Section X
Instruments

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Section X
Instruments

10-1. INSTRUMENTS.

10-2. DESCRIPTIONS.

a. Helicopters 4 through 913. Flight and engine instruments are mounted in the panel. The dual rotor and power turbine RPM tachometer indicator, engine torque pressure indicator, and gas producer tachometer indicator furnish engine information. Engine temperature is shown by a turbine outlet temperature indicator. A fuel quantity indicator, reading in gallons, is activated by a dual float system. Engine and transmission oil pressures, direct (wet line) reading on helicopters 4 through 253, and temperatures may be observed on indicators located in a cluster in the instrument panel. The engine and transmission oil pressures on helicopters 254 through 913 are electrically transmitted by transducers. A fuel pressure indicator is also provided. Generator load is shown on a loadmeter. The Instrument panel is secured to the pedestal (forward center of cabin) by mounting screws and plate nuts. Access to the instruments, tubing and electrical connections, is gained through access panel openings located on top and sides of the pedestal (figure 10-1 , sheets 1 and 2).

b. Helicopters 914 through 1657. Flight and engine instruments are mounted in a hinged panel (figure 10-1 , sheet 3). A dual rotor and power turbine RPM tachometer, direct (wet line) engine torque pressure indicator, and a gas producer tachometer furnish engine information. Engine temperature is shown by a turbine outlet temperature indicator that provides more reliable and accurate reading during starting. A fuel quantity indicator, reading in gallons, is activated by a dual float system. Engine and transmission oil pressures and temperatures may be observed on dual indicators located on the panel. Engine and transmission pressure indicators are direct (wet line) reading instruments. The fuel pressure and loadmeter indicator is a dual instrument. Fuel pressure indications are electrical transmitted by a transducer, and the loadmeter provides indications of the generator load. Eleven caution light segments are located across the top of the instrument panel. They provide ENG OUT, ENG CHIP. ROTOR LOW RPM, TRANS TEMP, TRANS PRESS, FUEL FILTER, FUEL PUMP, and A/F FUEL FILTER indications. They also provide BATTERY TEMP and BATTERY HOT indications on helicopters 1164 thru 1657. Three spare segments are provided on helicopters 914 to 1163 and one spare segment is provided on helicopters 1164 through 1657. The instrument panel is secured on the pedestal (forward center of cabin) by mounting screws and fasteners. Access to the instruments, tubing, and electrical connections is gained by removal of panel behind top of glare shield and six panel screws. Panel hinge will allow panel to be tilted rearward from top for easy access to all instruments.

c. Helicopters 1658 and subsequent flight and engine instruments are mounted on a hinged instrument panel (figure 10-1 , sheet 4). A dual rotor and power turbine RPM indicator, engine torque pressure (wet line) indicator, and gas producer indicator furnish engine operating information. The engine operating temperature level is depicted by the turbine-outlet-temperature indicator which provides useful accurate information for starting the engine. An electrically operated dual float system is provided to show the fuel quantity (gallons reserve) indication. The engine and transmission temperatures (electrical) and oil pressure (wet line) can be observed on the two direct reading indicators located on the instrument panel. The fuel pressure instrument and loadmeter are also combined in a dual indicator, both electrically operated by pressure switch and direct generator load respectively. Twenty caution light segments are located across the top of the instrument panel providing ENG OUT, ROTOR LOW RPM, TRANS OIL PRESS, TRANS OIL TEMP, BATTERY HOT, BATTERY TEMP, ENGINE CHIP, TRANS CHIP, FUEL FILTER, T/R CHIP, AF FUEL FILTER, FUEL PUMP, and eight SPARE segments to facilitate kit and auxiliary equipment installation. Also, a CAUTION LT TEST switch is provided for warning and caution panel lamp testing. The

instrument panel is secured by a hinge mounted to the pedestal. Access to the instruments, and their lines and connectors, is gained by removing the hardware behind the glare shield allowing the panel to be tilted aftward toward the pedestal for easy servicing.

10-3. TROUBLESHOOTING. For instruments with electrical connections, refer to Section XIII. for circuit diagrams and table 10-1 for troubleshooting procedures.

Note

Instruments must be tested and repaired by an authorized repair station. Therefore, disassembly of any unit is not recommended.

Table 10-1. INSTRUMENT TROUBLESHOOTING

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
INDICATOR — AIRSPEED		
Pointer fails to respond	Pressure line not connected	Connect line.
	Obstruction in line	Disconnect lines and blow lines clear.
	Defective indicator	Replace indicator.
Pointer indicates incorrectly	Leak in line	Repair or replace line.
	Defective or leaking indicator	Replace indicator.
	Vent obstructed or baffle bent	Drain moisture or clean obstruction from static line. Straighten baffle.
Pointer vibrates	Instrument loose on panel	Tighten instrument mounting screws.
Pointer oscillates	Leak in line	Repair or replace line.
	Defective instrument	Replace instrument.
ALTIMETER		
Pointer indicates incorrectly	Leak in static line	Repair or replace line.
	Static vent plugged	Clean static vent.
	Defective instrument	Replace instrument.

Table 10-1. INSTRUMENT TROUBLESHOOTING (Continued)

COMPASS — MAGNETIC (Pilots Stand-by)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Excessive card error	Improper compensation	Compensate compass.
	External magnetic interference	Locate and eliminate magnetic interference if possible.
	Air in bowl	Replace compass.
Excessive card oscillation	Insufficient liquid in bowl	Replace compass.
Card element not level	Leaking float chamber	Replace compass
	Card magnet is detached	Replace compass.
Card sluggish	Dirty pivots or jewels restricting rotation	Replace compass.
	Weak magnetic card	Replace compass

INDICATOR — DUAL AND GAS PRODUCER TACHOMETERS

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Excessive scale error	Weak magneto in tachometer	Replace respective tachometer generator.
Pointer moves backward	Leads reversed at indicator	Change leads in respective indicator disconnects.
Indication only one-half speed	Leads connected to wrong terminals on indicator	Refer to wiring diagram.
No reading on indicator either constant or intermittent	Break or short circuit	Repair or replace leads.
	Poor connections at indicator or generator disconnects	Clean and tighten connections.
	Open in unit circuit	Replace unit.
High reading on indicator either constant or intermittent	Indicator resistance out of adjustment	Replace indicator.

Table 10-1. INSTRUMENT TROUBLESHOOTING (Continued)

INDICATOR — TURBINE OUTLET TEMPERATURE (HELICOPTERS PRIOR TO 914)

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

INDICATOR — TURBINE OUTLET TEMPERATURE (HELICOPTERS 914 AND SUBSEQUENT)

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

DC LOADMETER

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
No reading or erratic reading	Defective generator	Replace generator.
	Open or short circuit in loadmeter	Replace loadmeter.

Table 10-1. INSTRUMENT TROUBLESHOOTING (Continued)

DC LOADMETER	
Dirty or worn mechanism in loadmeter	Replace loadmeter.
Voltage regulator faulty	Replace voltage regulator.

Note

Refer to Section XI for additional troubleshooting of circuits.

10-4. REMOVAL — INSTRUMENTS — GENERAL.

Note

This removal procedure for all instruments is relatively the same, except it is necessary to disconnect wiring from one type of instrument and tubing from another; therefore, a single removal and installation procedure will suffice for all instruments.

a. Ensure BATtery switch is OFF. Disengage mounting screws around edge of panel and tilt panel aft. Protect instruments from frontal damage and wires and tubes behind panel from becoming twisted or strained.

b. Disconnect wires or tubes from back of instrument and tape or replace cover over ends. Cover opening into instrument. Remove mounting screws from panel and instrument and remove.

10-5. DISASSEMBLY — GENERAL. Disassembly of instruments is not recommended. Instruments must be repaired and tested by an authorized repair station.

10-6. CLEANING — GENERAL. Wipe dust and clean instrument cover glass with a soft, clean, lint-free cloth.

10-7. INSPECTION — GENERAL. Inspect instruments for loose or cracked cover glasses, and for legibility of range markings. Inspect instrument for security of mounting.

10-8. TESTING — GENERAL. Instruments must be tested by an authorized instrument repair station.

10-9. REPAIR OR REPLACEMENT — GENERAL. Replace instrument if cover glass is loose or broken. Replace range marking as required.

10-10. REASSEMBLY — GENERAL. Instruments must be reassembled and tested by an authorized repair station.

10-11. INSTALLATION — GENERAL. Ensure BATtery switch is OFF. Position instrument in panel and install mounting screws. Remove tape or cover and connect wires or tubes to instrument. Close panel and tighten mounting screws.

10-12. REPLACING INSTRUMENT RANGE MARKING.

a. When replacing instrument range markings, (flight manual for ranges) use a suitable lacquer, scotch tape, or prepared decals. Protect markings by applying a light coat of clear adhesive varnish or lacquer (item 94, table 1-1).

b. Apply range markings accurately on cover glass.

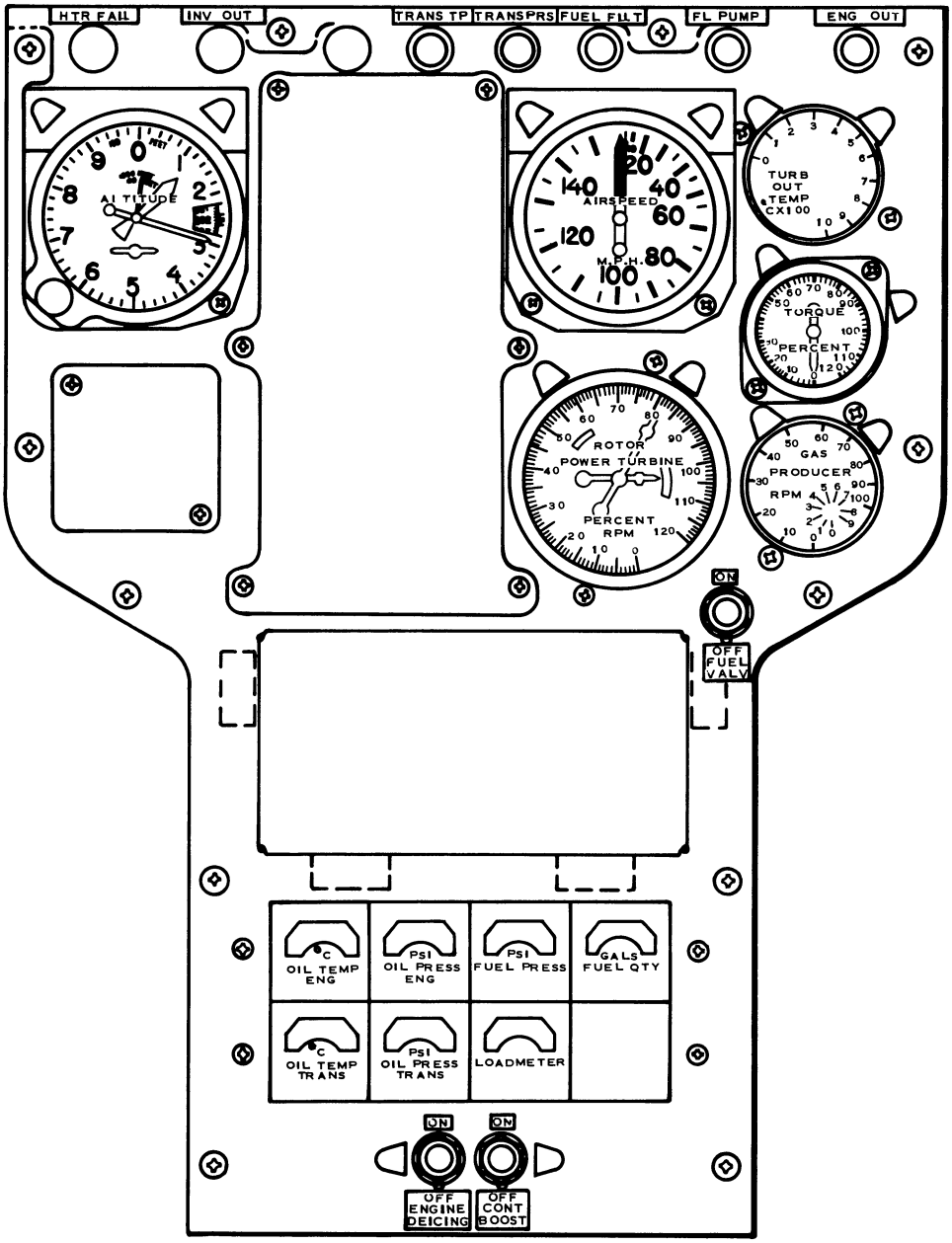

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Figure 10-1. Instrument Panel (Helicopters 4 through 153 (Sheet 1 of 4)

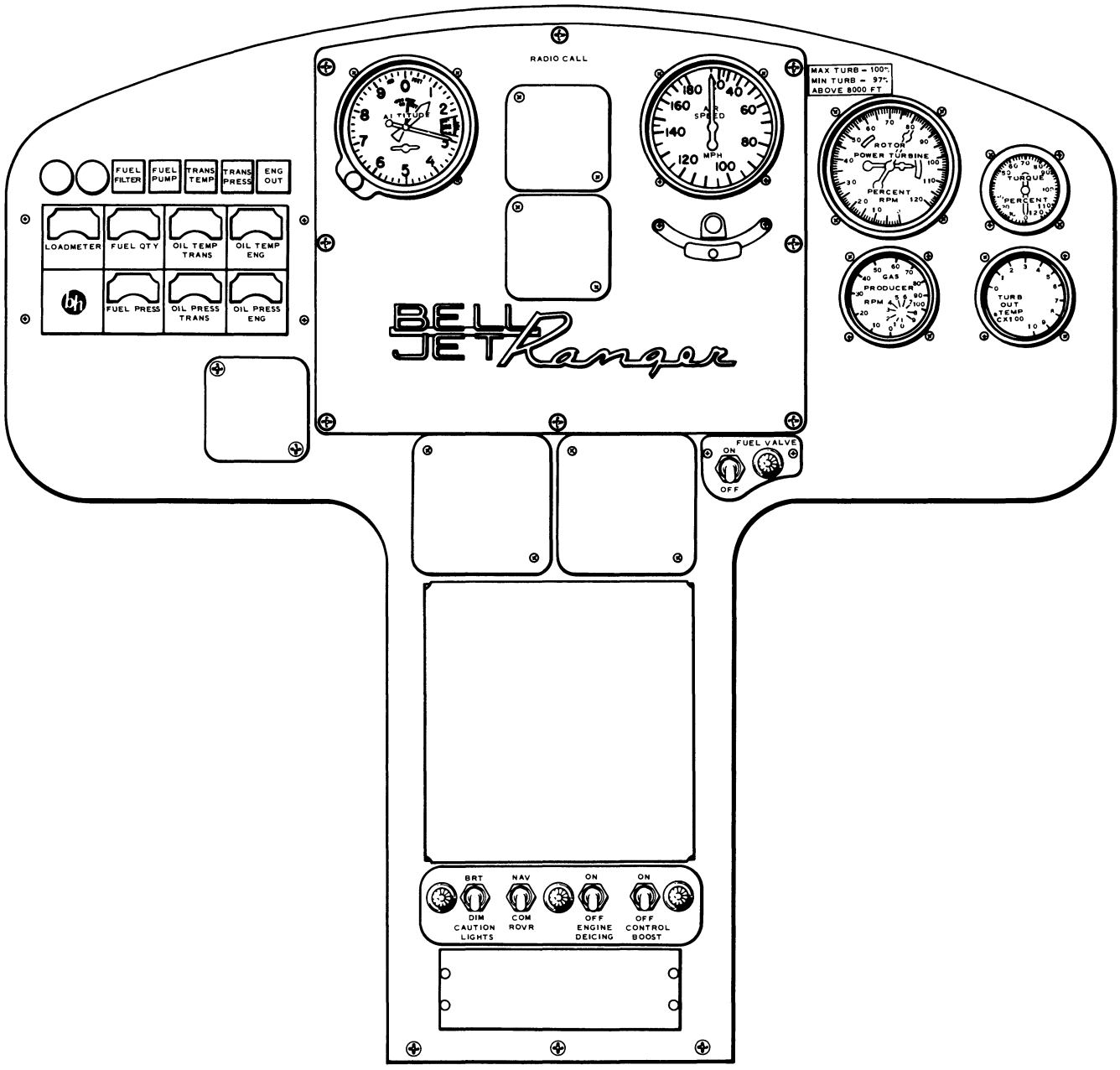

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Figure 10-1. Instrument Panel (Helicopters 154 through 913) (Sheet 2 of 4)

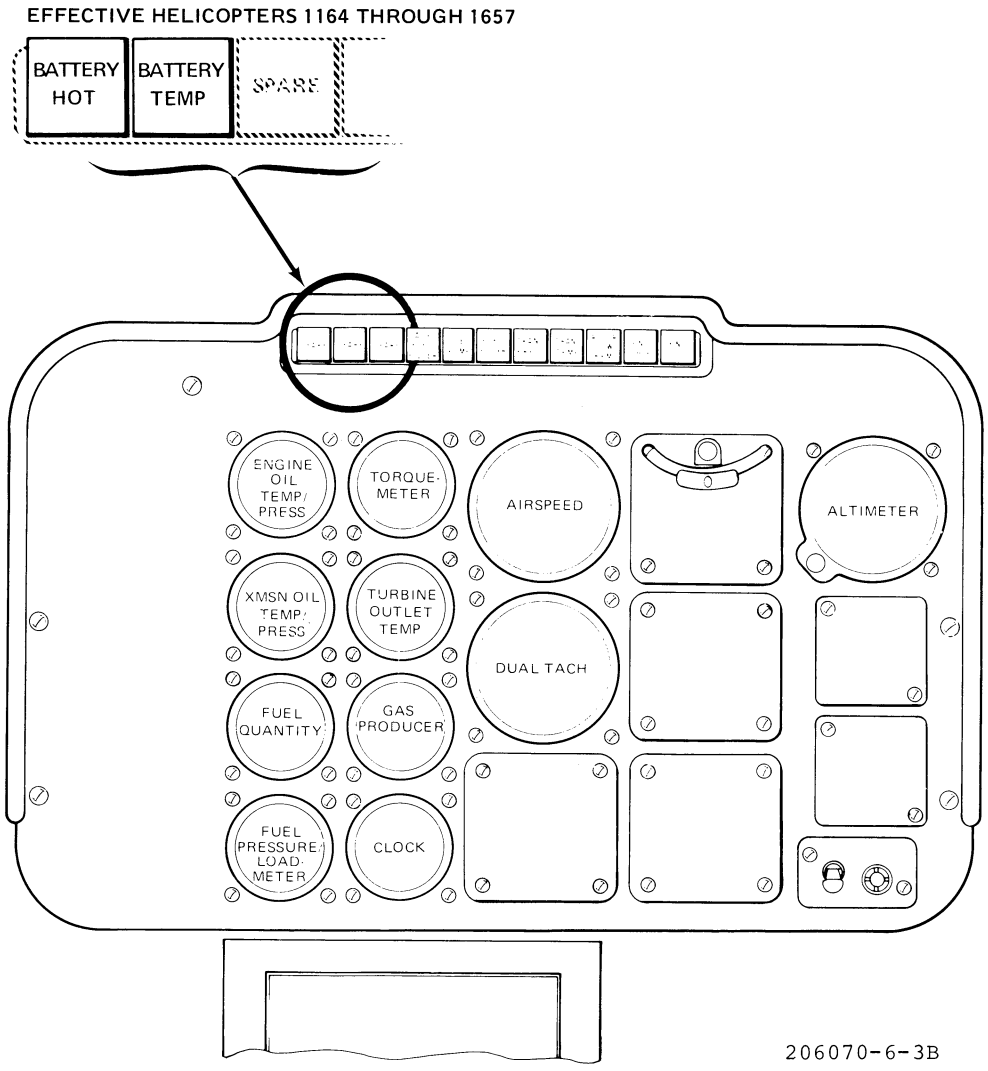


Figure 10-1. Instrument Panel (Helicopters 914 through 1657) (Sheet 3 of 4)

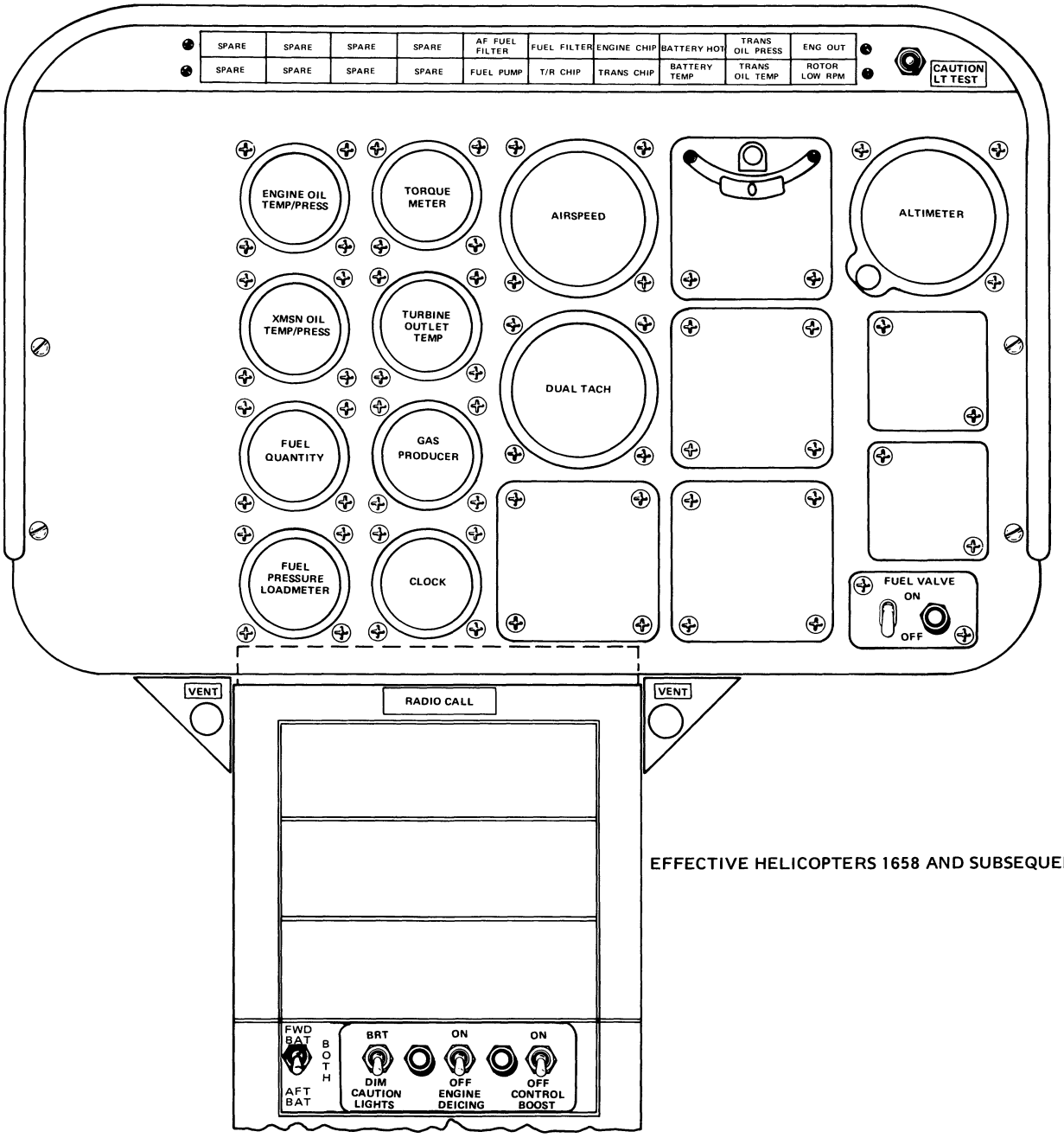


Figure 10-1. Instrument Panel (Helicopters 1658 and Subsequent) (Sheet 4 of 4)

10-13. FLIGHT INSTRUMENT.

10-14. INDICATOR — AIRSPEED.

10-15. DESCRIPTION. The airspeed indicator is a standard pitot-static instrument. This single scale indicator provides an airspeed reading in miles per hour by measuring the difference between the impact air pressure from the pitot tube and the static air pressure from the static vent (figures 10-1 and 10-2).

10-16. ALTIMETER.

10-17. DESCRIPTION. The altimeter furnishes a direct reading of helicopter height in feet above sea level. This instrument is vented to the static air system (figures 10-1 and 10-2).

10-18. ADJUSTMENT — ALTIMETER. Limited adjustment may be accomplished without removal from the helicopter. This adjustment is applicable to instruments manufactured by United Instruments, part numbers 5932 and 5934. Altimeter adjustment shall be accomplished as follows:

a. Rotate the altitude pointer set knob to obtain desired indication, tapping the instrument lightly to remove any possible friction error.

b. Loosen the knob lockscrew, and hold the screw or lockbar away from the knob without turning.

c. Rotate the knob to set the desired barometric indication at the index mark.

d. Push the knob inward, to original position, and secure the lockbar by tightening lockscrew until snug.

e. Apply light outward pressure to the knob and rotate to ensure that altitude pointer and barometric indicator are properly locked.

10-19. PITOT — STATIC SYSTEM.

10-20. DESCRIPTION. The electrically heated pitot tube is mounted on a support located in the most forward part of the cabin nose bubble just right of helicopter center line. This tube supplies impact air to the airspeed indicator. Static air pressure for instrument operation is obtained from two static vents which are located, one each, on the aft edge of the left and right lower plastic panels of the cabin nose bubble figure 10-2).

10-21. TROUBLESHOOTING PITOT — STATIC SYSTEM (refer to table 10-1).

10-22. REMOVAL — PITOT TUBE.

a. Check that all electrical power is OFF.

b. Remove screws and lock-washers attaching pitot head sleeve to pitot head and tube support.

c. Hold pitot head and slide sleeve forward until coupling in pitot pressure line is exposed. Disconnect pressure line and cap or cover opening in line and in pitot head to prevent entrance of foreign particles.

d. Disconnect electrical wiring, if existing, and cover wire ends with tape. Remove pitot head and sleeve from helicopter.

10-23. CLEANING — PITOT TUBE. Clean pitot tube head and sleeve with a clean, lint-free cloth dampened with approved cleaning solvent.

10-24. CLEANING — PITOT — STATIC SYSTEM.

Remove drain plugs and allow moisture to drain out.

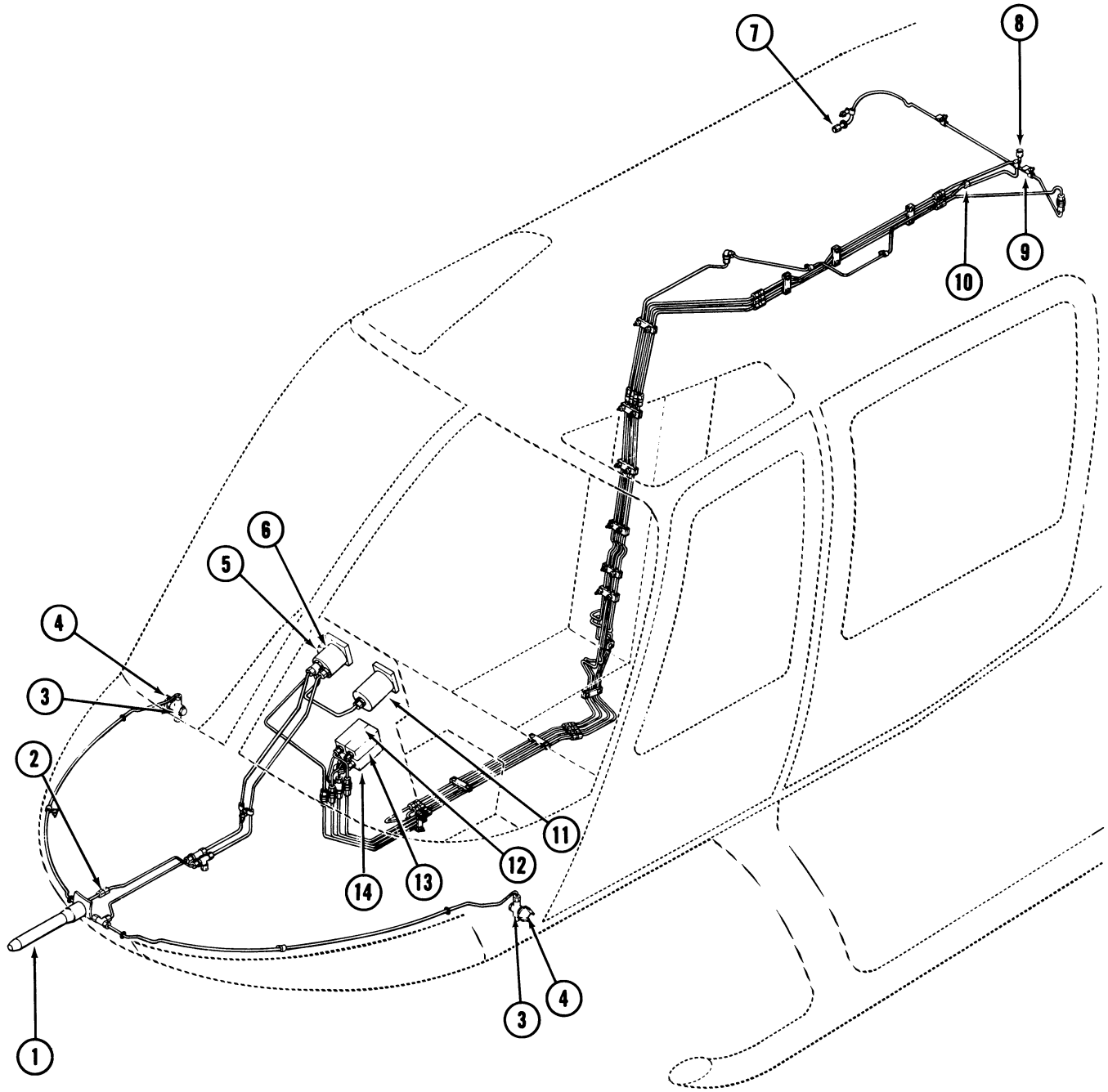
10-25. MINOR REPAIR — PITOT TUBE. Disconnect pitot tube pressure line from airspeed indicator and, using filtered compressed air, clear the line of obstructions or accumulated moisture. Check all line and electrical connections for tightness.

10-26. INSTALLATION — PITOT TUBE.

a. Position pitot head sleeve on pitot head. Remove tape from wire ends, and connect electrical wiring to pitot head.

b. Remove caps or covers from openings in pitot head and pressure line and connect pressure line to pitot head.

c. Align pitot head sleeve with holes in pitot head and tube support, and install attach lockwashers and screws.



1. Pitot Tube
2. Pitot Tube Disconnect
3. Static Vent Tee
4. Static Vent
5. Torque Pressure
6. Airspeed Indicator
7. Fuel Pressure Disconnect
8. Engine Oil Pressure Disconnect
9. Torque Pressure Disconnect
10. Transmission Oil Pressure Disconnect
11. Altimeter
12. Fuel Pressure Indicator
13. Engine Oil Pressure Indicator
14. Transmission Oil Pressure Indicator

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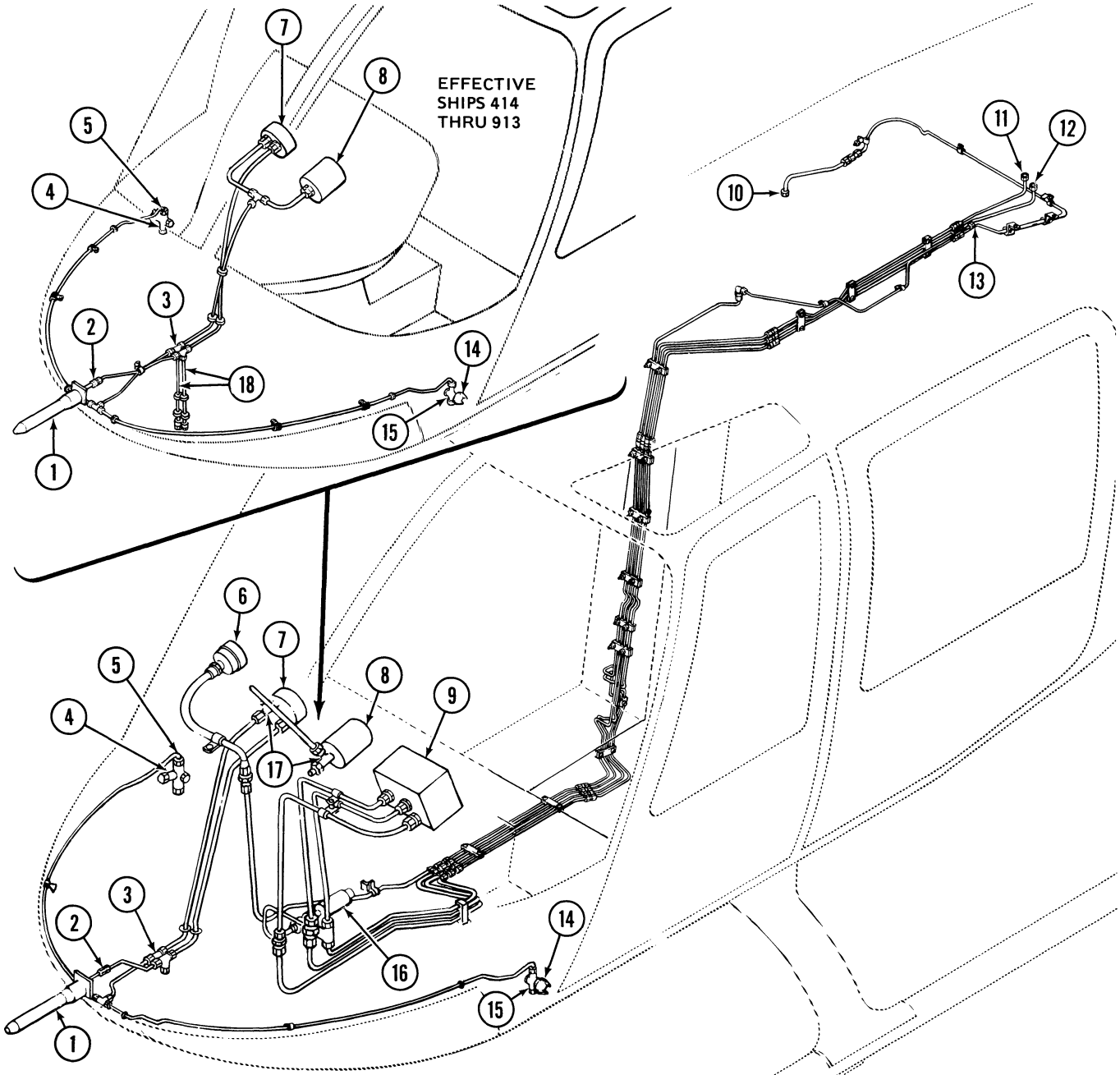
Figure 10-2. Instrument and Piping Installation (Helicopters 4 through 153) (Sheet 1 of 4)



1. Pitot tube
2. Pitot tube disconnect
3. Tee
4. Static vent tee
5. Static vent
6. Torquemeter
7. Airspeed indicator
8. Altimeter
9. Instrument cluster — engine oil, transmission oil, and fuel pressure
10. Fuel pressure disconnect
11. Engine oil pressure disconnect
12. Torque pressure disconnect
13. Transmission oil pressure disconnect
14. Static vent
15. Static vent tee
16. Switch — transmission oil
17. Restrictor
18. Drain tubes

NOTE

Ships 254 thru 913 contain transducers in the torquemeter, engine oil and transmission oil systems. Ships 154 thru 253 contain wet line systems.

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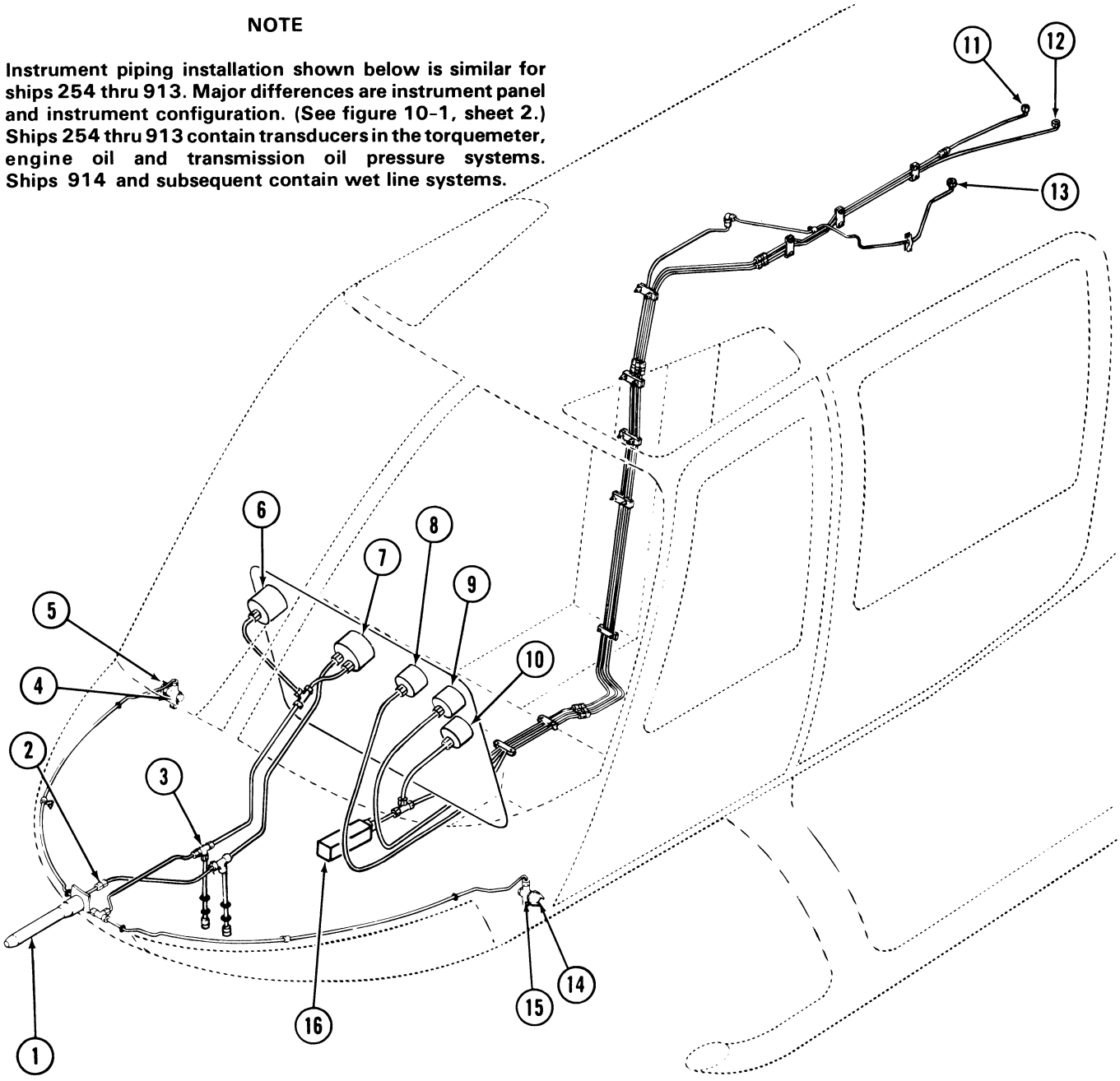
Figure 10-2. Instrument and Piping Installation (Helicopters 154 through 913) (Sheet 2 of 4)

NOTE

Instrument piping installation shown below is similar for ships 254 thru 913. Major differences are instrument panel and instrument configuration. (See figure 10-1, sheet 2.) Ships 254 thru 913 contain transducers in the torquemeter, engine oil and transmission oil pressure systems. Ships 914 and subsequent contain wet line systems.



1. Pitot tube
2. Pitot tube disconnect
3. Tee
4. Static vent tee
5. Static vent
6. Altimeter
7. Airspeed indicator
8. Torquemeter
9. Engine oil pressure indicator
10. Transmission oil pressure indicator
11. Engine oil pressure indicator
12. Torque pressure disconnect
13. Transmission oil pressure disconnect
14. Static vent
15. Static vent tee
16. Switch — Transmission oil

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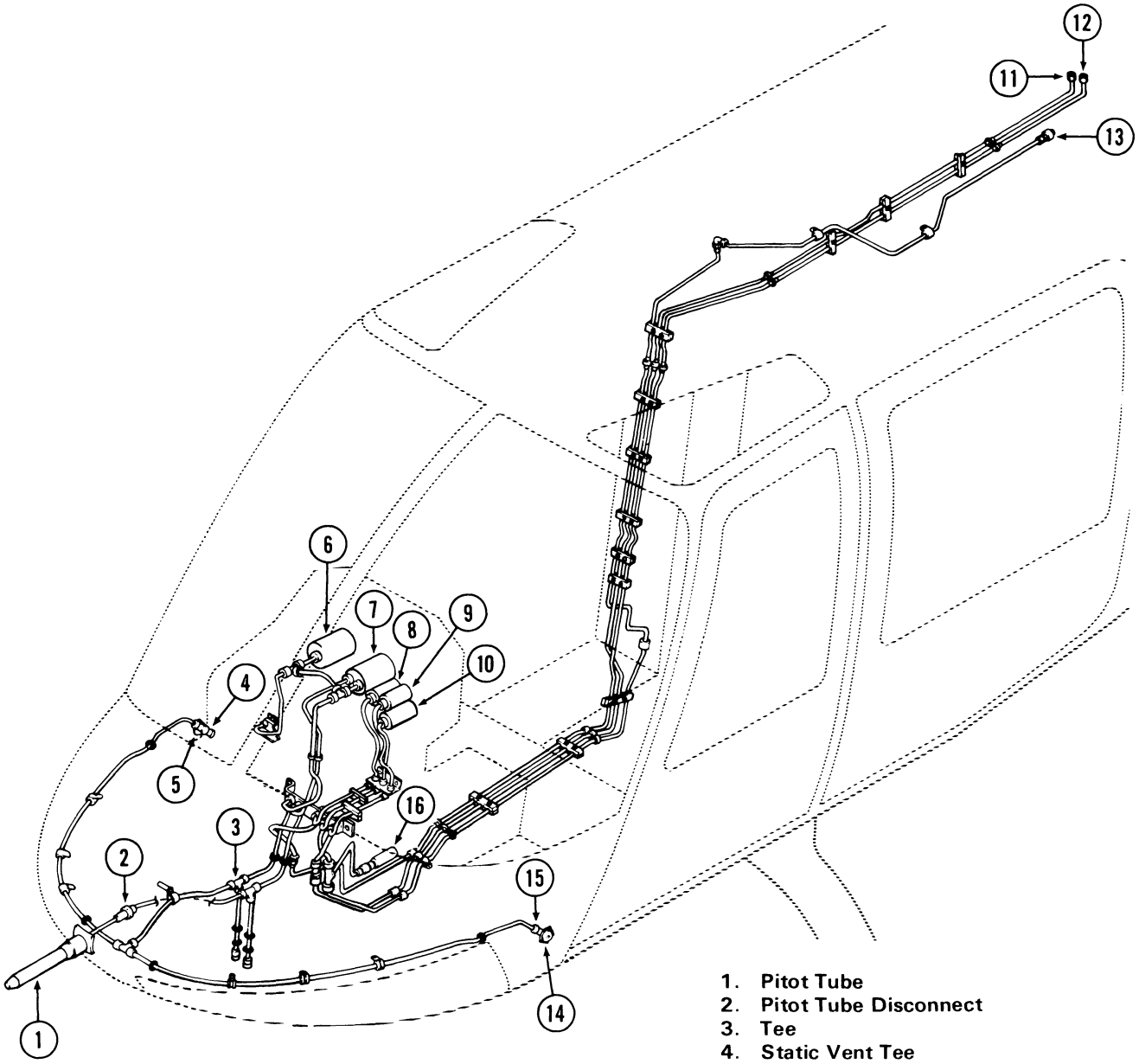
Figure 10-2. Instrument and Piping Installation (Helicopters 914 through 1657) (Sheet 3 of 4)



1. Pitot Tube
2. Pitot Tube Disconnect
3. Tee
4. Static Vent Tee
5. Static Vent
6. Altimeter
7. Airspeed Indicator
8. Torquemeter
9. Engine Oil Pressure Indicator
10. Transmission Oil Pressure Indicator
11. Engine Oil Pressure Disconnect
12. Torque Pressure Disconnect
13. Transmission Oil Pressure Disconnect
14. Static Vent
15. Static Vent Tee
16. Switch — Transmission Oil

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Figure 10-2. Instrument and Piping Installation (Helicopters 1658 and Subsequent) (Sheet 4 of 4)

10-27. REMOVAL — STATIC VENT(S). Disconnect static line from tee. Disconnect tee from static vent and remove vent.

10-28. CLEANING — STATIC VENT(S) (refer to paragraph 10-22).

10-29. MINOR REPAIR — STATIC VENT(S). Disconnect static lines from airspeed indicator and altimeter and, using filtered compressed air, blow the lines clear of obstruction or moisture. Make certain all static vent holes are clear. Check connections for tightness.

10-30. INSTALLATION — STATIC VENT(S). Position static vent and connect to tee. Connect tee and static line.

10-31. TEST PROCEDURE — PITOT SYSTEM.

CAUTION

Suction applied to pitot lines may damage instruments.

a. With the system completely installed, apply carefully regulated air pressure to the pitot intake. When airpseed indicator shows a reading between 50 and 100 MPH, close off pressure line to hold pressure constant. A good method is as follows: Use a piece of vinylite tubing (or similar flexible tubing) which will fit tightly over end of pitot tube. While observing the airspeed indicator, fold free end of tubing over and roll tubing slowly to create pressure. When desired reading has been reached, hold rolled end tightly for one minute to hold the pressure constant.

b. Tap the panel lightly, near the indicator, to overcome friction that might affect the pointer; watch for a drop in the reading which would indicate leakage. If reading drops more than 5 MPH in one minute, troubleshoot the system and repeat test.

10-32. COMPASS — MAGNETIC (Standby).

10-33. DESCRIPTION. The magnetic compass is a standard, non-stabilized, magnetic type instrument mounted on a support attached to the forward cabin, right side. The compass is used in conjunction with a compass correction card mounted below the compass.

10-34. REPAIR OR REPLACEMENT — MAGNETIC COMPASS (refer to paragraphs 10-9 through 10-11 and 10-35).

10-35. TEST PROCEDURE — MAGNETIC COMPASS COMPENSATION.

a. Position helicopter on compass rose. Observe the following precautions prior to start of compass compensation test procedures.

b. Ensure that all controls and equipment in helicopter is placed in normal flight position, and that the area is magnetically clean.

c. Secure helicopter right-hand skid to compass rose holding fixture. Use helicopter ground handling wheels or equivalent to support helicopter when rotating to different headings.

d. Start helicopter engine according to standard procedures.

e. Turn on power to all equipment, except landing lights. Allow approximately three minutes for equipment functions to stabilize.

f. Set E-W and N-S adjustments screws on standby compass to align the dot on the screw with the dot on the frame.

Note

The helicopter must be placed in simulated flight condition while swinging the compass.

g. Swing the helicopter to the magnetic North heading. Adjust the N-S adjustment screw until compass reads exactly North.

h. Swing the helicopter to the magnetic East heading. Adjust the E-W adjustment screw until compass reads exactly East.

i. Swing the helicopter to the magnetic South heading and note the resulting error. Adjust the N-S adjustment screw to remove one half of the error.

j. Swing the helicopter to the magnetic West heading and note the resulting error. Adjust the E-W adjustment screw to remove one half of the error.

j. Swing the helicopter in successive magnetic thirty degree headings and record all errors on the compass correction card.

Note

Maximum deviation on any heading shall not exceed 10 degrees.

10-36. ENGINE INSTRUMENTS.

10-37. INSTRUMENT INDICATOR — ENGINE POWER TURBINE (N2) ROTOR AND GAS PRODUCER (N1) TACHOMETERS.

10-38. DESCRIPTION. A dual rotor RPM and power turbine RPM tachometer reading in percent, furnishes engine and rotor information. This instrument is used in conjunction with two tach-generators. The tach-generators are self generating, and are not connected to the electrical system. During normal operation the helicopter power turbine and rotor RPM indicator needles are synchronized. The gas producer tachometer is a separate circuit with its tach-generator and indicates RPM of N1 (figures 10-1 and 10-2).

10-39. INDICATOR — TURBINE OUTLET TEMPERATURE (HELICOPTERS PRIOR TO 914).

10-40. DESCRIPTION. The turbine outlet temperature indicator receives temperature indications from bayonet type thermocouples mounted in the turbine outlet. The indicator is graduated in degrees centigrade and electrical power is not required as the system is self generating. After engine change calibrate circuit (figure 10-1 , sheets 1 and 2, and refer to **section XI**).

10-41. INDICATOR — TURBINE OUTLET TEMPERATURE (HELICOPTERS 914 AND SUB).

10-42. DESCRIPTION. The turbine outlet temperature indicator receives temperature indications from the bayonet type thermocouples mounted in the turbine outlet. The indicator is graduated in degrees centigrade and electrical power is supplied to the indicator sensors. The indicator's voltage operating range is from 10 to 30 Vdc and provides more accurate temperature indications during starting sequence when battery power may be low, or drop to 10 volts (figure 10-1 , sheets 3 and 4).

10-43. ENGINE OIL TEMPERATURE INDICATOR (HELICOPTERS PRIOR TO 914).

Note

INST CLUSTER Circuit breaker in overhead console, when pressed, supplies 27.5 Vdc (figure 11-3).

10-44. DESCRIPTION. The engine oil temperature indicator, located in instrument cluster, serves to indicate temperature of engine oil in degrees centigrade. The instrument is included in a bridge circuit with resistor element and temperature bulb located in engine oil tank. The indicator and bulb are matched electrically in bridge circuit and require no calibration (figures 10-1 sheets 1 and 2).

10-45. ENGINE OIL — TEMPERATURE INDICATOR (HELICOPTERS 914 AND SUB).

10-46. DESCRIPTION. The engine oil temperature indicator serves to indicate temperature of engine oil in degrees centigrade. The instrument has dual indicators providing both engine oil pressure and temperature. The temperature side of the instrument is included in a bridge circuit with resistor element of temperature bulb which is located in engine oil tank. The indicator and temperature bulb are matched electrically in the bridge circuit and do not require calibration (figures 10-1 sheets 3 and 4).

10-47. TRANSMISSION OIL TEMPERATURE INDICATOR (HELICOPTERS PRIOR TO 914).

10-48. DESCRIPTION. The transmission oil temperature indicator is mounted in same cluster with engine oil temperature indicator, and is also calibrated in degrees centigrade. The indicator is used in 28 Vdc bridge circuit with temperature bulb which is located in left side of transmission. The transmission oil temperature circuit also requires no calibration (figure 10-1 , sheets 1 and 2).

10-49. TRANSMISSION OIL — TEMPERATURE INDICATOR (HELICOPTERS 914 AND SUB).

10-50. DESCRIPTION. The transmission oil temperature indicator serves to indicate temperature of transmission oil in degrees centigrade. The instrument has dual indicators providing both transmission oil pressure and

temperature. The temperature side is used in the 28 Vdc bridge circuit with temperature bulb which is located in the oil filter head. The transmission oil temperature circuit does not require calibration (figures 10-1 , sheet 3 and 4).

10-51. ENGINE OIL PRESSURE INDICATOR (HELICOPTER PRIOR TO 914).

10-52. DESCRIPTION. The engine oil pressure indicator, precalibrated in pounds per square inch against a standard, is located in cluster with the engine and transmission oil temperature indicators, and is included in piping circuit from engine oil pressure disconnects. No installation calibration is required (figures 10-1 and 10-2 , sheets 1 and 2).

Note

Engine oil pressure indicator installed in all helicopters, except 254 through 913 have direct (wet line) reading instruments. Helicopters 254 through 913 are equipped with electrically operated engine oil pressure indicators with a transducer mounted in the piping circuit adjacent to the oil pressure switch.

10-53. ENGINE OIL PRESSURE INDICATOR (HELICOPTERS 914 AND SUB).

10-54. DESCRIPTION. The engine oil pressure indicator, precalibrated in pounds per square inch against a standard, is part of a dual instrument providing engine oil pressure and temperature indications. The piping installation provides direct (wet line) readings to the indicator. Calibration of the system is not required with installation. Bleeding pressure gauge lines will be required if air is allowed to enter the pressure lines (refer to paragraph 10-67; figures 10-1 and 10-2 , sheets 3 and 4).

10-55. TRANSMISSION OIL PRESSURE INDICATOR (HELICOPTERS PRIOR TO 914).

10-56. DESCRIPTION. The transmission oil pressure indicator, included in piping circuit to transmission oil pressure disconnect at lower firewall, is located in same cluster with engine oil pressure indicator. This unit indicates oil pressure in pounds per square inch, and is precalibrated (bench) against a standard. No calibration is required with installation (figures 10-1 and 10-2 , sheets 1 and 2).

Note

Transmission oil pressure indicators installed on all helicopters, except 254 through 913, have direct (wet line) reading instruments. Helicopters 254 through 913 are equipped with electrically operated transmission oil pressure indicators with a transducer mounted in the piping circuit at the left side of the transmission.

10-57. TRANSMISSION OIL PRESSURE INDICATOR (HELICOPTERS 914 AND SUB).

10-58. DESCRIPTION. The transmission oil pressure indicator, included in piping circuit to transmission oil pressure disconnect at lower firewall, is part of a dual instrument providing transmission oil pressure and temperature indications. This unit indicates oil pressure in pounds per square inch, and is precalibrated (bench) against a standard. No calibration is required with installation. Bleeding of pressure gauge lines will be required if air is allowed to enter the pressure lines. (refer to paragraph 10-67; figures 10-1 and 10-2, sheets 3 and 4).

10-59. FUEL PRESSURE INDICATOR (HELICOPTERS 154 THRU 913).

10-60. DESCRIPTION. The fuel pressure indicator, located in cluster with engine oil pressure indicator, is included in piping circuit to fuel cell pressure disconnect (top right side); the indicator is precalibrated in pounds per square inch against a standard and requires no calibration when installed figures 10-1 and 10-2 , sheets 1 and 2).

10-61. FUEL PRESSURE INDICATOR (HELICOPTERS 914 AND SUB).

10-62. DESCRIPTION. The fuel pressure indicator, located on the instrument panel, is a dual indicator with the loadmeter indicator.

Electrical circuitry is provided from the fuel pressure transducer to the indicator. The indicator is precalibrated in pounds per square inch against a standard, and requires no calibration when installed (figures 10-1 and 10-2, sheets 3 and 4).

10-63. ENGINE TORQUEMETER (HELICOPTERS PRIOR TO 914).

10-64. DESCRIPTION. The engine torquemeter, located in instrument panel, is precalibrated in percent against a standard. This instrument is included in piping circuit to lower firewall disconnect which continues to engine accessory drive gear box (forward side of engine). No calibration of the torquemeter is required when installed (refer to paragraph 10-68; figures 10-1 and 10-2, sheets 1 and 2).

Note

Engine torquemeter installed on all helicopters, except 254 through 913, are direct (wet line) reading instruments. Helicopters 254 through 913, torquemeter is electrically operated with a transducer mounted in the piping circuit.

a. Helicopters 254 through 913, that have not been converted to wet line torquemeter system, may contain indicators without the proper calibration information stamped on the identification plate. For "on helicopter" calibration checks, the following will apply.

(1) For torquemeter (206-070-399-1), used with the 250C18 engine installation:

114 PSIG	Equals	120%
95 PSIG	Equals	100%

(2) For torquemeter (206-070-399-03), used with the 250C20 engine installation:

91.8 PSIG	Equals	120%
76.5 PSIG	Equals	100%

b. For both torquemeters, the color range markings are as follows:

0 to 85%	Green Arc
85 to 100%	Yellow Arc
100%	Redline

Note

The 206-070-399-3 torquemeter used on the 206B helicopter is identified by "250 C20 ENG" on dial face.

10-64A. ENGINE TORQUEMETER TESTING.

a. Disconnect engine torque pressure line from transducer or attaching line to engine.

b. Apply 95 psi oil pressure from outside source (pressure hand gun) on the 206A helicopter or 76.5 psi on the 206B helicopter.

c. Torquemeter indicator should read 100 (±2.0) percent.

10-65. ENGINE TORQUEMETER (HELICOPTERS 914 AND SUB).

10-66. DESCRIPTION. The engine torquemeter, located on instrument panel, is precalibrated in pounds per square inch against a standard. This instrument is included in piping circuit to lower firewall disconnect which continues to engine accessory drive gear box (forward side of engine) and provides direct (wet line) readings. No calibration of the torquemeter is required when installed (refer to paragraph 10-67; ; figures 10-1 and 10-2, sheet 3)

10-67. BLEEDING PRESSURE GAUGE LINE.

a. Disconnect pressure gauge line at engine, transmission, or torquemeter inlet and place end of line in a receptacle so that end will be covered by accumulated fluid in receptacle. Station a man at the receptacle to observe when a bubble free flow has been established.

b. Remove mounting screws; carefully tilt panel aft as necessary. Protect instruments from frontal damage, and wiring and tubes behind panel from being twisted or strained. Disconnect pressure gauge line at the instrument and connect a low pressure filler gun, filled with light lubricating oil (item 20) to gauge line. Apply pressure slowly so line will be filled with light oil, displacing fluid in line. Continue to force light oil into line until a steady flow is established at the aft end.

c. When bleeding has been satisfactorily completed, remove filler gun and connect gauge line to instrument. Take precaution to hold fluid

loss to a minimum while connecting line. Carefully close instrument panel, taking care that wiring and tubes behind panel stow without twisting or interference. Secure panel. Connect aft end of gauge line at engine, transmission, or torquemeter inlet.

10-68. DELETED.

10-69. FUEL SYSTEM INSTRUMENTS.

10-70. FUEL QUANTITY INDICATOR (HELICOPTERS PRIOR TO 914).

10-71. DESCRIPTION. The fuel quantity indicator, located in instrument cluster on instrument panel, is calibrated in gallons. The instrument is a part of bridge circuit which includes tank units, two float elements, two calibration variable resistors, necessary terminal blocks, indicator and 28 Vdc which serves a common bus inside of instrument cluster unit (figures 10-1 and 10-2).

10-72. FUEL QUANTITY INDICATOR (HELICOPTERS 914 AND SUB).

10-73. DESCRIPTION. The fuel quantity indicator, located in instrument panel, is calibrated in gallons. The instrument is a part of bridge circuit which includes tank units, two float elements, two calibration variable resistors, necessary terminal blocks, indicator and 28 Vdc which serves a common bus inside of instrument cluster unit (figure 10-1 , sheet 3).

10-74. CALIBRATION — FUEL QUANTITY.

CAUTION

Observe standard precautionary steps when fueling or defueling helicopter.

Note

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

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

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

b. Set BATtery switch to OFF position.

c. Securely ground helicopter from static ground to earth.

d. Position helicopter one to two degrees nose down, for entire calibration procedure.

e. De-fuel fuel cell.

f. Helicopters prior to 914, press INST CLUSTER circuit breaker (figure 11-5). This breaker supplies 27.5 Vdc to fuel quantity system via common bus in cluster. Helicopters 914 and subsequent, reset FUEL QTY-PRESS circuit breaker in overhead console.

g. Remove pedestal side panels.

h. Connect source of external electrical power. Energize auxiliary power supply and adjust to 27.5 Vdc.

i. Observe that fuel quantity gauge pointer rests at zero; if the gauge pointer does not indicate zero, adjust R6 located in pedestal forward of instrument panel until gauge pointer does indicate zero.

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

k. Add measured quantities of fuel while observing same indications on gauge until gauge reads 40 gallons; check for leaks. Gauge should be accurate within 3 gallons.

l. Continue filling fuel cell, until spill-over is reached.

m. Adjust R5, located adjacent to R6, until gauge pointer indicates 75 gallons; observe for leaks.

n. De-fuel the fuel cell and measure; amount should be approximately 76 gallons.

o. Observe that fuel gauge reads zero as in step i.

p. Replace pedestal side panels.

q. Re-fuel as necessary.

10-75. FUEL TANKS UNITS — RESISTANCE MEASUREMENTS. The tank units are sealed and filled with inert gas and are unrepairable. The normal resistance readings may be taken from posts of the tank units as follows:

a. Fuel tank units installed on helicopters 4 through 103.

(1) Top Tank Unit (EA470-3518) Four Post.

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

(2) Lower Tank Unit (EA470B3519) Three Post.

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

b. Fuel tank units installed on helicopters 104 and subsequent.

(1) Top Tank Unit (EA470-3587) Four Post.

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

(2) Lower Tank unit (EA470B3588) Three Post.

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

c. The arm of the unit should be moved through the scale when checking and, at about the middle of travel, the readings should about equal out. There should also be no fluctuation of the needle as this is performed.

10-76. MISCELLANEOUS INSTRUMENT.

10-77. LOADMETER-DC (HELICOPTERS PRIOR TO 914).

10-78. DESCRIPTION. The dc loadmeter is included in instrument panel cluster. The loadmeter measures and indicates the output of the generator in percentage figure 10-2 , sheets 1 and 2).

10-79. LOADMETER-DC (HELICOPTERS 914 AND SUB).

10-80. DESCRIPTION. The dc loadmeter indicator measures and indicates the output of the generator in percentage. The indicator is a dual instrument providing loadmeter and fuel pressure indications (figures 10-1 and 10-2 sheets 3 and 4).

10-81. FREE AIR TEMPERATURE INDICATOR.

10-82. DESCRIPTION. Outside ambient air temperature may be determined by means of a free air temperature indicator mounted in the upper center of cabin bubble.

10-83. REMOVAL — TEMPERATURE INDICATOR. Remove nut from outside of bubble and remove temperature indicator from inside cabin.

10-84. CLEANING — TEMPERATURE INDICATOR. Clean the indicator with a soft, clean, lint-free cloth.

10-85. MINOR REPAIR — TEMPERATURE INDICATOR (Not Applicable).