SECTION 15A

ELECTRICAL SYSTEMS

NOTE

This Section applies to aircraft 1971 thru 1973 Models.

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15A-1. ELECTRICAL SYSTEMS.

15A-2. GENERAL. This section contains information necessary to maintain the Aircraft Electrical Power Supply System, Battery and External Power Supply System, Alternator Power Supply System, Aircraft Lighting System, Pitot Heater, Stall and Gear Warning System, Electric Clock, Cigar Lighter, Emergency Locator transmitter, and Electrical Load Analysis Chart.

15A-3. ELECTRICAL POWER SUPPLY SYSTEM.

15A-4. DESCRIPTION. Electrical energy for the aircraft is supplied by a 28-volt, direct-current, single-wire, negative ground electrical system. A single 24-volt battery supplied power for starting and furnishes a reserve source of power in the event of alternator failure. Two engine-driven alternators are the normal source of power during flight and maintain a battery charge controlled by a voltage regulator. An external power source receptable is available to supplement the battery alternator system for starting and ground operation.

15A-5. AMMETER.

15A-6. DESCRIPTION. The ammeter is connected between the battery and the aircraft bus. The meter indicates the amount of current flowing either to or from the battery. With a low battery and the engine operating at cruise speed the ammeter will show the full alternator output when all electrical equipment is off. When the battery is fully charged and cruise RPM is maintained with all electrical equipment off, the ammeter will show a minimum charging rate.

15A-7. SPLIT BUS BAR.

15A-8. DESCRIPTION. Electrical power is supplied through a split bus bar. One side of the bus bar supplies power to the electrical equipment while the other side supplies the electronic installations. When the master switch is closed the battery contactor engages and battery power is supplied to the electrical side of the split bus bar. The electrical bus feeds battery power to the electronics bus through a normally-closed relay; this relay opens when a starter switch is engaged or when an external power source is used, preventing transient voltages from damaging the semiconductor circuitry in the electronic installations.

15A-9. SPLIT BUS POWER RELAY.

15A-10. DESCRIPTION. (Refer to figure 15A-1.) A power relay is installed, beginning with 33701317 and F33700025, on the left side of the fuselage just forward of the circuit breaker panel beside the pilots seat. This relay is a normally closed type, opening when external power is connected or when the starter is engaged, thus removing battery power from the electronic side of the split bus and preventing transient voltages from damaging the electronics installations.

15A-11. REMOVAL AND INSTALLATION. For Removal and Installation of Split Bus Power Relay. Refer to figure 15A-1.

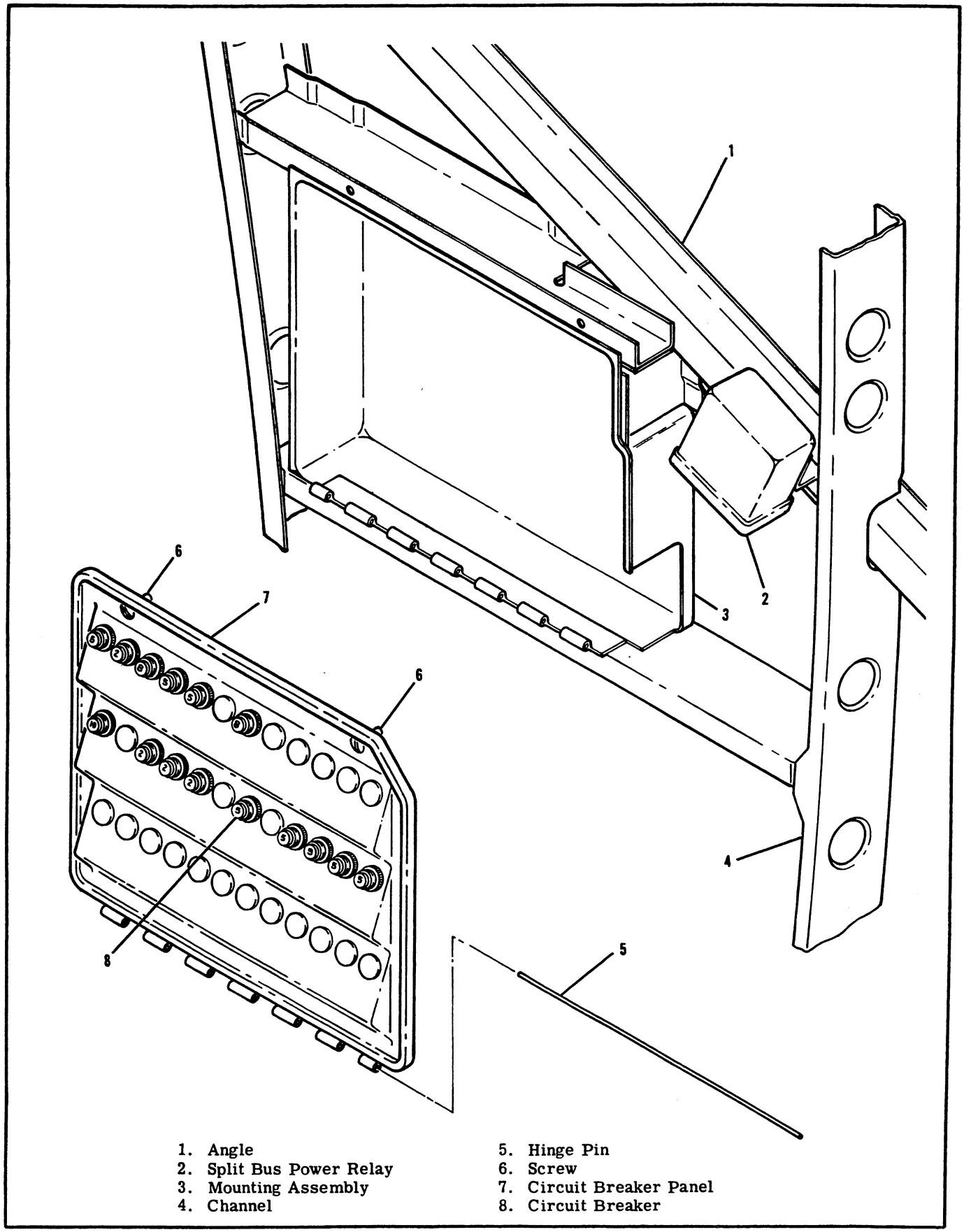
15A-12. MASTER SWITCH.

15A-13. DESCRIPTION. The operation of the battery and alternator systems is controlled by a master switch. The switch is a rocker type with double-pole, single-throw contacts. The switch, when operated, connects the battery contactor coil to ground and the alternator field circuit to the battery, activating the power systems. The master switch is located on the stationary instrument panel.

15A-14. CIRCUIT BREAKERS AND CIRCUIT BREAKER PANEL.

15A-15. DESCRIPTION. (Refer to figure 15A-1.) Most of the electrical circuits in the aircraft are protected by "push-to-reset" type circuit breakers mounted in a panel located on the left side of the cabin beside the pilots seat. Exceptions to this are the clock circuit, the alternator re-start circuit, the external power circuit, the flight hour recorder circuit, and the ammeter circuit which are protected by fuses. The circuit breakers have nomenclature beneath them which describes which circuit they protect. The circuit breaker panel is mounted by a hinge at the bottom and two screws securing it at the top.

15A-16. REMOVAL AND INSTALLATION. For removal and installation of circuit breakers and circuit breaker panel refer to figure 15A-1. To remove the circuit breaker panel loosen the two mounting screws at the top of the panel and the panel will swing out for access to the circuit breakers.



1. Angle
2. Split Bus Power Relay
3. Mounting Assembly
4. Channel
5. Hinge Pin
6. Screw
7. Circuit Breaker Panel
8. Circuit Breaker

Figure 15A-1. Circuit Breaker Panel Installation

15A-17. BATTERY POWER SYSTEM.

15A-18. BATTERY.

15A-19. DESCRIPTION. The battery is 24-volts and is approximately 17 ampere-hour in capacity. The battery is mounted on the forward left side of the firewall and is equipped with non-spill type filler caps.

15A-20. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
BATTERY WILL NOT SUPPLY POWER TO BUS OR IS INCAPABLE OF CRANKING ENGINE.	Battery discharged.	Measure voltage at "BAT" terminal of battery contactor with master switch and a suitable load such as a taxi light turned on. Normal battery voltage is 23.0 volts or more. If voltage is low, check fluid level in cells and charge battery at 10 amps for approximately 30 minutes or until the battery voltage rises to 29-volts. Check battery with a load type tester. If tester indicates a good battery, the malfunction may be assumed to be a discharged battery. If the tester indicates a faulty battery , replace the battery.
	Fualty contactor or wiring between contactor or master switch.	Measure voltage at master switch terminal (smallest) on contactor with master switch closed. Normal indication is zero volts. If a voltage reading is obtained, check wiring between contactor and master switch. Also check master switch. If voltage reads zero check continuity between "BAT" terminal and master switch terminal of contactor. Normal indication is 40 to 70 ohms (master switch open). If ohmmeter indicates an open coil, replace contactor. If ohmmeter indicates a good coil check voltage on "BUS"side of contactor with master switch closed. Meter normally indicates battery voltage. If voltage is zero or intermittant, replace contactor. If voltage is normal inspect wiring between contactor and bus. Replace or repair wiring.

15A-21. REMOVAL AND INSTALLATION. (Refer to figure 15A-2.)

a. To gain access to the battery, remove the upper left half of cowling.

b. Remove the battery box lid and disconnect the battery ground cable.

CAUTION

Always remove the ground cable first and connect it last to prevent accidentally shorting the battery to the airframe with tools.

c. Disconnect the positive cable from the battery and remove the battery from the aircraft.

d. To install a battery, reverse this procedure.

15A-22. CLEANING THE BATTERY. For maximum efficiency, the battery and connections should be kept clean at all times.

a. Remove the battery in accordance with preceding paragraph.

b. Tighten battery cell filler caps to prevent the cleaning solution from entering the cells.

c. Wipe battery cable ends, battery terminals and entire surface of the battery with a clean cloth

moistened with a solution of bicarbonate of soda (bakind soda) and water.

d. Rinse with clear water, wipe off excess water and allow battery to dry.

e. Brighten up cable ends and battery terminals with emery cloth or a wire brush.

f. Install the battery according to the preceding paragraph.

g. Coat the battery terminals and the cable ends with petroleum jelly.

15A-23. ADDING ELECTROLYTE OR WATER TO THE BATTERY. A battery being charged and discharged with use will decompose the water from the electrolyte by electrolysis. When the water is decomposed, hydrogen and oxygen gases are formed which escape into the atmosphere through the battery vent system. The acid in the solution chemically combines with the plates of the battery during discharge or is suspended in the electrolyte solution during charge. Unless the electrolyte has been spilled from a battery, acid should not be added to the solution. The water will decompose into gases and should be replaced regularly. Add distilled water as necessary to maintain the electrolyte level even with the horizontal baffle plate inside the battery. When "dry charged" batteries are put into service, fill as directed with electrolyte. However, as the electrolyte level falls below normal with use add only distilled water to maintain the proper level. The battery electrolyte contains approximately 25% sulphuric acid by volume. Any change in this volume will hamper the proper operation of the battery.

CAUTION

Do not add any type of "battery rejuvenator" to the electrolyte. When acid has been spilled from a battery, the acid balance may be adjusted by following instructions published by the Association of American Battery Manufacturers.

15A-24. TESTING THE BATTERY. The specific gravity check method of testing the battery is preferred when the condition of the battery is in a questionable state-of-charge. However, when the aircraft has been operated for a period of time with an alternator output voltage which is known to be correct, the question of battery capability may be answered more correctly with a load type tester. If testing the battery is deemed necessary, the specific gravity should be checked first and compared with the following chart:

BATTERY HYDROMETER READINGS

SPECIFIC GRAVITY READINGS	BATTERY CONDITION
1.280	100% Charged
1.250	75% Charged
1.220	50% Charged
1.190	25% Charged
1.160	Practically Dead

NOTE

All readings shown are for an electrolyte temperature of 80° Fahrenheit. For higher temperatures the readings will be slightly lower. For cooler temperatures the readings will be slightly higher. Some hydrometers will have a built-in temperature compensation chart and a thermometer. If this type tester is used, disregard this chart.

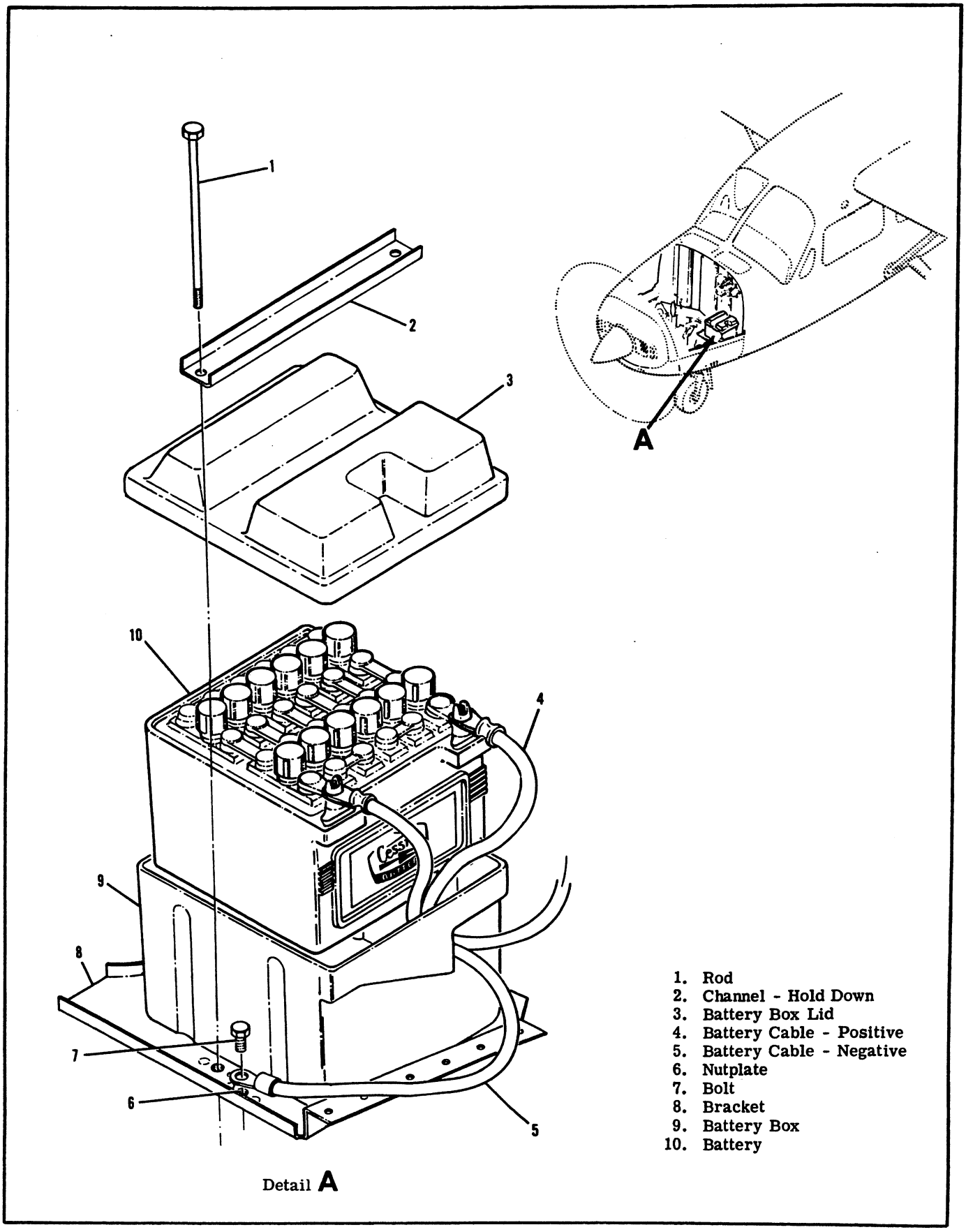
If a specific gravity reading indicates that the battery is not fully charged, the battery should be charged at approximately 10 amperes for 30 minutes, or until the battery voltage rises to 29-volts. After charging, a load type tester will give more meaningful results. A specific gravity check can be used after charging but the check cannot spot cells which short under load, broken connectors between plates of a cell, etc.

15A-25. CHARGING THE BATTERY. When the battery is to be charged, the level of electrolyte should be checked and adjusted by adding distilled water to cover the tops of the internal battery plates. The battery cables and connections should be clean.

WARNING

When a battery is charging, hydrogen and oxygen gases are generated. Accumulation of these gases can create a hazardous explosive condition. Always keep sparks and open flame away from the battery. Allow unrestricted ventilation of the battery area during charging.

SHOP NOTES:



1. Rod
2. Channel - Hold Down
3. Battery Box Lid
4. Battery Cable - Positive
5. Battery Cable - Negative
6. Nutplate
7. Bolt
8. Bracket
9. Battery Box
10. Battery

Figure 15A-2. Battery Box Installation

The main points of consideration during a battery charge are excessive battery temperature and violent gassing. Under a reasonable rate of charge (15 amperes or less) the battery temperatures should mot rise over 125°F nor should gassing be so violent that acid is blown from the vents.

15A-26. BATTERY BOX.

15A-27. DESCRIPTION. The battery is completely enclosed in a acid resistant plastic box which is located in the front engine compartment, left hand side. The box has a vent tube which protrudes through the bottom of the aircraft allowing battery gases and spilled electrolyte to escape.

15A-28. REMOVAL AND INSTALLATION. (Refer to figure 15A-2.) The battery box is held in place by two bolts and a channel which also holds the battery box lid. After removing the bolts, the lid and battery may be removed. The box then may also be removed after loosening clamp on drain tube attached to bottom of box.

15A-29. MAINTENANCE OF BATTERY BOX. The battery box should be inspected and cleaned periodically. The box and cover should be cleaned with a strong solution of bicarbonate of soda (baking soda) and water. Hard deposits may be removed with a wire brush. When all corrosive deposits have been removed from the box, flush it thoroughly with clean water.

WARNING

Do not allow acid deposits to come in contact with skin or clothing. Serious acid burns may result unless the affected area is washed immediately with soap and water. Clothing will be ruined upon contact with battery acid.

Inspect the cleaned box and cover for physical damage. A badly damaged box should be replaced.

15A-30. BATTERY CONTACTOR.

15A-31. DESCRIPTION. The battery contactor is bolted to the firewall above the battery box. The contactor is a solenoid plunger type, which is actuated by turning the master switch on. When the master switch is off, the battery is disconnected from the electrical system. A silicon diode is used to eliminate spiking of the transistorized radio equipment. The cathode (+) terminal of the diode connects to the battery terminal of the battery contactor. The anode (-) terminal of the diode connects to the same terminal on the contactor as the master switch wire. This places the diode directly across the contactor solenoid coil so that inductive spikes originating in the coil are clipped when the master switch is opened. See figure 15A-3 for pictorial installation of the battery contactor and diode.

15A-32. REMOVAL AND INSTALLATION. (Refer to figure 15A-3.

a. Open battery box and disconnect negative battery terminal.
b. Use figure 15A-3 as a guide for removal and installation of the contactor.

15A-33. BATTERY CONTACTOR CLOSING CIRCUIT.

15A-34. DESCRIPTION. The battery contactor closing circuit consists of a diode, resistor and fuse circuit added to the clock fuse bracket ot shunt a small charge around the battery contactor so that ground power may be used to close the contactor when the battery is too dead to energize the contactor by itself. (See figure 15A-3 for removal and installation information.)

WARNING

External power receptacle must be functionally checked after wiring, or after replacement of components of the external power or split bus systems. Incorrect wiring or malfunctioning components can cause immediate engagement of starter when ground service plug is inserted.

15A-35. GROUND SERVICE RECEPTACLE.

15A-36. DESCRIPTION. A ground service receptacle may be installed to permit the use of external power for cold weather starting or when performing lengthly electrical maintenance. A reverse polarity protection system is utilized whereby ground power must pass through an external power contactor to be connected to the bus. A silicon junction diode is connected in series with the coil on the external power contactor so that if the ground power source is inadvertently connected with a reversed polarity, the external power contactor will not close. This feature protects the diodes in the alternator, and other semiconductor devices used in the aircraft, from possible reverse polarity damage.

NOTE

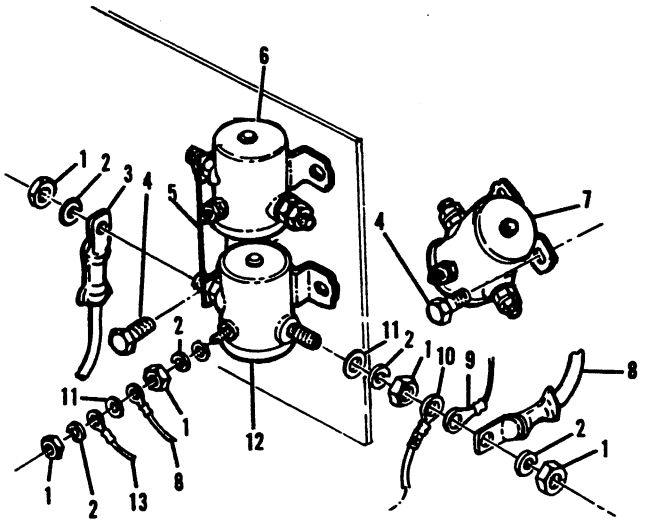
Maintenance of the electronic installations cannot be performed when using external power. Application of external power opens the relay supplying voltage to the electronics bux. For lengthy ground testing of electronics systems, connect a well regulated and filtered power supply directly to the battery side of the battery contactor. Adjust the supply for 28-volts and close the master switch.

NOTE

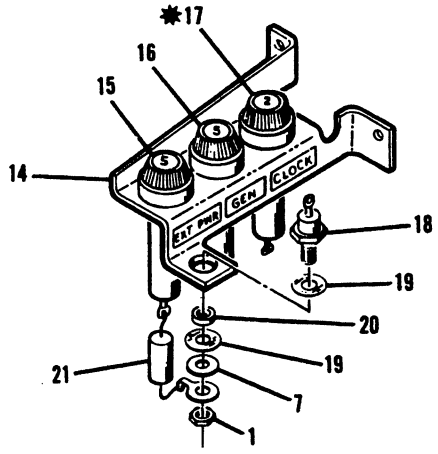
When using ground power to start the airplane, close the master switch before removing the ground power plug. This will ensure closure of the battery contactor and excitation of the alternator field in the event that the battery is completely dead.

NOTE

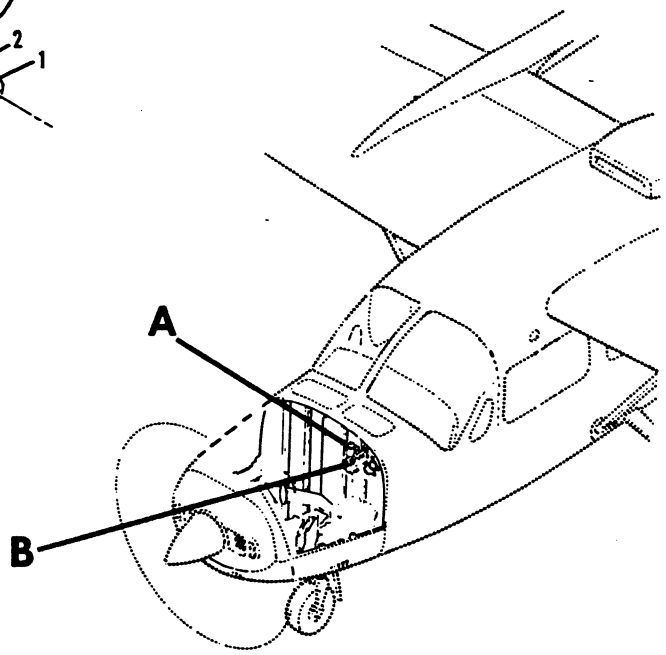
✱BEGINNING WITH AIRCRAFT SERIALS 33701463 AND F33700056 a 1 amp fuse replaces the 2 amp fuse for the clock.



Detail A

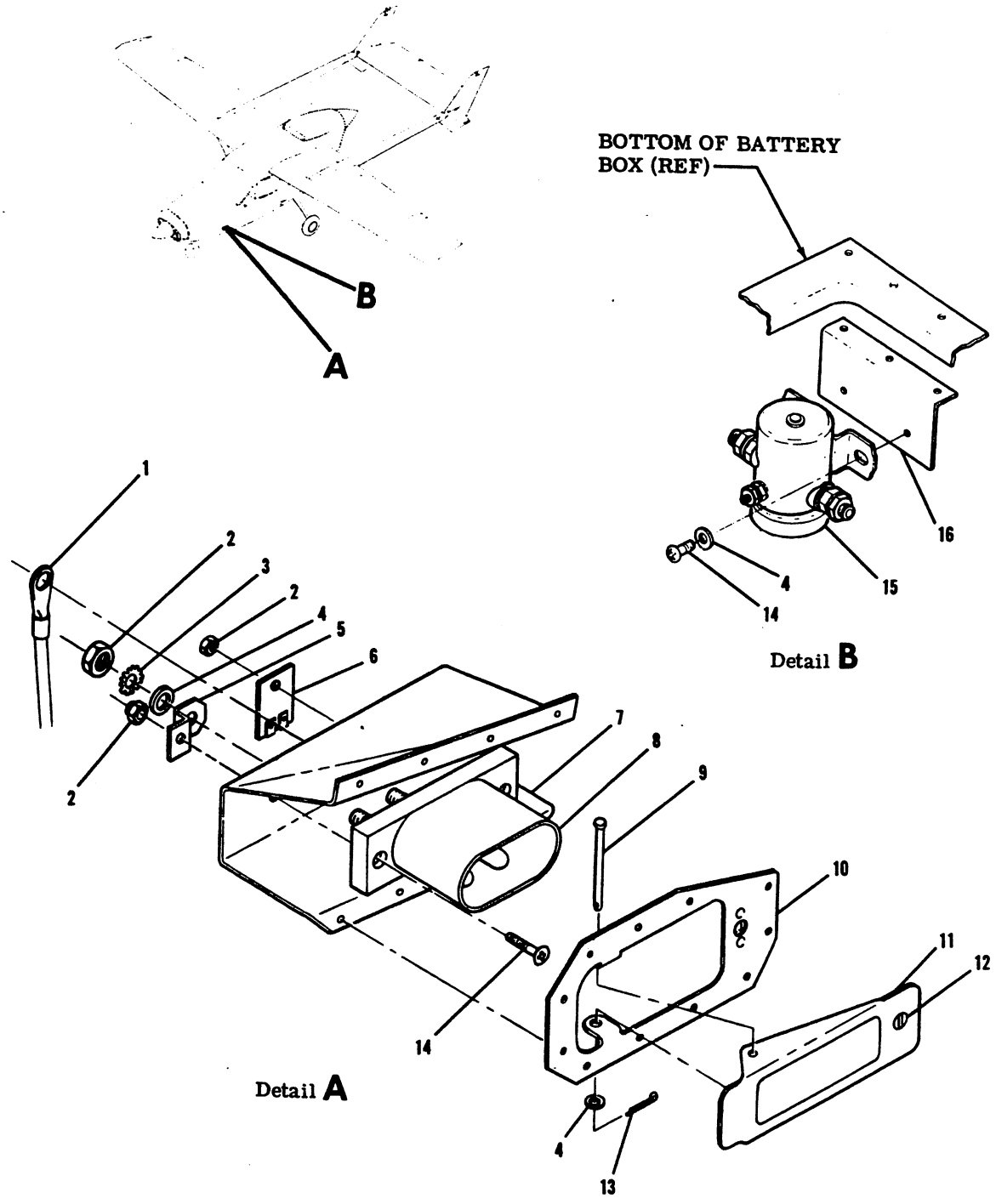


Detail B



1. Nut
2. Lockwasher
3. Ground Service Cable
4. Bolt
5. Bus Bar
6. Battery Contactor
7. Rear Starter Contactor
8. Power Cable
9. Clock Wire
10. Diode Wire
11. Washer
12. Front Starter Contactor
13. Master Switch Wire
14. Fuse Bracket
15. External Power Fuse
16. Alternator Fuse
✱17. Clock Fuse
18. Diode-Contactor Closing
19. Mica Washer
20. Insulating Spacer
21. Resistor-.75 Ohm

Figure 15A-3. Contactor and Fuse Installation



1. Power Cable
2. Nut
3. Lockwasher
4. Washer
5. Ground Strap
6. Diode Board
7. Bracket Assembly
8. Receptacle
9. Pin - Flathead
10. Doubler Assembly
11. Door Assembly
12. Stud
13. Pin - Cotter
14. Screw
15. External Power Contactor
16. Contactor Bracket Assembly

Figure 15A-4. Ground Service Receptacle Installation

15A-37. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
GROUND POWER WILL NOT CRANK ENGINE.	Ground service connector wired incorrectly.	1. Check for voltage at all three terminals of external power contactor with ground power connected and master switch off. If voltage is present on input and coil terminals but not on the output terminal, proceed to step 4. If voltage is present on the input terminal but not on the coil terminal, proceed to step 2. If voltage is present on all three terminals check wiring between contactor and bus. 2. Check for voltage at small terminal fo ground service receptacle. If voltage is not present, check ground service plug wiring. If voltage is present, proceed to step 3.
	Open or mis-wired diode on ground service diode board assembly.	3. Check polarity and continuity of diode on diode board at rear of ground service receptacle. If diode is open or improperly wired, replace diode board assembly
	Faulty external power contactor.	4. Check resistance from coil terminal of external power contactor to ground (master switch off and ground power unplugged). Normal indication is 40-70 ohms. If resistance indicates an open coil, replace contactor. If resistance is normal, proceed to step 5.
	Faulty contacts in external power contactor.	5. With master switch off and ground power applied, check for voltage drop between two large terminals of external power (turn on taxi light for a load). Normal indication id zero volts. If voltage is intermittantly present or present all the time, replace contactor.
STARTER ENGAGES WHEN GROUND POWER IS CONNECTED.	Shorted or reversed diode in split bus-bar system.	1. Check wiring to, and condition of diodes mounted on the split bus relay just forward of circuit breaker panel. Correct wiring or replace diode board assembly.

15A-38. REMOVAL AND INSTALLATION. Refer to figure 15A-4 as a guide for removal and installation of ground service receptacle.

15A-39. ALTERNATOR POWER SYSTEM.

15A-40. DESCRIPTION. Thru aircraft serials 33701398 and F33700045 the alternator system consisted of two engine-driven alternators and two solid state regulators in a one-in-use, one-in-standby circuit controlled by the pilot. A four light system is installed to indicate abnormal voltage and alternator failure. An alternator restart push button is also installed near the warning lights. Beginning with aircraft serials 33701399 and F33700046 the alternator system consists of two engine-driven alternators and two solid state regulators, (one for each alternator, mounted on the left hand side of the forward firewall. Each alternator system has a circuit breaker located on the breaker panel. A fuse, located on the circuit board between the front and rear regulators, protects the wires to the circuit breakers. A four light system is installed on the instrument panel to indicate abnormal high and low voltage also forward and rear alternators. An alternator restart push button switch and a system test push button switch are installed adjacent to the warning lights. A split rocker switch labeled "F" (forward) "R" (rear), located adjacent to the master switch, controls the alternators.

15A-41. ALTERNATOR.

15A-42. DESCRIPTION. The aircraft is equipped with 28-volt alternators rated at 38 amps. The moving center part of the alternator (rotor consists of an axial winding with radial interlocking poles which surround the winding. With excitation applied to the windings through slip rings the pole pieces assume magnetic polarity. The rotor is mounted in bearings and rotates inside the stator which contains the windings in which the ac current is generated. The stator windings are attached to two diode plates, each of which contains three silicon diodes. The diode plates are connected to accomplish full-wave, rectification of the ac current. The resulting dc output is applied to the aircraft bus and sensed by the voltage regulator. The regulator controls the excitation applied to the alternator field thus controlling the output voltage of the alternator.

15A-43. TROUBLE SHOOTING

(THRU 33701398 AND F33700045)

TROUBLE	PROBABLE CAUSE	REMEDY
AMMETER OR ALTERNATOR OUT LIGHT INDICATES ONE ALTERNATOR INOPERATIVE.	Open field winding in alternator.	1. Remove wire to field terminal of alternator in question and check resistance from the field terminal to the alternator case. Ohmmeter should indicate 10-12 ohms (Ford alternator). If ohmmeter indicates an open field, repair or replace alternator, if resistance is normal proceed to step 2.
	Open wiring between regulator and alternator.	2. Inspect wiring between alternator and regulator. Check for bad alternator switch. Repair or replace wiring. Replace switch.
	Shorted diodes in alternator.	3. Remove output lead from alternator in question and check resistance from battery terminal of alternator to alternator case. Ohmmeter should indicate conduction in one direction and infinite resistance in the other direction. If measurement indicates shorted diodes, repair or replace alternator.

15A-43. TROUBLE SHOOTING (CONT).

a. (THRU 33701398 AND F33700045)

TROUBLE	PROBABLE CAUSE	REMEDY
AMMETER OR ALTERNATOR OUT LIGHTS INDICATE BOTH ALTERNATORS INOPERATIVE.	Faulty regulator.	1. Switch to alternate regulator. If alternator output comes up, replace bad regulator. If alternate regulator has no effect, proceed to step 2.
	Open field circuit.	2. Check to ensure that field circuit breaker is closed. Check for bus voltage at "B" lead of regulator in use (disconnect regulator to measure). If voltage is not present, check wiring back to bus. Check master switch (alternator side). Check circuit breaker. If voltage is present, proceed to step 3.
	Faulty wiring between regulator and regulator switch	3. Check wiring. Repair or replace wiring.
HIGH VOLTAGE WARNING LIGHT ILLUMINATES OR BATTERY USES EXCESSIVE WATER.	Faulty regulator.	1. Check bus voltage using first one regulator then the other. If voltage is normal on the regulator, replace or adjust regulator in question. If voltage is high on both regulators, both regulators are faulty. Replace or adjust.
	CAUTION If replacement of both regulators is required, check aircraft wiring for an intermittent short which may be responsible for damaging both regulators.	If voltage is normal on both regulators, proceed to step 2.
	Faulty warning system.	2. Accomplish high voltage calibration of over-voltage relay or warning sensor. If calibration cannot be accomplished, replace the relay (or sensor).

15A-43. TROUBLE SHOOTING (CONT).

a. (THRU 33701398 AND F33700045)

TROUBLE	PROBABLE CAUSE	REMEDY
"DIS" (LOW VOLTAGE) LIGHT ILLUMINATES OR ALTERNATORS WILL NOT FULLY CHARGE BATTERY.	Regulators adjusted too low.	1. Check bus voltage using first one regulator then the other, If voltage is low on either regulator, adjust or replace regulator in question. If voltage is normal, proceed to step 2.
	Faulty low voltage warning sensor.	2. Accomplish low-voltage calibration of warning sensor. If calibration cannot be accomplished, replace the sensor.
ALTERNATOR OUT LIGHT INOPERATIVE.	Lamp bulb burned out.	1. Short between terminals 1 & 2 of the alternator failure sensor circuit board for the lamp in question (master switch ON and engines not running). Lamp should light. If lamp does not light, check wiring between circuit board and lamp assembly, replace lamp assembly. If lamp lights, proceed to step 2.
	Shorted diode or open resistor on alternator failure sensor.	2. Check voltage at terminal 3 of the alternator failure sensor circuit board. Normal indication is 9 to 11 volts for circuit boards using 1K resistors. 12 to 14 volts for boards using 2K resistors. If voltmeter indicates bus voltage, proceed to step 3. If voltage is zero, replace circuit board. If voltage reading on a board using a 2K resistor is low (about 11 volts with 24 volts on the bus), proceed to step 4. If voltage reading is normal, proceed to step 5.
		3. Disconnect leads to terminals 3 & 4 on the alternator failure sensor circuit board. Check resistance between terminals 3 & 4. Normal resistance is equal to that of the resistor on the circuit board. If resistor is open, replace the resistor. If the resistor is normal, disassemble alternator failure sensor and replace the diode.

15A-43. TROUBLE SHOOTING (CONT).

a. (THRU 33701398 AND F33700045)

TROUBLE	PROBABLE CAUSE	REMEDY
ALTERNATOR OUT LIGHT INOPERATIVE (Cont).	Wrong value of resistor on alternator failure sensor circuit board.	4. Disconnect leads to terminals 1 & 3 on the alternator failure sensor circuit board. Check resistance between terminals 1 & 3 (relay coil resistance). A coil resistance of 1500 ohms requires a 2K resistor. A coil resistance of 2300ohms re quires a 1K resistor. Some circuit boards with 1500 ohm relay coils were supplied with 2K resistors. Alternator out warning light operation is erratic at low bus voltage (engines not running). Replace 2K resistor with a 1K resistor as required.
	Faulty relay on alternator sensor circuit board.	5. Short terminal 3 on alternator failure sensor circuit board to ground and observe alternator out light. Lamp should be illuminated. If lamp does not light, replace circuit board.

b. (BEGINNING WITH 33701399 AND F33700046)

TROUBLE	PROBABLE CAUSE	REMEDY
AMMETER OR ALTERNATOR OUT LIGHT INDICATES ONE ALTERNATOR INOPERATIVE.	Over-voltage sensor tripped.	1. Recycle master switch. If alternator out indicator light stays out then condition was caused by a temporary over-voltage condition. If light comes back on with no over-voltage indication. Proceed to step 2.
	Faulty regulator.	2. Check for bus voltage at "B" lead of regulator. (Disconnect regulator to measure). If voltage is not present, check for voltage at alternator switch, field circuit breaker, alternator warning diode assy (term strip), master switch & alternator circuit breaker until faulty unit is found. If voltage is present, proceed to step 3.
	Faulty wiring from regulator to alternator.	3. Check wiring. Repair or replace wiring if no fault is found in the wiring, proceed to step 4.

15A-43. TROUBLE SHOOTING (CONT).

b. (BEGINNING WITH 33701399 AND F33700046)

TROUBLE	PROBABLE CAUSE	REMEDY
AMMETER OR ALTERNATOR OUT LIGHT INDICATES ONE ALTERNATOR INOPERATIVE (Cont).	Open field winding in alternator.	4. Remove wire to field terminal of alternator in question and check resistance from the field terminal to the alternator case. Ohmmeter should indicate 10-12 ohms (Ford Alternator). If ohmmeter indicates an open field, repair or replace alternator. If resistance is normal proceed to step 5.
	Shorted diodes in alternator.	5. Remove output lead from alternator in question and check resistance from battery terminal of alternator to alternator case. Ohmmeter should indicate conduction in one direction and infinite resistance in the other direction. If measurement indicates shorted diodes, repair or replace alternator.
AMMETER OR ALTERNATOR OUT LIGHTS INDICATE BOTH ALTERNATORS INOPERATIVE.	Over-voltage sensor tripped.	1. Recycle master switch. If alternator out indicator lights stay out then over-volt condition was temporary. If lights come back on proceed to step 2.
	Faulty regulator.	2. If alternator not charging lights come ON after recyling master switch, & over-volt light is on, check each alternator system separately to determine which is the faulty alternator system.
		If neither system indicates a faulty regulator and the over-volt light is not on, proceed to step 3.
	Open field circuits.	3. Check to ensure that field citcuit breakers and alternator circuit breaker are closed. Check for voltage at "B" lead of each regulator (disconnect regulator to measure). If voltage is not present, check for voltage at alternator switch, field circuit breaker, alternator warning diode assy (terminal strip) master switch & alternator circuit breaker until faulty unit is found. If voltage is present proceed to step 4.
	Faulty wiring from regulator to alternator	4. Check wiring. Repair or replace wiring.

15A-43. TROUBLE SHOOTING (CONT).

b. (BEGINNING WITH 33701399 AND F33700046)

TROUBLE	PROBABLE CAUSE	REMEDY
HIGH VOLTAGE SENSOR KEEPS TRIPPING OR BATTERY USES EXCESSIVE WATER.	Faulty regulator.	1. Check each alternator system separately to determine faulty regulator. Faulty regulator will trip over-voltage sensor & light high volts light. Replace or adjust faulty regulator.
	Faulty over-voltage sensor.	2. Accomplish high voltage calibration of over-voltage sensor. If calibration cannot be accomplished, replace the over-volt sensor.
	Faulty regulator.	3. Check bus voltage using each alternator system separately. Replace or adjust voltage regulator in question.
DIS (LOW VOLTAGE) LIGHT ILLUMINATES OR ALTERNATORS WILL NOT FULLY CHARGE BATTERY.	Regulators adjusted too low.	1. Check bus voltage using each alternator system separately. Adjust voltage of each regulator if required.
	Faulty low voltage warning sensor.	2. Accomplish low voltage calibration of over/under voltage sensor. If calibration cannot be accomplished, replace sensor.
ALTERNATOR OUT LIGHT INOPERATIVE.	Lamp bulb burned out.	1. Short between terminals 1 & 2 (for rear alternator) or terminals 6 & 7 (for front alternator) of the alternator failure sensor circuit board (master switch on & engines not running) lamp should light. If either lamp does not light, check wiring between circuit board & lamp assy; replace lamp assy. If lamp lights, proceed to step 2.
	Shorted diode or open resistor on alternator failure sensor.	2. Check voltage at terminal 3 (rear alternator) or terminal 5 (front alternator) of the alternator failure sensor circuit board. Normal indication is 9 to 11 volts. If voltmeter indicates proper voltage, proceed to step 3. If voltage is zero, check wiring & replace alternator failure sensor if necessary.

15A-43. TROUBLE SHOOTING (CONT).

b. (BEGINNING WITH 33701399 AND F33700046)

TROUBLE	PROBABLE CAUSE	REMEDY
ALTERNATOR OUT LIGHT INOPERATIVE (Cont).	Shorted diode or open resistor on alternator failure sensor (cont).	3. Disconnect leads to terminals 3, 4 & 5 of the alternator failure sensor circuit board check resistance between terminals 3 & 4 and between 4 & 5. Normal resistance is equal to that of the resistor on the circuit board. If either resistor is open, replace the resistor. If the resistors are normal, disassemble alternator failure sensor and replace the diode.
	Faulty relay on alternator sensor circuit board.	4. Short terminal 3 or terminal 5 on alternator sensor circuit board to ground & observe alternator out lights. Lamps should illuminate. If either lamp does not light, replace circuit board.

15A-44. REMOVAL AND INSTALLATION (FRONT ENGINE ALTERNATOR) (Refer to figure 15-5.)

a. THRU AIRCRAFT SERIALS 33701462 AND F337-00055.

1. Ensure that master switch is off and that negative lead is disconnected from battery.
2. Loosen bracket on right side of torque tube assembly. Lower torque tube to allow removal of alternator.
3. Shut off front fuel selector valve.
4. Remove fuel line at left side of alternator.

WARNING

Fuel draining from disconnected lines or hoses constitutes a fire hazard. Adequate safety precautions should be taken whenever it is necessary to disconnect fuel lines or hoses.

5. Remove screw holding support strap to clamp and pull blast tube away.
6. Disconnect wiring from alternator and lable wires.
7. Remove nuts and washers from alternator mounting bolts.
8. Remove alternator at left side of engine.
9. To install alternator, reverse this procedure.

b. BEGINNING WITH AIRCRAFT SERIALS 337-01463 AND F33700056.

1. Ensure that master switch is off.
2. Disconnect heat exchange hose on the left side of the firewall.
3. Remove the battery in accordance with paragraph 15A-21.
4. Remove the battery box in accordance with paragraph 15A-28.
5. Disconnect strainer drain control at the bellcrank, then remove locknut and pull control out of the tunnel.
6. Disconnect crankcase breather hose and remove.
7. Remove fuel line at left side of alternator.

WARNING

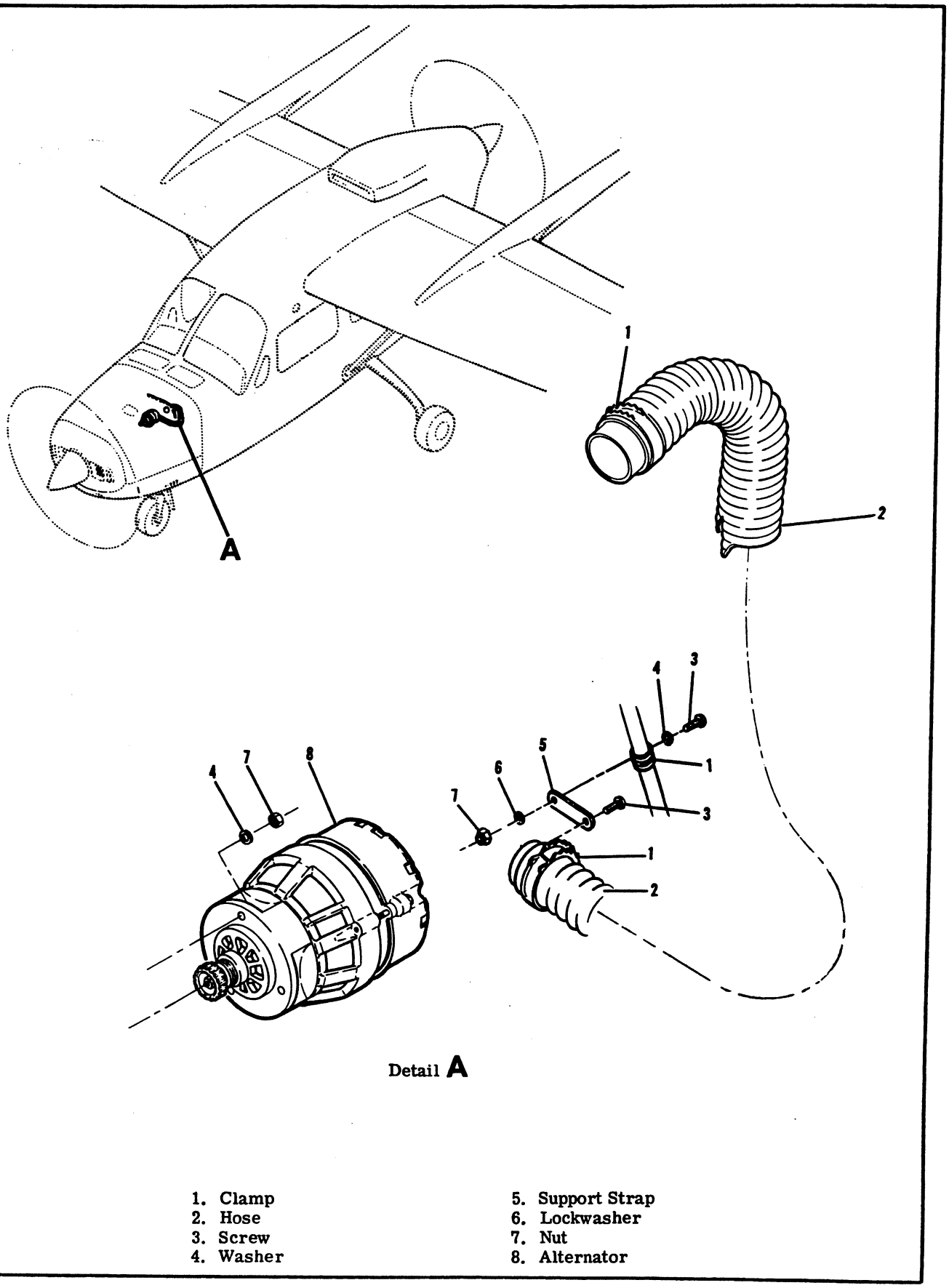
Fuel draining from disconnected lines or hoses constitutes a fire hazard. Adequate safety precautions should be taken whenever it is necessary to disconnect fuel lines or hoses.

8. Remove screw holding support strap to clamp and pull blast tube away.
9. Disconnect wiring from alternator and label wires.
10. Remove nuts and washers from alternator mounting bolts.
11. Remove alternator at left side of engine.
12. To install alternator, reverse this procedure.

15A-45. REMOVAL AND INSTALLATION (REAR ENGINE ALTERNATOR) (Refer to figure 15A-5.)

a. THRU AIRCRAFT SERIALS 33701462 AND F33700055.

1. Ensure that master switch is off and that negative lead is removed from the battery.
2. Remove screw holding support strap to clamp and pull blast tube away.
3. Remove wiring from alternator and label wires.
4. Remove nuts and washers from alternator mounting bolts.
5. Remove alternator.



1. Clamp
2. Hose
3. Screw
4. Washer
5. Support Strap
6. Lockwasher
7. Nut
8. Alternator

Figure 15A-5. Alternator Installation

6. To install the alternator, reverse this procedure.

b. BEGINNING WITH AIRCRAFT SERIALS 33701463 AND F33700056.

1. Ensure that master switch is off and that negative lead is removed from the battery.
2. Remove upholstery as necessary to gain access to the aft cabin wall access plate and remove.
3. Remove screw holding support strap to clamp and pull blast tube away.
4. Remove wiring from alternator and label wires using access hole in the firewall.
5. Remove nuts and washers from alternator mounting bolts.
6. Remove alternator.
7. To install the alternator, reverse this procedure.

15A-46. ALTERNATOR REVERSE VOLTAGE DAMAGE. The alternator is very susceptible to reverse polarity damage due to the very low resistance of the output windings and the low resistance of the silicon diodes in the output. Thru 337-0755 if a high current source, such as a battery or heavy duty ground power cart is attached to the aircraft with the polarity inadvertently reversed, the current through the alternator will flow almost without limit and the alternator will be immediately damaged. Beginning with 337-0756 diodes were installed to prevent the reverse polarity contactor from closing.

15A-47. ALTERNATOR REGULATORS.

15A-48. DESCRIPTION. Thru aircraft serials 33701398 and F33700045 the 28-volt regulators are solid-state devices mounted on the forward firewall. Two regulators are installed but only one regulator is in use at one time. The regulator in use is selected by a rocker type switch on the pilots switch panel. The regulators are identical and either one may be used to operate the system. Beginning with aircraft serials 33701399 and F33700047 the 28-volt regulators used are also solid-state devices mounted on the forward firewall but one regulator is used for the forward engine alternator and one for the rear engine alternator.

15A-49. TROUBLE SHOOTING. Refer to paragraph 15A-43.

15A-50. REMOVAL AND INSTALLATION. (Refer to figure 15A-6.)

a. Disconnect wires to regulator by pulling connection apart at the junction adjacent to the regulator.
b. Remove three screws attaching regulator to the adapter plate.
c. To install regulator, reverse this procedure. Be sure that grounding surfaces on firewall are clean and bright when reassembling.

15A-51. ADJUSTMENT.

a. THRU AIRCRAFT SERIALS 33701398 AND F33700045.

1. Remove regulator from firewall according to preceding paragraph except that all wires are left connected so that the system is still functional.
2. Remove the four screws on bottom of regulator and remove bottom cover exposing adjustment potentiometer.
3. Start engines and run them at approximately 1000 RPM for several minutes until ammeter shows that the battery is recharged after the starting discharge.
4. Turn on a taxi light and measure voltage at bus. Voltmeter should read 27.5 ± .2 volts.
5. If necessary, insert a small insulated screwdriver into the adjustment potentiometer on the bottom of the regulator in use. Adjust as required to obtain correct voltage.
6. Repeat for second regulator.
7. Allow a few minutes after adjusting regulator to allow battery to assume new voltage setting and check voltage again. Readjust as required.

NOTE

If the voltage was raised more than 0.3 volts considerable time may be required for the battery to assume full charge. In such cases it may be desirable to check the voltage after the aircraft has been flown.

8. Replace cover on bottom of regulators and reinstall regulators.

b. BEGINNING WITH AIRCRAFT SERIALS 33701399 AND F33700046.

1. Remove regulator from firewall according to preceding paragraph except that all wires are left connected so that the system is still functional. Make sure ground wire is connected.
2. Remove the four screws on bottom of regulator and remove bottom cover exposing adjustment potentiometer.
3. Start engine for regulator to be adjusted and run at approximately 1000 RPM for several minutes until ammeter shows that the battery is recharged after the starting discharge.
4. Turn on a taxi light and measure voltage at bus. Voltmeter should read 27.5 ± .2 volts
5. If necessary, insert a small insulated screwdriver into the adjustment potentiometer on the bottom of the regulator in use. Adjust as required to obtain correct voltage.
6. Repeat for second regulator.
7. Allow a few minutes after adjusting regulator to allow battery to assume new voltage setting and check voltage again. Readjust as required.

NOTE

If the voltage was raised more than 0.3 volts considerable time may be required for the battery to assume full charge. In such cases it may be desirable to check the voltage after the aircraft has been flown.

8. Replace cover on bottom of regulators and reinstall regulators.

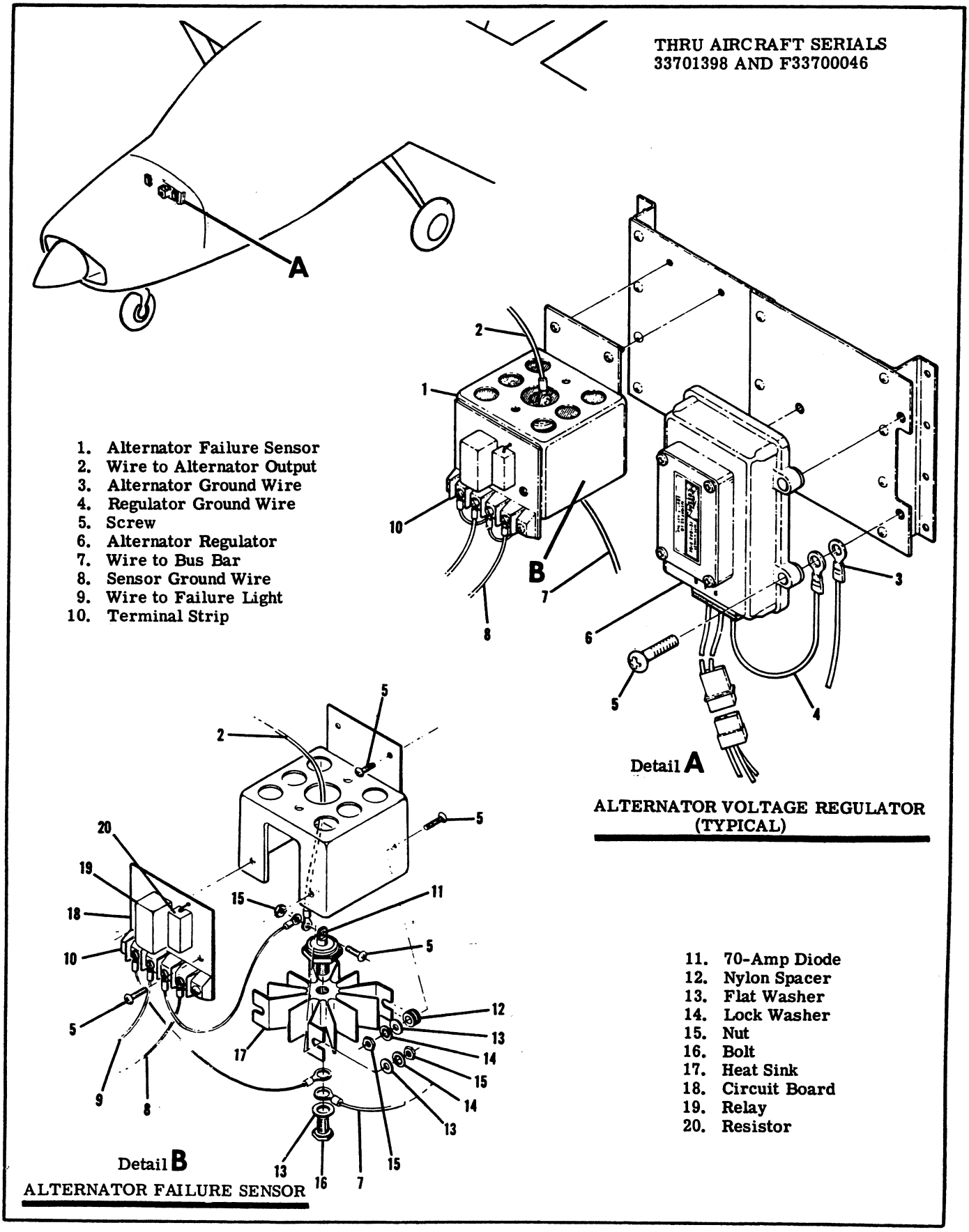


Figure 15A-6. Voltage Regulator and Alternator Failure Warning Sensor Installation (Sheet 1 of 2)

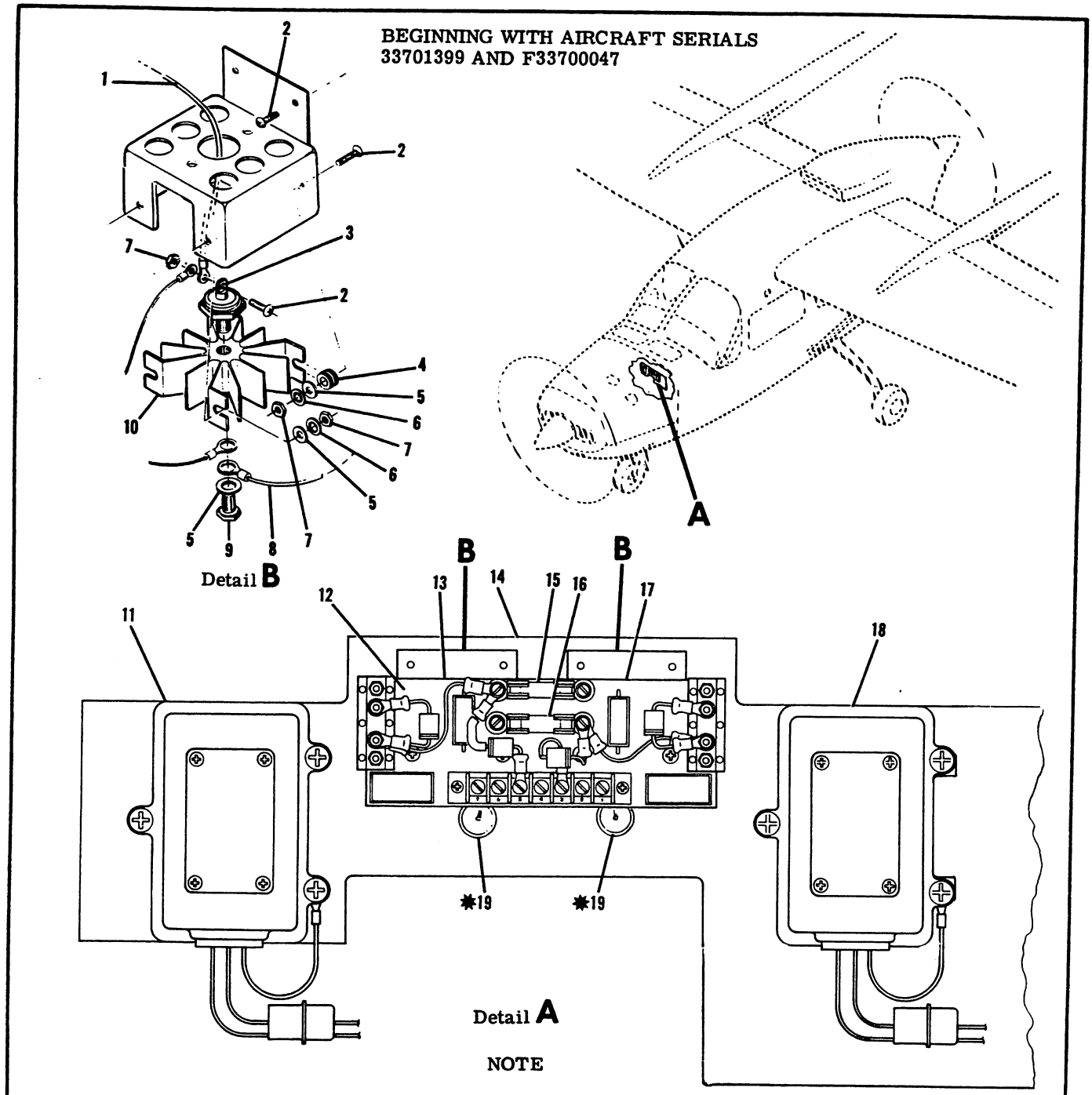


Figure 15A-6. Voltage Regulator and Alternator Failure Warning Sensor Installation (Sheet 2 of 2)

15A-52. OVER AND UNDER VOLTAGE WARNING CIRCUIT.

15A-53. DESCRIPTION. Thru aircraft serials 33701398 and F33700045. Two lights and a push button replace the voltmeter for monitoring bus voltage. The lights are labeled HIGH, meaning high bus voltage; and DIS, meaning a discharged battery or low bus voltage. A voltage sensor is connected to the bus and is adjusted to illuminate the HIGH light if the bus voltage exceeds 31 volts and the DIS light if the voltage drops below 24 volts. Testing of the DIS lamp is accomplished by observing that the lamp illuminates while cranking on engine. The HIGH lamp is tested by pressing the LIGHT TEST button adjacent to the light fixture. Beginning with aircraft serials 33701399 and F33700046. The alternator system includes an over and under voltage system. When system voltage exceeds 31.5 ± .5V an over-voltage tripout sensor automatically disables both front and rear alternators illuminating the red high voltage light. The amber discharge light and both alternator lights will illuminate as both alternators have been shut down and the aircraft storage battery is being discharged. To recycle the over-voltage tripout sensor turn off the "BATT" portion of the master switch. If the over-voltage tripout immediately recurs, then turn off "ONE" of the "ALT" switch portions of the master switch and recycle the "BATT" portion of the master switch. Repeat this procedure using the other "ALT" switch to determine which alternator-regulator system is producing the over-voltage condition. The remaining alternator-regulator system may not sustain the electrical load. The amber "DIS" light will illuminate indicating a discharge of the aircraft storage battery. Turn off low priority electrical accessories until the amber "DIS" light is off. The amber alternator system light will remain illuminated.

15A-54. REMOVAL AND INSTALLATION. (Refer to figure 15A-7.)

a. THRU AIRCRAFT SERIALS 33701398 AND F33700045.

1. Remove and tag leads to terminal strip on sensor.
2. Remove two screws holding sensor on control quadrant support angle.
3. To install, reverse this procedure.

b. BEGINNING WITH AIRCRAFT SERIALS 33701399 AND F33700046.

1. Disconnect lead plug.
2. Remove the four mounting screws holding the sensor unit on the control quadrant support angle.
3. To install, reverse this procedure.

15A-55. ADJUSTMENT

a. THRU AIRCRAFT SERIALS 33701398 AND F33700045.

1. The adjustment may be accomplished in the aircraft by disconnecting the wire attached to terminal 1 of the sensor and attaching a well regulated and filtered power supply to pin 1. Remove cover from sensor to expose adjustments.
2. Adjust power supply for 31 volts and turn the HIGH ADJUST pot (item 2, figure 15A-7) fully counterclockwise.
3. Turn HIGH ADJUST pot slowly clockwise until the HIGH light just comes on.
4. Readjust power supply for 24-volts and turn the LOW ADJUST pot (item 3, figure 15A-7) fully clockwise.
5. Turn LOW ADJUST pot slowly counterclockwise until the DIS light just comes on.
6. Seal pots and replace cover.
7. Disconnect power supply and replace lead previously removed from pin 1.

b. BEGINNING WITH AIRCRAFT SERIALS 33701399 AND F33700046.

1. Adjustment of over-volt tripout.

a. Connect over-volt sensor to test harness as shown in figure 15A-7. Connect test harness to a well filtered DC power supply.

CAUTION

The over-voltage sensor is a solid state device, observe proper polarity before applying power.

b. Turn both voltage adjustment potentiometers toward the center of the circuit board and against the stops.

c. Connect the wire from Pin 1 of the sensor to the "Plus" terminal of the power supply.

d. Set the power supply at 31.5 volts.

e. Turn the adjustment potentiometer for the front alternator SLOWLY counterclockwise until the relay energizes and the over-volt light comes on.

f. To check the voltage setting, decrease the voltage to 28 volts and reset the sensor by momentarily removing power to the sensor.

g. Gradually increase the voltage until the sensor again trips. Note the voltage. If the voltage is not within the tolerance of 31.5 ± .5 volts, readjust slightly and repeat step 6.

h. When proper voltage setting is obtained, set the voltage at 30.9 volts and maintain this voltage for several minutes to assure that the sensor will not trip below the lower limit of the tolerance (31 volts).

i. Remove the wire from Pin 1 of the sensor, from the power supply and connect the wire from Pin 2 of the sensor.

j. Repeat steps 3. thru 8. to adjust the rear alternator over-voltage sensor. The adjustment potentiometer must be turned in a clockwise direction for this adjustment.

NOTE

The adjustments must be made very slowly due to the time delay built into the system. Turning the potentiometers rapidly will result in a voltage setting below the desired value. It is also desirable to have the voltage setting as close to 31.5 volts as possible, this will help prevent nuisance trips due to transient voltages.

2. Adjustment of low voltage indicator.

a. Leave the sensor connected as in the preceding steps for adjusting the rear alternator over-voltage.

b. Turn the low voltage adjustment potentiometer fully counterclockwise.

c. Set the power supply voltage at 24 volts.

d. Turn the low voltage adjustment potentiometer slowly clockwise until the low voltage indicator light illuminates fully.

NOTE

If the low voltage potentiometer is adjusted slowly, the low voltage indicator light will glow dimly as the desired setting is approached and will turn on bright at the desired setting.

e. To check this setting, increase the power supply voltage until the low voltage light goes out. Gradually decrease the voltage until the low voltage light is fully illuminated.

15A-56. ALTERNATOR FAILURE WARNING CIRCUIT.

15A-57. DESCRIPTION. A silicon, junction, power diode is wired in series with each alternator output lead. A 28-volt reed type relay is connected across the diode. In normal operation the diode is in forward conduction and the relay sees about 1-volt drop across the diode and remains de-energized. If the alternator output should fail, bus voltage will exceed alternator output energizing the relay and directing power to the alternator out warning light on the pilots switch panel. The diode assembly for each alternator is mounted on the firewall near each alternator.

15A-58. REMOVAL AND INSTALLATION. (Refer to figure 15A-6.)

a. Disconnect output wire from alternator at the alternator.

b. Remove bolt from bottom of sensor assembly which attaches two wires to the diode heat sink.

c. Disconnect wires from terminal 2 of the sensor assembly terminal strip.

d. Remove two screws attaching assembly to bracket on firewall.

e. To replace diode, remove four screws attaching heat sink and circuit board to the assembly cover.

f. Remove diode and heat sink from cover.

g. Disconnect leads from anode of diode.

h. Unscrew diode to remove from heat sink.

i. When putting new diode on heat sink, coat bottom surface of diode hex with Dow-Corning DC -4 or a similar heat sink compound. Torque diode to 50 in.-lbs.

j. Reassemble diode and heat sink in cover by reversing above procedure.

CAUTION

Two nylon spacers are used on the two screws opposite the circuit board. These spacers are to insulate the heat sink from ground. After assembly, carefully inspect the installation of these two screws to ensure that no shorts exist.

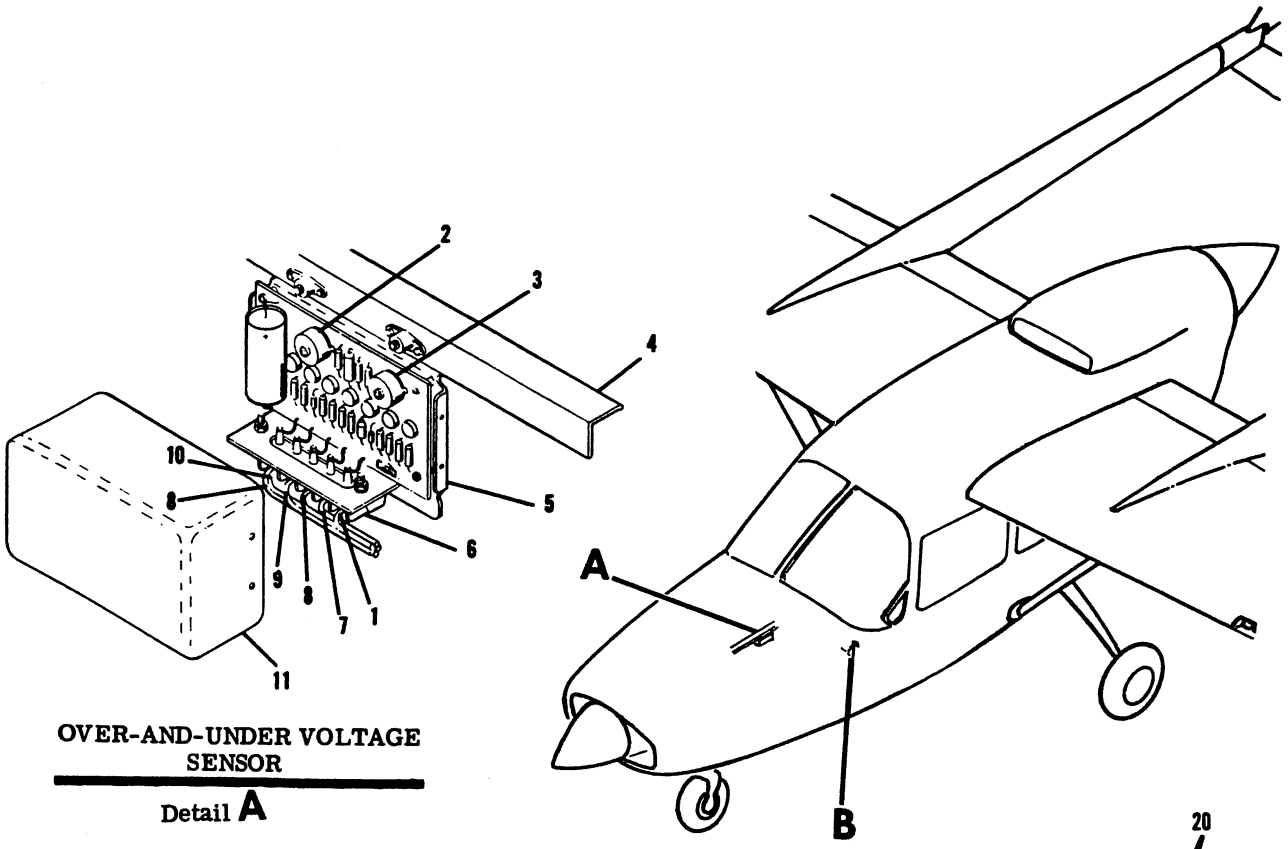
15A-59. ELECTRICAL SYSTEM WARNING LIGHTS.

15A-60. DESCRIPTION. The electrical system warning lights are mounted on the pilot's switch panel adjacent to the master switch. Two dual light assemblies are installed; one for the over-and-under voltage warning system and one for the alternator failure warning system. The bulbs are not replaceable in the light assemblies, however, the assemblies are easily snapped out for replacement. See figure 15A-7 for removal and installation information.

15A-61. ALTERNATOR RESTART SYSTEM.

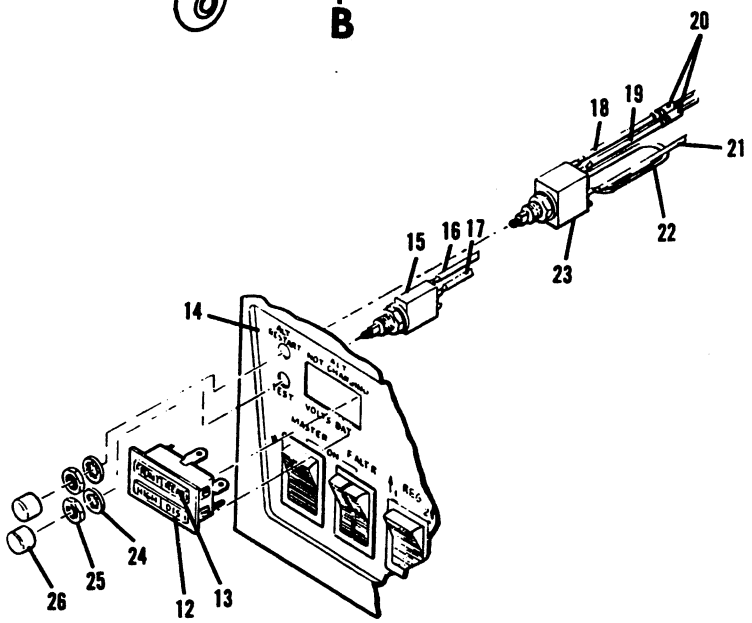
15A-62. DESCRIPTION. Thru aircraft serials 33701398 and F33700045. Alternators will run self-excited if battery contactor should fail, however, a small amount of momentary power is required to start the alternators if they should drop out due to a load surge. A momentary push button switch labeled ALT RESTART mounted adjacent to the master switch, is wired to provide starting power to the alternators when pushed. Should the alternators drop out during a battery system failure due to the actuation of some heavy drain device (flap motor, landing lights, etc.) they may be restarted by momentarily depressing the ALT RESTART button. See figure 15A-7 for removal and installation information. Beginning with 33701399 and F33700046. The alternator system is equipped with a restart push button switch on the instrument panel located adjacent to the warning lights. Also four alkaline dry cell batteries located on the control quadrant support forward of the panel supply power for the system. Depress the alternator restart switch and voltage from the batteries is supplied directly to both alternator fields. Alternators will "pick up" a full load using this excitation system without the benefit of the aircraft storage battery.

15A-63. EMERGENCY ALTERNATOR RESTART SYSTEM FUNCTIONAL TEST. Operation of the emergency alternator restart system should be tested occasionally. Start both front and rear engines and run at approximately 1500 RPM for several minutes. Turn on all electrical equipment to produce a maximum electrical running load condition. The amber "Dis" light should remain off. Momentarily turn off all sections of the Master Switch, then turn on both "ALT" switches. Depress the alternator restart switch for one second, both alternators will pick up the load. Note that fuel and cylinder head temperature gages are operating. The system should now be operating without benefit of the aircraft storage battery. If the system fails to pick up the electrical load, as evidenced by no fuel or cylinder head temperature gage indication, then turn off one of the higher electrical loads, such as landing lights or pitot heat, and depress the alternator restart switch. As the alkaline batteries deteriorate, approximately two years, they are less capable of restarting the alternator. Any time alternators cannot be restarted under full load, the batteries should be replaced.



OVER-AND-UNDER VOLTAGE SENSOR

Detail **A**

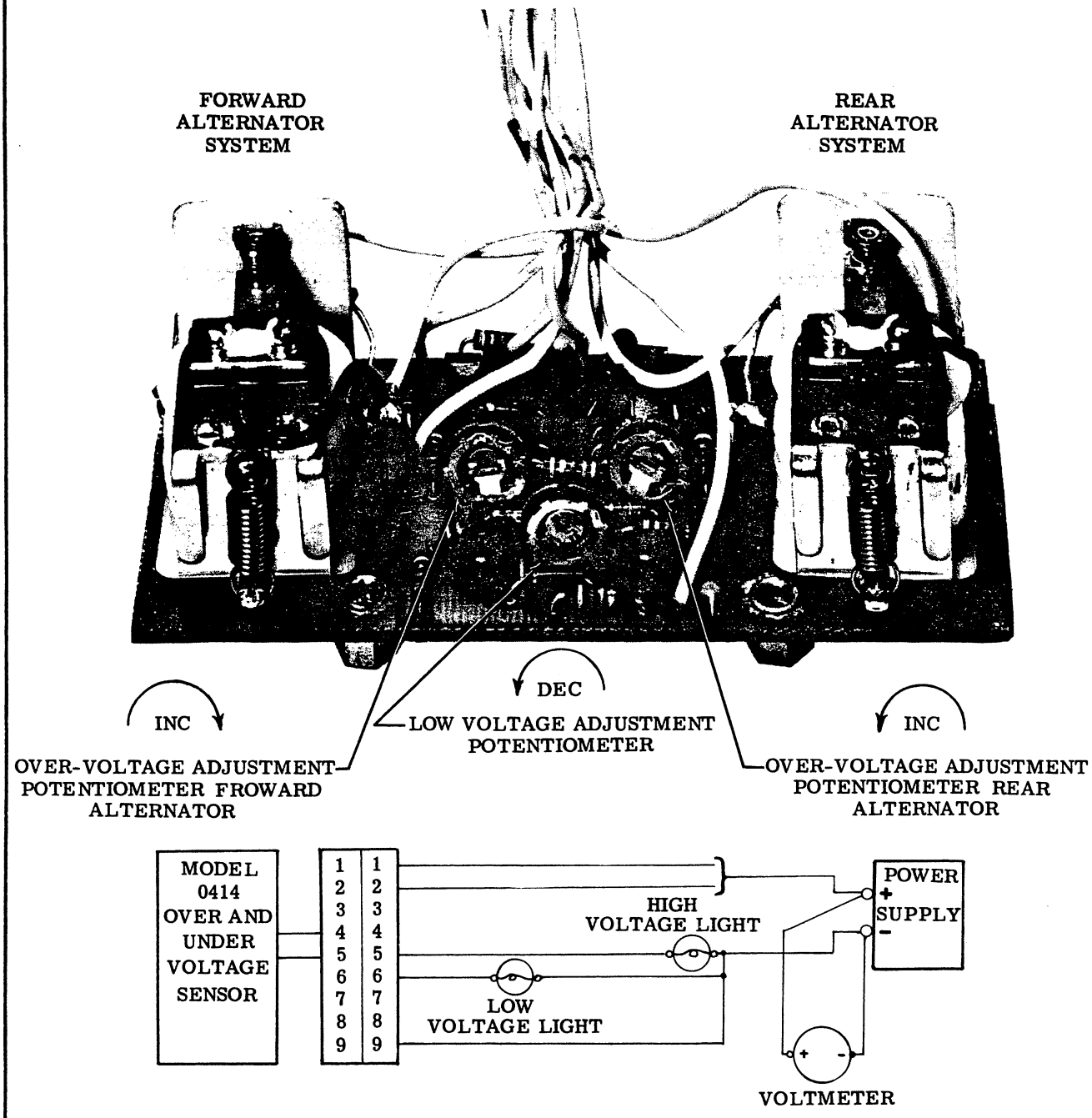


ELECTRICAL SYSTEM WARNING LIGHTS

Detail **B**

1. Ground Wire
2. Potentiometer - High Adjust
3. Potentiometer - Low Adjust
4. Support - Control Quadrant
5. Over-and-Under Voltage Sensor
6. Terminal Board
7. Wire to DIScharge Light
8. Wire to LIGHT TEST Switch
9. Wire to HIGH Light
10. Wire to Circuit Breaker
11. Cover - Voltage Sensor
12. Indicator Light - Voltage
13. Indicator Light - ALTERNATOR OUT
14. Instrument Panel - Lower
15. LIGHT TEST Switch
16. Wire to Voltage Sensor, Pin (1)
17. Wire to Voltage Sensor, Pin (3)
18. Wire to Voltage Regulator #1
19. Wire to Voltage Regulator #2
20. Resistor, 62 Ohm, 1 Watt
21. Jumper Wire
22. Wire to GEN Fuse
23. ALTernator RESTART Switch
24. Lockwasher
25. Nut
26. Push-Button, Switch

Figure 15A-7. Over-and-Under Voltage Warning System (Sheet 1 of 2)



NOTE

Use the wire connected to pin 1 when adjusting the over-voltage sensor for the rear alternator. Use the wire from pin 2 to adjust the over-voltage sensor for the front alternator system. Either wire may be connected to the power supply when adjusting the low voltage sensor.

Figure 15A-7. Over-and-Under Voltage Warning System (Sheet 2 of 2)

CAUTION

At completion of the preceding test, turn on the battery portion of the master switch so the battery can stabilize the system. Operating the electrical system without benefit of battery stabilization is not recommended.

15A-64. AIRCRAFT LIGHTING SYSTEM.

15A-65. DESCRIPTION. The aircraft lighting equipment consists of landing and taxi lights (available in both wings), navigation lights, anti-collision strobe lights, flashing beacon, courtesy lights, interior cabin lighting and instrument panel lights. An ice detector light is available which is installed on the left-hand side of the fuselage and illuminates the left wing. Snap-in type rocker switches are used. These switches have a design feature which permits them to snap into the panel from the cabin side and can subsequently be removed for easy maintenance. These switches also feature spade type slip-on terminals.

15A-66. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
LANDING OR TAXI LIGHT OUT.	Circuit breaker open.	Reset.
	Lamp burned out.	Replace lamp.
	Defective wiring.	Repair wiring.
	Defective switch.	Replace.
	Defective circuit breaker.	Replace.
ONE NAVIGATION LIGHT OUT.	Lamp burned out.	Replace lamp.
	Defective wiring.	Replace wiring.
ALL NAVIGATION LIGHTS OUT.	Circuit breaker open.	Reset.
	Faulty switch.	Replace.
	Defective wiring between circuit breaker and switch.	Repair.
ONE ANTI-COLLISION STROBE LIGHT WILL NOT LIGHT. THRU 1972 MODELS.	Flash tube burned out.	Test with new flash tube. Replace flash tube.
	Faulty wiring.	Test for continuity. Repair or replace.
	Faulty trigger head.	Test with new trigger head. Replace trigger head.
BOTH ANTI-COLLISION STROBE LIGHTS WILL NOT LIGHT. THRU 1972 MODELS.	Circuit breaker open.	Inspect. Reset.
	Faulty power supply.	Listen for whine in power supply to determine if power is operating.
	Faulty switch.	Test for continuity. Repair or replace.
	Faulty wiring.	Test for continuity. Repair or replace.

15A-66. TROUBLE SHOOTING (CONT).

TROUBLE	PROBABLE CAUSE	REMEDY
ONE ANTI-COLLISION STROBE LIGHT WILL NOT LIGHT. BEGINNING WITH 1973 MODELS.	Flash tube burned out.	Test with new flash tube. Replace flash tube.
	Faulty power supply.	Listen for whine in power supply to determine if power is operating.
	Faulty wiring.	Test for continuity. Repair or replace.
	Faulty trigger head.	Test with new trigger head. Replace trigger head.
BOTH ANTI-COLLISION STROBE LIGHTS WILL NOT LIGHT. BEGINNING WITH 1973 MODELS.	Circuit breaker open.	Inspect. Reset.
	Faulty switch.	Test for continuity. Repair or replace.
	Faulty wiring.	Test for continuity. Repair or replace.
FLASHING BEACON DOES NOT LIGHT.	Short circuit in wiring.	Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	Test circuit until short is located. Repair or replace wiring.
	Lamp burned out.	Test lamp with ohmmeter or a new lamp. Replace lamp. If lamp is good, proceed to step 4.
	Open circuit in wiring.	Test circuit from lamp to flasher for continuity. If no continuity is present, repair or replace wiring. If continuity is present, proceed to step 5.
	Defective switch.	Check voltage at flasher with master and beacon switch on. Should read battery voltage. Replace switch. If voltage is present, proceed to step 6.
	Defective flasher.	Install new flasher.
FLASHING BEACON CONSTANTLY LIT.	Defective flasher.	Install new flasher.

15A-66. TROUBLE SHOOTING (CONT).

TROUBLE	PROBABLE CAUSE	REMEDY
DE-ICE, COURTESY OR DOME LIGHT DOES NOT LIGHT.	Circuit breaker open.	Reset
	Lamp burned out.	Replace lamp.
	Faulty switch or wiring.	Repair or replace.
	Faulty lamp socket or circuit breaker.	Replace.
MAP, COMPASS OR FLAP INDICATOR LIGHT DOES NOT LIGHT.	Lamp burned out.	Replace.
	Circuit breaker open.	Reset.
	Rheostat open.	Replace.
	Faulty wiring.	Repair.
	Faulty circuit breaker.	Replace.
ONE OR TWO POST LIGHTS OUT.	Burned out lamp.	Replace lamp.
	Faulty lamp socket or wiring.	Repair or replace.
ALL POST LIGHTS OUT IN CIRCUIT.	Circuit breaker open.	Reset.
	Faulty section in series dropping resistor.	Replace resistor.
	Faulty section in selector switch.	Replace switch.
	Faulty wiring.	Repair wiring.
	Faulty transistor on the transistorized dimmer.	Replace transistor.
POST LIGHTS WILL NOT DIM.	Faulty light dimming transistor.	Test both transistors with new transistor. Replace faulty transistor.
	Open resistor or wiring in minimum intensity end of potentiometer.	Replace resistor or repair wiring.

15A-66. TROUBLE SHOOTING (CONT).

TROUBLE	PROBABLE CAUSE	REMEDY
ELECTROLUMINESCENT PANELS WILL NOT LIGHT.	Short circuit in wiring.	Repair wiring.
	Defective wiring.	Repair wiring.
	Defective rheostat or resistor.	Check input voltage at inverter (power pack) with master switch on. Voltmeter should give a smoothly varied reading over the entire control range of the rheostat. If no voltage is present or voltage has a sudden drop before rheostat has been turned full counterclockwise, replace rheostat.
	Defective inverter.	Check output voltage at inverter with ac voltmeter. Should read about 125 volts ac with rheostat set for full bright. Replace interior.

15A-67. LANDING AND TAXI LIGHTS.

15A-68. DESCRIPTION. Thru 1971 Models the landing and taxi lights are mounted in the leading edge of the left wing. The landing lamp is mounted on the inboard side and adjusted to throw its beam further forward than the taxi light. Beginning with 1972 Models the landing and taxi lights are mounted in the lower nose cowl. Both lamps are used for landing but only the right for taxi. Lights are controlled by a split rocker switch on the instrument panel.

15A-69. REMOVAL AND INSTALLATION (Refer to figure 15A-8.)

a. THRU AIRCRAFT SERIALS 33701398 AND F337-00045.

1. Remove the screws securing the landing light window assembly and the assembly will then be free for removal.
2. Remove the four attaching screws from the bracket assembly and remove the bracket.

NOTE

Do not reposition the landing and taxi light adjustment screws. If readjustment is required refer to figure 15A-8.

3. Remove the two screws securing the wiring to the lamp contacts and remove the lamp.
4. Install new lamp and reassemble.

b. BEGINNING WITH AIRCRAFT SERIALS 33701399 AND F33700046.

1. Remove screws securing the support assembly to the cowl and pull assembly forward from the cowl.
2. Remove the screws securing the wiring to the lamp contacts.
3. Remove the tinnerman screws from the bracket and remove bracket and lamp.
4. Install new lamp and reassemble.

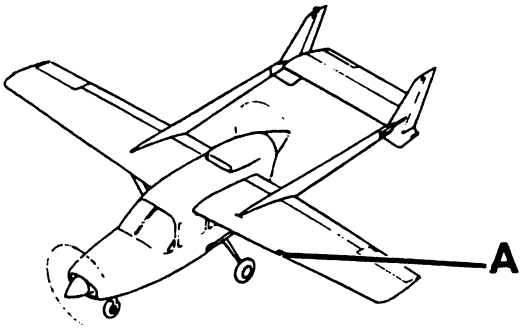
15A-70. NAVIGATION LIGHTS.

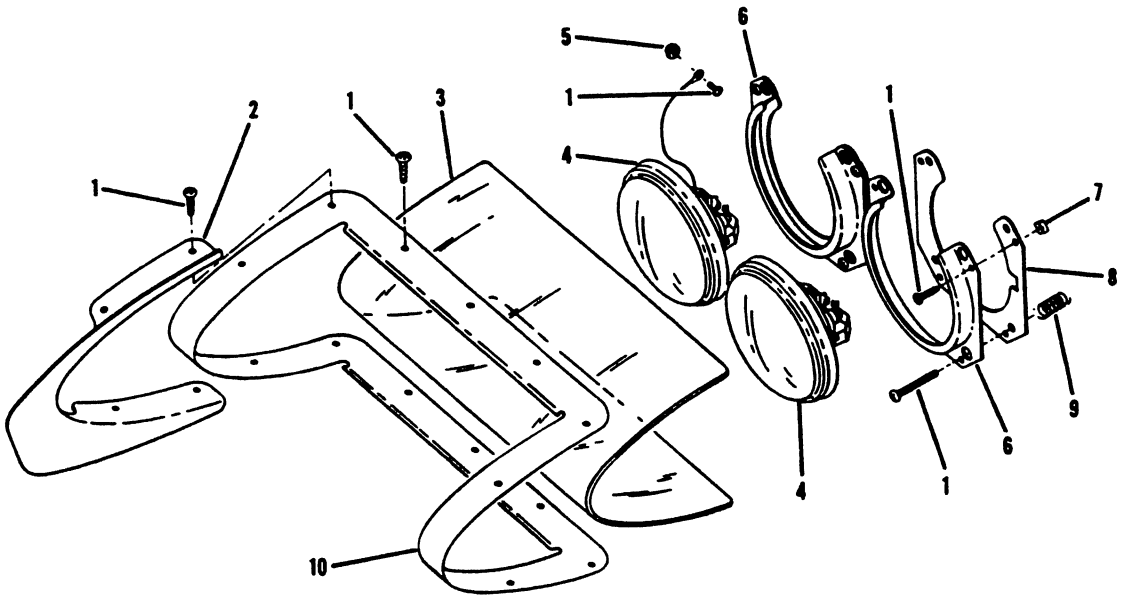
15A-71. DESCRIPTION. The navigation lights are located on each wing tip and the right hand lower fin tip. Operation of the lights is controlled by a switch on the pilots switch panel. A plastic light detector on each wing tip allows the pilot to determine if the lamps are working properly during flight.

15A-72. REMOVAL AND INSTALLATION. Figure 15A-9 shows in detail all components of the navigation lights. Use this figure as a guide for removal and installation.

15A-73. ANTI-COLLISION STROBE LIGHTS.

15A-74. DESCRIPTION. Beginning with 1970 models white strobe lights may be installed on the aircraft. The lights are located on each wing tip and mounted in the navigation light retainer. Beginning with 1973 models a light is also installed in the lower right hand fin tip with the navigation light. The lights are vibration resistant and operate on the principle of a capacitor discharge into a xenon tube producing an extremely high intensity flash. Energy is supplied to the strobe lights from a single power supply located on the under right side of the aft cabin top thru 1972 models. Beginning with 1973 models each strobe light is equipped with an individual power supply, one on each wing tip rib inside the tip assembly and one in the horizontal stabilizer on the right hand side.

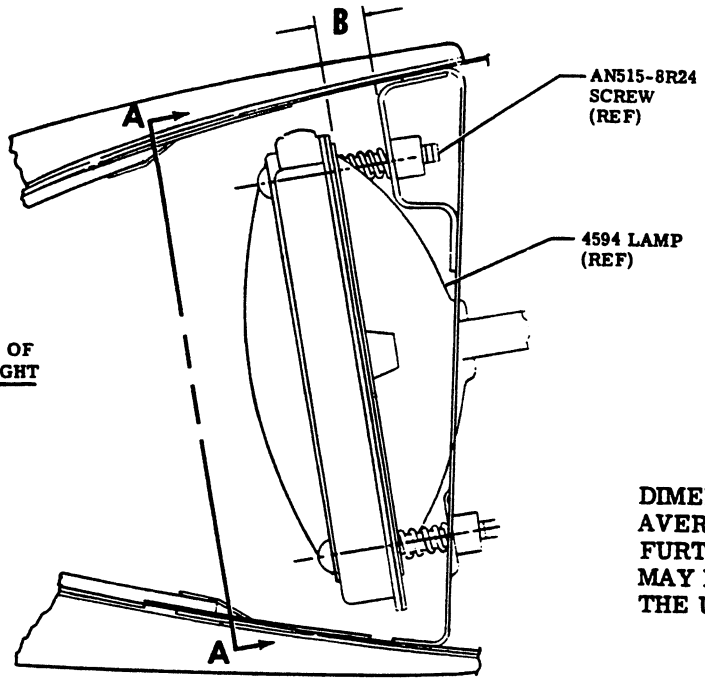




Detail **A**
THRU 33701398
AND F33700045

1. Screw
2. Shield
3. Window
4. Landing Light
5. Nut
6. Bracket
7. Tinnerman Nut
8. Retainer Plate
9. Spring
10. Retainer

Figure 15A-8. Landing and Taxi Light Installation (Sheet 1 of 3)



SIDE VIEW OF
LANDING LIGHT

NOTE
DIMENSIONS SHOWN ARE AVERAGE SETTINGS. FURTHER ADJUSTMENTS MAY BE MADE TO SUIT THE USER'S NEEDS.

ADJUSTMENT CHART						
SCREW NO.	1	2	3	4	5	6
DIMENSION B (RIGHT)	0.60	1.00	0.50	0.50	0.80	1.40
DIMENSION B (LEFT)	0.60	1.00	0.50	0.50	0.80	1.40

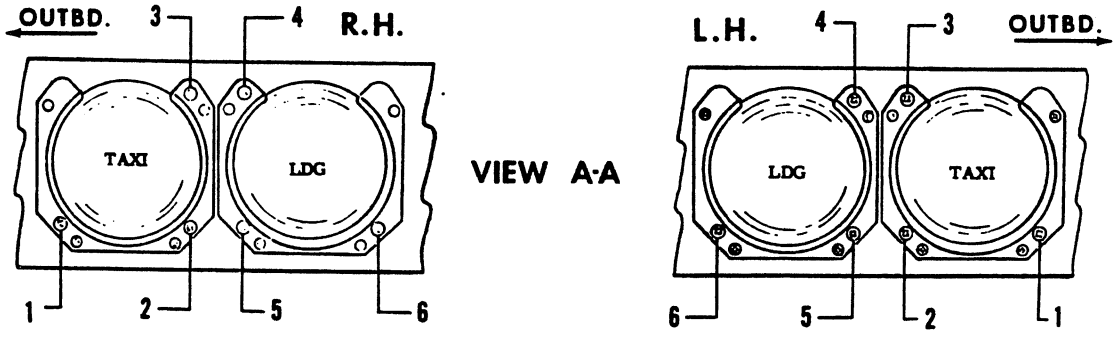
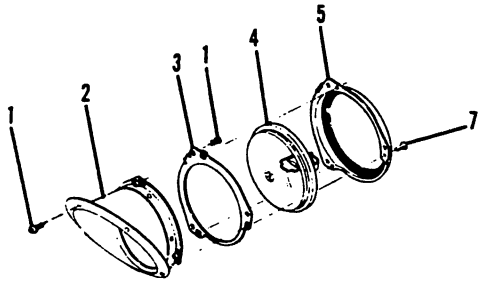
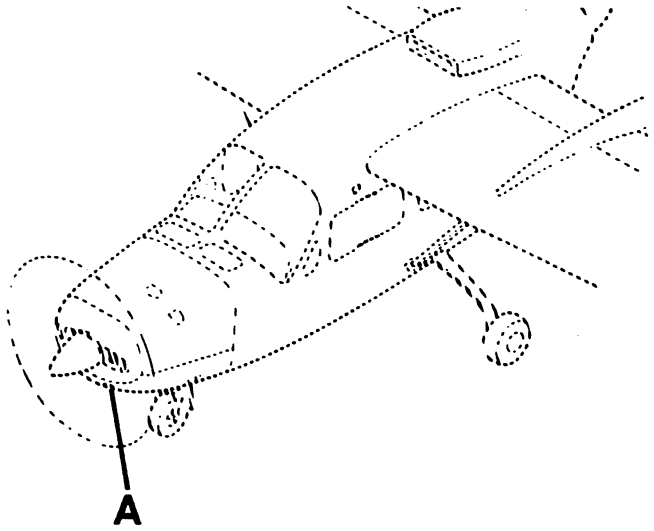


Figure 15A-8. Landing and Taxi Light Installation (Sheet 2 of 3)

NOTE

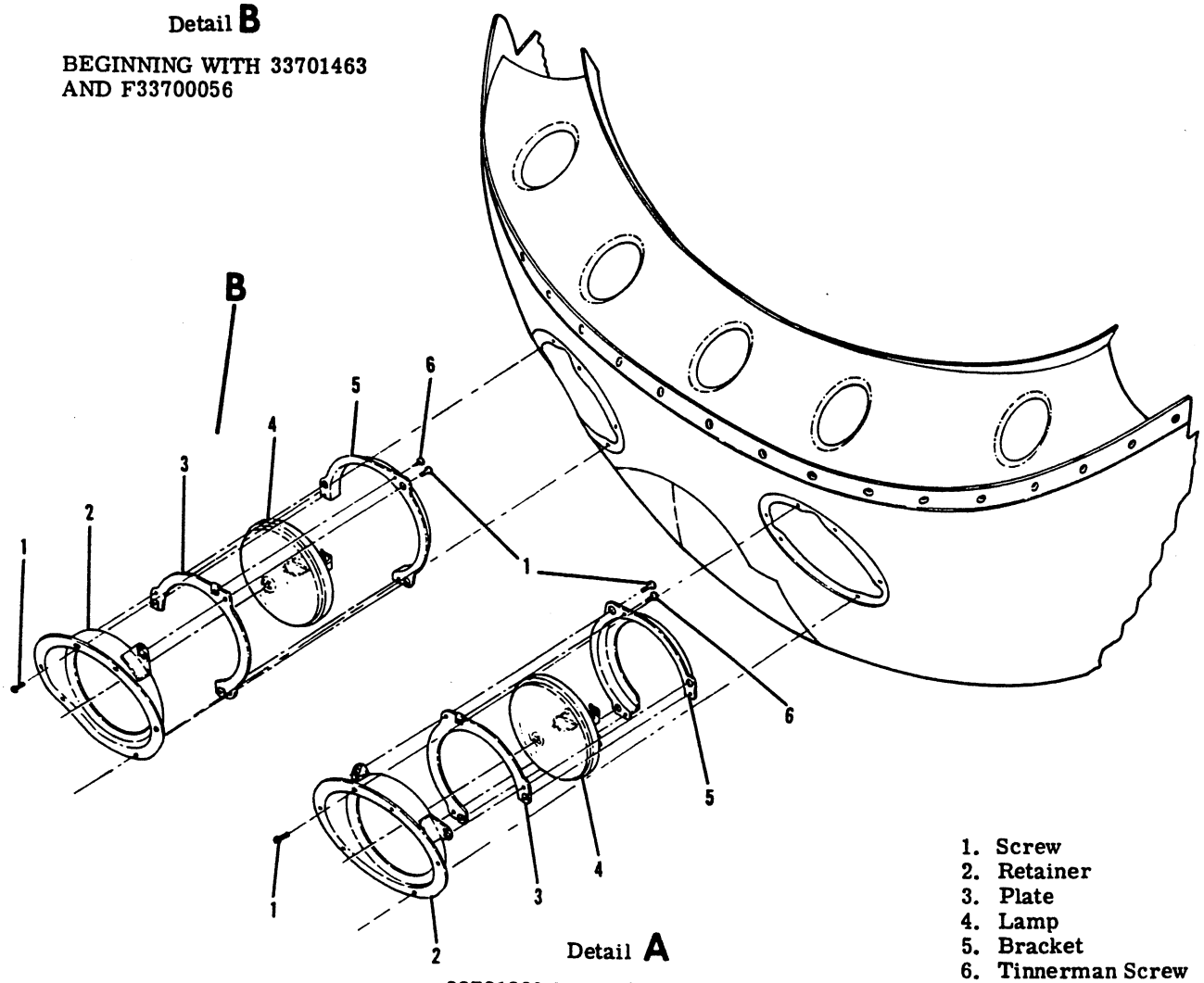
Should further adjustment be desired, washers may be added between retainer (2) and Plate (3).





Detail **B**

BEGINNING WITH 33701463 AND F33700056



Detail **A**

33701399 THRU 33701462 AND F33700046 THRU F33700055

1. Screw
2. Retainer
3. Plate
4. Lamp
5. Bracket
6. Tinnerman Screw
7. Nose Cap

Figure 15A-8. Landing and Taxi Light Installation (Sheet 3 of 3)

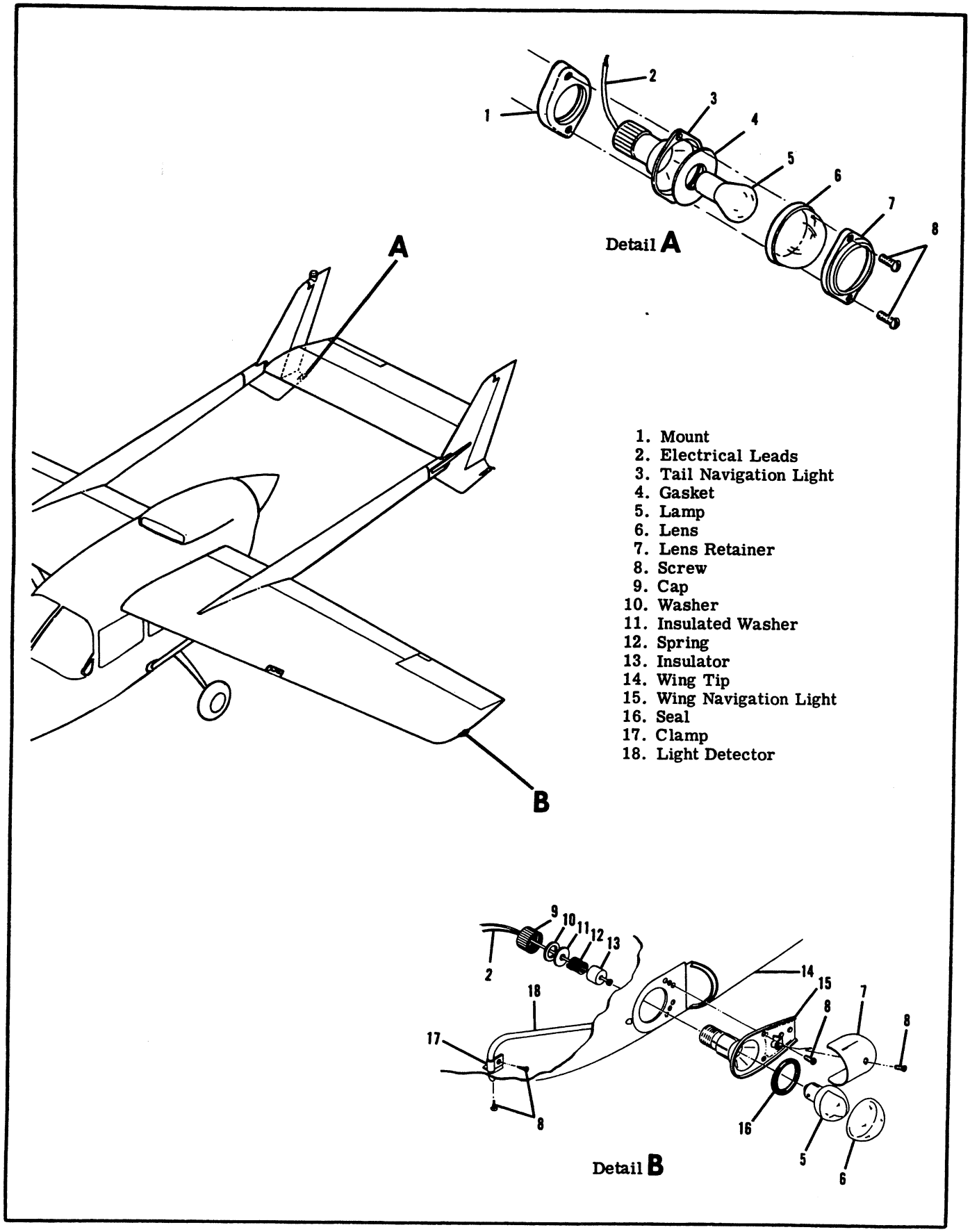
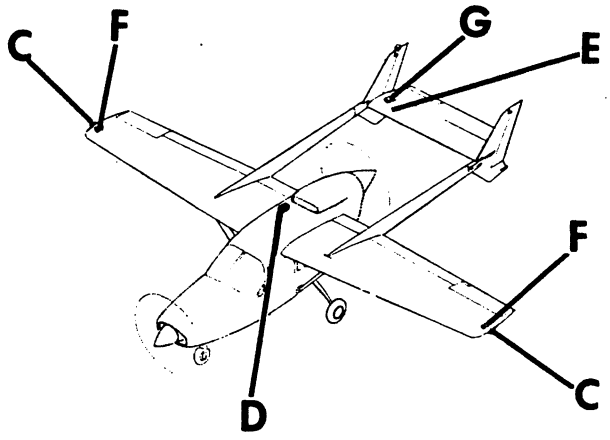
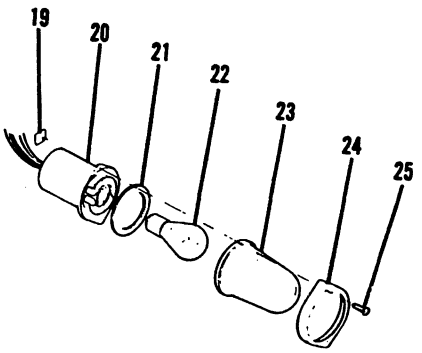
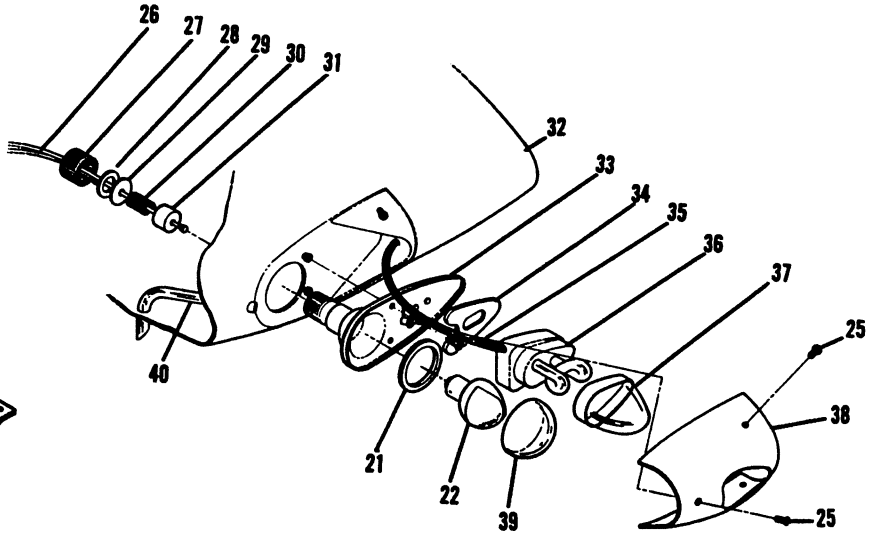


Figure 15A-9. Navigation and Strobe Light Installation (Sheet 1 of 3)

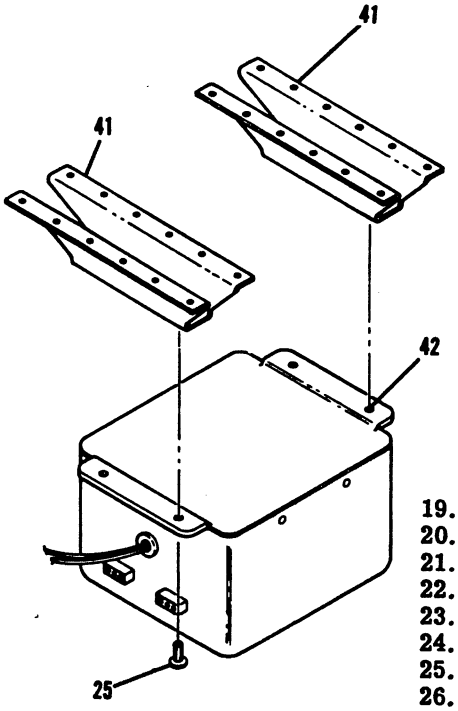




Detail **E**
BEGINNING WITH 33701463
AND F33700056



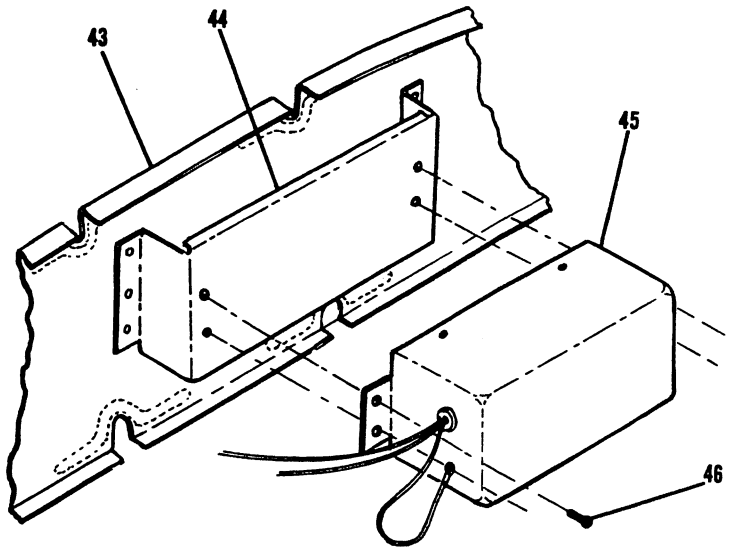
Detail **C**
33701195 THRU 33701462 AND
F33700001 THRU F33700055



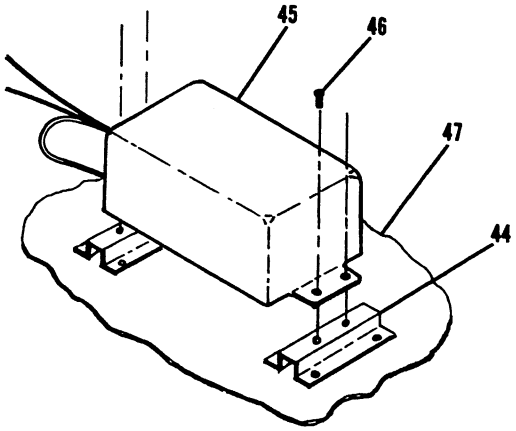
Detail **D**
33701195 THRU 33701462 AND
F33700001 THRU F33700055

19. Nut Plate
20. Lamp Base and Lamp (Strobe)
21. Gasket
22. Lamp - Navigation Light
23. Lens - Strobe and Navigation Light
24. Retainer
25. Screw
26. Electrical Leads
27. Cap
28. Washer
29. Insulated Washer
30. Spring
31. Insulator
32. Wing Tip
33. Lamp Base
34. Spacer
35. Lead - Strobe Light
36. Strobe Light
37. Lens - Strobe Light
38. Retainer
39. Lens - Navigation Light
40. Detector - Navigation Light
41. Bracket
42. Strobe Power Supply

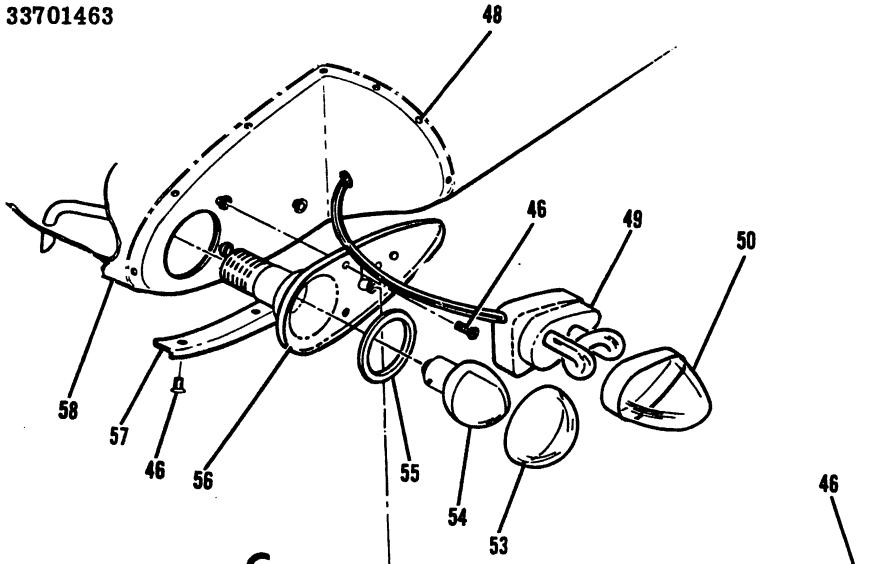
Figure 15A-9. Navigation and Strobe Light Installation (Sheet 2 of 3)



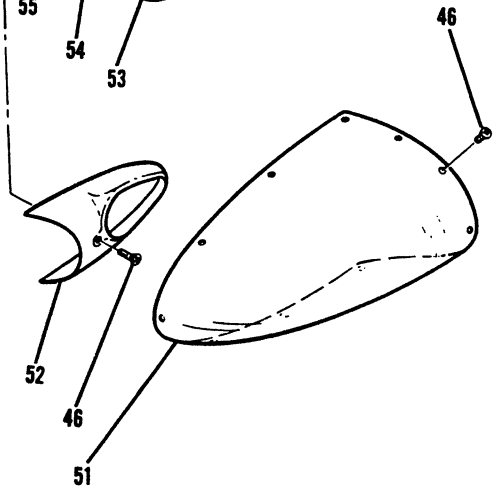
Detail F
BEGINNING WITH 33701463
AND F33700056



Detail G
BEGINNING WITH 33701463
AND F33700056



Detail C
BEGINNING WITH 33701463
AND F33700056



43. Wing Tip Rib
44. Bracket
45. Power Supply
46. Screw
47. Horizontal Stabilizer Skin (Lower)
48. Nut Plate
49. Strobe Light
50. Lens - Strobe Light
51. Lens Retainer
52. Retainer
53. Lens - Navigation Light
54. Lamp - Navigation Light
55. Gasket
56. Lamp Base
57. Deflector
58. Wing Tip

Figure 15A-9. Navigation and Strobe Light Installation (Sheet 3 of 3)

15A-75. REMOVAL AND INSTALLATION. Refer to figure 15A-9 as a guide for removal and installation.

WARNING

This anti-collision system is a high voltage device. Do not remove or touch tube assembly while in operation. Wait at least 5 minutes after turning off power before starting work.

15A-76. FLASHING BEACON LIGHT.

15A-77. DESCRIPTION. The flashing beacon is an iodine-vapor lamp, electrically switched by a solid-state flasher assembly that is located within the vertical fin tip. The switching frequency of the flasher assembly operates the beacon at approximately 45 flashes per minute.

15A-78. REMOVAL AND INSTALLATION. Refer to figure 15A-10 for removal and installation of flashing beacon light components.

15A-79. COURTESY LIGHT

15A-80. DESCRIPTION. Thru 1972 models the courtesy light consists of one light located on the underside of the right wing to provide ground lighting around the cabin area. The courtesy light has a clear lens and is controlled by a lside switch labeled, "Dome-Courtesy" and "Dome," located on the right-hand rear door post. The switch also operates the dome lights. Beginning with 1973 models the courtesy light is located on the lower, inside corner of the upper half of the cabin door. The light is controlled by a slide switch located just forward of the dome light.

15A-81. REMOVAL AND INSTALLATION. Refer to figure 15A-11 for removal and installation of courtesy light components.

15A-82. MAP LIGHTS.

15A-83. DESCRIPTION. White map lighting and red, non-glare instrument lighting are provided by an adjustable light mounted on the forward part of the left door post. The lights are controlled by a three-position type switch, with red, white and off positions. The map light contains a white bulb for general purpose lighting and a red bulb for general purpose lighting and a red bulb for adjustable instrument lighting. The intensity of the red bulb is controlled by a rheostat located on the instrument panel.

15A-84. REMOVAL AND INSTALLATION (Refer to figure 15A-12.)

a. For installation of defective lamp slide the hood and lens from the map light assembly and remove the bayonet type bulb.

b. For removal of the map light assembly remove the screws from the front doorpost shield. Remove the nut and washer attaching the map light to the shield. Remove the ground wire from the map light screw. Detach the wires at the quick disconnect fasteners and remove the map light assembly.

15A-85. INSTRUMENT FLOOD LIGHTS.

15A-86. DESCRIPTION. Standard instrument flood lighting is provided by four lamps mounted in the glare shield over the instrument panel. A movable red lens offers either red or white instrument lighting. The intensity of the instrument flood lighting is controlled by a rheostat mounted on the instrument panel.

15A-87. REMOVAL AND INSTALLATION.

a. Remove the two screws holding the flood lamp access plate to the underside of the glare shield.

b. Remove the access plate.

c. Pull the lamp socket assembly through the access hole.

d. Install the defective lamp and reinstall socket assembly.

15A-88. ELECTROLUMINESCENT PANEL LIGHTING.

15A-89. DESCRIPTION. Electroluminescent panel lighting consists of three panels; the switch panel, wing flap control panel and the heater control panel. Power required for the electroluminescent panels is an alternating current of 115 volts 400 Hz. This is provided by a 12-ounce, solid-state inverter located behind the instrument panel on the left-hand side. The intensity of the electroluminescent panel lighting is controlled by a rheostat located on the switch panel. These electroluminescent panels have an expected life of over 16,000 hours and no replacement should be necessary during the life of the aircraft.

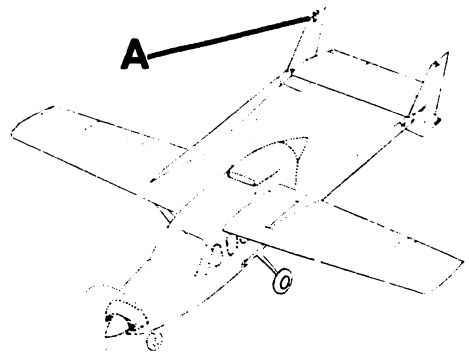
15A-90. TRANSISTORIZED LIGHT DIMMING.

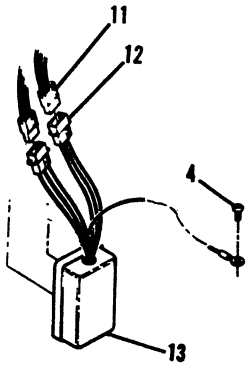
15A-91. DESCRIPTION. A remotely located, two-circuit, transistorized dimmer is installed as standard equipment to control the instrument panel lighting. Two rheostats, one inch in diameter, are mounted on the instrument panel. These rheostats control the transistors which in turn control the lamp voltage. The transistorized light dimming system makes it possible to use the same rheostats regardless of the optional equipment lamp load. The rheostat on the left, controls the instrument post lights and the instrument panel flood lighting. This rheostat has a push-pull switch which in the forward, or "in" position, controls the post lighting system. While in the "out" position the rheostat controls the glare shield flood lights. Both systems do not operate at the same time. The right rheostat knob controls the electroluminescent switch, wing flap and heater control panels.

15A-92. REMOVAL AND INSTALLATION. Refer to figure 15A-13 as a guide for removal and installation of transistorized light dimming components.

15A-93. POST LIGHTS.

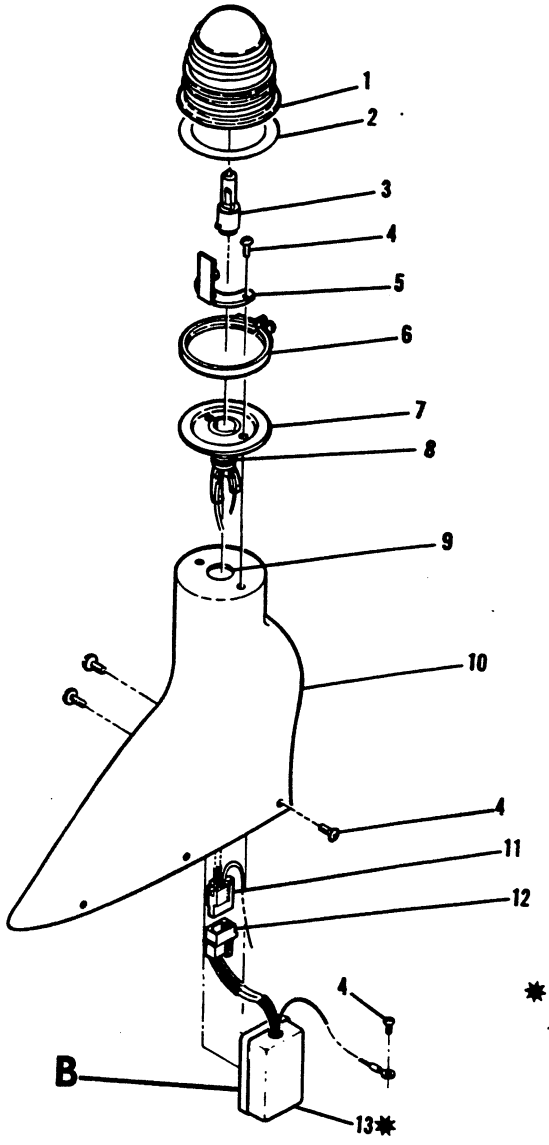
15A-94. DESCRIPTION. As optional equipment individual post lights are available for non-glare instrument lighting. The post light consists of a cap and clear lamp assembly with a blue tinted lens. The intensity of the post lighting is controlled by a





Detail **B**

BEGINNING WITH 33701463
AND F33700056



Detail **A**

1. Dome
2. Gasket
3. Lamp
4. Screw
5. Baffle
6. Clamp Assembly
7. Plate-Mounting
8. Socket Assembly
9. Nut Plate
10. Tip Assembly-Fin
11. Housing - Plug
12. Housing Cap
13. Flasher Assembly

✱THRU AIRCRAFT 33701462
AND F33700055

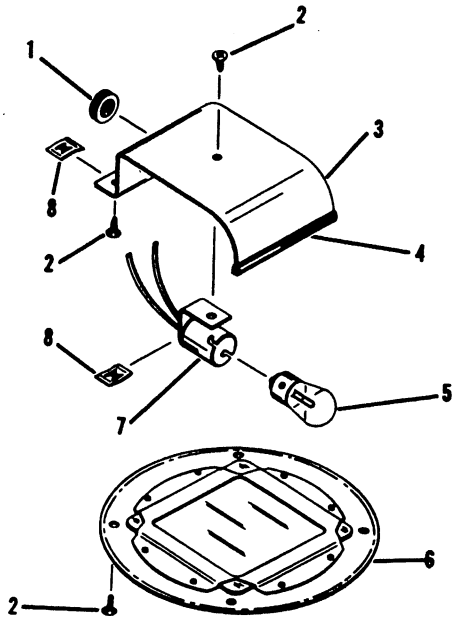
NOTE

When inserting lamp into socket always use a handkerchief or a tissue to prevent getting fingerprints on lamp.

CAUTION

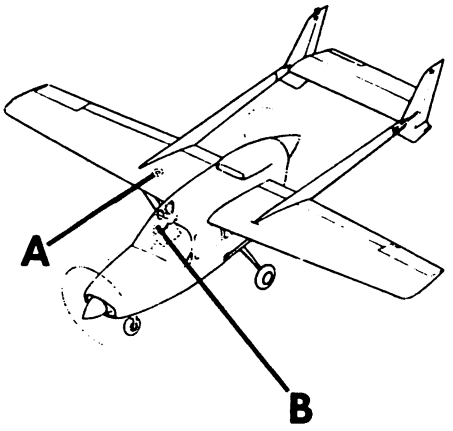
Fingerprints on lamp may shorten the life of the lamp.

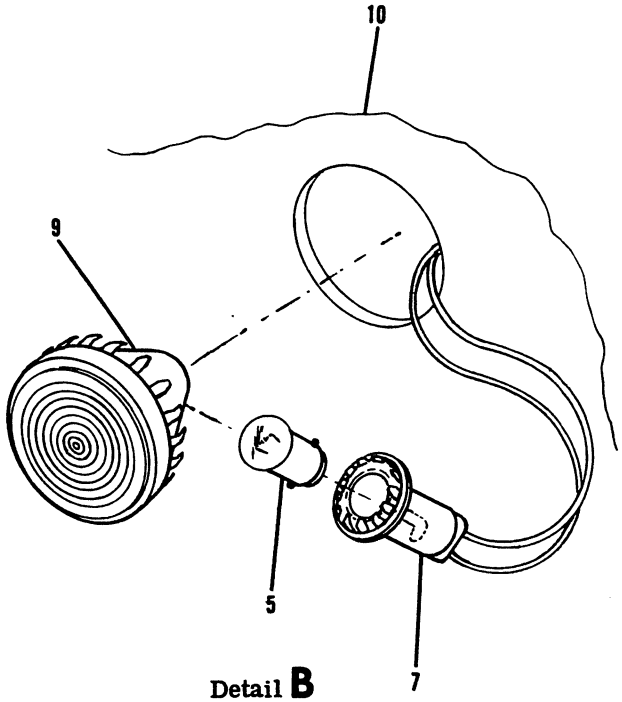
Figure 15A-10. Flashing Beacon Light Installation



Detail **A**

THRU 33701462 AND F33700055





Detail **B**

BEGINNING WITH 33701463
AND F33700056

1. Grommet
2. Screw
3. Shield
4. Channel
5. Lamp
6. Plate
7. Socket
8. Tinnerman Nut
9. Lens Assembly
10. Cabin Door (Upper)

Figure 15A-11. Courtesy Light Installation

rheostat mounted on the instrument panel. Refer to section 14 for illustration of instrument post lights.

15A-95. REMOVAL AND INSTALLATION. For removal of the post lamp slide the cap and lens assembly from the base. Slide the lamp from the socket and replace.

15A-96. DOME LIGHTS.

15A-97. DESCRIPTION. The dome light is located on the overhead console and controlled by a switch located just forward of the light. This switch also controls the courtesy light on the door. Light has a snap on lens for easy removal.

15A-98. COMPASS AND RADIO DIAL LIGHTS.

15A-99. DESCRIPTION. The compass and radio dial lights are contained within the individual units. The light intensity is controlled by the instrument panel light rheostat.

15A-100. AUDIO SWITCH LIGHTING.

15A-101. DESCRIPTION. Beginning with 1972 models the audio switches are located on the glare shield. Switches are push-button type. Switch lighting is controlled by a rheostat located on the glare shield below the switches.

15A-102. CONTROL WHEEL MAP LIGHT.

15A-103. DESCRIPTION. Thru 1971 models as optional equipment, a control wheel map light may be installed on the Model 337. The map light is located on the underside of the control wheel and the intensity is controlled by a thumb-operated potentiometer. For dimming, the potentiometer should be turned clockwise. Beginning with 1972 Models the control wheel map light is internally mounted in the control wheel. A rheostat switch located on the forward side of the control wheel controls the map light.

15A-104. REMOVAL AND INSTALLATION. (Refer to figure 15A-14.)

a. THRU AIRCRAFT SERIALS 33701398 AND F337-00045.

1. For easy access to the map light assembly, rotate the control wheel 90°.
2. Remove the four screws from the map light circuit board. The map light assembly will then be free for removel from the control wheel.
3. Free the printed circuit board from the map light housing and unsolder the leads of the defective lamp from the circuit board.
4. Replace lamp and resolder. Spot-cement bulb to board with RTV or similar adhesive.

b. AIRCRAFT SERIALS 33701399 THRU 33701440 AND F33700046 THRU F33700055.

1. Disconnect electrical cable connector on aft side of the control wheel.
2. Remove the screws securing the control wheel back plate to the control wheel tube adapter and remove wheel.

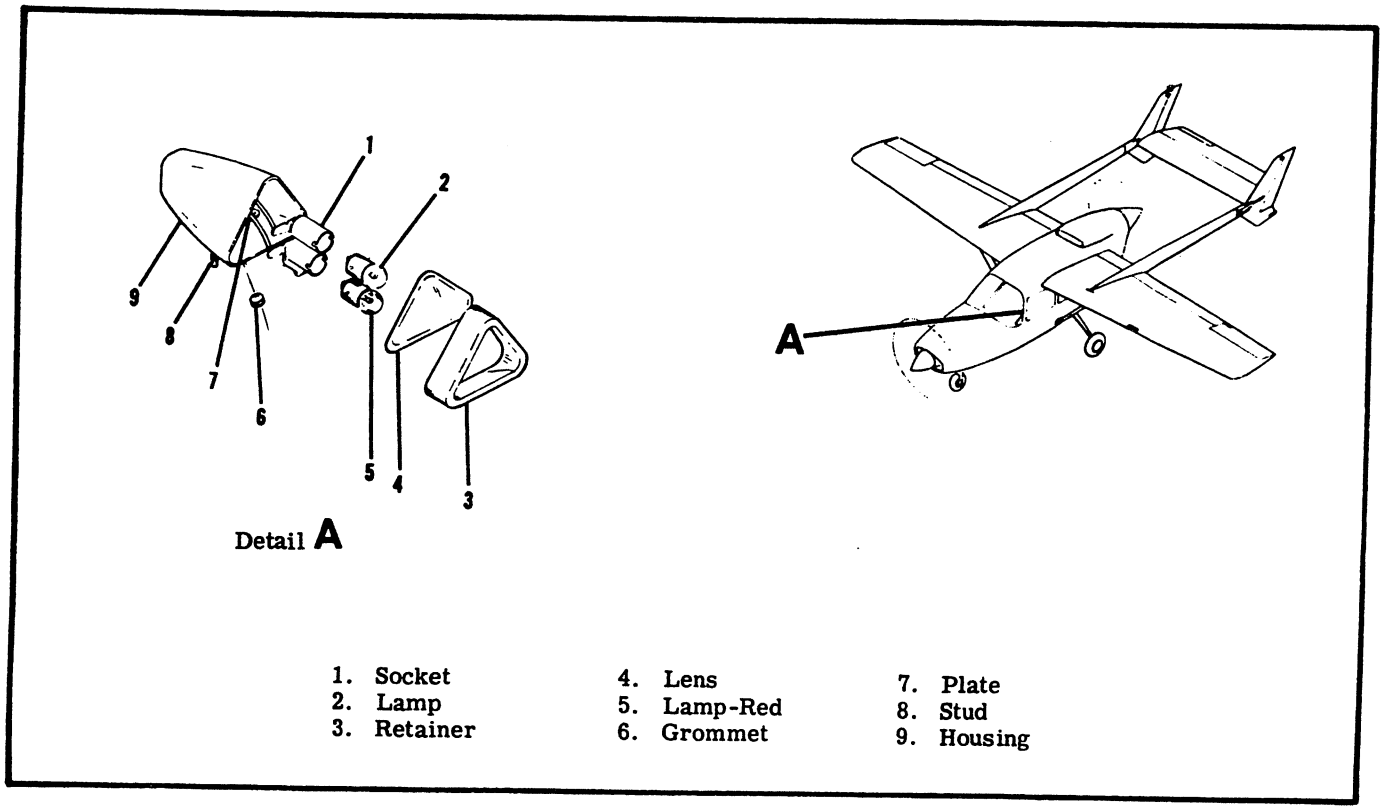
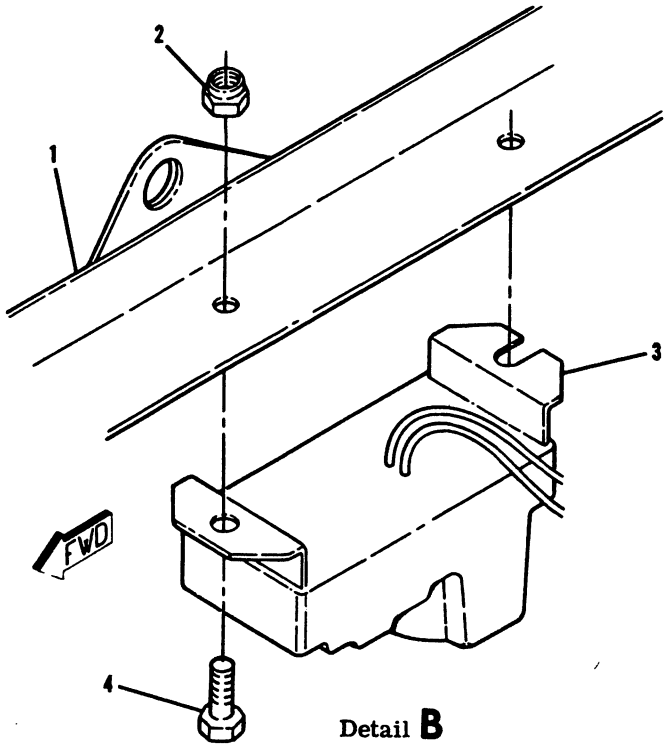
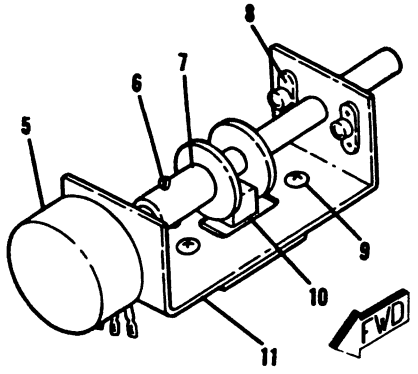


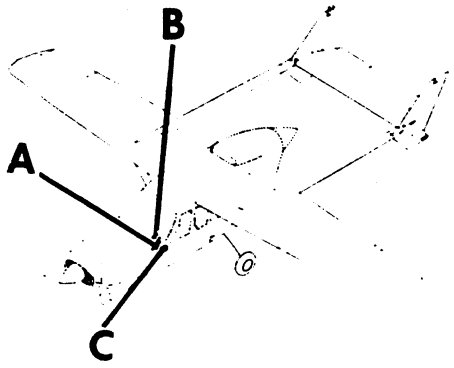
Figure 15A-12. Map Light Installation

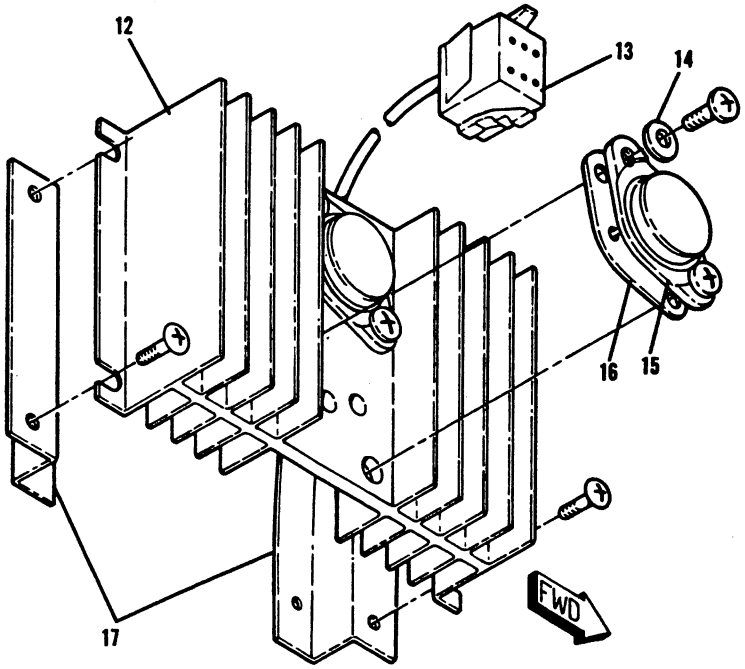


Detail **B**



Detail **A**

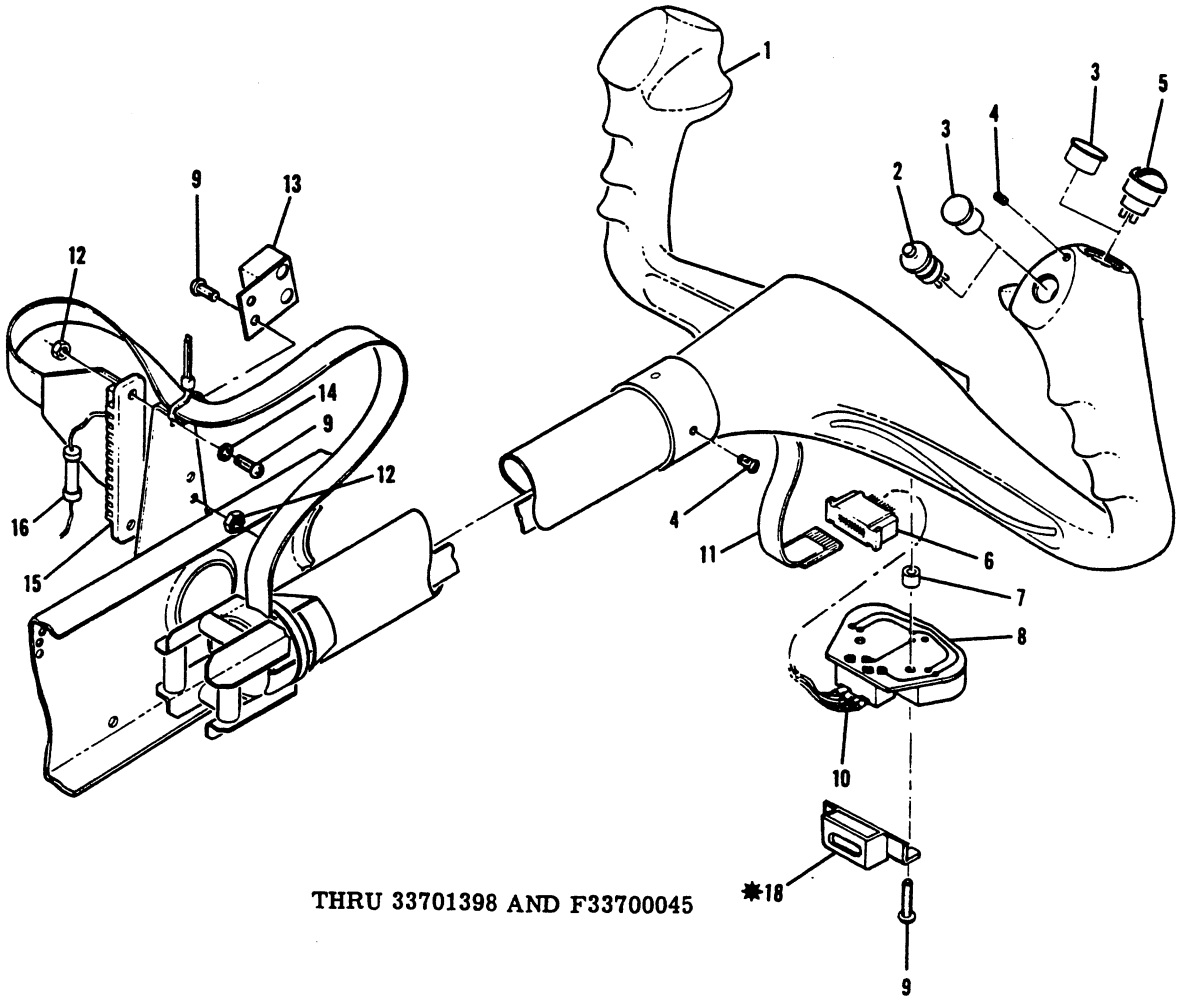




Detail **C**

1. Support
2. Locknut
3. Inverter
4. Bolt
5. Potentiometer
6. Cotter Pin
7. Shaft
8. Nutplate
9. Screw
10. Switch
11. Bracket Assembly
12. Heat Sink
13. Housing-Socket
14. Washer
15. Transistor
16. Mica Washer
17. Bracket

Figure 15A-13. Transistorized Light Dimming and Electroluminescent Panel Light Installation

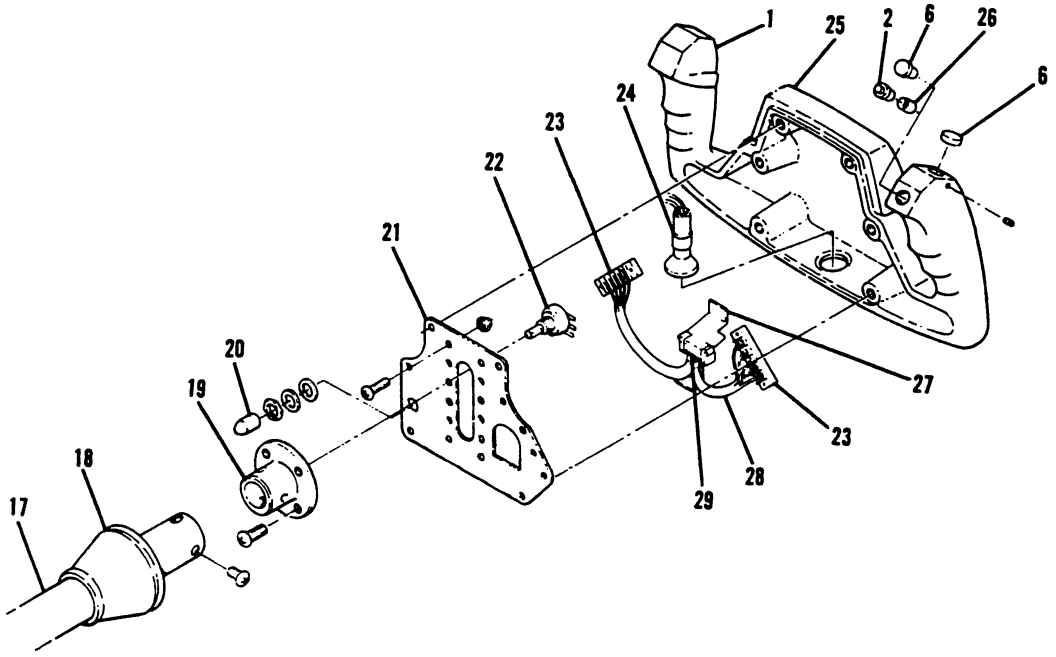


THRU 33701398 AND F33700045

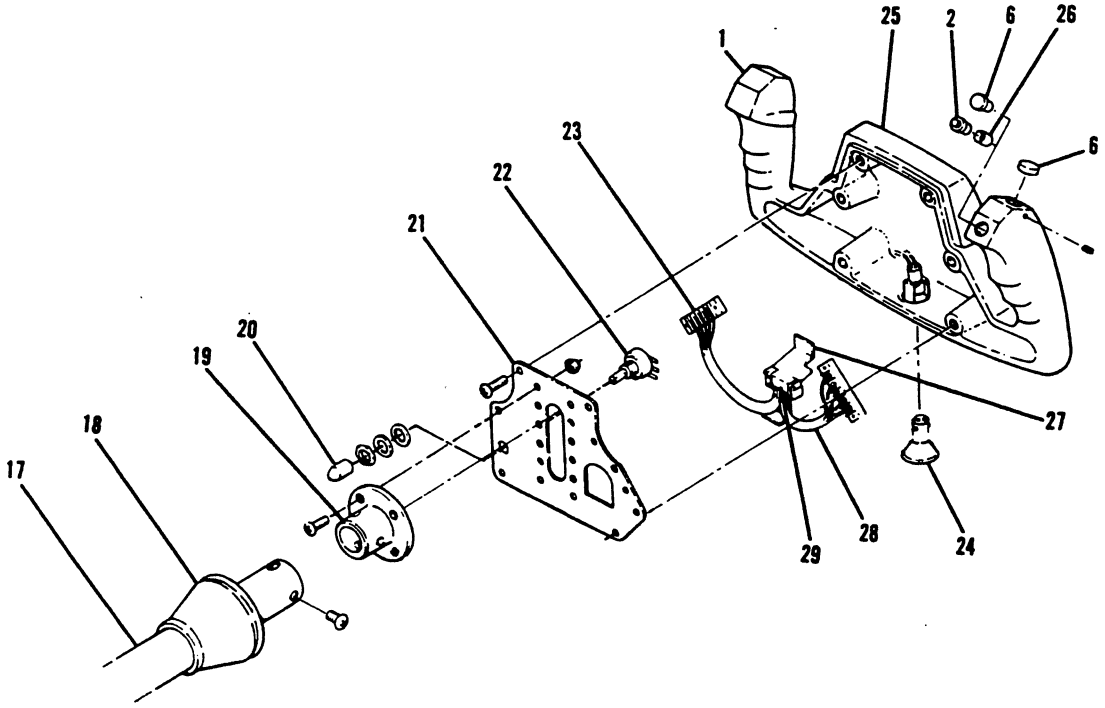
*BEGINNING WITH AIRCRAFT SERIAL 33701390

1. Control Wheel
2. Mike Switch
3. Plug Button
4. Set Screw
5. Trim Switch
6. Plug
7. Spacer
8. Map Light
9. Screw
10. Wire Leads
11. Cable Assembly
12. Nut
13. Block
14. Washer
15. Terminal
16. Fuse
17. Tube
18. Cover
19. Adapter
20. Rubber Cover
21. Plate
22. Map Light Rheostat
23. Terminal Block
24. Map Light
25. Pad
26. Insulator
27. Bracket
28. Cable
29. Connector

Figure 15A-14. Control Wheel Map Light Installation (Sheet 1 of 2)

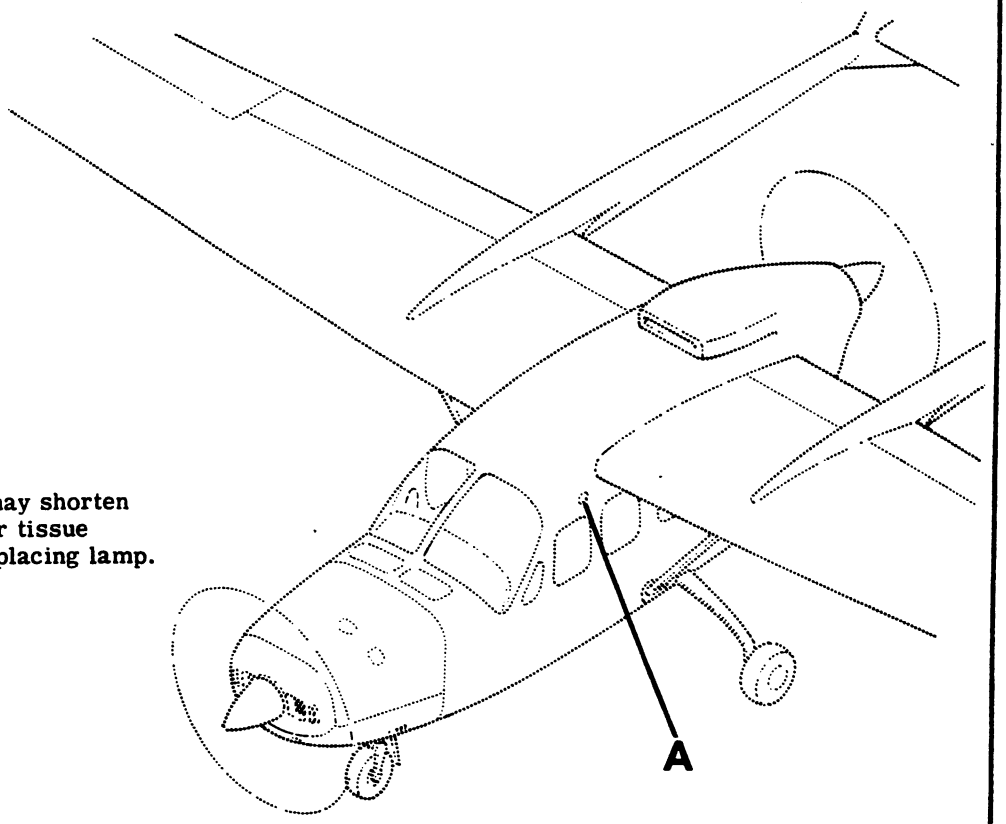


33701399 THRU 33701440 AND
F33700046 THRU F33700055



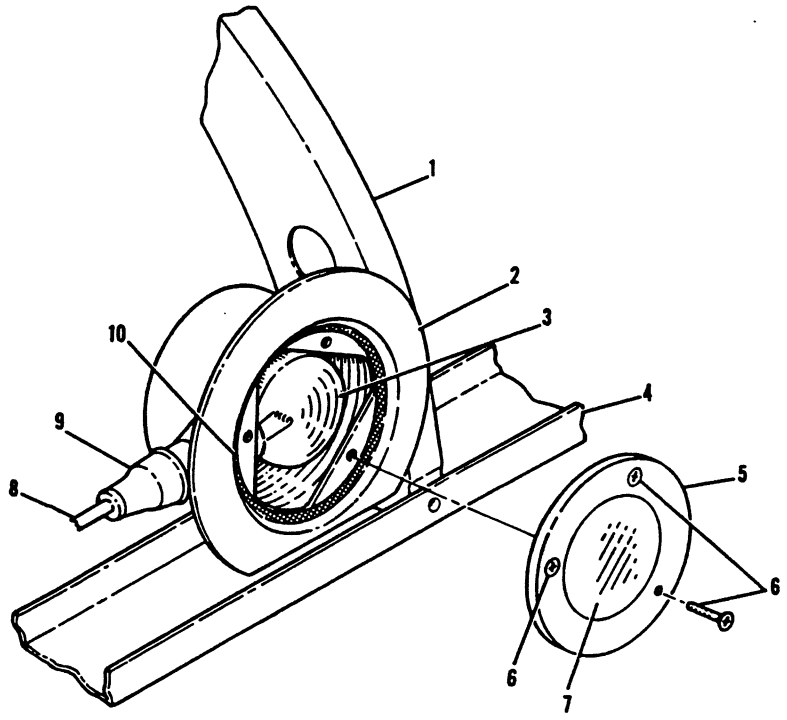
BEGINNING WITH 33701441
AND F33700056

Figure 15A-14. Control Wheel Map Light Installation (Sheet 2 of 2)



NOTE

Fingerprints on lamp may shorten life of lamp. A cloth or tissue should be used when replacing lamp.



Detail **A**

1. Bulkhead
2. Housing
3. Lamp
4. Channel
5. Ring-lens attaching
6. Screw
7. Lens
8. Wire Leads
9. Boot
10. Seal

Figure 15A-15. Ice Detector Light Installation

3. Remove the screws securing plate to the control wheel.

4. Disconnect socket from map light lamp and reflector unit.

5. Remove lamp and reflector unit.

NOTE

Lamp and reflector unit are bonded to the control wheel.

CAUTION

Care must be taken in removing excess bonding material, (do not hammer on control wheel) as control wheel could be damaged.

6. Using Conley Weld C1 and C2 or Hysol 5095 and 3673 bond new lamp and reflector unit to the control wheel.

7. To reassemble, reverse this procedure.

c. BEGINNING WITH AIRCRAFT SERIALS 33701441 AND F33700056. To remove, push upward on the lamp and turn. The lamp and reflector is replaced as a unit.

15A-105. ICE DETECTOR LIGHT.

15A-106. DESCRIPTION. The ice detector light is installed to facilitate the detector of wing ice at night or during reduced visibility. The light is mounted on the upper left fuselage forward of the wing and positioned to illuminate the leading edge of the wing. A rocker type switch on the switch panel controls the light.

15A-107. REMOVAL AND INSTALLATION. (Refer to figure 15A-15.)

a. Remove screws securing lens and remove lens.
b. Remove lamp and replace with new lamp.
c. Reinstall lens.

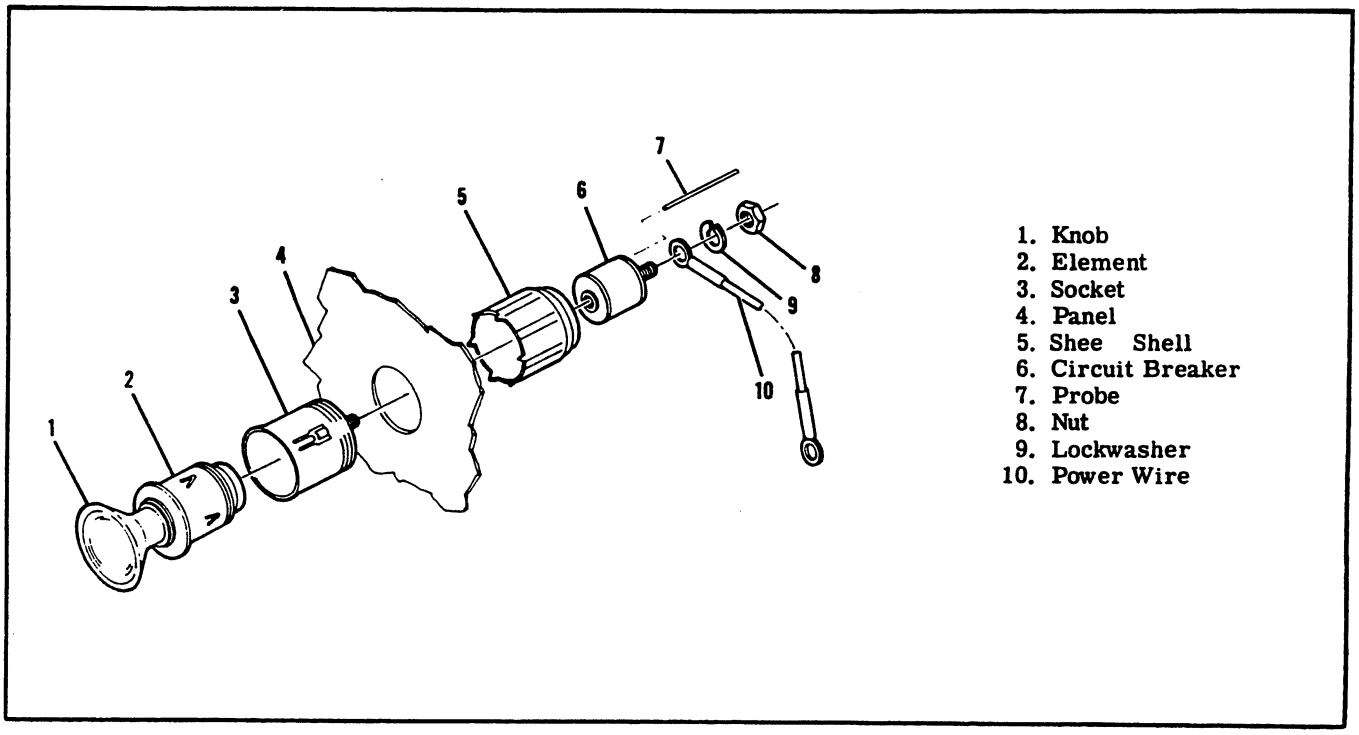
15A-108. LANDING GEAR INDICATOR LIGHTS.

15A-109. DESCRIPTION. Two position indicator lights show that the gear is either up or down and locked. The lights are "press-to-test" type. The gear-down indicator light (green) has two test positions; with the light pushed in half-way and either throttle retarded, the gear warning horn should sound, and with the light pushed full in, the light should illuminate. The gear-up indicator light (amber) has only one test position; with the light pushed full in, it should illuminate. The indicator lights contain dimming shutters for night operation.

15A-110. REMOVAL AND INSTALLATION. Refer to figure 15A-18 for removal and installation of components.

15A-111. STALL WARNING SYSTEM.

15A-112. DESCRIPTION. The stall warning circuit consists of a stall and gear warning horn and actuating switch. The switch is installed in the leading edge of the left wing and is actuated by airflow over the surface of the wing. The switch will close as a stall condition is approached. This condition actuates the warning horn which is attached to the left hand instrument panel bracket. The panel bracket is attached to the bottom of the instrument panel and



1. Knob
2. Element
3. Socket
4. Panel
5. Shee Shell
6. Circuit Breaker
7. Probe
8. Nut
9. Lockwasher
10. Power Wire

Figure 15A-16. Cigar Lighter Installation

firewall. The stall warning unit should actuate the stall warning horn approximately five to ten miles per hour above aircraft stall speed. Install the lip of the warning unit approximately one-eighth of an inch below the center line of the wing skin cutout. Test fly the aircraft to determine if the unit acutates the warning horn at the desired speed. If the unit actuates the horn at a speed in excess of ten miles per hour above stall speed, loosen the mounting screws and move the unit down. If the unit actuates the horn at a speed less than five miles per hour above stall speed, loosen the mounting screws and move the unit up. The stall and gear warning unit contains two separate horns. One horn produces a high pitched stall warning signal and the other an interrupted lower pitched gear warning signal.

15A-113. REMOVAL AND INSTALLATION. Refer to figure 15A-17 for removal and installation of components.

15A-114. CIGAR LIGHTER CIRCUIT.

15A-115. DESCRIPTION. The cigar lighter is a 12-volt unit and necessitates the use of a dropping resistor to reduce the voltage. The dropping resistor and an inline fuse are attached to the left hand instrument panel bracket which attached to the bottom of the instrument panel and firewall. The circuit is also protected by a circuit breaker mounted in the circuit breaker panel. Refer to figure 15A-16.

15A-116. PITOT AND STALL WARNING HEATERS.

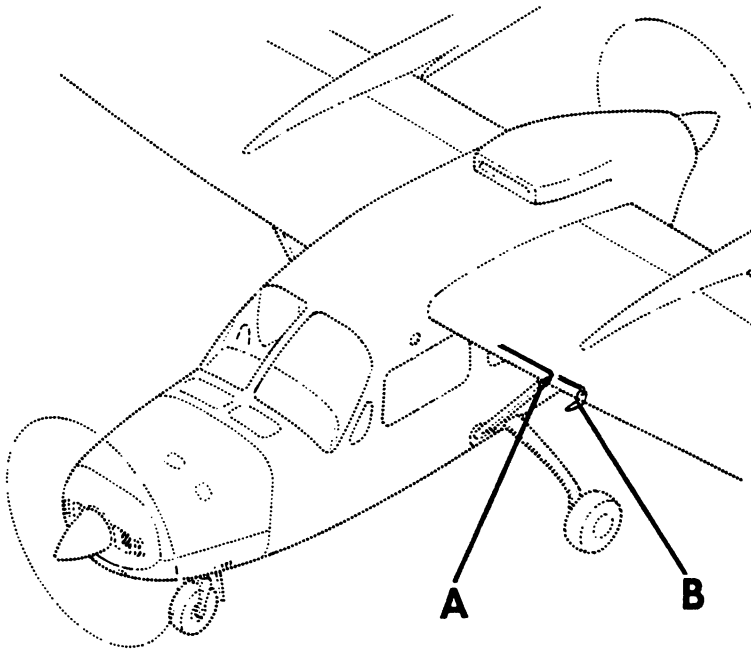
15A-117. DESCRIPTION. The pitot and stall warning heaters are resistance units mounted integrally in the pitot tube and stall warning transmitter. Both units are controlled by one switch. Refer to figure 15A-17.

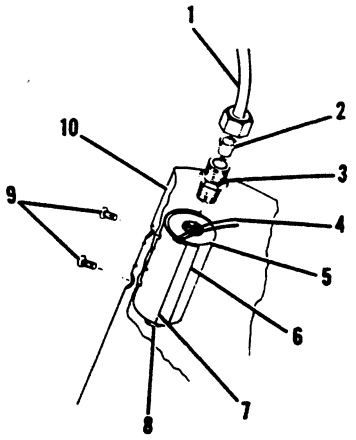
15A-118. HEATED WINDSHIELD PANEL.

15A-119. DESCRIPTION. The panel is constructed of two sheets of plate glass covering a layer of vinyl. Imbedded in the vinyl is a fine resistance wire which provides the heat for windshield de-icing. The lower edge of the panel is mounted on the deck skin just forward of the windshield. The upper end of the panel is supported by a rubber bumper which holds the panel off the windshield. The lower mounting bracket is hinged for easy cleaning between the panel and windsheild. The hinge pins are spring loaded so the panel may be easily removed. Power to the windshield panel is provided through a plug located in a junction box, just forward of the lower support bracket. A cover for the junction box is provided and is spring loaded to retract once released. A rocker type switch located on the instrument panel activates the unit. Circuit breaker for the unit is in the upper forward corner of the circuit breaker panel.

15A-120. REMOVAL AND INSTALLATION. Refer to figure 15A-19 for removal and installation of components.

SHOP NOTES:

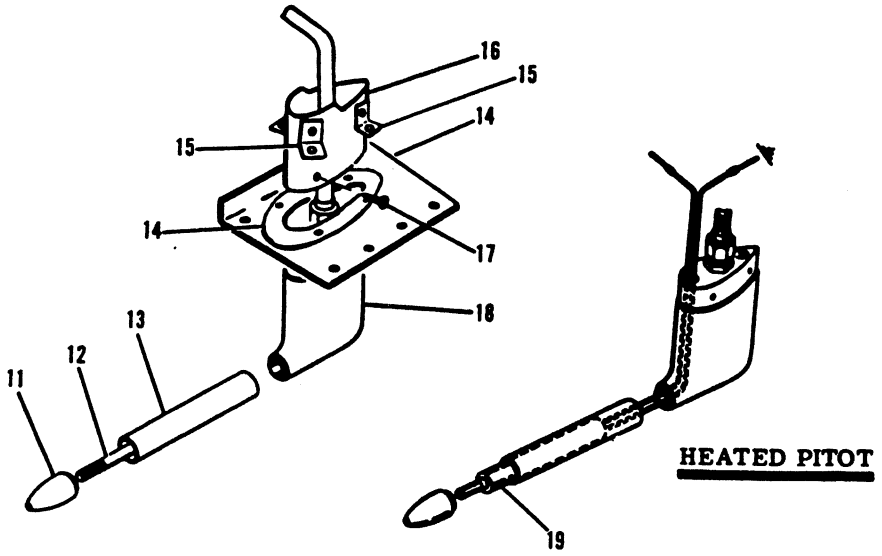




Detail **A**

BEGINNING WITH 33701463
AND F33700056

1. Line (to Airspeed Indicator)
2. Insert
3. Fitting
4. Pitot Heater Leads
5. Pitot Head
6. Insulator
7. Heater Element
8. Plug
9. Screw
10. Wing Strut Fairing
11. Pitot Head
12. Pitot Stem
13. Housing
14. Doubler
15. Bracket
16. Connector
17. Screw
18. Pitot Tube Body
19. Heater



Detail **B**

THRU 33701462 AND F33700055

Figure 15A-17. Pitot and Heated Pitot Installation

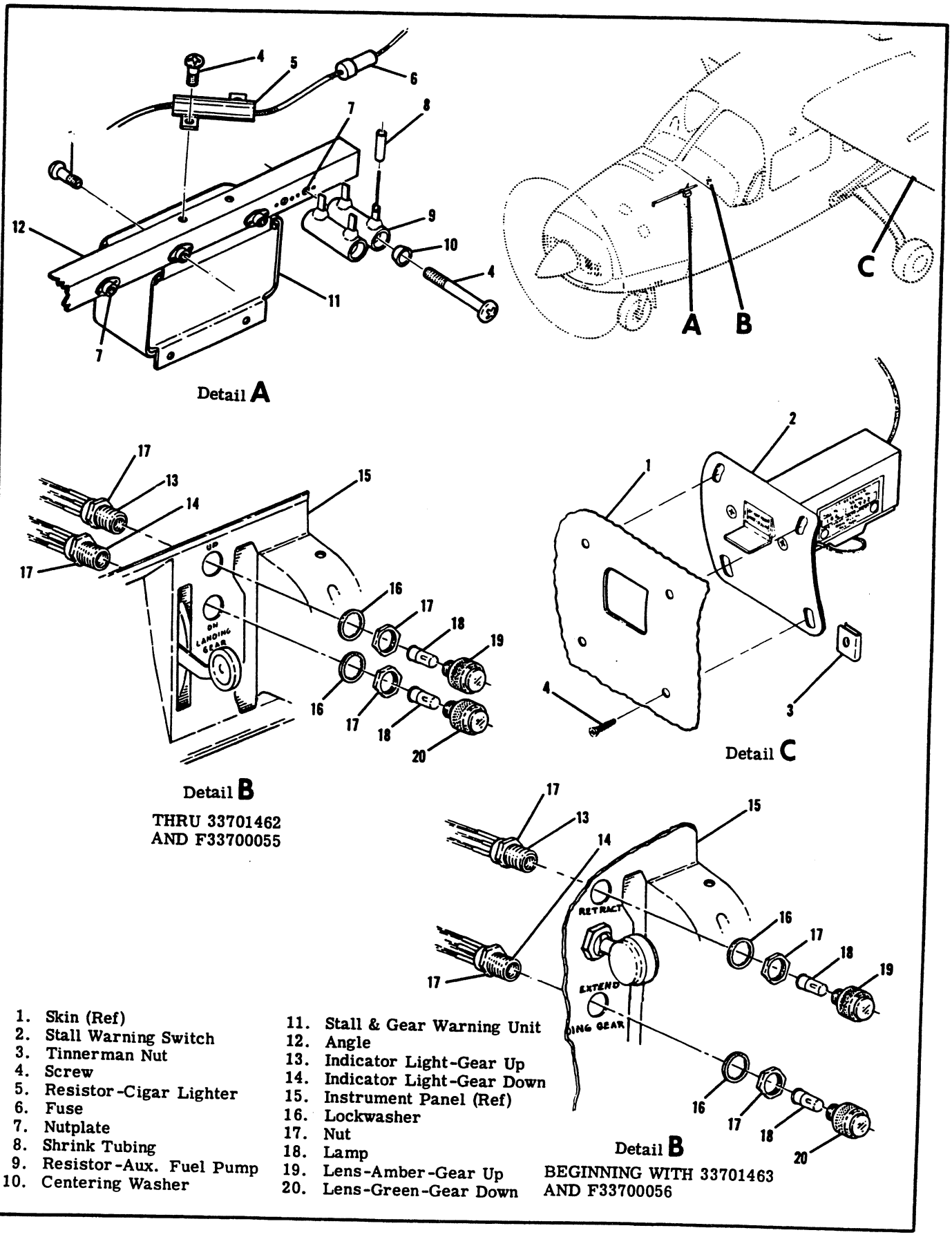


Figure 15A-18. Stall and Gear Warning Horn and Gear Indicator Light Installation

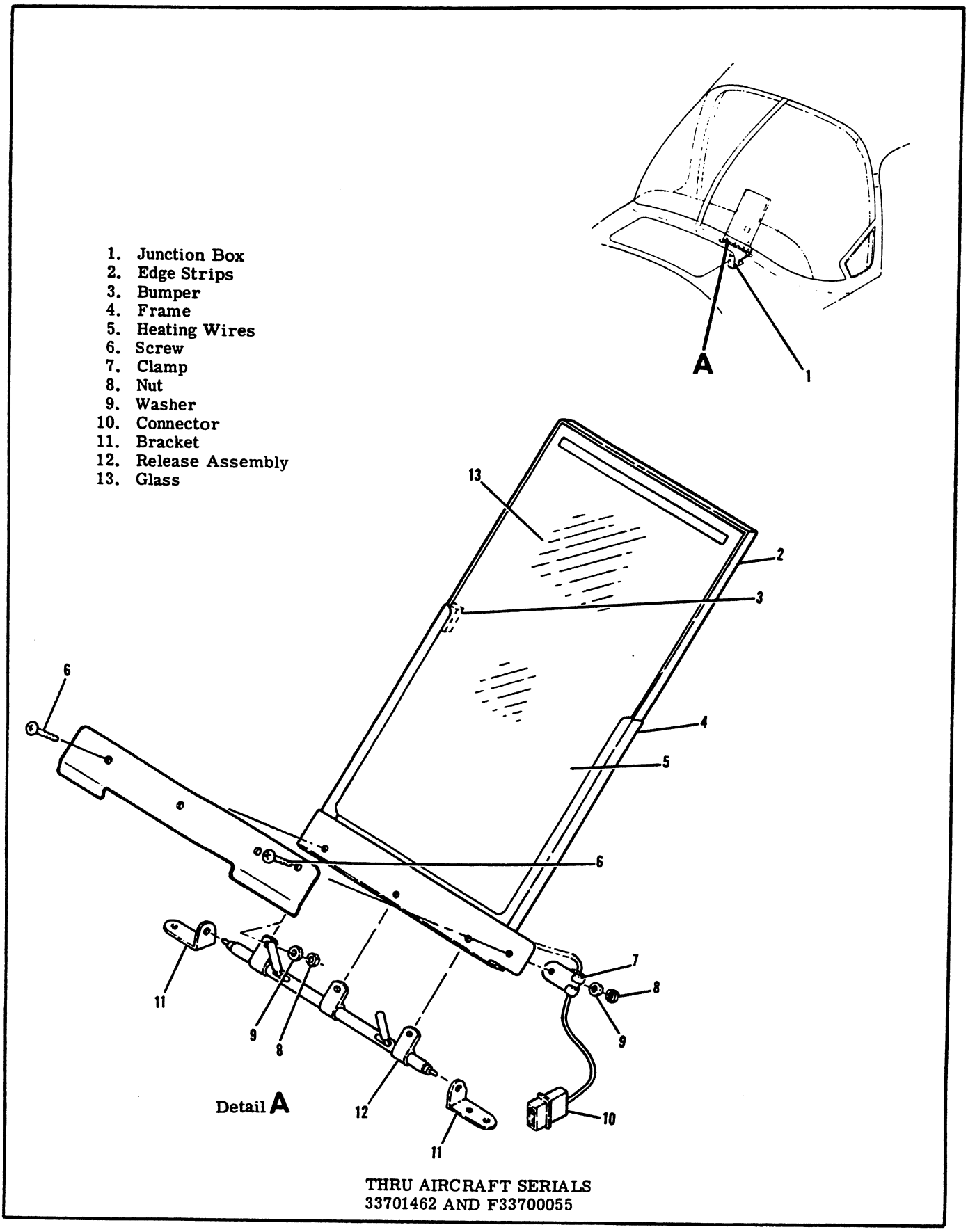
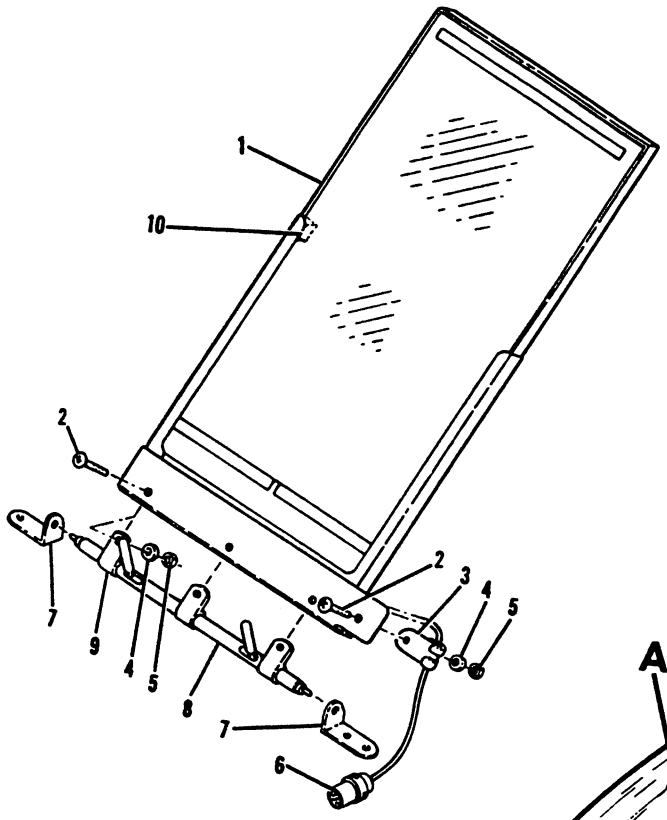
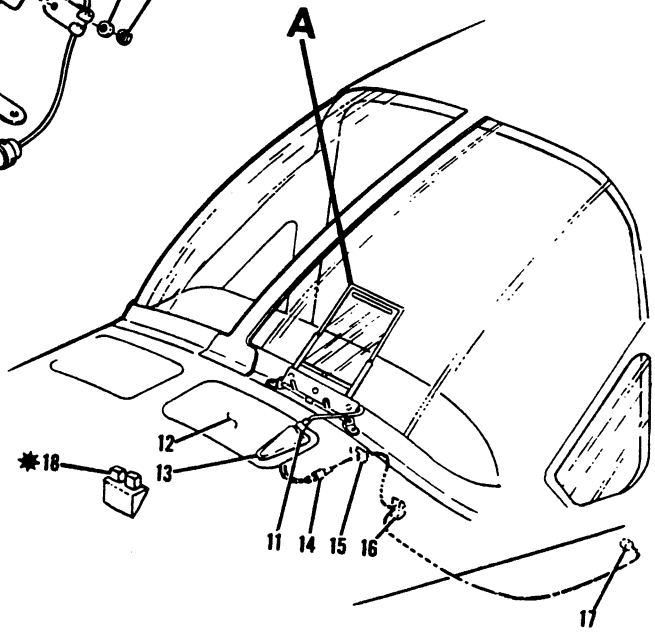


Figure 15A-19. Windshield Anti-Ice Panel Installation (Sheet 1 of 2)



Detail A



1. Frame Assembly
2. Screw
3. Clamp
4. Washer
5. Nut
6. Connector
7. Bracket
8. Release Assembly
9. Stop Assembly
10. Bumper
11. Receptacle
12. Door Assembly
13. Cover
14. Plug and Cap
15. Clamp
16. Switch
17. Circuit Breaker
18. Relay

✱ BEGINNING WITH AIRCRAFT SERIALS 33701317 AND F33700025

BEGINNING WITH AIRCRAFT SERIALS 33701463 AND F33700056

Figure 15A-19. Windshield Anti-Ice Panel Installation (Sheet 2 of 2)

15A-121. EMERGENCY LOCATOR TRANSMITTER.

15A-122. DESCRIPTION. The Emergency Locator Transmitter (ELT) is a self-contained, solid state unit, having its own power supply, with an external mounted antenna. The transmitter is designed to transmit simultaneously on dual emergency frequencies of 121.5 and 243.0 Megahertz. The unit is mounted in the tailcone on the right hand side, aft of the baggage curtain. Power is supplied by a battery-pack containing six, "Mag" D size dry cell batteries which are wired in series. The battery-pack service life is placarded on the batteries, and also on the outside, end of the transmitter cover. The transmitter broadcast tone is audio modulated in a swept manner over the range of 1600 to 300 Hz and is a distinct, easily recognizable distress signal for reception by search and rescue personnel, and others monitoring the emergency frequencies. When battery inspection and replacement schedules are adhered to, the transmitter will broadcast an emergency signal at rated power, for a continuous period of at least 48 hours at temperatures from +55°C to -20°C after an emergency landing. A three position switch on the forward end of the unit controls operation. Placing the switch in the ON position will energize the unit to start transmitting emergency signals. In the OFF position, the unit is inoperative. Placing the switch in the ARM position will set the unit to start transmitting emergency signals only after the unit has received a 5g (tolerances are +2g and -0g) impact force.

CAUTION

Do not leave the emergency locator transmitter in the ON position longer than 10 seconds or you may activate downed aircraft procedures by C.A.P., D.O.T. or F.A.A. personnel.

15A-123. REMOVAL AND INSTALLATION. (Refer to figure 15A-20).

a. Remove baggage curtain to gain access to the transmitter and antenna.

b. Disconnect co-axial cable from end of transmitter.

c. Cut four sta-straps and remove transmitter from tailcone mounting bracket.

d. To reinstall the transmitter, reverse this procedure.

CAUTION

Ensure that the direction of flight arrows (placarded on the transmitter) are pointing towards the nose of the aircraft.

15A-124. REMOVAL AND INSTALLATION OF ANTENNA. (Refer to figure 15A-20).

a. Disconnect co-axial cable from base of antenna.

b. Remove the nut and lockwasher attaching the antenna base to the fuselage (cabin top on 337 Series Aircraft) and the antenna will then be free for removal.

c. To reinstall the antenna, reverse this procedure.

15A-125. REMOVAL AND INSTALLATION OF BATTERY-PACK. (Refer to figure 15A-20).

a. After the transmitter has been removed from the aircraft in accordance with paragraph 15A-123, place the transmitter switch in the OFF position.

b. Remove the nine screws attaching the cover to the case and then remove the cover and rubber gasket to gain access to the battery-pack.

c. When the battery-pack is supplied with a plastic connector attached to the battery leads, merely disconnect the old battery-pack and replace with a new battery-pack, making sure the plastic connectors are completely mated.

CAUTION

Some early transmitters were delivered with transmitter leads soldered directly to battery-pack. Failure to observe proper polarity in connecting a new battery-pack in the transmitter may result in immediate failure of transistorized components attached to the printed circuit board in the transmitter.

NOTE

Before installing the new battery-pack, check to ensure that its voltage is 10.8 volts or greater.

NOTE

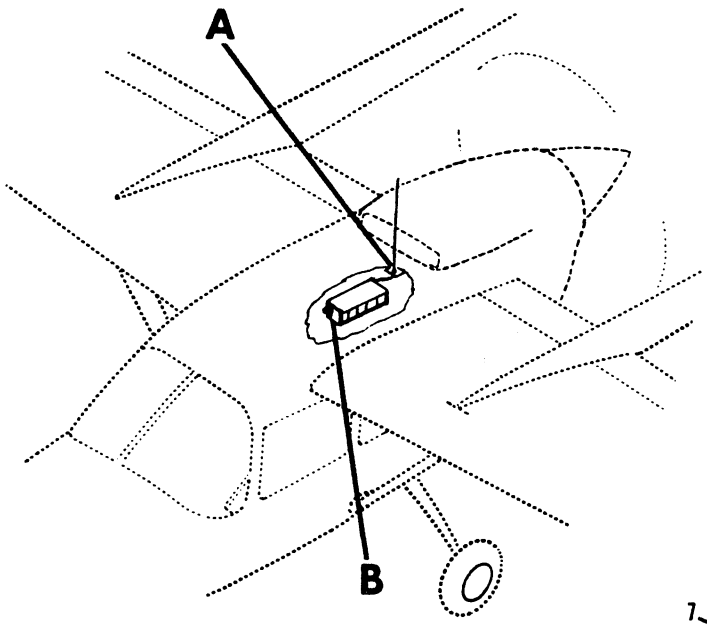
After relatively short periods of inactivation, the magnesium cell develops a coating over its anode which drastically reduces self-discharge and thereby gives the cell an extremely long storage life. This coating will exhibit a high resistance to the flow of electric current when the battery is first switched on. After a short while (less than 15 seconds), the battery current will completely dissolve this coating and enable the battery to operate normally. If this coating is present when your ELT is activated, there may be a few seconds delay before the transmitter reaches full power.

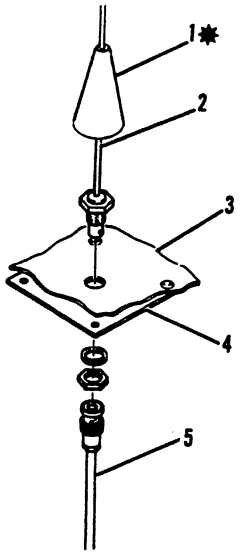
d. Replace the transmitter cover by positioning the rubber gasket on the cover and pressing the cover and case together and attach with nine screws. Care should be taken to avoid trapping the gasket and over-tightening screws.

e. Remove the old battery placard from the end of transmitter and replace with new battery placard supplied with the new battery-pack.

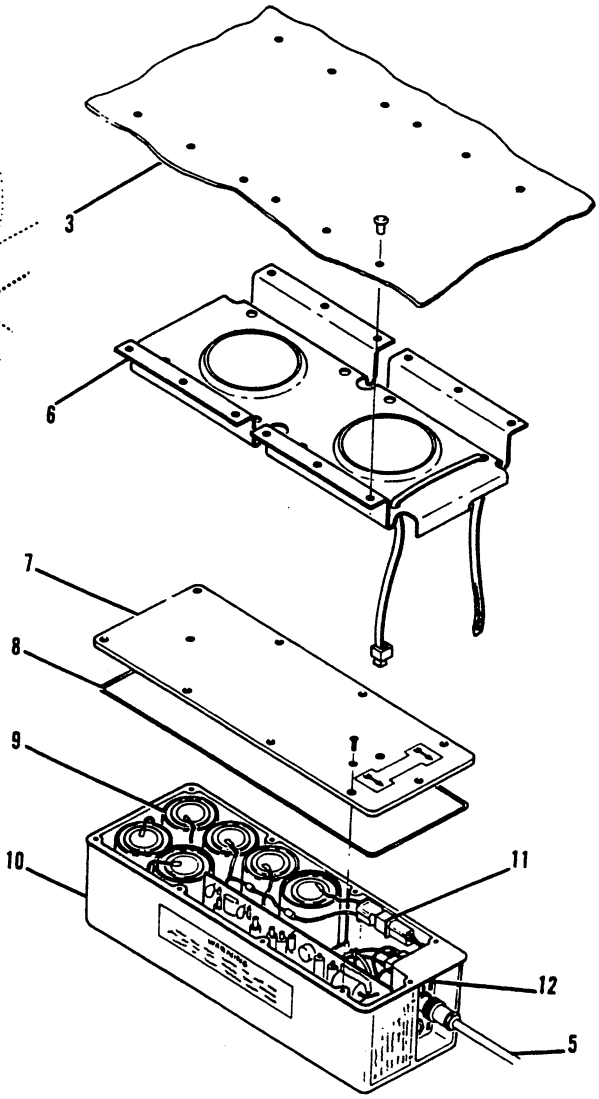
CAUTION

Be sure to enter the new battery-pack expiration date in the aircraft records. It is also recommended this date be placed in your ELT Owner's Manual for quick reference.





Detail **A**



Detail **B**

✱ NOTE

Beginning with 33701471 and F33700056, when installed by SK337-123. Also available through Service Parts.

1. Rubber Boot
2. Antenna
3. Cabin Top Skin
4. Doubler
5. Co-axial Cable
6. Bracket
7. Cover
8. Seal
9. Battery Pack
10. Transmitter
11. Connector
12. Arm Switch

Figure 15A-20. Emergency Locating Transmitter Installation

15A-126. TROUBLE SHOOTING. Should your Emergency Locating Transmitter fail the Periodic or 100 Hours performance checks, it is possible to a limited degree, to isolate the fault to a particular area of the equipment.

CAUTION

In order to protect your warranty, trouble shooting should be conducted without unscrewing the unit cover.

In performing the following trouble shooting procedure to test, peak effective radiated power, you will be able to determine if battery replacement is necessary or if your unit should be returned to your dealer for repair.

TROUBLE	PROBABLE CAUSE	REMEDY
*POWER LOW	Low battery voltage.	1. Set toggle switch to OFF. 2. Remove plastic plug from the remote jack and by means of a Switchcraft #750 jackplug, connect a Simpson 260 model voltmeter and measure voltage. If the voltage is 10-volts or less, the battery is below specification.
	Faulty transmitter.	3. If the battery voltage is 10.8 volts or more, it is O.K. If the battery is O.K., check the transmitter as follows: a. Remove the voltmeter. b. By means of a Switchcraft 750 jackplug and 3 inch long maximum leads, connect a Simpson Model 1223 ammeter to the jack. c. Set the toggle switch to ON and observe the ammeter current drain. If it is in the range 0-50 m2, the transmitter or the coaxial cable is faulty.
	Faulty co-axial antenna cable.	4. Check co-axial antenna cable for high resistance joints. If this is found to be the case, the cable should be replaced.

*This test should be carried out with the co-axial cable provided with your unit.

ELECTRICAL LOAD ANALYSIS CHART

1971, 1972, AND 1973 MODELS

STANDARD EQUIPMENT (RUNNING LOAD)	AMPS REQD 1971	1972	1973
Engine Gauges - Front			
Cylinder Head Temperature	.039	.039	.039
Oil Temperature	.033	.033	.033
Engine Gauges - Rear			
Cylinder Head Temperature	.039	.039	.039
Oil Temperature	.033	.033	.033
Turn Coordinator	.28	.28	.28
Flashing Beacon	6.0	6.0	6.0
**Panel Flood Lights	1.31	1.31	1.31
Compass Light	.04	.04	.04
Navigation Lights	1.97	1.97	1.97
Fuel Gauge - Left Main	.06	.06	.06
Fuel Gauge - Right Main	.06	.06	.06
Battery Contactor	.41	.41	.41
Tachometer	.05	.05	.05
Clock	†	†	†
Solenoid Valve - Door Opening	1.7	1.7	2.0
*Solenoid Valve - Gear Handle Lock	.25	.25	—
Solenoid Valve - Gear	—	—	2.0
Lamp (Gear Up or Gear Down)	.04	.04	.04
OPTIONAL EQUIPMENT (Running Load)			
Strobe Light(s)	.08	.08	1.8
Prop Synchronizer	1.00	1.00	1.00
Flight Hour Recorder	.04	.04	.04
Outside Air Temperature Gauge	.08	.08	.08
Pitot Heat	4.05	4.05	2.2
Stall Warning Heat	1.75	1.75	2.0
Windshield Heat	3.6	3.6	3.6
Post Lighting			
Engine Instruments	.24	.24	.24
Suction Gauge Light	.04	.04	.04
Switch Panel Lights	.40	.40	—
Gyro Slaving Meter			.04
Flight Instrument Lights	.24	.24	.28
Elevator Trim	.04	.04	.04
Fuel Economy Indicator Light	.04	.04	.04
Flight Hour Recorder Light	.04	.04	.04
Outside Air Temperature Light	.04	.04	.04
Prop Synchronizer Indicator Light			
Ammeter Light	.04	.04	.04
Prop De-Ice Ammeter Light	.04	.04	.04
Radio Dial Lights			
Cessna Transceiver 400	.23	.23	.30
Cessna Nav/Com 400	.46	.46	.80
Cessna ADF 400	.05	.05	.16
Cessna Transceiver 300	.06	.06	.06
Cessna Nav/Com 300, 360 Channel	.06	.06	.320
Cessna ADF 300	.04	.04	.08
Cessna Nav-O-Matic 300	.05	.05	.05
Cessna Nav-O-Matic 400	.05	.05	.05
Cessna Nav-O-Matic 400A	.05	.05	.05
Cessna DME 300	.08	.08	.14
Cessna Transponder 400	.44	.44	.44
Cessna HF 300	.12	.12	.12
SSB HF Transceiver	.20	.20	.08
Narco Mark 12B Nav/Com	.07	.07	—
300 Flight Director	.41	.41	.41
400 Flight Director	.41	.41	.41

OPTIONAL EQUIPMENT (Running Load) (Cont).	AMPS REQD 1971	1972	1973
Electronic Equipment			
Heated Pitot and Stall Warning Heaters	5.80	5.80	4.2
Strobe Lights	2.0	2.0	1.8
Cessna 300 ADF (Type R-521B)	1.1	—	—
Cessna 300 ADF (Type R-546A)	—	1.0	1.0
Cessna 300 ADF (Type R-546E)	—	1.0	1.0
Cessna 300 Marker Beacon (Type R-502B)	.02	.02	.02
Cessna 300 Nav/Com (360 Channel-Type RT-540A)	3.0	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-528A)	—	3.0	—
Cessna 300 Nav/Com (360 Channel-Type RT-528E)	—	—	3.0
Cessna 300 Nav/Com (360 Channel-Type RT-328A)	—	—	1.9
Cessna 300 Transceiver (Type RT-524A)	2.1	2.1	2.1
Cessna 300 HF Transceiver (Type PT-10A)	1.0	1.0	1.0
Cessna 300 Transponder (Type KT-75R)	0.7	0.7	—
Cessna 300 Transponder (Type KT-76 & KT-78)	—	1.3	1.3
Cessna 300 Navomatic (Type AF-512D)	1.8	1.8	—
Cessna 300 Navomatic (Type AF-394A)	—	—	1.75
Cessna 300 Integrated Flight Control System (Type AF-530FD)	—	—	5.0
Cessna 300 DME (Type KN-60B)	3.0	—	—
Cessna 300 DME (Type KN-60C)	—	1.4	1.4
Cessna 400 ADF (Type R-346A)	—	1.0	1.0
Cessna 300 Glideslope (Type R-543B)	0.4	0.4	0.4
Cessna 400 Glideslope (Type R-443A)	—	—	0.4
Cessna 400 Nav/Com (Type RT-522A)	3.0	3.0	—
Cessna 400E Nav/Com (RT-522A)	2.2	2.2	2.2
Cessna 400E Transceiver (RT532A)	1.9	1.9	1.9
Cessna 400 Nav/Com (Type RT-422A)	—	—	1.7
Cessna 400 Transceiver (Type RT-532A)	1.9	1.9	—
Cessna 400 Transceiver (Type RT-432A)	—	—	1.4
Cessna 400 Transponder (Type RT-506A)	1.5	1.5	1.5
Cessna 400 Nav-O-Matic (Type AF-520C)	1.25	1.25	—
Cessna 400 Nav-O-Matic (Type AF-420A)	—	—	1.2
Cessna 400A Nav-O-Matic (Type AF-530A)	—	—	5.0
Cessna 400 Integrated Flight Control System (Type FD-400A)	—	—	5.0
Sunair SSB Transceiver (Type ASB-125	2.5	2.5	2.5
Propeller Anti-Icing (Two Bladed Propeller)	—	8.0 to 12.0	8.0 to 12.0
ITEMS NOT CONSIDERED AS PART OF RUNNING LOAD			
Wing Flaps (ea.)	8.50	8.50	8.50
Dome Light(s) (ea.)	.14	.14	.10
Landing and Taxi Lights (left wing) (ea.)	3.57	3.57	—
Landing and Taxi Lights (right wing) (ea.)	3.57	3.57	—
Landing and Taxi Lights (ea.)	—	—	3.57
Cigarette Lighter	7.00	7.00	7.00
Fuel Boost Pumps (ea.) (Max.)	3.00	3.00	3.00
De-ice System	3.80	3.80	4.50
Cowl Flaps (ea.)	1.80	1.80	1.80
Courtesy Light	.46	.46	.46
Prop Anti-ice (Max.)	12.00	12.00	12.00
Electric Trim	1.80	1.80	1.80
Reading Lights (ea.)	.30	.30	.30
Map Light	.30	.30	.30

†Negligible

*In-flight running load

**When post lights are installed, subtract 1.19 amps from total running load for flood lighting which will not be used at the same time as post lighting.