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## **Service Bulletin TTC-SB-DHC3-04**

**Date:** April 26, 2007

**Title:** Parallel/Series Start Master Relay Installation

**Effectivity:** All DHC-3 Otter aircraft modified with Texas Turbine Conversions, Inc. STC SA09866SC or Canadian STC SA02-15, turbine engine conversion modified with the Parallel/Series Service Kit – TTC-SK-DHC3-01 modified after December 1, 2006.

**Reason:** Texas Turbine Conversions, Inc. has incorporated Service Kit TTC-SK-DHC3-02 into the Parallel/Series Start System, to increase the safety factor facilitated by a relay failure in the start system. An additional feature of the modification is the availability of selecting parallel starting only in the event of a weak battery.

**Description:** This service bulletin provides the requirements and installation instructions for the Start Master relay and its applicable hardware and wiring.

**Compliance:** Recommended

### **Accomplishment Instructions:**

1. Remove both side cowlings and lower cowlings to allow easy access for installation.
2. Remove Battery Box Cover and disconnect batteries.
3. Remove electrical junction box (j-box) cover.
4. Remove the 125 amp current limiter, and the mount screws. Rotate the current limiter mount vertical and mark and re-drill the holes with a #10 drill and de-burr.( see fig. 1)
5. Install 2 AN470AD6-3 rivets in the holes where the current limiter mount was removed. Re-install current limiter mount base, current limiter and cable.
6. Then using the 393010-7 Bus bar for alignment, match drill and de-bur the start master relay (29.311.12) to J-box , fabricate and install wire 231-A on the A1 or 86 terminal of the start master relay and wire 232 on the A2 or 85 terminal ( utilizing MS22759/8-18-9 wire and #8 ring terminals). Mount the start master relay to J-Box with 2 bolts (AN3-4A), 2 washers (AN960-10), and 2 steel lock nuts (AN363-1032). ( see fig. 1)
7. Route wires 231-A and 232 with the existing bundle down to the Eaton battery master relay. Wire 231-A(ground) will attach to terminal X1 with wire 231(existing) and wire 232 to terminal X2.

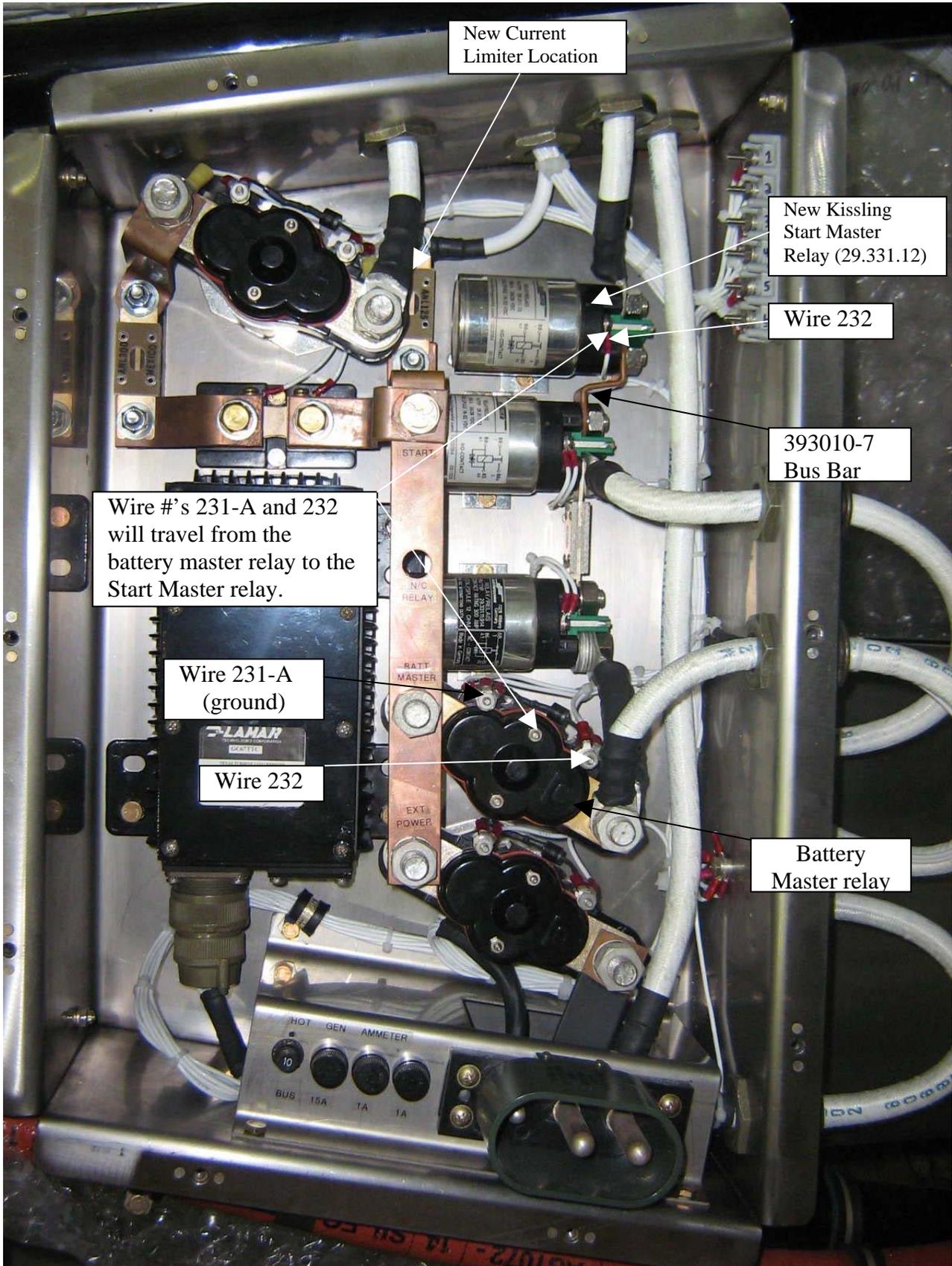
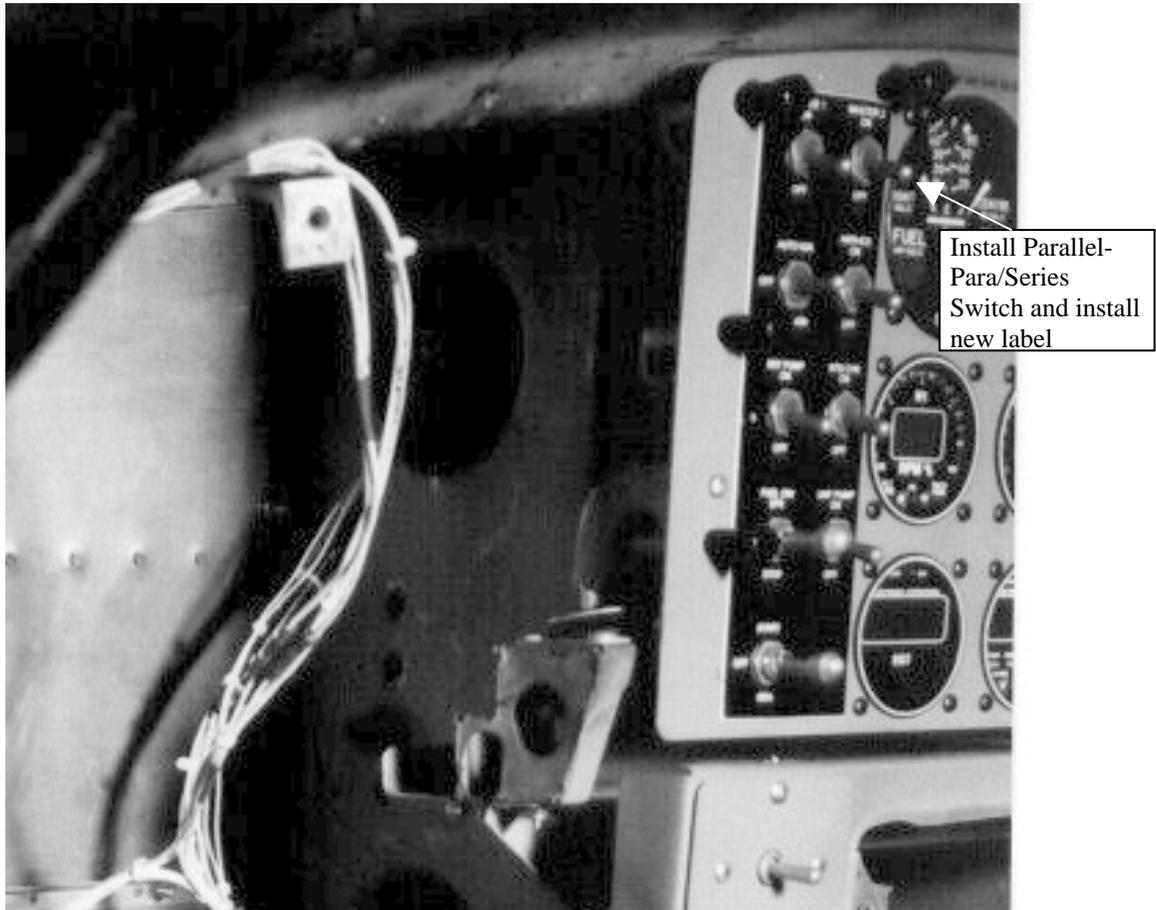


Figure 1

- Cut the starter cable to the appropriate length (remove the 1/2" ring terminal) to attach to the (1 or 88) terminal of the new start mater relay. Crimp a 3/8"70-10 ring terminal on the cable and install it on the relay. (see figure 1 for ring terminal clocking)

**THE FIREWALL FORWARD MODIFICATION IS COMPLETE**

- In the cockpit, open the engine instrument panel to allow installation of the Parallel/Series Toggle Switch.



**Figure 2**

- Install the parallel/series select switch 8501-K9 in the old battery master switch location, and re-label using a P-touch style label (Black with White lettering). The top side of the switch should read " Para/Series " and the bottom should read "Parallel" (fig. 2)
- Remove wires 600 and 601 and fabricate new wires using (MS22759/16-18-9) if they are not long enough to reach run between the Para/Series Select Switch and the Series Start Relay. Install wire 600 on terminal #3 and install wire 601 on terminal #6. Attach to appropriately marked leads or terminals with the corresponding ring terminal or spade connector. (see fig. 3)
- Fabricate and install wire 600-A (MS22759/16-18-9) on the START/GEN switch on the same post as wire 407 using a #8 ring terminal. Route the wire along the existing harness over the Para/Series Select Switch and attach it to the #2 terminal of the switch. (see fig. 3)



13. Fabricate and install wire 601-A (MS22759/16-18-9) on the FUEL ON/SPR switch on the same post as wire 404 using a #8 ring terminal. Route the wire along the existing harness over to the Para/Series Select Switch and attach it to the #5 terminal of the switch. (see fig. 3)
14. Secure all wires to the existing harnesses and re-install the engine instrument panel.

### **THE COCKPIT MODIFICATION IS COMPLETE**

15. Connect the two Elcon connectors to the batteries and safety wire.
16. Pull the ignition circuit breaker and verify that the engine cranks using the normal motoring procedure.

#### **NOTE**

The start system should crank normally, because the system does not switch to series until the fuel is turned on.

17. If system cranks normally, install battery box and j-box covers and test run engine. If engine does not crank normally, verify that wiring is correct and repeat step 17.

### **TO TEST THE PARALLEL/SERIES START**

18. Start engine using normal start procedures with Parallel-Para/Series Switch in Para/Series position. At 12-15% (when the fuel is turned ON) the system will automatically switch to a series start (48 volt start as indicated by a more rapid acceleration) and will stay series until starter cutout at 55-60%. Verify that generator functions normally and that bus voltage is approx. 26.5 volts. Shut down engine.

#### **NOTE**

During the series phase of the start it may take substantially more fuel enrichment to keep the start temperature up at 675C, or you may not be able to reach 675C. This is normal.

### **TO TEST THE PURE PARALLEL START**

19. Start engine using normal start procedures with Parallel-Para/Series switch in the Parallel position. The start will be similar to the old starting system. The engine will accelerate slower to idle speed (approx. 40 sec). **CAUTION** - Monitor EGT during start due to slower acceleration. DO NOT EXCEED START TEMP LIMIT.

### **THE PARALLEL/SERIES START SYSTEM MODIFICATION IS COMPLETE**

**Approval:** This service bulletin is FAA approved.

**Man-hours:** The modification should take no more than 2 man-hours.

**Material:** The appropriate materials will be supplied in the service kit TTC-SK-DHC3-04.

**Tooling:** 00 wire crimpers will be necessary to fabricate the heavy gauge cables.

**Weight and Balance:** Add 1.3 pounds at station 42.0