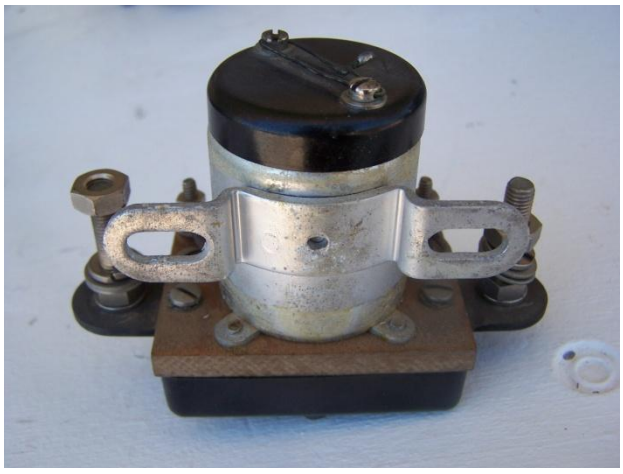
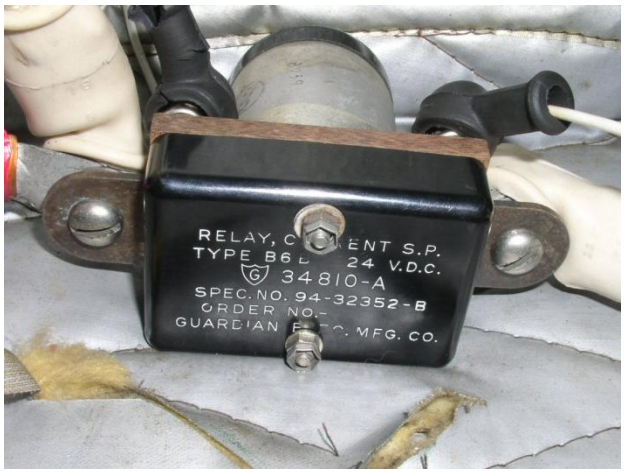
Travel Air 24 VDC Starter Solenoid Repair

Orig Nov 2010

Some time ago on a quick turn after a flight, the right engine on our Beech B95 Travel Air wouldn't start. It had just been running perfectly but now wouldn't turn over at all - no click or anything - so I suspected the starter solenoid. Naturally, it was late on a Friday, no chance for a shop to fix it or get parts until Monday. So, I checked further into the problem.

I took out the solenoid (original 1960 equipment, Guardian Electric p/n 34810-A) to check its coil resistance. The photos below show the relay. Note that subsequent or newer starter solenoids have different part numbers in the Beech parts book, so they may not have the same design features and problems I discuss here with this specific solenoid type.





The coil resistance readings were a surprise. It wasn't shorted nor was it open; the reading of 110 ohms looked reasonable. Why didn't it work? I noted two plastic covers on the unit which could be easily removed. The bottom cover, big and rectangular, enclosed the heavy contactors that carry juice to the starter motor. The contacts were only slightly tarnished, as one would expect from their beefy dimensions, but I cleaned them anyway. They moved freely within the coil and made good electrical connection. The top cover was circular, secured with two safety wired screws. Inside was a very small pair of contacts on a leaf spring. A resistance check revealed the contacts were not "contacting," showing about 110 ohms instead of zero. A simple cleaning restored good continuity. Great, but what do these little contacts do? This particular solenoid coil design, it seems, actually uses two coil windings. The small leaf-spring contacts are normally closed, connecting the windings in parallel. That draws a higher current to provide maximum magnetic force when the starter button is first pressed. Pressing the starter button causes the armature to snap the bottom contactors closed very rapidly with a loud click. Solenoid armature motion to its travel limit also opens the small top contacts, which cuts out one winding, reducing the current through the solenoid to a level that just keeps the

starting contactors closed. Interestingly, this “sustaining” coil is not strong enough itself to move the armature when you first press the starter button - both windings are needed. So, if the tiny contacts atop the solenoid get dirty the thing won’t work. This isn’t mentioned anywhere in the Beech manuals, a typical documentation shortcoming.

Reassembly was routine; the top cap uses safety wire and the bottom cover uses jam nuts. We put it back in the airplane, connected the starter wiring and made sure our A&P was happy with the work. At about a hundred dollars to needlessly replace the solenoid, plus labor, this is a very nice repair alternative!