Section XI
Electrical Systems

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Section XI
Electrical Systems

11-1. ELECTRICAL SYSTEM (Figure 11-1 , 11-2, and 11-5).

11-2. DESCRIPTION. The 206 helicopter is equipped with a 28 Vdc electrical system. Power for this system is obtained from a nickel-cadmium vented 24 volt 13 ampere-hour battery and a 150 ampere (derated to 105) amperes) 30 volt combination starter-generator. Major components of the dc power system include the battery, starter-generator, voltage regulator, relays, and circuit breakers. All circuits in the electrical system are single wire with a common ground return. The negative terminals of the starter-generator and battery are grounded to the helicopter structure.

11-3. SWITCHES. Switches are used to control the various electrical units of the helicopter. These switches are on the instrument, collective stick head, cyclic stick grip, and overhead console panels. Circuit breakers for the protection of electrical circuits are located on the overhead console panel. The panels are designed to provide easy access to these controls.

11-4. EXTERNAL POWER. External power may be supplied to the helicopter by means of a receptacle located at the lower front section of the helicopter fuselage.

11-5. WIRING. All wiring is adequately shielded and wires are marked with identification letters and numbers.

WIRING IDENTIFICATION CODE

CIRCUIT FUNCTION LETTER	DESCRIPTION
C	Control Surface
D	Instrument Circuits (Other than engine or flight instrument)
E	Engine Instrument Circuits
H	Heating, ventilating and De-icing
J	Ignition Circuit
K	Engine Control Circuit
L	Lighting Circuit
P	DC Power
Q	Fuel and Oil Circuit
W	Warning and Emergency

Identification of each cable is accomplished by a combination of letters and numbers.

(Example E17B20N)

E	Circuit Function
17	Cable Number
B	Cable Segment
20	Wire Size
N	Ground (as applicable)

11-6. TROUBLESHOOTING.

Note

For adjustment or repairs not covered in this manual, consult the handbook published by the applicable manufacturer.

BATTERY AND GENERATOR SYSTEM (See figure 13-2)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Battery will not hold charge	Demand too great	Use external power source whenever possible
	Charging rate too low	Adjust voltage regulator

BATTERY AND GENERATOR SYSTEM (See figure 13-2) (Cont)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
	Broken cell partitions	Replace battery.
	Shorted or grounded wire	Repair wiring.
	Unbalanced cells	Discharge and recharge battery with deep cycle in accordance with manufacturer's instructions.
Excessive loss of electrolyte	Charging rate too high, if loss is in individual cells(s) only, cell(s) is faulty.	Reduce charging rate.
	Cracked battery cells or case.	Replace battery.
Battery terminals corroded	Excessive charging or discharging rate.	Adjust charging rate or load and clean terminals.
Polarity reversed.	Connections reversed.	Change wiring.
Lack of power when external power plug is inserted.	Reverse polarity in plug. (Helicopters 1658 and subsequent only.)	Rework plug to correct polarity.
	Relay contacts corroded or pitted.	Replace relay.
	Voltage from external source too low.	Adjust output of external power.
	Voltage from external source too high.	Replace battery relay.
Actuation of battery switch fails to turn on power.	Battery relay contacts corroded or burned.	Replace relay.
	Faulty wiring between relay and battery switch.	Repair wiring.
	Defective battery switch.	Replace switch.
Starter-generator produces voltage, but loadmeter reads zero.	Loadmeter circuit breakers open.	Close circuit breakers.
	Defective reverse current relay.	Replace defective relay.
	No load on bus.	Add load to bus.

BATTERY AND GENERATOR SYSTEM (See figure 13-2) (Cont)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
	Defective loadmeter or loadmeter circuit.	Replace wiring or defective loadmeter. Tighten connections.
	Defective circuit breakers in loadmeter circuit.	Replace circuit breakers.
No starter-generator output.	No residual magnetism.	Replace resistor on generator field control relay.
	Open circuit in voltage regulator.	Replace regulator.
	Open generator field circuit.	Repair wiring or replace starter-generator.
	Armature burned out or shaft sheared.	Replace starter-generator.
	Brushes excessively worn.	Replace brushes.
	Faulty connections.	Replace or tighten connections.
	Armature or field winding short circuited.	Replace starter-generator.
	Brushes binding in holders.	Replace or clean and reset brushes.
	Commutator dirty, rough or pitted.	Replace starter-generator.
Regulator adjustment does not alter voltage within normal range.	Defective regulator.	Replace regulator.
	Faulty wiring.	Repair wiring.
Loadmeter fluctuates.	Voltage regulator unstable.	Replace regulator.

INDICATOR — TURBINE OUTLET TEMPERATURE (HELICOPTERS PRIOR TO 914)
(See figure 13-3)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
No reading on indicator	Loose connections on indicators, lead spool resistor, or terminal blocks.	Clean and tighten connections.
	Open circuit in indicator.	Replace indicator.
Incorrect reading	Harness not calibrated to 8 ohms.	Calibrate harness to 8 ohms.
Indicator shows excessive temperature.	Loose connectors.	Tighten connectors.
	Incorrect circuit resistance.	Adjust resistance.
	Defective indicator.	Replace indicator.

INDICATOR — TURBINE OUTLET TEMPERATURE (HELICOPTERS 914 AND SUBSEQUENT)
(See figure 13-3)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
No reading on indicator	Open or defective circuit breaker.	Check and replace faulty circuit breaker.
	Loose connections on indicator, terminal block or connector.	Clean and tighten connections.
	Defective indicator.	Replace indicator.
Inaccurate readings	Shorts or open in engine thermocouple harness.	Test harness.
Erratic reading	Voltage below 10 volts.	Replace battery.
	Open thermocouple harness.	Check harness.
Indicator shows excessive temperature.	Loose connectors.	Tighten connectors.
	Incorrect circuit resistance.	Adjust resistance.
	Defective indicator.	Replace indicator.

CAUTION AND WARNING LIGHT SYSTEM (See figure 13-4.)

TRANSMISSION PRESSURE CAUTION LIGHT

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Transmission pressure caution light fails to operate.	Defective or open circuit breaker.	Close or replace faulty circuit breaker.
	Lamp burned out.	Replace lamp.
	Faulty wiring.	Repair wiring.
	Faulty pressure switch.	Replace switch.
Transmission pressure light burns constantly.	Shorted wiring.	Repair wiring.
	Shorted switch.	Replace switch.

Note

For troubleshooting of TRANS TEMP, FUEL FILTER, FUEL PUMP, and ENG OUT caution light, refer to troubleshooting chart on transmisison pressure caution light; procedure is the same. Exception: The RPM SENSOR (effective on helicopters 584 and subsequent) operates ENGINE OUT caution light using signal from GAS PRODUCER tach generator. The RPM SENSOR also controls the HOUR METER.

GOVERNOR CONTROL SYSTEM (See figure 13-5)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Governor actuator fails to respond when governor RPM switch is placed to increase or decrease positions.	Defective or open circuit breaker in overhead console.	Close or replace faulty circuit breaker.
	Faulty wiring or loose connections.	Repair wiring or tighten connections.
	Switch contacts corroded or burned.	Replace switch.
	Defective governor control actuator.	Replace actuator.
	Leads connected to wrong terminals on actuator.	Refer to wiring diagram for correct terminals.
Actuator moves in opposite direction to increase/decrease selection.	Leads connected to wrong terminals on actuator or switch.	Refer to wiring diagram for correct terminals.

STARTER SYSTEM (See figure 13-6)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Starter fails to operate when START switch is depressed.	Defective starter circuit breakers.	Replace circuit breaker.
	Defective battery.	Replace battery.
	Switch contacts corroded or burned.	Replace switch.
	Defective starter relay.	Replace relay.
	Faulty wiring or loose connections.	Repair wiring and tighten connections.
	Brushes excessively worn.	Replace brushes.
	Armature burned out.	Replace starter-generator.

STARTER SYSTEM (See figure 13-6) (Cont)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Starter fails to produce sufficient RPM during start cycle (15% as indicated on gas producer tach.)	Excessive wear to bearings.	Replace bearing.
	Battery terminal voltage low.	Use power cart.

TEMPERATURE AND PRESSURE SYSTEM (See figures 13-7 , 13-15 , or 13-15A)

TRANSMISSION OIL TEMPERATURE BULB

INDICATION TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Indicator fails to operate.	Open or defective INST. CLUSTER circuit breaker.	Close or replace faulty circuit breaker.
	Faulty wiring or loose connections.	Repair wiring or tighten connections.
	Defective temperature bulb.	Replace bulb.
	Defective indicator.	Replace indicator.
	Defective XMSN Temperature circuit breaker.	Replace circuit breaker (Helicopters 914 and sub.)

Note

For troubleshooting of Engine Oil Temperature Bulb, refer to chart on transmission oil temperature bulb; procedure is the same.

TRANSMISSION OIL PRESSURE (S/N 254 THRU 913)

INDICATION TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Indicator fails to operate.	Faulty wiring or loose connections. Open or defective INST CLUSTER circuit breaker.	Repair wiring or tighten connection. Close or replace circuit breaker.
	Defective transmitter.	Perform function test. (Figure 11-4.) Replace if defective.
	Defective indicator.	Replace indicator.

Note

For troubleshooting of Engine Oil Pressure, Fuel Pressure (S/N 254 and subsequent), or Torque Pressure refer to chart on transmission oil pressure; procedure is the same.

TACHOMETER SYSTEM (See figure 13-8)

POWER TURBINE TACHOMETER GENERATOR

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Excessive indicator error.	Weak magnet in tachometer.	Replace tachometer
	Defective ENG Temperature circuit breaker.	Replace circuit breaker (Helicopters 914 and sub.)
Pointer moves backward.	Leads reversed at generator.	Reverse leads at generator.

TACHOMETER SYSTEM (See figure 13-8) (Cont)

POWER TURBINE TACHOMETER GENERATOR

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Indicates one-half actual speed.	Leads connected to wrong terminal on indicator.	Refer to wiring diagram and install wires in indicator plug correctly.
No reading on indicator.	Break or short circuit.	Repair wiring.
	Bad generator or indicator.	Replace faulty unit.
	Poor connection at generator.	Clean and tighten connections.
High or Low reading on indicator, either constant or termittent.	Poor connections at indicator or generator.	Clean and tighten connections.

NOTE

For troubleshooting of Rotor Tachometer Generator and Gas Producer Tachometer refer to chart on power turbine tachometer generator; procedure is the same.

HYDRAULIC CONTROL SYSTEM (See figure 13-9)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Hydraulic by-pass switch to OFF fails to operate operate solenoid.	Defective or open circuit breaker.	Close or replace faulty circuit breaker.
	Bypass switch contacts corroded or burned.	Replace switch.
	Faulty wiring or loose connections.	Repair wiring or tighten connections.
	Defective solenoid.	Replace solenoid.
Circuit breaker trips.	Wiring shorted.	Repair wiring.
	Solenoid shorted.	Replace solenoid.

FUEL VALVE SYSTEM (See figure 13-10)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTION ACTION
Fuel shut off valve fails to operate when fuel valve switch is actuated.	Open or defective circuit breaker.	Close or replace circuit breaker.
	Faulty wiring or loose connection.	Repair wiring or tighten connection.
	Faulty switch.	Replace switch.
	Defective fuel dump switch. (Helicopters 584 and subsequent)	Replace switch.
Fuel shut off valve operates in reverse.	Leads reversed between switch and valve.	Refer to wiring diagram and and correct as necessary.

IGNITION SYSTEM (See figure 13-11)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Ignition fails to operate when starter switch is depressed.	Starter or ignition circuit breaker open or defective.	Close or replace circuit breaker.
	Starter switch contact corroded or burned.	Replace switch.
	Loose connections or defective wiring.	Repair wiring and tighten connections.
	Defective generator field relay.	Replace relay.
	Defective igniter.	Replace igniter.

ENGINE DEICING SYSTEM (See figure 13-12)

INDICTION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Engine deicing switch fails to operate control.	Defective or open circuit breaker in heater control	Close or replace circuit breaker.

ENGINE DEICING SYSTEM (See figure 13-12) (Cont)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
	Defective engine deicing switch.	Replace switch.
	Loose connections or faulty wiring.	Tighten connections or repair wiring.
	Defective deicing control actuator.	Replace actuator.
Deicing control actuator operates in reverse.	Wiring reversed between switch and control.	Refer to wiring diagram and correct as necessary.
Circuit breaker trips.	Shorted wiring.	Repair wiring.
	Shorted control actuator.	Replace actuator.

FUEL QUANTITY SYSTEM (See figure 13-3)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
No indicator reading.	Open or defective INST. CLUSTER circuit breaker.	Close or replace circuit breaker.
	Defective fuel quantity-pressure circuit breaker (Helicopters 584 and subsequent)	Replace circuit breaker.
	Loose circuit connection(s).	Tighten connection(s).
	Defective indicator.	Replace indicator.
	Defective tank unit system.	Replace tank unit and recalibrate.
Incorrect indicator reading.	Improper resistance setting on R5 or R6.	Check resistance and calibrate system.
	Defective indicator.	Replace indicator.
	Defective tank unit.	Replace tank unit and recalibrate system.

Note

For calibration procedure refer to section X.

FUEL PUMP SYSTEM (See figure 13-14)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Fuel pump fails to operate when breaker is closed.	Defective breaker in pump circuit.	Replace circuit breaker.
	Faulty wiring or loose connections.	Repair wiring and tighten connections.
	Defective pump.	Replace pump.
Circuit breaker trips.	Wiring shorted.	Repair wiring.
	Shorted or defective pump.	Replace pump.

NIGHT FLYING SYSTEM (See figure 13-18)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Any lamp fails to light when circuit is energized.	Open lamp filament.	Replace lamp.
	Lamp improperly bonded to structure.	Bond as necessary to provide good electrical contact.
	Faulty wiring.	Repair wiring.
Landing light fails to operate when landing light switch is closed.	Faulty circuit breaker.	Replace breaker.
	Faulty landing light switch.	Replace switch.
	Defective relay.	Replace relay.
	Open lamp filament.	Replace lamp.
	Faulty wiring.	Repair wiring.
Circuit breaker trips.	Shorted wiring.	Repair as necessary.
Instrument lights fail to brighten as INST LT knob is rotated.	Faulty dimming resistor.	Replace resistor.
	Defective transistor dimmer element.	Replace dimmer element.
	Shorted wire.	Replace wire.
	Shorted lamp.	Replace lamp.

NIGHT FLYING SYSTEM (See figure 13-18) (Cont)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Anti-collision light fails to flash when circuit is energized.	Flash tube broken.	Replace flash tube.
Anti-collision light is inoperative.	Defective switch.	Replace switch.

DEFOGGING BLOWER SYSTEM (See system 13-16)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Blowers fail to operate when DEFOG BLOWER switch placed to ON.	Defective switch, faulty wiring, or loose connections.	Replace switch, repair wiring, or tighten connections.
	Defective blower.	Replace blower.
Circuit breaker trips.	Shorted wiring.	Repair wiring.
	Overloaded blower motor.	Check fans for free operation.
	Shorted blower motor.	Replace motor.

11-7. BATTERY (Figures 11-1 and 13-2).

11-8. DESCRIPTION. The battery installation on the Model 206 JetRanger consists of a vented, 24 volt, 13 ampere-hour nickel-cadmium battery located in the nose section of the helicopter.

11-9. MAINTENANCE — BATTERY.

Note

Refer to Marathon Battery Instruction Manual, for complete battery shop procedures. Observe the following operating practices to obtain maximum battery performance and service life.

a. Recondition the battery periodically. Reconditioning is a battery shop procedure including discharging and recharging the battery. The frequency of reconditioning should be about 100 hours flight time. However, the helicopter operator should maintain battery records to determine the maximum time between battery reconditioning periods for operating conditions. The following four variables determine the frequency that battery reconditioning is required:

(1) Type of starting service.

(2) Duty cycle for battery.

(3) Ambient operating temperatures.

(4) Generator voltage regulator setting.

b. Do not allow anything associated with lead-acid batteries, including acid fumes, to come in contact with the nickel-cadmium battery or its electrolyte.

Note

Nickel cadmium batteries are different from lead-acid batteries. Terminal voltage remains constant over ninety percent of total discharge time; a terminal voltage test is not conclusive. A hydrometer test is not effective because the electrolyte specific gravity remains constant if the battery is either in a charged or discharged condition.

Note

Quantity of charge in a battery cannot be determined with basic installed gages, such as a loadmeter. The state of charge must be determined by controlled discharge, such as performed during a deep cycle process.

c. Batteries may be checked during normal operation as follows: a battery being charged may be considered as having accepted as much charge from generator as it will accept when battery is switch from ON to OFF and observing affect on loadmeter. If change in indication is less than 1.5 percent, battery has accepted all the charge it will accept.

WARNING

Do not use acid. Injury may result and equipment damage can occur. Never use tools which have any acid deposit on them.

CAUTION

Do not adjust electrolyte level (add water) in the battery unless battery is fully charged.

Note

If one or more cells require more water than the others, they may be out of balance. Refer to Marathon Battery Instruction Manual.

d. If it is necessary to add water to the Marathon sintered-plate, nickel-cadmium battery occasionally, the amount of water used is relatively small when compared to the amount used in lead-acid batteries. Usage rate will depend upon the application, charging voltage, ambient temperature, and several other factors. For this reason, it is advisable to maintain accurate records so a realistic water replacement schedule can be established. Use only distilled or demineralized water. Storage batteries are easily contaminated through the use of tap water which contains minerals, chlorines, softening agents, and other foreign materials. Add distilled water to adjust liquid level only after charging and after the battery has been permitted to remain in a state of rest for a minimum of three hours. The proper liquid level of all Marathon sintered-plate, nickel-cadmium batteries is just above the tops of the plates or plastic insert (1/4 inch immediately after charge or 1/8 inch after three-hour stand). Determine this liquid level by looking down into the vent well after the filler cap has been removed. If it is not possible to determine the liquid level in this manner, use a polystyrene tube about six inches long, open on both ends and having approximately 1/8 inch inside diameter. Insert tube into the filler opening deep enough to touch the top of the plate or plastic insert. Grasp the tube between the thumb and the middle finger of the right hand, place the index finger over the top open end of the tube, and remove the tube from the filler well. If the liquid level in the lower end of the tube is as stated above, the liquid level is adjusted properly. If no liquid is withdrawn, add distilled or demineralized water until the proper level is reached in the polystyrene tube. Adjustments in liquid level may be made with a syringe.

11-10. REMOVAL — BATTERY.

a. Unlatch access door and rinse with water.

b. Loosen clamps and remove vent tubes from battery.

c. Disconnect cable from negative battery terminal and wrap wire end with tape.

d. Retract protective nipple, detach cable from positive battery terminal, and wrap wire with tape.

Note

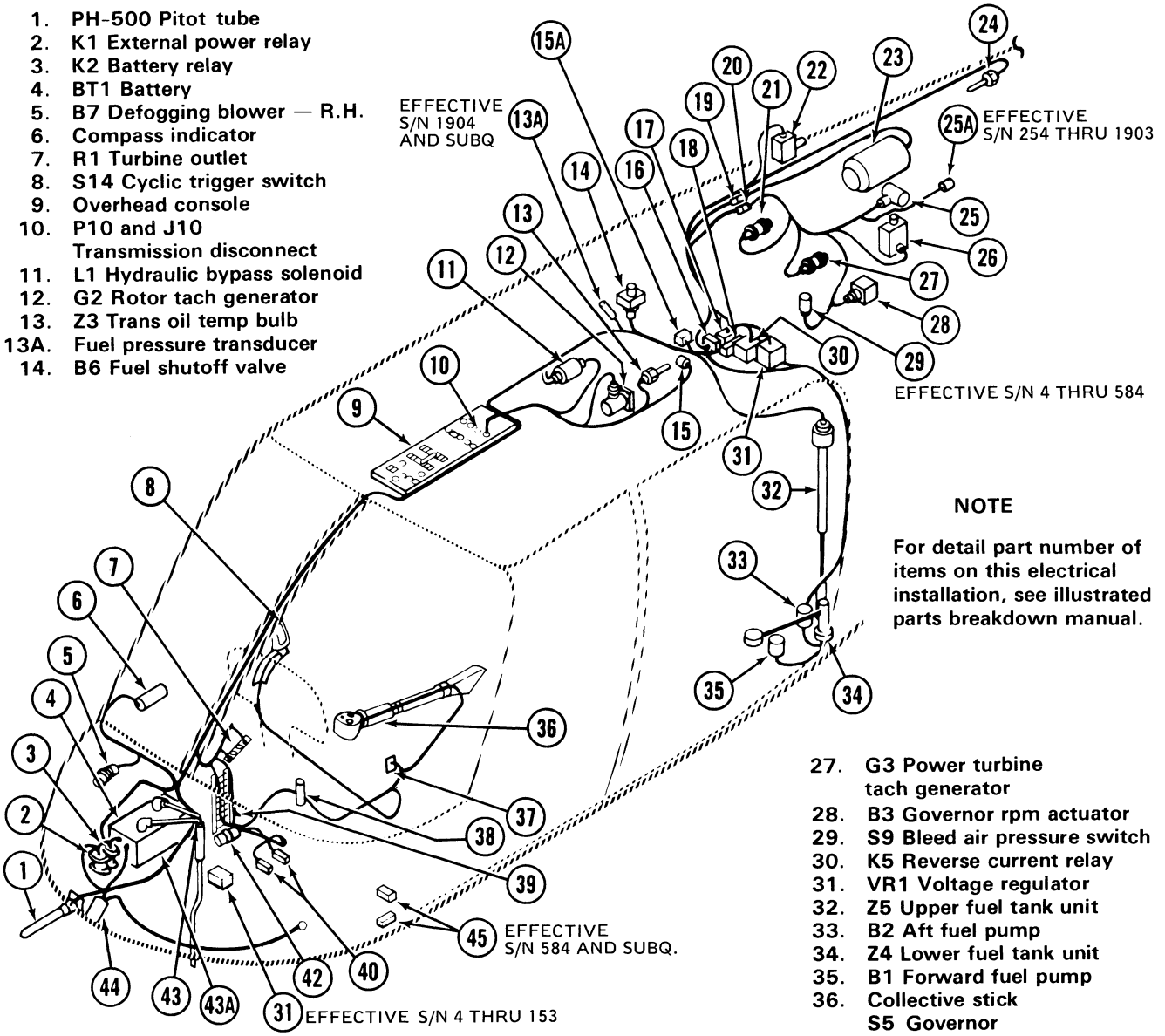
Retain insulating tubing, washer, insulator bushing, and channel used with each battery hold bolt for reinstallation.

e. Remove battery hold down bolts and remove battery.

11-11. CLEANING BATTERY.

CAUTION

Do not use a wire brush. Make sure that the vent plugs are closed before attempting to clean the battery. Make sure the cell tops are dry before returning the battery to use.



1. PH-500 Pitot tube
2. K1 External power relay
3. K2 Battery relay
4. BT1 Battery
5. B7 Defogging blower — R.H.
6. Compass indicator
7. R1 Turbine outlet
8. S14 Cyclic trigger switch
9. Overhead console
10. P10 and J10 Transmission disconnect
11. L1 Hydraulic bypass solenoid
12. G2 Rotor tach generator
13. Z3 Trans oil temp bulb
13A. Fuel pressure transducer
14. B6 Fuel shutoff valve
15. S3 Trans oil temp switch
15A. Loadmeter circuit breakers
16. R3 Loadmeter shunt
17. K4 Generator field relay
18. K3 Starter relay
19. P13 and J13 Starter generator disconnect
20. P12 and J12 Engine disconnect
21. G4 Gas producer tach generator
22. B4 Engine de-icing control
23. G1 Starter generator
24. Z2 Engine oil temp bulb
25. S10 Fuel filter differential pressure switch
25A. B11 Fuel pressure transducer
26. Z1 Igniter
27. G3 Power turbine tach generator
28. B3 Governor rpm actuator
29. S9 Bleed air pressure switch
30. K5 Reverse current relay
31. VR1 Voltage regulator
32. Z5 Upper fuel tank unit
33. B2 Aft fuel pump
34. Z4 Lower fuel tank unit
35. B1 Forward fuel pump
36. Collective stick S5 Governor S6 Starter switch
37. TB4 Collective terminal block
38. S4 Trans oil pressure switch
39. TB1 Instrument panel
40. Fuel indicator empty and full adjust pots, R5 and R6
41. External power and battery ground
42. B8 Defogging blower — L.H.
43. Battery vent tubes
43A. S103 Battery over-temp sensor module
44. J16 External power receptacle
45. RPM sensor

206075-100B

Figure 11-1. Electrical Installation (Effective Ships 4 through 2211)

Sheet 2 of Figure 11-1 deleted.

a. Clean the battery with a dry, soft fiber brush; wipe clean with a clean, soft cloth dampened with water.

CAUTION

Over-temp sensor, installed on helicopters 1164 and subsequent, must not be painted with alkaline paint.

b. Battery support tray and the adjacent area must be clean, dry, and free of all alkaline traces.

c. Paint the battery tray with an alkaline resistant paint as required.

11-12. CHARGING BATTERY IN HELICOPTER. (EXTERNAL POWER.)

a. Check that all electrical power is OFF.

b. Plug external power into helicopter.

c. Turn external power unit ON and note external power unit ampmeter.

d. Check and set voltage on external power unit at 27.5 to 28.0 volts.

e. Turn BATtery switch ON and note rise in ammeter reading on external power unit (approximately 100 amps).

f. Continue charging until ammeter has dropped to about the same reading recorded before the helicopter BATtery switch was actuated to ON. This time will be approximately ten minutes.

g. When current has dropped the battery is charged and ready for service. Turn BATtery switch OFF; turn external power OFF, and disconnect power unit.

11-13. CHARGING BATTERY OUT OF HELICOPTER. (EXTERNAL POWER.)

a. Use the same procedure outlined in paragraph 11-12 , except that the battery is not installed in the helicopter.

b. With this method the proper connector must be used to interconnect the battery and the external power unit.

CAUTION

Use of cable clips will damage battery terminals.

c. Make certain that connections and cables are capable of carrying at least 100 amps. Do not attempt to use battery cable clips; clips are unsatisfactory and will result in severe damage to battery terminals.

d. Charge the battery as outlined in paragraph 11-12 , recording first the current required by the external power unit, then closing generator power switch and continuing charge until current has dropped to the value first recorded on the external power unit.

e. When current has dropped, the battery is charged and ready for installation in the helicopter.

11-14. CHARGING BATTERY (SLOW CHARGE). Set battery charger on 24 volts slow rate. If battery is known to require a complete recharge, due to accidental discharge or because battery has been stored for exceptionally long periods of time (particularly at high temperatures), charging time should be approximately ten hours at approximately 1.5 amperes.

Note

The Marathon battery is sufficiently vented when installed in the helicopter to expell accumulated gases during charging and discharging.

Note

A new battery is discharged and may required approximatley ten hours charging at 1.5 amperes.

11-15. REPAIR AND REPLACEMENT — BATTERY. When necessary, replacement of individual cells may be performed. This requires the use of special equipment; consult manufacturer's manual for equipment and procedure involved.

11-16. INSTALLATION — BATTERY.

a. Position battery in helicopter and secure with two bolts. The two hold down bolts must be insulated from the battery. Assemble flat steel washer, polyamide (nylon) insulating bushing, and channel on bolt in order listed. Insert bolt through slotted lug on battery cover and insulating tubing. Start bolt in threads of anchor nut on battery supporting structure. Ensure that phenolic bushing is properly mated with bolt and channel, to serve as insulator, and that channel is positioned with flanges down to engage battery cover; to prevent bolt from moving out of slot. Install opposite bolt in same manner and torque bolts evenly (see torque note on battery).

b. Remove tape and install cable on positive terminal of battery. Position protective nipple over terminal.

c. Remove tape and install cable on negative terminal of battery.

d. Install vent tubes and tighten clamps.

e. Secure nose access door.

11-17. EXTERNAL POWER RECEPTACLE (figures 11-1 and 13-2).

11-18. DESCRIPTION. The external power receptacle located in front center at the nose section is a polarized receptacle used as contact point for external power plug.

11-19. REMOVAL — EXTERNAL POWER RECEPTACLE.

a. Set BATtery switch to OFF position.

b. Remove attachment screws and extract receptacle enough to gain access to power cables.

c. Disconnect power cables; wrap terminals with electrical tape and tag wires for indentification on reinstallation.

11-20. INSTALLATION — EXTERNAL POWER RECEPTACLE.

a. Set BATtery switch in OFF position

b. Remove tape from wire ends and connect cable to receptacle.

c. Position receptacle in helicopter and install attachment screws.

11-21. EXTERNAL POWER RELAY (figures 11-1 and 13-2).

11-22. DESCRIPTION. The external power relay, located in the nose section forward of pedestal, to electrically switch the external power receptacle to the main bus bar. It is controlled through the small positive pin from the external power source which energizes the circuit to the activating coil of the relay.

11-23. REMOVAL — EXTERNAL POWER RELAY.

a. Place BATtery switch to OFF. Remove external power.

b. Unlatch and raise nose access door.

c. Retract protective nipples to expose relay terminals.

d. Disconnect wires from relay and tape ends.

e. Remove attachment screws and ground wire and lift relay free.

11-24. INSTALLATION — EXTERNAL POWER RELAY.

a. Place BATtery switch in OFF. Remove external power.

b. Position relay and install mounting screws.

Note

Ground wire, P15A20, must be installed under one mounting screw. Remove finish locally to ensure good electrical contact.

c. Remove tape and connect relay wires.

d. Position protective nipple to cover relay terminals.

e. Lower and secure nose access door.

11-25. BATTERY RELAY (figure 11-1 and 13-2).

11-26. DESCRIPTION. The battery relay, located in the nose section forward of pedestal, is an electrically operated switch controlling battery current to the main bus bar. It is actuated by a battery switch located in the overhead console, which opens and closes the circuit to the relay energizing coil.

11-27. REMOVAL — BATTERY RELAY.

a. Disconnect battery (refer to paragraph 11-10).

b. Retract protective nipples to expose relay terminals.

c. Disconnect wires from relay and tape ends using electrical tape.

d. Remove attachment screws and lift relay free.

11-28. INSTALLATION — BATTERY RELAY.

a. Position relay and install attaching screws.

b. Remove protective tape and connect wire to relay.

c. Position protective nipples to cover relay terminals.

d. Connect battery (refer to paragraph 11-16).

11-29. TURBINE OUTLET TEMPERATURE SYSTEM (figures 11-1 and 13-3).

11-30. DESCRIPTION. The turbine outlet temperature (TOT) system consists of a TOT indicator, related wiring, and engine associated components. On helicopter prior to 914, a thermocouple resistor is utilized in the circuitry to attain proper operating resistance of the indicator circuit. On helicopters 914 and subsequent, a different TOT indicator is used. This indicator operates properly with a circuit resistance of 5 to 200 ohms; therefore, a thermocouple resistor is not required.

11-31. OPERATIONAL CHECK — TURBINE OUTLET TEMPERATURE SYSTEM. Check all electrical connections for security of attachment and accomplish following steps:

a. Helicopters prior to 914.

(1) Remove TOT indicator from instrument panel and functionally check with jetcal analyzer at 700°C and 750°C. Indicator should read within 5°C at either temperature.

(2) Replace indicator if faulty indication is received and forward defective indicator to instrument test lab for condition verification.

(3) If jetcal analyzer indicates that indicator operation is within specified limits, proceed with step (4) prior to reinstallation of indicator.

Note

To maintain proper accuracy, use only a wheatstone bridge when making resistance adjustments.

(4) Check total circuit lead resistance by using a Wheatstone bridge connected to the indicator leads (indicator disconnected). Resistance should read 8 (±0.05) ohms. Resistance may be adjusted by adding or removing turns of wire from resistance spool (see figure 11-1).

(5) If resistance is within limits and requires no adjustment, reinstall TOT indicator and proceed with steps (6) and (7).

(6) With the TOT indicator installed, disengage the circuitry from engine supplied harness at the nacelle terminal block and attach helicopter's harness leads to thermocouple test rig.

(7) Attach jetcal analyzer probes to test rig thermocouples and perform system checkout in accordance with analyzer operating instructions. This will validate instrument circuitry, isolating the difficulty to the engine and/or associated components. However; if proper system function is not attained through jetcal operation, steps (1) through (6) were not properly performed and should be repeated.

Note

During the course of troubleshooting, calibrated adjustments of indicators should be accomplished by qualified personnel only.

b. Helicopters 914 and subsequent.

Figure 11-2. Deleted.

Note

If electrical power is removed from the TOT indicator, the OFF flag will appear and the pointer will remain at its last reading. For example: if the last reading was 500°C when electrical power was removed, the pointer will continue to read 500°C until electrical power is reapplied. If, in the meantime, the temperature has dropped to 30°C; the pointer will motor down to read 30°C when power is reapplied. This is not sticking, but normal indicator operation. If the thermocouple leads are opened while electrical power is applied, the indicator pointer will spin or motor. This is also normal indicator operation.

(1) Disconnect electrical connector from TOT indicator and install TOT test adapter cable in accordance with figure 11-3 .

Note

It may be necessary to remove TOT indicator from instrument panel to accomplish the above step.

(2) Place BATtery switch to ON.

(3) Close TOT IND circuit breaker. Check that power OFF flag on indicator disappears within one second after circuit breaker is closed. If power OFF flag operates normally, proceed with step (5).

(4) If power OFF flag does not disappear, check for 28 Vdc at pin B and ground at pin C of TOT test adapter cable and/or P206.

(a) If 28 Vdc and ground are available, replace TOT indicator and forward defective indicator to instrument test lab for condition verification.

(b) If 28 Vdc and/or ground is not available, repair TOT test adapter cable and/or helicopter wiring.

(5) Functionally check TOT indicator at 737°C and 793°C with jetcal analyzer. Indicator shall read within 5°C at both temperatures.

(a) If indicator reads correctly, proceed with step (6).

(b) If indicator reads incorrectly, replace indicator and forward defective indicator to instrument test lab for condition verification.

(6) Open TOT IND circuit breaker. Check that power OFF flag appears on face of indicator.

(7) Place BATtery switch to OFF.

(8) Disconnect and remove TOT test adapter cable.

Note

To maintain proper accuracy, use only a wheatstone bridge to check resistance.

(9) Measure resistance of TOT circuit between pins D and E of P206. Resistance shall not be less than 5 ohms, nor more than 200 ohms. Normally, total resistance is 7 to 20 ohms.

(a) If resistance is within limits, proceed to step (10).

(b) If resistance is not within limits; ensure helicopter's wiring and connections are serviceable and proceed to step (10).

(10) Install TOT indicator, disengage instrument circuitry from engine supplied harness at the nacelle terminal block, and attach instrument harness leads to thermocouple test rig. Attach jetcal analyzer probes to test rig thermocouples and perform system checkout in accordance with analyzer operating instructions. This will validate instruments circuitry; isolating the difficulty to the engine and/or associated components. However; if proper system function is not attained through jetcal operation, steps (1) through (9), were not properly performed and should be repeated.

Note

During the course of troubleshooting, calibrated adjustments of indicators should be accomplished by qualified personnel only.

11-32. THERMOCOUPLE RESISTOR (helicopters prior to 914) (figures 11-1 and 13-3).

11-33. DESCRIPTION. The thermocouple resistor spool, located forward of the instrument panel, is used in conjunction with the turbine outlet temperature indicator and enables selection of the proper operating resistance of the indicator circuit.

11-34. REMOVAL — THERMOCOUPLE RESISTOR.

a. Remove right pedestal access door.

b. Remove safety wire.

c. Unlatch and remove resistor cover.

d. Remove thermocouple leads.

e. Remove attachment screws, nuts, and washers.

11-35. INSTALLATION — THERMOCOUPLE RESISTOR.

a. Position resistor in helicopter and install two attaching screws, nuts, and washers.

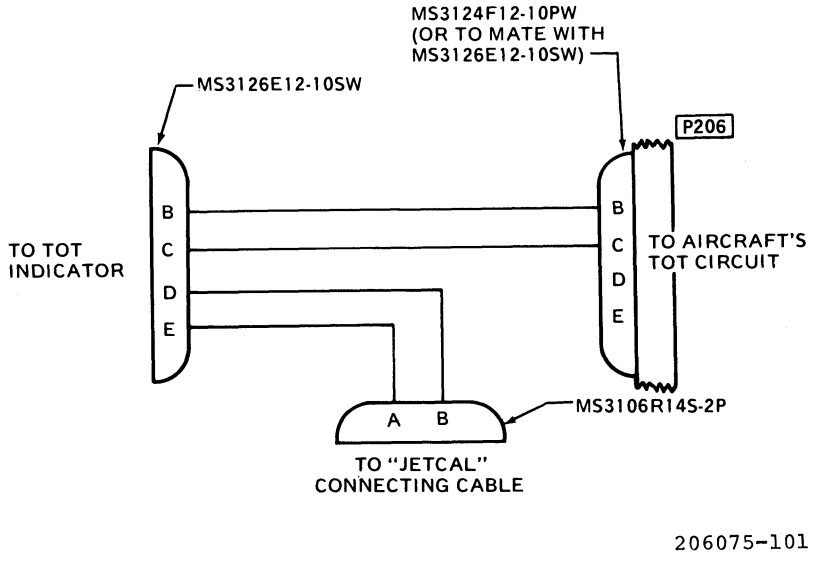


Figure 11-3. TOT Test Adapter Cable

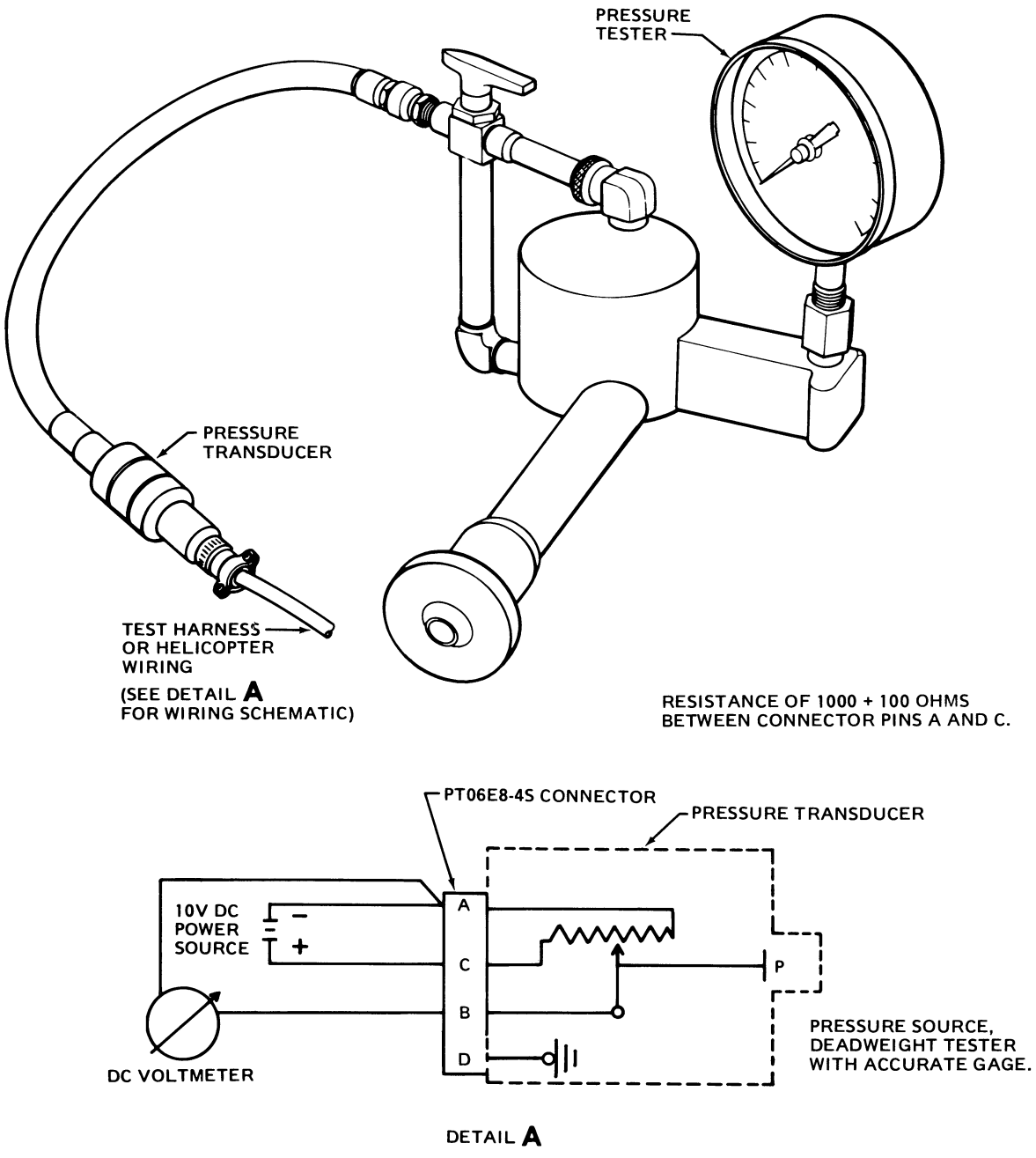


Figure 11-4. Functional Test Setup for Fuel Pressure Transducer

b. Connect thermocouple leads to resistor terminals.

c. Install resistor cover.

d. Safety wire cover fasteners.

e. Replace pedestal access door.

11-36. VOLTAGE REGULATOR (figures 11-1 and 13-2 .)

11-37. DESCRIPTION. Voltage regulators are carbon pile. On helicopters 4 to 153, a voltage regulator is installed and located below the instrument panel. On helicopters 154 and subsequent, a regulator is installed and located aft of the hat box section in the electrical compartment.

11-38. REMOVAL — VOLTAGE REGULATOR.

a. Set BATtery and GENerator switches to OFF position.

b. Remove pedestal access door.

c. Disconnect wiring and tape wire ends.

d. Remove four mounting screws and washers.

11-39. INSTALLATION — VOLTAGE REGULATOR.

a. Position regulator and install four mounting screws and washers.

b. Remove tape and connect terminal to regulator.

c. Replace pedestal access door.

11-40. ADJUSTING — VOLTAGE REGULATOR.

a. Adjust the voltage regulator by turning the adjustment screw on the base clockwise to increase voltage and counterclockwise to decrease voltage. Set regulator as follows:

CONDITION	GENERATOR SETTING
Winter: 32°F (0°C) or lower.	28.5 Vdc
Summer: 90°F (32.2°C) or higher.	27.0 Vdc
Fall and spring: 32°F to 89°F (0° to 31.67°C)	27.5 Vdc

b. Place positive meter lead on battery terminal of reverse current relay and negative lead on a ground terminal.

Note

Nickel cadmium batteries require a very accurate voltage setting; therefore, use a meter having a reading accuracy within one percent.

11-41. TRANSMISSION OIL PRESSURE SWITCH (figures 11-1 and 13-4).

11-42. DESCRIPTION. The transmission oil pressure switch, located in the forward cabin section below instrument panel, (paragraph 11-43) is a pressure operated switch installed in the transmission oil pressure indicator line. It serves to energize a transmission oil pressure caution light on the instrument panel, warning the pilot of low oil pressure.

11-43. REMOVAL — TRANSMISSION OIL PRESSURE SWITCH. (Located on roof, effective with helicopters S/N 254 and subsequent.)

a. Remove pedestal access doors. (Remove transmission cowling for helicopters S/N 254 thru 913.)

b. Disconnect cable and cover connectors for protection, cap or tape.

c. Disconnect and cap pressure line.

d. Remove mounting hardware.

11-44. INSTALLATION — TRANSMISSION OIL PRESSURE SWITCH.

a. Position switch in helicopter and install mounting hardware.

b. Uncap pressure line and connect to switch.

c. Remove protective covers and connect cable to switch.

d. Install pedestal access doors, transmission cowling as applicable.

11-45. GOVERNOR CONTROL SWITCH (figures 11-1 and 13-5).

11-46. DESCRIPTION. The governor control switch located in the pilots collective switch box; is a double pole, double-throw, spring loaded, momentary contact switch. It enables the pilot to increase or decrease the governor rpm actuator setting. With the switch in INCR position, the circuit to the actuator motor is completed and allows motor to move arm in one given direction. With the switch in DECR position the polarity to the actuator motor is reversed, allowing the actuator arm to move in the opposite direction. When the switch is at rest position, circuit is de-energized.

11-47. REMOVAL — GOVERNOR CONTROL SWITCH.

a. Set BATtery switch to OFF.

b. Remove switch plate mounting screws and lift plate sufficiently to gain access to switch wires.

CAUTION

Utilize care during switch removal to prevent chaffing or damage to wires.

c. Disconnect switch wires.

d. Remove switch from panel.

11-48. INSTALLATION — GOVERNOR CONTROL SWITCH.

a. Install switch to plate observing that indexing key is in proper position.

b. Connect wires to switch.

c. Position plate on switch box and install mounting screws.

11-49. STARTER SWITCH (figures 11-1 and 13-6).

11-50. DESCRIPTION. The starter switch, located in the collective stick switch box, is a single-pole, double-throw, push-button type switch. When switch is depressed to START, the starter relay actuating coil is energized.

11-51. REMOVAL — STARTER SWITCH (refer to paragraph 11-47; procedure is the same).

11-52. INSTALLATION — STARTER SWITCH (refer to paragraph 11-48; procedure is the same).

11-53. CYCLIC TRIGGER SWITCH (figure11-1).

11-54. DESCRIPTION. The cyclic trigger switch is a single-pole, single-throw trigger contact switch, furnished as a part of the cyclic stick grip assembly and establishes keying circuit provision for radio kit.

11-55. REMOVAL — CYCLIC TRIGGER SWITCH.

a. Set BATtery switch to OFF.

b. Unscrew and remove two attachment screws from grip cap.

c. Remove cap, release and lift switch sufficiently to gain access to switch wire.

CAUTION

Utilize care during switch removal and installation to prevent chaffing or damage to wires.

d. Diconnect wire from switch, identify and tape wire ends.

11-56. INSTALLATION — CYCLIC TRIGGER SWTICH.

a. Remove tape and attach wires to switch.

b. Carefully position switch in grip assembly observing that wires are free of obstruction.

c. Place cap on grip assembly and install two attachment screws.

11-57. CYCLIC BUTTON SWITCH.

11-58. DESCRIPTION. The cyclic button switch is a single-pole, single-throw, press contact switch furnished as a part of the cyclic stick grip

assembly and establishes keying circuit provisions for ICS and radio kits.

11-59. REMOVAL — CYCLIC BUTTON SWITCH (refer to paragraph 11-55; procedure is the same).

11-60. INSTALLATION — CYCLIC BUTTON SWITCH (refer to paragraph 11-56; procedure is the same).

11-61. TEMPERATURE BULBS.

11-62. DESCRIPTION — GENERAL. Electrical resistance type bulbs are used, in engine oil and transmission oil temperature circuits. Each bulb connected to an electrical resistance temperature indicator on the instrument panel, indicates an increase of temperature as the resistance in the bulb circuit is increased by rise of temperature in the bulb core. The resistance elements in the bulbs are hermetically sealed in metal wells.

11-63. TRANSMISSION OIL TEMPERATURE BULB (figures 11-1 and 13-7).

11-64. DESCRIPTION. The transmission oil temperature bulb is located on the left side of the transmission, and is connected to an indicator on the instrument panel.

11-65. REMOVAL — TRANSMISSION OIL TEMPERATURE BULB.

a. Disconnect electrical plug and tape end.

b. Remove safety wire and unscrew bulb from transmission.

11-66. INSTALLATION — TRANSMISSION OIL TEMPERATURE BULB.

a. Apply a light coat of anti-seize compound to threads of bulb.

b. Screw bulb into well, tighten and safety wire.

c. Remove electrical tape and connect electrical plug.

11-67. ENGINE OIL TEMPERATURE BULB (figures 11-1 and 13-7).

11-68. DESCRIPTION. The engine oil temperature bulb is mounted in engine oil reservoir located aft of the engine and is connected to an indicator on the instrument panel.

11-69. REMOVAL — ENGINE OIL TEMPERATURE BULB (refer to section VII).

11-70. INSTALLATION — ENGINE OIL TEMPERATURE BULB (refer to section VII).

11-71. TRANSMISSION OIL TEMPERATURE SWITCH (figures 11-1 , 13-4, and 13-7).

11-72. DESCRIPTION. The transmission oil temperature switch located adjacent to temperature bulb left side of transmission; is a hermetically sealed, temperature operated, single-pole switch that closes when temperature of transmission oil rises above safe operating range. This energizes a transmission temperature caution light on the instrument panel.

11-73. REMOVAL — TRANSMISSION OIL TEMPERATURE SWITCH (refer to paragraph 11-65; procedure is the same).

11-74. INSTALLATION — TRANSMISSION OIL TEMPERATURE SWITCH (refer to paragraph 11-66; procedure is the same).

11-75. TACHOMETER GENERATORS.

11-76. DESCRIPTION — GENERAL. The tachometer generators are provided to indicate power turbine and rotor speeds on the dual tachometer, and percent rpm of engine gas producer on gas producer tachometer. Each tachometer circuit is a self-contained electrical system; consisting of a three-phase alternating current generator, inner-connecting wiring and a three-phase synchronous motor. The indicators are driven by the output of their respective generators.

11-77. CLEANING — GENERAL. Clean the exterior of tachometer generator with a clean, soft, lint-free cloth, moistened with approved cleaning solvent.

11-78. ROTOR TACHOMETER GENERATOR (figures 11-1 and 13-8).

11-79. DESCRIPTION. The rotor tachometer generator is located on the forward left side of the transmission, and connected to the dual tachometer on the instrument panel to indicate rotor rpm.

11-80. REMOVAL — ROTOR TACHOMETER GENERATOR.

a. Disconnect electrical connector and tape end.

b. Remove nuts and washers from mounting studs and remove generator and gasket from adapter.

11-81. INSTALLATION — ROTOR TACHOMETER GENERATOR.

a. Position gasket and generator on adapter studs and secure with washers and nuts.

b. Remove tape from plug and connect to generator.

11-82. POWER TURBINE TACHOMETER GENERATOR (figures 11-1 and 13-8).

11-83. DESCRIPTION. The power turbine tachometer generator is mounted on the forward left-side of the power and accessory gearbox, and connected to the dual tachometer on the instrument panel to indicate engine output shaft rpm.

11-84. REMOVAL — POWER TURBINE TACHOMETER GENERATOR (refer to Section VII).

11-85. INSTALLATION — POWER TURBINE TACHOMETER GENERATOR (refer to Section VII).

11-86. GAS PRODUCER TACHOMETER (figures 11-1 and 13-8).

11-87. DESCRIPTION. The gas producer tachometer is mounted on the forward right side of the power and accessory gearbox, and connected to the gas producer tachometer on the instrument panel to indicate percent rpm of engine gas producer.

11-88. REMOVAL — GAS PRODUCER TACHOMETER (refer to Section VII).

11-89. INSTALLATION — GAS PRODUCER TACHOMETER (refer to Section VII).

11-90. ROTOR LOW RPM CAUTION SYSTEM. (Helicopters 584 and subsequent)

11-91. DESCRIPTION. The rotor low rpm caution system provides a visual and audible indication of a rotor low rpm condition. This system includes the ROTOR LOW RPM caution light located on the instrument panel, rotor low rpm warning alarm installed on right side plastic headliner and rotor low rpm sensor located on equipment shelf forward of the instrument panel. The rotor low rpm sensor is connected to the rotor tachometer generator circuit and when rotor rpm drops below 90 (±3) percent, the rotor low rpm sensor provides an electrical ground to complete the ROTOR LOW RPM caution light and rotor low rpm warning alarm circuits. A rotor low rpm warning alarm disable switch is installed under the copilot seat, slightly forward of the collective jackshaft. When the collective stick is in the extreme down position, a lever on the jackshaft contacts the switch and deactivates the rotor low rpm warning alarm.

11-92. TESTING — ROTOR LOW RPM CAUTION SYSTEM.

a. Disconnect electrical plug from engine rpm sensor and protect with cap or cover.

b. Disconnect electrical plug from rotor tachometer generator and connect plug to the appropriate receptacle on test stand.

c. Move collective stick to its lowest extreme.

d. Close CAUTION LTS circuit breaker on overhead console. Check that ROTOR LOW RPM caution light is illuminated and rotor low rpm warning alarm is not audible.

e. Raise collective stick and check that ROTOR LOW RPM caution light remains illuminated and rotor low rpm warning alarm is now audible.

f. Increase C1 test stand tachometer generator rpm until ROTOR LOW RPM caution light is extinguished and rotor low rpm warning alarm is not audible. Check that rotor indication on the dual tachometer is 90 (± 3) percent. Check that C1 test stand and the indicator read approximatley the same.

g. Decrease C1 test stand tachometer generator rpm to 85 percent. Check that ROTOR LOW RPM caution light is illuminated and rotor low rpm warning alarm is audible.

h. Move collective stick towards its lowest extreme. Check that rotor low rpm warning alarm is deactivated when collective stick is moved to within 1 (± 0.2) inch from its extreme down position, measured at grip adjacent to the switch box. Check that ROTOR LOW RPM caution light remains illuminated.

i. Reconnect electrical plug to rotor tachometer generator on the engine.

j. Reconnect electrical plug to engine rpm sensor.

11-93. ENGINE OUT WARNING SYSTEM (HELICOPTERS 584 AND SUBS).

11-94. DESCRIPTION. The engine out warning system provides a visual and audible indication of an engine out condition. This system includes the ENGINE OUT warning light located on the instrument panel, engine out warning alarm located on the overhead console, and engine rpm sensor located on equipment shelf forward of the instrument panel. The engine rpm sensor is connected to the gas producer tachometer generator circuit and when the gas producer rpm drops below 55 (± 3) percent, the engine rpm sensor provides an electrical ground to complete the ENGINE OUT warning light and engine out warning alarm circuit.

11-95. TESTING — ENGINE OUT WARNING SYSTEM.

a. Disconnect electrical plug from rotor rpm low sensor and protect with cap or cover.

b. Disconnect electrical plug from gas producer tachometer generator and connect plug to appropriate receptacle on C1 test stand or equivalent.

c. Close CAUTION LTS circuit breaker on overhead console. Check that ENGINE OUT warning light is illuminated and engine out warning alarm is audible.

d. Increase C1 test stand tachometer generator rpm until ENGINE OUT warning light is extinguished. Check that gas producer tachometer indicator reads 55 (± 3) percent and that engine out warning alarm is not audible. Check that C1 test stand and gas producer tachometer read approximately the same.

e. Decrease C1 test stand tachometer generator rpm to 50 percent. Check that ENGINE OUT warning light is illuminated and engine out warning alarm is audible.

f. Reconnect electrical plug to gas producer tachometer generator on the engine.

g. Reconnect electrical plug to rotor low rpm sensor.

11-96. HYDRAULIC BYPASS SOLENOID (figures 11-1 and 13-9).

11-97. DESCRIPTION. The hydraulic bypass solenoid, located on the service deck forward of the transmission, is controlled by the hydraulic boost switch (figure 11-5). With the switch in OFF the solenoid is energized, allowing the boost system to be bypassed.

11-98. REMOVAL — HYDRAULIC BYPASS SOLENOID.

a. Disconnect electrical receptacle and cover end with electrical tape.

b. Remove safety wire and screw valve from the body.

11-99. INSTALLATION — HYDRAULIC BYPASS SOLENOID.

a. Screw valve on body, tighten, and secure with safety wire.

b. Remove tape and attach electrical receptacle.

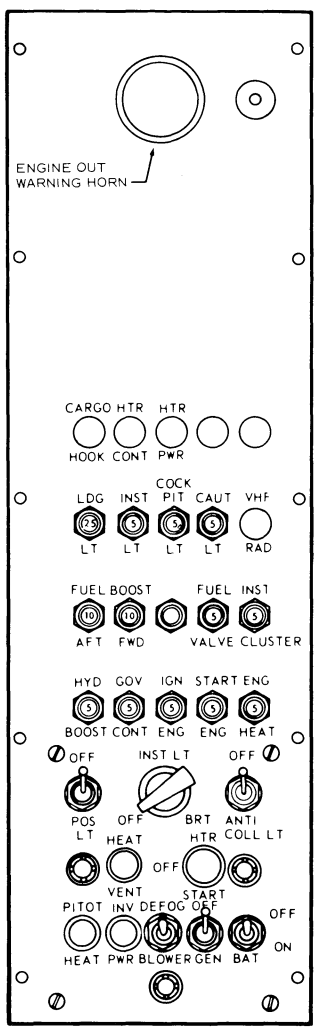
11-100. FUEL SHUT-OFF VALVE (figures 11-1 and 13-10).

11-101. DESCRIPTION. The fuel shut-off valve, located above the fuel cell on the right side of the helicopter, is an electrically operated solenoid valve and provides a means of shutting off fuel to the engine. The valve is controlled by a switch on the instrument panel figure 10-1).

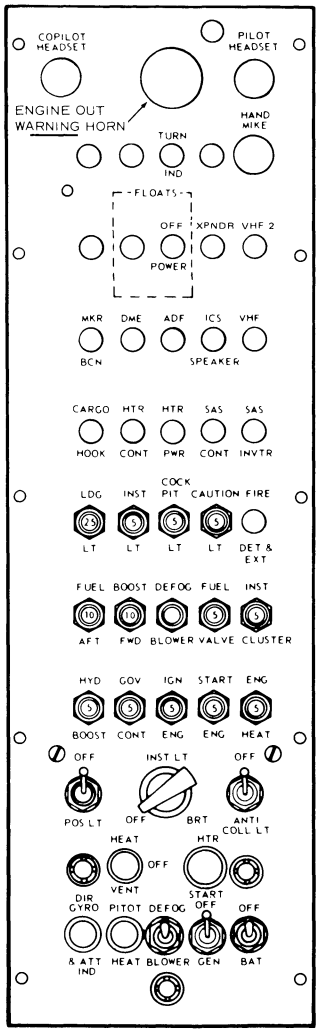
11-102. REMOVAL — FUEL SHUT-OFF VALVE (refer to Section VII).

11-103. INSTALALTION — FUEL SHUT-OFF VALVE (refer to Section VII).

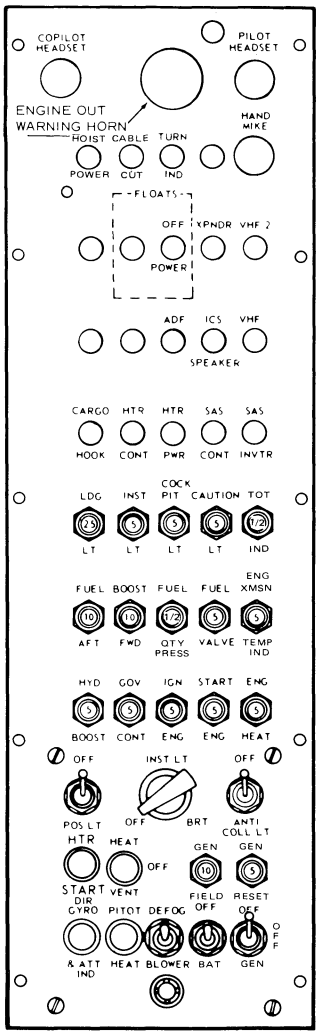
11-104. BLEED AIR PRESSURE SWITCH (figures 11-1 and 13-4) (Helicopters 4 thru 583).



(EFF SHIPS 4 THROUGH 153)



(TYPICAL SHIPS 154 THRU 1903)



(TYPICAL SHIPS 1904 AND SUBSEQUENT)

206075-102

Figure 11-5. Overhead Console

11-105. DESCRIPTION. The bleed air pressure switch, located beneath the service deck below the forward left side engine, is a pressure operated switch that closes when gas producer speed falls below 60% completing circuits to engine out audio horn (figure 11-5 and ENGINE OUT warning light simultaneously to alert pilot of engine failure.

11-106. REMOVAL — BLEED AIR PRESSURE SWITCH.

a. Check that all electrical power is OFF.

b. Open left engine cowling.

c. Disconnect electrical lead from bleed air pressure switch and cover wire end with tape.

d. Disconnect bleed air lines and remove switch. Cap or cover openings in bleed air lines.

11-107. INSTALLATION — BLEED AIR PRESSURE SWITCH.

a. Remove caps or covers from bleed air lines and connect lines to switch.

b. Remove tape from wire end and connect electrical lead to bleed air pressure switch.

c. Close engine cowling.

11-108. OVERVOLTAGE SENSING RELAY (figure 13-2) (S/N 584 and subsequent.)

11-109. DESCRIPTION. The overvoltage sensing relay is located on the equipment shelf above the baggage compartment. This relay is energized when line voltage reaches 31 (± 1) volt, and in turn, energizes the generator field reset relay to the trip position, thus removing the generator from the line.

11-110. REMOVAL — OVERVOLTAGE SENSING RELAY.

a. Ensure electrical power is OFF.

b. Remove panel aft of rear seat to gain access to overvoltage sensing relay.

c. Disconnect and tape wire ends.

d. Remove mounting screws, washers, and relay.

11-111. CLEANING — OVERVOLTAGE SENSING RELAY (refer to paragraph 11-77; procedure is the same).

11-112. INSTALLATION — OVERVOLTAGE SENSING RELAY.

Note

Remove finish locally to provide a good electrical ground.

a. Position relay on equipment shelf and install washers and screws.

b. Connect electrical wires to relay.

c. Reinstall panel aft of rear seat.

11-113. GENERATOR FIELD RESET RELAY (figures 11-1 and 13-2) (S/N 584 and subsequent).

11-114. DESCRIPTION. The generator field reset relay is located on the equipment shelf above the baggage compartment. This unit is a double action type relay, which opens the generator shunt field and disconnects the generator from the line when an overvoltage condition exists. It can be electrically reset by the generator field reset switch (S90).

11-115. REMOVAL — GENERATOR FIELD RESET RELAY.

a. Ensure electrical power is OFF.

b. Remove panel aft of rear seat to gain access to generator field reset relay.

c. Remove mounting screws, washers, and relay. Protect relay mounting socket on equipment shelf.

11-116. CLEANING — GENERATOR FIELD RESET RELAY (refer to paragraph 11-77; procedure is the same).

11-117. INSTALLATION — GENERATOR FIELD RESET RELAY.

a. Position relay in mounting socket on equipment shelf. Do not bend pins on relay.

b. Secure relay to socket with mounting screws and washers.

11-118. GENERATOR RESET SWITCH (figure 13-2) (S/N 584 and subsequent).

11-119. DESCRIPTION. The generator reset switch is located on the overhead console. This switch is a double pole, double throw, spring loaded switch with only momentary contact in the RESET position. It completes the generator field circuit in the ON position and supplies voltage to reset the generator field reset relay in the RESET position.

11-120. REMOVAL — GENERATOR RESET SWITCH.

a. Ensure electrical power is OFF.

b. Open overhead console.

c. Disconnect and tape wire ends.

d. Remove nut, lockwasher, and switch.

11-121. INSTALLATION — GENERATOR RESET SWITCH.

a. Install switch in overhead console with lockwasher and nut.

b. Connect electrical wires to switch.

c. Close overhead console.

11-122. REVERSE CURRENT RELAY (figures 11-1 and 13-2).

11-123. DESCRIPTION. The reverse current relay is located on equipment shelf above the baggage compartment; it prevents the generator from being connected to the line until operating voltage is attained, prevents reverse current flow, and holds the generator connected to line unless voltage drops to a point where continued operation would be detrimental to the electrical euqipment. Remove panel, located aft of rear seat, to gain access to reverse current relay.

11-124. TESTING — REVERSE CURRENT RELAY.

a. Check that GEN switch, on the overhead console panel, is in the OFF position. Start engine, unplug external power (if used), and turn battery switch ON.

b. Measure and record bus voltage at the BAT terminal of the reverse current relay.

c. Attach the ground lead to a voltmeter to any good ground on the helicopter. Attach the positive lead of the voltmeter to the GEN terminal of the reverse current relay. Turn GEN switch to ON.

d. Slowly speed up the engine to energize the reverse current relay. This will be indicated by a slight drop in the voltmeter reading. Reading on the voltmeter should be approximately 1/2 volt above the reading measured in step b. Slowly reduce engine speed. The reverse current relay should open at a voltage slightly lower than the voltage measured in step b.

11-125. REMOVAL — REVERSE CURRENT RELAY.

a. Set BATtery switch to OFF.

b. Retract nipples to expose terminals and remove bus bar.

c. Disconnect wires and tape ends.

d. Remove mounting screws, washers, and cable assembly clamp.

11-126. CLEANING — REVERSE CURRENT RELAY. Clean the exterior of reverse current relay with a clean, soft, lint-free cloth, moistened with approved cleaning solvent.

11-127. INSTALLATION REVERSE CURRENT RELAY.

a. Position relay and install cable clamp and mounting hardware.

b. Remove tape and connect wires.

c. Install bus bar and position nipples to cover terminals.

11-128. STARTER RELAY (figures 11-1 and 13-6).

11-129. DESCRIPTION. The starter relay is located adjacent to reverse current relay on equipment shelf above baggage compartment, and supplies direct current to the starter when the START switch is depressed.

11-130. REMOVAL — STARTER RELAY.

a. Ensure electrical power is OFF.

b. Remove relay cover.

c. Remove bus bar.

d. Disconnect and tape wire ends.

e. Remove mounting screws and washers.

11-131. INSTALLATION — STARTER RELAY.

a. Position relay and install mounting hardware.

b. Remove tape and connect wires.

c. Install bus bar.

d. Replace relay cover.

11-132. GENERATOR SHUNT (figure 13-2).

11-133. DESCRIPTION. The generator shunt is located just inboard of the starter relay on the equipment shelf above the baggage compartment. It provides a voltage drop proportional to the current to operate the loadmeter. Remove upholstered panel, located aft of rear seat, to gain access to generator shunt.

11-134. REMOVAL — GENERATOR SHUNT.

a. Check that all electrical power is OFF.

b. Retract nipples to expose terminals.

c. Disconnect electrical wiring and cover ends with tape.

d. Remove mounting screws and washers.

11-135. INSTALLATION — GENERATOR SHUNT.

a. Position shunt and install mounting hardware.

b. Remove tape and connect wiring.

c. Position nipples to cover terminals.

11-136. GENERATOR FIELD CONTROL RELAY (figures 11-1 and 13-12)

11-137. DESCRIPTION. The generator field control relay is located aft of the shunt on the equipment shelf above the baggage compartment. This unit is an electrical operated switch, which opens the starter-generator shunt field, when the generator is used as a starter. The resistor installed between terminals A1 and X2 provides approximately one volt (plus) to the A terminal of the starter-generator during engine starts and also closes igniter circuit. Refer to paragraph 11-132 for access to generator field control relay.

11-138. REMOVAL — GENERATOR FIELD CONTROL RELAY (refer to paragraph 11-125; procedure is the same).

11-139. CLEANING — GENERATOR FIELD CONTROL RELAY. Clean exterior of generator field control relay with a clean, soft lint-free cloth, moistened with approved cleaning solvent.

11-140. INSTALLATION — GENERATOR FIELD CONTROL RELAY (refer to paragraph 11-127; procedure is the same).

11-141. LOADMETER CIRCUIT BREAKERS (figure 13-2).

11-142. DESCRIPTION. Two circuit breakers are mounted on a bracket on equipment shelf above baggage compartment and are connected in the positive and negative loadmeter lines to prevent wire shorting damage.

11-143. ENGINE IGNITER (figures 11-1 and 13-11).

11-144. DESCRIPTION. The igniter, furnished with the power turbine, is located below the tachometer generator on the lower left section of engine and consists of a low tension capacitor discharge ignition exciter. This unit provides a continuous ignition arc during engine start cycle.

Note

For additional information consult manufacturers manual 5W2 and 5W3 Allison Publications.

11-145. ENGINE HEAT ACTUATOR (figures 11-1 and 13-12).

11-146. DESCRIPTION. The engine heat actuator, located on upper forward section of engine, provides electrical remote control of the

engine heat control valve and is energized through the engine heater switch located on the instrument panel (figure 11-1).

11-147. REMOVAL — ENGINE HEAT ACTUATOR (refer to Section VII).

11-148. INSTALLATION — ENGINE HEAT ACTUATOR (refer to Section VII).

11-149. GOVERNOR ACTUATOR (figures 11-1 and 13-5).

11-150. DESCRIPTION. The governor actuator is located on the forward left side of engine and is a reversible motor that provides increase or decrease of the governor setting. The unit is controlled by the governor switch on the collective stick.

11-151. REMOVAL — GOVERNOR ACTUATOR (refer to Section VII).

11-152. INSTALLATION — GOVERNOR ACTUATOR (refer to Section VII).

11-153. STARTER-GENERATOR (figures 11-1 , 11-5A, 13-2, and 13-16).

11-154. DESCRIPTION. The starter-generator is located on the underside of the engine to the right of the helicopter center line. This unit is used to start the engine, charge the battery, and supply power for the operation of dc equipment.

11-155. REMOVAL — STARTER-GENERATOR.

a. Disconnect electrical leads. Protect ends of wires with electrical tape.

b. Loosen nut on T-bolt securing V-clamp. Keeping starter generator flush against mounting pad, remove V-clamp.

c. Slide unit straight aft until splined shaft is clear of engine driveshaft. Do not unnecessarily rotate shaft.

CAUTION

Permitting unit to hang loosely, or without V-clamp installed and tightened, will cause undue bending force on the splined shaft shear point resulting in possible failure of the shaft at some future time.

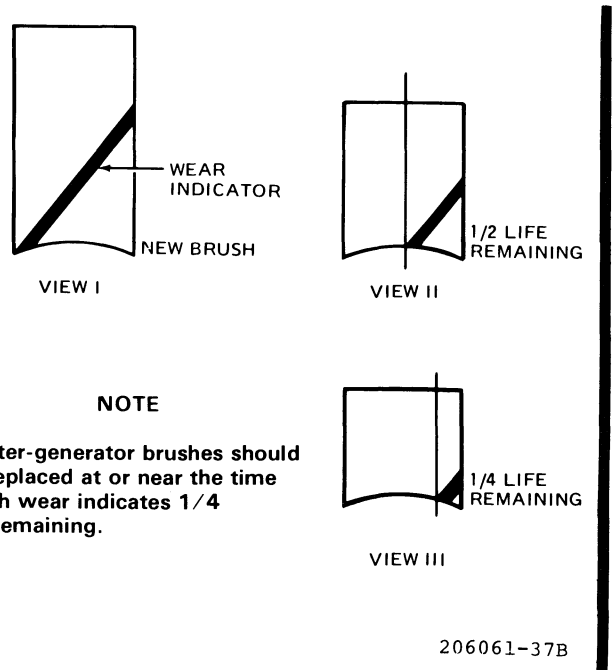


Figure 11-5A. Starter — generator brush wear

11-156. INSPECTION — STARTER-GENERATOR.

a. Remove brush band cover, inspect commutator. It should have a smooth bright appearance with light filming. If dark, black, or otherwise unairworthy send unit to overhaul properly tagged.

b. Remove brushes and rotate shaft, checking for cooling fan rub against body of unit. A *Feel* inspection of the bearings may be conducted while rotating the shaft. If bearing roughness is noted or fan rubs against body, send unit to overhaul properly tagged.

c. Inspect brushes and leads. Brushes should have at least 1/4 brush life or greater remaining (figure 11-5A) and should indicate that it is seated 100% of its surface of direction of unit rotation and a minimum of 75% axially. Leads should be flexible and have a bright appearance. If leads are dull redish brown or stiff and brittle and/or brushes have 1/4 or less brush life as shown in figure 11-2 and are improperly seated, install new brushes.

d. If inspection of brushes, leads, commutator and unit reveals that they are airworthy for operation until overhaul or next scheduled inspection, reinstall brushes and leads in holders. Ensure that brushes are returned to their exact original position to ensure proper seating. Reconnect brush leads. Ensure that the leads are free from contact with sides of holder, so they will move freely with the brush. Once brushes are installed, do not rotate shaft any more than necessary for installation.

e. Replace brush band cover and lockwire the attaching screws.

11-157. CLEANING — STARTER-GENERATOR.

a. With unit removed, thoroughly clean it's exterior with a clean cloth moistened in cleaning solvent (item 12, table 1-1). With a clean dry cloth wipe unit dry and clean splines of driveshaft.

CAUTION

Compressed air may force the foreign material or carbon dust into the unit causing a malfunction.

b. Check for foreign material (oil, dirt, etc.) which may have entered the unit. Remove with a vacuum cleaner only.

11-158. INSTALLATION — STARTER-GENERATOR.

a. Apply a film of grease (item 82, table 1-1) to splines of shaft and reinstall unit to the engine by reversing steps in paragraph 11-155 . Observe CAUTION statement.

b. When tightening V-clamp T-bolt nut, first tighten snugly, tap V-clamp with a rubber mallet, then final torque to 50 inch-pounds.

11-159. FUEL FILTER PRESSURE SWITCH (figures 11-1 , 13-4, and 13-10).

11-160. DESCRIPTION. The filter pressure switch, attached to lower firewall beneath the engine, is a pressure operated switch connected to the fuel filter caution light. Should the differential pressure across the filter exceed a predetermined limit, the switch will close and energize the FUEL FILTER caution light alerting the pilot of an impending bypass of the fuel filter.

11-161. REMOVAL — FUEL FILTER PRESSURE SWITCH.

a. Disconnect hose assembly from tee and seal hose ends. Remove tee from forward end of switch.

b. Remove jam nut from bulkhead fitting and hose from aft end of filter. Cap hose.

c. Disconnect electrical connection. Remove nuts securing switch to mounting bracket.

11-162. INSTALLATION — FUEL FILTER PRESSURE SWITCH.

a. Install union and new packing in each end of switch.

b. Install switch in mounting bracket and secure with nuts and washers on the aft end and install jam nut on forward end of bulkhead fitting.

c. Prior to 2124, install restrictor in forward end of tee fitting and a reducer on top of tee. Install tee on switch bulkhead fitting with openings in tee pointed forward and up.

d. Remove seals and connect hoses to tee and aft end of switch.

e. Connect electrical fitting.

11-163. PRESSURE TRANSDUCER (HELICOPTERS 254 and SUBS.)

11-164. FUEL PRESSURE TRANSDUCER (figures 11-1 and 13-15). The fuel pressure transducer is connected to the tee fitting at aft end of fuel pressure switch in the engine compartment. On helicopters 1904 and subsequent the fuel pressure transducer is located near the fuel shutoff valve. It is a pressure operated potentiometer and varies the input voltage to the fuel pressure indicator.

11-164A. TRANSMISSION OIL PRESSURE TRANSDUCER. (HELICOPTERS 254 THRU 913) (Figure 13-7). The transmission oil pressure transducer is connected to the cross fitting at the left side of the transmission. it is a pressure operated potentiometer that varies the input voltage to the transmission oil pressure indicator.

11-164B. ENGINE OIL PRESSURE TRANSDUCER. (HELICOPTERS 254 THRU 913) (figure 13-7). The engine oil pressure transducer is connected to the tee fitting at left side of the engine accessory section. it is a pressure operated potentiometer that varies the input voltage to the engine oil pressure indicator.

11-164C. TORQUE PRESSURE TRANSDUCER. (HELICOPTERS 254 THRU 913) (figures 11-1 and 13-15A). The torque pressure transducer is connected to the engine accessory seciton. it is a pressure operated potentiometer that varies the input voltage to the torque pressure indicator.

11-165. REMOVAL — PRESSURE TRANSDUCER.

a. Disconnect electrical connector from transducer.

b. Unscrew and remove transducer and packing. Cap or plug airframe fitting and transducer.

11-166. FUNCTIONAL TESTING — PRESSURE TRANSDUCER. (figure 11-4).

CAUTION

Electrical power on pin B of transducer may cause potentiometer in transducer to burn out.

Note

Transducer should be checked with a ohmmeter for proper resistances between connector pins A and C. If pressure tester is used, resistances can be checked between connector pins A and B.

a. Connect a 10 Vdc regulated power source to pins A and C of pressure transducer. (Figure 11-4; detail A for polarity of connections.)

b. Connect a dc voltmeter to pins A and B of pressure transducer.

c. Connect pressure source to pressure port of transducer. (Dead weight tester).

Note

Voltages are theoretical and do not provide for equipment or transducer inaccuracy and/or operator error. However, it indicates that the transducer is functional, if the test output voltages approximate the voltages shown in steps d., e., and f.

d. Apply zero pressure to transducer. Voltmeter should read less than 0.05 volt.

e. For fuel pressure, slowly apply 30 psi to transducer. Voltmeter should read approximately 5.0 volts.

f. For fuel pressure, slowly apply 45 psi to transducer. Voltmeter should read approximately 7.5 volts.

g. For transmission, torque, or engine oil pressure, slowly apply 75 psi to transducer. Voltmeter should read approximately 5.0 volts.

h. For transmission, torque, or engine oil pressure, slowly apply 110 psi to transducer. Voltmeter should read approximately 7.5 volts.

11-167. INSTALLATION — PRESSURE TRANSDUCER.

a. Install new packing on transducer.

b. Install transducer in airframe fitting.

c. Connect electrical connector to transducer.

11-168. FUEL QUANTITY TANK UNIT (figures 11-1 and 13-13).

11-169. DESCRIPTION. Two float type fuel level transmitters are mounted in the tank. One monitors fuel level up to the horizontal surface of the tank under the seat; the other monitors fuel level in the upper section of the tank, behind the seat. Both transmitters are connected to a common resistance type indicator on the instrument panel. As the floats travel up or down, resistance in the circuit is raised or lowered causing a deflection of the indicator pointer to give an indication of the fuel contained in the tank.

11-170. REMOVAL — FUEL QUANTITY TANK UNITS. (refer to Section VII.

11-171. INSTALLATION — FUEL QUANTITY TANK UNITS (refer to Section VII.

11-172. FUEL BOOST PUMPS (figures 11-1 and 13-14).

11-173. DESCRIPTION. Two electrically operated fuel boost pumps, submerged in the fuel cell, are accessible from the bottom of the fuselage. Both pumps are connected to a common fuel line and either will furnish sufficient flow for engine operation. The pumps are energized from separate circuit breakers in the overhead console, (figure 11-5) and may be operated separately or together.

11-174. REMOVAL — FUEL BOOST PUMPS (refer to Section VII.

11-175. INSTALLATION — FUEL BOOST PUMPS (refer to Section VII.

11-176. FUEL PRESSURE SWITCHES (figures 13-4 and 13-15).

11-177. DESCRIPTION. A pressure operated switch, located in the discharge port of each fuel boost pump provides an indication of pump failure. Should the pressure drop on either pump, the switch closes energizing a fuel pump caution light on the instrument panel.

11-178. REMOVAL — FUEL PRESSURE SWITCH.

a. Set BATtery switch to OFF position.

b. Disconnect electrical lead from switch and tape end.

c. Remove safety wire; unscrew and remove switch and packing and cap or plug opening.

11-179. INSPECTION — FUEL PRESSURE SWITCH.

a. Inspect switch for clogged pressure port.

Note

The fuel pressure switch is pre-set at the factory, no adjustment is provided. Should the switch fail to operate at this prescribed range, replacement of the switch is necessary.

b. Using a source of controlled monitored pressure and a test light, connected across the stud and case, slowly apply increasing pressure to the pressure port of the switch. At 6 psig the switch should open and extinguish the test light. On decreasing pressure the switch should close at 3.5 (± 0.5) psig and illuminate the test lamp.

11-180. INSTALLATION — FUEL PRESSURE SWITCH.

a. Remove cap or plug from pump opening. Lubricate threads and packing on switch and screw switch into pump unit.

b. Tighten switch to 40 inch-pounds and install lockwire.

c. Remove tape and connect electrical lead.

11-181. FUEL ADJUSTMENT RESISTOR (figure 11-1).

11-182. DESCRIPTION. Two 50 ohm variable resistors mounted in pedestal forward of

instrument panel are connected into the fuel quantity circuit and provide adjustment of circuit resistance for calibration of fuel indicator system.

Note

For calibration procedure of the fuel quantity system refer to Section X.

11-183. REMOVAL — FUEL ADJUSTMENT RESISTORS.

a. Set BATtery switch to OFF.

b. Remove left pedestal access door.

c. Disconnect wires and tape ends.

d. Remove mounting screws, washers and nuts.

11-184. INSTALLATION — FUEL ADJUSTMENT RESISTORS.

a. Position resistor in helicopter and install mounting hardware.

b. Remove tape and connect wires to resistor.

c. Install pedestal access door.

11-185. NIGHT FLYING SYSTEM (figures 11-1 , 11-5 , and 13-18).

11-186. DESCRIPTION. The night flying system provides equipment necessary for the illumination of instruments and switches, and also interior and exterior lighting used for night operation of the helicopter. This equipment consists of: two edge or integrally lit control panels, located on the instrument panel and one edge or integrally lit control panel, located in the forward section of the overhead console containing control switches and a light dimming rheostat, one transistorized dimming element, located on and behind the overhead console panel forward of the engine out warning horn (helicopters S/N 4 through 153), and located on support rails forward of instrument panel (helicopters S/N 154 thru 413). Helicopter S/N 414 thru 913 two transisters are paralleled. For helicopters S/N 914 and subsequent one transistor is for 28 volts and one is for 5V lights, and is controlled by the INST LT. rheostat; two landing lights, located in the lower center section of the nose; one landing light relay helicopter S/N 4 thru 103 and two landing lights relays helicopter S/N 104 and subsequent, located in the nose compartment below the instrument panel; one landing light switch, located in the pilots collective stick switch box; terminal block and instrument light assemblies, located on the instrument panel; one cockpit light, located on control post or below the pilots seat at centerline of helicopters; two position ligths, located on each on the right and left tip of the horizontal stabilizer; one flasher unit, located in the aft section of the tailboom, or aft of electrical shelf; one anti-collision light, located on the top fairing of the vertical stabilizer; one tail light, located on the aft tip of the tail boom fairing. All lighting circuits are energized from the 28 volt bus and protected by circuit breakers located in the overhead console.

11-187. PANEL LIGHTING (figure 11-5).

11-188. REMOVAL — EDGE OR INTEGRALLY-LIT PANEL.

a. Check that all electrical power is OFF.

b. Loosen set screw and remove INST. LT. rheostat knob.

c. Remove three edge lights (helicopters S/N 4 thru 583).

d. Remove four panel attachment screws and remove panel.

11-189. CLEANING — PANEL. Carefully clean the face and back of the control panel with a soft, dry, lint-free cloth. Compressed air may be used to blow dust and dirt from crevices.

11-190. INSTALLATION — EDGE OR INTEGRALLY-LIT PANEL.

a. Carefully position panel on overhead console and install four attachment screws.

b. Install and tighten three edge lights (finger tight) (helicopter S/N 4 thru 583).

11-191. LANDING LIGHTS (figure 13-18).

11-192. REMOVAL — LANDING LIGHTS.

a. Check that all electrical power is OFF.

b. Open or remove light access window.

c. Remove nuts, spacers, washers, and bolts attaching landing lights.

d. Disconnect electrical wiring from landing lights and cover wire ends with tape. Remove lights.

11-193. CLEANING — LANDING LIGHTS. Wipe exterior of light with a soft, clean, lint-free cloth.

11-194. INSTALLATION — LANDING LIGHTS.

a. Remove tape from wire ends and connect electrical wiring to landing lights.

b. Position light on mounting bracket and install attaching bolts, washers, spacers and nuts.

c. Position forward light so that lower forward edge of light is 6.00 inches forward of station 18. Aft light should be positioned so that the lower forward edge of light is 1.62 inches forward of station 18.

d. Install or close light access window.

11-195. LANDING LIGHT RELAY(S) (figure 13-18). (One relay on helicopters S/N 4 thru 103.)

11-196. REMOVAL — LANDING LIGHT RELAYS.

a. Check that all electrical power is OFF.

b. Disconnect all electrical wiring from the relay and cover wire ends with tape.

c. Remove screws and washers attaching relay and remove relay.

11-197. CLEANING — LANDING LIGHT RELAY(S). Clean exterior of landing light relay(s) with a clean, soft, lint-free cloth, moistened with approved cleaning solvent.

11-198. INSTALLATION — LANDING LIGHT RELAYS.

a. Position landing light relay beneath base of instrument pedestal and install attaching washers and screws.

b. Remove tape from wire ends and connect all electrical wiring.

11-199. LANDING LIGHT SWITCH (figure 13-18).

11-200. REMOVAL — LANDING LIGHT SWITCH. (Refer to paragraph 11-47; procedure is the same.)

11-201. INSTALLATION — LANDING LIGHT SWITCH. (Refer to paragraph 11-48; procedure is the same.)

11-202. INSTRUMENT LIGHTS — EXTERNALLY LIT (figures 10-1 and 13-18).

11-203. REMOVAL — INSTRUMENT LIGHTS (Effective helicopters 4 through 153).

a. Check that all electrical power is OFF. Disengage mounting screws around edge of instrument panel and tilt panel aft. Protect instruments from frontal damage and wires and tubes behind the panel from becoming twisted or strained.

b. Disconnect light wire from terminal block and detach from wire bundle.

c. Remove screws or nut attaching light to panel and remove light and leadwire from panel.

11-204. INSTALLATION — INSTRUMENT LIGHTS (Effective helicopters 4 through 153).

a. Insert lightwire into panel, position and install light.

b. Route lightwire to terminal block and attach to respective terminal.

c. Carefully replace and secure instrument panel.

11-205. ADJUSTMENT — RESISTOR (R9) (figure 13-18). (Effective helicopters 154 through 253). (Internally lit instruments only.)

a. Upon replacement of resistor (R9) for 5V instrument lights, connect voltmeter to 5 volt bus with resistor (R9) adjusted for minimum resistance with all lights connected.

b. Rotate INST light dimming control (in overhead console) in the direction of increasing brightness (BRT).

c. Observe voltmeter while continuing to rotate brightness control to full bright. Voltage should never exceed 5 (0, -0.3) volts.

d. Make necessary adjustments to resistor (R9) to maintain 5 (0, -0.3) volts while continuing to rotate INST light dimming control to full bright position.

11-206. COCKPIT LIGHT (figure 13-18).

11-207. REMOVAL — COCKPIT LIGHT.

a. Check that all electrical power is OFF.

b. Disconnect light wire by removing permanent splice and ground terminal and removing wire from grommet.

c. Remove mounting nuts, washers, screws, and spacer holding light base.

11-208. INSTALLATION — COCKPIT LIGHT.

a. Place light and spacer in position and install screws, washers, and nuts.

b. Connect light by inserting wire through grommet and installing permanent type splice and ground terminal.

11-209. POSITION LIGHT (figure 13-18).

Note

Lens or lamps may be replaced by removing one light fairing attachment screw and removing lens or lamp as necessary.

11-210. REMOVAL — POSITION LIGHTS.

a. Check that all electrical power is OFF.

b. To remove left and right position lights, remove three attaching screws and remove light from mounting. Back off coupling nut and disconnect electrical wiring from light. Cover wire ends with tape.

11-211. CLEANING — POSITION LIGHTS. Wipe exterior of lights with clean dry, lint-free cloth.

11-212. INSTALLATION — POSITION LIGHTS.

a. Remove tape from left and right position light wire ends.

b. Thread wires through coupling nut and connect to light.

c. Tighten coupling nut; position light and install three attaching screws.

11-213. FLASHER UNIT (figure 13-18).

11-214. REMOVAL — FLASHER UNIT.

a. Check that all electrical power is OFF.

b. Disconnect electrical wire and tape wire ends.

c. Remove attaching screws and washers and remove unit.

11-215. INSTALLATION — FLASHER UNIT.

a. Position flasher unit; install and tighten attaching screws and washers.

b. Remove tape and connect electrical wiring.

11-216. ANTI-COLLISION LIGHT (figure 13-18).

11-217. REMOVAL — ANTI-COLLISION LIGHT.

a. Check that all electrical power is OFF.

b. Release retainer ring clamp; remove lens and lift lamp support plate to gain access to wiring.

c. Disconnect electrical leads and cap end with tape.

d. Remove attachment screws and lift light base from fairing.

11-218. CLEANING — ANTI-COLLISION LIGHT. Wipe exterior of light with clean, dry, lint-free cloth.

11-219. INSTALLATION — ANTI-COLLISION LIGHT.

a. Place light base on fairing and install attachment screws.

Note

When replacing the bulb in the anti-collision beacon; touching the glass portion of the bulb with fingers will shorten life of bulb.

b. Remove tape from wire and connect to lamp terminals.

c. Position lamp support plate in base; replace lens; install and secure retainer ring.

11-220. TAIL LIGHT (figure 13-18).

11-221. REMOVAL — TAIL LIGHT.

a. Check that all electrical power is OFF.

b. Remove two attaching screws and remove light from mounting.

11-222. CLEANING — TAIL LIGHT (refer to paragraph 11-211; procedure is the same).

11-223. INSTALLATION — TAIL LIGHT.

a. Remove tape from wiring insert. Place insert in position and tighten coupling nut.

b. Position lamp support plate in base, replace lens, install and secure retainer ring.

c. Position light on mount; install and tighten attachment screws.

11-224. BATTERY TEMPERATURE SENSING SYSTEM (helicopters 1164 and subsequent) (figures 11-1 , 13-1, and 13-4).

CAUTION

This system is qualified only for the make and type of battery delivered with the Model 206B helicopter.

11-225. DESCRIPTION. The battery temperature sensing system consists of a battery over-temp sensor module (S103), BATTERY TEMP caution light (DS42), BATTERY HOT warning light (DS43), and related wiring. Switch (S1) in over-temp sensor module (S103) is actuated when battery case temperature reaches 130°F (54.4°C) which illuminates BATTERY TEMP caution light (DS42). If temperature reaches 140°F (60°C), switch (S2) in over-temp sensor module (S103) is actuated which illuminates BATTERY HOT warning light (DS43). When BATTERY TEMP caution light illuminates, the battery charging circuit must be disengaged to allow battery case temperature to drop below 130°F (54.4°C).

11-226. TESTING — BATTERY TEMPERATURE CAUTION AND WARNING LIGHTS.

a. Close caution light circuit breaker.

b. Disconnect electrical connector (P207) from sensor module.

c. Jumper P207 pin B to C. Check that BATTERY TEMP caution light illuminates.

d. Jumper P207 pin E to F. Check that BATTERY HOT warning light illuminates.

e. Remove jumpers.

f. Open caution light circuit breaker.

g. Reconnect electrical connector (P207) to sensor module.

11-227. REMOVAL — BATTERY OVER-TEMP SENSOR MODULE (S103).

a. Disconnect battery.

b. Remove battery.

c. Disconnect electrical connector (P207) from sensor module.

d. Remove retainer with spring and sensor module.

11-228. INSPECTION — BATTERY OVER-TEMP SENSOR MODULE. Inspect battery temperature sensor, spring, and retainer for condition and cleanliness.

11-229. TESTING — BATTERY OVER-TEMP SENSOR MODULE (S103) (figure 11-6).

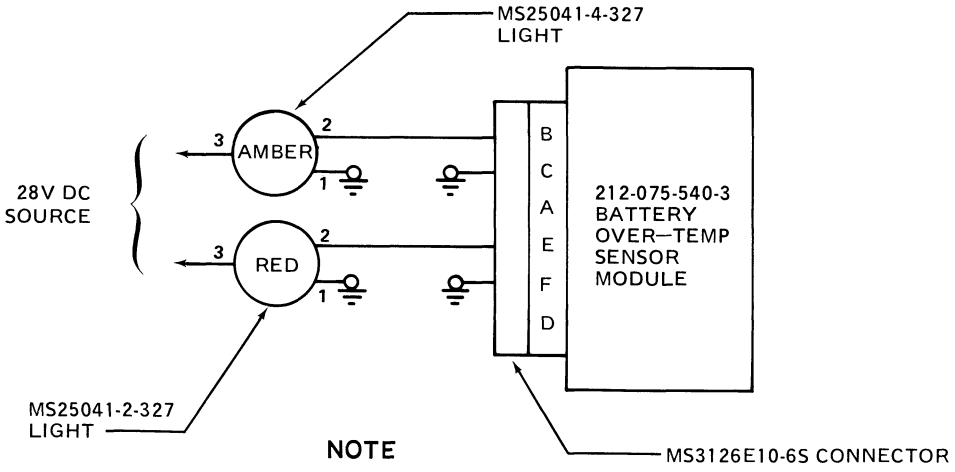
a. Remove sensor module from helicopter. (Refer to paragraph 11-227).

b. Submerge temperature sensitive side of sensor module in a controlled-temperature oil or water bath.

c. Connect sensor module to an electrical test harness as shown in figure 11-6 .

d. Increase and monitor oil or water temperature and check sensor module operation as follows:

TEMPERATURE	INDICATION
130°F ± 3°F (54.4°C ± 1.7°C)	Amber Light ON
140°F ± 3°F (60.0°C ± 1.7°C)	Red Light ON. (Amber light remains ON.)



All wiring 22 gage.

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Figure 11-6. Test Harness for Battery Temperature Sensor Module

e. Allow oil or water bath to cool and observe that lights extinguish within the above limits.

11-230. INSTALLATION — BATTERY OVER-TEMP SENSOR MODULE (S103).

a. Install retainer with spring sensor module.

b. Ensure that sensor plate protrudes approximately 0.03 inch above the rim of the retainer.

c. Connect electrical connector (P207) to sensor module.

d. Install battery. Ensure that sensor plate is in contact with battery surface.

e. Reconnect battery.