CHAPTER 37

ELECTRICAL SYSTEM

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CHAPTER 37

ELECTRICAL SYSTEM

37-00 Description

This section contains information for correcting difficulties that may arise in the electrical system. It includes a general description and some test and adjustment procedures.

14-volt electrical systems include a 14-volt, 70-ampere capacity alternator (limited to 50 amps continuous), battery relay, alternator control unit and 12-volt battery.

28-volt electrical systems include a 28-volt, 70-ampere capacity (limited to 64 amps continuous) alternator, battery relay, alternator control unit, and 24-volt battery. A 130-amp capacity alternator, limited to 85 amps continuous, is standard on the Police version.

The battery is in a fiberglass container located on the lower left steel tube frame, in the nose under the upper console, or in the left-front baggage compartment. Police and E.N.G. versions have the battery suspended from the tailcone.

Circuit breakers are located on the ledge just forward of the left-front seat. The breakers are marked to indicate their function and amperage and are of the push-to-reset type.

The master battery switch, located on the console, controls the battery relay, which disconnects the battery from all circuits except the tachometer and the clock. The tachometer and the clock also receive power directly from the battery via a Clutch switch terminal.

The alternator control unit (ACU) senses system voltage at the ammeter shunt via a remote sense wire. The 14-volt ACU has three functions: it regulates alternator output voltage to maintain a battery voltage of 13.7-13.9 volts, it warns of low-voltage by illuminating the ALT warning light if voltage decreases to 12.55-12.95 volts, and it protects against over-voltage by shutting off alternator field if voltage increases to 15.75-16.25 volts. The 28-volt ACU also has three functions: it warns of low-voltage by illuminating the ALT warning light if voltage decreases to 24.00-26.00 volts, it protects against over-voltage by shutting off alternator field if voltage increases to 32.00-33.40 volts, and it regulates alternator output voltage by modulating field current within a 0.25-1.00 volt window centered at 28.25-28.75 volts. This allows alternator output to more closely follow electrical load demands and reduces voltage fluctuations.

In addition to a circuit breaker, the clutch actuator circuit incorporates a low-amperage fuse to prevent a motor overload from tripping the circuit breaker and turning off the CLUTCH light prematurely, and to prevent motor burnout due to prolonged motor overload. This also results in drive belt overtensioning protection. A time delay is also included in the circuit to prolong actuator spring switch life, and to prevent overtensioning due to spring switch flutter resulting from excessive vibration. The time delay affects gearmotor operation only during Engage cycle; the time delay does not affect CLUTCH light operation and does not function during Disengage cycle. The time delay allows gearmotor operation 0.25 seconds after circuit completion (indicated by CLUTCH light illumination). Any circuit interruption

37-00 Description (continued)

(indicated by CLUTCH light extinguishing) instantly resets the time delay.

The lighting system includes the anti-collision light, navigation lights, two landing lights, post and internal lights for instruments and an overhead map light. Landing lights are wired through the clutch switch, turning the lights off when disengaged. Post and internal instrument light brightness is adjustable via a wire-wound rheostat on early 14-volt ships, or via an electronic dimmer on later 14-volt and all 28-volt ships. The electronic dimmer will shut down if encountering a short-to-ground circuit; dimmer will reset when short is cleared.

Warning lights on the instrument panel include clutch, low oil pressure, low fuel, main rotor and tail rotor gearbox chip lights, main rotor gearbox over-temp, engine fire (sensor activates at 275 ± 10 °F), low rotor RPM light, low voltage (ALT), rotor brake, and starter engaged. R44 IIs additionally include fuel filter, aux fuel pump, and carbon monoxide warning lights.

The gage cluster includes an ammeter, oil pressure, oil temperature, cylinder head temperature and main and auxiliary fuel quantities. Also provided on this circuit are the carburetor air temperature (O-540 only) and outside air temperature. The map light is on the same breaker as a back-up in the event of a short and failure of the lighting system circuit.

The tachometer is an electronic engine and rotor dual tachometer. The sensor for the engine tach is a contact assembly (breaker points) in the engine-right magneto (helicopter left side). A Hall Effect sensor for, and receiving power from, the rotor tachometer senses passage of two magnets on the main rotor gearbox input yoke. Signals from these sensors are conditioned by solid state circuits inside the dual tachometer. Each tachometer circuit has a separate circuit breaker and is completely independent of the other. They can be powered by either the alternator or the battery and receive current from two redundant sources. Power to the tachometer is interrupted only when the master battery and alternator switches are off and the clutch switch is disengaged. All tachometers operate on 14 volts; 28-volt ships utilize two voltage regulators to change 28 volts to the 14 volts required by both tachometers.

CAUTION

The installation of electrical devices can affect the accuracy and reliability of the electronic tachometer; therefore, no electrical equipment may be installed in the R44 helicopter unless that particular installation is specifically approved by the factory.

CAUTION

When installing upper console, ensure multi-pin connectors are matched correctly. Both halves of number 1 connector have a white stripe. Crossing connections will result in damage to electrical system.

37-00 Description (continued)

E.N.G. and Police versions each have an additional, right-side circuit breaker panel on the ledge just forward of the pilot's seat containing all circuit breakers for the optional E.N.G. or police equipment. The forward row of circuit breakers is connected to a 28-volt bus. The aft row of circuit breakers is connected to a 14-volt bus on E.N.G. versions while on police versions the outboard section of the aft row of circuit breakers is connected to a 14-volt bus. The 14-volt bus is powered by a 28- to 14-volt converter. A separate Master switch on the left side of the circuit breaker panel controls power to all E.N.G. or police equipment.

37-10 Battery

37-11 Lead-Acid Battery Installation

NOTE

Refer to Concorde Battery Corporation's Owner/Operator's Manual, and Instruction for Continued Airworthiness for battery maintenance procedures.

CAUTION

Use insulated tools when performing maintenance near battery.

CAUTION

To minimize risk of electrical discharge: When disconnecting battery, disconnect negative (ground) cable from battery first, then the positive cable. When connecting battery, connect positive cable to battery first, then the negative (ground) cable.

A. Disconnecting and Removing Battery

1. Turn battery switch off.

   a. Aft Battery: Remove engine left-hand side cowling. Loosen clamp securing cooling hose to battery cover assembly and disconnect hose. Remove cotter rings and wing nuts to release rods attaching battery cover to lower frames. Remove battery cover.

   b. Under-seat battery: Pivot forward left-hand seat forward and remove C748-5 cover assembly. Remove hardware securing D144-6 hold-down assembly to cabin and remove hold-down assembly.

   c. Tailcone-mounted battery: Remove screws securing D540-3 or -5 box and remove box from tailcone. Loosen but do not remove (4) NAS6604-3 bolts securing D362-10 straps. While holding battery, pull (forward) strap forward and slowly tilt battery to gain access to terminals.

2. Remove hardware securing negative (ground) cable to battery negative terminal.

3. Remove hardware securing positive cable to battery positive terminal. Carefully remove battery.

37-11 Lead-Acid Battery Installation (continued)

B. Installing and Connecting Battery

1. Turn battery switch off.
2. Aft Battery: Verify installation and good condition of G405-2 bumpers (or D832-1 neoprene strips, if installed) on C046-26 lower frame.
3. Position battery in helicopter and connect positive cable to battery first, then connect the negative (ground) cable. Special torque terminal bolts per § 23-33 and torque stripe per Figure 2-1. Position positive cable's nipple over terminal.
4. Under-seat battery: Install hardware securing D144-6 hold-down assembly to cabin so it just contacts top of battery (holes are slotted; adjust as required). Standard torque bolt per § 23-32 and torque stripe per Figure 2-1.
5. a. Aft Battery: Position battery cover assembly on battery and install wing nuts and cotter rings to secure rods attaching battery cover to lower frames. Connect cooling hose to battery cover and tighten clamp. Verify security. Install engine left-hand side cowling.

   b. Under-seat battery: Install C748-5 cover assembly and pivot forward left-hand seat aft.

   c. Tailcone-mounted battery: Position D362-10 straps under battery, standard torque (4) NAS6604-3 bolts securing straps. Position D540-3 or -5 box on tailcone and install screws, verify security.

37-12 Lithium-Ion Battery Installation

A. Description

A 17 amp-hour lithium-ion battery replaces the standard 24-volt lead-acid main battery. The lithium-ion battery includes built-in circuitry that monitors temperature, voltage, and current draw and manages battery charge and discharge. The circuitry automatically disables charge and/or discharge if any electrical or thermal problems are detected. The circuitry will also interrupt power if a start is attempted with insufficient charge to prevent permanent battery damage. The battery uses lithium-iron-phosphate chemistry which is less susceptible to thermal runaway than some other lithium battery chemistries.

The metal battery case is designed to contain any heat or gases generated within the battery and is vented overboard. No venting should occur during normal operation.

Two annunciator panel segments, BATT FAULT and BATT HEATER, show battery status. The annunciator panel test button should cause these segments to illuminate along with the rest of the annunciator panel. The segments will also illuminate briefly when the battery switch is turned on after several hours of inactivity.

BATT FAULT illuminates if the battery has an over- or under-voltage condition, an over-temperature condition, or if current draw exceeds limits. A flashing light indicates a recoverable fault. The light may go out if the fault corrects itself (e.g. temperature decrease) or may go out as a result of a power cycle at the next landing. A steady light indicates battery maintenance or replacement may be required. The emergency procedure for a fault light (flashing or steady) is to land as soon as practical. The alternator will continue to supply electrical power during the landing.

The battery incorporates an internal heater for cold weather operation. The heater attempts to maintain a battery temperature of at least 50°F (10°C). When the battery is switched ON, BATT HEATER illuminates while the heater is warming the battery and extinguishes when the battery is warm enough to attempt an engine start. On very cold days, the heating cycle may take 10 minutes or more. The heater light is disabled while the engine is running but the heater will continue to function as long as the battery switch is ON.

Nominal charging voltage for the lithium-ion battery is 28.8 volts. Some lead-acid chargers may not provide enough voltage to fully charge the battery. Ensure charging equipment is compatible with lithium-ion batteries.

37-12 Lithium-Ion Battery Installation

A. Description (continued)

NOTE

Refer to True Blue Power Installation Manual and Operating Instructions for battery maintenance procedures.

CAUTION

Use insulated tools when performing maintenance near battery.

CAUTION

To minimize risk of electrical discharge: When disconnecting battery, disconnect negative (ground) cable from battery first, then the positive cable. When connecting battery, connect positive cable to battery first, then the negative (ground) cable.

B. Disconnecting and Removing Battery

1. Turn battery switch off.
   a. Aft Battery: Remove engine left-hand side cowling. Loosen clamp securing cooling hose to battery cover assembly and disconnect hose. Remove cotter rings and wing nuts to release rods attaching battery cover to lower frames. Remove battery cover.
   b. Under-seat battery: Pivot forward left-hand seat forward and remove C748-5 cover assembly. Remove hardware securing D144-10 hold-down assembly to cabin and remove hold-down assembly.
2. Loosen clamp securing vent hose to battery and pull hose off of battery.
3. Disconnect F693 harness assembly from battery's comm connector.
4. Remove hardware securing negative (ground) cable to battery negative terminal.
5. Remove hardware securing positive cable to battery positive terminal. Carefully remove battery.

37-12 Lithium-Ion Battery Installation (continued)

C. Installing and Connecting Battery

1. Perform pre-installation inspection and completely charge battery per True Blue Power Installation Manual and Operating Instructions. If battery is new, also perform visual inspection, charging, capacity check, and return to service per True Blue Power Installation Manual and Operating Instructions.
2. Turn battery switch off. Position battery in helicopter.
3. Verify battery terminal surfaces are clean to ensure electrical conductivity. Install positive cable on battery positive terminal and install battery hardware. Special torque terminal bolt per § 23-33 and torque stripe per Figure 2-1. Slide nipple over terminal.
4. Install negative (ground) cable on battery negative terminal and install battery hardware. Special torque terminal bolt per § 23-33 and torque stripe per Figure 2-1.
5. Connect F693 harness assembly to battery's comm connector.
6. Connect vent hose to battery outlet and tighten clamp. Verify security.
7. a. Aft Battery: Position battery cover assembly on battery and install wing nuts and cotter rings to secure rods attaching battery cover to lower frames. Connect cooling hose to battery cover and tighten clamp. Verify security. Install engine left-hand side cowling.

   b. Under-seat battery: Install hardware securing D144-10 hold-down assembly to cabin so it just contacts top of battery (holes are slotted; adjust as required). Standard torque bolt per § 23-32 and torque stripe per Figure 2-1. Install C748-5 cover assembly and pivot forward left-hand seat aft.

D. Scheduled Maintenance and Inspections

Every 6 Months: If battery is unused for more than 6 months, either installed in helicopter or in storage, completely charge battery per True Blue Power Installation Manual and Operating Instructions.

Every 24 Months: Perform visual inspection, charging, capacity check, and return to service per True Blue Power Installation Manual and Operating Instructions every 24 months from date of aircraft delivery or subsequent new battery installation.

E. Special Maintenance and Inspections

No other battery maintenance other than routine maintenance specified by True Blue Power is permitted.

Operators are encouraged to review important safety information regarding handling, shipping, storage instructions, estimated unit life, and disposal instructions provided in True Blue Power Installation Manual and Operating Instructions.

Note: In accordance with industry and regulatory standards, the TB17 Lithium-ion battery will be shipped with a state of charge (SOC) not to exceed 30% of rated capacity.

37-20 RPM Governor

The governor maintains engine RPM by sensing changes and applying corrective throttle inputs through a friction clutch which can be easily overridden by the pilot. The governor is only active above 80% engine RPM and can be switched on or off using the toggle switch on the end of the right seat collective.

The governor is designed to assist in controlling RPM under normal conditions. It may not prevent over- or under-speed conditions generated by aggressive flight maneuvers.

CAUTION

When operating at high density altitudes, governor response rate may be too slow to prevent overspeed during gusts, pull-ups, or when lowering collective.

37-30 Clutch Actuator

After the engine is started, it is coupled to the rotor drive system through vee-belts which are tensioned by raising the upper drive sheave. An electric actuator, located between the drive sheaves, raises the upper sheave when the pilot engages the clutch switch. The actuator senses compressive load (belt tension) and switches off when the vee-belts are properly tensioned. The clutch caution light illuminates whenever the actuator circuit is energized, either engaging, disengaging, or re-tensioning the belts. The light stays on until the belts are properly tensioned or completely disengaged.

Belt slack during engine start should be adjusted such that blades begin turning within five seconds of clutch engagement. Excessive slack may cause belts to jump out of sheave grooves during start. Periodic readjustment by a mechanic may be required as belts wear in service.

A fuse located on or near the test switch panel prevents an actuator motor overload from tripping the circuit breaker. If the fuse blows, the actuator motor will stop but the clutch caution light will remain illuminated. An open circuit breaker removes power from both the motor and the light. With an open circuit breaker, no belt tensioning will occur, and the light will not function to indicate an abnormal condition.

CAUTION

Never take off while clutch caution light is on.

37-40 Lighting System

A red anti-collision light is installed on the tailcone and is controlled by the strobe switch. Position lights are installed on each side of the cabin and in the tail and are controlled by the nav lights switch. Post and internal lights (earlier aircraft) or a light at the top of the windshield (later aircraft) illuminate the instruments. Instrument lighting is active when the nav lights switch is on and lighting is dimmed via the knob above the nav lights switch. An overhead map light mounted on a swivel is controlled by an adjacent switch. The map light may be used for emergency lighting of the instrument panel.

Two landing lights are installed in the nose at different vertical angles to increase the lighted area. One landing light switch controls both lights and is located on the cyclic center post.

NOTE

Landing lights operate only when clutch actuator switch is in the engage position.

NOTE

Continuous operation of landing and position lights in flight is recommended to promote collision avoidance.

An optional flashing light may be mounted on the tailcone in addition to the standard anti-collision light. On earlier aircraft, the optional light is controlled by the strobe switch and the standard light is powered whenever the battery switch is on. On later aircraft, the optional light is controlled by a separate switch.

37-50 External Power Receptacle (Optional)

An optional 28-volt MS3506-compatible external power receptacle is located inside the right engine cowl door. When the battery is switched on, the external power relay and the battery relay both close, connecting external power to the aircraft electrical system and battery. The external power relay will not close if reverse polarity is sensed by the receptacle.

A separate wire from the external power receptacle to the battery bypasses the external power and battery relays. This wire allows battery charging via the external receptacle with the battery switch off. A 10-amp circuit breaker at the receptacle opens if current exceeds normal charging levels, and a diode provides polarity protection.

To use ground power for engine starting, have ground personnel connect ground power to the external receptacle prior to engaging starter, disconnect after engine start, and latch cowl door. Starts using ground power assist follow the same procedure as normal starts.

37-60 Audio System

A voice-activated intercom/audio system is standard and is controlled by a small control panel above the avionics stack. The ICS volume knob controls intercom volume but does not affect radio volume. The VOX squelch knob is used to set the threshold volume at which the intercom is activated. When the VOX knob is turned fully clockwise, keying is required to activate the intercom.

On R44s and R44 IIs, a toggle switch allows selection of PILOT ISO mode in which the pilot is connected only to the radio while the copilot and rear passengers remain connected to each other via the intercom.

A music input jack is located on the aft seat console on R44s and R44 IIs, or located on a panel between the seat back rests on R44 Cadets. This input is muted when the intercom is active, when transmitting, and during reception of radio signals.

Headset jacks are located in the ceiling. The cyclic grips are equipped with either transmit and intercom buttons or trigger-style intercom/transmit switches. For the trigger-style switch, the first detent activates the intercom and second detent transmits. For R44s and R44 IIs, additional intercom buttons are located inboard of the rear seats and on the left forward floor or seat support. For R44 Cadets, an additional intercom button is located on the outboard side of the left seat.

Audio control panels from several manufacturers are offered as options in place of the standard intercom system. Pilots should consult the manufacturer's operating instructions if an audio panel is installed.

37-70 Warning and Caution Lights

Warning and caution lights include clutch, main gearbox over-temperature, main and tail gearbox chip, engine fire, starter on, low fuel, fuel filter (R44 IIs), auxiliary fuel pump (R44 IIs), low RPM, alternator, low oil pressure, rotor brake, carbon monoxide, governor off, and full throttle (later aircraft). The clutch light indicates that the clutch actuator is operating. The low RPM light and horn indicate rotor RPM at 97% or below. The engine fire light is actuated by a temperature switch located at the forward end of the horizontal firewall. The low oil pressure and low fuel lights are actuated by sensors in those systems and are independent of the gage indicators. The alternator light warns of a possible alternator failure. The auxiliary fuel pump light monitors fuel pressure from the auxiliary pump and illuminates due to pump failure or when the clutch switch is not engaged. The fuel filter light warns of possible filter contamination. The governor-off light indicates the RPM governor is switched off.

The main and tail gearbox chip detectors are magnetic devices located in the drain plug of each gearbox. When metallic particles are drawn to the magnets they close an electrical circuit, illuminating the caution light. Metal particles may be caused by a failing bearing or gear, thus giving warning of impending gearbox failure. The main gearbox over-temp light is actuated by a temperature switch located near the input pinion.

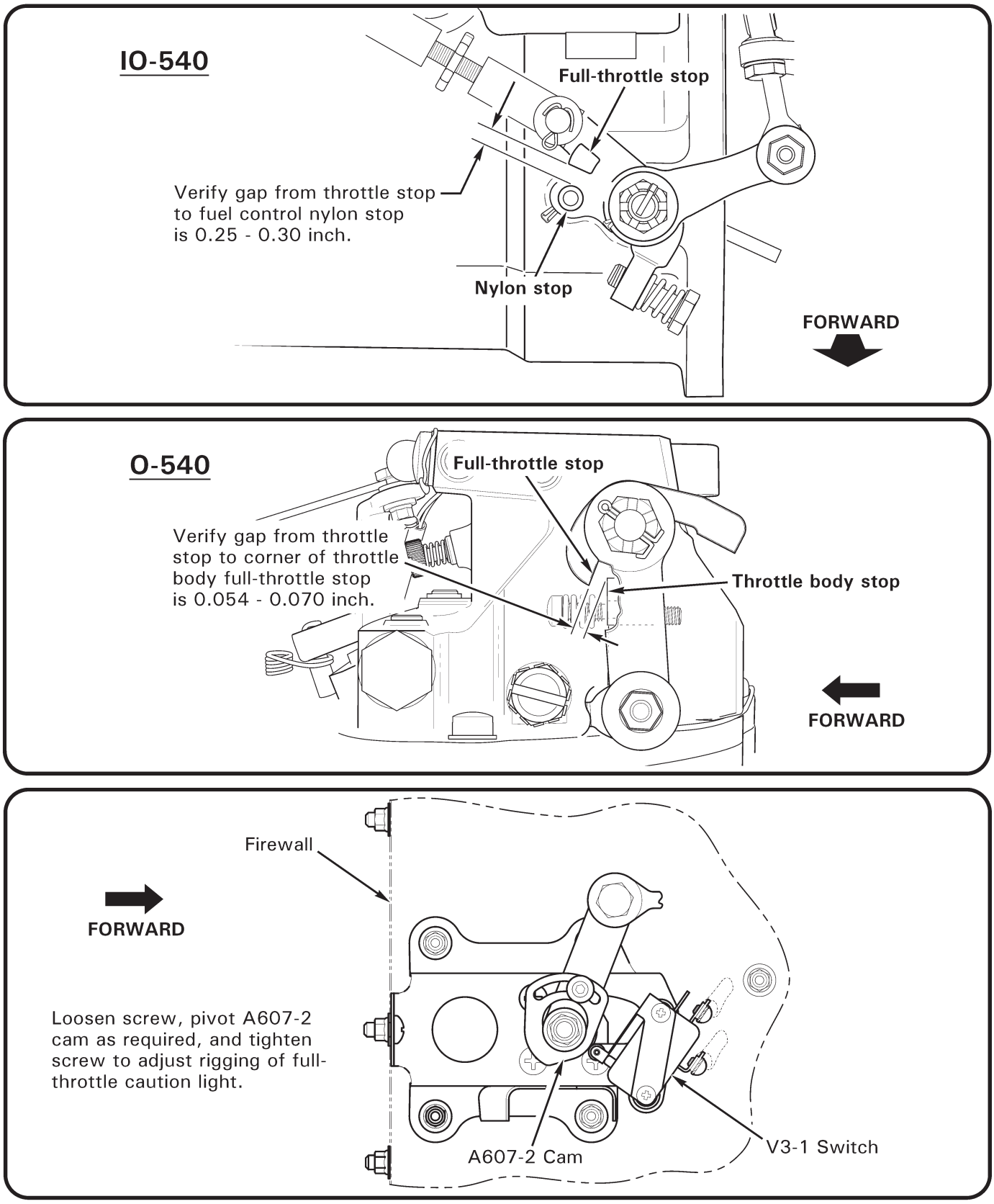

FIGURE 37-1 FULL THROTTLE CAUTION LIGHT RIGGING CHECK

37-70 Warning and Caution Lights (continued)

The carbon monoxide light is actuated by a sensor above the pilot's heater outlet and indicates elevated cabin carbon monoxide levels.

The full throttle light is activated by a switch in the throttle linkage and indicates that the engine is near full throttle.

A. Full Throttle Caution Light

1. Switch Rigging Check

   a. Turn fuel shut-off valve off.

   b. Turn battery switch on. Raise collective full up and slowly rotate twist grip open until full throttle caution light just illuminates.

   c. i. **IO-540:** Refer to Figure 37-1. Verify gap from throttle stop to fuel control nylon stop is 0.25–0.30 inch. Adjust switch as required per step 2.

      ii. **O-540:** Refer to Figure 37-1. Verify gap from throttle stop to corner of throttle body full-throttle stop is 0.054–0.070 inch. Adjust switch as required per step 2.

   d. Lower collective & turn battery switch off. Turn fuel shut-off valve on.

2. Switch Adjustment

   a. i. **IO-540:** Refer to Figure 37-1. Raise collective full up, rotate (throttle) twist grip as required, loosen screw, and pivot A607-2 slotted cam (in throttle linkage, forward of vertical firewall) so V3-1 switch activates when throttle stop is approximately 0.027 inch from fuel control nylon stop. Tighten screw.

      ii. **O-540:** Refer to Figure 37-1. Raise collective full up, rotate (throttle) twist grip as required, loosen screw, and pivot A607-2 slotted cam (in throttle linkage, forward of vertical firewall) so V3-1 switch activates when throttle stop is approximately 0.062 inch from corner of throttle body full-throttle stop. Tighten screw.

   b. Perform switch rigging check per step 1.

37-80 Carbon Monoxide Detector

The carbon monoxide (CO) detector, if installed, indicates elevated cabin CO levels. CO is an odorless, toxic gas present in engine exhaust which causes headaches, drowsiness, and possible loss of consciousness. CO levels may become elevated due to an exhaust leak or exhaust recirculation during prolonged hovering.

The CO detector system consists of a sensor above the pilot's heater outlet and a caution light. A system check (light flashes twice) is performed each time power is switched on. A sensor malfunction is indicated by a continuing flash every four seconds.

If the caution light illuminates, shut off heater and open nose and door vents as required to ventilate the cabin. If hovering, land or transition to forward flight. If symptoms of CO poisoning (headache, drowsiness, dizziness) accompany caution light, land immediately. Have exhaust system inspected before next flight.

Many chemicals can damage the CO sensor. Avoid use of solvents, detergents, or aerosol sprays near the sensor. Temporarily tape off openings in top and bottom of sensor housing when cleaning cabin interior.

37-90 Emergency Locator Transmitter (ELT)

The Emergency Locator Transmitter (ELT) installation consists of a transmitter with internal battery pack, an external antenna, and a remote switch/annunciator. The transmitter is mounted to the upper steel tube frame and is accessible through the aft, upper cowl door. The remote switch/annunciator is located left of the cyclic stick.

The ELT is operated by a switch on the transmitter and a remote switch in the cockpit. The transmitter switch has been secured in the AUTO or ARM position at installation and should always be in this position for flight. The remote switch/annunciator is a three position switch with indicator light. This switch should also be in the AUTO or ARMED (middle) position for flight. With both switches set to AUTO/ARM, the ELT will begin transmitting when subjected to a high "G" load. When the unit is transmitting, the red indicator light illuminates.

Moving the remote switch to ON activates the transmitter. Use the ON position if an emergency landing is imminent and time permits.

If the ELT is inadvertently activated, use the RESET position of the remote switch to stop transmission and reset the unit. The red indicator will extinguish when unit is reset.

NOTE
Earlier aircraft may have ELT installations without remote switch.

For more detailed instructions on ELT operation, maintenance, and required tests, refer to manufacturer's instructions supplied with the unit.

37-100 Low Rotor RPM Warning System

When the collective is raised 0.2 to 0.4 inch (measured at grip) above fully down, the low-rotor RPM warning unit must activate the low-rpm warning horn and low-rpm light at 97% to 96% rotor RPM; horn and light must turn off above 96% to 97% rotor RPM.

The low rotor RPM warning unit is located on the inside of the upper console, mounted on the left vertical panel. Adjustments are made by turning an exposed screw on warning unit, accessible by removing a black-plastic plug from a 3/8-inch diameter hole on the left vertical panel. The A569 warning unit's adjustment screw sensitivity is approximately 2 turns per 1% change. If warning unit cannot be adjusted to range stated above, it must be replaced.

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37-110 Troubleshooting

Following are some troubles and corrections. When investigating trouble, eliminate causes one by one, beginning with the most probable.

A. A569 Low Rotor RPM Warning Unit

Perform following tests prior to replacing A569 low rotor-rpm warning unit:

1. Verify:
   a. Low RPM light bulb is functional.
   b. Battery switch off.
   c. Full-down collective.
   d. Horn circuit breaker in.
2. Access and disconnect both horn and A569 low rotor-rpm warning unit from airframe electrical wiring.
3. Turn battery switch on and verify Horn Start circuit breaker remains in. If Horn Start circuit breaker pops then -70 wire is shorted to ground; repair as required. Turn battery switch off.
4. On the warning unit's airframe electrical connector, install a jumper between wires -70 & -75.
5. Turn battery switch on and verify Horn Start circuit breaker remains in. If Horn Start circuit breaker pops then a short-to-ground exists in -75 wire and/or collective-activated V3-1 switch; repair as required.
6. Fully raise collective and verify Horn Start circuit breaker remains in and Low RPM light illuminates. If Horn Start circuit breaker pops then a short-to-ground exists in -76 wire and/or -78 wire and/or collective-activated V3-1 switch; repair as required. If Low RPM light does not illuminate then collective-activated V3-1 switch is faulty or misadjusted and/or an open exists in -70, -75, or -76 wires.
7. Slowly raise and lower collective fully several times while simultaneously manipulating throttle. Verify Horn Start circuit breaker remains in and Low RPM light remains illuminated whenever collective is raised. If Horn Start circuit breaker pops then a short-to-ground condition is occurring in -70, -75, or -76 wires and/or collective-activated V3-1 switch due to collective movement. Check for pinched/rubbing wiring and repair as required.
8. Turn battery switch off. Connect horn to airframe wiring.
9. Turn battery switch on. Raise collective and verify horn activates and has consistent tone. If Horn Start circuit breaker pops then horn is faulty and/or -78 wire is shorted to ground; repair as required. If horn fails to activate then -79 wire is open or horn is faulty; repair as required. If tone is inconsistent then horn is faulty and/or poor connections exist; repair as required.

37-110 Troubleshooting (continued)

A. A569 Low Rotor RPM Warning Unit (continued)

10. Check A999 master radio relay current draw:
    a. Battery switch off and belt tension actuator fully disengaged.
    b. Disconnect A569 low-rpm warning unit's connector and place an ammeter in series (positive lead on pin 10) between pins 10 and 11 on airframe side of connector.
    c. Battery switch on, Horn Start and Clutch Start circuit breakers in, avionics off, rotor brake released, mixture at idle cut-off.
    d. Select key switch to Start (Both on Raven IIs) position and crank engine. Note and record current draw at ammeter while cranking engine. Select key switch to Off position.
    e. Disconnect 582 wire at tab on starter solenoid and isolate connector (do not let it ground). Select key switch to Start position. Note and record current draw at ammeter; for 14-volt systems current should be 94–156 milliamps and a buzzing sound should be heard from the starter vibrator (for 28-volt systems current should be 40–70 milliamps and starter vibrator should make no noise). Select key switch to Off position.
11. Check starter circuit:
    a. Battery switch off and belt tension actuator fully disengaged.
    b. Disconnect A569 low-rpm warning unit's connector and jump pins 10 and 11 on airframe side of connector.
    c. Battery switch on, Horn Start and Clutch Start circuit breakers in, rotor brake released, mixture at idle cut-off.
    d. Select key switch to Start position and crank engine. If engine does not crank there is a problem in the starter circuit. If engine cranks then there is a problem in either the A569 unit or the sense circuit.
12. Check A569 sense circuit:
    a. Battery switch on.
    b. Momentarily engage clutch and verify Clutch light illuminates then disengage clutch completely (switch to remain disengaged throughout this sequence).
    c. Battery switch off.
    d. Disconnect D602 time delay connector. Ground airframe-side plug's pin 1 thru a suitable voltage (post-light type) lamp.

CAUTION

Failure to ground pin 1 thru a suitable voltage lamp (such as direct grounding) may result in wiring damage.

37-110 Troubleshooting (continued)

A. A569 Low Rotor RPM Warning Unit (continued)

12. e. Verify less than 200 ohms (20 ohm nominal for 14-volt system; 70 ohm nominal for 28-volt system) to ground at pin 4 and at pin 5 on ship side of A569 connector.

    f. Battery switch on.

    g. With A569-5 unit connected to airframe harness, verify voltage does not exceed 0. 5V from pin 4 to ground and from pin 5 to ground.

    h. Battery switch on, Horn Start and Clutch Start circuit breakers 1n, rotor brake released, mixture at idle cut-off.

    i. Select key switch to Start position and crank engine. Failure of engine to crank indicates problem in A569 unit.

13. Upon completion of preceding tests, a faulty A569 low rotor-rpm warning unit may be replaced and adjusted per § 37-100.

37-110 Troubleshooting (continued)

B. General

TROUBLE	PROBABLE CAUSE	CORRECTION
No electrical power	Battery terminals corroded	Clean terminals
	Bad or no ground	Clean ground path
	Tripped circuit breaker	Check circuit, if circuit checks ok, reset circuit breaker
	Low battery voltage	Check battery. Recharge if necessary.
	Low or no alternator output	Check alternator belt tension, wiring, and alternator control unit
	Bad wire or terminal	Replace
Engine cranks slowly, but will not start	Low battery voltage	Service or replace battery
	Insufficient drive belt deflection	Adjust actuator down-limit screw
	Corroded or dirty battery or starter terminals	Clean terminals
	Bad starter relay, wires or terminals	Replace defective parts
Engine cranks, but will not start	Key switch in off position (IO-540)	Place switch in BOTH position
	Bad ignition switch	Replace switch
	Bad starting vibrator	Repair or replace vibrator
	Incorrect retard timing	Adjust retard magneto internal timing
Starter fails to operate	Rotor brake engaged	Release rotor brake
	Low battery charge	Check and recharge if necessary
	Circuit breakers tripped	Reset both HORN START and CLUTCH START circuit breakers
	Actuator not fully disengaged	Engage actuator momentarily, then fully disengage
	Loose connections	Check all wiring (refer to wiring diagram)
	Defective wiring	Check all wiring (refer to wiring diagram
	Starter motor - burned winding or bad brushes	Repair or replace starter
	Faulty A569 low-RPM warning unit	Check unit per Part !

37-110 Troubleshooting (continued)

B. General (continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
Discharged battery	Battery worn out	Replace battery.
	Charging rate not set correctly	Check alternator control unit output. Replace if below 13.4 volts.
	Standing too long	Remove and recharge battery if left in unused helicopter for four or more weeks.
Starter — Low cranking speed	Same electrical causes as listed under “starter fails to operate”	Same remedies listed for those troubles.
Battery life is short	Impurities in electrolyte	Replace battery.
	Low charging rate	Check ACU output. If below 13.4 volts replace the unit.
Electrolyte runs out of battery	Too much water added to battery.	Drain and keep battery at proper fluid level and specific gravity.
	Charging rate too high.	Check the ACU output voltage. Replace if necessary.
Excessive electrolyte inside container	Spillage from overfilling	Use care in adding water.
	Vent lines leaking or clogged	Repair or clean.
	Charging rate too high	Check the ACU output voltage. Replace if necessary.
Battery consumes excessive water	Charging rate too high (if in all cells)	Check the ACU output voltage. Replace if necessary.
Alternator fails to supply charging current with engine operating	ACU failure Open field circuit wiring	Check the ACU output voltage. Replace if necessary. Repair or replace wiring to field circuit.

37-110 Troubleshooting (continued)

B. General (continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
Starter kicks back while cranking; may cause broken starter or starter ring gear	Retard breaker contact in engine left magneto pushed out or no connection between lead and magneto contact	Measure retard breaker lead connection. Must be 0.609 in. ± 0.10 in. There must be a small amount of springback when the connector is placed into magneto.
	Incorrect ignition vibrator wiring	Trace ignition vibrator wiring from ignition switch to magneto. Correct as required.
	Bad ignition switch	Replace ignition switch
	Bad ignition vibrator	Replace vibrator
	Incorrect internal magneto retard breaker timing. Engine left magneto	Correct as required. Consult TCM Aircraft Products literature.
	Open circuit in ignition vibrator wiring circuit	Repair or replace wiring for ignition vibrator.

37-110 Troubleshooting (continued)

C. Clutch Actuator Electrical Troubleshooting

TROUBLE	CLUTCH LIGHT		PROBABLE CAUSE
	ON	OFF	
Disengaged actuator will not engage	X		Motor assembly seized
	X		Motor fuse blown (3-amp)
	X		Open circuit in motor wiring
	X		Overtravel switch assembly tripped or broken
		X	No voltage at circuit breaker
		X	Circuit breaker tripped
		X	Down limit switch stuck (normally closed)
		X	-113 wire not grounded
Engaged actuator will not disengage	X		Motor assembly seized
	X		Motor fuse blown (3-amp)
	X		Open circuit in motor wiring
	X		D602-1 time delay assembly internal diode open
		X	No voltage at circuit breaker
		X	Circuit breaker tripped
		X	Up limit switch stuck (normally closed)
		X	-113 wire not grounded
Clutch light flickers in flight			Actuator leaf spring improperly adjusted.
			C190 drive belts not matched properly.
			Open circuit in motor wiring.
			C184-1 or C007-3 bearing running rough.
Clutch light comes on for 1–6 seconds in flight			Normal operation of actuator as it retensions drive belts
Clutch light comes on for over 6 seconds in flight			Drive belts stretched beyond limit of actuator over-travel switch. Belts must be replaced.
			Actuator overtravel switch activated by outside force
Clutch light comes on for over 10 seconds in flight			Check sheaves and belts for excessive wear.
			Check column springs for operation.
			Verify fanwheel balance.
			Check or change out time delay.
			Remove actuator and send to RHC for evaluation.

37-110 Troubleshooting (continued)

D. Electrically Powered Instruments Accuracy Check

Using Vibrex 2000 balancing equipment (or similar) capable of displaying ±1 rpm resolution and calibrated within one year, verify tachometer accuracy per following tables. Connect equipment in accordance with §§ 10.221 and 6.240 (use photocell instead of Strobex per Figure 6-4A). Operate aircraft at noted tachometer indications and verify engine and rotor rpms as specified. Tachometer needles are 1% wide.

C792-x Dual Tachometer

Tachometer indication	Engine RPM	Rotor RPM
96%	2556-2561	383–384
100%	2662-2667	399–400
102%	2715-2721	407–408

The rotor tachometer may be adjusted per § 13-23. No other adjustments are permitted. If tachometer does not meet accuracy tolerance then it must be replaced or returned to RHC for repair.

A058-10 Carb. Air Temp. Probe

0 degrees	=	89.68/91.08 ohms
15 degrees	=	95.67/98.07 ohms
16 degrees	=	96.10/98.50 ohms
17 degrees	=	96.54/98.94 ohms
18 degrees	=	96.97/99.37 ohms
19 degrees	=	97.40/99.80 ohms
20 degrees	=	97.83/100.23 ohms
21 degrees	=	98.27/100.67 ohms
22 degrees	=	98.70/101.10 ohms
23 degrees	=	99.13/101.53 ohms
24 degrees	=	99.56/101.96 ohms
25 degrees	=	100.00/102.40 ohms

R44 C604-2 Carb. Air Temp. Gage at 13.7 Vdc;
R44 C604-8 Carb. Air Temp. Gage at 28.2 Vdc

77.40 ohms	=	-30 ± 2	degrees C
81.73 ohms	=	-20 ± 1.75	degrees C
86.05 ohms	=	-10 ± 1.5	degrees C
90.38 ohms	=	0 ± 1	degrees C
94.71 ohms	=	10 ± 1.5	degrees C
99.03 ohms	=	20 ± 1.75	degrees C
103.36 ohms	=	30 ± 2	degrees C

Example: Replacing the carburetor air temperature probe with a ¼ to 1-watt 100-ohm resistor should result in a indication of approximately 21 degrees C (measure exact resistor value & refer to above). A probe dipped in a Styrofoam cup full of crushed ice and water should indicate 90.38 ohms resistance per above table. Probe installation torque is 36 to 48 inch-pounds; over-torquing probe will result in damage.

37-110 Troubleshooting (continued)

D. Electrically Powered Instruments Accuracy Check (continued)

Following instrument cluster gages are calibrated at 20 to 25 degree angle from horizontal.

Fuel level senders should have 90 ± 2 ohms resistance when fully up (full fuel) and 0 to 0.5 ohm when fully down (no fuel). Perform fuel sender calibration per § 12.411 whenever sender is replaced, or if factory-set fuel gage potentiometers have been disturbed. On backside of each fuel gage are "Null" and "Gain" potentiometer screws, covered with aluminum tape pressed against the screw heads to prevent rotation. "Null" potentiometer is adjusted so gage indicates empty at 0.7 ohm sender circuit resistance; "Gain" is adjusted so gage indicates half at 42 ohms sender circuit resistance. Calibration values are:

Fuel Quantity Gages
6246-00473 (14V) & 6246-00716 (28V)

0.70 ohm =	E (empty) -1, +0	pointer width
21.20 ohms =	1/4 full ± 1	pointer width
42.00 ohms =	1/2 full ± 1	pointer width
67.50 ohms =	3/4 full ± 1	pointer width
90.00 ohms =	F (full) ± 1	pointer width

Ammeter
6246-00468 (14V & 28V)

-104 mV =	-70 amps ± 1	pointer width
-52 mV =	-35 amps ± 1	pointer width
0 mV =	0 amps ± ¼	pointer width
+52 mV =	+35 amps ± 1	pointer width
+104 mV =	+70 amps ± 1	pointer width

CHT Probe
3080-38 (14V & 28V)

200 degrees F =	745 ohms
475 degrees F =	38 ohms
500 degrees F =	32 ohms

CHT Gages
6246-00088 (14V) & 6246-00718 (28V)

745 ohms =	200 degrees F	± 1 pointer width
110 ohms =	350 degrees F	± 1 pointer width
34 ohms =	500 degrees F	± ½ pointer width

Oil Pressure Sending Unit
B308-1 (14V & 28V)

0 psi =	5-13 ohms
29 psi =	48-57 ohms
58 psi =	84-94 ohms
87 psi =	119 131 ohms
115 psi =	145-161 ohms

115-psi redline Oil Pressure Gages
6246-00647 (14V) & 6246-00715 (28V)

9 ohms =	0 psi	± 1 pointer width
46 ohms =	25 psi	± 1 pointer width
84 ohms =	55 psi	± 1 pointer width
131 ohms =	95 psi	± 1 pointer width
152 ohms =	115 psi	± 1 pointer width

37-110 Troubleshooting (continued)

D. Electrically Powered Instruments Accuracy Check (continued)

Oil Temperature Sender A760-1 (14V)	Oil Temperature Gage 6246-00090 (14V) 6246-00717 (28V)
100 degrees F = 497 ohms	903.5 ohms = 75 degrees F ± 1 pointer width
150 degrees F = 179 ohms	100 ohms = 180 degrees F ± 1 pointer width
200 degrees F = 72 ohms	36 ohms = 245 degrees F ± 1 pointer width
250 degrees F = 34 ohms	

37-120 Electrical Load Analysis

To calculate the total electrical load for a specific helicopter, identify all items of equipment installed on the helicopter from the table below and sum the corresponding continuous and intermittent loads.

Maximum continuous alternator load is given in the table below:

System Voltage	Alternator Rating	Maximum Continuous Load
14V	70 amp	50 amps
28V	70 amp	64 amps
28V	130 amp	85 amps

Intermittent loads are provided for reference.

Alternately, the electrical load may be measured directly at the battery output terminal with the alternator switched off and all other equipment turned on. The measured load may be scaled by the ratio of battery voltage to nominal system voltage to obtain a value that is compared with the alternator load limit.

WARNING

Field (non-factory) installation of electronic equipment can be hazardous. Due to the compactness of the console and tunnel containing the controls and wire bundles, installation of any additional wires can interfere with flight controls. Electronic tachometers, warning systems, and navigation equipment essential to flight are sensitive to interference from other electrical devices. The reliability and accuracy of the tachometers is essential for safe operation of the helicopter, and installation of an electrical device not tested and approved by RHC may result in a hazardous condition.

A. 14-Volt System

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
MAIN BUS					
ESSEX BATTERY RELAY	1	0.75	0.75	0.75	0.75
KISSLING BATTERY RELAY	1	0.35	0.35	0.35	0.35
ALTERNATOR FIELD	1	2.40	2.40	2.40	2.40
AVIONICS RELAY	1	0.13	0.13	0.13	0.13
ENGINE GAGE CLUSTER	1	0.60	0.60	0.60	0.60
HOURMETER	1	0.03	0.03	0.03	0.03
CARB AIR TEMP	1	0.13	0.13	0.13	0.13
AMMETER	1	0.50	0.50	0.50	0.50
DIGITAL OAT GAGE	1	0.15	0.15	0.15	0.15
MAP LIGHT	1	0.58	0.58	0.58	0.58

37-120 Electrical Load Analysis (continued)

A. 14-Volt System (continued)

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
MAIN BUS (continued)					
WARNING LIGHTS	10	0.00	0.08	0.00	0.80
FULL THROTTLE CAUTION LIGHT	1	0.00	0.08	0.00	0.08
LOW RPM HORN	1	0.00	0.25	0.00	0.25
RPM GOVERNOR MOTOR	1	0.00	1.50	0.00	1.50
BELT TENSION ACTUATOR	1	0.00	3.50	0.00	3.50
TRIM MOTORS	2	0.00	1.15	0.00	2.30
HYDRAULIC SHUTOFF SOLENOID	1	0.00	1.54	0.00	1.54
AUX POWER PLUGS (MAX)	1	10.00	10.00	10.00	10.00
HEATED PITOT	1	8.00	8.00	8.00	8.00

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
TACH BUS					
DUAL TACHOMETER (E)	1	0.10	0.10	0.10	0.10
DUAL TACHOMETER (R)	1	0.10	0.10	0.10	0.10

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
LIGHTS BUS					
POSITION LIGHTS (L, R, & AFT, INCANDESCENT)	3	2.20	2.20	6.60	6.60
POSITION LIGHTS (L & R, LED)	2	0.25	0.25	0.50	0.50
POSITION LIGHT (AFT, LED)	1	0.30	0.30	0.30	0.30
MAST MOUNTED POS LIGHT RELAY	1	0.20	0.20	0.20	0.20
MAST MOUNTED POSITION LIGHTS	2	2.20	2.20	4.40	4.40
MAST MOUNTED POSITION LIGHTS (LED)	2	0.25	0.25	0.50	0.50
OVERHEAD PANEL LIGHT	1	1.00	1.00	1.00	1.00
POST LIGHTS	7	0.08	0.08	0.56	0.56
INSTRUMENT LIGHTS	4	0.20	0.20	0.80	0.80
LANDING LIGHT RELAY	1	0.20	0.20	0.20	0.20
LANDING LIGHTS (INCANDESCENT)	2	7.70	7.70	15.40	15.40
LANDING LIGHTS (HID)	2	2.90	9.52	5.80	19.04
ANTI-COLLISION LIGHT & POWER SUPPLY	1	3.20	3.20	3.20	3.20
ANTI-COLLISION LIGHT (FORWARD)	1	3.40	3.40	3.40	3.40

37-120 Electrical Load Analysis (continued)

A. 14-Volt System (continued)

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
LIGHTS BUS (continued)					
ANTI-COLLISION LIGHT (LED)	1	0.90	4.00	0.90	4.00
ANTI-COLLISION LIGHT (LED, FORWARD)	1	0.90	4.00	0.90	4.00

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
AVIONICS					
KY197A COM	1	0.80	6.00	0.80	6.00
GTR225B COM	1	0.59	5.90	0.59	5.90
KX155 NAV/COM	1	0.40	6.00	0.40	6.00
KX165 NAV/COM	1	0.70	8.50	0.70	8.50
GNC420 COM/GPS	1	2.44	8.40	2.44	8.40
GNS430 COM/NAV/GPS	1	2.44	8.40	2.44	8.40
GNS530 COM/NAV/GPS	1	2.84	8.80	2.84	8.80
GTN625/635/650 COM/NAV/GPS	1	2.65	6.97	2.65	6.97
GTN725/750 COM/NAV/GPS	1	3.45	10.22	3.45	10.22
KR87 ADF	1	1.24	1.24	1.24	1.24
KN63 DME	1	1.21	1.21	1.21	1.21
GARMIN RADIO NAVIGATION INDICATOR	1	0.41	0.41	0.41	0.41
KING RADIO NAVIGATION INDICATOR	1	0.08	0.08	0.08	0.08
MARKER BEACON	1	0.50	0.50	0.50	0.50
GARMIN TRANSPONDER	1	1.10	3.10	1.10	3.10
GDL88 ADS-B IN	1	1.28	1.28	1.28	1.28
KCS55A HSI	1	3.23	3.23	3.23	3.23
RADAR ALTIMETER	1	1.45	1.45	1.45	1.45
AA12S AUDIO CONTROL (SINGLE, STEREO)	1	1.00	1.00	1.00	1.00
AMS42 DUAL AUDIO CONTROL	1	0.57	0.57	0.57	0.57
AIR COMM SINGLE AUDIO CONTROL	1	1.00	1.00	1.00	1.00
AIR COMM DUAL AUDIO CONTROL	1	3.00	3.00	3.00	3.00
GMA 350H AUDIO CONTROL	1	0.80	1.50	0.80	1.50
ASPEN EFD 500H EFD	1	1.60	1.60	1.60	1.60
ASPEN EFD 1000H PFD	1	4.80	4.80	4.80	4.80
ATTITUDE HORIZON (MECHANICAL)	1	0.54	1.40	0.54	1.40
ATTITUDE HORIZON (LCD)	1	0.20	0.20	0.20	0.20

37-120 Electrical Load Analysis (continued)

A. 14-Volt System (continued)

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
AVIONICS (continued)					
DIRECTIONAL GYRO	1	0.44	1.40	0.44	1.40
TURN COORDINATOR	1	0.70	0.70	0.70	0.70
KG102A GYRO	1	3.00	3.00	3.00	3.00
HELISAS	1	4.29	4.29	4.29	4.29
COOLING BLOWER	1	0.30	0.30	0.30	0.30

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
MARINE AVIONICS					
ICOM IC-M412 MARINE TRANSCIEVER	1	1.50	5.50	1.50	5.50
VERTEX VX-2200 FM TRANSCIEVER	1	2.50	11.00	2.50	11.00
KENWOOD TK-7160 OR TK8160 FM TRANSCIEVER	1	1.00	8.00	1.00	8.00
KENWOOD TK-7180 OR TK8180 FM TRANSCIEVER	1	1.00	9.00	1.00	9.00
YAESU FT-8800R FM TRANSCIEVER	1	0.50	8.00	0.50	8.00
GPSMAP 169 MARINE GPS	1	0.29	0.29	0.29	0.29

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
OTHER EQUIPMENT					
STARTER RELAY	1	0.00	15.00	0.00	15.00
STARTING VIBRATOR	1	0.00	2.50	0.00	2.50
STARTER MOTOR	1	0.00	200.00	0.00	200.00
CLOCK, STANDARD	1	0.02	0.02	0.02	0.02
CLOCK, DIGITAL	1	0.00	0.00	0.00	0.00

37-120 Electrical Load Analysis (continued)

B. 28-Volt System

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
MAIN BUS					
ALTERNATOR FIELD (70 AMP)	1	2.40	2.40	2.40	2.40
ALTERNATOR FIELD (130 AMP)	1	4.00	4.00	4.00	4.00
AMMETER	1	0.50	0.50	0.50	0.50
EATON BATTERY RELAY	1	0.50	0.50	0.50	0.50
KISSLING BATTERY RELAY	1	0.25	0.25	0.25	0.25
AVIONICS RELAY	1	0.10	0.10	0.10	0.10
CARB AIR TEMP	1	0.07	0.07	0.07	0.07
MAP LIGHT	1	0.30	0.30	0.30	0.30
MAP LIGHT (LED)	1	0.02	0.02	0.02	0.02
DIGITAL OAT GAGE	1	0.15	0.15	0.15	0.15
ENGINE GAGE CLUSTER	1	0.29	0.29	0.29	0.29
HOURMETER	1	0.02	0.02	0.02	0.02
HYDRAULIC SHUTOFF SOLENOID	1	0.80	0.80	0.80	0.80
LOW RPM HORN	1	0.00	0.25	0.00	0.25
LOW RPM WRG. UNIT	1	0.00	0.16	0.00	0.16
WARNING LIGHTS	12	0.00	0.04	0.00	0.48
RPM GOVERNOR MOTOR & CONVERTER	1	0.60	0.60	0.60	0.60
BELT TENSION ACTUATOR	1	0.00	1.40	0.00	1.40
TRIM MOTORS & CONVERTER	2	0.55	1.00	1.10	2.00
ELECTRIC FUEL PUMP	1	0.00	3.00	0.00	3.00
FUEL PRESS WARNING LIGHT	1	0.00	0.04	0.00	0.04
FUEL PUMP RELAY	1	0.00	0.09	0.00	0.09
FULL THROTTLE CAUTION LIGHT	1	0.00	0.04	0.00	0.04
AUX POWER PLUGS (MAX)	1	10.00	10.00	10.00	10.00
HEATED PITOT	1	4.00	4.00	4.00	4.00

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
TACH BUS					
DUAL TACHOMETER (E)	1	0.03	0.03	0.03	0.03
DUAL TACHOMETER (R)	1	0.04	0.04	0.04	0.04

37-120 Electrical Load Analysis (continued)

B. 28-Volt System (continued)

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
LIGHTS BUS					
INSTRUMENT LIGHTS	8	0.10	0.10	0.80	0.80
LANDING LIGHT RELAY	1	0.08	0.08	0.08	0.08
LANDING LIGHTS (INCANDESCENT)	2	3.57	3.57	7.14	7.14
LANDING LIGHTS (HID)	2	1.60	5.25	3.20	10.50
MAST MOUNTED POS LIGHT RELAY	1	0.20	0.20	0.20	0.20
OVERHEAD PANEL LIGHT	1	0.50	0.50	0.50	0.50
POSITION LIGHTS (INCANDESCENT)	3	1.10	1.10	3.30	3.30
POSITION LIGHTS (L & R, LED)	2	0.25	0.25	0.50	0.50
POSITION LIGHT (AFT, LED)	1	0.30	0.30	0.30	0.30
POSITION LIGHTS (MAST MOUNTED, INCANDESCENT)	2	2.20	2.20	4.40	4.40
POSITION LIGHT (MAST MOUNTED, LED)	2	0.25	0.25	0.50	0.50
POST LIGHTS	7	0.04	0.04	0.28	0.28
ANTI-COLLISION LIGHT & POWER SUPPLY	1	1.70	1.70	1.70	1.70
ANTI-COLLISION LIGHT (FORWARD)	1	1.80	1.80	1.80	1.80
ANTI-COLLISION LIGHT (LED)	1	0.67	3.00	0.67	3.00
ANTI-COLLISION LIGHT (LED, FORWARD)	1	0.67	3.00	0.67	3.00

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
AVIONICS					
KY196A COM	1	1.00	5.00	1.00	5.00
GTR225B COM	1	0.28	2.60	0.28	2.60
GNC420 COM/GPS	1	1.22	4.20	1.22	4.20
GNS430 COM/NAV/GPS	1	1.22	4.20	1.22	4.20
GNS530 COM/NAV/GPS	1	1.42	4.40	1.42	4.40
GTN625/635/650 COM/NAV/GPS	1	1.31	4.41	1.31	4.41
GTN725/750 COM/NAV/GPS	1	1.71	4.71	1.71	4.71
KTR909 UHF TRANSCIEVER	1	0.60	8.00	0.60	8.00
KX155 NAV/COM	1	0.40	6.00	0.40	6.00
KX165 NAV/COM	1	0.70	8.50	0.70	8.50
KR87 ADF	1	0.62	0.62	0.62	0.62
KN63 DME	1	0.61	0.61	0.61	0.61
GARMIN RADIO NAVIGATION INDICATOR	1	0.10	0.10	0.10	0.10

37-120 Electrical Load Analysis (continued)

B. 28-Volt System (continued)

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
AVIONICS (continued)					
KING RADIO NAVIGATION INDICATOR	1	0.06	0.06	0.06	0.06
MARKER BEACON	1	0.50	0.50	0.50	0.50
GARMIN TRANSPONDER	1	0.85	1.60	0.85	1.60
GDL88 ADS-B IN	1	0.64	0.64	0.64	0.64
KCS55A HSI	1	1.73	1.73	1.73	1.73
RADAR ALTIMETER	1	0.73	0.73	0.73	0.73
GMA 350H AUDIO CONTROL	1	0.40	1.00	0.40	1.00
AMS42 DUAL AUDIO CONTROL	1	0.41	0.41	0.41	0.41
AA12S AUDIO CONTROL (SINGLE, STEREO)	1	0.80	0.80	0.80	0.80
AIR COMM SINGLE AUDIO CONTROL	1	0.50	0.50	0.50	0.50
AIR COMM DUAL AUDIO CONTROL	1	1.50	1.50	1.50	1.50
ASPEN 500H EFD	1	0.80	0.80	0.80	0.80
ASPEN 1000H PFD	1	2.40	2.40	2.40	2.40
ATTITUDE HORIZON W/INCL (MECHANICAL)	1	0.27	0.70	0.27	0.70
ATTITUDE HORIZON (LCD)	1	0.18	0.18	0.18	0.18
BLIND ENCODER	1	0.15	0.15	0.15	0.15
DIRECTIONAL GYRO	1	0.25	0.60	0.25	0.60
TURN COORDINATOR	1	0.35	0.35	0.35	0.35
HORIZON REF IND.	1	1.80	1.80	1.80	1.80
HELISAS	1	2.14	2.14	2.14	2.14
COOLING BLOWER	1	0.20	0.20	0.20	0.20

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
AIR CONDITIONING					
COMPRESSOR	1	1.22	1.22	1.22	1.22
DOME LIGHT LED	1	0.02	0.02	0.02	0.02
EVAPORATOR BLOWER	1	8.25	8.25	8.25	8.25

37-120 Electrical Load Analysis (continued)

B. 28-Volt System (continued)

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
MARINE AVIONICS					
GPSMAP 162 MARINE GPS	1	0.14	0.14	0.14	0.14
ICOM IC-M412 MARINE TRANSCIEVER	1	1.50	5.50	1.50	5.50
VERTEX VX-2200 FM TRANSCIEVER	1	0.70	7.00	0.70	7.00
KENWOOD TK-7160 OR TK8160 FM TRANSCIEVER	1	1.00	8.00	1.00	8.00
KENWOOD TK-7180 OR TK8180 FM TRANSCIEVER	1	1.00	9.00	1.00	9.00
YAESU FT-8800R FM TRANSCIEVER	1	0.50	8.00	0.50	8.00
ROSS VHF FM TRANSCIEVER	1	0.60	6.00	0.60	6.00

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
OTHER EQUIPMENT					
STARTER MOTOR	1	0.00	200.00	0.00	200.00
STARTER ON LIGHT	1	0.00	0.04	0.00	0.04
STARTER RELAY	1	0.00	7.00	0.00	7.00
TCM STARTING VIBRATOR	1	0.00	2.50	0.00	2.50
UNISON STARTING VIBRATOR	1	0.00	5.00	0.00	5.00
CLOCK, STANDARD	1	0.02	0.02	0.02	0.02
CLOCK, DIGITAL	1	0.00	0.00	0.00	0.00

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
POLICE EQUIPMENT (28V BUS)					
POLICE EQUIPMENT RELAY	1	0.43	0.43	0.43	0.43
DIGITAL VCR	1	0.28	0.28	0.28	0.28
ETS	1	0.53	1.50	0.53	1.50
NAT FM CONTROL HEAD	1	1.00	1.00	1.00	1.00
NAT NTX138-000 FM RADIO	1	0.70	2.00	0.70	2.00
TECHNISONIC TFM-500 FM TRANSCIEVER	1	1.00	3.20	1.00	3.20
INFRARED CAMERA SYSTEM	1	7.00	12.00	7.00	12.00
INTERIOR LIGHT	1	0.22	0.22	0.22	0.22

37-120 Electrical Load Analysis (continued)

B. 28-Volt System (continued)

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
POLICE EQUIPMENT (28V BUS; continued)					
MICROWAVE SYSTEM	1	3.10	3.10	3.10	3.10
MONITOR	1	0.43	0.43	0.43	0.43
PA/SIREN	1	4.00	4.00	4.00	4.00
SEARCHLIGHT	1	27.00	27.00	27.00	27.00
SLAVE SYSTEM	1	0.15	0.49	0.15	0.49

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
POLICE EQUIPMENT (14V BUS)					
ROSEN FLAT SCREEN MONITOR @ 13.75V	1	3.70	4.20		
ROSEN FLAT SCREEN MONITOR	1	2.31	2.63	2.31	2.63
BENDIX/KING FM RADIO @ 13.75V	1	1.00	1.50		
BENDIX/KING FM RADIO	1	0.63	0.94	0.63	0.94
LOJACK @ 13.75V	1	0.75	0.75		
LOJACK	1	0.47	0.47	0.47	0.47
PANASONIC VHS RECORDER @ 13.75V	1	1.20	1.20		
PANASONIC VHS RECORDER	1	0.75	0.75	0.75	0.75

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
ENG EQUIPMENT (28V BUS)					
5" TRANSVIDEO MONITOR	3	0.28	0.59	0.84	1.77
6" SONY LCD MONITOR	1	0.43	0.43	0.43	0.43
AUDIO COOLING FAN	1	0.22	0.22	0.22	0.22
GENEVA AUDIO SYSTEM	1	1.92	1.92	1.92	1.92
AUDIO SYSTEM COOLING FAN	1	0.18	0.18	0.18	0.18
FLIR CAMERA SYSTEM	1	6.00	8.00	6.00	8.00
AFT COMPARTMENT COOLING FAN	1	0.20	0.20	0.20	0.20
DIRECTIONAL M/WAVE ANTENNA	1	0.70	0.70	0.70	0.70
DIRECTIONAL MICROWAVE SYSTEM	1	0.50	1.50	0.50	1.50
HD CAMERA SYSTEM	1	3.00	3.80	3.00	3.80

37-120 Electrical Load Analysis (continued)

B. 28-Volt System (continued)

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
ENG EQUIPMENT (28V BUS; continued)					
HD MICRO CAMERA SYSTEM	2	0.86	0.86	1.72	1.72
MICROWAVE POWER AMP	1	8.60	8.60	8.60	8.60
MICROWAVE RECEIVER	1	0.70	0.70	0.70	0.70
MICROWAVE TRANSMITTER	1	1.35	1.35	1.35	1.35
MICROWAVE ANTENNA ACTUATOR MOTOR	1	0.00	0.75	0.00	0.75
MICROWAVE TRANSMITTER	1	3.10	3.10	3.10	3.10
NEWS EQUIP RELAY	1	0.43	0.43	0.43	0.43
OMNI MICROWAVE ANTENNA MOTOR	1	0.00	0.75	0.00	0.75
POST LIGHT	3	0.04	0.04	0.12	0.12
INTERIOR LIGHT (FORWARD)	1	0.22	0.22	0.22	0.22
INTERIOR LIGHT (REAR)	1	0.22	0.22	0.22	0.22
RADIO DESIGN LABS VIDEO SWITCH	1	0.00	0.03	0.00	0.03
VIDEO TITLER	1	0.07	0.07	0.07	0.07

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
ENG EQUIPMENT (14V BUS)					
4" TELE LCD MONITOR @ 13.75V	3	0.50	0.50		
4" TELE LCD MONITOR	3	0.31	0.31	0.94	0.94
6" TRANSVIDEO REAR SEAT MONITOR @ 13.75V	1	1.50	1.50		
6" TRANSVIDEO REAR SEAT MONITOR	1	0.94	0.94	0.94	0.94
6.5" TRANSVIDEO MONITOR	3	0.30	0.30	0.90	0.90
9" ASTRO MONITOR @ 13.75V	1	1.67	1.67		
9" ASTRO MONITOR	1	1.04	1.04	1.04	1.04
AFT TALENT LIGHT @ 13.75V	1	1.00	1.00		
AFT TALENT LIGHT	1	0.63	0.63	0.63	0.63
AVIONICS INNOVATIONS AM/FM RECEIVER/CD @ 13.75V	2	0.38	0.70		
AVIONICS INNOVATIONS AM/FM RECEIVER/CD	2	0.23	0.44	0.47	0.88
AVIONICS INNOVATIONS AM/FM RECEIVERS @ 13.75V	2	0.65	0.65		

37-120 Electrical Load Analysis (continued)

B. 28-Volt System (continued)

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
ENG EQUIPMENT (14V BUS; continued)					
AVIONICS INNOVATIONS AM/FM RECEIVERS	2	0.41	0.41	0.81	0.81
DOWN CONVERTER @ 13.75V	1	0.54	0.54		
DOWN CONVERTER	1	0.34	0.34	0.34	0.34
KENWOOD FM RADIO & GENEVA INTERFACE @ 13.75V	2	1.16	8.16		
KENWOOD FM RADIO & GENEVA INTERFACE	2	0.73	5.10	1.45	10.20
KENWOOD FM TRANSCIEVER @ 13.75V	2	0.40	9.00		
KENWOOD FM TRANSCIEVER	2	0.25	5.63	0.50	11.25
FWD TALENT LIGHT @ 13.75V	1	1.00	1.00		
FWD TALENT LIGHT	1	0.63	0.63	0.63	0.63
LED VU METER @ 13.75V	1	0.20	0.20		
LED VU METER	1	0.13	0.13	0.13	0.13
SD MICRO CAMERAS @ 13.75V	3	0.41	0.41		
SD MICRO CAMERAS	3	0.26	0.26	0.77	0.77
UNIDEN SCANNER @ 13.75V	1	0.38	0.70		
UNIDEN SCANNER	1	0.23	0.44	0.23	0.44
SD MICRO CAMERA @ 13.75V	2	0.41	10.22		
SD MICRO CAMERA	2	0.26	6.39	0.51	12.78
SVHS VIDEO TAPE RECORDER @ 13.75V	1	1.50	1.50		
SVHS VIDEO TAPE RECORDER	1	0.94	0.94	0.94	0.94
SYNC AND OUTPUT AMPS @ 13.75V	2	0.10	0.10		
SYNC AND OUTPUT AMPS	2	0.06	0.06	0.13	0.13
SYNC GENERATOR @ 13.75V	1	0.25	0.25		
SYNC GENERATOR	1	0.16	0.16	0.16	0.16
TALENT LIGHT (W/SD) @ 13.75V	1	1.43	1.43		
TALENT LIGHT (W/SD)	1	0.89	0.89	0.89	0.89
TALENT LIGHT (W/HD) @ 13.75V	2	0.11	0.11		
TALENT LIGHT (W/HD)	2	0.07	0.07	0.14	0.14
TUNER DISTRIBUTION AMP @ 13.75V	1	0.02	0.02		
TUNER DISTRIBUTION AMP	1	0.02	0.02	0.02	0.02
TV TUNER @ 13.75V	1	0.83	0.83		
TV TUNER	1	0.52	0.52	0.52	0.52

37-120 Electrical Load Analysis (continued)

B. 28V System Voltage (continued)

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
ENG EQUIPMENT (14V BUS; continued)					
TV TUNER DISTRIBUTION AMP @ 13.75V	1	0.02	0.02		
TV TUNER DISTRIBUTION AMP	1	0.01	0.01	0.01	0.01
KRAMER VIDEO SWITCHER @ 13.75V	1	0.25	0.25		
KRAMER VIDEO SWITCHER	1	0.16	0.16	0.16	0.16
BURST ELECTRONICS VIDEO SWITCHER @ 13.75V	1	0.63	0.63		
BURST ELECTRONICS VIDEO SWITCHER	1	0.39	0.39	0.39	0.39
SONY VIDEO TAPE RECORDER @ 13.75V	1	2.16	2.16		
SONY VIDEO TAPE RECORDER	1	1.35	1.35	1.35	1.35
PANASONIC VIDEO TAPE RECORDER @ 13.75V	1	5.33	5.33		
PANASONIC VIDEO TAPE RECORDER	1	3.33	3.33	3.33	3.33

EQUIPMENT	QTY	CONTINUOUS AMPS EACH	INTERMITTENT AMPS EACH	CONTINUOUS TOTAL	INTERMITTENT TOTAL
ENG EQUIPMENT (5V BUS)					
VIDEO DISTRIBUTION AMPLIFIER @ 5V	1	0.50	0.50		
VIDEO DISTRIBUTION AMPLIFIER	1	0.11	0.11	0.11	0.11
SD MICRO CAM, RATIO CONV. @ 5V	2	0.66	0.66		
SD MICRO CAM, RATIO CONV.	2	0.15	0.15	0.29	0.29
SD MICRO CAM. UPCONVERTER @ 5V	2	0.70	0.70		
SD MICRO CAM. UPCONVERTER	2	0.16	0.16	0.31	0.31

37-130 Audio Alerts

All R44 helicopters have a low-RPM horn which sounds when rotor RPM is below 97%. The horn is muted when the collective is fully down. On earlier aircraft, the horn is provided by speakers in the side of the instrument console. On later aircraft, a tone generator in the audio system provides the horn through crew headsets.

Later aircraft include a high rotor RPM alert through the headsets. A warble tone (high/low tone) indicates rotor RPM is approaching 108%. A test button on the instrument panel permits pre-flight or in-flight testing of the high-RPM alert.

Additional audio alerts may be provided in the headsets depending on optional equipment installed, such as terrain warnings, traffic warnings, and autopilot modes.

37-140 Cockpit Camera

An optional video camera may be installed in the cabin ceiling. The camera records 4K video, intercom audio and radio communications, and GPS position both internally and to a removable flash drive inserted in the front of the camera housing. The internal memory retains only the most recent 3 hours of video and is not user-accessible. Recording starts automatically when the battery switch is turned on and stops when it is turned off.

Recording to the flash drive can be stopped or audio muted using the record and audio switches on the front of the camera housing. A switch in the down position turns off the associated function. Do not remove the flash drive while a recording is in progress as this will corrupt the video file. To remove a flash drive when the helicopter battery switch is on, first stop the recording using the record switch.

A blue flashing light on the camera housing indicates video is being recorded to the flash drive. A green steady light indicates the camera is powered and operating normally. The green light will change to an amber flashing light if an internal camera fault is detected, in which case video may not be recorded.

Video can be viewed on a Windows PC or Mac by removing the flash drive from the camera, inserting it into a USB port on a computer, and double clicking on the desired video file. Video is recorded in sequential 4 GB files with each file approximately 25 minutes in length. Video files are labeled HELICAM_xxxx.MP4, where xxxx is a sequential number. GPS position and altitude are recorded to files labeled HELICAM_xxxx.GPX on the flash drive, and are optionally displayed in the upper left hand corner of the video. A 128 GB flash drive (one supplied with each helicopter) will record approximately 13 hours of video. When full, the earliest video file is overwritten with the latest recording.

NOTE

Flash drives used with the camera must meet the criteria described in the Cockpit Camera User Guide in order to function reliably.

37-140 Cockpit Camera (continued)

Complete instructions are provided in the Cockpit Camera User Guide on the Robinson website https://robinsonheli.com. The guide also provides camera lens cleaning instructions, additional playback suggestions, instructions for visualizing GPS data, setting user preferences, updating camera software, and video post-processing and troubleshooting tips. User options include on screen display of time & date and/or GPS position, time zone and daylight saving time status, and units for on screen display of GPS altitude.

A. Removal

1. Turn battery & camera switches off.
2. **Remove F039-2 camera assembly per the following:**
   a. Remove (3) screws securing camera assembly to cabin.
   b. Cut & discard ty-raps securing wiring. Disconnect wiring at connectors. Disconnect F714-2 antenna assembly from camera assembly and remove camera assembly from helicopter.
3. **Remove F039-3 camera assembly per the following:**
   a. Remove MS27039C0807 screw securing D796-3 duct assembly and slide duct forward to release from cabin. Cut & discard ty-raps as required and disconnect electrical wiring at connectors. Remove duct from helicopter.
   b. Remove A701-1 tape securing F714-3 antenna assembly wire to duct assembly. Temporarily mark antenna location using felt-tip marker. Using a plastic razor blade, detach antenna from duct assembly.
   c. Disconnect RV-BATT-LIPO500 battery from RV-10251C extension harness.
   d. Remove (4) screws and associated hardware securing camera assembly to duct assembly and remove camera assembly.

B. Installation

1. **Install F039-2 camera assembly per the following:**
   a. Connect camera assembly wiring at connectors and lock connectors using MS3367-4-9 ty-rap. Cinch ty-rap until snug without over-tightening and trim tip flush with head. Connect F714-2 antenna assembly to camera assembly.
   b. Position camera assembly and install (3) screws securing camera to cabin.
2. **Install F039-3 camera assembly per the following:**
   a. Install (4) screws and associated hardware securing camera assembly to D796-3 duct assembly.
   b. Clean mating surfaces of duct assembly and F714-3 antenna assembly using alcohol wipe. Secure antenna to duct assembly using A701-7 tape where marked during removal. Install strip of A701-1 tape securing antenna wire.

37-140 Cockpit Camera (continued)

B. Installation (continued)

c. Connect RV-BATT-LIPO500 battery to RV-10251C extension harness or install new battery per Part C.

d. Position duct assembly in helicopter and connect electrical wiring at connectors. Lock connectors and secure wiring using MS3367-4-9 ty-raps, as required. Cinch ty-raps until snug without over-tightening and trim tips flush with heads. Align duct assembly, slide aft, and secure using MS27039C0807 screw.

3. Perform functional check per Part D and verify video image is approximately level.

4. To adjust video image loosen (2) NAS1352-04-4 screws securing lens. Rotate lens clockwise to rotate video image counterclockwise or rotate lens counterclockwise to rotate video image clockwise. Tighten screws. Repeat steps 3 and 4 as required.

C. Battery Replacement

1. Remove camera assembly per Part A.

NOTE

Batteries secured to D796-3 duct assembly may be replaced without removing F039-3 camera assembly from duct assembly.

2. Gently separate RV-BATT-LIPO500 battery connector from circuit board or disconnect at RV-10251C extension harness.

NOTE

Do not remove circuit board to access battery. If battery is internally installed in F039-3 camera assembly, gently unplug battery connector at circuit board and stow wire. Also order RV-10251C extension harness to relocate new battery.

3. Pull tab on 1024A38 tape to release battery. If battery is secured using A701-7 tape, use a plastic razor blade to separate battery from F039-2 camera assembly housing or D796-3 duct assembly. Remove old tape and clean mating surfaces using an alcohol wipe.

4. Install new battery using 1024A38 tape and carefully connect camera battery to circuit board or RV-10251C extension harness.

5. Install camera assembly per Part B.

37-140 Cockpit Camera (continued)

D. Functional Check

NOTE

Refer to cockpit camera user guide online at https://robinsonheli.com. Only use USB drives that meet criteria listed in Section 8 of the user guide.

1. Turn helicopter battery switch off.
2. Insert a compatible USB drive into camera assembly USB port.
3. Ensure camera assembly Record and Audio switches are set to ON.
4. Turn helicopter battery switch on, wait 60 seconds then turn switch off.
5. Wait 5 seconds, then remove USB drive from camera assembly.
6. Refer to Sections 2.2 and 2.4 of the cockpit camera user guide for video playback instructions. Insert USB drive into a computer and verify camera recorded a playable video during 60 second test.

37-150 Overspeed Protection

An engine start-up overspeed protection circuit is standard electrical equipment on R44 S/Ns 2625 thru 9999, R44 II S/Ns 14364 and 14412 thru 29999, and R44 Cadet S/Ns 30061 and 30071 thru 39999.

R44 S/Ns 2625 thru 2777, R44 II S/Ns 14364 & 14412 thru 14712, and R44 Cadet S/Ns 30061 & 30071 thru 30099 factory-installed circuit activates when C792-5 dual tachometer [internally] grounds pin 2 for 3s-5s (refer to Figure 14-21A [C024 Rev AS schematic]).

R44 S/Ns 2778 thru 9999, R44 II S/Ns 14713 thru 29999, and R44 Cadet S/Ns 30100 thru 39999 factory-installed circuit activates when D270-1 governor controller [internally] grounds pin 12 (of 44-pin connector) for 3s-5s (refer to Figure 14-21 [C024 Rev AT schematic]).

Engine start-up overspeeds typically occur if a start is initiated with the throttle open.

The start-up overspeed protection circuit is only active if the following 3 statements are true:

Engine start-up overspeed protection, activated by C792 dual tachometer, requires: (refer to C024 Revision AS schematic)	Engine start-up overspeed protection, activated by D270 governor, requires: (refer to C024 Revision AT schematic)
C792 Engine RPM indicates above 90 ± 3%	D270 Engine RPM signal is above 85% ± 3%
C792 Rotor RPM indicates below 50 ± 10%	D270 Rotor RPM signal is below 50% ± 10%
Clutch switch is Disengaged i.e. wire -66 is routing power to wire -3003	

Engine start-up overspeed protection occurs when dual tachometer or governor [internally] grounds wire -3002, activating F695-9 overspeed relay's coil and in turn grounding both magnetos' p-leads.

During flight, the start-up overspeed relay is disabled because the clutch switch is in the Engage position.

No periodic maintenance of the start-up overspeed protection circuit is required.

The start-up overspeed protection circuit cannot prevent all engine overspeeds.

37-160 Lycoming Electronic Ignition System (EIS)

Some aircraft are equipped with a Lycoming Electronic Ignition System (EIS). The EIS replaces the engine-left retard magneto & start booster. The remaining engine-right magneto provides redundant ignition, which eliminates the need for a back-up battery system.

Refer to Lycoming SI 1569 (current revision) for EIS instructions for continued airworthiness.

Intentionally Blank