

SECTION 16

ELECTRICAL SYSTEMS

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16-1. ELECTRICAL SYSTEMS.

16-2. GENERAL. This section contains service information necessary to maintain the Aircraft Electrical Power Supply System, Aircraft Lighting System, Pitor Heater, Cigar Lighter and Electrical Load Analysis Chart.

16-3. ELECTRICAL POWER SUPPLY SYSTEM.

16-4. DESCRIPTION. Electrical energy for the aircraft is supplied by a 12-volt, direct current, single-wire, negative ground electrical system. A single 12-volt battery supplies power for starting and furnishes a reserve source of power in the event of alternator failure. An engine-driven alternator is the normal source of power during flight and maintains a battery charge controlled by a voltage regulator. An external power receptacle is offered as optional equipment to supplement the battery system for starting and ground operation.

16-5. SPLIT BUS BAR.

16-6. 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 the 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 the starter switch is engaged or when an external power source is used, preventing transient voltages from damaging the semiconductor circuitry in the electronic installations.

16-7. SPLIT BUS POWER RELAY.

16-8. DESCRIPTION. A power relay is installed behind the instrument panel on all aircraft utilizing a split bus bar. The 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 electronic installations.

16-9. MASTER SWITCH

16-10. DESCRIPTION. On 1969 models the operation of the battery and alternator systems is controlled by a master switch. The switch is a pull 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. On 1970 models and on, a new master switch is utilized. This switch is a interlocking split rocker with the battery mode on the right hand side and the alternator mode on the left hand side. This arrangement allows the battery to be on the line without the alternator, however, operation of the alternator without the battery on the line is not possible. The switch is labeled "BAT" and "ALT" below the switch and is located on the left hand side of the switch panel.

16-11. AMMETER.

16-12. 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 the battery is fully charged and cruise is maintained with all electrical equipment off, the ammeter will show a minimum charging rate.

16-13. BATTERY POWER SYSTEM.

16-14. BATTERY.

16-15. DESCRIPTION. The battery is 12 volts and is approximately 25 ampere-hour capacity. The battery is mounted on the forward side of the firewall and is equipped with non-spill filler caps.

SHOP NOTES:

16-16. TROUBLE SHOOTING THE BATTERY POWER SYSTEM.

TROUBLE	PROBABLE CAUSE	REMEDY
BATTERY WILL NOT SUPPLY POWER TO BUS OR IS INCAPABLE OF CRANKING ENGINE.	Battery discharged.	1. Measure voltage at "BAT" terminal of battery contactor with master switch and a suitable load such as a taxi light turned on. Normal battery will indicate 11.5 volts or more. If voltage is low, proceed to step 2. If voltage is normal, proceed to step 3.
	Battery faulty.	2. Check fluid level in cells and charge battery at 20 amps for approximately 30 minutes or until the battery voltage rises to 15 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.
	Faulty contactor or wiring between contactor or master switch.	3. Measure voltage at master switch terminal (smallest) on contactor with master switch closed. Normal indication is zero volts. If voltage reads zero, proceed to step 4. If a voltage reading is obtained check wiring between contactor and master switch. Also check master switch.
	Open coil on contactor.	4. Check continuity between "BAT" terminal and master switch terminal of contactor. Normal indication is 16 to 24 ohms (Master switch open). If ohmmeter indicates an open coil, replace contactor. If ohmmeter indicates a good coil, proceed to step 5.
	Faulty contactor contacts.	5. Check voltage on "BUS" side of contactor with master switch closed. Meter normally indicates battery voltage. If voltage is zero or intermittent, replace contactor. If voltage is normal, proceed to step 6.
	Faulty wiring between contactor and bus.	6. Inspect wiring between contactor and bus. Repair or replace wiring.

16-17. REMOVAL AND INSTALLATION. (Refer to figure 16-1.)

- a. Remove top half of cowl.
- b. Remove the battery box cover.
- c. Disconnect the ground cable from the negative battery terminal.

CAUTION

- When installing or removing battery always observe the proper polarity with the aircraft electrical system (negative to ground). reversing the polarity, even momentarily, may result in failure of semiconductor devices (alternator diodes, radio protection diodes and radio transistors).
- Always remove the battery ground cable first and replace it last to prevent accidental short circuits.
- d. Disconnect the cable from the positive terminal of the battery.
- e. Lift the battery out of the battery box.
- f. To replace the battery, reverse this procedure.

16-18. CLEANING THE BATTERY. For maximum efficiency the battery and connections should be kept clean at all times.

- a. Remove the battery and connections in accordance with the preceding paragraph.
- b. Tighten battery cell filler caps to prevent the cleaning solution from entering the cells.
- c. Wipe the battery cable ends, battery terminals and the entire surface of the battery with a clean cloth moistened with a solution of bicarbonate of soda (baking 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 with petroleum jelly or an ignition spray product to reduce corrosion.

16-19. 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, however will decompose into gases and should be replaced regularly. Add distilled water as necessary to maintain the electrolyte level with the horizontal baffle plate or the split ring on the filler neck inside the battery. When "dry charged" batteries are put into service fill as directed with electrolyte. When 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.

16-20. TESTING THE BATTERY. The specific gravity of the battery may be measured with a hydrometer to determine the state of battery charge. If the hydrometer reading is low, slow-charge the battery and retest. Hydrometer readings of the electrolyte must be compensated for the temperature of the electrolyte. Some hydrometers have a built-in thermometer and conversion chart. The following chart shows the battery condition for various hydrometer readings with an electrolyte temperature of 80° Fahrenheit.

BATTERY HYDROMETER READINGS

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

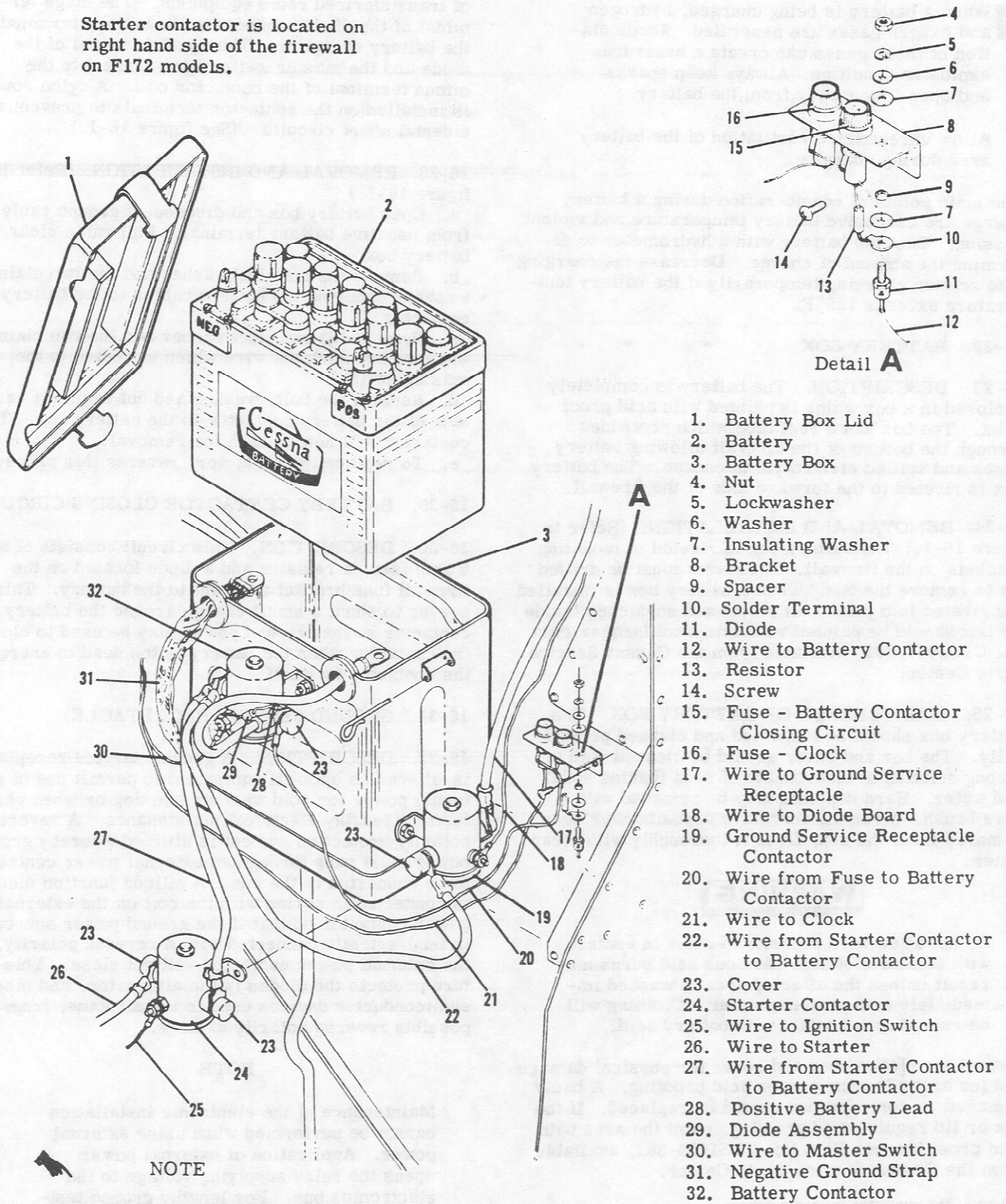
NOTE

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.

16-21. CHARGING THE BATTERY. When the battery is to be charged, the level of the electrolyte should be checked and adjusted by adding distilled water to cover the tops of the internal battery plates. Remove the battery from the aircraft and place in a well ventilated area for charging.

Note

Starter contactor is located on right hand side of the firewall on F172 models.



NOTE

BEGINNING WITH AIRCRAFT SERIALS 17260858 AND F17200945 a vented battery contactor is installed.

Figure 16-1. Battery and Electrical Equipment Installations

WARNING

When a battery is being charged, 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.

The main points of consideration during a battery charge are excessive battery temperature and violent gassing. Test the battery with a hydrometer to determine the amount of charge. Decrease the charging rate or stop charging temporarily if the battery temperature exceeds 125°F.

16-22. BATTERY BOX.

16-23. DESCRIPTION. The battery is completely enclosed in a box which is painted with acid proof paint. The box has a vent tube which protrudes through the bottom of the aircraft allowing battery gases and spilled electrolyte to escape. The battery box is riveted to the forward side of the firewall.

16-24. REMOVAL AND INSTALLATION. (Refer to figure 16-1.) The battery box is riveted to mounting brackets on the firewall. The rivets must be drilled out to remove the box. When a battery box is installed and riveted into place, all rivets and scratches inside the box should be painted with acidproof lacquer Part No. CES1054-381, available from the Cessna Service Parts Center.

16-25. 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 and for areas lacking proper acid proofing. A badly damaged or corroded box should be replaced. If the box or lid require acid proofing, paint the area with acid proof lacquer Part No. CES1054-381, available from the Cessna Service Parts Center.

16-26. BATTERY CONTACTOR.

16-27. DESCRIPTION. The battery contactor is bolted to the side of the battery box. The contactor is a plunger type contactor 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 transistorized radio equipment. The large terminal of the diode connects to the battery terminal of the battery contactor. The small terminal of the diode and the master switch wire connect to the minus terminal of the contactor coil. A nylon cover is installed on the contactor terminals to prevent accidental short circuits. (See figure 16-1.)

16-28. REMOVAL AND INSTALLATION. (Refer to figure 16-1.)

- Open battery box and disconnect ground cable from negative battery terminal. Pull cable clear of battery box.
- Remove the nut, lockwasher and the two plain washers securing the battery cables to the battery contactor.
- Remove the nut, lockwasher and the two plain washers securing the wire which is routed to the master switch.
- Remove the bolt, washer and nut securing each side of the battery contactor to the battery box. The contactor will now be free for removal.
- To replace the contactor, reverse this procedure.

16-29. BATTERY CONTACTOR CLOSING CIRCUIT.

16-30. DESCRIPTION. This circuit consists of a 5 amp fuse, a resistor and a diode located on the firewall fuse bracket adjacent to the battery. This serves to 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.

16-31. GROUND SERVICE RECEPTACLE.

16-32. DESCRIPTION. A ground service receptacle is offered as optional equipment to permit use of external power for cold weather starting or when performing lengthy 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 reverse polarity, the external power contactor will not close. This feature protects the diodes in the alternator, and other semiconductor devices used in the airplane, from possible reverse polarity damage.

NOTE

Maintenance of the electronic installation cannot be performed when using external power. Application of external power opens the relay supplying voltage to the electronics bus. For lengthy ground testing of electronic systems, connect a well regulated and filtered power supply directly to the battery side of the battery contactor. Adjust the supply for 14 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.

Failure to observe polarity when connecting an external power source directly to the battery or directly to the battery side of the battery contactor will damage the diodes in the alternator and other semiconductor devices used in the airplane.

16-33. TROUBLE SHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
STARTER ENGAGES WHEN GROUND POWER IS CONNECTED.	Shorted or reversed diode in split bus-bar system.	Check wiring to, and condition of diode mounted on the split bus relay bracket adjacent to the magneto switch. Correct wiring. Replace diode board assembly.
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 of 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 small (coil) terminal of external power contactor to ground (master switch off and ground power unplugged). Normal indication is 16-24 ohms. If resistance indicates an open coil, replace contactor. If resistance is normal, proceed to step 5.

16-33. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
GROUND POWER WILL NOT CRANK ENGINE (Cont).	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 is zero volts. If voltage is intermittently present or present all the time, replace contactor.

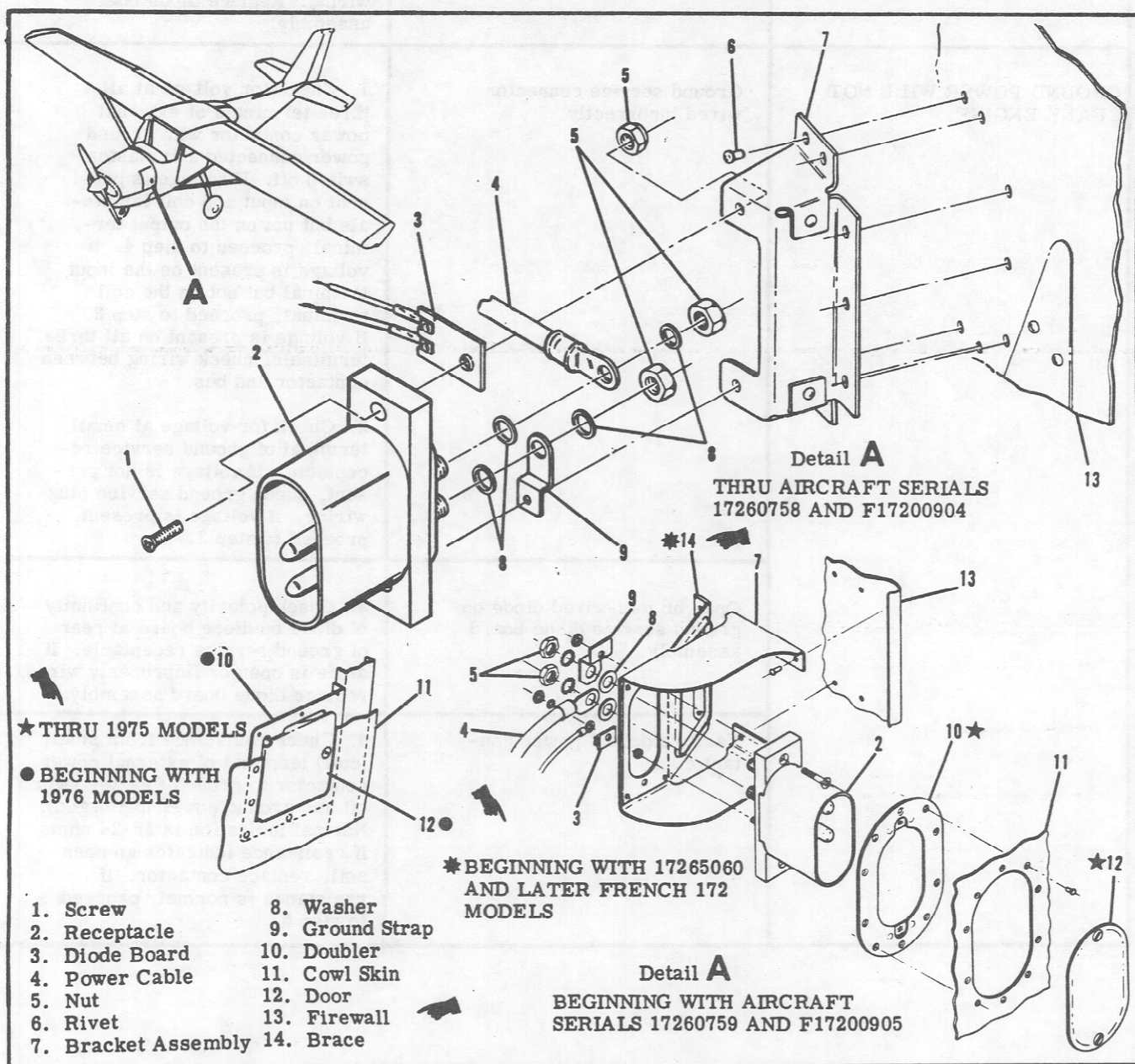


Figure 16-2. Ground Service Receptacle Installation

16-34. REMOVAL AND INSTALLATION. (Refer to figure 16-2.)

a. Open battery box and disconnect the ground cable from the negative terminal of the battery and pull the cable from the battery box.

b. Remove the nuts, washers, ground strap and diode board from the studs of the receptacle and remove the battery cable.

c. Remove the screws and nuts holding the receptacle. The receptacle will then be free from the bracket.

d. To install a ground service receptacle, reverse this procedure. Be sure to place the ground strap on the negative stud of the receptacle.

16-35. ALTERNATOR POWER SYSTEM.

16-36. DESCRIPTION. The alternator system consists of an engine driven alternator, a voltage regulator mounted on the left hand side of the firewall and a circuit breaker located on the instrument panel. The system is controlled by the left hand portion of the split rocker, master switch labeled "ALT." Beginning with 1972 models an over-voltage sensor switch and red warning light labeled "HIGH VOLTAGE" are incorporated to protect the system, (refer to para-

graph 16-42). The aircraft battery supplies the source of power for excitation of the alternator.

16-37. ALTERNATOR.

16-38. DESCRIPTION. The 60-ampere alternators used on the 172 model are three phase, delta connected with integral silicon diode rectifiers. The alternator is rated at 14 volts at 60 amperes continuous output. 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 winding 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 ac is generated. The stator windings are three-phase, delta connected and are attached to two diode plates, each of which contain three silicon diodes.

The diode plates are connected to accomplish full-wave, rectification of ac. 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.

16-39. TROUBLE SHOOTING THE ALTERNATOR SYSTEM

TROUBLE	PROBABLE CAUSE	REMEDY
AMMETER INDICATES HEAVY DISCHARGE WITH ENGINE NOT RUNNING OR ALTERNATOR CIRCUIT BREAKER OPENS WHEN MASTER SWITCH IS TURNED ON.	Shorted radio noise filter or shorted wire.	1. Remove cable from output terminal of alternator. Check resistance from end of cable to ground (MASTER SWITCH MUST BE OFF). If resistance does not indicate a direct short, proceed to step 4. If resistance indicates a direct short, proceed to step 2.
		2. Remove cable connections from radio noise filter. Check resistance from the filter input terminal to ground. Normal indication is infinite resistance. If reading indicates a direct short, replace filter. If no short is evident, proceed to step 3.
		3. Check resistance from ground to the free ends of the wires which were connected to the radio noise filter (or alternator if no noise filter is installed). Normal indication does not show a direct short. If a short exists in wires, repair or replace wiring.

16-39. TROUBLE SHOOTING THE ALTERNATOR SYSTEM (Cont.)

TROUBLE	PROBABLE CAUSE	REMEDY
AMMETER INDICATES HEAVY DISCHARGE WITH ENGINE NOT RUNNING OR ALTERNATOR CIRCUIT BREAKER OPENS WHEN MASTER SWITCH IS TURNED ON (Cont).	Shorted diodes in alternator.	4. Check resistance from output terminal of alternator to alternator case. Reverse leads and check again. Resistance reading may show continuity in one direction but should show an infinite reading in the other direction. If an infinite reading is not obtained in at least one direction, repair or replace alternator.
ALTERNATOR SYSTEM WILL NOT KEEP BATTERY CHARGED.	Regulator faulty or improperly adjusted.	1. Start engine and adjust for 1500 RPM. Ammeter should indicate a heavy charge rate with all electrical equipment turned off. Rate should taper off in 1-3 minutes. A voltage check at the bus should indicate a reading consistent with the voltage vs temperature chart on page 16-10. If charge rate tapers off very quickly and voltage is normal, check battery for malfunction. If ammeter shows a low charge rate or any discharge rate, and voltage is low, proceed to step 2.
		2. Stop engine, remove cowl, and remove cover from voltage regulator. Turn master switch ON/OFF several times and observe field relay in regulator. Relay should open and close with master switch and small arc should be seen as contacts open. If relay is inoperative, proceed to step 3. If relay operates, proceed to step 4.
		3. Check voltage at "S" terminal of regulator with master switch closed. Meter should indicate bus voltage. If voltage is present, replace regulator. If voltage is not present, check wiring between regulator and bus.
		4. Remove plug from regulator and start engine. Momentarily jumper the "A+" and "F" terminals together on the plug. Ship's ammeter should show heavy rate of charge. If heavy charge rate is observed, replace regulator. If heavy charge rate is not observed, proceed to step 5.

16-39. TROUBLE SHOOTING THE ALTERNATOR SYSTEM (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
ALTERNATOR SYSTEM WILL NOT KEEP BATTERY CHARGED (Cont).	Faulty wiring between alternator and regulator, or faulty alternator (Cont).	5. Check resistance from "F" terminal of regulator to "F" terminal of alternator. Normal indication is a very low resistance. If reading indicates no, or poor continuity, repair or replace wiring from regulator to alternator.
		6. Check resistance from "F" terminal of alternator to alternator case. Normal indication is 6-7 ohms. If resistance is high or low, repair or replace alternator.
		7. Check resistance from case of alternator to airframe ground. Normal indication is very low resistance. If reading indicates no, or poor continuity, repair or replace alternator ground wiring.
ALTERNATOR OVERCHARGES BATTERY - BATTERY USES EXCESSIVE WATER.	Regulator faulty or improperly adjusted.	Check bus voltage with engine running. Normal indication agrees with voltage vs temperature chart on page 16-13. Observe ship's ammeter, ammeter should indicate near zero after a few minutes of engine operation. Replace regulator.
OVER-VOLTAGE WARNING LIGHT ON.	Regulator faulty or improperly adjusted. Faulty sensor switch.	1. With engine running turn off and on battery portion of the master switch. If the light stays on shut down engine then turn on the "BAT and "ALT" portions of the master switch. Check for voltage at the "S" terminal of the voltage regulator. If voltage is present adjust or replace regulator. If voltage is not present check master switch and wiring for short or open condition. If wiring and switch are normal replace sensor.

16-40. REMOVAL AND INSTALLATION. (GEAR DRIVEN ALTERNATOR). (Refer to figure 16-3.)

- Ensure that the master switch is off and the negative lead is disconnected from the battery.
- Remove wiring from the alternator and label.
- Remove screw and nut holding blast tube to support strap clamp, blast tube will then be free for removal.
- Remove nuts and washers from alternator mounting bolts.
- Remove alternator.
- To replace alternator, reverse this procedure.

16-41. REMOVAL AND INSTALLATION. (BELT DRIVEN ALTERNATOR). (Refer to figure 16-4.)

- Ensure that the master switch is off and the negative lead is disconnected from the battery.
- Remove wiring from the alternator and label.
- Remove safety wire from the upper adjusting bolt and loosen bolt.
- Remove safety wire from lower adjusting bolt and remove bolt.
- Remove the locknut from the alternator mounting bolt.
- Remove the alternator drive belt and the alter-

nator mounting bolt, the alternator will then be free for removal.

g. To replace the alternator, reverse this procedure.

h. Apply a torque wrench to the nut on alternator pulley and adjust the belt tension so the belt slips when the following torque value is applied.

**TORQUE VALUES
FOR
CHECKING ALTERNATOR BELT TENSION**

<u>Used Belt</u>	<u>New Belt</u>
Slips At 7 to 9 Ft. Lbs.	Slips At 11 to 13 Ft. Lbs.

— NOTE —

Whenever a new belt is installed, belt tension should be checked within 10 to 25 hours of operation.

i. Tighten and safety wire upper and lower adjusting bolts.

j. Tighten alternator mounting bolt.

16-42. ALTERNATOR FIELD CIRCUIT PROTECTION. On all 172 models except the F172, a automatic resetting circuit breaker located on the back of the instrument panel is provided to protect the alternator field circuit.

16-43. OVER-VOLTAGE WARNING SYSTEM.

16-44. DESCRIPTION. The over-voltage system consists of an over-voltage sensor switch and a red warning light labeled "HIGH VOLTAGE". The over-voltage sensor is attached to the wire bundle behind the instrument panel and the light is located on the right hand side of the instrument panel. When an over-voltage tripoff occurs the over-voltage sensor turns off the alternator system and the red warning light comes on. The ammeter will show a discharge. Turn off both sections of the master switch to recycle the over-voltage sensor. If the over-voltage condition was transient, the normal alternator charging will resume and no further action is necessary. If the over-voltage tripoff recurs, then a generating system malfunction has occurred such that the electrical accessories must be operated from the aircraft battery only. Conservation of electrical energy must be practiced until the flight can be terminated. The over-voltage light filament may be tested at any time by turning off the "Alternator" portion of the master switch and leaving the battery portion on. This test does not induce an over-voltage condition on the electrical system. On models prior to aircraft serial 17260318 and F17200826, should nuisance trip-outs occur caused by voltage spikes or transient voltage, Cessna Single-engine Service Letter SE72-15 dated April 21, 1972 should be complied with.

NOTE

The over-voltage sensor switch contains solid state devices. Observe proper polarity before supplying power. Grounding the orange lead or interconnecting orange and black leads will destroy the device. When removal is required for replacement, identify (tag) wiring and follow the wiring diagram in Section 20 for re-wiring.

16-45. ALTERNATOR VOLTAGE REGULATOR.

16-46. DESCRIPTION. The alternator voltage regulator contains two relays. One relay is actuated by the aircraft master switch and connects the regulator to the battery. The second relay is a two-stage, voltage sensitive device which is used to control the current applied to the field winding of the alternator. When the upper set of contacts on the voltage regulator relay are closed, full bus voltage is applied to the field. This condition will exist when the battery is being heavily charged or when a very heavy load is applied to the system. When the upper contacts open, as the voltage begins to rise toward normal bus voltage, the voltage to the alternator field is reduced through a resistor network in the base of the regulator, thus reducing the output from the alternator. As the voltage continues to rise, assuming a very light load on the system, the lower contacts will close and ground the alternator field and shut the alternator completely off. Under lightly loaded conditions the voltage relay will vibrate between the intermediate charge rate and the lower (completely off) contacts. Under a moderate load, the relay will vibrate between the intermediate charge rate and the upper (full output) contacts.

The voltage relay is temperature compensated so that the battery is supplied with the proper charging voltage for all operating temperatures. With the battery fully charged (ship's ammeter indicating at or near zero) and a moderate load applied to the system (a taxi light turned on) the voltage at the bus bar should be within the range shown according to the air temperature on the following chart:

TEMPERATURE	BUS VOLTAGE
60 - 74°F	13.8 - 14.1
75 - 90°F	13.7 - 14.0
91 - 100°F	13.6 - 13.9
The voltage regulator is adjustable but adjustment on the airplane is not recommended. A bench adjustment procedure is outlined in the Cessna Alternator Charging Systems Service/Parts Manual.	

16-47. TROUBLE SHOOTING. For trouble shooting the voltage regulator refer to paragraph 16-39.

16-48. REMOVAL AND INSTALLATION. (Refer to figure 16-5.)

a. Make sure that the master switch is off, or dis-

connect the negative lead from the battery.

- b. Remove the connector plug from the regulator.
- c. Remove two screws holding the regulator on the

firewall.

- d. To replace the regulator, reverse the procedure. Be sure that the connections for grounding the alter-

WARNING

On models manufactured prior to mid 1971 should alternator thru-bolt loosening or breaking occur, Cessna Service Letter SE71-40 dated November 24, 1971 should be complied with. On models manufactured after mid 1971 a new high strength thru-bolt and a K shaped retainer are installed. Torque bolts 45 to 55 pound-inches.

- 1. Hose
- 2. Blast Tube Support
- 3. Clamp
- 4. Lock Washer
- 5. Screw
- 6. Support Strap
- 7. Nut
- 8. Alternator Assembly
- 9. Gear Drive Assembly
- 10. Washer

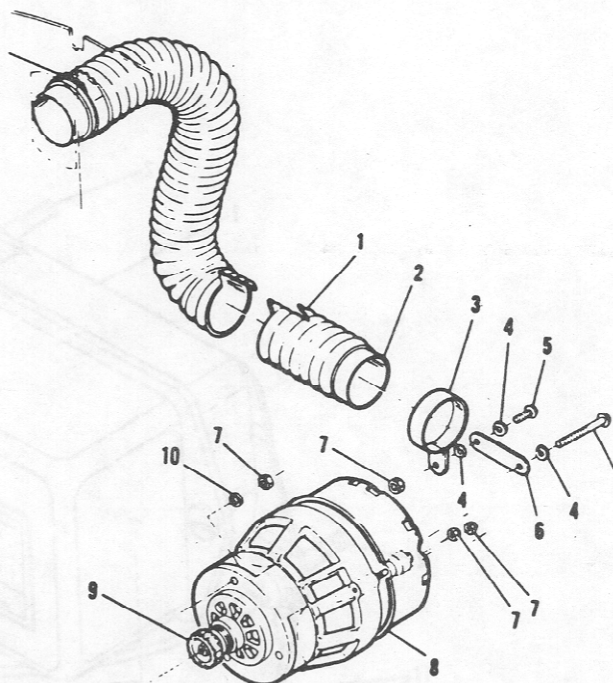
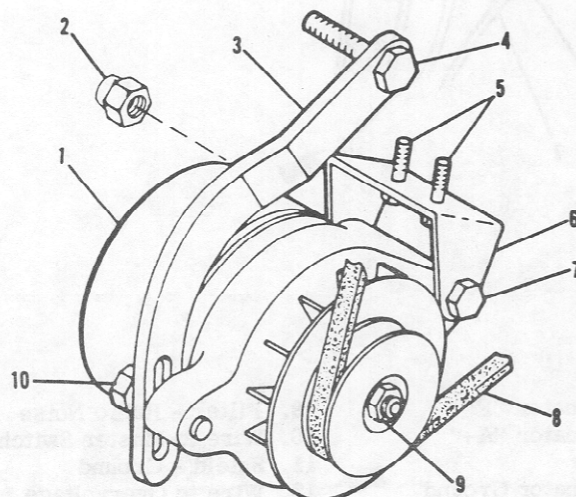


Figure 16-3. Gear-Driven Alternator Installation

NOTE

On Aircraft 17260759 thru 17261130 and F17200870 thru F17200878, F17200885, F17200886 and earlier 172 and F172 models on which Service Kit SK172-38 has been installed, Single-engine Service Letter SE72-33 Dated 10 November, 1972 should be complied with for maximum alternator drive belt adjustment.

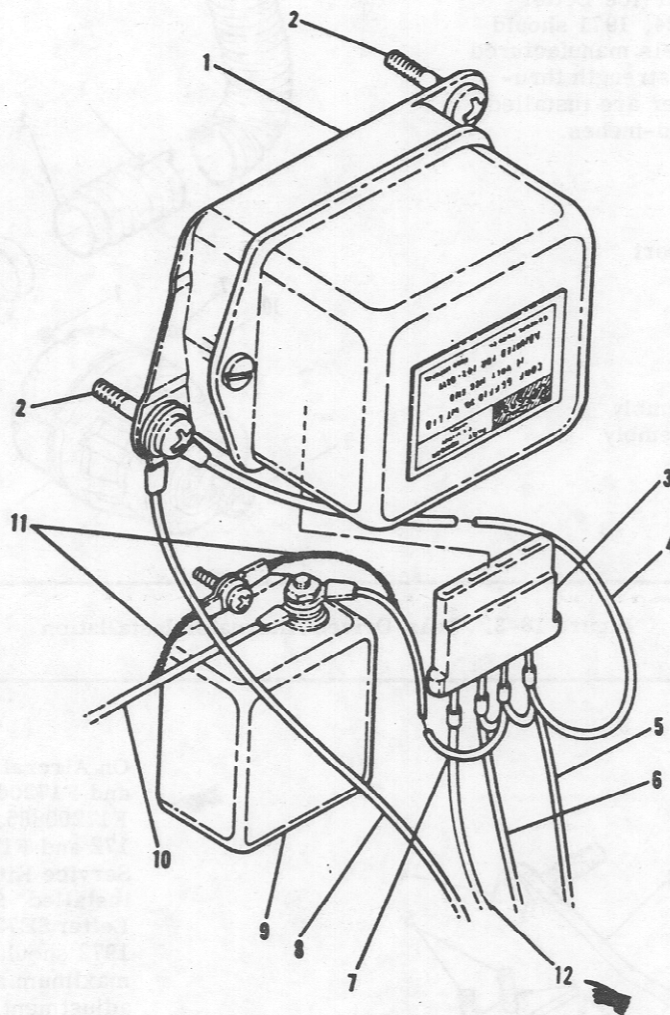


- 1. Alternator
- 2. Locknut
- 3. Adjusting Bracket
- 4. Upper Adjusting Bolt
- 5. Mounting Bracket Bolt
- 6. Mounting Bracket
- 7. Alternator Mounting Bolt
- 8. Drive Belt
- 9. Alternator Pulley Nut
- 10. Lower Adjusting Bolt

Figure 16-4. Belt-Driven Alternator Installation

nator, wiring shields and the base of the regulator are clean and bright before assembly. Otherwise,

poor voltage regulation and/or excessive radio noise may result.



- | | | |
|---------------------------|------------------------------|-------------------------------|
| 1. Voltage Regulator | 5. Wire to Alternator "F" | 9. Filter - Radio Noise |
| 2. Screw | 6. Wire to Alternator "A+" | 10. Wire to Master Switch |
| 3. Housing | 7. Wire to Filter | 11. Shield - Ground |
| 4. Wire Shields to Ground | 8. Wire to Alternator Ground | 12. Wire to Overvoltage Light |

Figure 16-5. Voltage Regulator Installation

16-49. AIRCRAFT LIGHTING SYSTEM.

16-50. DESCRIPTION. The aircraft lighting system consists of landing and taxi lights, navigation lights,

anti-collision strobe lights, flashing beacon light, dome, instrument flood lights and courtesy light, map light, control wheel map light, compass and radio dial lights.

16-51. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
LANDING AND TAXI LIGHT(S) OUT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is O.K. proceed to step 3.
	Defective wiring.	2. Test each circuit separately until short is located. Repair or replace wiring.
	Defective switch.	3. Check voltage at lights with master and landing and taxi light switches ON. Should read battery voltage. Replace switch.
LANDING AND/OR TAXI LIGHT OUT.	Lamp burned out.	1. Test lamp with ohmmeter or new lamp. Replace lamp.
	Open circuit in wiring.	2. Test wiring for continuity. Repair or replace wiring.
FLASHING BEACON DOES NOT LIGHT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is O.K. proceed to step 3.
	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring.
	Lamp burned out.	3. Test lamp with ohmmeter or a new lamp. Replace lamp. If lamp is good, proceed to step 4.
	Open circuit in wiring.	4. 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.	5. 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.	6. Install new flasher.
FLASHING BEACON CONSTANTLY LIT.	Defective flasher.	1. Install new flasher.
ALL NAV LIGHTS OUT.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is O.K. proceed to step 3.

16-51. TROUBLE SHOOTING (Cont).

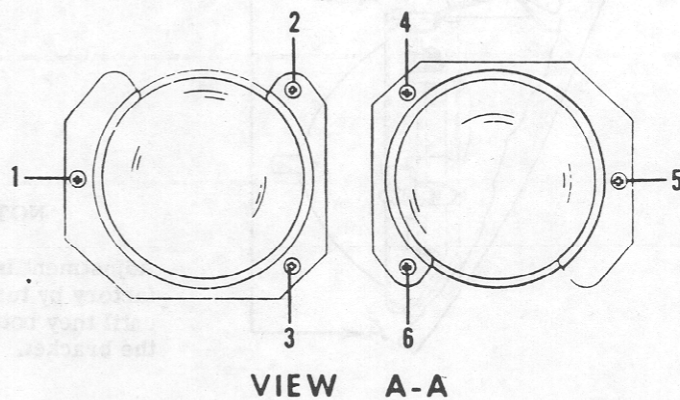
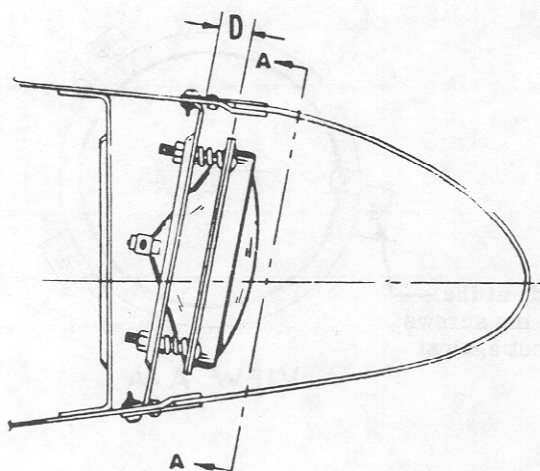
TROUBLE	PROBABLE CAUSE	REMEDY
ALL NAV LIGHTS OUT. (Cont).	Defective wiring.	2. Isolate and test each nav light circuit until short is located. Repair or replace wiring.
	Defective switch.	3. Check voltage at nav light with master and nav light switches on. Should read battery voltage. Replace switch.
ONE NAV LIGHT OUT.	Lamp burned out.	1. Inspect lamp. Replace lamp.
	Open circuit in wiring.	2. Test wiring for continuity. Repair or replace wiring.
ONE ANTI-COLLISION STROBE LIGHT DOES 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.
ONE ANTI-COLLISION STROBE LIGHT WILL NOT LIGHT. BEGINNING WITH 1973 MODELS.	Flash tube burned out.	Test with new 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.
DOME LIGHT TROUBLE.	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is O.K., proceed to step 3.
	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring.

16-51. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
DOME LIGHT TROUBLE (Cont).	Defective wiring (Cont).	3. Test for open circuit. Repair or replace wiring. If no short or open circuit is found, proceed to step 4.
	Lamp burned out.	4. Test lamp with ohmmeter or new lamp. Replace lamp.
	Defective switch.	5. Check for voltage at dome light with master and dome light switch on. Should read battery voltage. Replace switch.
INSTRUMENT LIGHTS WILL NOT LIGHT. (THRU 1970 MODELS).	Short circuit in wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is O.K. proceed to step 3.
	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring. 3. Test for open circuit. Repair or replace wiring. If no short or open circuit is found, proceed to step 4.
	Defective rheostat.	4. Check voltage at instrument light with master switch on. Should read battery voltage with rheostat turned full clockwise and voltage should decrease as rheostat is turned counterclockwise. If no voltage is present or voltage has a sudden drop before rheostat has been turned full counterclockwise, replace rheostat.
	Lamp burned out.	5. Test lamp with ohmmeter or new lamp. Replace lamp.
INSTRUMENT LIGHTS WILL NOT LIGHT (1971 MODELS & ON).	Short circuit wiring.	1. Inspect circuit breaker. If circuit breaker is open, proceed to step 2. If circuit breaker is OK, proceed to step 3.
	Defective wiring.	2. Test circuit until short is located. Repair or replace wiring. 3. Test for open circuit. Repair or replace wiring. If no short or open circuit is found, proceed to step 4.
	Faulty section in dimming potentiometer.	4. Lights will work when control is placed in brighter position. Replace potentiometer.

16-51. TROUBLE SHOOTING (Cont).

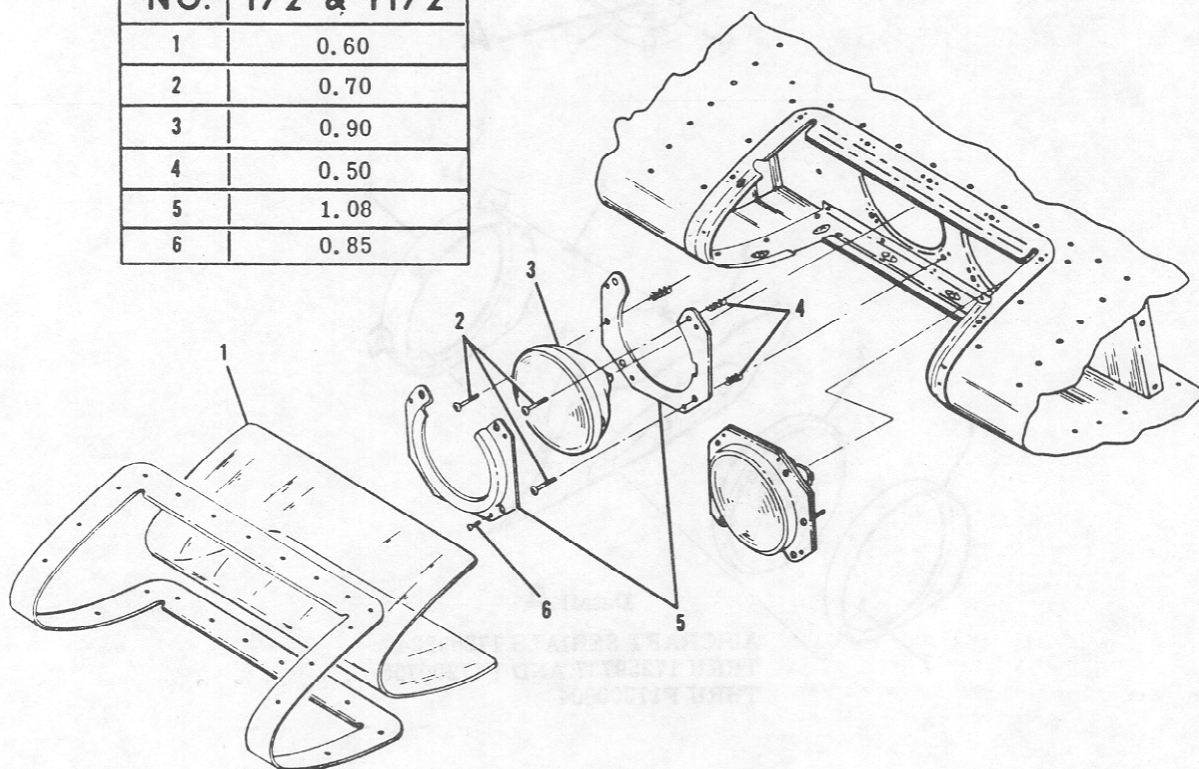
TROUBLE	PROBABLE CAUSE	REMEDY
INSTRUMENT LIGHTS WILL NOT LIGHT (1971 MODELS & ON). (Cont).	Faulty light dimming transistor.	5. Test both transistors with new transistor. Replace faulty transistor.
	Faulty selector switch.	6. Inspect. Replace switch.
INSTRUMENT LIGHTS WILL NOT DIM (1971 MODELS & ON).	Open resistor or wiring in minimum intensity end of potentiometer.	1. Test for continuity. Replace resistor or repair wiring.
	Shorted transistor.	2. Test transistor by substitution. Replace defective transistor.
CONTROL WHEEL MAP LIGHT WILL NOT LIGHT THRU 1970 AIRCRAFT ONLY.	Nav light switch turned off.	1. Nav light switch has to be ON before map light will light.
	Short circuit in wiring.	2. Check lamp fuse on terminal board located on back of stationary panel with ohmmeter. If fuse is open, proceed to step 3. If fuse is OK, proceed to step 4.
	Defective wiring.	3. Test circuit until short is located. Repair or replace wiring. 4. Test for open circuit. Repair or replace wiring. If a short or open circuit is not found, proceed to step 5.
CONTROL WHEEL MAP LIGHT WILL NOT LIGHT THRU 1970 AIRCRAFT ONLY (Cont).	Defective map light assembly.	5. Check voltage at map light assembly with master and nav switches on. If battery voltage is present, replace map light assembly.
CAUTION Failure to observe polarity shown on wiring diagrams 11.7.0, will result in immediate failure of the transistor on the map light circuit board assembly.		
CONTROL WHEEL MAP LIGHT WILL NOT LIGHT 1971 AIRCRAFT & ON.	Nav light switch turned off.	1. Nav light switch has to be ON before map light will light.
	Short circuit in wiring.	2. Check lamp fuse on terminal board located on back of stationary panel with ohmmeter. If fuse is open, proceed to step 3. If fuse is OK, proceed to step 4.



D I M E N S I O N D

NO.	172 & F172
1	0.60
2	0.70
3	0.90
4	0.50
5	1.08
6	0.85

THRU AIRCRAFT SERIALS
17259223 AND F17200754



1. Window

2. Adjusting Screw

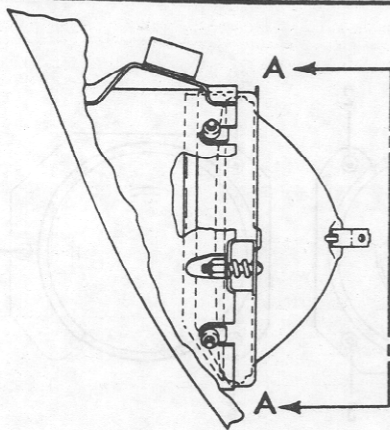
3. Lamp

4. Spring

5. Bracket

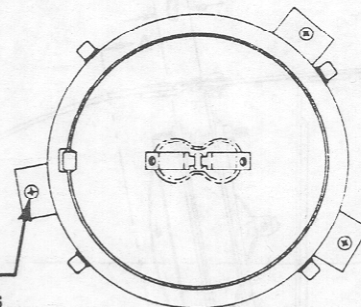
6. Screw

Figure 16-6. Landing and Taxi Light Installation (Wing) (Sheet 1 of 4)

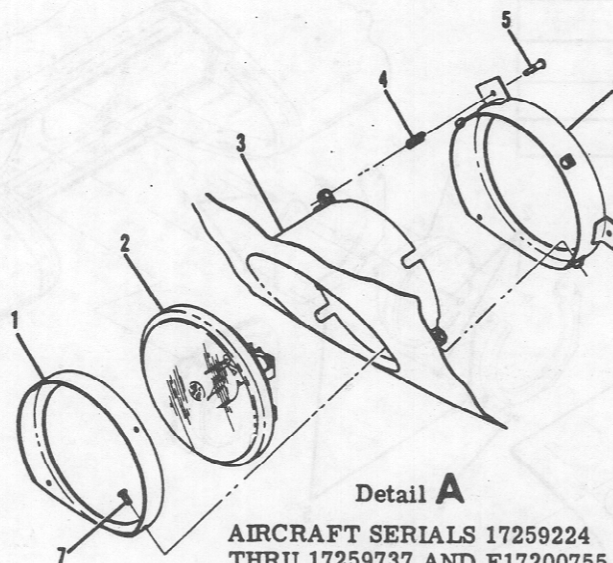
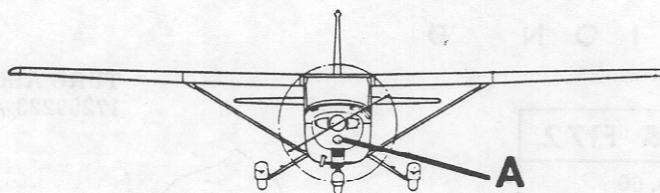


NOTE

Adjustment is made at the factory by turning the screws until they bottom out against the bracket.



VIEW A-A



Detail A

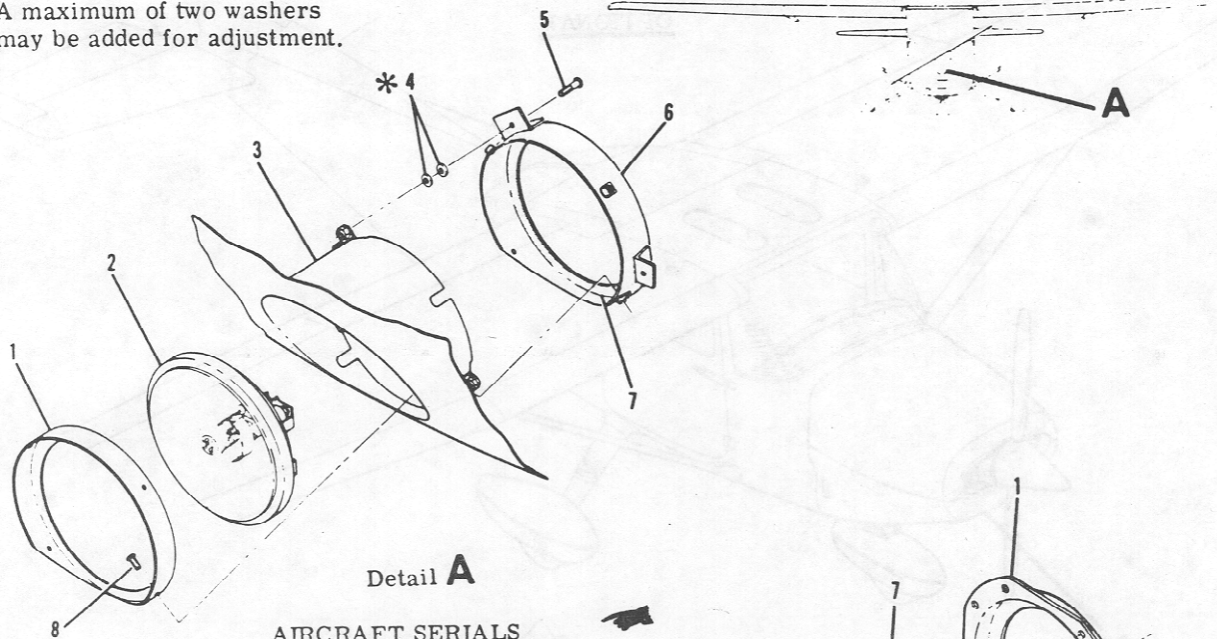
AIRCRAFT SERIALS 17259224
THRU 17259737 AND F17200755
THRU F17200804

1. Bracket
2. Lamp
3. Nose Cap
4. Spring
5. Adjustment Screw
6. Bracket Assembly
7. Screw

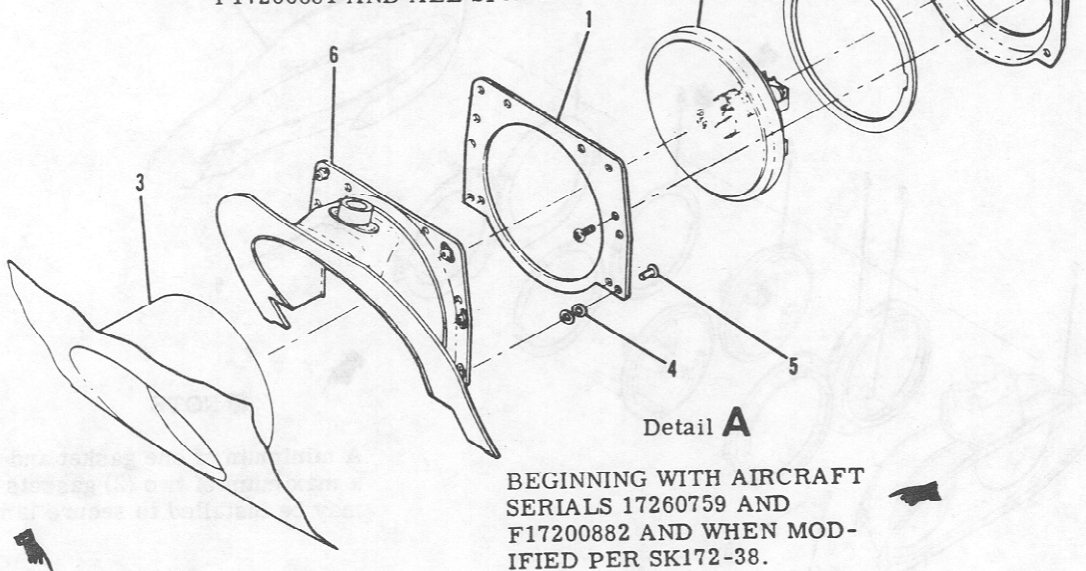
Figure 16-6. Landing and Taxi Light Installation (Cowl) (Sheet 2 of 4)

NOTE

* A maximum of two washers may be added for adjustment.



AIRCRAFT SERIALS
17259738 THRU 17260758
AND F17200805 THRU
F17200881 AND ALL SPARES



BEGINNING WITH AIRCRAFT
SERIALS 17260759 AND
F17200882 AND WHEN MOD-
IFIED PER SK172-38.

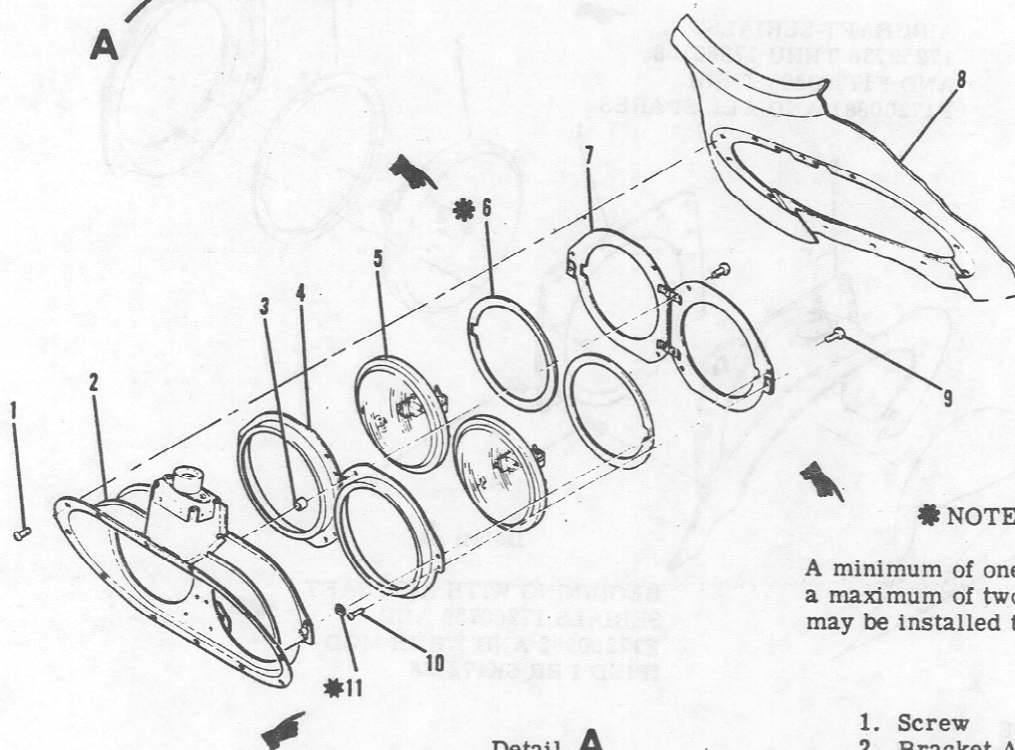
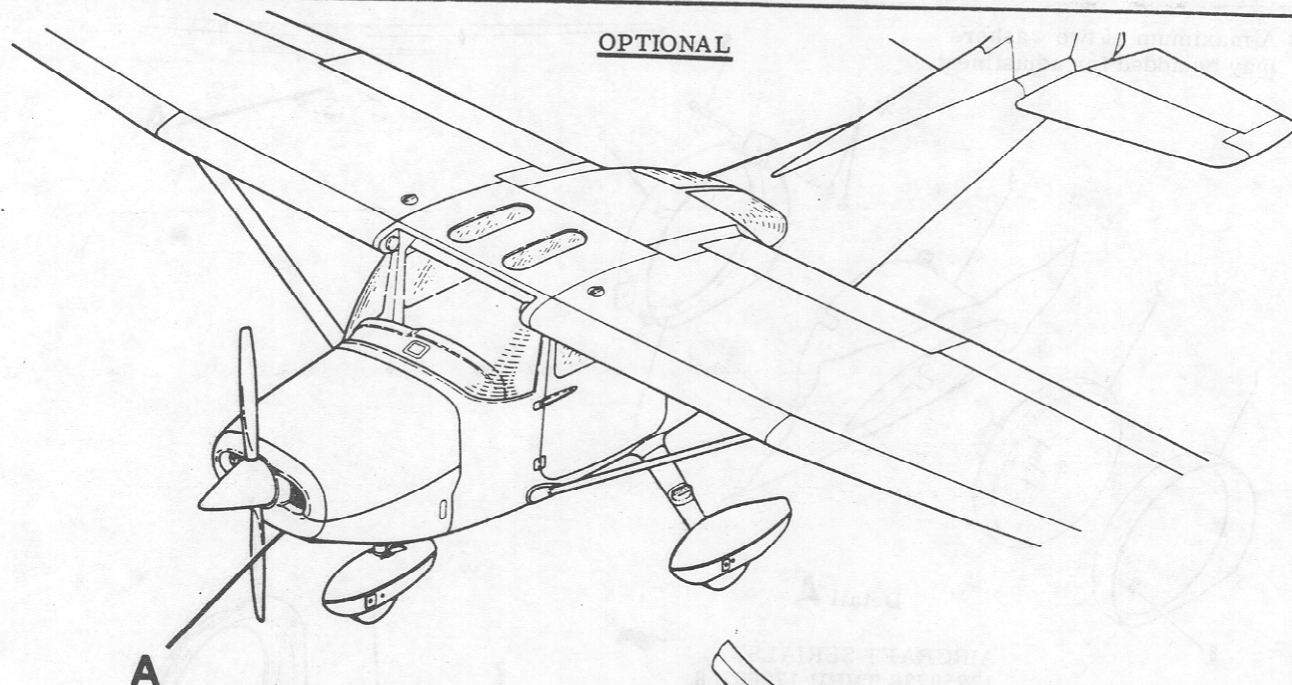
NOTE

On Aircraft 17260759 thru 17261130 and F17200870 thru F17200878, F17200885, F17200886 and earlier 172 and F172 models on which Service Kit SK172-38 has been installed, Single-engine Service Letter SE72-33, Dated 10 November, 1972 should be complied with for maximum alternator drive belt adjustment.

1. Bracket
2. Lamp
3. Landing Light Support
4. Washer
5. Adjustment Screw
6. Bracket Assembly
7. Gasket
8. Screw

Figure 16-6. Landing and Taxi Light Installation (Cowl) (Sheet 3 of 4)

OPTIONAL



*** NOTE**

A minimum of one gasket and a maximum of two (2) gaskets may be installed to secure lamp.

Detail A

BEGINNING WITH AIRCRAFT
SERIALS 17261899 AND F17201035

*** NOTE**

A maximum of two washers on each screw may be used for adjustment.

1. Screw
2. Bracket Assembly
3. Spacer
4. Bracket
5. Lamp
6. Gasket
7. Plate
8. Nose Cap
9. Screw
10. Screw
11. Washer

Figure 16-6. Landing and Taxi Light Installation (Cowl) (Sheet 4 of 4)

16-51. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
CONTROL WHEEL MAP LIGHT WILL NOT LIGHT 1971 AIRCRAFT & ON. (Cont.)	Defective wiring.	3. Test circuit until short is located. Repair or replace wiring. 4. Test for open circuit. Repair or replace wiring. If a short or open circuit is not found, proceed to step 5.
	Defective map light assembly.	5. Check voltage at map light assembly with master and nav switches on. If battery voltage is present, replace map light assembly.

16-52. LANDING AND TAXI LIGHTS (WING MOUNTED).

16-53. DESCRIPTION. The landing and taxi lights are mounted in the leading edge of the left wing. A clear plastic cover provides weather protection for the lamps and is shaped to maintain the leading edge curvature of the wing. The landing light lamp is mounted on the inboard side and adjusted to throw its beam further forward than the taxi light. The landing and taxi lights are both controlled by a single pull type switch located on the instrument panel.

16-54. REMOVAL AND INSTALLATION OF LANDING AND TAXI LIGHTS (WING MOUNTED).

- Remove the 18 screws securing the landing light window assembly (1) and the assembly will then be free for removal.
- Remove the four attaching screws (6) from the bracket assembly and remove the bracket.

NOTE

Do not reposition the landing and taxi light adjustment screws (2). If readjustment is required refer to figure 16-6.

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

16-55. LANDING AND TAXI LIGHT (COWL MOUNTED).

16-56. DESCRIPTION. The landing and taxi light is mounted in the forward end of the engine cowl. This position facilitates the use of one lamp as both a landing and taxi light. The landing and taxi light is controlled by a rocker type switch on the instrument panel.

16-57. REMOVAL AND INSTALLATION. (COWL MOUNTED) (THRU AIRCRAFT SERIALS 17260758 AND F17200881 EXCEPT WHEN MODIFIED IN ACCORDANCE WITH SK172-38) (Refer to figure 16-6.)

- Remove the 4 screws securing bracket (1) to nose cap (3) and remove the bracket.
- Pull the lamp away from the nose cap until the wire connections are exposed on the base of the lamp. Disconnect the wires and remove the lamp.
- To reinstall the lamp reverse this procedure.

16-58. REMOVAL AND INSTALLATION. (COWL MOUNTED) (BEGINNING WITH AIRCRAFT SERIALS 17260759 AND F1700882 AND WHEN MODIFIED IN ACCORDANCE WITH SK172-38) (Refer to figure 16-6.)

- Disconnect lamp wires then remove lower cowl.
- Remove screws (5) and remove lamp assembly.

NOTE

Note position and number of washers between support (6) and bracket (1).

- Remove screws (8) and remove lamp.
- To reinstall the lamp reverse this procedure.

16-59. ADJUSTMENT OF LANDING AND TAXI LIGHT (COWL MOUNTED) (AIRCRAFT SERIALS 17259224 THRU 17259737 AND F17200755 THRU F17200804 WHEN NOT MODIFIED IN ACCORDANCE WITH SK172-38) (Refer to figure 16-6.) Adjustment of the landing and taxi light is preset at the factory, however changes to this adjustment may be made as desired.

- Remove the lamp (See paragraph 16-57.)
- Adjustment is accomplished by turning the screws until they bottom out against the bracket.

NOTE

A screwdriver may be inserted through the lamp opening for screw adjustments.

Adjustments may also be made if the cowl is removed from the aircraft.

- a. Remove the cowl. (As outlined in Section 11).

CAUTION

When removing the cowl, ensure the landing and taxi wiring connection is disconnected before removing the bottom cowl. The connector is positioned at the aft end of the cowl on the lower right side.

- b. Make screw adjustments as desired or if factory adjustment is desired the screws should be turned until they bottom out against the bracket.

16-60. ADJUSTMENT OF LANDING AND TAXI LIGHT (COWL MOUNTED) (BEGINNING WITH AIRCRAFT SERIALS 17259738 AND F17200805 AND WHEN MODIFIED IN ACCORDANCE WITH SK172-38) (Refer to figure 16-6.) Adjustment of the landing and taxi light is pre-set at the factory, however changes to this adjustment may be made as desired by adding or subtracting from the number of washers (4). A maximum of two washers may be used.

16-60A. LANDING AND TAXI LIGHTS (DUAL, COWL MOUNTED, OPTIONAL).

16-60B. DESCRIPTION. Optional, dual, cowl mounted landing and taxi lights may be installed. The left hand light is used for taxi and the right hand for landing. Two rocker type switches on the pilots switch panel control the lights. A 20 amp circuit breaker is installed to protect the system.

16-60C. REMOVAL AND INSTALLATION. (Refer to figure 16-6.)

- a. Remove screws (1) and pull bracket assembly (2) from nose cap to gain access to electrical leads.
- b. Disconnect electrical leads from lamps making sure switches are off and leads do not short out.
- c. Remove screws (9) from plate (7) and remove lamp assembly from bracket (2). If left hand (taxi) light is being removed, note position of spacers (3) and (11) for reinstallation.
- d. Remove screws (10) from bracket (4) to disassemble lamp assembly.
- e. Install new lamp and reassemble.

16-61. NAVIGATION LIGHTS.

16-62. DESCRIPTION. The navigation lights are located on each wing tip and the top edge of the vertical fin. The lights are controlled by a pull type switch located on the instrument panel.

16-63. REMOVAL AND INSTALLATION. For removal and installation of navigation lights refer to figure 16-7.

16-64. ANTI-COLLISION STROBE LIGHTS.

16-65. DESCRIPTION. A white strobe light is installed on each wing tip and 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 power supply, mounted just aft of the baggage curtain, on the left side of the aircraft above the battery box thru 1972 Models, and one on each wing tip rib beginning with 1973 Models.

16-66. REMOVAL AND INSTALLATION. Use figure 16-7 as a guide for removal and installations of the anti-collision strobe light components.

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.

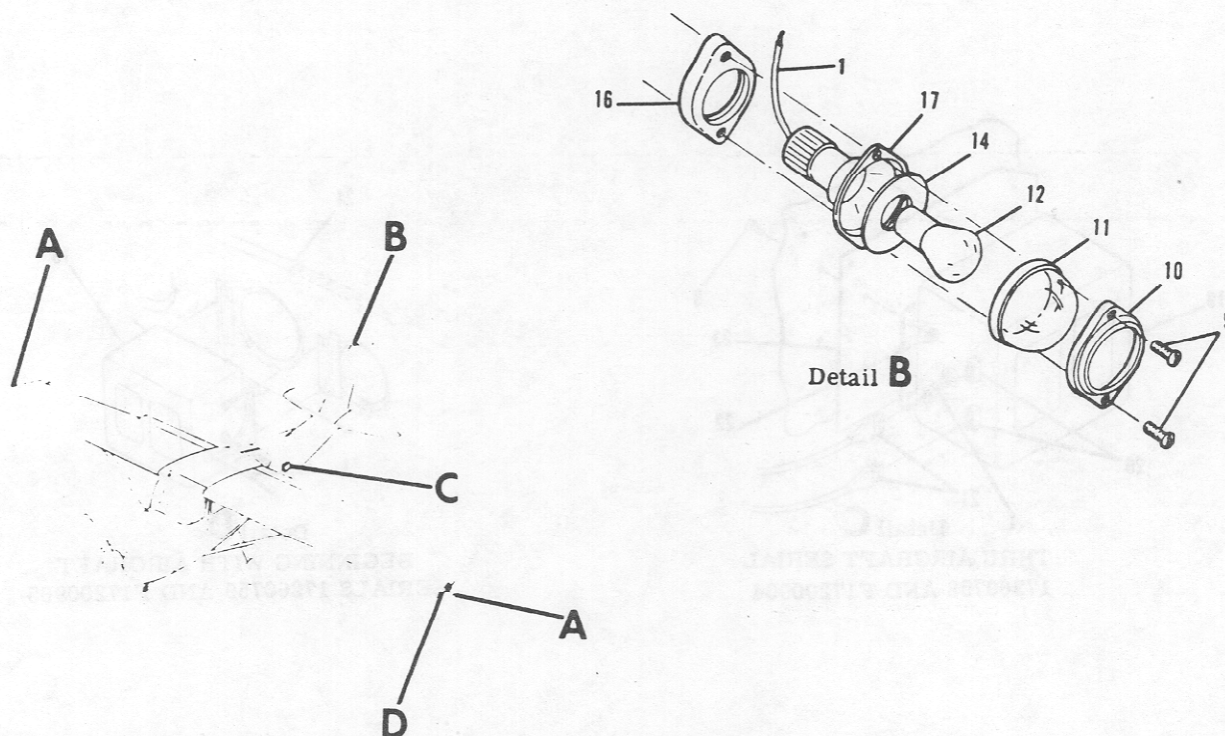
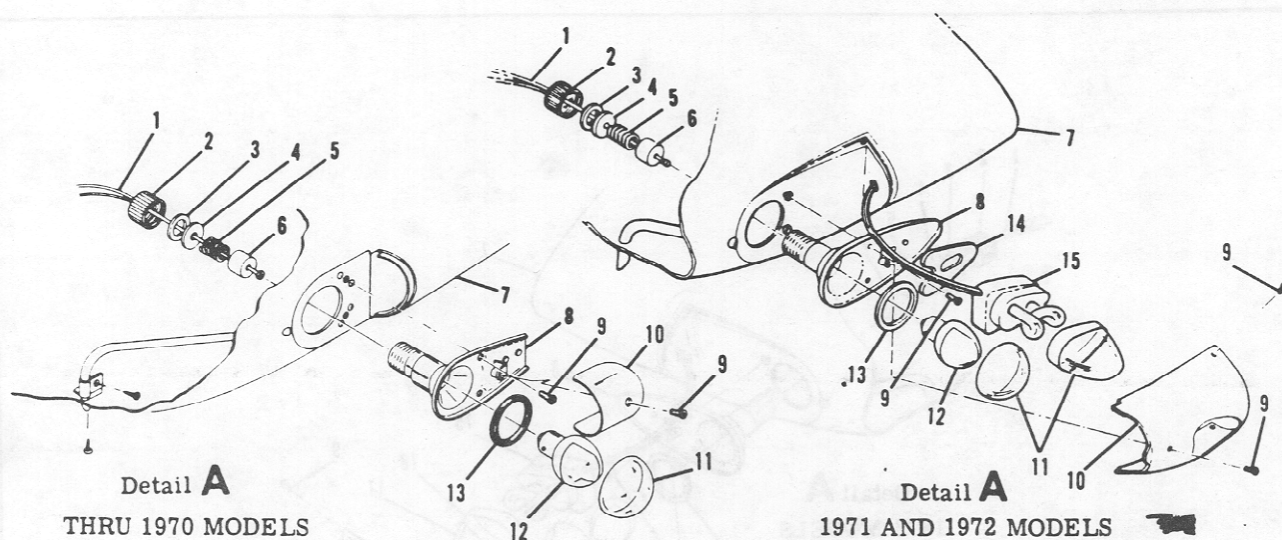
16-67. FLASHING BEACON.

16-68. DESCRIPTION. The flashing beacon light is attached to a thermoformed plastic mounting on the vertical fin. The flashing beacon is an iodine-vapor lamp electrically switched by a solid-state flasher assembly. The flasher assembly is located in the aft section of the tailcone. The switching frequency of the flasher assembly operates the beacon at approximately 45 flashes per minute.

16-69. REMOVAL AND INSTALLATION. For removal and installation of the flashing beacon refer to figure 16-8.

16-70. INSTRUMENT, DOME AND COURTESY LIGHTS.

16-71. DESCRIPTION. The instrument and dome lights are mounted in an overhead console located on the top of the cabin and provide non-glare instrument flood lighting and cabin lighting. The instrument flood light consists of a red lens and a single bulb. On models thru 1970, instrument flood lighting is controlled by a dimming rheostat mounted on the right side of the overhead console. On 1971 and on models, instrument flood lighting is controlled by a rheostat mounted on the lower, left hand portion of the instrument panel. The courtesy lights are mounted in the under side of each wing and consist of a lens and single bulb, lighting is controlled by the dome light switch.



1. Electrical Leads
2. Cap
3. Washer
4. Insulated Washer
5. Spring
6. Insulator
7. Wing Tip
8. Socket Assembly

17. Socket (Tail Light)
18. Gasket
19. Power Supply
20. Housing - Cap
21. Housing - Plug
22. Nut
23. Plate
24. Wing Tip Rib

9. Screw
10. Lens Retainer
11. Lens
12. Lamp
13. Seal
14. Gasket
15. Flash Tube Assembly
16. Mount

Figure 16-7. Navigation and Anti-Collision Strobe Light Installation (Sheet 1 of 2)

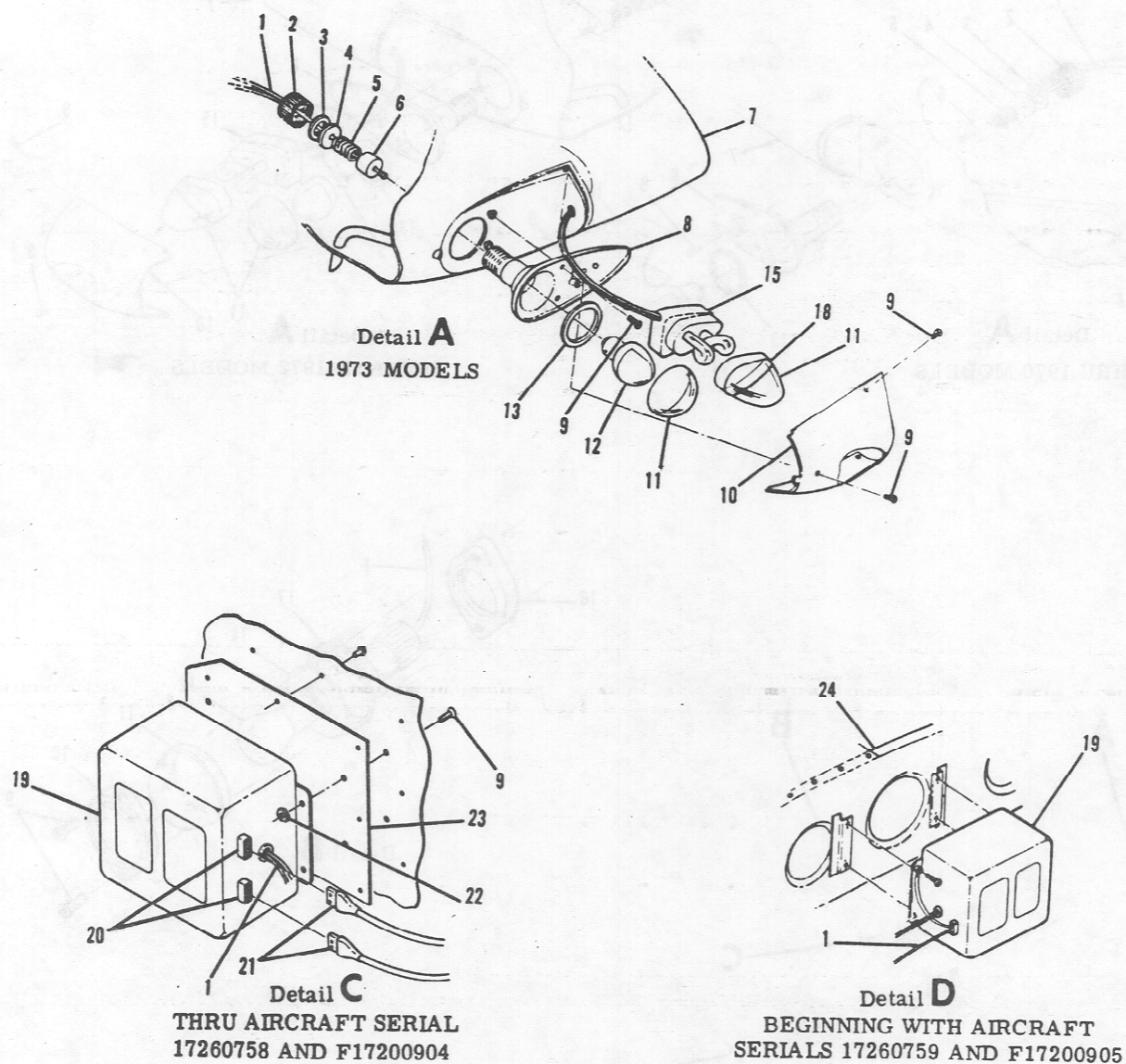


Figure 16-7. Navigation and Anti-Collision Strobe Light Installation (Sheet 2 of 2)

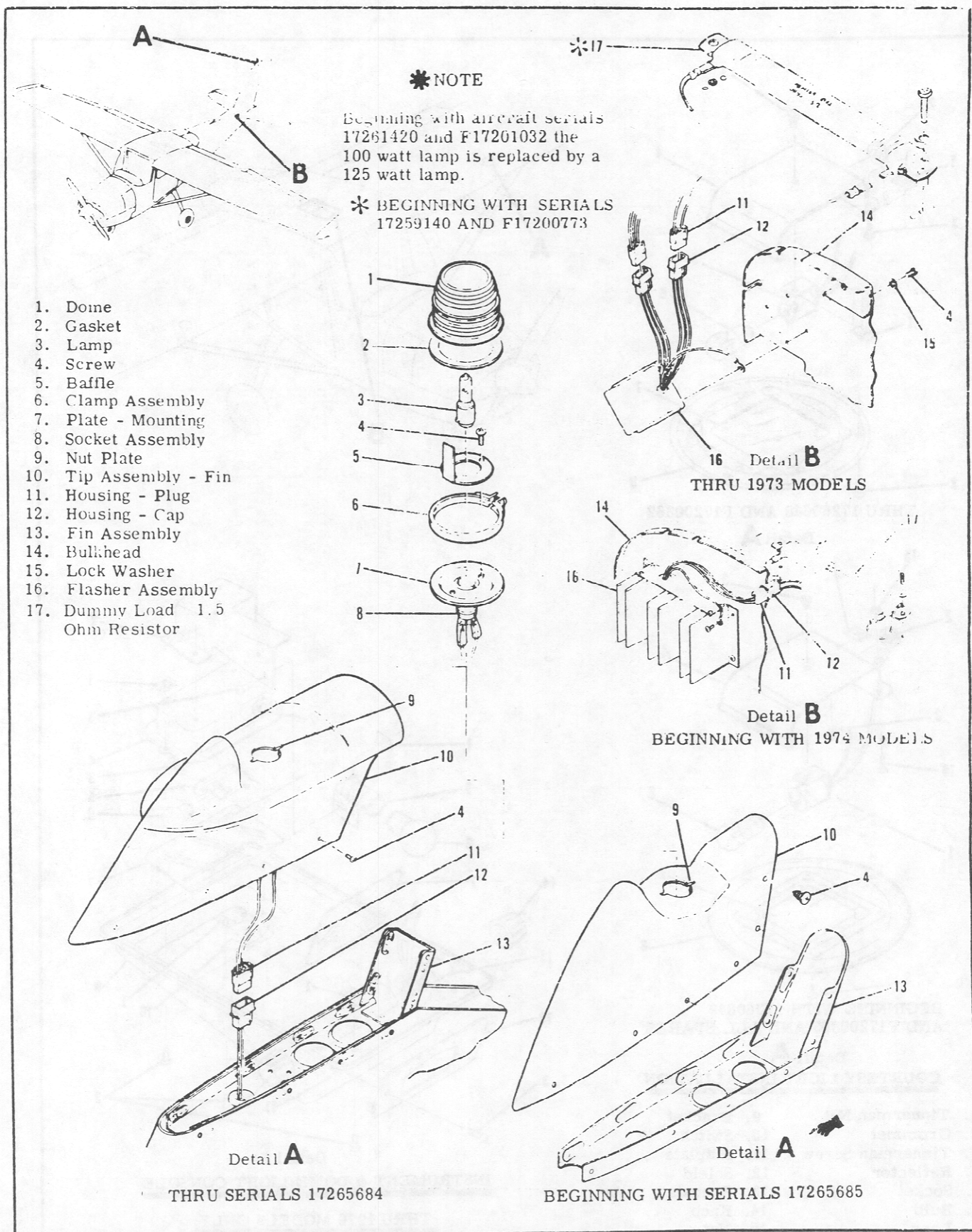
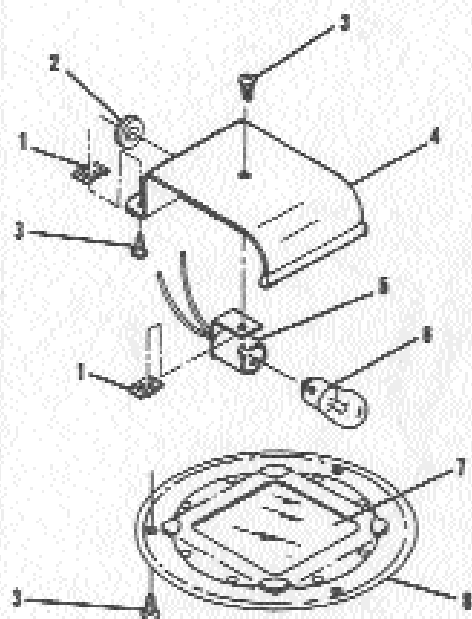
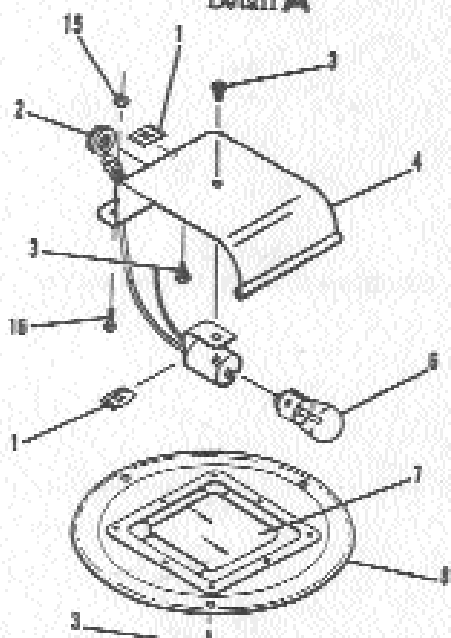


Figure 16-8. Flashing Beacon Light Installation



THRU 17200648 AND F17200882

Detail A

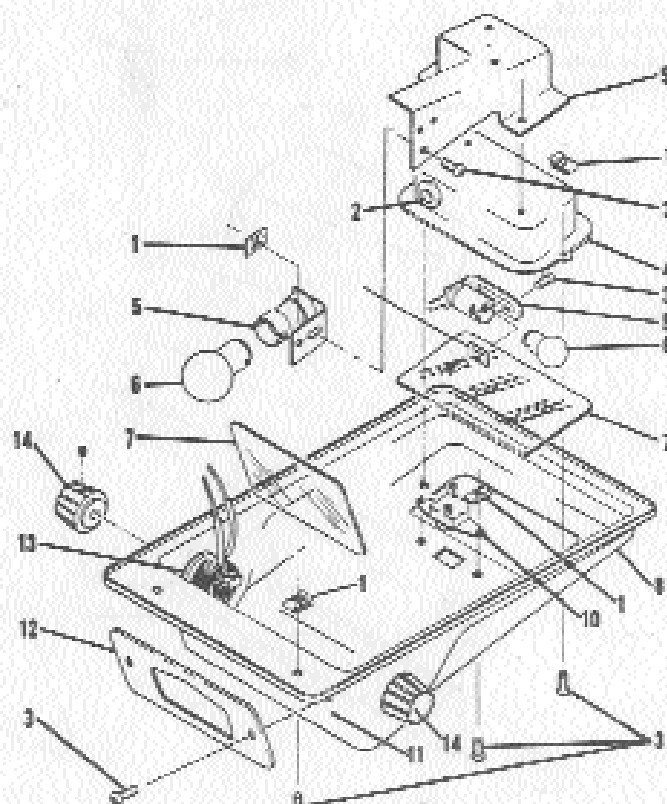
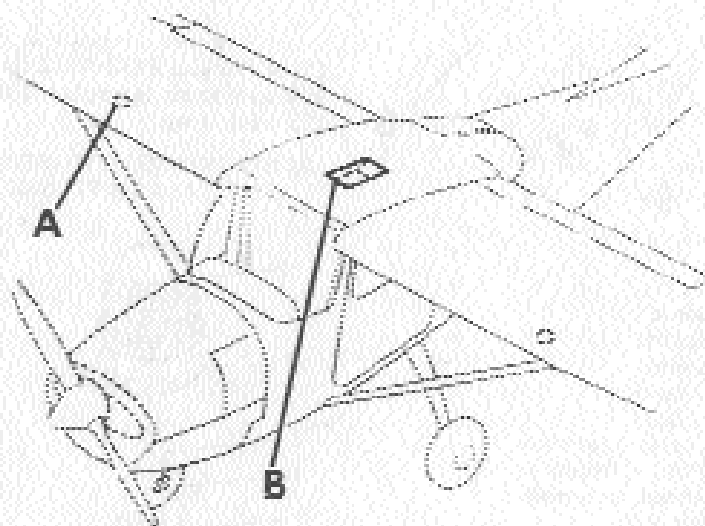


BEGINNING WITH 17200649
AND F17200883 AND ALL SPARES

Detail A

COURTESY LIGHT INSTALLATION

- | | |
|--------------------|-------------------|
| 1. Tinnerman Nut | 9. Bracket |
| 2. Grommet | 10. Switch |
| 3. Tinnerman Screw | 11. Nutplate |
| 4. Reflector | 12. Shield |
| 5. Socket | 13. Rheostat |
| 6. Bulb | 14. Knob |
| 7. Lens | 15. Nut |
| 8. Cover | 16. Machine Screw |



Detail B

INSTRUMENT & DOME LIGHT CONSOLE

THRU 1970 MODELS ONLY

Figure 18-9. Instrument, Dome and Courtesy Light Installation (Sheet 1 of 3)

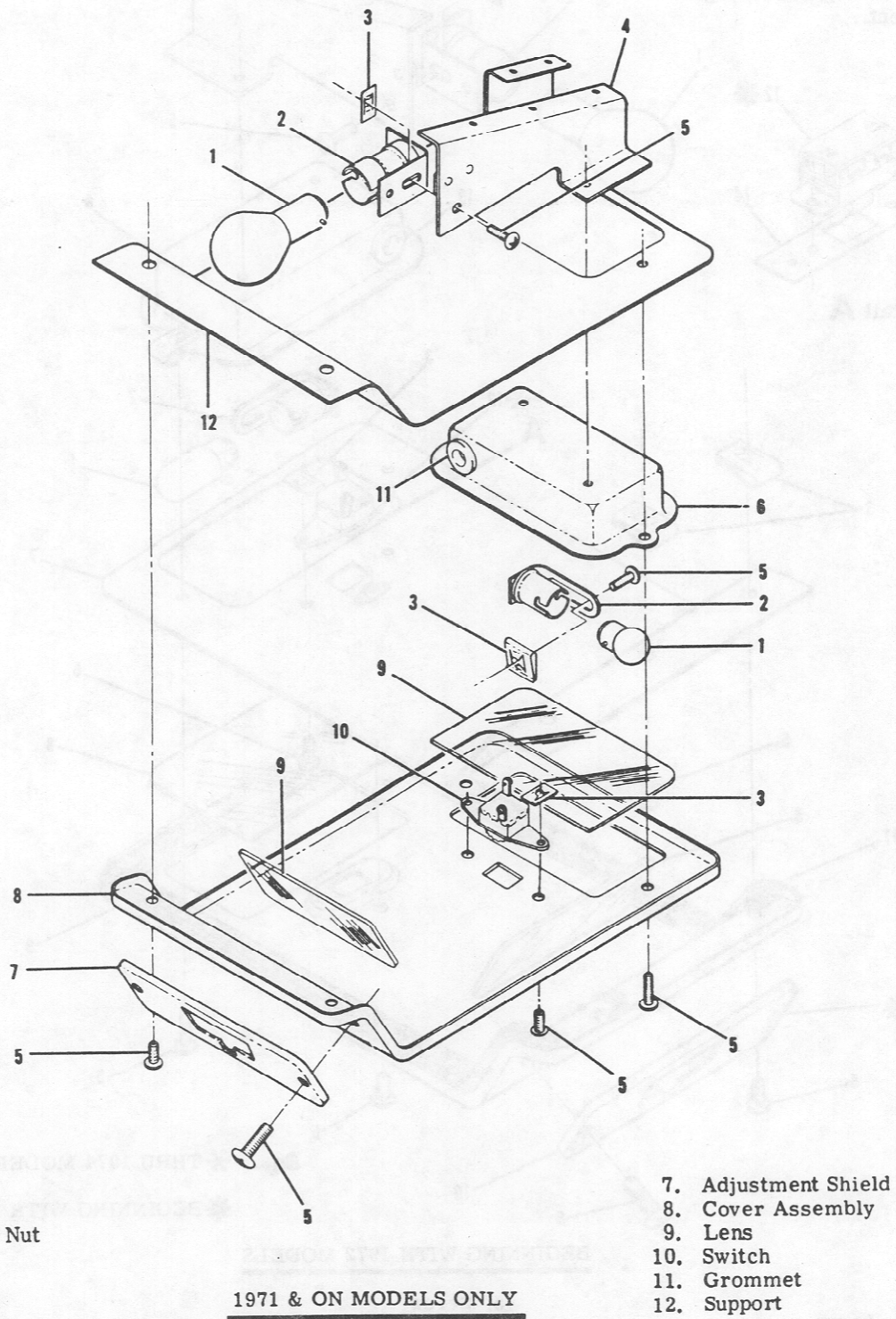


Figure 16-9. Instrument, Dome and Courtesy Light Installation (Sheet 2 of 3)

*** NOTE**

Beginning with 1975 Models
holes are elongated for light
adjustment..

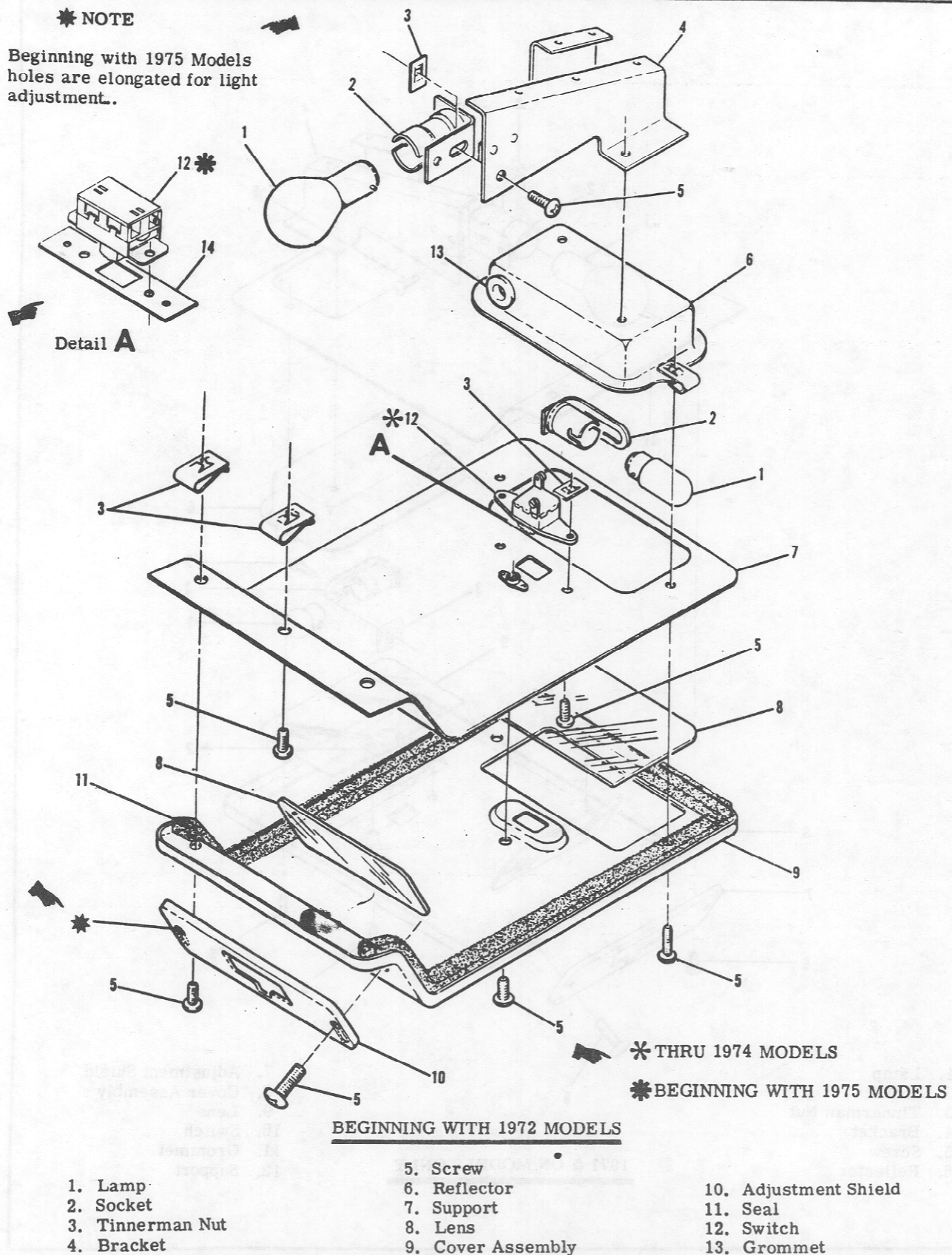


Figure 16-9. Instrument, Dome and Courtesy Light Installation (Sheet 3 of 3)

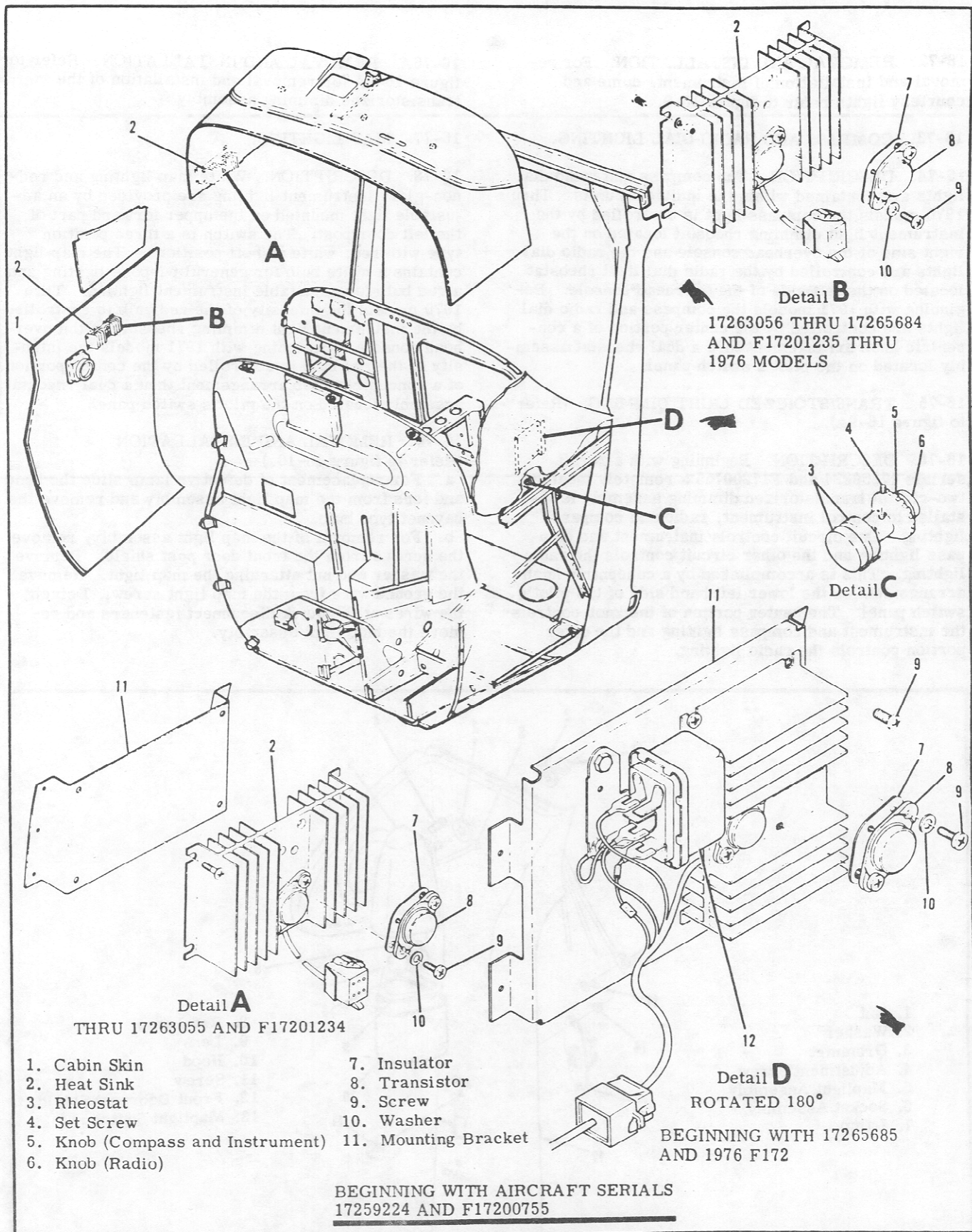


Figure 16-9A. Transistorized Dimming

16-72. REMOVAL AND INSTALLATION. For removal and installation of instrument, dome and courtesy lights refer to figure 16-9.

16-73. COMPASS AND RADIO DIAL LIGHTING.

16-74. DESCRIPTION. The compass and radio dial lights are contained within the individual units. Thru 1970 models the compass light is controlled by the instrument light dimming rheostat located on the right side of the overhead console and the radio dial lights are controlled by the radio dial light rheostat located on the left side of the overhead console. Beginning with 1971 models the compass and radio dial lights are controlled by the center portion of a concentric knob arrangement thru a dual rheostat assembly located on the pilot's switch panel.

16-75. TRANSISTORIZED LIGHT DIMMING. (Refer to figure 16-9A).

16-76. DESCRIPTION. Beginning with aircraft serials 17259224 and F17200755 a remotely located two-circuit transistorized dimming assembly is installed to control instrument, radio and compass lighting. One circuit controls instrument and compass lighting and the other circuit controls the radio lighting. This is accomplished by a concentric knob arrangement on the lower left hand side of the pilot's switch panel. The center portion of the knob controls the instrument and compass lighting and the outer portion controls the radio lighting.

16-76A. REMOVAL AND INSTALLATION. Refer to figure 16-9A for removal and installation of the transistorized dimming assembly.

16-77. MAP LIGHTING.

16-78. DESCRIPTION. White map lighting and red-non-glare instrument lighting are provided by an adjustable light mounted on the upper forward part of the left door post. The switch is a three position type with red, white and off positions. The map light contains a white bulb for general purpose lighting and a red bulb for adjustable instrument lighting. Thru 1970 models the intensity of the red bulb is controlled by the instrument light dimming rheostat on the overhead console. Beginning with 1971 models the intensity of the red bulb is controlled by the center portion of a concentric knob arrangement thru a dual rheostat assembly located on the pilot's switch panel.

16-79. REMOVAL AND INSTALLATION. (Refer to figure 16-10.)

a. For replacement 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 door post shield. Remove the washer and nut attaching the map light. Remove the ground wire from the map light screw. Detach the wires at the quick disconnect fasteners and remove the map light assembly.

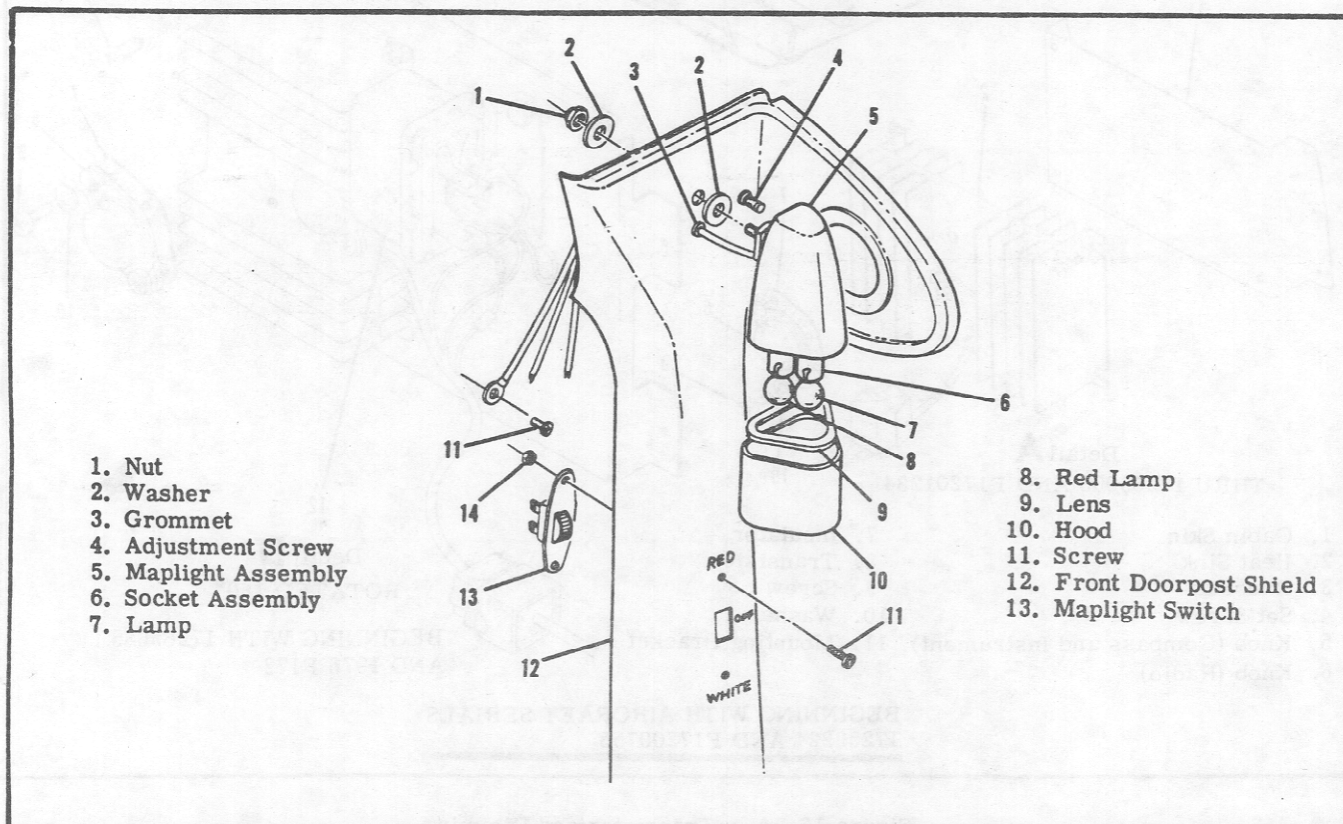
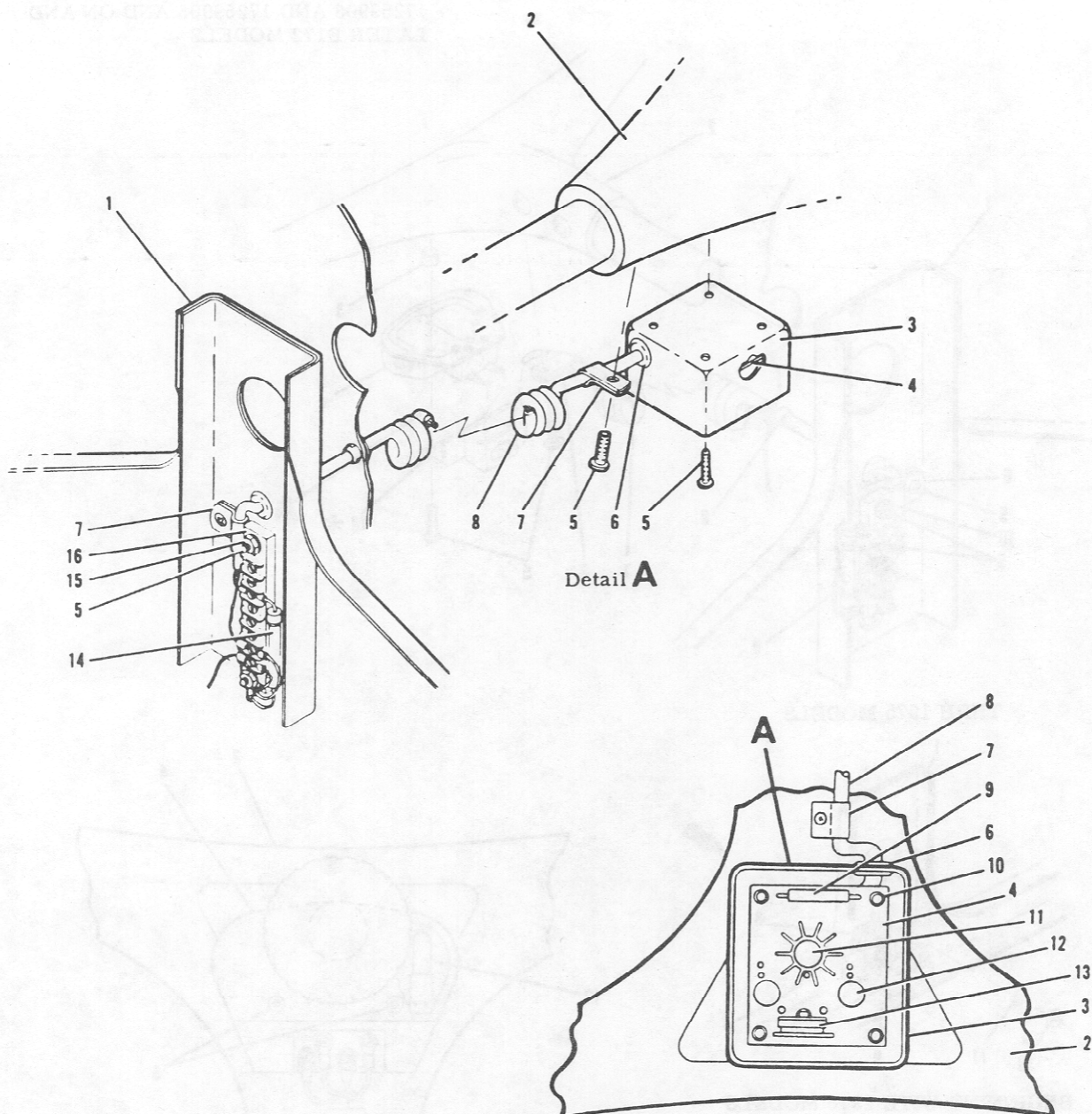


Figure 16-10. Map Light Installation



THRU 1970 MODELS ONLY

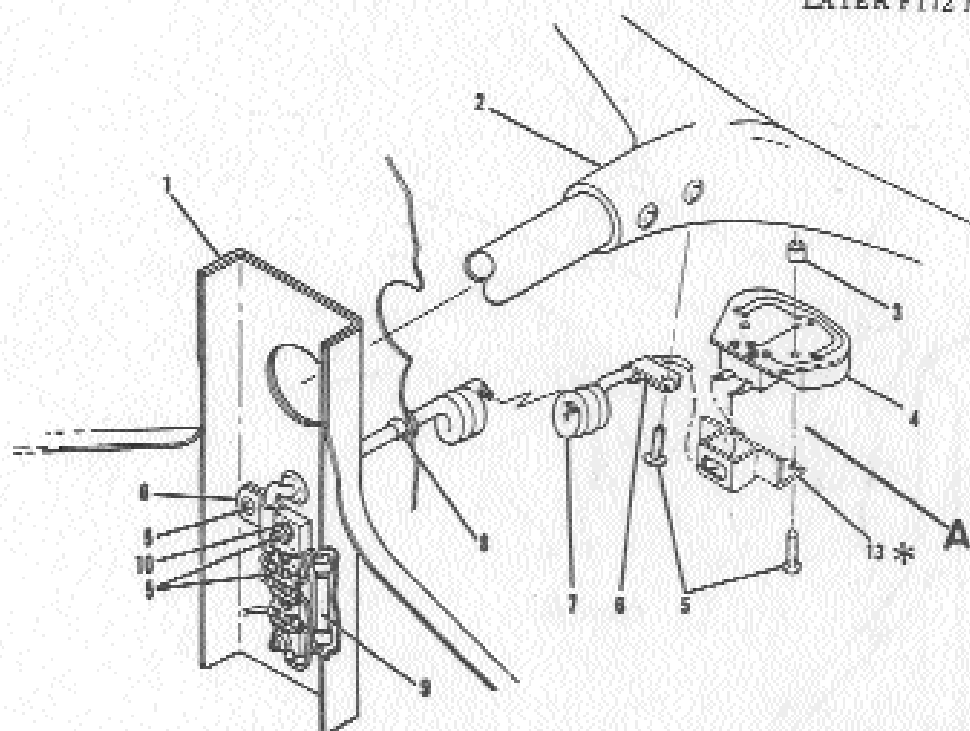
1. Stationary Panel Assembly
2. Control Wheel Assembly
3. Shield
4. Circuit Board
5. Screw

6. Grommet
7. Clamp
8. Cable Assembly
9. Resistor
10. Stand-Off
11. Diode

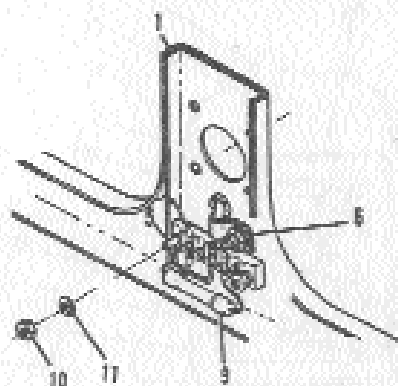
12. Light
13. Rheostat
14. 1/2 Amp - Fuse Assembly
15. Nut
16. Terminal Block

Figure 16-11. Control Wheel Map Light Installation (Sheet 1 of 2)

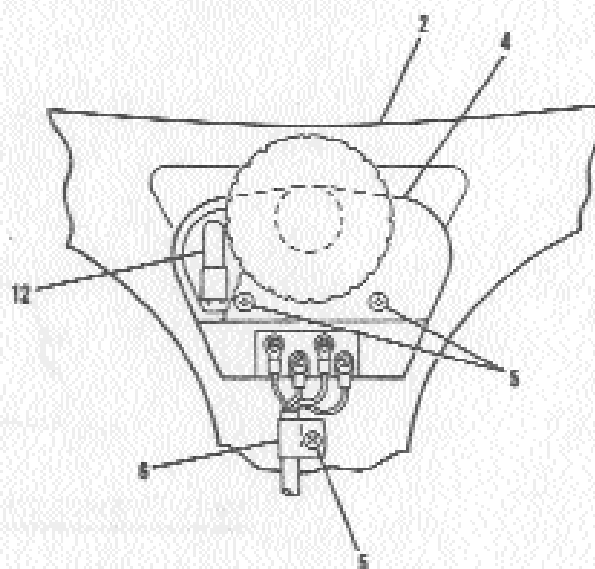
* AIRCRAFT SERIALS 17250879 THRU
17259903 AND 17259905 AND ON AND
LATER F172 MODELS



THRU 1975 MODELS



BEGINNING WITH 1976 MODELS



Detail A

1971 AND ON

1. Stationary Panel Assembly
2. Control Wheel Assembly
3. Spacer
4. Map Light Assembly
5. Screw
6. Clamp
7. Cable Assembly
8. Grommet
9. Fuse
10. Nut
11. Washer
12. Lamp
13. Cover

Figure 18-11. Control Wheel Map Light Installation (Sheet 2 of 2)

16-80. CONTROL WHEEL MAP LIGHT.

16-81. DESCRIPTION. An optional control wheel map light is available on the 172 model. The map light is mounted on the underside of the control wheel and the light intensity is controlled by a thumb operated rheostat. For dimming, the rheostat should be turned clockwise.

CAUTION

Thru 1970 aircraft only, failure to observe polarity shown on wiring diagram (page 20-38), will result in immediate failure of the transistor on the map light circuit board assembly.

16-82. REMOVAL AND INSTALLATION. (Thru 1970 Models) (Refer to Figure 16-11).

- a. For easy access to the map light assembly, rotate the control wheel 90°.
- b. Remove the four screws from the map light circuit board. The map light assembly will then be free for removal from the control wheel.
- c. Label the wires connecting to the map light circuit board assembly and remove the screws securing the wires to the circuit board assembly.
- d. To install the map light assembly, reverse this procedure.

16-83. REMOVAL AND INSTALLATION. (1971 Models and ON) (Refer to Figure 16-11).

- a. For easy access to the map light assembly rotate the control wheel 90°.

b. Label the wires connecting to the map light assembly (terminal block) and remove the screws securing the wires to the terminal block.

c. The assembly should now be free for removal. Remove the two screws securing the map light to the control wheel and remove the map light assembly.

d. For reassembly reverse this procedure.

16-84. PITOT HEATER

16-85. DESCRIPTION. An electrical heater unit is installed in some pitot tubes. The heater offsets the possibility of ice formations on the pitot tube. The heater is integrally mounted in the pitot tube and is operated by a pull type switch on the instrument panel. (See figure 16-12.)

16-86. CIGAR LIGHTER

16-87. DESCRIPTION. The cigar lighter (located on the instrument panel) is equipped with a thermal-actuated circuit breaker which is attached to the rear of the cigar lighter. The circuit breaker will open if the lighter becomes jammed in the socket or held in position too long. The circuit breaker may be reset by inserting a small probe into the .078 diameter hole in the back of the circuit breaker and pushing lightly until a click is heard.

CAUTION

Make sure master switch is "OFF" before inserting probe into circuit breaker on cigar lighter to reset.

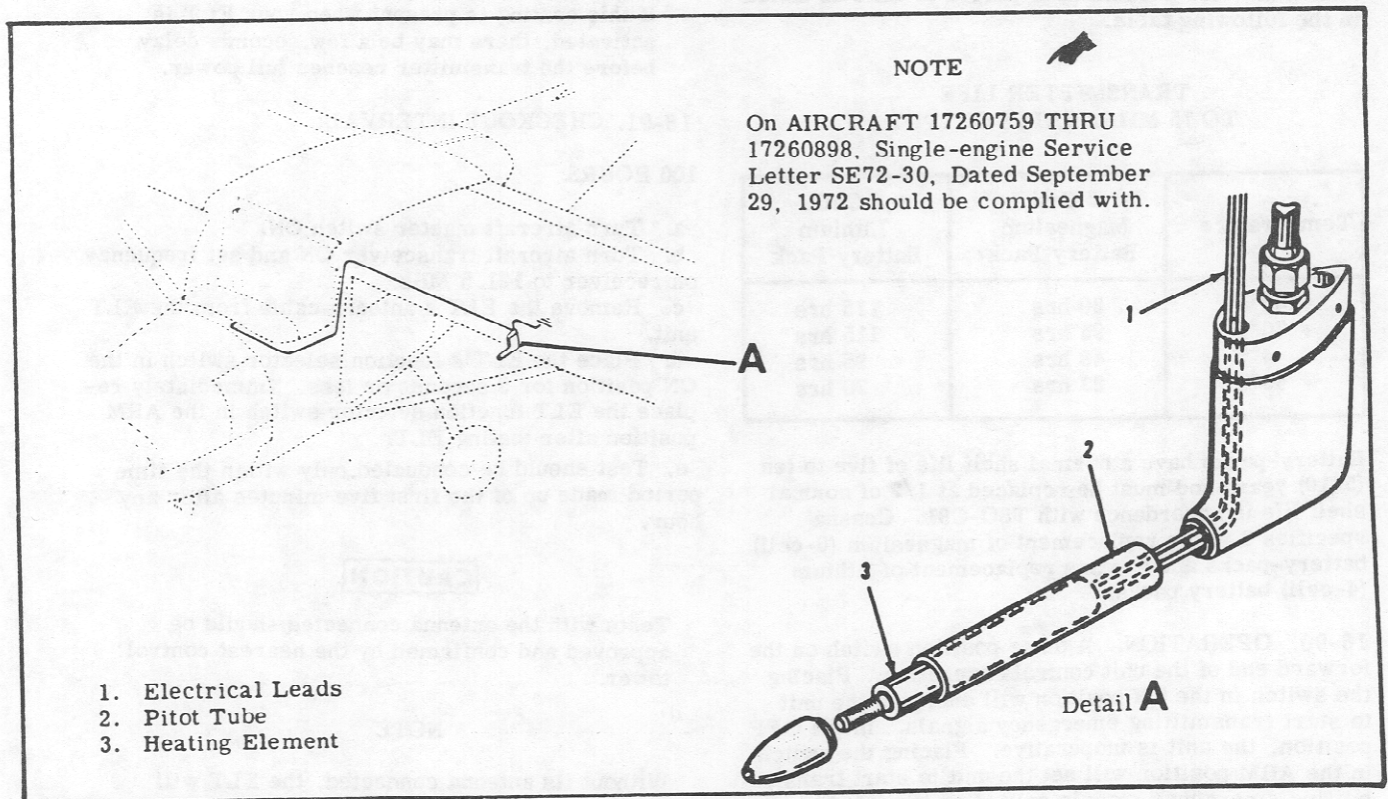


Figure 16-12. Pitot Heater Installation

16-88. EMERGENCY LOCATOR TRANSMITTER.

16-89. DESCRIPTION. The ELT is a self-contained, solid state unit, having its own power supply, with an externally mounted antenna. The C589510-0209 transmitter is designed to transmit simultaneously on dual emergency frequencies of 121.5 and 243.0 Megahertz. The C589510-0211 transmitter used for Canadian registry, operates on 121.5 only. The unit is mounted in the tailcone, aft of the baggage curtain on the right hand side. The transmitters are designed to provide a broadcast tone that is audio modulated in a swept manner over the range of 1600 to 300 Hz in a distinct, easily recognizable distress signal for reception by search and rescue personnel and others monitoring the emergency frequencies. Power is supplied to the transmitter by a battery pack which has the service life of the batteries placarded on the batteries and also on the outside end of the transmitter. ELT's thru early 1974 models, were equipped with a battery-pack containing six magnesium "D" size dry cell batteries wired in series. (See figure 16-14) Mid 1974 thru early 1975, ELT's are equipped with a battery-pack containing four "in-line" lithium "D" size batteries wired in series. Early 1975 and on ELT's are equipped with a battery-pack containing four lithium "D" size batteries which are stacked in two's (See figure 16-15). The ELT exhibits line of sight transmission characteristics which correspond approximately to 100 miles at a search altitude of 10,000 feet. When battery inspection and replacement schedules are adhered to, the transmitter will broadcast an emergency signal at rated power (75 MW-minimum), for a continuous period of time as listed in the following table.

TRANSMITTER LIFE
TO 75 MILLIWATTS OUTPUT

Temperature	6 Cell Magnesium Battery Pack	4 Cell Lithium Battery Pack
+130°F	89 hrs	115 hrs
+ 70°F	95 hrs	115 hrs
- 4°F	49 hrs	95 hrs
- 40°F	23 hrs	70 hrs

Battery-packs have a normal shelf life of five to ten (5-10) years and must be replaced at 1/2 of normal shelf life in accordance with TSO-C91. Cessna specifies 3 years replacement of magnesium (6-cell) battery-packs and 5 years replacement of lithium (4-cell) battery packs.

16-90. OPERATION. 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, for a duration of 11-16 milliseconds.

CAUTION

Do not leave the emergency locator transmitter in the ON position longer than 5 seconds or you may activate downed aircraft procedures by C. A. P., D. O. T. or F. A. A. personnel.

WARNING

Magnesium (6-cell) battery-packs (excluding 4 cell lithium battery-packs) after prolonged continuous use (1 hour) in a sealed environment give off explosive gas. If your ELT has operated for this time period or longer, as a precautionary measure, loosen the ELT cover screws, lift the cover to break air tight seal and let stand for 15 minutes before tightening screws. Keep sparks, flames and lighted cigarettes away from battery-pack.

NOTE

After relatively short periods of inactivation, the magnesium (6-cell) battery-pack 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.

16-91. CHECKOUT INTERVAL:

100 HOURS.

- Turn aircraft master switch ON.
- Turn aircraft transceiver ON and set frequency on receiver to 121.5 MHz.
- Remove the ELT's antenna cable from the ELT unit.
- Place the ELT's function selector switch in the ON position for 5 seconds or less. Immediately replace the ELT function selector switch in the ARM position after testing ELT.
- Test should be conducted only within the time period made up of the first five minutes after any hour.

CAUTION

Tests with the antenna connected should be approved and confirmed by the nearest control tower.

NOTE

Without its antenna connected, the ELT will produce sufficient signal to reach your receiver, yet it will not disturb other communications or damage output circuitry.

NOTE

After accumulated test or operation time equals 1 hour, battery-pack replacement is required.

- f. Check calendar date for replacement of battery-pack. This date is supplied on a sticker attached to the outside of the ELT case and to each battery.

16-92. REMOVAL AND INSTALLATION OF TRANSMITTER. (Refer to figure 16-13.)

- a. Thru 1973 Models remove baggage curtain to gain access to the transmitter and antenna.
- b. Beginning with 1974 Models remove cover in the extended portion of the baggage compartment to gain access to the transmitter, remove screws securing baggage compartment overhead cover and remove cover to gain access to the antenna.
- c. Disconnect co-axial cable from end of transmitter.
- d. Depending upon the particular installation, either cut four sta-straps and remove transmitter or cut sta-strap securing antenna cable and unlatch metal strap to remove transmitter.

NOTE

Transmitter is also attached to the mounting bracket by velcro strips; pull transmitter to free from mounting bracket and velcro.

NOTE

To replace velcro strips, clean surface thoroughly with clean cloth saturated in one of the following solvents: Trichloric thylene, Aliphatic Napthas, Methyl Ethyl Ketone or Enmar 6094 Lacquer Thinner. Cloth should be folded each time the surface is wiped to present a clean area and avoid redepositing of grease. Wipe surface immediately with clean dry cloth, do not allow solvent to dry on surface. Apply Velcro #40 adhesive to each surface in a thin even coat and allow to dry until quite tacky, but no longer transfers to the finger when touched (usually between 5 and 30 minutes). Porous surfaces may require two coats. Place the two surfaces in contact and press firmly together to insure intimate contact. Allow 24 hours for complete cure.

- e. To reinstall transmitter, reverse preceding steps.

NOTE

An installation tool is required to properly secure sta-straps on units installed with sta-straps. This tool may be purchased locally or ordered from the Pandiut Corporation, Tinley Park, Ill., part number GS-2B (Conforms to MS90387-1).

CAUTION

Ensure that the direction of flight arrows

(placarded on the transmitter) are pointing towards the nose of the aircraft.

16-92A. REMOVAL AND INSTALLATION OF ANTENNA. (Refer to figure 16-13.)

- a. Disconnect co-axial cable from base of antenna.
- b. Remove the nut and lockwasher attaching the antenna base of the fuselage and the antenna will be free for removal.
- c. To reinstall the antenna, reverse the preceding steps.

NOTE

Upon reinstallation of antenna, cement rubber boot (14) using RTV102, General Electric Co. or equivalent, to antenna whip only; do not apply adhesive to fuselage skin or damage to paint may result.

CAUTION

In-service 6 cell magnesium battery-pack powered ELT's require the installation of a static electricity suppressor in the antenna cable to prevent the possibility of damage to the case of the ELT. Refer to Cessna Avionics Service Letter AV74-16 and figure 16-13.

16-93. REMOVAL AND INSTALLATION OF MAGNESIUM SIX (6) CELL BATTERY-PACK. (Refer to figure 16-14.)

NOTE

Since replacement 6 cell magnesium battery-packs are no longer available, when in-service units require replacement, use the 4 cell lithium battery-pack. Refer to paragraph 16-94.

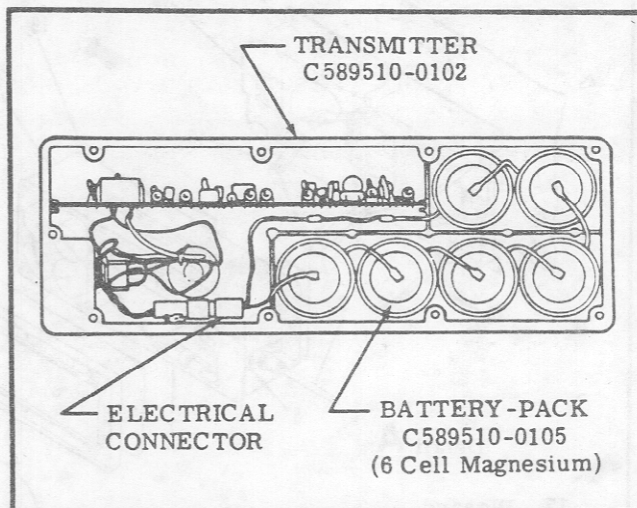


Figure 16-14. Magnesium 6 Cell Battery-Pack Installation

16-94. REMOVAL AND INSTALLATION OF LITHIUM FOUR (4) CELL BATTERY-PACK. (Refer to figure 16-15.)

NOTE

Transmitters equipped with the 4 cell battery-pack can only be replaced with another 4 cell battery-pack.

- After the transmitter has been removed from aircraft in accordance with para. 16-92, place the transmitter switch in the OFF position.
- Remove the nine screws attaching the cover to the case and then remove the cover to gain access to the battery-pack.

NOTE

Retain the rubber "O" ring gasket, rubber washers and screws for reinstallation.

- Disconnect the battery-pack electrical connector and remove battery-pack.
- Place new battery-pack in the transmitter with four batteries as shown in the case in figure 16-15.
- Connect the electrical connector as shown in figure 16-15.

NOTE

Before installing the new 4 cell battery-pack, check to ensure that its voltage is 11.2 volts or greater.

CAUTION

If it is desirable to replace adhesive material on the 4 cell battery-pack, use only 3M Jet Melt Adhesive #3738. Do not use other adhesive materials since other materials may corrode the printed circuit board assembly.

- Replace the transmitter cover by positioning the rubber "O" ring gasket, if installed, on the cover and pressing the cover and case together. Attach cover with nine screws and rubber washers.
- Remove the old battery-pack placard from the end of transmitter and replace with new battery-pack placard supplied with the new battery-pack.

CAUTION

Be sure to enter the new battery-pack expira-

tion date in the aircraft records. It is also recommended this date be placed in your ELT Owner's Manual for quick reference.

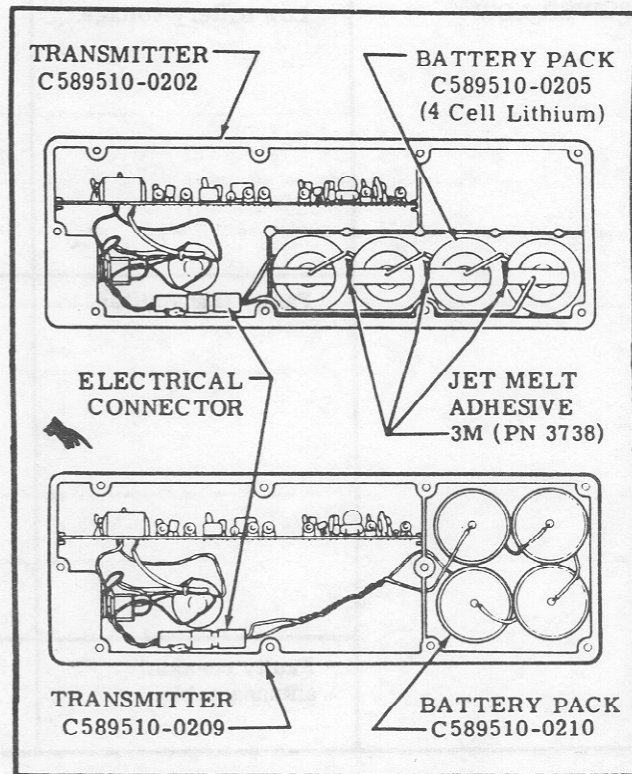


Figure 16-15. Lithium 4 Cell Battery Pack Installations

16-95. TROUBLE SHOOTING. Should your Emergency Locating Transmitter fail the 100 Hours performance checks, it is possible to a limited degree to isolate the fault to a particular area of the equipment. In performing the following trouble shooting procedures 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.

SHOP NOTES:

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 1750 jackplug, connect a Simpson 260 model voltmeter and measure voltage. If the battery-pack voltage on the 6-cell magnesium battery pack transmitter is 10.8 volts or less, and on the 4-cell lithium battery pack transmitters is 11.2 volts or less, the battery pack is below specification.
	Faulty transmitter.	3. If the battery-pack voltage meets the specifications in step 2, the battery-pack 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 maximum long leads, connect a Simpson Model 1223 ammeter to the jack. c. Set the toggle switch to ON and observe the ammeter current drain. If the current - drain is in the 85-100 ma range, the transmitter or the co-axial 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.

SHOP NOTES:

ELECTRICAL LOAD ANALYSIS CHART

STANDARD EQUIPMENT (RUNNING LOAD)	AMPS REQD							
	1969	1970	1971	1972	1973	1974	1975	1976
Battery Contactor	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Fuel Indicators	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Flashing Beacon Light	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Instrument Lights.	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.3
Position Lights.	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Turn Coordinator.	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Flap Position Indicator	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
OPTIONAL EQUIPMENT (RUNNING LOAD)								
Strobe Lights.	—	—	—	—	—	3.0	3.0	4.0
Cessna 300 ADF (Type R-521B)	1.6	1.6	1.6	1.6	—	—	—	—
Cessna 300 ADF (Type R-547A)	—	—	—	1.0	1.0	1.0	1.0	—
Cessna 300 ADF (Type R-546E)	—	—	—	1.0	1.0	1.0	1.0	1.0
Cessna 300 Marker Beacon (Type R-502B)	.02	.02	.02	.02	.02	.02	—	—
Cessna 300 Nav/Com (90 Channel-Type RT-517R)	4.5	4.5	4.5	—	—	—	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-540A)	4.5	4.5	4.5	—	—	—	—	—
Cessna 300 Nav/Com (100 Channel-Type RT-508A)	—	—	—	1.9	1.9	—	—	—
Cessna 300 Nav/Com (100 Channel-Type RT-308C)	—	—	—	—	—	1.5	1.5	1.5
Cessna 300 Nav/Com (360 Channel-Type RT-528A)	—	—	—	1.9	1.9	—	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-528E)	—	—	—	—	1.9	1.9	1.9	—
Cessna 300 Nav/Com (360 Channel-Type RT-328A)	—	—	—	—	1.9	—	—	—
Cessna 300 Nav/Com (360 Channel-Type RT-328C)	—	—	—	—	—	1.5	—	—
Cessna 300 Nav/Com (720 Channel-Type RT-328D)	—	—	—	—	—	—	1.5	—
Cessna 300 HF Transceiver (PT10-A)	—	—	—	—	—	1.5	1.5	1.5
Cessna 300 Transceiver (Type RT-524A)	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Cessna 300 Transponder (Type KT-75R)	1.5	1.5	1.5	1.5	—	—	—	—
Cessna 300 Transponder (Types KT-76 or KT-78)	—	—	—	1.3	1.3	1.3	1.3	—
Cessna 300 Transponder (RT-359A)	—	—	—	—	—	1.0	1.0	1.0
Cessna 400 Glideslope (Type R-542B)	0.5	0.5	0.5	0.5	—	—	—	—
Cessna 400 Glideslope (Type R-443A)	—	—	—	—	0.4	—	—	—
Cessna 400 Glideslope (Type R-443B) (40 Channel)	—	—	—	—	—	.4	.4	.4
Cessna 400 Marker Beacon (Type R-402A)	—	—	—	—	—	—	.3	.3
King KY-95 or KY-95F**	4.0	4.0	4.0	—	—	—	—	—
King KX-160E, AE or FE **	2.5	2.5	2.5	—	—	—	—	—
King KX-160-1 **	—	2.5	2.5	—	—	—	—	—
Narco Mark 12A Nav/Com	4.6	—	—	—	—	—	—	—
Narco Mark 12B with VOA-40 or VOA-50*	—	4.6	4.6	—	—	—	—	—
Sunair SS Band HF Transceiver (Type ASB-125)	—	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Cessna 300 DME (Type KN-60B)	3.0	3.0	3.0	—	—	—	—	—
Cessna 300 DME (Type KN-60C)	—	—	—	3.0	3.0	3.0	3.0	—
Cessna 300 Navomatic (Type AF-512C)	2.0	2.0	2.0	—	—	—	—	—
Cessna 300 Navomatic (Type AF-512D)	—	—	—	2.0	—	—	—	—
Cessna 300 Navomatic (Type AF-394A)	—	—	—	—	1.75	1.75	—	—
Cessna 300A Navomatic (Type AF-395A)	—	—	—	—	—	—	2.0	2.0
Cessna 200 Navomatic (Type AF-295A)	—	—	—	—	—	2.0	—	—
Cessna 200 Navomatic (Type AF-295B)	—	—	—	—	—	—	2.0	2.0
Cessna EA-401A Encoding Altimeter	—	—	—	—	—	—	.065	.065
Cessna 300 Nav/Com (360 Channel-RT-528-1)	—	—	—	—	—	—	—	1.9
Cessna 300 Nav/Com (720 Channel-RT-328T)	—	—	—	—	—	—	—	1.5
Narco 190 DME	—	—	—	—	—	—	—	3.0
†Negligible								
*Available on 172 Models only.								
**Available on F172 Models only.								

ELECTRICAL LOAD ANALYSIS CHART (CONT.)

ITEMS NOT CONSIDERED AS PART OF RUNNING LOAD	AMPS REQD							
	1969	1970	1971	1972	1973	1974	1975	1976
Cigarette Lighter	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Clock	†	†	†	†	†	†	†	†
Control Wheel Map Light	.33	.33	.33	.33	.33	.33	.33	.33
Courtesy & Dome Lights	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Flap Motor	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Landing Lights	15.6	15.6	—	—	—	—	—	—
Landing and Taxi Light (Cowl Mounted)	—	—	18.0	20.0	20.0	20.0	20.0	20.0
Landing and Taxi Lights (Cowl Mounted)	—	—	—	—	—	15.6	15.6	15.6
Map Light	.33	.33	.33	.33	.33	.33	.33	.33

†Negligible
 *Available on 172 Models only.
 **Available on F172 Models only.