INSTALLATION
AND
OPERATION
DATA

ADF-T-12B, ADF-T-12C
AUTOMATIC DIRECTION FINDER SYSTEM

Bendix Radio Division
AVIONICS PRODUCTS • BALTIMORE 4, MARYLAND

TM-34-3
Issue 7
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INSTALLATION DATA

1. GENERAL
   A. JOB/USE
      This section furnishes initial installation procedures for the ADF-T-12B, C System.

2. PRELIMINARY INSPECTION
   A. GENERAL
      Perform a preliminary inspection and test of the ADF-T-12B, C System before installation.
   B. INSPECTION PROCEDURE
      DETAIL STEPS/WORK ITEMS
      (1) Unpack the equipment and check it against installation requirements for correct model and part numbers of all components.
      (2) Visually inspect for any damage that may have occurred during shipment.
      (3) Perform test procedures outlined in the Maintenance Practices Section of the Manual to ensure proper component operation before installation.
      KEY ITEMS
      All servo amplifier-indicators are wired for top mounted fixed loop and sense antennas. Any change in either or both antenna mounting positions may require a cabling reversal, as noted in figure 407, Note 3.

3. SYSTEM CONFIGURATION
   A. The ADF-T-12B, C System consists of three principal components: the receiver, servo amplifier-indicator, and fixed loop antenna. The method of electrical connection between the system components is provided in figure 201. (See notes 201, figure 107, for alternate pin connection for bottom mounted antennas.)
   B. Figures 407 and 408 illustrate schematically the electrical interconnection for the ADF-T-12B and ADF-T-12C systems, respectively.

4. INSTALLATION KIT (Part No. 2T008)
   A. The following is a list of specific kit numbers, the aircraft on which they are used and whether they are distributor or factory kits.
   1. Cessna, 14V (2T008-01) Distributor
      2. Cessna, 14V (2T008-02) Distributor
      3. Beechcraft Bonanza, 14V (2T008-03) Distributor
      4. Piper, 14V (2T008-04) Distributor
      5. Mooney, 14V (2T008-05) Factory
      6. Navion, 14V (2T008-06) Factory
      8. Beechcraft, 28V (2T008-08) Factory
      9. Cessna, 14V (2T008-09) Factory
      10. Cessna Model 336 (2T008-10) Factory
      11. Cessna Models 310 - 320, 28V (2T008-11) Factory
      12. Piper 23 series, 14V (2T008-12) Factory
      13. Piper 24 series, 14V (2T008-13) Factory
      14. Cessna Model 310, 28V (2T008-14) Distributor
      15. Hughes 268A, 12V (2T008-15) Factory
      16. Grand Commander Aft, top, 28V (2T008-16) Factory
      17. Grand Commander Fwd, top, 28V (2T008-17) Distributor
      18. Pflaters Porter, 28V (2T008-18) Factory & Distributor
      19. Garden GY-80, 12V (2T008-19) Factory & Distributor
      20. Piper PA-28 series (Cherokee), 12V (2T008-20) Factory
      21. Piper PA-31 24 volt (2T008-21) Factory
      22. Lear Jet with 551B (2T008-22) Factory
      23. Lear Jet with 551E (2T008-23) Factory
      24. Mooney Mustang M22 (2T008-24) Factory
      25. Piper PA-28R (2T008-25) Factory
5. COMPONENT INSTALLATION PROCEDURES

A. RECEIVER

(1) General

(a) The receiver is usually mounted in or underneath the aircraft instrument panel. When
mounted in the instrument panel (see figure 203), the receiver dust cover is secured to
mounting brackets supplied by the factory or to mounting flanges in the panel cut-out, pro-
vided by the aircraft manufacturer. Outline dimensions of the receivers are shown in
figures 203 and 204.

(2) Receiver Installation Procedure

DETAIL STEPS/WORK ITEMS

(a) If a 14-volt d-c power source is
used, disregard steps (b) and (c)
and proceed to step (d).

(b) If a 28-volt d-c power source is
used, the 28-volt lamp shipped with
each receiver must be substituted
for the 14-volt lamp installed at
the factory.

(c) Remove voltage switch key
retained by a sheet metal screw
at the rear of the receiver.
Position switch to "OFF" and
replace voltage switch key to lock
switch in position.

(d) Fasten connector mounting bracket
with attached interconnect cable
assembly to rear of receiver dust
cover with the three screws supplied.

(e) Secure connector cover to rear of
receiver dust cover with the four
screws.

(f) Attach the receiver mounting brackets
to each side of the receiver dust
cover with four 6-32 X 3/8 machine
screws and applicable washers and nuts.

(g) Drill two holes on each side of
instrument panel cutout.

(h) Place receiver dust cover, with
attached mounting brackets, behind
panel cutout so that mounting holes
in the bracket align with holes in the
instrument panel.

(i) Secure receiver dust cover to in-
strument panel with four 6-32 X 3/8
screws and applicable washers and nuts.

(j) If found necessary, secure the rear
of the receiver dust cover with a
suitable supporting bracket.

KEY ITEMS

Remove plug from front panel located between
tuning meter and frequency dial and unlock
cover using phillips head screwdriver to
position locking cam 1/4-turn counterclockwise.
Slide cover back to expose lamp.
Turn unit over, remove sheet metal screw that
secures lamp holder.
Exchange lamps and reassemble.

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B. SERVO AMPLIFIER-INDICATOR
(1) General
   (a) Model 551A Servo Amplifier - Indicator is designed for mounting through the rear of a panel. Mounting-hole dimensions are included on the outline drawing, figure 205.
   (b) Model 551C DualADF Indicator is secured behind an aircraft instrument panel. Figure 212 is an outline drawing with mounting-hole dimensions.
   (c) Model 551E Servo Amplifier - Indicator is mounted through the rear of a panel. Mounting-hole dimensions are included on the outline drawing, figure 213.

(2) Installation Procedure
   DETAIL STEPS/WORK ITEMS
   KEY ITEMS
   (a) Using the appropriate outline drawing as a guide, cut a dial opening in the panel and drill mounting holes. Allow at least three inches for cable connections and removal passage.
   (b) Secure the unit in position with the hardware designated on the outline drawing.

C. REMOTE GONIO SYNCHRO
(1) General
   (a) Model 551B Remote Gonio Synchro is usually located remote from the instrument panel. Mounting-hole dimensions are included on the outline drawing, figure 207. Figure 206 is an outline drawing of a mounting bracket available for securing the 551B to a frame or bulkhead.

   DETAIL STEPS/WORK ITEMS
   KEY ITEMS
   (a) If the 551B is to be fastened through a panel, drill mounting holes as indicated in figure 207. Fasten the mounting bracket before securing the 551B in position.
   (b) If the 551B is to be mounted on the bracket shown in figure 206, drill mounting holes for the bracket using the outline drawing as a guide. Allow sufficient room for cable connections.

D. AUDIO AMPLIFIER
(1) General
   (a) The optional audio (speaker) amplifier is designed to mount in any convenient location in the aircraft such as behind the instrument panel, on a shelf, etc. Figure 201 illustrates the unit connected in the system.

(2) Audio Amplifier Installation Procedures
   DETAIL STEPS/WORK ITEMS
   KEY ITEMS
   (a) Drill three holes in the selected mounting surface of the dimensions illustrated in figure 211. NOTE
      Either No. 4 or 6 screws can be used for this installation.
   (b) Mount the screws in the drilled holes and tighten just enough so they cannot be removed by pulling.
   (c) Mount the audio amplifier on the screws by inserting the screw heads through the mounting holes in the flanges.
   (d) Slide the unit enough so the screw threads slip in the notches of the mounting holes.
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(e) Tighten screws securely.

(f) Wire audio amplifier cable to receiver connector (U1) and connect Amphenol plug to amplifier (see Figures 201, 407 and 408).

(g) Mount and connect speaker to shielded lead.

E. ANTENNAS

(i) (a) ADF-T-12B, C System accuracy depends on proper installation and location of the sense and loop antennas. If accurate over-the-station performance is required, these factors are especially important.

(b) Antenna locations must meet four requirements:

1. The two antennas must be mounted exactly on the fore and aft centerline of the aircraft, preferably on the underside.

2. If the fixed loop is mounted less than 10 feet from the receiver, the lead-in cable slack can be coiled.

3. When the 54-inch whip is employed (see Figure 208) as a sense antenna, it must be located at least 3 feet from the propeller, and mounted in a place having sufficient structural strength to prevent tearing if the antenna vibrates violently under icing conditions.

4. The fixed loop should be parallel to the ground, with the aircraft in its normal flight attitude.

NOTE

Specific installation data drawings for different types of aircraft are available on request from:

Service Manager
Bendix Radio Division
Avionics Products
Baltimore, Maryland 21204

(2) Fixed Loop Installation Procedure (See Figure 209)

DETAIL STEPS/WORK ITEMS

(a) Select mounting location for the fixed loop antenna so that the inherent 6 degree compensation factor of the loop adjusts for the quadrantal error of the aircraft.

By trial and error, test the quadrantal error as directed in paragraph G before proceeding. See following NOTE.

NOTE

Temporarily tape the loop to the outside (underside) of the aircraft during this test. Mount loop upside down for connector clearance. Dress loop cable in line with the fore-aft centerline of the loop. Make loop cable entrance into the aircraft, during test, without drilling entrance holes. Complete the procedure given in paragraph G and then proceed as follows.

(b) Drill five mounting holes at the selected location in the fuselage.

See figure 209 for installation information.

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(c) Mount fixed loop in position and place two 8-32 binding head screws through mounting holes with flat washers attached to hold loop in position, while doubler plate is being mounted.

See figure 210 for installation information.

(d) Place doubler plate in position inside the aircraft so that the mounting nuts on doubler plate align with fixed loop mounting screws.

Apply ECO-801 Type A sealer between doubler plate and aircraft skin.

(e) Remove loop from aircraft.

Apply ECO-801 Type A sealer between doubler plate and cable connector.

(f) Insert loop cable connector through doubler plate and aircraft skin from inside the aircraft.

(g) Secure cable connector and doubler plate to aircraft skin with two 8-32 screws placed in mounting holes from outside of aircraft.

Apply ECO-801 Type A sealer between loop gasket and aircraft skin.

(h) Place loop in position so that loop and loop cable connectors mate.

Gasket must be compressed to approximately 1/32 in. at loop center-line.

(i) Secure loop to aircraft skin with two 8-32 binding head screws placed from outside aircraft to match with elastic stop nuts on doubler plate.

F. INTERCONNECT CABLEING

(1) GENERAL

(a) Use only approved cables furnished with the basic interconnecting cable kits available to meet installation requirements for various aircraft as listed in paragraph 4.

G. QUADRANTAL ERROR COMPENSATION

(1) GENERAL

(a) To provide an inherent 6 degree quadrantal error factor, the cross-wound coils for the fixed-loop antenna are of different dimensions. When installing the fixed loop, a position should be selected where the quadrantal error caused by the physical presence of the aircraft is nearly cancelled by the 6 degree compensation of the loop. This is accomplished by a trial and error process.

(2) GROUND COMPENSATION PROCEDURE

**DETAILED STEPS/WORK ITEMS**

(a) Install the ADF-T-12E, C in the aircraft, but do not secure the fixed loop (figure 209).

(b) Select approximate location for fixed loop on fore-and-aft line of aircraft.

**KEY ITEMS**

See installation procedures paragraph 5.A.(2).
(c) If a ground compass rose design is available, position the aircraft on the design. If no design is available, use an alternate method to determine angles and degrees.

(d) Locate a radio station of known position. Use the ADF to take a bearing on the station. See NOTE below.

(e) Rotate the aircraft on the compass rose until the nose of the aircraft is pointing directly at the transmitting station.

(f) Set the aircraft’s directional gyro to zero degree in agreement with the servo amplifier-indicator reading.

(g) Rotate the aircraft counterclockwise around the compass rose in 15-degree increments. Compare the directional gyro and servo amplifier-indicator readings at each increment. Chart the results.

NOTE
The direction of bearing indications on the servo amplifier-indicator will be reversed with the loop mounted upside down. Compute the bearing differences accordingly.

(h) Repeat steps (d) thru (g) until a loop position is found where the 7.5 degree loop compensation reduces the quadrantal error to a minimum.

The station should be at least 20 miles from the aircraft. The signal frequency should be below 500 kc., non-fading, and static free.
The servo amplifier-indicator must now read zero.
The difference between the two instrument readings is the quadrantal error. Maximum errors will be at 45, 135, 225, and 315 degrees. See NOTE below.

Secure loop in this location. Refer to paragraph 5E (2).

H. SENSE ANTENNA ADJUSTMENT

(1) GENERAL

DETAIL STEPS/WORK ITEMS

(a) After the ADF-T-12B,C System is installed, adjust trimmer capacitor C-22 for optimum performance.

(2) ANTENNA ADJUSTMENT PROCEDURE

(a) Remove receiver chassis from receiver dust cover.

(b) Connect lap adapter cable between receiver connector J-1 and receiver dust cover connector P-1.

(c) Set the receiver function switch to REC and the bandswitch to the 180-449 position.

(d) Tune in a station as close to 449 kc. as possible.

(e) With suitable tool, adjust C-22 for maximum audio level in headset.

(f) Remove lap adapter cable and replace receiver chassis in receiver dust cover.

Lap adapter cable, part no. 2V011-01.

Rotate retaining screw on receiver front panel to secure receiver to dust cover.
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NOTE

If tuning meter other than the one supplied as an accessory is used to adjust sense trimmer C22, set scale for a 0-1 milliamper deflection.

I. PRE-FLIGHT CHECK OUT

(1) GENERAL

(a) Before take-off, perform the following tests to determine if the ADF-T-12B, C System is operating properly.

(2) CHECKOUT PROCEDURE

DETAIL STEPS/WORK ITEMS

(a) Tune in three stations on each band of receiver.

(b) Adjust volume control to desired listening level.

(c) Tune in one station in each band until a clear 1000-ops signal is heard.

(d) Position aircraft on a known true heading.

(e) Set receiver switch to ADF and tune in station.

(f) Compare bearing on servo amplifier-indicator with true bearing.

(g) Press TEST button on front panel of receiver and observe indicator pointer.

(h) Release TEST button, and observe indicator pointer.

KEY ITEMS

Receiver in REC mode. Select stations evenly spaced throughout each band. Maximum tuning meter deflection should be obtained at peak signal.

Function switch in CW position. (Models 201/B/B-1/D only)

Bearsings must agree within 4 degrees with little or no "hunting" observed on indicator.

Indicator pointer will rotate away from indicated bearing while TEST button is pressed.

Indicator pointer should return to the indicated bearing. Slow response indicates faulty ADF system.

J. FLIGHT TEST

(1) GENERAL

(a) Airborne test shall employ the following procedure.

(2) FLIGHT TEST PROCEDURE

DETAIL STEPS/WORK ITEMS

(a) From a distance of about 50 miles, select a station of average power and, using tuning meter, adjust till maximum signal strength is obtained (receivers 201C/D).

KEY ITEMS

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(b) Fly toward the station.
(c) Set the equipment for ADF operation.
(d) Note the bearing on the servo amplifier-indicator.
(e) Make a half-needle 360-degree turn and observe the servo amplifier-indicator. A half-needle turn is made at the rate of 90-degrees per minute.
(f) Select a range station to check the over-the-station performance of the system.
(g) Set the receiver to ADF and home-in on the range station.
(h) Observe the indicator pointer as the aircraft approaches and passes over the station.

Unless the station is weak, there should not be prolonged hunting by the indicator pointer.
The indicator pointer should track the turn without "losing" the station.

(i) When the station is passed and pointer reversal is unsatisfactory, the following information may help in correcting the trouble.

(3) ADJUSTMENT, ERROR CORRECTION

<table>
<thead>
<tr>
<th>Indication</th>
<th>Trouble</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reversal before entering cone of silence.</td>
<td>Sense antenna element too far aft.</td>
</tr>
<tr>
<td>Reversal after reaching cone of silence.</td>
<td>Sense antenna element too far forward.</td>
</tr>
<tr>
<td>Extended area of confusion.</td>
<td>Excessive pointer oscillation.</td>
</tr>
<tr>
<td>Excessive pointer oscillation.</td>
<td>Sense antenna too long or too short.</td>
</tr>
</tbody>
</table>

6. INSTALLATION OF CW OSCILLATOR KIT OPTION (part no. 2V017-01)

(1) Position the cw oscillator assembly (item 54, figure 302) at rear of the tuner chassis (item 78) next to connector J1 (item 65) and secure in position using two short metal screws (item 55).
(2) Solder the black wire from the assembly (item 54) to pin 9 of J1 (item 65).
(3) Solder the red wire from the assembly (item 54) to terminal 1 of function switch (item 39); terminal 1 is physically located at the six o’clock position on the switch wafer.
(4) Solder the green wire from the assembly (item 54) to the junction of R30, R31, C47, and T4-1 on the printed circuit board shown in figure 308.
Figure 20A
Typical Aircraft Installation

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Model 201C/D ADF Receiver, Outline Dimensions

Figure 294

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Model 551A Servo Amplifier-Indicator, Outline Dimensions

Figure 555

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Mounting Bracket for Model 551B Remote Genie Synchro
Figure 206

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Figure 308
Whip Antenna
Doubler Plate, Loop Mounting Installation

Figure 210

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Model 102A/B Audio Amplifier, Outline Dimensions
Figure 211

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Figure 409
ADF-T-12B System, Emergency Battery Operation Diagram

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