

## TROUBLE SHOOTING THE MODEL 210, T210 AND P210 DUAL ALTERNATOR SYSTEM

### TROUBLE SHOOTING THE MODEL 210 SERIES DUAL ALTERNATOR SYSTEM

The dual alternator system can be monitored by the aircraft's annunciator lights and volt-ammeter. The malfunctioning system can be isolated by observation of the annunciator lights and volt-ammeter during engine run-up.

Table 7-1 shows the indications for normal operation and seven situations caused by open circuit breakers or Master switches (ALT ON and BAT ON with the individual alternator sections labeled 1 and 2).

#### NOTE

The circuit breakers and switches associated with an inoperative alternator or battery system should be checked. If possible, the circuit breakers and switches should be set to restore normal operation.

**TABLE 7-1. ALTERNATOR MONITORING SYSTEM INDICATIONS**  
(Indications During Engine Run-up at 1700 RPM With  
30 Amps or More Load)

ANNUNCIATOR LIGHTS			VOLT-AMMETER				REMARKS
ALT 1 OFF	LOW V.	ALT 2 OFF	ALT 1 CHG	ALT 2 CHG	BAT	VOLTS	
OFF	OFF	OFF	+	+	+	28.8	Normal Operation
ON	OFF	OFF	0	+	+	28.8	ALT 1 Shut OFF.
OFF	OFF	ON	+	0	+	28.8	ALT 2 Shut OFF.
OFF	ON	OFF	+	+	(0 or -)	24.5 or less	Both Alt's ON Battery Not Charging.
ON	ON	ON	0	0	(-)	24.5 or less	Battery Supplying Power Both Alt's OFF.
ON	ON	OFF	0	+	(0 or -)	24.5 or less	ALT 2 ON Bat. Not Charging.
OFF	ON	ON	+	0	(0 or -)	24.5 or less	ALT 1 ON. Bat. Not Charging.
ON	OFF	ON	0	0	(0 or -)	Above 24	Neither Alt. Charging. Bat. Supplying Power

#### Abnormal Indications For The Situations In Table 7-1, Include the Following

1. "ALT OFF" lights, ON when the charge rate is +.
2. "ALT OFF" lights OFF when the charge rate is 0.
3. "LOW VOLT" light ON when the voltage is greater than 25.0-volts.
4. "LOW VOLT" light OFF when the voltage is less than 24.0-volts.

If the abnormal indications appear, a malfunction of the associated system has occurred. Also, if normal operation cannot be restored by circuit breakers and switches, a malfunction of the inoperative alternator system should be checked by the following procedures.

#### Equalization Circuit

Each alternator control unit has an equalization (paralleling) circuit which senses alternator output and field excitation to provide alternator paralleling. Failure of the equalization circuit in one alternator control unit (ACU) can result in the other "ALT OFF" light illuminating, unless the total load exceeds the output of one alternator. Each alternator system should be tested independently.

**TROUBLE SHOOTING THE MODEL 210, T210 AND P210 DUAL ALTERNATOR SYSTEM**

If both alternators function correctly independently, but one "ALT OFF" light illuminates when both alternators are turned on, the equalization circuit is suspect. Operation of both alternators may be restored by adding electrical load. If both alternators operate correctly with a load exceeding the capacity of one alternator, the equalization unbalance is too large, but the alternator systems are basically functional. Due to low signal levels from the shunts, it may be normal for one "ALT OFF" light to be illuminated under light load (less than 30 amps total) conditions.

**Test of Aircraft Wiring**

1. With engines stopped, disconnect both alternator control unit (ACU) connectors.
2. Shut OFF alternator switches and master switch.
3. Check for abnormal continuity in aircraft wiring harness for both left and right connectors. (Refer to Figure 33A, Item 1.)

PIN	ABNORMAL CONTINUITY	CAUSES	REMEDY
2 to 10	Greater than 1 OHM.	Open Circuit or Fuse Blown.	Repair Wire From Plug to Shunt. Replace Fuses.
5	Resistance to GND	Open or Poor Connection in Circuit.	Repair Wire.
7	Other than 100±20 OHMS Between Pin and Alt. Stator Terminal	Short, Open Wire or Defective Resistor.	Repair Wire or Replace Resistor.
9	Other than 72±15 OHMS to Ground.	Short, Open Wire or Defective Line Contactor Coil.	Repair Wire or Replace Replace Contactor.
12	Resistance to Ground.	Open or Poor Connection in Circuit.	Repair Wire.

4. Turn ON master (BAT) and alternator switch for the alternator being tested.

**NOTE**

If external power is used, set no higher than 24.0-volts.

5. Check for abnormal voltages on aircraft wiring harnesses.

PIN	ABNORMAL CONDITION	CAUSES	REMEDY
1 Field	More than 0 Volts	Field wire shorted to Voltage Source.	Repair Wire.
2 Sense	More than 0 Volts	Wiring Shorted to Voltage Source.  Line Contactor Failed Closed	Repair Wiring or  Replace Line Contactor.
3 Power Input	Zero (0) Volts	Open Circuit to Bus  Defective Switch or Circuit Breaker	Repair Wire or Replace  Switch or Circuit Breaker
4 LV Out	Zero (0) Volts	Open Circuit Through  LOW VOLT Bulb.	Repair Wire or Replace  LOW VOLT Bulb.

Continued On Next Page

**TROUBLE SHOOTING THE MODEL 210, T210 AND P210 DUAL ALTERNATOR SYSTEM**

<b>PIN</b>	<b>ABNORMAL CONDITION</b>	<b>CAUSES</b>	<b>REMEDY</b>
5 Remote Sense (-)	More than 0 Volts	A+ Short to Wire & Open Circuit to Ground	Repair Wire
6 Alt. Off	Zero (0) Volts	Open Circuit Through Bulb	Repair Wire or Replace Bulb
7 Aux Sense	More than 0 Volts	Wire Shorted to Voltage Source.	Repair Wiring.
8 LV Sense	Zero (0) Volts	Open Circuit to Battery Bus	Repair Wiring.
9 Line Cont	More than 0 Volts	Wiring Shorted to Voltage Source A+ Short to Line Contactor Wiring	Remove Short.
10 Neg Current Sense	More than 0 Volts	Short to Voltage Source	Remove Short.
11 EQ. Bus	More than 0 Volts	Wiring Shorted to Voltage Source	Remove Short
12 Pwr Gnd	More than 0 Volts	Short to Voltage Source	Repair Wiring

6. The aircraft's wiring should be correct now. If wiring defects have been located and repaired, reconnect the alternator control units and retest.

Test of Alternator Control Units

1. If abnormal operations persist, note the systems and identify the malfunctioning system.
2. With the engine stopped, master (BAT) switch off and alternator switches (1 and 2) off, connect the ACU from the abnormal system to the alternator system operating correctly.
3. Check the system with the abnormal ACU and correct alternator system with the engine running and the other alternator switch off. Observe the lights and volt-ammeter.
4. If the system under test has an abnormal behavior, the ACU should be replaced with a new unit.
5. Re-test the system to verify correct operation. If the test system functions correctly, the ACU is good. However, a component of the malfunctioning alternator system may be bad.

Tests of Alternator System Components

**NOTE**

The other components of an alternator system include; the field (ALT REG) and alternator (ALT) circuit breakers, the line contactor, the shunt-fuse assembly, the annunciator lamps or the alternator itself.

1. Connect a good ACU to the malfunctioning circuit.
2. Turn on the master (BAT) switch and alternator (1 and 2) switches, but do not start the engine.

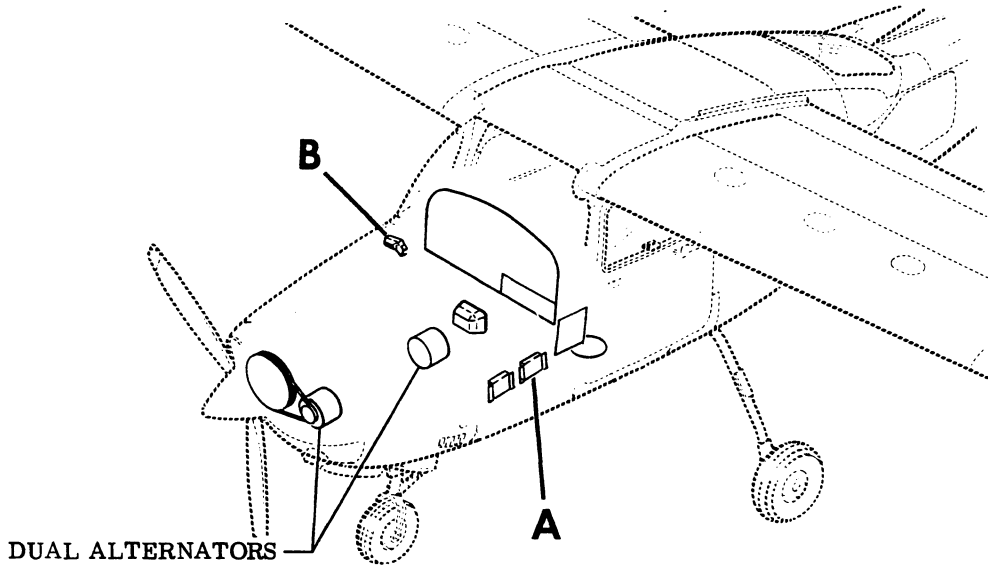
**TROUBLE SHOOTING THE MODEL 210, T210 AND P210 DUAL ALTERNATOR SYSTEM**

ABNORMAL SYSTEM	CAUSE AND REMEDY
Alternator Regulator Circuit Breaker	If ALT REG Circuit Breaker (5-amps) Continues to Open (After Testing the Wiring and the ACU), Replace the Circuit Breaker.
Alternator Circuit Breaker	<p>If the Circuit Breaker Opens at this Time, Check for Short to Ground Between the Bus and the Alternator Output Terminal.</p> <p align="center">NOTE</p> <p align="center">The Alternator Circuit Breaker is Best Tested Later When the Engine is Running.</p>
The Line Contactor	The Line Contactor Should Close Putting Battery Voltage on the Shunt Terminals. Check for Battery Voltage on the Shunt Terminals. If None, Check for Battery Voltage on the Bus Side of the Line Contactor and on the Line Contactor Coil. If Both of These Voltages Exist, Replace the Contactor. If Battery Voltage is not Evident Check the Wiring to the Bus and to Pin #9 of the ACU.
The Shunt-Fuse Assembly	The Fuses and Shunt Connections Were Checked Along With the Wiring. The Power Connection Will be Checked With the Engine Running.
The Annunciator Lamps	The Annunciator Lamps can be Tested by the Test Switch on the Annunciator Using the Press-To-Test Function on Each Lamp. Replace Burned Out Lamps Before Continuing.
The Alternator	<p>The Alternator May Have Defective Field or Stator Windings. Check the Voltage at the Field Terminal. If the Voltage is Battery Voltage, the Wiring to the Terminal is Good. If the Voltage is Nearly Zero, Separate the Wiring From the Terminal. If the Voltage on the Wiring Returns to Battery Voltage, the Alternator is Defective. If not, Check the Wiring to the ACU.</p> <p>If the ALT OFF Annunciator Light Remains Off, Check the Voltage at the Stator Terminals. A Voltage Greater Than 3.0 Volts Indicates the Alternator is Defective.</p>

**Test of Total System**

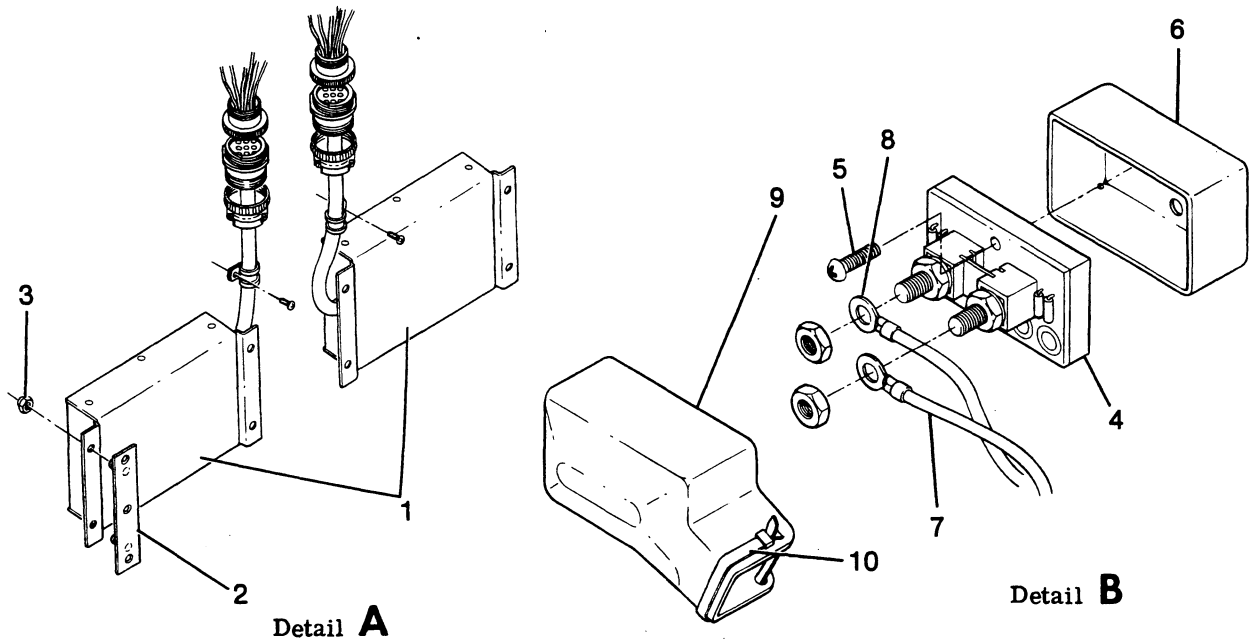
1. Connect the ACU's.
2. Start the engine, turn the battery (BAT) switch and one alternator (1 or 2) switch ON, idle engine at 1000 RPM's.
3. Adjust the aircraft electrical load to less than 20-amps. Monitor alternator output on volt-ammeter by selecting the appropriate ALT position on the volt-ammeter switch.
4. If the alternator indicates no output, check the alternator circuit breaker. If still no output, check the wiring between the alternator and bus and if wiring is good, replace the alternator.
5. The "ALT OFF" light should go out if the alternator indicates output. If not replace or repair the alternator.
6. Monitor the voltage as the engine is run up to 1700 RPM. The voltage should hold steady at about 28.0 volts.
7. Turn on equipment to provide electrical load of approximately 40 amps and increase engine speed to 2000 RPM. The alternator should continue to carry the load with the voltage steady at 28.0-volts. If not, repair or replace alternator.
8. Repeat the procedures in items 2 through 7 with the other alternator.
9. Set battery (BAT) and both alternators (1 and 2) switches ON, run engine at 2000 RPM with an electrical load between 40 to 80-amps.





DUAL ALTERNATORS

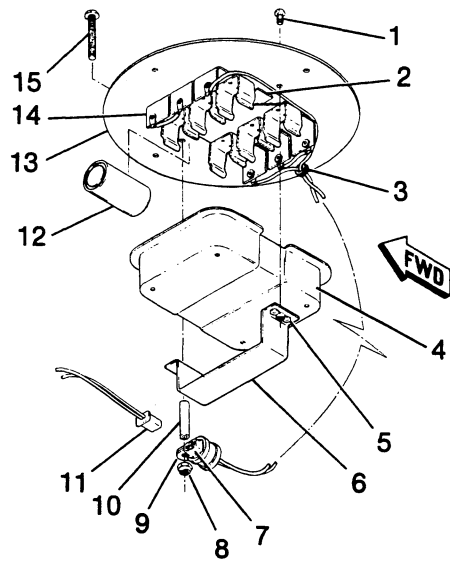
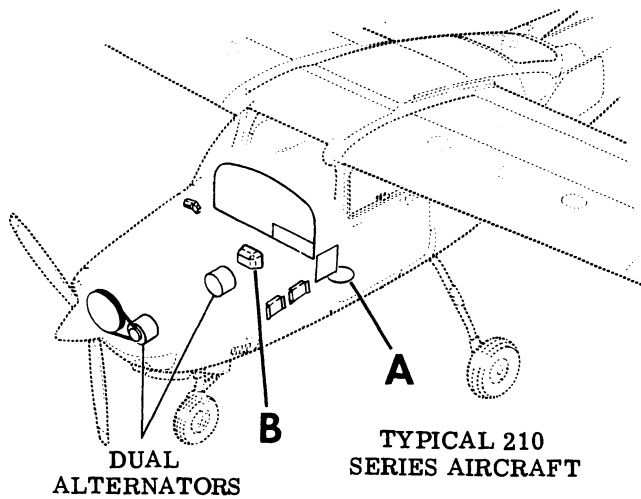
TYPICAL 210 SERIES AIRCRAFT



1. Alternator Control Unit (C711007-0101)
2. Stud Plate Assembly - Alternator Control Unit
3. Nut
4. Shunt Assembly - Battery
5. Screw

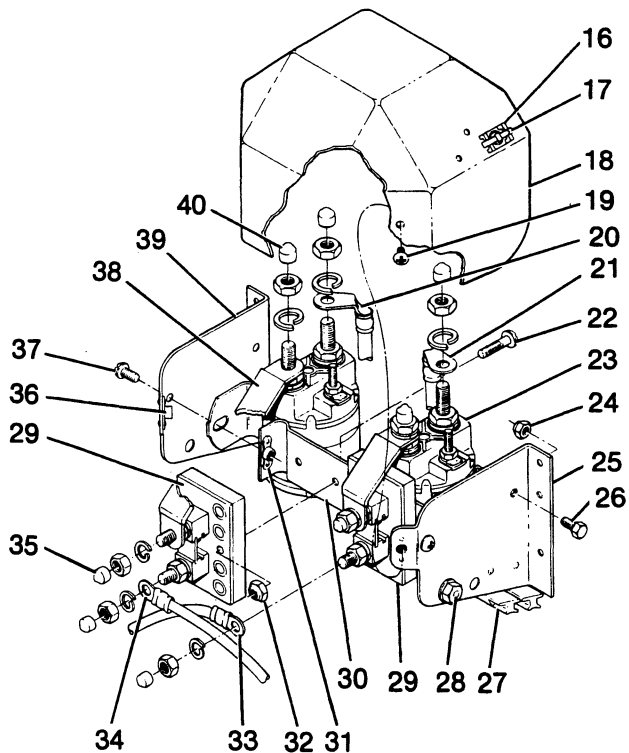
6. Sleeve - Battery Shunt
7. Cable Assy - Ckt Bkr To Bat Shunt
8. Cable Assy - Bat Shunt To Starter Contactor
9. Cover - Battery Shunt
10. Sta Strap

FIGURE 33A. DUAL ALTERNATOR CONTROL UNIT AND BATTERY SHUNT INSTALLATIONS - 1982 & ON 210 SERIES MODELS ONLY



Detail A

1. Screw
2. Shim - Battery Pack
3. Grommet
4. Cover - Battery Pack
5. Nutplate
6. Bracket Assy - Battery Pack
7. Housing - Plug
8. Nut
9. Clamp
10. Spacer
11. Housing - Cap
12. Battery
13. Plate - Battery Pack
14. Holder Assy - Battery
15. Screw
16. Anchor
17. Sta Strap
18. Cover Assy - Line Contactor Module
19. Screw
20. Cable Assy - 60-Amp Ckt Bkr To Inbd Line Contactor
21. Cable Assy - 60-Amp Ckt Bkr To Outbd Line Contactor
22. Screw
23. Contactor Assy - Dual Alternators
24. Nut
25. Support Assy - Outboard
26. Bolt
27. Mount
28. Diode - Dual Alternators
29. Shunt Assy - Dual Alternators
30. Bracket Assy
31. Nutplate
32. Nut
33. Cable Assy - Fwd Alt to Outbd Shunt
34. Cable Assy - Aft Alt to Inbd Shunt
35. Cover
36. Nutplate
37. Bracket Assy - Module
38. Bus Bar Assy - Dual Alternators
39. Support Assy - Inbd
40. Cover



Detail B

FIGURE 33B. ALTERNATOR RESTART AND DUAL ALTERNATOR LINE CONTACTOR MODULE INSTALLATIONS - 1982 & ON 210 SERIES MODELS ONLY