light, opens the circuit to the non-essential bus relay, de-energizing the non-essential bus and closes the circuit between the standby position of the standby generator switch and the standby reverse current relay allowing the standby reverse current relay to connect the standby generator to the main bus. No over-voltage protection is provided for the standby system. A loadmeter is provided for the measuring the system amperage, load on the standby generator.

12-43. TROUBLESHOOTING – GENERATOR AND BUS SYSTEM. In the following troubleshooting table, tripped circuit breakers and burned-out indicator lamps are omitted from indications of trouble. Such trouble is usually easily detected and corrected. (See figure 13-17.)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
DC GENERATOR light on caution panel not illuminated prior to engine start-up	Bus control relay defective.	Connect jumper between terminals B2 and B3 on relay. If light comes on, replace relay.
	Caution panel circuit defective	Disconnect plug P24 from caution panel and check for DC voltage between W (+) and Z(–). If voltage is present, replace caution panel.
DC GENERATOR light on caution panel does not go out after engine start-up	Bus control relay defective	(1) Move DC VOLTMETER switch alternately to MAIN GEN, STBY GEN, and ESS BUS positions (2) If rated voltage is indicated in all position and if main generator voltage is on essential bus, replace bus control relay. (3) If rated voltage is indicated in all positions and standby generator voltage is on essential bus, check main generator reverse current relay.
	Main generator reverse current relay defective	After (3) above, check for DC voltage at SW terminal of reverse current relay. If voltage is present, replace relay.
	Main generator voltage regulator defective or not properly adjusted	After (1) above, if main generator voltage is less than 1 volt above standby generator voltage, adjust or replace main generator voltage regulator.
No output from main generator (standby generator operates normally).	Main generator defective	(1) Place MAIN GEN switch in OFF and DC VOLTMETER switch in MAIN GEN position. (2) Remove plug P60 from main generator field relay, and jumper-connect pins H and N.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
	Caution	
If voltage begins to build up, return MAIN GEN switch quickly to OFF to prevent excessive voltage build-up.		
		(3) Place MAIN GEN switch in ON position and observe DC VOLTMETER. If voltage does not build up, replace generator.
	Overvoltage relay defective or improperly adjusted.	Check main generator field relay. If relay is tripped, place DC VOLTMETER switch in MAIN GEN position; then, while observing voltmeter, momentarily place MAIN GEN switch in RESET position. If voltage builds up and generator cuts out at less than 31 volts on each reset attempt, replace overvoltage relay.
	Defective main generator field relay	(1) Remove plug P60 from relay. Check for continuity between relay sockets N and P. If no continuity exists or if resistance is more than one ohm, replace relay.
		(2) If relay will not reset, check for voltage between pin B and aircraft structure when MAIN GEN switch is moved to RESET position. If voltage is present, replace relay.
No output from standby generator (main generator operates normally)	Standby generator defective	(1) Place DC VOLTMETER switch in STBY GEN position.
	Caution	
If voltage begins to build up, remove jumper from across pins H and N of Plug P60.		
		(2) Momentarily place a 16 gauge jumper wire across main voltage regulator terminal B and standby voltage regulator terminal A. If standby generator voltage, as indicated by DC VOLTMETER, does not build up, replace standby generator

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
	Standby generator voltage regulator defective	If voltage builds up in (2) above, replace voltage regulator
Standby generator output normal but does not switch onto main bus when main generator is cut out	Bus control relay defective	Check for DC voltage at terminal D2 on relay. If voltage is present (no voltage may indicate STARTER-GEN switch is defective), jumper-connect terminals D2 and D3. If standby generator switches onto main bus, replace relay.
	Standby generator reverse current relay defective	In step above, if standby generator does not switch onto main bus, replace reverse current relay

12-44. OPERATIONAL CHECK — MAIN GENERATOR CIRCUITRY. Disconnect wires P13A4, P13B4 and P13C4 from positive Terminal B, and disconnect wires P14A4, P14B4, and P14C4 from negative Terminal E of main generator. Connect these wires to a 28 volt dc power source, observing the proper polarity. Energize power source, reset generator field relay K7 with the main generator switch and accomplish following steps:

a. Close GEN & BUS RESET, MAIN GEN VM and CAUTION LIGHTS circuit breakers. There should be no voltage on the main bus in the electrical compartment. Check that DC voltmeter indicates voltage in the MAIN GEN position.

b. Close MAIN GEN FIELD circuit breaker. Position generator switch S8 to ON. Reverse current relay K5 should close and both essential and non-essential buses should be energized. Check that DC GENERATOR caution light is off.

c. Momentarily turn on a load, such as the main inverter, and check that main generator loadmeter reads upscale.

d. Slowly increase voltage of the power source. At 31 to 33 volts, over-voltage relay K6 should actuate, causing field relay K7 to trip and reverse current relay K5 to open and thus remove voltage from all buses. Do not exceed 33 volts.

e. Reduce voltage to 28 volts. Position battery switch S40 to ON. Reset main generator system by placing generator switch S8 in the RESET position and then back to OFF. Return battery switch to OFF. Position generator switch to ON. Field relay K7 should reset and reverse current relay K5 should reclose again energizing all buses.

f. Return generator switch to OFF., open GEN & BUS RESET circuit breaker, and reconnect wires.

12-45. OPERATIONAL CHECK — STARTER GENERATOR CIRCUITRY. Before performing starter generator circuitry test, disconnect wire P37A1 from positive Terminal B and disconnect wires K5A4 and K5C4 from negative Terminal E on the starter generator. Connect these wires to a 28 volt dc power source, observing the proper polarity.

a. Close both standby generator loadmeter circuit breakers in the electrical compartment. Position starter-generator switch S70 to START. Energize external power source. There should be no voltage on the main bus in the electrical compartment. Check that DC voltmeter indicates power source voltage in the STBY GEN position.

b. Close STBY GEN FIELD circuit breaker. Position starter generator switch S70 to STBY GEN and check that essential bus is energized.

c. Close GEN & BUS RESET circuit breaker. Position non-essential bus switch S62 to MANUAL ON. Both essential and non-essential buses should be energized. Check that DC voltmeter indicates voltage of the power source in the STBY GEN, ESS BUS and NON ESS BUS Positions.

d. Momentarily engage a load, such as the main inverter, and check that the standby generator loadmeter reads upscale. Return all switches and breakers to the open position and reconnect wires to their proper terminals.

12-46. MAIN GENERATOR.

12-47. The main DC generator is mounted on an accessory pad on the forward side of the main rotor transmission. Its capacity is rated at 300 amperes and its voltage is controlled by a voltage regulator which is part of the main generator system. It is driven at the same speed as the engine output shaft and has to be turned within a specific range of speed to furnish rated current at normal regulated voltage. (See figure 12-2.)

12-48. REMOVAL – MAIN GENERATOR.

a. Open forward transmission fairing.

b. Remove electrical connections from generator.

c. Loosen attaching nuts and position each washer out of recess, turn generator housing counterclockwise, and pull generator free of transmission drive.

12-49. INSPECTION—MAIN GENERATOR. Visually inspect generator for damage. Check terminals for damage and terminal board to insure that it is not warped or cracked. Check brush cover for dents and loose or bent pins. Check brushes for proper length and for freedom of movement in brush holders. Check brush springs for proper tension on brushes. Check all leads for indication of overheating and condition of insulation. Brush contact surface should be checked to determine that proper amount of area is making contact with commutater. Commutater should be checked to insure that it is not coated with oil or grease. Rock armature back and forth to determine that drive splines are not worn excessively.

12-50. REPAIR OR REPLACEMENT – MAIN GENERATOR. Replace items that do not meet inspection requirements.

12-51. INSTALLATION – MAIN GENERATOR.

a. Apply light coat of grease (item 9, table 1-2) on generator shaft. Align generator with transmission drive, and slide generator into drive spline.

b. Position generator on studs with terminals one bolt left of helicopter centerline and tighten retaining nuts to attach generator to drive pad.

c. Connect cables to generator terminals.

d. Position rubber boot to cover generator connections and secure with lacing cord.

12-52. BUS CONTROL RELAY.

12-53. Operation of the bus control relay is controlled through the IND terminal of the main generator reverse current relay. Closing of the reverse current relay supplies power from the main generator to the coil of the bus control relay. With this coil energized, one set of contacts B2 and B3 terminals open to remove power from the DC generator segment on the caution panel to turn light off. The contacts between A2 and A1 terminals close to allow main generator voltage to energize non-essential bus relay. The contacts between D2 and D3 terminals open to disconnect standby generator power from the "SW" terminal of the standby generator's reverse current relay. When the main generator's reverse current relay opens, the bus control relay's coil is not energized. It moves to it's spring loaded position which results in power supply to DC generator light on caution panel and removal of power to the non-essential bus relay coil resulting in non-essential bus disconnecting from the main bus. Power from the external power supply can close the non-essential relay through the disengaged bus control relay.

12-54. INSPECTION – BUS CONTROL RELAY. (Refer to paragraph 12-66; procedure is the same.)

12-55. REPAIR OR REPLACEMENT – BUS CONTROL RELAY. Replace item if inspection requirements are not met.

12-56. REVERSE CURRENT RELAY.

12-57. Two reverse current relays are mounted in the aft electrical compartment. Each is a part of two separate generator systems. It's purpose is to automatically connect and disconnect it's own generator to or from the DC bus.

a. Automatic connection of the generator to the DC bus is accomplished only when the following conditions of the generator voltage are satisfied:

(1) Polarity is correct.

(2) Minimum of (22 to 24) volts.

(3) Voltage at GEN terminal of reverse current relay exceeds voltage at it's BAT terminal by approximately 0.5 volt.

b. Automatic disconnection of the generator from the DC bus is accomplished by reverse current through the reverse current relay when generator voltage decreases below the voltage of another source connected to the bus.

c. Automatic operation of the reverse current relay is possible only when generator voltage is applied to the "SW" terminal of the unit.

12-58. INSPECTION – REVERSE CURRENT RELAY. Inspect for loose connections, damaged case or broken terminal studs.

12-59. REPAIR OR REPLACEMENT – REVERSE CURRENT RELAY. Replace item if inspection requirements are not met.

12-60. OVERVOLTAGE RELAY.

12-61. The overvoltage relay is located in the aft electrical compartment. Voltage from the main generator is applied to the coil of the relay only when main generator switch is ON. The relay's contacts are normally open but 31-33 volts across its coil from the main generator will close the relay which connects power from the bus to the trip coil of the main generator field control relay.

12-62. INSPECTION – OVERVOLTAGE RELAY. (Refer to paragraph 12-66; procedure is the same.)

12-63. REPAIR OR REPLACEMENT – OVERVOLTAGE RELAY. Replace item if inspection requirements are not met.

12-64. GENERATOR FIELD CONTROL RELAY.

12-65. UH-1D aircraft prior to serial #66-746 have a field control relay for only the main generator system located in aft electrical compartment. The above and subsequent serial numbered aircraft have two generator field control relays in the aft electrical compartment. The unit in the main generator system opens the shunt field circuit between the voltage regulator and the generator whenever the over-voltage relay closes the circuit to the trip coil of the field control relay. The tripped relay also opens the circuit to SW terminal of the main generator reverse current relay. Once it trips, the generator field control relay can be reset by placing the generator switch in the RESET position. The standby generator field control relay is a different type than that in the main generator system. Its purpose is to open the standby generator's shunt field circuit whenever the coil is energized. Power is applied to the coil whenever the starter relay is energized by pressing the start switch. The shunt field circuit is completed through the relay when the start switch is released.

Note

For wiring of standby generator field control relay. Refer to figure 13-17.

12-66. INSPECTION – GENERATOR FIELD CONTROL RELAY. Inspect relay for loose connections, damaged or broken contact pins or terminals, physical damage to case or insulation between contact pins, and discoloration that would indicate internal shorting or excessive overload.

12-67. REPAIR OR REPLACEMENT – GENERATOR FIELD CONTROL RELAY. Replace item if inspection requirements are not met.

12-68. NON-ESSENTIAL BUS RELAY.

12-69. The non-essential bus relay is mounted in the aft electrical compartment. This unit is an electrically operated switch between the main bus bar and the non-essential bus. It is operated by power from external power through the small short pin on the external power receptacle. When external power is supplied. Power from the main generator will also operate it through the bus control relay when main generator reverse current relay closes. Placing the non-essential bus switch in the manual position will also allow standby generator or battery power to close the relay.

12-70. INSPECTION – NON-ESSENTIAL BUS RELAY. (Refer to paragraph 12-11.)

12-71. REPAIR OR REPLACEMENT – NON-ESSENTIAL BUS RELAY. Replace item if inspection requirements are not met.

12-72. VOLTAGE REGULATOR.

12-73. Two voltage regulators are located in the aft electrical compartment (one for the main generator and one for the standby generator) on the left side of the helicopter. The voltage regulator controls the voltage output of the generator by controlling the magnetic field strength within the generator. Variation of the resistance through the carbon pile which is in series with the generator's shunt field coils controls shunt field current to control generator voltage output. The voltage regulator of the standby generator is set at a lower voltage than that of the main generator.

12-74. ADJUSTMENT – VOLTAGE REGULATOR. Adjust voltage regulator by turning adjustment screw on base of regulator clockwise to increase voltage and counterclockwise to decrease voltage. Adjust main generator voltage regulator to the following values dependent upon the average ambient temperature conditions.

27 volts	90° F (and above)
27.5 volts	32° F to 90° F
28.5 volts	32° F (and below)

Note

Always adjust the standby generator voltage regulator 1.0 volt below the main generator voltage regulator.

12-75. REMOVAL – VOLTAGE REGULATOR.

a. Be sure all electrical power is OFF.

b. Unlock snap clamps and remove regulator from mounting base.

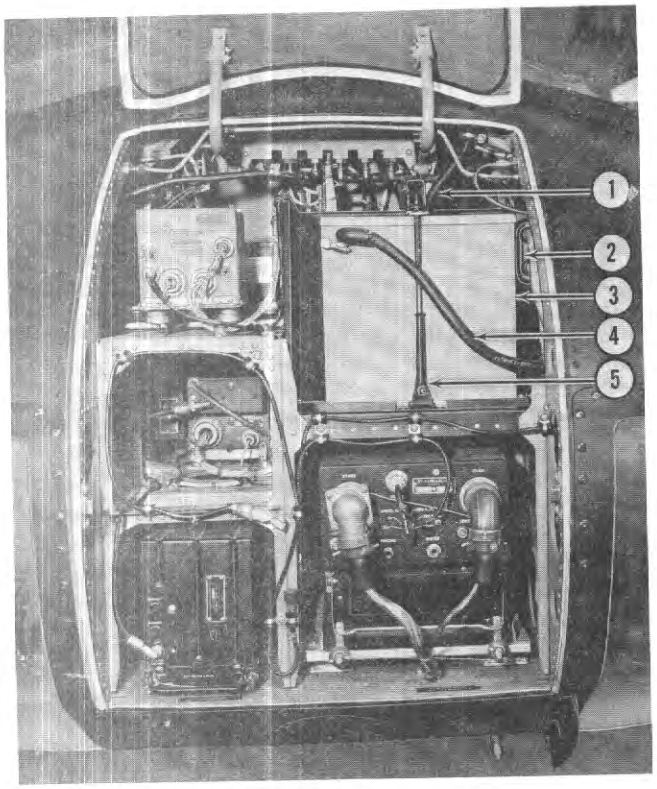
12-76. INSPECTION – VOLTAGE REGULATOR. Visually inspect regulator case for physical damage that could impair normal operation of the unit (cracked case, damaged contact pins, loose terminals, etc.) Check for secure mounting of regulator into regulator base. If contact pins are corroded, clean with pencil eraser. Do not use crocus or emery cloth as excessive plating may be removed. Inspect spring tabs for security of attachment and condition. Remove excessive corrosion by use of pencil eraser. Bent spring tabs may be repositioned by bending them in the direction opposite from which contact pins on regulator applies pressure. DO NOT BEND AN EXCESSIVE AMOUNT.

12-77. REPAIR OR REPLACEMENT – VOLTAGE REGULATOR. Replace item if inspection requirements are not met.

12-78. INSTALLATION–VOLTAGE REGULATOR. Position regulator on mounting base and lock snap clamps.

12-79. BATTERY SYSTEM.

12-80. The helicopter is equipped with a 24 volt, 34 ampere-hour, nickel-cadmium type battery, located in the nose compartment on helicopters not using armored seats. (See figure 12-3.) An alternate battery location is provided in the aft fuselage compartment, accessible by a door on right-hand side. Utilization of a specific battery location depends on loading of mission equipment for proper weight and balance of the aircraft. Each location is equipped with vent tubes, eyebolts for attaching tie-down rods, a battery cable and relay and a voltmeter circuit protected by a diode and a circuit breaker. See figures 12-1 and 12-2.



YUH-1D and UH-1D through 62-12376

205075-11
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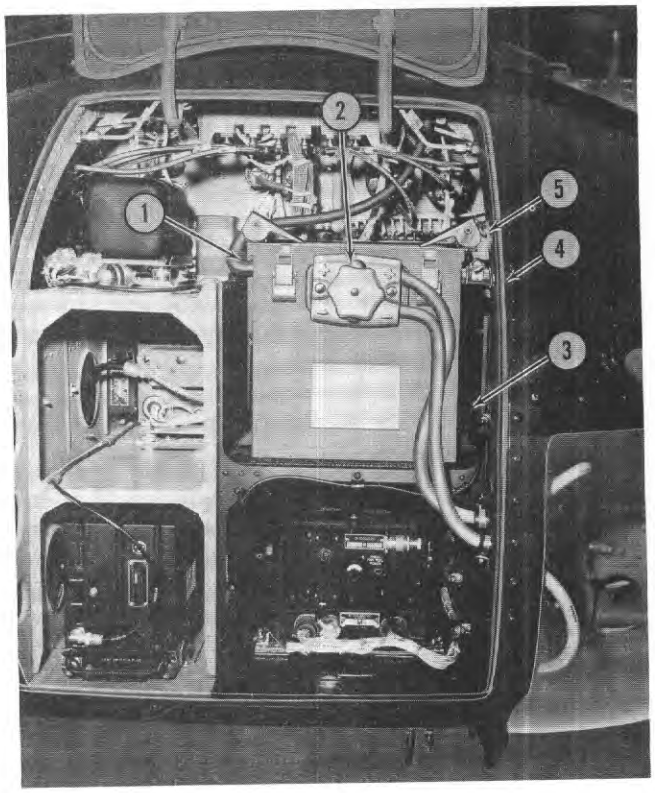
1. Vent Tube
2. Cable Connector
3. Battery



UH-1D 63-8739 and Subsequent

205075-13
AV 054190

4. Drain Tube
5. Tie-Down Rod

Figure 12-3. Battery installation (typical)

Caution

Rigid connecting link (205-030-249-3) must be installed in aft battery compartment before flight or ground run.

12-81. PURPOSE.

12-82. The prime purpose for the battery is to start the engine at remote fields where external power is not available. The battery is not to be used to power the inverters because battery will be electrically depleted. After engine is started, the battery switch should remain ON until the battery is fully recharged by the main generator. A fully charged battery can be determined only by moving the battery switch from ON to OFF and observing the effect on the generator loadmeter. If the change in indications is less than 5 amperes, the battery is fully charged. No other maintenance, servicing, or inspection of the battery is authorized at organizational maintenance level.

Note

Nickel-cadmium batteries shall not be serviced while installed in the helicopter. The battery shall be removed and serviced every 100 hours by authorized battery shop personnel only.

Caution

Remove battery to heated area if helicopter is to remain at outside tiedown for a prolonged period at -18° C (0° F) or below.

12-83. TROUBLESHOOTING – BATTERY SYSTEM. (See Figure 13-19.)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Battery (BT2) will not hold charge	Demand too great	Use external power source whenever possible
	Charging rate too low	Adjust voltage regulator
	Broken cell partitions	Replace battery
	Shorted or grounded wire	Repair wiring
	Unbalanced cells	Discharge and recharge battery.
Short battery life	Level of electrolyte below top of plate	Refill and recharge battery
Excessive loss of electrolyte	Charging rate too high, if loss is in individual cells only, cell is faulty	Reduce charging rate
	Cracked battery case	Check battery case for leaks; replace battery
Battery terminals corroded	Excessive charging or discharging rate	Adjust charging rate or load and clean terminals
Polarity reversed	Battery connections reversed	Check wiring to battery plug; reverse wiring if necessary
Actuation of battery toggle switch fails to turn on power	Battery relay points corroded or burned	Replace relay
	Faulty wiring between relay and battery switch	Check and repair wiring.

12-84. OPERATIONAL CHECK – BATTERY CIRCUITRY. Before connecting the battery, check for correct polarity and tightness of the battery leads and terminations. Open all circuit breakers and place all switches in the open position. Insure that battery switch is OFF. Close standby loadmeter circuit breaker, main generator voltmeter circuit breaker, battery relay circuit breaker, non-essential bus voltmeter circuit breaker, and the GEN and BUS reset circuit breaker. These circuit breakers are located in electrical compartment and on the overhead console.

Note

Unless otherwise specified, the voltmeter circuit breakers are to remain closed throughout the test.

a. Position DC voltmeter selector switch S2 to BAT and check that voltmeter indicates battery voltage.

b. Position DC voltmeter selector switch to each remaining position. Voltmeter should indicate zero voltage.

c. Position switch S2 to ESS BUS. Position battery switch S40 to ON. Check that voltmeter indicates battery voltage. Other positions, except BAT, should indicate zero.

d. Position non-essential bus switch S62 to MANUAL ON and check that voltmeter indicates battery voltage for the NON ESS BUS, ESS BUS and BAT positions of the selector switch. Return all switches to normal.

e. Repeat steps b, c, and d with the battery or 24 volt external power source connected to the power cables at the quick-disconnect in the aft battery location.

Note

Except where otherwise specified, all subsequent tests shall utilize external power. All circuit breakers shall be opened before external power is connected to the helicopter.

12-85. REMOVAL – BATTERY.

a. Check that BAT switch is OFF, and external power is not applied. Open compartment door.

b. Disconnect battery cable connector by turning knob counterclockwise.

c. Disconnect two vent tubes from battery case.

d. Open tie-down clamps and disengage rods from battery cover. Lift battery from compartment.

e. If battery is to be relocated, detach each tie-down rod from eyebolt at lower end by removing attaching bolt with nut and washers.

f. Stow battery cable connector in dummy receptacle. Close compartment door.

12-86. CLEANING – BATTERY. Maintenance of the battery consists of adjusting electrolyte level, cleaning corrosion from all terminals and connectors, and insuring that top of battery cells are dry. Only distilled water should be used to adjust the electrolyte level. A brush with non-electrical conducting bristles should be used to brush corrosion from terminals and connectors. Water should be used to rinse the battery terminals and connectors after brushing. The top of the cells should be thoroughly dried after rinsing. Check compartment for cleanliness and any indication of corrosion from alkaline deposits. Remove corrosion with fiber brush and neutralize with diluted boric acid solution. Rinse with clear water and dry thoroughly. Retouch compartment with alkali resistant varnish as necessary. (item 121, table 1-2).

Caution

Adjust level of the electrolyte only after battery is fully charged. Remove battery to heated area if helicopter is to remain at outside tiedown for a prolonged period in temperatures -18° C (0° F) or below.

Note

Servicing of batteries shall be accomplished in a battery shop area by qualified personnel.

12-87. INSPECTION – BATTERY. Inspect battery for the following conditions.

a. Loose connections at disconnect or between cells.

b. Electrolyte for proper level.

c. Clogged vent plugs or vent tubes.

d. Damage to individual cell cases (distortion due to overcharge, cracks, or leaks).

Note

Electrolyte will not be visible in partially charged battery. Electrolyte level should be adjusted by battery shop personnel.

12-88. REPAIR OR REPLACEMENT – BATTERY. Replace item if inspection requirements are not met. Repair of battery should be accomplished in an authorized battery repair station.

12-89. INSTALLATION – BATTERY.

a. Open compartment door. If battery is being relocated, install tie-down rods on eyebolts provided on shelf, using bolts, nuts, and washers removed from old location. Detach battery cable connector from dummy receptacle.

b. Place battery on shelf, aligned for connections. Engage tie-down rods to strap on cover, and close cam-type clamps.

c. Connect two vent tubes to battery case and tighten clamps.

d. Insert cable connector in battery receptacle and secure by turning knob clockwise.

e. Check that battery voltmeter circuit breaker, near left side of battery, is closed and that voltmeter will show indication when BAT switch is ON. Return switch to OFF after test. Close compartment door.

12-90. BATTERY RELAY.

12-91. The battery relay is mounted in the left hand side of the nose compartment. Helicopter serial number 65-9565 and subsequent have a battery relay for each battery location. The relay is an electrically operated switch between the battery and the main bus bar. It is controlled by a switch which opens or closes the circuit to the actuating coil of the relay.

12-92. INSPECTION – BATTERY RELAY. Inspect relay terminal for evidence of corrosion, pits or discoloration (indicating arcing due to loose connections), damaged case and/or broken terminals or electrical overload.

12-93. REPAIR OR REPLACEMENT – BATTERY RELAY. Replace item if inspection requirements are not met.

12-94. DC STARTER SYSTEM.

12-95. The starter generator is located on the underside of the engine. This unit is used to start the engine and supply standby power for operation of DC equipment. The starter is energized by the starter relay.

12-96. TROUBLESHOOTING–STARTER SYSTEM. (See figure 13-20.)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Starter (G6) fails to operate when START switch (S70) is depressed	Defective starter circuit breaker (CB11)	Replace circuit breaker
	Switch contacts corroded or burned	Replace switch
	Faulty wiring or loose connections	Replace wiring; tighten connections
	Defective starter relay (K3)	Replace relay
	Brushes excessively worn	Replace as required
	Armature burned out	Replace starter-generator
Starter fails to produce sufficient RPM during start cycle	Excessive wear to armature bearings	Replace starter
	Battery in low state of charge	Charge battery

12-97. OPERATIONAL CHECK — STARTER-GENERATOR.

a. Disconnect wires K4B4 and K4D4 from terminal C of the starter-generator. Position starter-generator switch S70 to START. Close STARTER RELAY circuit breaker. Actuate starter switch S6 to pilot's collective stick and check that starter relay closes and that voltage is present at the ends of the disconnected wires.

b. Position switch S70 to STBY GEN. Actuate starter switch S6 and check that the starter relay does not close.

c. Position switch S70 to START and actuate starter switch S77 on copilot's collective stick. Check that starter relay closes and that voltage is present at the ends of disconnected wires K4B4 and K4D4.

Note

UH-1D/H serial No.'s 68-15214 through 68-16628 do not employ S77 on copilot's collective stick.

d. Position switch S70 to STBY GEN. Actuate starter switch S77. Check that starter relay does not close. Open STARTER RELAY circuit breaker.

12-98. STARTER RELAY.

12-99. The starter relay is located in the aft electrical compartment. This unit is an electrically operated switch between the main bus bar and the starter-generator. It is energized when the starter switch on the pilot's or copilot's stick is depressed.

12-100. INSPECTION — STARTER RELAY. (Refer to paragraph 12-11.)

12-101. REPAIR OR REPLACEMENT — STARTER RELAY. Replace item if inspection requirements are not met.

12-102. RPM LIMIT WARNING SYSTEM.

12-103. The rpm limit warning system includes a detector unit in right side of nose compartment, a circuit breaker on overhead console, a warning light on instrument panel, audio oscillator device, ON/OFF audio switch on engine control panel and electrical wiring and connectors. Power is supplied by the 28-volt dc essential bus.

12-104. OPERATIONAL CHECK — RPM LIMIT WARNING SYSTEM. The rpm limit detector, operating on DC power, senses and interprets rotor and engine rpm through connection to tachometer circuits. If the rotor rpm exceeds normal limit, warning light will illuminate. When either rotor or engine rpm reaches low limit, an audio signal is produced in pilot's and copilot's headsets, and warning light is illuminated. For starting and ground operation, audio tone can be turned off by audio switch. (See figure 13-21.)

12-105. TESTING — RPM LIMIT WARNING SYSTEM. Test RPM Limit Warning System upon replacement of the limit warning detector, rotor tachometer or nII tachometer, by conducting following steps with helicopters engine running.

a. Position the LOW RPM audio switch (S93) on the pilot's engine control panel to AUDIO.

b. Adjust for an engine speed of approximately 6300 rpm (corresponds to 310 rotor rpm) and ascertain that the red RPM LIMIT warning light on the instrument panel is off and that the audio warning signal is not audible in the pilot's or copilot's headsets.

c. Decrease engine speed very slowly to the point where the RPM LIMIT warning light illuminates and a swept-frequency audio warning signal (series of audio bursts) is audible in the pilot's and copilot's headsets. This point should be at an engine speed of 6000 ±100 rpm (corresponds to 295 ±5 rotor rpm).

d. Position the LOW RPM audio switch (S93) to OFF. The audio signal in the headsets should cease.

e. Adjust for an engine speed below 5900 rpm (corresponds to 290 rotor rpm), the RPM LIMIT warning light should be illuminated, but the audio warning signal should not be audible in the pilot's and copilot's headsets.

f. Increase the engine speed and verify that the RPM LIMIT warning light extinguishes within the limits of 6000 ±100 engine rpm (corresponds to 295 ±5 rotor rpm). The LOW RPM audio switch should automatically return to the AUDIO position.

12-106. ALIGNMENT OF LOW RPM WARNING. If the RPM Limit Warning System does not meet the requirements of Paragraph 12-105, align system in accordance with Paragraph 12-107 or 12-108 whichever is applicable. If "Saturn Model 2390-2" appears on the detectors nameplate (figure 12-4), align system in accordance with Paragraph 12-107. All others are BHC designed (figure 12-5) aligned in accordance with Paragraph 12-108.

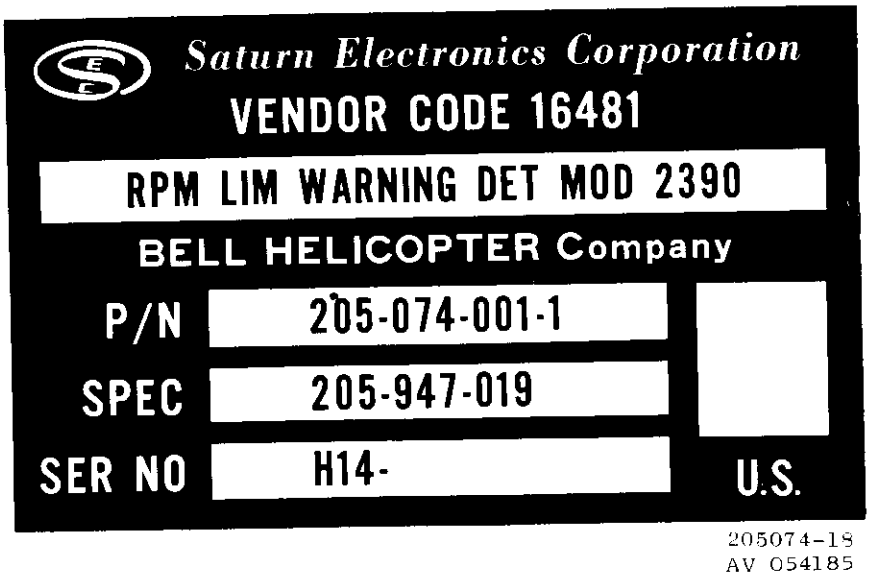


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Figure 12-4. RPM limit warning detector nameplate (Saturn)

Note

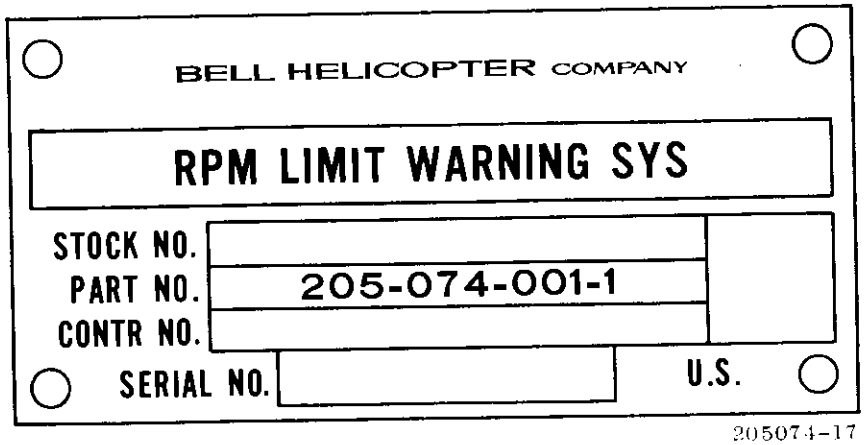
To increase the RPM at which the warning light will illuminate, turn either R1, R2, or R3 clockwise. One half turn of the potentiometer shaft will cause a change of 5 rotor rpm or 100 engine rpm. Do not adjust R4 and R5. These are bench check adjustments and are to be performed only by higher level maintenance facility.

Caution

Use caution in making adjustments as excessive turning of adjustment screw can damage box.

12-107. ALIGNMENT SATURN DESIGNED DETECTORS.

a. Loosen screws, and slide cover strips aft to expose potentiometer shaft.



205074-17
AV 054186

Figure 12-5. RPM limit warning detector nameplate (Bell)

b. Install jumper lead between TP6 and TP8 (See Figure 12-6) to deactivate the rotor low rpm signal).

c. Start helicopter engine and increase engine speed to approximately 6300 rpm (corresponds to 310 rotor *rpm*).

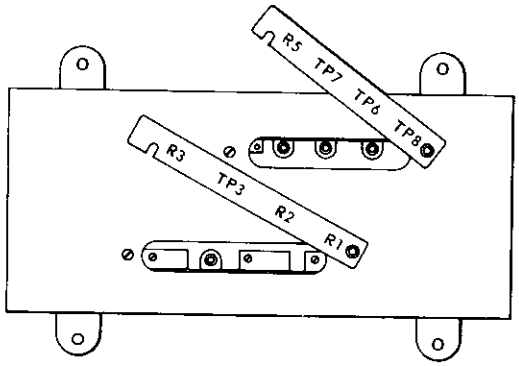
d. Slowly decrease engine speed to 6000 rpm (corresponds to 295 rotor rpm).

e. If, following Step d, the warning light is illuminated, turn R3 slowly counterclockwise until the warning light just extinguishes and then very slowly clockwise until the light again illuminates. If, following Step d, the warning light is extinguished, turn R3 slowly clockwise until the light just illuminates.

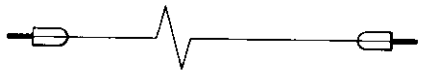
f. Vary the engine speed slowly above and below 6000 rpm (corresponds to 295 rotor rpm) while observing the warning light. Verify that the warning occurs at an engine speed of 6000 ±100 rpm (corresponds to 295 ±5 rotor rpm); if not, repeat Steps d, e, and f.

g. Remove jumper between TP6 and TP8, and install jumper between TP7 and TP8 (See Figure 12-6) to deactivate the engine low rpm signal.

h. Adjust for a rotor speed of 295 rpm (corresponds to 6000 engine rpm).



RPM LIMIT WARNING DETECTOR (SATURN)



"JUMPER" – 6 INCH 22 GA WIRE
(2) 490-102 TIP PLUGS
HERMAN H SMITH OR EQUV

205074-10
AV 054187

Figure 12-6. Alignment of rpm limit detector (Saturn)

i. If, following Step h, the warning light is illuminated, turn R1 slowly counterclockwise until the light just extinguishes, then very slowly clockwise until the light again illuminates. If, following Step h, the warning light is extinguished, turn R1 very slowly clockwise until the light just illuminates.

j. Vary rotor speed above and below 295 rpm (corresponds to 6000 engine rpm) while observing the warning light. Verify that warning occurs at 295 ±5 rotor rpm (corresponds to 6000 ±100 engine rpm). If light does not illuminate, repeat Steps h, i, and j.

k. Remove jumper.

12-108. ALIGNMENT BHC DESIGNED DETECTORS.

a. Disengage the RPM WARN SYSTEM circuit breaker and disconnect the ships harness from the RPM Limit Warning Detector.

Note

If desired, the detector may be detached from the frame of the helicopter and moved to a more accessible location during the alignment procedure.

b. Remove the cover of the detector and connect an Alignment Test Set (BHC No. 546-091-001) or equivalent to the ships harness and RPM Limit Warning Detector as shown in Figure 12-7 making certain that the correct lead is attached to TP1 and TP2 of the detector.

Note

A test light, which functions simultaneously with the helicopter's RPM limit warning light during calibration, is provided on the test harness so as to be readily visible to the electronic mechanic making adjustment.

c. Engage the RPM WARN SYSTEM circuit breaker and position the LOW RPM audio switch to the audio position. An audio warning should be present in both the pilot's and copilot's headsets.

d. Start the helicopter engine and increase speed to approximately 6300 rpm (corresponds to 310 rotor rpm). The audio signal in the headsets should cease.

e. Position the ENGINE-NORMAL-ROTOR switch on the test set to the ENGINE position.

f. Decrease the engine speed to 6000 rpm (corresponds to 295 rotor rpm).

g. If, following Step f, the warning light is illuminated turn R3 slowly counterclockwise until the warning light just extinguishes and then very slowly clockwise until the light again illuminates. If, following Step f, the warning light is extinguished, turn R3 very slowly clockwise until the light just illuminates.

h. Vary the engine speed slowly above and below 6000 rpm (corresponds to 295 rotor rpm) while observing the warning light. Verify that the warning occurs at an engine speed of 6000 ±100 rpm (corresponds to 295 ±5 rotor rpm); if not, repeat Steps f, g, and h.

i. Place the ENGINE-NORMAL-ROTOR switch on the test set in the ROTOR position.

j. Adjust for a rotor speed of 295 rpm (corresponds to 6000 engine rpm).

k. If, following Step j, the warning light is illuminated turn R1 slowly counterclockwise until the light just extinguishes, then very slowly clockwise until the light again illuminates. If, following Step j, the warning light is extinguished, turn R1 very slowly clockwise until the light just illuminates.

l. Vary the rotor speed above and below 295 rpm (corresponds to 6000 engine rpm) while observing the warning light. Verify that warning occurs at 295 ±5 rotor rpm (corresponds to 6000 ±100 engine rpm). If not, repeat Steps j, k, and l.

m. Position the ENGINE-NORMAL-ROTOR switch on the test set to the NORMAL position.

Note

Alignment Test Set, BHC No. 546-091-001, shall remain connected for the high RPM warning test.

12-109. HIGH ROTOR RPM WARNING TEST.

a. Position the LOW RPM audio switch to the AUDIO position.

b. With the rotor in flat pitch and the governor switch set to EMERGENCY, slowly increase throttle until the RPM LIMIT warning light illuminates. The warning light should illuminate at a rotor speed of 335 rpm (corresponds to an engine speed of 6800 rpm) and the audio warning signal should not be audible in the pilot's and copilot's headsets.

Warning

The following procedures are applicable to aircraft equipped with T53-L-9, 9A and L-11 engines. Aircraft equipped with T53-L-13 engine will be adjusted to 6750 rpm maximum with disregard to rotor rpm.

12-110. ALIGNMENT OF HIGH ROTOR RPM WARNING. If the RPM Limit Warning System does not meet the requirements of Paragraph 12-109, align system in accordance with the procedure of Paragraph 12-111 or 12-112, whichever is applicable. If "Saturn Model 2390-2" (Figure 12-4) appears on the detector's nameplate the system shall be aligned in accordance with Paragraph 12-111. All others are BHC designed (Figure 12-5) and shall be aligned in accordance with Paragraph 12-112.

12-111. ALIGNMENT OF HIGH ROTOR RPM WARNING — SATURN DESIGNED DETECTORS. (Figure 12-6.)

a. With the rotor in flat pitch and the governor set to EMERGENCY, slowly increase throttle until rotor speed is 335 rpm (corresponds to an engine speed of 6800 rpm).

b. If, following Step a, the warning light is illuminated, turn R2 clockwise until the light just extinguishes, then very slowly counterclockwise until the light just illuminates. If, following Step a, the warning light is extinguished, turn R2 slowly counterclockwise until the warning light just illuminates.

c. Vary the engine speed to verify that the warning light illuminates and that audio warning does not occur at 335 ±5 rotor rpm (corresponds to 6800 ±100 engine rpm). If the warning light does not illuminate, repeat steps a., b., and c.

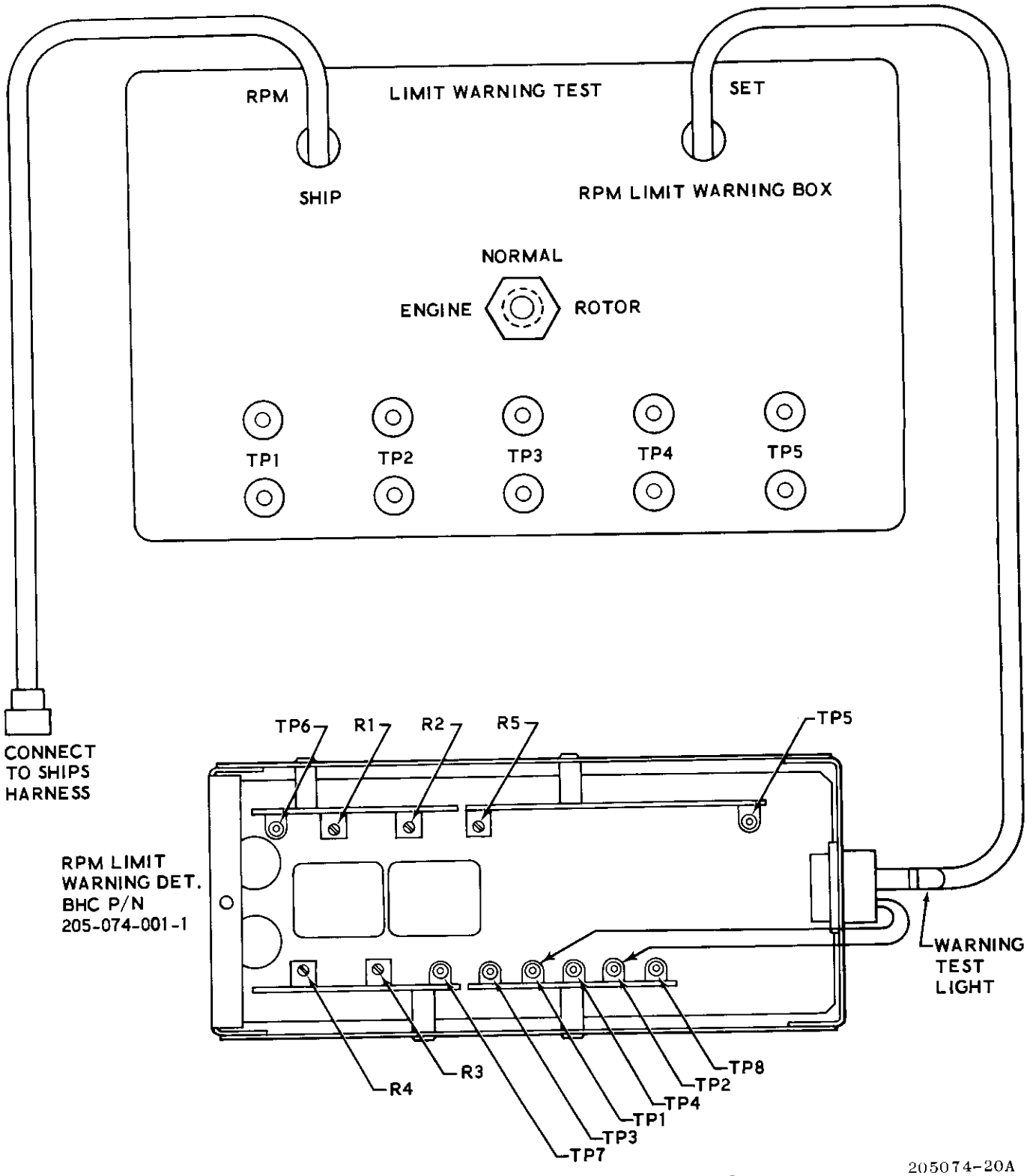
d. Repeat the "Low" and "High" rpm warning tests in the manner specified.

e. Close detector cover strips and tighten screws.

12-112. ALIGNMENT OF HIGH ROTOR RPM WARNING — BHC DESIGNED DETECTORS. (Figure 12-7.)

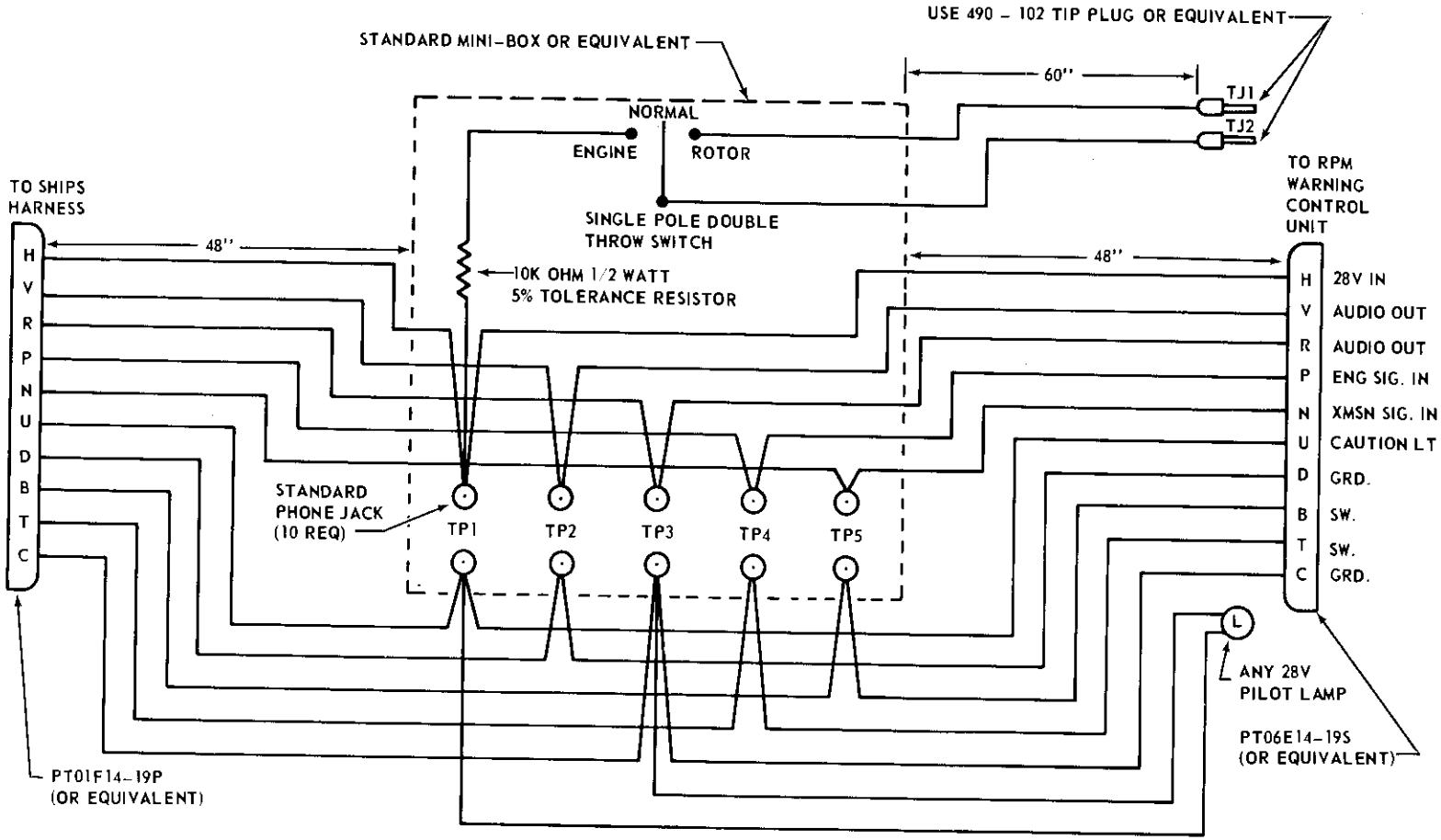
Note

The high engine potentiometer, R-4, is factory adjusted full clockwise and is not to be adjusted.



ALIGNMENT OF BHC DESIGNED DETECTORS

Figure 12-7. Alignment of rpm limit detector (Bell) (Sheet 1 of 2)



Note

Wire - 22 gage stranded.

Test points (TP) are provided for signal monitoring or continuity checking as necessary.

Note

With Engine - NORMAL ROTOR SELECTOR switch set to rotor position, TJ1 and TJ2 may be used as jumper when testing Saturn RPM warning system.

LIMIT WARNING TEST SET – SCHEMATIC

209075-42B
AV 054188-2

Figure 12-7. Alignment of rpm limit detector (Bell) (Sheet 2 of 2)

a. Position the ENGINE-NORMAL-ROTOR switch on the test set to the ROTOR position.

b. With the rotor in flat pitch and the governor set to EMERGENCY, slowly increase throttle until the rotor speed is 335 ±5 rpm (corresponds to an engine speed of 6800 ±100 rpm).

c. If, following Step b, the warning light is illuminated, turn R2 clockwise until the light just extinguishes, then very slowly counterclockwise until the light just illuminates. If, following Step b, the warning light is extinguished, turn R2 very slowly counterclockwise until the warning light just illuminates.

d. Vary the engine speed to verify that the warning light illuminates and that audio warning does not occur at 335 ±5 rotor rpm (corresponds to 6800 ±100 rpm). If the warning light does not illuminate, repeat Steps b, c, and d.

e. Disengage the RPM WARN SYSTEM circuit breakers.

f. Disconnect and remove the test set and reinstall the RPM Limit Warning Detector.

g. Engage the RPM WARN SYSTEM circuit breaker and repeat the "Low" and "High" rpm warning tests in the manner specified.

12-113. HYDRAULIC CONTROL SYSTEM.

12-114. The hydraulic system is composed of a hydraulic solenoid valve mounted on the bulkhead on the right side of the transmission. The valve is controlled by the HYD CONT switch on the hydraulic control panel and protected by a 5 ampere hydraulic control circuit breaker located on the overhead console. The valve is normally de-energized in ON position. This valve closes off hydraulic pump pressure to the flight control servos and allows unrestricted fluid flow to and from the servos when the control switch is in the closed (OFF) position. Manual operation of flight controls is then possible.

12-115. TROUBLESHOOTING — HYDRAULIC CONTROL SYSTEM. (See figure 13-22.)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Hydraulic solenoid fails to actuate when hydraulic control switch is placed to OFF position	Defective circuit breaker	Replace circuit breaker
	Faulty wiring or loose connections	Repair wiring and/or secure connections
	Defective hydraulic control switch	Replace switch
	Defective hydraulic solenoid	Replace solenoid

12-116. OPERATIONAL CHECK — HYDRAULIC SOLENOID.

a. Close HYD CONT circuit breaker. With external hydraulic pressure applied, position hydraulic control switch S7 to OFF. Close CAUTION LIGHTS circuit breaker and check that HYD PRESSURE caution light illuminates.

b. Operate the cyclic, collective and directional controls with switch S7 in the ON and OFF positions. Check that controls require more force to operate with switch S7 in the OFF position than in the ON position.

Note

This test is also a requirement of the hydraulic system functional test.

12-117. REMOVAL — HYDRAULIC SOLENOID VALVE.

a. Remove cowling from right hand side of transmission.

b. Slide a small drain pan under solenoid valve and disconnect hydraulic lines from valve. Cap all openings.

c. Disconnect electrical connector. Remove mounting nuts, washers, and bolts and remove valve.

12-118. INSPECTION — HYDRAULIC SOLENOID VALVE. Check valve for security, pressure leaks and proper actuation of solenoid.

12-119. REPAIR OR REPLACEMENT — HYDRAULIC SOLENOID VALVE. Replace item if inspection requirements are not met.

12-120. INSTALLATION — HYDRAULIC SOLENOID VALVE.

a. Position valve and install mounting bolts, washers, and nuts. Connect hydraulic lines and electrical connector.

b. Fill reservoir and bleed system. Install cowling.

12-121. FORCE TRIM SYSTEM.

12-122. The force trim system consists of an antitorque force from magnetic brake, a fore and aft force trim magnetic brake, a lateral force trim magnetic brake, pilot and copilot force trim switches, and a master force trim switch located on the hydraulic control panel. The magnetic brakes are wired in parallel. The force trim switches are all series wired. The system is protected by a 5 ampere FORCE TRIM circuit breaker located in overhead console. The entire system serves to return pilot and copilot cyclic sticks to desired initial position when master force trim switch is set to on. Pilots and copilot force trim switches may be triggered to de-energize brakes and eliminate centering force. See figures 12-1 and 12-2.

12-123. TROUBLESHOOTING — FORCE TRIM SYSTEM. (See figure 13-22.)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
All magnetic brakes fail to energize with FORCE TRIM switch in ON position	Faulty wiring or loose connections	Repair wiring and tighten connections
	Defective switch	Replace defective switch
Any magnetic brake fails to energize with FORCE TRIM switch in ON position	Defective magnetic brake	Replace defective brake
Magnetic brakes fail to de-energize when pilot or co-pilot FORCE TRIM switch is depressed.	Defective switch or shorted wiring	Replace switch or repair wiring

12-124. OPERATIONAL CHECK — FORCE TRIM SYSTEM.

a. Close FORCE TRIM circuit breaker. Position force trim switch S68 to ON. Check the cyclic stick and pedals for centering force.

b. Depress force trim switch S18 on the pilot's cyclic stick. Check that the three magnetic brakes de-energize and that there is no centering force in the cyclic stick and pedals.

c. Repeat step b. using switch S10 on the co-pilot's cyclic stick.

Note

For maintenance of magnetic brakes, refer to Chapter 9.

12-125. IGNITER SYSTEM.

12-126. Ignition to the power plant is provided by the igniter pack, furnished with and attached to the engine. This unit provides a continuous ignition arc during engine start cycle. The igniter solenoid valve located on the engine also operates during this cycle to direct fuel to the starting fuel nozzle during engine start. The circuits are energized when the FUEL SW located on the ENGINE CONTROL PANEL is placed to ON and the starter switch is depressed.

12-127. TROUBLESHOOTING—IGNITER SYSTEM. (See figure 13-23.)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Igniter or igniter solenoid valve fails to operate when starter switch is depressed.	Ignition circuit breaker open or defective	Check and replace faulty breaker
	Starter switch contacts corroded or burned	Replace switch
	Loose connections or defective wiring	Repair wiring and tighten connections
	Defective fuel switch	Replace switch
	Defective starting fuel switch (effective helicopters prior to 66-16034 only)	Replace switch
	Defective igniter	Replace igniter
	Defective igniter solenoid valve	Replace valve

12-128. OPERATION CHECK — IGNITION SYSTEM AND IGNITER SOLENOID VALVE. Conduct ignition system and igniter solenoid valve test in accordance with following steps.

a. Prior to helicopter Serial No. 66-16034, accomplish the following.

(1) Close IGNITION SYSTEM IGNITER SOL circuit breaker. Position fuel switch S38 and starting fuel switch S88 to ON. Actuate pilot's starter switch S6 and check that ignition unit and igniter solenoid valve both operate.

(2) Actuate copilot's starter switch S77. Check that ignition unit and igniter solenoid valve are both operating.

(3) Position starting fuel switch S88 to OFF. Actuate pilot's starter switch S6 and check that ignition unit operates.

(4) Repeat step (3) using copilot's starter switch S77.

(5) Position starting fuel switch S88 to ON. Place fuel switch S38 to OFF. Actuate pilot's starter switch S6 and check that neither the ignition nor the solenoid valve operates.

(6) Repeat step (5) using copilot's starter switch S77. Reconnect starter wires.

b. For helicopter Serial No. 66-16034 and subsequent, accomplish the following.

(1) Close IGNITION SYSTEM IGNITER SOL circuit breaker. Position fuel switch S38 to ON. Actuate pilot's starter switch S6 and check that ignition unit and igniter solenoid valve both operate.

(2) Actuate copilot's starter switch S77. Check that ignition unit and igniter solenoid valve are both operating.

(3) Position fuel switch S38 to OFF. Actuate pilot's starter switch S6 and check that neither the ignition nor the solenoid valve operates.

(4) Repeat step (3) using copilot's starter switch S77. Reconnect starter wires.

Note

UH-1D/H Serial No's 68-15214 through 68-16628 do not employ S77 on copilot's collective stick.

Note

For additional maintenance information refer to Chapter 5.

12-129. FUEL BOOST AND FUEL VALVE SYSTEM — ELECTRICAL.

12-130. The electrical portion of the fuel control system consists of fuel shutoff valve, fuel switch, right hand fuel cell boost pump, left and right auxiliary fuel pumps, fuel control relay, RH fuel transfer pump switch, LH fuel transfer pump switch, fuel transfer relay, associated interconnecting wiring, terminal boards, fuel cells and associated

switches. The electrical power is supplied through and protected by the FUEL VALVE 5 ampere, FUEL TANK SUMP PUMP 7.5 ampere and FUEL TRANS PUMPS 10 ampere circuit breakers. The entire system serves to supply, regulate and control fuel for operation of the helicopter.

12-131. TROUBLESHOOTING – FUEL BOOST AND FUEL VALVE SYSTEM. Use system wiring diagram figure 13-24, and standard troubleshooting techniques to isolate and correct malfunctions.

12-132. OPERATIONAL CHECK—FUEL VALVE.

a. Close FUEL VALVE circuit breaker. Position fuel switch S38 to ON and check that fuel valve opens.

b. Position switch S38 to OFF and check that fuel valve closes.

12-133. OPERATIONAL CHECK—FUEL PUMPS.

a. Close FUEL BOOST RIGHT circuit breaker. Position fuel switch S38 to ON. Check that the fuel pump is running and open circuit breaker.

b. Close FUEL TRANSFER PUMP circuit breaker. Position the right hand fuel transfer switch S46 to ON. Check that auxiliary fuel pump is running. When internal auxiliary tank is not installed, check for voltage at pin D on the tank receptacle J148 and pin A of external fuel control panel plug P57.

c. Connect a jumper wire between terminals 2 and 3 of TB4 on the access door of the center aft fuel cell (or ground terminal B1 of the fuel control relay K10 in the electrical compartment). Check for voltage at pin D of J148 and pin A of P57.

d. Connect another jumper wire between terminals 1 and 3 of TB4 (or ground terminal X1 of relay K10). Check that relay K10 shuts off the pump and voltage is not present at pin D of J148 and pin A of P57.

e. Remove jumper from terminals 1 and 3 of TB4 (or remove ground from X1 of relay K10). Check that relay K10 remains energized and voltage is not present at pin D of J148 and pin A of P57.

f. Remove jumper from terminals 2 and 3 of TB4 (or remove ground from B1 of relay K10). Check that relay de-energizes and that voltage is present at pin D of J148 and pin A of P57. Return switch S46 to OFF.

g. Repeat steps a. through f. using left hand fuel transfer switch S45 and left hand internal auxiliary fuel tank receptacle J147.

Note

For additional maintenance information refer to Chapter 5.

12-134. GOVERNOR CONTROL SYSTEM.

12-135. The governor control system consists of an engine control solenoid valve located on engine, and a motor driven RPM actuator also located on engine. Power is supplied by the 28 volt ESS BUS and protected by a 5 ampere GOV CONT circuit breaker located in overhead console. The governor control actuator is energized either by GOV-RPM switch (pilot's) or by GOV-RPM switch (copilot's). With the switch placed to increased position the circuit to the actuator motor is completed and allows motor to move actuator arm in one given direction. With the switch in DECR position polarity to the actuator motor is reversed, allowing the actuator arm to move in the opposite direction. The fuel control solenoid valve is energized by the governor AUTO EMER switch located on the engine control panel. (See figure 12-2.)

12-136. TROUBLESHOOTING – GOVERNOR CONTROL SYSTEM. (See figure 13-25.)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Governor actuator (B12) fails to respond when either RPM switch (S37) or (S51) is placed to 1NCR or DECR position	Faulty wiring or loose connections	Repair wiring and tighten connections
	Switch contacts corroded or burned	Replace switch
	Defective governor actuator	Replace actuator
Actuator (B12) operates in reverse	Switch (S37 or S51) or actuator wiring reversed	Check circuit diagram and correct wiring

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Fuel control solenoid valve (L-2) fails to operate when Gov. SW(S33) is actuated	Faulty wiring or loose connections	Repair wiring and tighten connections
	Switch contacts corroded or burned	Replace switch
	Defective fuel control solenoid valve	Replace valve
Solenoid valve operates in reverse	Switch or solenoid wiring reversed	Check circuit diagram and correct wiring

12-137. OPERATIONAL CHECK – GOVERNOR ACTUATOR AND AUTO-EMERGENCY VALVE.

a. Close GOV CONT circuit breaker. Position governor switch S33 to AUTO. Check that fuel control solenoid valve L2 on the engine is energized in the normal or automatic position (voltage at pin C of P90 on valve).

b. Position switch S33 to EMER and check that valve is energized in the bypass or emergency position (voltage at pin A of P90) and that GOV EMER indicator on caution panel is illuminated.

c. Return switch S33 to AUTO and check that GOV EMER indicator is extinguished.

d. Position governor rpm switch S37, on pilot's collective stick, to INCR and check that governor rpm actuator on the engine retracts.

e. Position switch S37 to DECR and check that actuator extends.

f. Repeat steps d. and e. using switch S51 on copilot's collective stick.

12-138. FUEL CONTROL SOLENOID. For description, removal, inspection, repair or replacement refer to Chapter 5.

12-139. GOVERNOR RPM ACTUATOR. For description, removal, inspection, repair or replacement refer to Chapter 5.

12-140. IDLE STOP SYSTEM.

12-141. The idle stop system consists of an idle stop release solenoid, an idle stop release switch located on pilot's collective stick and a 7.5 ampere IDLE STOP RELEASE circuit breaker which protects the system against overload.

12-142. TROUBLESHOOTING – IDLE STOP SYSTEM. Refer to figure 13-25, and use standard troubleshooting practice to isolate and correct malfunctions.

12-143. OPERATIONAL CHECK – IDLE STOP SOLENOID.

a. Close IDLE STOP REL circuit breaker.

b. Actuate the idle stop release switch S50 on the pilot's collective stick and check that solenoid retracts when power is applied.

12-144. IDLE STOP RELEASE SOLENOID. For description and maintenance information, refer to Chapter 5.

SECTION III AUXILIARY POWER

(Not Applicable)

SECTION IV ALTERNATING CURRENT POWER DISTRIBUTION SYSTEM

12-145. AC CIRCUIT BREAKERS.

12-146. The AC circuit breakers are mounted on the right hand, forward side of the pedestal. AC circuits can be opened and closed by operating these trip-free, push-pull type circuit breakers.

12-147. REMOVAL – AC CIRCUIT BREAKERS.

a. Be sure all electrical power is OFF.

b. Remove mounting screws of panel installation and carefully lift panel away from mount.

c. Disconnect wiring from breakers and cover wire ends. Remove mounting screws and lift breaker from panel.

12-148. INSPECTION – AC CIRCUIT BREAKERS. (Refer to paragraph 12-11.)

12-149. REPAIR OR REPLACEMENT – AC CIRCUIT BREAKERS. Replace item if inspection requirements are not met. (Refer to paragraph 12-12.)

12-150. INSTALLATION – AC CIRCUIT BREAKERS.

a. Position breaker in panel and install mounting screws.

b. Remove cover from wire end and install on breaker.

c. Position panel in place being careful not to damage wiring. Install mounting screws.

12-151. TRANSFORMER.

12-152. The transformer is mounted in the left hand nose electrical compartment. It reduces 115 volts ac to 28 volts ac for engine, transmission, and torquemeter indicator instruments and their transmitters.

12-153. REMOVAL – TRANSFORMER.

a. Be sure all electrical power is OFF.

b. Disconnect wiring from transformer and cover wire ends.

c. Remove mounting screws and lift transformer from compartment.

12-154. INSPECTION – TRANSFORMER. (Refer to paragraph 12-66.)

12-155. REPAIR OR REPLACEMENT – TRANSFORMER. Replace item if inspection requirements are not met.

12-156. INSTALLATION – TRANSFORMER.

a. Position transformer in compartment and install mounting screws.

b. Remove cover from wire ends and connect to proper terminals of transformer.

12-157. INVERTERS.

12-158. The AC power system consists of a main and a spare 115 volt, 400 Hz, 3 phase inverter. These units are located in the aft electrical compartment on helicopters through serial number 62-12366. On helicopters serial number 63-8739 and subsequent the inverters are located in the nose electrical compartment. All three phases of the inverter are loaded equally as far as is practicable. Since loads are primarily inductive in nature, power factor capacitors correction are mounted in the compartment with the inverters to maintain a power factor of .97 (lag) under normal load. (See figures 12-1 and 12-6.)

Caution

Do not press lever adjacent to unused receptacle of inverters on some aircraft. Damage to inverter may result by non-compliance.

12-159. TROUBLESHOOTING – INVERTERS. Perform checks as necessary to isolate trouble. (See figure 13-26.)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Main inverter fails to operate	Open circuit breaker	Reset circuit breaker
	Faulty wiring or connections in switch or power circuits	Check continuity of wiring. Repair wiring and tighten connections.
	Poor bonding to ground	Clean and tighten ground connections
	Faulty inverter control	Check for 28 volts dc on both main and spare swtich terminals; replace faulty control
	Defective inverter	Replace inverter
Spare inverter fails to operate	Open circuit breaker	Reset circuit breaker
	Faulty wiring or connections in switch or power circuits	Check continuity of wiring. Repair wiring and tighten connections
	Poor bonding to ground	Clean and tighten connections
	Faulty inverter changeover control	Replace faulty control
	Defective inverter	Replace inverter
Inverter runs but no voltage to instrument	Faulty wiring	Check continuity of wiring; repair wiring
	Defective inverter changeover relay	Check continuity of relay contacts; replace faulty relay
	Faulty inverter	Check for 115 volts ac output from inverter; replace faulty relay
Improper inverter output voltage or frequency	Low input voltage	Check for proper input voltage to inverter; correct low primary voltage condition
	Faulty inverter voltage regulator	Check inverter output voltage and frequency with voltmeter and frequency meters; replace faulty inverter

12-160. OPERATIONAL CHECK — INVERTER CIRCUITRY. Open all circuit breakers and perform the following steps:

a. Close the MAIN INVTR PWR, SPARE INVTR PWR, INVTR CONT, CAUTION LIGHTS, *J-2 CMPS IND, POWER FACTOR CORRECTION, and all AC circuit breakers in the pedestal breaker panel. Energize external power source. Check that INST INVERTER caution light illuminates.

Note

The J-2 CMPS IND is applicable only on helicopters prior to S/N 66-16307.

b. Position inverter switch S39 to MAIN ON. Check that main inverter and all AC instruments are on and INST INVERTER light is extinguished.

c. Select each phase on the AC voltmeter and check that voltmeter indicates 115 ±1.5 volts on each phase when DC bus voltage is 28 volts.

d. Position switch S39 to OFF and check that INST INVERTER light illuminates.

Note

When inverter switch S39 is moved from MAIN ON to OFF, the AC bus voltages decrease gradually because the buses remain connected to the main inverter output through the inverter relay contacts. If the MASTER CAUTION light is reset during the time period in which the main inverter is still decreasing in speed, false MASTER CAUTION and INST INVERTER indications may occur.

e. Position switch S39 to SPARE ON and check that AC voltmeter indicates 115 volts for each phase.

Note

When inverter switch S39 is moved from SPARE ON to OFF, the AC bus voltages will drop off immediately from the spare inverter output by the inverter relay.

12-161. REMOVAL — INVERTERS.

a. Be sure all electrical power is OFF.

b. Remove mounting hardware from inverter terminal box cover. Disconnect wiring from terminals and cover wire ends.

c. Remove mounting bolts and lift inverter from compartment.

12-162. INSPECTION — INVERTER. Inspect inverters for cracked or damaged cases, proper bonding and security of mounting broken connector pins or cracked connector inserts and proper operation.

12-163. REPAIR OR REPLACEMENT — INVERTERS. Repair connectors, replace brush caps or brushes as necessary and replace unit if other inspection requirements are not met.

12-164. INSTALLATION — INVERTERS.

a. Position inverter in compartment and install mounting bolts.

b. Remove cover from terminal box on inverter. Remove cover on wire ends and connect to proper terminals of inverter. Replace terminal box cover.

SECTION V LIGHTING PROVISIONS

12-165. DESCRIPTION.

12-166. Lighting provisions include all equipment necessary for the illumination of instruments and switches; also interior and exterior lighting used for night operation of the helicopter. (See figure 12-2.)

12-167. INTERIOR LIGHTS.

12-168. Interior light circuits include the instrument lights, instrument secondary lights located on the glare shield, console and pedestal panel lights, dome lights, and cockpit lights.

12-169. TROUBLESHOOTING — INTERIOR LIGHTS. Perform checks as necessary to isolate trouble. (See figures 13-27 and 13-28.)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Switch fails to operate lights	Defective switch or rheostat	Replace switch or rheostat
Circuit breaker breaking circuit	Short in switch or wires	Replace necessary parts
One light dim or intermittent	Poor ground	Remove light and clean ground
One light out	Burned out bulb	Replace bulb
	Corroded lamp socket	Clean terminals or replace light
	Broken wire	Replace wire

12-170. OPERATIONAL CHECK — COCKPIT LIGHTS. Close COCKPIT LIGHTS circuit breaker. Check that pilot and copilot utility lights are operational in each mode. (ON-OFF, Dim-Bright and Spot-Flood on both red and white.)

12-171. OPERATIONAL CHECK — DOME LIGHTS.

a. Close DOME LIGHTS circuit breaker. Position switch S1 to RED. Rotate rheostate R21 clockwise from OFF. Check that the three aft dome lights are full bright with R21 in the full clockwise position.

b. Repeat step (a) with switch S1 positioned to WHITE.

Note

Step c. is not applicable to Serial No. 66-16034 and subsequent.

c. Check that forward dome light is operational for both RED and WHITE positions of switch S35.

12-172. OPERATIONAL CHECK — INSTRUMENT PANEL LIGHTS.

a. Close INST PANEL LIGHTS circuit breaker. Rotate pilot's instrument lights rheostat R4 clockwise from OFF. Check that all instrument lights on the pilot's side of the panel, including the standby compass and collective stick light, come on and increase in brightness with clockwise rotation of the rheostat.

b. Rotate engine instrument lights rheostat R9 clockwise from OFF. Check that all engine instrument lights come on and increase in brightness with clockwise rotation of the rheostat.

c. Rotate the copilot's instrument lights rheostat R10 clockwise from OFF. Check that all instrument lights on the copilot's panel come on and increase in brightness with clockwise rotation of the rheostat.

12-173. CONSOLE AND PEDESTAL LIGHTS.

a. Close CONSOLE PED LIGHTS circuit breaker. Rotate pedestal lights rheostat R8 clockwise from OFF. Check that all edge lit panel lights on the pedestal come on and increase in brightness with clockwise rotation of the rheostat.

b. Rotate console lights rheostat R6 clockwise from OFF. Check that all edge lit panel lights in the overhead console plus the aft dome lights panel and crew ICS panel lights come on and increase in brightness with clockwise rotation of the rheostat.

12-174. INSTRUMENT SECONDARY LIGHTS.

a. Close INST SEC LIGHTS circuit breaker.

b. Rotate instrument secondary lights rheostat R5 clockwise from OFF. Check that instrument secondary lights come on and increase in brightness with clockwise rotation of the rheostat.

12-175. REMOVAL — INTERIOR LIGHTS.

a. Disengage appropriate circuit breaker.

b. Remove mounting hardware, lift out light assembly, and disconnect light wire.

12-176. INSPECTION — INTERIOR LIGHTS. Inspect lights for corroded lamp socket terminals, shorted or broken wires, cracked lens, burned out lamp bulbs, or improper bonding of light case to airframe.

12-177. REPAIR OR REPLACEMENT — INTERIOR LIGHTS. Light assembly may be repaired by replacing damaged or defective component parts. If light case is damaged beyond repair, complete unit must be replaced.

12-178. INSTALLATION — INTERIOR LIGHTS.

a. Connect light wire and install light assembly with mounting hardware.

b. Engage appropriate circuit breaker and check light for proper operation.

12-179. CAUTION LIGHT SYSTEM.

12-180. The caution light system includes a caution panel located in the pedestal and a master control warning light, located on instrument panel. The caution panel contains a number of internally lighted capsules that illuminate when associated switches, located at different places in the helicopter, actuate to complete circuits thus indicating malfunctions in respective systems. The panel is energized from 28V dc Essential Bus and protected by a 5 ampere circuit breaker located in the DC circuit breaker panel in overhead console. See figure 12-2.

12-181. TROUBLESHOOTING — CAUTION LIGHTS SYSTEM. Refer to schematic diagram and trace malfunctioning circuit or loop, using standard electronic troubleshooting procedures and standard test equipment. Localize malfunctioning switch components, and repair or replace as required. See figure 13-29.

12-182. CAUTION LIGHTS.

12-183. The following paragraphs cover operational checks of all caution lights. All circuit breakers shall be open before making tests.

12-184. OPERATIONAL CHECK — MASTER CAUTION PANEL. During checks in the following steps the master caution light should illuminate each time a caution panel segment illuminates, and shall be reset each time in readiness for another fault indication.

a. Close CAUTION LIGHTS and GOV CONT circuit breakers. Check that MASTER CAUTION light illuminates and that each caution light segment operates in accordance with Table 12-1.

TABLE 12-1. CAUTION PANEL INDICATION - LIGHTS

Caution Light	On/Off Condition
ENGINE OIL PRESS	ON
*ENGINE ICING	OFF
*ENGINE ICE DETECTOR	ON
LEFT FUEL BOOST	ON
RIGHT FUEL BOOST	ON
**ENG FUEL PUMP	ON
20 MINUTE FUEL	ON
AUX FUEL LOW	OFF
XMSN OIL PRESS	ON
XMSN OIL HOT	OFF
HYD PRESSURE	ON
INST INVERTER	ON
DC GENERATOR	ON
EXTERNAL POWER	ON
FUEL FILTER	OFF
GOV EMER	ON
CHIP DET	OFF
ENGINE CHIP DET	OFF
ENGINE INLET AIR	OFF
IFF	OFF

Note

*These caution lights not applicable on Helicopter S/N 66-16868 and subsequent.

Note

**ENG FUEL PUMP caution light will be illuminated only when a Hydra-Electric Company, P/N 40210 or Cook Electric Co. P/N 575-1337, fuel pump pressure switch is installed on the engine.

b. Reset the master caution light. Test the lights using the test switch on the panel. Push the dim switch to DIM and release. Check that caution lights do not dim.

c. Rotate pilot's instrument lights rheostat R4 clockwise from OFF. Again actuate the dim switch and check that lights dim and hold.

d. Rotate rheostat R4 counterclockwise to OFF and check that lights return to bright.

12-185. OPERATIONAL CHECK — ENGINE OIL PRESSURE LIGHT.

a. Connect a pressure gun to the engine oil pressure switch and apply pressure. Check that ENGINE OIL PRESSURE indicator extinguishes with increasing pressure at 27 ±1 psi.

b. Relieve pressure on engine oil pressure switch. Check that ENGINE OIL PRESSURE indicator illuminates before 25 psi decreasing pressure. (Refer to paragraph 10-95.)

12-186. OPERATIONAL CHECK – ENGINE ICING AND ENGINE ICE DETECTOR LIGHTS (PRIOR TO S/N 66-16868).

a. Connect test box, wired similar to that shown in figure 12-8, into the engine harness at the hot air valve and ice detector. (See figure 13-30 for system diagram.)

b. Position test switch to ENGINE OFF and close ANTI-ICE ENG circuit breaker. Check that probe deicer test light L1 is off. Probe heater test light L2 should remain on as long as power is applied to the system.

c. Position hot air valve switch S81 on the engine control panel to the closed position. Check that test light L3 illuminates.

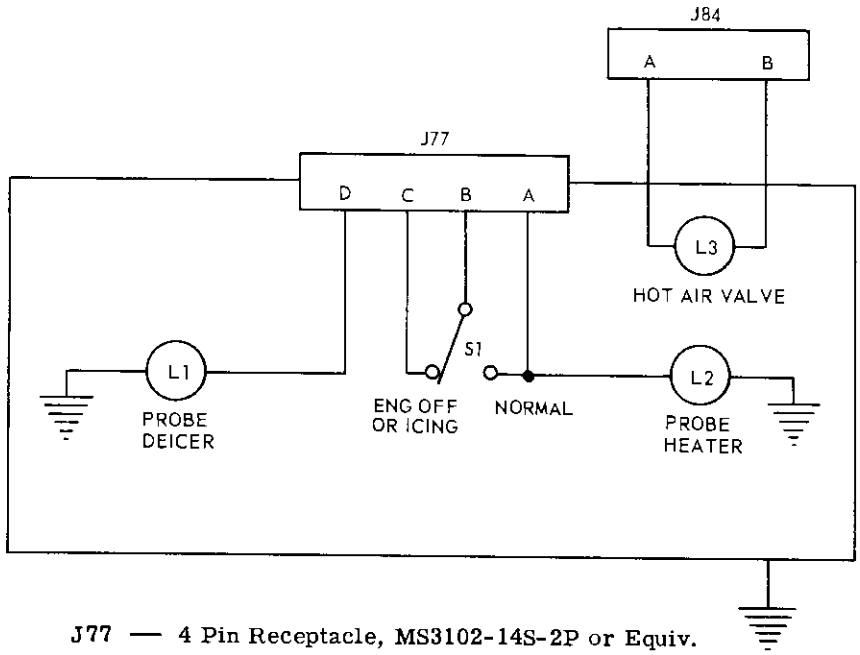
d. Simulate the engine operating condition by positioning test switch to NORMAL. Check that the light L1 remains off and the ENGINE ICE DET light on the caution panel extinguishes, indicating the system is armed.

e. Simulate icing condition by placing test switch in the icing (ENGINE OFF) position. Check that ENGINE ICING light on the caution panel illuminates, indicating an icing condition in the engine and that test light L1 illuminates, indicating power is applied to the probe deicing heater element.

Note

Do not leave switch in icing position for more than 10 seconds before returning it to the normal position.

f. Return test switch to NORMAL. Check that test light L1 and the ENGINE ICING caution light extinguish.



J77 — 4 Pin Receptacle, MS3102-14S-2P or Equiv.

J84 — 2 Pin Receptacle, MS3101-12S-3P or Equiv.

L1 — Any 28 Volt Lamp Not Exceeding 6 Amperes

S1 — Test Switch, On-None-On Type, MS35058-23 or Equiv.

L2 — Any 28 Volt Lamp Not Exceeding 1 Ampere

L3 — Any 28 Volt Lamp Not Exceeding 1 Ampere

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Figure 12-8. Wiring diagram - icing system test box

g. Simulate a failure of the ice detector probe by placing test switch in the icing position. After 11 to 18 seconds, check that test light L1 and ENGINE ICING light extinguish and that ENGINE ICE DET light illuminates, indicating that the system is disarmed. This condition is similar to the engine off condition or to losing electric power to the ice detection system.

12-187. LEFT AND RIGHT FUEL BOOST LIGHTS.

a. Disconnect wire Q42A20 from TB38 terminal No. 2 at left hand fuel cell and check that LEFT FUEL BOOST indicator extinguishes.

b. Disconnect wire Q40A20 from TB35 terminal No. 2 at right hand fuel cell and check that RIGHT FUEL BOOST indicator extinguishes.

c. Reconnect wires to correct terminals.

12-188. OPERATIONAL CHECK — ENGINE FUEL PUMP LIGHT. At the fuel differential pressure switch on the engine, disconnect both pressure ports. Determine the manufacturer and the manufacturer's part number of the fuel differential pressure switch, then accomplish following steps a. and b. as applicable.

Note

Cook Electric P/N 575-684, Hydraulic Research P/N 96025, and Gorn Electric P/N GP2B-3001-1 pressure switches are differential types which are activated only when a pressure imbalance exists between the fuel pumps. Equal pressures, whether low or high, have no effect on the caution indicator.

Note

Cook Electric Co. P/N 575-1337 and Hydra-Electric P/N 40210 pressure switches are not of a differential type and are normally closed. The caution light remains illuminated until both pumps have reached operating pressures. Low pressure from either or both fuel pumps will deactivate the switch and cause the caution light to illuminate.

a. To test Cook Electric Co., Part No. 575-684; Hydraulic Research and Mfg. Co., Part No. 96025; or Gorn Electric Co., Part No. GP2B-3000-1 proceed as follows:

(1) Apply pressure to a single port at a time and check that ENGINE FUEL PUMP indicator illuminates at 56.5 ±3.5 psi increasing differential pressure at either port.

(2) Relieve any applied pressure and reconnect the pressure hoses to the switch.

b. To test Cook Electric Co. P/N 575-1337 or Hydra-Electric Co., Part No. 40210, the ENGINE FUEL PUMP indicator shall be illuminated when both pressure ports are exposed to atmospheric pressure.

(1) Apply a steady pressure of 70 psi to the top pressure port of the switch and check that ENGINE FUEL PUMP indicator remains illuminated.

(2) Maintain a pressure of 70 psi at the top pressure port of the switch and apply an increasing pressure to the bottom pressure port. Check that ENGINE FUEL PUMP indicator extinguishes by the time that the pressure on the bottom port is 65 psi.

(3) Reduce pressure applied to the bottom port and check that ENGINE FUEL PUMP indicator illuminates at 56.5 ±3.5 psi decreasing pressure.

(4) Apply a steady pressure of 70 psi to the bottom port of the switch and allow pressure applied to the top port to decrease to atmospheric pressure. Check that ENGINE FUEL PUMP indicator illuminates.

(5) Maintain pressure applied to the bottom port at 70 psi and increase pressure applied to top port of the switch. Check that ENGINE FUEL PUMP indicator extinguishes by the time that the pressure applied to the top port is 65 psi.

(6) Reduce pressure applied to the top port. Check that ENGINE FUEL PUMP indicator illuminates at 56.5 ±3.5 psi decreasing pressure. Relieve pressure applied to both ports and reconnect the pressure hoses to the switch.

12-189. OPERATIONAL CHECK — TWENTY MINUTE FUEL LIGHT.

a. With 20 MINUTE FUEL indicator illuminated (no fuel in tanks) disconnect wire E12A20 at terminal 1 of TB38 under the left fuel cell and check that 20 MINUTE FUEL indicator extinguishes.

b. When 20 MINUTE FUEL indicator is extinguished (fuel in tanks) connect wire E12A20 to ground and check that 20 MINUTE FUEL indicator illuminates.

c. Reconnect wire E12A20 to terminal 1 of TB38.

12-190. OPERATIONAL CHECK – AUXILIARY FUEL LOW LIGHT. Close the FUEL TRANSFER PUMP circuit breaker and test auxiliary fuel low light in accordance with following steps a, b, or c, as applicable. (See figures 13-24 and 13-31.)

a. Internal Auxiliary Fuel Tank Provisions.

(1) Connect a jumper wire from pin E of the internal auxiliary fuel tank receptacle J148 to ground.

(2) Position right hand fuel transfer pump switch S46 to ON and check that the AUX FUEL LOW indicator illuminates.

(3) Connect another jumper wire from pin A of J148 to ground. Check that AUX FUEL LOW indicator extinguishes. Remove both jumper wires and position switch S46 to OFF.

(4) Connect a jumper wire from pin E of the internal auxiliary fuel tank receptacle J147 to ground. Position left hand fuel transfer pump switch S45 to ON. Check that AUX FUEL LOW indicator illuminates.

(5) Connect another jumper wire from pin A of J147 to ground. Check that AUX FUEL LOW indicator extinguishes. Remove both jumper wires and position switch S45 to OFF.

b. Internal Auxiliary Fuel Tank Installed.

(1) Position the right hand fuel pump transfer switch S46 to ON. Check that AUX FUEL LOW indicator illuminates.

(2) Return switch S46 to OFF and position left hand fuel transfer pump switch S45 to ON. Check that AUX FUEL LOW indicator illuminates.

c. External Auxiliary Fuel Tank Provisions.

(1) Connect a jumper wire between pins A and B of the right hand external fuel tank receptacle J1024. Check that AUX FUEL LOW indicator illuminates.

(2) Remove jumper wire and place it between pins A and B of the left hand external fuel tank receptacle J1017. Check that AUX FUEL LOW indicator illuminates.

12-191. OPERATIONAL CHECK – TRANSMISSION OIL PRESSURE LIGHT.

a. Apply pressure at the transmission oil pressure switch and check that XMSN OIL PRESS indicator extinguishes at 33 to 37 psi increasing pressure.

b. Relieve pressure on transmission oil pressure switch and check that XMSN OIL PRESS indicator illuminates at 28 to 32 psi decreasing pressure.

12-192. OPERATIONAL CHECK – TRANSMISSION OIL HOT LIGHT.

a. Connect stud on top of the transmission oil pressure switch (located on transmission) to ground and check that XMSN OIL HOT indicator illuminates.

b. Remove ground from transmission oil pressure switch and check that XMSN OIL HOT indicator extinguishes.

12-193. OPERATIONAL CHECK – HYDRAULIC PRESSURE LIGHTS.

a. Apply external hydraulic pressure to hydraulic system and check that HYD PRESSURE indicator extinguishes at 800 ±100 psi increasing pressure.

b. Relieve pressure applied to hydraulic system and check that HYD PRESSURE indicator illuminates at 500 ±100 psi decreasing pressure.

12-194. OPERATIONAL CHECK – INSTRUMENT INVERTER LIGHT. The instrument inverter light is checked as a part of the inverter system. (Refer to paragraph 12-160.)

12-195. OPERATIONAL CHECK – DC GENERATOR LIGHT. The DC generator light is checked as a part of the main generator system. (Refer to paragraph 12-44.)

12-196. OPERATIONAL CHECK – EXTERNAL POWER LIGHT. Before performing external power light test, disconnect external power from the helicopter. Perform the following steps:

a. Turn battery switch on. Open external power access door and check that EXTERNAL POWER indicator illuminates.

b. Close external power access door and check that EXTERNAL POWER indicator extinguishes.

12-197. OPERATIONAL CHECK – FUEL FILTER BYPASS LIGHT. Connect external power to the helicopter and perform following steps:

a. Disconnect plug P195 from fuel filter bypass switch. Short pin A to pin B and check that FUEL FILTER indicator illuminates.

b. Remove short between pins A and B of plug P195 and check that FUEL FILTER indicator extinguishes. Reconnect plug P195.

12-198. OPERATIONAL CHECK — TRANSMISSION OIL LEVEL LIGHT.

a. Close both BATTERY VM circuit breakers.

b. Actuate push button switch S4 on cabin bulkhead at station 123 and check operation of the indicator through the sight glass in the cabin bulkhead adjacent to the switch.

12-199. OPERATIONAL CHECK — GOVERNOR EMERGENCY CAUTION LIGHT. (S/N 66-16868 and subsequent).

a. Verify that GOV CONT circuit breaker is closed. Position governor switch on the engine control panel to AUTO. Check that GOV EMER indicator light is extinguished.

b. Move governor switch to EMER position. Check that GOV EMER indicator is illuminated.

12-200. OPERATIONAL CHECK — TRANSMISSION AND TAIL ROTOR GEAR BOX CHIP DETECTOR LIGHT.

a. Check that CHIP DETECTOR light is extinguished with the CHIP DET selector switch in the BOTH position.

b. Short transmission magnetic chip detector output wire to ground. Position CHIP DET selector switch to each of its three positions and check that CHIP DETECTOR light illuminates with the switch in the BOTH and XMSN positions only. Remove short.

c. Short tail rotor shaft chip detector (in 42° gear box) output wire to ground. Position CHIP DET switch to each of its three positions and check that CHIP DETECTOR light illuminates with the switch in the BOTH and XMSN positions only. Remove short.

d. Short tail rotor chip detector (in 90° gear box) output wire to ground. Position CHIP DET selector switch to BOTH and TAIL ROTOR and check that CHIP DETECTOR light illuminates in both positions. Remove short.

12-201. OPERATIONAL CHECK — ENGINE CHIP DETECTOR LIGHT.

a. Check that ENGINE CHIP DET light is extinguished.

b. Short engine magnetic chip detector output wire to ground. Check that ENGINE CHIP DET light illuminates.

c. Remove short and observe that ENGINE CHIP DET light extinguishes.

12-202. OPERATIONAL CHECK - ENGINE AIR FILTER CONTROL (HELICOPTERS PRIOR TO 66-16868 ONLY).

a. Open all circuit breakers and position all switches to OFF. Connect test apparatus to pressure switch as shown in figure 12-9.

b. Close ENG AIR FILTER CONT circuit breaker. Press ENGINE INLET FILTER CLOGGED indicator I72 (press-to-test type) and observe that the indicator illuminates.

c. Gradually apply pressure to pressure switch 42D128 with pressure bulb until ENGINE INLET FILTER CLOGGED indicator I72 illuminates (See CAUTION below). The indicator should illuminate at 8.0 ±0.75 inches of water.

Caution

Do not exceed an applied pressure of 15 inches of water.

d. Relieve applied pressure and observe that ENGINE INLET FILTER CLOGGED indicator I72 extinguishes. Disconnect test apparatus.

12-203. OPERATIONAL CHECK — ENGINE INLET AIR DETECTOR LIGHT (S/N 66-16868 AND SUBSEQUENT).

a. Open all circuit breakers and position all switches to OFF. Connect test apparatus to pressure switch as shown in Figure 12-9.

b. Close CAUTION LIGHTS circuit breaker. Gradually apply pressure to pressure switch with pressure bulb until ENGINE INLET AIR caution indicator illuminates (see Caution below). The indicator should illuminate at 8.0 ±0.75 inches of water.

Caution

Do not exceed an applied pressure of 15 inches of water.

c. Relieve applied pressure and observe that ENGINE INLET AIR caution indicator extinguishes. Disconnect test apparatus.

12-204. OPERATIONAL CHECK — FIRE DETECTION.

a. Close FIRE DET circuit breaker.

b. Depress fire detector test switch S20 on the instrument panel. Check that fire detection control relay actuates and causes the FIRE WARNING light to illuminate. (See figure 13-32.)

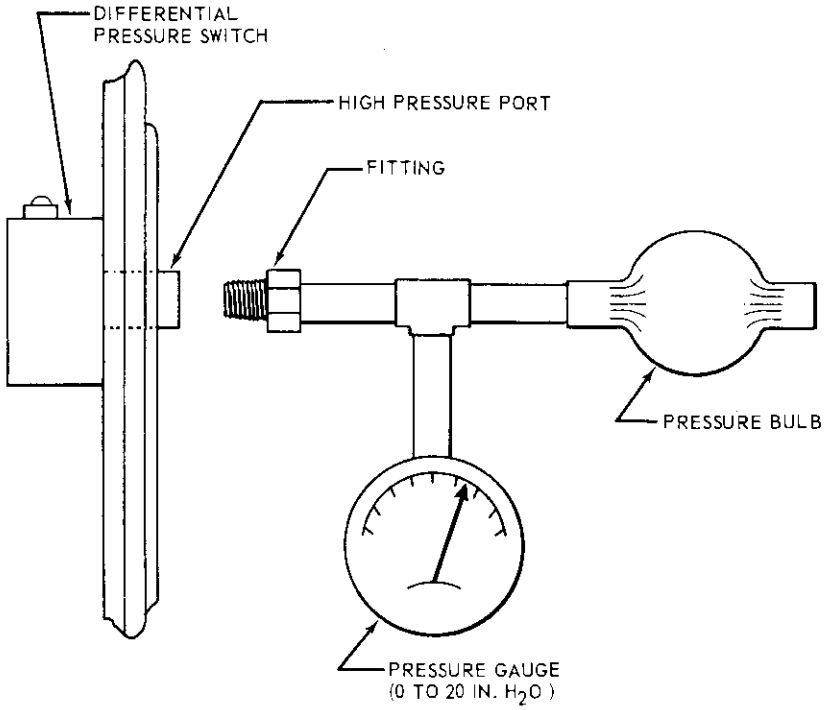

Figure 12-9. Engine air filter pressure tool

12-205. EXTERIOR LIGHTS.

12-206. LANDING LIGHT AND SEARCHLIGHT.

12-207. One landing light and one searchlight are located on the underside of the cabin. Each has an individual control and power circuits which are protected by circuit breakers. Control switches for both lights are located on the pilot's collective stick. They consist of four switches, two that control power to the lamps, and two that control the positions of the lights. Power from the essential bus to all four control switches is applied through one circuit breaker and one wire to all control switches.

Caution

Do not operate landing or searchlight in areas of combustible material, such as tall grass, etc.

12-208. TROUBLESHOOTING - LANDING OR SEARCHLIGHT. Perform checks as necessary to isolate trouble. (See figure 13-33.)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Light inoperative	Defective switch	Replace switch
Circuit breaker 'pops'	Short in switch or wire	Replace necessary parts
One light dim, constant or intermittently	Poor ground	Place temporary jumper from bare metal on lamp to metal frame and then turn on. If lamp burns brightly constantly, check mounting of lamp for corrosion and/or paint and clean as necessary.
	Loose power lead or corroded terminal	Tighten or clean connection in power circuit.
	Relay contacts badly burned.	Replace relay.
One light out	Burned out bulb Corroded socket Broken wires	Replace bulb Clean terminals Repair wires

12-209. OPERATIONAL CHECK — LANDING LIGHT.

a. Close LDG LT PWR and LDG & SEARCH LIGHT CONT circuit breakers. Position lamp control switch S76 on the pilot's collective stick to ON and check that landing light illuminates. Return switch S76 to OFF.

b. Position extend-retract switch S25 to EXTEND (fwd position). Check that light extends and is stopped by the extend limit switch at approximately 120 degrees extension.

c. Position switch S25 to RETRACT (aft position). Check that light retracts and is stopped in the stowed position by the retract limit switch.

12-210. OPERATIONAL CHECK — CONTROLLABLE LANDING LIGHT (SEARCHLIGHT).

a. Close SEARCHLIGHT PWR and LDG & SEARCHLIGHT CONT circuit breakers. Position lamp control switch S75 to ON and check that searchlight illuminates. Return switch to OFF.

b. Position four-way switch S12 to EXT (fwd position). Check that light extends and is stopped by extend limit switch at approximately 120 degrees extension.

c. Position switch S12 to RETR (aft position). Check that light retracts.

d. With light partially extended, position switch S12 to "L" and check that light rotates to the left.

e. Position switch S12 to "R" and check that light rotates to the right.

f. With light extended and rotated, position switch S75 to S.L. STOW. Check that light retracts and is stopped by the retract limit switch and then rotates to its level stowed position and stops.

12-211. REMOVAL — LANDING OR SEARCH LIGHT.

a. Be sure all electrical power is OFF.

b. Remove mounting screws forward of light lens.

c. Remove clamp from wires and pull light assembly through hole.

d. Remove terminal cover and disconnect wires.

12-212. INSPECTION — LANDING OR SEARCH LIGHT.

a. Check light for defective or broken seal.

b. Check for loose connections, and damaged or defective component parts (terminal strips, limit switches, drive motors, relays, etc.).

12-213. REPAIR OR REPLACEMENT — LANDING OR SEARCH LIGHT.

a. Accomplish replacement of sealed beam lamp unit as follows: Remove three screws from lamp retainer ring, remove ring and gasket, lift lamp and disconnect wiring.

Note

Observe position of lamp before removal and install new unit in same position using reverse order of removal procedure.

b. Replace complete unit if inspection items in paragraph 12-212, step b., are not met.

c. Replace landing light motor as follows:

(1) Remove cover plate and remove screws in clamp.

(2) Remove gear and motor together.

(3) Remove gear from motor.

(4) Install gear on new motor and replace in helicopter.

12-214. INSTALLATION — LANDING OR SEARCH LIGHT.

a. Connect wires and install terminal cover and clamp.

b. Insert light through hole, align mounting holes and install screws.

c. Check light for proper operation.

12-215. ANTI-COLLISION LIGHT.

12-216. Anti-collision light circuit consists of a circuit breaker, a switch, and anti-collision light assembly. Anti-collision light is installed on tailpipe fairing. Circuit breaker and switch are on overhead console. (See figure 13-34.)

12-217. OPERATIONAL CHECK—ANTI-COLLISION LIGHT.

a. Close ANTI COLL LIGHT circuit breaker.

b. Position anti-collision light switch S59 to ON and check that lamp(s) illuminate and that the light rotates at approximately 45 RPM giving 90 flashes per minute.

12-218. REMOVAL — ANTI-COLLISION LIGHT.

a. Be sure that all electrical power is OFF.

b. Remove mounting screws around base of light, lift light up, and disconnect electrical connector.

12-219. INSPECTION — ANTI-COLLISION LIGHT.

a. Inspect light for broken cover, lens or burned out lamp bulb element.

b. Inspect light for damaged case, broken connector, pins, and damaged rotation motor or drive unit.

12-220. REPAIR OR REPLACEMENT — ANTI-COLLISION LIGHT.

a. Loosen screw securing lens cover retaining ring, lift lens from light base. Install and secure new lens cover in reverse order of removal procedure.

b. Replace item if inspection requirements in paragraph 12-219, are not met.

12-221. INSTALLATION — ANTI-COLLISION LIGHT.

a. Connect electrical connector to light and secure with lockwire.

b. Place light in recess and install mounting screws.

c. Check light for proper operation.

12-222. NAVIGATION LIGHTS.

12-223. The navigation lights circuit consists of circuit breaker, two selector switches, flasher, two red lights on the left side and two green lights on the right side (one each above and below the cabin door), three fuselage white lights (one each above the cabin door and one on bottom right side of cabin), and one amber/clear light in the vertical fin of the aft section assembly. On UH-1D/H serial number 65-9565 and subsequent the white lights are protected by a separate circuit breaker. (See figure 13-34.)

12-224. OPERATIONAL CHECK — FUSELAGE AND NAVIGATION LIGHTS.

a. Close FUS LIGHTS circuit breaker. Place navigation lights switch S13 to STEADY. Position dim-bright switch S14 to BRT. Check that the two upper and one lower fuselage lights are on bright.

b. Position switch S14 to DIM and check that the fuselage lights specified in step a. are on dim.

c. Close NAV LIGHTS circuit breaker. Check that the two red (left side) and the two green (right side) navigation lights and the tail light are illuminated and are on dim.

d. Position switch S14 to BRT. Check that all lights specified in steps a. and c. are on bright.

e. Position switch S13 to FLASH. Check that the two red and two green navigation lights, and the tail light flash at a rate of approximately 85 ±15 cycles.

12-225. REMOVAL — NAVIGATION LIGHTS.

a. Check that all electrical power is OFF.

b. Remove cover retaining screw. Remove two screws attaching light assembly to bracket, pull assembly from helicopter, and disconnect electrical connector. Lift light assembly from helicopter. Cover loose wire with tape.

12-226. INSPECTION — NAVIGATION LIGHTS. (Refer to paragraph 12-176; procedure is the same.)

12-227. REPAIR OR REPLACEMENT — NAVIGATION LIGHTS. Replace faulty or damaged component parts (lens, lamp bulbs, etc.). If light case is damaged beyond repair complete unit must be replaced.

12-228. INSTALLATION — NAVIGATION LIGHTS.

a. Remove tape from wire and connect wire to light. Secure light to adapter bracket with two screws. Install cover with screw.

b. Check operation of light.

12-229. NAVIGATION LIGHTS FLASHER.

12-230. The navigation lights flasher is mounted in the aft electrical compartment. On UH-1D/H helicopters through serial number 64-13901 this unit will cause the white and colored navigation lights to flash alternately. On UH-1D/H serial number 65-9565 and subsequent it will cause only the colored navigation lights to flash.

12-231. REMOVAL — NAVIGATION LIGHTS FLASHER.

a. Be sure all electrical power is OFF.

b. Disconnect electrical connector. Remove mounting bolts and lift from compartment.

12-232. INSPECTION — NAVIGATION LIGHTS FLASHER. Inspect flasher case for dents or damage that would impair normal operation of the unit. Check connector for broken or corroded pins and cracked inserts.

12-233. REPAIR OR REPLACEMENT — NAVIGATION LIGHTS FLASHER. Replace item if inspection requirements are not met.

12-234. INSTALLATION — NAVIGATION LIGHTS FLASHER.

a. Position flasher in compartment and install mounting bolts.

b. Connect electrical connector. Check for proper operation.

12-235. RHEOSTAT.

12-236. The rheostats are mounted on the INST LTG panel in the overhead console. The rheostats are a means of turning on and dimming instrument, instrument secondary, console, and pedestal lights.

12-237. REMOVAL — RHEOSTAT.

a. Be sure all electrical power is OFF. Disengage fasteners to allow access to right hand side of overhead console.

b. Remove pointer knob and mounting hardware of rheostat. Disconnect wires from terminals of rheostat and cover wire ends.

12-238. INSPECTION — RHEOSTAT. (Refer to paragraph 12-11.)

12-239. REPAIR OR REPLACEMENT — RHEOSTAT. Replace item if inspection requirements are not met.

12-240. INSTALLATION — RHEOSTAT.

a. Position rheostat in panel and install mounting hardware and pointer knob.

b. Remove cover from wire ends and connect to proper terminals of rheostat.

c. Carefully close panel assembly of overhead console, noting that wires stow without binding or interference. Engage panel fasteners.

behind heater panel in overhead console. Find wire H110A20 attached to a terminal of K-46 relay. Temporarily jump this relay terminal to ground, thus simulating an overheat condition. Check that bleed air valve returns to the off or closed position.

(6) Remove the temporary jumper. Check that the bleed air valve returns to its preset position.

(7) Move switch S83 to OFF and then in turn to positions 1, 2, 3, and 4. Check that the bleed air valve is closed when switch S83 is in the OFF position and full-on when switch S83 is in position 4.

b. For helicopter Serial No. 66-16868 and subsequent, accomplish the following:

(1) Check that wire H86A20 is connected to terminal 16 (position 3) instead of terminal 13 of switch S85. Close CABIN HEATER AIR VALVE circuit breaker.

(2) Move switch S85 to OFF and then in turn to positions 1, 2, and 3. Check that the door post outlet valve and the aft outlet valve are closed when switch S85 is in the OFF position and full-on when switch S85 is in position 3.

(3) With switch S85 in position 1 or 2, move the aft outlet limit lever to the full-on position. This actuates switch S87. Check that the door post outlet valve and the aft outlet valve are closed when switch S85 is in the OFF position.

(4) Move aft outlet limit lever slightly toward the OFF position so that the door post outlet valve and the aft outlet valve return to their preset positions.

(5) Position switch S83 to ON. Obtain access to relay K-46 behind heater panel in overhead console. Find wire H110A20 attached to a terminal of K-46 relay. Temporarily jump this relay terminal to ground, thus simulating an overheat condition. Check that the variable mixture solenoid valve, L21, makes an audible click, thus signifying the off or closed position. Check that the bleed air valve motor, B34, is functioning.

(6) Remove the temporary jumper. Check that the variable mixture solenoid valve, L21, makes an audible click, thus signifying its return to the on or open position.

(7) Position switch S83 to ON and then OFF, while listening to determine that the bleed air valve motor and the solenoid valve, L21, is functioning.

12-246. OPERATIONAL CHECK—HEATED BLANKET RECEPTACLES — UTILITY OUTLETS.

a. Close both HEATED BLANKET circuit breakers.

b. Check for 28v dc at each receptacle mounted in the cabin roof. (Six receptacles on all aircraft prior to Serial No. 66-16034 and two receptacles on Serial No. 66-16034 and subsequent.) (See figure 13-36.)

12-247. OPERATIONAL CHECK — PILOT AND COPILOT WINDSHIELD WIPERS.

a. Suitably protect windshield against scratching by wiper blades. (See figure 13-37.)

b. Close WINDSHIELD WIPER PILOT and WINDSHIELD WIPER COPILOT circuit breakers. Position wiper selector switch S124 to BOTH. Position windshield wiper switch S23 to LOW. Check that pilot's and copilot's wipers operate at low speed.

c. Position switch S23 to MED position. Check that both wipers operate at medium speed.

d. Position S23 to HIGH. Check that both wipers operate at high speed.

e. Position switch S23 to PARK. Check that both wipers move at high speed to their park positions and stop.

f. Open WINDSHIELD WIPER COPILOT circuit breaker. Position selector switch S124 to PILOT. Check that pilot's wiper operates with wiper switch S23 in the LOW, MED, HIGH, and PARK positions.

g. Open WINDSHIELD WIPER PILOT circuit breaker. Close WINDSHIELD WIPER COPILOT circuit breaker. Position selector switch S124 to COPILOT. Check that copilot's wiper operates with wiper switch S23 in the LOW, MED, HIGH, and PARK positions. Position wiper switch S23 to OFF and open the WINDSHIELD WIPER COPILOT circuit breaker.

12-248. OPERATIONAL CHECK — CARGO HOOK.

a. Close both CARGO HOOK REL circuit breakers. Close and latch the hook. Position the cargo release switch to ARM. Check that cargo release armed light on the instrument panel is illuminated. (See figure 13-38.)

b. Depress cargo release switch S32 on the pilot's cyclic stick. Check that solenoid in the hook actuates and causes the hook to fall open.

c. Repeat step b. for switch S78 on the copilot's cyclic stick.

12-249. OPERATIONAL CHECK — RESCUE HOIST PROVISIONS. These checks shall be conducted on each helicopter having complete provisions for the rescue hoist. (See figure 13-39.)

a. Check that wire M20A20 is connected to HOIST PWR circuit breaker (1 ampere).

CHAPTER 13

WIRING DIAGRAMS

SECTION I GENERAL

13-1. SCOPE.

13-2. This chapter contains wiring diagrams and essential wiring information for the electrical systems and circuits in the UH-1D/H helicopter to assist maintenance personnel in understanding the circuits and components installed in the helicopter and in troubleshooting and tracing of inoperative and malfunctioning circuits.

13-3. WIRING DATA.

13-4. All wiring is adequately shielded and wires are marked with identification letters and numbers;

a. Wire Identification. Identification of each wire is accomplished by a combination of letters and numbers. (See figure 13-1.)

b. Abbreviations. Abbreviations used are in accordance with MIL-STD-12 except when the abbreviation depicts a marking actually found in the aircraft.

c. Symbols. Diagram components symbols are drawn in accordance with MIL-STD-15-1. (See figure 13-2.)

13-5. EQUIPMENT LIST.

13-6. The purpose of Tables 13-1 thru 13-4 is to provide maintenance personnel with the necessary information to correlate equipment location, wiring diagrams and text. Alphabetical, numerical code item numbers are assigned to each piece of equipment and is common in equipment location, illustrations, wiring diagrams and text.

13-7. CONNECTOR REPLACEMENT CHART.

13-8. The purpose of Table 13-5 is to provide maintenance personnel with necessary information to replace (resolder or crimp) a damaged electrical connector. The chart contains the connector code item number, the connector pin letters or numbers, and the wire number that installs in each respective pin. Only those connectors that are not shown in their entirety in one of the system diagrams are presented in table 13-5.

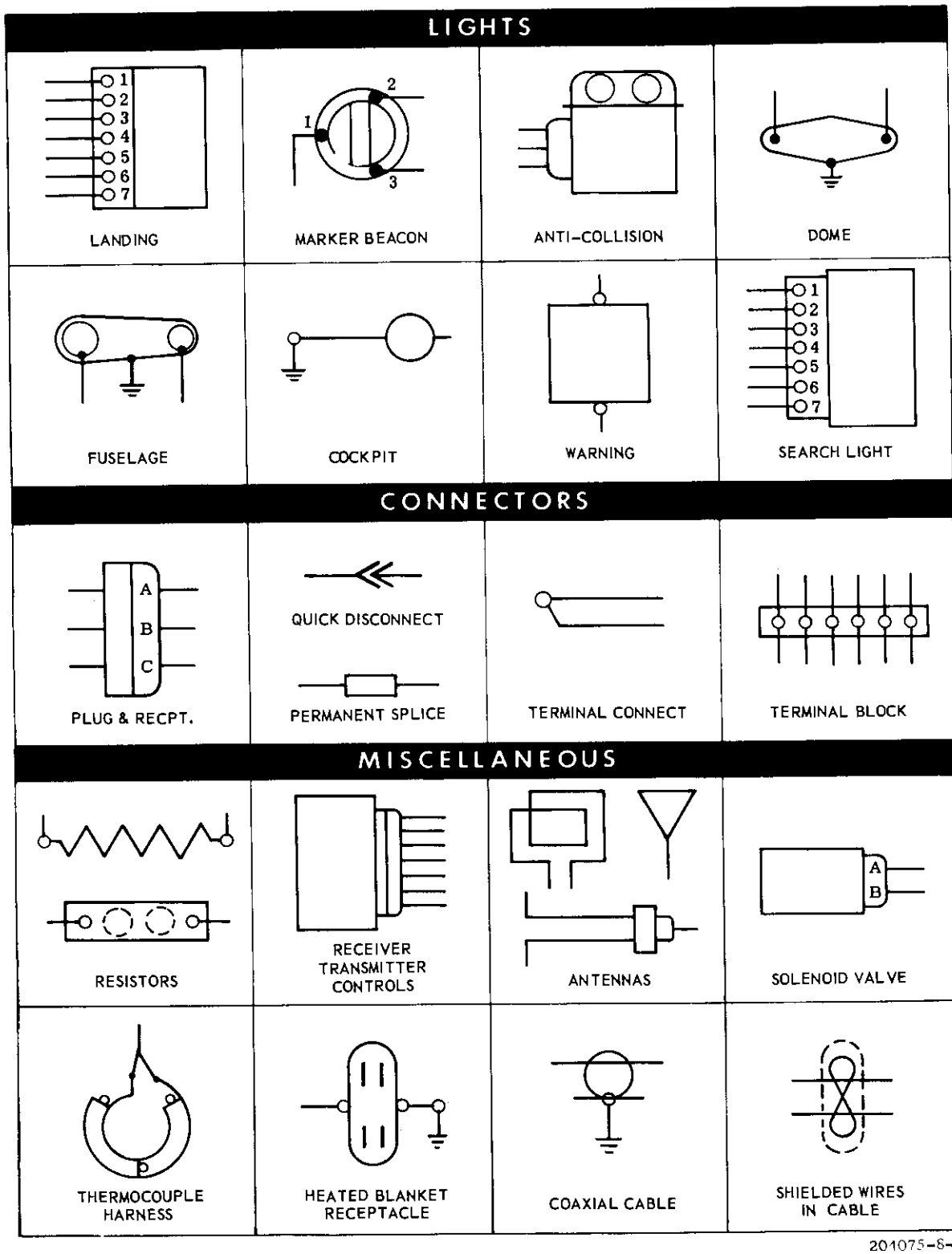

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Figure 13-2. Electrical symbol chart (Sheet 1 of 2)

TABLE 13-1. EQUIPMENT LIST - HELICOPTERS SERIAL NO. 65-9565 THROUGH 65-12895

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
A1	Panel, DC Power	E 2	Detector, Magnetic Chip
A2	Panel, AC Power	E3	Detector, Magnetic Chip
A3	Panel, Engine	E4	Detector, Magnetic Chip
A4	Panel, Caution		
A6	Panel, Instrument Lights	G2	Generator, 30 VDC (300A)
A7	Panel, Exterior Lights	G3	Generator, Tach. (Gas Prod.)
A8	Panel, Hydraulic Control	G4	Generator, Tach. (Pwr. Turb.)
A10	Panel, Miscellaneous	G5	Generator, Tach. (Rotor)
A11	Panel, Heating	G6	Generator, Starter 28V (200A)
A12	Cargo Hook Assembly	HR1	Heater, Pitot Tube
A13	Panel, Resistor		
A14	Panel, AC Circuit Breaker	I1	Indicator, Attitude (Copilot)
A15	Panel, Overhead Console	I2	Indicator, Fuel Quantity
A20	Panel Assembly, Aft Dome Lights	I3	Indicator, Torque - Pilot
A21	Panel, Dome Lights & Pitot Heater	I4	Indicator, Oil Pressure (Engine)
A26	Panel,Assembly, Ext. Fuel	I5	Indicator, Oil Pressure (XMSN)
		I6	Indicator, Fuel Pressure
B1	Syncro XMTR Torque Pressure	I7	Indicator, Tach. (Gas Prod.)
B3	Syncro XMTR, XMSN Oil Pressure	I8	Indicator, Tach-Dual (Pilot)
B3	Syncro XMTR, Engine Oil Pressure	I9	Light, Utility (Pilot)
B4	Syncro XMTR, Fuel Pressure	I10	Light, Dome
B5	Motor, Fuel Shutoff Valve	I11	Light, Search
B6	Motor, R/H Fuel Boost Pump	I12	Light, Fire Warning
B7	Motor, Windshield Wiper	I13	Light, Master Caution
B8	Motor, R/H Aux. Fuel Pump	I14	Light, Instrument Secondary
B12	Motor, Gov. RPM Actuator	I15	Lamp, Instrument & Edge Lights
B13	Motor, L/H Aux. Fuel Pump	I16	Light, Landing
B19	Motor, Bleed Air Valve	I17	Light, Left Navigation
B31	Motor, Copilot Windshield Wiper	I18	Light, Right Navigation
BT2	Battery	I19	Light, Tail
		I20	Light, Top Fuselage
C1	Capacitor, PF Corr. (MIL-C-25)	I21	Indicator, XMSN Oil Temp.
C7	Capacitor, Filter, JN14	I22	Indicator, Engine Oil Temp.
CB1	Circuit Breaker (5A)	I23	Indicator, Turn & Slip (Pilot)
CB2	Circuit Breaker (10A)	I25	Light, XMSN Sump Inspect
CB3	Circuit Breaker (15A)	I26	Light, Bottom Fuselage
CB4	Circuit Breaker (20A)	I28	Light, Utility (Copilot)
CB5	Circuit Breaker (25A)	I31	Indicator, Exh. Temp. (Pilot)
CB6	Circuit Breaker (1A)	I34	Standby Compass (Pilot)
CB7	Circuit Breaker (35A)	I40	Light, Anti-Collision
CB8	Circuit Breaker (1.5A)	I42	Indicator, Attitude (Pilot)
CB11	Circuit Breaker (7.5A)	I44	Light, Cargo Release Armed
CB12	Circuit Breaker (50A)	I45	Light, Hi-Lo RPM Warn.
CP1	Coupler, Fuel Qty. Sys. "J" Box, Unshielded	I72	Light, Air Filter, Warning
CP2	Coupler, Fuel Qty. Sys. "J" Box, Shielded	J2	Recept. Pitot Tube Heater
		J3	Recept. Instrument Panel Disc.
CR2	Diode, Ext. Power Relay	J4	Recept. Fuel Quantity Ind.
CR30	Diode, Batt. Voltage Fwd. Loc	J5	Recept. Fuel Pressure Ind.
CR31	Diode, Batt. Voltage Aft Loc	J6	Recept. Copilot Att. Ind.
		J7	Recept. Engine Oil Temperature Ind.
D1	Interver, 250 V.A. 3 Ph (Main)	J8	Recept. Engine Oil Pressure Ind.
D2	Inverter, 250 V.A. 3 Ph (Spare)	J9	Recept. Pilot Dual Tach. (Rotor)
DS1	Control Assembly, RPM Warn.	J10	Recept. Pilot Dual Tach. (Pwr. Turb.)
		J11	Recept. XMSN Oil Temperature Ind.
E1	Detector, Magnetic Chip	J12	Recept. XMSN Oil Pressure Ind.

TABLE 13-1. EQUIPMENT LIST - HELICOPTERS SERIAL NO. 65-9565 THROUGH 65-12895 (CONT)

ITEM NO.	DESCRIPTION
L9	Mag. Brake Fore & Aft Force Trim
L10	Mag. Brake Lat. Force Trim
L14	Solenoid, Door Post Htr. Outlet Valve
L15	Solenoid, Aft Outlet Valve Act.
M1	Meter, DC Load (Stand-By-Gen.)
M2	Meter, DC Volts
M3	Meter, AC Volts
M4	Meter, DC Load (Main Gen)
O2	Guard - Generator Sw-DC Pwr. Panel
P2	Plug, Pitot Tube Heater
P3	Plug, Instrument Panel Conn.
P4	Plug, Fuel Qty. Ind.
P5	Plug, Fuel Press. Ind.
P6	Plug, Copilot Att. Ind.
P7	Plug, Engine Oil Temp. Ind.
P8	Plug, Engine Oil Press. Ind.
P9	Plug, Pilot Dual Tach. (Rotor)
P10	Plug, Pilot Dual Tach. (Pwr. Turb.)
P11	Plug, XMSN Oil Temp. Ind.
P12	Plug, XMSN Oil Press. Ind.
P15	Plug, Pilot, Torque Meter
P16	Plug, Pilot, Turn & Slip Ind.
P17	Plug, Gas Prod. Turb. Tach
P20	Plug, Pilot's Cyclic Stick
P21	Plug, Hydraulic Cont. Panel
P22	Plug, Copilot Cyclic Stick
P23	Plug, Engine Panel
P24	Plug, Caution Panel
P25	Plug, Pilot Collective Stick
P26	Plug, Windshield Wiper
P28	Plug, Hyd. Bypass Sol. Valve
P29	Plug, Cargo Hook
P32	Plug, Cargo Hook Disc.
P35	Plug, Rotor Tach. Gen.
P36	Plug, XMSN Oil Pressure Sw.
P37	Plug, XMSN Oil Temp. Bulb
P38	Plug, Copilot Windshield Wiper
P39	Plug, XMSN Oil Press. XMTR
P41	Plug, XMSN Disc.
P42	Plug, Shielded Tank Unit Disc L/H Tank
P43	Plug, Monitor Tank Unit Disc L/H Tank
P44	Plug, Unshielded Tank Unit Disc. L/H Tank
P46	Plug, Fuel Tank Disc. L/H Cell
P47	Plug, Fuel Tank Disc. L/H Cell
P48	Plug, Fuel Tank Disc. L/H Cell
P53	Plug, Unshielded Tank Unit Aft Cell
P54	Plug, Shielded Tank Unit Aft Cell
P55	Plug, Fuel Tank Disc. - Aft Cell
P56	Plug, Fuel Tank Disc. - Aft Cell
P57	Plug, Ext. Fuel Cont. Panel
P60	Plug, Field Relay Gen.
P64	Plug, Torque Press. XMTR
P65	Plug, Eng. Oil Press. XMTR
P66	Plug, Fuel Press. XMTR
P68	Plug, Muff Heater Disc.
P71	Plug, Fuel Valve Shut-off
P72	Plug, Engine Oil Press. Sw.
P74	Plug, Battery Disc. Fwd.
P75	Plug, Navigation Lights Flasher
P77	Plug, Ice Detector
P80	Plug, Eng. Air Pressure Sw.
P81	Plug, Starter Deck
P84	Plug, De-Iceing Hot Air Valve
P85	Plug, Oil Temp. Bulb
P86	Plug, Power Turb. Tach.
P87	Plug, Gas Prod. Tach.
P88	Plug, Ignition Unit-Eng.
P89	Plug, Ignition Sol. Valve
P90	Plug, Fuel Cont. Sol. Valve
P91	Plug, Engine Disc.
P92	Plug, Engine Forward Disc.
P93	Plug, Fire Det. Forward Disc.
P94	Plug, Fire Det. Element R/H
P95	Plug, Fire Det. Element L/H
P96	Plug, Fire Det. Element R/H
P97	Plug, Fire Det. Element L/H
P98	Plug, Tail Light Disc.
P99	Plug, Thermocouple Disc. - Engine
P99A	Plug, Thermocouple Disc. - Engine
P99B	Plug, Thermocouple Disc. - Engine
P102	Plug, Standby Compass (Pilot)
P107	Plug, Copilot Coll. Stick
P108	Plug, Fuel Diff. Press. Sw.
P110	Plug, Anti-Collision Light Disc.
P111	Plug, Anti-Collision Light
P112	Plug, Mag. Brake Anti-Torque
P113	Plug, Mag. Brake Fore and Aft
P114	Plug, Displacement, Roll & Pitch Gyro
P130	Plug, Rate Switching Gyro
P131	Plug, Attitude Ind.
P135	Plug, Ice-Interpreter
P136	Plug, Ice-Interpreter
P138	Plug, Door Post - Aft Outlet Valve Act.
P146	Plug, Bleed Air Valve
P147	Plug, Unshielded Tank Coupler Disc.
P148	Plug, Unshielded Tank Coupler Disc.
P149	Plug, Unshielded Tank Coupler Disc.
P151	Plug, Shielded Tank Coupler Disc.
P152	Plug, Shielded Tank Coupler Disc.
P153	Plug, Shielded Tank Coupler Disc.
P155	Plug, Hi-Lo RPM Warning
P156	Plug, Engine Fuel Filter Bypass
P166	Plug, Aft Outlet Valve
P191	Plug, Inverter Disc. - Main
P192	Plug, Inverter Disc. - Spare
P194	Plug, Engine Chip Detector
P1017	Plug, Ext. Fuel Disc. L/H
P1024	Plug, Ext. Fuel Disc. R/H

TABLE 13-1. EQUIPMENT LIST - HELICOPTERS SERIAL NO. 65-9565 THROUGH 65-12895 (CONT)

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
Z5	XMSN Oil Temperature Bulb	Z16	Fuel Qty. Tank Unit - Aft
Z6	Engine Oil Temperature Bulb	Z17	Displacement - Roll and Pitch Gyro
Z8	Ice Interpreter		
Z9	Fire Det. Cont.	Z18	Rate Switching Gyro
Z13	Ice Detector	Z22	Fuel Qty. Tank Unit R/H Forward

TABLE 13-2. EQUIPMENT LIST - HELICOPTERS SERIAL NO. 66-746 THROUGH 66-17144

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
A1	Panel, DC Power	E1	Detector, Magnetic Chip
A2	Panel, AC Power	E2	Detector, Magnetic Chip
A3	Panel, Engine	E3	Detector, Magnetic Chip
A4	Panel, Caution	E4	Detector, Magnetic Chip
A6	Panel, Instrument Lights		
A7	Panel, Exterior Lights	G2	Generator, 30 VDC (300A)
A8	Panel, Hydraulic Cont.	G3	Generator, Tach. (Gas Prod.)
A10	Panel, Misc.	G4	Generator, Tach. (Pwr. Turb.)
A11	Panel, Heating	G5	Generator, Tach (Rotor)
A12	Cargo, Hook Assembly	G6	Generator, Starter 28V (200A)
A13	Panel, Resistor	HR1	Heater, Pilot Tube
A14	Panel, AC Circuit Breaker		
A15	Panel, Overhead Console	I1	Indicator, Attitude (Copilot)
A20	Panel, Assembly Aft Dome Lts.	I2	Indicator, Fuel Qty.
A21	Panel, Dome Light Pitot Heater	I3	Indicator, Torque - Pilot
A26	Planel, Assembly Ext. Fuel	I4	Indicator, Oil Press. (Eng.)
		I5	Indicator, Oil Press. (XMSN)
B1	Synchro XMTR, Torque Press.	I6	Indicator, Fuel Pressure
B3	Synchro XMTR, XMSN Oil Press.	I7	Indicator, Tach. (Gas Prod.)
B3	Synchro XMTR, Eng. Oil Press.	I8	Indicator, Tach. Dual (Pilot)
B4	Synchro XMTR, Fuel Press.	I9	Light, Utility (Pilot)
B5	Motor, Fuel Shut-Off Valve	I10	Light, Dome
B6	Motor, R/H Fuel Boost Pump	I11	Light Search
B7	Motor, Windshield Wiper	I12	Light, Fire Warning
B8	Motor, R/H Aux. Fuel Pump	I13	Light, Master Caution
B12	Motor, Gov. RPM Actuator	I14	Light, Instrument Secondary
B13	Motor, L/H Aux. Fuel Pump	I15	Lamp, Instrument & Edge Lights
B19	Motor, Bleed Air Valve	I16	Light, Landing
B22	Motor, Boom Actuator Hoist	I17	Light, Left Navigation
B31	Motor, Copilot Windshield Wiper	I18	Light, Right Navigation
B33	Motor, Winch Assy. Hoist	I19	Light, Tail
B34 ⚠1	Motor, Bleed Air Valve	I20	Light, Top Fuselage
BT2	Battery	I21	Indicator XMSN Oil Temp.
		I22	Indicator, Engine Oil Temp.
C1	Capacitor, PF (Corr (MIL-C-25)	I23	Indicator, Turn & Slip (Pilot)
C7	Capacitor, Filter	I25	Light, XMSN Sump Inspect
CB1	Circuit Breaker (5A)	I26	Light, Bottom Fuselage
CB2	Circuit Breaker (10A)	I28	Light, Utility (Copilot)
CB3	Circuit Breaker (15A)	I31	Indicator, Exhaust Temp. (Pilot)
CB4	Circuit Breaker (20A)	I34	Standby, Compass (Pilot)
CB5	Circuit Brekaer (25A)	I40	Light, Anti-Collision
CB6	Circuit Breaker (1A)	I42	Indicator, Attitude (Pilot)
CB7	Circuit Breaker (35A)	I44	Light, Cargo Release Armed
CB8	Circuit Breaker (1.5A)	I45	Light, Hi-Lo RPM Warn.
CB11	Circuit Breaker (7.5A)	I72 ⚠2	Light, Air Filter Warning
CB12	Circuit Breaker (50A)		
CP1	Fuel Qty. Sys. "J" Box, Unshielded	J2	Recept. Pitot Tube Heater
CP2	Fuel Qty. Sys. "J" Box Shielded	J3	Recept. Instr. Panel Disc.
CR2	Diode, External Power Relay	J4	Recept. Fuel Qty. Ind.
CR30	Diode, Batt. Voltage Fwd. Loc	J5	Recept. Fuel Press. Ind.
CR31	Diode, Batt. Voltage Aft Loc	J6	Recept. Copilot Att. Ind.
		J7	Recept. Engine Oil Temp. Ind.
D1	Inverter (Main)	J8	Recept. Engine Oil Press. Ind.
D2	Inverter (Spare)	J9	Recept. Pilot Dual Tach. Rotor
DS1	Control Assy, RPM Warning	J10	Recept. Pilot Dual Tach. Pwr. Turb.

TABLE 13-2. EQUIPMENT LIST - HELICOPTERS SERIAL NO. 66-746 THROUGH 66-17144 (CONT)

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
J11	Recept. XMSN Oil Temp. Ind.	J105	Recept. Heated Blanket L/H
J12	Recept. XMSN Oil Press. Ind.	J106	Recept. Heated Blanket R/H
J15	Recept. Pilot Torque Meter	J107	Recept. Copilot Collective Stick
J16	Recept. Pilot Turn & Slip Ind.	J108	Recept. Fuel Diff. Press. Sw.
J17	Recept. Gas Prod. Tach.	J109	Recept. External Power
J20	Recept. Pilot Cyclic Stick	J110	Recept. Anti-Collision Light Disc.
J21	Recept. Hydraulic Cont. Panel	J111	Recept. Anti-Collision Light
J22	Recept. Copilot Cyclic Stick	J112	Recept. Mag. Brake Anti-Torque
J23	Recept. Engine Panel	J113	Recept. Mag. Brake Fore & Aft
J24	Recept. Caution Panel	J114	Recept. Mag. Brake - Lat.
J25	Recept. Pilot Collective Stick	J115	Recept. Test-Eng. Vibration Meter
J26	Recept. Windshield Wiper (Pilot)	J119	Recept. Cabin Roof Disc. Hoist
J28	Recept. Hydraulic Bypass Sol.	J127 ⚠1	Recept. Var. Mix. Valve Disc.
J29	Recept. Hydraulic Press. Warning Sw.	J129	Recept. Displacement Roll & Pitch Gyro
J31	Recept. Cargo Hook	J130	Recept. Rate Switch Gyro
J32	Recept. Cargo Sling Disc.	J131	Recept. Attitude Ind.
J35	Recept. Rotor, Tach. Gen.	J135	Recept. Ice Interpreter
J36	Recept. XMSN Oil Press. Sw.	J136	Recept. Ice Interpreter
J37	Recept. XMSN Oil Temp. Bulb	J138	Recept. Door Post Outlet Valve Act.
J38	Recept. Copilot Windshield Wiper	J146	Recept. Bleed Air Valve
J39	Recept. XMSN Oil Press. XMTR	J147	Recept. Internal Aux. Fuel Disc L/H
J41	Recept. XMSN Disc.	J148	Recept. Internal Aux. Fuel Disc. R/H
J42	Recept. Fuel Tank Disc. L/H	J155	Recept. Hi-Lo RPM Warning
J43	Recept. Compensator Fuel Tank Disc L/H	J156	Recept. Engine Fuel Filter Bypass Sw.
J44	Recept. Fuel Tank Disc. L/H	J166	Recept. Aft Outlet Valve
J53	Recept. Bulkhead Feed-thru-Aft Fuel Cell	J191	Recept. Main Inverter Power
J54	Recept. Bulkhead Feed-thru-Aft Fuel Cell	J102	Recept. Spare Inverter Power
J57	Recept. Ext. Fuel Cont. Panel	J194	Recept. Engine Chip Detector
J60	Recept. Socket, Relay-Gen-Field	J268	Recept. Hoist Cont. Box
J64	Recept. Torque Press. XMTR	J269	Recept. Hoist Cont. Box
J65	Recept. Engine Oil Press. XMTR	J270	Recept. Hoist Cont. Box
J66	Recept. Fuel Press. XMTR	J271	Recept. Hoist Cont. Box
J68	Recept. Disc. Muff Heater	J272	Recept. Hoist Cont. Box
J71	Recept. Engine Fuel Valve	J273	Recept. Hoist Cont. Pendent
J72	Recept. Engine Oil Press. Sw.	J274	Recept. Hoist Boom Act.
J74	Recept. Battery Disc.	J275	Recept. Hoist Winch Assembly
J75	Recept. Navigation Lights Flasher	J1017	Recept. Ext. Fuel Disc. L/H
J77	Recept. Ice Detector	J1024	Recept. Ext. Fuel Disc. R/H
J80	Recept. Engine Air Filter Press. Sw.		
J81	Recept. Starter-Deck	K1	Relay, Ext. Power
J84	Recept. De-Icing Hot Air Valve	K2	Relay, Non-Ess Bus
J85	Recept. Engine Oil Temp. Bulb	K3	Relay, Starter
J86	Recept. Power Turbine Tach.	K4	Relay, Bus Cont. (Gen Fail)
J87	Recept. Gas Turbine Tach.	K5	Relay, Reverse Curr. (Main)
J89	Recept. Primer Valve (Fuel Ign. Sol.)	K6	Relay, Overvoltage
J90	Recept. Fuel Cont. Sol. Valve	K7	Relay, Gen Field
J91	Recept. Engine Disc.	K8	Relay, AC Failure
J92	Recept. Engine Firward Disc.	K9	Relay, Battery
J93	Recept. Fire Det. Forward Disc.	K10	Relay, Fuel Transfer
J94	Recept. Fire Det. Element R/H	K15	Relay, Standby Gen Field
J95	Recept. Fire Det. Element L/H	K23	Relay, Standby Gen. Rev. Curr.
J96	Recept. Fire Det. Element R/H	K24	Relay, Cargo Hook Release
J97	Recept. Fire Det. Element L/H	K27	Relay, Inverter
J98	Recept. Tail Light Disc.	K32	Relay, Hoist Power
J99	Recept. Thermocouple Disc.	K35	Relay, Main Invtr. Power
J102	Recept. Standby Compass (Pilot)	K36	Relay, Spare Invtr. Power

TABLE 13-2. EQUIPMENT LIST - HELICOPTERS SERIAL NO. 66-746 THROUGH 66-17144 (CONT)

ITEM NO.	DESCRIPTION
K37	Relay, Lo-Fuel Caution Light
K38	Relay, Lo-Fuel Caution Light
K46	Relay, Overheat
K65	Relay, Battery Aft Location
K66	Relay, Battery Feeder
L1	Solenoid, Primer (Ignition)
L2	Solenoid, Fuel Cont. Valve
L4	Solenoid, Hydraulic Bypass
L6	Solenoid, Hot-Air De-Icer
L7	Solenoid, Idle Stop Rel.
L8	Mag. Brake - Anti-Torque Force Trim
L9	Mag. Brake - Fore & Aft Force Trim
L10	Mag. Brake - Lat Force Trim
L14	Solenoid, Door Post Htr. Outlet Valve
L15	Solenoid, Aft Outlet Valve Act.
L21 ⚠	Solenoid, Var. Mix Valve
M1	Meter, DC Load (Standby Gen)
M2	Meter, DC Volts
M3	Meter, AC Volts
M4	Meter, DC Load (Main Gen)
O2	Guard, Gen-Sw. DC Power Panel
O3	Guard, Cable Out Sw-Hydraulic Panel
P2	Plug, Pitot Tube Htr
P3	Plug, Inst. Panel Conn.
P4	Plug, Fuel Qty. Ind.
P5	Plug, Fuel Press. Ind.
P6	Plug, Copilot Att. Ind.
P7	Plug, Engine Oil Temp. Ind.
P8	Plug, Engine Oil Press. Ind.
P9	Plug, Pilot Dual Tach. (Rotor)
P10	Plug, Pilot Dual Tach. (Power-Turb.)
P11	Plug, XMSN Oil Temp. Ind.
P12	Plug, XMSN Oil Press. Ind.
P15	Plug, Pilot Torque Meter
P16	Plug, Pilot Turn & Slip Ind.
P17	Plug, Gas Prod Turb. Tach.
P20	Plug, Pilot's Cyclic Stick
P21	Plug, Hydraulic Cont. Panel
P22	Plug, Copilot Cyclic Stick
P23	Plug, Engine Panel
P24	Plug, Caution Panel
P25	Plug, Pilot Collective Stick
P26	Plug, Windshield Wiper (Pilot)
P28	Plug, Hydraulic Bypass Sol. Valve
P29	Plug, Hydraulic Press. Warning Sw.
P31	Plug, Cargo Hook
P32	Plug, Cargo Hook Disc.
P35	Plug, Rotor Tachometer Gen.
P36	Plug, XMSN Oil Press. Sw.
P37	Plug, XMSN Oil Temp. Bulb
P38	Plug, Copilot Windshield Wiper
P39	Plug, XMSN Oil Press. XMTR
P41	Plug, XMSN Dis.
P42	Plug, Shld Tank Unit Disc. (L/H Tank)
P43	Plug, Monitor Tank Unit Disc. (L/H Tank)
P44	Plug, Unshld Tank Unit Disc. (L/R Tank)
P46	Plug, Fuel Tank Disc. L/H Cell
P46	Plug, Fuel Tank Disc. L/H Cell
P48	Plug, Fuel Tank Disc. L/H Cell
P53	Plug, Unshld Tank Unit - Aft Cell
P54	Plug, Shielded Tank Unit - Aft Cell
P55	Plug, Fuel Tank Disc. - Aft Cell
P56	Plug, Fuel Tank Disc. - Aft Cell
P57	Plug, Ext. Fuel Cont. Panel
P60	Plug, Field Relay Gen.
P64	Plug, Torque Press. XMTR
P65	Plug, Eng. Oil Press XMTR
P66	Plug, Fuel Press. XMTR
P68	Plug, Muff Heater Disc.
P71	Plug, Fuel Valve Shut-Off
P72	Plug, Engine Oil Press. Sw.
P74	Plug, Battery Disc.
P75	Plug, Nav. Lights Flasher
P77	Plug, Ice Detector
P80	Plug, Engine Filter Press. Sw.
P81	Plug, Starter Deck
P84	Plug, De-Ice Hot Air Valve
P85	Plug, Oil Temp. Bulb
P86	Plug, Power Turb. Tach.
P87	Plug, Gas Prod. Tach.
P88	Plug, Ignition Unit - Engine
P89	Plug, Ignition Sol. Valve
P90	Plug, Fuel Cont. Sol. Valve
P91	Plug, Engine Disc.
P92	Plug, Engine Forward Disc.
P93	Plug, Fire Det. Forward Disc.
P94	Plug, Fire Det. Element - R/H
P95	Plug, Fire Det. Element - L/H
P96	Plug, Fire Det. Element - R/H
P97	Plug, Fire Det. Element - L/H
P98	Plug, Tail Light Disc.
P99A	Plug, Thermocouple Disc - Engine
P99B	Plug, Thermocouple Disc - Engine
P102	Plug, Standby Compass (Pilot)
P107	Plug, Copilot Coll. Stick.
P108	Plug, Fuel Diff. Press. Sw.
P110	Plug, Anti Coll. Light Disc.
P111	Plug, Anti Coll. Light
P112	Plug, Mag. Brake - Anti-Torque
P113	Plug, Mag. Brake - Fore & Aft
P114	Plug, Mag. Brake - Lat.
P119	Plug, Cabin Roof Disc. Hoist
P127 ⚠	Plug, Var. Mix Valve Disc.
P129	Plug, Displacement, Roll & Pitch Gyro
P130	Plug, Rate Switch Gyro
P131	Plug, Attitude Ind.
P135	Plug, Ice Interpreter
P136	Plug, Ice Interpreter
P138	Plug, Door Post, Aft Out Val. Act.

TABLE 13-2. EQUIPMENT LIST - HELICOPTERS SERIAL NO. 66-746 THROUGH 66-17144 (CONT)

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
P146	Plug, Bleed Air Valve	S25	Switch, Landing Lt. (Ext. Retr)
P147	Plug, Unshielded Tank Coupler Disc.	S26	Switch XMSN Oil Temp.
P148	Plug, Unshielded Tank Coupler Disc.	S27	Switch, Hydraulic Press.
P149	Plug, Unshielded Tank Coupler Disc.	S28	Switch, XMSN Oil Press. Warn.
P151	Plug, Shielded Tank Coupler Disc.	S29	Switch, Eng. Oil Press. Warn.
P152	Plug, Shielded Tank Coupler Disc.	S31	Switch, Limit (Ext. Pwr. Door)
P153	Plug, Shielded Tank Coupler Disc.	S32	Switch, Cargo Release (Pilot)
P155	Plug, Hi-Lo RPM Warning	S33	Switch, Gov. (Auto-Emer)
P156	Plug, Engine Fuel Filter Bypass	S35 ③	Switch, Fwd. Dome Lt.
P166	Plug, Aft Outlet Valve	S36	Switch, Cargo Release
P191	Plug, Inverter Disc. - Main	S37	Switch, RPM Gov. (Pilot)
P192	Plug, Inverter Disc. - Spare	S38	Switch, Fuel (ON-OFF)
P194	Plug, Engine Chip Detector	S39	Switch, Invtr (Main - Spare)
P268	Plug, Hoist to Ship	S40	Switch, Battery (ON-OFF)
P269	Plug, Cable, Out & Up Limit	S41	Switch, Upper Float
P270	Plug, Hoist to Cont. Pendant	S42	Switch, Lower Float
P271	Plug, Boom Act.	S44	Switch, Fuel - Low Level
P272	Plug, Hoist to Winch Assy	S45	Switch, Fuel - Transfer L/H
P273	Plug, Cont. Pendant	S46	Switch, Fuel - Transfer R/H
P274	Plug, Boom Act.	S49	Switch, J-2 Comp. De-slave
P275	Plug, Winch Assembly	S50	Switch, Idle Stop Rel. (Pilot)
P1017	Plug, Ext. Fuel Disc. L/H	S51	Switch, RPM Gov. (Copilot)
P1024	Plug, Ext. Fuel Disc. R/H	S58	Switch, Fuel Diff. Press.
		S59	Switch, Anti-Coll. Light
R1	Shunt, Ammeter (Stby Gen.)	S62	Switch, Non-Ess Bus Cont.
R2	Shunt, Ammeter (Main Gen.)	S63	Switch, Ext. Fuel Jett.
R3	Resistor - Windshield Wiper	S68	Switch, Force Trim
R4	Rheostat, Pilot Inst. Lt. Dim	S70	Switch, Starter Gen.
R5	Rheostat, Sec. Inst. Lt. Dim	S73	Switch, Overheat Bleed Air
R6	Rheostat, Overhead Console	S75	Switch, Searchlight (ON-STOW)
R7	Resistor, Navigation Lts. Dim	S76	Switch, Landing Light (ON-OFF)
R8	Rheostat, Ped. Lights Dim	S77	Switch, Starter (Copilot Coll)
R9	Rheostat, Engine Inst. Lights Dim	S78	Switch, Cargo Rel (Copilot)
R10	Rheostat, Copilot Inst. Lights Dim	S79	Switch, Fuel Ejector Flow Sw. L/H
R11	Resistor, Fire Det. Cont.	S80	Switch, Fuel Ejector Flow Sw. R/H
R12	Resistor, Spool Thermocouple	S81	Switch. De-Ice (ON-OFF)
R21	Rheostat, Aft Dome Lts.	S83	Switch, Bleed Air (ON-OFF)
R26	Rheostat, Course Ind. Lt. Dim	S84 ①	Switch, Bleed Air (Ht-Def)
R27	Resistor, AC Load Balancing	S85	Switch, Aft Outlets (Htr)
		S87	Switch, Aft-Outlet Limit
S1	Switch, Aft Dome Lt.	S88 ③	Switch, Start Fuel
S2	Switch, Rotary (DC VM Sel)	S93	Switch, Hi-Lo RPM
S4	Switch, XMSN Sump Inspection Lt.	S94	Switch, Fuel Filter Bypass
S5	Switch, Fuel Qty. Test	S96	Switch, Cable Cut
S6	Switch, Starter (Pilot Coll)	S97	Switch, Cable Up Limit
S7	Switch, Hydraulic Boost Cont.	S101	Switch, Overload Sense
S8	Switch, Gen. (ON-OFF-RESET)	S111	Switch, Fuel Trans. Pump
S9	Switch, Pitot Heater	S112	Switch, Pilot Hoist Cont.
S10	Switch, Force Trim (Copilot Cyc.)	S114	Switch, Fire Control
S11	Switch, Rotary (AC VM Sel)	S115	Switch, Fire Control
S12	Switch, Searchlight Cont.	S124	Switch, Sel-W/Wiper
S13	Switch, Nav. Lts. (Flash Steady)	S134	Switch, Chip Det. Sel
S14	Switch, Nav. Lts. (Bright-Dim)	S195	Switch, Diff. Press.
S18	Switch, Force Trim (Pilot Cyc.)		
S20	Switch, Test (Fire Det.)	T1	Transformer 115/28V
S23	Switch, Windshield Wiper	RB1	Term. Blk. Fwd. Inst. Panel

TABLE 13-2. EQUIPMENT LIST - HELICOPTERS SERIAL NO. 66-746 THROUGH 66-17144 (CONT)

ITEM NO.	DESCRIPTION
TB2	Term. Blk. Overhead Console R/H
TB3	Term. Blk. Overhead Console L/H
TB4	Term. Blk. Aft Fuel Cell
TB9	Term. Blk. Top Ext. & Dome Lts.
TB12	Term. Blk. Ped. Panel Edge Lts.
TB13	Term. Blk. Inst. Panel Lts.
TB14	Term. Blk. Inst. Panel Sec. Lts.
TB15	Term. Blk. Cockpit Lts L/H
TB16	Term. Blk. Cockpit Lts. R/H
TB25	Term. Blk. Thermocouple Ind.
TB26	Term. Blk. DC Gnd & Audio
TB27	Term. Blk. Aft Thermo Lead
TB29	Term. Blk. Inst. Ground
TB34	Term. Blk. Aft Dome Lt. Panel
TB35	Term. Blk. R/H Fuel Cell
TB36	Term. Blk. Ext. Power Diode
TB38	Term. Blk. Left-hand Fuel Cell
TB39	Term. Blk. Elec. Compt. Aft
TB45	Term. Blk. Pitot Heater - Disc.
TB60	Term. Blk. Battery Voltage, Fwd.
TB61	Term. Blk. Battery Voltage, Aft
VR1	Regulator - Voltage (Main Gen)
VR2	Regulator, Voltage (Stby Gen.)
W1	Cable Assembly
Z2	Engine, Ignition Unit
Z3	Flasher Unit - Nav. Lts.
Z5	XMSN Oil Temp. Bulb
Z6	Engine Oil Temp. Bulb
Z8	Ice Interpreter
Z9	Fire Det. Cont.
Z13	Ice Detector
Z16	Fuel Qty. Tank Unit - Aft
Z17	Displacement - Roll * Pitch Gyro
Z18	Rate Switching Gyro
Z22	Fuel Qty. Tank Unit R/H Fwd.
Z24	Hoist Control Box
Z25	Hoist Cable Cutter
Z41	Hoist Control Pendant

NOTES

(1) EFF 66-16868 thru 66-17144

(2) EFF 66-746 through 66-16867

(3) EFF 66-746 through 66-1210, 66-16000 through 66-16033

TABLE 13-3. EQUIPMENT LIST - HELICOPTERS SERIAL NO. 67-17145 THROUGH 67-19537

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
A1	Panel, DC Power	E1	Detector Magnetic Chip
A2	Panel, AC Power	E2	Detector Magnetic Chip
A3	Panel, Engine	E3	Detector, Magnetic Chip
A4	Panel, Caution		
A6	Panel, Instrument Lights	G2	Generator, 30VDC (300A)
A7	Panel, Ext. Lights	G3	Generator, Tach (Gas Prod)
A8	Panel, Hydraulic Cont.	G4	Generator, Tach (Pwr Turb)
A10	Panel, Miscellaneous	G5	Generator, Tach (Rotor)
A11	Panel, Heating	G6	Generator, Starter 28V (200A)
A12	Cargo, Hook Assembly	HR1	Heater, Pitot Tube
A13	Panel, Resistor		
A14	Panel, AC Circuit Breaker	I1	Indicator, Attitude (Copilot)
A15	Panel, Overhead Console	I2	Indicator, Fuel Qty.
A20	Panel Assembly Aft Dome Lights	I3	Indicator, Torque - Pilot
A21	Panel, Dome Lt. & Pitot Heater	I4	Indicator, Oil Press (Eng)
A26	Panel, Assembly Ext. Fuel	I5	Indicator, Oil Press (XMSN)
		I6	Indicator, Fuel Press.
B1	Syncro XMTR, Torque Press.	I7	Indicator, Tach (Gas Prod)
B2	Syncro XMTR, XMSN Oil Press.	I8	Indicator, Tach Dual (Pilot)
B3	Syncro XMTR, Engine Oil Press.	I9	Light, Utility (Pilot)
B4	Syncro XMTR, Fuel Press.	I10	Light, Dome
B5	Motor, Fuel Shutoff Valve	I11	Light, Search
B6	Motor, R/H Fuel Boost Pump	I12	Light, Fire Warning
B7	Motor, Windshield Wiper	I13	Light, Master Caution
B8	Motor, R/H Aux. Fuel Pump	I14	Light, Instr. Secondary
B12	Motor, Gov. RPM Actuator	I15	Lamp, Instr. & Edge Lights
B13	Motor, L/H Aux. Fuel Pump	I16	Light, Landing
B22	Motor, Boom Actuator Hoist	I17	Light, Left Nav.
B31	Motor, Copilot Windshield Wiper	I18	Light, Right Nav.
B35	Motor, Winch Assembly, Hoist	I19	Light, Tail
B34	Motor, Bleed Air Valve	I20	Light, Top Fuselage
BT2	Battery	I21	Indicator, XMSN Oil Temp.
		I22	Indicator, Eng. Oil Temp.
C1	Capacitor, PF Corr. (MIL-C-25)	I23	Indicator, Turn & Slip (Pilot)
C7	Capacitor Filter, JN14	I25	Light, XMSN Sump Inspect
CB1	Circuit Breaker (5A)	I26	Light, Bottom Fuselage
CB2	Circuit Breaker (10A)	I28	Light, Utility (Copilot)
CB3	Circuit Breaker (15A)	I31	Indicator, Exh. Temp. (Pilot)
CB4	Circuit Breaker (20A)	I34	Standby Compass (Pilot)
CB5	Circuit Breaker (25A)	I40	Light, Anti-Collision
CB6	Circuit Breaker (1A)	I42	Indicator, Attitude (Pilot)
CB7	Circuit Breaker (35A)	I44	Light, Cargo Release Armed
CB8	Circuit Breaker (2A)	I45	Light, Hi-Lo RPM Warn.
CB11	Circuit Breaker (7.5A)		
CB12	Circuit Breaker (50A)	J2	Recept. Pitot Tube Heater
CB13	Circuit Breaker (1A)	J3	Recept. Instrument Panel Disc.
CP1	Coupler, Fuel Qty. Unshielded	J4	Recept. Fuel Quantity Ind.
CP2	Coupler, Fuel Qty. Shielded	J5	Recept. Fuel Press. Ind.
CR2	Diode, Ext. Power Relay	J6	Copilot Att. Ind.
CR30	Diode, Battery Voltage Fwd. Loc	J7	Recept. Engine Oil Temp. Ind.
CR31	Diode, Battery Voltage, Aft Loc	J8	Recept. Engine Oil Press. Ind.
		J9	Recept. Pilot Dual Tach. Rotor
D1	Inverter (Main)	J10	Recept. Pilot Dual Tach. Pwr. Turb.
D2	Inverter (Spare)	J11	Recept. XMSN Oil Temp. Ind.
DS1	Control Assembly RPM Warn.	J12	Recept. XMSN Oil Press. Ind.

TABLE 13-3. EQUIPMENT LIST - HELICOPTERS SERIAL NO. 67-17145 THROUGH 67-19537 (CONT)

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
J15	Recept. Pilot Torque Meter	J110	Recept. Anti-Coll. Lt. Disc.
J16	Recept. Pilot Turn & Slip Ind.	J111	Recept. Anti-Coll. Light
J17	Recept. Gas Prod. Tach.	J112	Recept. Mag. Brake - Anti-Torque
J20	Recept. Pilot Cyclic Stick	J113	Recept. Mag. Brake - Fore & Aft
J23	Recept. Engine Panel	J114	Recept. Mag. Brake Lat.
J24	Recept. Caution Panel	J115	Recept. Test - Eng. Vibration Meter
J25	Recept. Pilot Coll. Stick	J119	Recept. Cabin Roof Disc. Hoist
J26	Recept. Windshield Wiper	J127	Recept. Var. Mix. Valve Disc.
J28	Recept. Hydraulic Bypass Sol.	J129	Recept. Displacement Roll & Pitch Gyro
J29	Recept. Hydraulic Press. Warn. Sw.	J130	Recept. Rate Switch Gyro
J31	Recept. Cargo Hook	J131	Recept. Attitude Indicator
J32	Recept. Cargo Sling Disc.	J135	Recept. Ice Interpreter
J35	Recept. Rotor, Tach. Gen.	J136	Recept. Ice Interpreter
J36	Recept. XMSN Oil Press. Sw.	J138	Recept. Door Post Outlet Valve Act.
J37	Recept. XMSN Oil Temp. Bulb	J146	Recept. Bleed Air Valve
J38	Recept. Copilot Windshield Wiper	J147	Recept. Internal Aux. Fuel Disc. L/H
J39	Recept. XMSN Oil Press. XMTR	J148	Recept. Internal Aux. Fuel Disc. R/H
J41	Recept. XMSN Disc.	J155	Recept. Hi-Lo RPM Warn.
J42	Recept. Fuel Tank Disc R/H	J156	Recept. Eng. Fuel Filter Bypass Sol.
J43	Recept. Compensator Fuel Tank Disc R/H	J166	Recept. Aft Outlet Valve
J44	Recept. Fuel Tank Disc. R/H	J191	Recept. Main Invtr. Pwr.
J53	Recept. Blkhd Feed-thru-Aft Fuel Cell	J192	Recept. Spare Invtr. Pwr.
J54	Recept. Blkhd Feed-thru-Aft Fuel Cell	J194	Recept. Engine Chip Detector
J57	Recept. Ext. Fuel Cont. Panel	J267	Recept. Battery Disc. Aft
J60	Recept. Socket, Relay-Gen. Field	J268	Recept. Hoist Cont. Box
J64	Recept. Torque Press. XMTR	J269	Recept. Hoist Cont. Box
J65	Recept. Engine Oil Press. XMTR	J270	Recept. Hoist Cont. Box
J66	Recept. Fuel Press. XMTR	J271	Recept. Hoist Cont. Box
J68	Recept. Disc. Muff Heater	J272	Recept. Hoist Cont. Box
J71	Recept. Engine Fuel Valve	J273	Recept. Hoist Cont. Pendant
J72	Recept. Engine Oil Press. Sw.	J274	Recept. Hoist Cont Boom Act.
J74	Recept. Battery Disc. Fwd.	J275	Recept. Hoist Winch Assy.
J75	Recept. Nav. Lights Flasher	J1017	Recept. Ext. Fuel Disc L/H
J77	Recept. Ice Detector	J1024	Recept. Ext. Fuel Disc. R/H
J80	Recept. Eng. Air Filter Press. Sw.		
J81	Recept. Starter Deck	K1	Relay, Ext. Power
J84	Recept. De-Icing Hot Air Valve	K2	Relay, Non-Ess Bus
J86	Recept. Power Turb. Tach.	K3	Relay, Starter
J88	Recept. Ingition Unit, Eng.	K4	Relay, Bus Cont. (Gen Fail)
J89	Recept. Primer Valve (Fuel Ign. Sol.)	K5	Relay, Reverse Curr (Main)
J90	Recept. Fuel Cont. Sol. Valve	K6	Relay, Over Voltage
J91	Recept. Engine Disc.	K7	Relay, Gen. Field
J92	Recept. Engine Forward Disc.	K8	Relay, AC Failure
J93	Recept. Fire Det. Fwd. Disc.	K9	Relay, Battery
J94	Recept. Fire Det. Element R/H	K10	Relay, Fuel Transfer
J95	Recept. Fire Det. Element L/H	K15	Relay, Standby Gen. Field
J96	Recept. Fire Det. Element R/H	K23	Relay, Standby Gen. Rev. Curr.
J97	Recept. Fire Det. Element L/H	K24	Relay, Cargo Hook Release
J98	Recept. Tail Light Disc.	K27	Relay, Inverter
J99	Recept. Thermocouple Disc.	K32	Relay, Hoist Power
J102	Recept. Standby Compass (Plt)	K35	Relay, Main Invtr. Pwr.
J105	Recett. Heated Blanket L/H	K36	Relay, Spare Invtr. Pwr.
J106	Recept. Heated Blanket R/H	K37	Relay, Lo-Fuel Caution Lt.
J107	Recept. Copilot Coll. Stick	K38	Relay, Lo-Fuel Caution Lt.
J108	Recept. Fuel Diff. Press. Sw.	K46	Relay, Overheat
J109	Recept. Ext. Power	K65	Relay, Battery Aft Location

TABLE 13-3. EQUIPMENT LIST - HELICOPTERS SERIAL NO. 67-17145 THROUGH 67-19537 (CONT)

ITEM NO.	DESCRIPTION	ITEM	DESCRIPTION
K66	Relay, Battery Feeder		
L1	Solenoid, Primer (Ignition)	P47	Plug, Fuel Tank Disc. R/H Cell
L2	Solenoid, Fuel Cont. Valve	P48	Plug, Fuel Tank Disc. R/H Cell
L4	Solenoid, Hydraulic Bypass	P53	Plug, Unshld Tank Unit - Aft Cell
L6	Solenoid, Hot-Air De-Ice	P54	Plug, Shld Tank Unit - Aft Cell
L7	Solenoid, Idle Stop Rel.	P55	Plug, Fuel Tank Disc - Aft Cell
L8	Mag. Brake - Anti-Torque Force Trim	P56	Plug, Fuel Tank Disc - Aft Cell
L9	Mag. Brake - Fore & Aft Force Trim	P57	Plug, Ext. Fuel Cont. Panel
L10	Mag. Brake - Lat. Force Trim	P60	Plug, Field Relay Gen.
L14	Solenoid, Door Post Aft Outlet Valve	P64	Plug, Torque Press. XMTR
L15	Solenoid, Aft Outlet Valve Act.	P65	Plug, Engine Oil Press. XMTR
L21	Solenoid, Var. Mix Valve	P66	Plug, Fuel Press. XMTR
		P68	Plug, Muff Heater Disc.
M1	Meter, DC Load (St-by Gen.)	P71	Plug, Fuel Valve Shut-off
M2	Meter, DC Volts	P72	Plug, Eng. Oil Press. Sw.
M3	Meter, AC Volts	P74	Plug, Battery Disc. Fwd.
M4	Meter, DC Load (Main Gen.)	P75	Plug, Nav. Lts. Flasher
		P77	Plug, Ice Detector
O2	Guard-Gen. Sw. - DC Pwr. Panel	P80	Plug, Eng. Air Filter Press. Sw.
O3	Guard-Cable Cut Sw. - Hyd Panel	P81	Plug, Starter Deck
P2	Plug, Pitot Tube Htr.	P84	Plug, De-icing Hot Air Valve
P3	Plug, Inst. Panel Conn.	P85	Plug, Oil Temp. Bulb
P4	Plug, Fuel Qty. Ind.	P86	Plug, Pwr. Turb. Tach.
P5	Plug, Fuel Press. Ind.	P87	Plug, Gas Prod. Tach.
P6	Plug, Copilot Att. Ind.	P88	Plug, Ignition Unit - Engine
P7	Plug, Eng. Oil Temp. Ind.	P89	Plug, Ignition Sol. Valve
P8	Plug, Eng. Oil Press. Ind.	P90	Plug, Fuel Cont. Sol. Valve
P9	Plug, Pilot Dual Tach. (Rotor)	P91	Plug, Engine Disc.
P10	Plug, Pilot Dual Tach. (Pwr Turb.)	P92	Plug, Engine Forward Disc.
P11	Plug, XMSN Oil Temp. Ind.	P93	Plug, Fire Det. Forward Disc.
P12	Plug, XMSN Oil Press. Ind.	P94	Plug, Fire Det. Element R/H
P15	Plug, Pilot Torque Meter	P95	Plug, Fire Det. Element L/H
P16	Plug, Pilot Turn & Slip Ind.	P96	Plug, Fire Det. Element R/H
P17	Plug, Gas Prod. Turb. Tach.	P97	Plug, Fire Det. Element L/H
P20	Plug, Pilot's Cyclic Stick	P98	Plug, Tail Light Disc.
P21	Plug, Hydraulic Cont. Panel	P99A	Plug, Thermocouple Disc. Engine
P22	Plug, Copilot Cyclic Stick	P99B	Plug, Thermocouple Disc. Engine
P23	Plug, Engine Panel	P102	Plug, Standby Compass (Pilot)
P24	Plug, Caution Panel	P107	Plug, Copilot Coll. Stick
P25	Plug, Pilot Coll. Stick	P108	Plug, Fuel Diff. Press. Sw.
P26	Plug, Windshield Wiper	P110	Plug, Anti-Coll. Lt. Disc.
P28	Plug, Hyd. Bypass Solenoid Valve	P111	Plug, Anti-Coll. Lt.
P29	Plug, Hyd. Press. Warning Sw.	P112	Plug, Mag. Brake Anti-Torque
P31	Plug, Cargo Hook	P113	Plug, Mag. Brake Fore & Aft
P32	Plug, Cargo Hook Disc.	P114	Plug, Mag. Brake - Lat.
P35	Plug, Rotor Tach. Gen.	P119	Plug, Cabin Roof Disc. Hoist
P36	Plug, XMSN Oil Press. Sw.	P127	Plug, Var. Mix Valve Disc.
P37	Plug, XMSN Oil Temp. Bulb	P129	Plug, Displacement, Roll & Pitch Gyro
P38	Plug, Copilot W/S Wiper	P130	Plug, Rate Switching Gyro
P39	Plug, XMSN Oil Press. XMTR	P131	Plug, Attitude Ind.
P41	Plug, XMSN Disc.	P135	Plug, Ice Interpreter
P42	Plug, Shielded Tank Unit Disc (R/H Tank)	P136	Plug, Ice Interpreter
P43	Plug, Monitor Tank Unit Disc (R/H Tank)	P138	Plug, Door Post - Aft-Out Val. Act.
P44	Plug, Unshielded Tank Unit Disc (R/H Tank)	P146	Plug, Bleed Air Valve
P46	Plug, Fuel Tank Disc R/H Cell	P147	Plug, Unshld-Tank Coupler Disc.

TABLE 13-3. EQUIPMENT LIST - HELICOPTERS SERIAL NO. 67-17145 THROUGH 67-19537 (CONT)

ITEM NO.	DESCRIPTION
P148	Plug, Unshld-Tank Coupler Disc.
P149	Plug, Unshld-Tank Coupler Disc.
P151	Plug, Shld-Tank Coupler Disc.
P152	Plug, Shld-Tank Coupler Disc.
P153	Plug, Shld-Tank Coupler Disc.
P155	Plug, Hi-Lo RPM Warning
P156	Plug, Eng. Fuel Filter Bypass
P166	Plug, Aft Outlet Valve
P191	Plug, Inverter Disc. - Main
P192	Plug, Inverter Disc. - Spare
P194	Plug, Engine Chip Detector
P267	Plug, Battery Disc. Aft
P268	Plug, Hoist to Ship
P269	Plug, Cable Cut & Slip Limit
P270	Plug, Hoist to Cont. Pendant
P271	Plug, Boom Act.
P272	Plug, Hoist to Winch Assy.
P273	Plug, Cont. Pendant
P274	Plug, Boom Act.
P275	Plug, Winch Assy
P1017	Plug, Ext. Fuel Disc. L/H
P1024	Plug, Ext. Fuel Disc. R/H
R1	Shunt-Ammeter (Stby Gen.)
R2	Shunt-Ammeter (Main Gen.)
R3	Resistor-Windshield Wiper
R4	Rheostat, Plt Inst. Lt. Dim
R5	Rheostat, Sec. Inst. Lt. Dim
R6	Rheostat, Overhead Console
R7	Resistor, Nav. Lts. Dim
R8	Rheostat, Ped. Lts. Dim
R9	Rheostat, Eng. Inst. Lts. Dim
R10	Rheostat, Copilot Inst. Lts. Dim
R11	Resistor, Fire Det. Cont.
R12	Resistor, Spool Thermocouple
R21	Rheostat, Aft Dome Lts.
R26	Rheostat, Course Ind. Lt. Dim
R27	Resistor, AC Load Balancing
S1	Switch, Aft Dome Lt.
S2	Switch, Rotary (DC VM Sel)
S4	Switch, XMSN Sump Insp. Lt.
S5	Switch, Fuel Qty Test
S6	Switch, Starter (Plt Coll)
S7	Switch, Hyd Boost Cont.
S8	Switch, Gen. (On-Off Reset)
S9	Switch, Pitot Heater
S10	Switch, Force Trim (Copilot Sw.)
S12	Switch, Searchlight Cont.
S13	Switch, Nav. Lts. (Flash Steady)
S14	Switch, Nav. Lts. (Bright-Dim)
S18	Switch, Force Trim (Plt-Cyl)
S20	Switch, Test (Fire Det.)
S23	Switch, Windshield Wiper
S25	Switch, Landing Lt. (Ext-Retr)
S26	Switch, XMSN Oil Temp.
S27	Switch, Hyd. Press.
S28	Switch , XMSN Oil Press. Warning
S29	Switch, Eng. Oil Press. Warning
S31	Switch, Limit (Ext. Pwr. Door)
S32	Switch, Cargo Release (Plt)
S33	Switch, Gov. (Auto-Emer)
S39	Switch, Invtr. (Main-Spare)
S36	Switch, Cargo Release
S37	Switch, RPM Gov. (Plt)
S38	Switch, Fuel (ON-OFF)
S40	Switch, Battery (ON-OFF)
S41	Switch, Upper Float
S42	Switch, Lower Float
S44	Switch, Fuel - Low Level
S45	Switch, Fuel - Transfer L/H
S46	Switch, Fuel - Transfer R/H
S47	Switch, ICS Sw. Pilot's Cyclic Stick
S48	Switch, KS SW Copilot's Cyclic Stick
S50	Switch, Idle Stop Rel (Plt)
S51	Switch, RPM Gov. (Copilot)
S58	Switch, Fuel Diff. Press.
S59	Switch, Anti-Coll. Lt.
S62	Switch, Non-Ess Bus Cont.
S63	Switch, Ext. Fuel Jett.
S68	Switch, Force Trim
S70	Switch, Starter-Gen.
S73	Switch, Overheat Bleed Air
S77	Switch, Searchlight (ON-STOW)
S76	Switch, Landing Lt. (ON-OFF)
S77	Switch, Starter (Copilot Coll)
S78	Switch, Cargo Rel (Copilot)
S79	Switch, Fuel Ejector Flow Sw. L/H
S80	Switch, Fuel Ejector Flow Sw. R/H
S81	Switch, De-Ice (ON-OFF)
S83	Switch, Bleed Air (ON-OFF)
S85	Switch, Aft Outlets (Htr)
S87	Switch, Aft-Outlet, Limit
S93	Switch, Hi-Lo RPM
S94	Switch, Fuel Filter Bypass
S96	Switch, Cable Cut
S97	Switch, Cable Up Limit
S101	Switch, Overload Sense
S111	Switch, Fuel Trans. Pump
S112	Switch, Pilot Hoist Cont.
S114	Switch, Fire Control
S115	Switch, Fire Control
S124	Switch, Sel - W/Wiper
S134	Switch, Chip Det. Sel.
S195	Switch, Diff. Press.
T1	Transformer 115/28V
TB1	Term. Blk. Fwd. Inst. Panel
TB2	Term. Blk. Overhead Console R/H
TB3	Term. Blk. Overhead Console L/H
TB4	Term. Blk. Aft Fuel Cell
TM9	Term. Blk. Top Ext. & Dome Lts.

TABLE 13-3. EQUIPMENT LIST - HELICOPTERS SERIAL NO. 67-17145 THROUGH 67-19537 (CONT)

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
TB12	Term. Blk. Ped. Panel Edge Lts.	VR 1	Regulator - Voltage (Main Gen)
TB13	Term. Blk. Inst. Panel Lts.	VR2	Regulator - Voltage (Stby Gen)
TB14	Term. Blk. Inst. Panel Sec. Lts.		
TB15	Term. Blk. Cockpit Lts. L/H	W1	Cable Assembly - Fire Det.
TB16	Term. Blk. Cockpit Lts. R/H		
TB22	Term. Blk. Copilot Headset	Z2	Engine, Ignition Unit
TB23	Term. Blk. Pilot Headset	Z3	Flasher Unit - Nav. Lts.
TB25	Term. Blk. Thermocouple Ind.	Z5	XMSN Oil Temp. Bulb
TB26	Term. Blk. DC Gnd. & Audio	Z6	Engine Oil Temp. Bulb
TB27	Term. Blk. Aft Thermo Lead	Z8	Ice Interpreter
TB29	Term. Blk. Inst. Ground	Z9	Fire Det. Cont.
TB34	Term. Blk. Aft Dome Lt. Panel	Z13	Ice Detector
TB35	Term. Blk. R/H Fuel Cell	Z16	Fuel Qty. Tank Unit - Aft
TB36	Term. Blk. Ext. Power Diode	Z17	Displacement - Roll & Pitch Gyro
TB38	Term. Blk. L/H Fuel Cell	Z18	Rate Switching Gyro
TB39	Term. Blk. Elect. Compt. Aft	Z22	Fuel Qty. Tank Unit R/H Fwd.
TB45	Term. Blk. Pitot Htr. - Disc.	Z24	Hoist Control Box
TB60	Term. Blk. Battery Voltage, Fwd.	Z25	Hoist Cable Cutter
TB61	Term. Blk. Battery Voltage, Aft	Z41	Hoist Control Pendant

TABLE 13-4. EQUIPMENT LIST - HELICOPTERS SERIAL NO. 68-15214 THROUGH 68-16628

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
A1	Panel, DC Power	E3	Detector, Magnetic Chip
A2	Panel, AC Power	E4	Detector, Magnetic Chip
A3	Panel, Engine		
A4	Panel, Caution	G2	Generator, 30 VDC (300A)
A6	Panel, Inst. Lights	G3	Generator, Tach (Gas Prod)
A7	Panel, Ext. Lights	G4	Generator, Tach (Pwr Turb)
A8	Panel, Hydraulic Control	G5	Generator, Tach (Rotor)
A10	Panel, Miscellaneous	G6	Generator, Starter 28 V (200A)
A11	Panel, Heating		
A12	Cargo Hook Assy	HR1	Heater, Pitot Tube
A13	Panel, Resistor		
A14	Panel, AC Circuit Breaker	I1	Indicator, Attitude (Copilot)
A15	Panel, Overhead Console	I2	Indicator, Fuel Qty
A20	Panel Assy, Aft Dome Lts	I3	Indicator, Torque - Pilot
A21	Panel, Dome Lt & Pitot Htr	I4	Indicator, Oil Press (Eng)
A26	Panel Assy, Ext. Fuel	I5	Indicator, Oil Press (XMSN)
		I6	Indicator, Fuel Press
B1	Syncro XMTR, Torque Press	I7	Indicator, Tach (Gas Prod)
B2	Syncro XMTR, XMSN Oil Press	I8	Indicator, Tach-Dual
B3	Syncro, XMTR, Engine Oil Press	I9	Light, Utility (Pilot)
B4	Syncro XMTR, Fuel Press	I10	Light, Dome
B5	Motor, Fuel Shut-Off Valve	I11	Light, Search
B6	Motor, R/H Fuel Boost Pump	I12	Light, Fire Warning
B7	Motor, Windshield Wiper	I13	Light, Master Caution
B8	Motor, R/H Aux. Fuel Pump	I14	Light, Instr, Secondary
B12	Motor, Gov RPM Actuator	I15	Lamp, Instr & Edge Lights
B13	Motor, L/H Aux. Fuel Pump	I16	Light, Landing
B31	Motor, Copilot Windshield Wiper	I17	Light, Left Nav.
B34	Motor, Bleed Air Valve	I18	Light, Right Nav.
BT2	Battery	I19	Light, Tail
		I20	Light, Top Fuselage
C1	Capacitor, PF Corr. (MIL-C-25)	I21	Indicator, XMSN Oil Temp
C7	Capacitor, Filter, JN14	I22	Indicator, Eng. Oil Temp.
CB1	Circuit Breaker (5A)	I23	Indicator, Turn & Slip (Plt)
CB2	Circuit Breaker (10A)	I25	Light, XMSN Sump Inspect
CB3	Circuit Breaker (15A)	I26	Light, Bottom Fuselage
CB4	Circuit Breaker (20A)	I28	Light, Utility (Copilot)
CB5	Circuit Breaker (25A)	I31	Indicator, Exh. Temp (Plt)
CB6	Circuit Breaker (1A)	I34	Standby Compass (Plt)
CB7	Circuit Breaker (35A)	I40	Light, Anti-Collision
CB8	Circuit Breaker (2A)	I42	Indicator, Attitude (Plt)
CB11	Circuit Breaker (7.5A)	I44	Light, Cargo Release Armed
CB12	Circuit Breaker (50A)	I45	Light, Hi-Lo RPM Warn.
CB13	Circuit Breaker (1A)		
CP1	Coupler, Fuel Qty. Unshielded	J2	Recept. Pitot Tube Htr
CP2	Coupler, Fuel Qty. Shielded	J3	Recept. Instr. Panel Disc.
CR2	Diode, Ext. Pwr. Relay	J4	Recept. Fuel Qty Ind.
CR30	Diode, Batt. Voltage Fwd Loc	J5	Recept. Fuel Press Ind.
CR31	Diode, Batt. Voltage Aft Loc	J6	Recept. Copilot Att. Ind.
		J7	Recept. Eng. Oil Temp. Ind.
D1	Inverter, 250V.A. 3 Ph (Main)	J8	Recept. Eng. Oil Press. Ind.
D2	Inverter, 250V.A. 3 Ph (Spare)	J9	Recept. Pilot Dual Tach Rotor
DS1	Control Assy, RPM Warn.	J10	Recept. Pilot Dual Tach Pwr Turb.
		J11	Recept. XMSN Oil Temp. Ind.
E1	Detector, Magnetic Chip	J12	Recept. XMSN Oil Press. Ind.
E2	Detector, Magnetic Chip	J15	Recept. Pilot Torque Meter