CHAPTER 96 — ELECTRICAL SYSTEM

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TABLES

ELECTRICAL SYSTEM

96-1. ELECTRICAL SYSTEMS.

Models 206A, 206B and 206B JetRanger III helicopters are equipped with a 28 volt direct current (Vdc) electrical system. Power for this system is obtained from a nickel-cadmium, vented, 24 volt, 13 ampere-hour or 17 ampere-hour (S/N 4299 and subsequent) battery and a 30 volt, 150 ampere (derated to 105 amperes) combination starter-generator. Major components of dc power system include battery, starter-generator, voltage regulator, relays, and circuit breakers. All circuits in electrical system are single wire with a common ground return. Negative terminals of starter-generator and battery are grounded to helicopter structure.

Controls for electrical systems are located on overhead console and instrument panel. For location of control relays, power relays, voltage regulators, and other electrical components, refer to figure 96-1. Refer to Chapter 98 for electrical systems wiring diagrams.

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

96-2. OPERATIONAL CHECKS.

When performing operational checks, external power should be utilized whenever possible. Perform operational checks to ensure circuits are free of malfunctions after equipment has been replaced or airframe wiring repaired or replaced.

NOTE

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

96-3. WIRING IDENTIFICATION.

Wires are marked with identification letters and numbers.

CIRCUIT IDENTIFICATION LETTERS	WIRING IDENTIFICATION CODE
C	Control Surface
D	Instrument Circuits (Other than flight instrument)
E	Engine Instrument Circuits
H	Heating, Ventilating, and De-icing
J	Ignition Circuit
K	Engine Control Circuit
L	Lighting Circuit
N	Ground
P	DC Power
Q	Fuel and Oil Circuit
R	Radio/Navigation
W	Warning and Emergency

Example (E17B20N)

E	Circuit Function
17	Wire Number
B	Wire Segment
20	Wire Size
N	Ground

96-4. DC POWER SYSTEM LOADING.

DC power system loading data is given in table 96-1.

Table 96-1. DC power system loading

1.	**DC GENERATOR POWER CAPACITY AT 30 VDC:**	
	105 amperes (continuous) 170 amperes (2 minutes) 200 amperes (5 seconds)	
	NOTE	
	Generator is rated at 150 amperes (continuous) but is derated to 105 amperes for this installation.	
2.	**BASIC HELICOPTER OPERATING LOADS:**	
	Start and Warmup	
	5 seconds	22.08 amperes
	2 minutes	19.17 amperes
	15 minutes	18.47 amperes
	Takeoff	
	5 seconds	19.42 amperes
	2 minutes	18.52 amperes
	15 minutes	18.39 amperes

Table 96-1. DC power system loading (Cont)

Cruise	
5 seconds	19.42 amperes
2 minutes	18.52 amperes
15 minutes	18.39 amperes
Landing	
5 seconds	38.54 amperes
2 minutes	37.17 amperes
15 minutes	24.60 amperes
3. BATTERY CHARGING LOAD:	
13 AH Battery	44.20 to 3.90 amperes
17 AH Battery*	57.80 to 3.70 amperes
4. AUXILIARY KITS LOADING:	
SCAS	2.20 amperes
Flight Instruments	1.80 amperes
Pitot Heaters	4.00 amperes 5.80 amperes
Heater	16.70 amperes
ECU	39.00 amperes
Auto Relight	0.05 amperes
Hoist	27.50 amperes
Cargo Hook Release only	10.40 amperes
Rotor Brake	0.40 amperes
Emergency Floats	1.17 amperes
Avionics Kits Helicopters S/N 2212 Through 3216	
VHF NAV/COM Receiver	1.02 amperes
VHF NAV/COMM Transmitter	3.10 amperes
Voltage Converter	0.10 amperes
Audio Panel	1.10 amperes
ADF	1.00 amperes
Omni/ILS Indicator	0.20 amperes
Transponder	1.30 amperes

Table 96-1. DC power system loading (Cont)

Avionics Kits Helicopters S/N 3217 and Subsequent	
VHF NAV/COMM Receiver	0.56 amperes
VHF NAV/COMM Transmitter	2.75 amperes
Audio Panel	1.84 amperes
ADF	0.59 amperes
Omni/ILS Indicator	0.20 amperes
Transponder	1.17 amperes

*Battery ratings are based on a 1 hour discharge rate.

96-5. ELECTRICAL COMPONENTS.

Included in this category are relays, solenoids, variable resistors, switches, circuit breakers, plugs, leads, connectors, wiring, receptacles, shunts, capacitors, diodes, transistors, resistors, inductors, transducers, synchros, and panel lights.

96-6. REMOVAL.

PRIOR TO EXTENSIVE ELECTRICAL MAINTENANCE, DISCONNECT BATTERY AND EXTERNAL POWER.

1. Ensure battery switch is set to OFF.

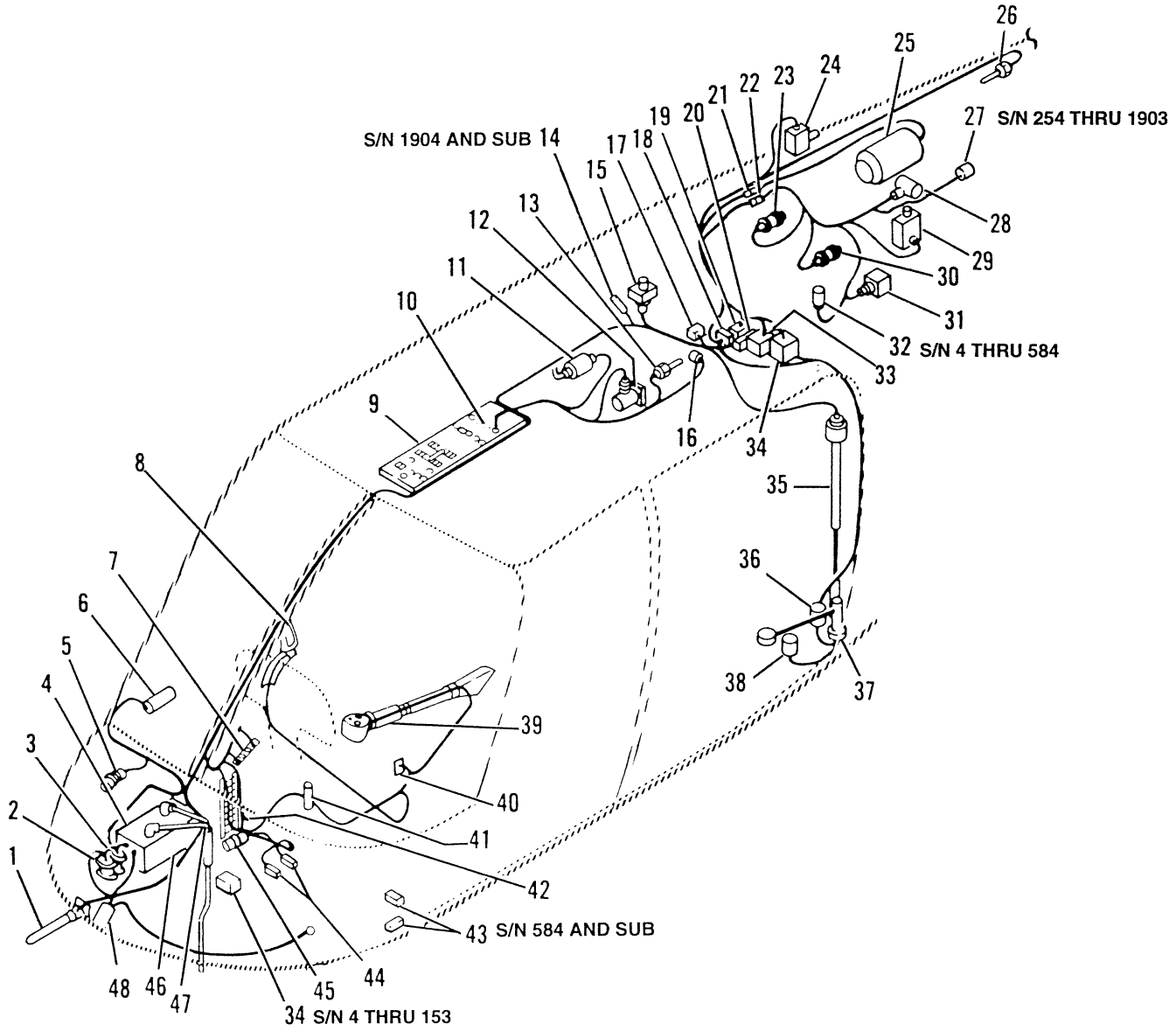
2. Open circuit breaker(s) of affected electrical system.

3. Remove or loosen attaching hardware, clamps, retainers, connectors, or conductors.

4. Identify and tag wires.

5. Protect wire and connector ends with tape or caps.

6. Remove component.



HELICOPTERS S/N 4 THRU 2211

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Figure 96-1. Electrical equipment location (Sheet 1 of 7)

1. Pitot tube (PH500)
2. External power relay (K1)
3. Battery relay (K2)
4. Battery (BT1)
5. Defogging blower RH (B7)
6. Compass indicator
7. R1 turbine outlet (R1)
8. Cyclic trigger switch (S14)
   Cyclic button switch (S15)
9. Overhead console
10. Transmission disconnect (P10 and J10)
11. Hydraulic bypass solenoid (L1)
12. Rotor tachometer generator (G2)
13. XMSN oil temperature bulb (Z3)
14. Fuel pressure transducer (B11)
15. Fuel shutoff valve (B6)
16. XMSN oil temperature switch (S3)
17. Loadmeter circuit breakers
18. Loadmeter shunt (R3)
19. Generator field relay (K4)
20. Starter relay (K3)
21. Starter-generator disconnect (P13 and J13)
22. Engine disconnect (P12 and J12)
23. Gas producer tachometer generator (G4)
24. Engine heater control (B4)
25. Starter-generator (G1)
26. Engine oil temperature bulb (Z2)
27. Fuel pressure transducer (B11)
28. Fuel filter differential pressure switch (S10)
29. Igniter (Z1)
30. Power turbine tachometer generator (G3)
31. Governor rpm actuator (B3)
32. Bleed air pressure switch (S9)
33. Reverse current relay (K5)
34. Voltage regulator (VR1)
35. Upper fuel tank unit (Z5)
36. Aft fuel pump (B2)
37. Lower fuel tank unit (Z4)
38. Forward fuel pump (B1)
39. Collective stick Governor (S5)
    Starter switch (S6)
40. Collective terminal block (TB4)
41. XMSN oil pressure switch (S4)
42. Instrument panel (TB1)
43. RPM sensor
44. Fuel indicator empty and full adjust potentiometers (R5 and R6)
45. Defogging blower, LH (B8)
46. Battery vent tubes
47. Battery overtemperature sensor module (S103)
48. External power receptacle (J16)

NOTE

For detail part number of items, see illustrated parts breakdown manual.

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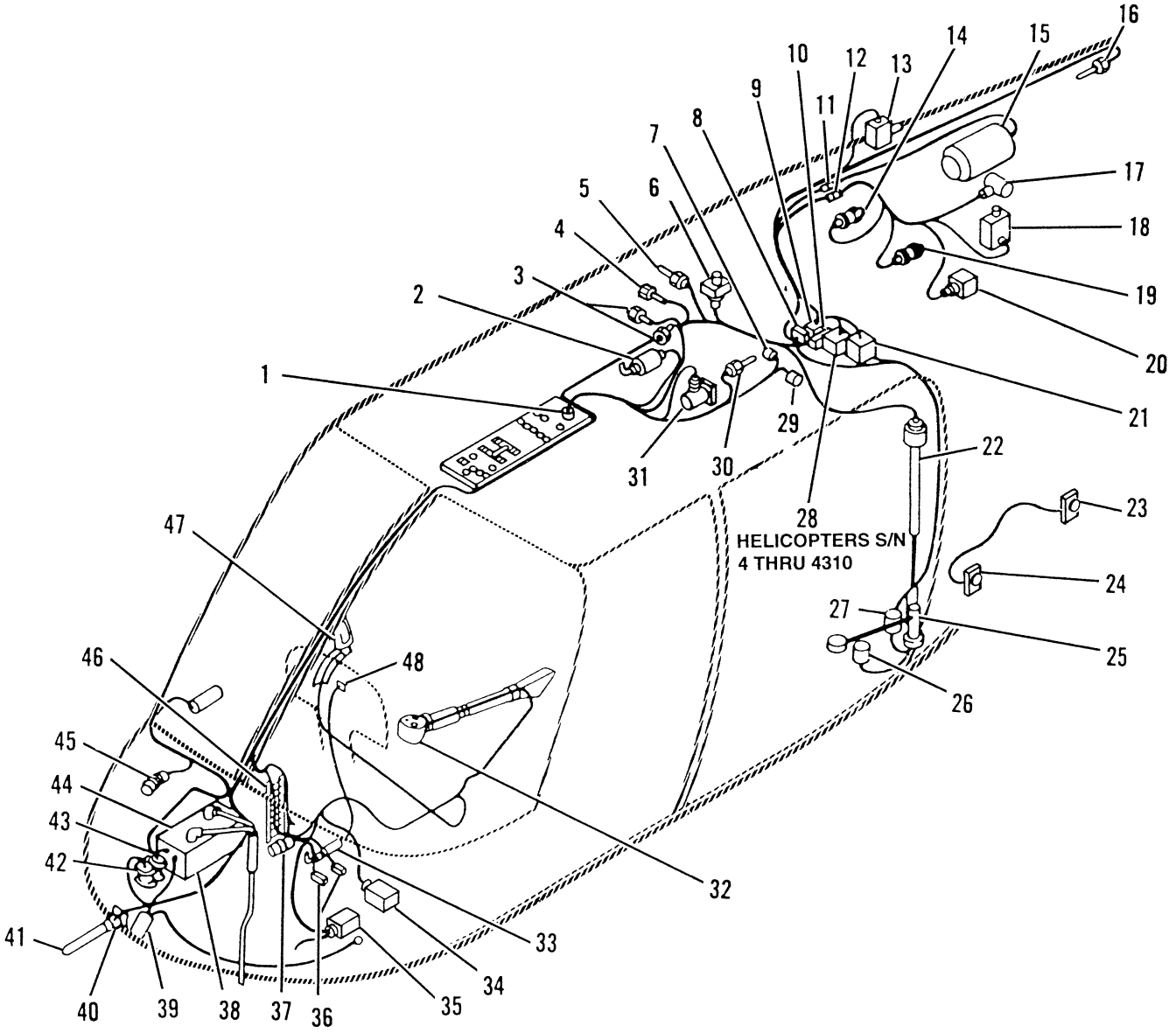
Figure 96-1. Electrical equipment location (Sheet 2)



HELICOPTERS S/N 2212 AND SUBSEQUENT

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Figure 96-1. Electrical equipment location (Sheet 3)

1. Transmission connector (P9 and J9)
2. Hydraulic bypass solenoid (L1)
3. Transmission chip detectors (E4 and E5)
4. Tail rotor chip detector (E7)
5. Fuel pressure transducer (B11)
6. Fuel shutoff valve (B6)
7. Transmission oil temperature switch (S3)
8. Loadmeter shunt (R3)
9. Generator field relay (K4)
10. Starter relay (K3)
11. Engine disconnect (P13 and J13)
12. Engine disconnect (P12 and J12)
13. Engine heater control (B4)
14. Gas turbine tachometer generator (G4)
15. Starter-generator (G1)
16. Engine oil temperature bulb (Z2)
17. Fuel filter differential pressure (S10)
18. Igniter (Z1)
19. Power turbine tachometer generator (G3)
20. Governor RPM actuator (B3)
21. Voltage regulator (VR1)
22. Upper fuel tank unit (Z5)
23. Fuel drain valve switch (S91)
24. Fuel drain valve (B15)
25. Lower fuel tank unit (Z4)
26. Forward fuel pump (B1)
27. Aft fuel pump (B2)
28. Reverse current relay (K5)
29. Hydraulic temperature switch (S115)
30. Transmission temperature bulb (Z3)
31. Rotor tachometer generator (G2)
32. Collective stick switches (S5, S6, and S49)
33. Transmission oil temperature switch (S4)
34. Low RPM sensor (S98)
35. RPM sensor (S97)
36. Fuel indicator adjust potentiometer (R5 and R6)
37. Defogging blower LH (B8)
38. Battery overtemperature switch (S103)
39. Starter-generator disconnect (J16)
40. Pitot tube disconnect (P29)
41. Pitot tube (PH-500)
42. External power relay (K1)
43. Battery relay (K2)
44. Battery (BT1)
45. Defogging blower RH (B7)
46. Instrument panel terminal board (TB1)
47. Cyclic stick switches (S14 and S15)
48. Transmission oil temperature caution LT (I1)

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Figure 96-1. Electrical equipment location (Sheet 4)

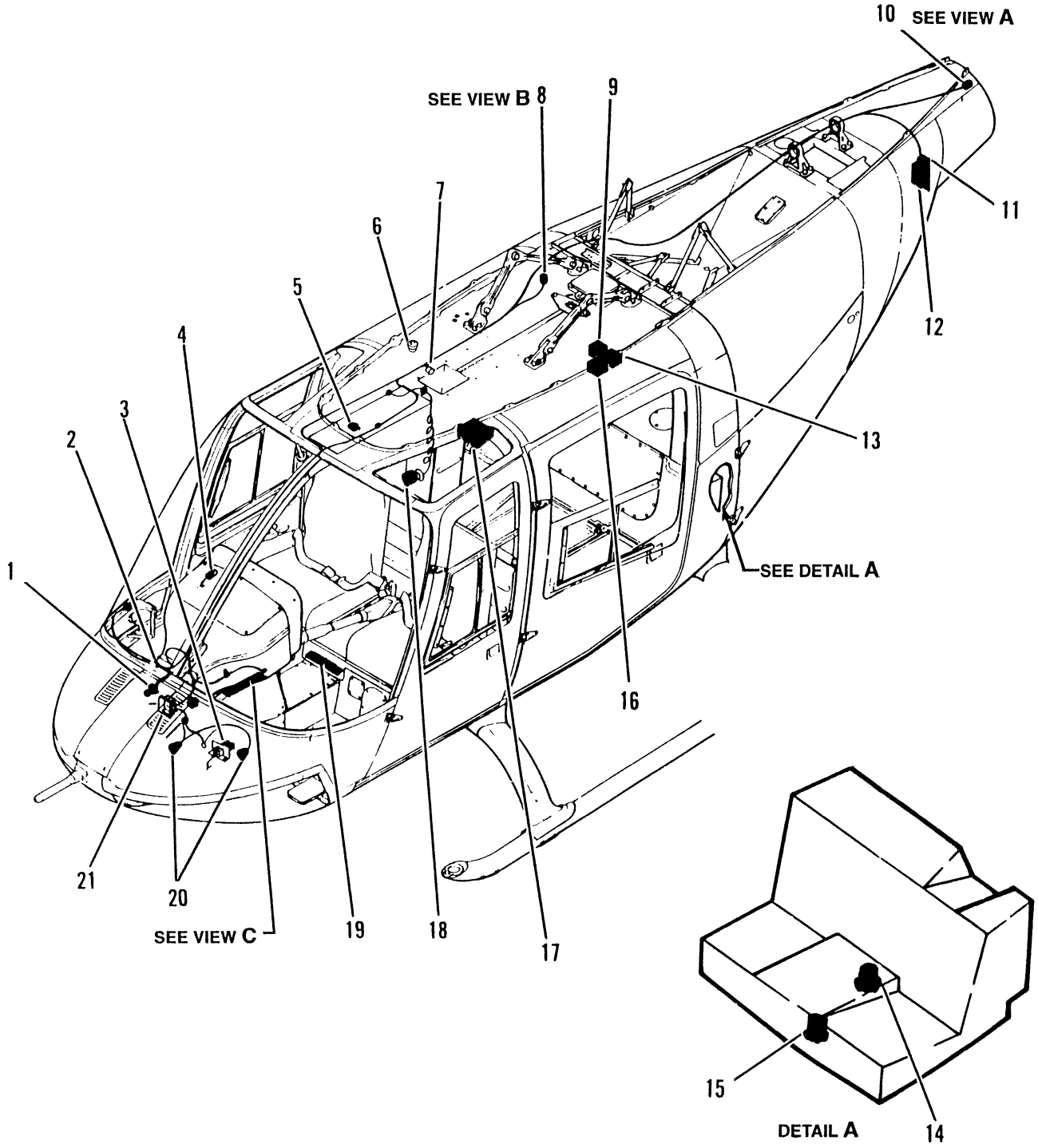

Figure 96-1. Electrical equipment location (Sheet 5)

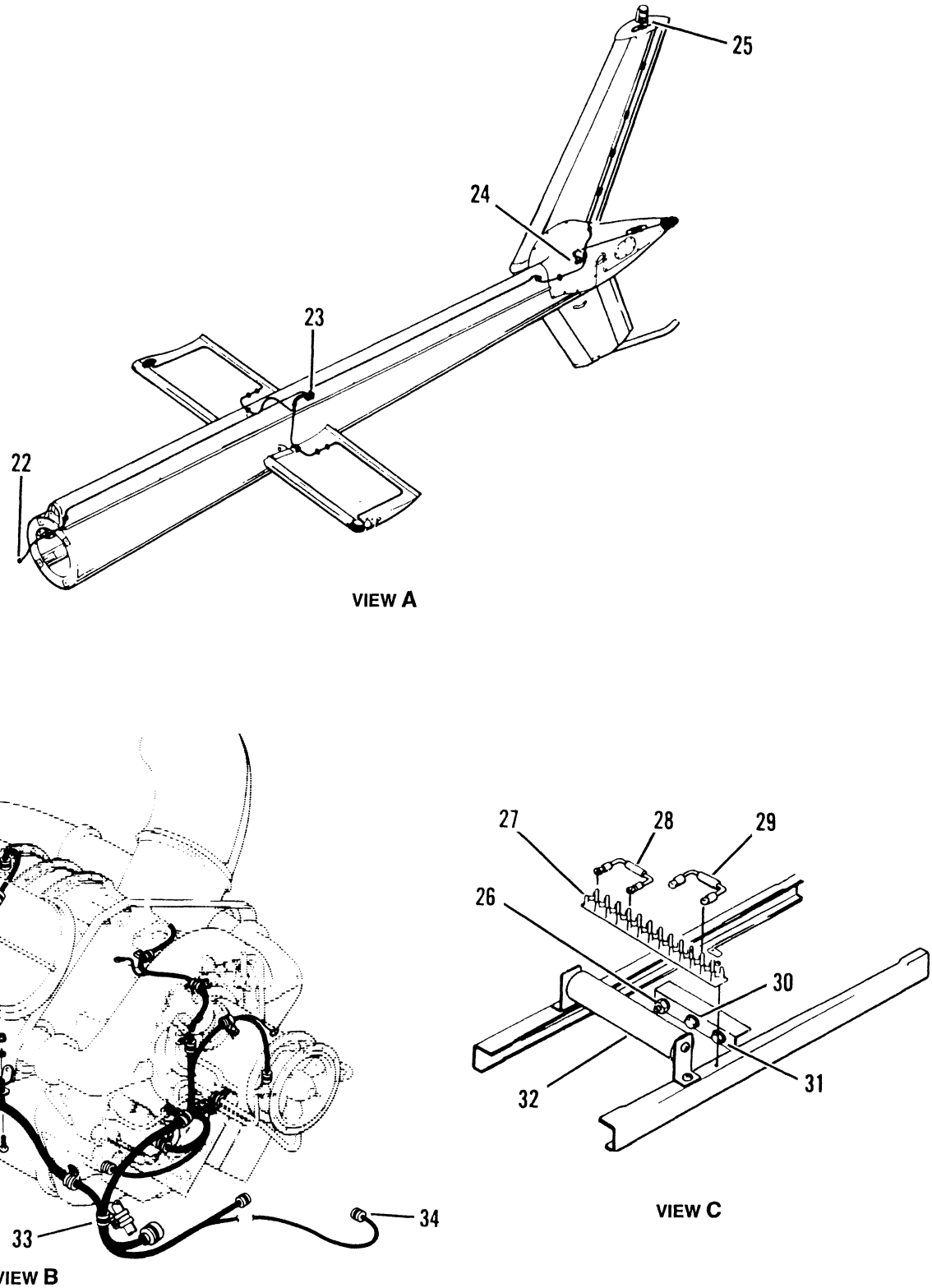

Figure 96-1. Electrical equipment location (Sheet 6)

1. TOT overtemperature reset key switch (S114)
2. Dimmer relay (K24)
3. Horn mute relays (4XK1 and 4XK2)
4. Caution light disconnect (J209 and P209)
5. Auxiliary, power, rectifier, dimmer control, resistors (J217, J187, R7, R50, R52, R60)
6. Low RPM warning LT (DS39)
7. Headliner disconnect (J222)
8. Engine disconnect no. 2 (J176)
9. Generator field reset relay (K41)
10. Tailboom disconnect (J24)
11. Flasher assembly connector (P194)
12. Power supply strobe assembly (A412A)
13. Generator field control resistor (R2)
14. Fuel pressure switch aft (S12)
15. Fuel pressure switch forward (S11)
16. Overvolt sensor relay (K42)
17. Reading LT position LT SW, anticollision LT SW (DS46L/R, S116, S117)
18. Cockpit light (DS6)
19. Terminal block (TB4)
20. Landing lights (DS7 and DS8)
21. Landing light relays (K8 and K20)
22. Tailboom disconnect (P24)
23. Tailboom terminal block (TB7)
24. Remote light disconnect (J195 and P195)
25. Vertical fin disconnect (J197 and P197)
26. Diode, 5.6V zener (CR2)
27. Instrument LT terminal block (TB6)
28. Resistor post LT (R35)
29. Voltage drop resistor (R61)
30. Dimmer circuit transistor (Q1)
31. Dimmer circuit transistor (Q2)
32. Voltage drop resistor (R51)
33. Reverse current relay (K5)
34. Voltage regulator (VR1)

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Figure 96-1. Electrical equipment location (Sheet 7)

96-7. INSPECTION.

1. Inspect variable resistors for proper mounting, corrosion, burned element, damaged wiper, cracks, and correct resistance.

2. Inspect switches for weak detents, proper mounting, corrosion, and continuity in on and off positions.

3. Inspect circuit breakers for proper mounting, corrosion, continuity in circuit power on and power off conditions, and reset retentions.

4. Inspect plugs, connectors and receptacles for proper mounting, contact corrosion, damaged contacts, broken wires, insert cracks, and faulty insulation.

5. Inspect leads and wiring for loose terminal connections, chafing, corrosion, deterioration, or damaged insulation, excessive stress, broken strands, damaged shielding, routing, and mounting conditions.

6. Inspect shunts for corrosion, proper mounting, physical damage, and discoloration (indicating excessive overloading).

7. Inspect relays and solenoids for loose connections, damaged or broken contact pins or terminals, damage to case or insulation between contact pins, and evidence of corrosion, pits or discoloration (indicating arcing due to loose connections, internal shorting or excessive overload).

8. Visually check diode and transistors for loose connection and broken leads. Check suspected faulty diode front-to-back conductivity ratio with standard ohmmeter. Check resistance of transistor between emitter and base, and base and collector per manufacturer specifications.

9. Visually check panel lights for corrosion and burned elements.

96-8. REPAIR.

1. Clean and tighten loose terminal connections, mounting, and attachments of electrical components.

2. Replace miscellaneous electrical components which fail to meet inspection requirements.

96-9. INSTALLATION.

1. Install component with attaching hardware or clamps.

2. Attach identified terminals and/or connectors.

96-10. CONTROL PANELS — ELECTRICAL.

Controls are mounted in the overhead console instrument panel and instrument panel pedestal. See figure 96-2 for console/panel illustration and Chapter 95 for instrument panel.

96-11. REMOVAL.

NOTE

Removal procedure for all panels is similar. A single removal procedure is shown:

1. Ensure electrical power is set to OFF.

2. Disconnect battery.

3. Disengage fasteners. Lift panel from mount and disconnect electrical connector(s).

96-12. INSPECTION.

Visually inspect for scratched, chipped, or broken edge or integrally lit panels, loose connections, defective switches, damaged connectors, and broken or missing mounting fasteners.

96-13. REPAIR.

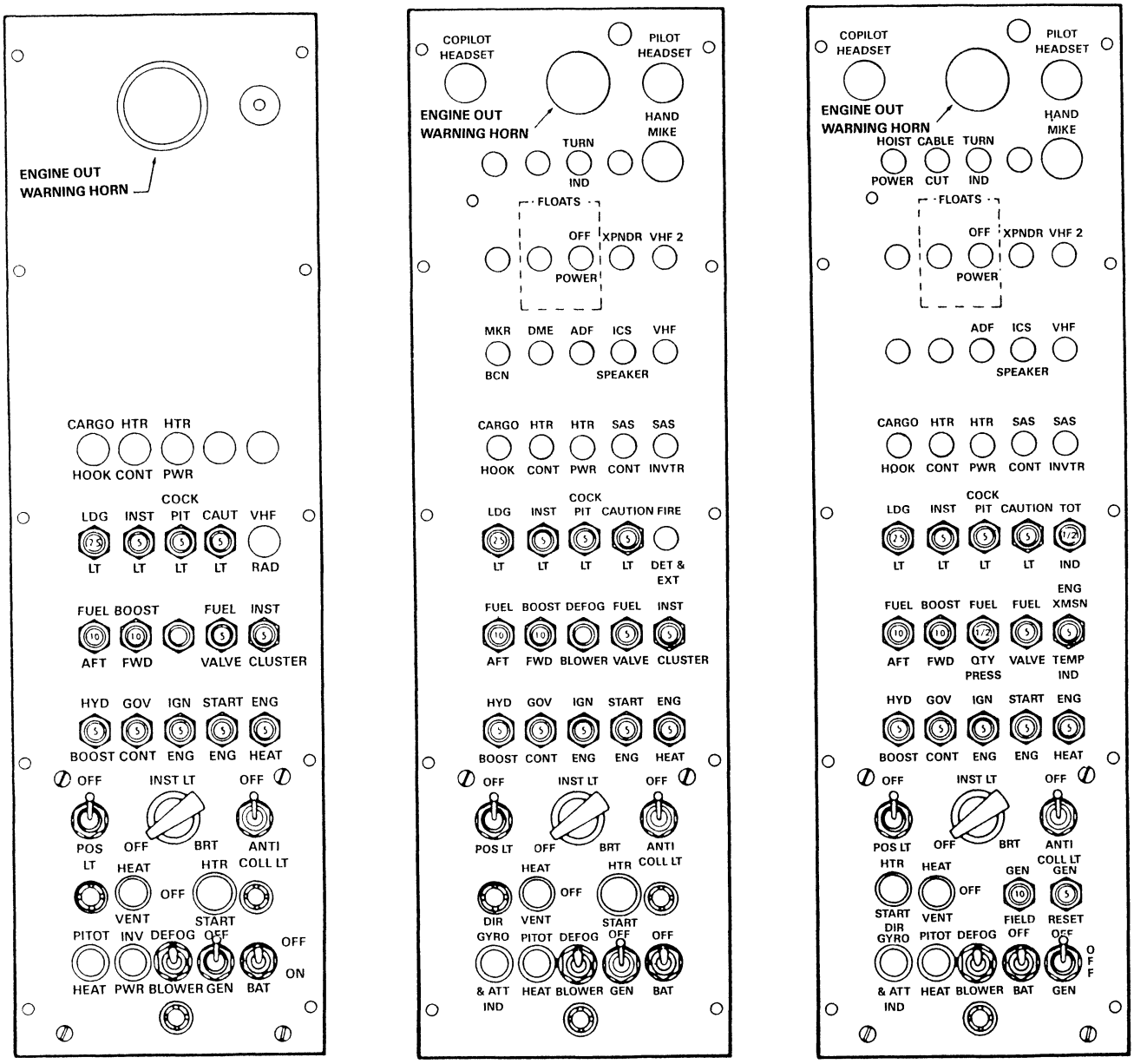
Replace items which fail to meet inspection requirements.

96-14. INSTALLATION.

Connect electrical connector(s). Position panel in mount. Engage fasteners.

96-15. CIRCUIT BREAKERS.

Circuit breakers are mounted in overhead console. Circuits can be opened and closed with these push-pull circuit breakers (figure 96-2).



S/N 4 THRU 153

S/N 154 THRU 1903

S/N 1904 THRU 2211

HELICOPTERS S/N 4 THRU 2211

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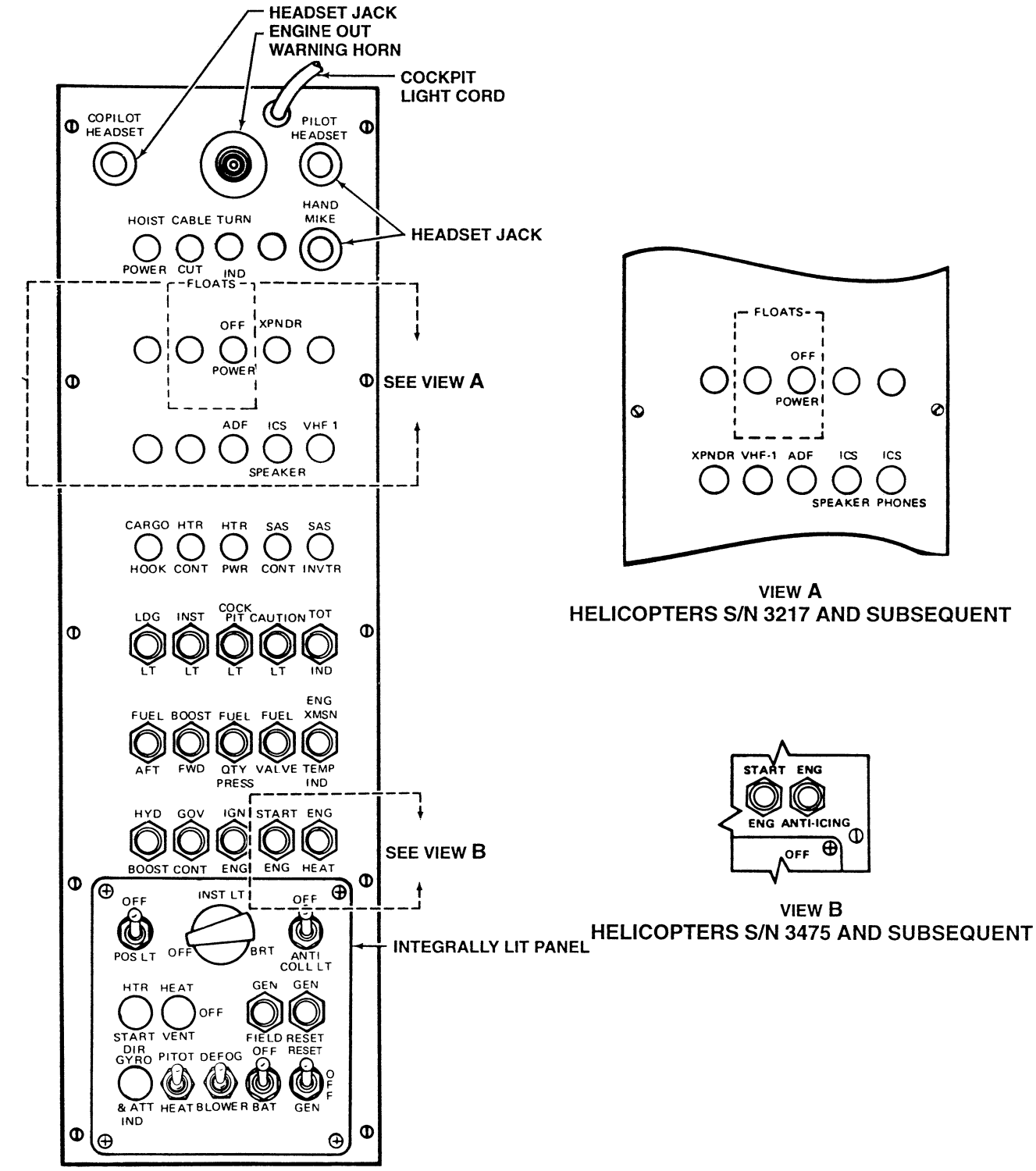
Figure 96-2. Overhead console (Sheet 1 of 2)



206A/BS-M-96-2-2

Figure 96-2. Overhead console (Sheet 2)

NOTE

For additional maintenance information, refer to paragraph 96-7.

96-16. REMOVAL.

1. Ensure electrical power is set to OFF.
2. Disconnect battery.
3. Disengage fasteners and lift panel assembly.
4. Identify and tag wiring to breaker(s).
5. Disconnect wiring and cover wire ends.
6. Remove mounting nut and lift breaker from panel.

98-17. INSPECTION.

Inspect circuit breakers for proper mounting, corrosion, and check continuity.

96-18. REPAIR OR REPLACEMENT.

Replace circuit breaker if inspection warrants.

96-19. INSTALLATION.

1. Position breaker in panel and install mounting nut.
2. Remove cover from wire ends and connect to breaker.
3. Seat panel assembly and engage fasteners.
4. Ensure electrical power is set to OFF.
5. Connect battery.

DC POWER SYSTEMS

96-20. DC POWER SYSTEMS.

DC power systems include battery, external power, generator, and starter-igniter systems. Refer to Chapter 98 for wiring diagrams. See figure 96-1 for equipment location.

96-21. BATTERY SYSTEM.

Battery system includes battery, battery relay, and battery switch. Helicopters S/N 716 and subsequent are equipped with BATT TEMP and BATT HOT sensors and related wiring.

96-22. TROUBLESHOOTING — BATTERY SYSTEM.

Refer to figure 96-3 and perform necessary checks to isolate trouble.

96-23. BATTERY.

Battery (BT1) is located in nose section of helicopter. For helicopters S/N 4 through 4298, battery is a vented, 24-volt, 13-ampere-hour, nickel-cadmium battery. For helicopters S/N 4299 and subsequent, battery is a vented, 24-volt, 17 ampere-hour, nickel-cadmium battery.

96-24. MAINTENANCE.

NOTE

Refer to manufacturer instruction manual for complete battery shop procedures. Observe following operating practices to obtain maximum performance and service life.

1. Recondition battery periodically. Reconditioning is a battery shop procedure including discharging and recharging battery. Frequency of reconditioning should be about every 100 hours flight time. Records should be maintained to determine maximum time between battery reconditioning periods for operating conditions. The following four variables determine frequency for battery reconditioning:

a. Type of starting service

b. Duty cycle for battery

c. Ambient operating temperatures

d. Generator voltage regulator setting.

WARNING

DO NOT USE ACID. INJURY MAY RESULT AND EQUIPMENT DAMAGE CAN OCCUR. NEVER ALLOW ANYTHING ASSOCIATED WITH (INCLUDING ACID FUMES) OR CONTAMINATED BY LEAD-ACID TO COME IN CONTACT WITH BATTERY.

NOTE

Nickel-cadmium batteries are different from lead-acid batteries. Terminal voltage remains constant over 90 percent of total discharge time; a terminal voltage test is not conclusive. A hydrometer test is not effective because electrolyte specific gravity remains constant if battery is either in a charged or discharged condition.

2. Batteries may be checked during normal helicopter operation as follows: a fully charged battery can be determined only by moving battery switch from BAT to OFF and observing effect on generator loadmeter. If change in indication is less than B3 1.0 percent or A B 1.5 percent, battery is fully charged.

CAUTION

DO NOT ADJUST ELECTROLYTE LEVEL (ADD WATER) IN 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 manufacturer instruction manual.

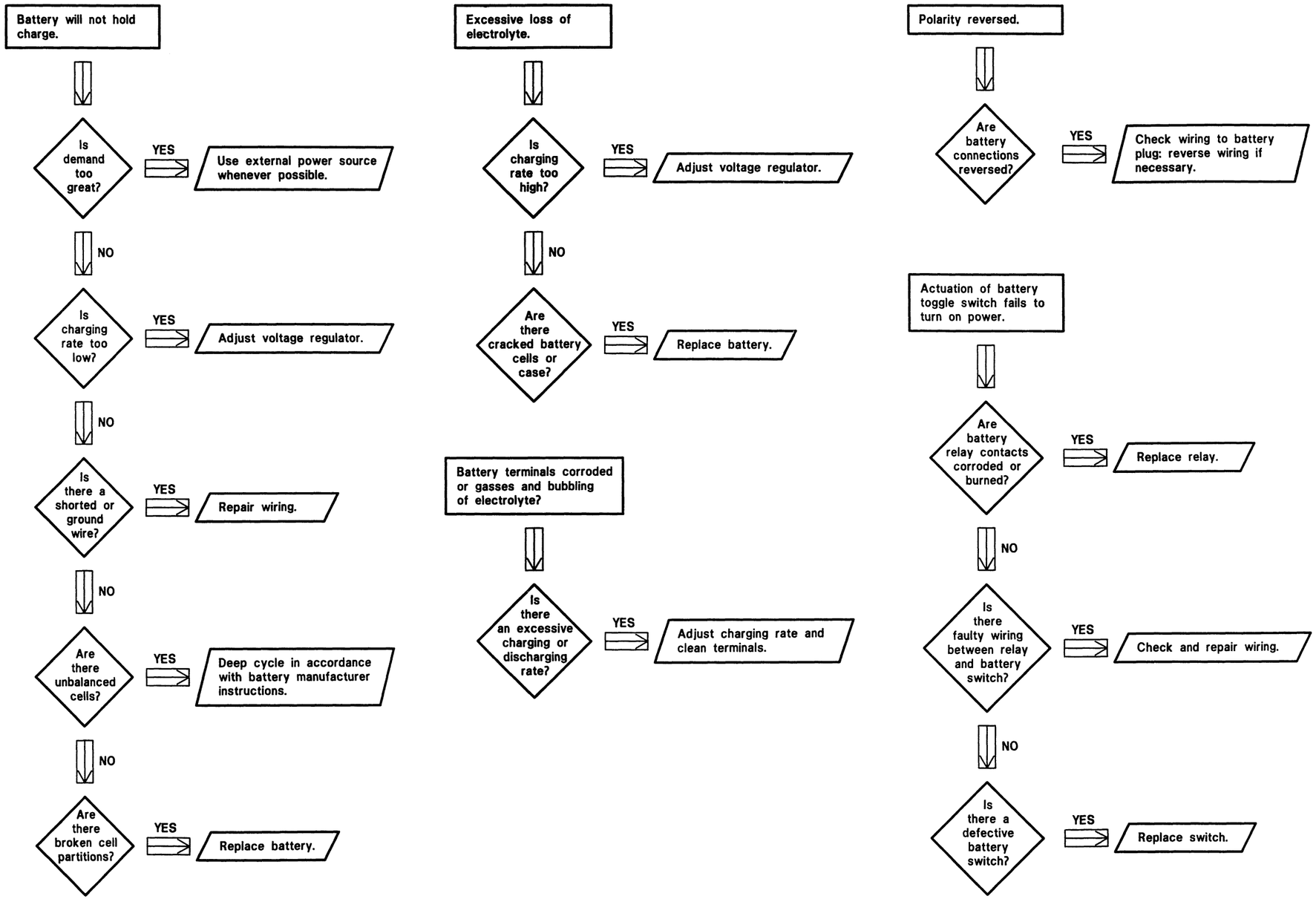


Figure 96-3. Battery system troubleshooting flow chart

3. If it is necessary to add water to the sintered-plate, nickel-cadmium battery, refer to BHT-ELEC-SPM.

96-25. REMOVAL.

NOTE

Ensure battery switch is in OFF position and external power disconnected.

1. Unlatch access door and rinse with water.

2. Loosen clamps and remove vent tubes from battery.

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

4. Retract protective nipple, detach cable from positive battery terminal, and wrap end with tape.

NOTE

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

5. Remove battery holddown bolts and remove battery.

96-26. CLEANING.

CAUTION

DO NOT USE A WIRE BRUSH. ENSURE VENT PLUGS ARE CLOSED BEFORE ATTEMPTING TO CLEAN THE BATTERY. ENSURE CELL TOPS ARE DRY BEFORE RETURNING BATTERY TO USE.

1. Clean battery and overtemp sensor with a dry, soft fiber brush; wipe clean with a clean, soft cloth dampened with water.

CAUTION

DO NOT VARNISH OR PAINT OVERTEMP SENSOR.

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

3. Paint battery tray with alkaline resistant varnish (C-237).

96-27. CHARGING BATTERY IN HELICOPTER (EXTERNAL POWER).

1. Ensure electrical power is OFF.

2. Plug external power into helicopter.

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

4. Turn external power unit ON and note reading of external power unit ammeter.

5. Set battery switch to BAT and note rise in ammeter reading on external power unit (approximately 100 amps).

6. Continue charging until ammeter has dropped to about the same reading recorded before the helicopter battery switch was actuated. This time will be approximately 10 minutes.

7. When current has dropped to previously recorded reading, the battery is charged and ready for service. Set battery switch to OFF; turn external power OFF, and disconnect power unit.

96-28. CHARGING BATTERY OUT OF HELICOPTER (EXTERNAL POWER).

1. Use same procedure outlined in paragraph 96-27 except battery is not installed in helicopter.

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

CAUTION

DO NOT USE CABLE CLIPS. DAMAGE TO BATTERY TERMINALS WILL RESULT.

3. Ensure connections and cables are capable of carrying at least 100 amps.

4. Charge battery as outlined in paragraph 96-27 , recording first the current required by external power unit, then closing generator power switch and continuing charge until current has dropped to value first recorded on external power unit.

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

96-29. 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 10 hours (BHT-ELEC-SPM).

NOTE

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

NOTE

A new battery is discharged and may require approximately 10 hours charging (BHT-ELEC-SPM).

96-30. REPAIR AND REPLACEMENT.

When necessary, replacement of individual cells may be performed. This requires use of special equipment. Consult manufacturer manual for equipment and procedure involved.

96-31. INSTALLATION.

NOTE

Ensure battery switch is in OFF position and external power disconnected.

1. Position battery in helicopter and secure with two bolts. The two holddown bolts must be insulated from 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 phenolic bushing is properly mated with bolt and channel to serve as insulator. Position channel 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).

2. Remove tape and connect cable to positive terminal of battery. Position protective nipple over terminal.

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

NOTE

Quick-disconnects for battery cables are available as a kit upon customer request.

4. Install vent tubes and tighten clamps.

5. Secure nose access door.

96-32. BATTERY RELAY.

Battery relay (K2), located in the nose section forward of pedestal, is an electrically operated switch controlling battery current to main bus bar. It is energized by battery switch located in overhead console, which opens and closes power to relay coil.

96-33. REMOVAL.

1. Disconnect battery (paragraph 96-25).

2. Retract protective nipples to expose relay terminals.

3. Disconnect wires from relay and tape ends.

4. Remove attachment screws and lift relay free.

96-34. INSTALLATION.

1. Position relay and install attaching screws.

2. Remove protective tape and connect wires to relay.

3. Position protective nipples to cover relay terminals.

4. Connect battery (paragraph 96-31).

96-35. OPERATIONAL CHECK — BATTERY SYSTEM.

1. Before connecting power to battery circuitry for the first time, open all circuit breakers; set all switches to OFF. Verify an open circuit exists between positive battery cable and ground.

2. Connect battery and check connections for tightness and correct polarity.

NOTE

This check may be accomplished with battery or external power.

3. Set battery switch (S1) to BAT. Check battery voltage is approximately 24 volts on 28 Vdc bus in overhead console.

4. Set battery switch to OFF. Check that no voltage is present on 28 Vdc bus.

96-36. EXTERNAL POWER SYSTEM.

CAUTION

MAXIMUM CURRENT OF EXTERNAL POWER SOURCE SHOULD NOT EXCEED 1000 AMPS.

External power system includes external power receptacle, external power relay, and related wiring.

96-37. TROUBLESHOOTING.

Refer to figure 96-4 and perform checks as necessary to isolate trouble.

96-38. EXTERNAL POWER RECEPTACLE.

External power receptacle (J16) is located on front center of the nose section. It is a polarized receptacle and used to connect external power to the helicopter.

96-39. REMOVAL.

1. Set battery switch to OFF. Remove external power.

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

3. Disconnect power cables; wrap terminals with electrical tape and tag wires for identification.

96-40. INSTALLATION.

1. Set battery switch to OFF.

2. Remove tape from wire ends and connect cables to receptacle.

3. Position receptacle in helicopter and install attachment screws.

96-41. EXTERNAL POWER RELAY.

External power relay (K1) located in nose section forward of pedestal, electrically controls external power to main bus bar. Small positive pin of external power receptacle energizes circuit to relay coil, causing contacts to close.

96-42. REMOVAL.

1. Set battery switch to OFF. Remove external power.

2. Unlatch and raise nose access door.

3. Retract protective nipples to expose relay terminals.

4. Disconnect wires from relay and tape ends.

5. Remove attachment screws and ground wire and remove relay.

96-43. INSTALLATION.

1. Set battery switch to OFF. Remove external power.

2. Position relay and install mounting screws.

NOTE

Ground wire, P15A20N, must be installed under one mounting screw. Remove protective coating from wire end and screw to ensure good electrical bonding.

3. Remove tape and connect relay wires.

4. Position protective nipple to cover relay terminals.

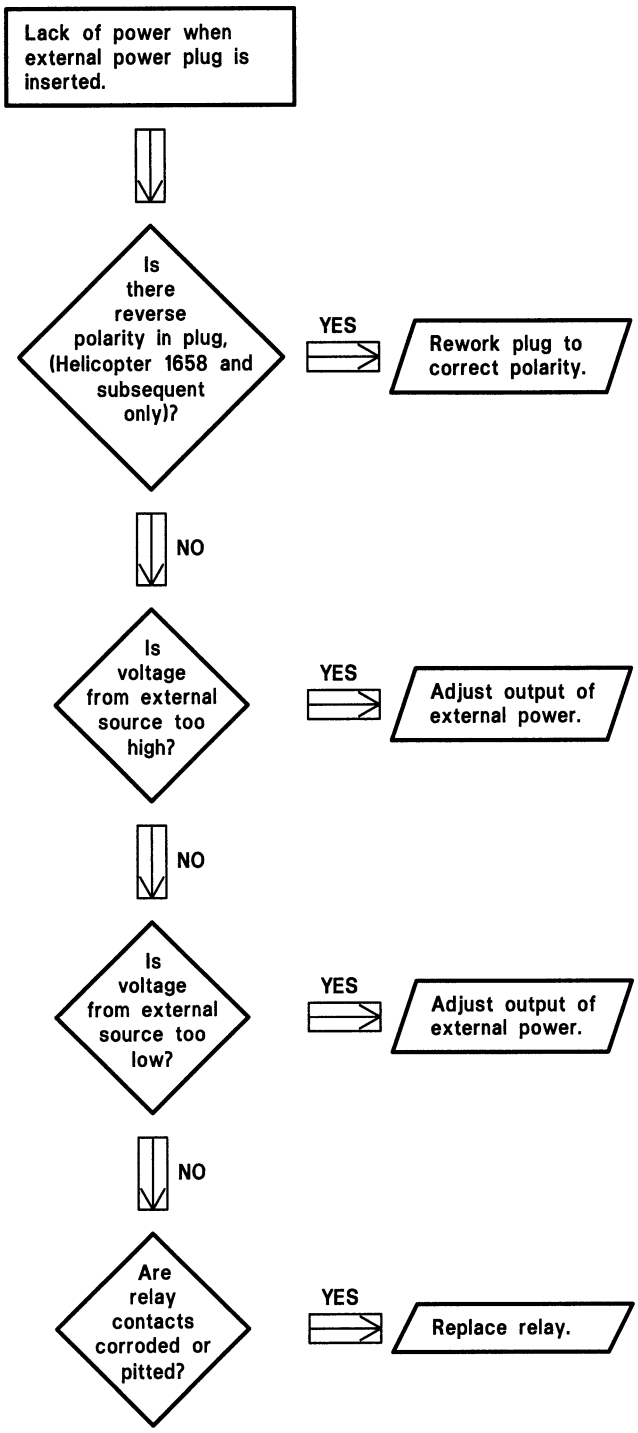
5. Lower and secure nose access door.

96-44. OPERATIONAL CHECK.

CAUTION

BEFORE CONNECTING EXTERNAL POWER, OPEN ALL CIRCUIT BREAKERS AND PLACE ALL SWITCHES TO OFF.

1. Check wiring of external power receptacle (J16) for correct polarity and terminations.



206A/BS-M-96-4

Figure 96-4. External power system troubleshooting flow chart

2. Connect external dc power source to external power receptacle, energize and adjust to 28 (±0.5) volts. Measure voltage on 28 Vdc bus in overhead console. Bus voltage should be within ±1 volt of external power source voltage.

3. Deenergize external power source. Check there is no voltage on 28 Vdc bus.

96-45. GENERATOR SYSTEM.

For helicopters S/N 4 through 4310 the generator system consists of the generator portion of starter-generator, voltage regulator, reverse current relay, generator reset switch, generator shunt, generator reset relay, field control relay, and over-voltage sensing relay.

The generator furnishes regulated power for all dc electrical circuits of helicopter. Generator output is transferred to main bus when generated voltage exceeds bus voltage by 0.30 to 0.42 volts. Reverse current relay connects generator power to bus when voltage regulator senses adequate generator voltage. Over-voltage sensing relay and reverse current relay provide protection against over-voltage and reverse-current conditions. Voltage regulator compensates for voltage fluctuations caused by varying load conditions.

For helicopters S/N 4311 and subsequent the generator system consists of the generator portion of the starter-generator, solid state voltage regulator, line control relay, field ignition relay, generator reset switch, and generator shunt.

The generator furnishes regulated power for all dc electrical circuits of the helicopter. Generator output is transferred to main bus when a minimum of 24 vdc is achieved.

The solid state voltage regulator monitors for: a minimum of 24 vdc output from the generator; over-voltage of 31 ± Vdc; low voltage of 18 ± 1.8 Vdc, and reverse-current protection range between 16 and 25 amps. The voltage regulator compensates for voltage fluctuations caused by varying load conditions.

96-46. TROUBLESHOOTING.

Refer to figure 96-5 and perform checks as necessary to isolate trouble.

96-47. GENERATOR.

Starter-generator (G1) is located on underside of the engine to right of helicopter centerline. This unit is used to start engine, charge battery, and supply power for operation of dc equipment.

96-48. REMOVAL.

Refer to Chapter 71 for generator removal.

96-49. INSPECTION.

1. Inspect for warped or cracked terminal board or terminal damage.

2. Inspect brush cover for dents, loose or bent pins, broken spring, or damaged insulation.

3. Clean exterior of unit with a clean cloth moistened in solvent (C-304) and wipe dry.

CAUTION

COMPRESSED AIR MAY FORCE THE FOREIGN MATERIAL OR CARBON DUST INTO THE UNIT CAUSING A MALFUNCTION.

4. Remove brush band cover and inspect for oil, dirt, or other foreign material. Remove material with a vacuum cleaner.

5. Rotate splined shaft to check for fan rub and bearing condition. Inspect splined shaft for wear.

6. Inspect commutator for a smooth, bright appearance with light filming.

7. Inspect brushes.

a. Brush leads shall be flexible and have a bright appearance.

b. Brushes shall have more than one-fourth life remaining (figure 96-6).

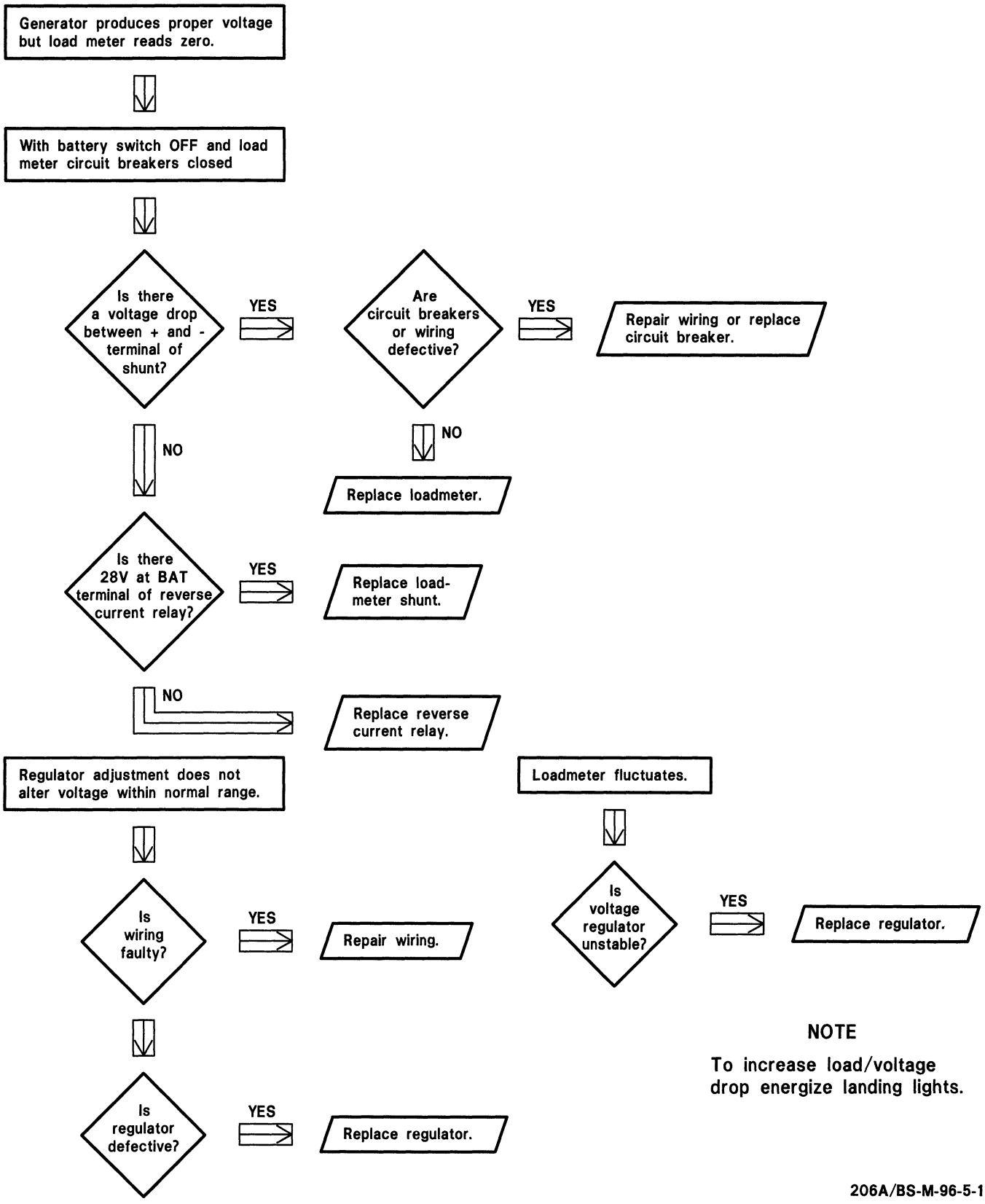
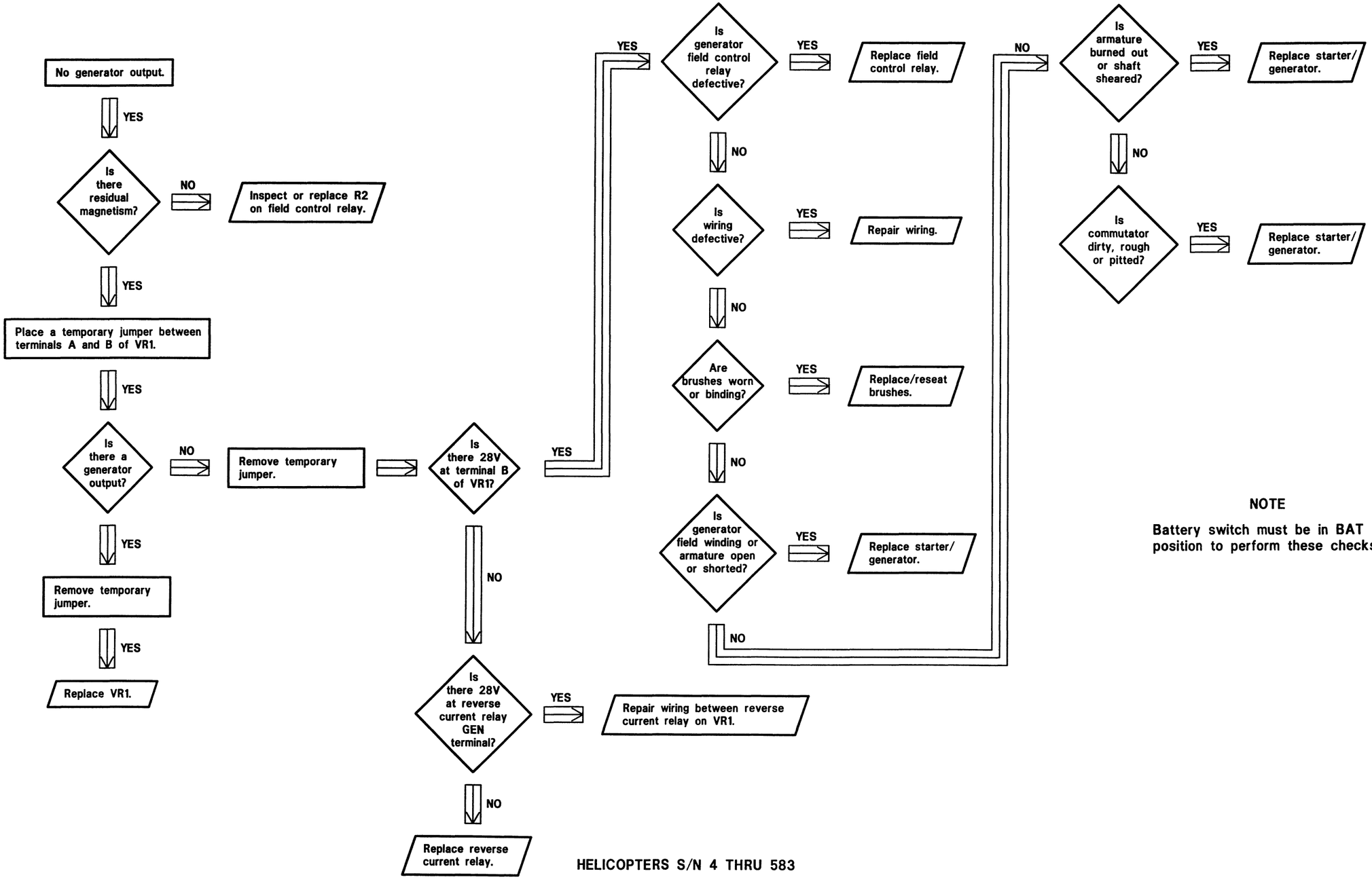


Figure 96-5. Generator system troubleshooting flow charts (Sheet 1 of 3)

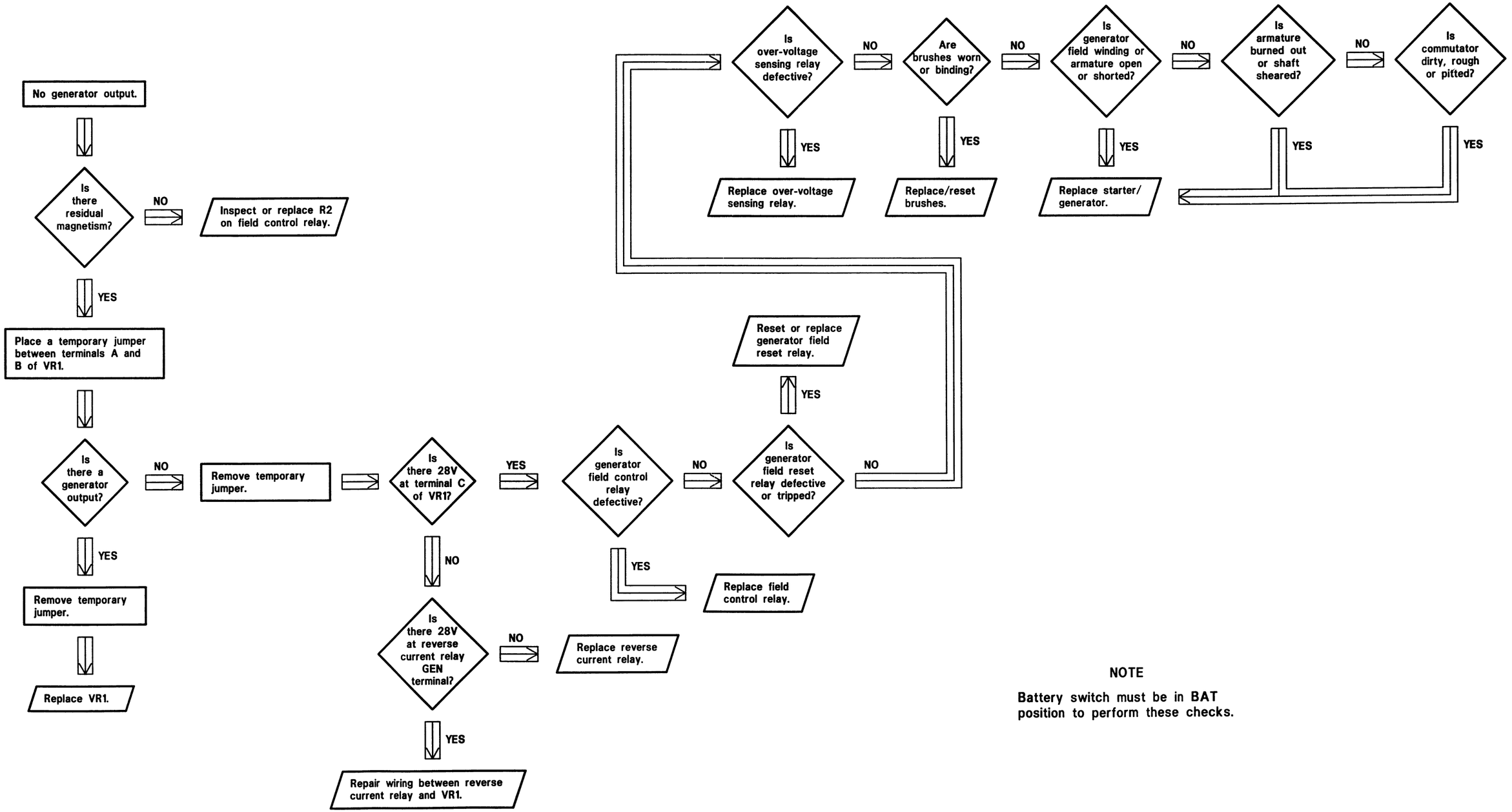


NOTE

Battery switch must be in BAT position to perform these checks.

206A/BS-M-96-5-2

Figure 96-5. Generator system troubleshooting flow charts (Sheet 2)



HELICOPTERS S/N 584 AND SUBSEQUENT

NOTE

Battery switch must be in BAT position to perform these checks.

206A/BS-M-96-5-3

Figure 96-5. Generator system troubleshooting flow charts (Sheet 3)

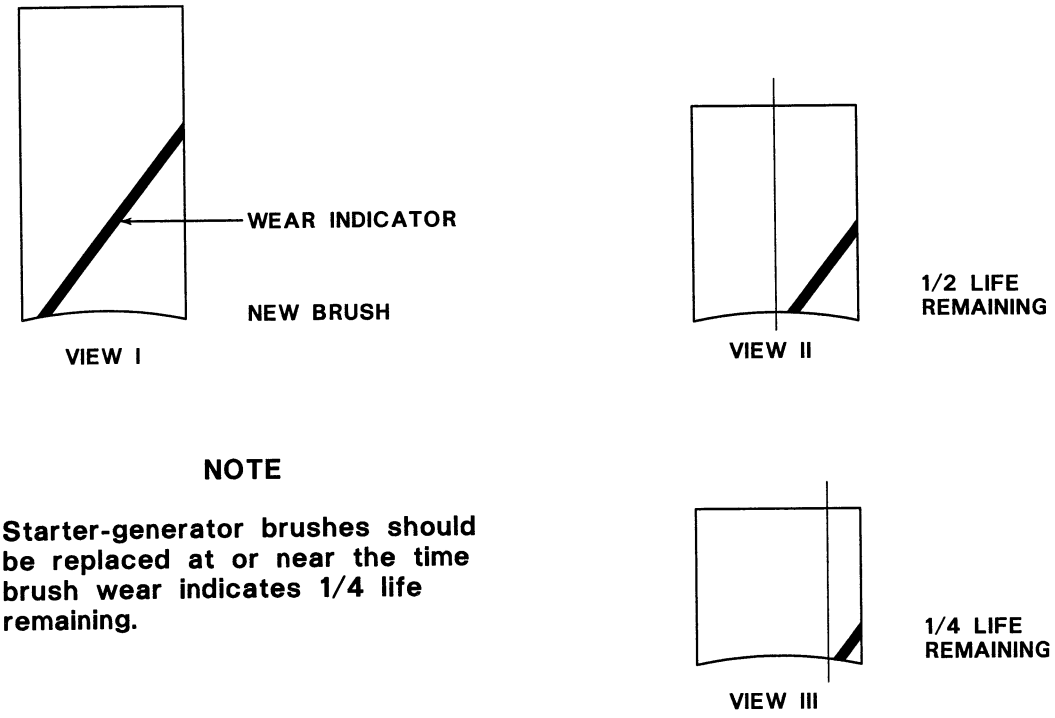


Figure 96-6. Starter-generator brush wear

c. Brushes shall be properly seated. A 100 percent seat in direction of rotation and a minimum 75 percent axially is mandatory.

CAUTION

ENSURE THAT BRUSH LEADS ARE SECURED AND DO NOT RUB OR HANG ON BRUSH HOLDER.

NOTE

If brushes pass inspection, return to their original positions in the starter-generator. If any of the brushes will require replacement before next scheduled overhaul or inspection, tag unit with appropriate comment and send to overhaul shop.

96-50. REPAIR OR REPLACEMENT.

Replace starter-generator if it does not meet inspection requirements.

96-51. INSTALLATION.

Refer to Chapter 71 for generator installation.

96-52. VOLTAGE REGULATOR.

A carbon pile type voltage regulator (VR1) is located below the instrument panel on helicopters S/N 4 through 153 and on the equipment shelf above the baggage compartment on helicopters S/N 154 and subsequent. The VR1 functions as a variable resistor in generator shunt field circuit to maintain a generator output voltage constant at adjusted value, regardless of the varying load.

96-53. REMOVAL.

1. For helicopters S/N 4 through 153:

a. Set BAT and GEN switches to OFF.

b. Remove pedestal access door.

c. Disconnect wires and tape ends.

d. Disconnect four mounting screws and washers.

e. Lift voltage regulator from shelf.

2. For helicopters S/N 154 through 4310:

a. Set BAT and GEN switches to OFF.

b. Remove hat rack access cover.

c. Release holding clips on front of voltage regulator.

d. Lift voltage regulator from shelf.

3. For helicopters S/N 4311 and subsequent:

a. Set BAT and GEN switches to OFF.

b. Remove hat rack access cover.

c. Remove voltage regulator mounting screws.

d. Disconnect voltage regulator.

e. Lift voltage regulator from shelf.

96-54. INSPECTION.

Inspect regulator case for physical damage that could impair normal operation of unit (cracked case, damaged contact pins). Check for secure mounting of regulator.

96-55. REPAIR OR REPLACEMENT.

Replace unit if inspection requirements are not met.

96-56. INSTALLATION.

1. For helicopters S/N 4 through 153:

a. Position voltage regulator on shelf.

b. Install four mounting screws and washers.

c. Remove tape and connect wires.

d. Install pedestal access door.

2. For helicopters S/N 154 through 4310:

a. Position voltage regulator on shelf.

b. Engage holding clips on front of voltage regulator.

c. Install hat rack access cover.

3. For helicopters S/N 4311 and subsequent:

a. Position voltage regulator on shelf.

b. Install voltage regulator mounting screws.

c. Connect voltage regulator.

d. Install hat rack access cover.

96-57. ADJUSTMENT.

NOTE

Multimeter must have an accuracy of ±1 percent to ensure accurate voltage regulator settings. Operate helicopter per applicable BHT 206 A/B Series JetRanger Flight Manual.

Set multimeter to appropriate scale to measure 28 Vdc. Connect positive lead to dc bus located adjacent to voltage regulator and negative lead to airframe ground. Voltage regulator output can be adjusted by varying potentiometer located adjacent, slightly below, and forward of voltage regulator. Turning adjustment screw of potentiometer clockwise will increase voltage, counterclockwise will decrease voltage. Set regulator as follows:

AMBIENT TEMPERATURE	GENERATOR SETTING
32°F (0°C) or lower	28.5 Vdc
32 to 89°F (0 to 32°C)	27.5 Vdc
90°F (32°C) or higher	27.0 Vdc

96-58. REVERSE CURRENT RELAY (Helicopters S/N 4 through 4310).

Reverse current relay (K5) is located on equipment shelf above baggage compartment. Reverse current relay prevents generator from being connected to line until operating voltage is attained, prevents reverse current flow, and keeps generators on line unless voltage drops to a point where continued operation would be detrimental to electrical equipment.

96-59. REMOVAL.

1. Set BAT switch to OFF.

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

3. Disconnect wires and tape ends.

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

96-60. CLEANING

Clean exterior of reverse current relay with a clean, soft, lint-free cloth, moistened with solvent (C-304).

96-61. INSTALLATION.

1. Position relay on shelf and install cable clamp and mounting hardware.

2. Remove tape and connect wires.

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

96-62. GENERATOR RESET SWITCH (Helicopters S/N 584 and subsequent).

Generator reset switch (S90) is located in overhead console (figure 96-2). This switch is a double pole, double throw, spring-loaded switch with only momentary contact in RESET position. It completes generator field circuit in ON position and supplies voltage to reset generator field reset relay in RESET position.

96-63. REMOVAL.

1. Verify electrical power is OFF.

2. Open overhead console.

3. Disconnect and cover wire ends with tape.

4. Remove nut, lockwasher, and switch.

96-64. INSTALLATION.

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

2. Remove tape from wire ends and connect electrical wires to switch.

3. Close overhead console.

96-65. GENERATOR SHUNT.

Generator shunt (R3) is located just inboard of starter relay on the equipment shelf above baggage compartment. It provides a voltage drop proportional to the generator load current for indication on loadmeter.

96-66. REMOVAL.

1. Verify electrical power is OFF.

2. Retract nipples to expose terminal.

3. Disconnect electrical wiring and cover wire ends with tape.

4. Remove mounting screws and washers.

96-67. INSTALLATION.

1. Position generator shunt and install mounting screws and washers.

2. Remove tape from wire ends and connect wiring.

3. Position nipples to cover terminals.

96-68. GENERATOR FIELD CONTROL RELAY (Helicopters S/N 4 through 4310).

Generator field control relay (K4) is located aft of generator shunt on equipment shelf above baggage compartment. This unit is an electrically operated switch, which opens the starter-generator shunt field when generator is used as a starter and it also completes the igniter circuit. Resistor installed between terminals A1 and X2 provides approximately one volt (positive) to terminal A of starter-generator during engine starts.

96-69. REMOVAL.

1. Verify electrical power is OFF.

2. Remove panel aft of rear seat to gain access to generator field control relay.

3. Remove mounting screws, washers, and relay.

96-70. CLEANING.

Clean exterior of relay with clean, soft, lint-free cloth, moistened with approved cleaning solvent.

96-71. INSTALLATION.

1. Position relay on equipment shelf. Do not bend pins on relays.

2. Secure relay with mounting screws and washers.

96-72. GENERATOR FIELD RESET RELAY (Helicopters S/N 4 through 4310).

Generator field reset relay (K41) is located on the equipment shelf above the baggage compartment. This unit is a double action type relay, which opens generator shunt field and disconnects generator from line when over-voltage condition exists. It can be electrically reset by the generator reset switch (S90).

96-73. REMOVAL.

1. Verify electrical power is OFF.

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

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

96-74. CLEANING.

Clean exterior of relay with clean, soft, lint-free cloth, moistened with approved cleaning solvent.

96-75. INSTALLATION.

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

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

96-76. OVERVOLTAGE SENSING RELAY (Helicopters S/N 4 through 4310).

The overvoltage sensing relay (K42) is located on equipment shelf above the baggage compartment. This relay is energized when line voltage reaches 31 (±1) volts. In turn it energizes the generator field reset relay to trip position, removing generator from line.

96-77. REMOVAL.

1. Verify electrical power is OFF.

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

3. Disconnect and cover wire ends with tape.

4. Remove mounting screws, washers, and relay.

96-78. CLEANING.

Clean exterior of relay with clean, soft, lint-free cloth, moistened with approved cleaning solvent.

96-79. INSTALLATION.

NOTE

Remove finish locally to provide good electrical ground.

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

2. Connect electrical wires to relay.

3. Install panel aft of rear seat.

96-80. STARTER-IGNITER SYSTEM.

The starter-igniter system includes starter portion of starter-generator, starter relay, generator field control relay, igniter, and starter switch.

96-81. TROUBLESHOOTING.

Refer to figure 96-7 and perform checks as necessary to isolate trouble. Refer to Chapter 98 for wiring diagrams.

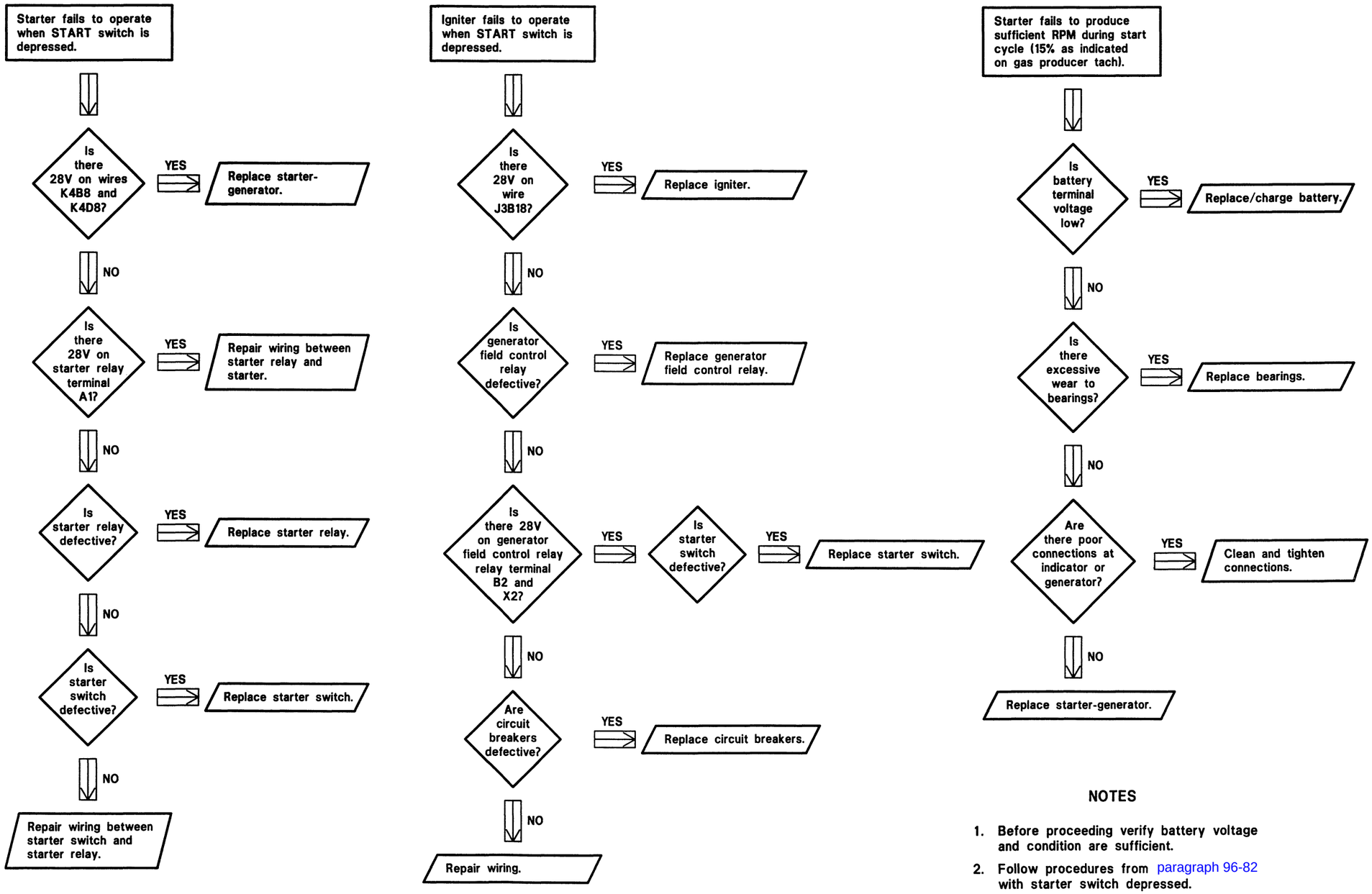
96-82. OPERATIONAL CHECK.

1. Disconnect wires (K4B8 and K4D8) from terminal C on starter-generator and isolate wires from ground.

2. Disconnect wire (J3B18) from igniter unit and isolate wire from ground.

3. Connect external power source.

4. Energize external power source. Close START ENG circuit breaker. Depress starter switch on pilot collective stick. Check approximately 28 Vdc is present at wires (K4B8 and K4D8) while starter switch is depressed.



NOTES

1. Before proceeding verify battery voltage and condition are sufficient.
2. Follow procedures from paragraph 96-82 with starter switch depressed.

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Figure 96-7. Starter system troubleshooting flow chart

5. Release starter switch. Check for zero voltage at wires (K4B8 and K4D8).

6. Close IGN ENG circuit breaker. Depress starter switch on pilot collective stick. Check approximately 28 Vdc is present at wire (J3B18).

7. Release starter switch. Check for zero voltage at wire (J3B18).

8. Open START ENG and IGN ENG circuit breakers.

9. De-energize external power source and reconnect wires (K4B8 and K4D8) to starter-generator and wire (J3B18) to ignition unit.

96-83. STARTER.

The starter-generator (G1) located on underside of engine, is energized by starter relay to start engine. Refer to Chapter 71 for removal, inspection, repair or replacement, and installation procedures.

96-84. STARTER RELAY.

The starter relay (K3) is located on electrical equipment shelf above baggage compartment and supplies direct current to starter when starter switch is depressed.

96-85. REMOVAL.

1. Ensure electrical power is OFF.

2. Remove cover from electrical panel assembly.

3. Disconnect bus bar from relay.

4. Disconnect wires and tape ends.

5. Remove mounting screws and washers.

6. Remove relay.

96-86. INSTALLATION.

1. Position relay on electrical panel and secure with washers and mounting screws.

2. Remove tape and connect wires.

3. Install bus bar.

4. Install cover on electrical panel assembly.

96-87. GENERATOR FIELD CONTROL RELAY (Helicopters S/N 4 through 4310).

Refer to paragraph 96-68 for description and maintenance of generator field control relay.

96-88. IGNITER.

Igniter (Z1) is furnished with the turbine engine and is located below power turbine tachometer generator on lower left section of engine. This unit consists of a low tension capacitor discharge ignition exciter, which provides continuous ignition arc during engine start cycle.

NOTE

For additional information, refer to applicable Series Allison Operation and Maintenance Manual 10W2.

96-89. STARTER SWITCH.

The starter switch (S6), located in collective stick switchbox, is a double-pole, single-throw, pushbutton type switch. When switch is depressed to START, starter relay and generator field control relay energize. This applies power to starter and igniter and completes the generator field shunt weakening circuit.

96-90. REMOVAL.

1. Ensure electrical power is OFF.

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

NOTE

Ensure wires are not damaged when removing starter switch.

3. Disconnect, identify and tag wires, and tape wire ends.

4. Remove switch from switch plate.

96-91. INSTALLATION.

1. Ensure indexing key is in proper position and install switch in switch plate.

2. Connect wires to switch.

3. Position plate on switchbox and secure with mounting screws.

INDICATING SYSTEMS

96-92. INDICATING SYSTEMS

The following procedures cover only instrument system components, which are engine, transmission, or airframe mounted. Refer to Chapter 95 for individual indicator and indicator circuitry maintenance, operational checks, etc. Refer to Chapter 98 for systems wiring diagrams.

96-93. OIL TEMPERATURE BULBS

Electrical temperature sensitive resistance bulbs are used in engine oil and transmission oil temperature indicating systems. Each bulb is part of a resistive bridge circuit connected in series with indicator. As engine or transmission oil temperature changes, resistance of bulb will change, causing indicator movement. The resistance elements of bulbs are hermetically sealed in metal wells. The transmission oil temperature bulb (Z3) is located on left side of transmission and the engine oil temperature bulb (Z2) is mounted in a line near engine oil reservoir.

96-94. OIL TEMPERATURE BULBS — REMOVAL

1. Disconnect and protect electrical connector with tape or cap.

2. Remove lockwire and remove temperature bulb.

96-95. OIL TEMPERATURE BULBS — INSTALLATION

1. Screw bulb into well or line fitting, tighten, and secure with lockwire.

2. Remove tape or cap and connect electrical connector to temperature bulb.

96-96. TACHOMETER GENERATORS

Tachometer generators (G2 and G4) are three-phase alternating current generators that generate signals to drive dual and gas producer tachometer indicators. Rotor tachometer generator is located on forward left side of transmission. The power turbine tachometer generator is mounted on forward left side and gas producer tachometer generator is mounted on forward right side of power and accessory gearbox.

96-97. TACHOMETER GENERATORS — TROUBLESHOOTING

The gas producer tachometer generator and power turbine tachometer generator are identical and therefore interchangeable with regard to troubleshooting procedures (Figure 96-8 and Chapter 98).

96-98. TACHOMETER GENERATORS — REMOVAL

1. Disconnect and protect electrical connector with tape or cap.

2. Remove nuts and washers from mounting studs.

3. Remove tachometer generator and gasket.

96-99. TACHOMETER GENERATORS — CLEANING

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

96-100. TACHOMETER GENERATORS — INSTALLATION

MATERIALS REQUIRED

Refer to BHT-ALL-SPM for specifications.

NUMBER	NOMENCLATURE
C-561	Grease

1. Apply a thing film of grease (C-561) to the drive of the tachometer generator.

2. Position gasket and tachometer generator on mounting studs and install with washers and nut. Tighten the nuts.

3. Remove tape or cap and connect electrical connector to tachometer generator.

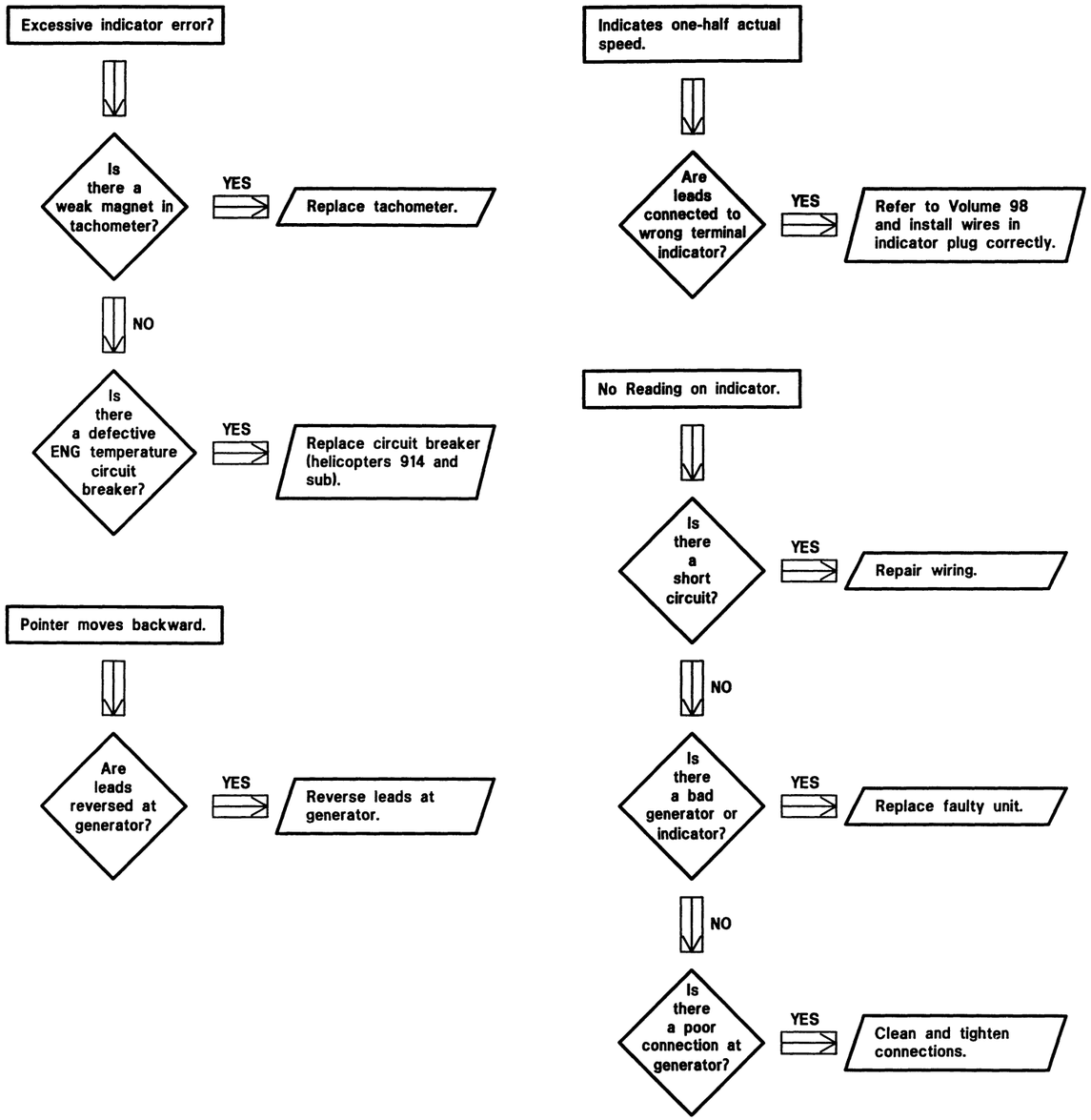

Figure 96-8. Tachometer system troubleshooting flow chart

NOTE

For troubleshooting of rotor tachometer generator and gas producer tachometer refer to chart on power turbine tachometer generator; procedure is the same.

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96-101. BLEED AIR PRESSURE SWITCH (HELICOPTERS S/N 4 THROUGH 583)

The bleed air pressure switch, located beneath the service deck below the forward left side engine, is a pressure operated switch (Figure 96-1 and Chapter 98). It closes when gas producer speed falls below 60% completing circuits to engine out warning horn (Figure 96-2) and ENG OUT warning light (Figure 96-12) simultaneously to alert pilot of engine failure.

96-102. BLEED AIR PRESSURE SWITCH — REMOVAL

1. Verify electrical power is OFF.

2. Open left engine cowling.

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

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

96-103. BLEED AIR PRESSURE SWITCH — INSTALLATION

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

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

3. Close engine cowling.

96-104. TRANSMISSION OIL PRESSURE TRANSDUCER (HELICOPTERS S/N 254 THROUGH 913)

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 input voltage to the transmission oil pressure indicator (Chapter 98).

96-105. ENGINE OIL PRESSURE TRANSDUCER (HELICOPTERS S/N 254 THROUGH 913)

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 (Chapter 98).

96-106. TORQUE PRESSURE TRANSDUCER (HELICOPTERS S/N 254 THROUGH 913).

The torque pressure transducer is connected to the engine accessory section. It is a pressure operated potentiometer that varies the input voltage to the torque pressure indicator (Chapter 98 and TB BHT-206-08-73).

96-107. FUEL QUANTITY SYSTEM

96-108. FUEL QUANTITY INDICATOR (HELICOPTERS S/N 4 THROUGH 2211)

The fuel quantity indicator, located on instrument panel, on helicopters S/N 914 through 2211, and in instrument cluster on helicopters prior to S/N 914, is calibrated in gallons. Indicator is part of bridge circuit, which includes two tank units, two float elements, two calibration variable resistors, necessary terminal blocks, indicator, and 28 VDC that serves a common bus inside instrument cluster unit.

96-109. FUEL QUANTITY INDICATOR (HELICOPTERS S/N 2212 AND SUBSEQUENT)

The fuel quantity indicator, located on instrument panel, is calibrated in gallons. The indicator is part of the bridge circuit, which includes two fuel level transmitter (resistive float elements), two variable calibration resistors, and terminal blocks. Both fuel level transmitters are mounted in tank. One monitors fuel level up to the horizontal surface of tank under the seat; the other monitors fuel level in upper section of tank behind the seat.

96-110. FUEL QUANTITY SYSTEM — CALIBRATION

CAUTION

OBSERVE STANDARD PRECAUTIONARY MEASURE WHEN FUELING OR DEFUELING HELICOPTERS (CHAPTER 12).

NOTE

Fuel quantity calibration is accomplished with auxiliary 27.5 VDC supplied to helicopter external power receptacle.

Accomplish the following procedures when it is necessary to calibrate the fuel quantity system.

1. Place helicopter at a safe distance from fire hazard areas.

2. Set BAT switch to OFF position.

3. Securely ground helicopter from static ground to earth.

4. Position helicopter 1 or 2° nose down for entire calibration procedure.

5. Defuel fuel cell.

6. On helicopters prior to S/N 1904, close INST CLUSTER circuit breaker. This breaker provides 27.5 VDC to fuel quantity system via common bus in cluster. Helicopters S/N 1904 and subsequent, reset FUEL QTY-PRESS circuit breaker in overhead console.

7. Remove pedestal side panels.

8. Connect source of external electrical power. Energize auxiliary power supply and adjust to 27.5 VDC.

9. Observe that fuel quantity gauge pointer resets at zero. If gauge pointer does not indicate zero, adjust R6 located in pedestal forward of instrument panel until gauge pointer indicates zero.

10. Add 1 gallon of fuel to fuel cell. The gauge pointer should still indicate zero. Check for fuel leaks.

11. Add measured quantities of fuel while observing indications on gauge until gauge reads 40 gallons. Check for leaks. Gauge should be accurate within 3 gallons (11.36 L).

12. Continue filling fuel cell until tank is full.

NOTE

Tank capacity is 76 gallons (287.7 L) for helicopters prior to S/N 3566, and 93 gallons (352 L) for helicopters S/N 3567 and subsequent.

13. Adjust R5, located adjacent to R6, until gauge pointer indicates tank capacity. Check for leaks.

14. Defuel fuel cell and measure; amount should be approximately tank capacity.

15. Observe that fuel gauge reads zero as in step 9.

16. Replace pedestal side panels.

17. Refuel as necessary.

96-111. FUEL TANK UNITS— RESISTANCE MEASUREMENTS

Tank units are sealed and filled with inert gas and are not repairable. Normal resistance readings may be taken from posts of tank units as follows:

NOTE

A zero ohms reading of resistance verifies potentiometer not open and capable of offering minimum ohms of resistance. A selected ohms reading of resistance verifies potentiometer not open and capable of offering selected ohms of resistance. These tests verify potentiometer serviceable at its full range of resistance.

1. Fuel tank units installed on helicopters S/N 4 through 103.

a. Top tank unit (EA470-3518) four post.

A to D	0 ohms	Full tank
B to C	118 ohms	Full tank
A to D	118 ohms	Empty tank
B to C	0 ohms	Empty tank

b. Lower tank unit (EA470B3519) three post.

B to C	118 ohms	Full tank
A to C	0 ohms	Full tank
B to C	0 ohms	Empty tank
A to C	118 ohms	Empty tank

2. Fuel tanks installed on helicopters S/N 104 through 2211.

a. Top tank unit (EA470-3587) four post.

A to D	0 to 3 ohms	Full tank
B to C	80.7 to 86.7 ohms	Full tank
A to D	80.7 to 86.7 ohms	Empty tank
B to C	0 to 3 ohms	Empty tank

b. Lower tank unit (EA470B3588) three post.

B to C	0 to 3 ohms	Empty tank
C to A	80.7 to 86.7 ohms	Empty tank
B to C	80.7 to 86.7 ohms	Full tank
C to A	0 to 3 ohms	Full tank

3. Tank units installed on helicopters S/N 2212 and subsequent.

a. Top tank unit (EA470-3709) four post.

B to C	0 to 3 ohms	Empty tank
A to D	80.7 to 86.7 ohms	Empty tank
A to D	0 to 3 ohms	Full tank
B to C	80.7 to 86.7 ohms	Full tank

b. Lower tank unit (EA470B-3710) three post.

B to C	0 to 3 ohms	Empty tank
C to A	80.7 to 86.7 ohms	Empty tank
B to C	80.7 to 86.7 ohms	Full tank
C to A	0 to 3 ohms	Full tank

c. Alternate tank units (7740-00303 and 7740-00302).

A to B	101 to 109 ohms	Full tank
A to B	101 to 109 ohms	Empty tank
B to C	92 to 98 ohms	Full tank
B to C	1 to 3 ohms	Empty tank

4. Arm of unit should be moved through full range of internal variable resistor when performing this check. There shall also be no fluctuation of the ohmmeter needle during this check.

96-112. TROUBLESHOOTING.

When troubleshooting the fuel quantity system, refer to figure 96-9 and Chapter 98.

96-113. REMOVAL/INSTALLATION.

Refer to Chapter 28.

96-114. FUEL PRESSURE SYSTEM.

The fuel pressure system is composed of two electrically operated fuel boost pumps, submerged in the fuel cell, 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 96-2) and may be operated separately or together.

96-115. FUEL PRESSURE TRANSDUCER (Helicopters S/N 254 and subsequent).

The fuel pressure transducer is connected to the tee fitting at aft end of fuel pressure switch in the engine compartment. On helicopters S/N 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.

96-116. REMOVAL.

1. Set battery switch to OFF. Disconnect external power.

2. Disconnect electrical connector from transducer.

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

4. Apply fuel pressure and check for fuel leaks.

96-117. INSTALLATION.

1. Install new packing on transducer.

2. Install transducer into tee fitting.

3. Remove tape or cap from electrical connector and connect transducer.

96-118. OPERATIONAL CHECK.

CAUTION

ELECTRICAL POWER ON PIN B OF TRANSDUCER MAY CAUSE POTENTIOMETER IN TRANSDUCER TO BURN OUT.

NOTE

Transducer should be checked with an 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.

1. Connect 10 Vdc regulated power source to pins A and C of pressure transducer. Refer to figure 96-10, detail A for polarity of connections.

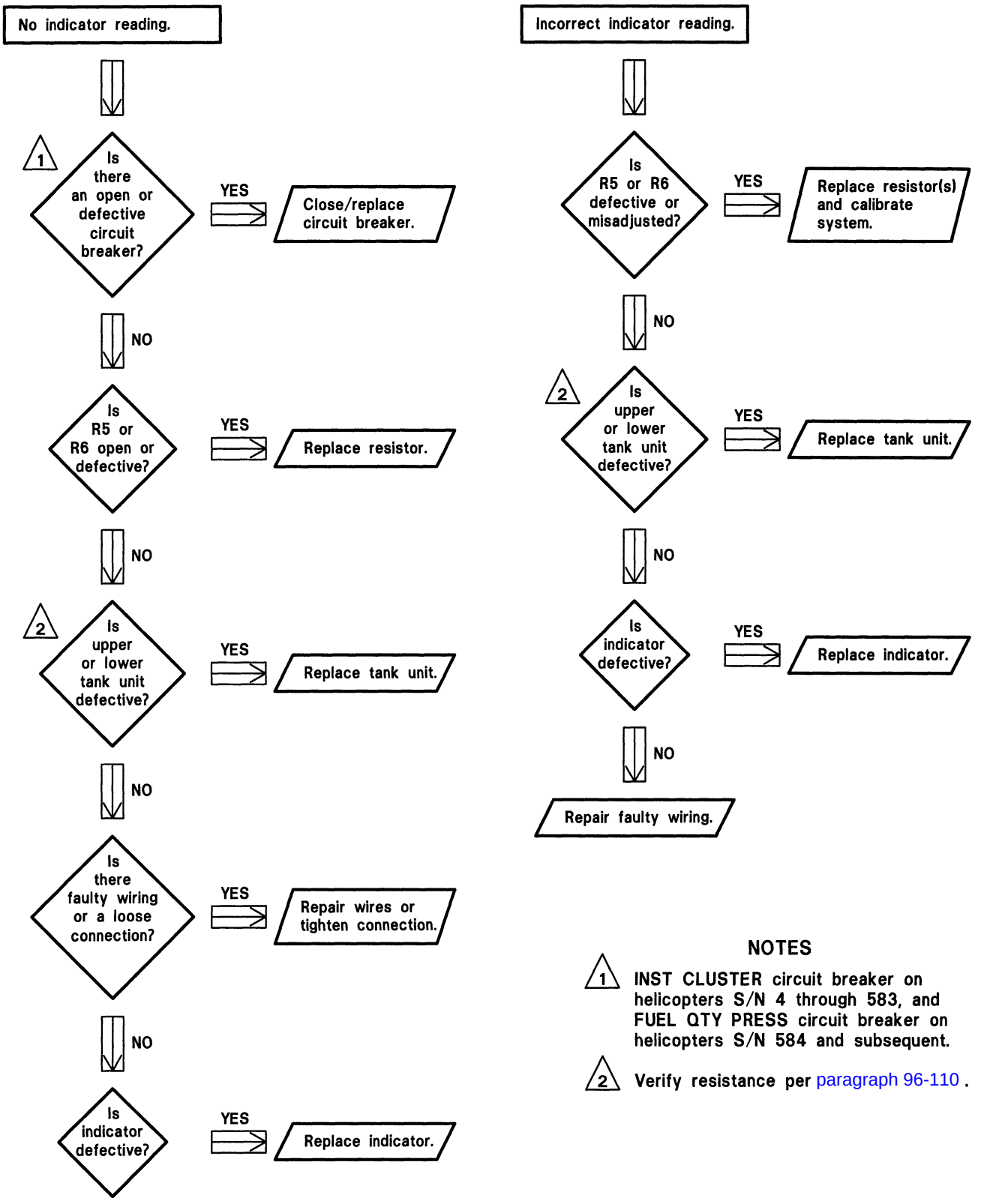

Figure 96-9. Fuel quantity system troubleshooting flow chart

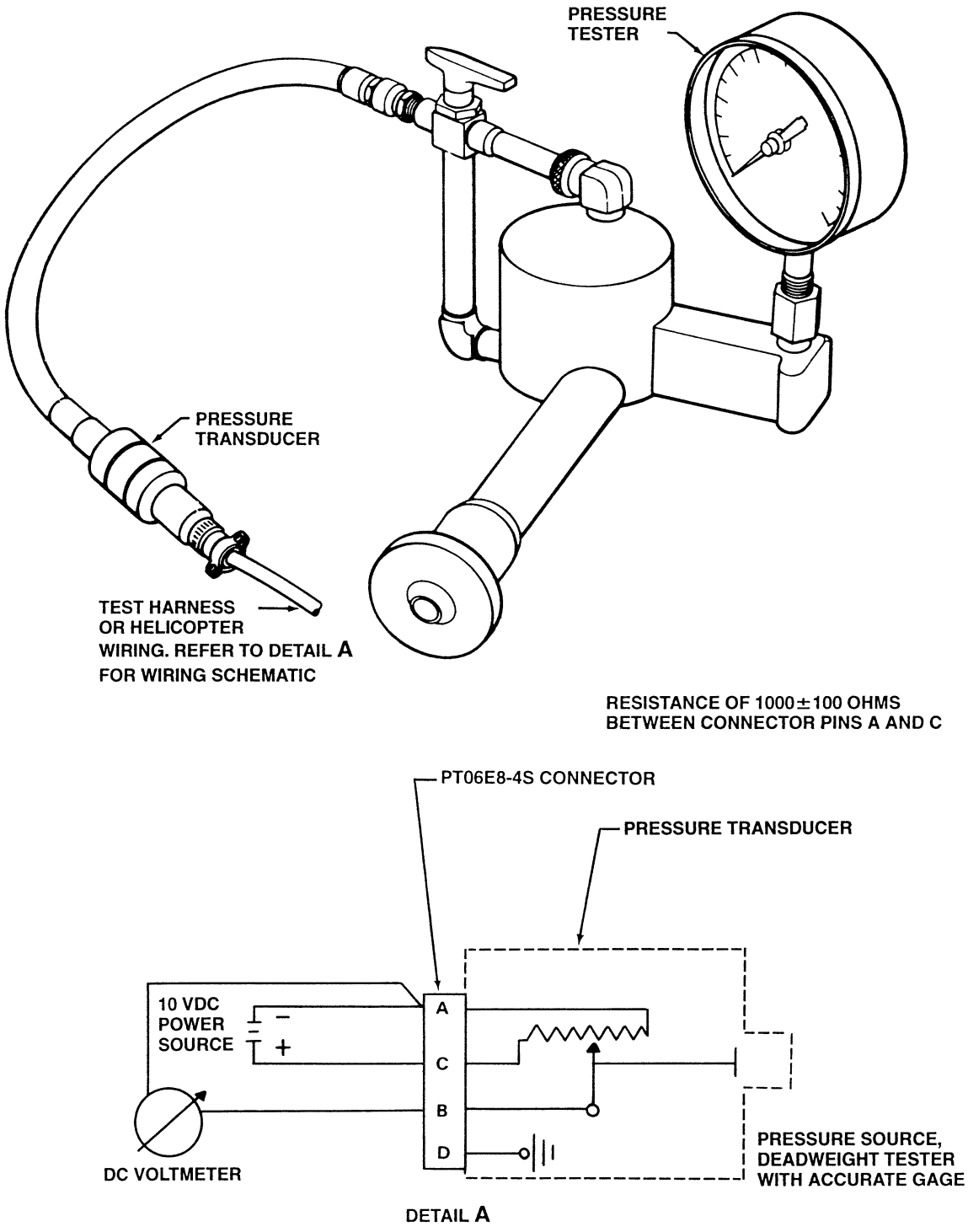

Figure 96-10. Functional test setup for fuel pressure transducer

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

3. Connect pressure source to pressure port of transducer (deadweight tester).

NOTE

The transducer is functional, if test output voltages approximate voltages shown in steps 4. and 5.

4. Apply zero pressure to transducer. Voltmeter shall read less than 0.05 volt.

5. Slowly apply 30 psi (207 kPa) to transducer. Voltmeter shall read approximately 5.0 volts.

LIGHTING SYSTEMS

96-119. LIGHTING SYSTEMS.

Lighting system comprises equipment for illumination of instruments, and switches, operation of interior/exterior, and landing lights. Refer to Chapter 98 for individual system wiring diagrams.

96-120. INTERIOR LIGHTING SYSTEM.

The interior lighting system includes the following components and related wiring:

1. Two edge or integrally lit control panels, located on instrument panel.

2. One integrally lit control panel, located in forward section of overhead console.

3. Light dimming circuit containing:

a. A light dimming rheostat located on the overhead console.

b. On helicopters S/N 4 through 153, a single transistor dimming element is located above the overhead console panel, forward of the warning horn.

c. On helicopters S/N 154 through 203 and S/N 254 through 413, the dimming element is located on the support rails forward of the instrument panel.

d. On helicopters S/N 204 through 253 and S/N 414 through 915, the dimming element contains two transistors installed in parallel. For helicopters S/N 915 and subsequent, one transistor is for 28 volts and one is for the 5-volt instrument lights.

4. A cockpit light is located on the control post between the crew seats or below the pilot seat at centerline of helicopter.

NOTE

All lighting circuits are connected to 28 Vdc bus; circuit breakers are located in the overhead console.

96-121. TROUBLESHOOTING.

Using the appropriate test equipment, test circuit performance. Refer to Chapter 98 for wiring diagrams.

96-122. PANEL LIGHTING.

96-123. REMOVAL.

1. Ensure electrical power is OFF.

2. Loosen setscrew and remove INST LT rheostat knob.

3. Remove four panel attachment screws and remove panel.

96-124. CLEANING.

Clean face and back of control panel with a soft, dry, lint-free cloth. Compressed air may be used to blow dust and dirt from crevices.

96-125. INSTALLATION.

1. Position panel on overhead console and install four attachment screws.

2. Install INST LT rheostat knob and tighten setscrew.

3. Secure panel with attachment screws.

96-126. TRANSISTOR.

96-127. REPLACEMENT.

1. Ensure electrical power is OFF.

2. Gain access to defective transistor.

3. Verify transistor is defective (paragraph 96-7).

4. Remove cover, nut, lockwasher, washers, and mica washer (figure 96-11).

5. Tag and unsolder wires.

6. Remove transistor, mica washer, and insulator.

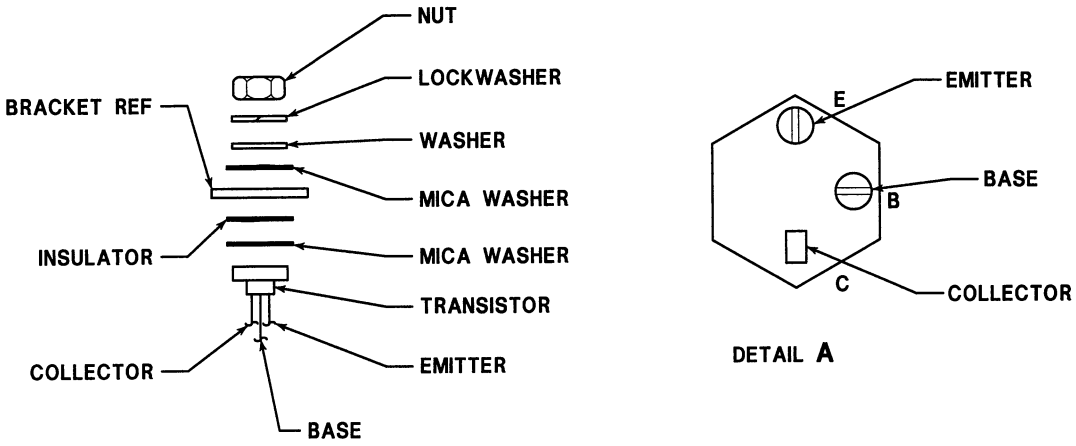

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Figure 96-11. Transistor replacement

7. Solder wires to replacement transistor.

8. Apply heat conductive silicon compound to mica washers.

9. Install transistor insulator and mica washer in helicopter structure.

10. Install mica washer, washers, and lockwasher on transistor.

CAUTION

DO NOT OVERTORQUE MOUNTING NUT. THIS MAY SHORT TRANSISTOR TO GROUND OR PHYSICALLY DAMAGE TRANSISTOR.

11. Secure transistor with nut and cover.

96-128. COCKPIT LIGHT.

96-129. REMOVAL.

1. Ensure electrical power is OFF.

2. Disconnect 28 Vdc wire at splice and disconnect ground wire from terminal.

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

96-130. INSTALLATION.

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

2. Connect 28 Vdc wire by splicing and connect ground wire to terminal.

96-131. EXTERIOR LIGHTING SYSTEM.

The exterior lighting system includes the following components and related wiring:

1. Two landing lights are in the lower section of the nose.

2. Helicopters S/N 4 through 103 utilize one relay for the landing lights; helicopters S/N 104 and subsequent utilize two. These relays are located in the nose compartment below the instrument panel. An option of both landing lights ON, or forward landing lights ON only, is available.

3. The landing light switch is located on the pilot collective stick switchbox.

4. The position lights are located on the tips of the horizontal stabilizers.

5. On helicopters S/N 4 through 583 the flasher unit for the anticollision light is located in the aft section of the tailboom, or on the aft side of the electrical shelf. On helicopters S/N 584 and subsequent, an anticollision light (strobe light assembly) is mounted on top of the vertical fin. A 28 Vdc HS power supply (A412A) furnishes power to all exterior lighting units.

6. The taillight is located on the aft tip of the tail rotor gearbox fairing.

96-132. LANDING LIGHTS.

96-133. REMOVAL.

1. Ensure electrical power is OFF.

2. Open or remove light access window.

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

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

96-134. CLEANING.

Wipe exterior of light with a soft, clean, lint-free cloth.

96-135. INSTALLATION.

1. Remove tape from wire ends and connect electrical wiring.

2. Place light on mounting bracket and install attaching bolts, washers, spacers, and nuts.

3. Position forward light so lower forward edge is 6.00 inches (152.40 mm) forward of Station 18. Aft light shall be positioned so lower forward edge is 1.62 inches (41.15 mm) forward of Station 18.

4. Install or close light access window.

96-136. LANDING LIGHT RELAY(S).

NOTE

Helicopters S/N 4 through 103 utilize one relay. Helicopters S/N 104 and subsequent utilize two. Refer to paragraph 96-131.

Landing light relays (K20 and K8) are located in nose compartment below instrument panel.

96-137. REMOVAL.

1. Ensure electrical power is OFF.

2. Disconnect electrical wiring from relay and cover ends with tape.

3. Remove screws and washers attaching relay(s) and remove relay(s).

96-138. INSTALLATION.

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

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

96-139. LANDING LIGHT SWITCH.

96-140. REMOVAL.

1. Set battery switch to OFF.

2. Remove switch plate mounting screws on collective stick and lift plate sufficiently to gain access to wires.

3. Identify, tag, and disconnect switch wires.

4. Remove switch from panel.

96-141. INSTALLATION.

1. Secure switch to plate. Ensure indexing key is in proper position.

2. Connect wires to switch.

3. Position plate on switchbox and install mounting screws.

96-142. POSITION LIGHTS.

NOTE

Only one removal and installation procedure is cited. Procedures for left and right light assemblies are identical.

96-143. REMOVAL.

1. Ensure electrical power is OFF.
2. Remove three screws from light assembly.
3. Lift light assembly from horizontal stabilizer.
4. Disconnect wires at quick-disconnect splice.
5. Protect wire ends with tape.
6. Remove light assembly.

96-144. INSTALLATION

1. Remove tape from wire ends.
2. Connect light assembly wires to quick-disconnect splice.
3. Place light assembly in position on horizontal stabilizer.
4. Secure light assembly with three screws.

96-145. TAILLIGHT.

96-146. REMOVAL.

1. Ensure electrical power is OFF.
2. Remove two screws from light assembly.
3. Lift light assembly from shock mount.
4. Disconnect wires at quick-disconnect splice.
5. Protect wire ends with tape.
6. Remove light assembly.

96-147. INSTALLATION.

1. Remove tape from wire ends.
2. Connect wires to quick-disconnect splice.
3. Place light assembly in position on shock mount.
4. Secure light assembly with two screws.

96-148. ANTICOLLISION LIGHT (STROBE LIGHT ASSEMBLY).

96-149. REMOVAL.

1. Ensure electrical power is OFF.
2. Loosen lockring assembly around strobe light assembly.
3. Remove lockring and lift strobe light assembly clear of mounting plate.
4. Disconnect electrical connector (P195).
5. Protect connector with cap or tape.
6. Remove strobe light assembly.

96-150. INSTALLATION.

1. Remove tape or cap from connector.
2. Connect electrical connector (P195).
3. Place strobe light assembly in position against mounting plate.
4. Position lockring assembly around the base of strobe light assembly; ensure bottom of lockring assembly engages mounting plate.
5. Tighten lockring assembly.

96-151. HS POWER SUPPLY A412A AND FLASHER UNIT.

NOTE

Helicopters S/N 4 through 583 utilize a flasher unit and an anticollision light. Helicopters S/N 584 and subsequent utilize a power supply and strobe assembly.

96-152. FLASHER UNIT.

Refer to Chapter 98.

96-153. REMOVAL.

1. Ensure electrical power is OFF.

2. Disconnect electrical wire and cover wire end with tape.

3. Remove attaching screws and washers and remove unit.

96-154. INSTALLATION.

1. Position flasher unit. Install and tighten attaching screws and washers.

2. Remove tape from wire end and connect electrical wiring.

96-155. HS POWER SUPPLY A412A.

96-156. REMOVAL.

1. Ensure electrical power is OFF.

2. Disconnect 28 Vdc wire at splice and disconnect ground wire at bulkhead terminal. Identify and tag wires.

3. Disconnect electrical connector (P194).

4. Protect wires and electrical connector with tape and cap.

5. Remove four screws, nuts, and washers.

6. Remove power supply (right side of baggage compartment, Station 154.66 against bulkhead).

96-157. INSTALLATION.

1. Place power supply into position against bulkhead.

2. Remove tape and cap from wires and electrical connector.

3. Connect 28 Vdc wire by splicing, connect ground wire to terminal, and connect electrical connector to power supply.

4. Secure power supply with four screws, nuts, and washers.

CAUTION AND WARNING SYSTEMS

96-158. CAUTION AND WARNING SYSTEMS.

Caution and warning systems consist of caution lights (segments) located across top of instrument panel, and their respective sensing devices. A caution light test switch allows testing of caution lights. A bright/dim switch (located on an edge-lit panel of instrument pedestal) in conjunction with INST LT control varies intensity of caution lights. An ENG OUT warning horn is located on overhead console. Refer to figure 96-12 for caution panel.

96-159. TROUBLESHOOTING.

Refer to Caution and Warning Light Circuit wiring diagram in Chapter 98. Perform checks as necessary to isolate trouble.

96-160. OPERATIONAL CHECK — CAUTION AND WARNING LIGHTS.

1. Depress and hold CAUTION LT TEST switch. All caution and warning lights, including spares, shall illuminate.

2. Release switch; lights shall extinguish.

3. Rotate INST LT control fully CCW (OFF) and momentarily set CAUTION LIGHTS BRT/DIM switch to DIM. Caution lights shall not illuminate.

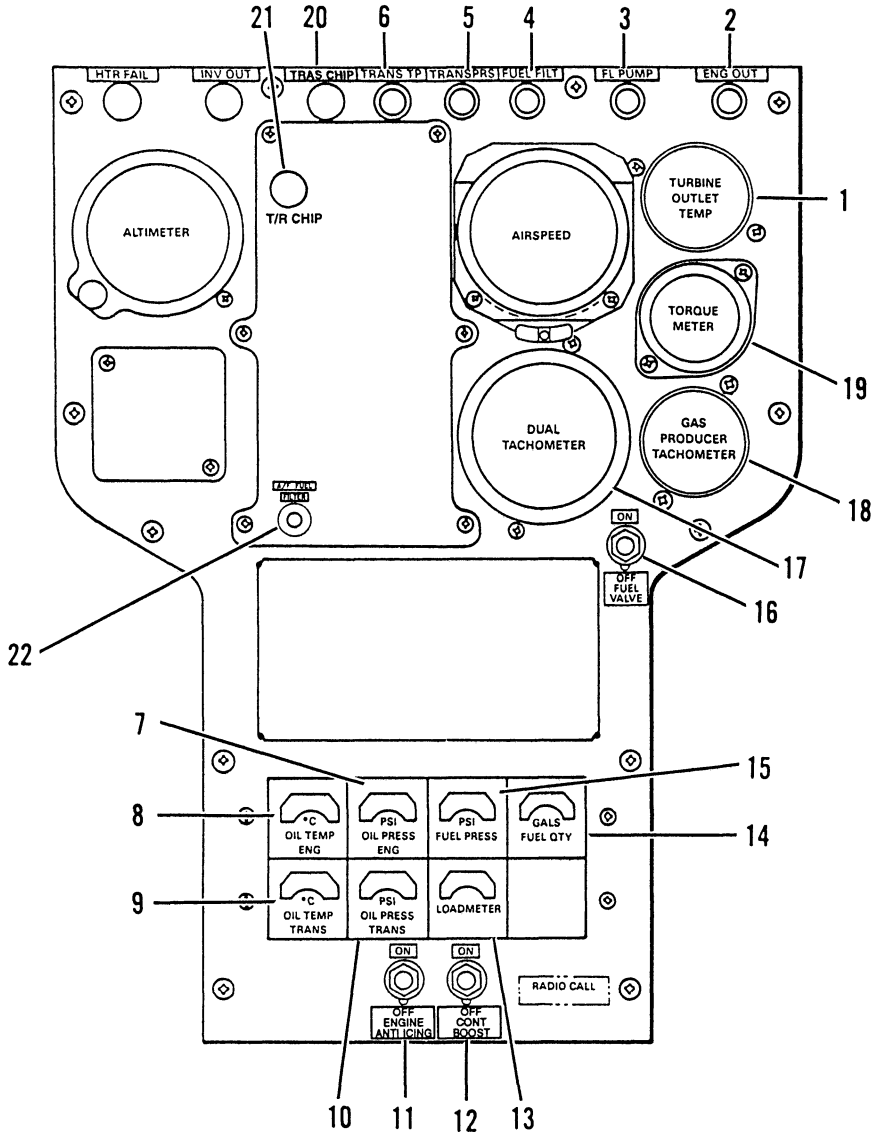
4. Rotate INST LT control fully CW (full BRT). Momentarily set CAUTION LIGHTS BRT/DIM switch to DIM. Caution lights identified in table 96-2 as "Fixed Dimming" shall dim.

Table 96-2. Caution panel lights

SEGMENT	NOMENCLATURE	SEGMENT CONDITION	SEGMENT DIMMING RESPONSE
1	SPARE (AUX BATTERY HOT) *	OFF	Variable
2	SPARE (AUX BATTERY TEMP) *	OFF	Variable
3	SPARE (HEATER FAIL) *	OFF	Fixed
4	SPARE	OFF	Variable
5	SPARE (FLOAT PWR) *	OFF	Fixed
6	SPARE (FLOAT TEST) *	OFF	Variable **
7	SPARE	OFF	Variable
8	SPARE (ENGINE RELIGHT) *	OFF	Variable
9	SPARE (A/F FUEL FILTER) *	OFF	Variable
10	FUEL PUMP	ON	Variable
11	SPARE	OFF	Variable
12	T/R CHIP	OFF	Variable
13	ENGINE CHIP	OFF	Variable
14	TRANS CHIP	OFF	Variable
15	BATTERY HOT	OFF	Variable
16	BATTERY TEMP	OFF	Variable
17	TRANS OIL PRESS	ON	Variable
18	TRANS OIL TEMP	OFF	Variable
19	ENG OUT	ON	None
20	ROTOR LOW RPM	ON	None

* Parentheses indicate kit provisions.

** Before kit is installed, SPARE light dims (variable). After kit installation, light is always bright.



HELICOPTERS S/N 4 THRU 153

1. Turbine outlet temperature indicator
2. Engine out caution light
3. Fuel pump caution light
4. Fuel filter caution light
5. Transmission oil pressure warning light
6. Transmission temperature caution light
7. Engine oil pressure indicator
8. Engine oil temperature indicator
9. Transmission oil temperature indicator
10. Transmission oil pressure indicator
11. S8 engine anti-icing switch
12. Control boost switch
13. Loadmeter indicator
14. Fuel quantity indicator
15. Fuel pressure indicator
16. Fuel valve switch
17. Dual tachometer indicator
18. Gas producer tachometer
19. Torque meter
20. Transmission chip detector
21. Tail rotor chip detector
22. Airframe fuel filter

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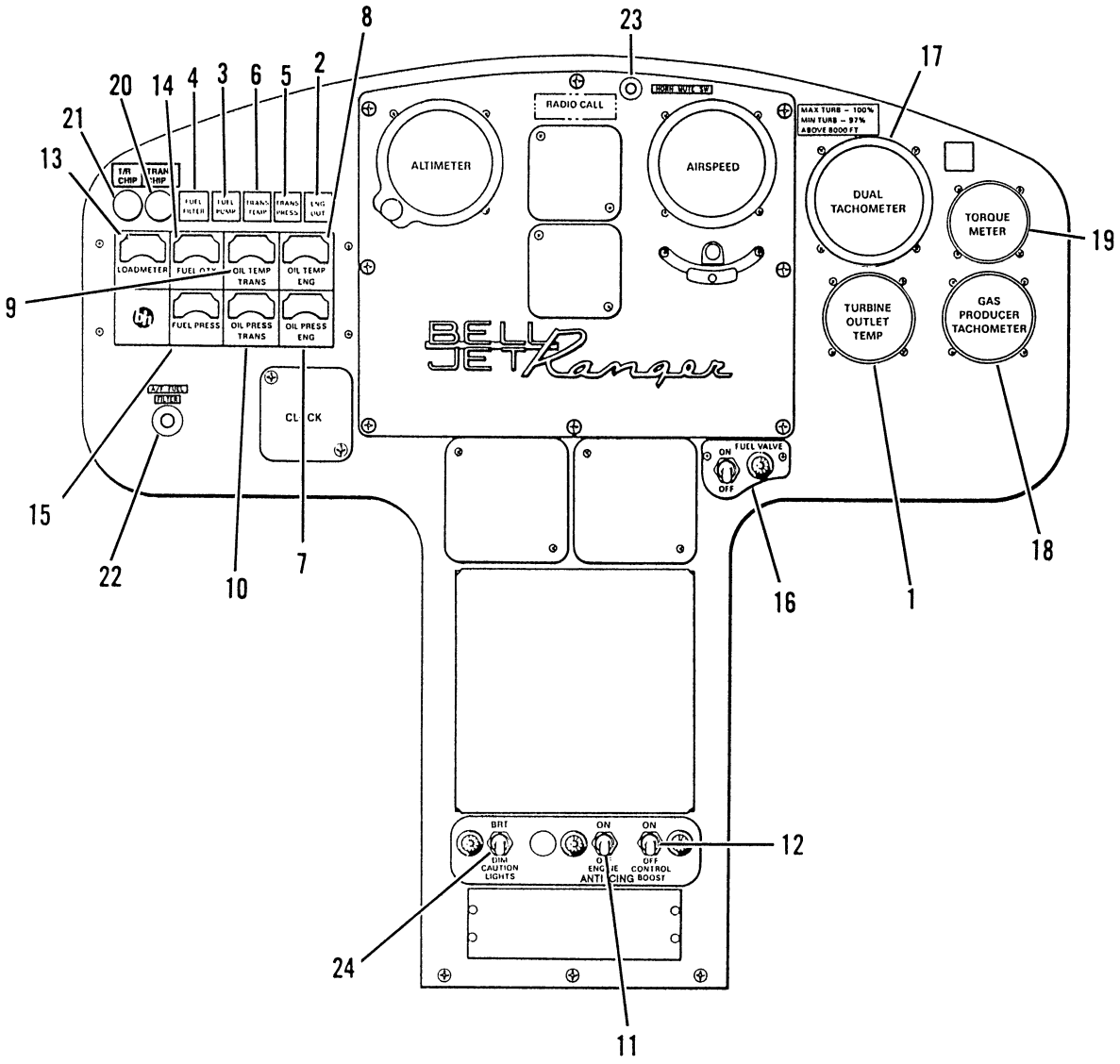
Figure 96-12. Caution panel installation (Sheet 1 of 5)



HELICOPTERS S/N 154 THRU 913

1. Turbine outlet temperature indicator
2. Engine out caution light
3. Fuel pump caution light
4. Fuel filter caution light
5. Transmission oil pressure warning light
6. Transmission temperature caution light
7. Engine oil pressure indicator
8. Engine oil temperature indicator
9. Transmission oil temperature indicator
10. Transmission oil pressure indicator
11. Engine anti-icing switch
12. Control boost switch
13. Loadmeter indicator
14. Fuel quantity indicator
15. Fuel pressure indicator
16. Fuel valve switch
17. Dual tachometer indicator
18. Gas producer tachometer
19. Torque meter
20. Transmission chip detector
21. Tail rotor chip detector
22. Airframe fuel filter
23. Low rpm warning horn mute switch
24. Caution lights bright/dim switch

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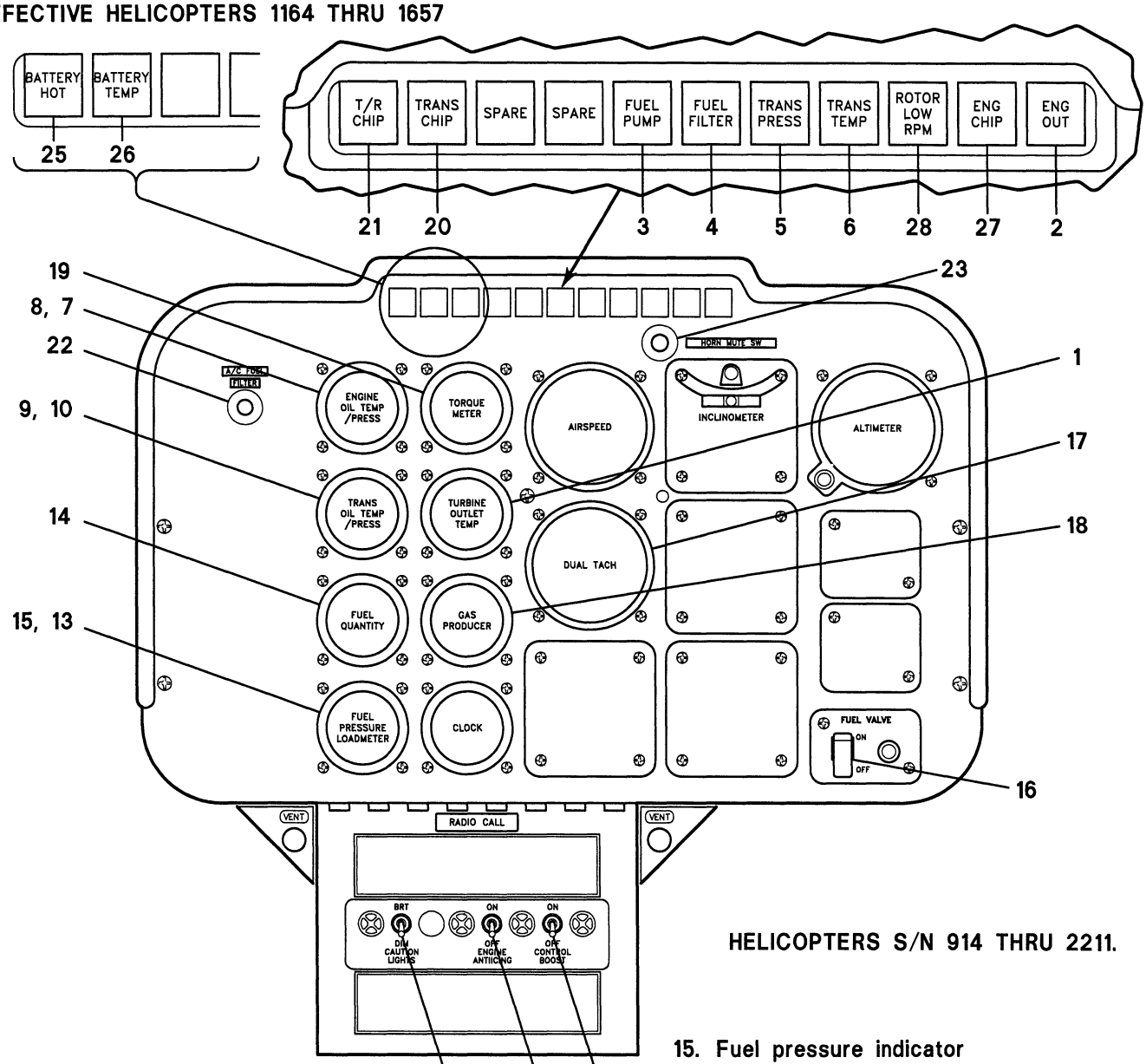
Figure 96-12. Caution panel installation (Sheet 2)

EFFECTIVE HELICOPTERS 1164 THRU 1657



HELICOPTERS S/N 914 THRU 2211.

1. Turbine outlet temperature indicator
2. Engine out caution light
3. Fuel pump caution light
4. Fuel filter caution light
5. Transmission oil pressure warning light
6. Transmission temperature caution light
7. Engine oil pressure indicator
8. Engine oil temperature indicator
9. Transmission oil temperature indicator
10. Transmission oil pressure indicator
11. Engine anti-icing switch
12. Control boost switch
13. Loadmeter indicator
14. Fuel quantity indicator
15. Fuel pressure indicator
16. Fuel valve switch
17. Dual tachometer indicator
18. Gas producer tachometer
19. Torque meter
20. Transmission chip detector
21. Tail rotor chip detector
22. Airframe fuel filter
23. Low RPM warning horn mute switch
24. Caution lights bright/dim switch
25. Battery temperature caution light
26. Battery temperature warning
27. Engine chip detector
28. Rotor low RPM caution light

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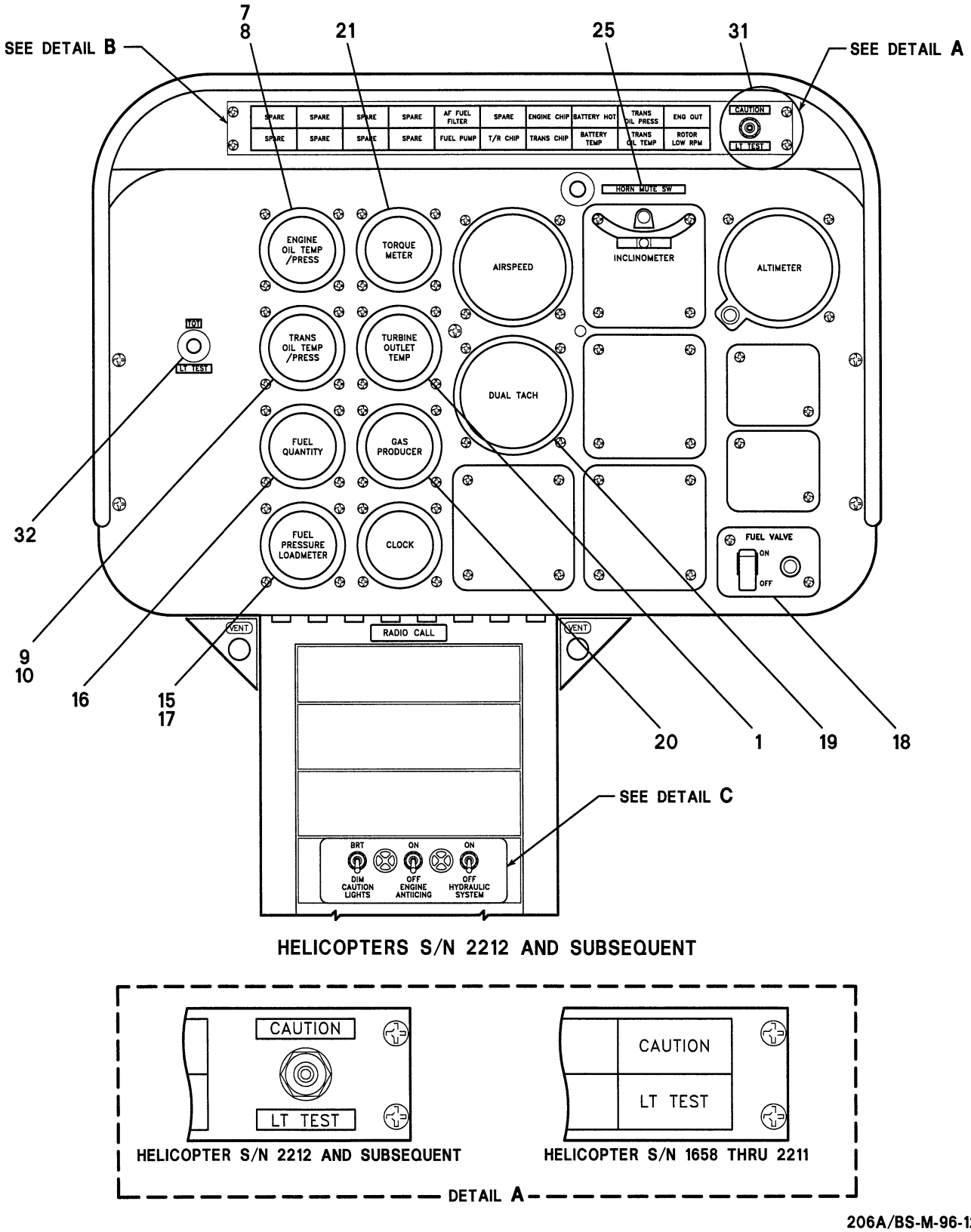
Figure 96-12. Caution panel installation (Sheet 3)



HELICOPTERS S/N 2212 AND SUBSEQUENT

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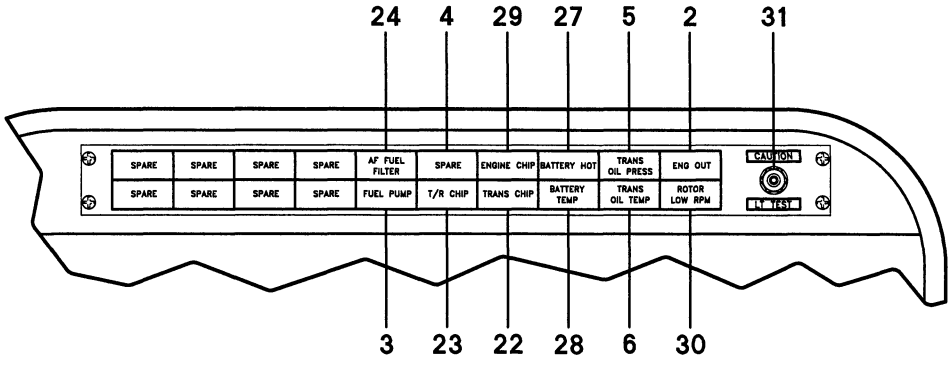
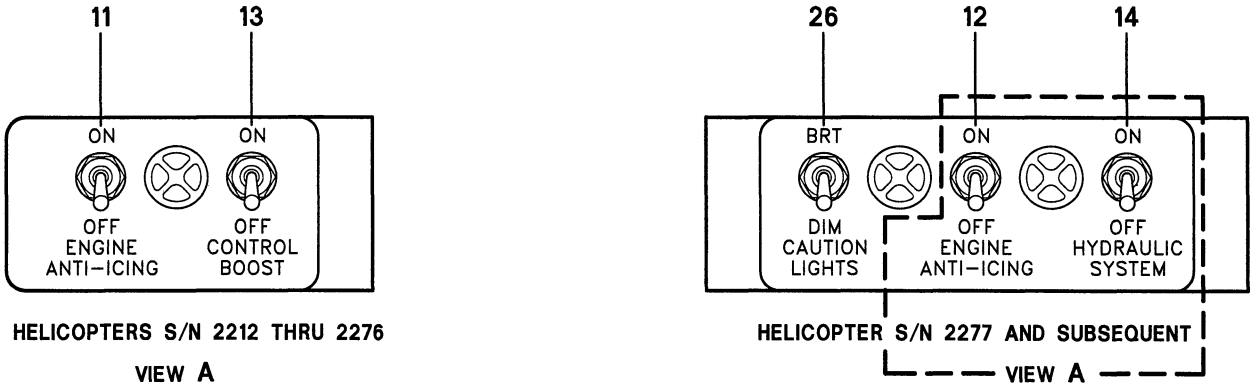
Figure 96-12. Caution panel installation (Sheet 4)



DETAIL B



DETAIL C

1. Turbine outlet temperature indicator
2. Engine out caution light
3. Fuel pump caution light
4. Spare
5. Transmission temperature caution light
6. Transmission oil temperature warning light
7. Engine oil pressure indicator
8. Engine oil temperature indicator
9. Transmission oil temperature indicator
10. Transmission oil pressure indicator
11. Engine anti-icing switch
12. Engine anti-icing switch
13. Control boost switch
14. Hydraulic system switch
15. Loadmeter indicator
16. Fuel quantity indicator
17. Fuel pressure indicator
18. Fuel valve switch
19. Duel tachometer indicator
20. Gas producer tachometer
21. Torque meter
22. Transmission chip detector
23. Tail rotor chip detector
24. Airframe fuel filter
25. Low RPM warning horn mute switch
26. Caution lights brights/dim switch
27. Battery temperature caution light
28. Battery temperature warning
29. Engine chip detector
30. Rotor low RPM caution
31. Caution light test switch
32. Turbine outlet temperature light test switch

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Figure 96-12. Caution panel installation (Sheet 5)

5. Rotate INST LT control CCW toward OFF. Caution lights identified in table 96-2 as "Variable Dimming" shall decrease in intensity as control is rotated.

6. Rotate INST LT control fully CCW (OFF). Caution lights illuminated dimly shall become bright.

96-161. ENGINE OUT WARNING SYSTEM.

Engine out warning system provides a visual and audible indication of an engine out condition. System includes ENG OUT warning light on caution panel, engine out warning horn in overhead console, and engine rpm sensor on equipment shelf forward of instrument panel. On helicopters S/N 4 through 583 the ENG OUT warning light and horn are operated by the bleed air pressure switch. Refer to indicating system for description. Engine rpm sensor is connected to gas producer tachometer generator. When gas producer rpm drops below 55 (±3) percent, engine rpm sensor completes an electrical ground to ENG OUT warning light and engine out alarm (horn) circuit.

96-162. OPERATIONAL CHECK.

SPECIAL TEST EQUIPMENT

NUMBER	NOMENCLATURE
Howell H337 or Equivalent	Engine Test Set

1. Disconnect electrical connector (P10) from gas producer tachometer generator and connect to appropriate receptacle on test set.

2. Apply electrical power to helicopter.

3. Close CAUTION LT circuit breaker on overhead console. ENG OUT warning light shall be illuminated and engine out alarm shall be audible.

4. Turn test set ON, and increase tachometer generator rpm until ENG OUT warning light extinguishes. Gas producer tachometer indicator should read 55 (±3) percent and engine out alarm shall not be audible. Increase test set rpm generator to 100 percent. Test set tachometer and gas producer tachometer shall read within ±4 percent.

5. Decrease test set tachometer generator rpm to 50 percent. ENG OUT warning light shall illuminate and engine out alarm shall be audible.

6. Turn test set and helicopter power OFF, and disconnect gas producer tachometer generator connector (P10).

7. Connect electrical connector (P10) to gas producer tachometer generator on the engine.

96-163. ROTOR LOW RPM CAUTION SYSTEM (Helicopters S/N 4 thru 583 with SI206-74 installed and Helicopters S/N 584 and subsequent).

Rotor low rpm caution system provides visual and audible indication of rotor low rpm condition. System includes ROTOR LOW RPM caution light on caution panel, rotor low rpm alarm in right side plastic headliner, and rotor low rpm sensor on equipment shelf forward of instrument panel. Rotor low rpm sensor is connected to rotor tachometer generator. When rotor rpm drops below 90 (±3) percent, rotor low rpm sensor completes electrical ground to ROTOR LOW RPM caution light and rotor low rpm warning circuit. Rotor low rpm warning alarm disable switch is installed under copilot seat, slightly forward of collective jackshaft. When collective stick is in extreme down position, a lever on the jackshaft opens switch and deactivates rotor low rpm alarm.

96-164. OPERATIONAL CHECK.

SPECIAL TEST EQUIPMENT

NUMBER	NOMENCLATURE
Howell H337 or Equivalent	Engine Test Set

1. Disconnect electrical connector (P6) from rotor tachometer generator and connect to appropriate receptacle on test set.

2. Move collective stick to its lowest extreme.

3. Apply electrical power to helicopter.

4. Close CAUTION LT circuit breaker on overhead console. ROTOR LOW RPM caution light shall illuminate and rotor low rpm warning alarm shall not be audible.

5. Raise collective stick. ROTOR LOW RPM caution light shall remain illuminated and rotor low rpm alarm shall now be audible.

6. Increase test set tachometer generator rpm until ROTOR LOW RPM caution light extinguishes and rotor low rpm alarm is not audible.

7. Increase test set rpm to 100 percent. Rotor percent rpm indicator (marked R) shall indicate in green area.

8. Decrease test set tachometer generator rpm until ROTOR LOW RPM caution light illuminates and rotor low rpm warning alarm is audible. ROTOR PERCENT RPM indicator shall read 90 (±3) percent.

9. Move collective stick to its lowest position. Rotor low rpm audible alarm shall be deactivated when collective stick is moved to within 1 ± 0.2 inch (25.40 ± 5.08 mm) of its lowest position (measured at grip adjacent to switchbox). ROTOR LOW RPM light shall remain illuminated.

10. Turn test set and helicopter power OFF, and disconnect rotor tachometer generator connector (P6).

11. Connect electrical connector (P6) to rotor tachometer generator.

96-165. TRANSMISSION OIL PRESSURE/ TEMPERATURE CAUTION SYSTEM.

Transmission oil pressure/temperature caution system is comprised of piping (wet line), pressure switch, temperature sensing switch, caution lights (segments), and associated wiring.

96-166. TRANSMISSION OIL PRESSURE CAUTION SYSTEM.

Transmission oil pressure switch (S4) is connected with a T-fitting into oil pressure piping (wet line). Switch is located centered, forward, and below instrument panel. Contacts of switch are kept open by transmission oil pressure, unless pressure drops to 28 psig (193 kPa) or below. When switch is allowed to close at 28 psig (193 kPa), it completes transmission oil pressure caution circuit; transmission oil pressure segment on caution panel illuminates.

96-167. OPERATIONAL CHECK.

SPECIAL TEST EQUIPMENT

NUMBER	NOMENCLATURE
Barfield Model 2311F or Equivalent	Pressure Tester 0 – 150 psi (0 – 1034 kPa)

1. Disconnect transmission oil pressure line at engine compartment firewall, and block source line connected to transmission.

2. Connect calibrated pressure source to piping connected to pressure switch.

3. Vary pressure between 0 and 35 psig (0 and 241 kPa).

4. TRANS OIL PRESS caution segment shall illuminate with pressure in 0 to 28 psig (0 to 193 kPa) range.

5. When pressure exceeds 28 psig (193 kPa), caution segment shall extinguish.

6. Return pressure to zero, disconnect pressure source, and reconnect transmission oil pressure piping.

96-168. REMOVAL.

1. Ensure electrical power is OFF.

2. Disconnect electrical connector (P4) and protect with cap or tape.

3. Disconnect and cap pressure line.

4. Remove mounting hardware and switch.

5. Cover open port in transmission.

96-169. INSTALLATION.

1. Remove cover over transmission port.

2. Place switch in position and install mounting hardware.

3. Uncap pressure line and connect to switch.

4. Remove protective cover and connect electrical connector to switch.

96-170. TRANSMISSION OIL TEMPERATURE CAUTION SYSTEM.

Transmission oil temperature switch (S3) is a hermetically sealed, temperature sensitive component. Switch will close when transmission oil temperature rises above safe operating limit. This completes transmission oil temperature caution circuit; TRANS OIL TEMP segment on caution panel illuminates. Switch is located adjacent to transmission oil temperature bulb on left side of transmission.

96-171. OPERATIONAL CHECK.

1. Momentarily connect a jumper between wire (D3C20) on transmission oil temperature switch (S3) and ground.

2. TRANS OIL TEMP segment on caution panel shall illuminate.

3. Remove jumper.

96-172. REMOVAL.

1. Ensure electrical power is OFF.

2. Disconnect electrical lead and protect with tape.

3. Remove switch.

4. Protect opening in transmission with plug.

96-173. INSTALLATION.

1. Remove protective plug from opening in transmission.

2. Install switch.

3. Connect electrical lead.

96-174. TROUBLESHOOTING — TRANSMISSION OIL PRESSURE/ TEMPERATURE CAUTION SYSTEM.

Refer to caution and warning light circuits and oil temperature indicator circuit wiring diagrams (Chapter 98). Refer to figures 96-13 and 96-14 and perform checks as necessary to isolate trouble.

96-175. BATTERY TEMPERATURE SENSING SYSTEM (Helicopters S/N 716 and subsequent).

THE FOLLOWING PARAMETERS AND PROCEDURES ARE FOR ONE SPECIFIC TYPE OF BATTERY. SENSING SYSTEM CHARACTERISTICS AND PERFORMANCE DATA MAY VARY WITH TYPE OF BATTERY USED. REFER TO VENDOR MANUALS TO ENSURE COMPATIBILITY OF EQUIPMENT.

Battery temperature sensing system consists of battery overtemp sensor module (S103), BATTERY TEMP caution light (DS42), BATTERY HOT warning light (DS43), and related wiring. Switch (S1) in overtemp sensor module (S103) closes 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 overtemp sensor module (S103) closes 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).

96-176. OPERATIONAL CHECK — BATTERY TEMPERATURE SENSING SYSTEM.

1. Close CAUTION LT circuit breaker.

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

3. Jumper (P207) pin B to C. BATTERY TEMP caution light shall illuminate.

4. Jumper (P207) pin E to F. BATTERY HOT warning light shall illuminate.

5. Remove jumpers.

6. Open CAUTION LT circuit breaker.

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

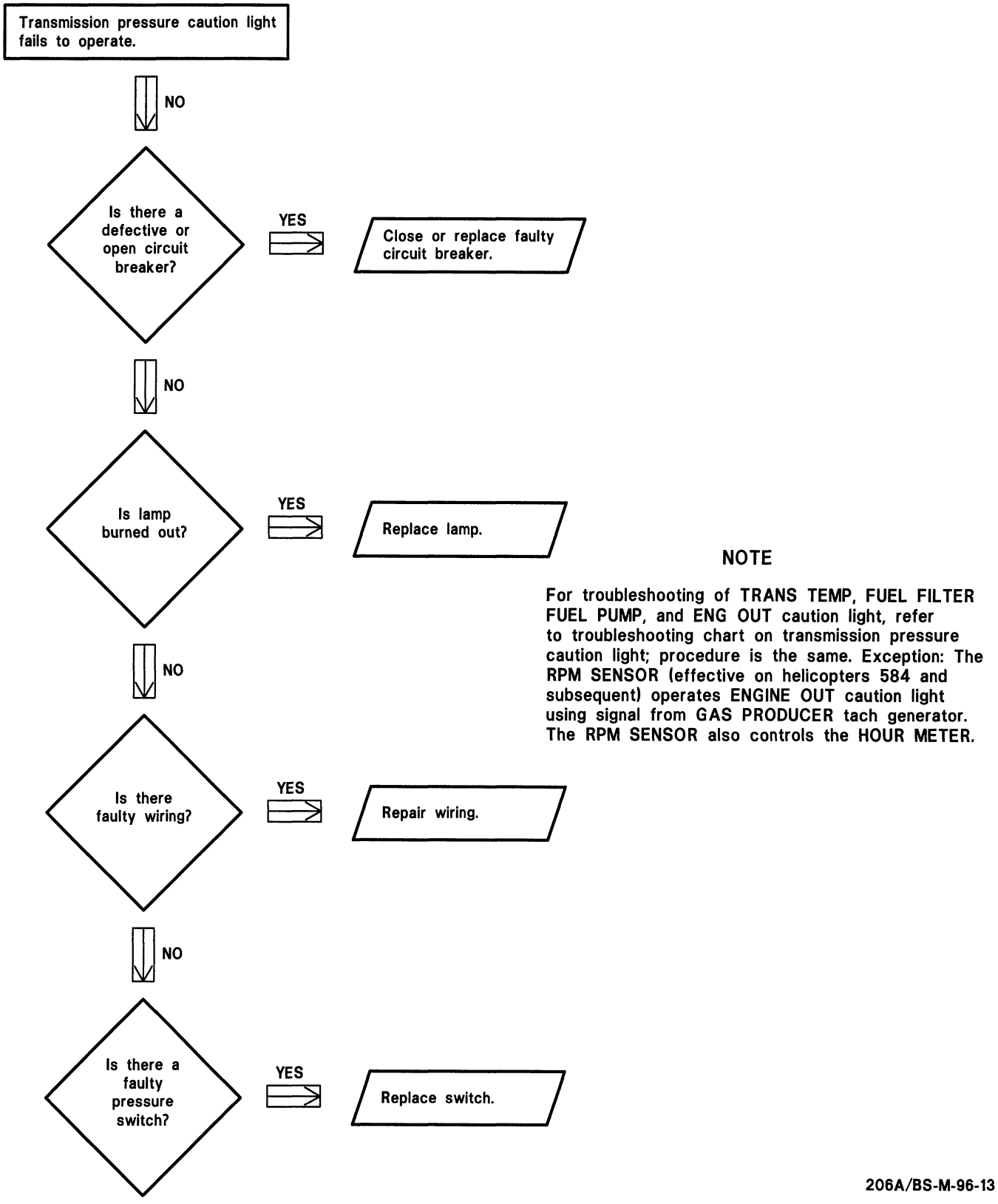
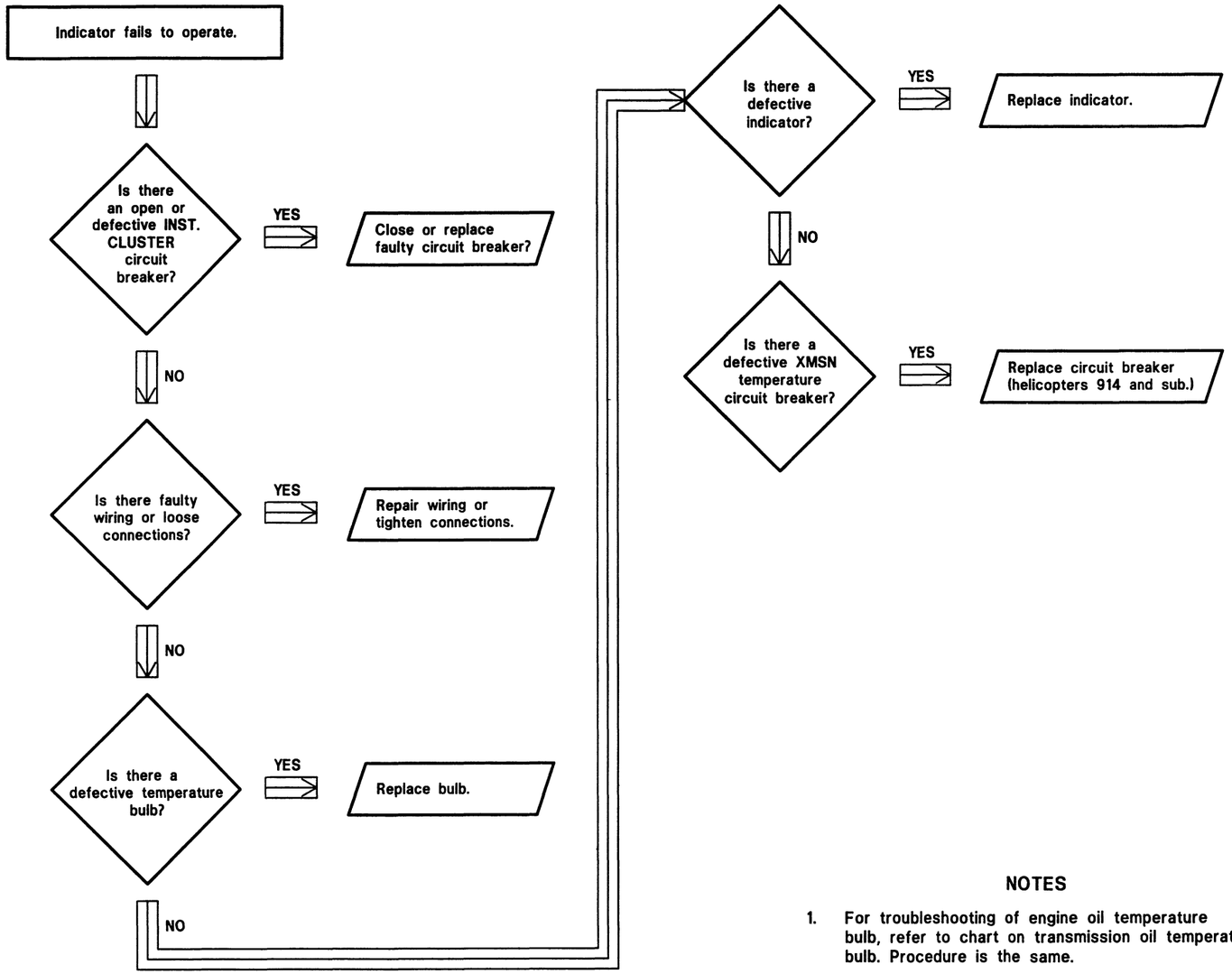


Figure 96-13. Transmission oil pressure caution light troubleshooting flow chart

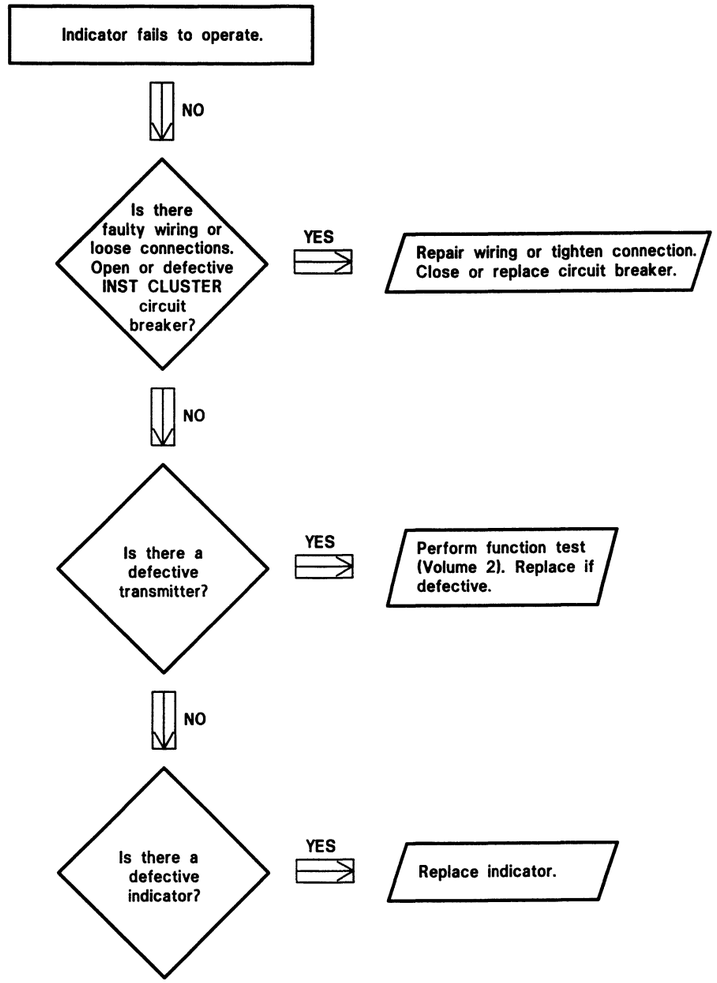
TRANSMISSION OIL TEMPERATURE BULB



NOTES

1. For troubleshooting of engine oil temperature bulb, refer to chart on transmission oil temperature bulb. Procedure is the same.
2. 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.

TRANSMISSION OIL PRESSURE (S/N 254 THRU 913)



206A/BS-M-96-14

Figure 96-14. Transmission oil temperature and pressure system troubleshooting flow chart

96-177. REMOVAL — BATTERY OVERTEMP SENSOR MODULE.

1. Disconnect battery.

2. Remove battery.

3. Disconnect electrical connector (P207) from sensor module (S103).

4. Remove retainer with spring and sensor module.

96-178. INSPECTION — BATTERY OVERTEMP SENSOR MODULE.

Inspect battery temperature sensor, spring, and retainer for condition and cleanliness.

96-179. INSTALLATION — BATTERY OVERTEMP SENSOR MODULE.

1. Install retainer with spring and sensor module (S103).

2. Ensure sensor plate protrudes approximately 0.03 inch (0.76 mm) above the rim of the retainer.

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

4. Install battery. Ensure sensor plate is in contact with battery surface.

5. Reconnect battery.

96-180. OPERATIONAL TEST — BATTERY OVERTEMP SENSOR MODULE.

NOTE

Following test requires use of locally manufactured test harness shown in figure 96-15.

1. Remove sensor module (S103) from helicopter (paragraph 96-177).

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

3. Connect sensor module to test harness shown in figure 96-15.

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

TEMPERATURE	INDICATION
130 ±3°F (54.4 ±1.6°C)	Amber Light ON
140 ±3°F (60.0 ±1.6°C)	Red Light ON (Amber light remains ON)

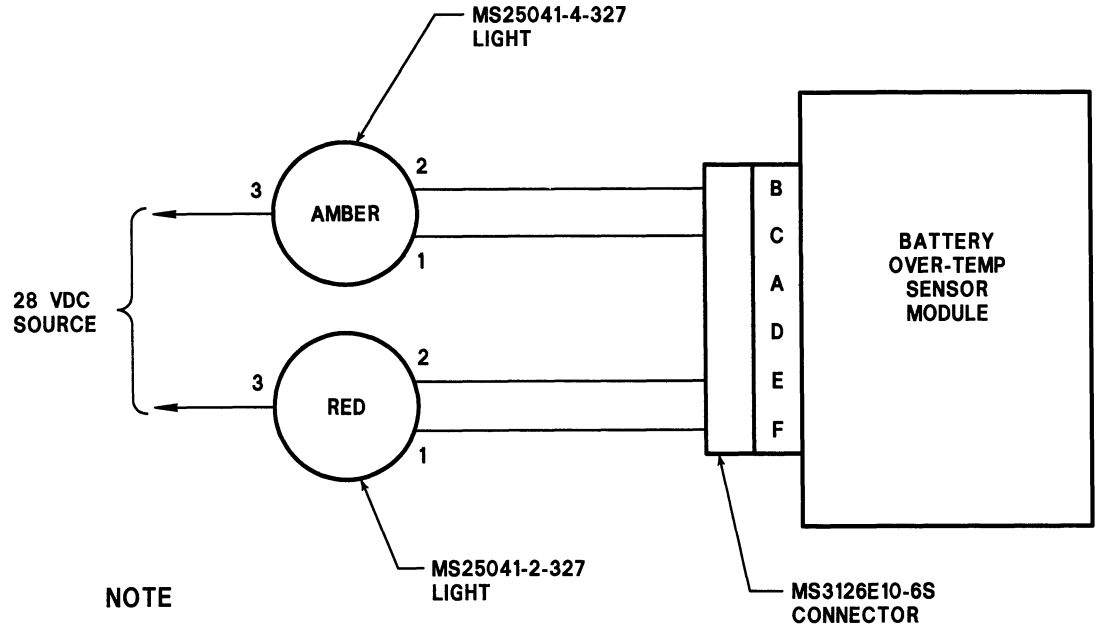


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Figure 96-15. Test harness for battery temperature sensor

96-181. ENGINE CHIP DETECTOR CAUTION SYSTEM (HELICOPTERS S/N 914 AND SUBSEQUENT)

Engine chip detector caution system is comprised of ENG CHIP caution light, two engine mounted (part of engine) magnetic drain plug/chip detectors, and related wiring. If metal particles should segregate from engine into oil, the magnet will attract these particles. If sufficient metal has been attracted to complete circuit between pole (core of chip detector) and ground, ENG CHIP caution light will illuminate.

NOTE

For additional information on magnetic drain plugs/chip detectors, refer to applicable Rolls-Royce Series Operation and Maintenance Manual.

96-182. ENGINE CHIP DETECTOR CAUTION SYSTEM — OPERATIONAL CHECK

1. Close CAUTION LT circuit breaker.

2. Disconnect electrical connector (P190) from upper engine chip detector. Connect temporary jumper between pin of plug and helicopter structure. ENG CHIP caution light shall illuminate.

3. Remove temporary jumper. ENG CHIP caution light shall extinguish.

4. Connect electrical connector (P190) to engine chip detector. ENG CHIP caution light shall remain extinguished.

5. Disconnect electrical connector (P191) from lower engine chip detector. Connect temporary jumper between pin of connector and helicopter structure. ENG CHIP caution light shall illuminate.

6. Remove temporary jumper. ENG CHIP caution light shall extinguish.

7. Connect electrical connector (P191) to engine chip detector. ENG CHIP caution light shall remain extinguished.

96-183. TRANSMISSION CHIP DETECTOR CAUTION SYSTEM

Transmission chip detector caution system includes TRANS CHIP caution light, two transmission chip detectors (mounted 90° apart), tail rotor gearbox chip detector, and a mast bearing chip detector on helicopters S/N 3905 and subsequent, and related wiring. For maintenance instructions on chip detectors, refer to Chapter 63.

96-184. TRANSMISSION CHIP DETECTOR CAUTION SYSTEM — OPERATIONAL CHECK

1. Close CAUTION LT circuit breaker.

2. Remove one transmission chip detector and ground probe (core of chip detector) to helicopter structure. TRANS CHIP caution light shall illuminate.

3. Install chip detector. TRANS CHIP caution light shall extinguish.

4. Complete step 2 and step 3 for remaining transmission chip detectors.

96-185. TAIL ROTOR GEARBOX CHIP DETECTOR CAUTION SYSTEM

Tail rotor gearbox chip detector caution system includes T/R CHIP caution light, tail rotor gearbox chip detector, and related wiring. For maintenance instructions on tail rotor gearbox chip detector, refer to Chapter 65.

96-186. TAIL ROTOR GEARBOX CHIP DETECTOR CAUTION SYSTEM — OPERATIONAL CHECK

1. Close CAUTION LT circuit breaker.

2. Remove tail rotor gearbox chip detector and ground the probe to helicopter structure. T/R CHIP caution light shall illuminate.

3. Install chip detector. T/R CHIP caution light shall extinguish.

96-186A.FUEL LOW CAUTION SYSTEM

The fuel low system, which is independent of the fuel quantity system, illuminates a FUEL LOW caution light when there is approximately 20 U.S. gallons (206A/B and B3 helicopters S/N 4 through 4052 Post TB 206-84-94 or Post TB 206-85-113) or 12 to 19 U.S. gallons (206B3 helicopters S/N 4053 and subsequent) of usable fuel remaining.

96-186B.FUEL LOW CAUTION SYSTEM — OPERATIONAL CHECK

1. Jack the helicopter (Chapter 7) until the skids are clear of the ground.

2. Level the helicopter (Chapter 8), and then adjust to obtain a nose low calibration attitude of 1.2°.

3. With helicopter power on and FUEL LOW caution light not illuminated, defuel system (Chapter 12) while monitoring both the fuel quantity indicator and FUEL LOW caution light. Verify that FUEL LOW caution light illuminates at approximately 20 U.S. gallons (206A/B and B3 helicopters S/N 4 through 4052 Post TB 206-84-94 or Post TB 206-85-113) or 12 to 19 U.S. gallons (206B3 helicopters S/N 4053 and subsequent) of usable fuel remaining.

4. With helicopter power on and FUEL LOW caution light illuminated, fuel system (Chapter 12) while monitoring both the fuel quantity indicator and FUEL LOW caution light. Verify that FUEL LOW caution light extinguishes at approximately 20 U.S. gallons (206A/B and B3 helicopters S/N 4 through 4052 Post TB 206-84-94 or Post TB 206-85-113) or 12 to 19 U.S. gallons (206B3 helicopters S/N 4053 and subsequent) of usable fuel remaining.

5. Lower the helicopter and remove the jacks (Chapter 7).

96-187. FUEL FILTER DIFFERENTIAL PRESSURE SWITCH

Filter pressure switch (S10) is part of fuel filter assembly, which is mounted on lower engine firewall. Switch is pressure operated and connected to fuel filter caution light. If fuel filter pressure drops below safe operating limit due to clogged filter, switch closes, and fuel filter caution light illuminates. Fuel is bypassing filter at this time. (See Figure 96-1 for equipment location and Chapter 98 for wiring diagram.)

NOTE

Helicopters S/N 2212 through 3567 that have TB 206-82-75 incorporated and helicopters S/N 3567 and subsequent will not have fuel filter differential pressure switch or FUEL FILTER caution light segment.

96-188. FUEL FILTER CAUTION LIGHT — TROUBLESHOOTING

Refer to caution and warning light circuits wiring diagram in Chapter 98. Perform checks as necessary to isolate trouble.

96-189. FUEL FILTER DIFFERENTIAL PRESSURE SWITCH — REMOVAL

1. Set battery switch to OFF. Disconnect external power.

2. Disconnect hose assembly and seal hose ends.

3. Remove jamnut from bulkhead fitting and hose from aft end of filter. Cap hose.

4. Disconnect electrical connector (P23). Remove nuts securing switch to mounting bracket.

5. Remove unions from each end of switch. Remove and discard packings.

96-190. FUEL FILTER DIFFERENTIAL PRESSURE SWITCH — INSTALLATION

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

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

3. Remove seals and connect hoses to aft end of switch.

4. Connect electrical connector (P23).

5. Apply fuel pressure and check for fuel leaks.

96-191. FUEL FILTER DIFFERENTIAL PRESSURE SWITCH CAUTION LIGHT CIRCUIT — OPERATIONAL CHECK

1. Close CAUTION LT circuit breaker.

2. Disconnect electrical connector (P23) from fuel filter differential pressure switch.

3. Jumper pins B and C of connector (P23). The FUEL FILTER caution light shall illuminate.

4. Remove jumper. FUEL FILTER caution light shall extinguish.

5. Connect (P23) to fuel filter differential switch electrical connector. FUEL FILTER caution light shall remain extinguished.

96-192. AIRFRAME FUEL FILTER CAUTION SYSTEM (AFTER INCORPORATION OF TB 206-82-75)

Airframe fuel filter (impending bypass) switch is part of engine inlet fuel filter assembly, which is mounted on left side of engine compartment. Switch is pressure operated and is connected to A/F FUEL FILTER caution light. If filter element becomes too clogged to allow normal fuel flow, bypass valve opens and allows fuel to circumvent filter. Impending bypass switch closes prior to bypass occurring; caution light illuminates. Circuit incorporates a press-to-test button on filter assembly; depressing button will illuminate caution light and verify circuit integrity.

96-193. AIRFRAME FUEL FILTER CAUTION SYSTEM — TROUBLESHOOTING

Refer to Chapter 28 and caution and warning light circuits wiring diagram in Chapter 98. Perform checks necessary to isolate trouble.

96-194. FUEL PRESSURE SWITCHES

A pressure sensitive switch is mounted in outlet port of each fuel boost pump (forward and aft). If pressure at outlet drops to 3.5 ±0.5 PSI (24.13 ±3.45 kPa) due to pump failure, switch closes. This completes electrical circuit to FUEL PUMP segment on caution panel; light illuminates.

96-195. FUEL PRESSURE SWITCHES — REMOVAL

1. Set battery switch to OFF. Disconnect external power.

2. Disconnect electrical lead from switch and tape end.

3. Remove lockwire, unscrew and remove switch and packing. Plug pump opening.

96-196. FUEL PRESSURE SWITCHES — INSPECTION

Inspect switch for clogged pressure port.

96-197. FUEL PRESSURE SWITCHES — INSTALLATION

1. Remove plug from pump opening. Lubricate threads and packing on switch and screw switch into pump unit.

2. Torque switch to 40 inch-pounds (4.52 Nm) and install lockwire.

3. Remove tape and connect electrical lead.

4. Apply fuel pressure and check for fuel leaks.

96-198. FUEL PRESSURE SWITCHES — OPERATIONAL CHECK

SPECIAL TOOLS REQUIRED

NUMBER	NOMENCLATURE
Barfield Model 2311F or Equivalent	Pressure Tester 0 - 150 PSI (0 - 1034 kPa)

NOTE

Pressure switch is preset by manufacturer and cannot be adjusted. If it fails operational check, replacement of switch is necessary.

1. Set battery switch to OFF. Disconnect external power.

2. Remove pressure switch from pump.

3. Connect controlled calibrated low air pressure source to switch.

4. Close CAUTION LT circuit breaker.

5. Ensure case of switch is grounded.

6. FUEL PUMP segment illuminates.

7. Increase air pressure. At 6 PSIG (41.4 kPa), switch shall open and extinguish FUEL PUMP segment.

8. Decrease air pressure to zero. On decreasing pressure, switch shall close at 3.5 ±0.5 PSIG (24.13 ±3.45 kPa) and illuminate FUEL PUMP segment.

9. Disconnect pressure source from switch and install pressure switch on pump.

10. Apply fuel pressure and check for leaks.

96-199. FUEL PUMP CAUTION LIGHT — TROUBLESHOOTING

Refer to caution and warning light circuits wiring diagram in Chapter 98. Perform checks as necessary to isolate trouble.

ENGINE CONTROL AND ACCESSORY SYSTEMS

96-200. ENGINE CONTROL AND ACCESSORY SYSTEMS.

Engine control and accessory systems include fuel boost pumps, fuel shutoff valve, fuel dump system, governor control switch, governor actuator, and engine anti-icing control unit.

96-201. FUEL BOOST PUMPS.

Two electric fuel boost pumps (B1 and B2) are mounted submerged in fuel cell. They are accessible from bottom of fuselage. Both pumps are connected to a common fuel line. Either pump can furnish sufficient fuel flow for engine operation. Pumps are controlled by separate circuit breakers in overhead console (figure 96-2) and may be operated separately or together. (See figure 96-1 for equipment location and Chapter 98 for wiring diagram.)

96-202. TROUBLESHOOTING.

Refer to fuel pump circuit wiring diagram in Chapter 98. Refer to figure 96-16 and perform checks necessary to isolate trouble.

96-203. REMOVAL/INSTALLATION.

Refer to Chapter 28.

96-204. FUEL SHUTOFF VALVE.

Fuel shutoff valve, located above fuel cell on right side of helicopter, is an electric solenoid valve and provides the means to shut off fuel to engine. Valve is controlled by a switch on instrument panel (Chapter 95).

96-205. TROUBLESHOOTING.

Refer to fuel valve circuit wiring diagram in Chapter 98. Refer to figure 96-17 and perform checks necessary to isolate trouble.

96-206. REMOVAL/INSTALLATION.

Refer to Chapter 28.

96-207. FUEL DRAIN SYSTEM (Helicopters S/N 716 and subsequent).

Fuel drain system consists of solenoid actuated fuel drain valve (B15) and fuel drain switch (S91). Valve is located at lowest point of lower fuel cell, and vents directly overboard when energized. Drain switch is spring-loaded to off position, and is mounted flush with fuselage. Switch has a rubber cover, and is located on right side of helicopter, directly above rear skid mount. As long as switch is depressed, 28 Vdc is applied to valve solenoid; this opens drain valve and allows venting. Drain system provides for quick drainage of moisture accumulation from tank system prior to flight. System receives power through fuel valve circuit breaker (CB2) when the fuel shutoff valve is in the OFF position.

96-208. TROUBLESHOOTING.

Refer to fuel valve circuit wiring diagram in Chapter 98. Refer to figure 96-17 and perform checks necessary to isolate trouble.

96-209. REMOVAL/INSTALLATION.

Refer to Chapter 28.

96-210. REMOVAL — FUEL DRAIN SWITCH.

1. Ensure electrical power is OFF.

2. Disconnect, identify and tag wires, and protect wire ends with tape.

3. Remove four mounting screws from outside through fuselage.

4. Remove switch from inside fuselage skin.

96-211. INSTALLATION — FUEL DRAIN SWITCH.

1. Position switch in place against inside fuselage skin.

2. Secure switch with four screws from outside through fuselage.

3. Connect wires to switch.

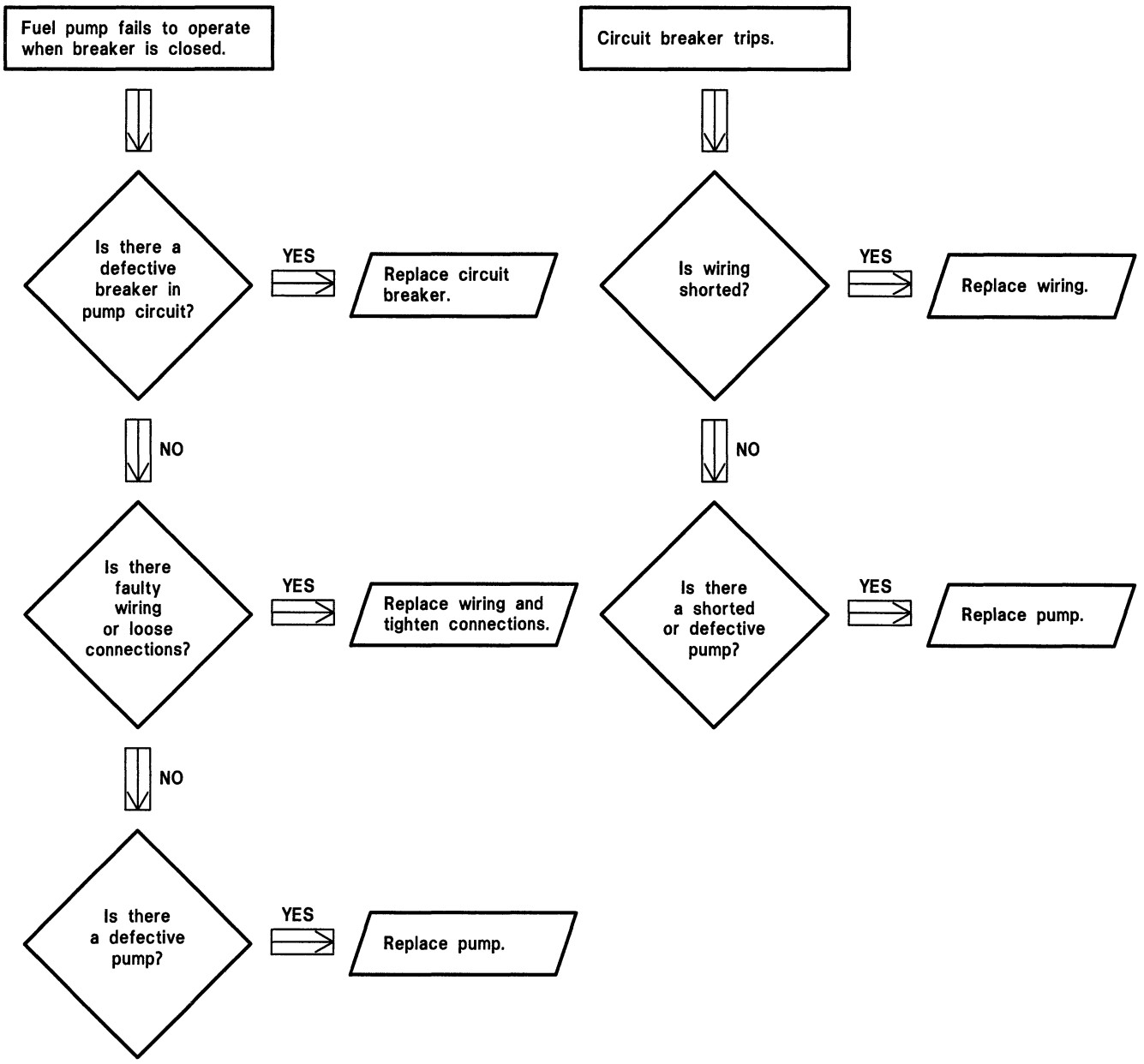

Figure 96-16. Fuel boost pump system troubleshooting flow chart

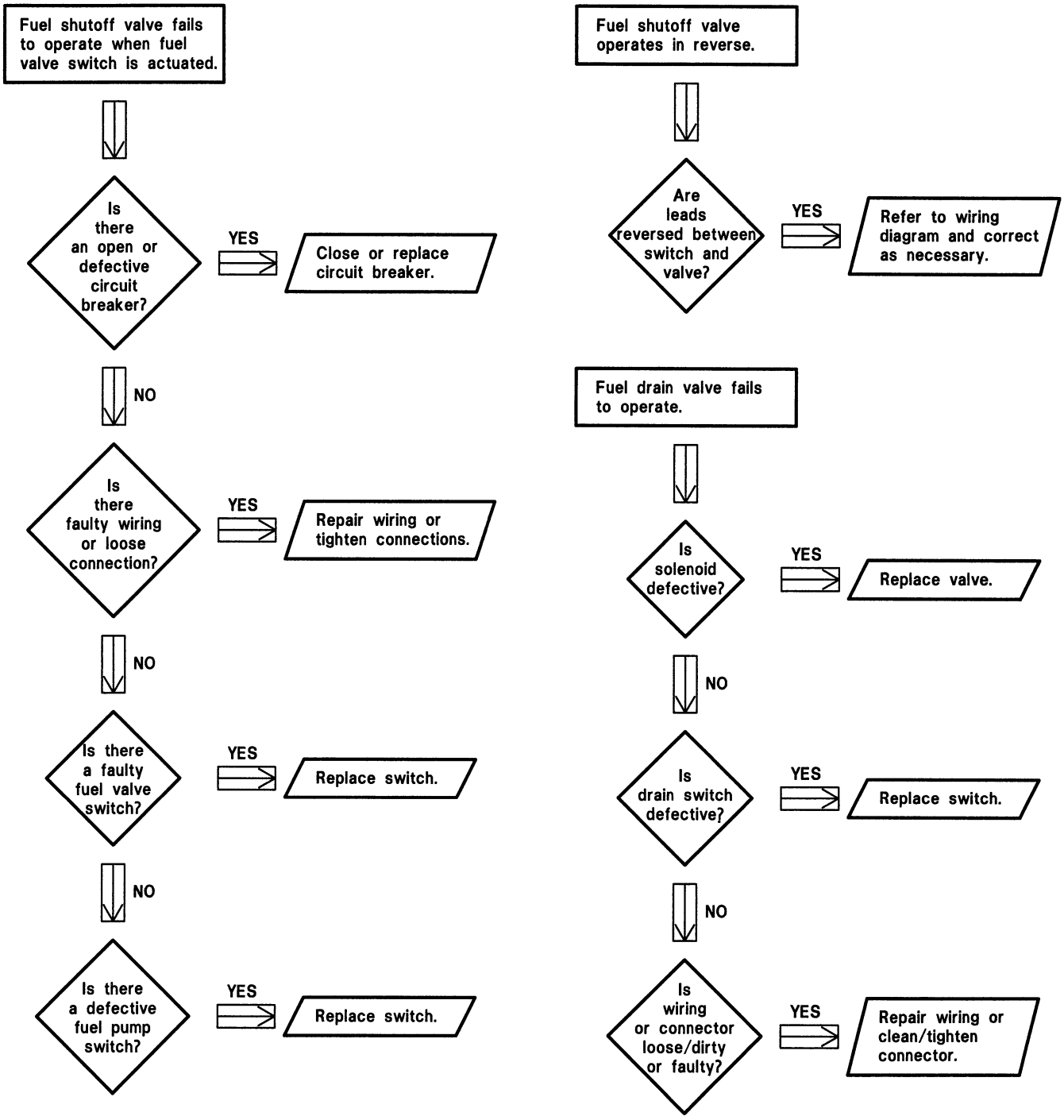

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Figure 96-17. Fuel shutoff and drain valve system troubleshooting flow chart

96-212. GOVERNOR RPM SWITCH.

Governor rpm switch (S5), located in pilot collective switchbox, is double-pole, double-throw, spring-loaded to center, momentary contact switch. It enables pilot to increase or decrease governor rpm actuator setting. With switch in INCR position, circuit to actuator motor is completed and allows motor to move arm in one given direction. With switch in DECR position polarity to actuator motor is reversed, allowing actuator arm to move in opposite direction. When switch is at center position, circuit is de-energized. (See figure 96-1 for equipment location and Chapter 98 for wiring diagram.)

96-213. TROUBLESHOOTING — GOVERNOR CONTROL SYSTEM.

Refer to figure 96-18 and perform checks necessary to isolate trouble

96-214. REMOVAL — GOVERNOR CONTROL SWITCH.

1. Set BAT switch to OFF.

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

3. Disconnect wires from switch, identify and tag wires, and protect wire ends with tape.

4. Remove switch from panel.

96-215. INSTALLATION — GOVERNOR CONTROL SWITCH.

1. Install switch to plate. Ensure indexing key is in proper position.

2. Remove tape from wire ends, and connect wires to switch.

3. Position plate on switchbox and secure with mounting screws.

96-216. GOVERNOR ACTUATOR.

Governor actuator (B3) is located on forward left side of engine. It is a reversible motor and provides increase or decrease of governor setting. Unit is controlled by governor switch on collective stick. (See figure 96-1 for equipment location and Chapter 98 for wiring diagram.)

96-217. REMOVAL/INSTALLATION.

Refer to Chapter 76.

96-218. ENGINE ANTI-ICING ACTUATOR.

Engine anti-icing actuator (B4) is located on upper forward section of engine; its position determines condition (open or closed) of engine anti-icing valve. Actuator is controlled by anti-icing switch on instrument panel pedestal (Chapter 95). (See figure 96-1 for equipment location and Chapter 98 for wiring diagram.)

96-219. TROUBLESHOOTING — ENGINE ANTI-ICING.

Refer to figure 96-19 and perform checks as necessary to isolate trouble.

96-220. REMOVAL/INSTALLATION — ENGINE ANTI-ICING ACTUATOR.

Refer to Chapter 71.

96-221. REMOVAL/INSTALLATION — ENGINE ANTI-ICING SWITCH.

Refer to Chapter 71.

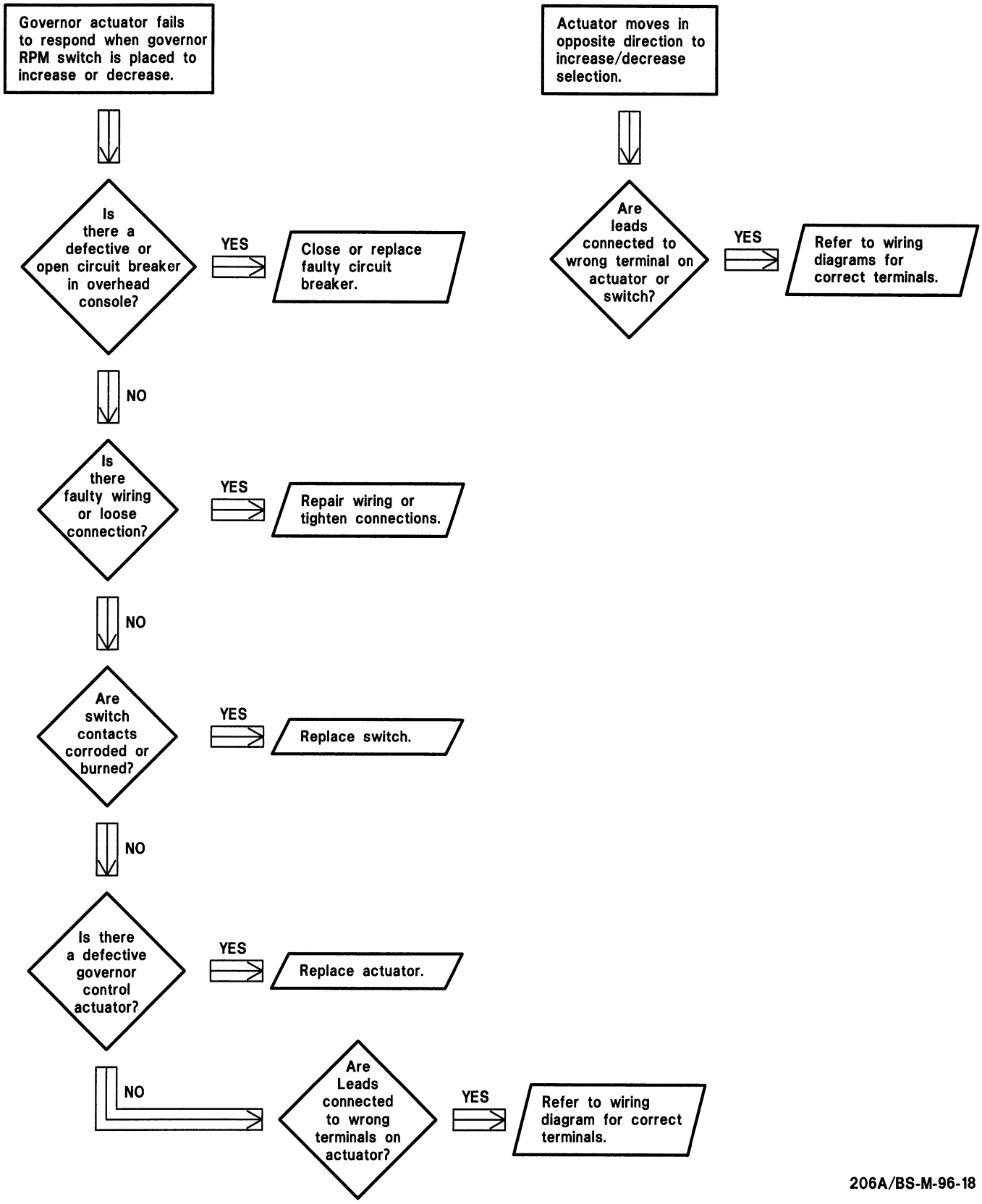

Figure 96-18. Governor control system troubleshooting flow chart

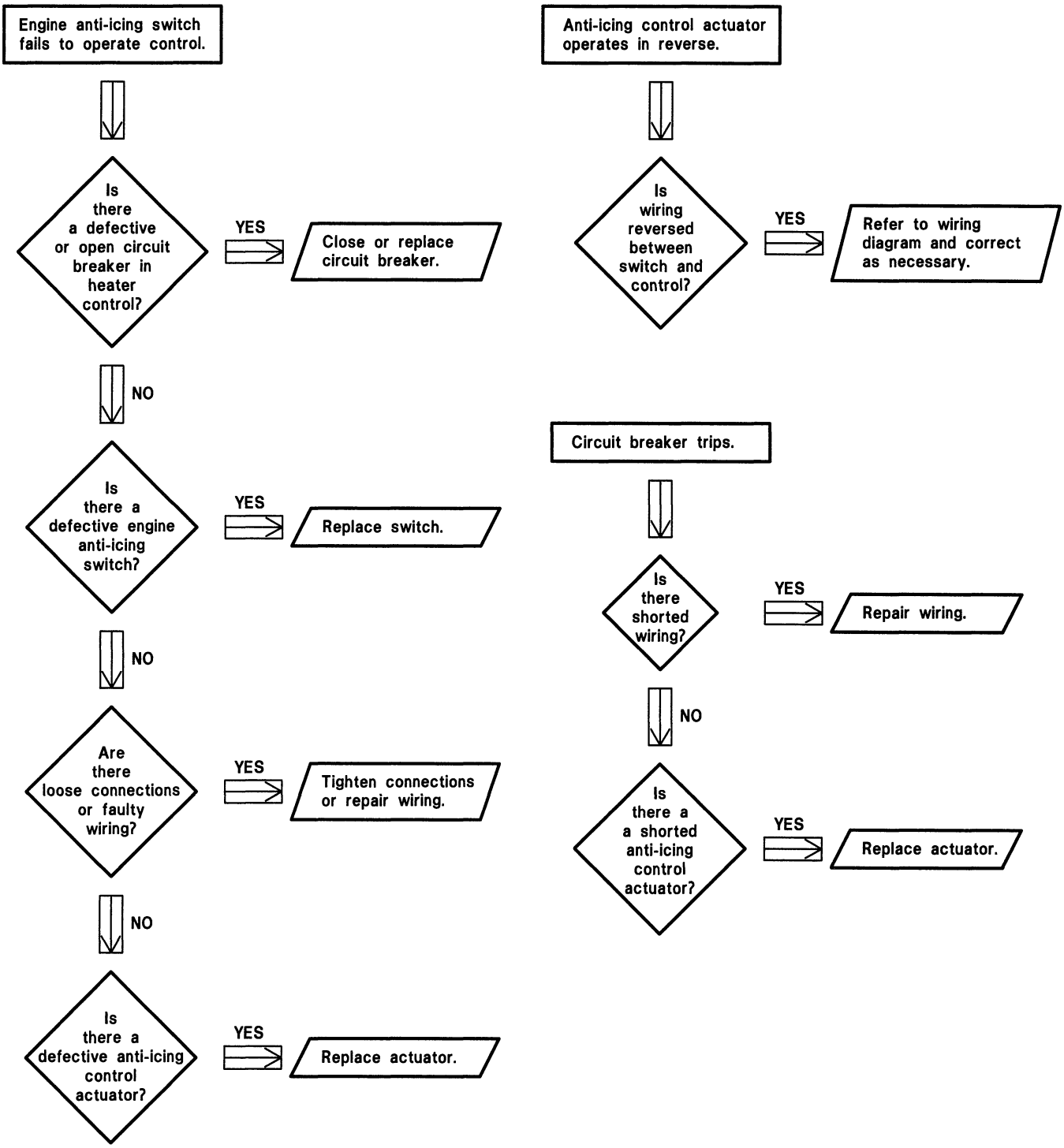

Figure 96-19. Engine anti-icing system troubleshooting flow chart

HYDRAULIC CONTROLS

96-222. HYDRAULIC CONTROL SYSTEM.

Hydraulic servo actuators are used as power boost source for the flight control system. Hydraulic control system reduces operating load on flight controls.

96-223. HYDRAULIC BYPASS SOLENOID AND SWITCH.

Hydraulic bypass SOLENOID (L1) is located on service deck forward of transmission; it is controlled by control boost switch (S7) in instrument panel pedestal. With switch OFF, SOLENOID is energized, allowing boost system to be bypassed. Setting switch to ON activates control boost system.

96-224. TROUBLESHOOTING — HYDRAULIC CONTROL SYSTEM.

Refer to figure 96-20 and perform checks as necessary to isolate trouble. Refer to Chapter 98 for wiring diagram.

96-225. REMOVAL — CONTROL BOOST SWITCH.

1. Verify electrical power is OFF.

2. Disengage mounting screws attaching instrument panel to console structure.

CAUTION

PROTECT INSTRUMENTS FROM FRONTAL DAMAGE AND WIRES AND TUBES FROM BEING TWISTED AND STRAINED WHEN ACCESSING INSTRUMENT PANEL.

3. Open instrument panel to gain access.

4. Remove attaching hardware and switch from instrument panel.

5. Remove electrical wires from switch and cover wire ends with tape.

96-226. INSTALLATION — CONTROL BOOST SWITCH.

1. Verify electrical power is OFF.

2. Remove tape from wire ends and install electrical wires on switch.

3. Install switch in instrument panel using attaching hardware.

4. Close instrument panel and engage mounting screws around edge of panel.

96-227. REMOVAL — HYDRAULIC BYPASS SOLENOID.

1. Set BAT switch to OFF.

2. Disconnect electrical connector and cover end with tape or cap.

3. Remove lockwire and remove valve from valve housing.

4. Cap valve housing opening.

96-228. INSTALLATION — HYDRAULIC BYPASS SOLENOID.

1. Remove cap from valve housing opening.

2. Screw valve into valve housing, tighten, and secure with lockwire.

3. Remove tape or cap and connect electrical connector.

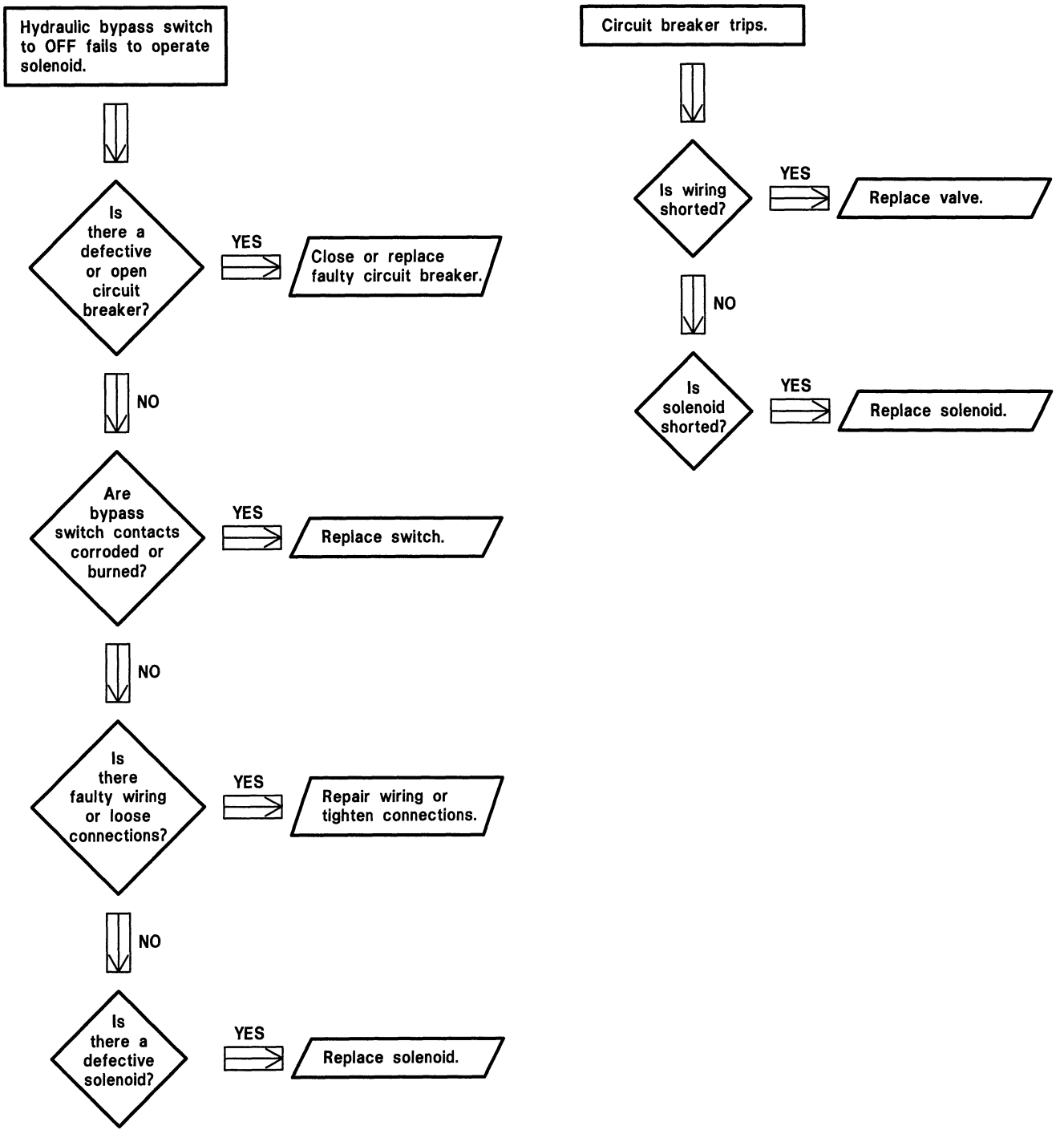

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Figure 96-20. Hydraulic control system troubleshooting flow chart

HEATING SYSTEMS

96-229. HEATING SYSTEMS.

Helicopter is equipped with windshield defogging system (Chapter 21) and pitot tube heater. Refer to Chapter 98 for wiring diagrams.

96-230. DEFOGGING BLOWER SYSTEM.

Defogging system consists of two nozzle assemblies with flexible ducting and two blower motors. Closing DEFOG BLOWER (switch type) circuit breaker powers blower motors, which force air through ducting and nozzles against windshield. Circuit breakers are located in overhead console.

96-231. TROUBLESHOOTING — DEFOGGING BLOWER SYSTEM.

Refer to figure 96-21 and perform checks as necessary to isolate trouble.

96-232. REMOVAL/INSTALLATION — BLOWER MOTOR.

Refer to Chapter 21.

96-233. PITOT TUBE HEATER (Helicopters S/N 2212 and subsequent).

Pitot tubes contain a high temperature heating element. Closing PITOT HEAT circuit breaker applies power to heater. Switch type circuit breaker is located in overhead console.

96-234. FUNCTIONAL CHECK.

WARNING

USE EXTREME CARE WHEN IN PROXIMITY OF PITOT TUBE WITH HEAT APPLIED. TOUCHING TUBE MAY RESULT IN SERIOUS BURNS.

1. Remove pitot dust cover.
2. Momentarily close PITOT HEAT circuit breaker. Carefully check area around pitot tube for evidence of emanating heat.
3. Open PITOT HEAT circuit breaker.
4. Install pitot dust cover.

96-235. REMOVAL/INSTALLATION.

Refer to Chapter 95.

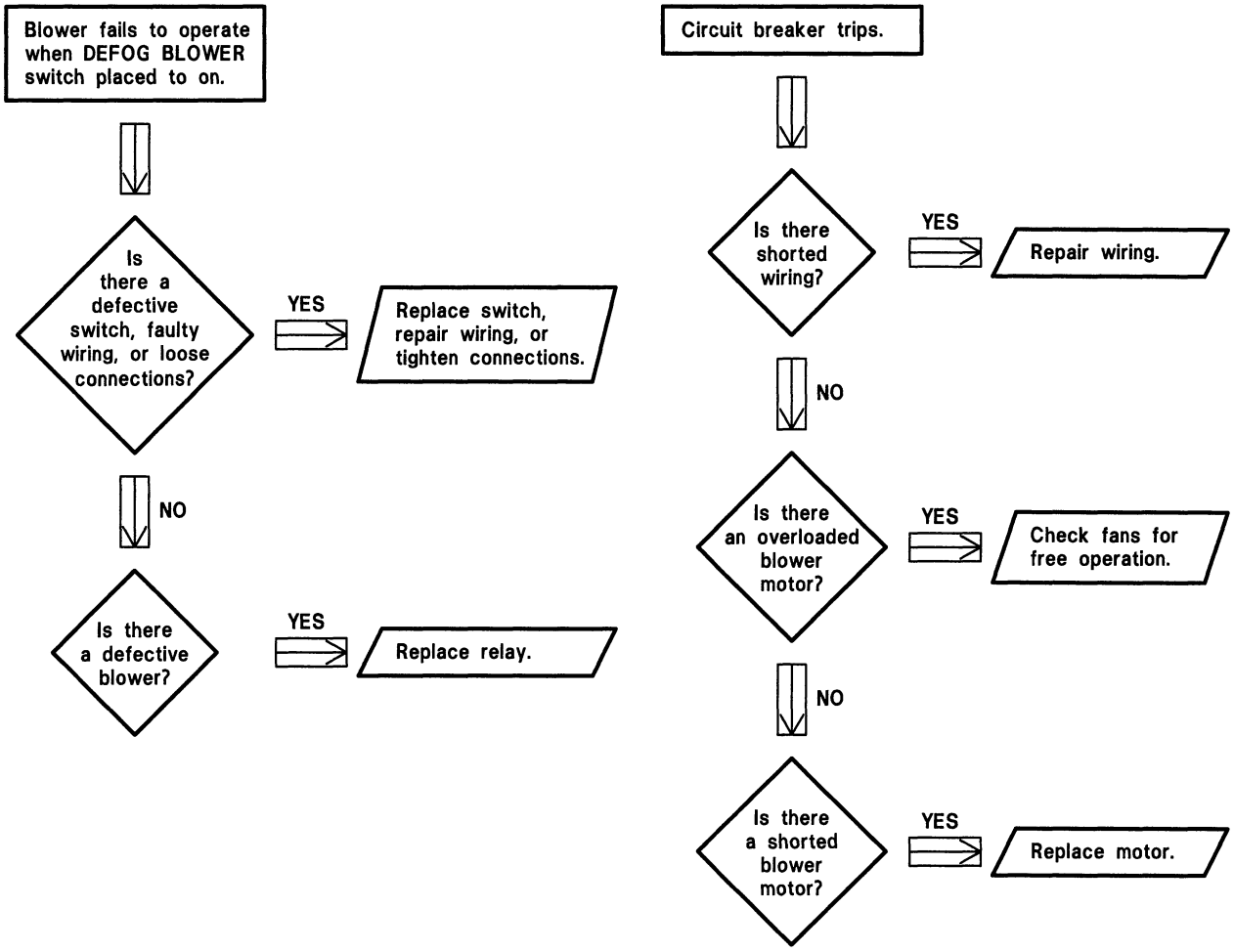

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Figure 96-21. Defogging blower system troubleshooting flow chart

MISCELLANEOUS ELECTRICAL SYSTEMS

96-236. MISCELLANEOUS ELECTRICAL SYSTEMS.

Miscellaneous electrical systems provide interconnecting circuitry for optional equipment kits.

96-237. CYCLIC TRIGGER SWITCH.

Cyclic trigger switch (S14), a single-pole, single-throw, trigger contact switch, is part of cyclic stick grip assembly. It provides keying capabilities for radio kit.

96-238. CYCLIC BUTTON SWITCH.

Cyclic button (S15), a single-pole, single-throw, press contact switch, is part of cyclic stick grip assembly. It provides keying capabilities for ICS and radio kits.

96-239. REMOVAL — CYCLIC TRIGGER OR BUTTON SWITCH.

1. Set battery switch to OFF.

2. Remove two attachment screws from grip cap.

3. Remove cap and lift switch sufficiently to gain access to switch wires.

4. Disconnect wires from switch, identify and tag wires, and protect wire ends with tape.

96-240. INSTALLATION — CYCLIC TRIGGER OR BUTTON SWITCH.

1. Remove tape and attach wires to switch.

2. Position switch in grip assembly. Ensure indexing key is in proper position.

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

96-241. AUXILIARY RECEPTACLE, 28 VDC (Helicopters S/N 2212 and subsequent).

The 28 Vdc auxiliary receptacle (J217), located on left side of pedestal is used to supply 28 Vdc to Chadwick Balancer, portable radio, and auxiliary/test equipment. Refer to Chapter 98 for wiring diagram.

OPTIONAL EQUIPMENT — KITS

96-242. OPTIONAL EQUIPMENT.

Since customer requirements vary extensively, basic helicopter does not contain all electrical equipment or wiring for every possible configuration.

96-243. KITS.

Some kit provision wiring is provided in helicopter basic wiring harness for the following:

1. Dual battery kit
2. Bleed air heater kit
3. Environmental control system (ECS)
4. Engine relight kit
5. Floats position lights kit
6. Pop-out floats kit
7. Cargo hook
8. Hoist
9. Flight instrument auxiliary equipment kit.

Refer to Chapter 98 for kit provisions wiring diagram.

DUAL BATTERY

96-244. DUAL BATTERY.

The auxiliary battery offers increased electrical power for cold weather starts, short trips, and frequent starts. The kit consists of a 13 ampere-hour battery, relay, heat sensors, and a three-position switch. The BAT SEL switch (three-position battery select switch) is located in the bottom edge-lit panel which is mounted in the instrument panel pedestal. The switch allows selective usage of the main battery (FWD BAT) and/or the auxiliary battery (AFT BAT). The auxiliary battery is located in the left aft compartment.

96-245. OPERATIONAL CHECK — DUAL BATTERY.

1. Position BAT SEL switch to BOTH.

2. Disconnect electrical connector from main battery.

3. Position BAT switch to BAT. Voltage (approximately 24 Vdc) should be present at BAT terminal of reverse current relay (K5).

4. Position BAT switch to OFF. Reconnect electrical connector to main battery.

5. Disconnect electrical connector from auxiliary battery.

6. Position BAT switch to BAT. Voltage (approximately 24 Vdc) should be present at BAT terminal of reverse current relay (K5).

7. Position BAT switch to OFF. Reconnect electrical connector to auxiliary battery.

96-246. TROUBLESHOOTING — DUAL BATTERY SYSTEM.

Perform necessary checks to isolate trouble. Refer to Chapter 98 for wiring diagram and figure 96-22 for troubleshooting chart.

96-247. MAINTENANCE REMOVAL/INSTALLATION — AUXILIARY BATTERY.

Refer to paragraphs 96-23 through 96-32.

96-248. AUXILIARY BATTERY TEMPERATURE SENSING SYSTEM.

Refer to paragraph 96-175.

96-249. OPERATIONAL CHECK/TEST, REMOVAL/INSTALLATION — AUXILIARY BATTERY TEMPERATURE SENSOR.

Refer to paragraphs 96-176 through 96-179.

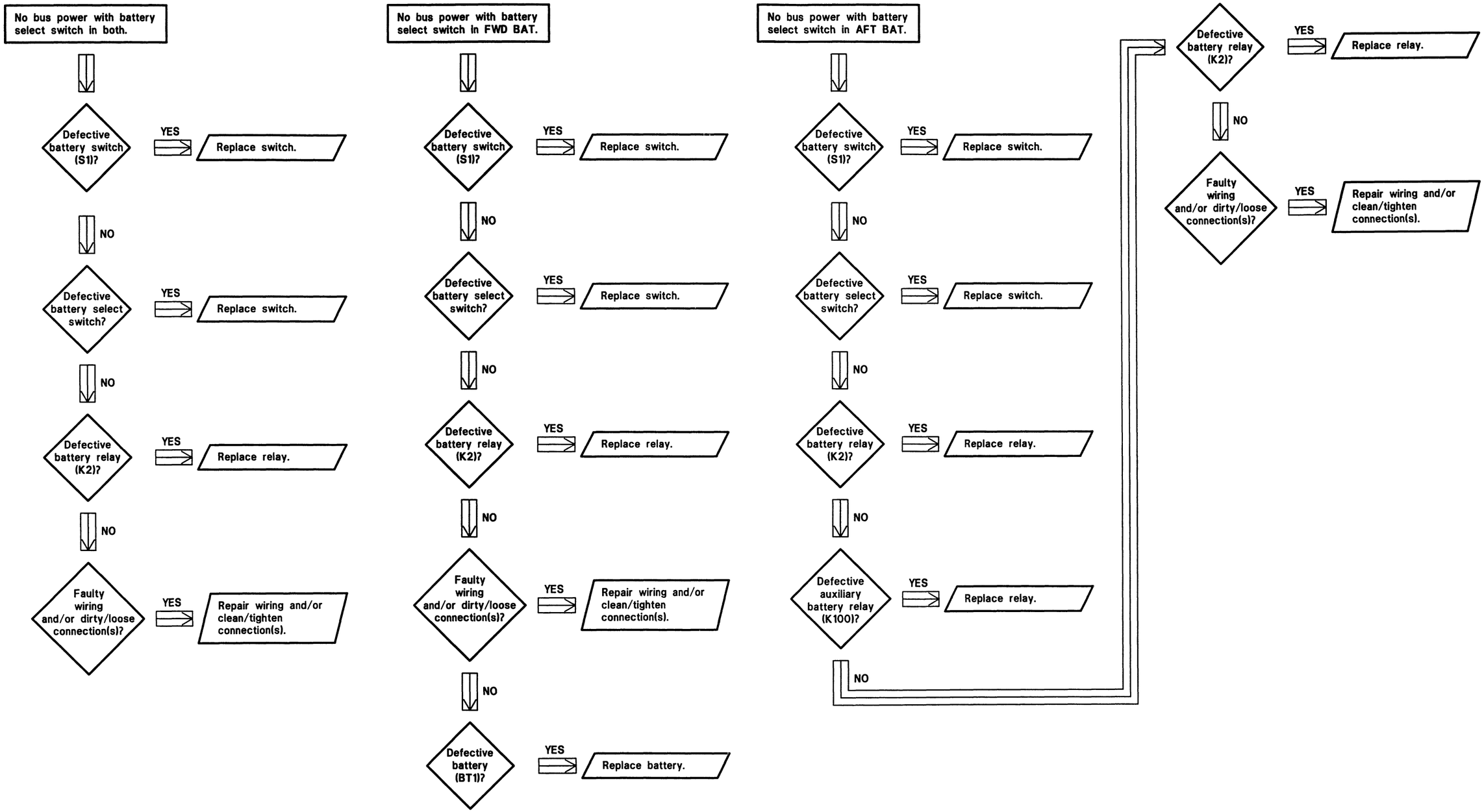

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Figure 96-22. Dual battery kit troubleshooting flow chart

BLEED AIR HEATER

96-250. BLEED AIR HEATER.

The bleed air heater delivers heated forced air from the engine and outside to the forward and passenger compartment and to the windshield. The kit consists of electrically actuated shutoff and air-mixing valves, circuit breaker, switches, relay, overheat sensing switch caution light, and associated ducting and hardware. The heater and overheat sensing switch are located in the equipment compartment directly above the baggage compartment. Electrical controls for the heater are located in the overhead console.

96-251. OPERATION — BLEED AIR HEATER.

NOTE

Engine must be operating for heater operation.

1. After selecting HEAT on HEAT/VENT switch (overhead console), closing HTR CONT circuit breakers activates the bleed air heater. An audible “thump” sound indicates solenoid opened damper.

2. The temperature control, located below and to the right of the overhead console, determines the setting of the overheat sensing switch. The overheat sensing switch is located in the heater duct in the equipment compartment.

3. The overheat sensing switch (S69) opens the HTR CONT circuit breaker within six seconds when temperature selected by the temperature control is exceeded. This de-energizes the heater valve solenoid, which shuts off bleed air.

96-252. TROUBLESHOOTING — BLEED AIR HEATER.

Perform checks necessary to isolate trouble. Refer to Chapter 98 for wiring diagrams and figure 96-23 for troubleshooting chart.

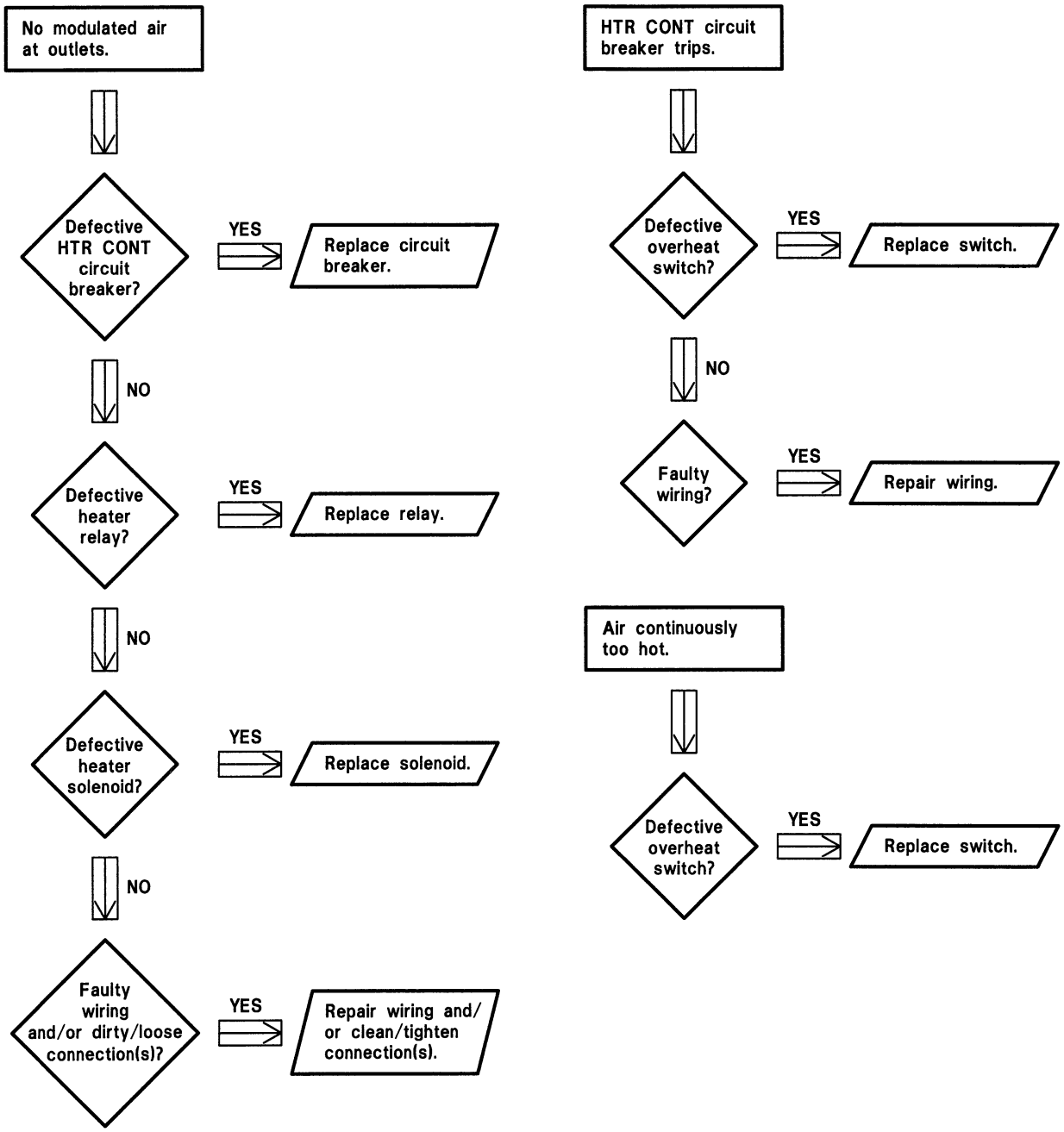

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Figure 96-23. Bleed air heater troubleshooting flow chart

ENVIRONMENTAL CONTROL SYSTEM (ECS)

96-253. ENVIRONMENTAL CONTROL SYSTEM (ECS).

The environmental control is capable of heating, cooling, and dehumidifying air to the cabin. The kit consists of an environmental control unit (ECU), control panel, circuit breaker, switches, solenoid valve, relay, and associated ducting and hardware. The ECU is located in the equipment compartment directly above the baggage compartment. Electrical controls for the ECU are located in the overhead console. The ECU receives bleed air directly from the engine.

96-254. OPERATION — ENVIRONMENTAL CONTROL SYSTEM.

NOTE

Engine must be operating for ECS operation.

1. After closing the ECS circuit breaker and positioning the COOL/HEAT switch to MAX HEAT, the ECS is activated. An audible “thump” sound indicates solenoid opened heater.

2. The temperature control plus ECS control switch located in the overhead console, determines the temperature delivered to the cabin from the heat exchanger.

3. The duct overheat switch and/or the airframe thermostat switch keep the ECS operating within the temperature limits determined by the position of the COOL/WARM knob. When temperature limit is exceeded, one or both switches close. This closes the bleed air valve and de-energizes the blower relay.

4. The ECS overload sensor protects the blower motor from being overloaded. A motor overload condition causes the sensor to close. This de-energizes the blower relay.

96-255. TROUBLESHOOTING — ENVIRONMENTAL CONTROL SYSTEM.

Perform checks necessary to isolate trouble. Refer to Chapter 98 for wiring diagram and figure 96-24 for troubleshooting chart.

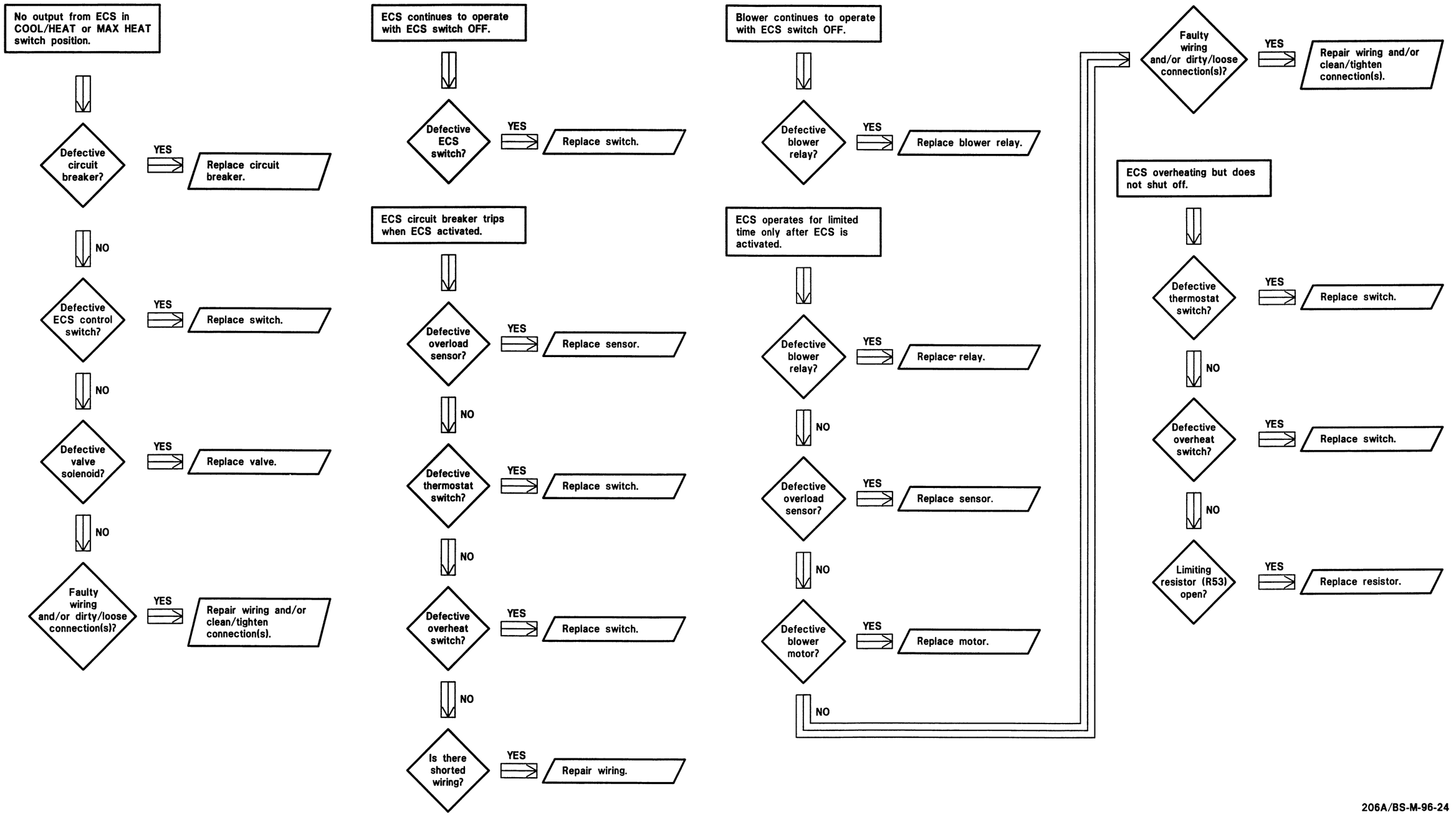

Figure 96-24. Environmental control system troubleshooting flow chart

ENGINE RELIGHT

96-256. ENGINE RELIGHT.

The engine relight kit offers automatic relight capabilities in the event of a flameout. The kit consists of a control assembly, a three-position (OFF RESET-ARMED-TEST) control switch, relays caution light, and associated wiring, tubing, and hardware. The control assembly is mounted on the engine power-and-accessories gearbox. The control switch is mounted on the upper left corner of the instrument panel. The ENGINE RELIGHT caution light is part of the caution panel assembly.

96-257. OPERATION — ENGINE RELIGHT.

1. With the ENG IGN circuit breaker closed, and the relight control switch positioned to OFF RESET, the engine relight feature is not activated. This switch position is also used to reset the relight control and extinguish the ENGINE RELIGHT caution light.

2. With the ENG IGN circuit breaker closed, and the relight control switch positioned to ARMED (ON) the relight system is ready to provide automatic relight of the engine in case of flameout. The relight control unit senses flameout and initiates relight sequence.

3. Positioning the relight control switch to TEST tests the caution circuit and illuminates the ENGINE RELIGHT caution light.

96-258. TROUBLESHOOTING — ENGINE RELIGHT.

Refer to Chapter 98 for wiring diagram, and figure 96-25 for troubleshooting chart. Perform checks necessary to isolate trouble.

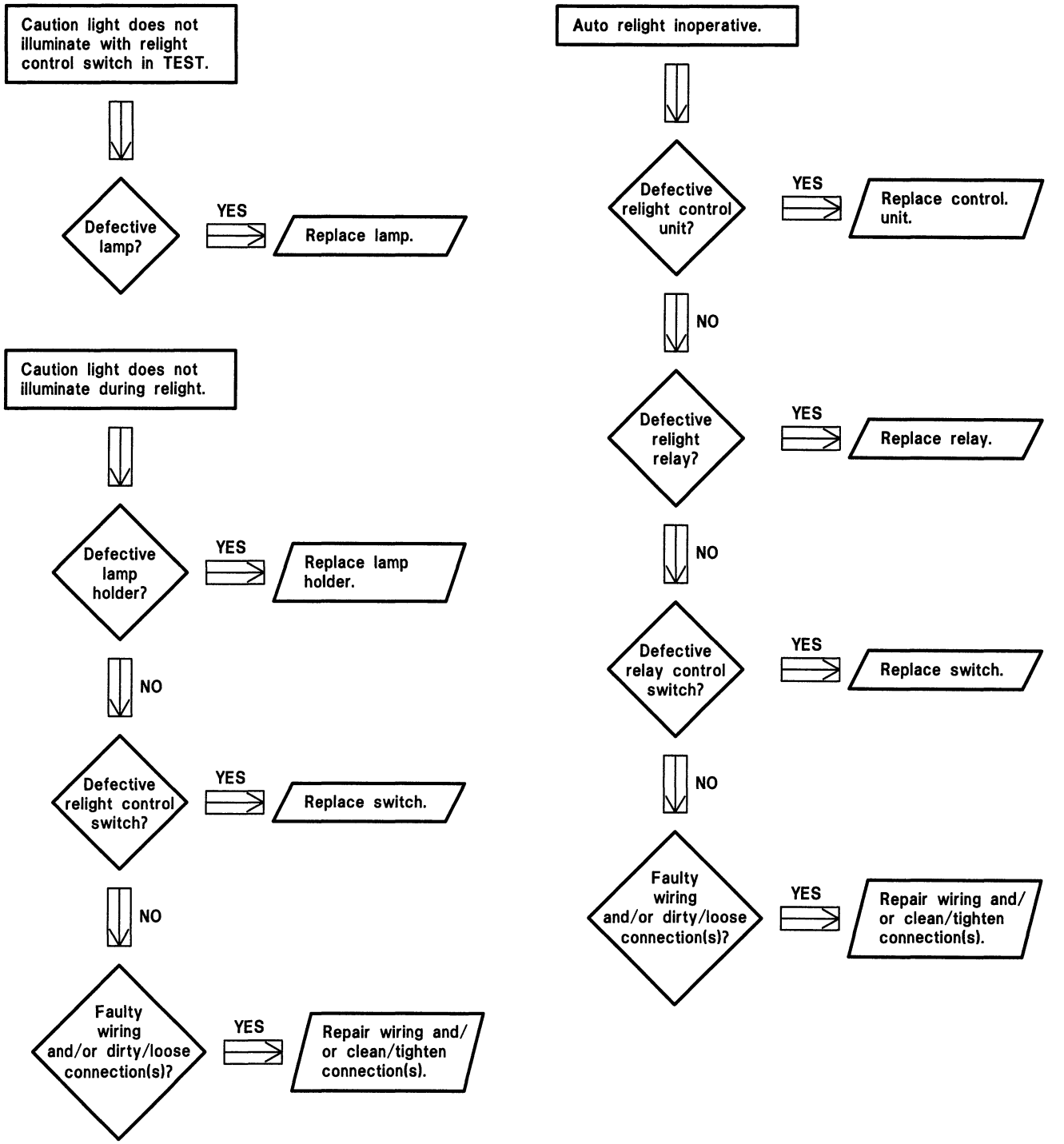

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Figure 96-25. Engine relight kit troubleshooting flow chart

FLOAT LANDING GEAR

96-259. FLOAT LANDING GEAR.

A fixed float landing gear is available for installation when water landings are predominant. The kit consists of floats, mounting, crosstubes, and adapter assemblies and necessary components and hardware for installation of position lights. The position lights are installed into the right and left ends of the forward crosstube. The float mounted lights are electrically connected directly to POS LT (switch type) circuit breaker CB5. The horizontal stabilizer mounted position must be disconnected at TB7. Installation of additional position lights is necessary to ensure adequate visibility of lights in flight.

96-260. OPERATIONAL CHECK — FLOAT LANDING GEAR POSITION LIGHTS.

1. Apply external or internal power.

2. Close POS LT circuit breaker.

3. Position lights installed in floats should illuminate, position lights on horizontal stabilizer should remain extinguished.

4. Open POS LT circuit breaker.

96-261. TROUBLESHOOTING — FLOAT LANDING GEAR POSITION LIGHTS.

Perform checks necessary to isolate trouble. Refer to Chapter 98 for wiring diagram, and see figure 96-26 for troubleshooting chart.

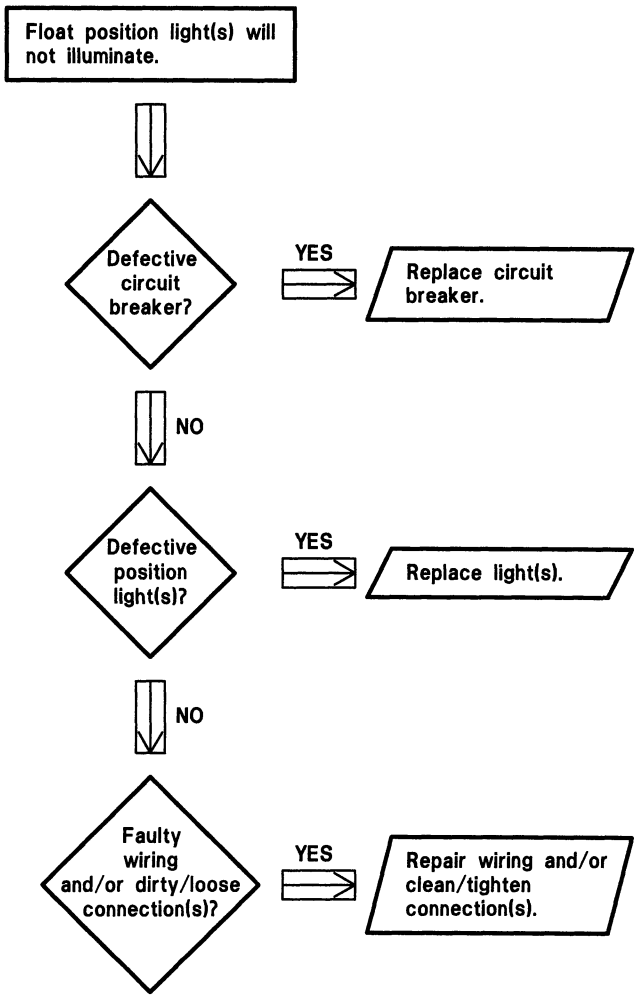

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Figure 96-26. Float landing gear position lights troubleshooting flow chart

EMERGENCY FLOTATION LANDING GEAR

96-262. EMERGENCY FLOTATION LANDING GEAR.

The inflatable flotation landing gear is available for installation when overwater operations are anticipated. The kit consists of inflatable floats, compressed nitrogen (N2) bottle, circuit breaker, switches, caution and position lights, and necessary electrical components and hardware for installation. Three float bags are attached to each skid. The N2 bottle is mounted parallel to the lateral axis of the helicopter immediately aft of the forward crosstube. The two additional position lights are installed immediately forward of the forward crosstube and illuminate when POS LT (switch type) circuit breaker CB5 is closed. The FLOAT TEST and FLOAT ARM lights are part of the caution panel assembly on top of the instrument panel. The inflation valve is connected to the N2 bottle and secured immediately adjacent thereto. The FLOAT TEST switch is located in the upper left corner of the instrument panel; the FLOAT INFLATE switch is incorporated into the collective stick; the FLOATS circuit breaker, inflation relay, and the FLOAT ARM switch are mounted in the overhead console. The FLOAT ARM switch is protected by a switch guard. Power to the inflation valve allows discharge of N2 into tubing connected to floats; floats will inflate.

96-263. OPERATIONAL CHECK — EMERGENCY FLOTATION LANDING GEAR.

1. Position lights:

a. Apply external or internal power.

b. Close the POS LT circuit breaker.

c. All four position lights should light.

d. Open POS LT circuit breaker and remove power.

2. Inflation circuitry:

a. Apply external or internal power.

b. Close FLOATS circuit breaker. Ensure FLOAT ARM switch is off (switch covered with guard).

c. Position FLOAT TEST switch to TEST. Momentarily depress FLOAT INFLATE switch on collective stick.

d. FLOAT TEST segment on caution panel should illuminate.

e. Position FLOAT TEST switch to NORMAL.

ENSURE THAT FLOAT INFLATE SWITCH ON COLLECTIVE STICK IS NOT ACTUATED WHILE PERFORMING THE FOLLOWING CHECK.

f. Position FLOAT ARM switch to ARM (lift guard).

g. FLOAT ARM segment on caution panel should illuminate.

h. Position FLOAT ARM switch to OFF.

96-264. TROUBLESHOOTING — EMERGENCY FLOTATION LANDING GEAR.

Perform checks necessary to isolate trouble. Refer to Chapter 98 for wiring diagram and figure 96-27 for troubleshooting chart.

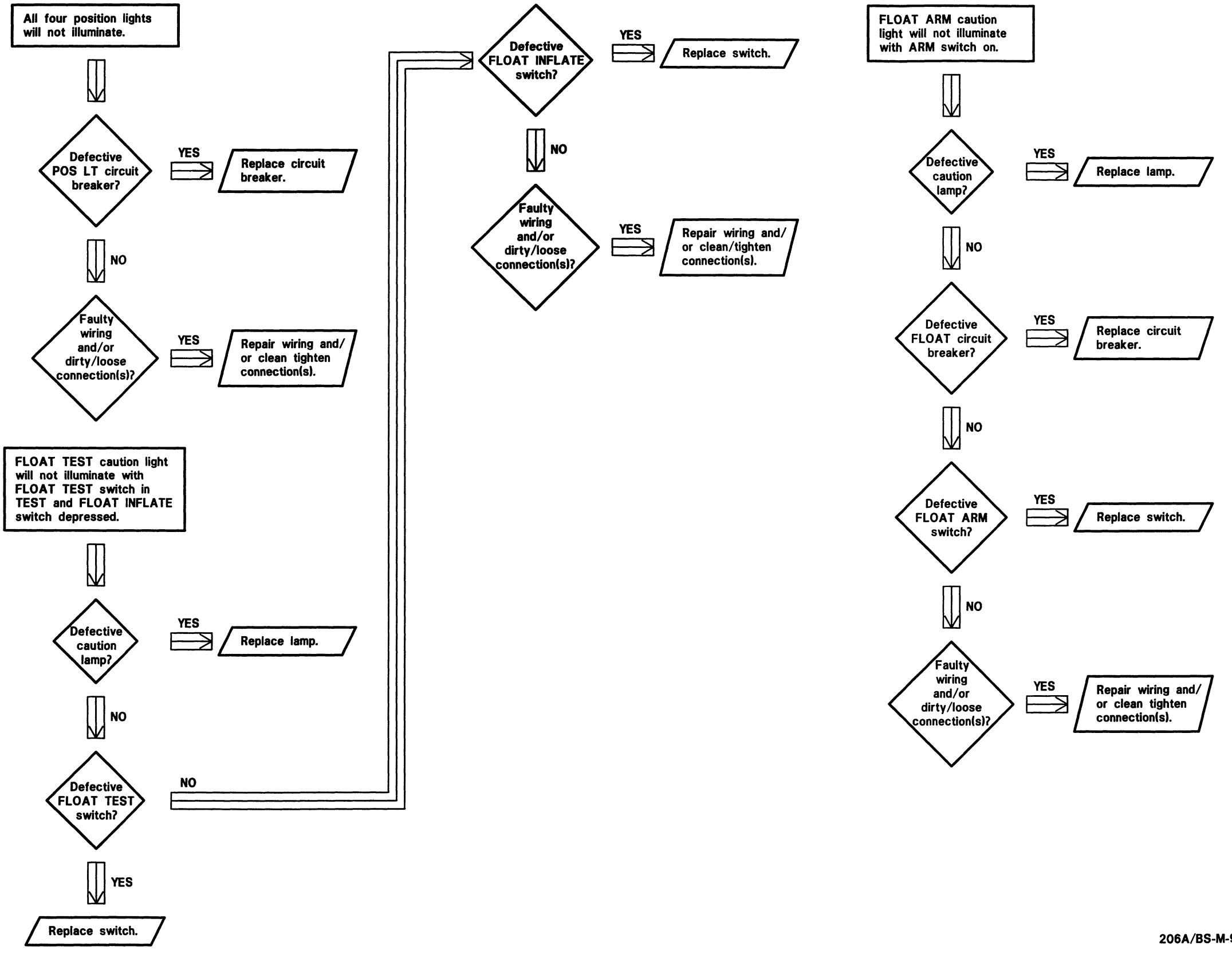


Figure 96-27. Emergency flotation landing gear troubleshooting flow chart

CARGO HOOK

96-265. CARGO HOOK.

96-266. OPERATIONAL CHECK — CARGO HOOK.

1. Apply external or internal power.

2. Close CARGO HOOK circuit breaker.

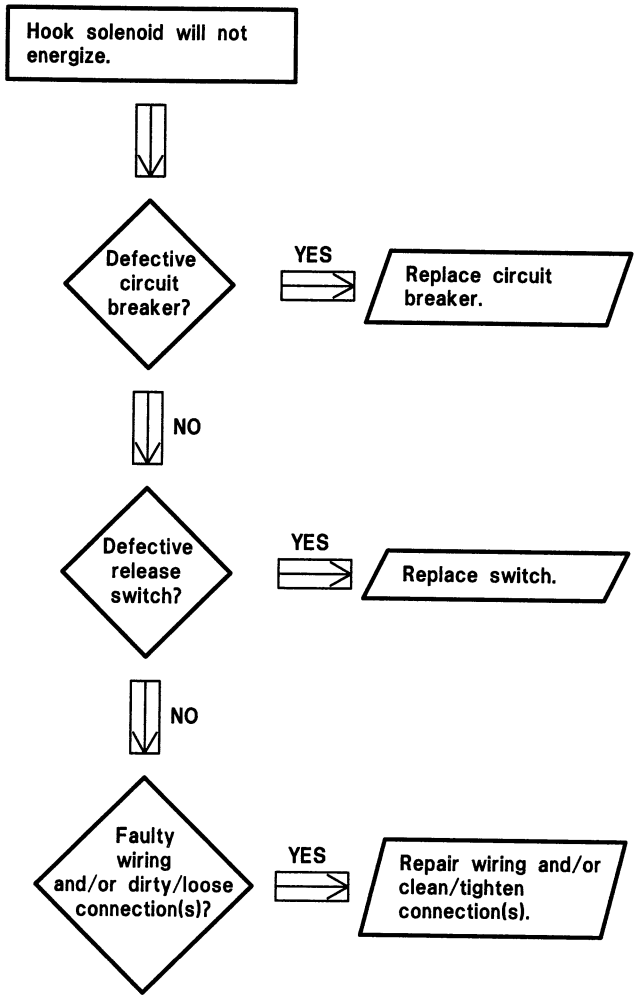
3. Close and latch cargo hook.

4. Depress the release switch on the pilot cyclic stick. The solenoid in the hook assembly should energize and cause the hook to fall open.

5. Open CARGO HOOK circuit breaker, and turn off power.

96-267. TROUBLESHOOTING — CARGO HOOK.

Perform checks necessary to isolate trouble. Refer to Chapter 98 for wiring diagram and figure 96-28 for troubleshooting chart.



206A/BS-M-96-28

Figure 96-28. Cargo hook troubleshooting flow chart

HOIST

96-268. HOIST.

The hoist is mounted above the left rear door, on a three-point support beam assembly. The winch is controlled electrically by a switch in the pilot (or copilot) cyclic stick or by the switch in the passenger compartment pistol-grip pendant. Both positions use a three-position switch (UP, DOWN, OFF), spring-loaded to the OFF position, to control movement of the winch. The hoist control panel incorporates a guarded CABLE-CUT switch and a three-position switch which is used to select the position (pilot or crew), or hoist control.The HOIST POWER and CABLE CUT circuit breakers are located in the overhead console. A warning light on the control indicates motor overheat condition. Power for the winch is controlled by a relay; the cable cutter is solenoid actuated. A load sensor prevents the winch from raising loads in excess of maximum rating. Limit switches remove motor power at either end of the hoist cable.

96-269. OPERATIONAL CHECK — HOIST.

NOTE

Ensure electrical connector (P184) is disconnected from cable cutter solenoid circuit before commencing the following check.

1. Winch operation:

a. Apply external or internal power, and close HOIST POWER circuit breaker.

b. Select PILOT on control panel.

c. Selectively position the switch on the cyclic stick to UP and DN. The hoist should travel up and down.

d. Select CREW on control panel.

e. Selectively position the pendant switch to RAISE and LOWER. The hoist should travel up and down. Position pilot switch to UP and DN. The hoist should not move.

f. Continue to raise hoist until upper limit is reached. Power to the winch motor should be removed.

g. Open HOIST POWER circuit breaker and turn off power.

2. Cable cut:

a. Disconnect electrical disconnect (P184) from cable cut solenoid.

b. Apply external or internal power. Close CABLE CUT circuit breaker.

c. Raise guard and position cable cut switch to ON.

d. 28 Vdc should be present at pin C of electrical connector (P184).

e. Open CABLE CUT circuit breaker, and turn off power.

f. Reconnect electrical connector (P184).

96-270. TROUBLESHOOTING — HOIST.

Perform checks necessary to isolate trouble. Refer to Chapter 98 wiring diagram and figure 96-29 for troubleshooting chart.

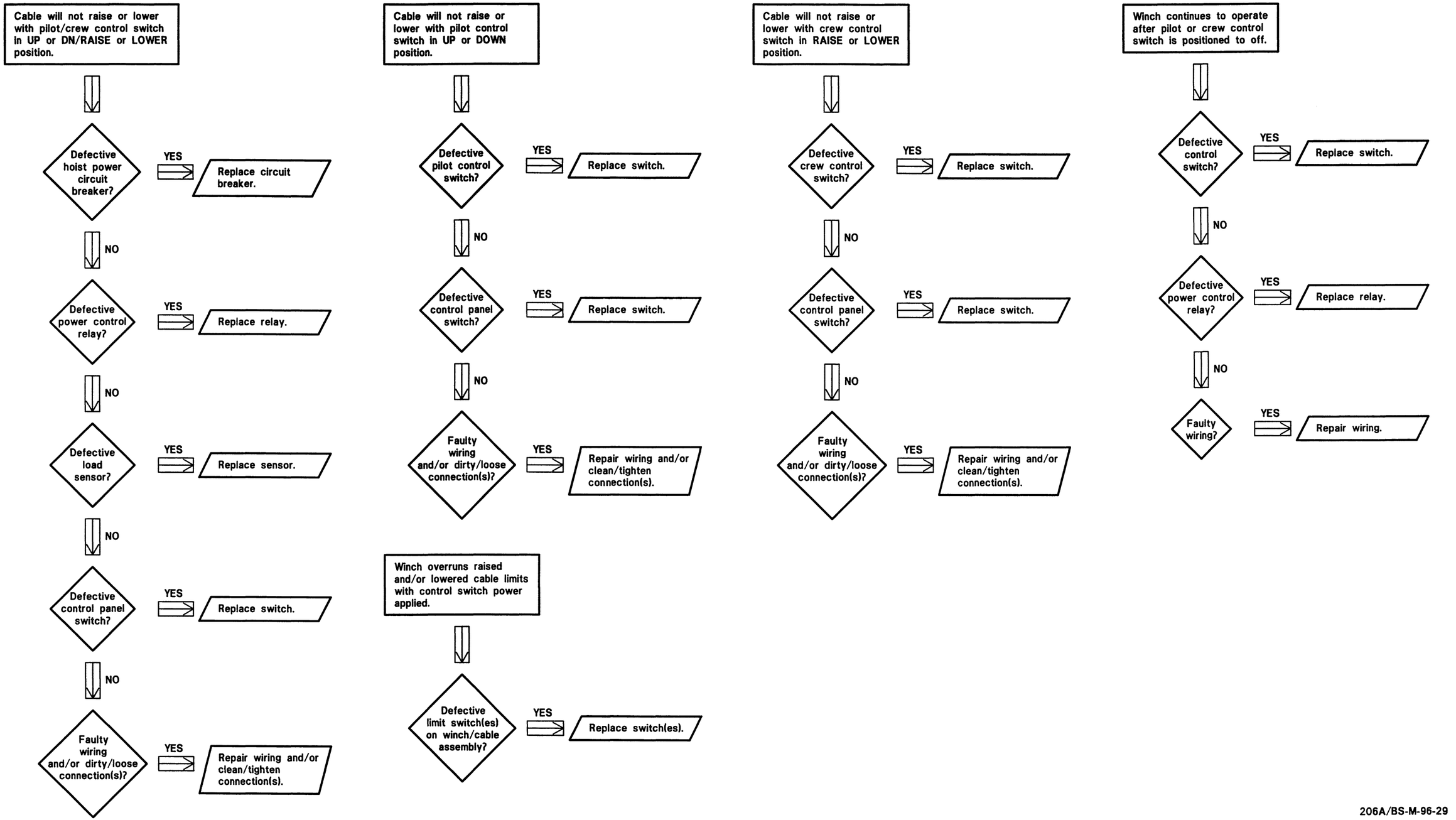


Figure 96-29. Hoist troubleshooting flow chart