (32–35)	64–68 (40–42)	–	50–53 (31–33)	55–59 (34–37)

* O/D switch OFF

Torque Specifications
(Refer to the A340E automatic transmission)

AUTOMATIC TRANSMISSION (A340E)

Specifications

Line pressure					
Engine idling		D range	363 – 422 kPa	3.7 – 4.3 kgf/cm^2	53 – 61 psi
		R range	490 – 588 kPa	5.0 – 6.0 kgf/cm^2	71 – 85 psi
At stall		D range	932 – 1,178 kPa	9.5 – 12.0 kgf/cm^2	135 – 171 psi
(Throttle valve fully opened)		R range	1,294 – 1,638 kPa	13.2 – 16.7 kgf/cm^2	188 – 238 psi
Engine stall revolution		C&C	2,200 ± 150 rpm		
		Except C&C	2,450 ± 150 rpm		
Time lag	N range →	D range	Less than 1.2 seconds		
	N range →	R range	Less than 1.5 seconds		
Engine idling speed (A/C OFF)		N range	800 rpm		
Throttle cable adjustment					
Throttle valve fully opened			Between boot end face and inner cable stopper		
			0 – 1 mm	0 – 0.04 in.	
Torque converter sleeve runout		Limit	0.30 mm	0.0118 in.	
Torque converter installation distance			18.0 mm	0.709 in.	
Drive plate runout		Limit	0.20 mm	0.0079 in.	

Shift point

CBU
Tire size: P205/75R14 P215/65R15

km/h (mph)

		Throttle valve fully open [ ] Fully closed							
		1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
D range	NORM	61–66 (38–41)	108–117 (67–73)	143–152 (89–94)	43–48 (27–30)	26–30 (16–19)	136–145 (85–90)	100–105 (62–65)	44–49 (27–30)
	PWR	61–66 (38–41)	119–127 (74–79)	147–156 (91–97)	47–52 (29–32)	26–30 (16–19)	140–149 (87–93)	110–119 (68–74)	44–49 (27–30)
2 range	NORM PWR	53–57 (33–35)	126–135 (78–84)	–	–	–	–	119–128 (74–80)	47–52 (29–32)
L range	NORM PWR	–	–	–	–	–	–	101–110 (63–68)	57–62 (35–39)

Lock-up point

CBU
Tire size: P205/75R14 P215/65R15

km/h (mph)

		Throttle valve opening 5%					
		Lock-up ON			Lock-up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D range	NORM	–	79–83 (49–52)	79–83 (49–52)	–	71–76 (44–47)	68–73 (42–45)
	PWR	–	61–66 (38–41)	79–83 (49–52)	–	68–73 (42–45)	68–76 (42–47)

* O/D switch OFF

Shift point

CBU
Tire size: 185R14-8

km/h (mph)

		Throttle valve fully open [ ] Fully closed							
		1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
D range	NORM	52–56 (32–35)	73–100 (45–62)	135–142 (84–88)	37–41 (23–25)	22–26 (14–16)	130–136 (81–85)	86–90 (53–56)	43–47 (27–29)
	PWR	52–56 (32–35)	102–109 (63–68)	148–154 (92–96)	40–44 (25–27)	22–26 (14–16)	141–148 (88–92)	95–102 (59–63)	43–47 (27–29)
2 range	NORM PWR	45–49 (28–30)	108–115 (67–71)	–	–	–	–	102–109 (63–68)	40–44 (25–27)
L range	NORM PWR	–	–	–	–	–	–	87–94 (54–58)	49–53 (30–33)

Lock-up point

CBU
Tire size: 185R14-8

km/h (mph)

		Throttle valve opening 5%					
		Lock-up ON			Lock-up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D range	NORM	–	67–71 (42–44)	68–71 (42–44)	–	61–65 (38–40)	58–62 (36–39)
	PWR	–	58–62 (36–39)	68–71 (42–44)	–	52–56 (32–35)	61–65 (38–40)

* O/D switch OFF

Specifications (Cont'd)

Shift point C & C Tire size: 185R14-8 185R14-6 (Double tire) km/h (mph)			Throttle valve fully open [ ] Fully closed							
			1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
	D range	NORM	43–47 (27–29)	84–91 (52–57)	129–135 (80–84)	73–77 (45–48)	21–25 (13–16)	123–130 (76–81)	77–81 (48–50)	38–42 (24–26)
		PWR	51–55 (32–34)	97–103 (60–64)	132–138 (82–86)	73–77 (45–48)	21–25 (13–16)	126–132 (78–82)	90–97 (56–60)	45–48 (28–30)
	2 range	NORM PWR	43–47 (27–29)	103–110 (64–68)	–	–	–	–	97–104 (60–65)	38–42 (24–26)
	L range	NORM PWR	–	–	–	–	–	–	83–89 (52–55)	47–51 (29–32)

Lock-up point C & C Tire size: 185R14-8 185R14-6 (Double tire) km/h (mph)			Throttle valve opening 5%					
			Lock-up ON			Lock-up OFF		
			2nd	*3rd	O/D	2nd	*3rd	O/D
	D range	NORM	–	73–77 (45–48)	73–77 (45–48)	–	61–65 (38–40)	67–71 (42–44)
		PWR	–	73–77 (45–48)	73–77 (45–48)	–	67–71 (42–44)	67–71 (42–44)
	* O/D switch OFF							

Shift point C & C Tire size: 185R14-6 (Double tire) km/h (mph) (Differential gear ratio 4.300)			Throttle valve fully open [ ] Fully closed							
			1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
	D range	NORM	41–45 (25–28)	80–87 (50–54)	123–129 (76–80)	69–73 (43–45)	20–24 (12–15)	117–124 (73–77)	73–77 (45–48)	37–40 (23–25)
		PWR	49–53 (30–33)	92–99 (57–62)	126–132 (78–82)	69–73 (43–45)	20–24 (12–15)	120–126 (75–78)	86–92 (53–57)	42–46 (26–29)
	2 range	NORM PWR	41–45 (25–28)	98–105 (61–65)	–	–	–	–	93–99 (58–62)	37–40 (23–25)
	L range	NORM PWR	–	–	–	–	–	–	79–85 (49–53)	45–48 (28–30)

Lock-up point C & C Tire size: 185R14-6 (Double tire) km/h (mph) (Differential gear ratio 4.300)			Throttle valve opening 5%					
			Lock-up ON			Lock-up OFF		
			2nd	*3rd	O/D	2nd	*3rd	O/D
	D range	NORM	–	69–73 (43–45)	69–73 (43–45)	–	58–62 (36–39)	64–68 (40–42)
		PWR	–	69–73 (43–45)	69–73 (43–45)	–	64–68 (40–42)	64–68 (40–42)
	* O/D switch OFF							

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
Oil cooler pipe union nut	34	350	25
Torque converter x Drive plate	41	420	30
Drive plate x Crankshaft	83	850	61
Extension housing x Transmission case	36	370	27
Parking lock pawl bracket	7.4	75	65 in.·lbf
Valve body x Transmission case	10	100	7
Detent spring x Valve body	10	100	7
Solenoid x Valve body	10	100	7
Oil strainer	10	100	7
Oil pan	7.4	75	65 in.·lbf
Speed sensor	16	160	12
Speedometer driven gear lock plate	16	160	12

Torque Specifications (Cont'd)

Part tightened		N·m	kgf·cm	ft·lbf
Cooler union		29	300	22
Neutral start switch	Bolt	13	130	9
	Nut	6.9	70	61 in.·lbf
Control shaft lever		16	160	12

AUTOMATIC TRANSMISSION (A340H)
Specifications

Line pressure				
Engine idling	D range	422 – 481 kPa	4.3 – 4.9 kgf/cm^2	61 – 70 psi
	R range	520 – 618 kPa	5.3 – 6.3 kgf/cm^2	75 – 90 psi
At stall	D range	1,118 – 1,363 kPa	11.4 – 13.9 kgf/cm^2	162 – 198 psi
(Throttle valve fully opened)	R range	1,373 – 1,716 kPa	14.0 – 17.5 kgf/cm^2	199 – 249 psi
Engine stall revolution		2,850 ± 150 rpm		
Time lag	N range → D range	Less than 1.2 seconds		
	N range → R range	Less than 1.5 seconds		
Engine idling speed (A/C OFF)	N range	850 rpm		
Throttle cable adjustment				
Throttle valve fully opened		Between boot end face and inner cable stopper		
		0 – 1 mm	0 – 0.04 in.	
Torque converter sleeve runout	Limit	0.30 mm	0.0118 in.	
Torque converter installation distance		18.0 mm	0.709 in.	
Drive plate runout	Limit	0.20 mm	0.0079 in.	

Shift point km/h (mph)

Transfer shift position "H2" or "H4"		Throttle valve fully open [ ] Fully closed							
		1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
D range	NORM	50–53 (31–33)	90–96 (56–60)	131–138 (81–86)	35–39 (22–24)	21–25 (13–16)	125–132 (78–82)	84–91 (52–57)	40–44 (25–27)
	PWR	50–53 (31–33)	90–96 (56–60)	131–138 (81–86)	38–42 (24–26)	21–25 (13–16)	125–132 (78–82)	84–91 (52–57)	40–44 (25–27)
2 range	NORM PWR	43–46 (27–29)	103–109 (64–68)	–	–	–	–	97–103 (60–64)	38–42 (24–42)
L range	NORM PWR	–	–	–	–	–	–	82–89 (51–55)	47–51 (29–32)

Lock-up point km/h (mph)

Transfer shift position "H2" or "H4"		Throttle valve opening 5 %					
		Lock-up ON			Lock-up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D range	NORM	–	52–56 (32–35)	64–68 (40–42)	–	50–53 (31–33)	55–59 (34–37)
	PWR	–	52–56 (32–35)	64–68 (40–42)	–	50–53 (31–33)	55–59 (34–37)

* O/D switch OFF

Torque Specifications
(Refer to the A340E automatic transmission)

Torque Specifications (Cont'd)

Part tightened		N·m	kgf·cm	ft·lbf
Cooler union		29	300	22
Neutral start switch	Bolt	13	130	9
	Nut	6.9	70	61 in.·lbf
Control shaft lever		16	160	12

AUTOMATIC TRANSMISSION (A340H)

Specifications

Line pressure				
Engine idling	D range	422 – 481 kPa	4.3 – 4.9 kgf/cm^2	61 – 70 psi
	R range	520 – 618 kPa	5.3 – 6.3 kgf/cm^2	75 – 90 psi
At stall	D range	1,118 – 1,363 kPa	11.4 – 13.9 kgf/cm^2	162 – 198 psi
(Throttle valve fully opened)	R range	1,373 – 1,716 kPa	14.0 – 17.5 kgf/cm^2	199 – 249 psi
Engine stall revolution		2,850 ± 150 rpm		
Time lag	N range → D range	Less than 1.2 seconds		
	N range → R range	Less than 1.5 seconds		
Engine idling speed (A/C OFF)	N range	850 rpm		
Throttle cable adjustment				
Throttle valve fully opened		Between boot end face and inner cable stopper		
		0 – 1 mm	0 – 0.04 in.	
Torque converter sleeve runout	Limit	0.30 mm	0.0118 in.	
Torque converter installation distance		18.0 mm	0.709 in.	
Drive plate runout	Limit	0.20 mm	0.0079 in.	

Shift point km/h (mph)

Transfer shift position "H2" or "H4"		Throttle valve fully open [ ] Fully closed							
		1 → 2	2 → 3	3 → O/D	[3 → O/D]	[O/D → 3]	O/D → 3	3 → 2	2 → 1
D range	NORM	50–53 (31–33)	90–96 (56–60)	131–138 (81–86)	35–39 (22–24)	21–25 (13–16)	125–132 (78–82)	84–91 (52–57)	40–44 (25–27)
	PWR	50–53 (31–33)	90–96 (56–60)	131–138 (81–86)	38–42 (24–26)	21–25 (13–16)	125–132 (78–82)	84–91 (52–57)	40–44 (25–27)
2 range	NORM PWR	43–46 (27–29)	103–109 (64–68)	–	–	–	–	97–103 (60–64)	38–42 (24–42)
L range	NORM PWR	–	–	–	–	–	–	82–89 (51–55)	47–51 (29–32)

Lock-up point km/h (mph)

Transfer shift position "H2" or "H4"		Throttle valve opening 5 %					
		Lock-up ON			Lock-up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D range	NORM	–	52–56 (32–35)	64–68 (40–42)	–	50–53 (31–33)	55–59 (34–37)
	PWR	–	52–56 (32–35)	64–68 (40–42)	–	50–53 (31–33)	55–59 (34–37)

* O/D switch OFF

Torque Specifications (Refer to the A340E automatic transmission)

AUTOMATIC TRANSMISSION (A340F)

Specifications

Line pressure					
Engine idling		D range	363 – 422 kPa	3.7 – 4.3 kgf/cm^2	53 – 61 psi
		R range	490 – 588 kPa	5.0 – 6.0 kgf/cm^2	71 – 85 psi
At stall		D range	932 – 1,177 kPa	9.5 – 12.0 kgf/cm^2	135 – 171 psi
		R range	1,294 – 1,638 kPa	13.2 – 16.7 kgf/cm^2	188 – 238 psi
Engine stall revolution			2,200 ± 150 rpm		
Time lag	N range	→ D range	Less than 1.2 seconds		
	N range	→ R range	Less than 1.5 seconds		
Engine idling speed (A/C OFF)		N range	800 rpm		
Throttle cable adjustment					
Throttle valve fully opened			Between boot end face and inner cable stopper		
			0 – 1 mm	0 – 0.04 in.	
Torque converter sleeve runout		Limit	0.30 mm	0.0118 in.	
Torque converter installation distance			20.0 mm	0.787 in.	
Drive plate runout			0.20 mm	0.0079 in.	

Shift point km/h (mph)

		Throttle valve fully open [ ] Fully closed							
		1 → 2	2 → 3	3 → O/D	[3→ O/D]	[O/D→ 3]	O/D → 3	3 → 2	2 → 1
D range	NORM	44–48 (27–30)	93–99 (58–61)	134–141 (83–87)	35–39 (22–24)	21–25 (13–16)	128–135 (79–84)	87–94 (54–58)	40–43 (25–27)
	PWR	47–51 (29–32)	93–99 (58–61)	148–155 (92–96)	50–53 (31–33)	21–25 (13–16)	143–149 (89–92)	87–94 (54–58)	41–45 (25–28)
2 range	NORM PWR	43–46 (27–29)	103–109 (64–68)	–	–	–	–	97–103 (60–64)	38–42 (24–26)
L range	NORM PWR	–	–	–	–	–	–	82–89 (51–55)	47–51 (29–32)

Lock-up point km/h (mph)

		Throttle valve opening 5%					
		Lock-up ON			Lock-up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D range	NORM	–	41–45 (25–28)	59–63 (37–39)	–	38–42 (24–26)	55–59 (34–37)
	PWR	–	55–59 (34–37)	75–79 (47–49)	–	50–53 (31–33)	70–73 (43–45)

* O/D switch OFF

Torque Specifications
(Refer to the A340E automatic transmission)

AUTOMATIC TRANSMISSION (A340F)

Specifications

Line pressure					
Engine idling		D range	363 – 422 kPa	3.7 – 4.3 kgf/cm^2	53 – 61 psi
		R range	490 – 588 kPa	5.0 – 6.0 kgf/cm^2	71 – 85 psi
At stall		D range	932 – 1,177 kPa	9.5 – 12.0 kgf/cm^2	135 – 171 psi
		R range	1,294 – 1,638 kPa	13.2 – 16.7 kgf/cm^2	188 – 238 psi
Engine stall revolution			2,200 ± 150 rpm		
Time lag	N range	→ D range	Less than 1.2 seconds		
	N range	→ R range	Less than 1.5 seconds		
Engine idling speed (A/C OFF)		N range	800 rpm		
Throttle cable adjustment					
Throttle valve fully opened			Between boot end face and inner cable stopper		
			0 – 1 mm	0 – 0.04 in.	
Torque converter sleeve runout		Limit	0.30 mm	0.0118 in.	
Torque converter installation distance			20.0 mm	0.787 in.	
Drive plate runout			0.20 mm	0.0079 in.	

Shift point km/h (mph)

		Throttle valve fully open [ ] Fully closed							
		1 → 2	2 → 3	3 → O/D	[3→ O/D]	[O/D→ 3]	O/D → 3	3 → 2	2 → 1
D range	NORM	44–48 (27–30)	93–99 (58–61)	134–141 (83–87)	35–39 (22–24)	21–25 (13–16)	128–135 (79–84)	87–94 (54–58)	40–43 (25–27)
	PWR	47–51 (29–32)	93–99 (58–61)	148–155 (92–96)	50–53 (31–33)	21–25 (13–16)	143–149 (89–92)	87–94 (54–58)	41–45 (25–28)
2 range	NORM PWR	43–46 (27–29)	103–109 (64–68)	–	–	–	–	97–103 (60–64)	38–42 (24–26)
L range	NORM PWR	–	–	–	–	–	–	82–89 (51–55)	47–51 (29–32)

Lock-up point km/h (mph)

		Throttle valve opening 5%					
		Lock-up ON			Lock-up OFF		
		2nd	*3rd	O/D	2nd	*3rd	O/D
D range	NORM	–	41–45 (25–28)	59–63 (37–39)	–	38–42 (24–26)	55–59 (34–37)
	PWR	–	55–59 (34–37)	75–79 (47–49)	–	50–53 (31–33)	70–73 (43–45)

* O/D switch OFF

Torque Specifications
(Refer to the A340E automatic transmission)

TRANSFER (RF1A Type Transfer W56)

Specifications

Output shaft bearing thrust clearance			Less than 0.10 mm (0.0039 in.)	
Output shaft snap ring thickness		Mark		
		0	2.40 – 2.45 mm	0.0945 – 0.0965 in.
		1	2.45 – 2.50 mm	0.0965 – 0.0984 in.
		2	2.50 – 2.55 mm	0.0984 – 0.1004 in.
		3	2.55 – 2.60 mm	0.1004 – 0.1024 in.
		4	2.60 – 2.65 mm	0.1024 – 0.1043 in.
		5	2.65 – 2.70 mm	0.1043 – 0.1063 in.
Output shaft runout		Limit	0.03 mm	0.0012 in.
Output shaft outer diameter	Limit	Part A	44.984 mm	1.7710 in.
		Part B	34.984 mm	1.3773 in.
Low gear to output shaft oil clearance		STD	0.010 – 0.055 mm	0.0004 – 0.0022 in.
		Limit	0.075 mm	0.0030 in.
Low gear thrust clearance		STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
		Limit	0.30 mm	0.0118 in.
Transfer drive gear to output shaft oil clearance		STD	0.009 – 0.051 mm	0.0004 – 0.0020 in.
		Limit	0.071 mm	0.0028 in.
Transfer drive gear thrust clearance		STD	0.09 – 0.27 mm	0.0035 – 0.0106 in.
		Limit	0.32 mm	0.0126 in.
Input shaft bearing thrust clearance			Less than 0.15 mm (0.0059 in.)	
Input shaft snap ring thickness		Mark		
		1	2.05 – 2.10 mm	0.0807 – 0.0827 in.
		3	2.15 – 2.20 mm	0.0846 – 0.0866 in.
		5	2.25 – 2.30 mm	0.0886 – 0.0906 in.
Counter shaft bearing thrust clearance			Less than 0.15 mm (0.0059 in.)	
Counter shaft snap ring thickness		Mark		
		1	2.10 – 2.15 mm	0.0827 – 0.0846 in.
		3	2.20 – 2.25 mm	0.0866 – 0.0886 in.
Idler gear shaft bearing thrust clearance			Less than 0.15 mm (0.0059 in.)	
Idler gear shaft snap ring thickness		Mark		
		A	1.50 – 1.55 mm	0.0591 – 0.0610 in.
		B	1.60 – 1.65 mm	0.0630 – 0.0650 in.
Shift fork to hub sleeve clearance		Limit	1.0 mm	0.039 in.
Speedometer driven gear oil seal depth			20 mm	0.79 in.
Front drive gear oil seal depth			7 mm	0 28 in

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
Adaptor x Reduction gear case	39	400	29
Reduction gear case x Front case x Rear case	39	400	29
Rear case x Extension housing	39	400	29
Front case x Rear case	39	400	29
Reduction case x Front case	39	400	29
Reduction case x Transfer case cover	8.8	90	78 in.·lbf
Output shaft x Companion flange	123	1,250	90
Front drive gear bearing retainer x Front case	18	185	13
Front case x Bearing retainer	18	185	13
Straight screw plug	12	120	9
Transfer indicator switch	34	350	25
Speedometer driven gear lock plate	11	115	8

TRANSFER (VF1A Type Tansfer/G58, R150F, A340F) Specifications

Oil pump body	Body clearance	STD	0.10 – 0.16 mm	0.0039 – 0.0063 in.
		Limit	0.16 mm	0.0063 in.
	Tip clearance	STD	0.08 – 0.16 mm	0.0031 – 0.0063 in.
		Limit	0.16 mm	0.0063 in.
	Side clearance	STD	0.03 – 0.08 mm	0.0012 – 0.0031 in.
		Limit	0.08 mm	0.0031 in.
Rear output shaft assem–bly	Drive sprocket thrust clearance	STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
		Limit	0.25 mm	0.0098 in.
	Driven sprocket oil clearance	STD	0.010 – 0.055 mm	0.0004 – 0.0022 in.
		Limit	0.055 mm	0.0022 in.
	Rear output shaft journal diameter			
	Part A	Limit	27.98 mm	1.1016 in.
	Part B	Limit	36.98 mm	1.4559 in.
	Front drive shift fork to hub sleeve clearance	Limit	1.0 mm	0.039 in.
	High and low shift fork to hub sleeve clearance	Limit	1.0 mm	0.039 in.
	Rear output shaft snap ring thickness	Mark		
		A	2.10 – 2.15 mm	0.0827 – 0.0846 in.
		B	2.15 – 2.20 mm	0.0846 – 0.0866 in.
		C	2.20 – 2.25 mm	0.0866 – 0.0886 in.
		D	2.25 – 2.30 mm	0.0886 – 0.0906 in.
		E	2.30 – 2.35 mm	0.0906 – 0.0925 in.
		F	2.35 – 2.40 mm	0.0925 – 0.0945 in.
		G	2.40 – 2.45 mm	0.0945 – 0.0965 in.
		H	2.45 – 2.50 mm	0.0965 – 0.0984 in.
		J	2.50 – 2.55 mm	0.0984 – 0.1004 in.
		K	2.00 – 2.05 mm	0.0787 – 0.0807 in.
		L	2.05 – 2.10 mm	0.0807 – 0.0827 in.

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
Adaptor x Reduction gear case	39	400	29
Reduction gear case x Front case x Rear case	39	400	29
Rear case x Extension housing	39	400	29
Front case x Rear case	39	400	29
Reduction case x Front case	39	400	29
Reduction case x Transfer case cover	8.8	90	78 in.·lbf
Output shaft x Companion flange	123	1,250	90
Front drive gear bearing retainer x Front case	18	185	13
Front case x Bearing retainer	18	185	13
Straight screw plug	12	120	9
Transfer indicator switch	34	350	25
Speedometer driven gear lock plate	11	115	8

TRANSFER (VF1A Type Tansfer G58 R150F A340F) Specifications

Oil pump body	Body clearance	STD	0.10 – 0.16 mm	0.0039 – 0.0063 in.
		Limit	0.16 mm	0.0063 in.
	Tip clearance	STD	0.08 – 0.16 mm	0.0031 – 0.0063 in.
		Limit	0.16 mm	0.0063 in.
	Side clearance	STD	0.03 – 0.08 mm	0.0012 – 0.0031 in.
		Limit	0.08 mm	0.0031 in.
Rear output shaft assem–bly	Drive sprocket thrust clearance	STD	0.10 – 0.25 mm	0.0039 – 0.0098 in.
		Limit	0.25 mm	0.0098 in.
	Driven sprocket oil clearance	STD	0.010 – 0.055 mm	0.0004 – 0.0022 in.
		Limit	0.055 mm	0.0022 in.
	Rear output shaft journal diameter			
	Part A	Limit	27.98 mm	1.1016 in.
	Part B	Limit	36.98 mm	1.4559 in.
	Front drive shift fork to hub sleeve clearance	Limit	1.0 mm	0.039 in.
	High and low shift fork to hub sleeve clearance	Limit	1.0 mm	0.039 in.
	Rear output shaft snap ring thickness	Mark		
		A	2.10 – 2.15 mm	0.0827 – 0.0846 in.
		B	2.15 – 2.20 mm	0.0846 – 0.0866 in.
		C	2.20 – 2.25 mm	0.0866 – 0.0886 in.
		D	2.25 – 2.30 mm	0.0886 – 0.0906 in.
		E	2.30 – 2.35 mm	0.0906 – 0.0925 in.
		F	2.35 – 2.40 mm	0.0925 – 0.0945 in.
		G	2.40 – 2.45 mm	0.0945 – 0.0965 in.
		H	2.45 – 2.50 mm	0.0965 – 0.0984 in.
		J	2.50 – 2.55 mm	0.0984 – 0.1004 in.
		K	2.00 – 2.05 mm	0.0787 – 0.0807 in.
		L	2.05 – 2.10 mm	0.0807 – 0.0827 in.

Specifications (Cont'd)

Input shaft	Input shaft journal outer diameter	Limit	47.59 mm	1.8736 in.
	Input shaft bushing diameter	Limit	39.14 mm	1.5409 in.
	Synchronizer ring to sprocket clearance	STD	1.15 – 1.8 5 mm	0.0453 – 0.0728 in.
		Limit	0.8 mm	0.0031 in.
	Input shaft snap ring thickness	Mark		
		A	2.10 – 2.15 mm	0.0827 – 0.0846 in.
		B	2.15 – 2.20 mm	0.0846 – 0.0866 in.
		C	2.20 – 2.25 mm	0.0866 – 0.0886 in.
		D	2.25 – 2.30 mm	0.0886 – 0.0906 in.
		E	2.30 – 2.35 mm	0.0906 – 0.0925 in.
		F	2.35 – 2.40 mm	0.0925 – 0.0945 in.
		G	2.40 – 2.45 mm	0.0945 – 0.0965 in.
		H	2.45 – 2.50 mm	0.0965 – 0.0984 in.
		J	2.50 – 2.55 mm	0.0984 – 0.1004 in.
		K	2.55 – 2.60 mm	0.1004 – 0.1024 in.
		L	2.60 – 2.65 mm	0.1024 – 0.1043 in.
		M	2.65 – 2.70 mm	0.1043 – 0.1063 in.
		N	2.70 – 2.75 mm	0.1063 – 0.1083 in.
		P	2.75 – 2.80 mm	0.1083 – 0.1102 in.
		Q	2.80 – 2.85 mm	0.1102 – 0.1122 in.
		R	2.85 – 2.90 mm	0.1122 – 0.1142 in.
		S	2.90 – 2.95 mm	0.1142 – 0.1161 in.
		T	2.95 – 3.00 mm	0.1161 – 0.1181 in.
		U	3.00 – 3.05 mm	0.1181 – 0.1201 in.
Planetary gear	Pinion gear thrust clearance	STD	0.11 – 0.86 mm	0.0043 – 0.0339 in.
		Limit	0.86 mm	0.0339 in.
	Pinion gear oil clearance	STD	0.009 – 0.038 mm	0.0004 – 0.0015 in.
		Limit	0.038 mm	0.0015 in.
	Outer bearing snap ring thickness	Mark		
		1	1.45 – 1.50 mm	0.0571 – 0.0591 in.
		2	1.50 – 1.55 mm	0.0591 – 0.0610 in.
		3	1.55 – 1.60 mm	0.0610 – 0.0630 in.
		4	1.60 – 1.65 mm	0.0630 – 0.0650 in.
		5	1.65 – 1.70 mm	0.0650 – 0.0669 in.
	Inner bearing depth		5.0 – 5.6 mm	0.197 – 0.220 in.
Oil seal	Speedometer driven gear oil seal depth		25 mm	0.98 in.
	Shift fork shaft oil seal depth		–0.5 – 0.5 mm	–0.020 – 0.020 in.

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
Oil pump plate	7.4	75	65 in.·lbf
Straight screw plug for oil pump body	29	300	22
Straight screw plug for ring gear	19	190	14
Oil pump body x Front case	11	115	8
Separator with oil strainer	18	185	13
Straight screw plug for shift fork shaft	19	190	14
Front case x Rear case	37	380	27
Extension housing	11	115	8
Companion flange lock nut	118	1,200	87
Control retainer or upper cover	18	185	13
Front retainer	11	115	8
Transfer indicator switch	37	380	27
Transfer assembly x Transmission	37	380	27
Transfer L4 position switch	37	380	27

TRANSFER (Installation of Transfer)
Torque Specifications

Part tightened		N·m	kgf·cm	ft·lbf
Transfer x Transfer adaptor	W56	39	400	29
	G 58, R 150F, A340F	37	380	27
Engine rear mounting		25	260	19
Transfer x Dynamic damper (Regular cab wI Planetary gear type transfer)		37	380	27

PROPELLER SHAFT

Specifications

Spider axial play			Less than 0.05 mm (0.0020 in.)	
Spider bearing selection		Mark		
Bearing cup outer diameter		None	29.008 – 29.021 mm	1.1420 – 1.1426 in.
		Red	29.028 – 29.041 mm	1.1428 – 1.1433 in.
Bearing hole inner diameter		None	29.000 – 29.020 mm	1.1417 – 1.1425 in.
		Drill	29.021 – 29.042 mm	1.1426 – 1.1434 in.
Snap ring thickness	Color	Mark		
	None	1	2.100 – 2.150 mm	0.0827 – 0.0846 in.
	None	2	2.150 – 2.200 mm	0.0846 – 0.0866 in.
	None	3	2.200 – 2.250 mm	0.0866 – 0.0886 in.
	Brown	None	2.250 – 2.300 mm	0.0886 – 0.0906 in.
	Blue	None	2.300 – 2.350 mm	0.0906 – 0.0925 in.
	None	6	2.350 – 2.400 mm	0.0925 – 0.0945 in.
	None	7	2.400 – 2.450 mm	0.0945 – 0.0965 in.
	None	8	2.450 – 2.500 mm	0.0965 – 0.0984 in.
Runout		Limit	0.8 mm	0.031 in.

Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
Front differential x Front propeller shaft (4WD)	74	750	54
Front propeller shaft x Transfer (4WD)	74	750	54
Propeller shaft x Rear differential 3VZ–E (M/T)	76	780	56
Ex. 3VZ–E (M/T)	74	750	54
Propeller shaft x Transfer 3VZ–E (M/T)	76	780	56
Ex. 3VZ–E (M/T)	74	750	54
Intermediate shaft x Propeller shaft (4WD)			
3VZ–E (M/T)	76	780	56
Ex. 3VZ–E (M/T)	74	750	54
Propeller shaft x Differential (2WD)	74	750	54
Intermediate shaft x Propeller shaft (2WD)	74	750	54
Center support bearing x Frame	36	370	27
Intermediate shaft x Center bearing x Joint flange			
1 st	181	1,850	134
2nd	Loosen nut		
3rd	69	700	51
Front propeller shaft No. 2 dust cover set bolts	17	175	13
Front propeller shaft No. 2 dust cover set nut	13	135	10
(wl VF 1 A type transfer and A340H)			
Front propeller shaft dust cover subassembly x Bracket	23	230	17
Front propeller shaft dust cover subassembly x Transfer	37	370	27
Propeller shaft protector x Frame	29	300	22

SUSPENSION AND AXLE

Specifications (Front/2WD)

Cold tire inflation pressure	Tire size	Pressure kPa (kgf/cm2, psi)	
		Front	Rear
	P195/75R14 P205/75R14 P215/65R15	200 (2.0, 29)	240 (2.4, 35)
	185R14LT-6PR	220 (2.2, 32)	220 (2.2, 32)
	185R14LT-8PR	200 (2.0, 29)	450 (4.5, 65)

Chassis ground clearance	Model	Tire size	Clearance mm (in.)	
			Front	Rear
	RN80L – TRMDEA RN80L – TRMDEK	P195/75R14	257 (10.12)	263 (10.35)
	RN80L – TRSDEA RN80L – TRSDEK	P195/75R14	257 (10.12)	263 (10.35)
	RN80L – TRMREA RN80L – TRMREK	P195/75R14	260 (10.23)	268 (10.55)
	RN85L – TRMDEA RN85L – TRMDEK	P195/75R14	263 (10.35)	261 (10.28)
	RN85L – TRSDEA RN85L – TRSDEK	P195/75R14	262 (10.31)	261 (10.28)
	RN90L – CRMDEA RN90L – CRMDEK	P205/75R14	278 (10.94)	264 (10.39)
	RN90L – CRSDEA RN90L – CRSDEK	P205/75R14	278 (10.94)	264 (10.39)
	VZN85L – THMDEA	185R14LT – 8PR	260 (10.24)	284 (11.18)
	VZN85L – THSDEA	185R14LT – 8PR	258 (10.16)	283 (11.14)
	VZN85L – TWMREA6	185R14LT – 6PR	259 (10.20)	234 (9.21)
	VZN85L – TINSREA6	185R14LT – 6PR	259 (10.24)	235 (9.25)
	VZN90L – CRMDEA VZN90L – CRMDEK	P205/75R14	277 (10.91)	266 (10.47)
	VZN90L – CRSDEA VZN90L – CRSDEK	P205/75R14	277 (10.91)	265 (10.43)
	VZN90L – CRMGEA	P205/75R14	273 (10.75)	262 (10.31)
	VZN90L – CRPGEA	P205/75R14	273 (10.75)	262 (10.31)
		P215/75R15	274 (10.79)	263 (10.35)
	VZN95L – TWMREA6	185R14LT – 6PR	259 (10.20)	232 (9.13)
	VZN95L – TWSREA6 VZN95L – TWSREK6	185R14LT – 6PR	259 (10.20)	232 (9.13)

Front wheel alignment	Model	Camber	Caster	Steering axis inclination	Toe–in mm (in.)
	RN80L – TRSDEA RN80L – TRSDEK	0°30′ ± 45′	0°43′ ± 45′	10°00′ ± 45′	1.32±2 (0.0520±0.08)
	RN80L – TRMDEA RN80L – TRMDEK	0°30′ ± 45′	0°44′ ± 45′	10°00′ ± 45′	1.32±2 (0.0520±0.08)
	RN80L – TRMREA RN80L – TRMREK	0°28′ ± 45′	0°40′ ± 45′	10°01′ ± 45′	1.74±2 (0.0685±0.08)

Specifications (Front/2WD) (Cont'd)

Front wheel alignment (cont'd)	Model	Camber	Caster	Steering axis inclination	Toe–in mm (in.)
	RN85L – TRMDEA RN85L – TRMDEK	0°27′ ± 45′	0°59′ ± 45′	10°02′ ± 45′	2.09±2 (0.0822±0.08)
	RN85L – TRSDEA RN85L – TRSDEK	0°27′ ± 45′	0°58′ ± 45′	10°02′ ± 45′	2.09±2 (0.0822±0.08)
	RN90L – CRSDEA RN90L – CRSDEK	0°23′ ± 45′	1°15′ ± 45′	10°06′ ± 45′	3.27±2 (0.1287±0.08)
	RN90L – CRMDEA RN90L – CRMDEK	0°23′ ± 45′	1°15′ ± 45′	10°06′ ± 45′	3.27±2 (0.1287±0.08)
	VZN85L – THMDEA	0°29′ ± 45′	0°34′ ± 45′	10°00′ ± 45′	5.61±2 (0.2209±0.08)
	VZN85L – THSDEA	0°30′ ± 45′	0°33′ ± 45′	10°00′ ± 45′	4.85±2 (0.1909±0.08)
	VZN85L – TWMREA6	0°29′ ± 45′	1°46′ ± 45′	10°00′ ± 45′	5.73±2 (0.2256±0.08)
	VZN85L – TWSREA6	0°29′ ± 45′	1°45′ ± 45′	10°00′ ± 45′	5.73±2 (0.2256±0.08)
	VZN90L – CRMDEA VZN90L – CRMDEK	0°23′ ± 45′	1°11′ ± 45′	10°06′ ± 45′	3.27±2 (0.1287±0.08)
	VZN90L – CRSDEA VZN90L – CRSDEK	0°23′ ± 45′	1°12′ ± 45′	10°06′ ± 45′	3.27±2 (0.1287±0.08)
	VZN90L – CRMGEA	0°25′ ± 45′	1°13′ ± 45′	10°04′ ± 45′	2.82±2 (0.1110±0.08)
	VZN90L – CRPGEA	0°25′ ± 45′	1°12′ ± 45′	10°04′ ± 45′	2.82±2 (0.1110±0.08)
	VZN95L – T1lVMREA6	0°29′ ± 45′	1°47′ ± 45′	10°00′ ± 45′	5.73±2 (0.2256±0.08)
	VZN95L – TWSREA6 VZN95L – TWSREK6	0°29′ ± 45′	1°46′ ± 45′	10°00′ ± 45′	5.73±2 (0.2256±0.08)
	Wheel angle Max.	Inside wheel	$34°^{+1°}_{-2°}$		
		Outside wheel	30°		
		At 20° (outside wheel)	22°15′ (Inside wheel)		

Disc wheel lateral runout	Limit	1.2 mm	0.047 in.	
Wheel bearing preload (starting) (rotating load at hub bolt)		5.9 — 17.7 N	0.6 — 1.8 kgf	1.3 — 4.0 lbf
		Add oil seal frictional force		
Hub axial play	Limit	0.05 mm	0.0020 in.	
		0 mm	0 in.	
Lower ball joint vertical play	Limit	2.3 mm	0.091 in.	
Upper ball joint vertical play	Lower ball joint	0.1—4.9 N·m	1—50 kgf·cm	1—43 in.·lbf
Ball joint rotation condition	Upper ball joint	2.0—3.9 N·m	20—40 kgf·cm	17—35 in.·lbf

Specifications (Front/4WD)

Cold tire inflation pressure	Tire size		Pressure kPa (kgf/cm², psi) Front	Rear
	P225/75R15		180 (1.8, 26)	200 (2.0, 29)
	31X10.5 R15LT		180 (1.8, 26)	200 (2.0, 29)
Front wheel alignment — Specifications with vehicle height set to standard height	Standard vehicle height for alignment inspection	Front	Difference between the height at center of tip of drive shaft and the height at center of tip of front side adjusting cam bolt	58.5 mm (2.303 in.)
		Rear	Difference between the height of center of rear leaf spring front bushing and the height of center of rear axle shaft	61.0 mm (2.402 in.)
	Camber			0°45′ ± 45′
		Left–right error		30′ or less
	Caster			2°30′ ± 45′
		Left–right error		30′ or less
	Steering axis inclination			11°50′ ± 45′
		Left–right error		30′ or less
	Toe–in			1 ± 2 mm (0.04 ± 0.08 in.)
	Wheel angle	Max. Inside wheel		32°00′ $^{+1°}_{-2°}$
		Outside wheel		31°
		At 20° (outside wheel)		21°10′ (inside wheel)

				Height mm (in.)	
Front wheel alignment — Specifications at vehicle height of non–loaded vehicle	Vehicle height of non–loaded vehicle	Model	Tire size	Front Height at center of tip of front side adjusting cam bolt	Rear Height of center of rear leaf spring front bushing
		RN101 L – TRLDEA RN101 L – TRLDEK	P225/75R15	281.6 (11.087)	426.9 (16.807)
		RN101 L – TRMDEA	P225/75R15	281.8 (11.095)	426.9 (16.807)
		RN101 L – TRPDEA	P225/75R15	281.4 (11.079)	424.9 (16.728)
		RN106L – TRMDEA	P225/75R15	285.9 (11.256)	427.5 (16.831)
		RN106L – TRMDEA RN106L – TRLDEK	P225/75R15	285.6 (11.244)	427.5 (16.831)
		RN110L – CRMDEA	P225/75R15	292.0 (11.496)	423.2 (16.661)
		RN110L – CRPDEA	P225/75R15	291.4 (11.472)	420.2 (16.543)
		RN110L – CRLDEA	P225/75R15	291.3 (11.468)	423.1 (16.657)
		RN110L – CRLDEK	P225/75R15	291.1 (11.461)	426.4 (16.787)
		VZN100L – TRMDEA VZN100L – TRMDEK	P225/75R15	279.5 (11.003)	422.5 (16.634)
			31X10.5R15LT	311.0 (12.244)	454.1 (17.878)
		VZN105L – TRMDEA VZN105L – TRMDEK	P225/75R15	283.6 (11.165)	422.6 (16.638)
			31X10.5R15LT	315.1 (12.405)	454.3 (17.886)
		VZN110L – CRMDEA	P225/75R15	289.8 (11.409)	418.8 (16.448)
			31X10.5R15LT	321.3 (12.650)	450.4 (17.732)
		VZN110L – CRMDEK	P225/75R15	289.8 (11.409)	422.1 (16.618)
			31X10.5R15LT	321.3 (12.650)	453.4 (17.850)
		VZN110L – CRPDEA	P225/75R15	289.4 (11.394)	417.4 (16.433)
			31X10.5R15LT	321.0 (12.638)	449.0 (17.677)

Specifications (Front/4WD) (Cont'd)

Front wheel alignment — Specifications at vehicle height of non–loaded vehicle

Vehicle height of non–loaded vehicle

Model	Tire size	Height mm (in.) Front (Height at center of tip of front side adjusting cam bolt)	Rear (Height of center of rear leaf spring front bushing)
VZN110L – CRPDEK	P225/75R15	289.2 (11.386)	420.6 (16.559)
	31X10.5R15LT	320.7 (12.626)	452.3 (17.807)
VZN110L – CRMGEA	P225/75R15	283.1 (11.146)	415.6 (16.362)
	10.5R15LT	314.7 (12.390)	447.3 (17.610)
VZN110L – CRMGEK	P225/75R15	282.9 (11.138)	418.8 (16.488)
	31X10.5R15LT	314.4 (12.378)	450.5 (17.736)
VZN110L – CRPGEA	P225/75R15	282.7 (11.130)	413.9 (16.296)
VZN110L – CRPGEK	31X10.5R15LT	314.3 (12.374)	445.6 (17.543)

Alignment

Model	Camber	Caster	Steering axis inclination	Toe–in mm (in.)
RN106L series	0°42′ ± 45′	1°41′ ± 45′	11°53′ ± 45′	2.22±2 (0.0874±0.08)
VZN100L series	0°43′ ± 45′	1°41′ ± 45′	11°52′ ± 45′	1.91±2 (0.0751±0.08)
VZN105L series	0°42′ ± 45′	1°45′ ± 45′	11°53′ ± 45′	2.22±2 (0.0874±0.08)
RN101L – TRMDEA	0°43′ ± 45′	1°38′ ± 45′	11°52′ ± 45′	1.92±2 (0.0756±0.08)
RN101L – TRLDEA	0°43′ ± 45′	1°38′ ± 45′	11°52′ ± 45′	1.92±2 (0.0756±0.08)
RN101L – TRLDEK	0°43′ ± 45′	1°37′ ± 45′	11°52′ ± 45′	1.92±2 (0.0756±0.08)
RN101L – TRPDEA	0°43′ ± 45′	1°41′ ± 45′	11°52′ ± 45′	1.91±2 (0.0752±0.08)
RN110L – CRMDEA	0°40′ ± 45′	1°49′ ± 45′	11°55′ ± 45′	2.69±2 (0.1059±0.08)
RN110L – CRPDEA	0°40′ ± 45′	1°52′ ± 45′	11°55′ ± 45′	2.69±2 (0.1059±0.08)
RN110L – CRLDEA	0°40′ ± 45′	1°49′ ± 45′	11°55′ ± 45′	2.68±2 (0.1055±0.08)
RN110L – CRLDEK	0°40′ ± 45′	1°44′ ± 45′	11°55′ ± 45′	2.68±2 (0.1055±0.08)
VZN110L – CRMDEA	0°40′ ± 45′	1°52′ ± 45′	11°55′ ± 45′	2.69±2 (0.1059±0.08)
VZN110L – CRMDEK	0°40′ ± 45′	1°48′ ± 45′	11°55′ ± 45′	2.69±2 (0.1059±0.08)
VZN110L – CRPDEA	0°40′ ± 45′	1°53′ ± 45′	11°55′ ± 45′	2.69±2 (0.1059±0.08)
VZN110L – CRPDEK	0°40′ ± 45′	1°49′ ± 45′	11°55′ ± 45′	2.69±2 (0.1059±0.08)
VZN110L – CRMGEA	0°42′ ± 45′	1°55′ ± 45′	11°53′ ± 45′	2.25±2 (0.0886±0.08)
VZN110L – CRMGEK	0°42′ ± 45′	1°50′ ± 45′	11°53′ ± 45′	2.25±2 (0.0886±0.08)
VZN110L – CRPGEA	0°42′ ± 45′	1°56′ ± 45′	11°53′ ± 45′	2.25±2 (0.0886±0.08)

Camber left–right error		30′ or less
Caster left–right error		30′ or less
Steering axis inclination left–right error		30′ or less
Wheel angle	Max. Inside wheel	32°00′ +1° −2°
	Outside wheel	31°
	At 200 (outside wheel)	21°10′ (inside wheel)

Disc wheel lateral runout Limit		1.2 mm	0.047 in.
Wheel bearing preload (starting) (rotating load at hub bolt)		28 – 56 N	2.9 – 5.7 kgf 6.4 – 12.6 lbf
Free wheeling hub ring oil clearance		0.3 mm	0.012 in.
Automatic locking hub brake shoe thickness		1.5 mm	0.059 in.
Front drive shaft thrust clearance	Minimum	0.075 – 0.690 mm	0.0030 – 0.0272 in.
	Maximum	1.0 mm	0.039 in.

Specifications (Front/4WD) (Cont'd)

Front drive shaft thrust clearance adjusting shim thickness		1.80 mm 2.25 mm	0.0709 in. 0.0886 in.
Front drive shaft grease capacity			
	Outboard joint (black)	195 – 205 g	0.43 – 0.45 lb
	Inboard joint (brown)	270 – 280 g	0.60 – 0.62 lb
Front differential drive pinion bearing preload			
(starting)	New bearing	1.2 – 1.9 N·m	12 – 19 kgf·cm 10.4 – 16.5 in.·lbf
	Reused bearing	0.6 – 1.0 N·m	6 – 10 kgf·cm 5.2 – 8.7 in.·lbf
Front differential companion flange deviation			
	Maximum vertical runout	0.10 mm	0.0039 in.
	Maximum lateral runout	0.10 mm	0.0039 in.
Front differential ring gear runout		0.07 mm	0.0028 in.
Front differential ring gear backlash		0.13 – 0.18 mm	0.0051 – 0.0071 in.
Front differential preload (starting).	Total preload	Add drive pinion preload	
		0.4 – 0.6 N·m	4 – 6 kgf·cm 3.5 – 5.2 in.·lbf
Front differential side gear backlash		0.05 – 0.20 mm	0.0020 – 0.0079 in.
Front differential rear oil seal drive in depth		1.5 mm	0.059 in.
Clutch sleeve clearance (A.D.D.)	Limit	0.35 mm	0.0138 in.
Nut tightening limit		70 mm	3.43 in.
Lower ball joint vertical play		2.3 mm	0.091 in.
Upper ball joint vertical play	Limit	0 mm	0 in.
Lower ball joint turning torque		0.1 – 4.9 N·m	1 – 50 kgf·cm 1 – 43 in.·lbf
Upper ball joint turning torque		2.0 – 3.9 N·m	20 – 40 kgf·cm 17 – 35 in.·lbf

Specifications (Rear)

Rear axle shaft (Single tire)	Maximum shaft runout Maximum flange runout	2.0 mm 0.2 mm	0.079 in. 0.008 in.
Rear axle shaft and hub (Double tire)	Maximum shaft runout Preload (starting)	2.0 mm Add oil seal frictional force 1.0 – 14.7 N	0.079 in. 0.1 – 1.5 kgf 0.2 – 3.3 lbf
7.5 in. differential	Drive pinion bearing preload (starting)		
	New bearing	1.2 – 1.9 N·m	12 – 19 kgf·cm 10.4 – 16.5 in.·lbf
	Reused bearing	0.6 – 1.0 N·m	6 – 10 kgf·cm 5.2 – 8.7 in.·lbf
	Total preload (starting)	Add drive pinion bearing preload	
	New and reused bearing	0.4 – 0.6 N·m	4 – 6 kgf·cm 3.5 – 5.2 in.·lbf
	Drive pinion to ring gear backlash	0.13 – 0.18 mm	0.0051 – 0.0071 in.
	Pinion gear to side gear backlash	0.05 – 0.20 mm	0.0020 – 0.0079 in.
	Ring gear runout Limit	0.07 mm	0.0028 in.
	Companion flange deviation		
	Maximum vertical runout	0.10 mm	0.0039 in.
	Maximum lateral runout	0.10 mm	0.0039 in.
8.0 in. differential	Drive pinion bearing preload (starting)		
	2 pinion type New bearing	1.9 – 2.5 N·m	19 – 26 kgf·cm 16.5 – 22.6 in.·lbf
	Reused bearing	0.9 – 1.3 N·m	9 – 13 kgf·cm 7.8 – 11.3 in.·lbf
	4 pinion type New bearing	1.0 – 1.6 N·m	10 – 16 kgf·cm 8.7 – 13.9 in.·lbf
	Reused bearing	0.5 – 0.8 N·m	5 – 8 kgf·cm 4.3 – 6.9 in.·lbf

Specifications (Rear) (Cont'd)

8.0 in. differential (cont'd)	Total preload (starting)	Add drive pinion bearing preload 0.4 – 0.6 N·m 4 – 6 kgf·cm 3.5 – 5.2 in.·lbf
	Drive pinion to ring gear backlash	0.13 – 0.18 mm 0.0051 – 0.0071 in.
	Pinion gear to side gear– backlash	0.05 – 0.20 mm 0.0020 – 0.0079 in.
	Ring gear runout Limit	0.10 mm 0.0039 in.
	Companion flange deviation	
	Maximum vertical runout	0.10 mm 0.0039 in.
	Maximum lateral runout	0.10 mm 0.0039 in.

Torque Specifications (Front/2WD)

Part tightened	N·m	kgf·cm	ft·lbf
Knuckle stopper bolt lock nut	34	350	25
Tie rod clump bolt	22	225	16
Steering knuckle x Upper ball joint	108	1,100	80
Steering knuckle x Lower ball joint	142	1,450	105
Steering knuckle x Tie rod	90	920	67
Upper suspension arm x Upper ball joint	31	320	23
Lower suspension arm x Lower ball joint	127	1,300	94
Torsion bar spring lock nut	83	850	61
Lower suspension arm x Strut bar	95	970	70
Lower suspension arm x Stabilizer bar	13	130	9
Lower suspension arm x Shock absorber	18	185	13
Shock absorber x Frame	25	250	18
Lower arm shaft nut	226	2,300	166
Upper arm shaft x Frame	96	980	71
Upper suspension arm set bolt	126	1,280	93
Strut bar x Frame	123	1,250	90
Stabilizer bar bracket x Frame	29	300	22
Hub nut	103	1,050	76

Torque Specifications (Front/4WD)

Part tightened	N·m	kgf·cm	ft·lbf
Knuckle stopper bolt lock nut	47	480	35
Free wheeling hub body x Axle hub	31	315	23
Free wheeling hub body x Front drive shaft	18	185	13
Free wheeling hub body x Cover	10	100	7
Axle hub bearing lock nut	47	480	35
Upper suspension arm x Upper ball joint	33	340	25
Upper ball joint x Steering knuckle	142	1,450	105
Steering knuckle arm x Steering knuckle	183	1,870	135
Lower suspension arm x Shock absorber	137	1,400	101
Lower suspension arm x Stabilizer bar	25	260	19
Lower suspension arm x Lower ball joint	142	1,450	105
Front drive shaft x Side gear shaft	83	845	61
Front differential front mounting bolt	147	1,500	108
Front differential rear left mounting bolt	167	1,700	123

Torque Specifications (Front/4WD) (Cont'd)

Part tightened	N·m	kgf·cm	ft·lbf
Front differential rear right mounting bolt	167	1,700	123
Differential tube x Bracket	127	1,300	94
Front differential x Bracket	78	800	58
Ring gear x Differential case	97	985	71
Differential carrier x Differential tube (wlo A.D.D.¿Differential	85	900	65
carrier x Side bearing cap	78	800	58
Differential carrier x Carrier cover	47	475	34
Lower suspension arm x Frame	196	2,000	145
Upper suspension arm shaft x Frame	178	1,810	131
A.D.D. clutch case x Differential carrier	78	800	58
A.D.D. clutch case x Differential to be	78	800	58
A.D.D. clutch case cover x A.D.D. clutch case	21	210	15
Upper suspension arm shaft lock nut	226	2,300	166
Upper suspension arm x Torque arm	87	890	64
Shock absorber x Frame	25	250	18
Stabilizer bar bracket x Frame	29	300	22
Hub nut	103	1,050	76

Torque Specifications (Rear)

Part tightened		N·m	kgf·cm	ft·lbf
Ring gear x Differential case		97	985	71
Bearing cap x Differential carrier		78	800	58
Differential carrier x Axle housing	Single tire	25	250	18
	Double tire	31	315	23
Rear axle housing x Bearing retainer		69	700	51
Spring center bolt		44	450	33
Front spring bracket x Hanger pin				
Rubber bushing type		91	930	67
Press–installed bushing type		157	1,600	116
Rear spring shackle x Leaf spring		91	930	67
Rear shock absorber x U–bolt seat	2WD	25	260	19
	4WD	72	730	53
Rear shock absorber x Body	2W D	25	260	19
	4WD	72	730	53
U–bolt x U–bolt seat				
2WD	0.5 ton	147	1,500	108
	1 ton, C &C	123	1,250	90
4WD	Xtra cab	123	1,250	90
	Regular cab	147	1,500	108
Stabilizer bar x Stabilizer bar link		36	365	26
Stabilizer bar bracket x Axle housing		13	130	9
Hub nut		103	1,050	76

BRAKE SYSTEM

Specifications

Brake pedal	Pedal height (from asphalt sheet)			
		2WD	148 – 153 mm	5.83 – 6.02 in.
		4WD	145 – 150 mm	5.71 – 5.91 in.
	Stop light switch to pedal clearance		0.5 – 2.4 mm	0.02 – 0.09 in.
	Pedal freeplay		3 – 6 mm	0.12 – 0.24 in.
	Pedal reserve distance at 490 N (50 kgf, 110.2 lbf)			
	2WD	22R-E engine	More than 70 mm (2.76 in.)	
		3VZ-E engine		
		1 ton	More than 75 mm (2.95 in.)	
		1/2 ton	More than 65 mm (2.56 in.)	
		C & C		
		SRW	More than 75 mm (2.95 in.)	
		DRW	More than 55 mm (2.17 in.)	
	4WD		More than 65 mm (2.56 in.)	
Brake booster	Booster push rod piston clearance			
		w/ SST	0 mm	0 in.
Front disc brake	**PD 60, 66 type**			
	Disc thickness			
		PD 60 type STD	25.0 mm	0.984 in.
		Limit	23.0 mm	0.906 in.
		PD 66 type STD	30.0 mm	1.181 in.
		Limit	28.0 mm	1.102 in.
	Disc runout			
		PD 60 type Limit	0.09 mm	0.0035 in.
		PD 66 type Limit	0.12 mm	0.0047 in.
	Pad thickness			
		PD 60 type STD	9.5 mm	0.374 in.
		Limit	1.0 mm	0.039 in.
		PD 66 type STD	9.7 mm	0.382 in.
		Limit	1.0 mm	0.039 in.
	FS 17, 18 type			
	Disc thickness	STD	22.0 mm	0.866 in.
		Limit	20.0 mm	0.787 in.
	Disc runout	Limit	0.09 mm	0.0035 in.
	Pad thickness			
		FS 17 type STD	9.5 mm	0.374 in.
		Limit	1.0 mm	0.039 in.
		FS 18 type STD	10.0 mm	0.394 in.
		Limit	1.0 mm	0.039 in.
	S12 + 12 type			
	Disc thickness	STD	20.0 mm	0.787 in.
		Limit	18.0 mm	0.709 in.
	Disc runout	Limit	0.09 mm	0.0035 in.
	Pad thickness	STD	9.5 mm	0.374 in.
		Limit	1.5 mm	0.059 in.

Specifications (Cont'd)

Rear brake	2WD			
	Drum inner diameter	STD	254.0 mm	10.000 in.
		Limit	256.0 mm	10.079 in.
	Lining thickness	STD	5.0 mm	0.197 in.
		Limit	1.0 mm	0.039 in.
	4WD			
	Drum inner diameter	STD	295.0 mm	11.614 in.
		Limit	297.0 mm	11.693 in.
	Lining thickness	STD	6.0 mm	0.236 in.
		Limit	1.0 mm	0.039 in.
Parking brake	2W D	1/2 ton	12 – 18 clicks	
		1 ton	11 – 17 clicks	
	4WD		11 – 17 clicks	

Torque Specifications

Part tightened		N·m	kgf·cm	ft·lbf
Master cylinder x Piston stopper bolt		10	100	7
Master cylinder x Reservoir		1.7	17.5	15.2 in.·lbf
Master cylinder x Brake booster		13	130	9
Brake tube union nut		15	155	11
Brake booster clevis lock nut		25	260	19
Brake booster x Pedal bracket		13	130	9
Front brake wheel cylinder x Backing plate		18	185	13
Front brake cylinder installation bolt				
(PD 60, 66 type disc)		39	400	29
Front brake cylinder sliding pin (FS 17, 18 type disc)		88	900	65
Torque plate x Steering knuckle	2WD	108	1,100	80
	4WD	123	1,250	90
Rear brake wheel cylinder x Backing plate				
	Leading–trailing type	10	100	7
	Duo–servo type	14	145	10
Bleeder plug		11	110	8
LSP & BV (LSPV) bracket x Frame		19	195	14
LSP & BV (LSPV) x LSP & BV (LSPV) bracket		13	130	9
LSP & BV (LSPV) spring x LSP & BV (LSPV) bracket		18	185	13
LSP & BV (LSPV) spring x Shackle		18	185	13
LSP & BV (LSPV) shackle lock nut		25	250	18
LSP & BV (LSPV) shackle x Shackle bracket		13	130	9
LSP & BV (LSPV) shackle bracket x Rear axle housing		19	195	14
Brake actuator x PS pressure line		47	475	34
Brake actuator x Actuator bracket		13	130	9
Actuator bracket x Frame		28	290	21
Speed sensor x Rear differential		19	195	14
Speed sensor wire harness x Clamp bracket		19	195	14
Clamp bracket x Rear differential		19	195	14
Deceleration sensor x Body		5.4	55	48 in.·lbf

BRAKE SYSTEM

Specifications

Brake pedal	Pedal height (from asphalt sheet)			
		2WD	148 – 153 mm	5.83 – 6.02 in.
		4WD	145 – 150 mm	5.71 – 5.91 in.
	Stop light switch to pedal clearance		0.5 – 2.4 mm	0.02 – 0.09 in.
	Pedal freeplay		3 – 6 mm	0.12 – 0.24 in.
	Pedal reserve distance at 490 N (50 kgf, 110.2 lbf)			
	2WD	22R-E engine	More than 70 mm (2.76 in.)	
		3VZ-E engine		
		1 ton	More than 75 mm (2.95 in.)	
		1/2 ton	More than 65 mm (2.56 in.)	
		C & C		
		SRW	More than 75 mm (2.95 in.)	
		DRW	More than 55 mm (2.17 in.)	
	4WD		More than 65 mm (2.56 in.)	
Brake booster	Booster push rod piston clearance			
		w/ SST	0 mm	0 in.
Front disc brake	**PD 60, 66 type**			
	Disc thickness			
		PD 60 type STD	25.0 mm	0.984 in.
		Limit	23.0 mm	0.906 in.
		PD 66 type STD	30.0 mm	1.181 in.
		Limit	28.0 mm	1.102 in.
	Disc runout			
		PD 60 type Limit	0.09 mm	0.0035 in.
		PD 66 type Limit	0.12 mm	0.0047 in.
	Pad thickness			
		PD 60 type STD	9.5 mm	0.374 in.
		Limit	1.0 mm	0.039 in.
		PD 66 type STD	9.7 mm	0.382 in.
		Limit	1.0 mm	0.039 in.
	FS 17, 18 type			
	Disc thickness	STD	22.0 mm	0.866 in.
		Limit	20.0 mm	0.787 in.
	Disc runout	Limit	0.09 mm	0.0035 in.
	Pad thickness			
		FS 17 type STD	9.5 mm	0.374 in.
		Limit	1.0 mm	0.039 in.
		FS 18 type STD	10.0 mm	0.394 in.
		Limit	1.0 mm	0.039 in.
	S12 + 12 type			
	Disc thickness	STD	20.0 mm	0.787 in.
		Limit	18.0 mm	0.709 in.
	Disc runout	Limit	0.09 mm	0.0035 in.
	Pad thickness	STD	9.5 mm	0.374 in.
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Specifications (Cont'd)

Rear brake	2WD			
	Drum inner diameter	STD	254.0 mm	10.000 in.
		Limit	256.0 mm	10.079 in.
	Lining thickness	STD	5.0 mm	0.197 in.
		Limit	1.0 mm	0.039 in.
	4WD			
	Drum inner diameter	STD	295.0 mm	11.614 in.
		Limit	297.0 mm	11.693 in.
	Lining thickness	STD	6.0 mm	0.236 in.
		Limit	1.0 mm	0.039 in.
Parking brake	2W D	1/2 ton	12 – 18 clicks	
		1 ton	11 – 17 clicks	
	4WD		11 – 17 clicks	

Torque Specifications

Part tightened		N·m	kgf·cm	ft·lbf
Master cylinder x Piston stopper bolt		10	100	7
Master cylinder x Reservoir		1.7	17.5	15.2 in.·lbf
Master cylinder x Brake booster		13	130	9
Brake tube union nut		15	155	11
Brake booster clevis lock nut		25	260	19
Brake booster x Pedal bracket		13	130	9
Front brake wheel cylinder x Backing plate		18	185	13
Front brake cylinder installation bolt				
(PD 60, 66 type disc)		39	400	29
Front brake cylinder sliding pin (FS 17, 18 type disc)		88	900	65
Torque plate x Steering knuckle	2WD	108	1,100	80
	4WD	123	1,250	90
Rear brake wheel cylinder x Backing plate				
	Leading–trailing type	10	100	7
	Duo–servo type	14	145	10
Bleeder plug		11	110	8
LSP & BV (LSPV) bracket x Frame		19	195	14
LSP & BV (LSPV) x LSP & BV (LSPV) bracket		13	130	9
LSP & BV (LSPV) spring x LSP & BV (LSPV) bracket		18	185	13
LSP & BV (LSPV) spring x Shackle		18	185	13
LSP & BV (LSPV) shackle lock nut		25	250	18
LSP & BV (LSPV) shackle x Shackle bracket		13	130	9
LSP & BV (LSPV) shackle bracket x Rear axle housing		19	195	14
Brake actuator x PS pressure line		47	475	34
Brake actuator x Actuator bracket		13	130	9
Actuator bracket x Frame		28	290	21
Speed sensor x Rear differential		19	195	14
Speed sensor wire harness x Clamp bracket		19	195	14
Clamp bracket x Rear differential		19	195	14
Deceleration sensor x Body		5.4	55	48 in.·lbf

STEERING

Specifications

Steering column	Steering wheel freeplay		Maximum	30 mm	1.18 in.
	Pawl stopper		Mark		
			1 or A	12.65 – 12.75 mm	0.4980 – 0.5020 in.
			2 or B	12.55 – 12.65 mm	0.4941 – 0.4980 in.
			3 or C	12.45 – 12.55 mm	0.4902 – 0.4941 in.
			4 or D	12.35 – 12.45 mm	0.4862 – 0.4902 in.
			5 or E	12.25 – 12.35 mm	0.4823 – 0.4862 in.
Manual gear housing	Sector shaft thrust clearance			0.05 mm	0.0020 in.
	Thrust washer thickness (2WD)			1.95 mm	0.0768 in.
				2.00 mm	0.0787 in.
				2.05 mm	0.0807 in.
				2.10 mm	0.0827 in.
				2.15 mm	0.0847 in.
	Thrust washer thickness (4WD)			1.95 mm	0.0768 in.
				2.00 mm	0.0787 in.
				2.05 mm	0.0807 in.
	Worm bearing preload	(2WD) at Starting		0.3 – 0.5 N·m 3 – 5 kgf·cm	2.6 – 4.3 in.·lbf
		(4WD) at Starting		0.3 – 0.5 N·m 3.5 – 5 kgf·cm	3.0 – 4.3 in.·lbf
	Total preload	(2WD) at Starting		0.8 – 1.0 N·m 8 – 10.5 kgf·cm	6.9 – 9.1 in.·lbf
		(4WD) at Starting		0.8 – 1.1 N·m 8 – 11.0 kgf·cm	6.9 – 9.5 in.·lbf
	Sector shaft end cover bushing inside diameter (4WD)		Maximum	36.07 mm	1.4201 in.
Power steering	Drive belt tension		New belt	441 – 667 N·m	45 – 68 kgf 100 – 150 lbf
			Used belt	265 – 441 N·m	27 – 45 kgf 60 – 100 lbf
	Maximum rise of oil level			5 mm	0.20 in.
	Oil pressure at idle speed		Minimum	7,335 kPa	75 kgf/cm^2 1,067 psi
	Steering effort	(w/o PPS)	Maximum	39 N	4 kgf 8.8 lbf
		(w/ PPS)	Maximum	29 N	3 kgf 6.6 lbf
	Rotor shaft bushing oil clearance		STD	0.01 – 0.03 mm	0.0004 – 0.0012 in.
			Maximum	0.07 mm	0.0028 in.
	Rotor to cam ring oil clearance (RN series)		Maximum	0.06 mm	0.0024 in.
	Vane plate to rotor groove clearance		Maximum	0.03 mm	0.0012 in.
	Vane plate	Minimum length		14.988 mm	0.5901 in.
		Minimum height		8.1 mm	0.319 in.
		Minimum thickness		1.797 mm	0.0707 in.
	Vane plate length	Rotor and cam ring mark			
			None	14.996 – 14.998 mm	0.59039 – 0.59047 in.
			1	14.994 – 14.996 mm	0.59032 – 0.59039 in.
			2	14.992 – 14.994 mm	0.59024 – 0.59032 in.
			3	14.990 – 14.992 mm	0.59016 – 0.59024 in.
			4	14.988 – 14.990 mm	0.59008 – 0.59016 in.

Specifications (Cont'd)

Power steering (cont'd)	Flow control valve spring length	
	STD	37 mm 1.46 in.
	Minimum	35 mm 1.38 in.
	Pump rotating torque Maximum	0.3 N·m 2.8 kgf·cm 2.4 in.·lbf
	Worm gear valve body ball clearance	0.15 mm 0.0059 in.
	Cross shaft adjusting screw thrust clearance	0.03 – 0.05 mm 0.0012 – 0.0020 in.
	Worm gear preload at Starting	0.3 – 0.5 N·m 3 – 5.5 kgf·cm 2.6 – 4.8 in.·lbf
	Total preload at Starting	0.5 – 0.9 N·m 5 – 9.5 kgf·cm 4.3 – 8.3 in.·lbf

Torque Specifications

	Part tightened	N·m	kgf·cm	ft·lbf
Steering column	Steering wheel set nut	34	350	25
	Column tube x Body	25	260	19
	Breakaway bracket x Body	25	260	19
	Column hole cover x Body	7.8	80	69 in.·lbf
	Main shaft x Intermediate shaft	35	360	26
	Intermediate shaft x Worm shaft	35	360	26
	Turn signal bracket x Upper column tube	7.8	80	69 in.·lbf
	Tilt pawl set nut	5.9	60	52 in.·lbf
	Compression spring set bolt	7.8	80	69 in.·lbf
	Tilt lever retainer set nut	15	150	11
	Protector x Breakaway bracket	19	195	14
	Tilt lever assembly installation bolt	2.0	20	17 in.·lbf
Manual gear housing	**[2WD]**			
	Gear housing x Body	118	1,200	87
	Intermediate shaft x Worm shaft	35	360	26
	Relay rod x Pitman arm	90	920	67
	Pitman arm x Sector shaft	123	1,250	90
	Worm bearing adjusting screw lock nut	109	1,110	80
	End cover set bolt	18	185	13
	Sector shaft adjusting screw lock nut	27	275	20
	Bleeder plug	7.4	75	65 in.·lbf
	[4WD]			
	Gear housing x Body	142	1,450	105
	Intermediate shaft x Worm shaft	35	360	26
	Pitman arm x Sector shaft	177	1,800	130
	Relay rod x Pitman arm	90	920	67
	Worm bearing adjusting screw lock nut	109	1,110	80
	End cover set bolt	93	1,000	72
	Sector shaft adjusting screw lock nut	44	450	33
	Bleeder plug	20	200	14

Torque Specifications (Cont'd)

	Part tightened		N·m	kgf·cm	ft·lbf
Power steering (PS pump)	Pressure tube x PS pump (RN series/4WD)		36	370	27
	Return hose clamp	(RN series)	1.5	15	13 in.·lbf
		(VZN series)	3.9	40	35 in.·lbf
	Pressure tube union bolt		47	475	34
	Pulley set nut		43	440	32
	PS pump x Bracket				
	(RN series)		39	400	29
	(VZN series)	Through bolt	58	590	43
		Adjusting bolt	39	400	29
	PS pump x Adjusting stay (VZN series)		41	420	30
	Reservoir tank x PS pump (VZN series)				
		12 mm bolt	13	130	9
		14 mm bolt	41	420	30
	Suction port union (RN series)		13	130	9
	Air control valve		36	370	27
	Pressure port union		69	700	51
	Front housing x Rear housing (RN series)		46	470	34
Power steering (Gear housing)	Pressure tube		44	450	33
	Return tube	Union bolt	47	475	34
		Others	49	500	36
	Return hose clamp	4WD	3.9	40	35 in.·lbf
	Intermediate shaft x Worm shaft		35	360	26
	Gear housing x Body	2WD	118	1,200	87
		4WD	142	1,450	105
	Pitman arm x Cross shaft		177	1,800	130
	Cross shaft adjusting screw set nut		46	470	34
	Cross shaft end cover set bolt		46	470	34
	Bleeder plug		7.8	80	69 in.·lbf
	Plunger guide nut		20	205	15
	Worm gear valve body set bolt		46	470	34
	Solenoid valve set bolt (wl PPS)		10	100	7
Steering linkage (2WD)	Pitman arm x Sector shaft	MS	123	1,250	90
		PS	177	1,800	130
	Pitman arm x Relay rod		90	920	67
	Tie rod tube clamp bolt		25	260	19
	Tie rod x Relay rod		90	920	67
	Tie rod x Knuckle arm		90	920	67
	Relay rod x Idler arm		59	600	43
	Knuckle arm x Steering knuckle		108	1,100	80
	Steering damper x Frame		13	130	9
	Steering damper x Relay rod		59	600	43
	Idler arm x Idler arm bracket		78	800	58
	Idler arm bracket x Frame		118	1,200	87

Torque Specifications (Cont'd)

	Part tightened	N·m	kgf·cm	ft·lbf
Steering linkage (4WD)	Pitman arm x Sector shaft	177	1,800	130
	Pitman arm x Relay rod	90	920	67
	Tie rod tube clamp bolt	25	260	19
	Tie rod x Relay rod	90	920	67
	Tie rod x Knuckle arm	90	920	67
	Relay rod x Idler arm	59	600	43
	Relay rod x Steering damper	59	600	43
	Knuckle arm x Steering knuckle	183	1,870	135
	Idler arm x Idler arm bracket	78	800	58
	Idler arm bracket x Frame	142	1,450	105

BODY
Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
MOON ROOF			
Removable roof hinge case x Body	3.4	35	30 in.·lbf
Removable roof lock base x Body	5.9	60	52 in.·lbf
Removable roof hinge x Removable roof	2.9	30	26 in.·lbf
Removable roof handle x Removable roof	2.9	30	26 in.·lbf
ONE–TOUCH TAIL GATE			
Tail gate stay x Tail gate	14	140	10
SEAT			
Front Seat			
Seat adjuster x Body	37	375	27
Rear Jump Seat (Extra Cab)			
Back panel trim x Body	4.9	50	43 in.·lbf
Seat cushion x Body	4.9	50	43 in.·lbf
SEAT BELT			
Seat belt anchor x Body	43	440	32
Seat belt guide x Body	43	440	32
Buckle x Body	43	440	32

Torque Specifications (Cont'd)

	Part tightened	N·m	kgf·cm	ft·lbf
Steering linkage (4WD)	Pitman arm x Sector shaft	177	1,800	130
	Pitman arm x Relay rod	90	920	67
	Tie rod tube clamp bolt	25	260	19
	Tie rod x Relay rod	90	920	67
	Tie rod x Knuckle arm	90	920	67
	Relay rod x Idler arm	59	600	43
	Relay rod x Steering damper	59	600	43
	Knuckle arm x Steering knuckle	183	1,870	135
	Idler arm x Idler arm bracket	78	800	58
	Idler arm bracket x Frame	142	1,450	105

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Torque Specifications

Part tightened	N·m	kgf·cm	ft·lbf
MOON ROOF			
Removable roof hinge case x Body	3.4	35	30 in.·lbf
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ONE–TOUCH TAIL GATE			
Tail gate stay x Tail gate	14	140	10
SEAT			
Front Seat			
Seat adjuster x Body	37	375	27
Rear Jump Seat (Extra Cab)			
Back panel trim x Body	4.9	50	43 in.·lbf
Seat cushion x Body	4.9	50	43 in.·lbf
SEAT BELT			
Seat belt anchor x Body	43	440	32
Seat belt guide x Body	43	440	32
Buckle x Body	43	440	32

LUBRICANT

Item			Capacity			Classification
			Liters	U S qts	Imp. qts	
Manual transmission oil						
2W D	G57		2.2	2.3	1.9	API GL–4 or GL–5 SAE 75W–90
	R 150		3.0	3.2	2.6	API GL–4 or GL–5 SAE 75W–90
4WD	G58		3.9	4.1	3.4	API GL–4 or GL–5 SAE 75W–90
	R 150F		3.0	3.2	2.6	
Automatic transmission fluid						ATF DEXRON 11
A43D	Dry fill		6.5	6.9	5.7	
	Drain and refill		2.4	2.5	2.1	
A340E	Dry fill		7.2	7.6	6.3	
	Drain and refill		1.6	1.7	1.4	
A340H						
(Transmission)	Dry fill		10.3	10.9	9.1	
	Drain and refill		4.5	4.8	4.0	
(Transfer)	Dry fill		1.1	1.2	1.0	
	Drain and refill		0.8	0.8	0.7	
A340F	Dry fill		7.6	8.0	6.7	
	Drain and refill		1.6	1.7	1.4	
Transfer oil	W56 (RF 1 A)		1.6	1.7	1.4	API GL–4 or GL–5
	G 58, R 150F, A340F (VF 1 A)		1.1	1.2	1.0	SAE 75W–90
Differential oil						Standard differential API GL–5 hypoid gear oil Above –18°C (0°F) SAE 90 Below –18°C (0°F) SAE 80W–90 or 80W A.D. D. (4WD Front only) TOYOTA "GEAR OIL SUPER" oil or hypoid gear oil API GL–5 SAE 75W–90
2WD	7.5 in.		1.35	1.4	1.2	
	8.0 in.	2 pinion	1.8	1.9	1.6	
		4 pinion	2.2	2.3	1.9	
4WD	Front	Standard differential	1.6	1.7	1.4	
		A.D.D.	1.86	2.0	1.6	
	Rear		2.2	2.3	1.9	
Steering gear box oil						API GL–4, SAE 90
	2W D		380 — 400 cc	23.2 — 24.4 cu in.		
	4WD		400 cc	24.4 cu in.		

LUBRICANT (Cont'd)

Item	Capacity			Classification
	Liters	US qts	Imp. qts	
Power steering fluid				ATF DEXRON° 11
Pump	300 cc	18.3 cu in.		
Total	900 cc	54.9 cu in.		
Ball joint grease (2WD)	—			Molybdenum disulphide lithium base, NLG I No. 1 or No. 2
Chassis grease (4WD)				
Propeller shaft (Except double cardan joint)	—			Lithium base, NLG I No. 2
Double cardan joint				Molybdenum disulphide lithium base, NLG I No. 2
Wheel bearing grease	—			Lithium base multipurpose, NLG I No. 2
Steering knuckle and front axle shaft grease (4WD)	—			Molybdenum disulphide lithium base, NLG I No. 2
Brake fluid	—			SAE J 1703 or FMVSS No. 116 DOT 3

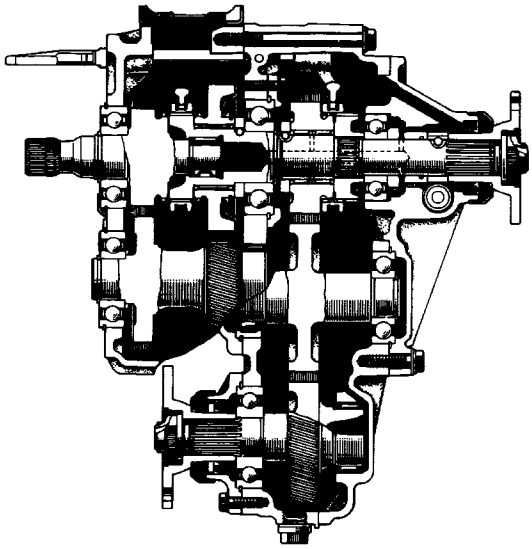
TRANSFER

DESCRIPTION

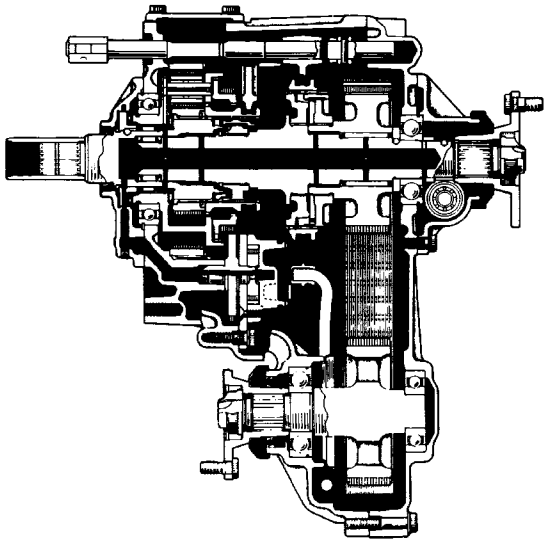
TRANSFER

The Transfer transmits the drive force from the transmission to the front wheels, switching between 2WD, 4WD (High) and 4WD (Low).
In the Truck the types of gear used during deceleration produce 2 types of transfer.
The specifications and cross–section diagrams are as shown.

RF1A Type Transfer



VF1A Type Transfer



E9702 TF0637

Specification

Transfer / Items		RF1A Type Transfer	VF1A Type Transfer	
Type of Engine		22R-E	22R-E	3VZ-E
Type of Transmission		W56	G58, *A340F	R150F
Type of Reduction Gear		Counter Gear	Planetary Gear	
Gear Ratio	H2 and H4	1.000	1.000	
	L4	2.276	2.566	
Oil Capacity liters (US qts., Imp. qts.)		1.6 (1.7, 1.4)	1.1 (1.2, 1.0)	
Oil Grade		API GL-4 or GL-5	API GL-4 or GL-5	
Oil Viscosity		SAE 75W-90	SAE 75W-90	

Automatic Transmission

PRECAUTIONS

When working with FIPG material, you must be observe the following.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket sur–faces.
- Thoroughly clean all components to remove all the loose material.
- Clean both sealing surfaces with a non–residue solvent.
- Apply the seal packing in approx. 1 mm (0.04 in.) bead along the sealing surface.
- Parts must be assembled within 10 minutes of application. Otherwise, the packing (FIPG) material must be removed and reapplied.

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Hard to shift or will not shift	Transfer faulty	Disassemble and inspect transfer	TF–4, 32
Transfer jumps out of gear	Transfer faulty	Disassemble and inspect transfer	TF–4, 32

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TROUBLESHOOTING

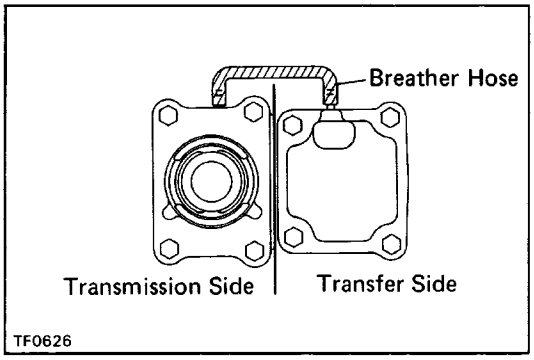
Problem	Possible cause	Remedy	Page
Hard to shift or will not shift	Transfer faulty	Disassemble and inspect transfer	TF–4, 32
Transfer jumps out of gear	Transfer faulty	Disassemble and inspect transfer	TF–4, 32

REMOVAL OF TRANSFER

1. REMOVE TRANSFER WITH TRANSMISSION

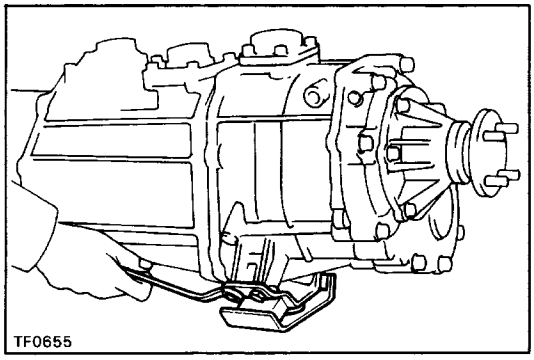
MT – See pages MT–14 to 25

AT – See pages AT–210 and 211

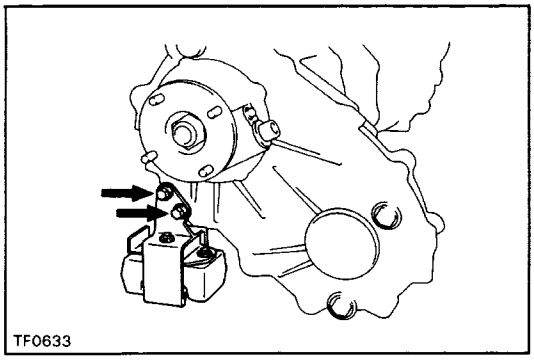


2. (22R–E1G58, A340F)
REMOVE BREATHER HOSE

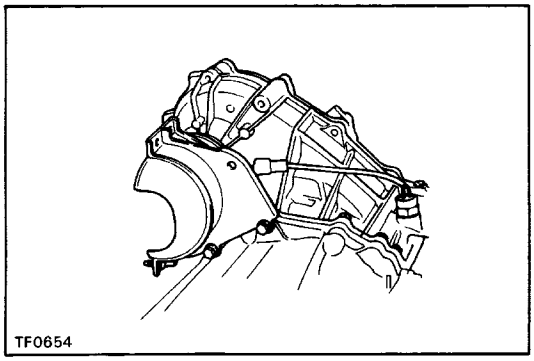
Disconnect the breather hose from transfer upper cover and transmission control retainer.



3. REMOVE ENGINE REAR MOUNTING



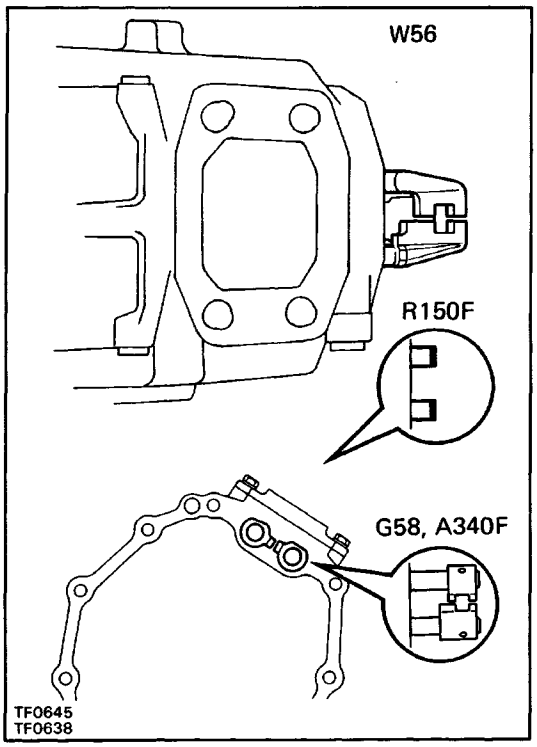
4. (Regular Cab w/ VF1A Type Transfer)
REMOVE DYNAMIC DAMPER



5. REMOVE PROPELLER SHAFT UPPER DUST COVER AND TRANSFER FROM TRANSMISSION

(a) Remove the dust cover bolt from the bracket.
(b) Remove the transfer adaptor rear mounting bolts.
(c) Pull the transfer straight up and remove it from the transmission.

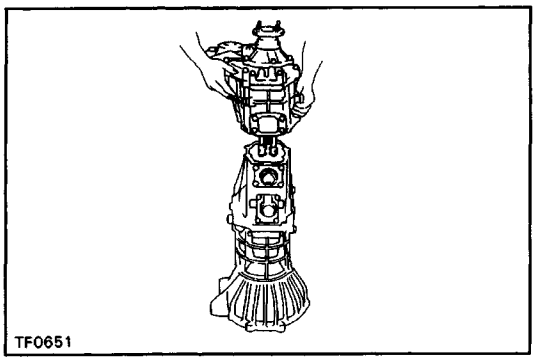
HINT: Take care not to damage the adaptor rear oil seal with the transfer input gear spline.



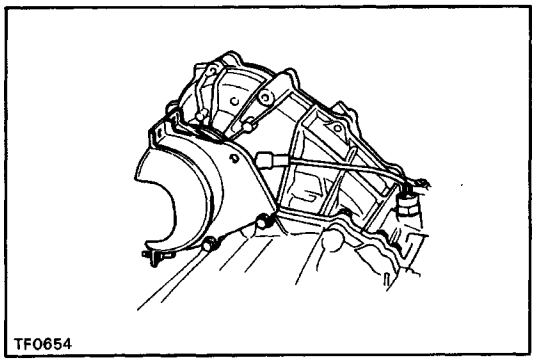
INSTALLATION OF TRANSFER

1. INSTALL TRANSFER AND PROPELLER SHAFT UPPER DUST COVER TO TRANSMISSION WITH NEW GASKET

(a) Shift the two shift fork shafts to the high–four position.

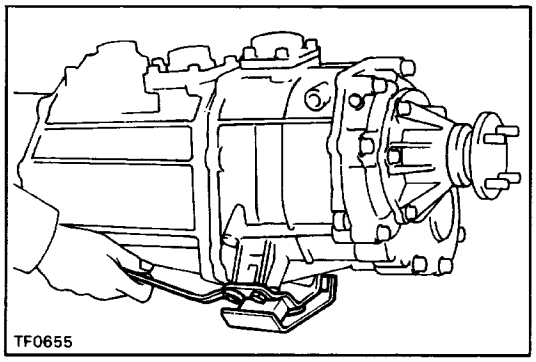


(b) Apply MP grease to the adaptor oil seal.
(c) Place a new gasket to the transfer adaptor.
(d) Install the transfer to the transmission.
HINT: Take care not to damage the oil seal by the input gear spline when installing the transfer.

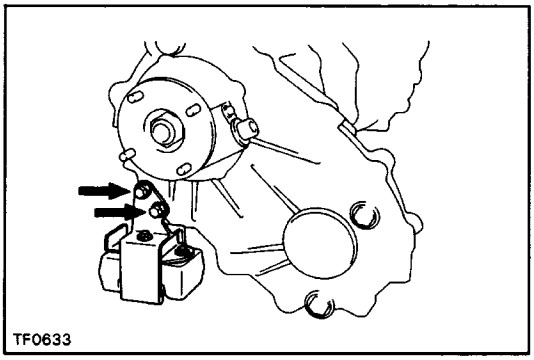


(e) Install and torque the bolts with the propeller shaft upper dust cover.
Torque:
W56 39 N–m (400 kgf–cm, 29 ft–lbf)
R 150F, G58, A340F
37 N–m (380 kgf–cm, 27 ft–lbf)

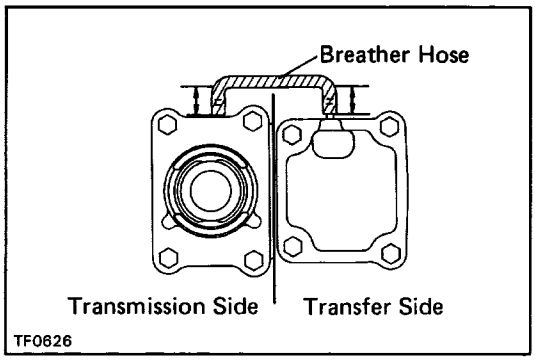
(f) Install the dust cover bolt to the bracket.
Torque:
R 150F, G58, A340F
23 N–m (230 kgf–cm, 17 ft–lbf)
W56 39 N–m (400 kgf–cm, 29 ft–lbf)



2. INSTALL ENGINE REAR MOUNTING
Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)



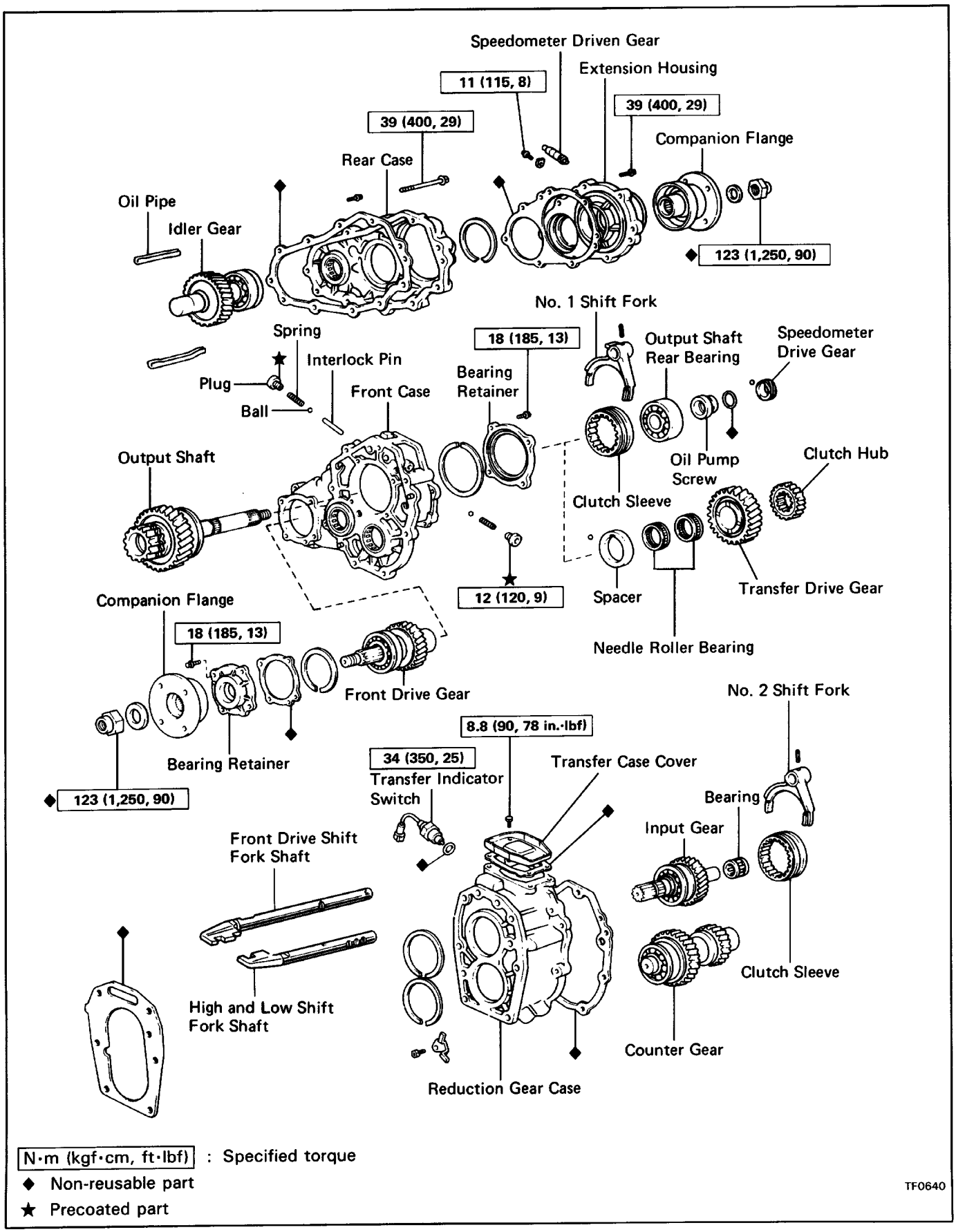
3. (Regular Cab wI VF 1 A Type Transfer)
INSTALL DYNAMIC DAMPER
Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)



4. (22R–EIG58, A340F)
INSTALL BREATHER HOSE
Connect the breather hose for transfer upper cover and transmission control retainer as shown.
Hose depth: 13 mm (0.51 in.)

5. INSTALL TRANSFER WITH TRANSMISSION
MT – See pages MT–14 to 2 5.
AT – See pages AT–210 and 211.
6. FILL TRANSMISSION AND TRANSFER WITH OIL
MT – See page MT–24.
AT – See page AT–181.
7. PERFORM ROAD TEST
Check for abnormal noise and smooth operation.

(RF1A TYPE TRANSFER) COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
★ Precoated part

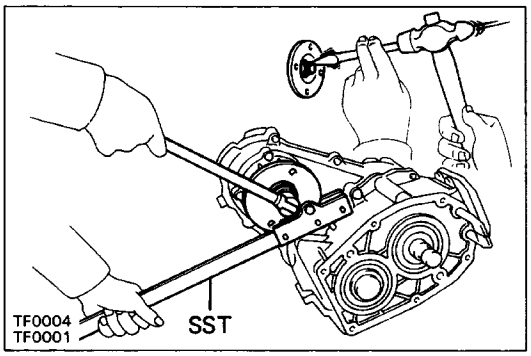
TF0640

DISASSEMBLY OF TRANSFER

(See page TF–7)

1. REMOVE No. 1 SPEED SENSOR

2. REMOVE TRANSFER INDICATOR SWITCH



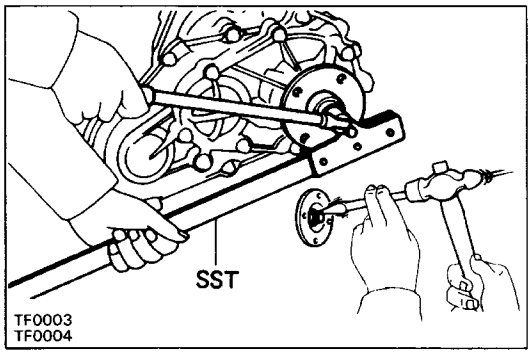
3. REMOVE FRONT COMPANION FLANGE

(a) Using a hammer and chisel, loosen the staked part of the nut.

(b) Using SST to hold the flange, remove the nut and washer.

SST 09330–00021

(c) Remove the companion flange.



HINT: If the companion flange is difficult to remove, use SST.

4. REMOVE REAR COMPANION FLANGE

(a) Using a hammer and chisel, loosen the staked part of the nut.

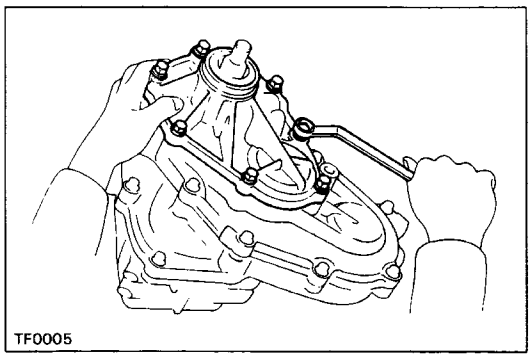
(b) Using SST to hold the flange, remove the nut and washer.

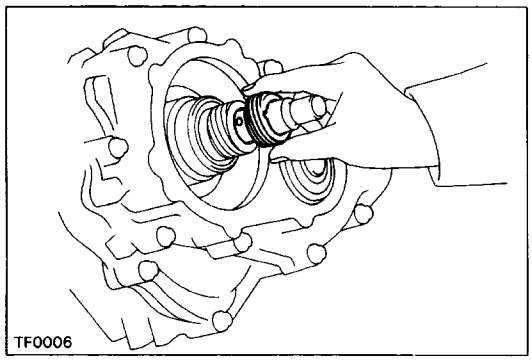
SST 09330–00021

(c) Remove the companion flange.

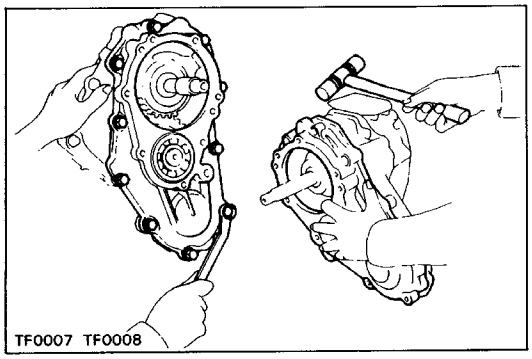
5. REMOVE EXTENSION HOUSING

Remove the seven bolts and remove the extension housing.





6. REMOVE SPEEDOMETER DRIVE GEAR, STEEL BALL, OIL PUMP SCREW AND BEARING

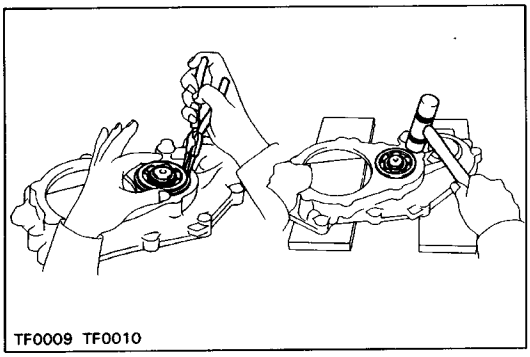

TF0007 TF0008

7. REMOVE REAR CASE

(a) Remove the ten bolts.

(b) Using a plastic hammer, remove the rear case with the idler gear.

HINT: Hold the front case so the rear does not descend. If it descends, the clutch hub and steel ball may fall out.

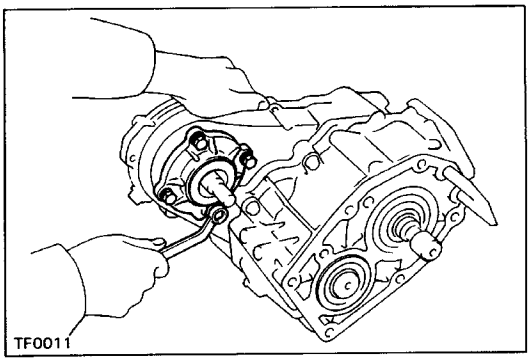

TF0009 TF0010

8. REMOVE IDLER GEAR FROM REAR CASE

(a) Using snap ring pliers, remove the snap ring.

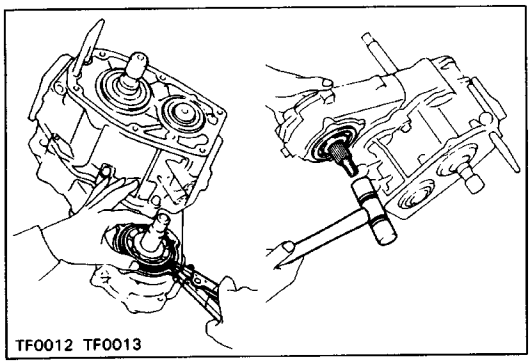
(b) Using a plastic hammer, tap out the idler gear from the rear case.

HINT: Place the rear case on something soft such as wooden blocks.


TF0011

9. REMOVE BEARING RETAINER

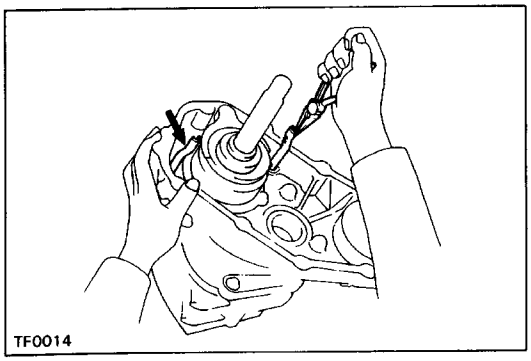
Remove the four bolts and remove the bearing retainer.


TF0012 TF0013

10. REMOVE FRONT DRIVE GEAR

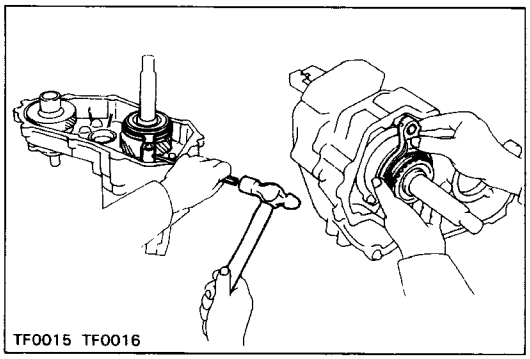
(a) Using snap ring pliers, remove the snap ring.

(b) Using a plastic hammer, tap out the front drive gear from the front case.


TF0014

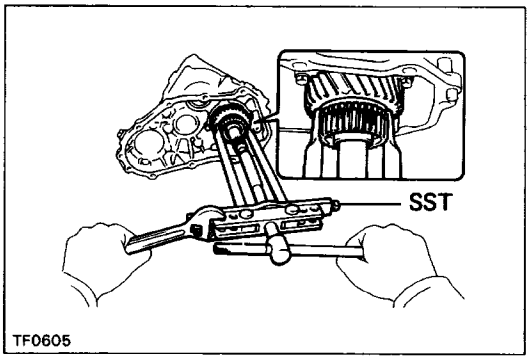
11. REMOVE OIL PIPES

Using pliers, remove the two oil pipes.


TF0015 TF0016

12. REMOVE SHIFT NO. 1 FORK AND CLUTCH SLEEVE

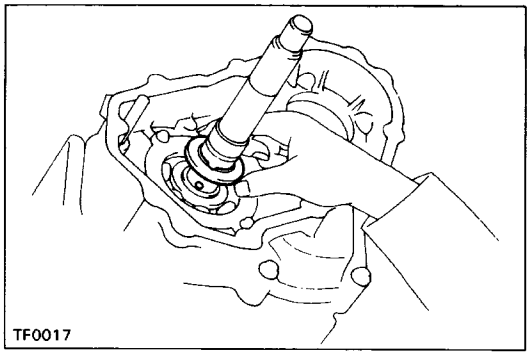
(a) Shift the fork shafts to the high–low position.
(b) Using a pin punch and a hammer, drive out the slotted spring pin.
(c) Remove the shift No. 1 fork together with the clutch sleeve.



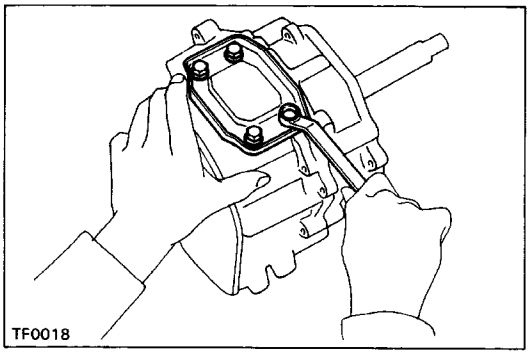
TF0605

13. REMOVE CLUTCH HUB AND TRANSFER DRIVE GEAR

Using SST, remove clutch hub and transfer drive gear.
SST 09950–20017

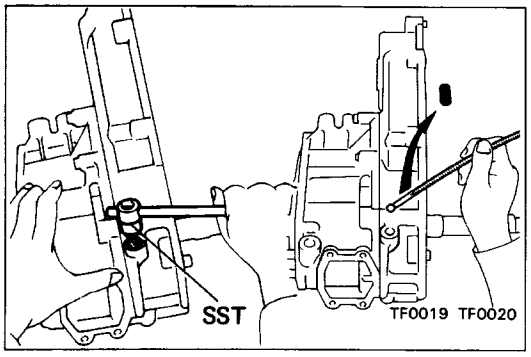

TF0017

14. REMOVE NEEDLE ROLLER BEARING, NO.2 SPACER AND STEEL BALL


TF0018

15. REMOVE TRANSFER CASE COVER

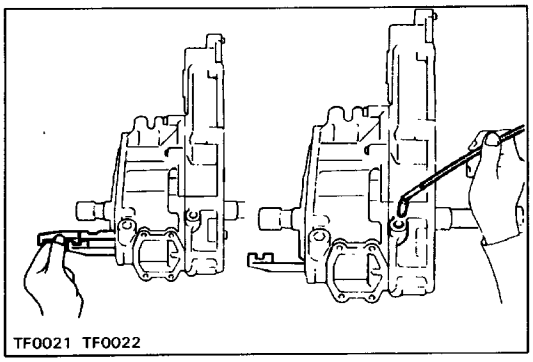
Remove the four bolts and remove the transfer case cover and gasket.



TF0019 TF0020

16. REMOVE STRAIGHT SCREW PLUGS, SPRINGS AND LOCKING BALLS

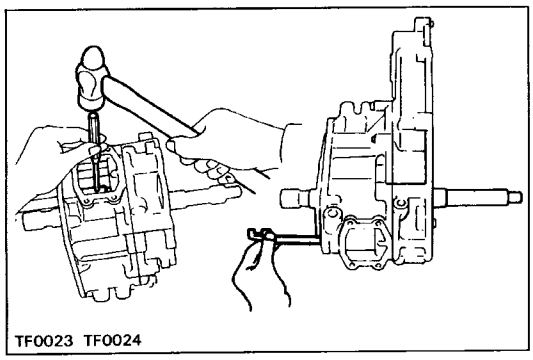
(a) Using SST, remove the plug on the right side.
SST 09313–30021
(b) Using a magnetic finger, remove the spring and ball.
(c) Remove the plug, spring and ball on the left side in the same procedure.


TF0021 TF0022

17. REMOVE FRONT DRIVE SHIFT FORK SHAFT

18. REMOVE INTERLOCK PIN

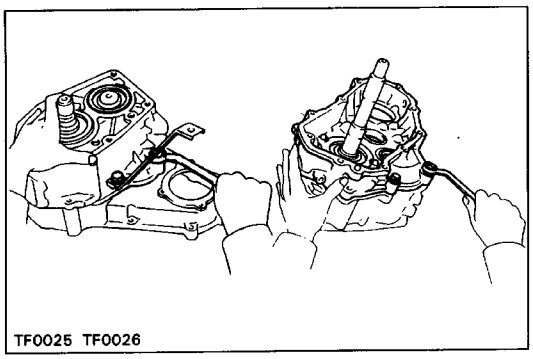
Using a magnetic finger, remove the interlock pin.


TF0023 TF0024

19. REMOVE HIGH AND LOW SHIFT FORK SHAFT

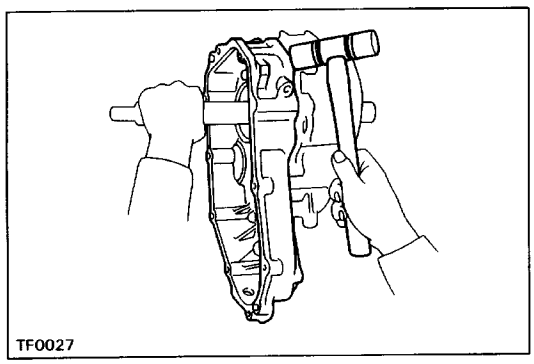
(a) Using a pin punch and a hammer, drive out the slotted spring pin.

(b) Remove the shaft.

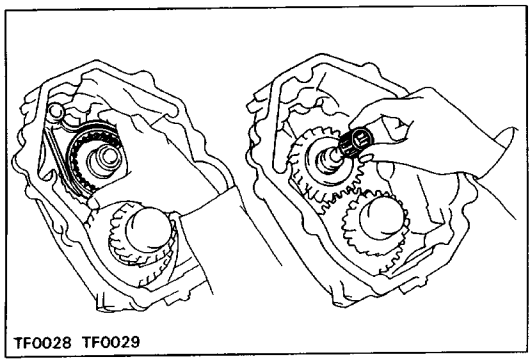

TF0025 TF0026

20. REMOVE FRONT CASE

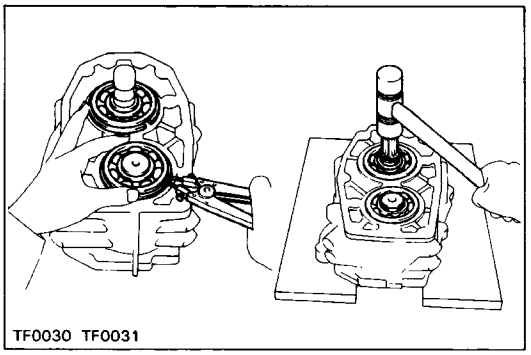
(a) Remove the four bolts.


TF0027

(b) Using a plastic hammer, remove the front case with the output shaft.


TF0028 TF0029

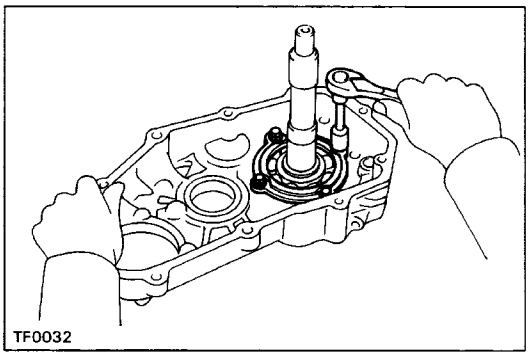
21. REMOVE NO.2 FORK WITH CLUTCH SLEEVE AND NEEDLE ROLLER BEARING FROM INPUT SHAFT


TF0030 TF0031

22. REMOVE INPUT GEAR AND COUNTER GEAR FROM REDUCTION GEAR CASE

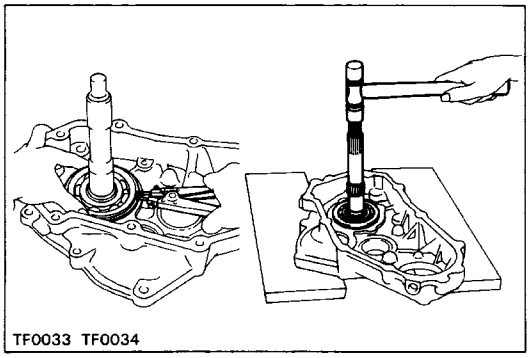
(a) Using a snap ring pliers, remove the two snap rings.
(b) Using a plastic hammer, tap out the input gear and counter gear from the reduction gear case.

HINT: Place the reduction gear case on something soft such as wooden blocks.


TF0032

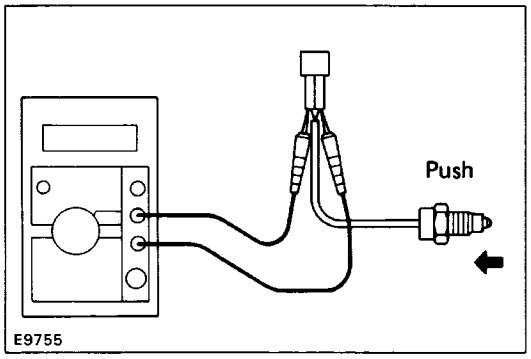
23. REMOVE OUTPUT SHAFT FROM FRONT CASE

(a) Remove the four bearing retainer bolts and remove the bearing retainer.


TF0033 TF0034

(b) Using a snap ring pliers, remove the snap ring.
(c) Using a plastic hammer, tap out the output shaft from the front case.

HINT: Place the front case on something soft such as wooden blocks.



E9755

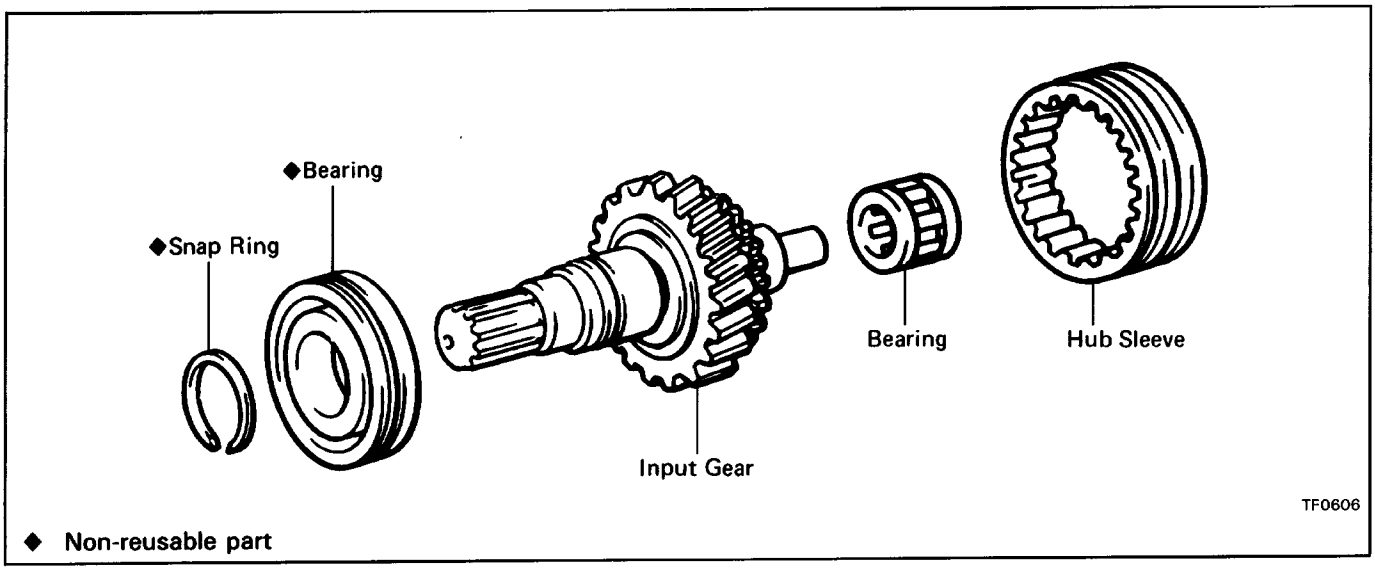
24. INSPECTION OF TRANSFER INDICATOR SWITCH

Check that there is continuity between terminals as shown.

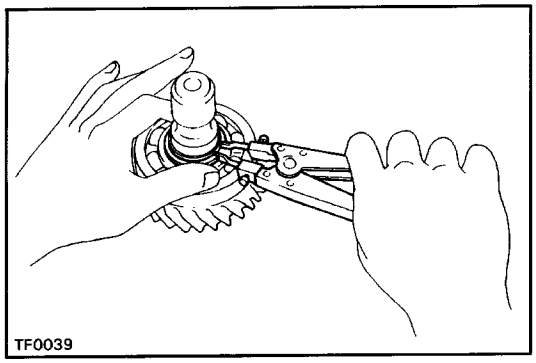
Switch Position	Specified
Push	Continuity
Free	No continuity

If operation is not as specified, replace the switch.

COMPONENT PARTS
Input Gear
COMPONENTS



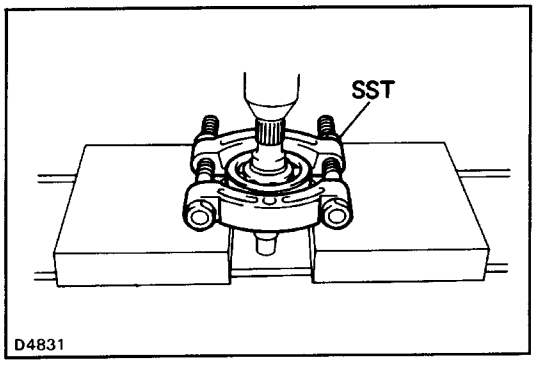
◆ Non-reusable part



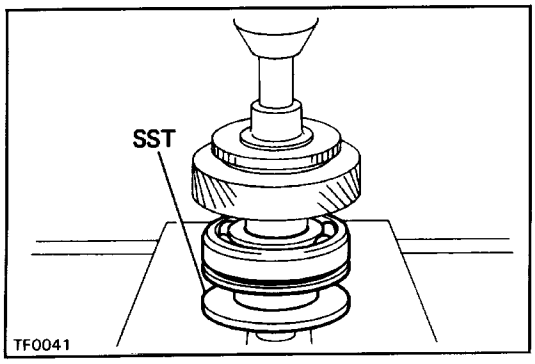
REPLACEMENT OF BEARING

IF NECESSARY, REPLACE INPUT GEAR BEARING

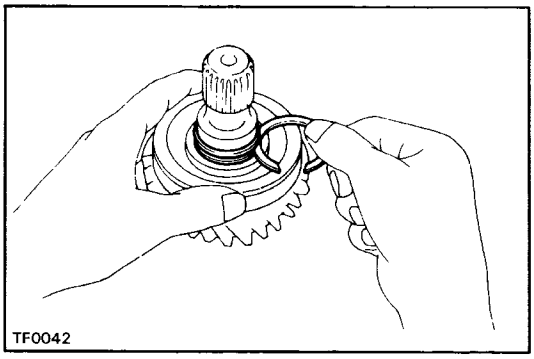
(a) Using snap ring pliers, remove the snap ring.



(b) Using SST and a press, remove the bearing.
SST 09950–00020

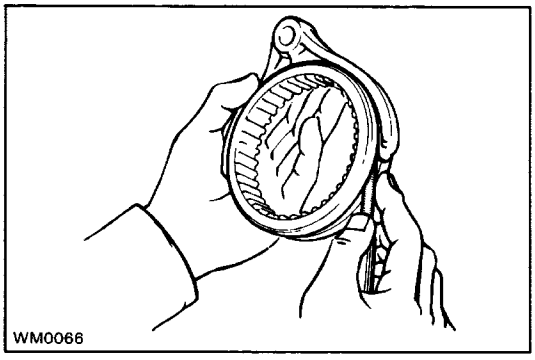


(c) Using SST, press in a new bearing.
SST 09316–60010 (09316–00070)



(d) Select a snap ring that will allow minimum axial play and install it on the shaft.
Maximum play: 0.15 mm (0.0059 in.)

Mark	Thickness mm (in.)
1	2.05 – 2.10 (0.0807 – 0.0827)
3	2.15 – 2.20 (0.0846 – 0.0866)
5	2.25 – 2.30 (0.0886 – 0.0906)



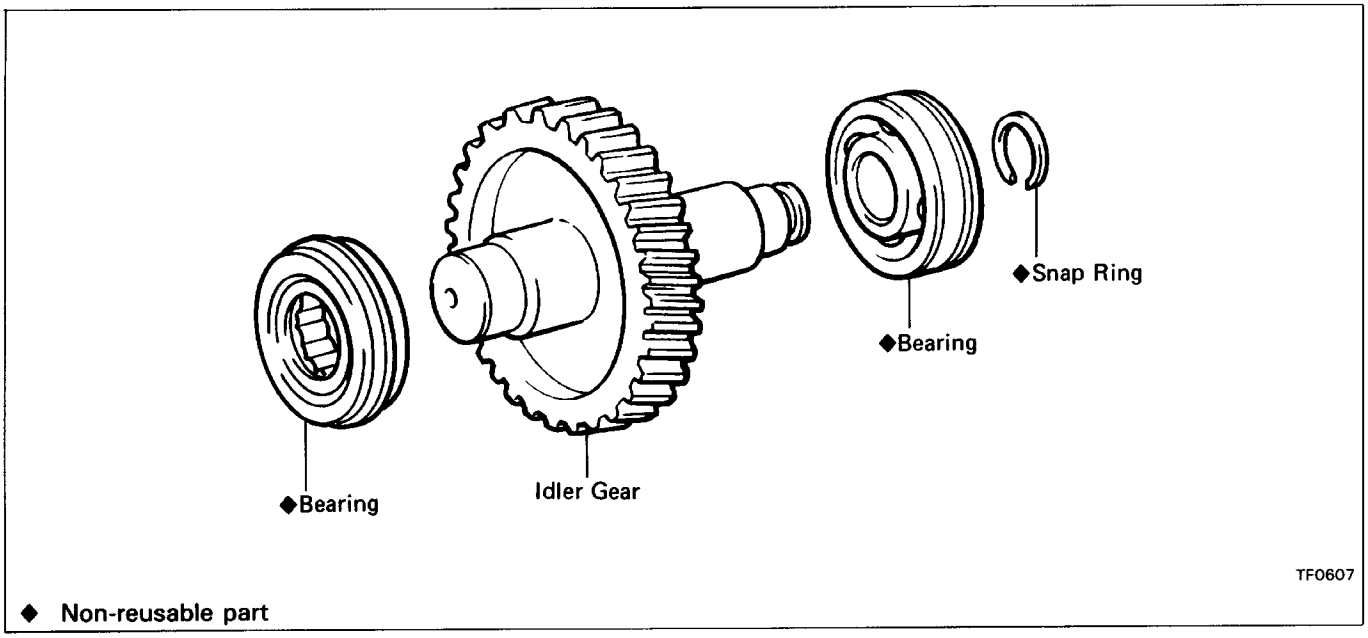
INSPECTION OF HUB SLEEVE AND SHIFT FORK MEASURE

CLEARANCE OF SHIFT FORK AND HUB SLEEVE

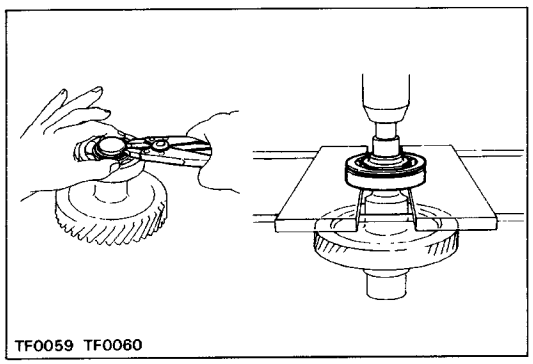
Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.
Maximum clearance: 1.0 mm (0.039 in.)
If the clearance exceeds the limit, replace the shift fork or hub sleeve.

Idler Gear

COMPONENTS



◆ Non-reusable part

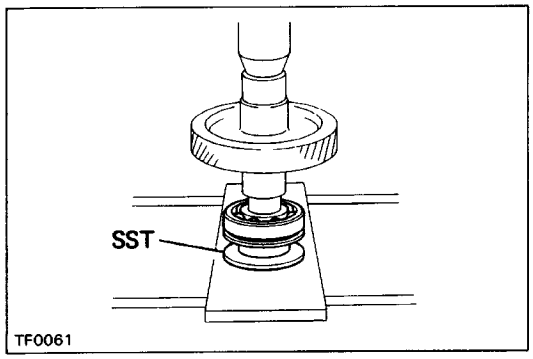


REPLACEMENT OF BEARING

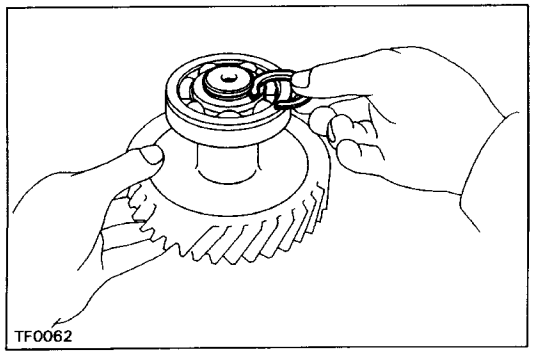
1. IF NECESSARY, REPLACE IDLER GEAR REAR BEARING

(a) Using snap ring pliers, remove the snap ring.

(b) Using a press and 19 mm socket wrench, remove the bearing.



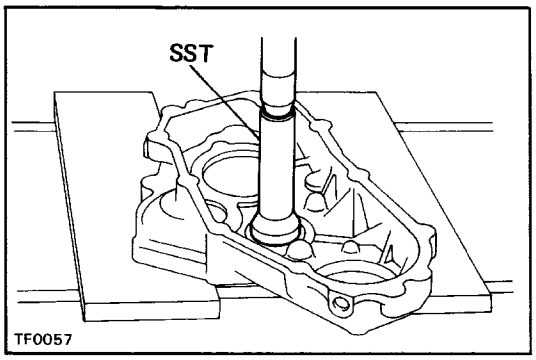
(c) Using SST and a press, press in a new bearing.
SST 09316–60010 (09316–00020)



(d) Select a snap ring that will allow minimum axial play and install it on the shaft.

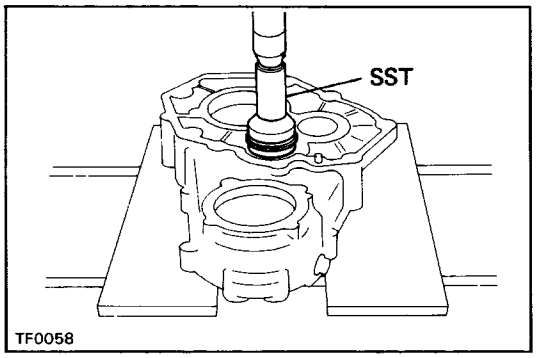
Maximum play: 0.15 mm (0.0059 in.)

Mark	Thickness mm(in.)
A	1.50 – 1.55 (0.0591 – 0.0610)
B	1.60 – 1.65 (0.0630 – 0.0650)



2. IF NECESSARY, REPLACE IDLER GEAR FRONT BEARING

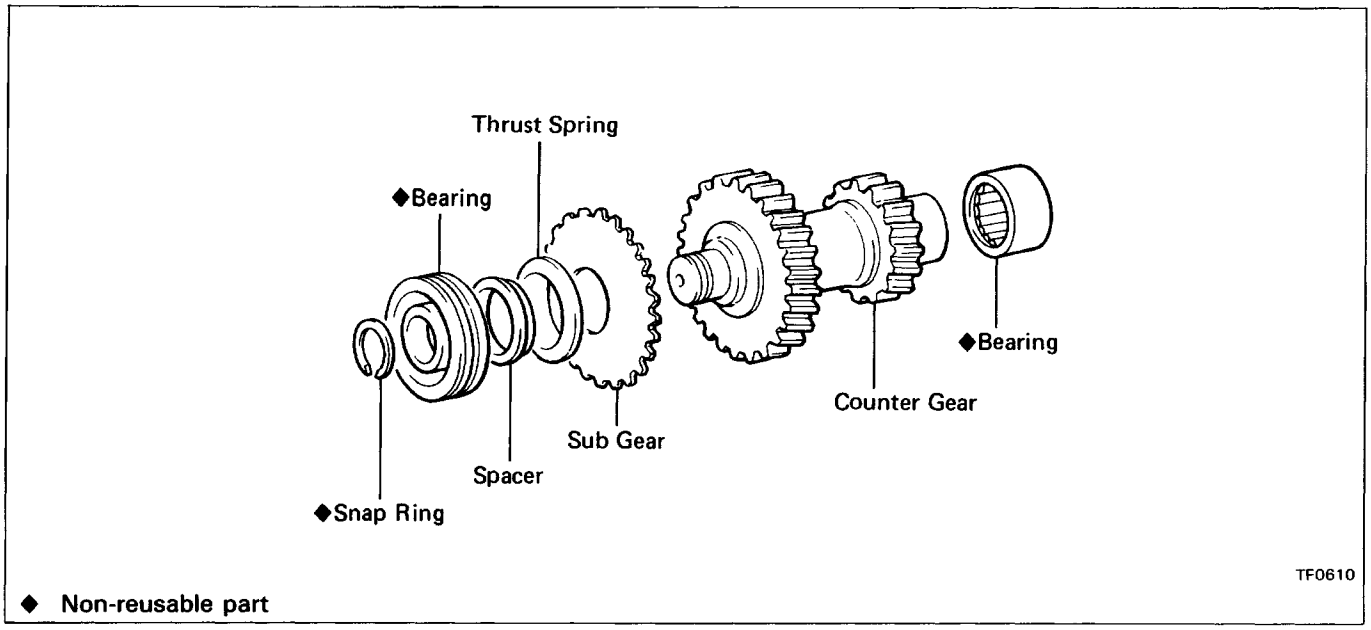
(a) Using SST and a press, press out the bearing.
SST 09310–35010



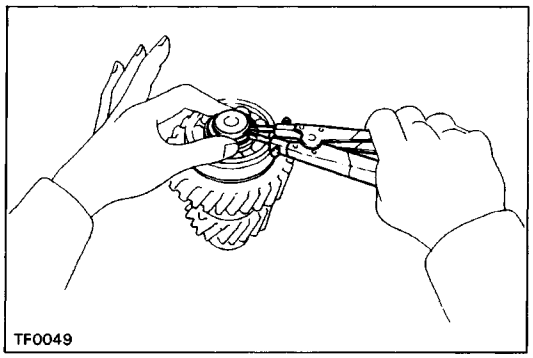
(b) Using SST and a press, press in a new bearing up to the position of the snap ring.
SST 09310–35010

Counter Gear

COMPONENTS



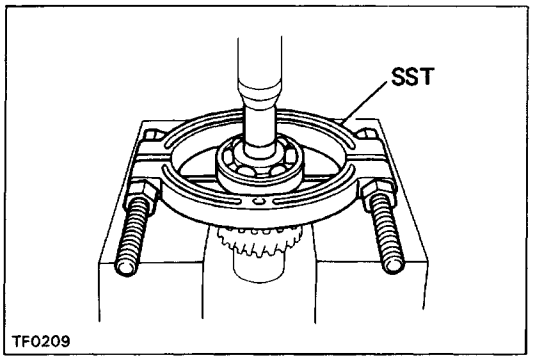
◆ Non-reusable part



REPLACEMENT OF BEARINGS

1. IF NECESSARY, REPLACE COUNTER GEAR FRONT BEARING AND SUB GEAR

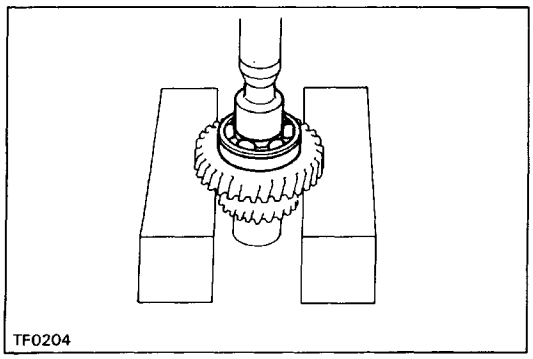
(a) Using snap ring pliers, remove the snap ring.



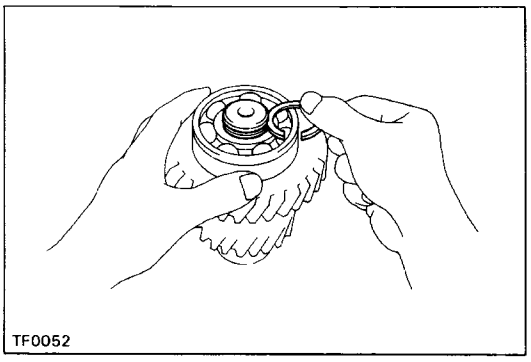
(b) Using SST and a press, remove the bearing.
SST 09950–00020

(c) Remove the spacer, thrust spring and sub gear.

(d) Install the sub gear, thrust spring and spacer on the counter gear.

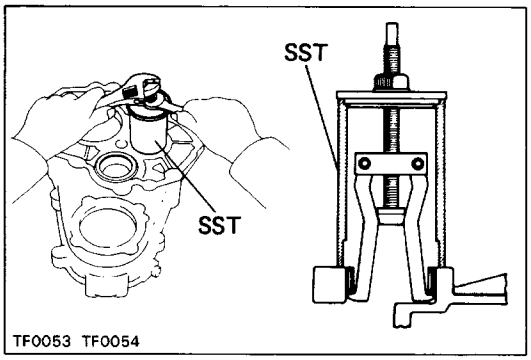


(e) Using a press and 32 mm socket wrench, install a new bearing.


TF0052

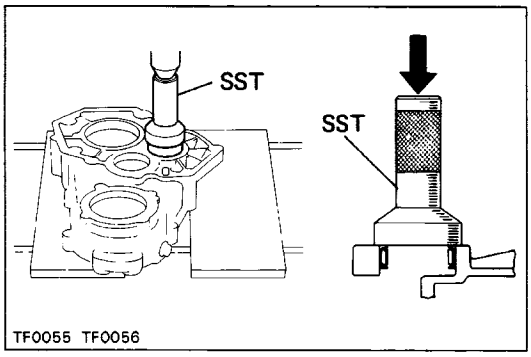
(f) Select a snap ring that will allow minimum axial play and install it on the shaft.
Maximum play: 0.15 mm (0.0059 in.)

Mark	Thickness mm (in.)
1	2.10 – 2.15 (0.0827 – 0.0846)
3	2.20 – 2.25 (0.0866 – 0.0886)



TF0053 TF0054

2. IF NECESSARY, REPLACE COUNTER GEAR REAR BEARING
(a) Using SST, remove the bearing.
SST 09612–30012

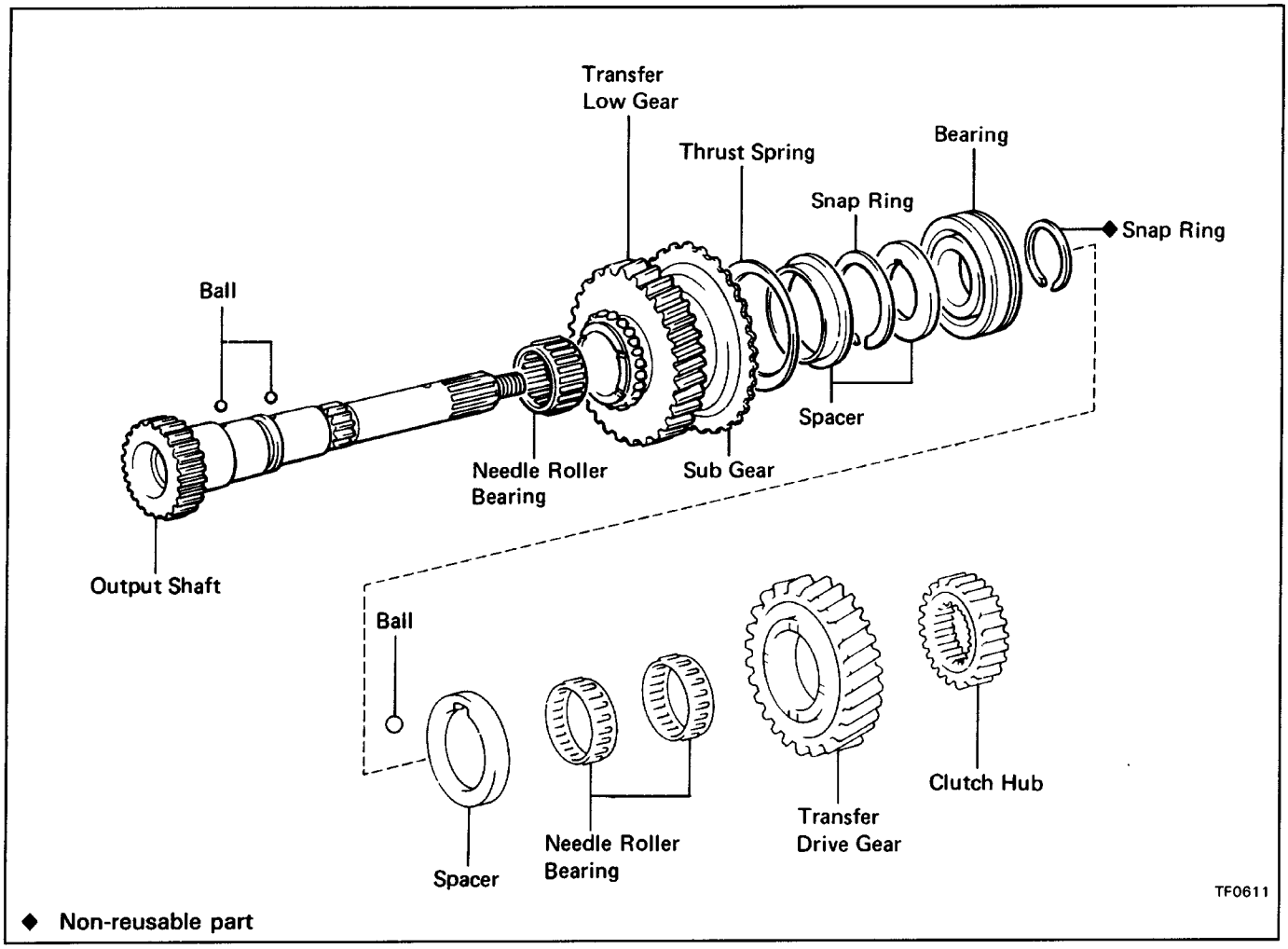


TF0055 TF0056

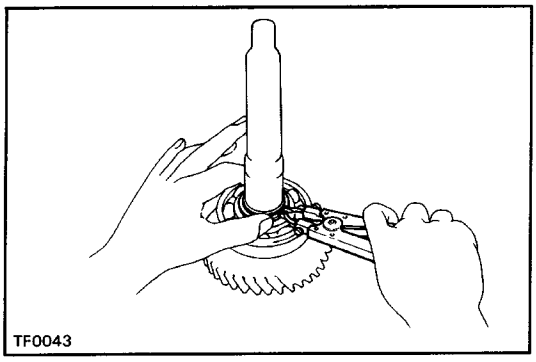
(b) Using SST and a press, press in a new bearing.
SST 09310–35010

Output Shaft

COMPONENTS



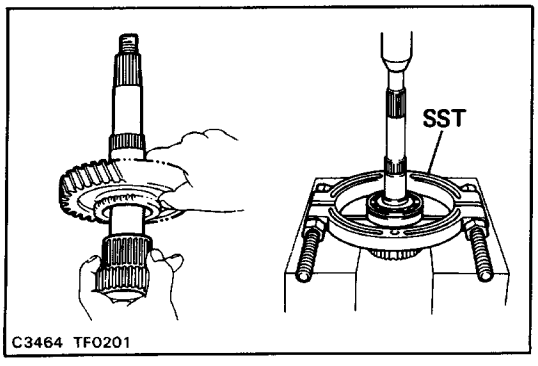
◆ Non-reusable part



DISASSEMBLY OF OUTPUT SHAFT ASSEMBLY

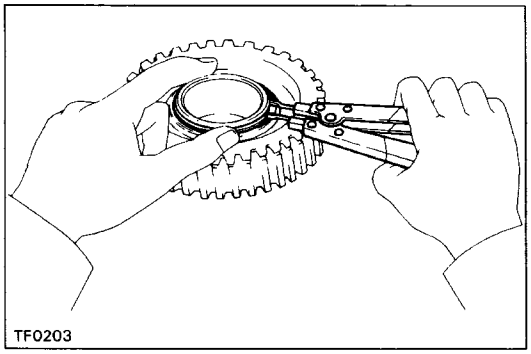
REMOVE OUTPUT SHAFT FRONT BEARING, LOW GEAR AND SUB GEAR

(a) Using snap ring pliers, remove the snap ring.



(b) Using SST and a press, remove the bearing, No. 1 spacer and low gear.
SST 09950–00020

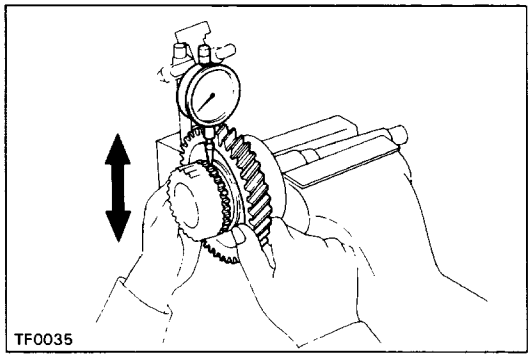
(c) Remove the steel ball and needle roller bearing.


TF0203

(d) Using snap ring pliers, remove the snap ring from the low gear.
(e) Remove the spacer, thrust spring and sub gear.

INSPECTION OF OUTPUT SHAFT ASSEMBLY

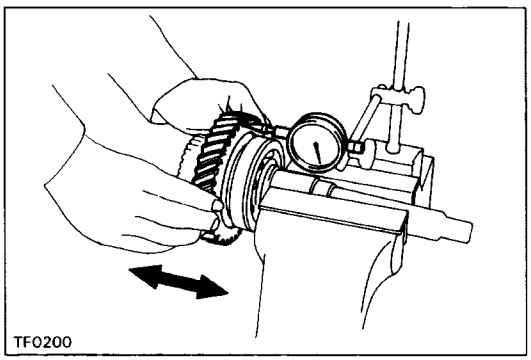
1. CHECK OIL CLEARANCE AND THRUST CLEARANCE OF TRANSFER LOW GEAR


TF0035

(a) Using a dial indicator, measure the oil clearance between the gear and shaft with the needle roller bearing installed.

Standard clearance: 0.010 – 0.055 mm (0.0004 – 0.0022 in.)
Maximum clearance: 0.075 mm (0.0030 in.)

If the clearance exceeds the limit, replace the gear, needle roller bearing or shaft.


TF0200

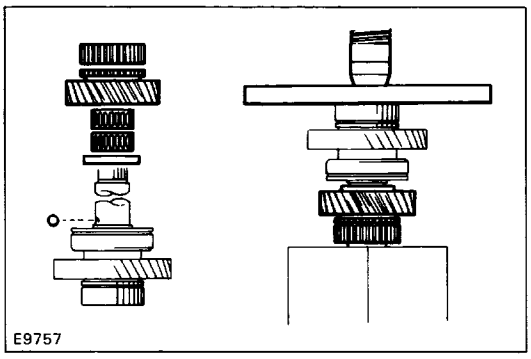
(b) Using a dial indicator, measure the thrust clearance with the spacer and bearing installed.

HINT: Do not touch the shaft end of the dial indicator to the sub gear.

Standard clearance: 0.10 – 0.25 mm (0.0039 – 0.0098 in.)
Maximum clearance: 0.30 mm (0.0118 in.)

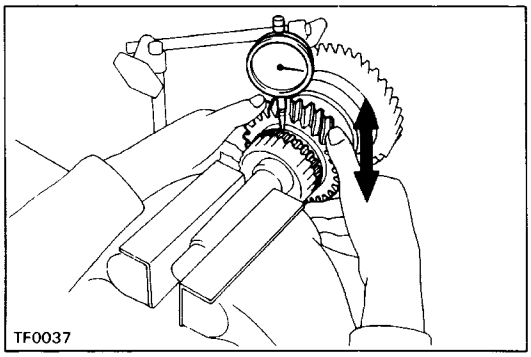
If the clearance exceeds the limit, replace the spacer.

2. CHECK OIL CLEARANCE AND THRUST CLEARANCE OF TRANSFER DRIVE GEAR


E9757

(a) Using a press, install the ball, spacer, two needle roller bearings and transfer drive gear.

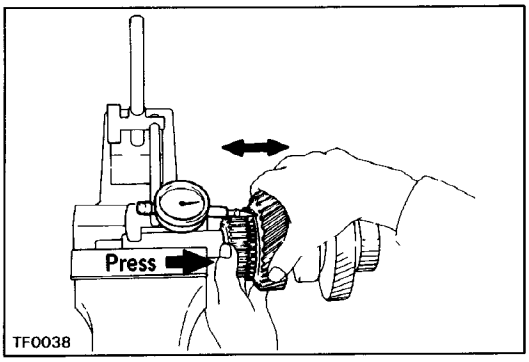
HINT: Do not loosen the ball.


TF0037

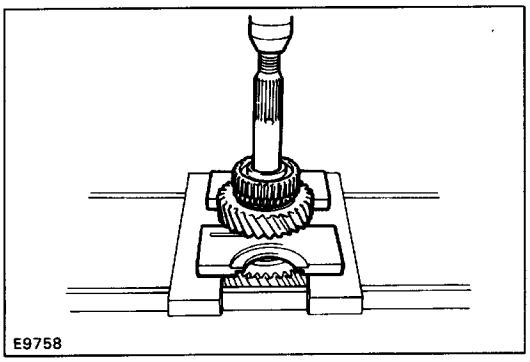
(b) Using a dial indicator, measure the oil clearance between the gear and shaft with the needle roller bearing installed.

Standard clearance: 0.009 – 0.051 mm (0.0004 – 0.0020 in.)
Maximum clearance: 0.71 mm (0.0028 in.)

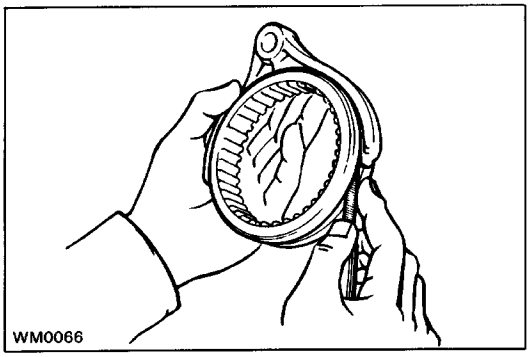
If the clearance exceeds the limit, replace the gear, needle roller bearing or shaft.



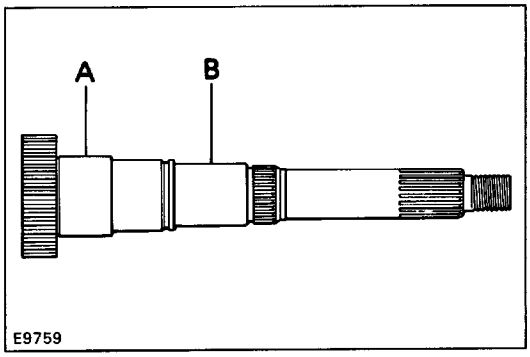
(c) Using a dial indicator, measure the thrust clearance with the clutch hub and spacer installed.
Standard clearance: 0.09 – 0.27 mm
(0.0035 – 0.0106 in.)
Maximum clearance: 0.32 mm (0.0126 in.)
If the clearance exceeds the limit, replace the spacer.



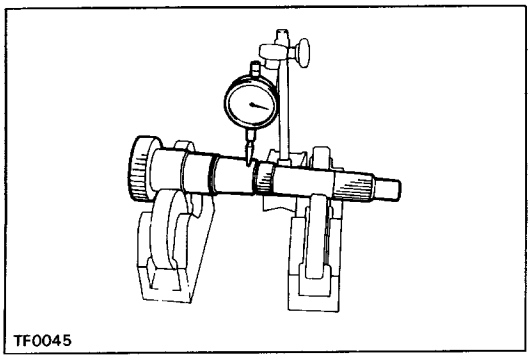
(d) Using a press, remove the ball, spacer, two needle roller bearings and transfer drive gear.



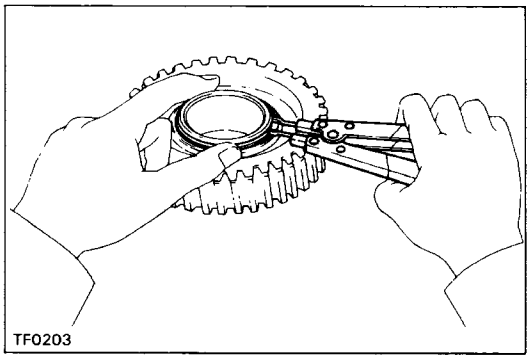
3. MEASURE CLEARANCE OF SHIFT FORKS AND HUB SLEEVES
Using a feeler gauge, measure the clearance between the hub sleeve and shift fork.
Maximum clearance: 1.0 mm (0.039 in.)
If the clearance exceeds the limit, replace the shift fork or hub sleeve.



4. INSPECT OUTPUT SHAFT
(a) Using a micrometer, measure the outer diameter of the output shaft.
Maximum outer diameter:
Part A 44.984 mm (1.7710 in.)
B 34.984 mm (1.3773 in.)



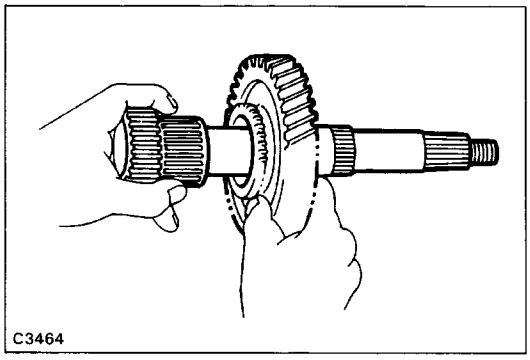
(b) Using a dial indicator, measure the shaft runout.
Maximum runout: 0.03 mm (0.0012 in.)


TF0203

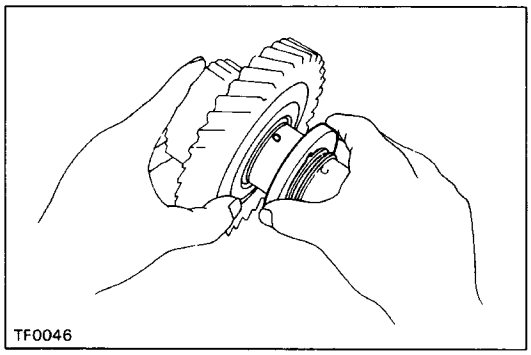
ASSEMBLY OF OUTPUT SHAFT

INSTALL OUTPUT SHAFT FRONT BEARING LOW GEAR AND SUB GEAR

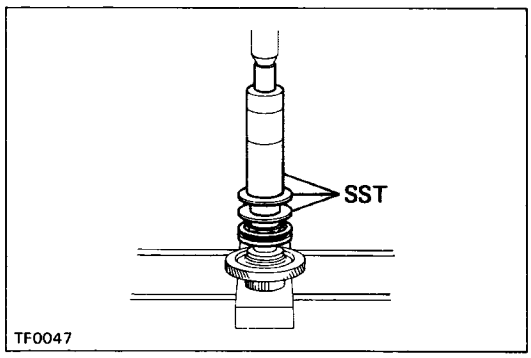
(a) Install the sub gear, thrust spring and spacer.
(b) Using snap ring pliers, install the snap ring.


C3464

(c) Apply MP grease to the needle roller bearing.
(d) Install the low gear with needle roller bearing to the output shaft.

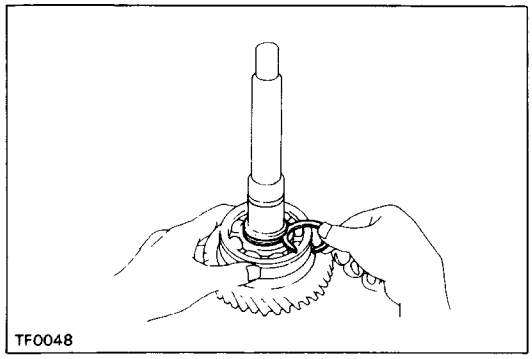

TF0046

(e) Install the steel ball on the output shaft.
(f) Install the No. 1 spacer.



TF0047

(g) Using SST and a press, install a new bearing.
SST 09316–60010 (09316–00010, 09316–00040, 09316–00050)

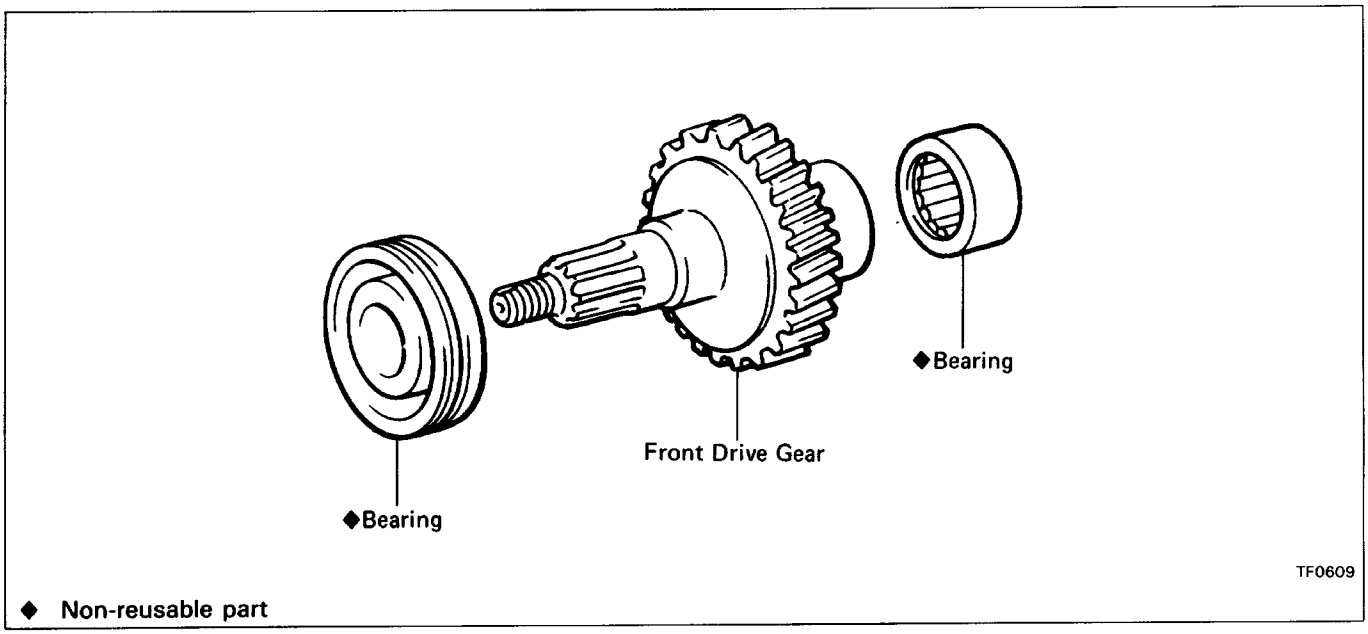

TF0048

(h) Select a snap ring that will allow minimum axial play and install it on the shaft.
Maximum play: 0.10 mm (0.0039 in.)

Mark	Thickness mm (in.)
0	2.40 – 2.45 (0.0945 – 0.0965)
1	2.45 – 2.50 (0.0965 – 0.0984)
2	2.50 – 2.55 (0.0984 – 0.1004)
3	2.55 – 2.60 (0.1004 – 0.1024)
4	2.60 – 2.65 (0.1024 – 0.1043)
5	2.65 – 2.70 (0.1043 – 0.1063)

Front Drive Gear

COMPONENTS



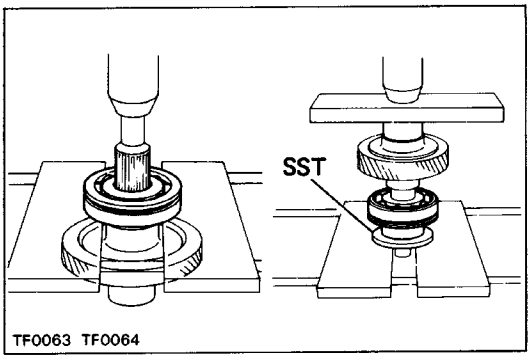
◆ Non-reusable part

REPLACEMENT OF BEARINGS

1. IF NECESSARY, REPLACE FRONT DRIVE GEAR FRONT BEARING

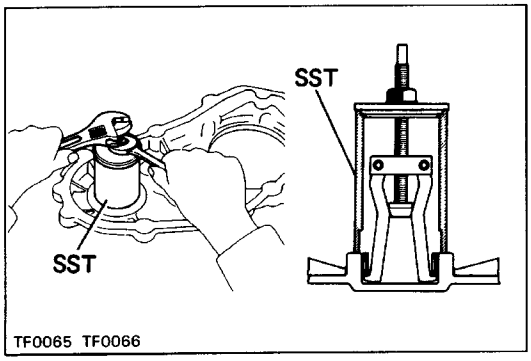
(a) Press out the bearing.

(b) Using SST and a press, press in a new bearing.
SST 09316–60010 (09316–00020)

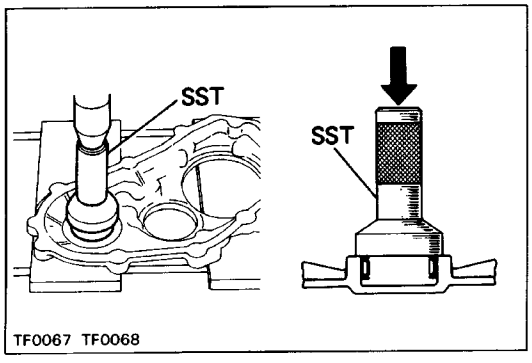


2. IF NECESSARY, REPLACE FRONT DRIVE GEAR REAR BEARING

(a) Using SST, remove the bearing.
SST 09612–30012

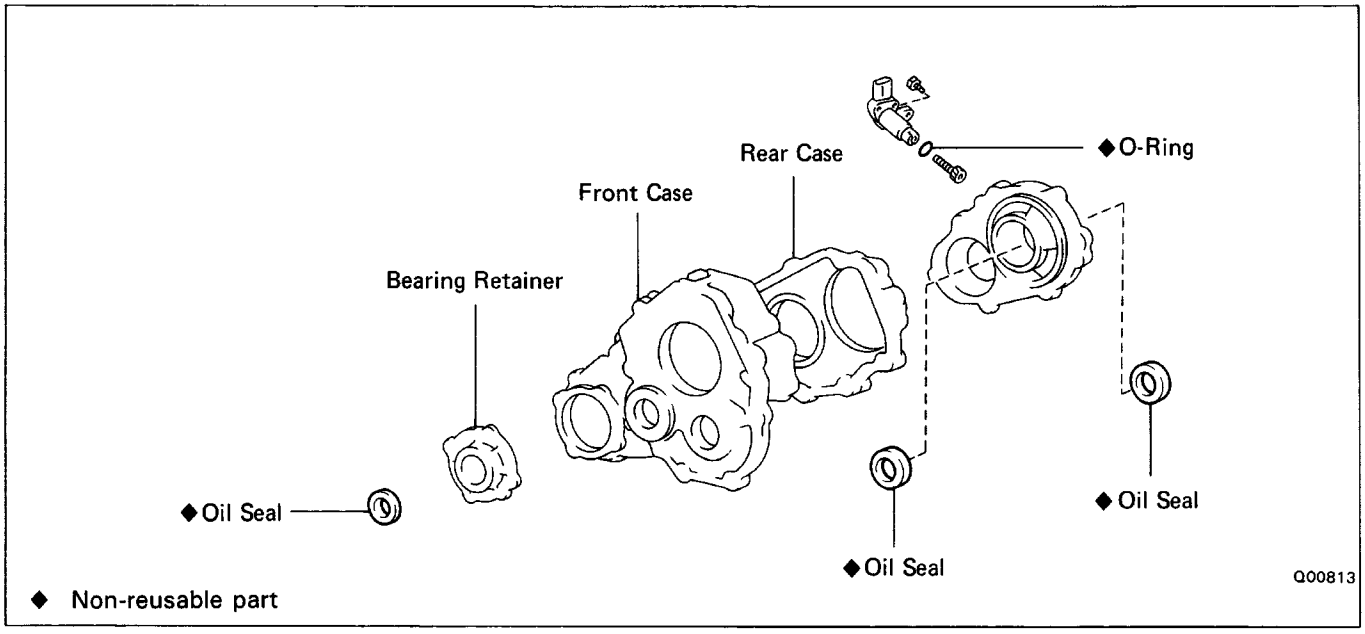


(b) Using SST and a press, press in a new bearing.
SST 09310–3 5010



Oil Seals

COMPONENTS

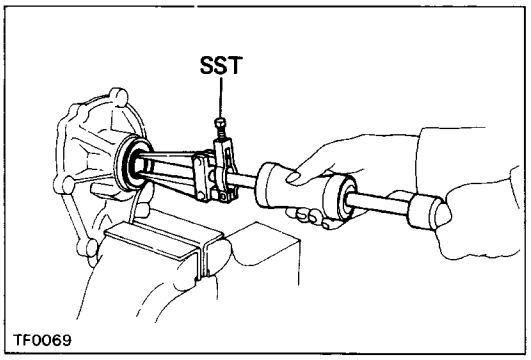


◆ Non-reusable part

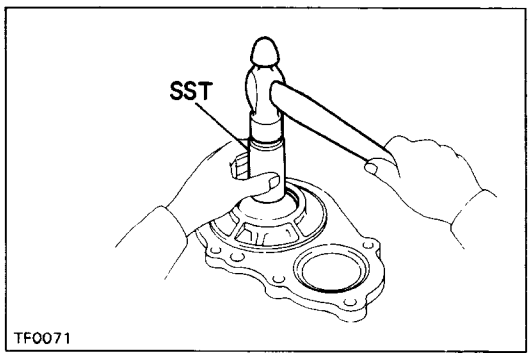
REPLACEMENT OF OIL SEALS

1. IF NECESSARY, REPLACE EXTENSION HOUSING OIL SEAL

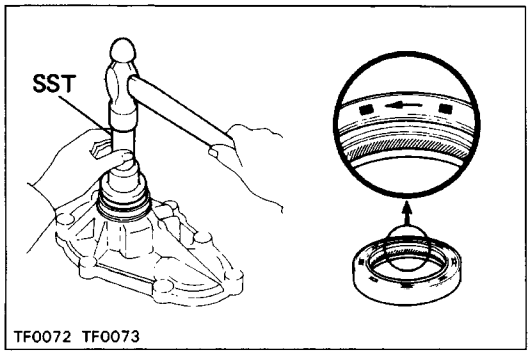
(a) Using SST, remove the two oil seals.
SST 09308–00010

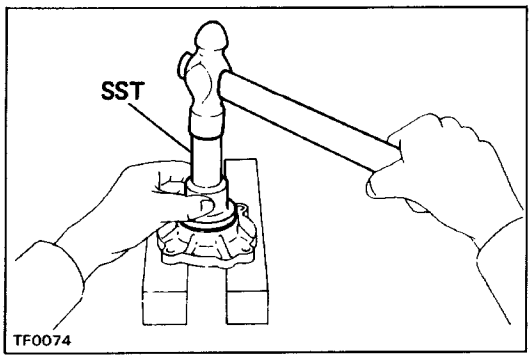


(b) Using SST and a hammer, drive in a new oil seal.
SST 09310–35010
HINT: When assembling a new oil seal for the oil pump screw, position the flat surface upward.



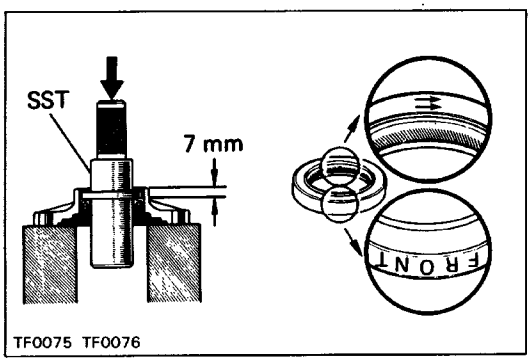
(c) Using SST and a hammer, drive in a new oil seal.
SST 09325–20010
HINT: Take note of the groove direction and be careful not to interchange this seal with the front drive gear oil seal. This oil seal has one arrow mark pointing counter–clockwise to distinguish it from the front drive gear oil seal.



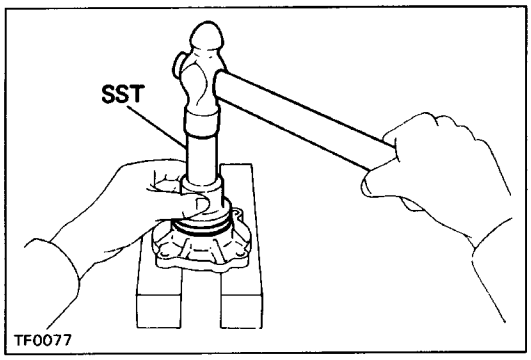


2. IF NECESSARY, REPLACE FRONT DRIVE GEAR OIL SEAL

(a) Using SST and a hammer, drive out the oil seal and dust cover.
SST 09325–20010
HINT: Place the bearing retainer on something soft such as wooden blocks.



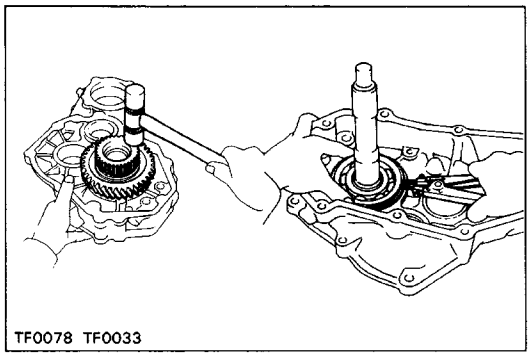
(b) Using SST and a hammer, drive in a .new oil seal to a depth of 7 mm (0.28 in.) from the end.
SST 09325–20010
HINT: Take note of the groove direction and be careful not to interchange this seal with the output shaft oil seal. This oil seal has two arrow marks pointing clockwise and the word FRONT to distinguish it from the output shaft.



(c) Using SST and a hammer, drive in a new dust cover.
SST 09325–20010

ASSEMBLY OF TRANSFER

(See page TF–7)

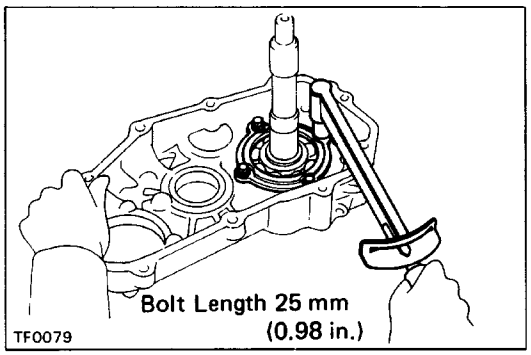

TF0078 TF0033

1. INSTALL OUTPUT SHAFT TO FRONT CASE

(a) Using a plastic hammer, install the output shaft to the front case.

HINT: Place the front case on something soft such as wooden blocks.

(b) Using snap ring pliers, install the snap ring.



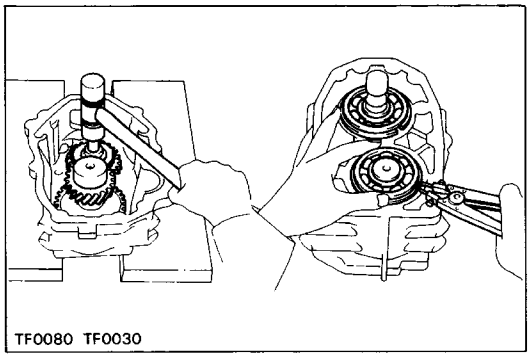
TF0079

2. INSTALL BEARING RETAINER TO FRONT CASE

(a) Install the bearing retainer with four bolts.

(b) Torque the bolts.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

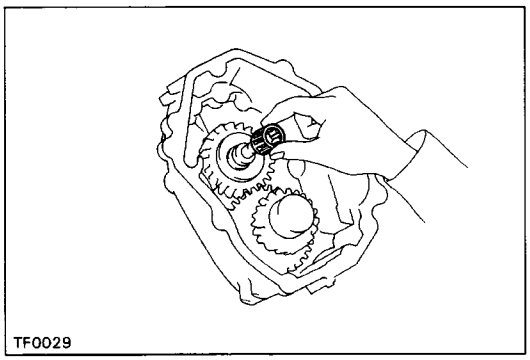

TF0080 TF0030

3. INSTALL INPUT GEAR AND COUNTER GEAR TO REDUCTION GEAR CASE

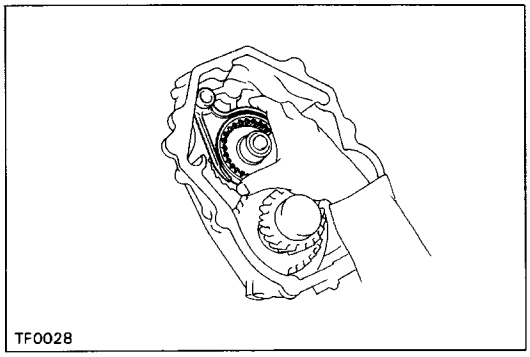
(a) Using a plastic hammer, install the input gear and counter gear to the reduction gear case.

HINT: Place the reduction gear case on something soft such as wooden blocks.

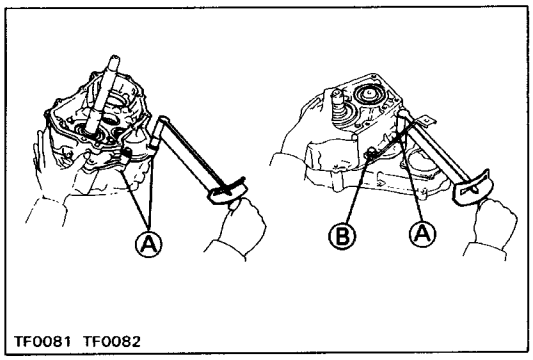
(b) Using snap ring pliers, install the snap rings.


TF0029

4. INSTALL ROLLER BEARING ON INPUT SHAFT


TF0028

5. INSTALL NO.2 HUB SLEEVE AND NO.2 SHIFT FORK ON INPUT SHAFT



TF0081 TF0082

6. INSTALL REDUCTION GEAR CASE WITH NEW GASKET TO FRONT CASE

(a) Place a new gasket on the front case.

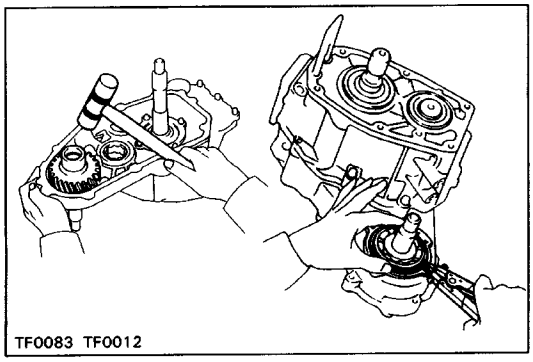
(b) Install the reduction gear case together with the input gear and counter gear.

(c) Install and torque the bolts as shown in the figure.

Torque:

(A) Bolt length 47 mm (1.85 in.)
39 N–m (400 kgf–cm, 29 ft–lbf)

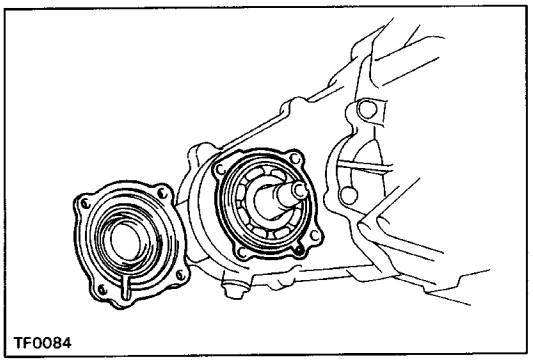
(B) Bolt length 49 mm (1.93 in.)
39 N–m (400 kgf–cm, 29 ft–lbf)


TF0083 TF0012

7. INSTALL FRONT DRIVE GEAR

(a) Using a plastic hammer, install the front drive gear.

(b) Using snap ring pliers, install the snap ring.

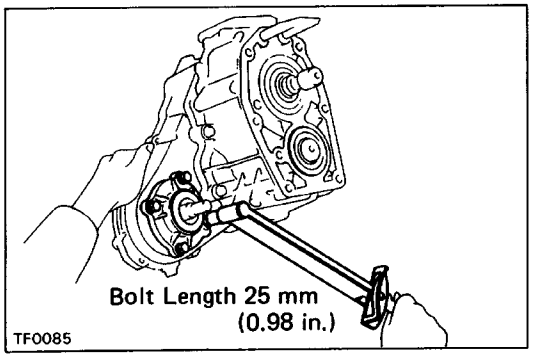

TF0084

8. INSTALL BEARING RETAINER WITH NEW GASKET

(a) Place a new gasket on the front case.

(b) Apply MP grease to the oil seal.

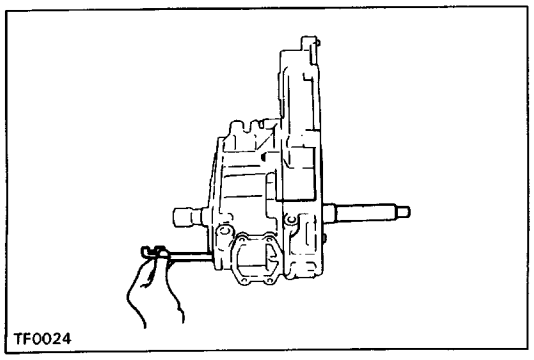
(c) Install the bearing retainer.



TF0085

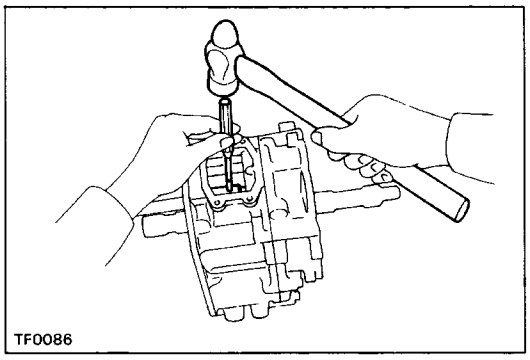
(d) Install and torque the bolts.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)

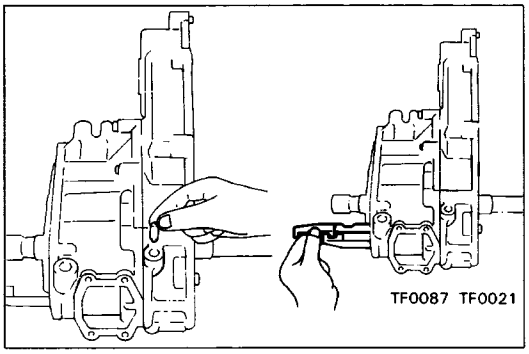

TF0024

9. INSTALL HIGH AND LOW SHIFT FORK SHAFT

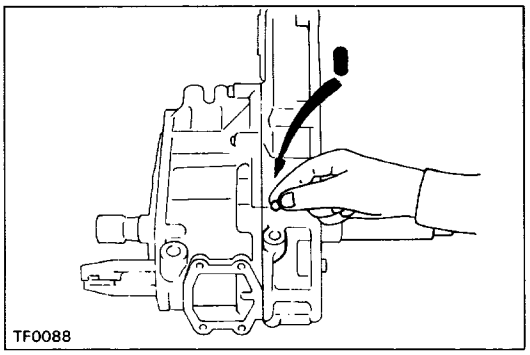
(a) Install the high and low shift fork shaft to the No.2 shift fork.



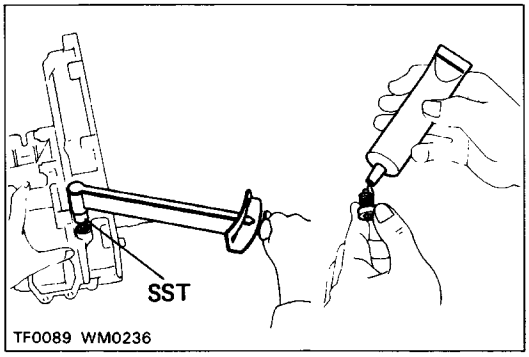
(b) Align the slotted spring hole in the fork with the hole in the shaft.
(c) Using a pin punch and hammer, drive in the slotted spring pin.



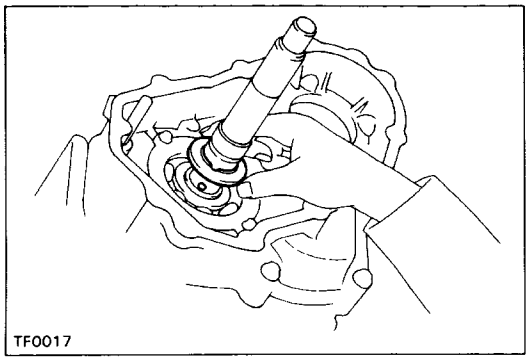
10. INSTALL INTERLOCK PIN AND FRONT DRIVE SHIFT FORK SHAFT
(a) Install the interlock pin.
(b) Install the front drive shift fork shaft with the two grooves facing outward.



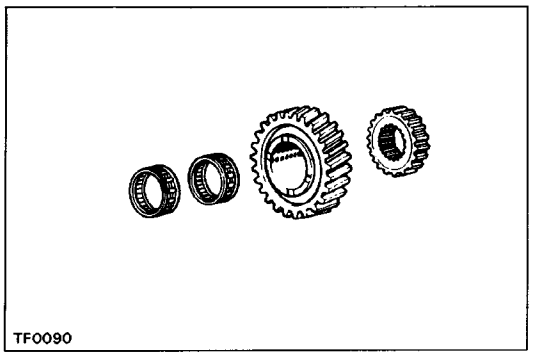
11. INSTALL TWO BALLS, SPRINGS AND PLUGS
(a) Install the ball and spring.



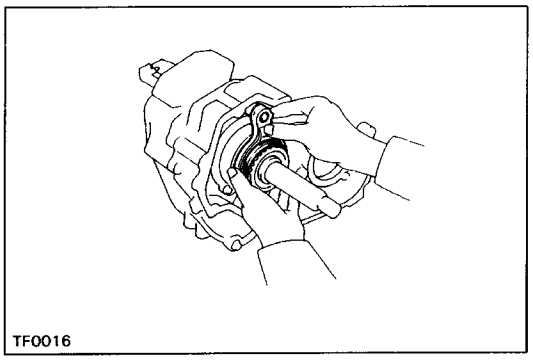
(b) Apply liquid sealer to the plug threads.
Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
(c) Using SST, install and torque the plug.
SST 09313–30021
Torque: 12 N–m (120 kgf–cm, 9 ft–lbf)
(d) Install the ball, spring and plug to the opposite side.



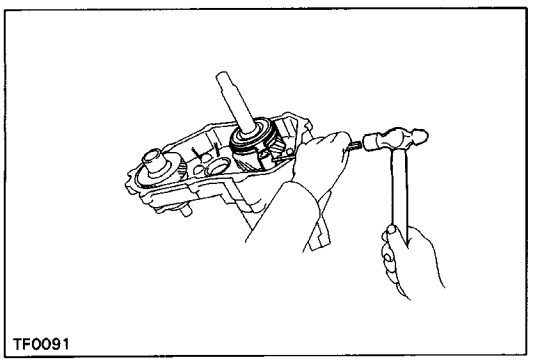
12. INSTALL LOCKING BALL AND NO.2 SPACER


TF0090

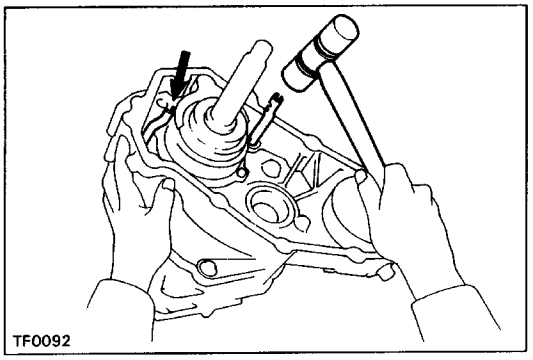
13. INSTALL NEEDLE ROLLER BEARINGS, TRANSFER LOWER GEAR AND CLUTCH HUB


TF0016

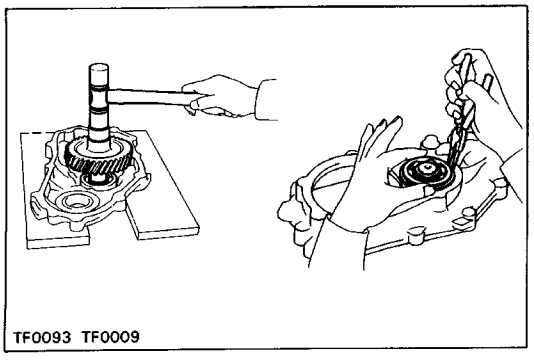
14. INSTALL NO. 1 SHIFT FORK AND HUB SLEEVE
(a) Install the No.1 shift fork together with the hub sleeve to the front drive shift fork shaft.


TF0091

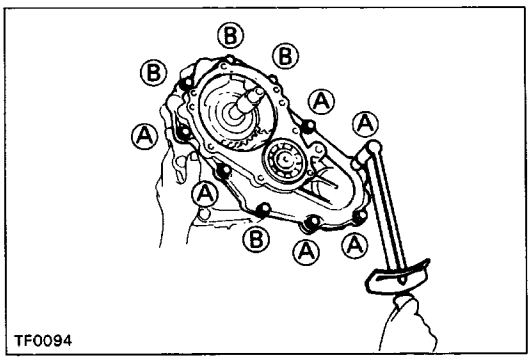
(b) Align the slotted pin hole in the fork with the hole in the shaft.
(c) Using a pin punch and hammer, install the slotted spring pin.


TF0092

15. INSTALL OIL PIPES
Install the two oil pipes with the cutout side positioned upward.


TF0093 TF0009

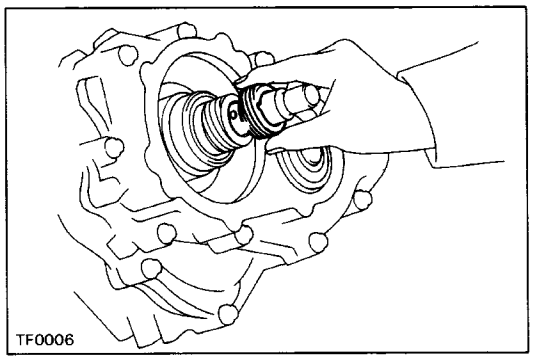
16. INSTALL IDLER GEAR TO REAR CASE
(a) Using a plastic hammer, install the idler gear to the rear case.
HINT: Place the rear case on something soft such as wooden blocks.
(b) Using snap ring pliers, install the snap ring.



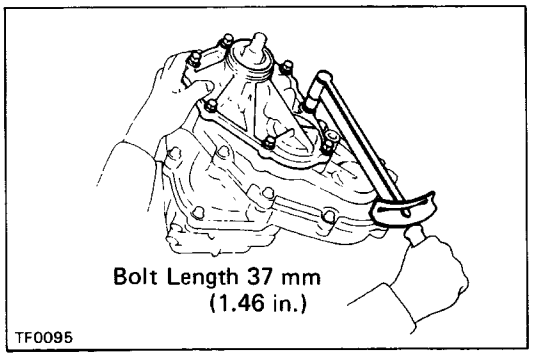
17. INSTALL REAR CASE WITH NEW GASKET

(a) Place a new gasket on the front case.
(b) Install the rear case together with the idler gear.
(c) Install and torque the bolts as shown in the figure.

Torque:
(A) Bolt length 47 mm (1.85 in.)
Ⓑ 39 N–m (400 kgf–cm, 29 ft–lbf)
(B) Bolt length 112 mm (4.41 in.)
39 N–m (400 kgf–cm, 29 ft–lbf)

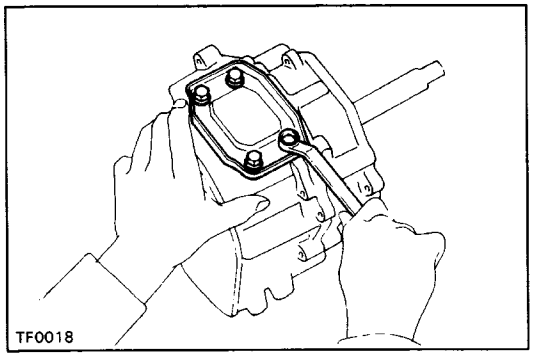


18. INSTALL BEARING, OIL PUMP SCREW, LOCKING BALL AND SPEEDOMETER DRIVE GEAR



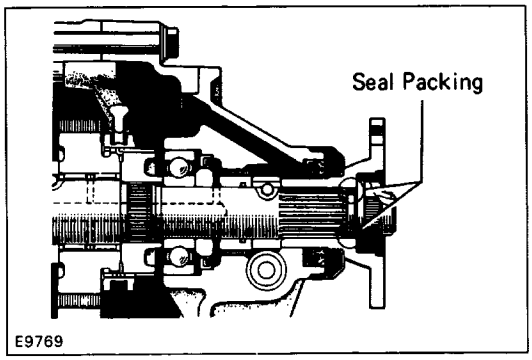
19. INSTALL EXTENSION HOUSING WITH NEW GASKET

(a) Place a new gasket to the rear case.
(b) Apply MP grease to the two oil seals.
(c) Install the extension housing with seven bolts.
Torque the bolts.
Torque: 39 N–m (400 kgf–cm, 29 ft–lbf)



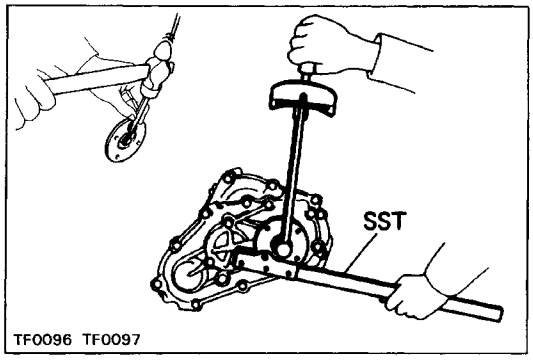
20. INSTALL TRANSFER CASE COVER WITH NEW GASKET

(a) Place a new gasket to the transfer case cover.
(b) Install and torque the four bolts.
Torque: 8.8 N–m (90 kgf–cm, 78 in.lbf)

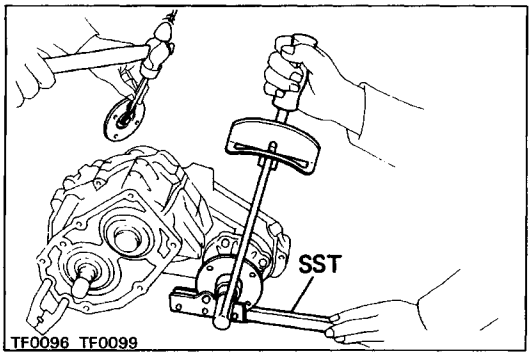


21. INSTALL REAR COMPANION FLANGE

(a) Install the companion flange to the output shaft.
(b) Apply seal packing to the output shaft and companion flange as shown.
Seal packing: Part No. 08826–00090 THREE BOND 1281 or equivalent



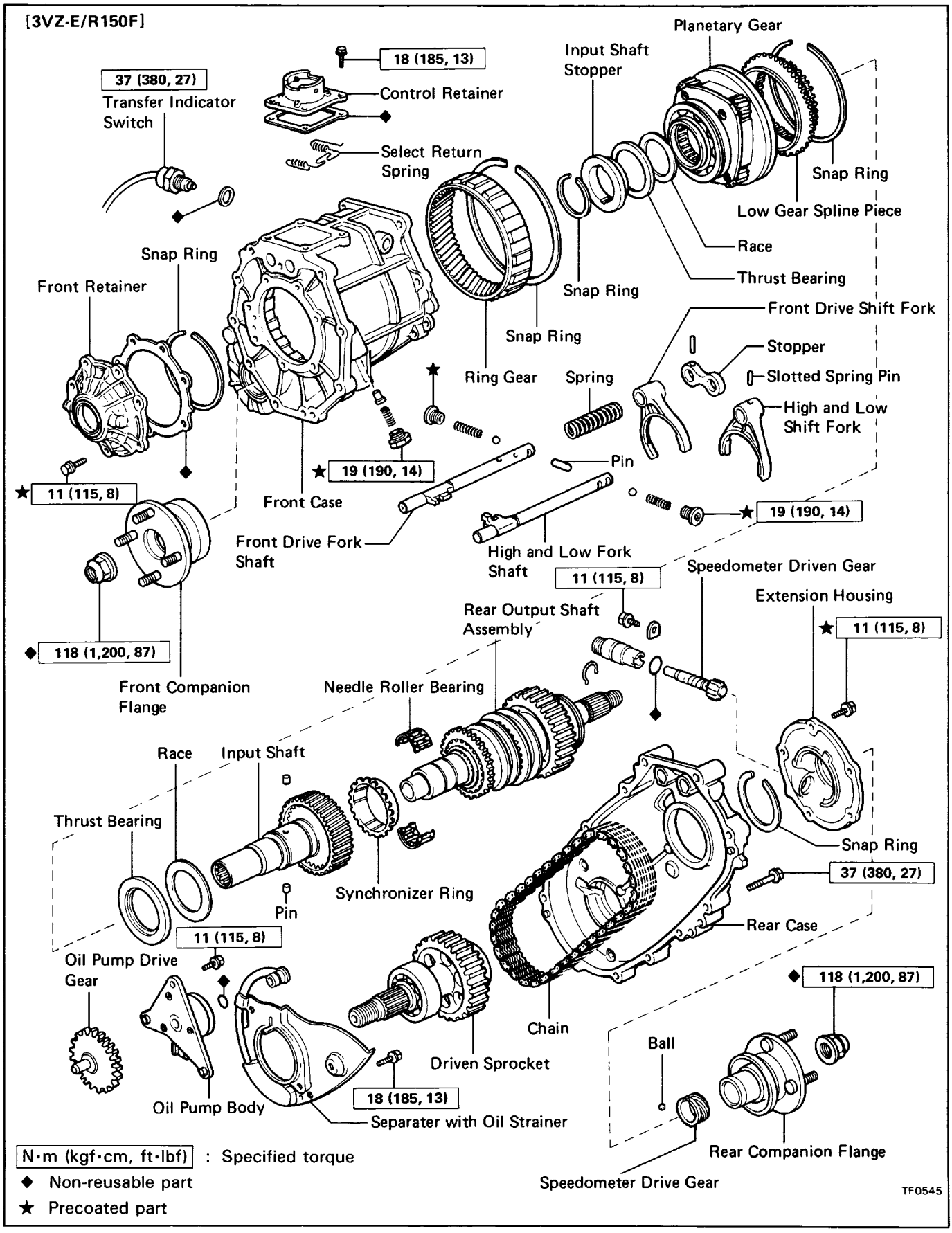
(c) Using SST to hold the flange, install the washer and nut. Torque the nut.
SST 09330–00021
Torque: 123 N–m (1,250 kgf–cm, 90 ft–lbf)
(d) Stake the nut.



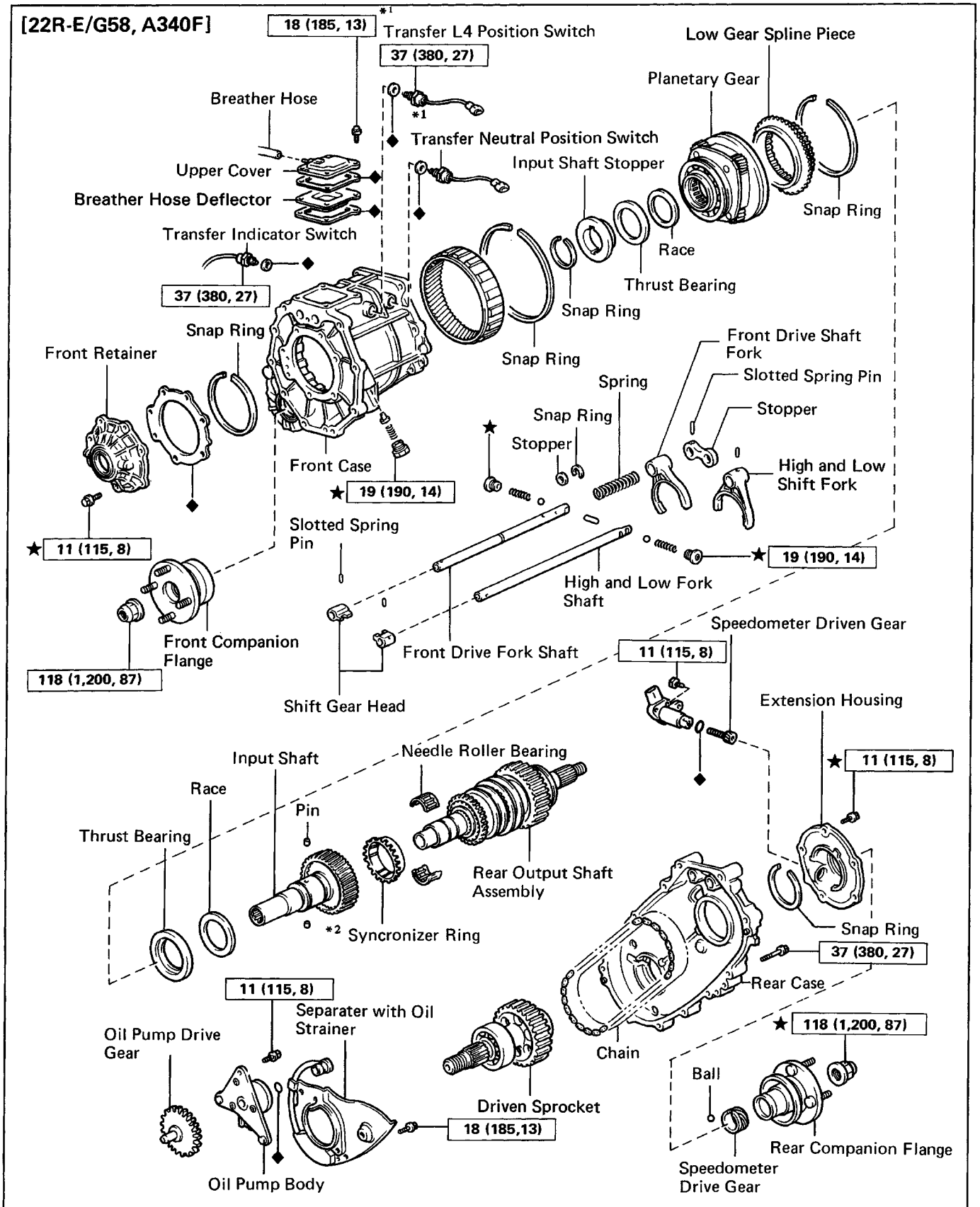
22. INSTALL FRONT COMPANION FLANGE
(a) Install the companion flange to the front drive gear.
(b) Using SST to hold the flange, install the washer and nut. Torque the nut.
SST 09330–00021
Torque: 123 N–m (1,250 kgf–cm, 90 ft–lbf)
(c) Stake the nut.

23. INSTALL TRANSFER INDICATOR SWITCH WITH WASHER
Torque: 34 N–m (350 kgf–cm, 25 ft–lbf)
24. INSTALL NO. 1 SPEED SENSOR
(a) Install the No. 1 speed sensor.
(b) Install and torque the bolt.
Torque: 11 N–m (115 kgf–cm, 8 ft–lbf)

(VF1A TYPE TRANSFER) COMPONENTS



COMPONENTS (Cont'd)



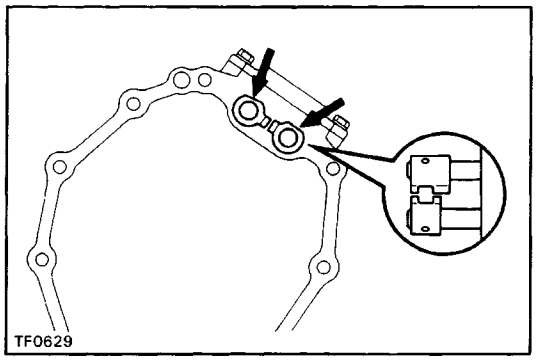
DISASSEMBLY OF TRANSFER

(See pages TF–32 and 33)

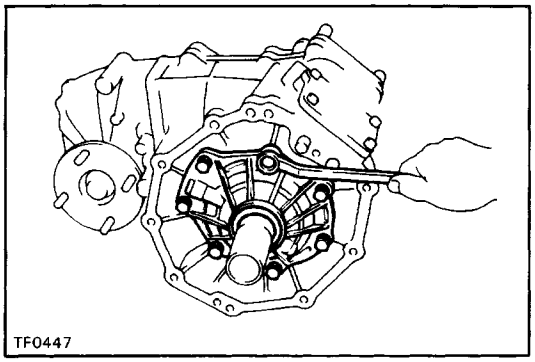
1. REMOVE SPEEDOMETER DRIVEN GEAR

2. REMOVE TRANSFER INDICATOR SWITCH

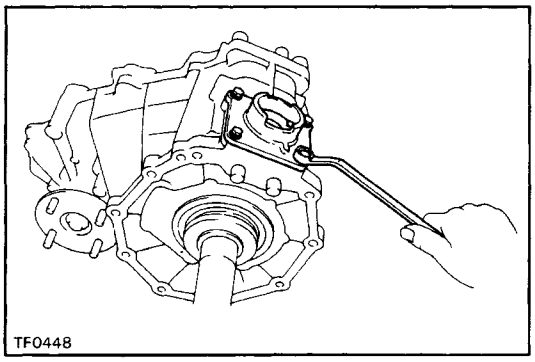
3. (22R–E/A340F)
REMOVE TRANSFER L4 POSITION SWITCH



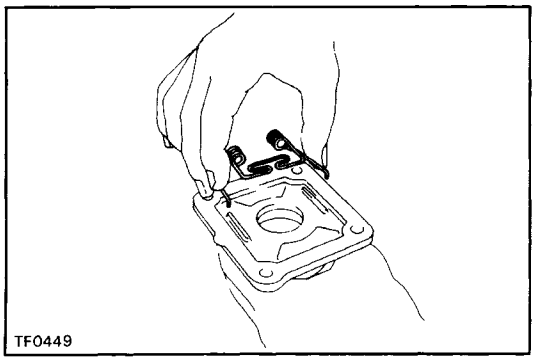
4. (22R–E/G58, A340F)
REMOVE SHIFT GEAR HEAD NO. 1 AND NO.2
(a) Using a pin punch and hammer, drive out the two slotted spring pins.
(b) Remove two shift gear heads.



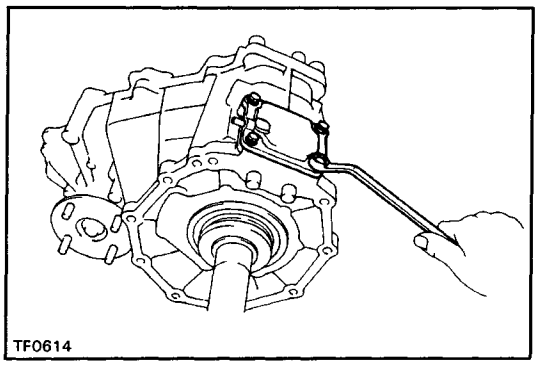
5. REMOVE FRONT RETAINER
Remove the seven bolts and the front retainer.



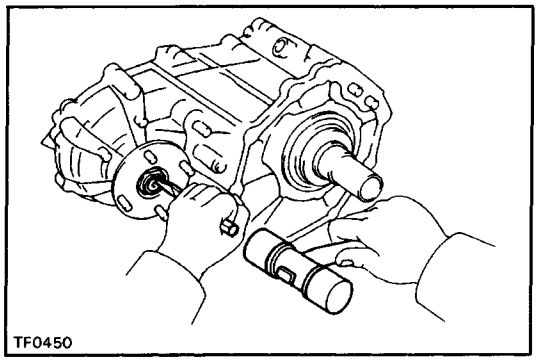
6.–1 (3VZ–E/R150F)
REMOVE CONTROL RETAINER
(a) Remove the four bolts and the control retainer.



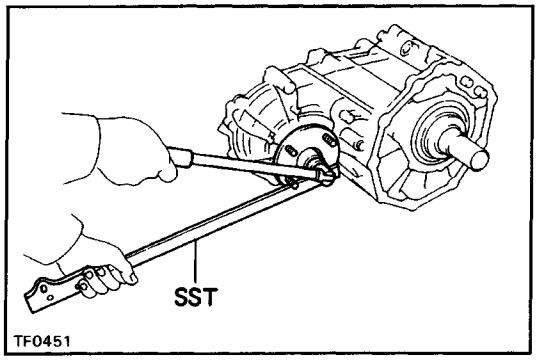
(b) Remove the select return spring from the retainer.



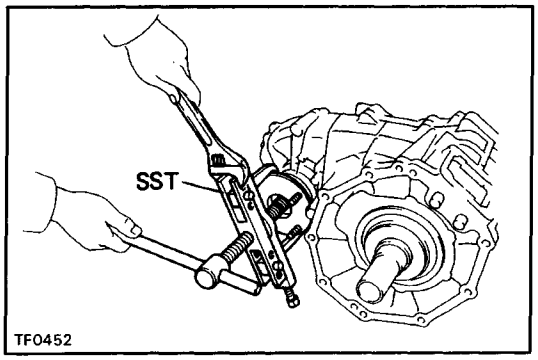
6.–2 (22R–E/G58, A340F)
REMOVE UPPER COVER AND OIL DEFLECTOR
Remove the four bolts and the upper cover and oil deflec–tor.



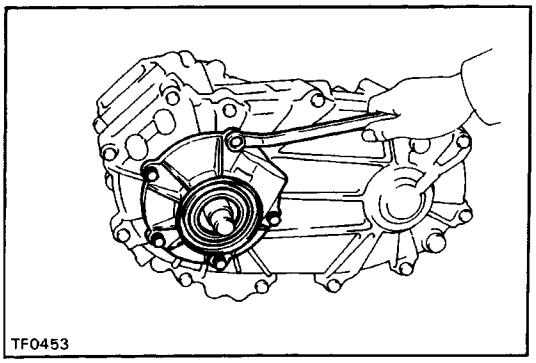
7. REMOVE FRONT COMPANION FLANGE
(a) Using a hammer and chisel, loosen the staked part of the nut.



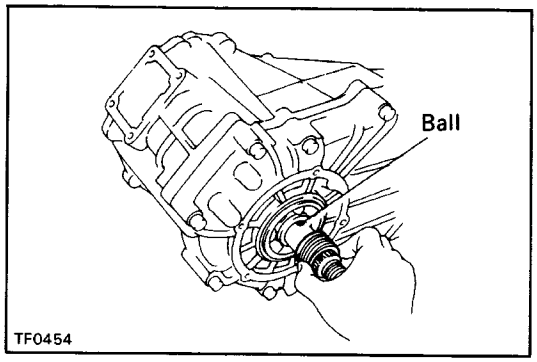
(b) Using SST to hold the flange, remove the compan–ion flange lock nut.
SST 09330–00021 –



(c) Using SST, remove the companion flange.
SST 09950–20017
8. REMOVE REAR COMPANION FLANGE
Remove the rear companion flange in the same way as the front companion flange.



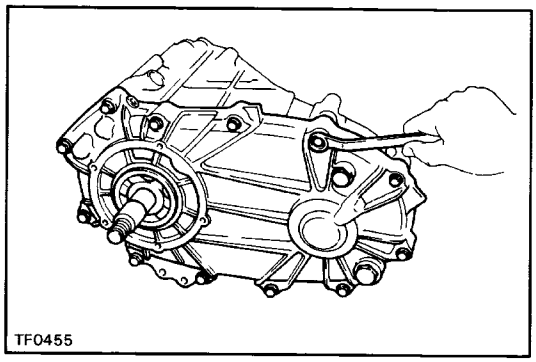
9. REMOVE EXTENSION HOUSING
(a) Remove the five bolts.
(b) Using a plastic hammer, tap the extension housing and remove it.



10. REMOVE SPEEDOMETER DRIVE GEAR

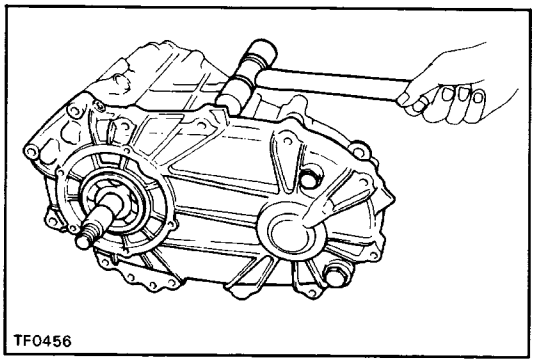
(a) Remove the speedometer drive gear.

(b) Using a magnetic finger, remove the ball from the rear output shaft.

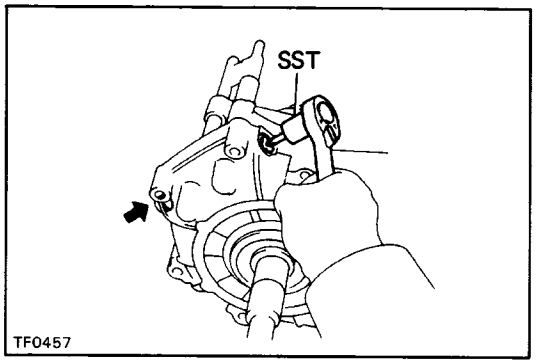


11. SEPARATE FRONT CASE AND REAR CASE

(a) Remove the twelve bolts.



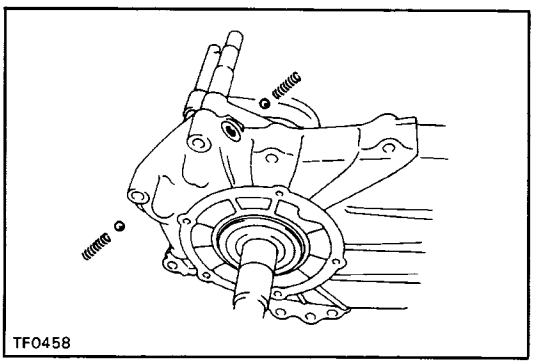
(b) Using a plastic hammer, tap the rear case and separate the front case and rear case.



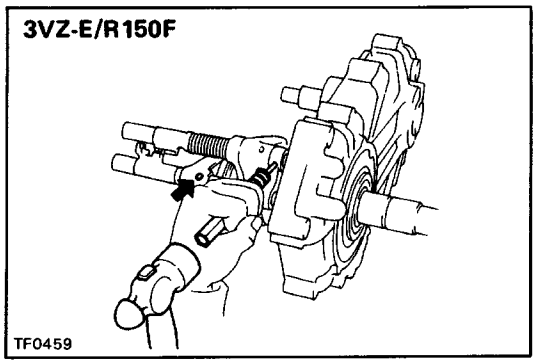
12. REMOVE STRAIGHT SCREW PLUGS, SPRINGS AND LOCKING BALLS

(a) Using SST, remove the two screws.

SST 09313–30021



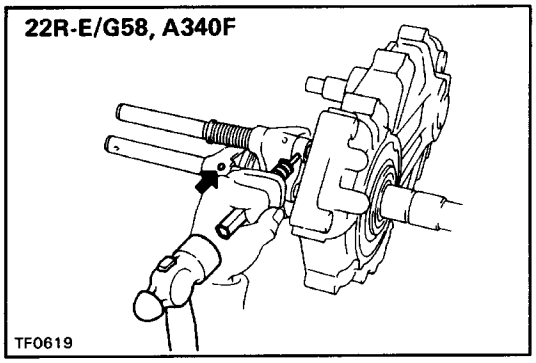
(b) Using a magnetic finger, remove the spring and ball from the both holes.

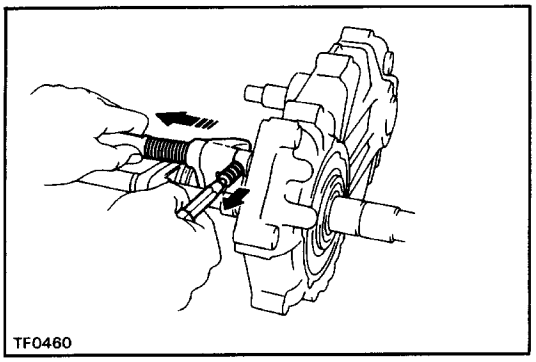


13. REMOVE FRONT DRIVE FORK SHAFT, FORK AND SPRING

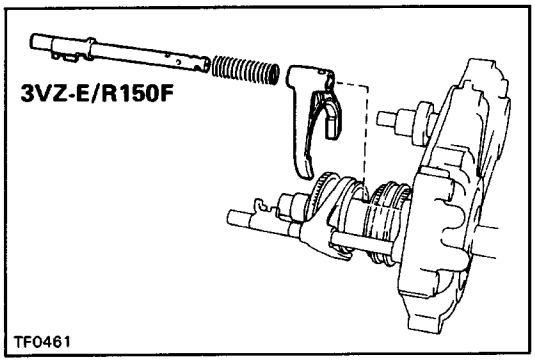
(a) Using a pin punch and hammer, drive out the two slotted spring pins.

HINT: When the pin is removed from the front drive fork shaft, the shaft will spring loose if the pin punch is re–moved, so keep the pin punch inserted in the shaft hole.

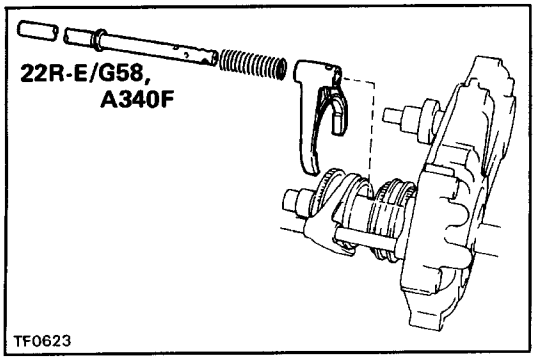


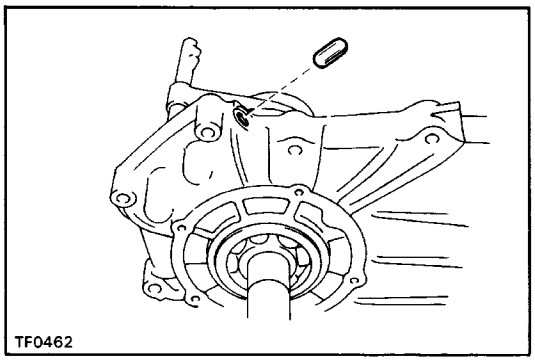


(b) Hold the front drive fork shaft in place by hand, when removing the pin punch.

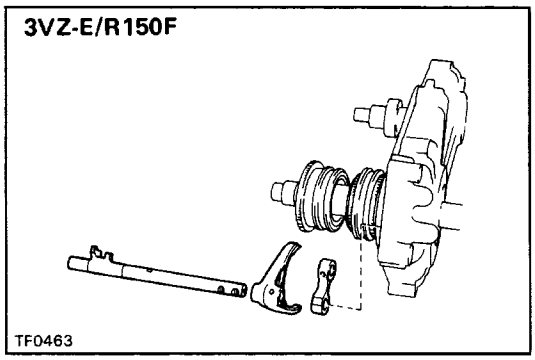


(c) Remove the front drive fork shaft, spring and fork.



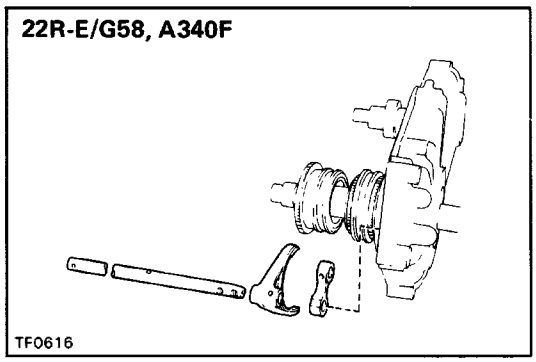

TF0462

(d) Using a magnetic finger, remove the straight pin.

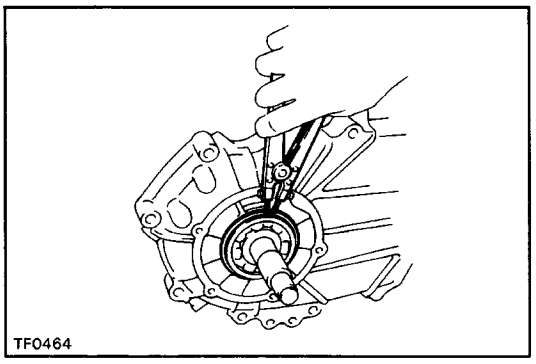


TF0463

14. REMOVE HIGH AND LOW FORK SHAFT, FORK AND STOPPER

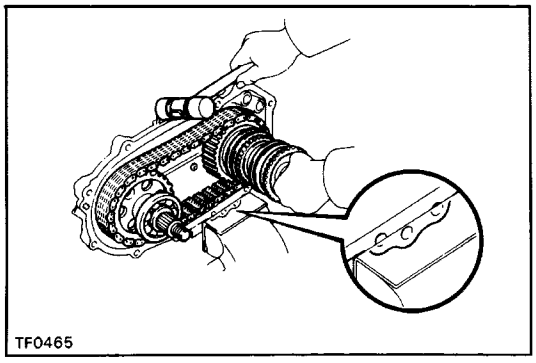


TF0616


TF0464

15. REMOVE REAR OUTPUT SHAFT, DRIVEN SPROCKET AND CHAIN

(a) Using snap ring pliers, remove the snap ring.

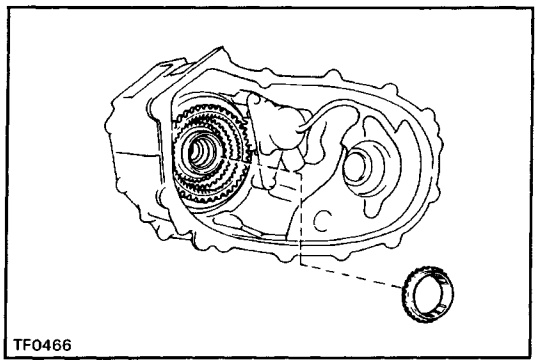

TF0465

(b) Mount the rear case in the vise.

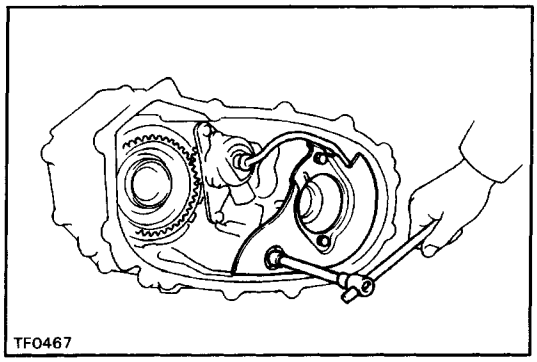
NOTICE: Be careful not to damage the sealing surface.

(c) Using a plastic hammer, tap the rear case with pull–ing the rear output shaft and driven sprocket.

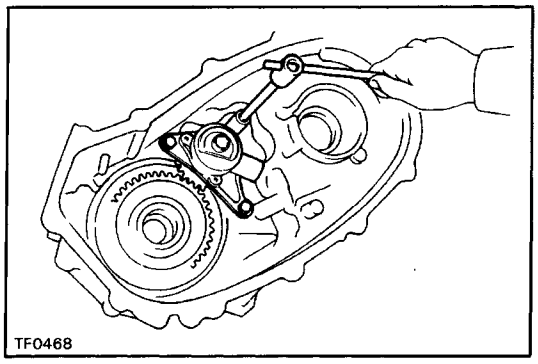
(d) Remove the chain.



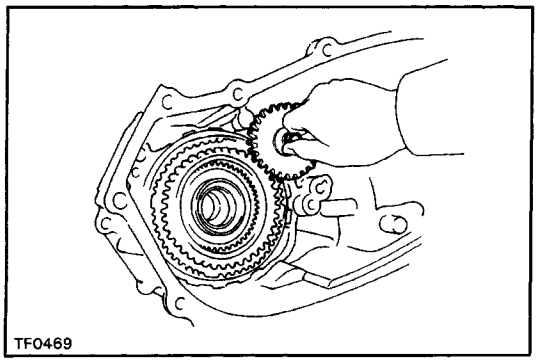
16. (13150F, G58)
REMOVE SYNCHRONIZER RING FROM INPUT SHAFT



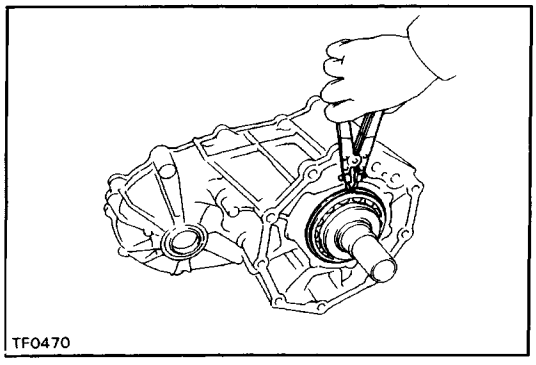
17. REMOVE SEPARATER WITH OIL STRAINER
(a) Remove the three bolts and the separater with the oil strainer.
(b) Remove the 0–ring from the oil strainer pipe.



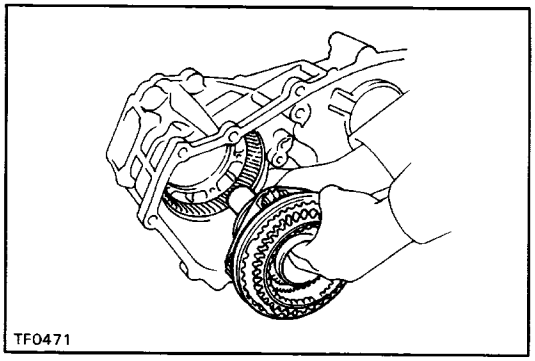
18. REMOVE OIL PUMP BODY ASSEMBLY
Remove the three bolts and the oil pump body assembly.



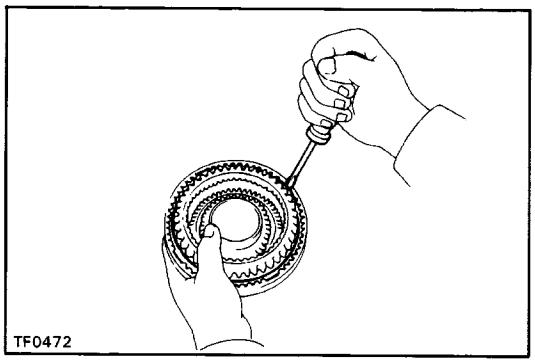
19. REMOVE OIL PUMP DRIVE GEAR



20. REMOVE PLANETARY GEAR ASSEMBLY WITH INPUT SHAFT
(a) Using snap ring pliers, remove the snap ring.

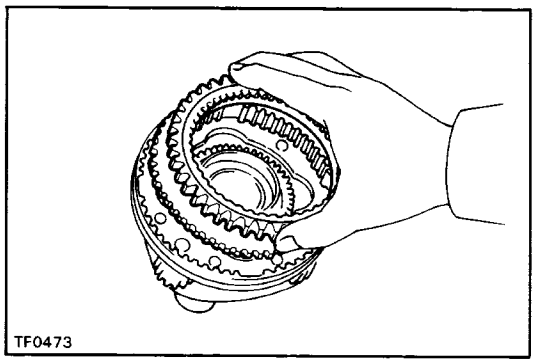


(b) Pull out the planetary gear assembly with the input shaft.

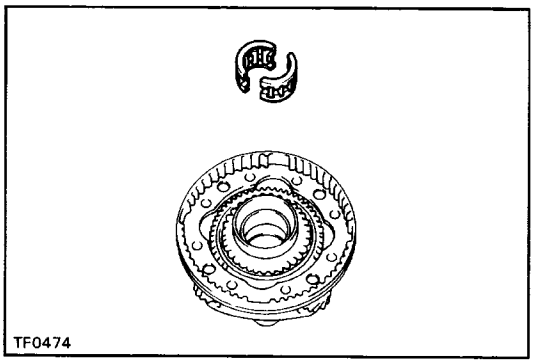


21. REMOVE LOW GEAR SPLINE PIECE

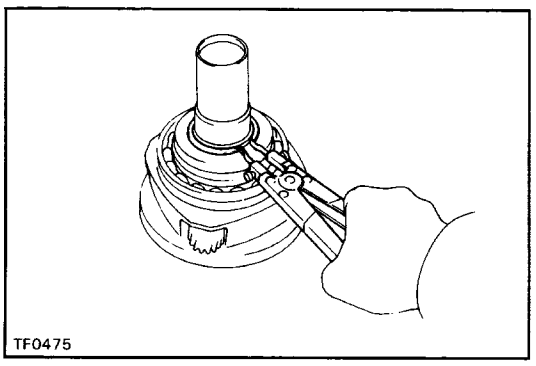
(a) Using a screwdriver, remove the snap ring.



(b) Remove the low gear spline piece.

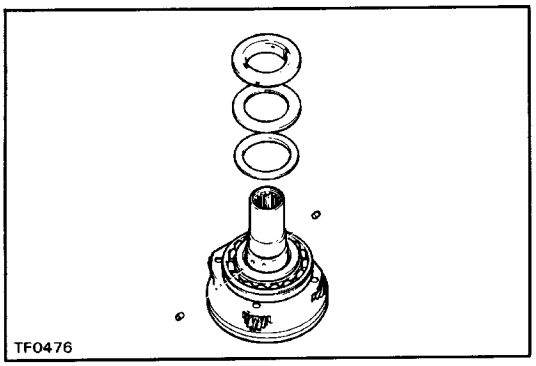


22. REMOVE NEEDLE ROLLER BEARING FROM INPUT SHAFT

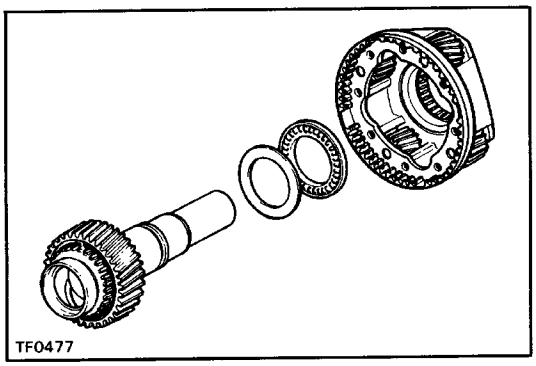


23. REMOVE INPUT SHAFT STOPPER AND THRUST BEARING

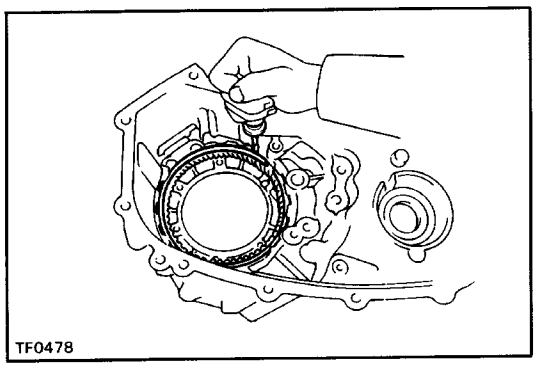
(a) Using snap ring pliers, remove the snap ring.



(b) Remove the input shaft stopper, thrust bearing, race and the two pins.

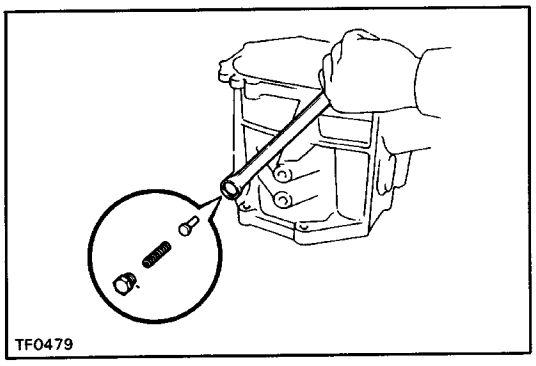


24. REMOVE INPUT SHAFT, THRUST BEARING AND RACE

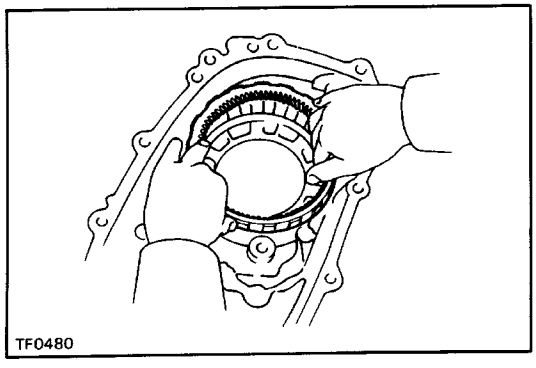


25. REMOVE PLANETARY RING GEAR

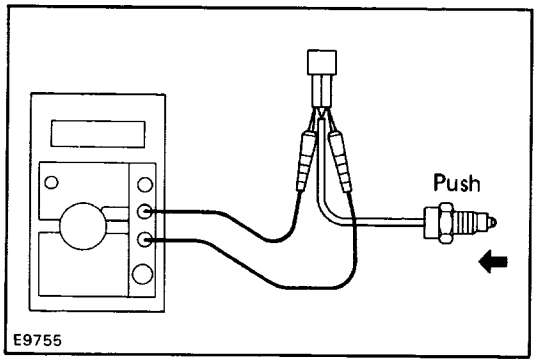
(a) Using a screwdriver, remove the snap ring.



(b) Remove the plug, spring and pin.



(c) Remove the planetary ring gear.

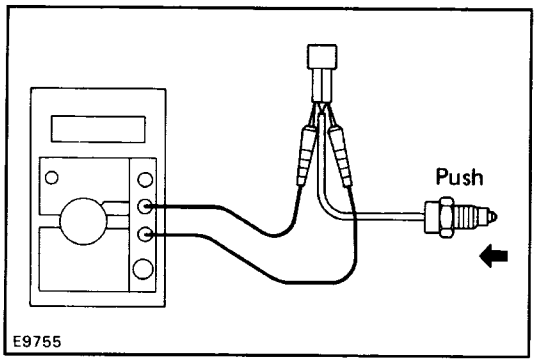


26. INSPECT TRANSFER INDICATOR SWITCH

Check that there is continuity between terminals as shown.

Switch Position	Specified
Push	Continuity
Free	No continuity

If operation is not as specified, replace the switch.



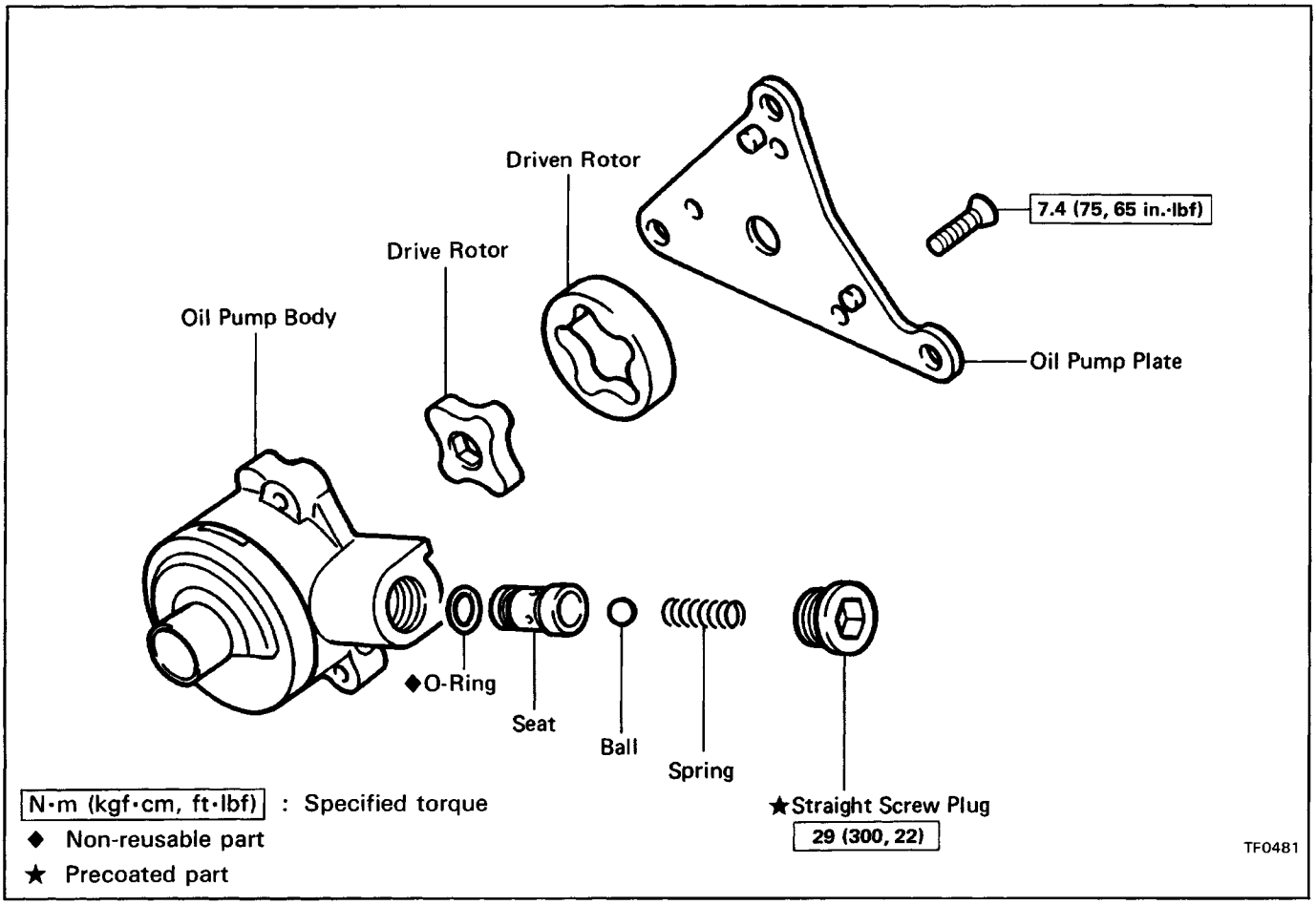
27. (22R–E/A340F)
INSPECT TRANSFER L4 AND NEUTRAL POSITION SWITCH

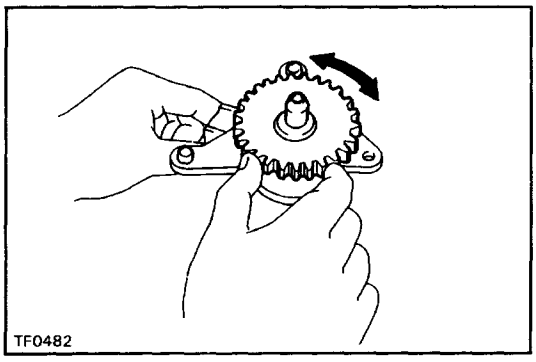
Check that there is continuity between terminals as shown.

Switch Position	Specified
Push	Continuity
Free	No continuity

If operation is not as specified, replace the switch.

COMPONENT PARTS
Oil Pump Body
COMPONENTS

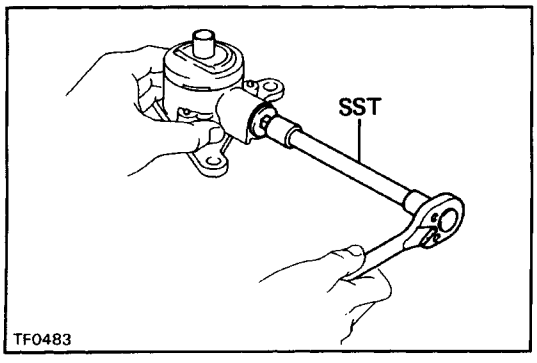




DISASSEMBLY OF OIL PUMP BODY

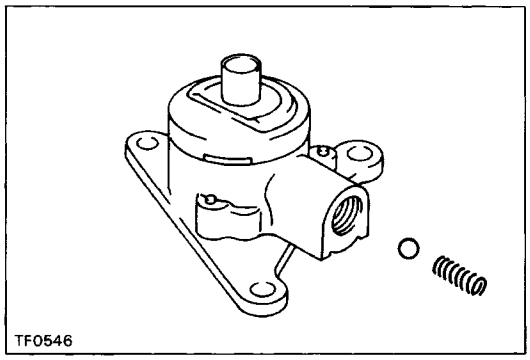
1. CHECK OPERATION OF OIL PUMP

Install the oil pump drive gear to the drive rotor, check that the drive rotor turns smoothly.

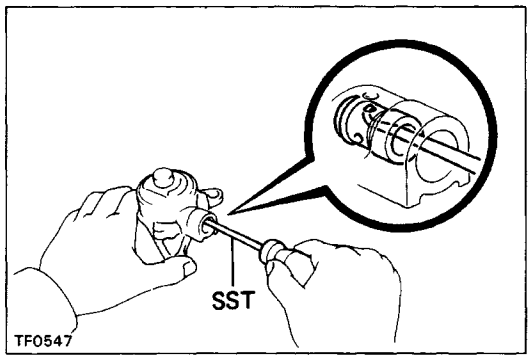


2. REMOVE STRAIGHT SCREW PLUG, SPRING, BALL AND SEAT

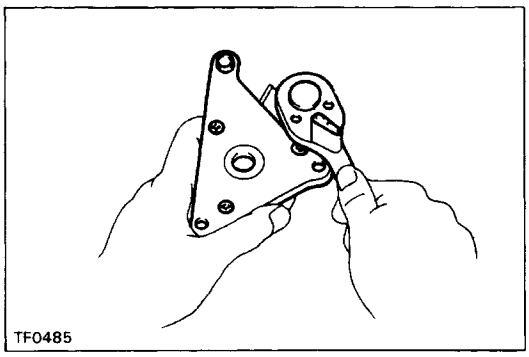
(a) Using SST, remove the straight screw plug.
SST 09043–38100



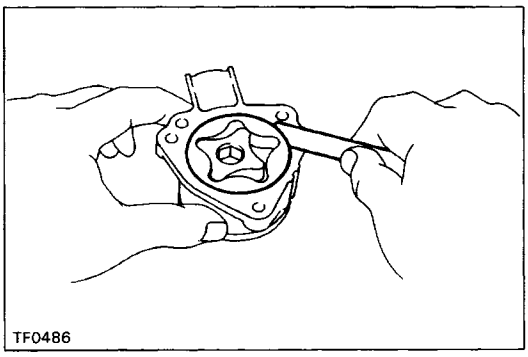
(b) Using a magnetic finger, remove the spring and ball.

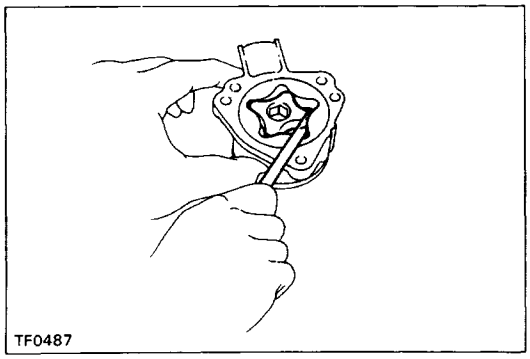


(c) Using SST, pull out the seat.
SST 09921–00010
(d) Remove the O–ring from the seat.



3. REMOVE OIL PUMP PLATE
(a) Using a torx socket wrench, unscrew the three torx screws.
(Torx socket wrench T30 09042–00010)
(b) Remove the oil pump plate.
4. REMOVE DRIVE ROTOR AND DRIVEN ROTOR

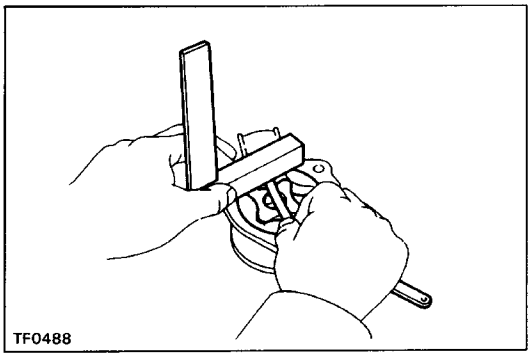




INSPECTION OF OIL PUMP BODY

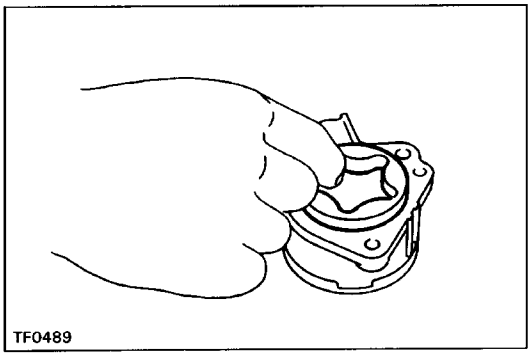
1. CHECK BODY CLEARANCE OF DRIVEN ROTOR
Push the driven rotor to one side of the body.
Using a feeler gauge, measure the clearance.
Standard clearance: 0.10 – 0.16 mm
(0.0039 – 0.0063 in.)
Maximum clearance: 0.16 mm (0.0063 in.)
If the clearance exceeds the limit, replace the drive rotor, driven rotor or pump body.

2. CHECK TIP CLEARANCE OF BOTH ROTORS
Using a feeler gauge, measure the clearance between both rotor tips.
Standard clearance: 0.08 – 0.16 mm
(0.0031 – 0.0063 in.)
Maximum clearance: 0.16 mm (0.00631n.)
If the clearance exceeds the limit, replace the drive rotor, driven rotor or pump body.



3. CHECK SIDE CLEARANCE OF BOTH ROTORS

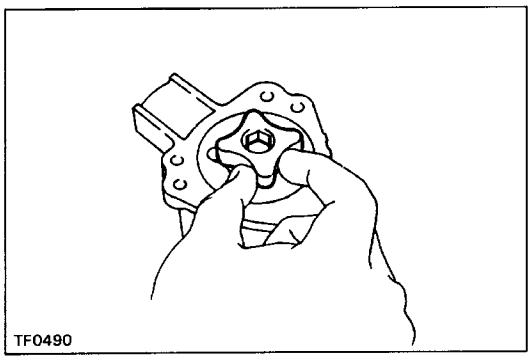
Using a steel straight edge and feeler gauge, measure the clearance between the rotors and straight edge.
Standard clearance: 0.03 – 0.08 mm
(0.0012 – 0.0031 in.)
Maximum clearance: 0.08 mm (0.0031 in.)
If the clearance exceeds the limit, replace the drive rotor, driven rotor or pump body.



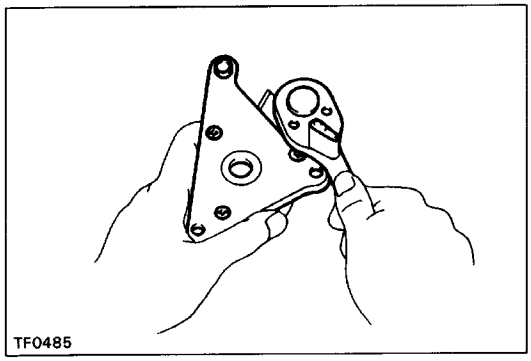
ASSEMBLY OF OIL PUMP BODY

1. INSTALL OIL PUMP DRIVE ROTOR AND DRIVEN ROTOR

(a) Apply gear oil to the both rotors.
(b) Install the driven rotor.

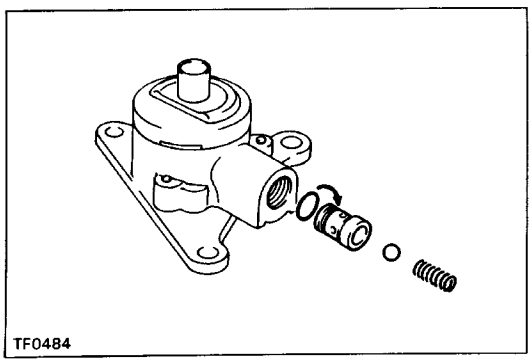


(c) Install the drive rotor.



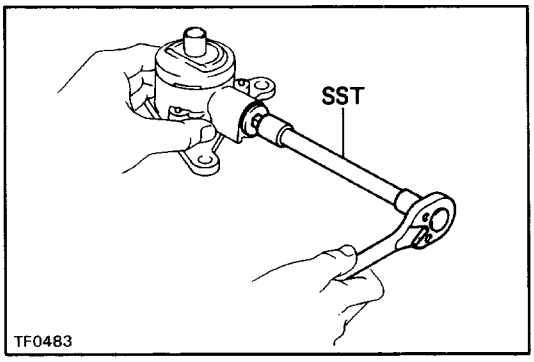
2. INSTALL OIL PUMP PLATE

(a) Install the oil pump plate.
(b) Using a torx socket wrench, tighten the three torx screws.
(Torx socket wrench T30 09042–00010)
Torque: 7.4 N–m (75 kgf–cm, 65 in.–lbf)

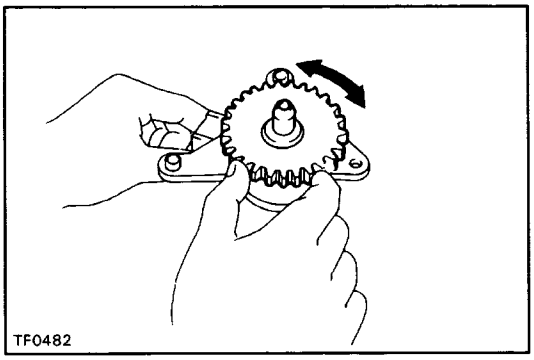


3. INSTALL SEAT, BALL, SPRING AND STRAIGHT SCREW PLUG

(a) Install a new O–ring to the seat.
(b) Install the seat, ball and spring.
HINT: When installing the seat, push the seat until it touches the bottom of the hole in the body.



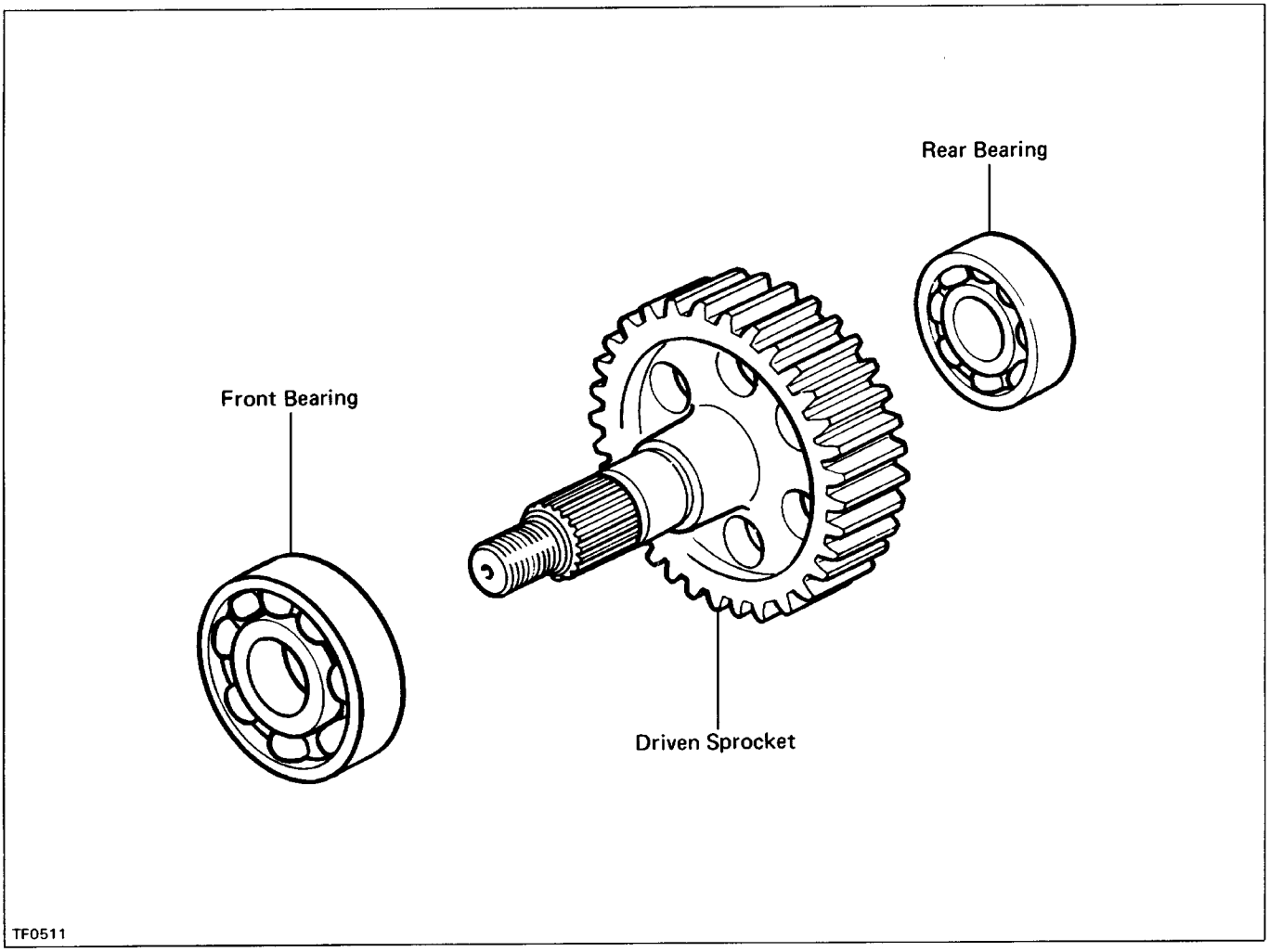
(c) Apply liquid sealer to the plug.
Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
(d) Using SST, torque the plug.
SST 09043–38100
Torque: 29 N–m (300 kgf–cm, 22 ft–lbf)

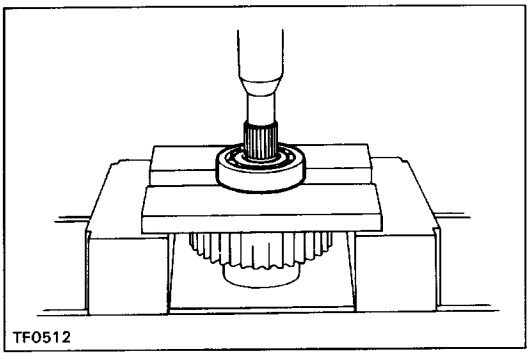


4. CHECK OPERATION OF OIL PUMP
Install the oil pump drive gear to the drive rotor, check that the drive rotor turns smoothly.

Driven Sprocket

COMPONENTS

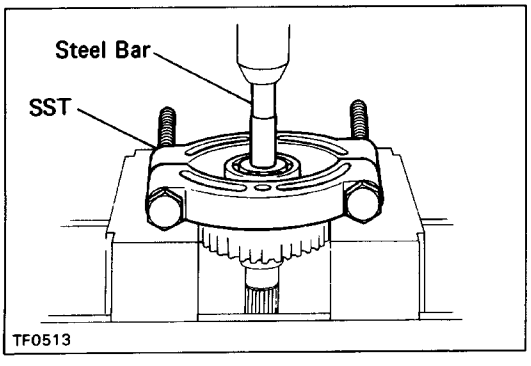




DISASSEMBLY OF DRIVEN SPROCKET

1. REMOVE FRONT BEARING

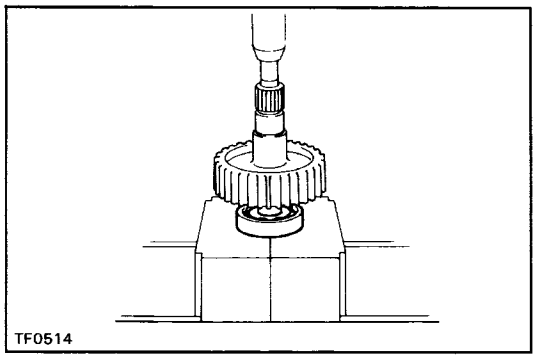
Using a press, remove the front bearing.



2. REMOVE REAR BEARING

Using SST and a press, remove the rear bearing.

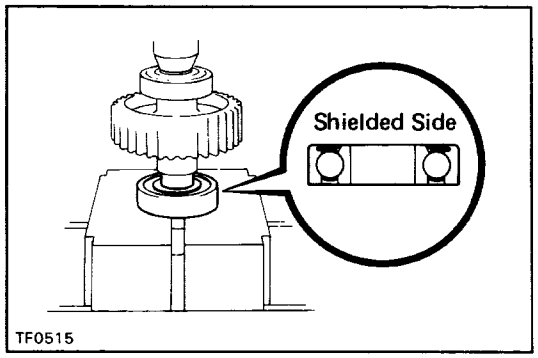
SST 09950–00020



ASSEMBLY OF DRIVEN SPROCKET

1. INSTALL REAR BEARING

Using a press, install the rear bearing.



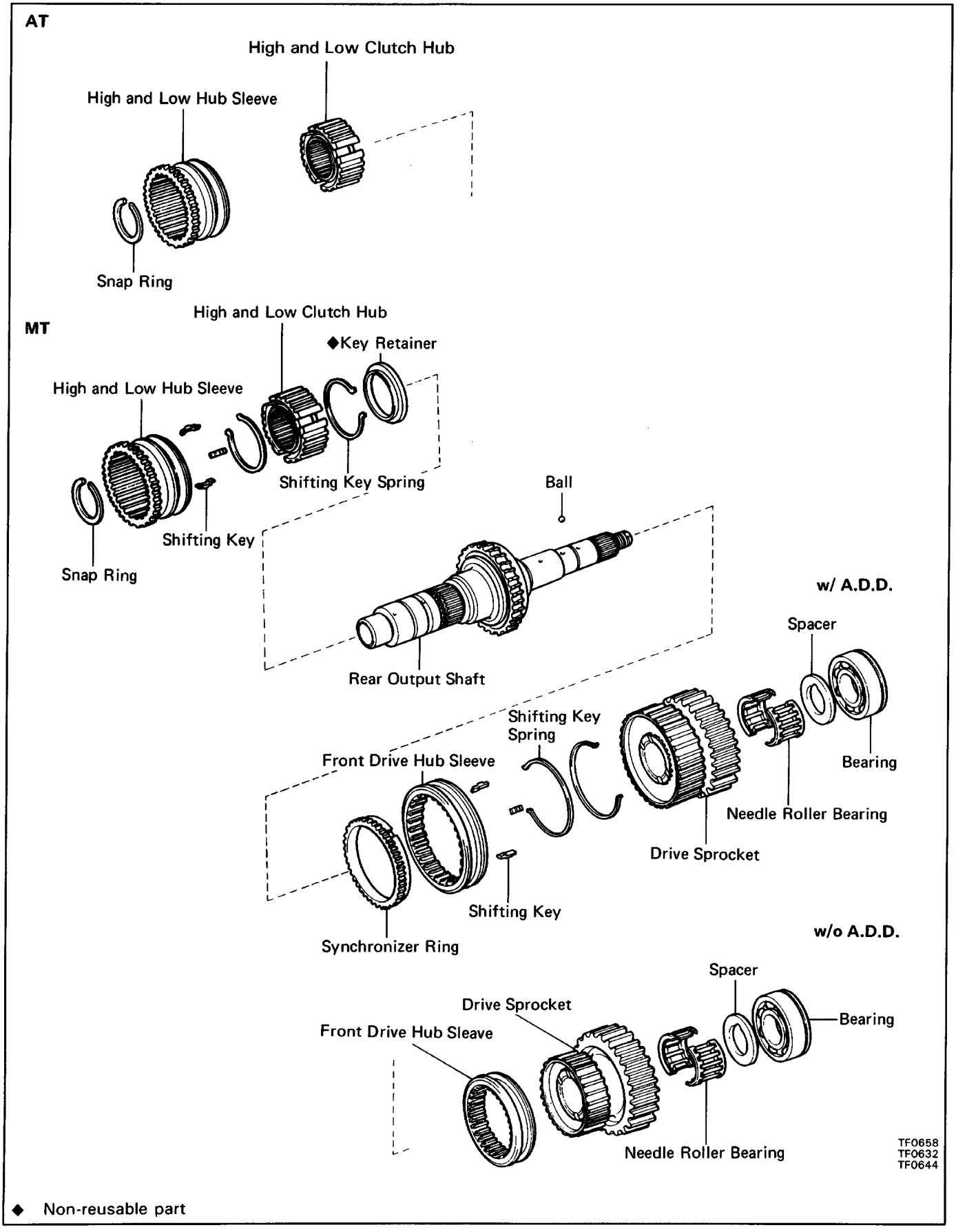
2. INSTALL FRONT BEARING

Using a press, install the front bearing.

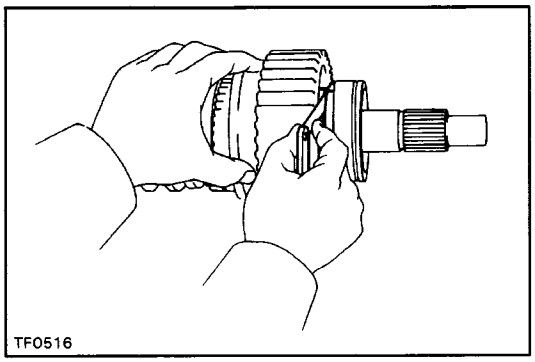
HINT: Make sure to install the bearing in the correct di–rection.

Rear Output Shaft Assembly

COMPONENTS



◆ Non-reusable part


TF0516

DISASSEMBLY OF REAR OUTPUT SHAFT ASSEMBLY

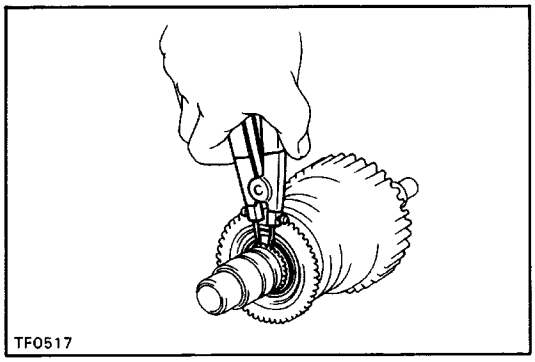
1. MEASURE DRIVE SPROCKET THRUST CLEARANCE

Using a feeler gauge, measure the drive sprocket thrust clearance.

Standard clearance: 0.10 – 0.25 mm (0.0039 – 0.0098 in.)

Maximum clearance: 0.25 mm (0.0098 in.)

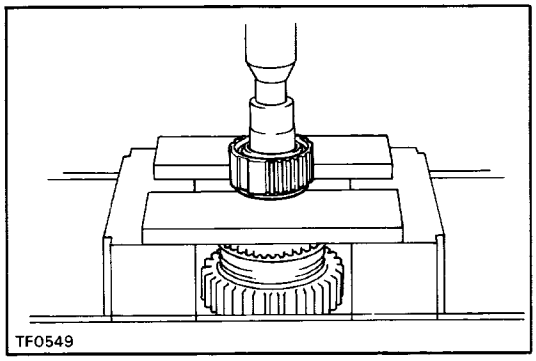
If the clearance exceeds the limit, replace the drive sprocket.


TF0517

2.–1 (MT)

REMOVE HIGH AND LOW HUB SLEEVE ASSEMBLY

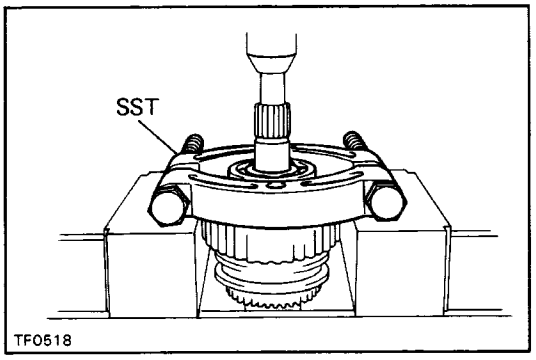
(a) Using snap ring pliers, remove the snap ring.
(b) Remove the hub sleeve and shifting keys.
(c) Using a press, remove the clutch hub, key springs and key retainer.


TF0549

2.–2 (AT)

REMOVE HIGH AND LOW HUB SLEEVE ASSEMBLY

(a) Using snap ring pliers, remove the snap ring.
(b) Remove the hub sleeve.
(c) Using a press, remove the clutch hub.

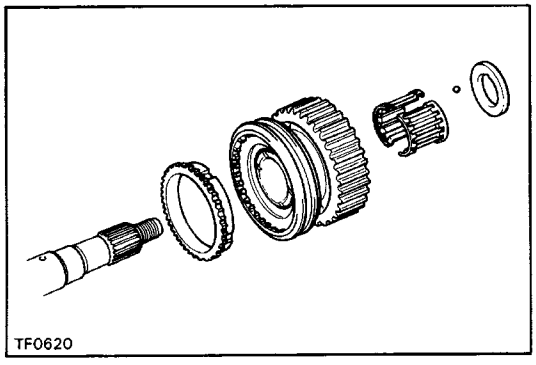


TF0518

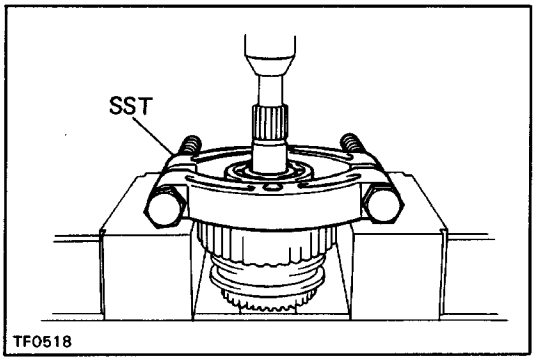
3.–1 (w/ A.D.D.)

REMOVE REAR BEARING, SPACER AND DRIVE SPROCKET WITH FRONT DRIVE HUB SLEEVE ASSEMBLY

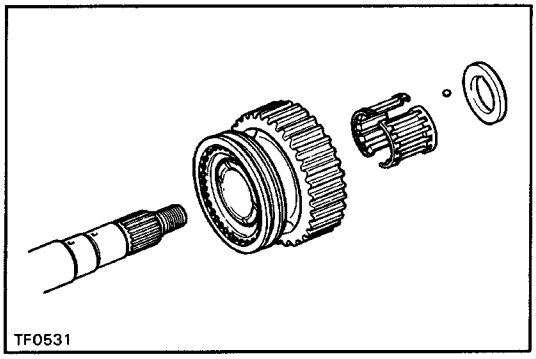
(a) Using SST and a press, remove the bearing.
SST 09950–00020


TF0620

(b) Remove the spacer and ball.
(c) Remove the drive sprocket with front drive hub and hub sleeve.
(d) Remove the needle roller bearing.
(e) Remove the synchronizer ring.

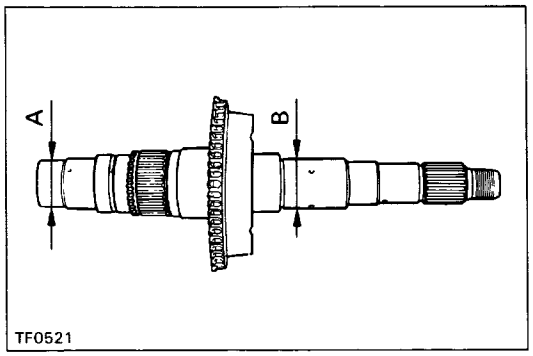


3.–2 (w/o A.D.D.)
REMOVE REAR BEARING, SPACER AND DRIVE SPROCKET WITH FRONT DRIVE HUB SLEEVE ASSEMBLY
(a) Using SST and a press, remove the bearing.
SST 09950–00020



(b) Remove the spacer and ball.
(c) Remove the drive sprocket with front drive hub and hub sleeve.
(d) Remove the needle roller bearing.

4. (w/ A.D.D.)
REMOVE SHIFTING KEYS AND KEY SPRINGS FROM FRONT DRIVE HUB ASSEMBLY
Using screwdriver, remove the two shifting key springs and three shifting keys.



INSPECTION OF REAR OUTPUT SHAFT ASSEMBLY

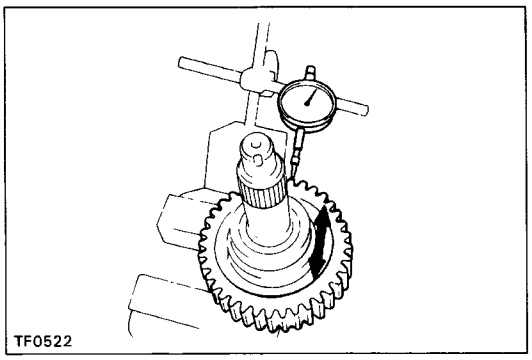
1. INSPECT REAR OUTPUT SHAFT

Using a micrometer, measure the outer diameter of the rear output shaft journal surface.

Minimum diameter:

Part A 27.98 mm (1.1016 in.)

B 36.98 mm (1.4559 in.)



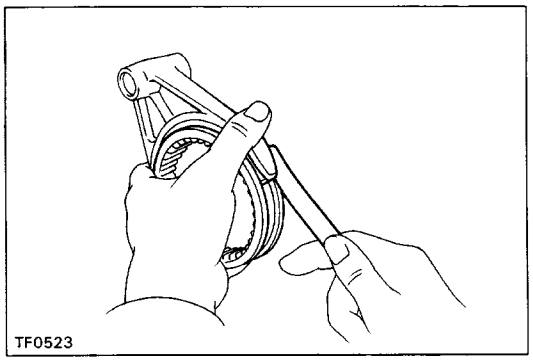
2. CHECK OIL CLEARANCE OF DRIVE SPROCKET

Using a dial indicator, measure the oil clearance between the sprocket and shaft with the needle roller bearing installed.

Standard clearance: 0.010 – 0.055 mm (0.0004 – 0.0022 in.)

Maximum clearance: 0.055 mm (0.022 in.)

If the clearance exceeds the limit, replace the drive sprocket, rear output shaft or needle roller bearing.

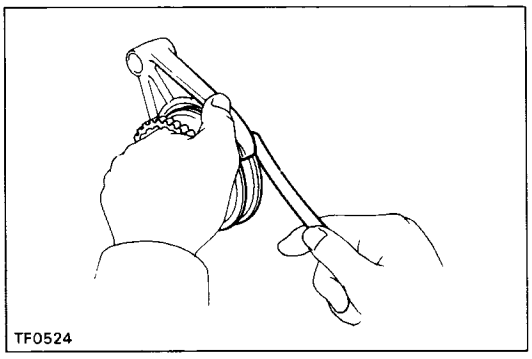


3. MEASURE CLEARANCE OF FRONT DRIVE SHIFT FORK AND HUB SLEEVE

Using a feeler gauge, measure the clearance between the front drive shift fork and hub sleeve.

Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the limit, replace the shift fork or hub sleeve.

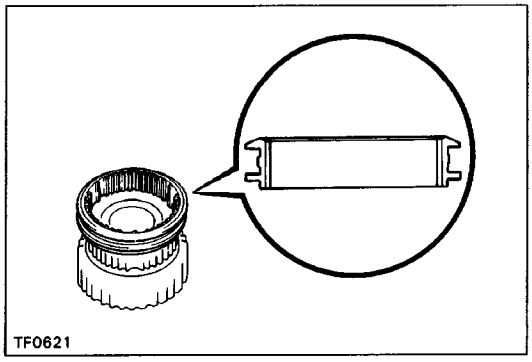


4. MEASURE CLEARANCE OF HIGH AND LOW SHIFT FORK AND HUB SLEEVE

Using a feeler gauge, measure the clearance between the high and low shift fork and hub sleeve.

Maximum clearance: 1.0 mm (0.039 in.)

If the clearance exceeds the limit, replace the shift fork or hub sleeve.


TF0621

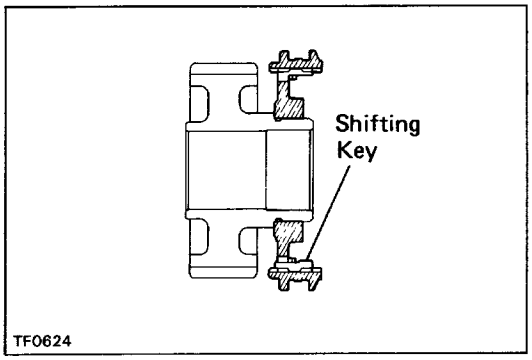
ASSEMBLY OF REAR OUTPUT SHAFT ASSEMBLY

1.–1 (wl A.D.D.)

INSTALL FRONT DRIVE CLUTCH HUB AND HUB SLEEVE

(a) Install the front drive hub sleeve onto the clutch hub.

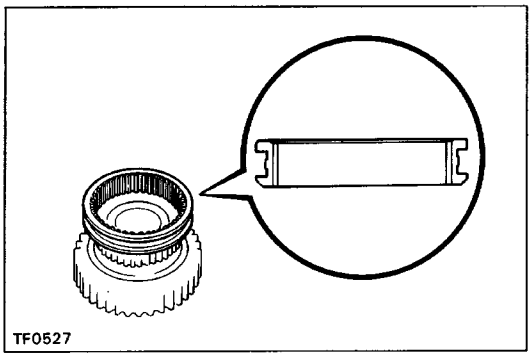
HINT: Make sure to install the hub sleeve in the correct direction.



TF0624

(b) Install the shifting keys and springs.

NOTICE: Install the key springs positioned so that their end gaps are not in line.

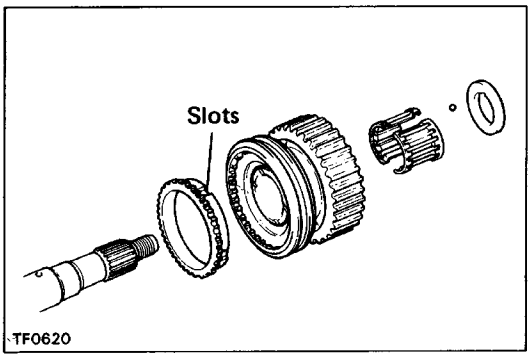

TF0527

1.–2 (w/o A.D.D.)

INSTALL FRONT DRIVE CLUTCH HUB AND HUB SLEEVE

Install the front drive hub sleeve onto the clutch hub.

HINT: Make sure to install the hub sleeve in the correct direction.



TF0620

2.–1 (w/ A.D.D.)

INSTALL DRIVE SPROCKET WITH FRONT DRIVE HUB SLEEVE ASSEMBLY, SPACER AND REAR BEARING

(a) Apply gear oil to the shaft and needle roller bearing.

(b) Install the synchronizer ring.

(c) Install the needle roller bearing in the drive sprocket.

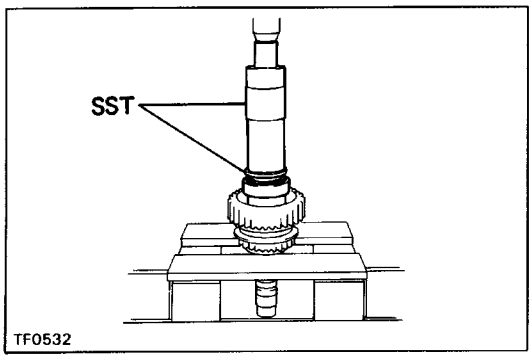
(d) Install the drive sprocket with the front drive hub sleeve.

(e) Place the synchronizer ring on the gear and align the ring slots with the shifting keys.

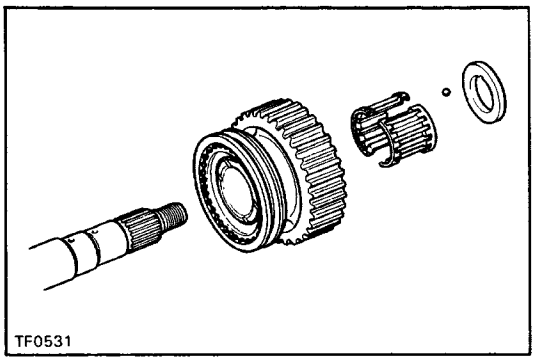
(f) Install the spacer to align it with the ball.

(g) Using SST and a press, install the rear bearing with the outer race snap ring groove toward the rear.

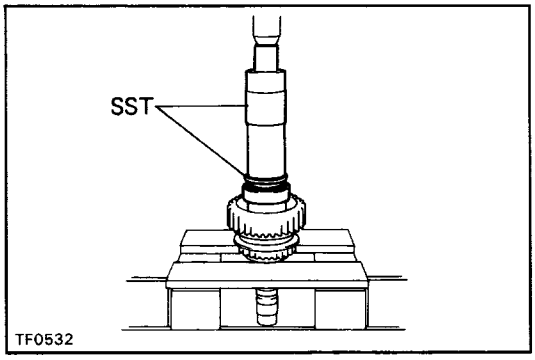
SST 09316–60010 (09316–00010, 09316–00070)



TF0532

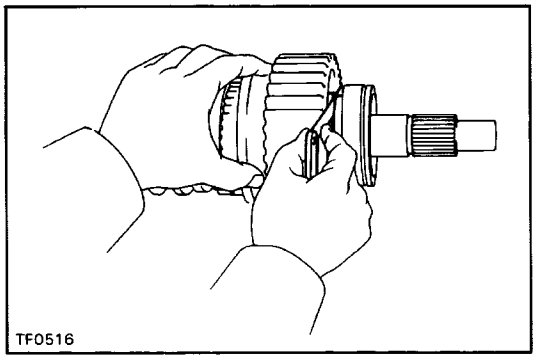

TF0531

2.–2 (w/o A.D.D.)
INSTALL DRIVE SPROCKET WITH FRONT DRIVE HUB SLEEVE ASSEMBLY, SPACER AND REAR BEARING
(a) Apply gear oil to the shaft and needle roller bearing.
(b) Install the needle roller bearing in the drive sprocket.
(c) Install the drive sprocket with the front drive hub sleeve.
(d) Install the spacer to align it with the ball.

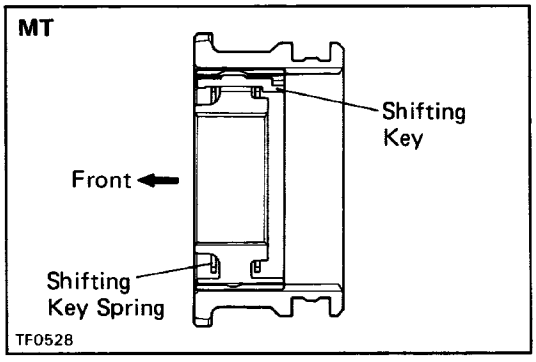


TF0532

(e) Using SST and a press, install the rear bearing with the outer race snap ring groove toward the rear.
SST 09316–60010 (09316–00010, 09316–00070)

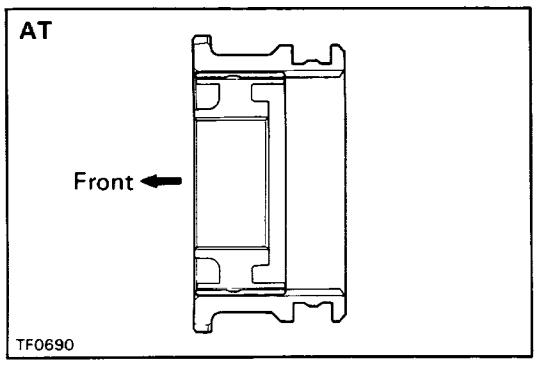

TF0516

3. MEASURE DRIVE SPROCKET THRUST CLEARANCE
Using a feeler gauge, measure the drive sprocket thrust clearance.
Standard clearance: 0.10 – 0.25 mm
(0.0039 – 0.0098 in.)



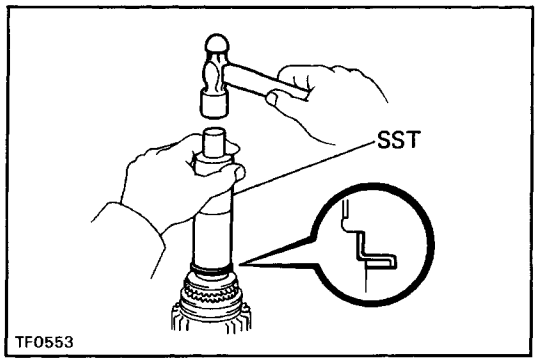
TF0528

4.–1 (MT)
INSERT HIGH AND LOW CLUTCH HUB INTO HUB SLEEVE
(a) Install the clutch hub and shifting keys to the hub sleeve.
(b) Install the shifting key springs under the shifting keys.
NOTICE: Install the key springs positioned so that their end gaps are not in line.

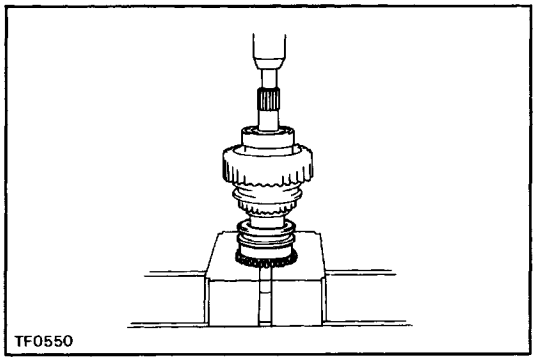


TF0690

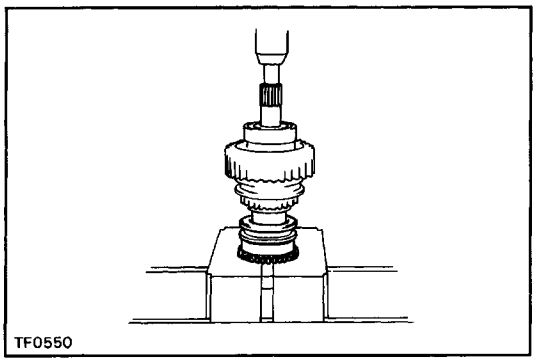
4.–2 (AT)
INSERT HIGH AND LOW CLUTCH HUB INTO HUB SLEEVE
Install the clutch hub to the hub sleeve.



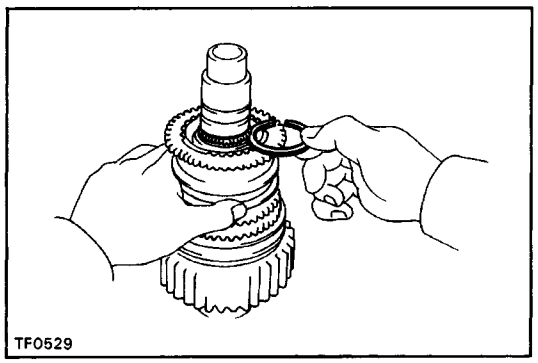
5.–1 (MT)
INSTALL HIGH AND LOW HUB SLEEVE ASSEMBLY
(a) Using SST and a hammer, drive in a new key retainer.
SST 09316–60010 (09316–00010)
NOTICE: Be careful not to deform or damage the key retainer.



(b) Using a press, install the high and low hub sleeve assembly.

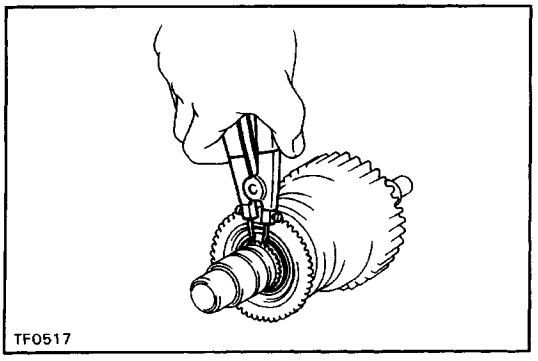


5.–2 (AT)
INSTALL HIGH AND LOW HUB SLEEVE ASSEMBLY
Using a press, install the high and low hub sleeve assembly.



6. INSTALL SNAP RING
(a) Select a snap ring that will allow minimum axial play.

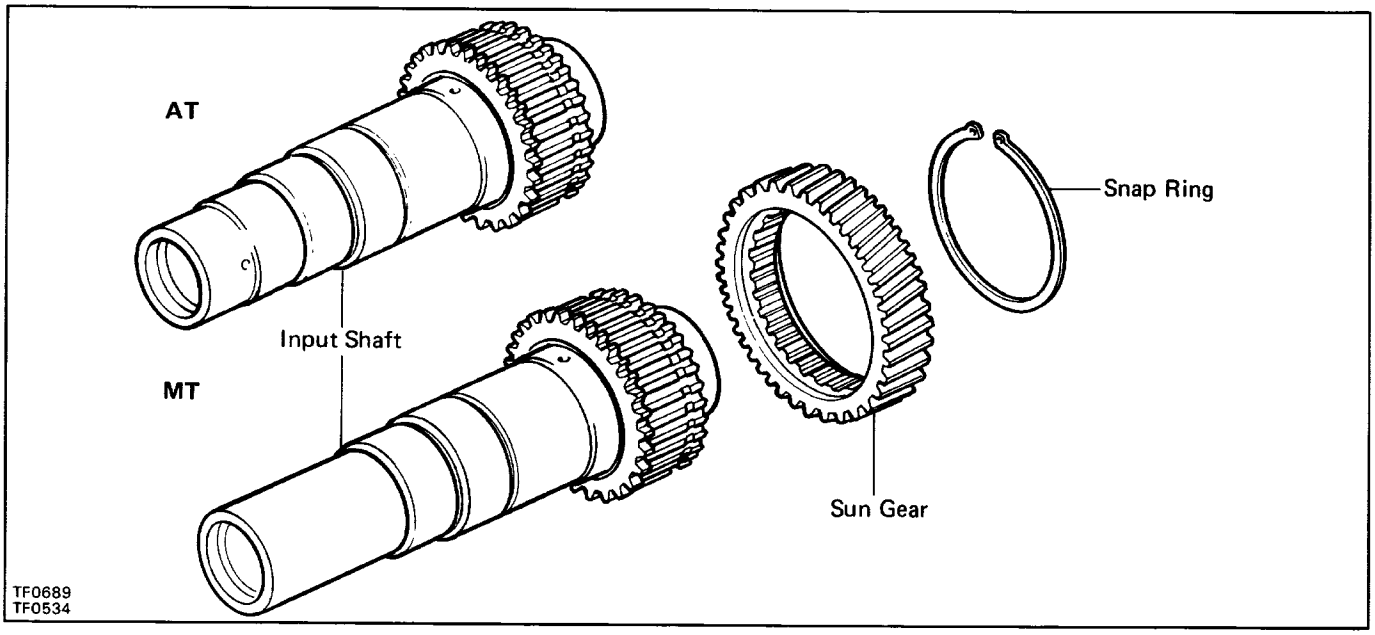
Mark	Thickness mm (in.)
A	2.10 – 2.15 (0.0827 – 0.0846)
B	2.15 – 2.20 (0.0846 – 0.0866)
C	2.20 – 2.25 (0.0866 – 0.0886)
D	2.25 – 2.30 (0.0886 – 0.0906)
E	2.30 – 2.35 (0.0906 – 0.0925)
F	2.35 – 2.40 (0.0925 – 0.0945)
G	2.40 – 2.45 (0.0945 – 0.0965)
H	2.45 – 2.50 (0.0965 – 0.0984)
J	2.50 – 2.55 (0.0984 – 0.1004)
K	2.00 – 2.05 (0.0787 – 0.0807)
L	2.05 – 2.10 (0.0807 – 0.0827)



(b) Using snap ring pliers, install the snap ring.

Input Shaft

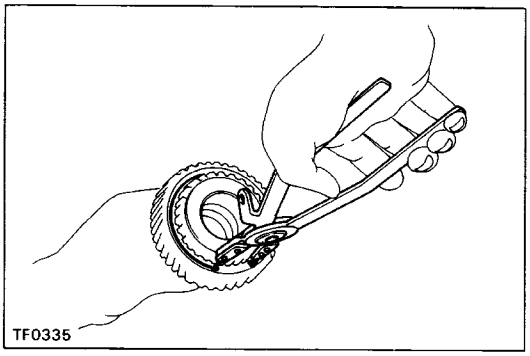
COMPONENTS



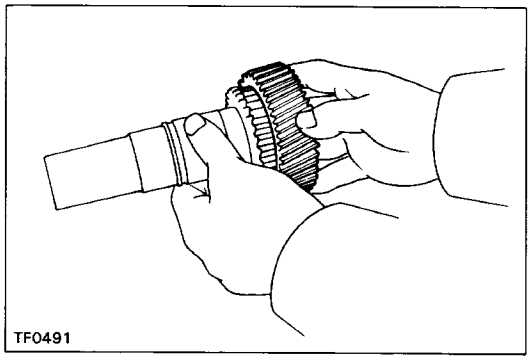
DISASSEMBLY OF INPUT SHAFT

REMOVE SUN GEAR

(a) Using snap ring pliers, remove the snap ring.



(b) Remove the sun gear from the input shaft.

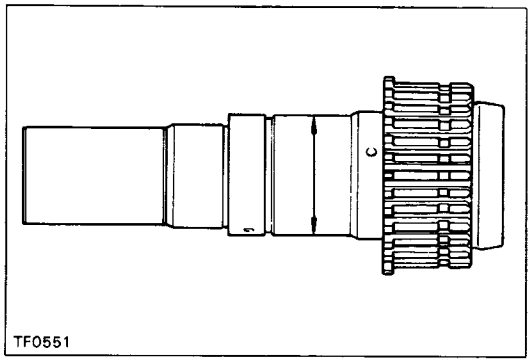


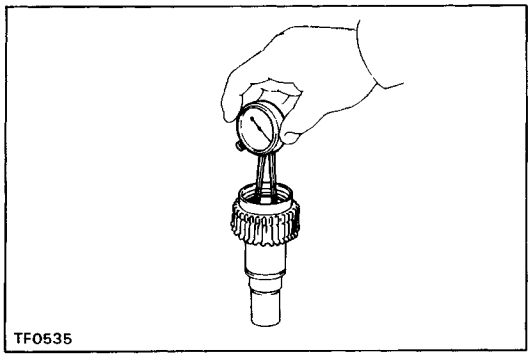
INSPECTION OF INPUT SHAFT

1. INSPECT INPUT SHAFT

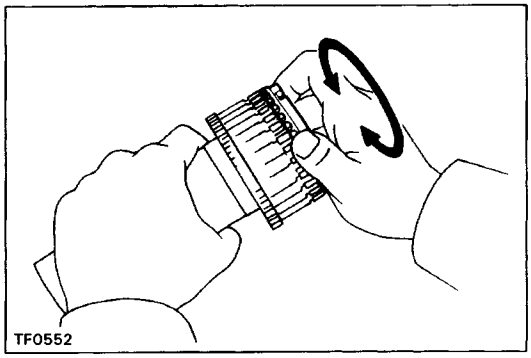
(a) Using a micrometer, measure the outer diameter of the input shaft journal surface.

Minimum diameter: 47.59 mm (1.8736 in.)

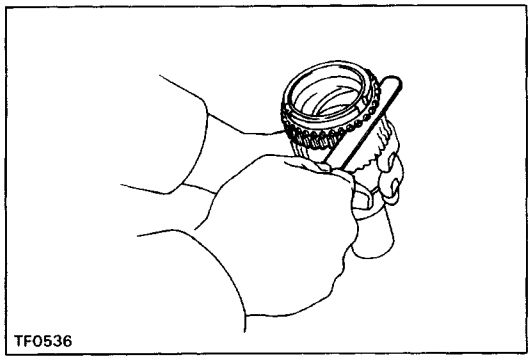




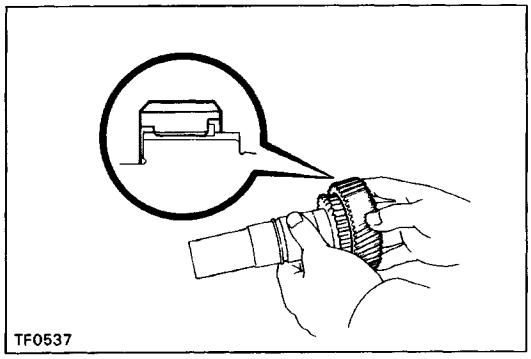
(b) Using a dial indicator, measure the inside diameter of the input shaft bushing.
Maximum inside diameter: 39.14 mm (1.5409 in.)
If the inside diameter exceeds the limit, replace the input shaft.



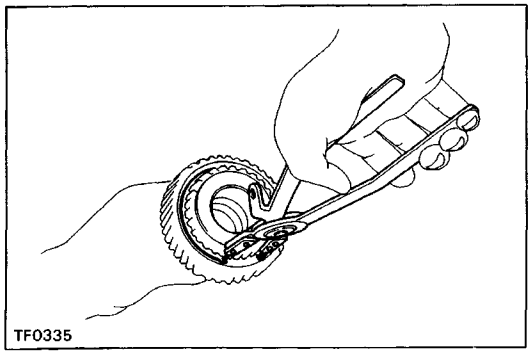
2. INSPECT SYNCHRONIZER RING
(a) Turn the ring and push it in to check the braking ac–tion.



(b) Measure the clearance between the synchronizer ring back and the input shaft spline end.
Standard clearance: 1.15 – 1.85 mm
(0.0453 – 0.0728 in.)
Minimum clearance: 0.8 mm (0.031 in.)
If the clearance is less than the limit, replace the synchro–nizer ring.



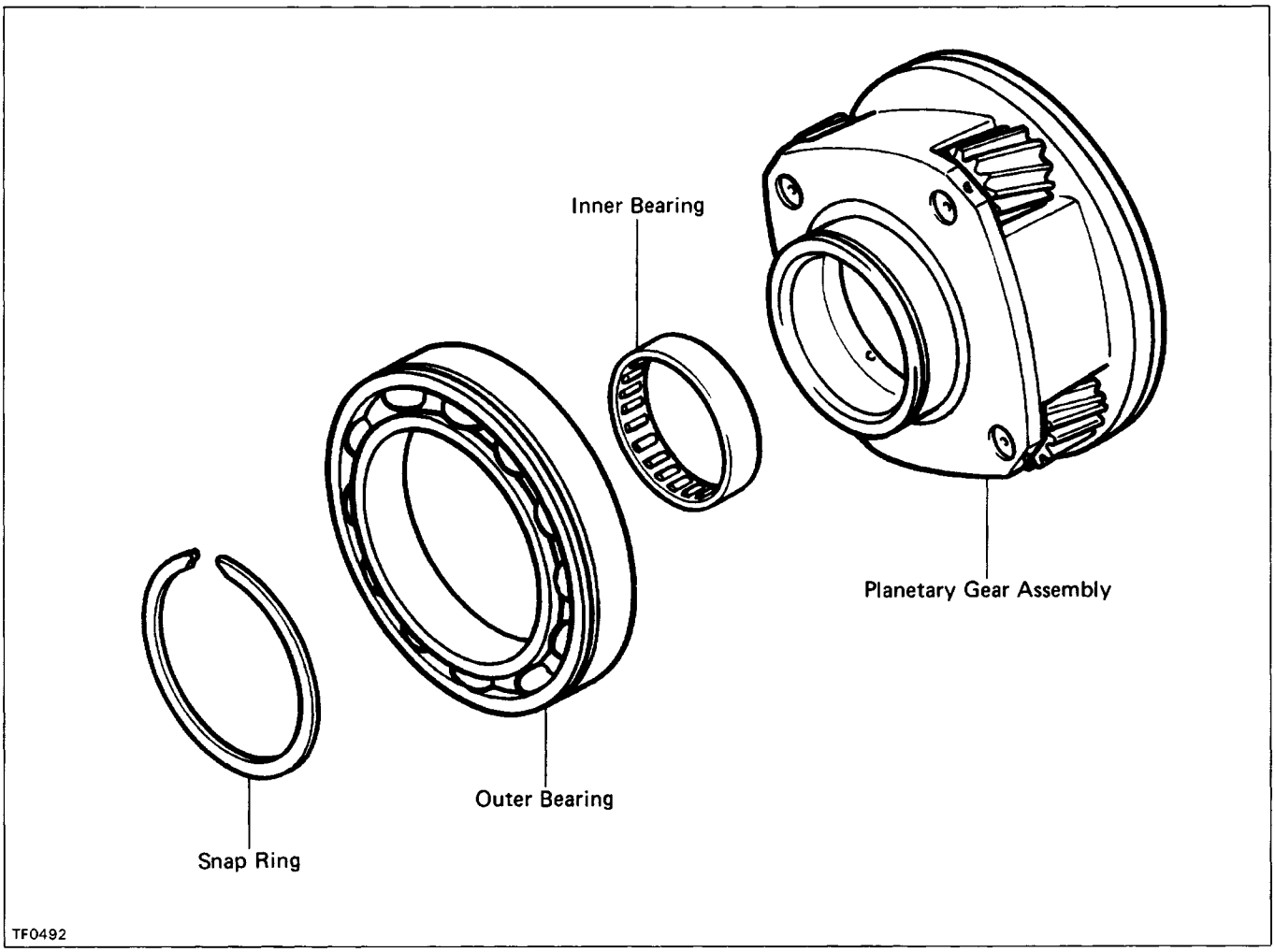
ASSEMBLY OF INPUT SHAFT
INSTALL SUN GEAR
(a) Install the sun gear to the input shaft.
HINT: Make sure to install the sun gear in the correct di–rection.

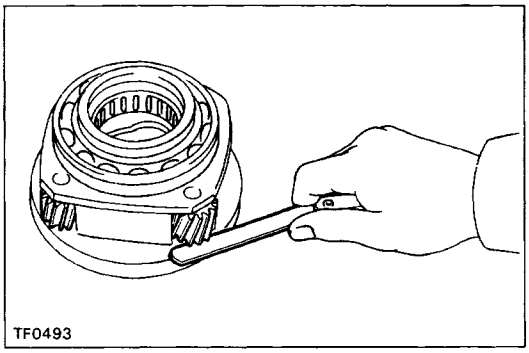


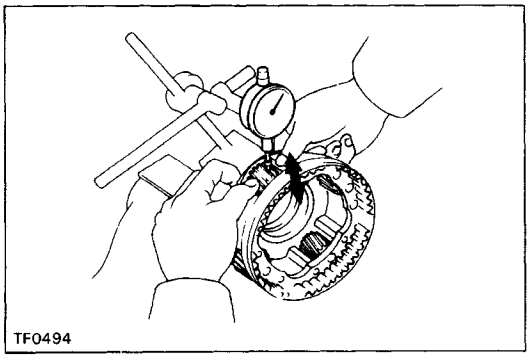
(b) Using snap ring pliers, install the snap ring.

Planetary Gear

COMPONENTS







INSPECTION OF PLANETARY GEAR

1. MEASURE PLANETARY PINION GEAR THRUST CLEARANCE

Using a feeler gauge, measure the planetary pinion gear thrust clearance.

Standard clearance: 0.11 – 0.86 mm (0.0043 – 0.0339 in.)

Maximum clearance: 0.86 mm (0.0339 in.)

If the clearance exceeds the limit, replace the planetary gear assembly.

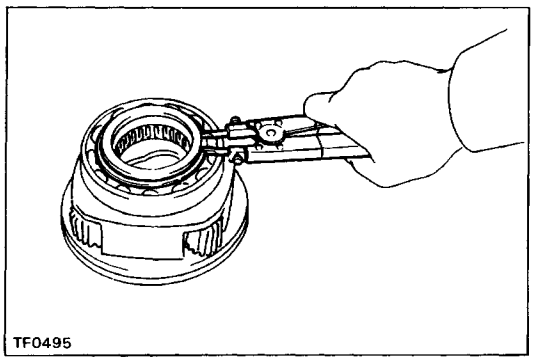
2. CHECK OIL CLEARANCE OF PLANETARY PINION GEAR

Using a dial indicator, measure the oil clearance of the planetary pinion gear.

Standard clearance: 0.009 – 0.038 mm (0.0004 – 0.0015 in.)

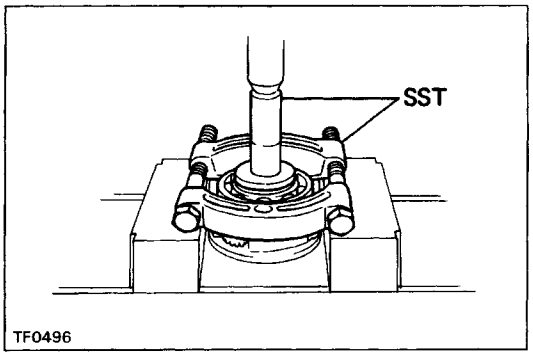
Maximum clearance: 0.038 mm (0.0015 in.)

If the clearance exceeds the limit, replace the planetary gear assembly.

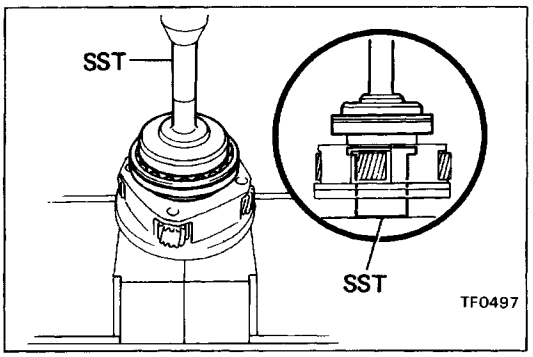


3. IF NECESSARY, REPLACE PLANETARY GEAR OUTER BEARING

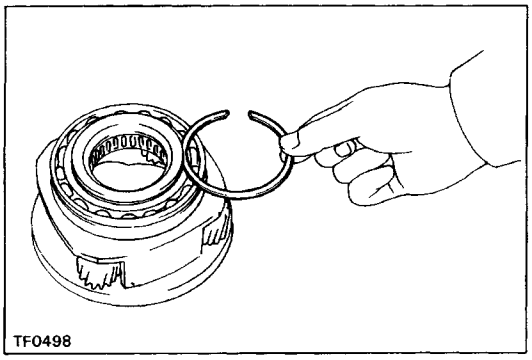
(a) Using snap ring pliers, remove the snap ring.



(b) Using SST and a press, remove the bearing.
SST 09554–30011 and 09555–55010

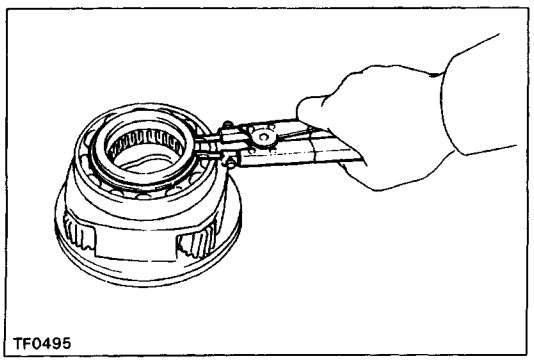


(c) Using SST and a press, install a new bearing with the outer race snap ring groove toward the front.
SST 09223–15010 and 09515–30010

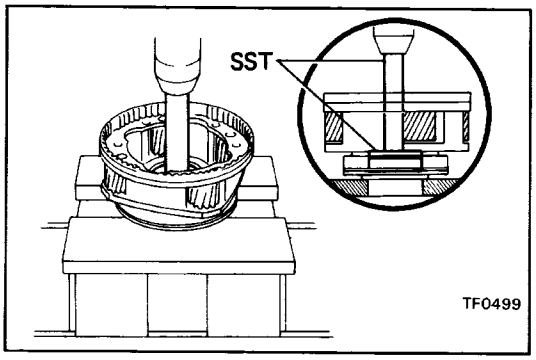


(d) Select a snap ring that will allow minimum axial play.

Mark	Thickness mm (in.)
1	1.45 – 1.50 (0.0571 – 0.0591)
2	1.50 – 1.55 (0.0591 – 0.0610)
3	1.55 – 1.60 (0.0610 – 0.0630)
4	1.60 – 1.65 (0.0630 – 0.0650)
5	1.65 – 1.70 (0.0650 – 0.0669)

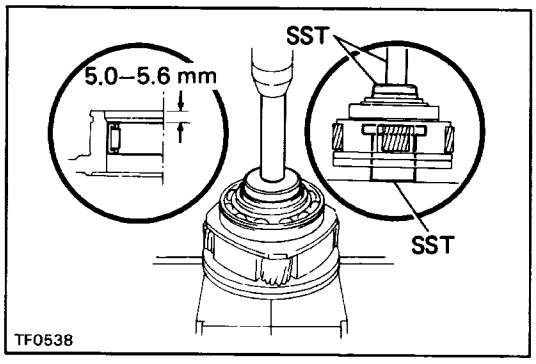


(e) Using snap ring pliers, install the snap ring.



4. IF NECESSARY, REPLACE PLANETARY GEAR INNER BEARING

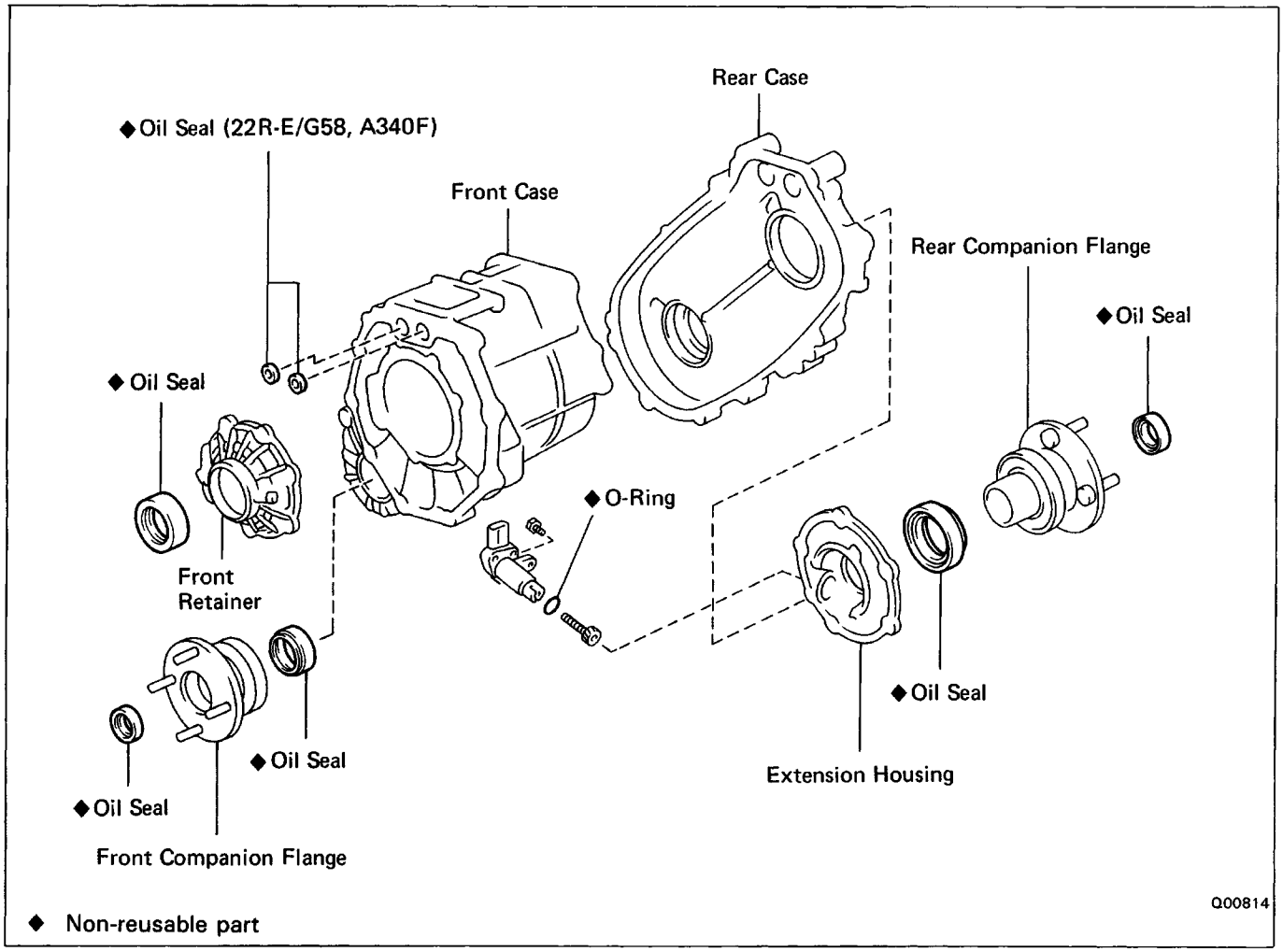
(a) Using SST and a press, remove the bearing.
SST 09550–10012 (09252–10010, 09557–10010)

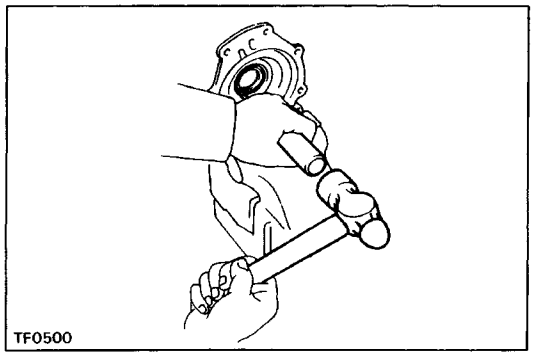


(b) Using SST and a press, install a new bearing.
SST 09550–10012 (09252–10010, 09557–10010) and 09515–30010
Bearing depth: 5.0 – 5.6 mm (0.197 – 0.220 in.)

Oil Seals

COMPONENTS

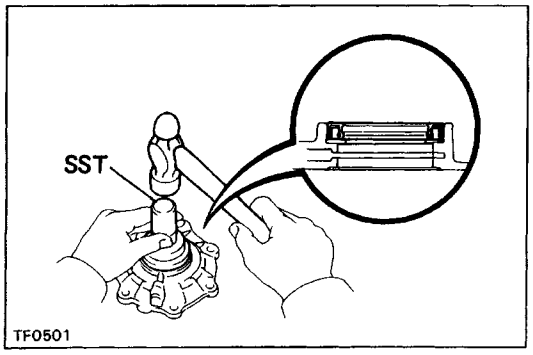




REPLACEMENT OF OIL SEALS

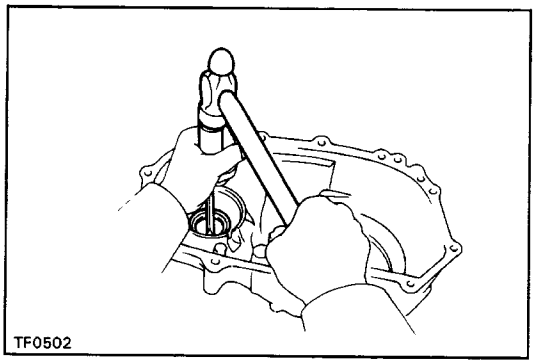
1. IF NECESSARY, REPLACE FRONT RETAINER OIL SEAL

(a) Using a screwdriver and hammer, drive out the oil seal.



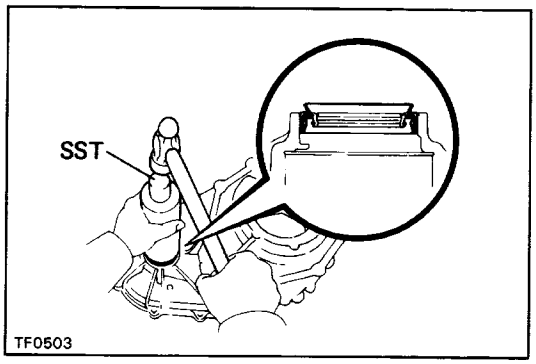
(b) Using SST and a hammer, drive in a new oil seal until its surface is flush with the retainer upper surface.
SST 09223–22010

(c) Coat the lip of the oil seal with MP grease.



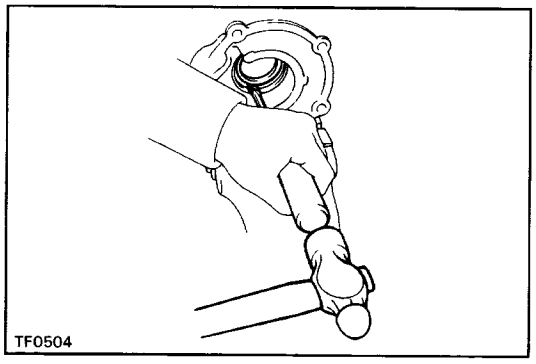
2. IF NECESSARY, REPLACE FRONT CASE OIL SEAL

(a) Using a screwdriver and hammer, drive out the oil seal.



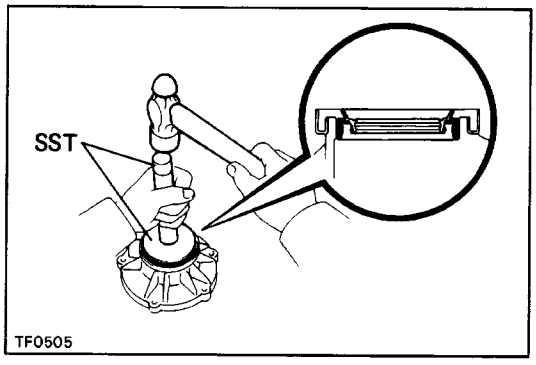
(b) Using SST and a hammer, drive in a new oil seal until its surface is flush with the case upper surface.
SST 09316–60010 (09316–00010)

(c) Coat the lip of the oil seal with MP grease.



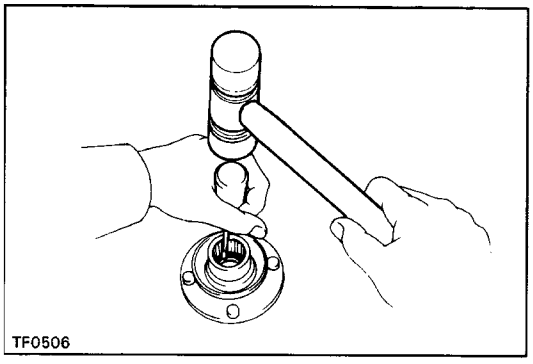
3. IF NECESSARY, REPLACE EXTENSION HOUSING OIL SEAL

(a) Using a screwdriver and hammer, drive out the oil seal.



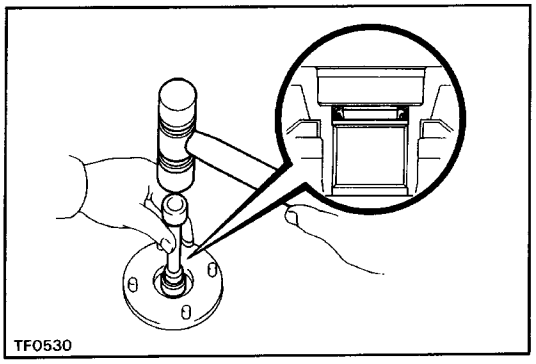
(b) Using SST and a hammer, drive in a new oil seal until its surface is flush with the housing upper surface.
SST 09550–22011 (09550–00020, 09550–00031)

(c) Coat the lip of the oil seal with MP grease.

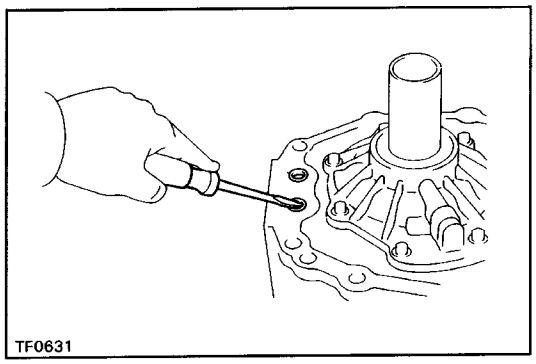


4. IF NECESSARY, REPLACE FRONT AND REAR COMPANION FLANGES OIL SEAL

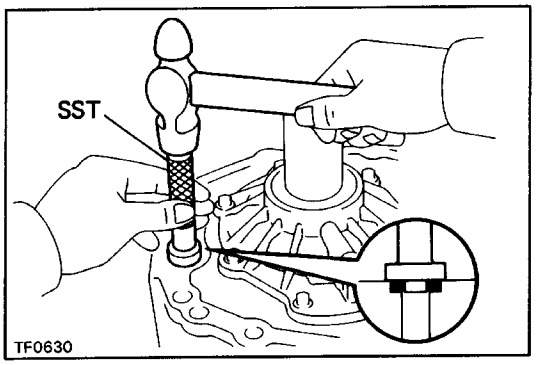
(a) Using a screwdriver and hammer, drive out the oil seal.



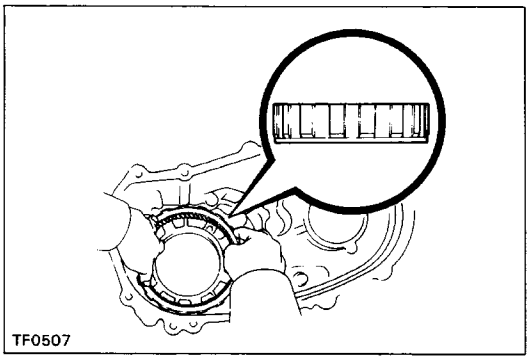
(b) Using a socket wrench and hammer, drive in a new oil seal.
(c) Coat the lip of the oil seal with MP grease.



5. (22R–E/G58, A340F)
IF NECESSARY, REPLACE SHIFT FORK SHAFT OIL SEALS
(a) Using a screwdriver, pry out the oil seal.



(b) Using SST and a hammer, drive in a new oil seal.
SST 09304–12012
Oil seal depth: –0.5 – 0.5 mm
(–0.0197 – 0.0197 in.)



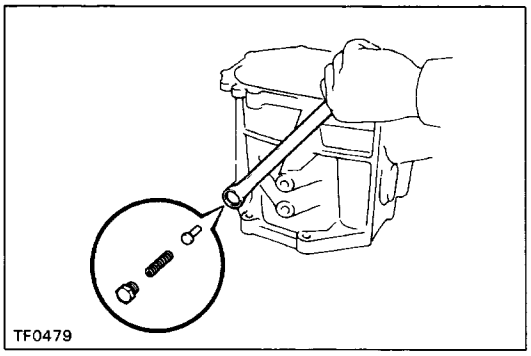
ASSEMBLY OF TRANSFER

(See pages TF–32, 33)

1. INSTALL PLANETARY RING GEAR

(a) Install the planetary ring gear to the front case.

HINT: Make sure to install the ring gear in the correct direction.



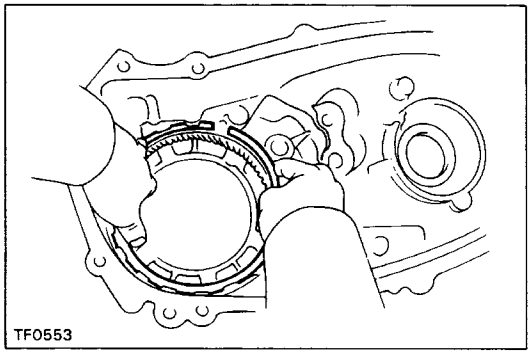
(b) Install the pin and spring.

(c) Apply liquid sealer to the plug.

Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

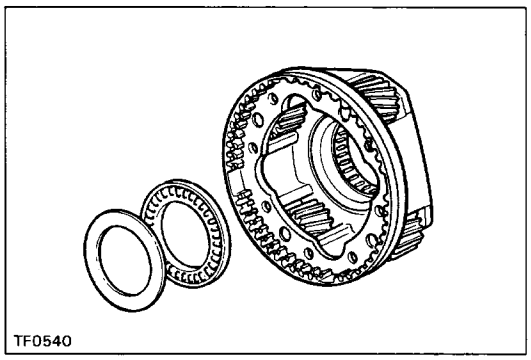
(d) Install and torque the plug.

Torque: 19 N m (190 kgf –cm, 14 ft–lbf)



(e) Install the snap ring.

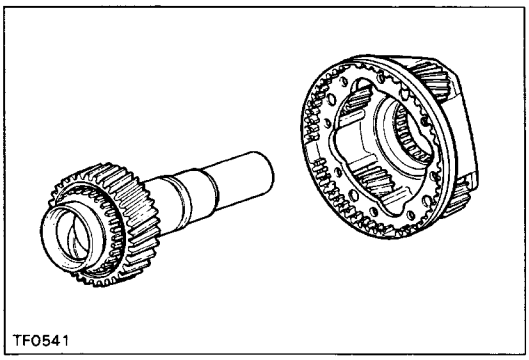
HINT: Be sure the end gap of the snap ring is not aligned with the upper side of the case.



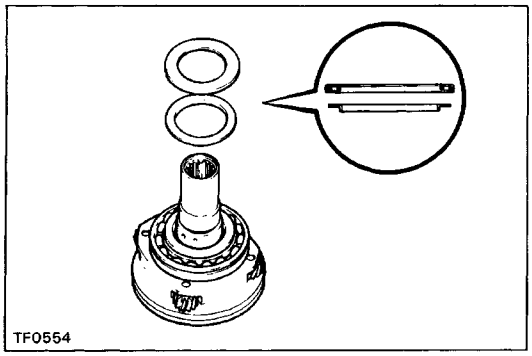
2. INSTALL INPUT SHAFT TO PLANETARY GEAR ASSEMBLY

(a) Apply gear oil to the thrust bearing and race.

(b) Install the race and thrust bearing.

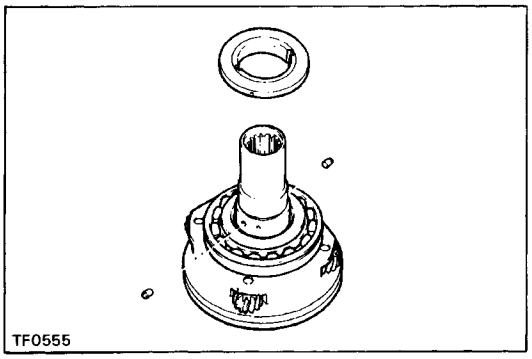


(c) Install the input shaft into the planetary gear assembly.

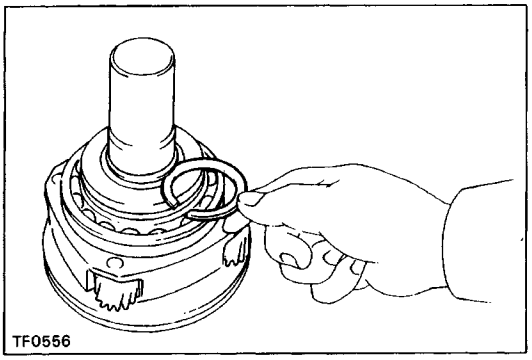


3. INSTALL THRUST BEARING AND INPUT SHAFT STOPPER

(a) Apply gear oil to the thrust bearing and race.
(b) Install the race and thrust bearing.



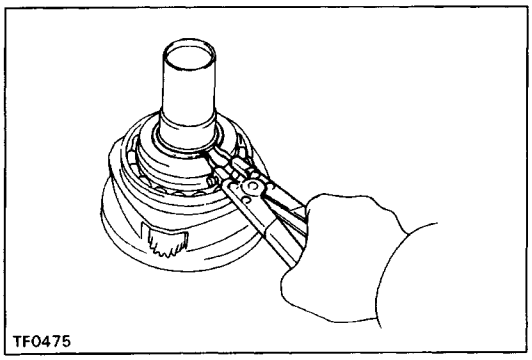
(c) Install the two pins onto the input shaft.
(d) Install the input shaft stopper.



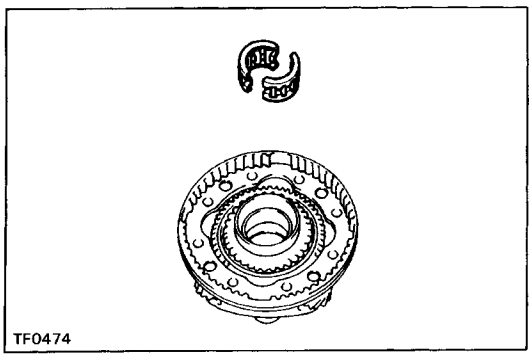
4. INSTALL SNAP RING

(a) Select a snap ring that will allow 0.05 – 0.15 mm (0.0020 – 0.0059 in.) axial play.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	2.10 – 2.15 (0.0827 – 0.0846)	L	2.60 – 2.65 (0.1024 – 0.1043)
B	2.15 – 2.20 (0.0846 – 0.0866)	M	2.65 – 2.70 (0.1043 – 0.1063)
C	2.20 – 2.25 (0.0866 – 0.0886)	N	2.70 – 2.75 (0.1063 – 0.1083)
D	2.25 – 2.30 (0.0886 – 0.0906)	P	2.75 – 2.80 (0.1083 – 0.1102)
E	2.30 – 2.35 (0.0906 – 0.0925)	Q	2.80 – 2.85 (0.1102 – 0.1122)
F	2.35 – 2.40 (0.0925 – 0.0945)	R	2.85 – 2.90 (0.1122 – 0.1142)
G	2.40 – 2.45 (0.0945 – 0.0965)	S	2.90 – 2.95 (0.1142 – 0.1161)
H	2.45 – 2.50 (0.0965 – 0.0984)	T	2.95 – 3.00 (0.1161 – 0.1181)
J	2.50 – 2.55 (0.0984 – 0.1004)	U	3.00 – 3.05 (0.1181 – 0.1201)
K	2.55 – 2.60 (0.1004 – 0.1024)		

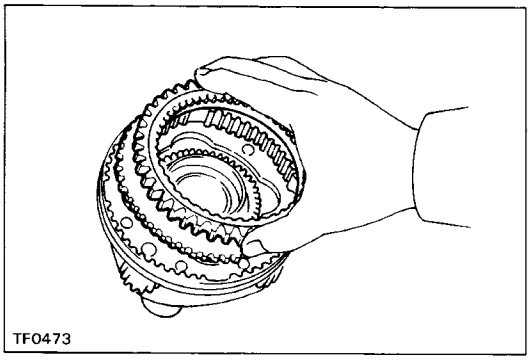


(b) Using snap ring pliers, install the snap ring.



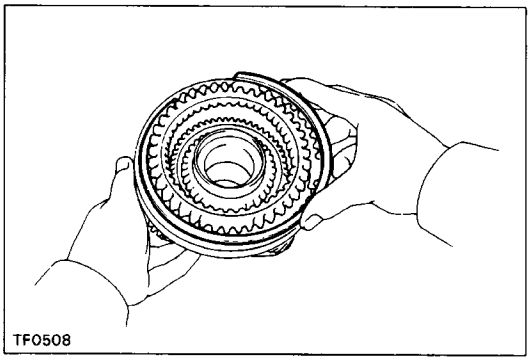
5. INSTALL NEEDLE ROLLER BEARING INTO INPUT SHAFT

(a) Apply gear oil to the needle roller bearing.
(b) Install the needle roller bearing into the input shaft.



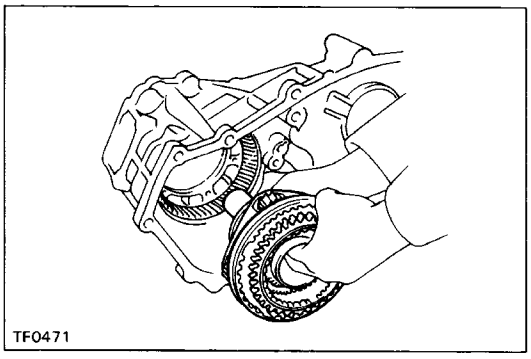
6. INSTALL LOW GEAR SPLINE PIECE

(a) Install the low gear spline piece to the planetary carrier.



(b) Install the snap ring.

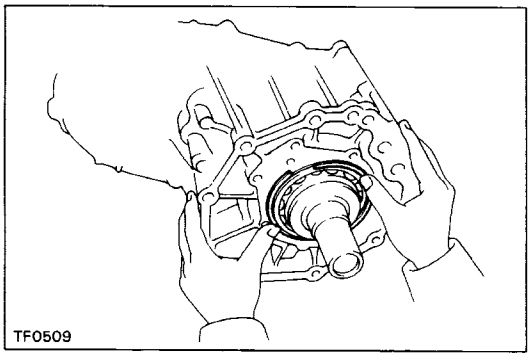
HINT: Be sure the end gap of the snap ring is not aligned with cutout portion of the planetary carrier.



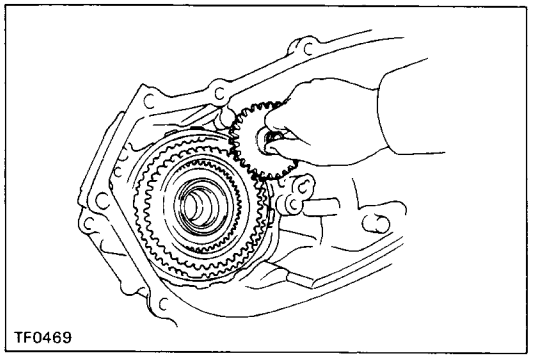
7. INSTALL PLANETARY GEAR ASSEMBLY TO FRONT CASE

(a) Install the planetary gear assembly with the input shaft.

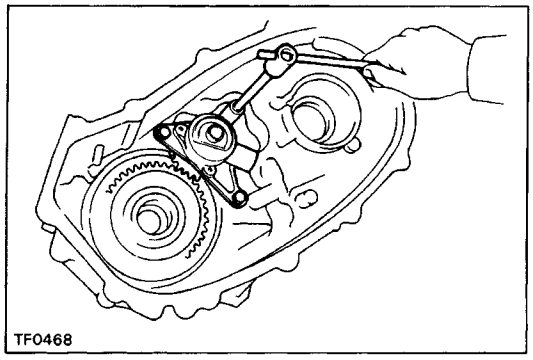
HINT: If necessary, heat the front case to about 70˚C (158˚F).



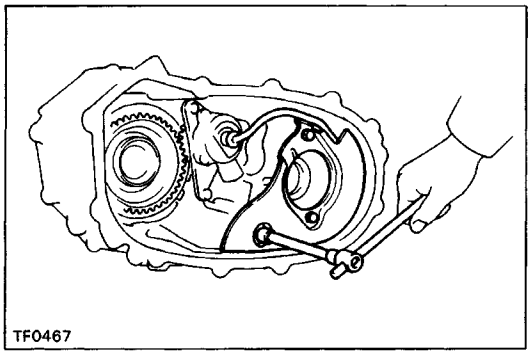
(b) Install the snap ring.



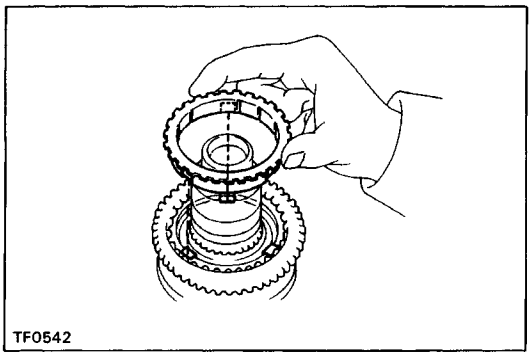
8. INSTALL OIL PUMP DRIVE GEAR


TF0468

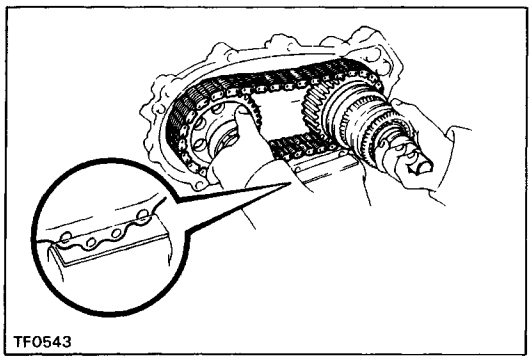
9. INSTALL OIL PUMP BODY ASSEMBLY
(a) Install the oil pump body assembly.
(b) Install and torque the three bolts.
Torque: 11 N–m (115 kgf–cm, 8 ft–lbf)


TF0467

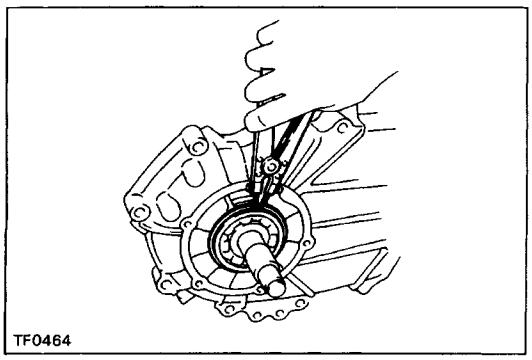
10. INSTALL SEPARATER WITH OIL STRAINER
(a) Coat a new O–ring with gear oil and install it to the oil strainer pipe.
(b) Install the separater with the oil strainer.
(c) Install and torque the three bolts.
Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)


TF0542

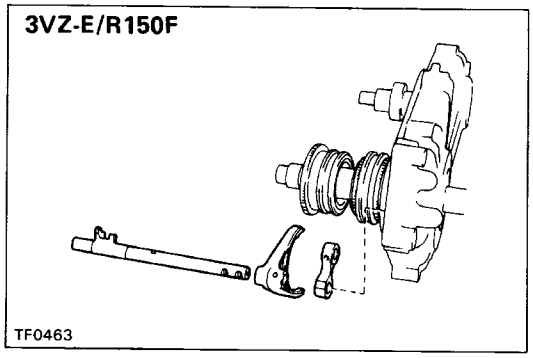
11. INSTALL REAR OUTPUT SHAFT, DRIVEN SPROCKET AND CHAIN
(a) Apply MP grease to the synchronizer ring (R150F, G58).
(b) Align the synchronizer ring slots with the shifting keys, and install it on the high and low clutch hub.

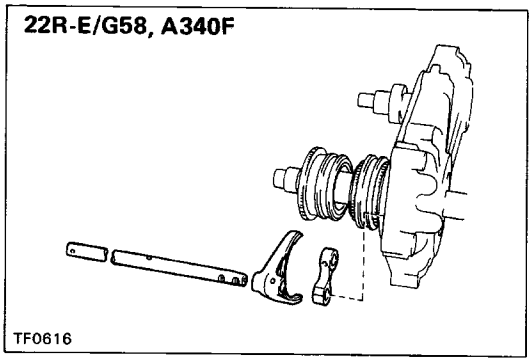

TF0543

(c) Assemble the rear output shaft, driven sprocket and chain.
(d) Mount the rear case in the vise.
NOTICE: Be careful not to damage the sealing surface.
(e) Using a plastic hammer, tap the rear case with pushing the rear output shaft and driven sprocket.
HINT: If necessary, heat the rear case to about 70°C (158°F).


TF0464

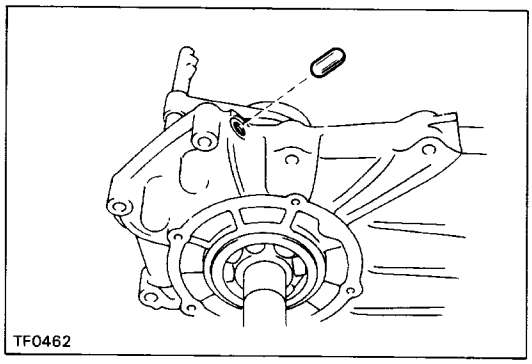
(f) Using snap ring pliers, install the snap ring.





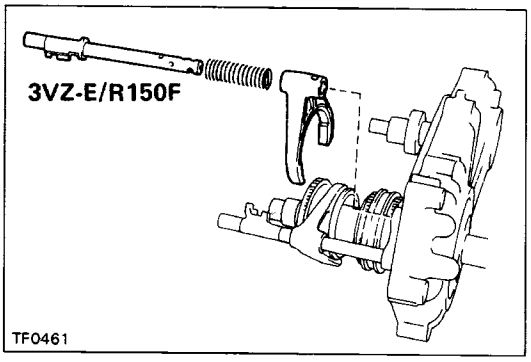
12. INSTALL HIGH AND LOW FORK SHAFT, FORK AND STOPPER

(a) Place the high and low shift fork into the groove of the hub sleeve.
HINT: Make sure to install the shift fork in the correct direction.
(b) Install the fork shaft to the rear case through the shift fork and stopper.

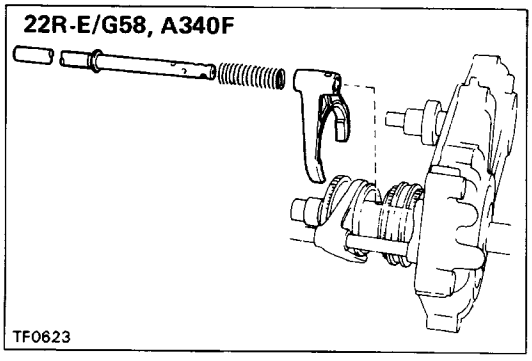


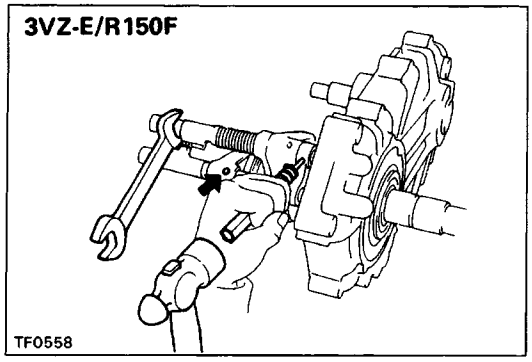
13. INSTALL FRONT DRIVE FORK SHAFT, FORK AND SPRING

(a) Apply gear oil to the straight pin, and insert it into the case hole.

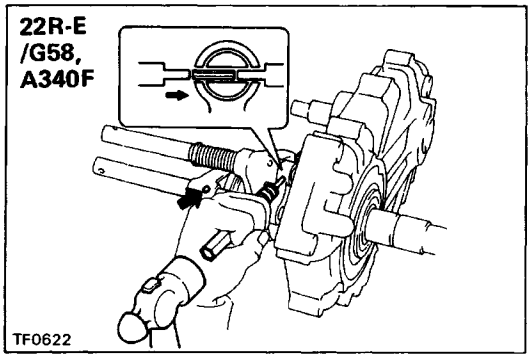


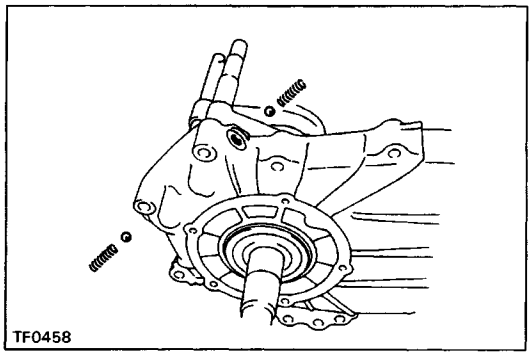
(b) Place the front drive shift fork into the groove of the hub sleeve.
HINT: Make sure to install the shift fork in the correct direction.
(c) Install the spring to the fork shaft.
(d) Install the fork shaft to the rear case through the shift fork and stopper.



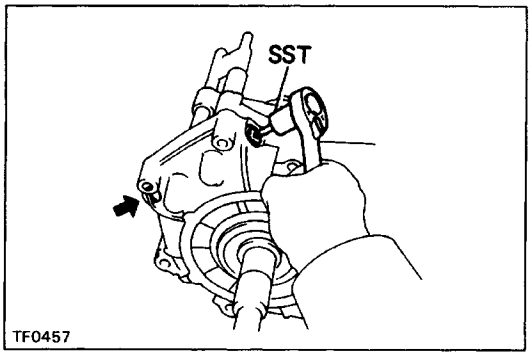


(e) Using a pin punch and hammer, drive in the two slotted spring pins.
HINT: When installing the pin in the front drive fork shaft, push the shaft towards the rear case and install the pin while the spring is compressed.

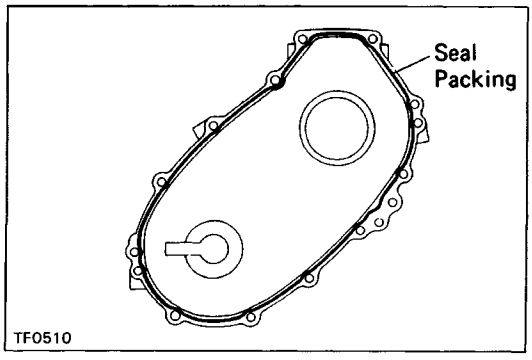




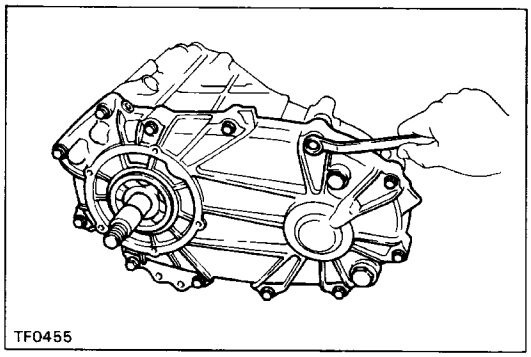
14. INSTALL STRAIGHT SCREW PLUGS, SPRINGS AND LOCKING BALLS
(a) Install the ball and spring into the both holes.



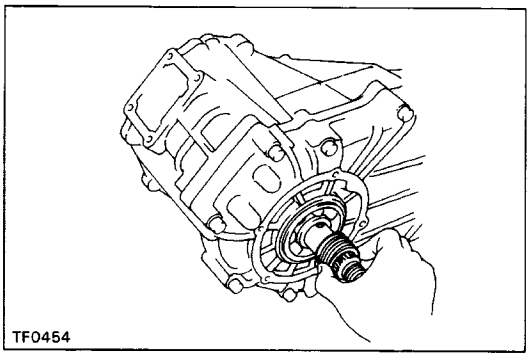
(b) Apply liquid sealer to the plugs.
Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
(c) Using SST, install and torque the two screws.
SST 09313–30021
Torque: 19 N–m (190 kgf–cm, 14 ft–lbf)



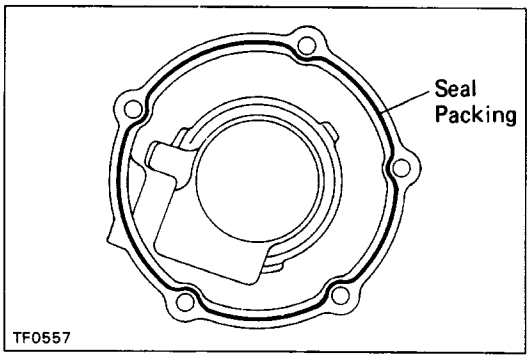
15. ASSEMBLE FRONT CASE AND REAR CASE
(a) Apply seal packing to the rear case as shown in the figure.
Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent


TF0455

(b) Shift the high and low hub sleeve to low side (rear side).
(c) Assemble the front case and rear case.
(d) Install and torque the twelve bolts.
Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)

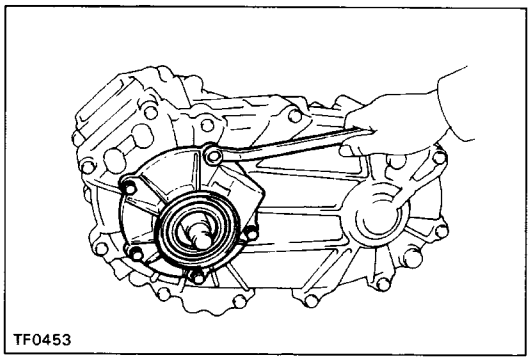

TF0454

16. INSTALL SPEEDOMETER DRIVE GEAR
(a) Install the ball on the rear output shaft.
(b) Install the speedometer drive gear.
HINT: Make sure to install the speedometer drive gear in the correct direction.

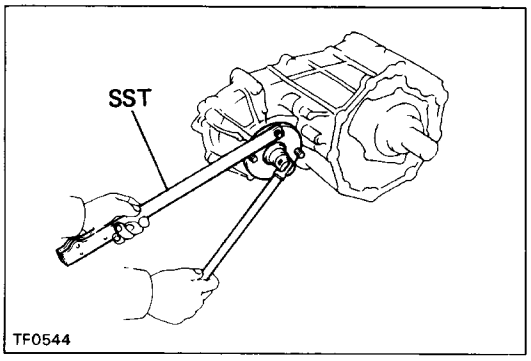


TF0557

17. INSTALL EXTENSION HOUSING
(a) Apply seal packing to the extension housing as shown in the figure.
Seal packing: Part No. 08826–00090, THREE BOND 1281 or equivalent

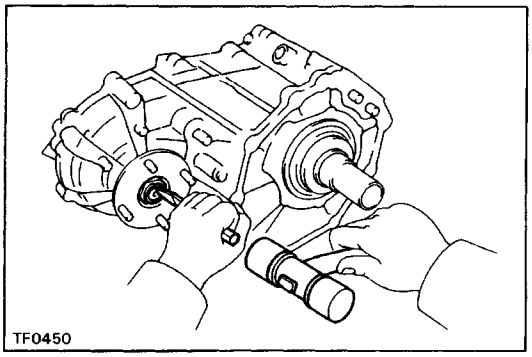

TF0453

(b) Install the extension housing to the rear case.
(c) Apply liquid sealer to the bolts.
Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
(d) Install and torque the five bolts.
Torque: 11 N–m (115 kgf–cm, 8 ft–lbf)



TF0544

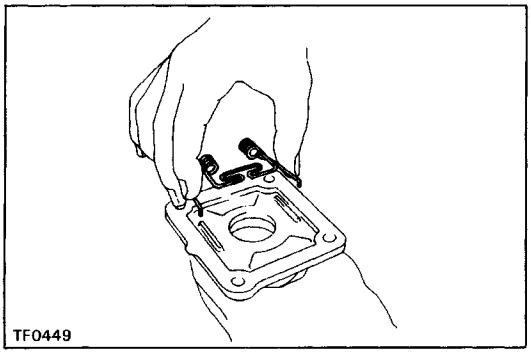
18. INSTALL FRONT COMPANION FLANGE
HINT: Front companion flange bolts are silver.
(a) Apply gear oil to the companion flange inner sur–face.
(b) Install the front companion flange to the driven sprocket shaft.
(c) Using SST to hold the flange, install the companion flange lock nut.
SST 09330–00021
Torque: 118 N–m (1,200 kgf–cm, 87 ft–lbf)
(d) Stake the lock nut.



19. INSTALL REAR COMPANION FLANGE

HINT: Rear companion flange bolts are black.

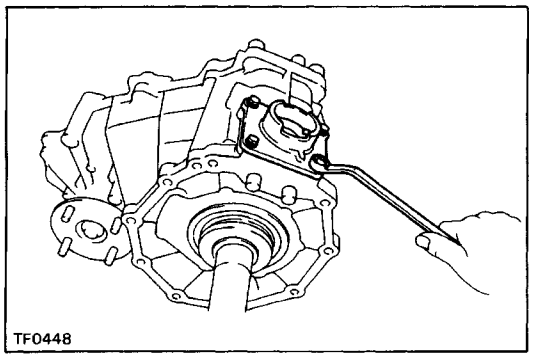
Install the rear companion flange in the same way as the front companion flange.



20.–1 (3VZ–E/R 150F)

INSTALL CONTROL RETAINER

(a) Install the select return spring to the control re–tainer.

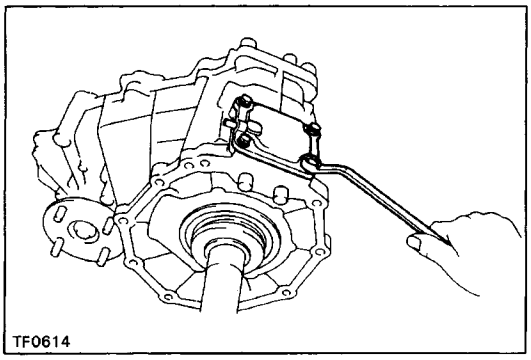


(b) Remove the gasket and install a new one to the con–trol retainer.

(c) Install the control retainer.

(d) Install and torque the four bolts.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



20.–2 (22R–E/G58, A340F)

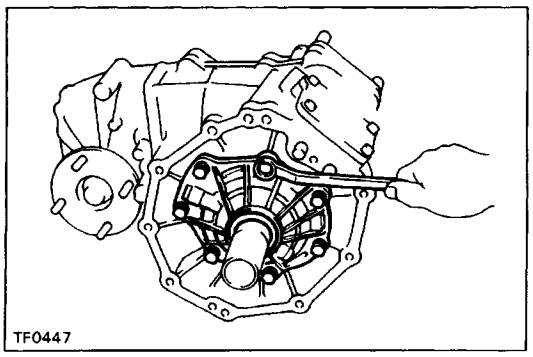
INSTALL UPPER COVER AND OIL DEFLECTOR

(a) Remove the gasket and install a new one to the case cover.

(b) Install the upper cover and oil deflector.

(c) Install and torque the four bolts.

Torque: 18 N–m (185 kgf–cm, 13 ft–lbf)



21. INSTALL FRONT RETAINER

(a) Remove the gasket and install a new one to the front retainer.

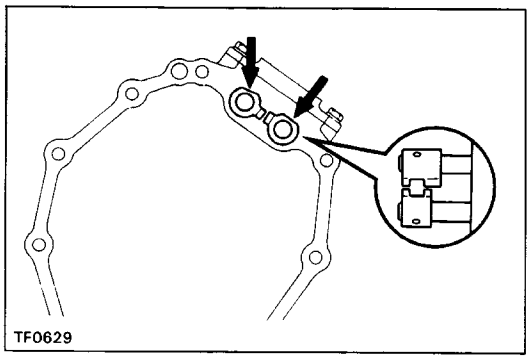
(b) Install the front retainer.

(c) Apply liquid sealer to the bolts.

Sealant: Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(d) Install and torque the seven bolts.

Torque: 11 N m (115 kgf –cm, 8 ft–lbf)



22. (22R–E1G58, A340F))
INSTALL SHIFT GEAR HEAD NO. 1 AND NO.2
(a) Install two shift gear heads.
(b) Using a pin punch and hammer, drive in the two slotted spring pins.

23. CHECK FOLLOWING ITEMS:
(a) Check to see that the input shaft and output shafts rotate smoothly.
(b) Check to see that shifting can be made smoothly to all positions.
24. INSTALL TRANSFER INDICATOR SWITCH
Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)
25. INSTALL NO. 1 SPEED SENSOR
(a) Install No.1 speed sensor.
(b) Install and torque the bolt.
Torque: 11 N–m (115 kgf–cm, 8 ft–lbf)
26. (22R–E/ 340F)
INSTALL TRANSFER L4 AND NEUTRAL POSITION SWITCH
Torque: 37 N–m (380 kgf–cm, 27 ft–lbf)