

## CHAPTER 79 — ENGINE OIL SYSTEM

### CONTENTS — MAINTENANCE PROCEDURES

Paragraph Number	Title	Chapter/Section Number	Page Number
79-1	Engine oil system.....	79-00-00	3
79-2	Troubleshooting .....	79-00-00	3

### ENGINE OIL COOLING SYSTEM

79-3	Engine oil cooling system .....	79-00-00	7
79-4	Reduction (combining) gearbox oil temperature switch .....	79-00-00	7
79-7	Check valves .....	79-00-00	7
79-10	Drain valves .....	79-00-00	10
79-13	Combining gearbox and transmission oil cooler	79-00-00	10
79-17	Engine power section oil cooler .....	79-00-00	13
79-21	Engine and transmission oil cooler blower.....	79-00-00	16
79-22	Maintenance .....	79-00-00	16

### FIGURES

Figure Number	Title	Page Number
79-1	Engine oil system schematic.....	4
79-2	Engine oil cooling system.....	8
79-3	Reduction (combining) gearbox oil temperature switch .....	9
79-4	Engine oil cooling system check valve.....	11
79-5	Engine oil cooling system drain valve.....	12
79-6	Combining gearbox and transmission oil cooler .....	14
79-7	Engine power section oil cooler.....	17
79-8	Engine and transmission oil cooler blower.....	18

### TABLES

Table Number	Title	Page Number
79-1	Troubleshooting - engine oil system .....	3



## ENGINE OIL SYSTEM

### 79-1. ENGINE OIL SYSTEM.

This chapter contains maintenance data for both engine (power sections) oil systems and reduction (combining) gearbox oil system.

The oil systems of power sections and reduction (combining) gearbox are separate systems and are connected by external hoses to three radiator-type coolers located aft of engine (figure 79-1). The upper cooler is a dual unit, serving both the combining gearbox and transmission oil system. The coolers are installed in a structural support, and are connected by air ducts to two blowers mounted on (and shaft-driven by) the combining gearbox. Drain lines with manual

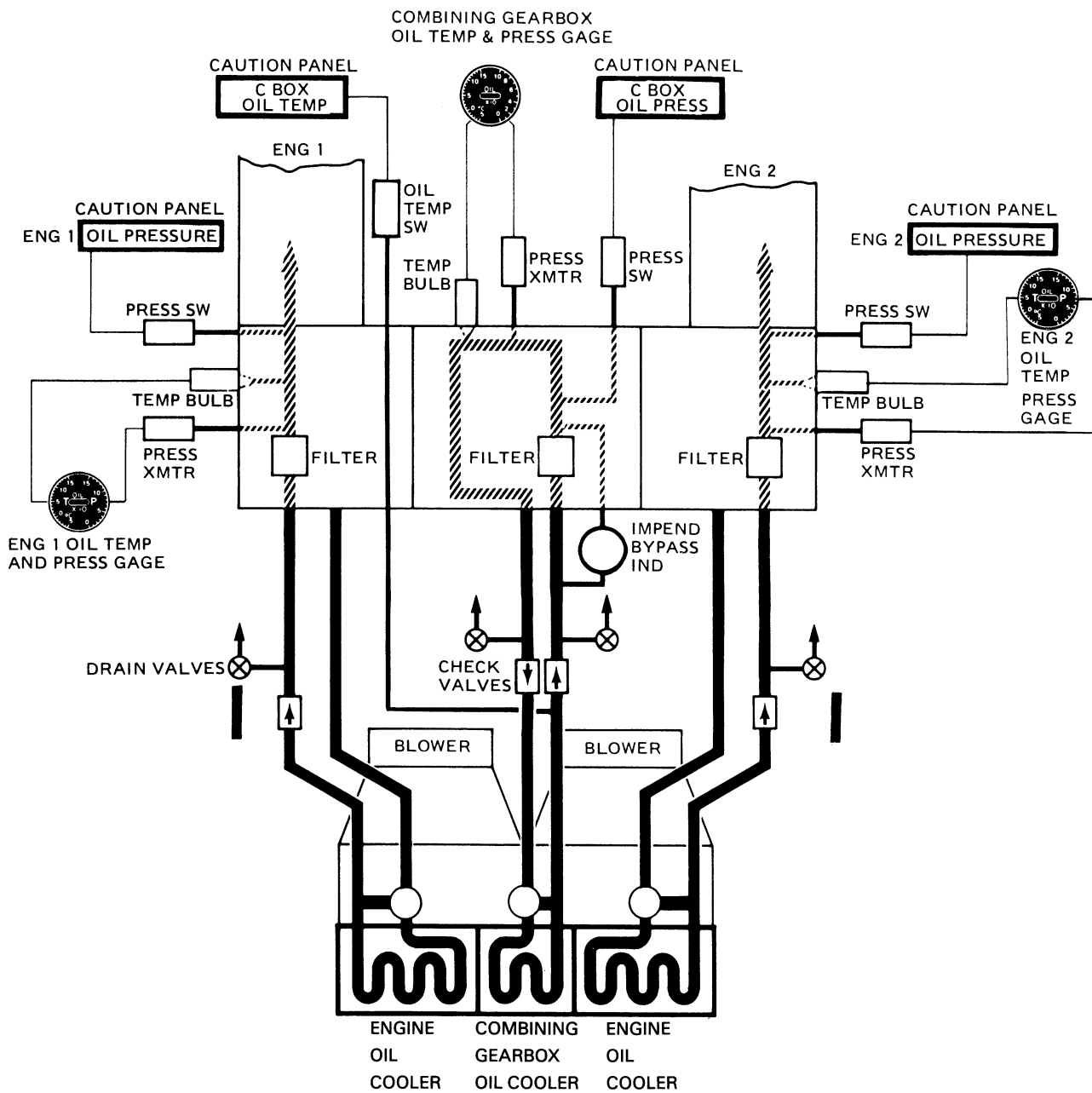
valves are provided for all engine-to-cooler lines (figure 79-2).

The oil supply for each power section is located in a tank in the accessory gearbox. The combining gearbox has an internal oil supply. A temperature bulb and pressure transmitter in each system are connected to oil temperature and pressure gages on the instrument panel. Pressure switches, temperature switches, and chip detectors in each system are connected to segments on the caution panel.

### 79-2. TROUBLESHOOTING.

**Table 79-1. Troubleshooting - engine oil system**

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
ENG CHIP ENG 1 or ENG 2 segment(s) illuminates	Normal wear	<p>Remove all chip detectors and oil filters. Verify metallic pickup consists of nothing larger than fuzz or fine slivers.</p> <p>Change oil (Chapter 12). Clean chip detectors and oil filters. Run affected power section for 10 minutes at conveniently high power level.</p> <p>Pull chip detectors and oil filters again. If no significant pickup is found, engine is acceptable. If significant metallic pickup is found on combining gearbox, third oil system chip detector, or filter, replace gearbox. If significant pickup is found on accessory gearbox chip detector, replace power section and combining gearbox (Chapter 71).</p>



212-M-79-1

Figure 79-1. Engine oil system schematic

Table 79-1. Troubleshooting - engine oil system (Cont)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
	Excessive wear.	<p>1. Remove all chip detectors and filters. If metallic pickup consists of flakes or other particles not in the category of fuzz or fine slivers, excessive wear is indicated.</p> <p>2. If excessive pickup occurs on either of combining gearbox input section chip detectors or the input power section oil filters, replace gearbox. Flush power section oil system.</p> <p>If excessive pickup is found on combining gearbox third oil system chip detectors, replace gearbox. If excessive pickup is found on accessory gearbox chip detector, replace power section and combining gearbox.</p> <p>3. Rotate power turbine of affected power section by hand and check for roughness or other abnormalities. Refer to Pratt and Whitney of Canada, Ltd. PT6T-3 Series engine maintenance manual for further procedures.</p> <p>4. If excessive pickup is found on combining gearbox third oil system chip detectors, replace combining gearbox. If excessive pickup is found on accessory gearbox chip detector, replace power section and reduction gearbox</p>
	Chips in oil cooler.	Check external lines of cooling system for evidence of metal chips.

Table 79-1. Troubleshooting — Engine Oil System (Cont)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
		<p>a. If metallic pickup is found in external lines of engine oil system or if particles are suspected of being present in oil cooler, replace cooler with new oil cooler (<a href="#">paragraph 79-17</a>).</p> <p>b. If replacing engine because of metallic chip damage, replace oil cooler with new cooler (<a href="#">paragraph 79-17</a>).</p>
OIL PRESSURE ENG 1 or ENG 2 low	Fault in pressure gauge or caution panel circuits.	Replace faulty electrical components or repair circuit. A direct reading gauge can be connected at points shown in <a href="#">Figure 79-1</a> to check accuracy of indicating system.
	No oil supply.	Check oil level.
	Faulty oil pump or pressure relief valve.	Refer to Pratt & Whitney PT6T-3 Maintenance Manual.
Reduction gearbox impending bypass indicator extended	Impending filter bypass.	<p>1. Reset the indicator button and verify that it does not extend a second time by running the helicopter.</p> <p>2. If indicator extends a second time, remove the filter and inspect for blockage.</p> <p>a. If filter is found serviceable, replace the impending bypass indicator (<a href="#">Chapter 71</a>).</p> <p>b. If filter is found obstructed or contaminated, refer to Pratt &amp; Whitney PT6T-3 Maintenance Manual for corrective action.</p>

## ENGINE OIL COOLING SYSTEM

### 79-3. ENGINE OIL COOLING SYSTEM.

The engine oil cooling system (figure 79-2) consists of engine power section and reduction (combining) gearbox oil coolers and lines, valves, and switch between engine and coolers.

### 79-4. REDUCTION (COMBINING) GEARBOX OIL TEMPERATURE SWITCH.

#### 79-5. Removal.

1. Open left engine oil cooler support cowling.
2. Drain oil from combining gearbox oil cooler until oil level is below switch (4, figure 79-3).
3. Disconnect connector (5).
4. Remove switch (4) with packing (3). Discard packing.
5. Remove bushing (2) with packing (1).

#### 79-6. Installation.

1. Install bushing (2, figure 79-3) with new packing (1).
2. Install switch (4) with packing (3). Torque switch 25 in.lbs. (2.82 Nm) maximum.
3. Connect connector (5).
4. Check gearbox oil level, service if required (Chapter 12).
5. Ground run helicopter (BHT-212-FM). Ensure C BOX TEMP caution panel segment is extinguished.
6. Check for oil leaks.
7. Check combining gearbox oil level and service as required (Chapter 12).

8. Close and secure cowling.

### 79-7. CHECK VALVES.

Four check valves are installed in engine oil cooling system. One check valve is used in each power section oil inlet line and one check valve is used in inlet and outlet oil lines of combining gearbox.

#### NOTE

Removal and installation of all check valves is similar. The following procedures are typical for any valve. Clamping arrangement however, may be different.

#### 79-8. Removal.

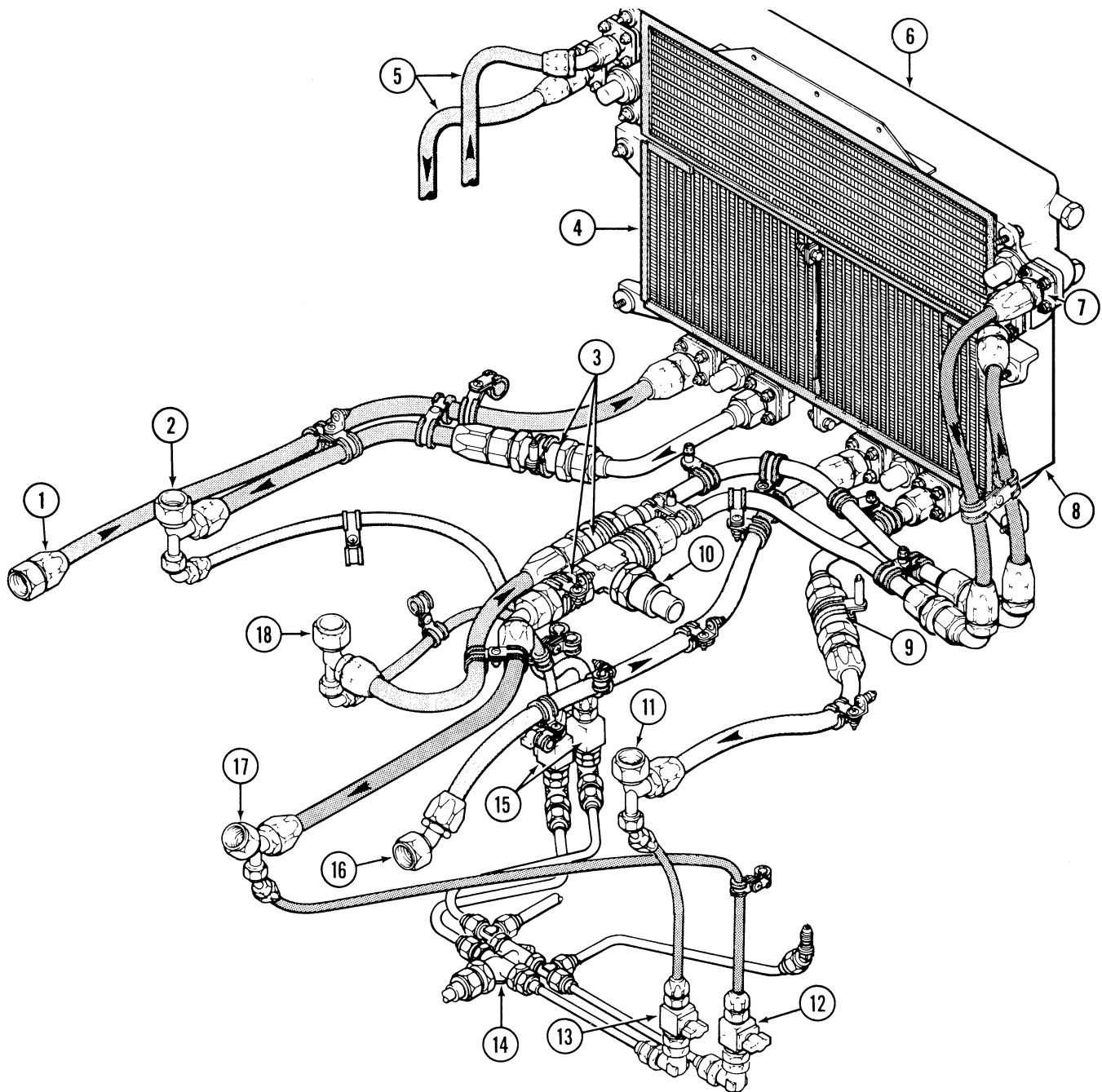
1. Open engine side cowling.
2. Drain oil from appropriate power section or from combining gearbox.
3. Disconnect tube (5, figure 79-4) and hose (10).
4. Remove screw (9), washer (8), spacer (6), clamp (7), and check valve.

#### 79-9. Installation.



ENSURE CHECK VALVE IS  
INSTALLED WITH ETCHED  
ARROW IN DIRECTION OF FLOW.

1. Position clamp (7, figure 79-4) on check valve. Secure clamp with screw (9), washer (8), and spacer (6).
2. Connect tube (5) and hose (10).

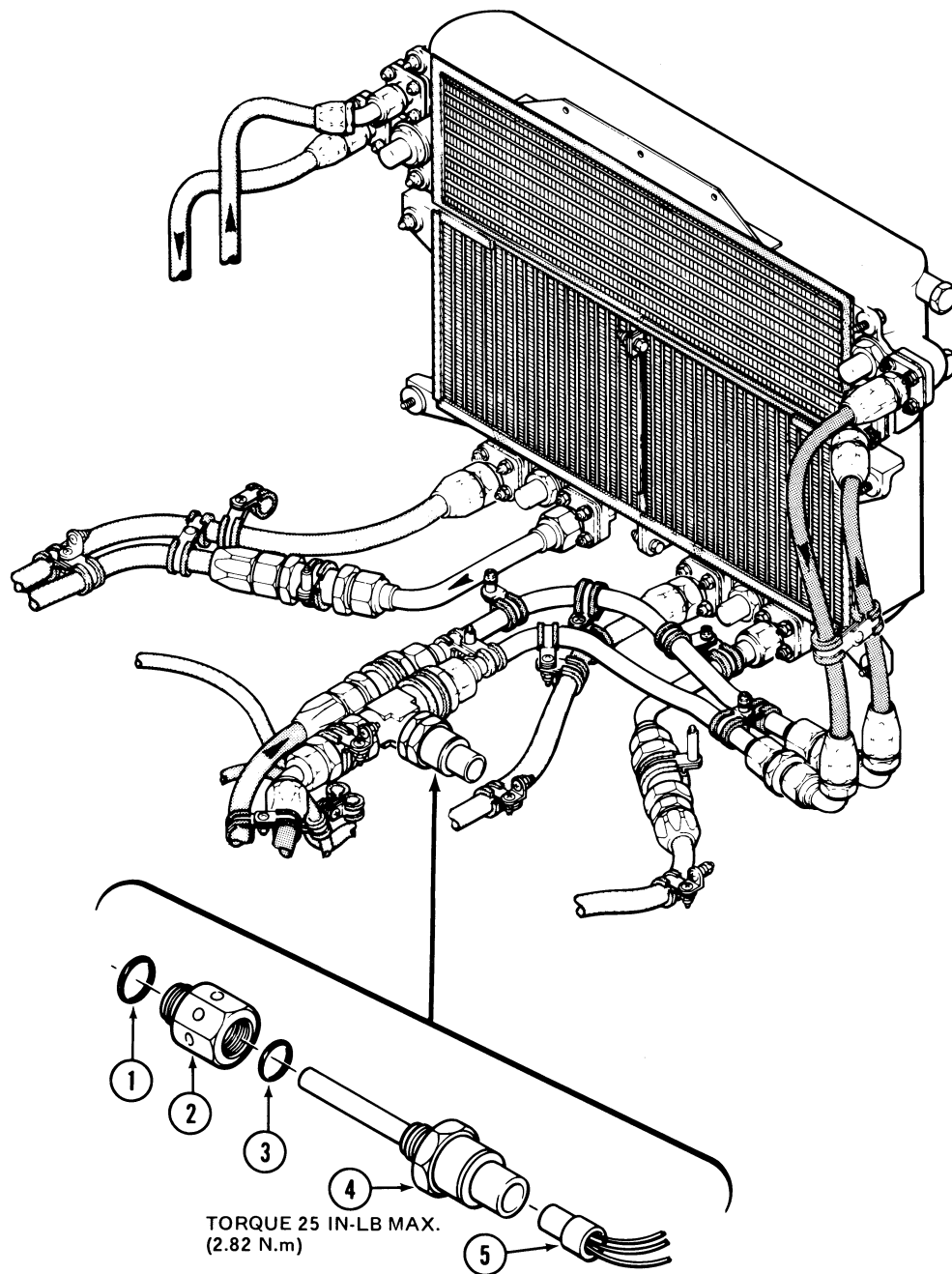


- |  |  |
|--|--|
| 1. Right engine oil cooler inlet           | 10. Combining gearbox oil temperature switch |
| 2. Right engine oil cooler outlet          | 11. Left engine oil cooler outlet            |
| 3. Check valves                            | 12. Drain valve                              |
| 4. Right engine oil cooler                 | 13. Drain valve                              |
| 5. Transmission oil cooler connections     | 14. Drain manifold                           |
| 6. Transmission oil cooler                 | 15. Drain valves                             |
| 7. Combining gearbox oil cooler connection | 16. Left engine oil cooler inlet             |
| 8. Left engine oil cooler                  | 17. Combining gearbox oil cooler outlet      |
| 9. Check valve                             | 18. Combining gearbox oil cooler inlet       |

212-M-79-2

Figure 79-2. Engine oil cooling system





1. Packing
2. Bushing
3. Packing
4. Temperature switch
5. Electrical connector

212-M-79-3

**Figure 79-3. Reduction (combining) gearbox oil temperature switch**

3. Check oil level in appropriate power section or combining gearbox. Service as required (Chapter 12).
4. Ground run helicopter (BHT-212-FM) and check for oil leaks.
5. Check oil level in appropriate power section or combining gearbox. Service as required (Chapter 12).
6. Close and secure cowling.

#### **79-10. DRAIN VALVES.**

Four drain valves are installed in engine oil system. Two drain valves are installed in combining gearbox oil system and one drain valve is installed in each power section oil system. The drain valves are mounted on engine aft center service deck.

#### **NOTE**

Maintenance procedures for all drain valves are the same except for location.

#### **79-11. Removal.**

1. Open engine side cowling where drain valve is located.
2. Remove access panel below side cowling.
3. Drain oil from appropriate power section or from combining gearbox.
4. Disconnect hose (5, figure 79-5) and tube (12).
5. Loosen nut (8) and remove elbow (10) and union (11) as an assembly. Discard packing.
6. Remove nuts (8 and 7) and drain valve (4).

#### **79-12. Installation.**

1. Position valve (3, figure 79-5) and washer (6) on service deck and install nut (7).

2. Install nut (8), new packing (9), elbow (10), and union (11). Align elbow (10) with tube (12). Tighten nut (8) against elbow (10).
3. Connect hose (5) and tube (12).
4. Check oil level in appropriate power section or combining gearbox. Service if needed (Chapter 12).
5. Ground run helicopter (BHT-212-FM) and check for oil leaks.
6. Check oil level in appropriate power section or combining gearbox, service if needed (Chapter 12).
7. Install access panel. Close and secure cowling.

#### **79-13. COMBINING GEARBOX AND TRANSMISSION OIL COOLER.**

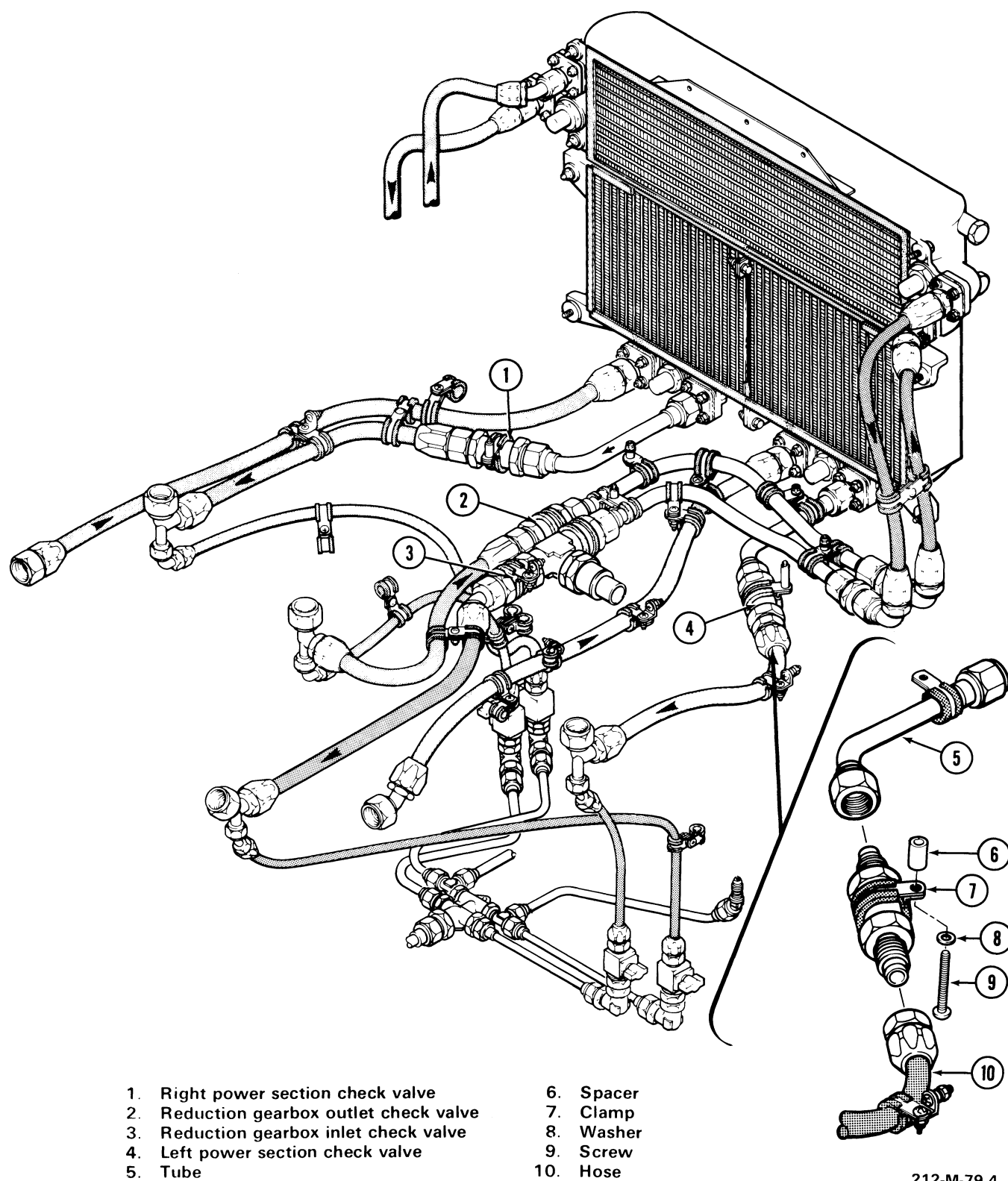
#### **79-14. Removal.**

1. Remove oil cooler support fairing.

#### **NOTE**

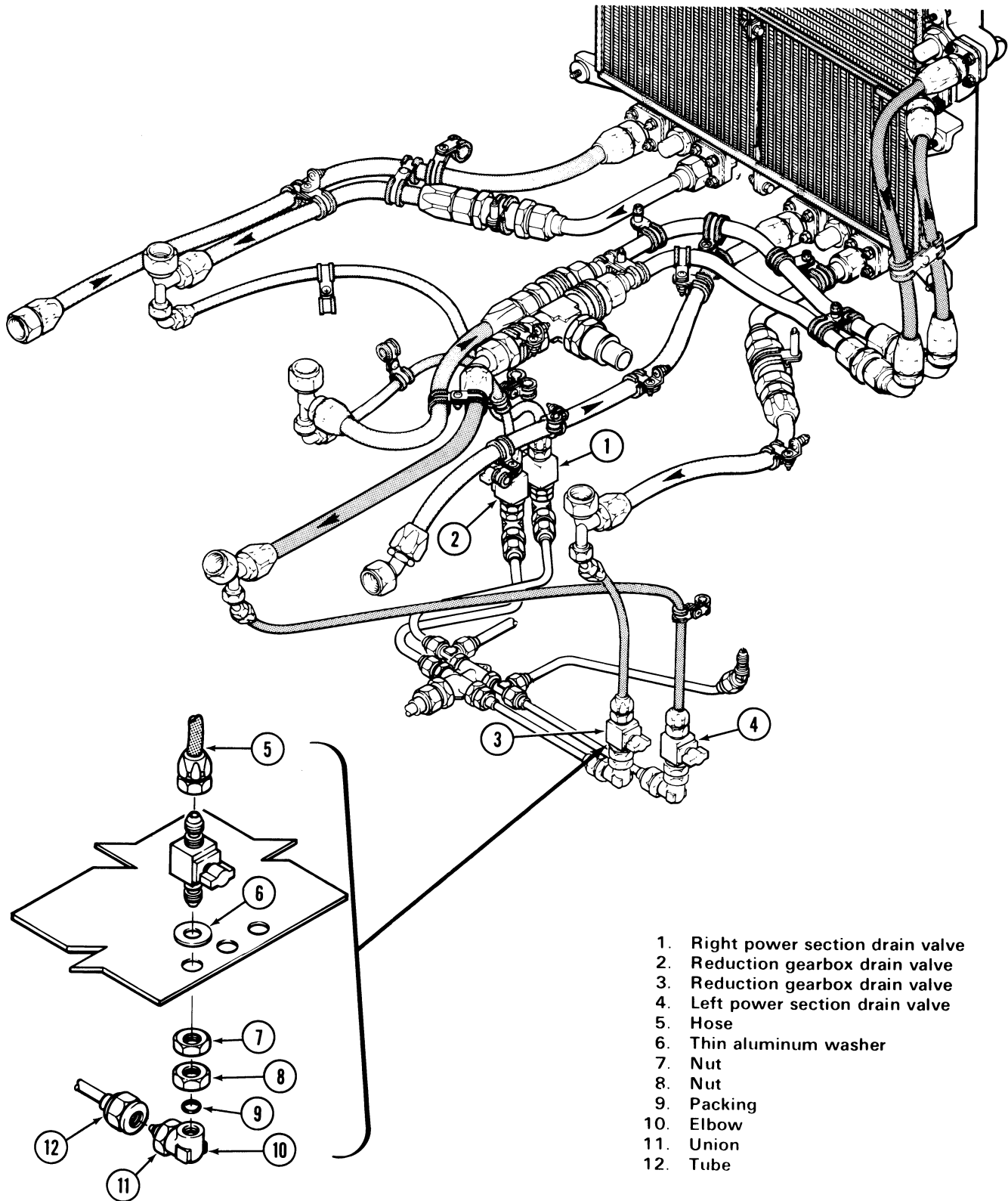
If oil hoses attached to cooler have enough slack, cooler can be removed by removing bolts (8, figure 79-6) and washer (7) then moving cooler aft prior to disconnecting hoses. If this is possible, skip steps 3. through 5.

2. Remove combining gearbox cowling.
3. Remove ejectors (Chapter 71).
4. Remove oil cooler duct.
5. Remove access panel located below aft end of ejector.
6. Drain cooler.
7. Use suitable container to catch spilled oil. Disconnect hoses (1, 22, 19, and 11).
8. Remove bolts (8) and remove cooler (6).



212-M-79-4

Figure 79-4. Engine oil cooling system check valve



212-M-79-5

Figure 79-5. Engine oil cooling system drain valve

9. Remove nuts (2), washers (3), connector (4), and gasket (5). Discard gasket.

10. Remove nuts (23), washers (24), flange (25), elbow (26), and gasket (27). Discard gasket.

11. Remove nuts (18), washers (17), flange (16), elbow (15), and gasket (14). Discard gasket.

12. Remove nuts (12), washers (13), connector (10), and gasket (9). Discard gasket.

### 79-15. Inspection.

1. Inspect fitting, lines, and mountings for damage and general conditions.

2. Inspect air passages of oil cooler core for restrictions, bent core or cooling fins, and leaks.

### 79-16. Installation.

1. Install gasket (5, figure 79-6), connector (4), washers (3), and nuts (2).

2. Install gasket (27), elbow (26), flange (25), washers (24), and nuts (23).

3. Install gasket (14), elbow (15), flange (16), washers (17), and nuts (18).

4. Install gasket (9), connector (10), washers (13), and nuts (12).

#### NOTE

If oil cooler was removed without removing ejectors and oil cooler duct, connect hoses to cooler prior to positioning cooler to support.

5. Position cooler (6) in opening of support (20).

6. Install bolts (8) with washers (7).

7. Connect hoses (1, 22, 19, and 11).

8. Install access panel located below aft end of ejector.

9. Install oil cooler duct.

10. Install ejectors (Chapter 71).

11. Check combining gearbox and transmission oil level, service if required (Chapter 12).

12. Install cowling.

13. Install oil cooler support fairing.

14. Ground run helicopter (BHT-212-FM) and check for oil leaks.

15. Check combining gearbox and transmission oil level. Service if required (Chapter 12).

### 79-17. ENGINE POWER SECTION OIL COOLER.

### 79-18. Removal.

1. Remove combining gearbox and transmission oil cooler (paragraph 79-14).

#### NOTE

Either oil cooler can be removed individually or both coolers can be removed as a unit.

2. Drain oil from appropriate cooler.

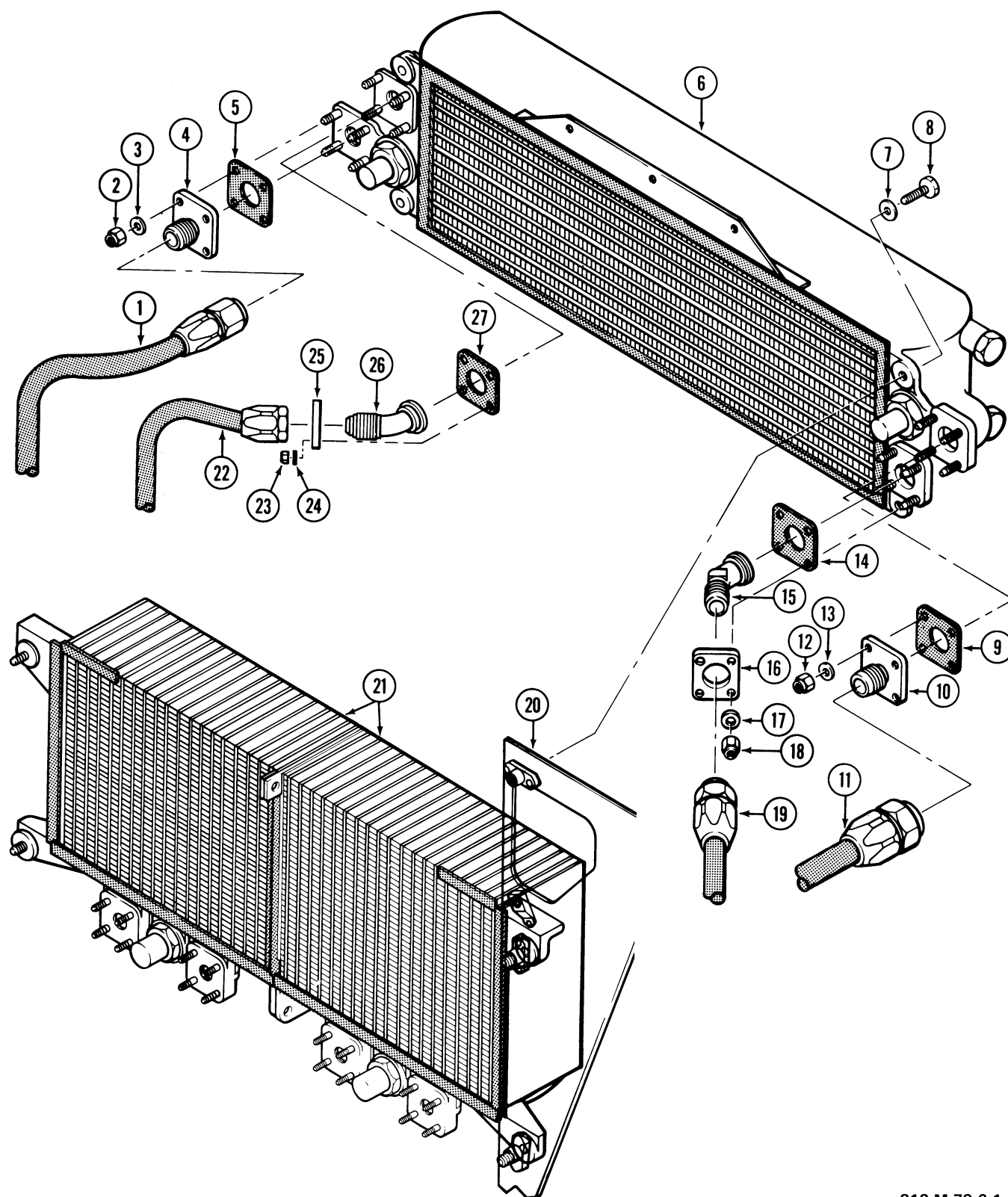
3. If removing oil cooler (3, figure 79-7), disconnect hose (23), tube (22), and remove bolts (2).

4. If removing oil cooler (8), disconnect tube (16), hose (17), and remove bolts (9).

#### NOTE

If removing oil coolers as a unit, bolts (7 and 18) can remain in place until coolers are removed.

5. Remove bolt (7).



212-M-79-6-1

Figure 79-6. Combining gearbox and transmission oil cooler (sheet 1 of 2)

- |  |                               |
|--|-------------------------------|
| 1. Transmission oil hose                     | 15. Elbow                     |
| 2. Nut                                       | 16. Flange                    |
| 3. Thin aluminum washer                      | 17. Thin aluminum washer      |
| 4. Connector                                 | 18. Nut                       |
| 5. Gasket                                    | 19. Hose                      |
| 6. Reduction gearbox and transmission cooler | 20. Oil cooler support        |
| 7. Thin aluminum washer                      | 21. Power section oil coolers |
| 8. Bolt                                      | 22. Hose                      |
| 9. Gasket                                    | 23. Nut                       |
| 10. Connector                                | 24. Thin aluminum washer      |
| 11. Hose                                     | 25. Flange                    |
| 12. Nut                                      | 26. Elbow                     |
| 13. Thin aluminum washer                     | 27. Gasket                    |
| 14. Gasket                                   |                               |

212-M-79-6-2

**Figure 79-6. Combining gearbox and transmission oil cooler (sheet 2)**

6. Remove two bolts (18).

7. Remove cooler from oil cooler support.

**NOTE**

Removal procedures are the same for connectors on both coolers.

8. Remove nuts (15), washers (14), connector (13), and gasket (12). Discard gasket.

**79-19. Inspection.**

1. Inspect fittings, lines, and mountings for damage and general condition.

2. Inspect air passages of oil cooler core for restriction, bent core or cooling fins, and leaks.

**79-20. Installation.****NOTE**

Installation procedures are the same for connectors on both coolers.

1. Install gasket (12, figure 79-7), connector (13), washers (14), and nuts (15).

**NOTE**

If oil coolers are being installed as a unit, install bolts (7 and 18) with washers and nuts prior to installing coolers.

2. Position cooler (3 or 8) in oil cooler support.

3. If installing cooler (3), install bolt (2) with washer (1). Connect tube (22) and hose (23).

4. If installing cooler (8), install bolt (9) with washer (10). Connect hose (17) and tube (16).

5. Install bolt (7), washers (6 and 5), and nut (4).
6. Install bolts (18), washers (19 and 20), and nuts (21).
7. Install combining gearbox and transmission oil cooler (paragraph 79-16).
8. Check combining gearbox, transmission, and engine power sections oil levels. Service if required (Chapter 12).
9. Ground run helicopter (BHT-212-FM) and check for oil leaks.
10. Check combining gearbox, transmission, and engine power sections oil levels. Service if required (Chapter 12).

#### **79-21. ENGINE AND TRANSMISSION OIL COOLER BLOWER.**

Two shaft driven blowers are mounted on upper aft pads of the combining gearbox. The blowers provide air through connecting ducts to ensure adequate air flow through the four oil coolers (figure 79-8).

#### **79-22. MAINTENANCE.**

##### **79-23. Removal.**

1. Open engine top and upper cowl.
2. Open oil cooler air scoop.
3. Remove combining gearbox top cowl.
4. Remove ejector (Chapter 71).

5. Loosen or remove screw (4, figure 79-8) and remove boot (2) from blower (1).
6. Remove nuts (7) and washers (8). Remove blower (1).
7. Remove opposite blower in same manner.

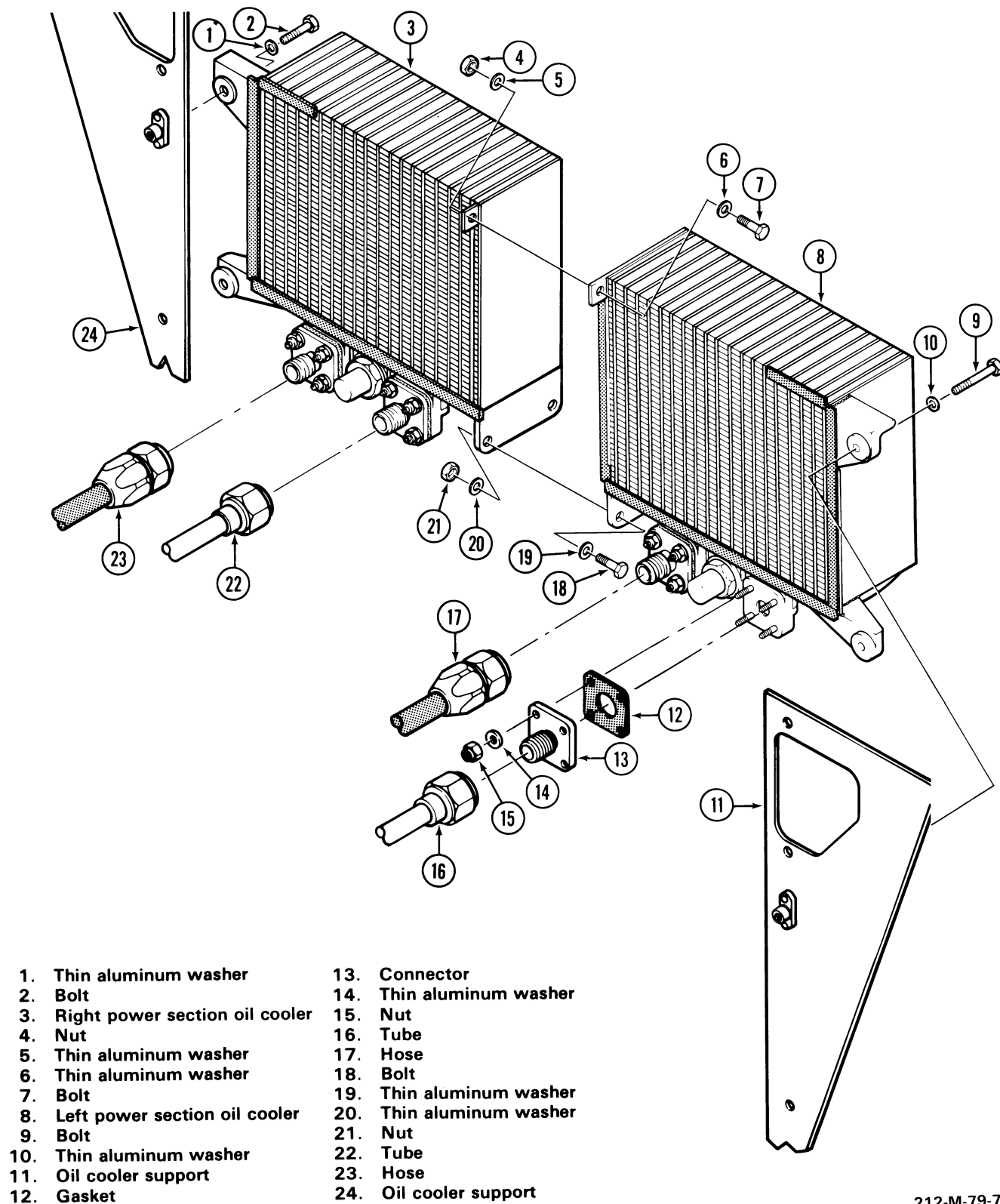
##### **79-24. Inspection.**

1. Inspect boot (2) for holes and deterioration.
2. Inspect blades of impeller and guide vanes for cracks and nicks.
3. Rotate impeller and check bearing for roughness and impeller tip clearance to case assembly of 0.010 in. (0.254 mm) minimum.

##### **79-25. Installation.**

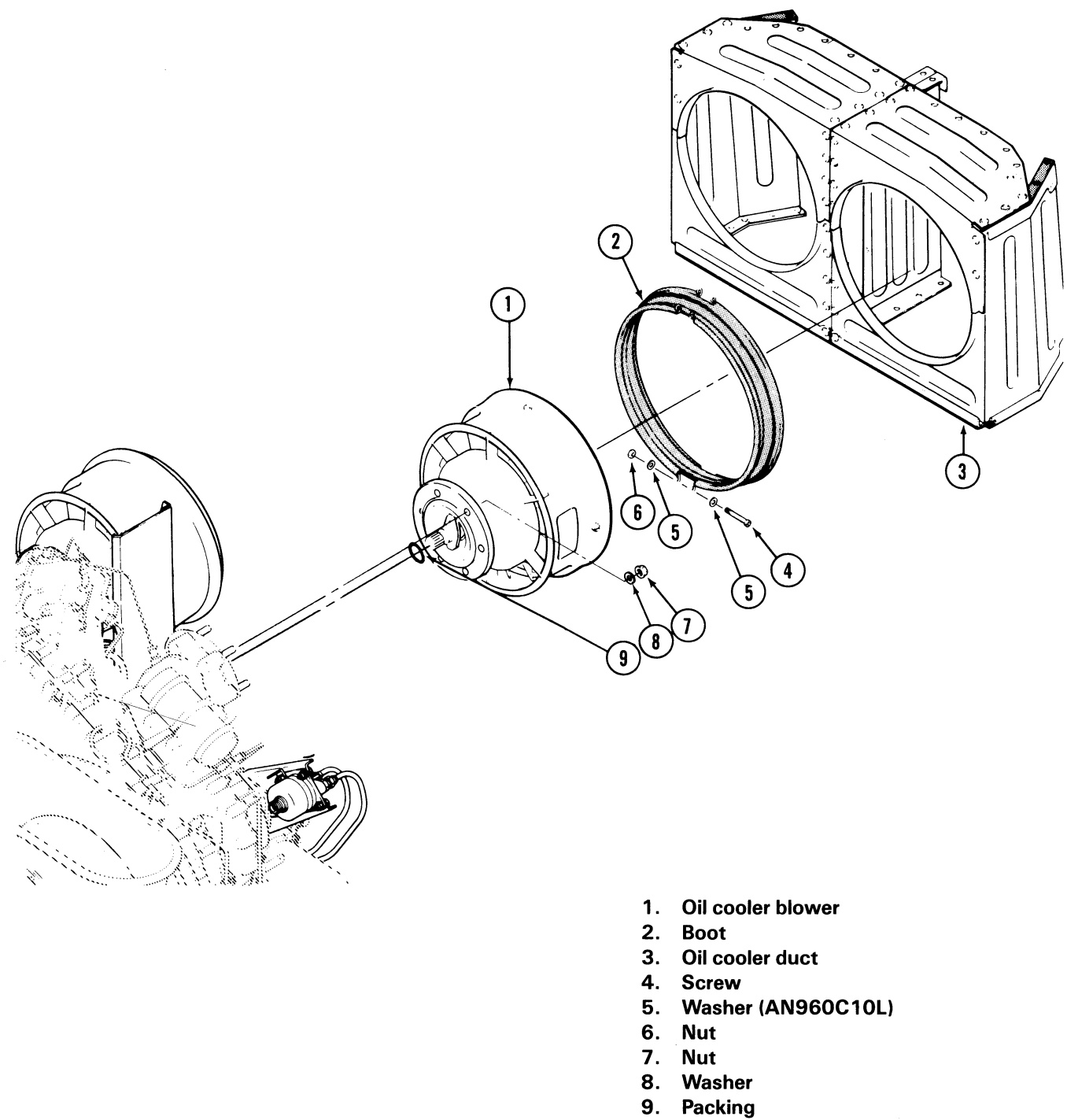
1. Place packing (9, figure 79-8) on shaft of blower (1).
2. Position blower (1) on combining gearbox pad. Install nuts (7) and washer (8). Torque nuts (160 to 190 in.lbs. (18.08 to 21.47 Nm)
3. Position boot (2) on blower. Install screw (4), two washers (5), and nut (6).
4. Install ejector (Chapter 71).
5. Install combining gearbox top cowl.
6. Close and secure open cowling.
7. Install opposite blower in the same manner.





212-M-79-7

Figure 79-7. Engine power section oil cooler



212-M-79-8

Figure 79-8. Engine and transmission oil cooler blower