ELECTRICAL SYSTEMS

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ELECTRICAL SYSTEMS

24-1. ELECTRICAL SYSTEMS.

l. During normal operation, the electrical systems use three vdc sources of power: a 150 amp main generator, a 15 amp standby generator, and a 24 vdc 17 ampere hour (AH) battery. (Refer to Figure 24-1.)

2. A 24 vdc standby battery is installed to provide power to the pilot attitude indicator, should the other three sources of power fail.

3. Two identical, but separate inverters are utilized. The first provides ac power to elements of the avionics system. The second provides ac power to the MINISTAB system.

4. Power derived from the main generator and the main battery is applied to three buses: essential 1, essential 2, and the nonessential bus. The standby generator provides power to the essential 1 bus.

5. Each bus is isolated to prevent a failure from affecting the remaining buses. The buses are switched in an automatic load-shedding sequence in the event of power failure. A voltage monitoring system permits determination of the condition of the generators, batteries, and buses, as desired.

6. In normal operation, the main generator is the primary source of power and supplies all three buses. In the event the main generator fails, the standby generator becomes the primary source of power for essential 1. The nonessential and essential 2 buses are dropped to reduce the load. (The dropped buses may be retrieved, if necessary, with the RECOVER/NORMAL NON ESS switch located on the voltmeter panel.) A main generator failure will illuminate the MAIN GEN FAIL caution light.

7. In the unlikely event of dual generator failure, the essential 1 bus and essential 2 bus will be powered by the main battery. The pilot can retrieve the nonessential bus by using the RECOVER / NORMAL NON ESS switch.

8. If for any reason the essential 1 bus becomes isolated from the main battery, valid attitude information is still available from the pilot attitude indicator for at least 30 minutes duration. The indicator is powered separately by a 24 vdc standby battery.

24-2. PRINCIPLES OF OPERATION - ELECTRICAL SYSTEM.

The principles of operation are described in the following paragraphs. (Refer to Figure 24-2.)

24-3. NORMAL OPERATION.

1. Power Off. Relay K202 is not energized and the battery is totally disconnected from the system.

2. Power On.

   a. External power unit connected. Relays K201 and K206 are energized. Power is supplied to essential 1 bus through CB223 and CB217. Power is supplied to essential 2 bus through CB218 and CB219. Power is supplied to nonessential bus through CB220.

   b. Main battery on. When OFF/BAT switch is placed to BAT, relay K202 is energized and delivers battery power to the essential 1 bus through CB215 and CB221; to essential 2 bus through CB219; and to nonessential bus through K206 and CB220.

   c. Start sequence. Relays K203 and K210 (K210 ignitor relay not in illustration) are energized and deliver battery power to the main generator, ignitor, and start circuit of the main regulator.

After the engine has started and the standby generator switch is turned on power is supplied to essential 1 bus through CB216.

3. Standard Operation. When the engine reaches ground-idle, the pilot resets then turns on the main generator which begins charging the battery through K205, K206 and K202.

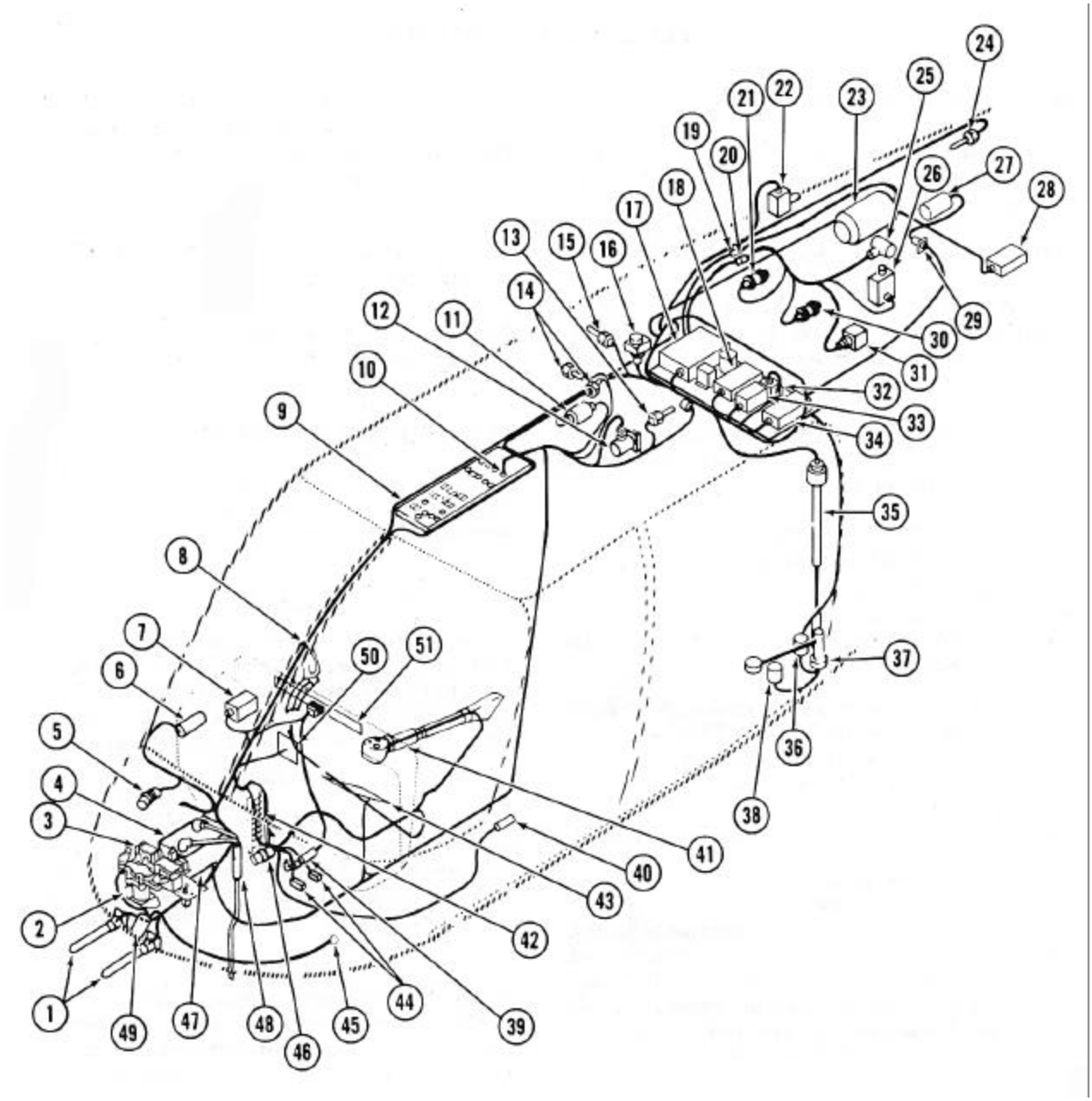


Figure 24-1. Electrical Systems Component Locations (Sheet 1 of 2)

1. **PH-500 Pitot tube**
2. **K201 External power relay**
3. **Battery compartment module**
4. **BT1 Battery**
5. **B7 Defogging blower - right**
6. **Pilot compass indicator**
7. **Pilot standby attitude indicator**
8. **S14 Cyclic trigger switch S15 Cyclic button switch**
9. **Upper circuit breaker panel**
10. **P10 and J10 Transmission disconnect**
11. **L1 Hydraulic bypass solenoid**
12. **G2 Rotor tech generator**
13. **Z3 Transmission oil temperature bulb**
14. **B11 Fuel pressure transducer**
15. **S3 Transmission oil temperature switch**
16. **B6 Fuel shutoff valve**
17. **Bus switching unit**
18. **FCS avionics inverter**
19. **Starter generator disconnect**
20. **P12 and J12 Engine disconnect**
21. **G4 Gas producer tach generator**
22. **B4 Engine heater control**
23. **G1 Starter generator**
24. **Z2 Engine oil temperature bulb**
25. **S10 Fuel filter differential pressure switch**
26. **Z1 Igniter**
27. **Standby generator**
28. **Standby battery**
29. **Standby generator disconnect**
30. **G3 Power turbine tech generator**
31. **83 Governor RPM actuator**
32. **Standby generator regulator**
33. **Main generator regulator**
34. **Avionics inverter**
35. **Z5 Upper fuel tank unit**
36. **B2 Aft fuel pump**
37. **Z4 Lower fuel tank unit**
38. **61 Forward fuel pump**
39. **S4 Transmission oil pressure switch**
40. **Copilot compass indicator**
41. **Collective stick S5 Governor RPM switch S6 Starter switch**
42. **TB1 Instrument panel terminal block**
43. **Console circuit breaker panel**
44. **Fuel indicator empty and full adjustment pots. R5 and R6**
45. **External power ground**
46. **B8 Defogging blower - left**
47. **S103 Battery over-temperature sensor module**
48. **Battery vent tubes**
49. **J16 External power receptacle**
50. **Voltmeter panel**
51. **Master caution panel**

Figure 24-1. Electrical Systems Component Locations (Sheet 2 of 2)

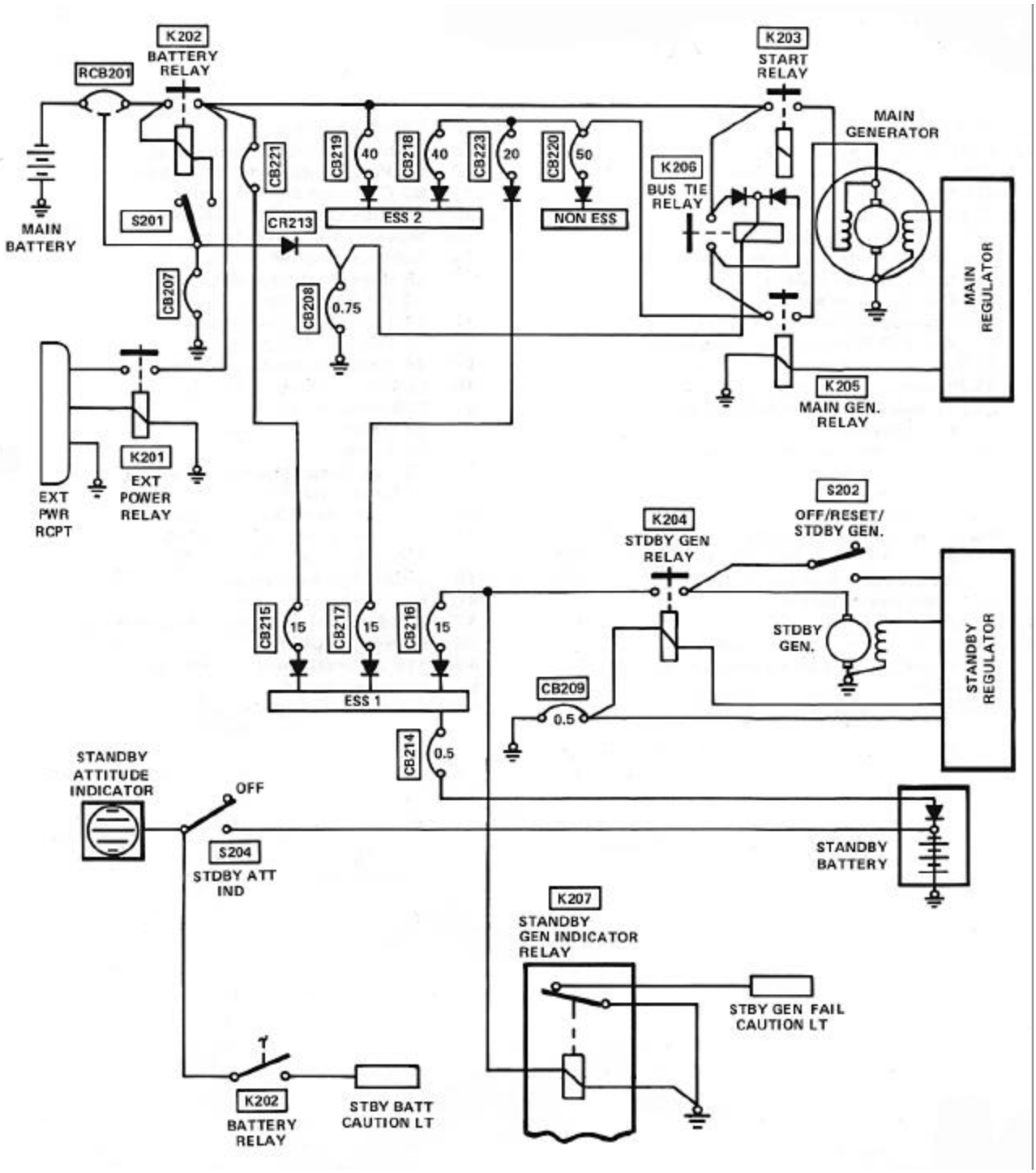


Figure 24-2. Electrical System Simplified Schematic Diagram

24-4. COMPONENT FAILURE.

1. Main Generator. Main generator failure is detected by the main voltage regulator. When the voltage regulator detects overvoltage or undervoltage the voltage will be removed from K205 coil. (Figure 24-2.) K205 de-energizes and disconnects the main generator from the circuit and provides a ground input to the MAIN GEN FAIL caution light. The main voltage regulator delivers a +28 vdc to the bus tie relay which causes it to de-energize. This automatically disconnects the nonessential load from the battery, which will now supply only the essential 1 and essential 2 loads. Should it be necessary, the nonessential bus can be recovered for temporarily powering loads through the RECOVER NORMAL NON ESS switch.

2. Standby Generator. Standby generator failure is detected by the standby regulator which de-energizes K204 and disconnects the standby generator from the circuit. Relay K207 de-energizes and provides a ground for the STBY GEN FAIL caution light. This failure does not affect the operation of the helicopter. Should the main generator fail following the standby generator failure, the only remaining power source is the main battery. Assuming a 17 AH battery charged at 50% (13.6 AH)., the helicopter can be operated approximately 1 hour using full essential 1 bus loads. Following depletion of the main battery the standby battery can be selected to power the pilot standby attitude indicator.

3. Battery. If a battery failure occurs, the symptoms may indicate a short or open circuit. During a short circuit condition, RCB201 will trigger its auxiliary switch which will de-energize battery relay (K202) and bus tie relay (K206). The main generator is removed from the circuit and the standby generator will supply essential 1 bus. Essential 2 and nonessential buses are de--energized. Essential 2 and nonessential buses are recoverable since the short circuit is isolated by relay K206. The recovery requires resetting the main generator and turning it on.

4. Short Circuit on Battery Feeder. High currents flowing from the battery will trip RCB201 and consequently K202 and K206. If the short circuit is a ground, the main generator will trip off, and the standby generator will automatically feed essentail bus 1. The main generator can be recovered in the same manner as in paragraph (3.) above. All three buses will then be available.

5. Short Circuit of a Bus. A short circuit on any bus will disconnect the bus from the system, by tripping its associated circuit breakers. A permanent short circuit will disable a bus permanently, but will not affect other buses.

24-5. MAIN BATTERY SWITCHING AND PROTECTION.

The main battery is switched and protected by a combination of relays and an overload sensor located in the battery compartment. (Refer to Figure 24-3.)

1. Manual Switching - Relay (K202). Battery on/off manual switching is accomplished through the main battery switch, S201, which provides a ground to K202 through CB207: thus energizing K202. The battery power is consequently delivered to the rest of the system. The following currents are applied to K202, in normal conditions:

   a. Initial power on - 105 amperes (approximately) assuming all equipment is on. This load should not appear since the normal procedure requires loading to be kept to a minimum prior to engine start.

   b. Starting sequence - A current of up to 360 amperes (starting surge) is drawn by the starter generator. This current decreases to 100 amperes after 16 seconds.

   c. Charging period - After the engine has reached ground-idle, the generator switch is positioned to MAIN GEN and the generator delivers current of up to 150 amperes to recharge the battery.

2. Automatic Switching - Remote Controlled Circuit Breaker (RCB201). RCB201 is the sensing element which detects an overload and trips the battery relay circuit breaker.

   a. RCB201 is a thermal device which senses the current passing through the terminals L1 to L2. When current exceeds a certain threshold, a bimetallic disc distorts and a nonconductive plunger changes the state of auxiliary contacts from S1-S2 to S1-S3. Current will continue to flow through L1, L2 until K202 is de-energized. Sl-S3 applies 28 vdc to the battery circuit breaker CB207 which trips at 1 ampere. Upon tripping, the circuit breaker removes the ground on K202 coil, which in turn is de-energized.

   b. RCB201 is designed to trip at 125 amperes nominal. It will sustain 200% of rated capacity for 10 to 20 seconds, at 77 degrees F. In some cases of high ambient temperature, low battery voltage, lengthy engine start, RCB201 may trip when no real overload condition exists. This tripping will occur only during startup. A special circuit, referred to as "Battery Protection Start Override" prevents tripping of the battery relay during the start phase.

3. Battery Protection Start Override.

   a. During the power-on operation, ground is applied to K202 coil through CB207, S201, the contacts of K208, and RCB201 auxiliary contacts. K202 is energized and the electrical system is powered.

   b. When the start switch is depressed, K208 is energized, and the ground supplied by S201 to RCB201-S1 is transferred to RCB201-S2. In this configuration, as long as the start switch remains depressed, the tripping of RCB201 will not trip CB207. If RCB201 trips, its contacts S3-Sl will energize K209. K208 remains energized and supplies a ground to the caution panel light through diode CR208. Caution light BATTERY RLY indicates that RCB201 has tripped during the start sequence. This indicates proper circuit operation and no corrective action is needed.

   c. Once the start sequence is completed, the battery will be recharged at a high current and may maintain RCB201 in the tripped status. When RCB201 returns to its normal status, a ground appears at its S1 terminal. Relays K209 and K208 de-energize. Caution light BATTERY RLY extinguishes and the battery relay remains energized through RCB201 auxiliary contacts and K208 contacts.

   d. Should an overload occur outside a start sequence, 28 vdc will appear on RCB201-S1 and trip CB207. Relay K202 de-energizes and disconnects the battery.

4. Self-Monitoring Functions - Main Battery System. Self-monitoring is provided by a combination of the auxiliary contacts of K202 and the battery switch (S201). When the relay and switch position do not agree, BATTERY RLY caution light will be illuminated. Illumination occurs when:

   a. Battery relay contacts are welded shut.

   b. Battery protection has tripped and the battery power is no longer available.

   c. Battery relay does not de-energize due to a stray ground.

   d. Battery relay de-energizes due to loss of holding current in the relay.

   e. Battery is overloaded during start.

24-6. EXTERNAL POWER SWITCHING.

1. External power switching is provided by relay K201, (Figure 24-2) which is energized by the application of 28 vdc generated by the ground power unit.

2. Diode CR210 (not shown) provides protection against polarity inversion should the ground power cables be improperly connected at the ground power unit.

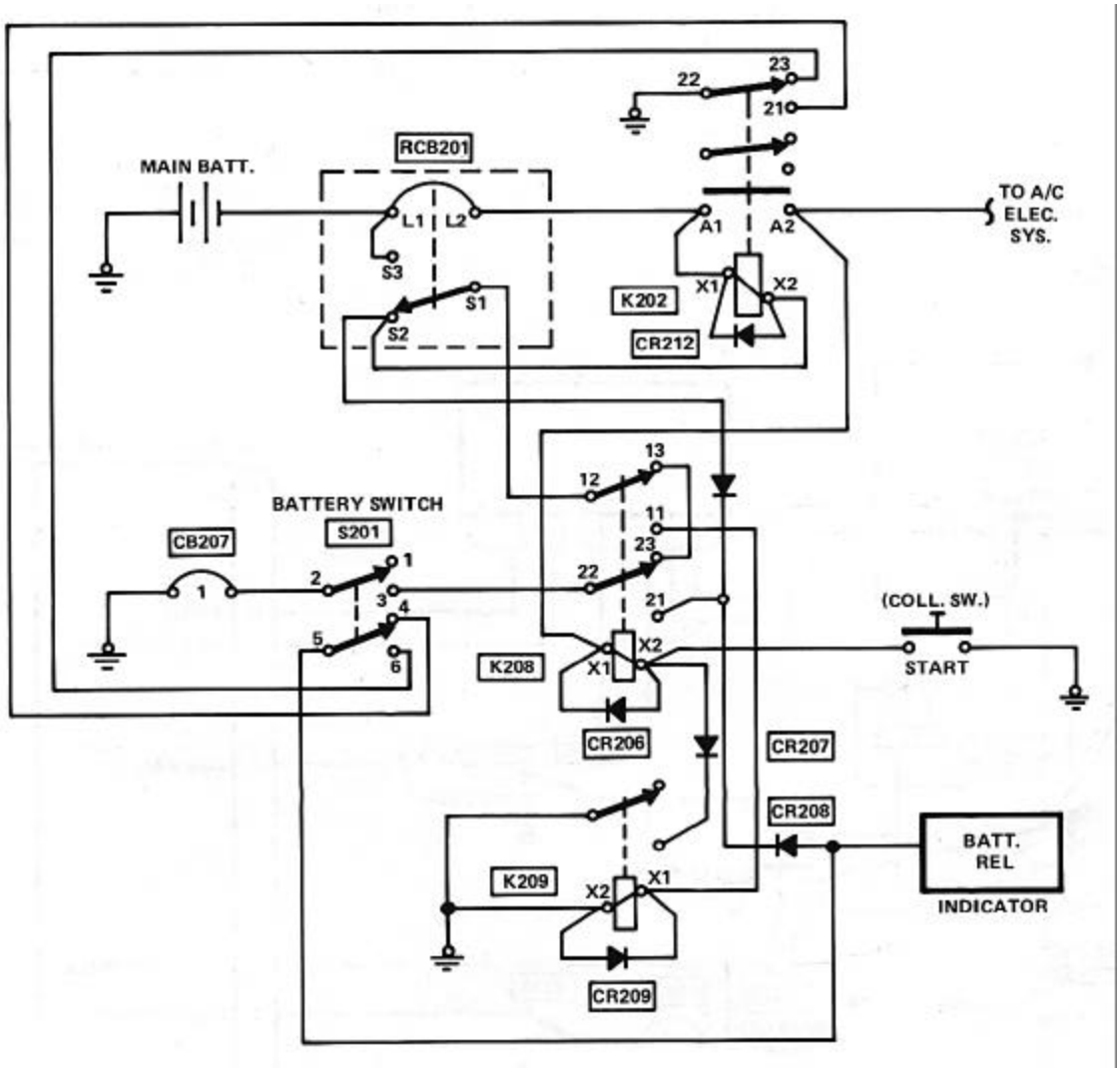


Figure 24-3. Battery Protection Start Override

24-7. MAIN GENERATOR SWITCHING AND PROTECTION.

1. Start Mode. In the start mode, power is provided to the starter windings through starter relay (K203) which is energized through CB213 and ground through start switch (S206). When the engine ignites, the pilot releases S206 which disengages starter relay K203. (Refer to Figure 24-4.).

2. Main Generator Startup. Prior to startup, the main generator must be reset so that excitation current can be delivered to the field coil. Upon reset, a latching relay is energized inside the voltage regulator. When RESET MAIN GEN switch (S290) is positioned to MAIN GEN, it delivers power to the voltage regulator (from the main generator output). The main generator is excited and delivers power to the voltage sense input of the voltage regulator, which regulates the output of the generator. When the generator voltage is within acceptable limits, the voltage regulator applies 28 vdc to the line control relay output, which energizes the main generator relay (K205) to deliver power to the rest of the system.

3. Main Generator Switching. The switching element is relay K205, which is controlled through the RESET MAIN GEN switch (S290).

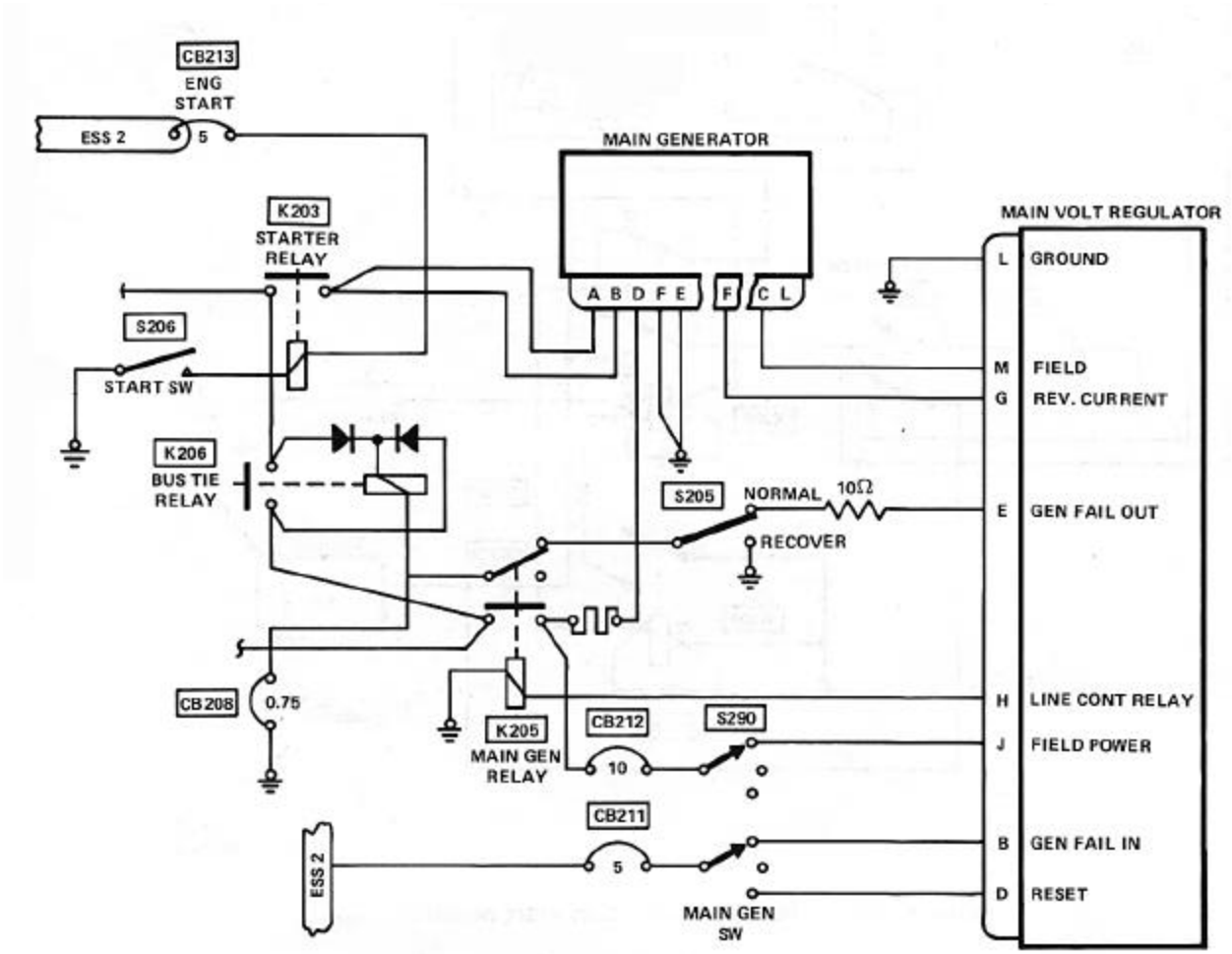


Figure 24-4. Main Generator Simplified Schematic Diagram

4. Main Generator Protection.

a. Overvoltage protection. This protection is provided internally within the main voltage regulator. An electronic circuit detects an overload and the following reactions take place:

(1) Generator excitation is cut off.

(2) Line control relay output current delivered by the main voltage regulator is interrupted, thus de-energizing K205.

(3) Main voltage regulator pin E (GEN FAIL OUT) delivers 28 vdc which trips the bus tie relay circuit breaker CB208. Consequently, the loss of the main generator automatically disconnects the battery from the nonessential bus.

b. Undervoltage protection. During an undervoltage condition, the internal generator fail relay in the main voltage regulator energizes and delivers 28 vdc to the grounded side of the bus tie relay (K206), through the auxiliary contacts of relay K205 which has tripped due to the undervoltage. The undervoltage condition triggers the same sequence as the overvoltage condition explained above.

24-8. STANDBY GENERATOR SWITCHING AND PROTECTION.

1. Switching. The standby generator is regulated and protected by the standby generator regulator. When the generator shaft begins rotating, the generator is self-excited. The voltage at pin G of standby regulator becomes 28 vdc. Relay K207, which supplies a ground to illuminate the STBY GEN FAIL caution light, becomes energized and extinguishes the light.

2. Protections.

a. Overvoltage protection. Overvoltage protection is a function of the standby regulator. (Refer to Figure 24-2.) If an overvoltage condition is detected by the standby regulator, the internal overvoltage relay trips, thus cutting off the standby regulator input current. The internal capacitor, which was charged at 28 vdc, keeps supplying current to the standby regulator. The internal overvoltage relay applies 28 vdc to the grounded side of K204 and trips CB209, thus disconnecting the standby generator system from the aircraft circuits, and illuminates the STBY GEN FAIL caution light.

b. Reset - standby generator. If the STBY GEN FAIL caution light illuminates, the pilot may attempt a reset by positioning the OFF/ RESET/ STBY GEN switch to OFF/RESET. This action will break the overvoltage circuit. By positioning the switch to STBY GEN, the generator is reset and if the fault was temporary, the generator will operate normally. If the fault was more than transitory, the generator will become disconnected, as described above, and the STBY GEN FAIL light will illuminate.

TH-57C PECULIAR DATA AND INFORMATION

24-9. WIRING IDENTIFICATION.

(Example) (1NAV102B22)

1NAV	System
1--	Circuit Function
-02	Wire Number
B	Wire Segment
22	Wire Size

24-10. WIRE CIRCUIT FUNCTION.

100	Ground
200	Power
300	Light Dimming
400	Signal
500	Data Bus
700	Logic

24-11. DC POWER SYSTEM LOADING.

DC power system loading data is given in Table 24-1. Circuit breaker decals are in parentheses.

Table 24-1. DC POWER SYSTEM LOADING

1. DC GENERATOR POWER CAPACITY AT 30 VDC:	
105 amperes (continuous)	
170 amperes (2 minutes)	
200 amperes (5 seconds)	
2. BASIC HELICOPTER OPERATING LOADS:	
The bus load distribution is summarized below:	
ESSENTIAL. 1	7.64 amperes
ESSENTIAL. 2	26.05 amperes
NONESSENTIAL	39.58 amperes
TOTAL.	73.27 amperes

Table 24-1 DC POWER SYSTEM LOADING (Cont.)			
3. ESSENTIAL 1 LOAD:			
Equipment	Circuit Breaker	Current Amperes	Circuit Breaker Part Number
3 Axis Flight Control System (FCS)	5	2.99	7277-5-5
Comm 1 (UHF COMM)	10	0.33	7277-5-10
Global Positioning System	5	3.3	7277-5-5
(RMI Right)	1	0.15	7277-5-1
(ADF)	1	0.33	7277-5-1
(ICS Right Norm)	2	0.15	7277-5-2
(ICS Left EMER)	3	0.03	7277-5-3
Map Light	5	0.02	7277-5-5
Turn and Slip, Right (TURN IND RIGHT)	1	0.04	7277-5-1
Transponder (XPDR)	3	1.08	7277-5-3
Attitude Director Indicator (ADI)	5	0.90	7277-5-5
STDBY GENERATOR RELAY	1	0.28	8500-K9
Standby Generator Relay Indicator	Sub-circuit of STDBY GEN	0.04	N/A
SENSOR R.P.M.	1	0.10	7277-5-1
(LOW ROTOR RPM)	None	0.10	N/A
(COCKPIT LT RIGHT)	5	0.17	7277-5-5
(FORCE TRIM)	1	0.10	7277-5-1
ESSENTIAL 1 TOTAL 10.11			

Table 24-1 DC POWER SYSTEM LOADING (Cont.)

4. ESSENTIAL 2 LOAD:

Equipment	Circuit Breaker	Current Amperes	Circuit Breaker Part Number
(VHF COMM)	See Below		
Transmit Receive	10	0.46 0.40	7277-5-10
(NAV 1)	3	1.12	7277-5-3
Compass/HSI (HSI)	3	1.73	7277-5-3
DME/TACAN (DME)	2	0.95	7277-5-2
(RAD ALT)	5	0.85	7277-5-5
(RMI LEFT)	1	0.15	7277-5-1
(ICS RIGHT EMER)	3	1.60	7277-5-1
(ICS LEFT NORM)	2	1.60	7277-5-5
COCKPIT LT LEFT	5	0.17	7277-5-5
(CAUTION LT)	Sub-circuit of Inst Lt	1.70	7277-5-5
INST LT (INST LT)	5	1.00	7277-5-5
(PITOT HEAT RIGHT)	5	4.00	MS24509-10
Turn and Slip, Left (TURN IND LEFT)	5	0.20	7277-5-5
Fuel/Pressure/Loadmeter	1/2	0.10	7277-5-10
Engine Instruments	Sub-circuit of Inst Lt	.125	N/A
Transmission Oil Temp/Press (ENG XMSN IND)	1/2	.125	7277-5-5
Torque Indicator	2	.75	7277-5-2
Turbine Out Temperature Indicator (TOT IND)	1/2	.125	7277-5-1-2
Fuel Quantity Indicator (FUEL QTY PRESS)	1/2	.125	7277-5-1-2
(BAT RELAY)	1	0.06	7277-5-1
RPM Governor Actuator (GOV CONT)	5	0.90	7277-5-5

Table 24-1 DC POWER SYSTEM LOADING (Cont.)			
4. ESSENTIAL 2 LOAD: (Cont.)			
Equipment	Circuit Breaker	Current Amperes	Circuit Breaker Part Number
(FUEL BOOST AFT)	10	4.00	7277-5-10
(ENG IGN)	5	0.00	7277-5-5
Fixed Landing Light (LDG LT)	25	0.00	MS24509-10
AVIONICS (and Yaw Axis) INVerter	5	0.00	7277-5-5
CDI, Horizon, Left	5	0.80	7277-5-5
Encoding Altimeter (ENC ALT)	2	0.85	7277-5-3
(FORCE TRIM)	5	0.10	7277-5-5
(YAW FCS)	5	1.50	7277-5-5
(HYD BOOST)	5	N/A	7277-5-5
(ENG START)	5	N/A	7277-5-5
(FUEL VALVE)	5	N/A	7277-5-5
Engine Heat (ENG ANTI-ICING)	5	N/A	7277-5-5
(FIRE DET)	None	N/A	N/A
Main Generator	None	0.04	MS24524-31
MAIN GENerator	None	0.60	N/A
(MAIN GEN RESET)	5	N/A	7277-5-5
(MAIN GEN FIELD)	10	N/A	7277-5-10
BUS TIE RELAY	None	0.06	N/A
ESSENTIAL 2 TOTAL:		25.44	

Table 24-1. DC POWER SYSTEM LOADING (Cont)

5. NONESSENTIAL LOAD:			
Equipment	Circuit Breaker	Current Amperes	Circuit Breaker Part Number
(PITOT HEAT LEFT)	5	4.00	MS24509-5
(DEFOG BLOWER)	5	2.80	MS24509-5
(POS LT)	5	2.08	MS24509-5
(ANTI COLT. LT)	10	1.70	MS24509-10
(FUEL BOOST FWD)	10	4.00	MS24509-10
(SEARCHLIGHT POWER)	20	25.00	7277-5-20
(SEARCHLIGHT CONT)	5	N/A	7277-5-5
(AUX RCP)	15	N/A	7277-5-15
(HEATER)	25	N/A	7277-5-20
NONESSENTIAL TOTAL		39.58	

24-12. ELECTRICAL CONTROL PANELS.

Electrical control panels are mounted in the overhead console, center instrument panel, and the lower radio console. (Refer to Figure 24-5.)

24-13. REMOVAL - ELECTRICAL CONTROL PANELS.

1. Disconnect battery.
2. Ensure all electrical power is off.
3. Disengage fasteners holding panel mounting.
4. Lift panel from mount.
5. Disconnect and tag electrical connector or connections.

NOTE

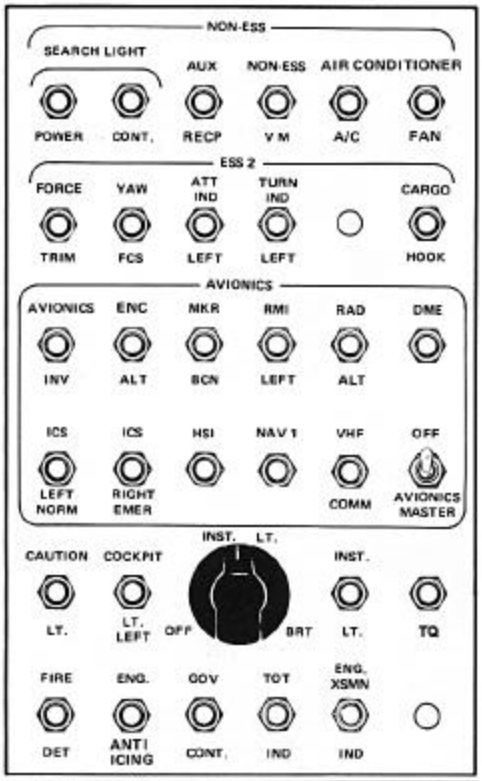
The upper circuit breaker panel is hinged and maintenance of the panel is limited, ordinarily, to replacing switches, circuit breakers, buses, and diodes.

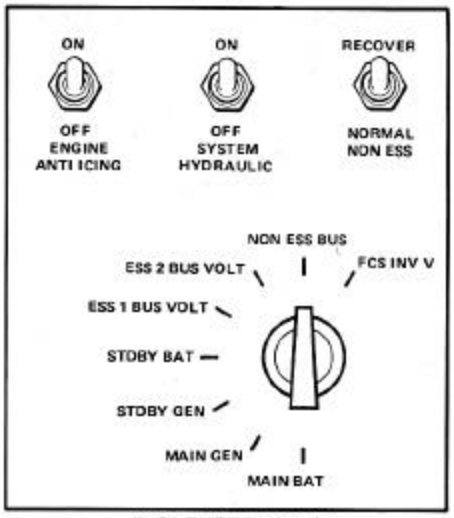
24-14. INSTALLATION - ELECTRICAL CONTROL PANELS.

1. Disconnect battery.
2. Ensure all electrical power is off.
3. Connect electrical connector on connections and remove tag/s. Carefully position panel to mount. Engage fasteners to secure panel.

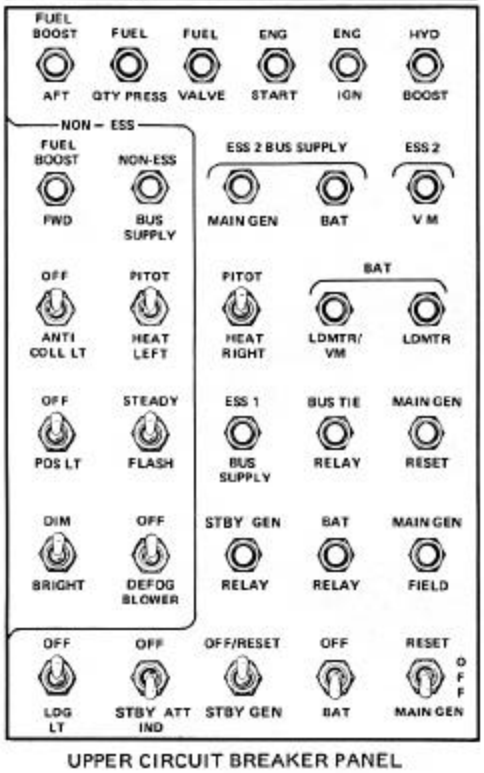
24-15. CIRCUIT BREAKERS.

The circuit breakers are mounted on the upper and lower electrical control panels. Circuits can be opened and closed by operating these trip-free, push-pull circuit breakers. (Refer to Figure 24-5.)

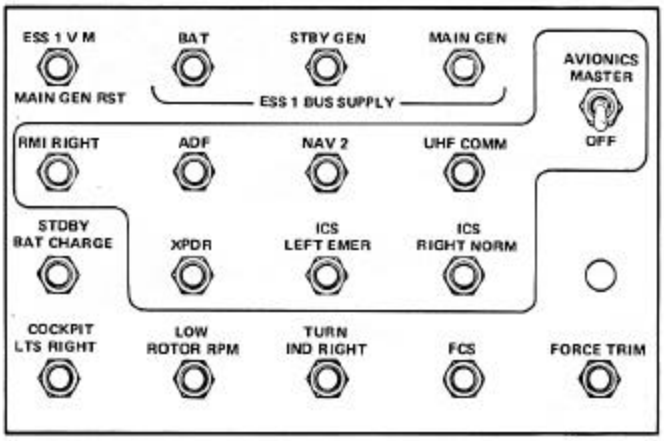




VOLTMETER PANEL



UPPER CIRCUIT BREAKER PANEL



LOWER CIRCUIT BREAKER PANEL

Figure 24-5. Electrical Control Panels

DC POWER SYSTEM

24-18. DC POWER SYSTEM.

The dc power system includes the main battery, standby battery, external power, main and standby generators, bus switching unit, and starter-igniter systems wiring diagrams.

24-19. OPERATIONAL CHECK / TROUBLESHOOTING – DC POWER SYSTEM.

Table 24-2 describes normal conditions/ actions in column one with desired results in column two. Column three lists likely causes for abnormal results in order of probability. Column four shows action required to correct apparent malfunctions.

Table 24-2. TROUBLESHOOTING DC POWER SYSTEM

PROCEDURE	RESULTS	PROBABLE CAUSE	CORRECTIVE ACTION
1. Position BAT/OFF switch to OFF.			
2. Position STBY ATT IND/OFF switch to STBY ATT IND.			
3. Position voltmeter selector switch to STDBY BAT and observe the voltmeter.	Voltmeter shall indicate 20 vdc or greater.	Defective circuit breaker. Defective standby battery. Defective switch S204. Defective wiring.	Replace circuit breaker. Replace standby battery. Replace switch. Repair wiring.
4. Observe standby (pilot) attitude indicator.	Flag has retracted.	Defective attitude indicator.	Replace attitude indicator.
5. Observe master caution panel.	STBY BAT indicator will be illuminated.	Lamp burned out. Faulty wiring.	Replace lamp. Repair wiring.
6. Position STBY ATT IND/OFF switch to OFF.			

Table 24-2. TROUBLESHOOTING DC POWER SYSTEM (CONT.)

PROCEDURE	RESULTS	PROBABLE CAUSE	CORRECTIVE ACTION
7. Close all circuit breakers and position all switches to OFF.			
8. Open BUS TIE RELAY circuit breaker.			
9. Position BAT/OFF switch to BAT and observe master caution panel.	BATTERY RLY indicator will not be illuminated.	BAT RELAY circuit breaker defective (CB207).	Replace circuit breaker.
		Relay K202 defective	Replace battery compartment module.
		Relay K208 defective	Replace switch.
		BATT/OFF switch defective.	Replace switch.
10. Position voltmeter selector switch to ESS 1 BUS VOLT and observe voltmeter.	Voltmeter shall indicate approx-imately 24vdc.	BAT circuit breaker (CB215) defective.	Replace circuit breaker.
		Main GEN RESET circuit breaker (CB224) defective.	Replace circuit breaker.
		Circuit breaker (CB221) defective.	Replace battery compartment module.
		Diode CR203 open.	Replace diode.
11. Position voltmeter selector switch to ESS 2 BUS VOLT and observe voltmeter.	Voltmeter shall indicate approxi-mately 24vdc.	ESS 2 VM circuit breaker (CB225) defective.	Replace circuit breaker.
		ESS 2 BUS SUPPLY BAT circuit breaker (CB219) defective.	Replace circuit breaker.
		Diode CR203 open.	Replace diode.
		Main battery shunt (R201) open.	Replace shunt.

Table 24-2. TROUBLESHOOTING DC POWER SYSTEM (CONT.)

PROCEDURE	RESULTS	PROBABLE CAUSE	CORRECTIVE ACTION
12. Position voltmeter selector switch to MAIN GEN and observe voltmeter.	Voltmeter shall indicate 0 vdc.	Bus switching unit defective.	Replace bus switching unit.
13. Position voltmeter selector switch to NON-ESS BUS VOLT and observe voltmeter.	Voltmeter shall indicate 0 vdc.	Diode CR204 shorted. Diode CR201 shorted. Bus switching unit defective.	Replace diode. Replace diode. Replace bus switching unit.
14. Position voltmeter selector switch to STDBY GEN and observe voltmeter.	Voltmeter shall indicate 0 vdc.	Diode CR202 shorted.	Replace diode.
15. Close BUS TIE RELAY circuit breaker.			
16. Position voltmeter selector switch to NON-ESS BUS VOLT and observe voltmeter.	Voltmeter shall indicate approximately 24vdc.	Bus switching unit defective. NON ESS VM circuit breaker (CB226) defective. BUS TIE RELAY circuit breaker (CB208) defective. NON ESS BUS SUPPLY circuit breaker (CB220) defective.	Replace bus switching unit. Replace circuit breaker. Replace circuit breaker. Replace circuit breaker.

Table 24-2. TROUBLESHOOTING DC POWER SYSTEM (CONT.)

PROCEDURE	RESULTS	PROBABLE CAUSE	CORRECTIVE ACTION
17. Position RESET/OFF/MAIN GEN switch to MAIN GEN and observe master caution panel.	MAIN GEN FAIL indicator will not be illuminated	MAIN GEN FIELD circuit breaker (CB212) defective.	Replace circuit breaker.
		Main generator defective.	Refer to paragraph 24-42.
	STBY GEN FAIL indicator will be illuminated.	Bus switching unit defective.	Replace bus switching unit.
18. Open BUS TIE RELAY circuit breaker.			
19. Position BAT/OFF switch to OFF.			
20. Position voltmeter selector switch to ESS 1 BUS VOLT and observe voltmeter.	Voltmeter shall indicate approximately 28 vdc.	MAIN GEN circuit breaker (CB217) defective.	Replace circuit breaker.
		ESS 1 MAIN GEN circuit breaker (CB223) defective.	Replace circuit breaker.
		Diode CR201 open.	Replace diode.
21. Position voltmeter selector switch to ESS 2 BUS VOLT and observe voltmeter.	Voltmeter shall indicate approximately 28 vdc.	Diode CR204 open.	Replace diode.
		ESS 2 BUS SUPPLY MAIN GEN circuit breaker (CB218) defective.	Replace circuit breaker.
22. Position voltmeter selector switch to MAIN BAT and observe voltmeter.	Voltmeter shall indicate 0 vdc.	Diode CR205 shorted.	Replace diode.
		Diode CR215 shorted.	Replace diode.

Table 24-2. TROUBLESHOOTING DC POWER SYSTEM (CONT.)

PROCEDURE	RESULTS	PROBABLE CAUSE	CORRECTIVE ACTION
23. Position STBY GEN- OFF/ RESET switch to STBY GEN and observe master caution panel.	STBY GEN FAIL indicator will not be illuminated	Bus switching unit defective.	Replace bus switching unit.
		STBY GEN RE-LAY circuit breaker (CB209) defective.	Replace circuit breaker.
		Standby generator defective.	Refer to paragraph 24-54.
		STBY GEN-OFF/RESET switch (S202) defective.	Replace switch.
24. Position RESET/OFF/MAIN GEN switch off (centered) and observe master caution panel.	MAIN GEN FAIL indicator will be illuminated.	Bus switching unit defective.	Replace bus switching unit.
25. Position voltmeter selector switch to ESS 1 BUS VOLT and observe voltmeter.	Voltmeter indication shall be 27 vdc.	Shunt R202 defective.	Replace bus switching unit.
		Diode CR202 open.	Replace diode.
		STBY GEN circuit breaker (CB216) defective.	Replace circuit breaker.
26. Position voltmeter selector switch to STDBY GEN and observe voltmeter.	Voltmeter indication shall be approximately 27 vdc.	Circuit breaker CB204 defective.	Replace bus switching unit.
27. Position RESET/OFF/MAIN GEN switch to MAIN GEN.			
28. Position voltmeter selector switch to MAIN GEN and observe.	Voltmeter indication shall be 28 vdc.	Circuit breaker CB202 defective.	Replace circuit breaker.

24-20. MAIN BATTERY SYSTEM.

The main battery system includes the battery, battery compartment module, battery switch, battery shunt, and related wiring.

24-21. OPERATIONAL CHECK - MAIN BATTERY SYSTEM.

1. Before connecting power to the battery circuitry for the first time, open ESS 2 BUS SUPPLY BAT, BUS TIE RELAY and ESS 1 BUS SUPPLY BAT circuit breakers. Position all switches to their open or off positions. Check that an open circuit exists between the positive terminal of the battery quick-disconnect and ground.
2. Connect battery and check all battery circuitry connections for tightness and correct polarity.
3. Position OFF/BAT switch to BAT position voltmeter selector switch to MAIN BAT. Check that battery voltage (approximately 24 vdc) is shown on voltmeter.
4. Position OFF/BAT switch to OFF. Check that pointer returns to lowest scale reading (15) on voltmeter.
5. On upper breaker panel, position OFF/ AVIONICS MASTER switch to OFF. On lower circuit breaker panel, position AVIONICS MASTER/OFF switch to OFF.
6. On upper circuit breaker panel, pull ENG START circuit breaker out.
7. On voltmeter panel, set RECOVER/ NORMAL NON ESS switch to NORMAL NON ESS; select ESS 1 BUS VOLT with selector switch. Check that ac and dc voltmeter returns to lowest scale reading.
8. Position OFF/BAT switch to BAT. Check voltmeter for 24 vdc.
9. Press and hold START switch on cyclic controls.
10. Check that BATTERY RLY caution light is on. Check voltmeter for 24vdc.
11. Release START switch.
12. Check that BATTERY RLY caution light is off.
13. Position OFF/BAT switch to OFF.

24-22. TROUBLESHOOTING – MAIN BATTERY SYSTEM.

Perform necessary checks to isolate trouble.

24-23. MAIN BATTERY SHUNT.

The main battery shunt is located in the upper circuit breaker panel. The shunt provides a voltage drop proportional to the battery load current (except in start) to operate the main battery position of the load meter.

24-24. MAINTENANCE – MAIN BATTERY SHUNT.

Check for broken studs, corrosion and loose terminals.

24-25. STANDBY BATTERY SYSTEM.

The standby battery system includes the standby battery, STDBY BAT CHARGE circuit breaker, OFF/STBY ATT IND switch and assorted wiring.

24-26. STANDBY BATTERY.

The standby battery is a 24vdc, 1.65 ampere-hour source of emergency power which can be utilized to power the standby Attitude Director Indicator (ADI) in the event of a total electrical system failure. This unit comprises 18 self-contained 1.25 vdc nickel-cadmium dry cells and a charging circuit. The standby battery is located at the top right forward part of the compartment immediately aft of the baggage compartment. The STDBY BAT CHARGE circuit breaker is accessible through a hole in the separation wall between the baggage compartment and left aft compartment. (Refer to Figure 24-1.)

24-27. OPERATIONAL CHECK – STANDBY BATTERY.

1. Ensure all electrical power is off.

NOTE

Do not use standby battery for prolonged ground operation of the pilot ADI. If extended ground operation is required, position the NORMAL NON ESS/ RECOVER switch (S205) to RECOVER. This conserves standby battery charge and allows the main battery to power the ADI.

Table 24-3. TROUBLESHOOTING MAIN BATTERY SYSTEM

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Battery will not hold charge.	Charging rate too low.	Adjust voltage regulator.
	Broken cell partition.	Replace battery.
	Shorted or grounded wire.	Repair wiring.
	Unbalanced cells.	Deep cycle in accordance with battery manufacturer instructions.
Excessive loss of electrolyte.	Charging rate too high. If loss is in individual cell(s) only, cell(s) is/are faulty.	Reduce charging rate.
	Cracked battery case.	Replace battery.
Battery terminals corroded or gasses and bubbling in electrlyte.	Excessive charging or discharging rate.	Adjust charging rate or load and clean terminals.
Polarity reversed.	Battery connections reversed.	Correct correction.
Actuation of battery toggle switch fails to turn on power.	Battery relay points corroded or burned.	Replace battery compartment module.
	Defective circuit breaker RCB201.	Replace battery compartment module.
	Faulty wiring between relay and battery switch.	Repair wiring.
	Defective battery toggle switch.	Replace switch.

2. On upper circuit breaker panel, position OFF/ STBY ATT IND switch to STBY ATT IND.

3. Check that STBY BAT caution light is illuminated.

4. Check that right attitude indicator begins to erect, flag is retracted, and instrument lighting is on.

5. Position OFF/STBY ATT IND switch to OFF.

24-28. REMOVAL-STANDBY BATTERY.

1. Ensure all electrical power is off.

2. Unlatch and open baggage compartment door.

3. Remove bulkhead panel to aft compartment.

4. Cover Air Conditioner condenser coils.

5. Pull circuit breaker on battery.

6. Disconnect battery connector.

7. Remove four nuts, washers, and bolts holding battery.

8. Remove battery and store in safe place.

24-29. MAINTENANCE - STANDBY BATTERY.

1. Ensure all electrical power is off.

2. Remove battery. (Refer to paragraph 24-28.)

3. Remove and tag wires to battery terminals.

4. Remove cover and inspect terminals for evidence of overheating or damaged threads.

5. Inspect cage for electrolyte leakage evidenced by either a liquid or white powdery carbonates.

DO NOT USE METALLIC BRUSHES.

6. Clean exterior with suitable solvent.

7. Perform a deep cycle of standby battery as follows:

a. Check battery voltage between the 22.5(+) and GND (-) terminals.

b. Check each half battery voltage between the +11.25V and GND (-) terminals and between the +22.5V and 11.25V terminals.

NOTE

If battery voltage is 18 volts or less, perform step c. If difference between each half battery voltage is greater than 1 volt, perform step c. If battery voltage is greater than 18 volts and if difference between each half battery voltage is less than 1 volt, proceed to step d.

c. Charge battery. Connect a constant current source of 150 ± 10 milliamperes to battery for 16 hours. Proceed to step d.

d. Discharge battery (Refer to paragraph 24-32A).

NOTE

If discharge time is greater than 2 hours, perform step e. If discharge time is less than 2 hours, repeat steps c and d again.

e. Charge battery. Connect a constant current source of 150 ± 10 milliamperes to battery for 16 hours. Proceed to step f (battery is suitable for service).

NOTE

If discharge time is still less than 2 hours, after three charge-discharge cycles, remove battery from service.

f. Identify and connect wires to battery terminals.

g. Install cover.

h. Install standby battery. (Refer to paragraph 24-35.)

24-30. DISCHARGE - STANDBY BATTERY.

CAUTION!

NEVER DISCHARGE BATTERY BELOW 18 VDC. DISCHARGES BELOW THIS LEVEL, WILL CAUSE CELL REVERSAL AND DESTRUCTION OF THE BATTERY.

1. Connect a 750 ± 10 milliampere load across the battery terminals. Note time and constantly monitor both battery voltage and difference between half battery voltages.

NOTE

Half battery voltages are read between the 22.5V (+) and 11.25V (+) terminals, and the 11.25V (+) and GND (-) terminals.

2. Terminate dicharge when either battery voltage falls to 18 vdc or difference between half battery voltage is 1 vdc. Note time.

24-31. SHELF STORAGE - STANDBY BATTERY.

NOTE

Batteries are normally shipped fully charged.

For batteries that have been stored more than 45 days, reconditioning is required. For batteries stored less than 45 days a top charge of 150 milliamperes for four hours is required.

NOTE

It is not recommended to leave battery on a trickle charge while in storage.

24-32. RECONDITIONING - STANDBY BATTERY.

1. Charge battery. Connect a contant current source of 75 milliamperes to battery for 48 hours.
2. Discharge battery (Refer to paragraph 2432A).
3. Charge battery. Connect a constant current source of 150 ± 10 milliamperes to battery for 14 hours. Return battery to storage.

24-33. INSTALLATION - STANDBY BATTERY.

1. Ensure all electrical power is off.
2. Unlatch and open baggage compartment door.
3. Remove bulkhead panel to aft compartment.
4. Support battery in place, install four bolts, washers, nuts.
5. Connect battery connector.
6. Install bulkhead panel to aft compartment.

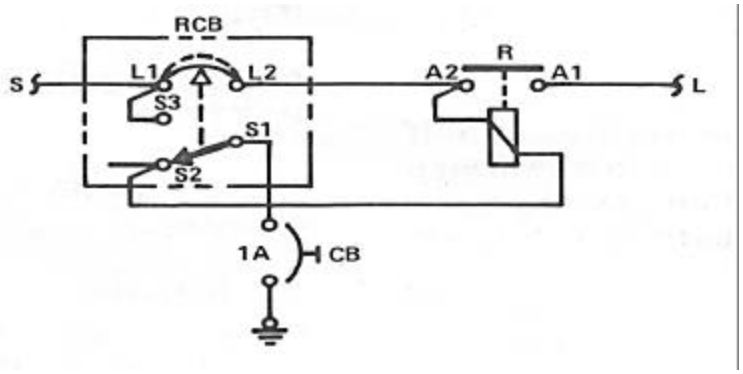


Figure 24-6. Typical RCB Circuit

7. Push in circuit breaker on battery.

8. Perform operational check. (Refer to paragraph 24-29.)

24-34. BATTERY COMPARTMENT MODULE.

1. The battery compartment module is composed of the main battery relay K202, CB221, RCB201, and battery protection start override circuit. It is located forward of the main battery, in the battery compartment.

2. The main battery relay is an electrically operated switch controlling battery current to the essential buses. Circuit breaker CB221 provides essential 1 battery feeder protection.

3. The RCB protects the main battery bus and is an integral part of the battery protection start override circuit.

4. The RCB is a thermal device which senses the current passing through the terminals Ll and L2. When current exceeds a certain threshold, a bi-metallic disc distorts and a non-conductive plunger changes the state of contacts from Sl-S2 to Sl-S3. Current will continue to flow through Ll-L2 until some form of switching device (i.e., relay R with contacts Al-A2) is operated by S1-S3. This device is not a switch in itself. (Refer to Figure 24-6.)

5. Current from source S is controlled by relay R. When R is energized, current passes from Ll to L2 in RCB to load L. Relay R will be energized by a control 28 vdc (either switched or hardwired to 28 vdc from source S) and enabled by a ground passing through RCB S2-Sl and circuit breaker CB. RCB S3 is hardwired to Ll source 28 vdc.

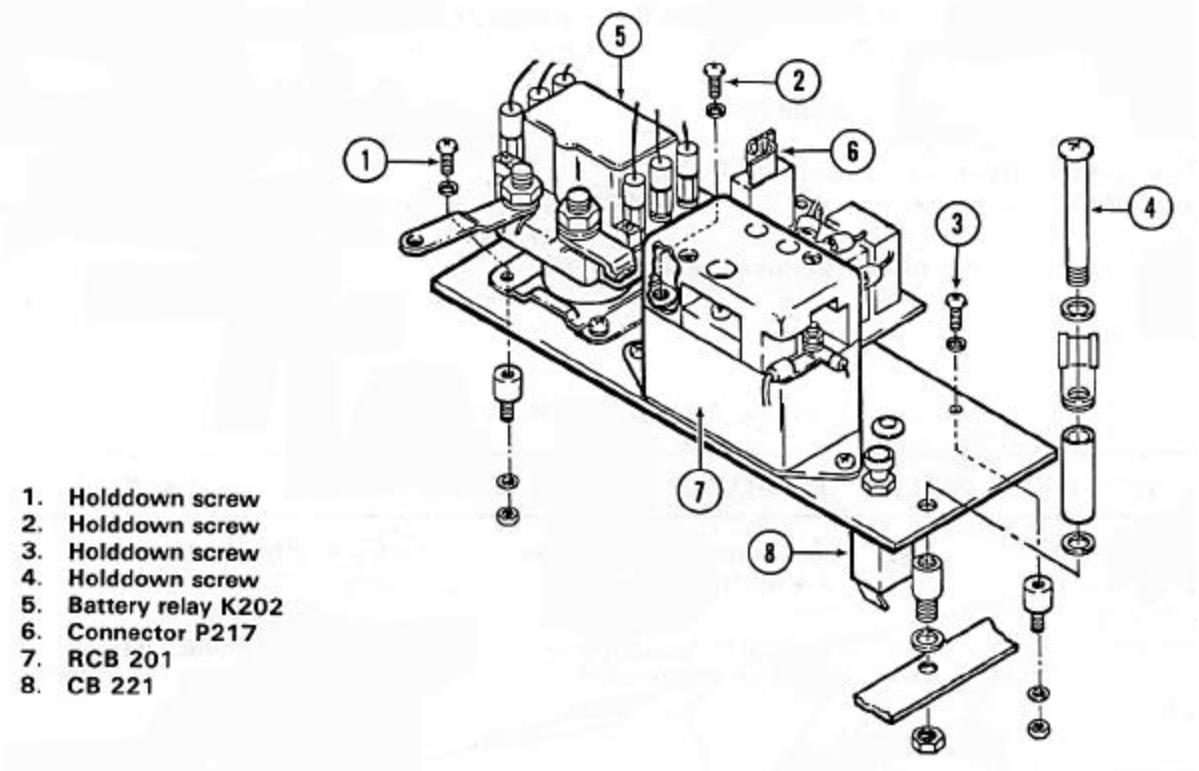


Figure 24-7. Battery Compartment Module

6. When the current passing through Ll-L2 exceeds a specified threshold, contacts S1-S2 change to Sl-S3.

7. When Sl-S2 break, the ground is removed from the coil of Relay R.

8. When S1-S3 make, 28 vdc is applied directly to ground through CB, which immediately trips.

9. With load L disconnected, the bi-metallic disc in RCB will return to normal position and SlS3 will change to Sl-S2. Relay R, however, will remain de-energized due to CB being tripped. Resetting CB will energize relay R.

24-35. REMOVAL- BATTERY COMPARTMENT MODULE.

1. Unlatch and raise nose access door.

2. Disconnect battery.

3. Retract protective nipple at K201/A2 to expose relay terminal.

4. Tag and remove wire No. P6A2 from K201/A2, tape, and label.

5. Protect wire end with protective tape.

6. Remove bus bar from K201/A2 and K202/A1.

7. Tag and remove the 5 wires from K202/23, 22, 21, 13, 12 using pin extractor.

8. Remove connector P217.

9. Remove cover on RCB201.

10. Tag and remove wire No. ELS223A04 from RCB201/L1.

11. Refer to Figure 24-7 and remove four holddown screws and lift module enough to get to terminals.

12. Tag and remove wire No. ELS224C12.

13. Protect wire with protective tape.

14. Lift free.

24-36. INSPECTION OF BATTERY COMPARTMENT MODULE.

Refer to paragraph 24-8 of basic manual for inspection procedures for miscellaneous electrical components.

24-37. INSTALLATION - BATTERY COMPARTMENT MODULE.

1. Unlatch and raise nose access door.

2. Remove protective tape and connect wire No. ELS224C12 to CB221 terminal.

3. Refer to Figure 24-7 and install battery compartment module and install four hold down screws.

4. Connect wire No. ELS223A04 to RCB201/L2.

5. Install cover on RCB201.

6. Connect P217 connector.

7. Identify, remove protective tape, and connect five wires to K202/23, 22, 21, 13, 12.

8. Connect bus bar to K201/A2 and K202/Al.

9. Remove protective tape and connect wire No. P6A2 to K201/A2.

10. Position protective nipple to cover relay terminal.

11. Operational check dc power systems. (Refer to paragraph 24-19.)

24-38. STANDBY GENERATOR SYSTEM.

1. The standby generator system includes the standby generator, standby voltage regulator, standby generator relay, standby generator OFF/ RESET/STBY GEN switch, and standby generator shunt.

2. The standby generator furnishes standby power at a regulated voltage to the essential 1 bus. The generator is self-exciting through its main output. The standby generator relay switches the generator to its bus when the voltage regulator senses adequate generator voltage.

3. The regulator provides voltage regulation, overvoltage, undervoltage, and short circuit protection. The OFF/RESET/STBY GEN switch in the open (OFF/RESET) position simulates undervoltage to the voltage regulator which opens the generator relay.

24-39. STANDBY GENERATOR.

The standby generator is located on the left side of the engine. It is mounted on an auxiliary pad of the gearbox. The generator is cooled by ram air picked up by an external scoop and ducted into the generator housing. This unit is used for standby power.

24-40. TROUBLESHOOTING – STANDBY GENERATOR SYSTEM.

Perform checks as necessary to isolate trouble. (Refer to Table 24-4.)

24-41. REMOVAL–STANDBY GENERATOR.

1. Open engine cowling door, left side.
2. Remove bolt attaching ground leads to air duct.
3. Remove bolts and washers connecting inner and outer duct halves.
4. Disconnect and tag electrical leads connected to the A and F posts on generator.
5. Remove nuts and washers attaching generator to drive pad.
6. Remove generator and gasket.

24-42. INSPECTION-STANBY GENERATOR.

1. Check for terminal damage.
2. Clean exterior of unit with a clean cloth moistened in solvent (C304) and wipe dry.

DO NOT USE COMPRESSED AIR FOR INTERNAL CLEANING OF GENERATOR.

Table 24-4. TROUBLESHOOTING STANDBY GENERATOR SYSTEM

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Generator produces voltage but loadmeter indicates zero.	Loadmeter circuit breakers open.	Close circuit breakers.
		Repair or replace wiring.
	Defective loadmeter or loadmeter circuit.	Replace defective loadmeter. Tighten connections.
	Defective circuit breakers in loadmeter circuit.	Replace bus switching unit.
No generator voltage output as indicated on loadmeter.	Open circuit in voltage regulator.	Replace regulator.
	Open generator field circuit.	Repair wiring or replace generator.
	Armature burned out or shaft sheared.	Replace generator.
	Brushes excessively worn.	Replace generator.
	Defective connections.	Replace or tighten connections.
	Armature or field winding short circuited.	Replace generator.
	Brushes binding.	Replace generator.
	Commutator dirty, rough, or pitted.	Replace generator.
Movement of regulator adjustment does not alter voltage within normal range.	Defective regulator.	Replace regulator.
	Defective wiring.	Replace wiring.
Loadmeter fluctuates.	Voltage regulator unstable.	Replace regulator.

3. Inspect for oil, dirt, or other foreign material that has entered the unit. Remove material with a vacuum cleaner only.

4. Rotate splined shaft to check for chafing and bearing condition.

5. Inspect commutator for a smooth bright appearance with a light filming.

6. Inspect brushes:

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

   b. Brushes must have more than 0.700 inch overall length.

   c. Brushes must be properly seated. (A 100% seat in direction of rotation and a minimum 75% axially is mandatory.)

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

NOTE

If brushes pass inspection they must be returned to their exact original position in the generator.

7. If any of the brushes require replacement before the next scheduled overhaul or inspection, tag unit with appropriate comment and send to next higher maintenance level.

24-43. REPAIR-STANDBY GENERATOR.

Replace standby generator if it does not meet inspection requirements.

24-44. INSTALLATION - STANDBY GENERATOR.

1. Mount new gasket on engine drive pad.

2. Install generator with the post pointing directly outboard. Secure generator using washers and nuts.

3. Mount inner-half of cooling duct on generator with bolt and washer.

4. Attach ground leads to generator with bolt and washer.

5. Connect the correct electrical leads to F and A+ posts using nuts and washers.

6. Attach outer half of cooling duct to inner half with bolts and washers.

7. Close cowling door.

8. Perform operational test of generator. (Refer to paragraph 24-19.)

24-45. STANDBY GENERATOR RESET SWITCH.

The standby generator reset switch is located on the overhead console. This switch is a single pole, single throw switch. In the STDBY GEN position it applies the generator output voltage to the standby voltage regulator sensing input. In the OFF/RESET position the circuit is open.

24-46. MAINTENANCE - STANDBY GENERATOR RESET SWITCH.

Refer to paragraph 24-5 of this manual for repair of miscellaneous electrical components.

24-47. STANDBY GENERATOR SHUNT.

The standby generator shunt is located in the bus switching unit. It provides a voltage drop proportional to the generator load current to operate the standby generator position of the loadmeter.

24-48. MAINTENANCE - STANDBY GENERATOR SHUNT.

Refer to paragraph 24-56 for repair of bus switching unit.

24-49. STANDBY VOLTAGE REGULATOR.

The standby voltage regulator is a solid-state, linear regulator, which obtains its operating power from the standby generator. The voltage regulator has a built-in over-voltage trip-out relay which has been preset and cannot be field adjusted. The regulator is equipped with an external voltage adjustment control screw. The standby voltage regulator is located on the equipment shelf above the baggage compartment, behind the main voltage regulator.

24-50. REMOVAL - STANDBY VOLTAGE REGULATOR.

1. Position OFF/BAT and RESET/OFF/ MAIN GEN switches to OFF.

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

3. Remove mounting screws and washers.

4. Lift regulator from shelf.

24-51. INSPECTION - STANDBY VOLTAGE REGULATOR.

1. Visually inspect regulator case for cracks and damaged contact pins. Check for secure mounting of regulator.

2. Check electrical connector for damage or corrosion.

3. Replace regulator if inspection requirements are not met.

24-52. INSTALLATION -STANDBY VOLTAGE REGULATOR.

1. Position regulator and install mounting screws and washers.

2. Remove cap or tape and connect electrical connector to regulator.

24-53. ADJUSTMENT - STANDBY VOLTAGE REGULATOR.

NOTE

Ensure that the main voltage regulator is adjusted to the prevalent ambient temperature requirement. Refer to paragraph 24-48.

1. Close all circuit breakers.

2. Position OFF/BAT switch to BAT.

3. Position OFF/RESET/STBY GEN switch to STBY GEN and position RESET/OFF/MAIN GEN switch to MAIN GEN.

4. Position both AVIONICS MASTER/OFF switches to AVIONICS MASTER.

5. Turn on the following systems:

   a. All avionics equipment.

   b. Compass.

   c. Standby attitude indicator.

   d. Searchlight.

   e. Landing lights.

   f. Cockpit lighting.

   g. Anti-collision lights.

   h. Left and right pitot heaters.

   i. Blower.

   j. Defogger.

   k. Heater or air conditioning.

   l. Position STAB and FT switches on controller to ON.

6. Position voltmeter selector switch to STDBY GEN.

NOTE

Ensure that engine is turning at 100% NR while making adjustments.

7. Adjust standby voltage regulator adjustment for a 10%, maximum indication on the loadmeter.

NOTE

If a 101% indication on the loadmeter cannot be obtained, connect a multimeter (scale set to read +28 vdc) with the positive lead to terminal 1 of standby generator shunt and the negative lead to helicopter ground. Adjust standby voltage regulator adjustment clockwise until its voltage (as indicated on multimeter) becomes approximately equal to the main voltage regulator setting. Loadmeter indication will now increase.

8. Turn searchlight and landing lights off. Return helicopter systems to normal loads.

9. Loadmeter shall indicate beteen 0 and 101%.

24-54. BUS SWITCHING UNIT.

The bus switching unit is mounted on the right side of the equipment shelf above the baggage compartment. It comprises a metal tray containing relays, circuit breakers, diodes, shunts, etc., which are a part of the two generator systems, the bus system and the starter system.

The functions of the relays are as follows:

1. Starter Relay (K203): Energized when starter switch is pressed. When energized, completes circuit between the start motor, battery relay and the external power relay.

2. Ignition Start Relay (K210): Energized when starter switch is pressed. When energized completes circuit between essential 2 bus and engine igniter. Also, completes circuit between essential 2 bus and main generator regulator (generator shunt winding excitation).

3. Bus Tie Relay (K206): Energized when power is applied (battery relay or external power relay energized). When energized completes circuit between battery relay and external power relay and the three buses: essential l, essential 2, and non-essential.

4. Main Generator Relay (K205): When energized completes circuit between generator (output terminal) and contacts of K206 bus tie relay.

5. Standby Generator Relay (K204): Energized when standby generator begins operating. When energized completes circuit between standby generator and essential 1 bus. Also completes circuits between standby generator and voltmeter selector.

6. Standby Generator Indicator Relay (K207): Energized when standby generator begins operating. When energized removes ground from STBY GEN caution light, extinguishing light. When de-energized provides ground for STBY GEN light, illuminating light.

24-55. REMOVAL - BUS SWITCHING UNIT.

1. Disconnect battery.

2. Check that all electrical power is off.

3. Remove mounting screws and washers securing cover and lift cover free.

4. Disconnect P222 connector and tape or install plastic cover.

NOTE

When disconnecting wires, tag wires, and tape ends using electrical tape.

5. Disconnect wire No. P6B2 from K203/A2.

6. Disconnect wire No. ELS226B08 from K205/Al.

7. Disconnect wire No. P9B8 and P9A8 from R203/1.

8. Disconnect wire No. K4C8 and K4A8 from K203/Al.

9. Disconnect wire No. ELS225A12 from R202/2.

10. Disconnect wire No. ELS20OD16 and ELS200016 from K204/Al.

11. Remove mounting screws and washers, and ground wire securing bus switching unit to equipment shelf.

12. Remove bus switching unit.

24-56. INSPECTION -BUS SWITCHING UNIT.

Inspect all bus switching unit components.

24-57. REPAIR - BUS SWITCHING UNIT.

Replace bus switching unit if any component fails to meet inspection requirements.

24-58. INSTALLATION - BUS SWITCHING UNIT.

1. Check that all electrical power is off.

2. Position bus switching unit and install ground wires, mounting screws and washers.

NOTE

Identify and remove tag and protective tape from each wire called for at each wire installation step.

3. Connect wire No. ELS20OD16 and ELS200016 to K204/Al.

4. Connect wire No. ELS225A12 to R202/2.

5. Connect wire No. P9B8 and P9A8 to R203/1.

6. Connect wire No. K4C8 and K4A8 to K203/Al.

7. Connect wire No. ELS226B08 to K205/Al.

8. Connect wire No. P6B2 to K203/A2.

9. Remove tape or plastic cover from P222 and connect.

10. Position cover and install mounting screws and washers.

11. Operational check DC power system. (Refer to paragraph 24-19.)

24-59. STARTER SWITCH.

The starter switch, located in the collective stick switch box, is a double pole, single throw, two position toggle switch. The switch is covered with a red safety guard. When the guard is down against the switch cover plate, the starter switch is in the off position. When switch is positioned to ON (safety guard up), the starter relay actuates and completes the power circuit to the starter.

24-60. STARTER RELAY.

The starter relay is located in the bus switching unit and supplies direct current to the starter when the starter switch is actuated.

24-61. OPERATIONAL CHECK — STARTER SYSTEM.

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

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

BEFORE CONNECTING EXTERNAL ELECTRICAL POWER, VERIFY THE FOLLOWING:

1. **ESS 1 BUS SUPPLY BAT CIRCUIT BREAKER IS OPEN**
2. **BUS TIE RELAY CIRCUIT BREAKER IS OPEN**
3. **BOTH AVIONICS MASTER/OFF SWITCHES ARE OFF.**

3. Connect external power source at external power receptacle.

4. Energize external power source. Close ESS 1 BUS SUPPLY BAT, BUS TIE RELAY, ESS 2 BUS SUPPLY BAT, and ENG START circuit breakers. Position both AVIONICS MASTER/ OFF switches to AVIONICS MASTER. Actuate starter switch on pilot collective stick. Check that external power source voltage (approximately 28 vdc) is present at end of wires K4B8 and K4D8 while starter switch is actuated.

5. Release pilot starter switch. Check for zero voltage at open end of wires K4B8 and K4D8.

6. Close ENG IGN circuit breaker. Actuate START switch on pilot collective stick. Check that external power source voltage is present at open end of wire J3B18.

7. Release START switch. Check that there is zero voltage at open end of wire J3B18.

8. Open ENG START and ENG IGN circuit breakers.

9. De-energize external power source.

10. Connect wires K4B8 and K4D8 to starter-generator and wire J3B18 to igniter unit. Check that connections are tight and secure.

11. On upper circuit breaker panel, open BUS TIE RELAY and ESS 2 BUS BAT circuit breakers.

12. On upper circuit breaker panel, position OFF/ AVIONICS MASTER switch to OFF. On lower circuit breaker panel, position AVIONICS MASTER/OFF switch to OFF.

13. On upper circuit breaker panel, open ENG START circuit breaker.

14. On voltmeter panel, position RECOVER/ NORMAL NON ESS switch to NORMAL, select ESS 1 BUS VOLT with selector switch.

15. Check voltmeter for lowest scale indication.

16. Position OFF/BAT switch to BAT. Check voltmeter for 24 vdc.

17. Press and hold starter switch on cyclic controls.

18. Check that BATTERY RLY caution light is illuminated. Check voltmeter for 24 vdc.

19. Release starter switch.

20. Check that BATTERY RLY caution light is extinguished.

21. Position OFF/BAT switch to OFF.

24-62. TROUBLESHOOTING — STARTER-IGNITER SYSTEM.

Perform checks as necessary to isolate trouble. (Refer to Table 24-5.)

Table 24-5. TROUBLESHOOTING STARTER-IGNITER SYSTEM

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Starter fails to operate when START switch is actuated.	Defective starter circuit breaker.	Replace circuit breaker.
	Defective battery.	Replace battery.
	Switch contacts corroded or burned.	Replace switch.
	Defective wiring or loose connections.	Repair wiring. Tighten connections.
	Defective starter relay.	Replace buss switching unit.
	Brushes excessively worn.	Replace starter-generator.
	Armature burned out.	Replace starter-generator.
Starter fails to produce sufficient RPM during start cycle (15% as indicated on gas producer tachometer).	Excessive wear to bearing, or brushes.	Replace starter-generator.
	Low battery voltage.	Check and recharge battery as necessary.
Igniter fails to operate when START switch is actuated.	Igniter circuit breaker open or defective.	Reset tripped igniter circuit breaker or replace faulty breaker.
	START switch contact corroded or burned.	Replace switch.
	Loose connections or defective wiring.	Tighten connections or repair wiring.
	Defective igniter.	Replace igniter.

24-63. STATIC INVERTERS.

There are two static inverters. Each inverter is a solid state unit which takes a 28 vdc input and produce a 400 Hz, 115 vac and 26 vac output. Both inverters are located on the forward equipment shelf above the baggage compartment. No. 2 inverter, is for the flight control system and No. 1 is for avionics and flight control system yaw axis.

24-64. REMOVAL- STATIC INVERTER.

1. Remove electrical connector and tape or install plastic cap.
2. Remove mounting screws and washers.
3. Lift inverter free.

24-65. INSPECTION - STATIC INVERTER.

Visually inspect static inverter case for physical damage that could impair normal efficient operation of the unit. (Damaged case, damaged or corroded electrical connector pins.)

24-66. REPAIR - STATIC INVERTER.

Replace unit if inspection requirements are not met.

24-67. INSTALLATION - STATIC INVERTER.

1. Position unit and install mounting screws and washers.
2. Remove tape or plastic cap.
3. Install electrical connector.

24-68. FORCE TRIM SWITCH.

The FORCE TRIM switch is a normally closed, momentary push button switch, furnished as part of the cyclic stick grip assembly and establishes a force trim off-condition when depressed, then on when released.

24-69. REMOVAL - FORCE TRIM SWITCH.

1. Position OFF/BAT switch to OFF.
2. Pull switch outward from cyclic grip until terminals and switch wiring is clear of grip.

CAUTION!

UTILIZE CARE DURING SWITCH REMOVAL AND INSTAILATION TO PREVENT CHAFING OR DAMAGE TO WIRES.

NOTE

Ensure that loose wires do not fall inside of grip.

3. Desolder switch wires from terminals.
4. Identify and tape wire ends.

24-70. INSTALLATION - FORCE TRIM SWITCH.

1. Remove tape and solder switch wires to terminals as identified.
2. Position switch wires inside of grip ensuring wires are free of obstruction.
3. Firmly seat switch in grip.

24-71. FLIGHT CONTROL SYSTEM (FCS) OFF SWITCH.

The FCS switch is a normally closed, momentary push button switch, furnished as part of the cyclic stick grip assembly and establishes a FCS off or on condition (depending on system condition) when depressed. Removal and installation procedures are identical to that of the FORCE TRIM switch.

24-72. FUEL LOW CAUTION SYSTEM

The fuel low caution system provides a visual indication of a low fuel condition, 20 U.S. gallons of fuel remaining. This includes the fuel low level float switch (Figure 24-8) and the FUEL LOW caution light located on the caution panel light assembly.

24-73. OPERATIONAL CHECK - FUEL LOW CAUTION SYSTEM.

1. Defuel helicopter.
2. Position OFF/BAT switch to BAT and close CAUTION LT circuit breaker.

3. Verify FUEL LOW caution light is illuminated.

4. Open CAUTION LT circuit breaker and position BAT switch to OFF.

5. Add 21 U.S. gallons of fuel.

6. Position OFF/BAT switch to BAT and close CAUTION LT circuit breaker.

7. Verify FUEL LOW caution light is extinguished.

24-74. TROUBLESHOOTING - FUEL LOW CAUTION SYSTEM.

1. Perform checks as necessary to isolate trouble. (Refer to Table 24-)

24-75. REMOVAL - FUEL LOW LEVEL FLOAT SWITCH.

1. Disconnect battery.

2. Defuel helicopter.

3. Disconnect electrical wire from float switch. (Figure 24-8).

4. Remove bolts and washers from fitting and drain and fuel cell. Remove fitting and drain and float switch.

5. Remove and discard packing.

24-76. INSPECTION - FUEL LOW LEVEL FLOAT SWITCH.

Inspect fuel low level float switch for clogged parts, damaged threads, cracks and corrosion.

24-77. INSTALLATION - FUEL LOW LEVEL FLOAT SWITCH.

1. Install new packing (Figure 28-1) on fitting and drain. Position fitting and drain in fuel cell, align bolt holes. Install washers and bolts through fitting and drain and fuel cell. Torque bolts 25 - 35 inch-pounds.

2. Connect electrical wire to float switch.

3. Refuel helicopter and check for leaks.

4. Connect battery.

Table 24-6. TROUBLESHOOTING FUEL LOW CAUTION SYSTEM

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
FUEL LOW caution light fails to illuminate.	Defective or open circuit breaker.	Push in or replace defective circuit breaker.
	Lamp burned out.	Replace lamp.
	Defective wiring.	Repair or replace faulty wiring.
	Defective fuel low level float switch.	Replace fuel level float switch.
FUEL LOW caution light fails to extinguish.	Defective wiring.	Repair or replace faulty wiring.
	Defective fuel low level float switch.	Replace fuel low level float switch.
	Less than 20 U.S. gallons of fuel in fuel cell.	Add fuel to fuel cell.

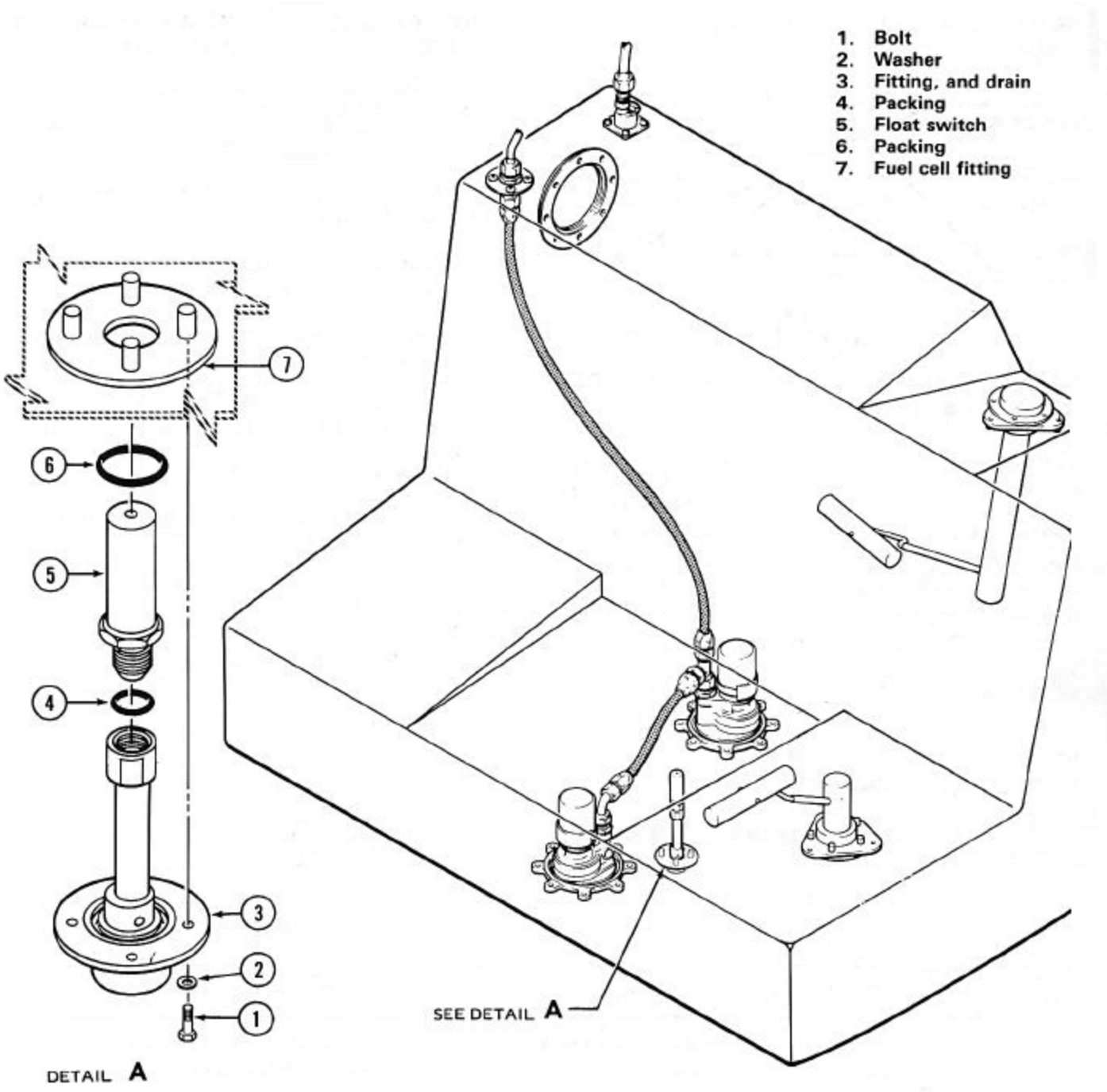


Figure 24-8. Fuel Low Level Float Switch

Table 24-7. TROUBLESHOOTING HYDRAULIC LOW PRESSURE CAUTION SYSTEM

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
HYDRAULIC PRESSURE caution light fails to illuminate.	Defective or open circuit breaker.	Push in or replace defective circuit breaker.
	Lamp burned out.	Replace lamp.
	Defective wiring.	Repair or replace faulty wiring.
	Defective pressure switch.	Replace faulty pressure switch.
HYDRAULIC PRESSURE caution light fails to extinguish.	Defective wiring.	Repair or replace faulty wiring.
	Defective pressure switch.	Replace defective pressure switch.

24-78. HYDRAULIC LOW PRESSURE CAUTION SYSTEM.

The hydraulic low pressure caution system provides a visual indication of low hydraulic pressure. This system includes the HYDRAULIC PRESSURE caution light (illuminates when pressure is less than 400 psi) located on the caution panel light assembly and hydraulic pressure switch located three inches forward of the hydraulic line filter.

24-79. OPERATIONAL CHECK -HYDRAULIC LOW PRESSURE CAUTION SYSTEM.

1. Ensure electrical power is off.
2. Disconnect hydraulic pressure switch connector P114.
3. Position OFF/BAT switch to BAT and close CAUTION LT circuit breaker.
4. Caution panel light assembly indicator HYDRAULIC PRESSURE will be extinguished.
5. Connect a temporary short between pin B of P114 and helicopter ground.
6. Caution panel light assembly indicator HYDRAULIC PRESSURE will be illuminated.
7. Remove temporary short.
8. Open CAUTION LT circuit breaker and position OFF/BAT switch to OFF.
9. Connect hydraulic pressure switch connector P114.

24-80. TROUBLESHOOTING - HYDRAULIC LOW PRESSURE CAUTION SYSTEM.

Perform checks as necessary to isolate trouble. (Refer to Table 24-7.)

24-81. REMOVAL - HYDRAULIC PRESSURE SWITCH.

1. Ensure electrical power is off.
2. Ensure hydraulic pressure is zero.
3. Disconnect electrical connector from pressure switch.
4. Place wiping cloths around pressure switch to catch hydraulic fluid.
5. Disconnect hydraulic lines from pressure switch.
6. Remove pressure switch.

24-82. INSPECTION - HYDRAULIC PRESSURE SWITCH.

1. Inspect hydraulic pressure switch for clogged pressure ports, cracks, corrosion and leakage.
2. Inspect for worn or damaged threads.

24-83 INSTALLATION - HYDRAULIC PRESSURE SWITCH.

1. Install new packing at each end of pressure switch.
2. Connect and secure hydraulic lines to pressure switch.
3. Connect electrical connector to pressure switch.

24-84. FIRE DETECTOR SYSTEM.

The fire detector system provides a visual indication of an engine fire. The system includes a FIRE DET circuit breaker, overheat detector, FIRE DETECTOR TEST switch and ENG FIRE caution light.

24-85. OPERATIONAL CHECK – FIRE DETECTOR SYSTEM.

1. Ensure electrical power is off.
2. Disconnect P176 connector.
3. Check for continuity at J176 between pins B and C.
4. Check for continuity at J176 between pins E and D.
5. Check for an open circuit at J176 between pins B and E.
6. Check for an open circuit at P176 between pins C and D.
7. Position OFF/BAT switch to BAT, and close FIRE DET circuit breaker.
8. Check for 28 vdc at P176 pin B.
9. Open FIRE DET circuit breaker.
10. Position OFF/BAT switch to OFF. Connect P176.
11. Position OFF/BAT switch to BAT.
12. Close FIRE DET and CAUTION LT circuit breakers.
13. Press FIRE DETECTOR TEST switch.
14. Ensure that ENG FIRE caution light illuminates.

24-86. TROUBLESHOOTING - FIRE DETECTOR SYSTEM.

Perform checks as necessary to isolate trouble. (Refer to Table 24-8.)

24-87. REMOVAL – FIRE DETECTOR.

1. Ensure electrical power is off.
2. Disconnect electrical connector from fire detector (sensing unit).
3. Disconnect thermocouple wire from sensing unit.

NOTE

If thermocouple wire requires removal, slide wire loose from spacing clips and remove.

4. Remove mounting screws and washers.
5. Remove fire detector (sensing unit).

Table 24-8. FIRE DETECTOR SYSTEM , TROUBLESHOOTING

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
ENG FIRE caution light will not illuminate.	Defective or open circuit breaker.	Push in or replace defective circuit breaker.
	Defective wiring.	Repair or replace wiring.
	Defective overheat detector.	Replace overheat detector.
	Defective FIRE DETECTOR TEST switch.	Replace FIRE DETECTOR TEST switch.
	ENG FIRE bulb burned out.	Replace ENG FIRE bulb.
ENG FIRE caution light is illuminated when power is applied.	Defective wiring.	Repair or replace wiring.
	Defective overheat detector.	Replace overheat detector.
	Defective FIRE DETECTOR TEST switch.	Replace FIRE DETECTOR TEST switch.

24-88. INSPECTION-FIRE DETECTOR.

1. Position fire detector (sensing unit) on shelf and install washers.

NOTE

If thermocouple wire was removed, position wire inline with mounting clips and sensing unit and slide wire into mounting clips.

2. Connect thermocouple wire to sensing unit.

3. Connect electrical connector to sensing unit.

24-89. ANTI-COLLISION LIGHT.

A second anti-collision light is located under the helicopter fuselage forward of the tail boom. This system includes the OFF/ANTI-COLL LT circuit breaker/switch. HS power supply and anti-collision light. The HS power supply is located at the lower left aft corner of the compartment aft of the baggage compartment. The TH-57 upper and lower anti-collision light lenses are safety wired to a locally manufactured bracket (Figure 24-9) to prevent loss of lenses in flight. Refer to 24-90 and 24- 91 for directions to accomplish this procedure.

24-90. ANTI-COLLISION LIGHT SHIELD

1. Locally manufacture anti-collision light deflector shield in accordance with figure 24-9. The shield is constructed from 2024 Aluminum of .025 thickness.

24-91. UPPER AND LOWER ANTI-COLLISION LIGHT LENS

1. To safety both the upper and lower lenses, thread .032 stainless steel safety wire through one hole on the deflector shield, around the anti-collision light lens, through the other hole and twist the wire tight enough to secure the lens but not so tight as to distort the deflector shield.

24-92. OPERATIONAL CHECK - ANTI-COLLISION LIGHT.

1. Position OFF/BAT switch to BAT.

2. Position ANTI-COLL LT circuit breaker/switch to ANTI-COLL LT.

3. Observe that anti-collision light flashes.

24-93. TROUBLESHOOTING – ANTI-COLLISION LIGHT.

Perform checks as necessary to isolate trouble. (Refer to Table 24-9.)

24-94. SEARCHLIGHT.

A controllable searchlight is located in the lower center section of the nose. Switches on the collective switch box provide for searchlight control. The searchlight system includes:

SEARCH LIGHT CONT circuit breaker and OFF/LDG LT circuit breaker, SEARCH LT STOW/OFF/ON switch, SEARCH LT UP/ DOWN/L/R switch and the searchlight.

24-95. OPERATIONAL CHECK - SEARCHLIGHT.

1. Position OFF/BAT switch to BAT. Close NON-ESS BUS SUPPLY circuit breaker, OFF/

Table 24-9. TROUBLESHOOTING ANTI-COLLISION LIGHT

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Anti-collision light fails to flash.	Defective or open circuit breaker/switch.	Push in or replace circuit breaker/switch.
	Defective wiring.	Replace wiring.
	Defective power supply.	Replace power supply.
	Defective anti-collision light flash tube.	Replace anti-collision light flash tube.

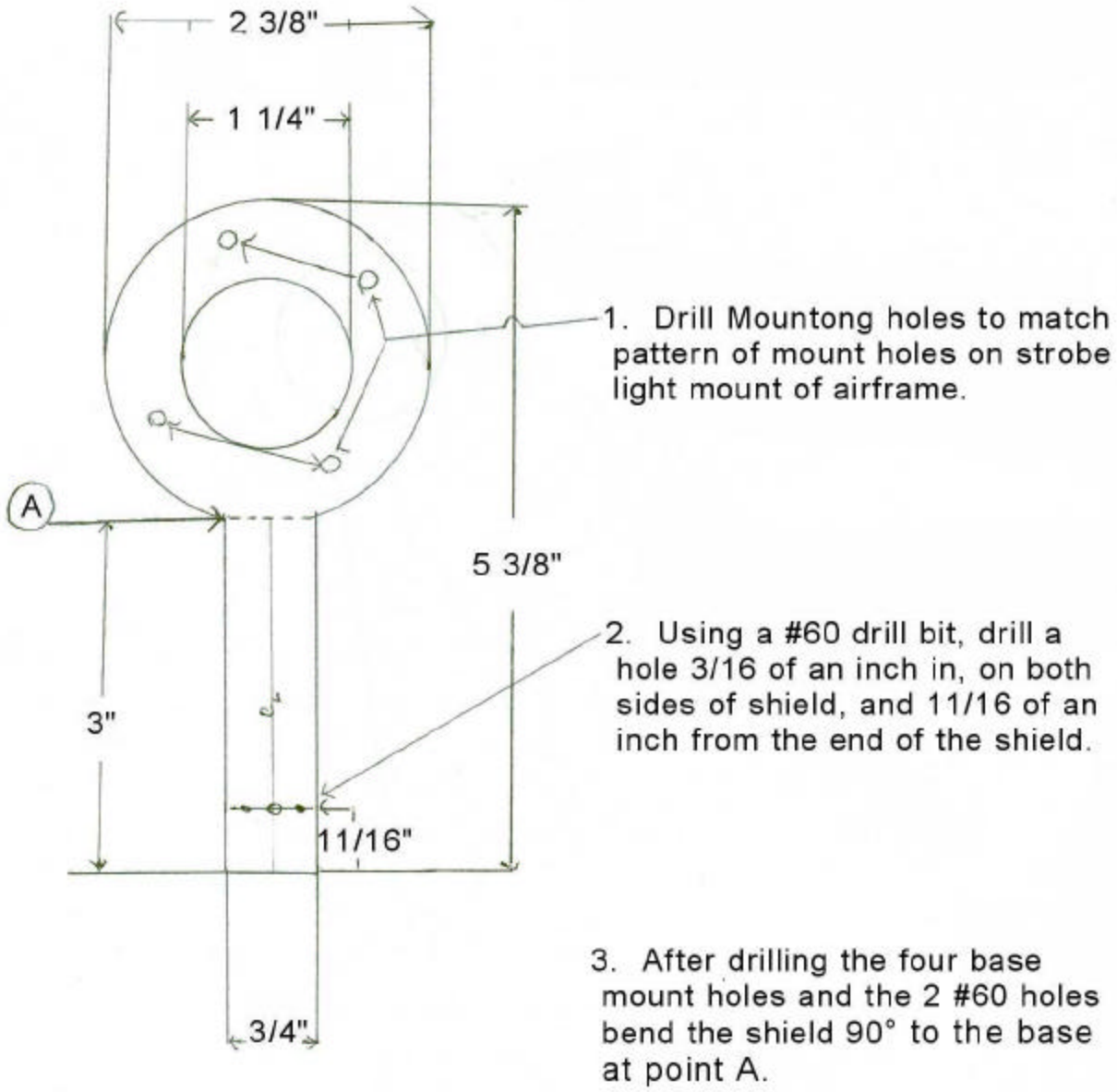


Figure 24-9. Anti-Collision Light Shield

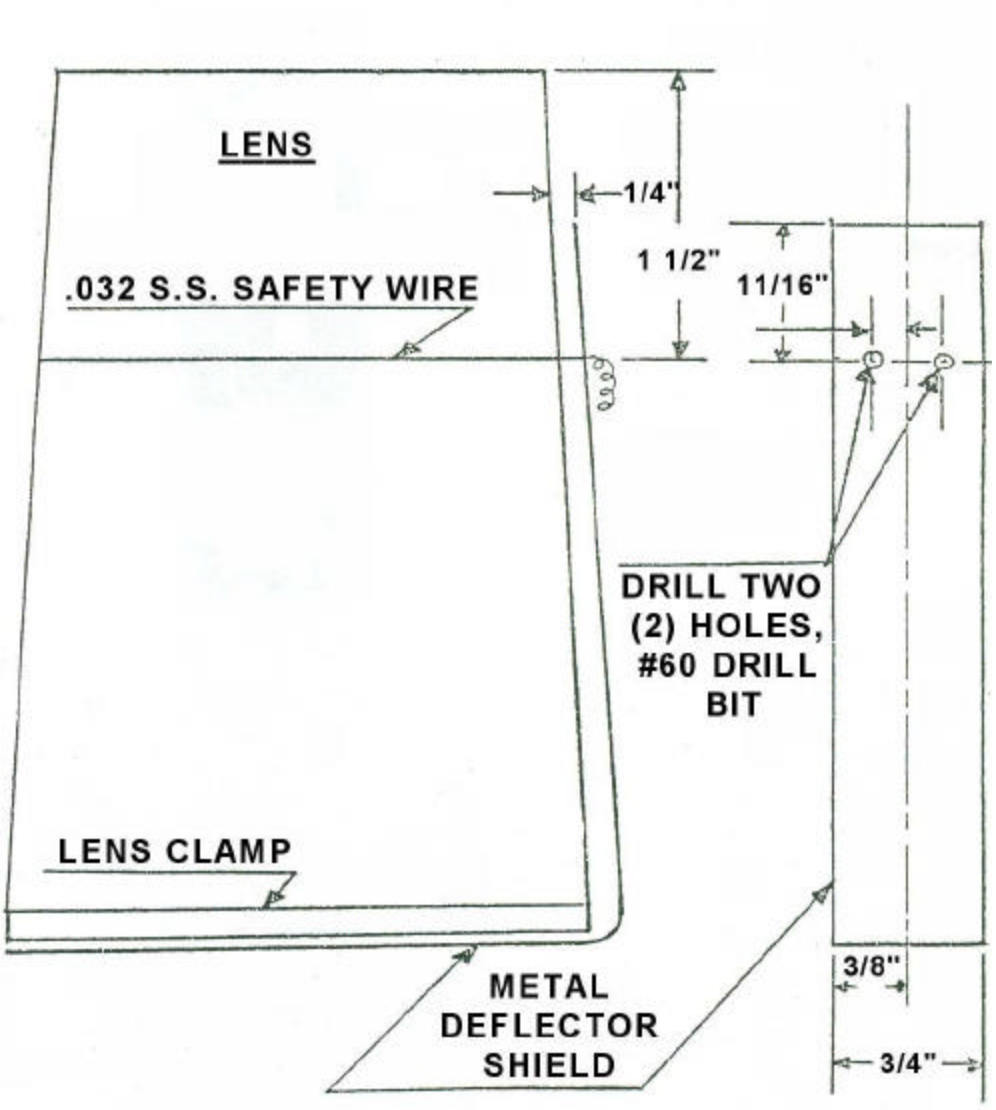


Figure 24-9. Upper Anti-Collision Light Lens Safety Wire

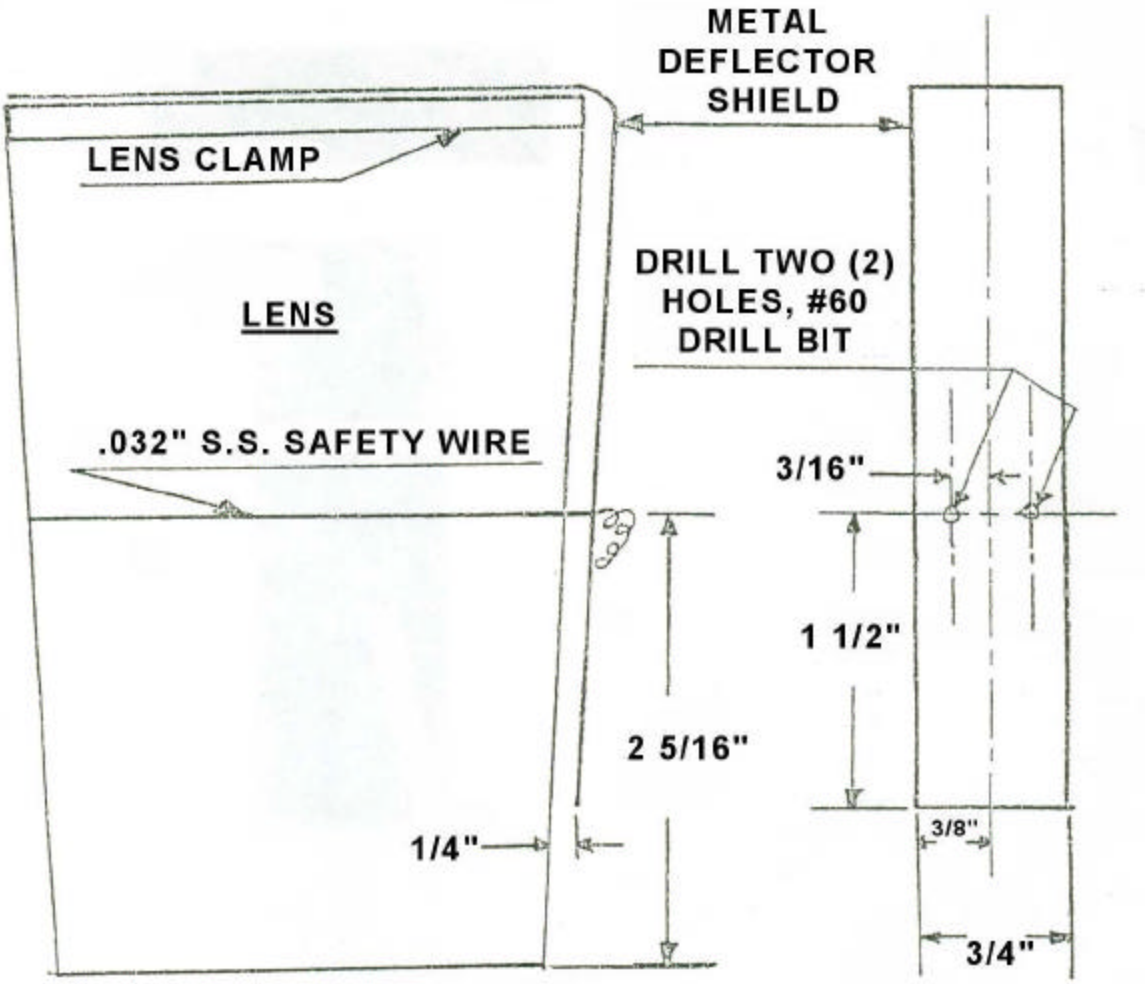


Figure 24-10. Lower Anti-Collision Light Lens Safety Wire

Table 24-10. TROUBLESHOOTING SEARCHLIGHT

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Searchlight will not extend.	Defective circuit breaker.	Replace circuit breaker.
	Defective SEARCH LT switch.	Replace SEARCH LT switch.
	Defective searchlight.	Replace searchlight.
	Defective or faulty wiring.	Repair or replace wiring.
Searchlight will not illuminate.	Open or defective circuit breaker.	Close or replace circuit breaker.
	Defective or faulty wiring.	Repair or replace wiring.
Searchlight will not rotate.	Defective switch.	Replace switch.
	Defective searchlight.	Replace searchlight.
	Defective wiring.	Repair or replace wiring.
Searchlight will not pivot.	Defective switch.	Replace switch.
	Defective searchlight.	Replace searchlight.
	Defective wiring.	Repair or replace wiring.
Searchlight will not stow.	Defective switch.	Replace switch.
	Defective searchlight.	Replace searchlight.
	Defective wiring.	Repair or replace wiring.

LDG LT and SEARCH LIGHT CONT circuit breaker.

2. Position SEARCH LT switch to ON.
3. Searchlight will rotate from stowed position and will be illuminated.
4. Position SEARCH LT switch to UP.
5. Observe that searchlight pivots up.
6. Position SEARCH LT switch to DOWN.
7. Observe that searchlight pivots down.
8. Position SEARCH LT switch to L.
9. Observe that searchlight rotates left.
10. Position SEARCH LT switch to R.
11. Observe that searchlight rotates right.
12. Position SEARCH LT switch to OFF.
13. Observe that searchlight extinguishes.
14. Position SEARCH LT switch to STOW.
15. Observe that searchlight moves to stowed position.
16. Position SEARCH LT switch to OFF.

24-96. TROUBLESHOOTING SEARCHLIGHT

Perform checks as necessary to isolate trouble. (Refer to Table 24-10.)

24-97. REMOVAL-SEARCHLIGHT

NOTE

Searchlight should be in stowed position for removal.

1. Ensure electrical power is off.
2. Disconnect electrical wires from terminal board (forward of mounting plate) and tape wire ends.
3. Remove the four screws and sleeving from mounting plate.
4. Remove searchlight by tilting searchlight canopy assembly down, and lifting searchlight unit out, canopy assembly first.

24-98. INSPECTION – SEARCHLIGHT.

Inspect searchlight for cracks, dents, corrosion, and frayed wiring.

24-99. INSTALLATION-SEARCHLIGHT.

1. Ensure electrical power is off.
2. Position searchlight unit on mounting plate by inserting searchlight unit forward, with the canopy assembly lowered, and lift into position.
3. Install four sleeves and screws into mounting plate and tighten.
4. Remove tape from electrical wires and connect terminal board.

24-100. REMOVAL-SEARCHLIGHT LAMP.

1. Ensure electrical power is off.
2. Remove screws from retainer ring.
3. Remove retainer ring and lower lens from canopy assembly until electrical wires are accessible.
4. Disconnect wires, and tape wire ends. Remove lamp.

24-101. INSTALLATION – SEARCHLIGHT LAMP.

1. Ensure electrical power is off.
2. Remove tape from wire ends. Connect wires to lamp.
3. Position lens into canopy assembly and position retainer ring into lens.
4. Install screws into retainer ring and tighten.

24-102. COCKPIT LIGHTING SYSTEM.

The two cockpit lights are included in the interior lighting system. The cockpit lights are located behind the pilot and copilot. Each light is controlled by a separate circuit breaker.

24-103. OPERATIONAL CHECK – COCKPIT LIGHTS.

1. Right cockpit light.
   a. Position OFF/BAT switch to BAT.
   b. Close COCKPIT LT RIGHT circuit breaker.
   c. Verify that right cockpit light illuminates.
   d. Open COCKPIT LT RIGHT circuit breaker.
   e. Position OFF/BAT switch to OFF.
2. Left cockpit light.
   a. Position OFF/BAT switch to BAT.
   b. Close COCKPIT LT LEFT circuit breaker.

Table 24-11. COCKPIT LIGHTS, TROUBLESHOOTING

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Cockpit light (right or left) fails to illuminate.	Defective wiring.	Repair or replace wiring.
	Defective lamp.	Replace lamp.
	Defective circuit breaker.	Replace circuit breaker.

c. Verify that left cockpit light illuminates.

d. Open COCKPIT LT LEFT circuit breaker.

e. Position OFF/BAT switch to OFF.

24-104. TROUBLESHOOTING – COCKPIT LIGHTS.

Perform checks as necessary to isolate trouble. (Refer to Table 24-11.)

24-105. REMOVAL - COCKPIT LIGHTS LAMP.

1. Ensure electrical power is off.

2. Remove lamp cover.

3. Remove lamp.

24-106. INSTALLATION - COCKPIT LIGHTS LAMP.

1. Install lamp.

2. Install lamp cover.

24-107. AIR CONDITIONING SYSTEM.

The air conditioning system has two operating modes. With the AIR COND/OFF/FAN switch positioned to AIR COND, the evaporator blower is automatically activated and distributes cold air. With the AIR COND/OFF/FAN switch positioned to FAN, cabin air is circulated. Blower motor speed control is selected by positioning the FAN/HI/LO switch to either HI or LO. Temperature control is accomplished by positioning the temperature control to the desired cooling air temperature (MIN/MAX). The air conditioning system consists of the following equipment:

1. Compressor, located on engine firewall drain pan.

2. Condenser/blower, located behind the baggage compartment just aft of the access panel.

3. Evaporator, located just aft of remote units platform on left side of helicopter.

4. Evaporator blower, located on top of baggage compartment adjacent to access panel on right side of helicopter.

5. Forward evaporator and blower located at the forward right side of instrument console.

6. Forward Defog Blowers, located on either side of the console.

7. The ENVIRONMENTAL CONTROL panel, located on lower left side below the instrument panel.

8. Electrical panel, located on the shelf aft of the remote units platform.

9. Circuit breakers, located on the overhead circuit breaker panel.

24-108. OPERATIONAL CHECK – AIR CONDITIONING SYSTEM.

1. Position OFF/BAT switch to BAT.

2. Close AIR CONDITIONER FAN and A/C circuit breakers.

3. Position FAN/HI/LO switch to LO.

4. Position temperature control to MAX.

5. Position HTR CONT valve to OFF.

6. Position AIR COND/OFF/FAN switch to FAN.

7. Verify slow air flow at air vents.

Table 24-12. TROUBLESHOOTING AIR CONDITIONING SYSTEM

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
No forced air from forward vents.	Defective AIR COND/OFF/ FAN switch.	Replace switch.
	Defective AIR CONDI-TIONER FAN circuit breaker.	Replace circuit breaker.
	Defective wiring.	Repair or replace wiring.

Table 24-12. AIR CONDITIONING SYSTEM, TROUBLESHOOTING (Cont'd)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
No forced air from cabin vents.	Defective evaporator blower.	Replace evaporator blower.
	Defective FAN/HI/LO switch.	Replace switch.
	Defective wiring.	Repair or replace wiring.
No cool air generated in AIR COND position.	Defective condenser blower motor.	Replace condenser blower motor.
	Defective condenser relay.	Replace condenser relay.
	Defective AIR CONDI-TIONER A/C circuit breaker.	Replace circuit breaker.
	Defective wiring.	Repair or replace wiring.
Can not control temperature.	Defective temperature controller.	Replace temperature controller.
	Defective temperature control.	Replace temperature control.
	Defective wiring.	Repair or replace wiring.

8. Position FAN/HI/LO switch to HI.

9. Verify an increase in air flow from air vents.

10. Position AIR COND/OFF/FAN switch to AIR COND.

11. Verify air flow from vents decreases in temperature.

12. Position all switches to OFF or normal position.

13. Open AIR CONDITIONER FAN and A/C circuit breakers.

24-109. TROUBLESHOOTING – AIR CONDITIONING SYSTEM.

Refer to Table 24-12 for trouble shooting chart.

24-110. MAINTENANCE – AIR CONDITIONING SYSTEM.

Refer to Chapter 21.

24-111. CARGO HOOK KIT.

The cargo hook kit provides for loads of up to 1500 lbs. to be transported. The cargo hook kit includes a manual release handle located between pilot and copilot, CARGO HOOK circuit breaker located the circuit breaker panel, a CARGO RELEASE switch located on the cyclic stick, and a cargo hook assembly located under the helicopter between the skids.

24-112. OPERATIONAL CHECK – CARGO HOOK.

1. Electrical release.

   a. Position OFF/BAT switch to BAT.

   b. Close CARGO HOOK circuit breaker.

   c. Position CARGO RELEASE switch to RELEASE.

   d. Observe that cargo hook opens.

   e. Open CARGO HOOK circuit breaker.

   f. Position OFF/BAT switch to OFF.

   g. Close cargo hook.

2. Manual release.

Table 24-13. TROUBLE SHOOTING CARGO HOOK

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Cargo hook does not operate electrically, manual cable release operates normally.	Open electrical circuit, faulty wiring, circuit breaker, switch or solenoid	Disconnect cable from electrical connector on Cargo Hook.
Cargo hook does not operate electrically or manually.	Defective internal mechanism	Using multimeter, check for 2.75 to 3.25 ohms between pins A and B of electrical connector. If open indication is obtained. check solenoid for 2.75 to 3.25 ohms resistance, replace solenoid if required. Disassemble, and inspect internal mechanism for binding, jamming, and worn or broken parts. Repair.
Cargo hook operates electrically, but not manually.	Defective manual release cable	Check manual release cable and cable connection to Cargo Hook. Correct any defects.
Load beam fails to relatch after load release.	Defective manual release system Defective latch mechanism	If load beam does not swing back up, check return spring, pin, and arm assembly. Replace defective part.
Cargo hook manual release pull-off exceeds 10 Lbs. (at the hook).		Check pivot points for excessive friction and lubricate. Check contact surfaces between latch and load beam. Check operation of unit using manual release knob.
Circuit breaker opens when Cargo Hook is energized.	Short in the system, faulty wiring, circuit breaker or solenoid	Check for shorts to ground. Check solenoid, repair or replace

a. Position and individual outside the helicopter at the cargo hook.

b. Have individual exert approximately 10 pounds of pull pressure on the cargo hook.

c. Pull up on manual release handle.

d. Verify that cargo hook opens prior to full extension of manual release handle.

e. Push manual release handle down to its full travel.

f. Close cargo release hook.

g. Verify cargo hook closes.

24-113. TROUBLESHOOTING – CARGO HOOK.

1. Electrical release. Perform checks as necessary to isolate trouble. (Refer to Table 24-13.)