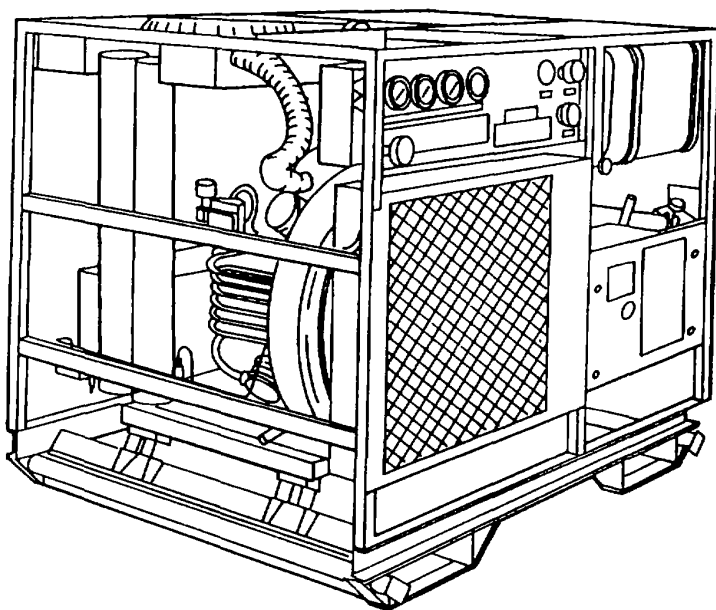


TECHNICAL MANUAL

**OPERATOR'S, UNIT, DIRECT
SUPPORT AND GENERAL SUPPORT
MAINTENANCE MANUAL**

**COMPRESSOR UNIT,
DIESEL ENGINE DRIVEN
20 CFM, 3200 PSI
MODEL K-20-D
(NSN 4310-01-227-1408)**



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CHANGE
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DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 31 July 1996

Operator's, Unit, Direct Support and General Support
Maintenance Manual

**COMPRESSOR UNIT,
DIESEL ENGINE DRIVEN
20 CFM, 3200 PSI
MODEL K-20-D
(NSN 4310-01-227-1408)**

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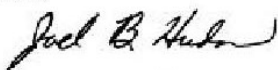
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WARNING

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with protective equipment (goggles/shields, gloves, etc.). Failure to do this may result in injury.

WARNING

Do not attempt to service the compressor, separators, purifiers, valves, air lines or fittings unless all air pressure has been relieved. Compressed air can be extremely dangerous. Do not exceed 35 psi line pressure for parts and equipment cleaning.

WARNING

Eye protection equipment must be worn when using compressed air for cleaning.

WARNING

The lead battery when filled, contains a strong sulfuric acid which can cause severe skin burns. When handling batteries wear protective clothing and eye protection.

WARNING

Wear face shield and clear immediate area of personnel when using low pressure air.

WARNING

Repair or replace worn or damaged parts immediately with authorized parts. Failure of a component during equipment usage could result in injury or death to the operator.

WARNING

Do not attempt to disassemble diving system components while pressurized. Failure to observe this warning may result in injury or death to personnel.

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with accepted army diving cleaning procedures. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

WARNING

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

WARNING

Remove all traces of lacquer thinner, as applicable, and rinse with fresh water. Residual lacquer thinner will contaminate breathing atmosphere and may cause injury or death to personnel.

WARNING

Do not use trichloroethylene or methyl chloroform in cleaning operations associated with any diving system. Use of either chemical, or similar contaminants, can result in death when operators/divers are exposed to these contaminants under pressure. The contaminants are not water soluble. If contamination or suspected contamination occurs, immediately discontinue all equipment/diving operations and notify the Army Diving Safety Office, Autovon 927-1329/Commercial (804) 878-1329. The only acceptable cleaning agents are tribasic sodium phosphate and nonionic soaps, liquid Joy and liquid Ivory.

WARNING

Fire may be caused by spilled fuel. Serious burns may result from accidental ignition of fuel spilled when servicing fuel system components. Emergency fuels are particularly hazardous. Use a fuel catch pan when draining fuel from any fuel line or fuel system component. Be sure that area around fuel atomizer assembly is not contaminated by fuel when testing inciter or ignition exciter.

WARNING

Battery electrolyte must be handled with care to avoid acid burns from spillage of battery electrolyte. Do not add electrolyte to a battery that has been previously filled. Use care not to spill electrolyte on skin when checking liquid level and specific gravity of a battery with a hydrometer.

WARNING

Dry cleaning solvent PD-680 used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 138°F (60°C).

WARNING

Leave 1 1/2 threads exposed on fitting when applying teflon tape. This will ensure that no teflon tape will hang down inside the air system. Teflon tape should be wrapped in such a manner that when the fitting is tightened the tape will not loosen. Failure to wrap teflon tape correctly may result in contamination or blockage of the air system and subsequent possible injury or death to the diver.

Charge cylinders at slow rate to avoid excessive heat buildup.

Do not re-fuel while engine is in operation.

During engine operation proper fire fighting equipment should be serviceable and kept near in the event of a fire.

Operation of the equipment presents a noise hazard to personnel in the area, proper hearing protection should be worn by all personnel in the vicinity of the equipment

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Operator, Unit, Direct Support, and General Support Maintenance Manual
for
COMPRESSOR UNIT, DIESEL ENGINE DRIVEN 20 CFM 3200 PSI
(MODEL K-20-D)
NSN 4310-01-227-1408

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to: Commander, US Army Aviation and Troop Command, ATTN: AMSAT-I-MP, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished directly to you.

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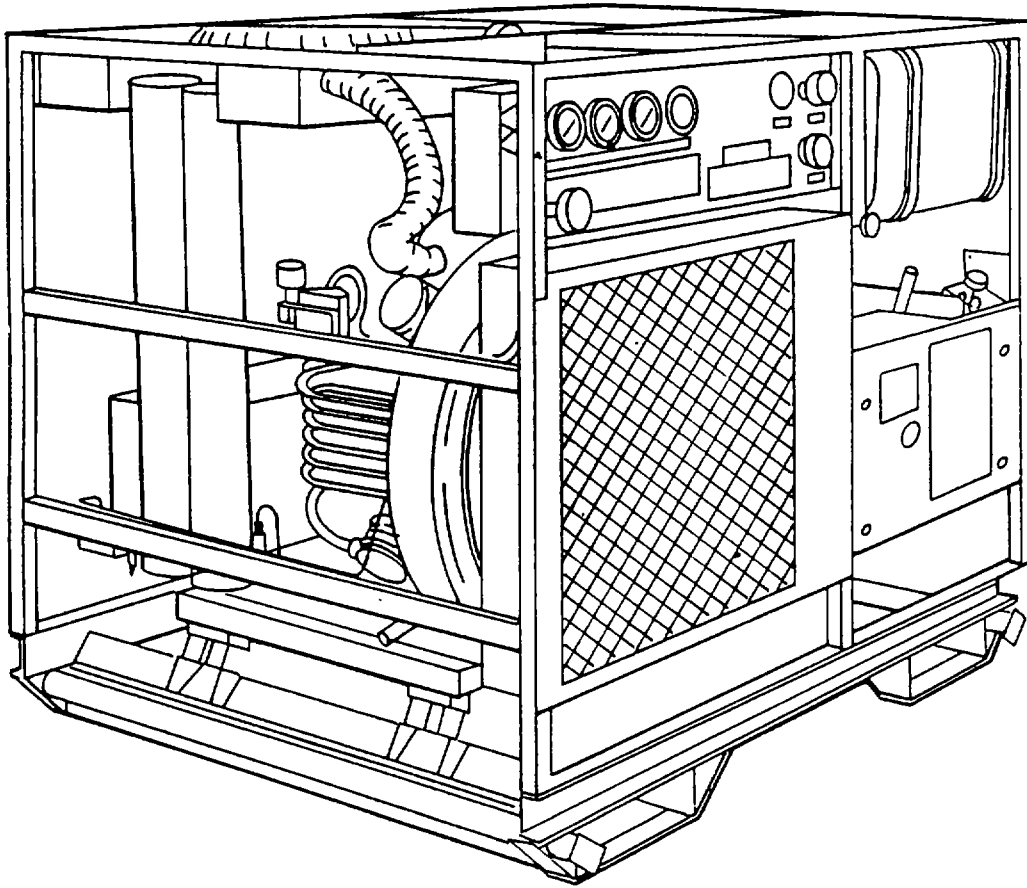


Figure 1-1. Compressor Unit, Model K-20-D.

CHAPTER 1 INTRODUCTION

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OVERVIEW

This chapter contains general information pertaining to Compressor Unit, Diesel Engine Driven, 20 Cubic Feet per Minute (CFM), Model K-20-D, and its components.

Section I. GENERAL INFORMATION

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1-1	Scope	1-1
1-2	Maintenance Forms, Records and Reports.....	1-1
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1-4	Preparation for Storage or Shipment.....	1-1
1-5	Reporting Equipment Improvement Recommendations (EIR's)	1-1
1-6	List of Abbreviations.....	1-2

1-1. **Scope.** This manual contains operator, unit, direct support and general support maintenance for Compressor Unit, Model K-20-D (figure 1-1).

1-2. **Maintenance Forms, Records and Reports.** Department of the Army forms and procedures used for equipment maintenance will be those prescribed in DA PAM 738-750, The Army Maintenance Management System (TAMMS).

1-3. **Destruction of Army Materiel to Prevent Enemy Use.** Refer to TM 750-244-3 for procedures to destroy Compressor Unit to prevent enemy use.

1-4. **Preparation for Storage or Shipment.** Refer to Chapter 4, Section VIII, and TM 38-230 for procedures to place the equipment into storage and prepare equipment for shipment.

1-5. **Reporting Equipment Improvement Recommendations (EIR).** If your Compressor Unit needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to us at: Commander, U.S. Army Troop Support Command, ATTN: AMSTR-MOF, 4300 Goodfellow Boulevard, St. Louis, Missouri 63120-1798. We will send you a reply.

1-6. **List of Abbreviations.**

AC	alternating current
AH	ampere/hour
AMP	ampere
ASME	American Society of Mechanical Engineers
BTU	British Thermal Unit
CFM	cubic feet per minute
DC	direct current
GPH	gallons per hour
FSW	feet of sea water
kPa	Kilo Pascals
NEDU	Navy Experimental Diving Unit
NM	newtons per square meter
PSI	pounds per square inch
RPM	revolutions per minute
TSP	trisodium phosphate
V	volt

Section II. EQUIPMENT DESCRIPTION AND DATA

Paragraph		Page
1-7	Equipment Characteristics, Capabilities and Features	1-2
1-8	Location and Description of Major Components.....	1-2
1-9	Equipment Data	1-4
1-10	Safety, Care and Handling	1-5

1-7. **Equipment Characteristics, Capabilities, and Features.** The compressor unit is driven by a two cylinder, air cooled, diesel engine connected to a four stage, reciprocating, air cooled, compressor. It is designed for continuous operation at a rated capacity of 20 cfm at pressures up to 3200 psi (22,064 kPa). It is also designed to operate under extreme climatic conditions. The K-20-D Compressor Unit is a portable, self contained skid mounted unit. The frame is constructed of welded steel channel. The subframe is attached to the main frame by 10 anti-vibration mounts. Slings/Tie-downs for hoisting or securing the compressor unit are welded to the skids and located at the four corners of the skids.

1-8. **Location and Description of Major Components.** (figure 1-2)

DIESEL ENGINE (1). Two cylinder four cycle diesel engine capable of producing 23 Hp at 2200 RPM.

AIR COMPRESSOR (2). Four-stage reciprocating air compressor cable of producing 20 cfm of diving air at 3200 psi.

PURIFIERS (3). Consist of two purifying cylinders with two purifying filters.

CONTROL PANEL (4). Contains controls and indicators needed to start, monitor, and terminate engine and compressor operations.

BATTERIES (5). A 12-volt (V) battery for starting the diesel engine.

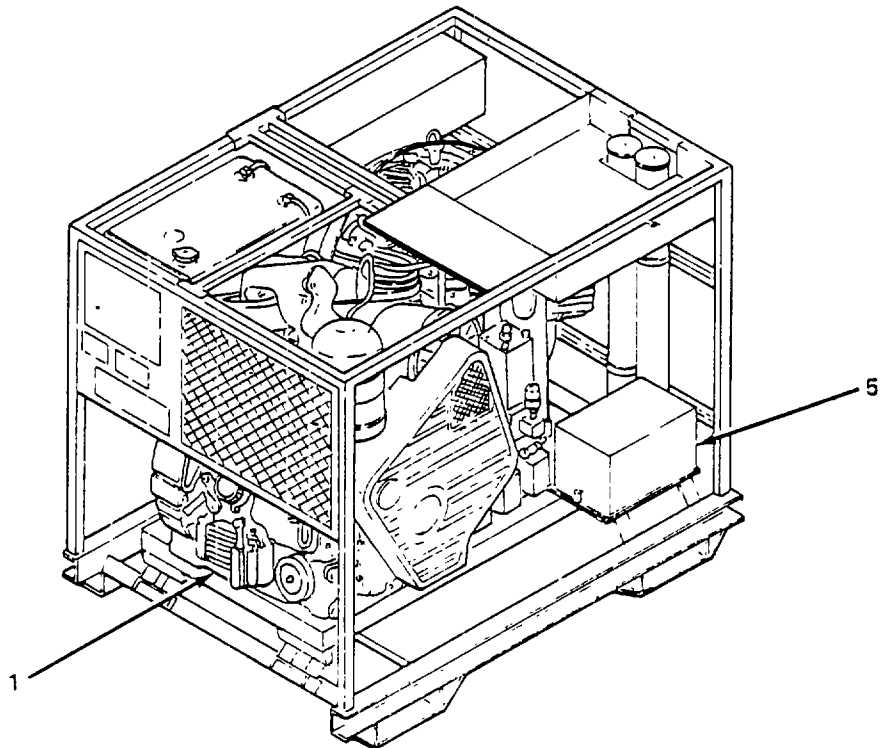
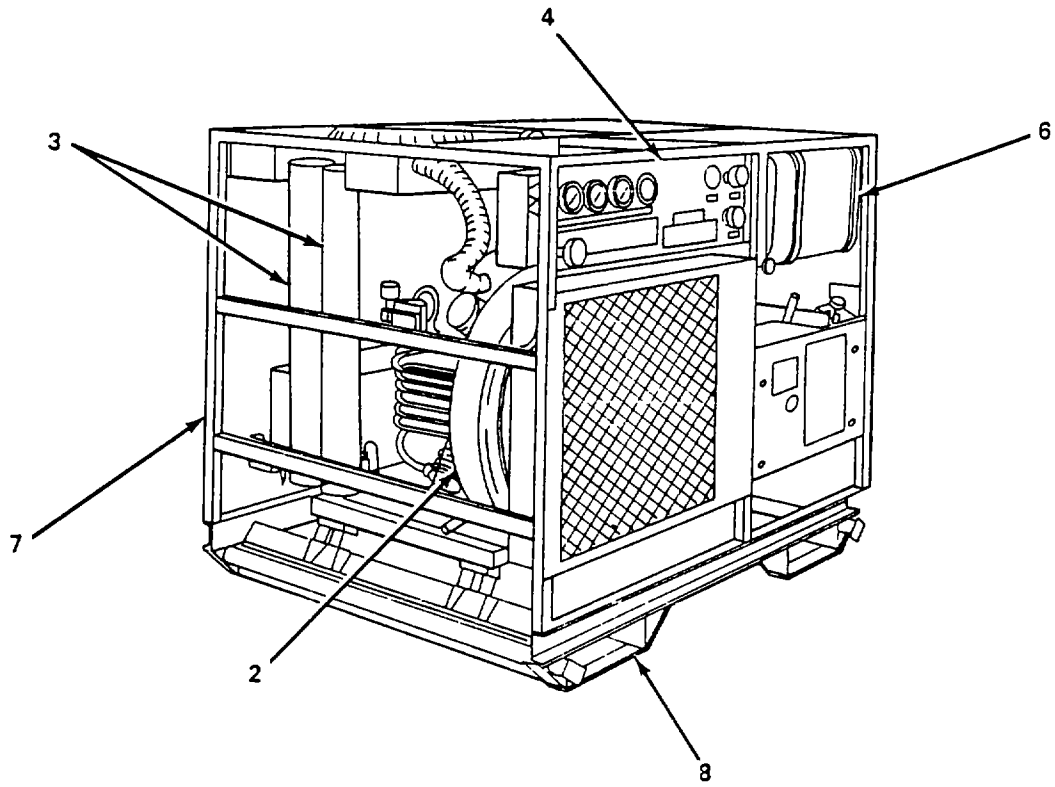


Figure 1-2. Location of Major Components.

FUEL TANK (6). A 13 gallon fuel tank supplies fuel for diesel engine.

MAIN FRAME (7). The main frame is constructed of welded steel channel.

SKID (8). Provides a means to lift the compressor unit.

1-9. Equipment Data.

a. Diving Air Compressor.

Weight..... 1850 lb
 Length..... 59 in.
 Width..... 48 in.
 Height..... 49 in.

b. Diesel Engine.

Manufacturer Deutz
 Engine type 4-cycle diesel
 Model FL912/W

 Displacement..... 1885 cu in.
 Bore..... 3.93 in.
 Stroke..... 4.72 in
 Horsepower 23 at 2200 rpm
 Compression ratio..... 19:1
 Cooling Forced air

 Starting system..... 12 volt
 Oil capacity..... 6 1/2 qts
 Height..... 32 in.
 Length 36 in.
 Width..... 28 in .
 Weight..... 650 lb (dry)

c. Compressor.

Manufacturer Bauer Compressor, Inc.
 Type Four-stage reciprocating
 Model K-180

 High-pressure cylinders 2
 Low-pressure cylinders 2
 Oil capacity..... 4 qt
 Maximum operating pressure..... 9 psig
 Rated flow 20 scfm at 1300 rpm and 3200 psig
 Length 20 in.
 Width..... 25 in.
 Height..... 30 in.
 Weight..... 250 lb

1-10. **Safety, Care, and Handling.** The following are general safety rules and precautions that should be followed when operating the K-20-D Compressor Unit.

- a. Always ensure that the intake air is absolutely pure and free of exhaust fumes.
- b. Always use air intake hose. This will help preclude intake of exhaust fumes.
- c. Filling hoses must be in satisfactory condition and threads undamaged. Pay particular attention to damage at hose connections. If the rubber is scored, hose must be discarded, otherwise water can enter and attack wire gauze causing it to rust, thus endangering pressure tightness.
- d. Never open filling valves when under pressure and not connected. Highly compressed air emerging can cause serious accidents.
- e. Check for leakage of the complete system from time to time by brushing all fittings and couplings with soapy water. Repair any leakage.
- f. Always shut down and bleed air from the system prior to carrying out any work on the compressor.
- g. Always disconnect the system from the battery prior to carrying out any work on compressor unit.
- h. Never reweld pressure lines.

Section III. PRINCIPLES OF OPERATION

Paragraph	Page
1-11 General.....	1-5
1-12 Pneumatic System.....	1-5

1-11. **General.** (Figure 1-3) The K-20-D Compressor Unit consists of a high pressure compressor coupled by a V-belt drive to a two cylinder diesel engine.

1-12. **Pneumatic System.** The four stage compressor is connected by a matched set of drive belt/s to the engine. The compressor is air cooled with inter-stage coolers, an after cooler, oil and moisture separators and an axial cooling fan. The compressor will deliver 20 cfm of diving air at 3200 psi (22064 kPa). When the relief valve closes at that pressure, the compressor begins delivering compressed air to the service outlet.

a. When the clutch is engaged, the compressor operates as follows: The first stage of the compressor draws in atmospheric air through the micronic intake filter (1). Here the air is compressed to a pressure of approximately 44 psi (303.38 kPa). The compressed air entering the second stage is cooled by inter-cooler (2). In the second stage the air is further compressed to approximate 210 psi (1447.95 kPa), and then passes through inter-cooler (3) and inter-filter (6) to the third stage. In the third stage the air is a compressed to 1015 to 1088 psi (6998.42 to 7501.76 kPa). Leaving the third stage the air passes through inter-cooler (4) and inter-filter (7) to the fourth stage. In the fourth stage the air is finally compressed to 3200 psi (22064 kPa). On leaving the fourth stage the air is passed through after-cooler (5) and routed through the oil and water separator (11). The intermediate pressures of the individual stages are monitored by the intermediate pressure safety valves (8), (9), and (10). Final pressure is monitored by final pressure safety valve in the purification system.

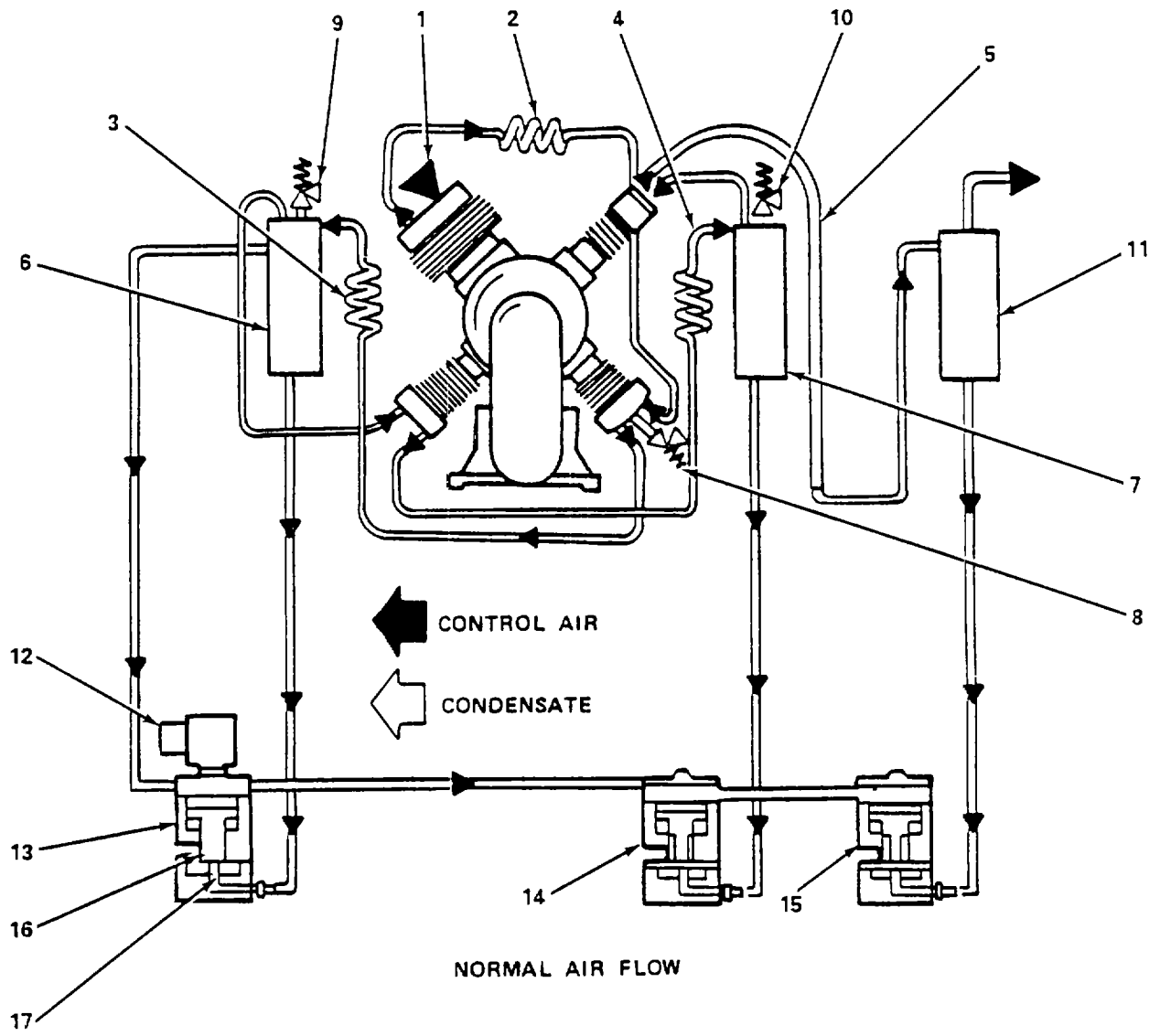


Figure 1-3. Flow Diagram.

b. Normal Operation. The drain valves are connected in cascade and operated pneumatically via a normally closed 3-way solenoid valve (12) actuated by an electrical signal. The required control air applied to the solenoid valve is taken from the inlet to the second stage cylinder. The control pressure is approximately 72.5 psi (499.88 kPa). The control air for the condensate drain valve for the oil and water separator (11) is taken from the intermediate filter (6). At compressor start, both condensate drain valves (13) and (14) are open. At start-up of the compressor, the 3-way solenoid valve (12) is energized and opens. Due to the pressure built up by the compressor operation control air flows into the condensate drain valves (13) and (14). The valve-pistons (16) are pressed onto valve seats (17) and the condensate valve closes.

c. Condensate Drain. Every 15 minutes the solenoid valve (12) is energized for approximately 6 seconds. Solenoid valve (12) closes the control air path from the second stage inter-filter (6). The servo-pistons (16) of the condensate drain valves are unloaded, and the control pressures are vented through the relief port of the solenoid valve. The pistons of the drain valves are raised, the valves open, and the condensate is drained.

d. Start Unloading. The unloading during the starting phase of the compressor is effected due to the lack of control air immediately after switching on the unit. After the compressor has attained nominal speed, control air flows through the open solenoid valve (12) to the condensate drain valves (13), (14), and (15). These valves close and the compressor delivers air to the consuming device.

e. Standstill Drainage. At compressor shut-down, solenoid valve (12) is energized and vents condensate drain valves (13) to (15). The valve pistons are raised by the residual pressure within the filters and separators. The valves open, and the filters are drained at standstill of the compressor unit.

**CHAPTER 2
OPERATING INSTRUCTIONS**

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Section II. Operator Preventive Maintenance Checks and Services	2-5
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OVERVIEW

This chapter provides information and procedures required by the operator to operate the compressor unit safely and efficiently.

**Section I. DESCRIPTION AND USE OF OPERATOR'S
CONTROLS AND INDICATORS**

Paragraph		Page
2-1	General.....	2-1
2-2	Control Panel.....	2-1
2-3	Diesel Engine.....	2-4

2-1. **General.** This section contains a list of the operator's controls and indicators and a description of their function.

2-2. **Control Panel.** (figure 2-1)

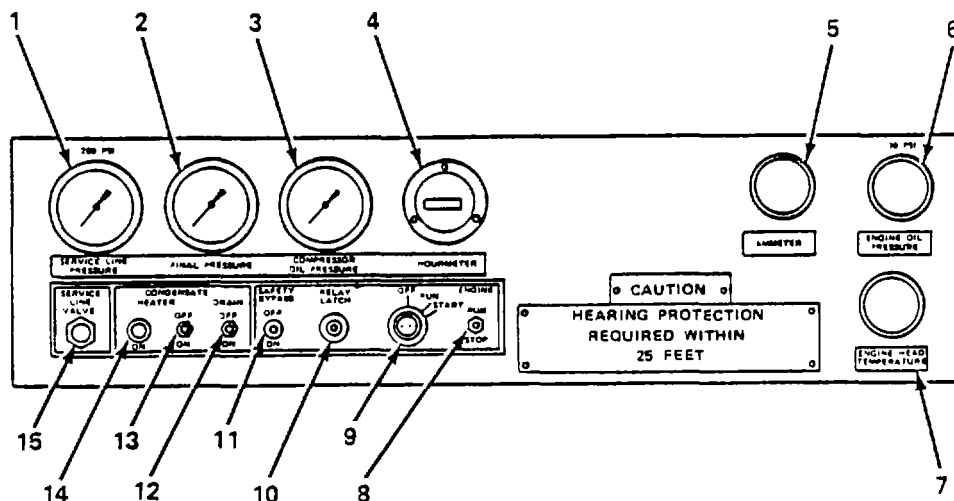


Figure 2-1. Control Panel Controls and Indicators.

Key	Control or Indicator	Function
1	Service Line Pressure Gage	Indicates the air pressure delivered to the service outlet.
2	Final Pressure Gage	Indicates the air pressure delivered from the fourth (final stage) of the compressor.
3	Compressor Oil Pressure Gage	Indicates the lubricating oil pressure which normally reads between 750 and 800 psi (5171.25 and 5516 kPa).
4	Hourmeter	Electrically operated. Indicates total running hours of the compressor. Reads from 000.0 to 999.9 hours.
5	Ammeter	Indicates alternator output.
6	Engine Oil Pressure Gage	Indicates engine oil pressure, normally 90 psi (620.55 kPa).
7	Engine Head Temperature Gage	Indicates the temperature in the engine head, normally 110°F (43°C).

Key	Control or Indicator	Function
8	Engine Run Stop Switch	Spring loaded toggle switch. When depressed energizes a solenoid which pushes the engine stop lever, thus shutting the engine down.
9	Ignition Switch	Key operated, three position (OFF, RUN, START) switch. Turning key to START position and pushing in starts engine. When engine starts, release key and turn to RUN position. To stop engine, turn key to OFF position.
10	Relay Latch Pushbutton	Works in conjunction with ignition switch. Pushbutton is pushed in and held until engine started, then released. Activates automatic shutdown in case of excessive engine or compressor temperature or abnormal oil pressure.
11	Safety Bypass Switch	Turn position toggle switch. Used during cold weather for engine starts for clutch disengaged. Must be in ON position when starting engine so that low oil pressure safety on the compressor does not shut down engine. Once clutch is engaged, must be in OFF position
12	Condensate Drain Switch	Two position (ON/OFF), spring loaded toggle switch. Causes all condensate drains to open when held in the ON position. Normally held for six seconds every 15 minutes by operator.
13	Condensate Heater Switch	Two position (ON/OFF) toggle switch. Controls the heater for the condensate valve assembly. Used in cold weather only.
14	Condensate Heater Lamp	Indicates when condensate heater is on.
15	Service Line Valve	Controls air flow to the service line outlet.

2-3. Diesel Engine. (figure 2-2)

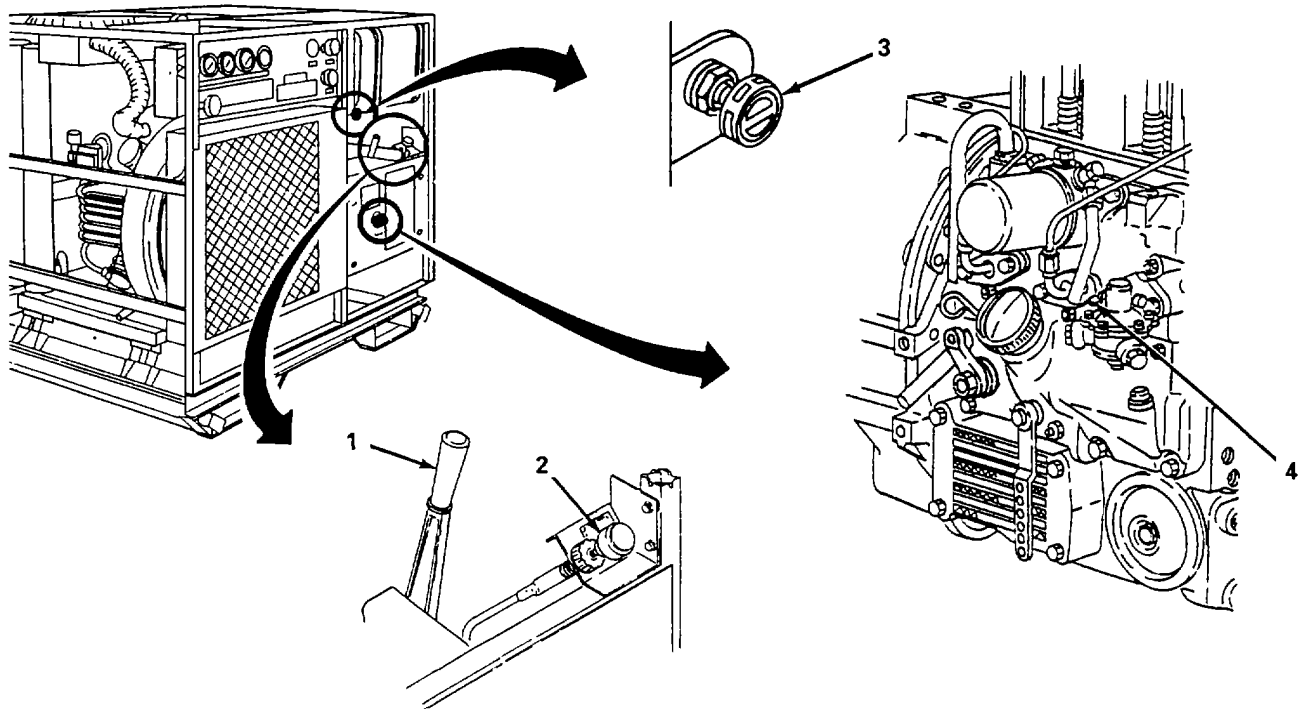


Figure 2-2. Diesel Engine Controls and Indicators.

Key	Control or Indicator	Function
1	Power Take-off Control Lever	Engages clutch which transmits engine power to air compressor.
2	Throttle Control	Controls engine speed. Turning control counterclockwise increases speed, turning clockwise decreases speed.
3	Ether Injector Pump	When pumped, ether is forced from the reservoir into air intake of engine to help start the engine in cold weather condition.
4	Fuel Feed Pump	Hand activated lever on pump used to prime fuel system.

**Section II. OPERATOR PREVENTIVE MAINTENANCE
CHECKS AND SERVICES (PMCS)**

Paragraph		Page
2-4	General.....	2-5
2-5	Purpose of PMCS Table.....	2-5
2-6	Explanation of Columns	2-5
2-7	Reporting Deficiencies	2-6
2-8	Equipment is Not Ready/Available If Column	2-6
2-9	Special Instructions	2-6

2-4. **General.** Operator PMCS are performed to ensure that the compressor unit is ready for operation at all times. Perform the checks and services at the specified intervals.

a. Before you Operate. Always keep in mind the CAUTIONS and WARNINGS. Perform your before (B) PMCS prior to the equipment leaving its containment area or performing its intended mission.

b. While you Operate. Always kept in mind the CAUTIONS and WARNINGS. Perform your during (D) PMCS when the equipment is being used in its intended mission.

c. After you Operate. Be sure to perform your after (A) PMCS after the equipment has been taken out of its mission mode or returned to its containment area.

d. If your Equipment Fails to Operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See DA Pam 738-750.

2-5. **Purpose of PMCS Table.** The purpose of the PMCS table is to provide a systematic method of inspecting and servicing the equipment. In this way, small defects can be detected early before they become a major problem causing the equipment to fail to complete its mission. The PMCS table is arranged with the individual PMCS procedures listed in sequence under assigned intervals. The most logical time (before, during, or after operation) to perform each procedure determines the interval to which it is assigned. Make a habit of doing the checks in the same order each time and anything wrong will be seen quickly. See paragraphs 2-6 and 2-7 for an explanation of the columns in table 2-1.

2-6. **Explanation of Columns.** The following is a list of the PMCS table column headings with a description of the information found in each column.

a. Item No. This column shows the sequence in which the checks and services are to be performed, and is used to identify the equipment area on the Equipment Inspection and Maintenance Worksheet, DA Form 2404.

b. Interval. This column shows a dot (•) when each check is to be done.

c. Item to be Inspected/Procedures. This column identifies the general area or specific part where the check or service is to be done, and explains how to do them.

d. Equipment is Not Ready/Available If. See paragraph 2-8.

2-7. **Reporting Deficiencies.** If your equipment does not perform as required, refer to Chapter 3 under Troubleshooting for possible problems. Report any malfunctions or failures on DA Form 2404, or refer to DA Pam 738-750.

2-8. **Equipment is Not Ready/Available If Column.** This column lists conditions that make the equipment unavailable for use because it is unable to perform its mission, or because it would represent a safety hazard. Do not accept or operate equipment with a condition in the "Equipment is Not Ready If" column.

NOTE

The terms ready/available and mission capable refer to the same status: Equipment is on hand and is able to perform its combat mission. Refer to DA Pam 738-750.

2-9. **Special Instructions.** Preventive maintenance is not limited to performing the checks and services listed in the PMCS table

WARNING

Dry cleaning solvent PD-680 used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 138°F (60°C).

a. Keep it Clean. Dirt, grease, oil, and debris get in the way and may cover up a serious problem. Clean as you work and as needed. Use dry cleaning solvent on all metal surfaces. Use soap and water to clean rubber or plastic material.

b. Bolts, Nuts, and Screws. Check them all for obvious looseness, missing, bent, or broken condition. You can't try them all with a tool, but look for chipped paint, bare metal, or rust around boltheads. If you find one you think is loose, tighten it, or report it to unit maintenance if you can't tighten it.

c. Electrical Wires and Cables Connectors. Look for bare wires, and loose or broken connectors. Report defects to unit maintenance.

d. Fluid Lines. Look for wear, damage, and leaks. Make sure clamps and fittings are tight. Wet spots and stains around a fitting or connector can mean a leak. If a leak comes from a loose connector, tighten it. If something is broken or worn out, report it to unit maintenance.

e. Leakage Definitions. It is necessary for you to know how fluid leakage affects the status of your equipment. The following are definitions of the types/classes of leakage you need to know to be able to determine the status of your equipment. Learn and be familiar with them. When in doubt, NOTIFY YOUR SUPERVISOR!

Leakage Definitions:

- | | |
|----------|--|
| Class I | Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops. |
| Class II | Leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked/inspected. |

Class III Leakage of fluid great enough to form drops that fall from the item being checked/inspected.

CAUTION

Equipment operation is allowable with minor leakage (Class I or II) of any fluid except fuel. Of course, consideration must be given to the fluid capacity in the item being checked/inspected. When in doubt, notify your supervisor.

When operating with Class I or II leaks, continue to check fluid level more often than required in the PMCS.

Class III leaks should be reported to your supervisor or unit maintenance.

f. Painting. Touch-up filter separator as needed. Refer to TM 43-0139 for specific painting procedures.

Table 2-1. Operator Preventive Maintenance Checks and Services (PMCS).

NOTE

Within designated intervals, these checks are to be performed in the order listed.

If the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

B - Before

D - During

A - After

W - Weekly

ITEM NO	INTERVAL				ITEM TO BE INSPECTED PROCEDURES	EQUIPMENT IS NOT READY/ AVAILABLE IF:
	B	D	A	W		
1	•		•		Fuel tank. Check fuel supply, add diesel oil as required to keep fuel tank full. Inspect fuel lines, fitting and straps for cracks.	
2	•		•		Engine crankcase. Check oil level. Add oil as required	Oil level is at or below the ADD OIL line, or above the FULL line.
3	•		•		Give compressor overall visual check.	
CAUTION						
Do not overfill compressor oil tank.						
4	•		•		Compressor crankcase. Check oil level. Add oil as required.	Oil level is at or below the ADD OIL line, or above the FULL line

Table 2-1. Operator Preventive Maintenance Checks and Services (PMCS) (Cont).

ITEM NO	INTERVAL				ITEM TO BE INSPECTED PROCEDURES	EQUIPMENT IS NOT READY/ AVAILABLE IF:
	B	D	A	W		
5	•		•		Belt guard. Inspect for tears or holes in mesh.	
6	•		•		Drive belts tension. Press down on drive belts one at a time and measure distance, if more than 0.4-0.6 inches, belts require adjustment.	Belt depression is more than 1/2 inch. Do not operate until adjusted.
7	•		•		Battery holddown and cables. Inspect for cracked or leaking case and broken, loose, or bent posts. Check for loose battery cables.	Battery is cracked.
8				•	Check electrolyte level. Add distilled water if level is low.	Electrolyte level is low.
9	•	•	•		Gages. Inspect for damaged pointers, cracked lenses, liquid fill leaks, loose tube connections or loose wires, loose hardware, plus operation and normal readings during operation.	Gages damaged or inoperative. Do not operate until repaired.
10	•		•		Switches, controls and valves. Inspect for proper operation. Check for looseness damage and missing parts.	Switches damaged or inoperative.
<p><u>WARNING</u></p> <p>Examine hoses before pressurizing. Worn or frayed hose may explode.</p>						
11	•		•		Fuel, air, oil lines, and fittings. Inspect for wear, cracks, cuts, fraying, leaks and loose connections.	Fuel, air, oil lines or fittings damaged. Do not operate with damaged hose or fittings.
12		•			Exhaust system. Inspect muffler, silencer and exhaust pipe for any holes caused by rust. Inspect for loose or missing parts.	

Table 2-1. Operator Preventive Maintenance Checks and Services (PMCS) (Cont).

ITEM NO	INTERVAL				ITEM TO BE INSPECTED PROCEDURES	EQUIPMENT IS NOT READY/ AVAILABLE IF:
	B	D	A	W		
13	•		•		Check alternator V-belt tension. Visually inspect for wear, fraying and peeling through guard screen. Check belt tension through hand opening.	Belt depression is more than 1/2 inch.
14	•				Clutch. Check clutch engagement, there should be a noticeable snapping action when clutch is properly adjusted.	Clutch slips, handle disengages, no snapping action, or clutch has no adjustment left.
15				•	Pressure Maintenance Valve (PMV).	PMV does not maintain 1800 to 2000 psi on the final pressure gage.

Section III. OPERATION UNDER USUAL CONDITIONS

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2-11	Pre-Operational Checks.....	2-9
2-12	Start-Up Procedures.....	2-11
2-13	Shut-Down Procedures.....	2-13

2-10. **General.** This section describes the operating procedures for the K-20-D Compressor Unit. Included are pre-operational checks, start-up procedures and shut-down procedures.

2-11. **Pre-Operational Checks.** After performing PMCS procedures in Section II, proceed with the following (figure 2-3):

- a. Ensure that the engine exhaust is located down-wind and the pre-filter air-intake is up-wind and fully extended.
- b. Check oil level in the compressor and engine, add as required.
- c. Check fuel in tank; top off if required.
- d. Ensure that the air cleaner bowl (1) has been filled (use same grade motor oil for engine).
- e. Check ether reservoir (2); add if required (cold weather).

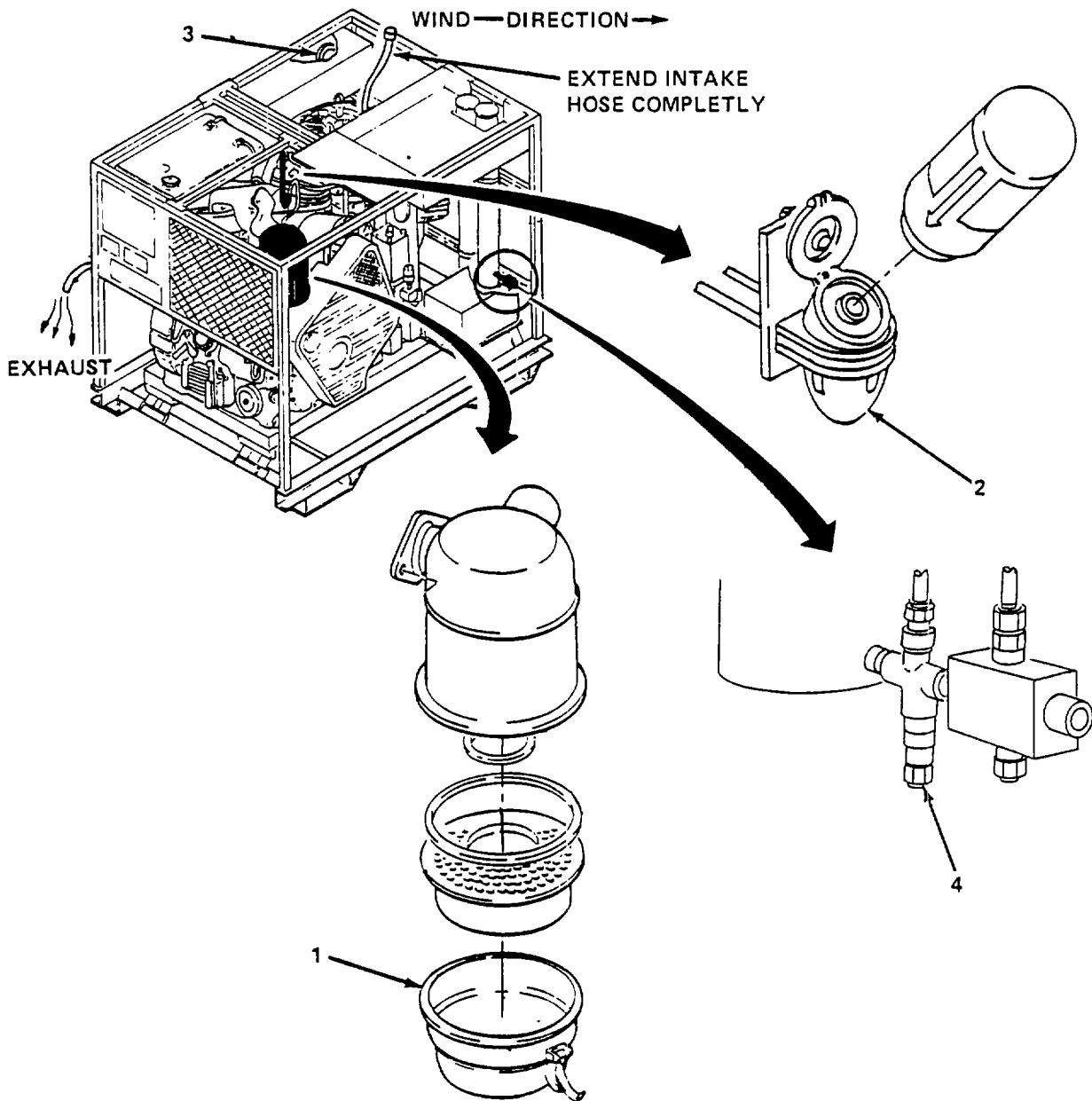


Figure 2-3. Pre-Operational Checks.

- f.* Check log book to determine if cartridge life has been exceeded. If it has, insert new cartridges. Refer to maintenance schedule for cartridge life and instructions on replacing cartridges.
- g.* Close service valve (3).
- h.* Close automatic bleed valve (4).
- i.* Check oil pressure regulator. Ensure that it has not been screwed all the way in.

2-12. **Start-Up Procedures.** (figure 2-4)**NOTE**

In cold weather, two personnel will be required to start the engine. One person to operate the RELAY LATCH and ignition switches, and one person to operate the ether injector pump.

- a. Insert key into ignition switch (1).
- b. Press button on top of engine throttle control (2), pull the engine throttle control all the way out until it stops (approximately 4 inches), push in on engine throttle control to about one-fourth the distance (approximately 1 inch). then release button.
- c. Disengage clutch by pulling clutch lever (3) forward (toward front of unit).
- d. Turn ignition key to RUN position.
- e. Set ENGINE RUN/STOP switch (4) to RUN position.
- f. Set SAFETY BYPASS switch (5) to the ON position.
- g. In cold weather, when the engine starts to turn over, pump the ether injector pump (6) very slowly. Stop pumping just as engine starts.

CAUTION

Do not actuate starter for more than 20 seconds at a time. Wait one minute between each starting attempt.

- h. Press and hold in RELAY LATCH switch (7) and at same time, turn and hold ignition key (1) in the START position. Engine should start.
- i. When engine starts, release the RELAY LATCH switch (7) and the ignition key (ignition switch will spring back to RUN position).
- j. If engine does not start, release the RELAY LATCH switch (7) and ignition key. Wait for 15 seconds and repeat step g, (if cold weather start), step h and step i.
- k. After engine starts, check ENGINE OIL PRESSURE gage (8) for 90 psi (620.55 kPa).
- l. Check ENGINE HEAD TEMPERATURE gage (9) for approximately 110° F (43° C).
- m. When ENGINE OIL PRESSURE and ENGINE HEAD TEMPERATURE readings are acceptable, turn engine throttle control (2) in counterclockwise direction until it stops (full throttle).
- n. Engage clutch by pushing clutch lever (3) towards back of unit.

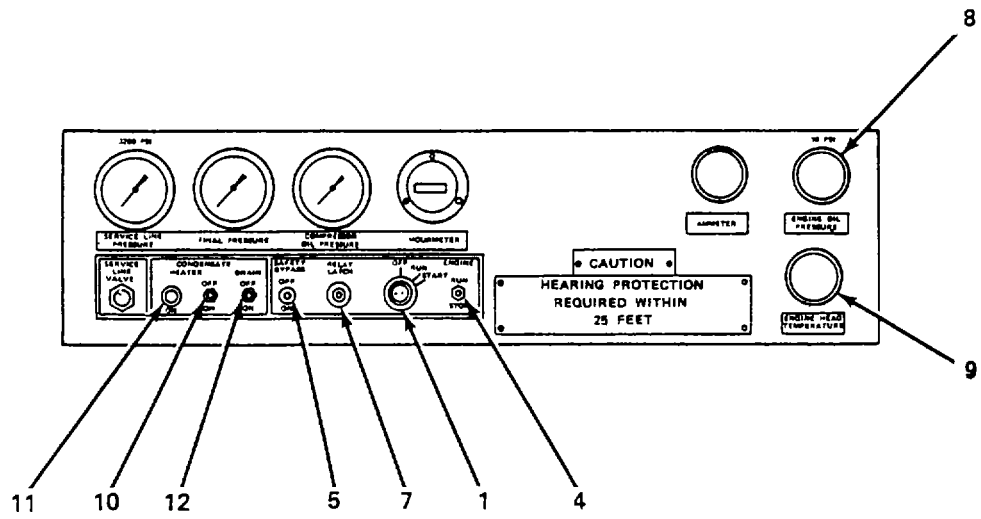
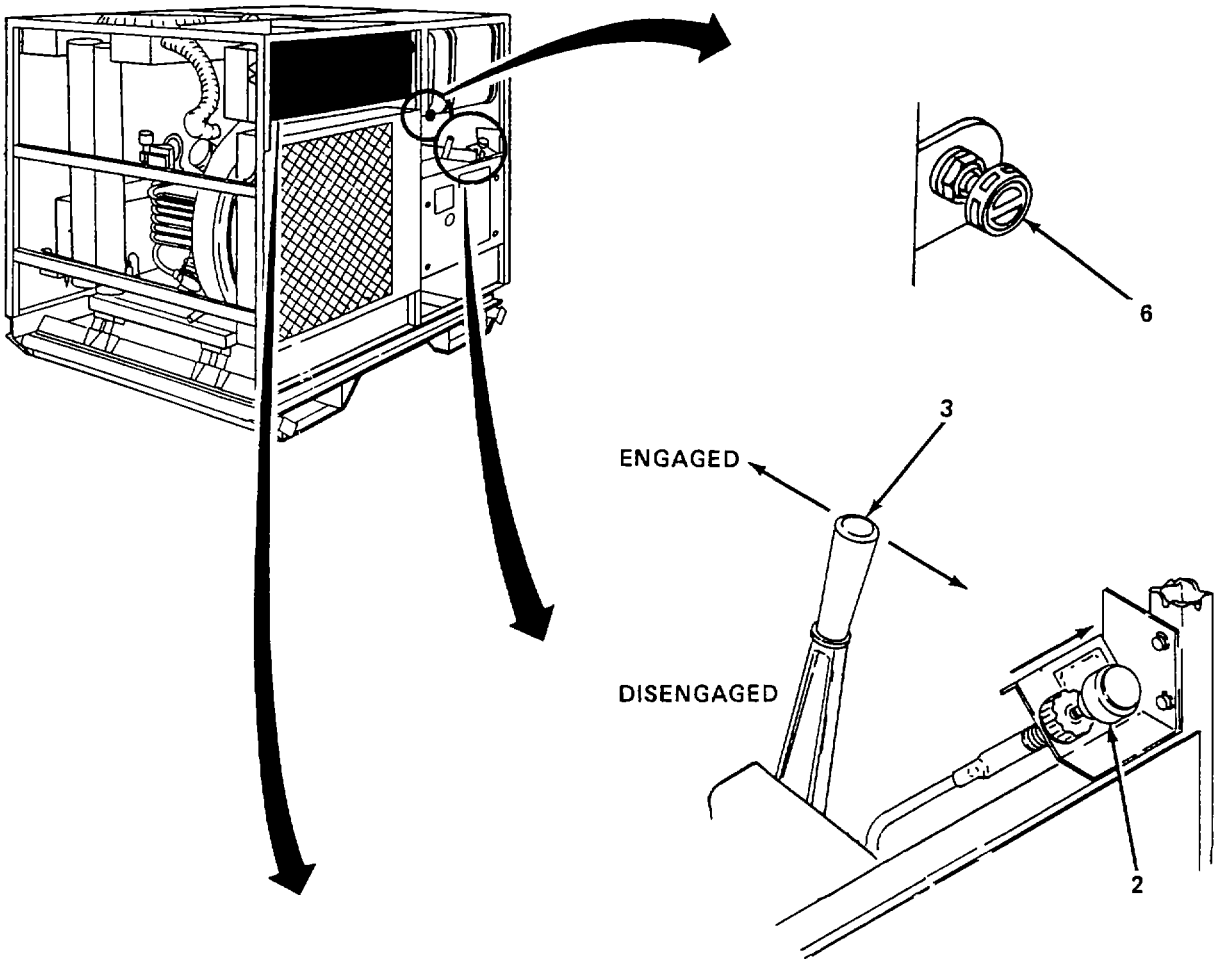


Figure 2-4. Start-Up Procedures.

- o. Check COMPRESSOR OIL PRESSURE gage (8) for reading in range of 750 to 800 psi (5171.25 to 5516 kPa).
- p. Set SAFETY BYPASS switch (5) to OFF position.
- q. Set CONDENSATE HEATER switch (10) to ON position and verify CONDENSATE HEATER lamp (11) is lit.
- r. Compressor is now operational.
- s. Mandatory requirements as follows:

WARNING

Failure to operate the condensate drain switch at the directed time intervals may cause air to become contaminated and endanger personnel.

- (1) Every 15 minutes, press and hold the CONDENSATE DRAIN switch (12) in the ON position for six seconds.
- (2) During high humidity and temperature, the CONDENSATE DRAIN switch (12) must be activated every 10 minutes.

2-13. Shut-Down Procedures. (figure 2-5)

CAUTION

Diesel engine should not be suddenly shut down from full-load condition.

- a. Press button on top of engine throttle control (1) and push engine throttle control all the way in until it stops, then release button. Engine should be idling.
- b. Disengage clutch by pulling clutch lever (2) forward (towards front of unit).
- c. Set ENGINE RUN/STOP switch (3) to STOP position and hold in STOP position until engine completely stops. Release engine RUN/STOP switch.
- d. Set CONDENSATE HEATER switch (4) to OFF position and verify lamp (5) is not lit.
- e. Turn ignition switch (6) to OFF position.
- f. Open bleed valve (7).
- g. Close service line control valve (8).

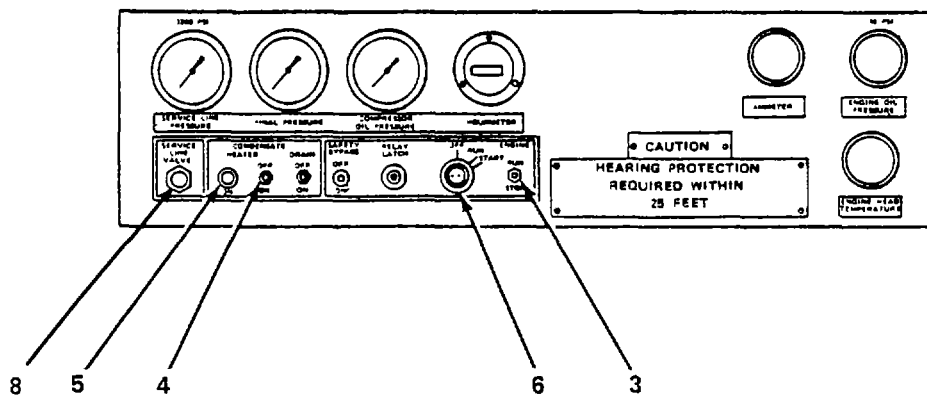
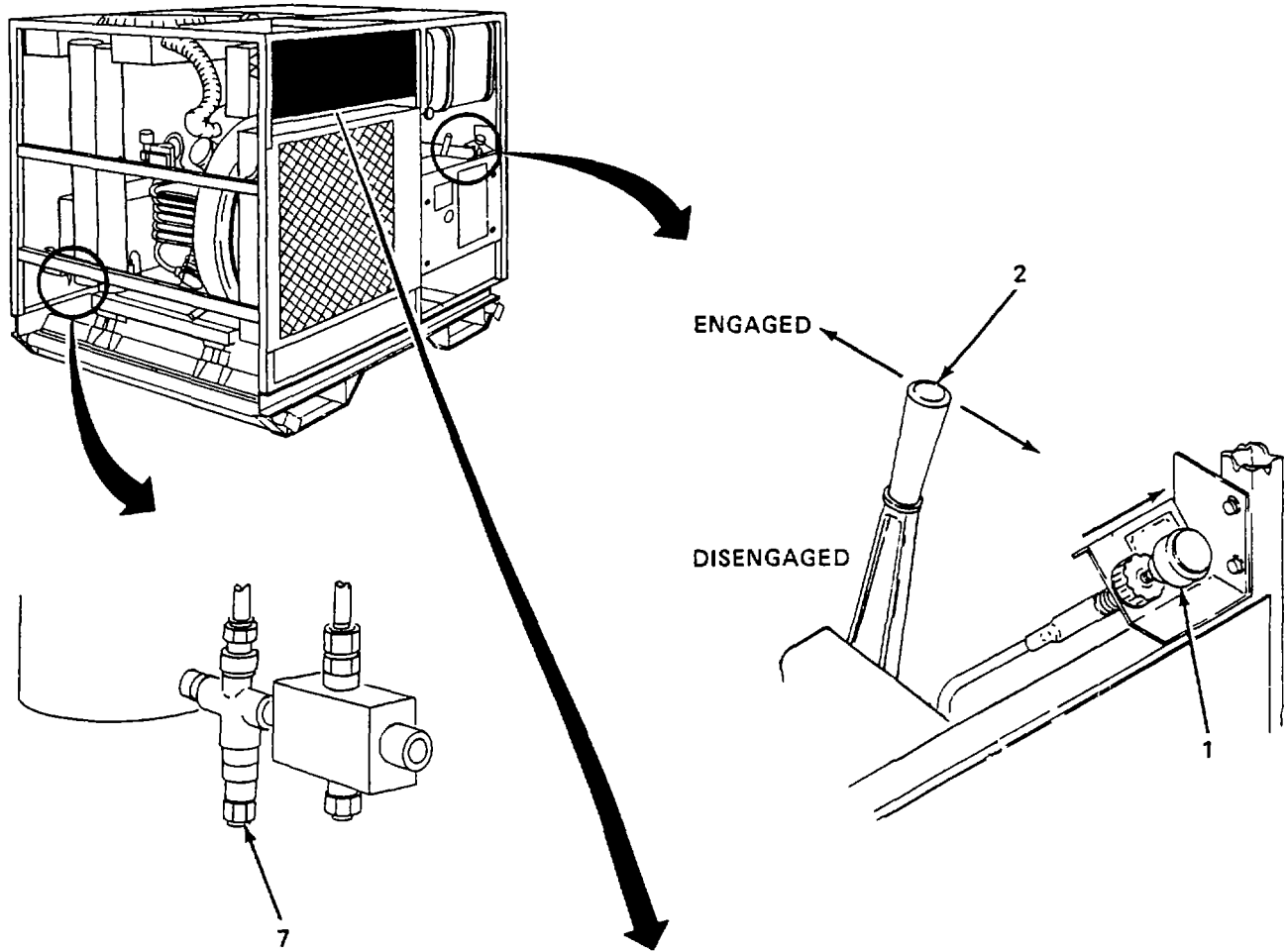


Figure 2-5. Shut-Down Procedures.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

Paragraph		Page
2-14	Operation in Extreme Cold.....	2-15
2-15	Operation in Extreme Heat.....	2-17
2-16	Operation in Dusty or Sandy Areas	2-17
2-17	Operation in Rainy or High Humidity Conditions	2-17
2-18	Operation in Salt Water Areas	2-17
2-19	Operation at High Altitudes	2-18

2-14. Operation in Extreme Cold.

NOTE

When operating the K-20-D in cold weather 32°F (0°C) or below, both the engine and compressor lubricating oils must be changed to cold weather oils.

To ensure satisfactory cold starting, the choice of the viscosity grade should be governed by the ambient temperature prevailing at the time of starting. As to the oil change intervals, it should be kept in mind that operation below 50°F (10°C) requires shorter oil change intervals.

Use winter-grade fuel in winter because, with ordinary fuel, waxing may occur at low temperatures and clog the fuel filter. At excessively low temperatures, even winter-grade fuel may tend to wax. Therefore, if only summer-grade fuel is available, or if winter-grade fuel is used at excessively low temperatures, the following percentages are recommended (figure 2-6) for mixtures of diesel fuel and kerosene or regular-grade gasoline.

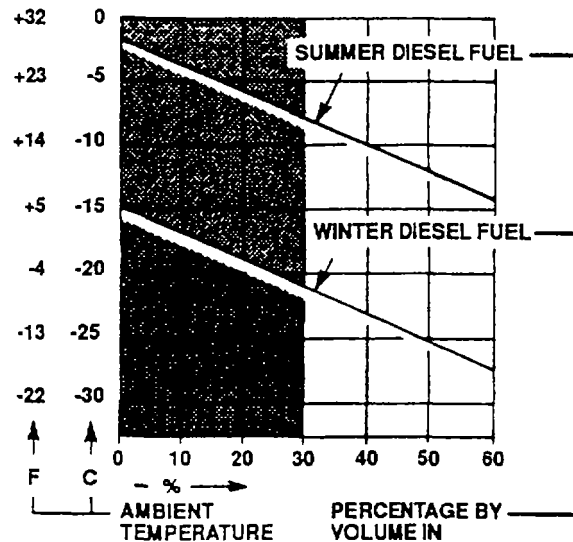


Figure 2-6. Fuel Mixture by Temperature.

Prepare the blend in the tank itself: fill in the gasoline first, then add diesel fuel. The blend is as easily flammable as pure gasoline. A mixture of the latter, however, is permissible for a short period only, but never for permanent operation.

CAUTION

A maximum mixture of regular-grade gasoline is 30 percent; when mixing more than 30 percent, use kerosene only. Never use premium fuel.

Check hoses and ducts for cracks or other cold weather damage prior to starting compressor. Keep fuel tank full to minimize moisture condensation.

- a. Locate ignition switch.
- b. Pull the engine throttle OUT 1/4 to 1/2 (press button on top of throttle control to release from position).
- c. Disengage clutch.
- d. Turn safety bypass switch to ON.
- e. Press and hold relay latch button in.

CAUTION

Do not actuate starter for more than 20 seconds at a time. Wait one minute between each starting attempt.

- f. While engine is cranking, pump ether injection pump (item 6, figure 2-4) very slowly. Stop pumping just as engine starts.
- g. Let the engine run about five minutes before engaging the clutch.

NOTE

Engage clutch before turning safety bypass switch to OFF.

- h. Once the clutch is engaged, the bypass switch must be placed in the OFF position, activating the low pressure safety shutdown.
- i. The compressor will deliver air until the final pressure gauge reads 3200 psi. The unloader valve will open automatically and dump air until the pressure drops down to 2800 psi if this amount is exceeded. This cycle will repeat itself automatically.

CAUTION

The condensate heater should only be operated when the engine is running, since the heating element uses energy from the electrical system. In cold weather, 32°F (0°C), the condensate heater should be left on until the unit is shut down.

- j. Set condensate heater switch to the ON position.

2-15. Operation in Extreme Heat.

CAUTION

Do not operate the compressor if the ambient temperature exceeds 125°F (52°C).

- a. Keep all engine, compressor, and heat exchanger cooling fins clean and free of obstructions.
- b. Ensure that cooling air flow is not restricted and that cooling air comes from the coldest available source. Avoid having heated air drawn into the cooling fan.
- c. If possible, provide shade to protect the unit from direct sunlight.

2-16. Operation in Dusty or Sandy Areas.

- a. Protect the unit from dust and sand. Take advantage of all natural barriers that could protect the unit from blowing dust or sand. Install a tarpaulin when the unit is not in operation.
- b. Keep fuel clean. Strain the fuel before adding to the tank. Ensure the fuel storage and transfer cans are clean.
- c. Check and service the engine/compressor air cleaners often.
- d. Clean the engine, compressor, and heat exchanger cooling fins often. Wipe with clean cloth.

2-17. Operation in Rainy or High Humidity Conditions.

- a. Store unit in a sheltered area when not in use.
- b. Keep fuel clean and free of water. To minimize condensation, keep the fuel tank full when the unit is not in use.
- c. Whenever possible, protect the unit from direct rainfall when operating. Cover the unit with a tarpaulin suspended about three feet above the unit.
- d. Drain the oil/moisture separators often. Press and hold the condensate drain switch for 10 to 15 seconds every 10 minutes of continuous operation.
- e. Do not allow water to enter compressor air intake hose.

2-18. Operation in Salt Water Areas.

- a. Avoid direct contact with salt water to prevent corrosion. If salt water does come in contact with the unit, rinse the unit with clean, fresh water.
- b. Repair any paint damage, such as cracks and chips. Apply standard issue rustproofing material to all exposed ferrous metal (steel) surfaces. If rustproofing material is not available, apply a light film of oil or grease to all exposed metal surfaces.

2-19. Operation at High Altitudes.

- a. Engine power output will decrease to about 3-1/2 percent for every 1000 feet above sea level. The compressor will have a similar loss of operating efficiency.
- b. Service the engine/compressor air cleaner often to minimize this loss of efficiency.

CHAPTER 3
OPERATOR MAINTENANCE

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CHAPTER 4
UNIT MAINTENANCE

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OVERVIEW

This chapter contains information for troubleshooting and maintenance of the compressor unit by unit level maintenance personnel.

Section I. REPAIR PARTS; SPECIAL TOOLS; TEST, MEASUREMENT AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

Paragraph	Page
4-1 Common Tools and Equipment	4-1
4-2 Special Tools, TMDE, and Support Equipment	4-1
4-3 Repair Parts	4-1

4-1. **Common Tools and Equipment.** For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

4-2. **Special Tools, TMDE, and Support Equipment.** For a listing of special tools, TMDE, and support equipment authorized for use on this equipment, refer to the Repair Parts and Special Tools List, TM 5-4310-386-24P and the maintenance allocation chart (MAC), Appendix B of this manual.

4-3. **Repair Parts.** Repair parts are listed and illustrated in the Repair Parts and Special Tools List for Compressor Unit, Model K-20-D, TM 5-4310-386-24P.

Section II. SERVICE UPON RECEIPT

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4-5 Site and Shelter Requirements	4-2
4-6 Service Upon Receipt	4-2

4-4. **General.** This section covers information required by unit level maintenance personnel to ensure the equipment will be adequately inspected, serviced, and operationally tested before it is subjected to normal use. These procedures include site and shelter requirements, service upon receipt of material, and preliminary servicing and adjustment.

4-5. **Site and Shelter Requirements.**

a. **Site.** The usage site for the compressor should be selected so as to avoid excessive dust, mud, rain, snow, heat, or cold. The compressor must be kept as level as possible. The compressor must never be operated if it is tilted at an angle in excess of 15 degrees in any direction.

b. **Shelter.** Ensure all loose trash is removed from the area of the compressor, because refuse can be drawn into the cooling air inlets. Ensure compressor is not operated inside closed rooms or buildings. If such operation is mandatory, connect extension pipe to engine exhaust and pipe exhaust fumes outside. Also, ensure the compressor is protected from rain, wind, snow, dust, and tropical or desert sun. A temporary shelter should be provided by tarpaulins or other means. The maximum usage should be made of natural shelter such as trees, hills, and rock formations.

4-6. **Service Upon Receipt.**

a. Inspection. Perform the following after the compressor unit has been uncrated.

- (1) Inspect the unit for damage during shipment. If the equipment has been damaged, report the damage on DD Form 6, Packaging Improvement Report.
- (2) Check the equipment against the packing list to verify completeness. Report all discrepancies in accordance with DA PAM 738-750.
- (3) Check engine exhaust opening for obstruction. Normally covered with duct tape. If so, remove.
- (4) Check compressor microbic air filter opening for obstruction, normally covered with duct tape. If so, remove.
- (5) Make a thorough visual inspection of the engine and compressor for loose or missing mounting hardware or damaged or missing parts.
- (6) Check all fuel and air hoses and fittings for loose connections. Tighten any loose connections.
- (7) Check all wiring and harnesses for loose connections and terminals. Tighten any found loose.
- (8) Check Depot preservation check list for any additional inspections that may be required.

b. Preliminary Service and Adjustment.

- (1) Batteries.
 - (a) Cut nylon strapping securing battery to frame.
 - (b) Remove battery vent caps.

WARNING

Battery electrolyte contains sulfuric acid which can cause severe burns. Always dilute electrolyte with water. Never pour water into electrolyte as high temperatures will be generated and splashing of the electrolyte may result. If electrolyte comes in contact with skin or clothing, rinse immediately with clear water.

NOTE

Batteries are shipped dry charged. Electrolyte must be requisitioned separately.

- (c) Fill battery cells to the slots in filler wells with electrolyte and install the vent caps. Make sure that the vent holes in the caps are open.
- (d) Cut nylon strapping securing battery cables to frame.
- (e) Connect battery cables.
- (f) Apply an approved corrosion preventive compound to battery posts and cable terminals.

NOTE

If compressor unit is not to be operated within 12 hours, batteries must be charged.

- (g) After 30 minutes, check electrolyte levels. Add electrolyte as required.
- (2) Fuel. A preservative is normally added to the fuel in the fuel tank before shipment. The fuel tank and fuel line must be drained of this mixture.
 - (a) Remove the fuel cap from the fuel tank and look into fuel tank to determine the amount of mixture in tank.
 - (b) Obtain a container large enough to accept the fuel from the tank.
 - (c) Disconnect the fuel line at the fuel pump and let mixture drain into container.
 - (d) Reconnect fuel line, add fuel to tank (enough to fill container), disconnect fuel line from fuel pump and drain fuel into container.
 - (e) Reconnect fuel line and fill fuel tank.

- (3) Lubrication system.
 - (a) Check to see that drain plug is installed in engine crankcase.
 - (b) Check oil level in engine crankcase. Oil level should show at top mark on dipstick.
 - (c) Fill crankcase to the proper level with oil, item 14, Appendix E, if applicable.
 - (d) Check to see that drain plug is installed in compressor.
 - (e) Check oil level in compressor. Oil level should show at top indenture on dipstick.

WARNING

You must use approved compressor lubricant. Failure to do so may contaminate compressed air.

- (f) Fill compressor to proper level with oil, item 15, Appendix E, if applicable.
 - (g) Refer to Section III of this chapter to lubricate clutch throw-out collar, clutch main shaft bearing, clutch pilot bearing, and clutch lever shaft.
 - (h) Inspect engine alternator and compressor belt drive for proper tension. Adjust belt tension so that a firm push with thumb at a point midway between the two pulleys will depress the belt 0.4 - 0.6 inches.
- (4) Purification cartridges.
 - (a) Cut nylon strapping securing wooden container to frame.
 - (b) Open wooden container and remove cartridge containers.
 - (c) Remove cartridge containers.
 - (d) Have Direct Support maintenance install cartridges in purification cylinder.

Section III. LUBRICATION INSTRUCTIONS

Paragraph	Page
4-7 General	4-4
4-8 Lubrication Instruction	4-4

4-7. **General.** There is no Lubrication Order (L.O.) for the K-20-D Compressor Unit. This section includes instructions for lubricating the compressor unit. The items to be lubricated in the following will be included in the PMCS chart with the interval in hours listed and this paragraph referenced.

4-8. **Lubrication Instruction.**

a. General. Keep all lubricants in closed containers and store in a clean, dry place away from external heat. Allow no dust, dirt or other foreign materials to mix with the lubricants. Keep all lubrication equipment clean and ready for use.

b. Cleaning. Keep all external parts not requiring lubrication free of lubricants. Before lubricating the compressor unit, wipe all lubrication points free of dirt and grease. Clean all lubrication points after lubricating to prevent accumulation of foreign matter.

c. Service. (figure 4-1)

- (1) The crankcase oil level must be checked at eight hour intervals of operation or more often should oil consumption increase.
- (2) A new or reconditioned engine shall have the oil changed after 25 hours of operation. Thereafter, the interval is lengthened to 250 hours.
- (3) Before draining the engine crankcase, operate the engine until the ENGINE HEAD TEMPERATURE gage on instrument panel reaches a minimum of 110°F (46°C) to ensure suspension and drainage of particles.
- (4) Stop engine. Place container under drain plug (1) located in the center bottom of engine and remove drain plug (1) and gasket (2).
- (5) After oil has drained completely, install drain plug (1) and gasket (2).
- (6) Refer to paragraph d. below and service the oil filter.
- (7) Remove the engine oil filter cap (3).
- (8) Fill crankcase with oil to the top mark on the dipstick (4).
- (9) Operate the engine until the ENGINE HEAD TEMPERATURE gage reaches 110°F (46°C).
- (10) Stop engine, let stand for five minutes, then check oil level and add oil as necessary to bring it to the top mark on the dipstick (4).
- (11) Inspect the engine for oil leaks.

d. Oil Filter Service. (figure 4-2)

- (1) Thoroughly clean the oil filter casing and surrounding areas. Place container under oil filter drain plug (1), remove drain plug (1) and gasket (2) and let oil drain completely.
- (2) Install oil filter drain plug (1) and gasket (2).
- (3) Remove screw (3) on oil filter, remove filter bowl (4), strainer (5), and seal (6).
- (4) Wash filter bowl (4), strainer (5) and seal (6) in clean diesel fuel.
- (5) Install seal (6), strainer (5), filter bowl (4), and screw (3).

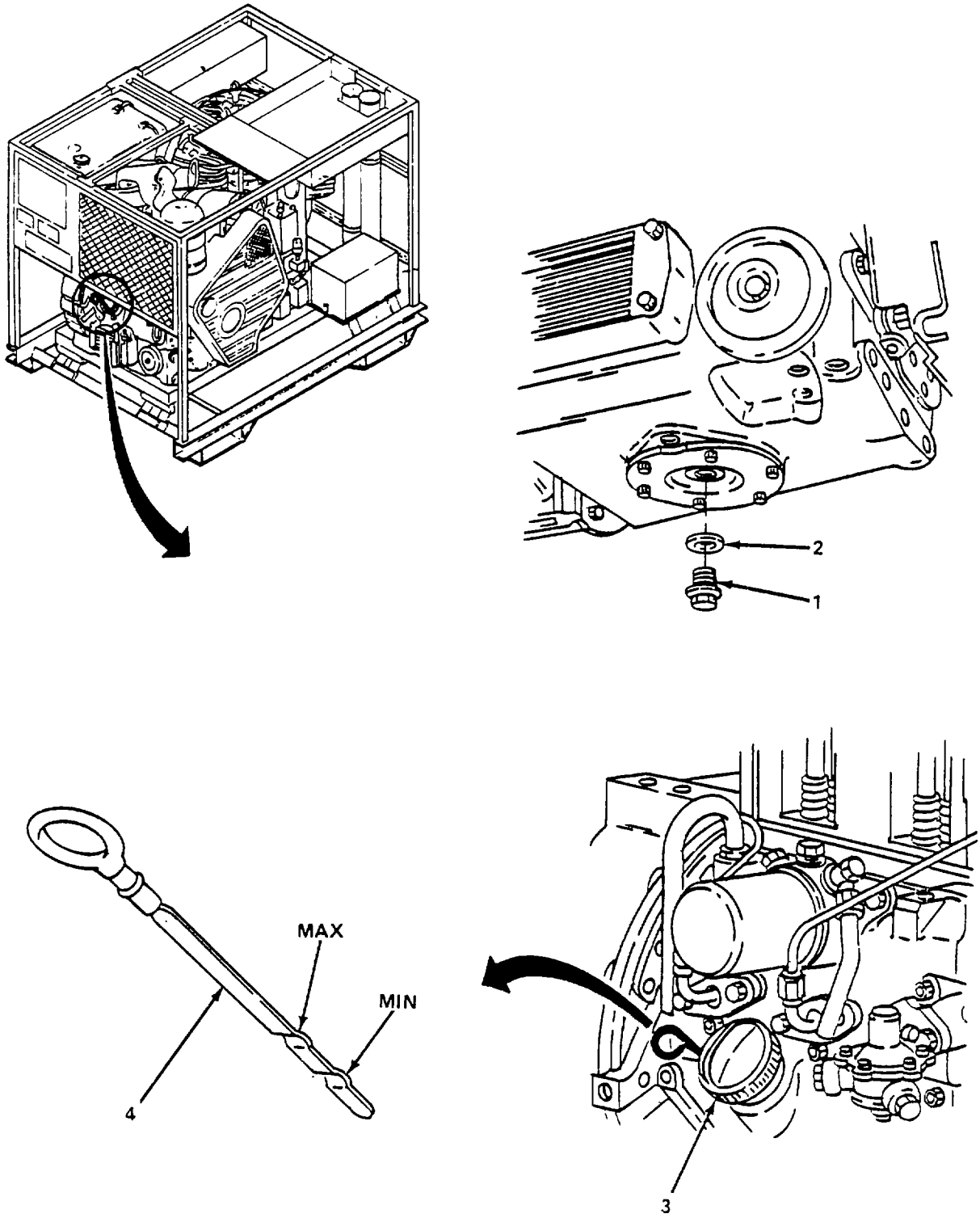


Figure 4-1. Servicing Engine.

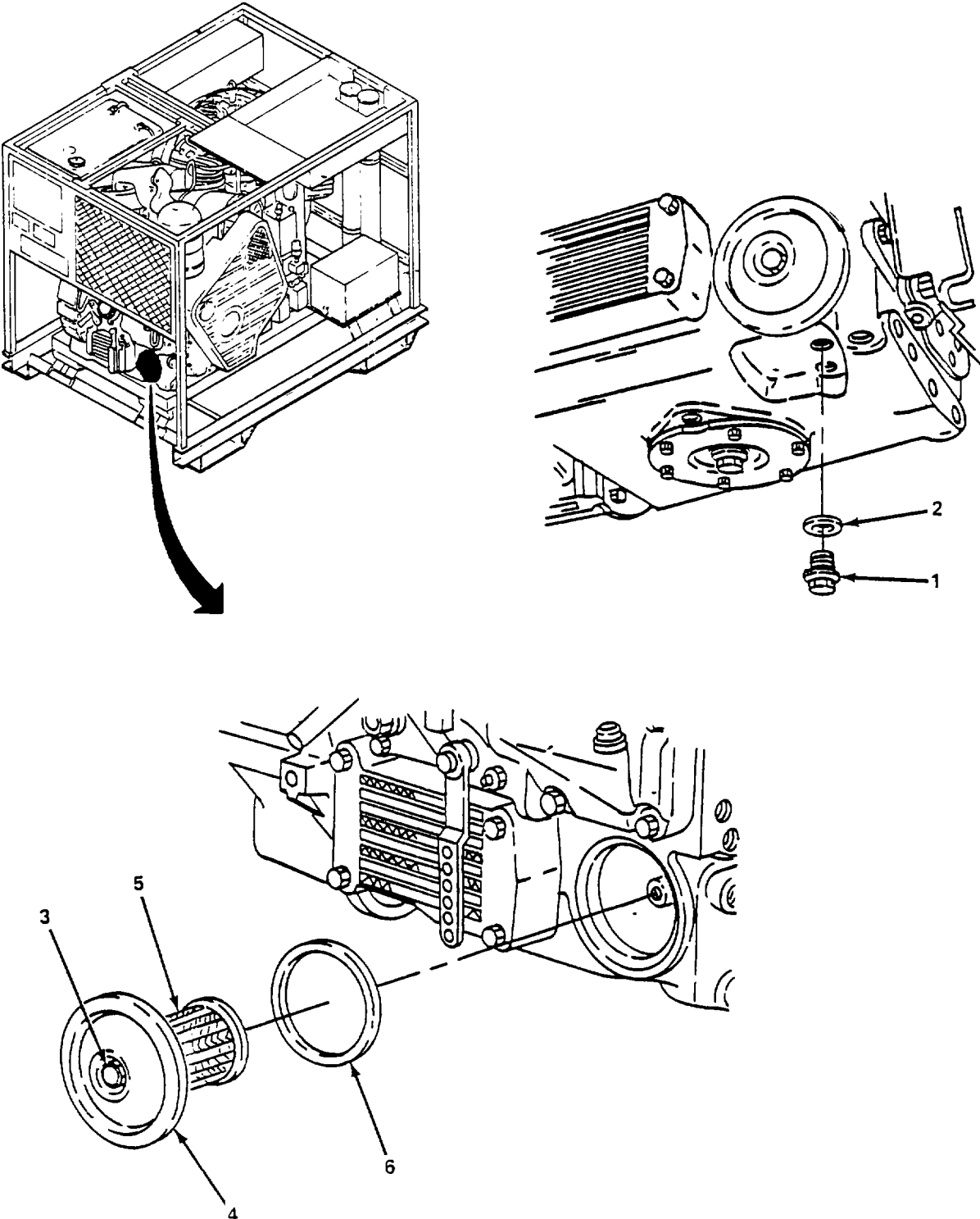


Figure 4-2. Servicing Engine Oil Filter.

e. Oil Bath Air Filter. (figure 4-3)

- (1) The oil bath air filter must be checked at 10 hour intervals of operation.
- (2) Release two clips (1) on the side of the filter housing (2).
- (3) Separate the bowl (3) and metal filter (4).
- (4) Pour engine oil out of bowl.
- (5) Clean bowl and metal filter with clean diesel fuel.
- (6) Fill bowl (3) with engine oil, item 16, Appendix E, to the oil level mark (5).
- (7) Place metal filter (4) into bowl (3).
- (8) Mate bowl (3) to filter housing (1) and secure clips.

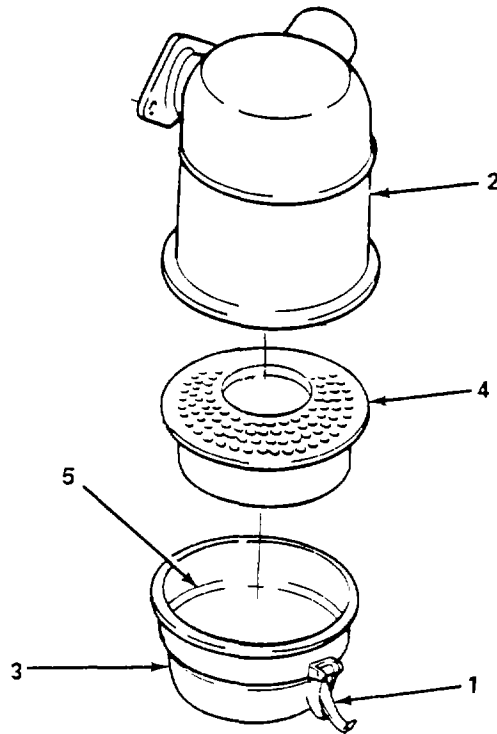


Figure 4-3. Servicing Engine Oil Bath Air Filter.

f. Compressor Oil. (figure 4-4)

- (1) The compressor oil level must be checked at eight hour intervals of operation or more often should oil consumption increase.
- (2) A new or reconditioned compressor shall have the oil changed after 25 hours of operation. Thereafter, the interval is lengthened to 250 hours.
- (3) Before draining the compressor, operate the compressor until the ENGINE HEAD TEMPERATURE gage on the instrument panel reads 110°F (46°C) to ensure suspension and drainage of particles.
- (4) Stop compressor unit, place container under drain plug (1) located on left side of compressor and remove drain plug.
- (5) After oil has drained completely, install drain plug (1).
- (6) Remove the oil filter cap (2).
- (7) Fill compressor with oil to the top indentation on dipstick (3).
- (8) Operate the compressor unit until the ENGINE HEAD TEMPERATURE reads 100°F (46°C)
- (9) To ensure proper operation of the oil pump, perform the following:
 - (a) Loosen vent screw (4) by one or two turns until oil emerges free of air bubbles. Then tighten vent screw.
 - (b) Loosen coupling (5) until bubble free oil emerges. Then tighten coupling.

g. Clutch. (figure 4-5) Remove the front panel on the compressor unit, and lubricate the following grease fittings with grease using hand operated grease gun as follows:

- (1) Remove four bolts (1), lockwashers (2), and washers (3) and remove panel (4).
- (2) Lubricate throw-out collar (5) one stroke of grease gun, every 10 hours.
- (3) Lubricate main shaft bearing (6). four strokes of grease gun, every 50 hours.
- (4) Lubricate lever shaft (7) (2 places), one stroke of grease gun, every 10 hours.
- (5) Lubricate pilot bearing (8), two strokes of grease gun, every 100 hours.
- (6) Install panel (4) and secure with four washers (3), lockwashers (2), and bolts (1).

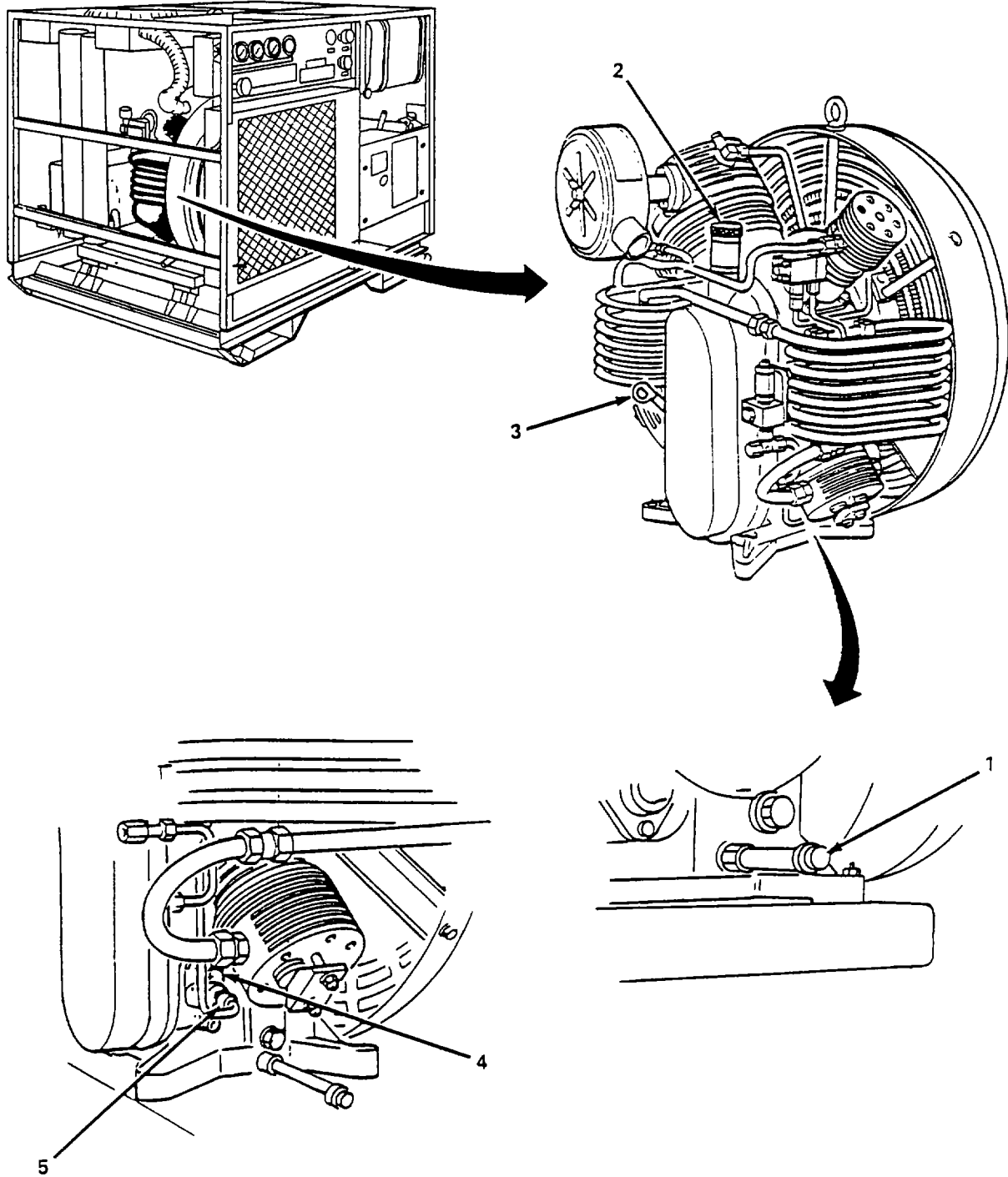


Figure 4-4. Servicing Compressor Oil.

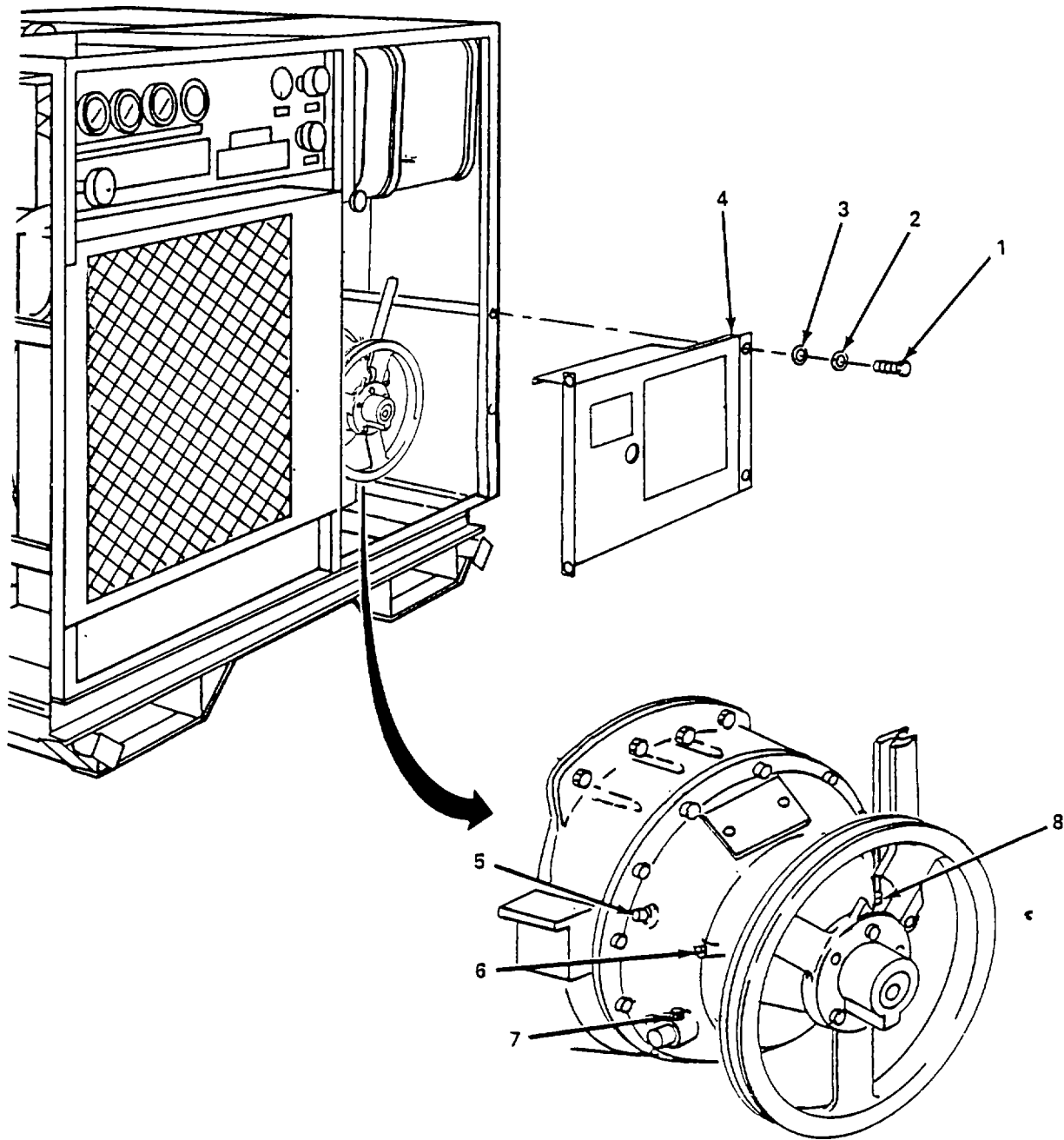


Figure 4-5. Servicing Engine Clutch.

**Section IV. UNIT PREVENTIVE MAINTENANCE CHECK
AND SERVICES (PMCS)**

Paragraph		Page
4-9	General	4-12
4-10	PMCS Intervals	4-12
4-11	PMCS Procedures	4-12

4-9. **General.** The compressor unit must be inspected and serviced to ensure that it is ready for operation at all times. Inspection will allow defects to be discovered before they result in serious equipment damage or failure. The checks and service necessary to maintain the compressor unit for proper operation are listed and described in the Preventive Maintenance Checks and Service (PMCS) table.

4-10. **PMCS Intervals.** The PMCS intervals are weekly, monthly, and hourly. The weekly and monthly intervals are to be done in calendar days. The hourly intervals are to be according to hours of operation of the compressor unit. Accurate and timely entries in the logbook must be made in order to accomplish the hourly tasks in a timely manner.

4-11. **PMCS Procedures.** Table 4-1 lists and describes operator/unit PMCS required for the compressor unit. The table consists of the following four columns:

- a. Item Number. Procedures are listed in logical order regardless of interval. The item number will be entered in the TM number column when recording PMCS results on DA Form 2404.
- b. Interval. The interval column is headed W for weekly, M for monthly and H for hourly.
- c. Items To Be Inspected. Items in this column are listed by functional group and item common name.
- d. Procedures. Information in this column contain procedures needed to accomplish the checks and services.

Table 4-1. Unit Preventive Maintenance Checks and Services (PMCS).

W - Weekly

M - Monthly

S - Semiannually

H - Hourly

Item No.	Interval				Item to be Inspected	Procedures
	W	M	S	H		
1	•				Compressor unit	Inspect for loose, damaged, or missing parts.
2	•				Compressor unit drive belt	Inspect drive belts for wear, fraying, peeling, cracking, and tension. Adjust and replace belts as needed (para. 4-20).
3		•			Air compressor Inspect	Inspect air compressor for oil leaks, cracks, loose, damaged, or missing parts.
				250	Service	Service air compressor (para. 4-21).
			•		Test	Check compressor for tag indicating last hydrostatic test. If no tag is present or date on tag is more than 1 year old, have compressor and purification cylinders tested in accordance with TB 43-0151.
4		•			Compressor air and oil lines	Inspect air and oil lines for cracks, holes, or loose fittings. Notify your supervisor of damaged parts.
5				100	Flywheel/fanwheel assembly	Inspect cooling fins for damage. Replace any items that are damaged or missing and clean flywheel/fanwheel fins (para. 4-24).
6			•		Compressor fanwheel guard	Inspect guard and notify direct support maintenance of any damage.
7				100	Air intake filter	Inspect air intake filter for cracks, loose, damaged, or missing parts. Replace damaged parts. Refer to para. 4-21.

Table 4-1. Unit Preventive Maintenance Checks and Services (PMCS).

W - Weekly

M - Monthly

S - Semiannually

H - Hourly

Item No.	Interval				Item to be Inspected	Procedures																																								
	W	M	S	H																																										
8				*	Purification cartridges	Inspect cartridges for cracks, loose, damaged, or missing parts. Notify your supervisor for cartridge replacement.																																								
					<table border="1"> <thead> <tr> <th>Temperature F°/C°</th> <th>Hours Between Replacement</th> <th>Temperature F°/C°</th> <th>Hours Between Replacement</th> </tr> </thead> <tbody> <tr> <td>122/49</td> <td>15</td> <td>68/20</td> <td>75</td> </tr> <tr> <td>115/46</td> <td>19</td> <td>65/18</td> <td>86</td> </tr> <tr> <td>110/43</td> <td>22</td> <td>60/15</td> <td>104</td> </tr> <tr> <td>105/40</td> <td>24</td> <td>55/13</td> <td>117</td> </tr> <tr> <td>100/37</td> <td>29</td> <td>50/10</td> <td>135</td> </tr> <tr> <td>95/35</td> <td>32</td> <td>45/7</td> <td>172</td> </tr> <tr> <td>80/32</td> <td>38</td> <td>40/4</td> <td>201</td> </tr> <tr> <td>75/24</td> <td>60</td> <td>35/2</td> <td>234</td> </tr> <tr> <td>70/21</td> <td>73</td> <td>32/0</td> <td>285</td> </tr> </tbody> </table>	Temperature F°/C°	Hours Between Replacement	Temperature F°/C°	Hours Between Replacement	122/49	15	68/20	75	115/46	19	65/18	86	110/43	22	60/15	104	105/40	24	55/13	117	100/37	29	50/10	135	95/35	32	45/7	172	80/32	38	40/4	201	75/24	60	35/2	234	70/21	73	32/0	285	
Temperature F°/C°	Hours Between Replacement	Temperature F°/C°	Hours Between Replacement																																											
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75/24	60	35/2	234																																											
70/21	73	32/0	285																																											
					<p>* Refer to table above for hours of operation between purification cartridge replacement. Identify the closest temperature to the temperature at which the equipment has been operated in and compare the hours of operation against the value in the table. Take in consideration all hours the equipment was operated above or below that temperature.</p>																																									
9	•				Compressor drive belt	Inspect drive belt for wear, fraying, peeling, cracking, and tension. Replace and adjust belt as needed (para. 4-25).																																								
10	•				Engine																																									
					Inspect	Inspect for cracks, loose, damaged, or missing parts.																																								
				250	Service	Service engine. Refer to para. 4-29.																																								

Table 4-1. Unit Preventive Maintenance Checks and Services (PMCS).

W - Weekly

M - Monthly

S - Semiannually

H - Hourly

Item No.	Interval				Item to be Inspected	Procedures
	W	M	S	H		
11		•			Exhaust system	Inspect for leaks, holes and cracked seams, loose or missing parts. Replace damaged parts. Refer to para. 4-39.
12				600	Intake manifold	Inspect for cracks, leakage around gasket, loose, damaged, or missing parts. Replace damaged parts. Refer to para. 4-38.
13			•		Fuel lines and fittings	Inspect for leakage, crimped tubing, fitting tightness and seal, and for damaged fitting threads. Replace damaged parts. Refer to para. 4-31.
14				250	Fuel filter assembly	Service fuel filter. Refer to para. 4-33.
15				100	Oil bath filter assembly	Service oil bath filter. Refer to para. 4-37.
16		•			Starter	Inspect for cracks, loose, damaged, or missing parts. Test starter and replace. Refer to para. 4-47.
17		•			Starting aid	Inspect starting aid for cracked brackets, loose, damaged, or missing parts. Replace damaged parts. Refer to para. 4-48.
18			•		Alternator	Inspect for cracks, loose, damaged, or missing parts. Test alternator and replace if defective. Refer to para. 4-44.
19	•				Alternator V-belt	Inspect belts for wear, fraying, peeling, cracking and tension. Adjust belt tension if belt deflection exceeds 1/2 in. (13 mm) (para. 4-41).
20			•		Wiring harness	Inspect wiring harness for frayed or burnt wires. Replace damaged parts. Refer to para. 4-43.
21		•			Battery, hold down and cables	Inspect battery and hold for loose, damaged, or missing parts. Inspect cables for cracks, or signs of burnt wires. Check electrolyte level. Add distilled water if level is low. Refer to para. 4-45.

Table 4-1. Unit Preventive Maintenance Checks and Services (PMCS).

W - Weekly

M - Monthly

S - Semiannually

H - Hourly

Item No.	Interval				Item to be Inspected	Procedures
	W	M	S	H		
22				100	Oil filter assembly	Service oil filter. Refer to para. 4-49.
23				100	Engine lube oil cooler	Inspect engine lube oil cooler for damage. Service engine lube oil cooler (para. 4-51),
24				8	Power take-off	a. Lubricate clutch release bearing (1) with all purpose grease.
				50		b. Lubricate power take-off main bearing (2) with all purpose grease.
				500		c. Lubricate clutch release levers and link pins (3).
				500		d. Lubricate clutch release shaft bearings (4) through grease fittings.

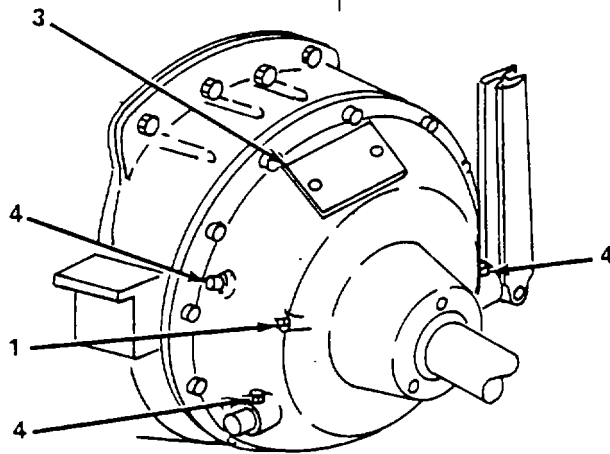


Table 4-1. Unit Preventive Maintenance Checks and Services (PMCS).

		W - Weekly		M - Monthly		S - Semiannually		H - Hourly	
Item No.	Interval				Item to be Inspected	Procedures			
	W	M	S	H					
25			*		Inner and outer frame assemblies	Inspect frame for cracks or broken welds. Notify general support maintenance of damaged parts.			
26		*			Control panel assembly	Inspect control panel for loose, damaged, or missing parts. Check that panel and gage lights are operational. Notify your supervisor for replacement of damaged or missing parts.			
27		*			Fuel tank and filler cap	Inspect fuel tank and filler cap for cracks, loose, damaged, or missing parts. Replace damaged parts. Refer to para. 4-26.			
28	*				Meters and gauges	Inspect for damaged faces, pointers, lenses, leaks, and proper operation. Replace as required. Ensure gauges are in calibration. Refer to para. 4-19.			
29	*				Switches and controls	Inspect for operation and damage. Replace as required. Refer to para. 4-19.			

Section V. UNIT TROUBLESHOOTING PROCEDURES

Paragraph	Page
4-12 General.....	4-17
4-13 Unit Troubleshooting Procedures	4-17

4-12. **General.** This section contains troubleshooting procedures to determine the probable cause of observed equipment malfunctions. Test or inspections are provided to isolate the faulty component and corrective actions are provided to eliminate the malfunction.

4-13. **Unit Troubleshooting Procedures.** Refer to symptom index to locate the troubleshooting procedures for the observed malfunction. Table 4-2 lists the common malfunctions that may occur during the operation or maintenance of the engine. Perform the tests or inspections, and the recommended corrective action in the order listed in the troubleshooting table. If the malfunction is corrected by a specific corrective action, do not continue with the remaining steps, if any, of the troubleshooting procedures. If the malfunction is not corrected by the listed corrective actions, notify your supervisor.

SYMPTOM INDEX

Symptom	Page
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2. Engine fails to start or difficult to start	4-19
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4. Engine gives poor performance	4-21
5. Engine oil pressure zero or too low	4-22
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8. Engine smokes blue	4-24
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11. Engine overheats or backfires	4-25
12. Engine stops suddenly	4-25
13. Battery undercharged (ammeter indicates constant discharge)	4-26
14. Battery overcharges	4-26
15. Battery charges at idle but discharges under load	4-26
16. Ammeter indicates discharge but battery appears charged	4-26
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18. Compressor output low	4-27
19. Low compressor oil pressure (shutdown)	4-27
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26. Compressor overheats	4-29
27. Compressor speed low	4-29

Table 4-2. Unit Troubleshooting Procedures.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

ENGINE

1. ENGINE DOES NOT TURN OVER.

Step 1. Improper starting procedure.

Follow proper starting procedure (para. 2-12).

Step 2. Check to see if battery is defective or dead.

Recharge or replace (para. 4-45).

Step 3. Check to see if cable connections of starter motor circuit are oxidized.

Replace cable connections (para. 4-45).

Step 4. Check to see if cable connections of starter motor circuit are loose.

Tighten connections (para. 4-45).

Step 5. Check to see if starter motor is defective or pinion does not engage.

Replace starter motor (para. 4-47).

Step 6. Check to see if starting aid is defective.

Replace starting aid or ensure ether reservoir is full (para. 4-48).

2. ENGINE FAILS TO START OR DIFFICULT TO START.

Step 1. Improper starting procedure.

Follow proper starting procedure (para. 2-12).

Step 2. Check to see if engine shutdown lever has been placed in operating position.

Place shutdown lever in operating position (para. 2-12).

Step 3. Check to see if the speed control lever has been placed in the starting position.

Set speed control lever to about one-quarter speed (para. 2-12).

Table 4-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
2. ENGINE FAILS TO START OR DIFFICULT TO START (Cont)		
	Step 4. Check to see if fuel tank is empty.	Fill tank as needed.
	Step 5. Check to see if there is air in the fuel system.	Air bleed the fuel system (para. 4-30).
	Step 6. Check to see if cable connections of starter motor circuits are loose.	Tighten connections (para. 4-45).
	Step 7. Check to see if wrong grade of motor oil has been used.	Change to proper viscosity oil (para. 4-29).
	Step 8. Check to see if fuel filters and/or lines are fouled.	<ul style="list-style-type: none"> a. Replace fuel filter (para. 4-33). b. Inspect fuel for contamination; clean tank (para. 4-30).
	Step 9. Check to see if starting aid is defective.	Replace starting aid or ensure either reservoir is full (para. 4-48).
3. TEMPERATURE SHUTDOWN ACTIVATES.		
	Step 1. Check to see if oil level is too low.	Fill to required level (para. 4-29)
	Step 2. Check to see if oil level is too high.	Drain to proper level (para. 4-29).
	Step 3. Check to see if blower V-belt is loose, cracked, or broken.	Replace V-belt (para. 4-40).

Table 4-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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3. TEMPERATURE SHUTDOWN ACTIVATES (Cont).

Step 4. Check to see if cooling air is heating up (heat is being recycled).

Clean cooling system of contaminants. Ambient temperature above operating parameters.

Step 5. Check to see if cooling fins are soiled.

Clean the cooling system (para. 4-42).

Step 6. Check to see if air cowling plates are loose, cracked, or missing.

Tighten or replace, as needed (para. 4-42).

Step 7. Check to see if lube oil cooler is soiled.

Clean oil cooler to ensure heat transfer to surrounding and/or flush core (para. 4-51).

Step 8. Check to see if oil bath air cleaner is contaminated.

Clean oil bath air cleaner (para. 4-37).

4. ENGINE GIVES POOR PERFORMANCE.

Step 1. Check to see if engine shutdown lever is not in the operating position.

Place shutdown lever in operating position (para. 2-12).

Step 2. Check to see if oil level is too high.

Drain to proper level (para. 4-29).

Step 3. Check to see if oil bath air cleaner is contaminated.

Clean oil bath air cleaner (para. 4-37).

Step 4. Check to see if speed control lever is not reaching full-load stop.

Free of obstruction.

Table 4-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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4. ENGINE GIVES POOR PERFORMANCE (Cont).

Step 5. Check to see if fuel filter and/or lines are fouled.

- a. Clean or replace fuel filter para. 4-33).
- b. Replace fuel lines (para. 4-31).

Step 6. Check to see if there is air in fuel system.

Air bleed the fuel system (para. 4-30).

Step 7. Check to see if fuel feed pump is defective.

Replace defective fuel feed pump (para. 4-32).

Step 8. Check to see if exhaust back pressure is excessive.

Clean cooling systems of contamination (para. 4-42).

5. ENGINE OIL PRESSURE ZERO OR TOO LOW.

Step 1. Check to see if engine is excessively inclined.

Ensure that inclination is no greater than 15 degrees in direction.

Step 2. Check to see if engine oil is too low.

Fill to proper level (para. 4-29).

Step 3. Check to see if wrong grade of motor oil is being used.

Change to proper viscosity oil.

Step 4. Check to see if lube oil cooler is soiled.

Clean exterior and flush core (para. 4-51).

Table 4-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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6. ENGINE OIL CONSUMPTION EXCESSIVE.

Step 1. Check to see if the engine is excessively inclined.

Ensure that engine is not inclined over 15 degrees.

Step 2. Check to see if oil level is too high.

Drain to proper level (para. 4-29).

Step 3. Check to see the engine is run mainly at low load.

Operate engine at rated rpm.

Step 4. Check to see if oil metering screw for rocker arm lubrication is incorrectly set.

Adjust oil metering screw. Notify Direct Support Maintenance.

Step 5. Check engine oil breather.

Clean or replace.

7. ENGINE SMOKES WHITE.

Step 1. Check to see if engine is below start limit temperature or cold start procedure has been unobserved.

Observe ambient condition.

Step 2. Check to see if starting aid is defective.

Replace defective starting aid (para. 4-48).

Step 3. Check stop lever position when starting.

Possible defective run solenoid.

Step 4. Check air in fuel system.

Bleed air from fuel system (para. 4-30).

Table 4-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

8. ENGINE SMOKES BLUE.

Step 1. Check to see if the engine is excessively inclined.

Ensure that engine is not inclined over 15 degrees.

Step 2. Check to see if oil level is too high.

Drain to proper level.

Step 3. Check to see the engine is run mainly at low load.

Operate engine at rated rpm.

9. ENGINE SMOKES BLACK.

Step 1. Check to see if oil bath air cleaner is contaminated.

Clean oil bath air cleaner (para. 4-37).

Step 2. Check to see if exhaust back pressure is excessive.

Clear exhaust system of blockage (para. 4-42).

Step 3. Check fuel return lines for clogging or crimping.

Clean, replace as necessary (para. 4-31).

10. ENGINE DOES NOT RUN SMOOTHLY.

Step 1. Check to see if engine mounts are loose.

Tighten engine mounts (para. 4-53).

Step 2. Check to see if there is air in the fuel system.

Air bleed the fuel system (para. 4-30).

Step 3. Check to see if fuel return line is clogged.

Flush return line (para. 4-35).

Table 4-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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11. ENGINE OVERHEATS OR BACKFIRES.

Step 1. Check to see if crankcase oil level is too low.

Fill to proper level.

Step 2. Check to see if belts are slipping on engine cooling fan.

Adjust (para. 4-41).

Step 3. Check to see if fuel in tank is of poor grade.

Drain. Replace.

Step 4. Check to see if cooling air ducting is dirty.

Clean cooling air ducting (para. 4-42).

NOTE

When engine stops suddenly with compressor engaged and safety bypass off, engine can be shut down by low compressor oil pressure or compressor 4th stage head temperature.

12. ENGINE STOPS SUDDENLY.

Step 1. Check to see if fuel tank is empty.

Add fuel as required.

Step 2. Check crankcase oil level.

Add oil, as required.

Step 3. Check cylinder head temperature gauge.

Let engine cool. Check air cooling ducting fins (para. 4-42).

Step 4. Restart engine and check oil pressure.

If low, notify Direct Support Maintenance.

Table 4-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

13. BATTERY UNDERCHARGED (AMMETER INDICATES CONSTANT DISCHARGE).

Step 1. Inspect for defective cables, dirty or corroded battery posts and terminals.

Clean or replace as necessary (para. 4-45).

Step 2. Check for loose or broken V-belt.

Tighten or replace V-belt (para. 4-41).

Step 3. Check for defective alternator.

Replace defective alternator (para. 4-44).

14. BATTERY OVERCHARGES.

Step 1. Check for defective wire harness.

Perform harness test (para. 4-43).

Step 2. Check for poor or inadequate ground.

Ensure clean ground contact (para. 4-45).

Step 3. Check for broken ammeter lead wire.

Clean, repair, or replace as necessary (para. 4-43).

15. BATTERY CHARGES AT IDLE BUT DISCHARGES UNDER LOAD CONDITIONS.

Step 1. Check for loose or slipping V-belts.

Adjust belt tension or replace belts as necessary (para. 4-41).

Step 2. Check for defective alternator.

Replace defective alternator (para. 4-44).

16. AMMETER SHOWS (-) UNDER MODERATE LOAD; BATTERY APPEARS CHARGED.

Check for defective alternator.

Replace defective alternator (para. 4-44).

Table 4-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
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17. COMPRESSOR WILL NOT LOAD.

Step 1. Check to see if pressure relief valve is leaking or not closing properly.

Adjust or replace. Notify Direct Support Maintenance.

Step 2. Check to see if bleed valve is open.

Close.

Step 3. Check to see if cartridges are not in purifiers.

Notify Direct Support Maintenance.

18. COMPRESSOR OUTPUT LOW.

Step 1. Check to see if air intake filter is clogged.

Clean or replace clogged air intake filter assembly (para. 4-22).

Step 2. Check to see if condensate drain valves are leaking.

Clean, tighten, and reset.

Step 3. Check to see if compressor is at rated speed.

Increase engine speed (para. 2-12).

19. LOW COMPRESSOR OIL PRESSURE (SHUTDOWN).

Step 1. Check to see if oil lines are leaking.

Repair/replace.

Step 2. Check to see if crankcase oil level is low.

Add oil as required.

Step 3. Check to see if flywheel fan cooling fins are dirty.

Clean dirty flywheel fan (para. 4-24).

Table 4-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

20. **COMPRESSED AIR HAS OILY TASTE.**

Step 1. Check to see if wrong oil is being used.

Drain and replace.

Step 2. Check to see if cartridge life has expired.

Notify Direct Support Maintenance. Replace.

NOTE

Small air bubbles are normal in sight glass when compressor is above 4500 psi.

21. **COMPRESSOR DOES NOT ATTAIN FINAL PRESSURE.**

Step 1. Check to see if final stage safety valve is opening prematurely.

Notify Direct Support Maintenance.

Step 2. Check to see if condensate drain valves or fittings are leaking.

Tighten and reseal.

22. **EXCESSIVE VIBRATION OF UNIT.**

Step 1. Check antivibration mounts for wear, looseness, or damage.

Tighten.

Step 2. Check to see if compressor or engine bolts are loose.

Tighten any loose hardware.

23. **CONDENSATE DRAIN SYSTEM NOT DRAINING (COLD WEATHER ONLY).**

Step 1. Check to see if condensate heater switch and light are on.

Step 2. Check fuse.

Replace defective fuse (para. 4-43).

Table 4-2. Unit Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
-------------	--------------------	-------------------

24. COMPRESSOR OUTPUT INSUFFICIENT.

Step 1. Check to see if air intake filter is clogged.

Replace air intake filter element (para. 4-22).

Step 2. Check engine compressor rpm.

Adjust as required.

25. SAFETY VALVES BETWEEN INDIVIDUAL STAGES RELEASING PRESSURE.

Step 1. Check intermediate stage pressure.

Notify Direct Support Maintenance.

Step 2. Check to see if valves are not closing properly.

Notify Direct Support Maintenance.

26. COMPRESSOR OVERHEATS (SHUTDOWN ACTIVITIES).

Step 1. Check to see if intake or outlet valves are not closing properly.

Notify Direct Support Maintenance.

Step 2. Check to see if there is an insufficient supply of cooling air.

Move to location which permits adequate air for cooling and observe ambient temperature for operation.

Step 3. Check to see if flywheel fan cooling fins are dirty.

Clean flywheel fan cooling fins (para. 4-24).

27. COMPRESSOR SPEED LOW.

Step 1. Check to see if drive belts have proper tension.

Adjust idler pulley (para. 4-20).

Step 2. Check to see if engine is running at rated speed.

Increase engine speed to correct RPM.

4-29/(4-30 blank)

Section VI. UNIT MAINTENANCE PROCEDURES

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4-14. **General.** This section contains unit level maintenance procedures as authorized by the maintenance allocation chart (MAC) in Appendix B of this manual.

4-15. Beltguard.

This task covers: Replace

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Equipment Condition

Compressor unit shut down (para. 2-13).

Materials/Parts

Beltguard

Replace. (figure 4-6)

- (1) Remove six bolts (1) and lockwashers (2) and remove beltguard (3).
- (2) Install beltguard (3) and secure with six bolts (1) and lockwashers (2).

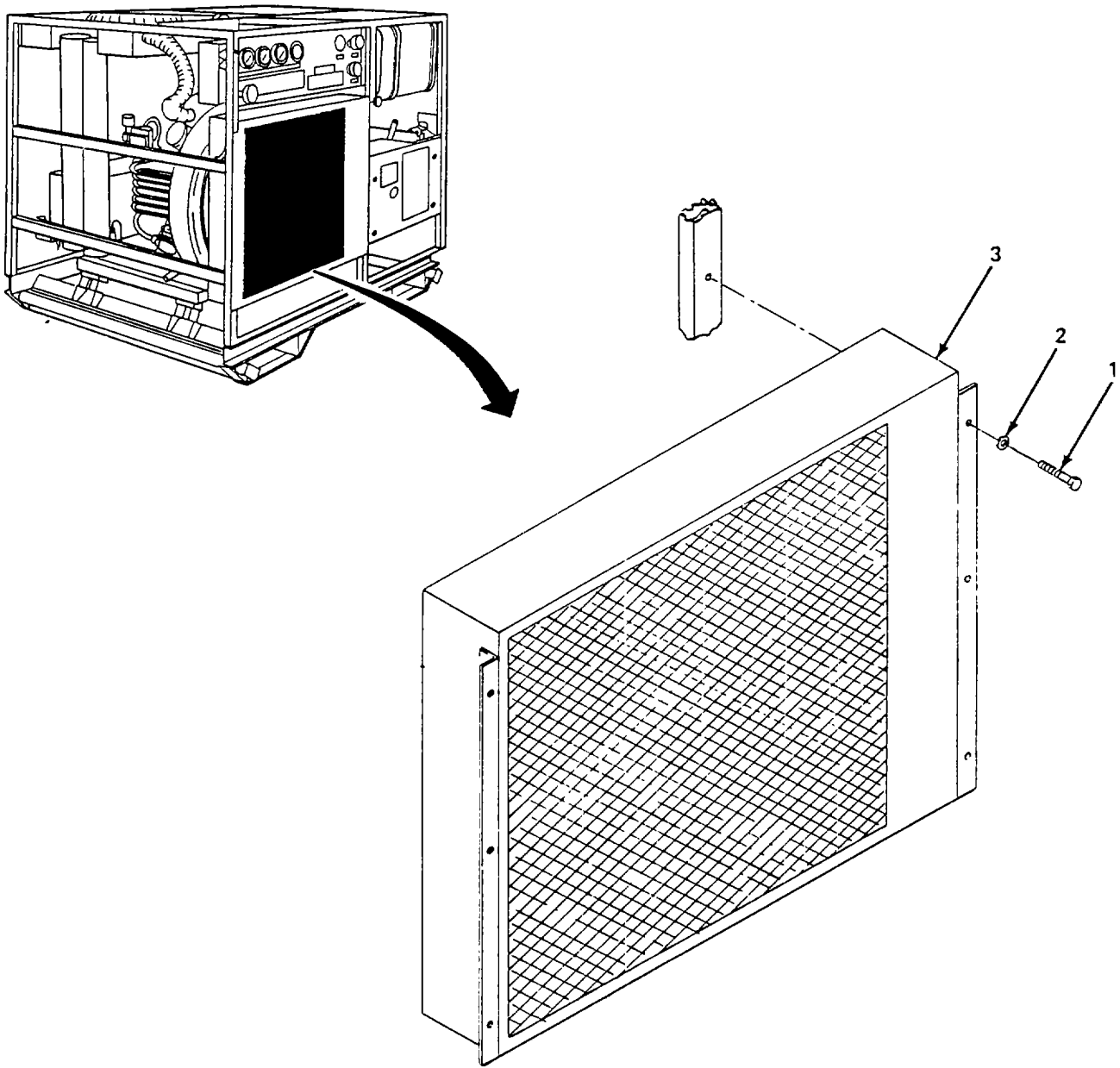


Figure 4-6. Belt Guard, Replace.

4-16. Clutch Panel.

This task covers: Replace

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Equipment Condition

Compressor unit shut down (para. 2-13).

*Materials/Parts***Clutch Panel**

Replace. (figure 4-7)

- (1) Remove four bolts (1), lockwashers (2), and washers (3) that secure clutch panel (4).
- (2) Remove clutch panel (4).
- (3) Install clutch panel (4) on frame (5) and secure with four washers (3), lockwashers (2), and bolts (1).

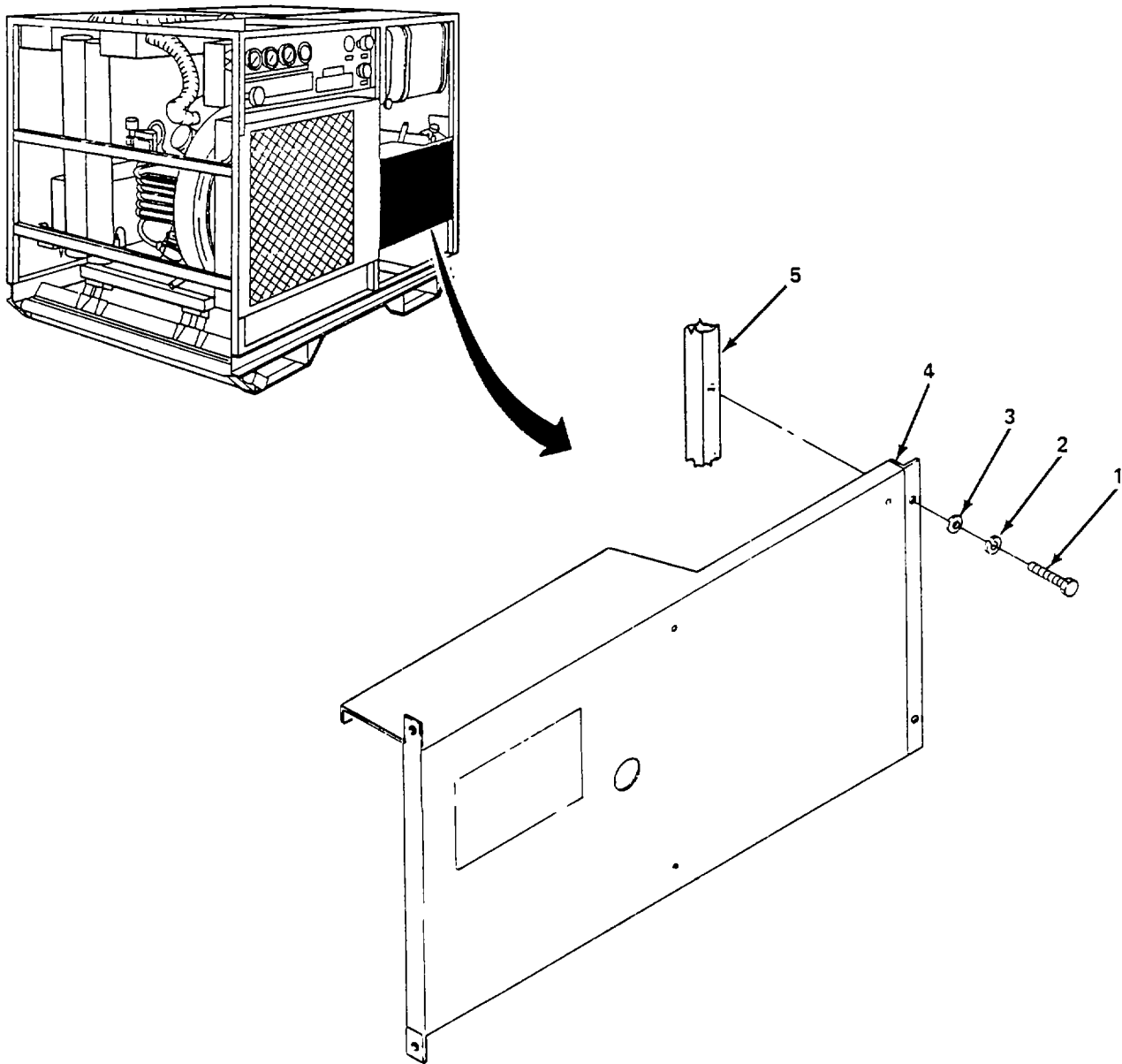


Figure 4-7. Clutch Panel, Replace.

4-17. Side Panel.

This task covers: Replace

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Equipment Condition

Compressor unit shut down (para. 2-13).

*Materials/Parts**Side Panel*

Replace. (figure 4-8)

- (1) Remove nine screws (1), lockwashers (2), washers (3), and plate (4).
- (2) Remove side panel (5) from frame (6).
- (3) Install side panel (5) and plate (4) on frame (6), and secure with nine screws (1), lockwashers (2), and washers (3).

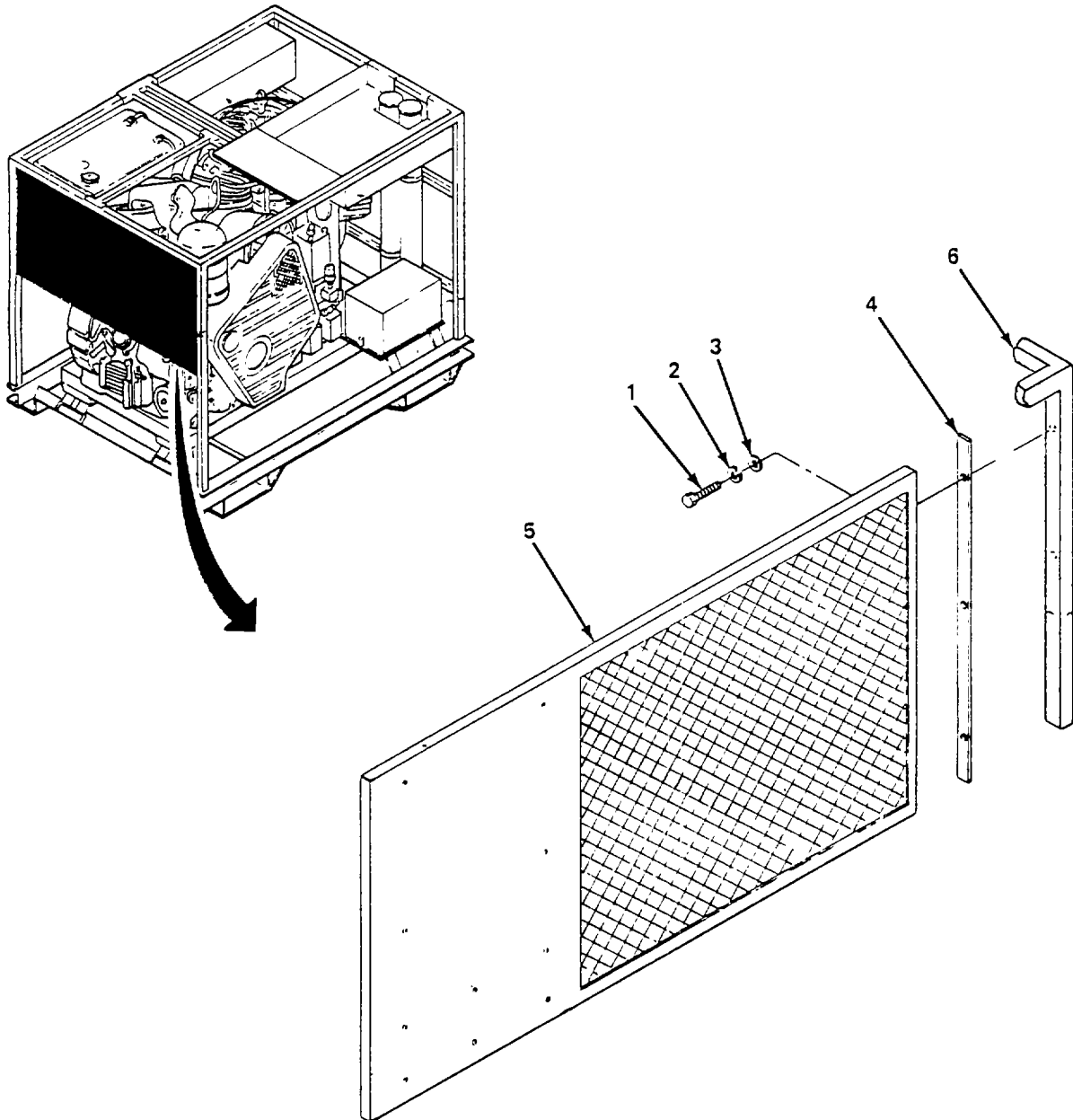


Figure 4-8. Side Panel, Replace.

4-18. Top Tray.

This task covers: Replace

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Equipment Condition

Compressor unit shut down (para. 2-13).

*Materials/Parts***Top Tray**

Replace. (figure 4-9)

- (1) Remove seven screws (1), lockwashers (2), and washers (3).
- (2) Remove top tray (4) from frame (5).
- (3) Install top tray (4) on frame (5) and secure with seven washers (3), lockwashers (2), and screws (1).

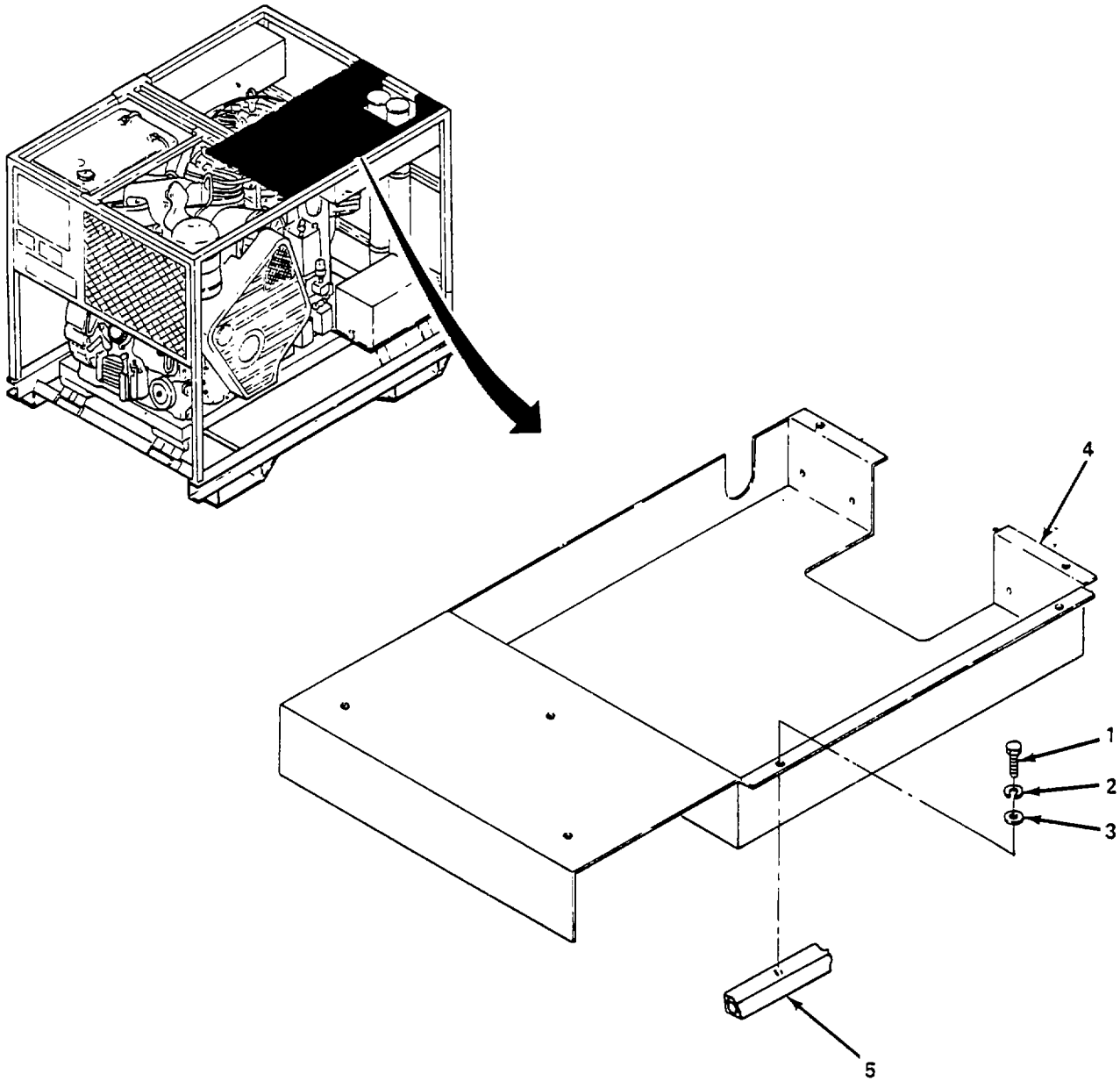


Figure 4-9. Top Tray, Replace.

4-19. Controls and Indicators.

This task covers: Replace

INITIAL SETUP
Tools

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Materials/Parts

Throttle Control
Hourmeter
Indicator Light
Switches (ON/OFF)
Relay Latch
Switch (Engine RUN/STOP)

Materials/Parts (Cont)

Start Switch
Ammeter
Engine Oil Pressure Gage
Temperature Gage

Equipment Condition

Compressor unit shut down (para. 2-13).

Replace.

- (1) Engine oil pressure gage. (figure 4-10)
 - (a) Loosen screw (1) on clamp (2) and remove hose (3).
 - (b) Remove fitting (4) from oil pressure gage (5).
 - (c) Remove nuts (6), washers (7), and tag and remove three wires (8).
 - (d) Remove nut (9), washer (10), and bracket (11).
 - (e) Remove screw (12) and nut (13) and tag and remove two wires (14).
 - (f) Remove oil pressure gage (5) from control panel (15).
 - (g) Install oil pressure gage (5), bracket (11), and secure with washer (10) and nut (9).
 - (h) Install two wires (14) and secure with nut (13) and screw (12).
 - (i) Install three wires (8), washer (7), and nut (6).
 - (j) Install fitting (4) on oil pressure gage (5).
 - (k) Install hose (3) and tighten screw (1) on clamp (2).

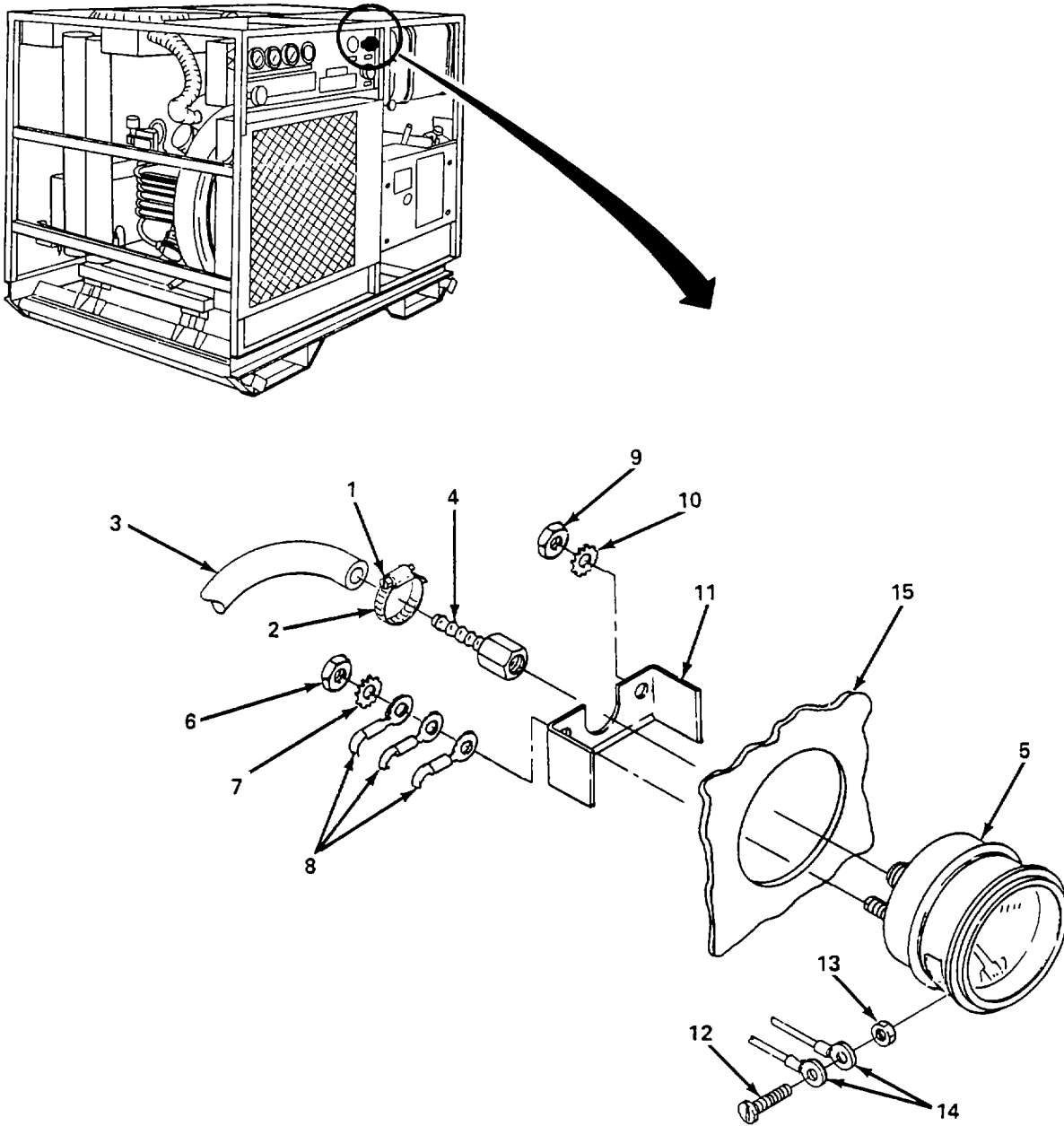


Figure 4-10. Engine Oil Pressure Gage, Replace.

4-19. Controls and Indicators (Cont).

(2) *Temperature gage.* (figure 4-11)

(a) Remove wire (1) from temperature gage (2).

(b) Remove nut (3), washer (4), and tag and remove two wires (5).

(c) Remove nut (6), washer (7), and bracket (8).

(d) Remove screw (9), nut (10), and tag and remove wire (11).

(e) Remove temperature gage (2) from control panel (12).

(f) Install temperature gage (2), bracket (8) and secure with washer (7) and nut (6).

(g) Install wire (11), nut (10), and screw (9).

(h) Install two wires (5) and secure with washer (4) and nut (3).

(i) Install wire (1) on temperature gage (2).

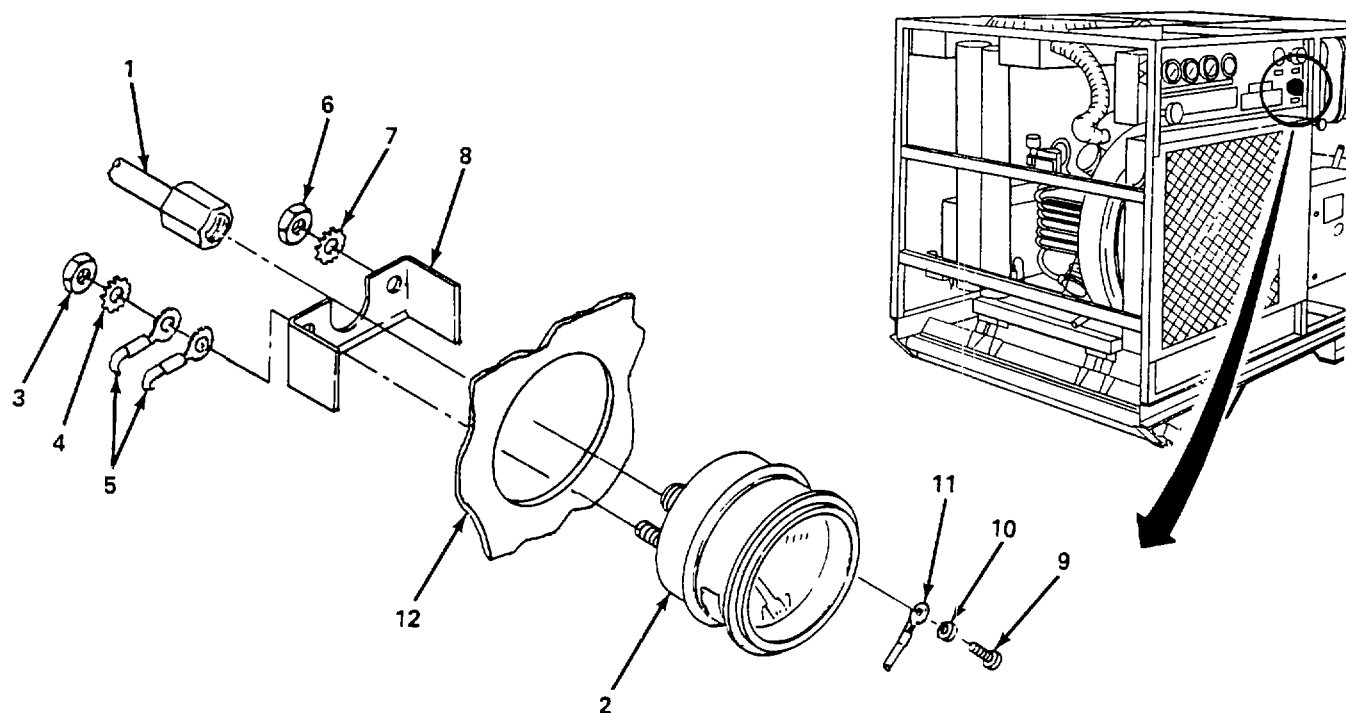


Figure 4-11. Temperature Gage, Replace.

(3) Ammeter. (figure 4-12)

- (a) Remove nut (1), washer (2), tag and remove wire (3) and nut (4).
- (b) Remove nut (5), washer (6) and tag and remove three wire (7).
- (c) Remove bracket (8) and remove ammeter (9) from control panel (10).
- (d) Install ammeter (9) and bracket (8).
- (e) Install three wires (7) and secure with washer (6) and nut (5).
- (f) Install nut (4), wire (3), and secure with washer (2) and nut (1).

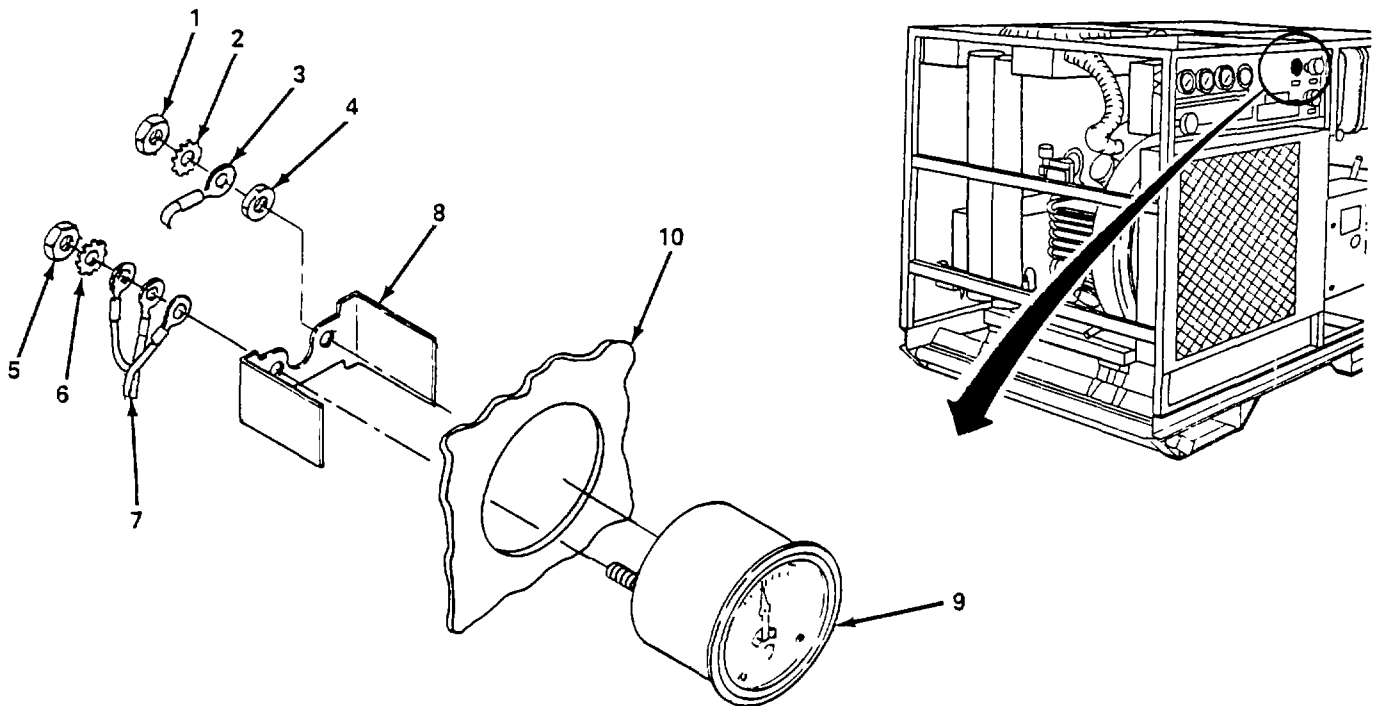


Figure 4-12. Ammeter, Replace.

4-19. Controls and Indicators (Cont).

(4) Hourmeter. (figure 4-13)

- (a) Tag and disconnect four wire (1) from meter (2).
- (b) Remove three nuts (3) and screws (4).
- (c) Remove meter (2) from control panel (5).
- (d) Install meter (2) and secure with three screws (4) and nuts (3).
- (e) Connect four wires (1) to meter (2).

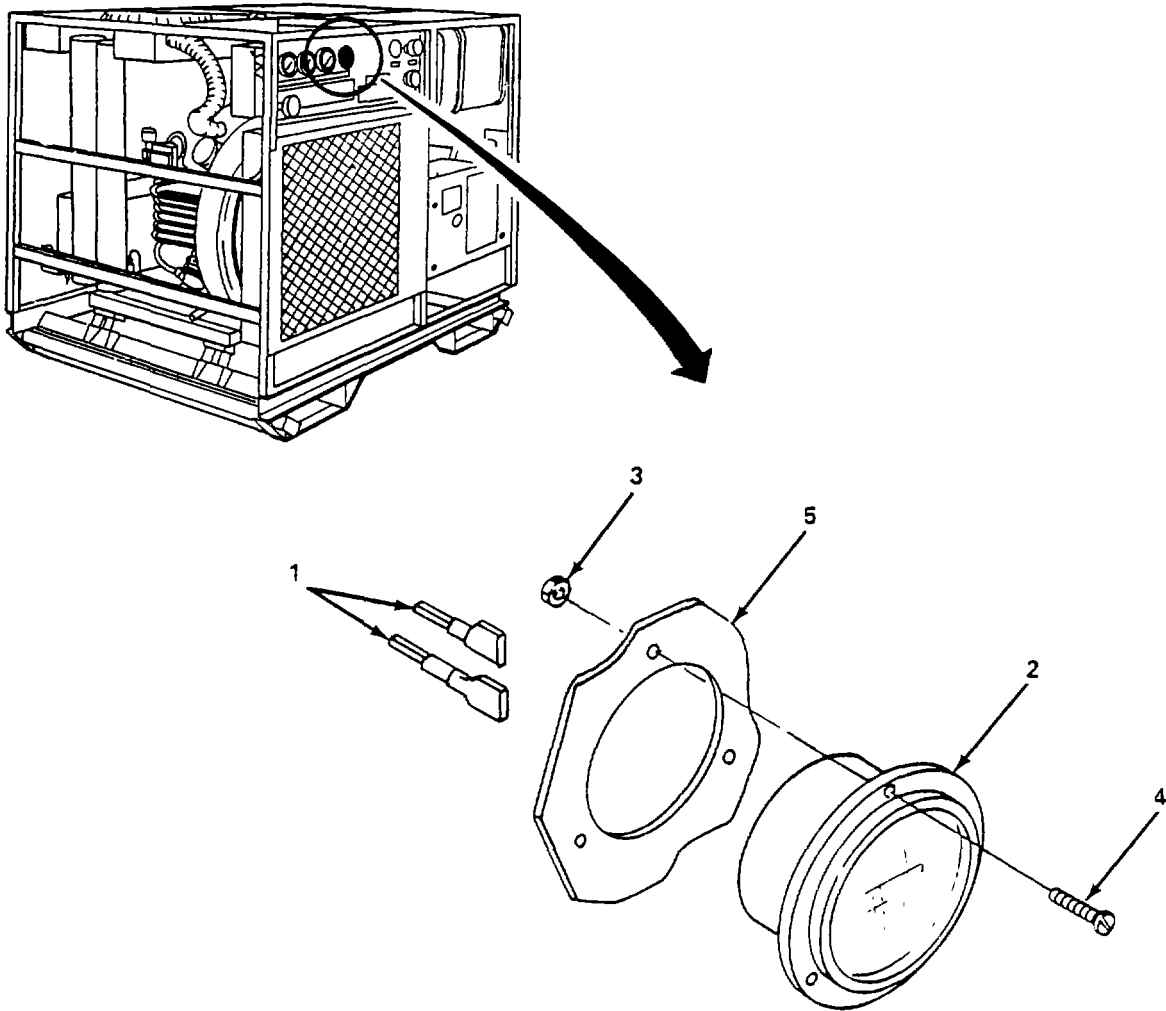


Figure 4-13. Hourmeter, Replace.

(5) *Start switch.* (figure 4-14)

- (a) Loosen three screws (1) and tag and remove five wires (2) from switch (3).
- (b) Remove key (4) and remove nut (5).
- (c) Remove switch (3) from control panel (6).
- (d) Install switch (3) and secure with nut (5).
- (e) Install key (4).
- (f) Install five wires (2) and tighten three screws (1).

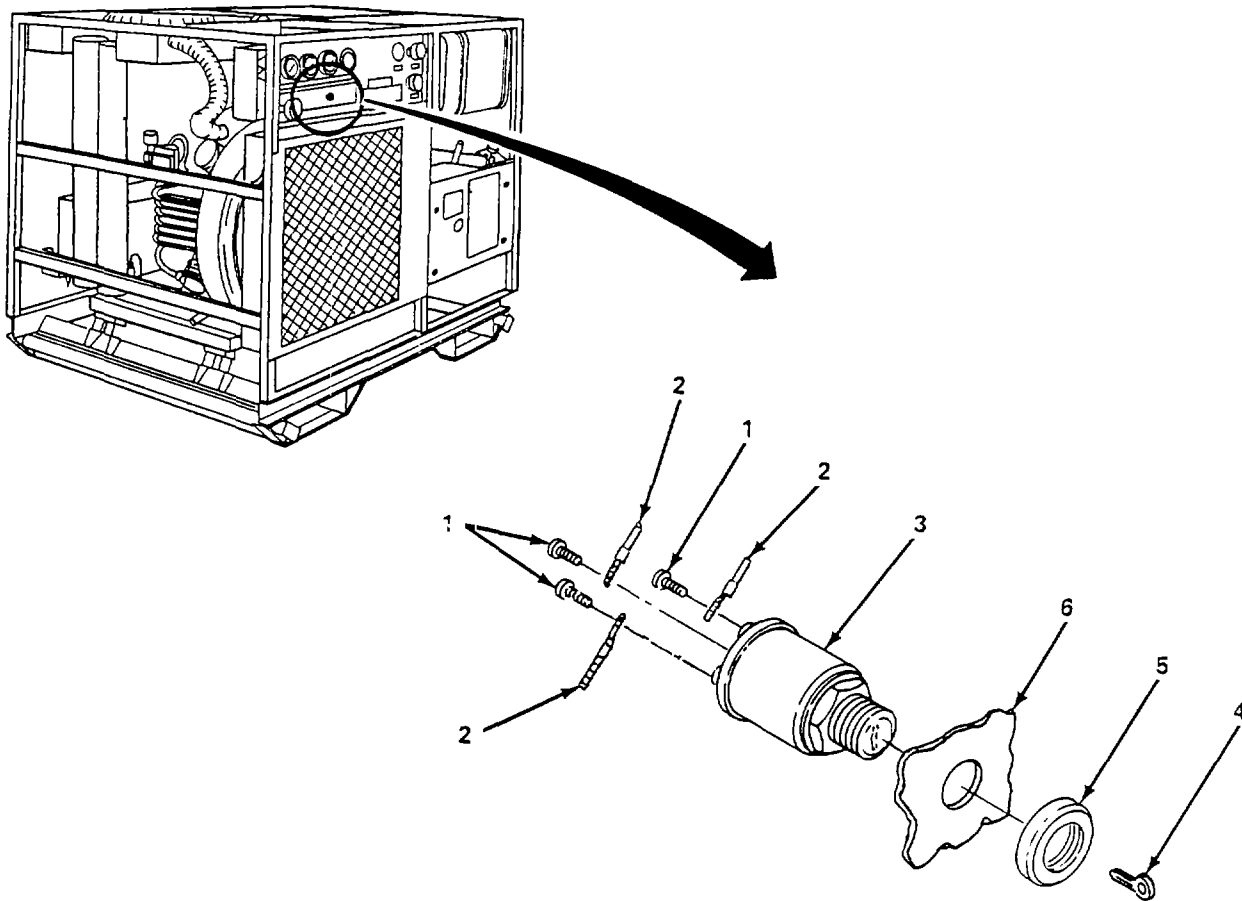


Figure 4-14. Start Switch, Replace.

4-19. Controls and Indicators (Cont).

(6) Engine RUN/STOP switch. (figure 4-15)

- (a) Loosen three screws (1) and tag and remove five wires (2) from switch (3).
- (b) Remove nut (4) and remove switch (3) from control panel (5).
- (c) Install switch (3) and secure with nut (4).
- (d) Install five wires (2) and tighten three screws (1).

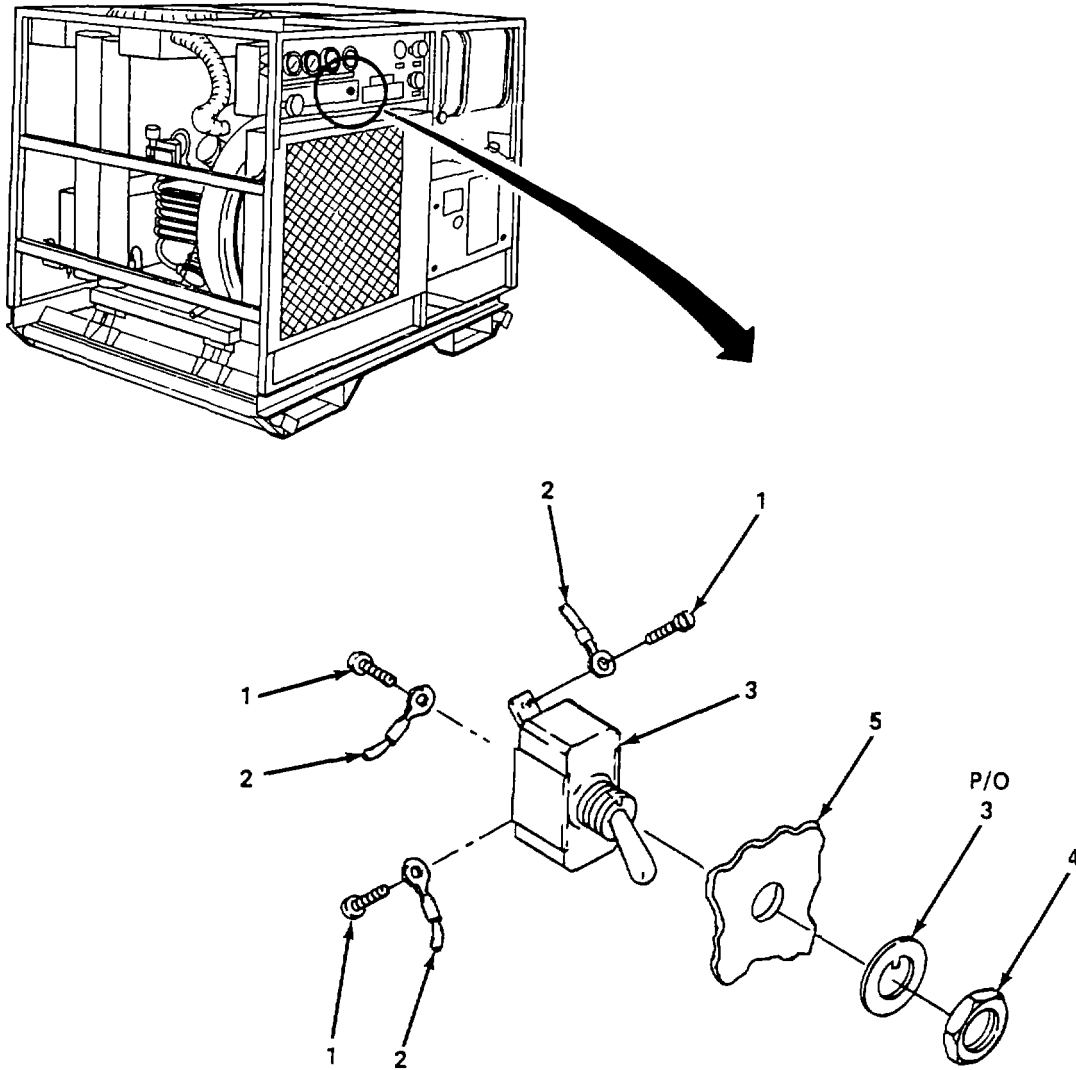


Figure 4-15. Engine RUN/STOP Switch, Replace.

(7) *Relay latch.* (figure 4-16)

- (a) Loosen three screws (1) and tag and remove three wires (2) from relay latch (3).
- (b) Remove nut (4) and remove relay latch (3) from control panel (5).
- (c) Install relay latch (3) and secure with nut (4).
- (d) Install three wires (2) and tighten three screws (1).

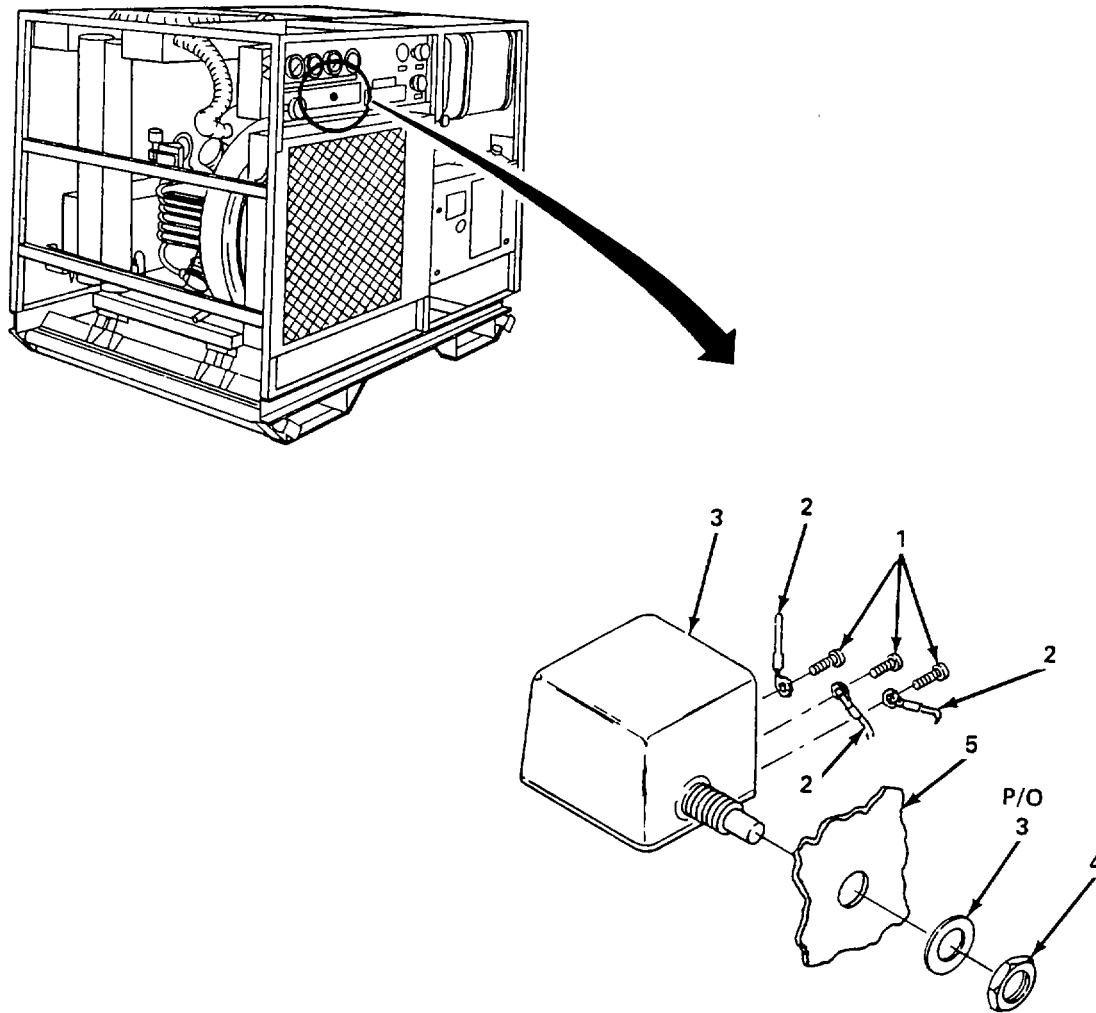


Figure 4-16. Relay Latch, Replace.

4-19. Controls and Indicators (Cont).

(8) Switches (ON/OFF). (figure 4-17)

NOTE

There are three ON/OFF switches. Replacement of each switch is the same.

- (a) Loosen two screws (1) and tag and remove three wires (2) from switch (3).
- (b) Remove nut (4) and remove switch (3) from control panel (5).
- (c) Install switch (3) and secure with nut (4).
- (d) Install two wires (2) and tighten two screws (1).

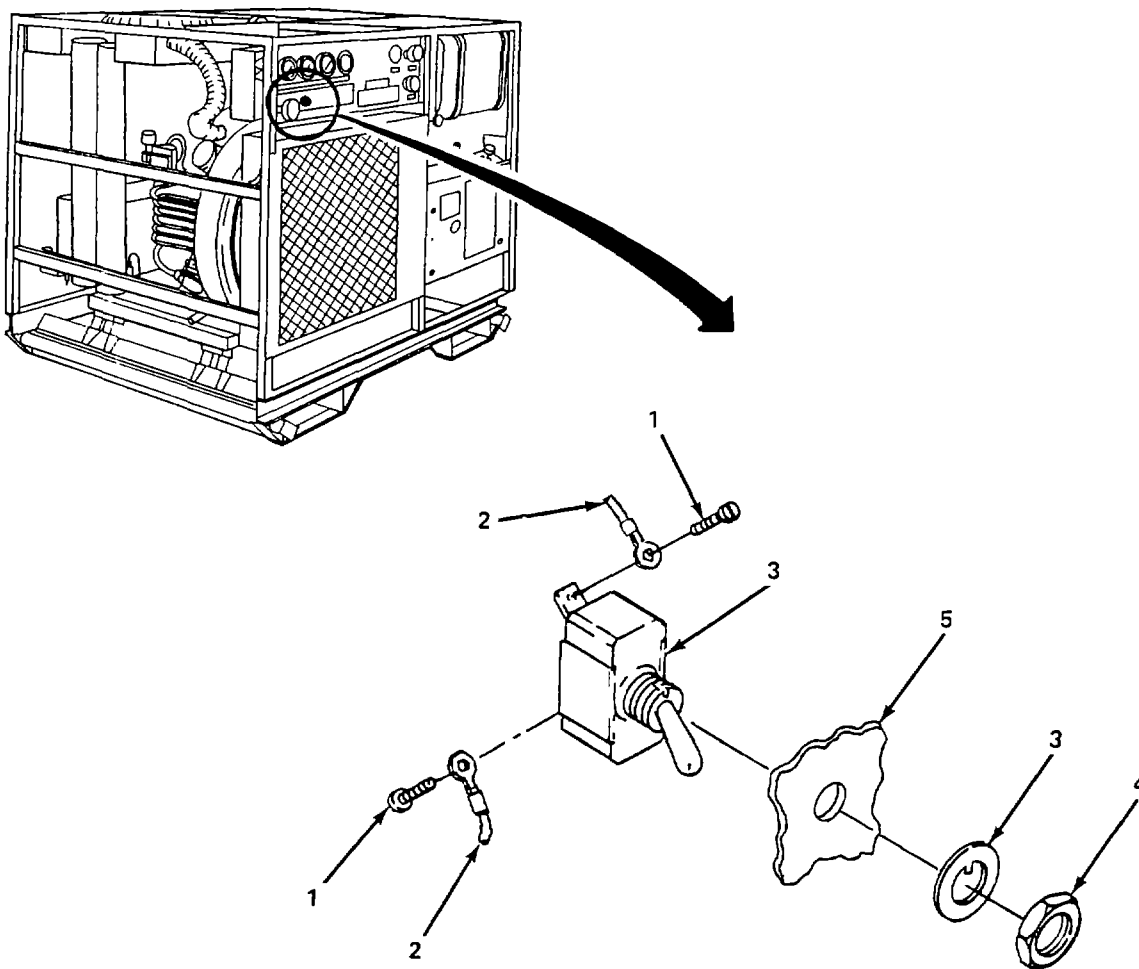


Figure 4-17. Switches (ON/OFF), Replace.

(9) *Indicator light.* (figure 4-18)

- (a) Tag and disconnect two wires (1) from indicator light (2).
- (b) Remove nut (3) and remove indicator light (2) from control panel (4).
- (c) Install indicator light (2) and secure with nut (3).
- (d) Connect two wires (1) on indicator light (2).

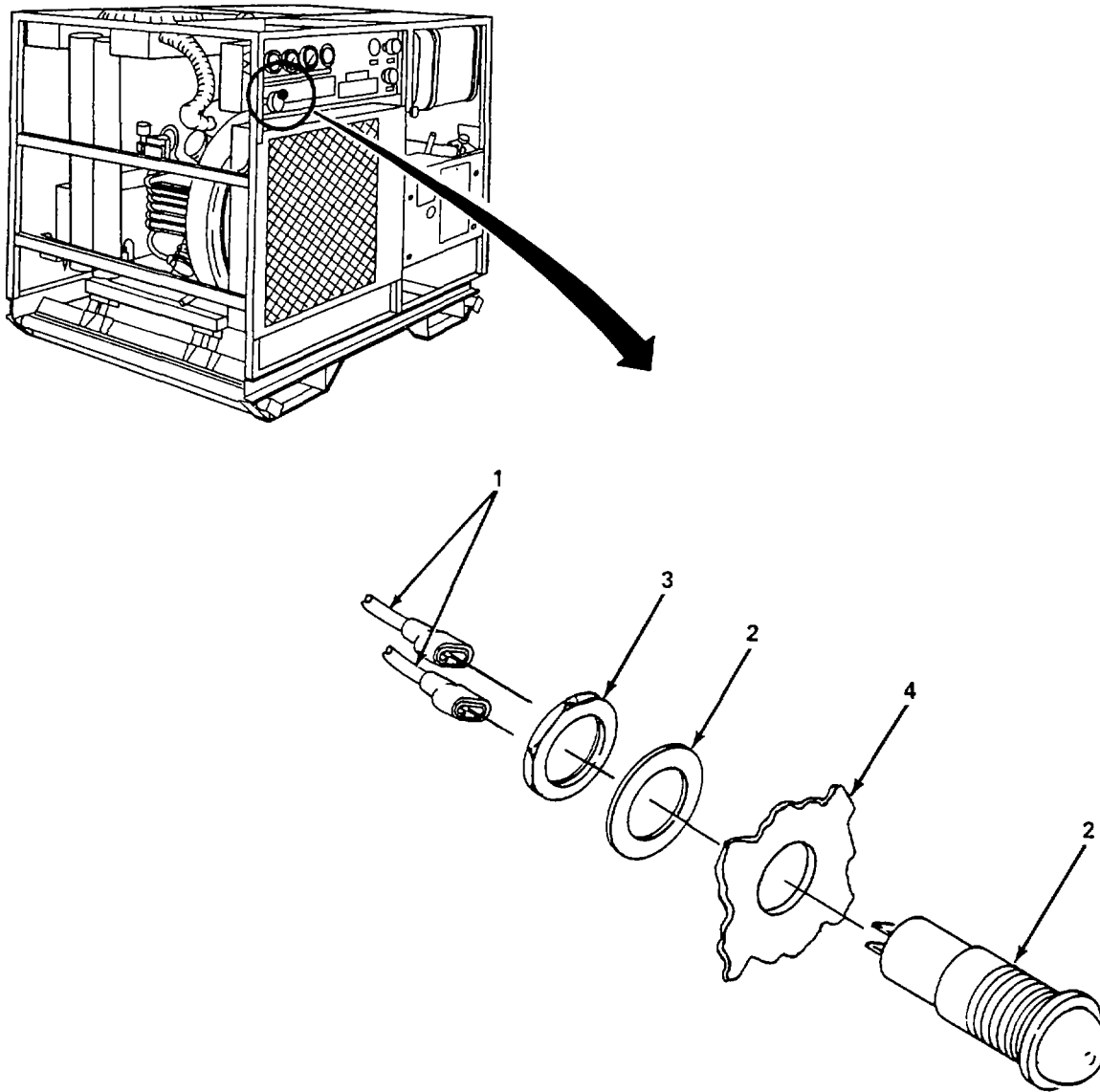


Figure 4-18. Indicator Light, Replace.

4-19. Controls and Indicators (Cont).

(10) *Throttle control.* (figure 4-19)

- (a) Loosen two nuts (1) and remove end fitting (2) from lever (3).
- (b) Remove nut (4) and washer (5).
- (c) Remove throttle cable (6) from bracket (7) and from throttle control (8).
- (d) Remove nut (9) and lockwashers (10) and remove throttle control (8) from bracket (11).
- (e) Install throttle control (8) and secure with lockwasher (10) and nut (9).
- (f) Install throttle cable (6) on throttle control (8) and through bracket (7).
- (g) Install washer (5) and nut (4).
- (h) Install end fitting (2) in lever (3) and tighten two nuts (1).

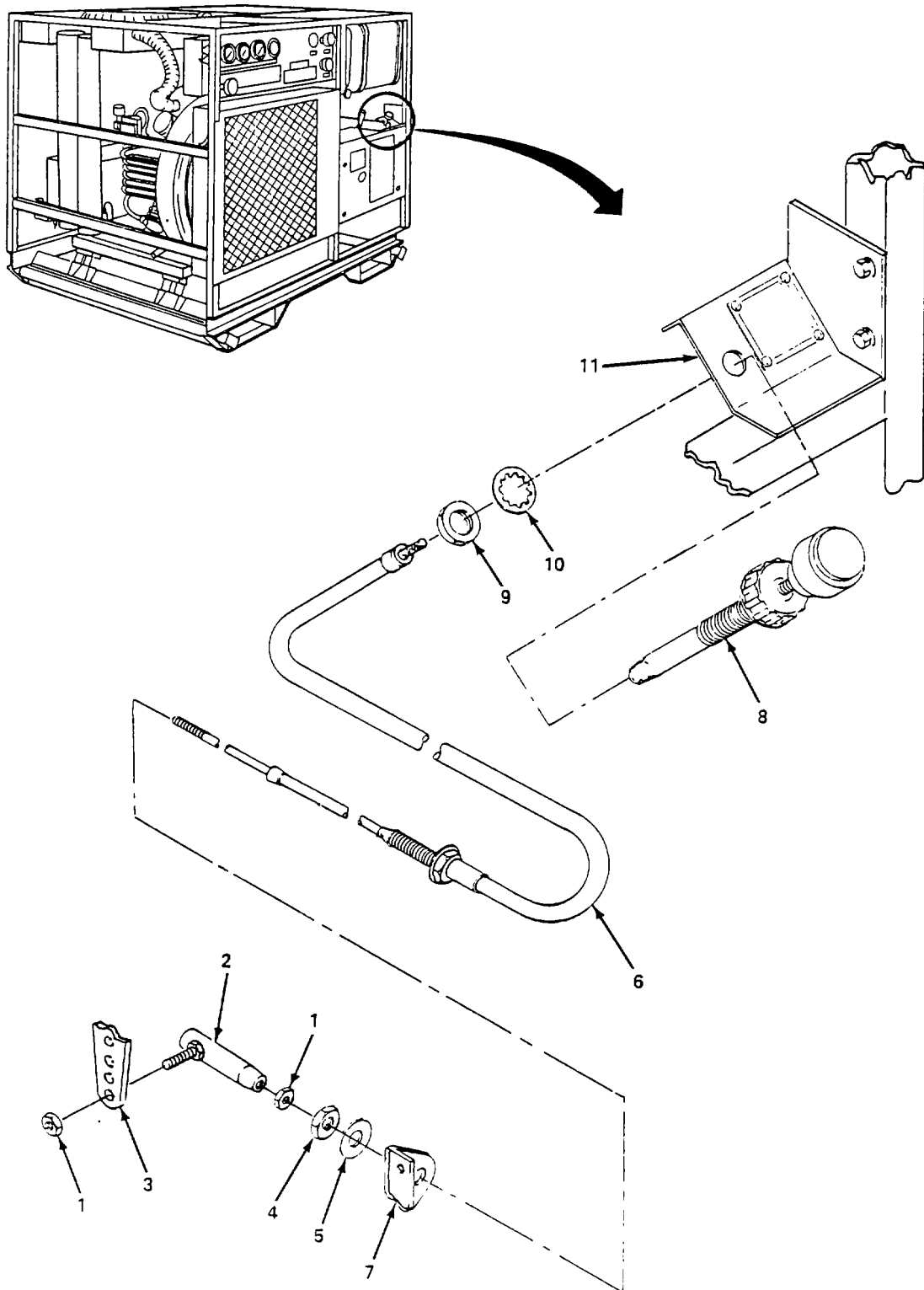


Figure 4-19. Throttle Control, Replace.

4-19. Controls and Indicators (Cont).

(11) Solenoid. (figure 4-20)

- (a) Remove nut (1), washer (2), and tag and remove two wires (3).
- (b) Remove nut (4), washer (5), and tag and remove wire (6).
- (c) Remove nut (7), washer (8), and tag and remove two wires (9).
- (d) Remove nut (10), washer (11), and tag and remove wire (12).
- (e) Remove two nuts (13), washers (14), and bolts (15).
- (f) Remove solenoid (16) from control panel (17).
- (g) Install solenoid (16) in control panel (17) and secure with two bolt (15), washers (14), and nuts (13).
- (h) Install wire (12) and secure with washer (11) and nut (10).
- (i) Install two wires (9) and secure with washer (8) and nut (7).
- (j) Install wire (6) and secure with washer (5) and nut (4).
- (k) Install two wires (3) and secure with washer (2) and nut (1).

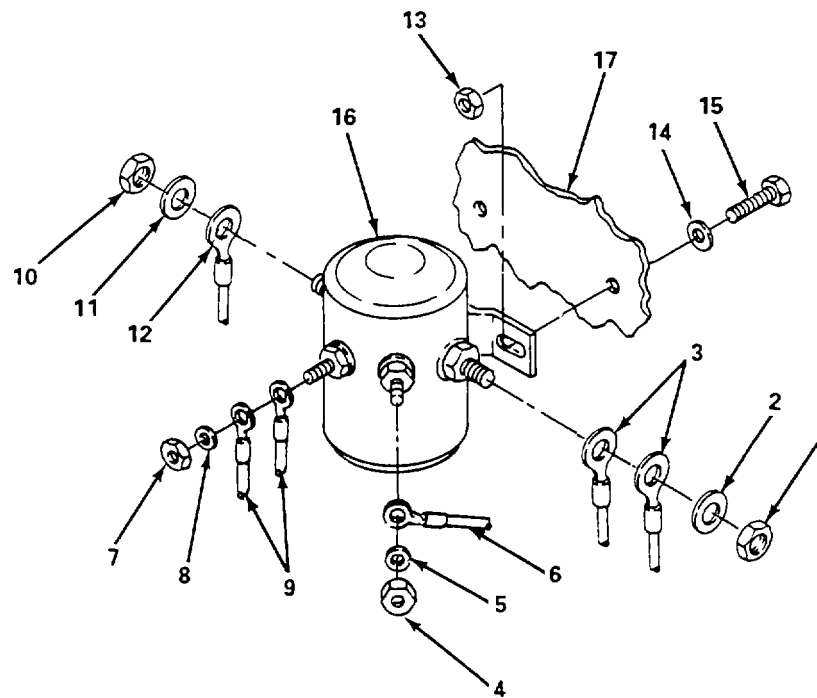
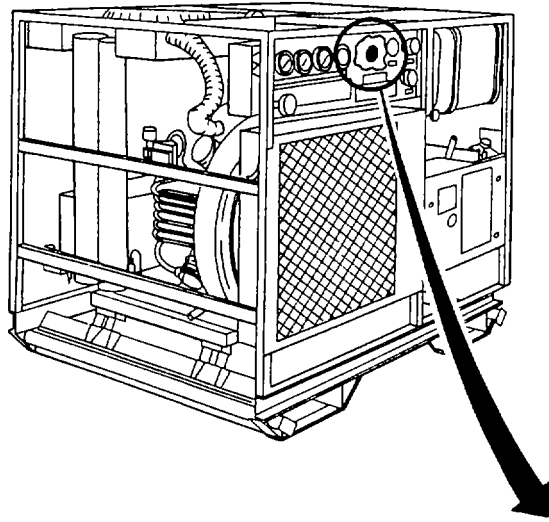


Figure 4-20. Solenoid, Replace.

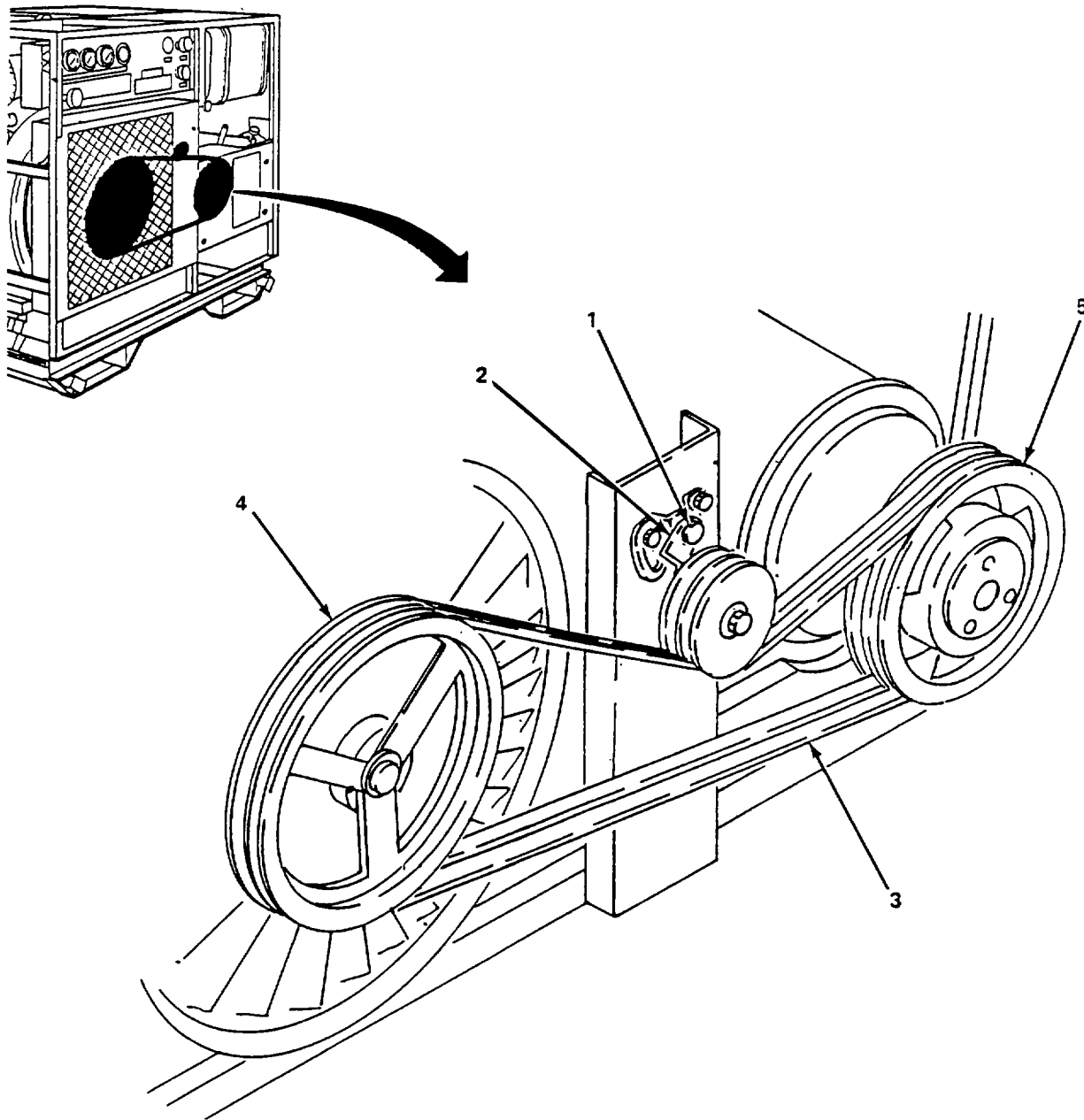


Figure 4-21. Compressor Drive Belt and Pulleys, Adjust.

4-20. Compressor Drive Belt and Pulleys (Cont).

- b. Replace. (figure 4-22).

NOTE

When only one belt is stretched, worn, or damaged, always replace both belts.

- (1) Loosen bolt (1) on idler pulley control arm (2).
- (2) Pull idler pulley control arm (2) up.
- (3) Remove drive belts (3) and discard.
- (4) Remove bolt (1) and idler pulley (4) and pulley control arm (2).
- (5) Remove two nuts (5), four washers (6) and bolts (7) and remove arm (8).
- (6) Remove three bolts (9) and washers (10) and remove pulley (11).
- (7) Install pulley (11) and secure with three washers (10) and bolts (9).
- (8) Install arm (8) and secure with two bolts (7), four washers (6) and two nuts (5).
- (9) Install idler pulley (4) and control arm (2) and hand tighten bolt (1).
- (10) Install belts (3) on compressor pulley (12) and engine pulley (11) and under idler pulley.
- (11) Push down on idler pulley control arm (2) until slack is removed from belts (3).
- (12) Tighten bolt (1).
- (13) Run compressor unit for 15 minutes and recheck belt tension.

FOLLOW-ON MAINTENANCE
Install beltguard (para. 4-15).

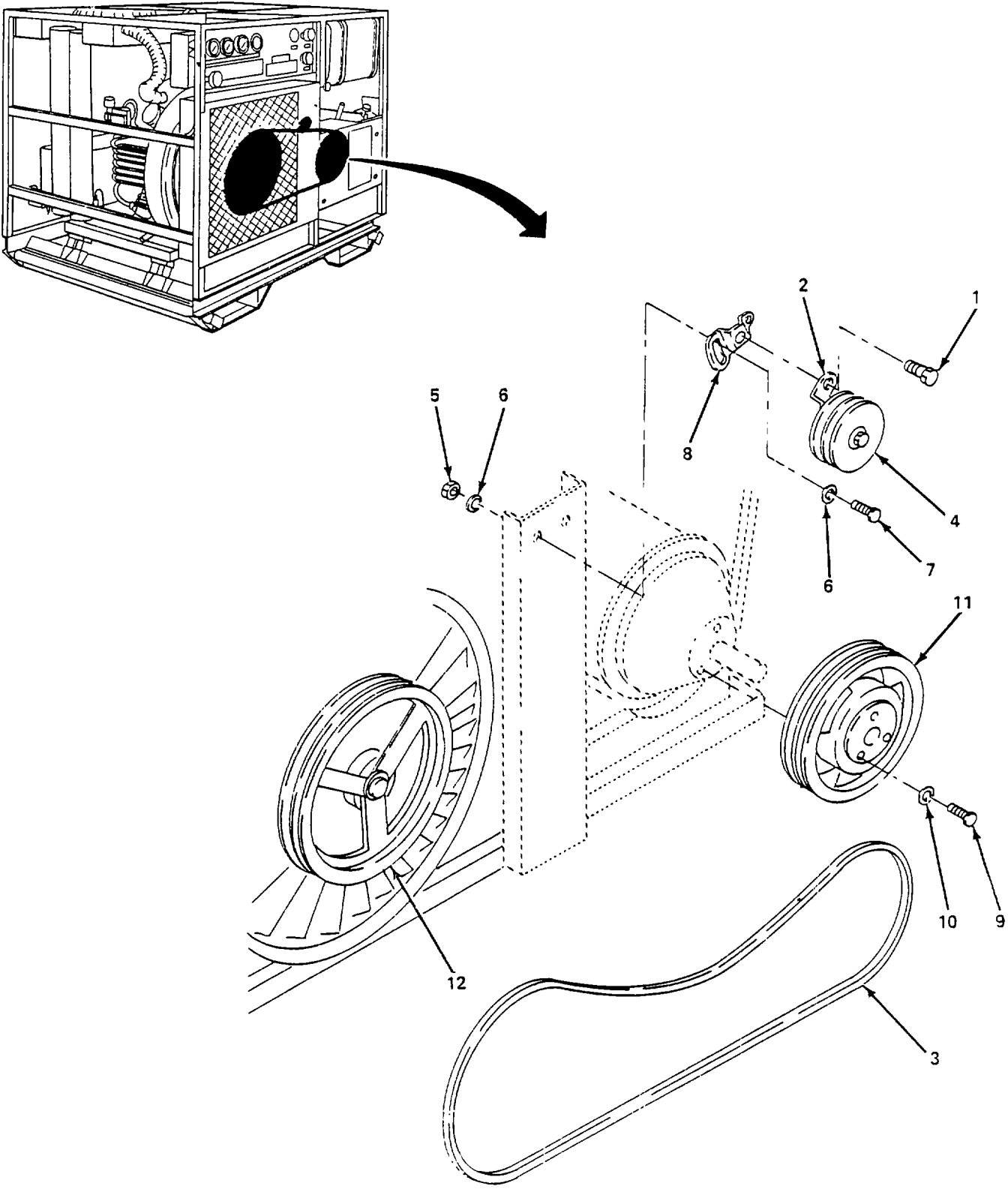


Figure 4-22. Compressor Drive Belt and Pulley, Replace.

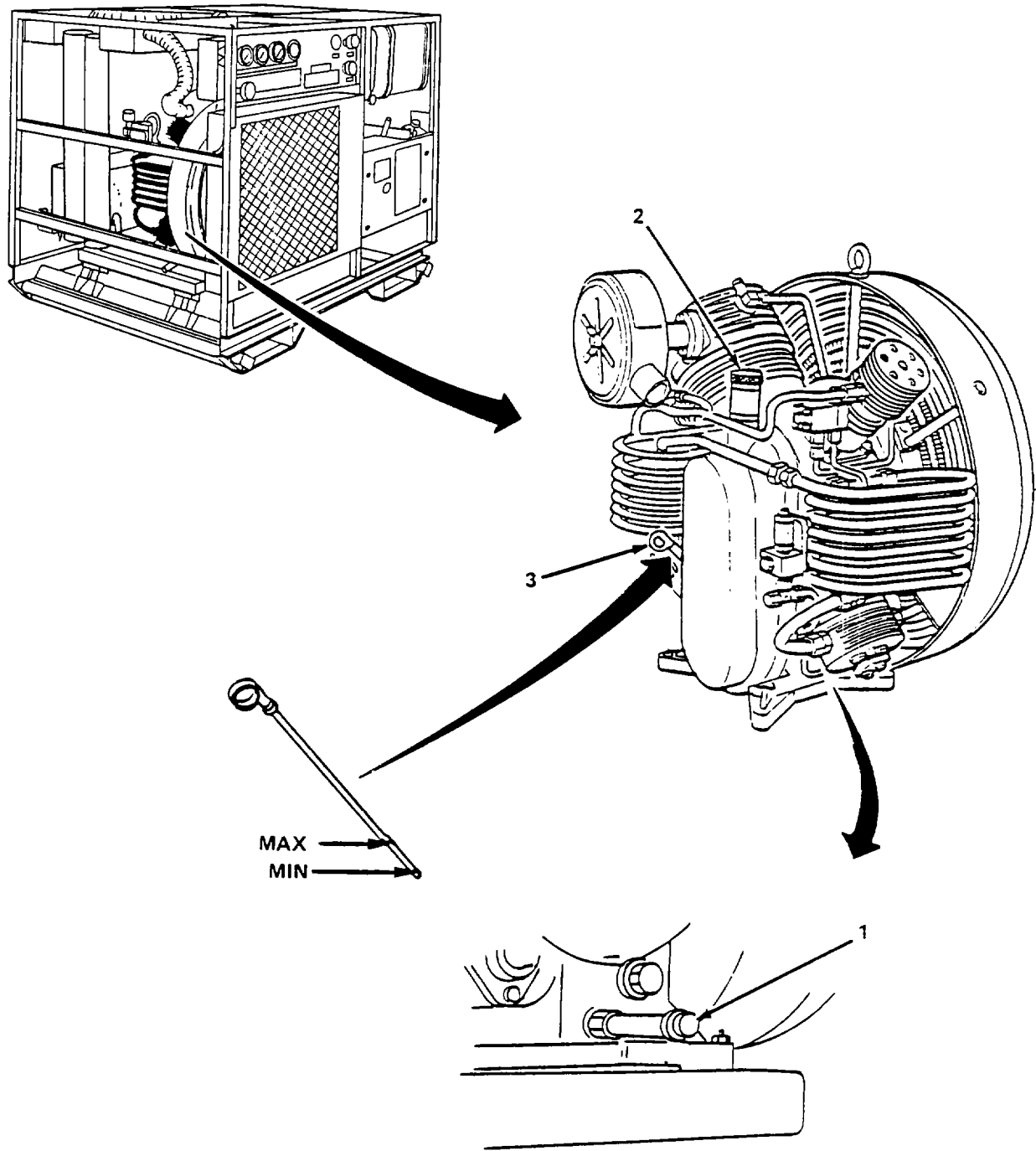


Figure 4-23. Air Compressor Assembly, Service (Oil Change).

4-21. **Air Compressor Assembly (Cont).**

- (2) Intercoolers. (figure 4-24)
 - (a) Remove six screws (1) and washers (2) and remove beltguard (3).
 - (b) Remove eye bolt (4) and washer (5).
 - (c) Remove four bolts (6) and washers (7) and remove fanwheel guard (8).
 - (d) Clean intercoolers (9) of all dirt.
 - (e) Install fanwheel guard (8) and secure with four washers (7) and bolts (6).
 - (f) Install washer (5) and eye bolt (4).
 - (g) Install beltguard (3) and secure with six washers (2) and screws (1).

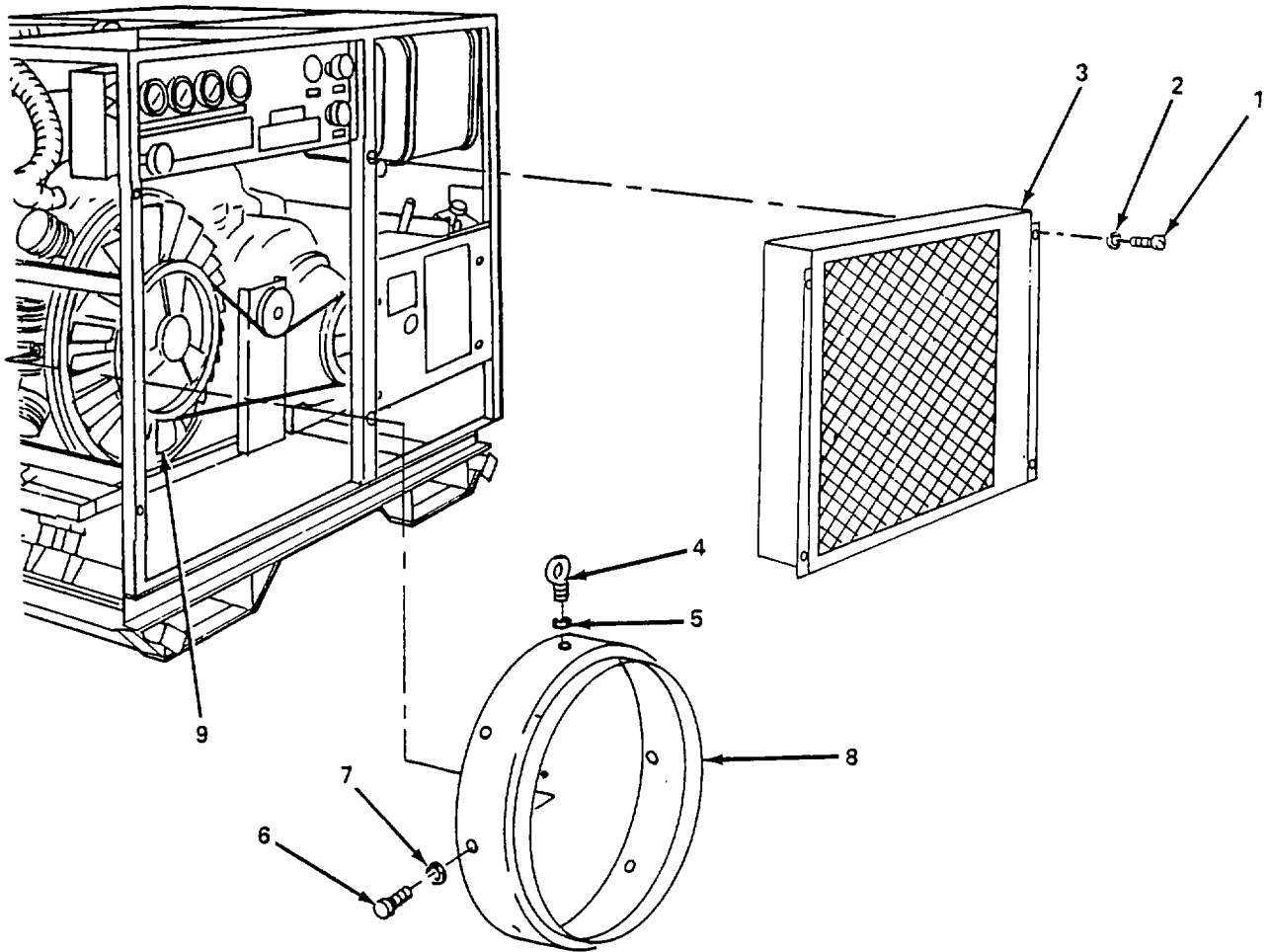


Figure 4-24. Air Compressor Assembly, Service (Intercooler).

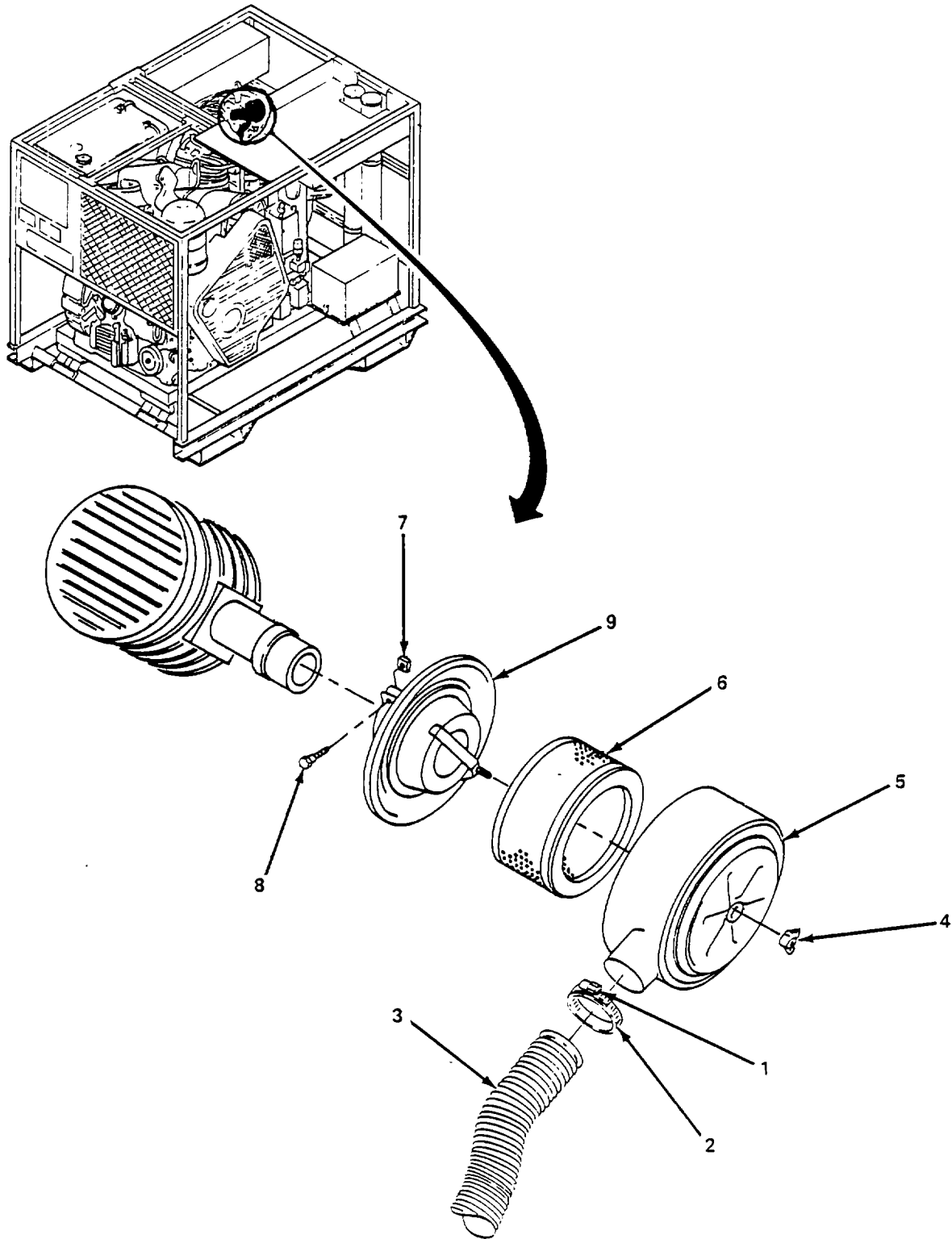


Figure 4-25. Compressor Air Intake Filter Assembly, Replace.

4-23. Compressor Fanwheel Guard

This task covers:

- a. Replace
-

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Materials/Parts

Fanwheel Guard

Equipment Condition

Compressor unit shut down (para. 2-13).
Beltguard removed (para. 4-15).
Compressor drive belts removed (para. 4-20).

Replace. (figure 4-26)

- (1) Remove eye fitting (1) and washer (2).
- (2) Remove four hex screws (3) and washers (4) from fanwheel guard (5).
- (3) Remove fanwheel guard (5) from compressor (6).
- (4) Install fanwheel guard (5) on compressor (6) and secure with four hex screws (3) and washer (4).
- (5) Install eye fitting (1) and washer (2).

FOLLOW-ON MAINTENANCE

- (1) Install compressor driver belts (para. 4-20).
- (2) Install beltguard (para. 4-15).

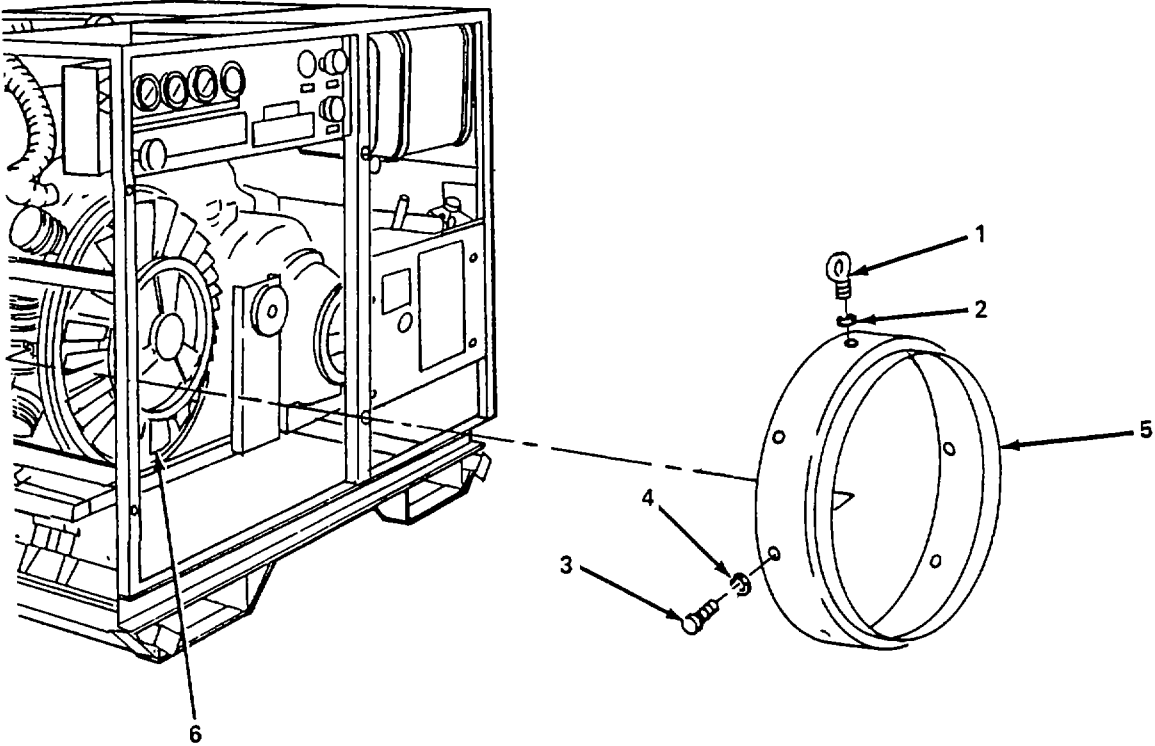


Figure 4-26. Compressor Fanwheel Guard, Replace.

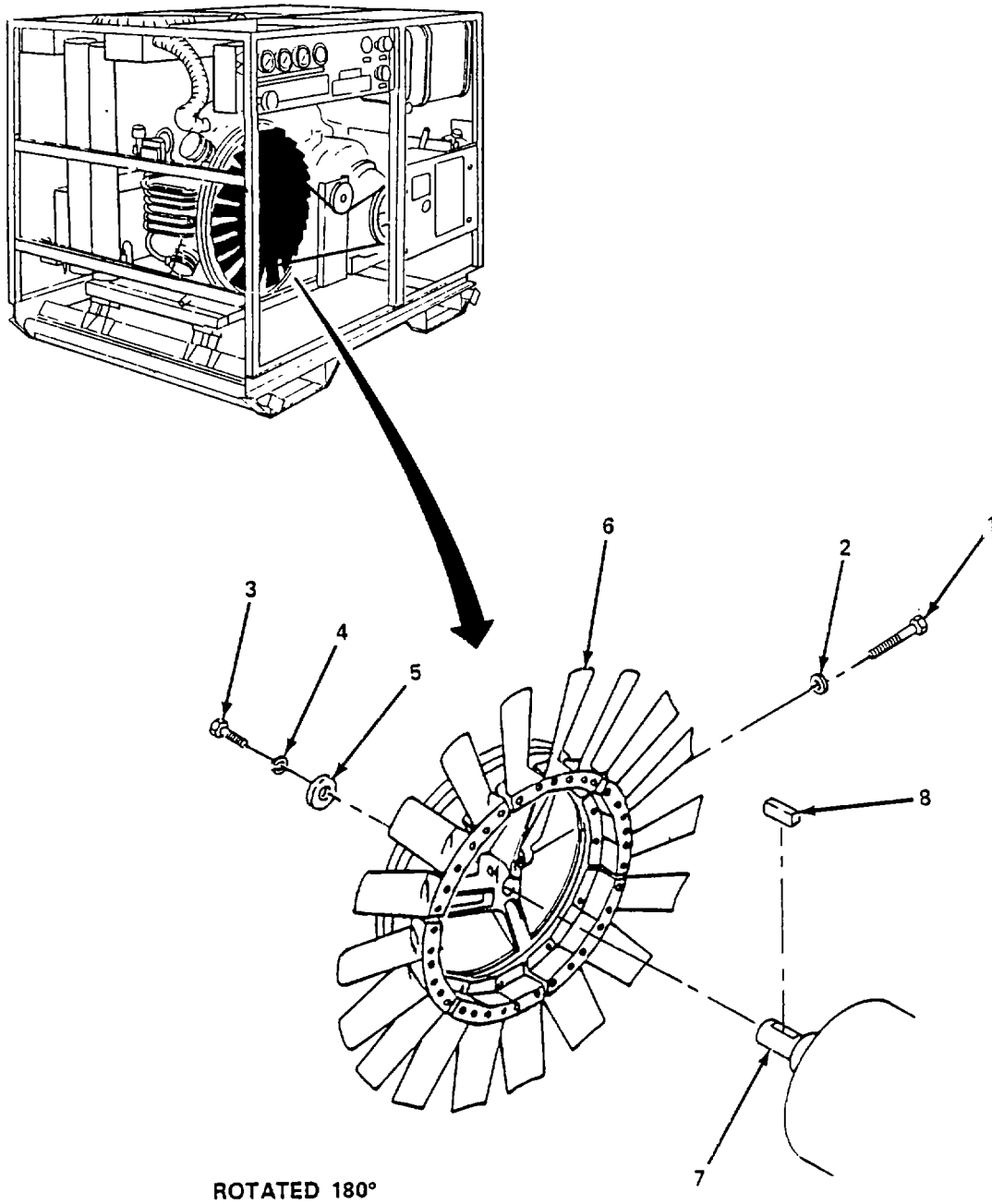


Figure 4-27. Compressor Flywheel/Fanwheel Assembly, Replace.

4-24. **Compressor Flywheel/Fanwheel Assembly (Cont).**b. *Repair.* (figure 4-28)

- (1) Compressor flywheel/fanwheel assembly removed (para. a. above).
- (2) Remove 36 bolts (1) and washers (2), and remove six wing supports (3) and 18 fan wings (4).

WARNING

Dry cleaning solvent PD-680 used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 138°F (60°C).

- (3) Clean all components with dry cleaning solvent and dry thoroughly.
- (4) Inspect all components and replace if cracks, bent, worn, or otherwise damaged.
- (5) Install six wing supports (3) and 18 fan wings (4) on pulley (5) and secure with 36 bolts (1) and washers (2).
- (6) Install compressor flywheel/fanwheel assembly (para. a. above).

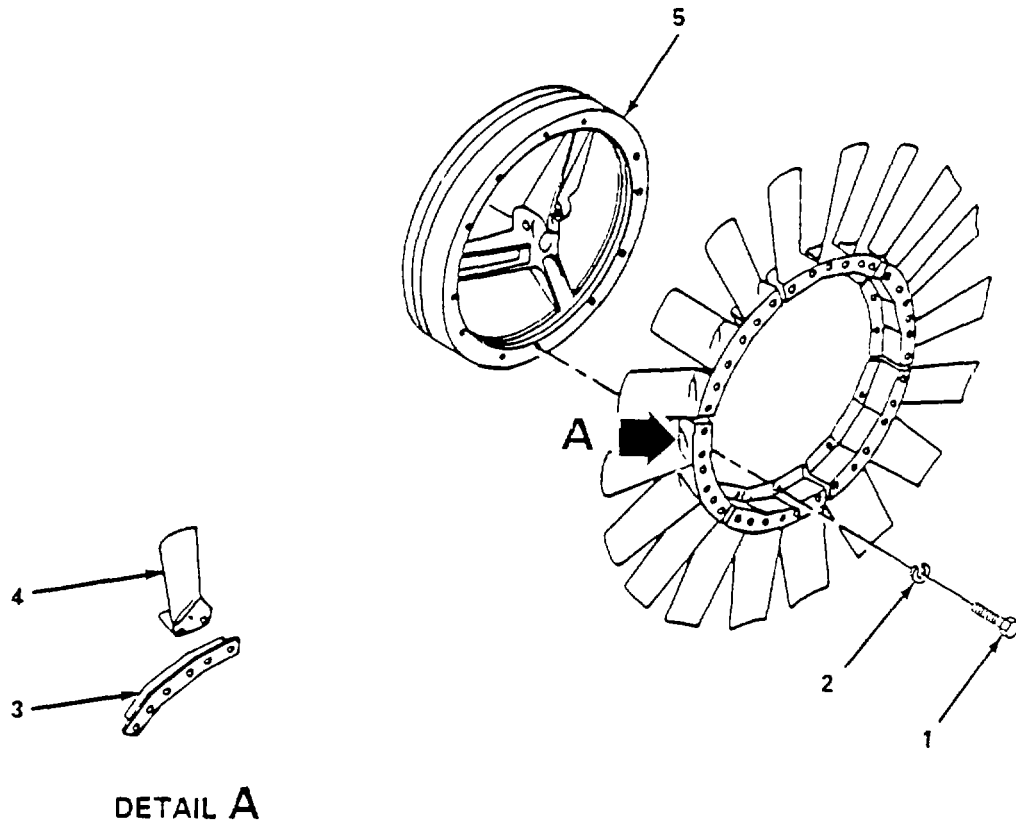


Figure 4-28. Compressor Flywheel/Fanwheel Assembly, Repair.

FOLLOW-ON MAINTENANCE
Install compressor fanwheel guard (para. 4-23).

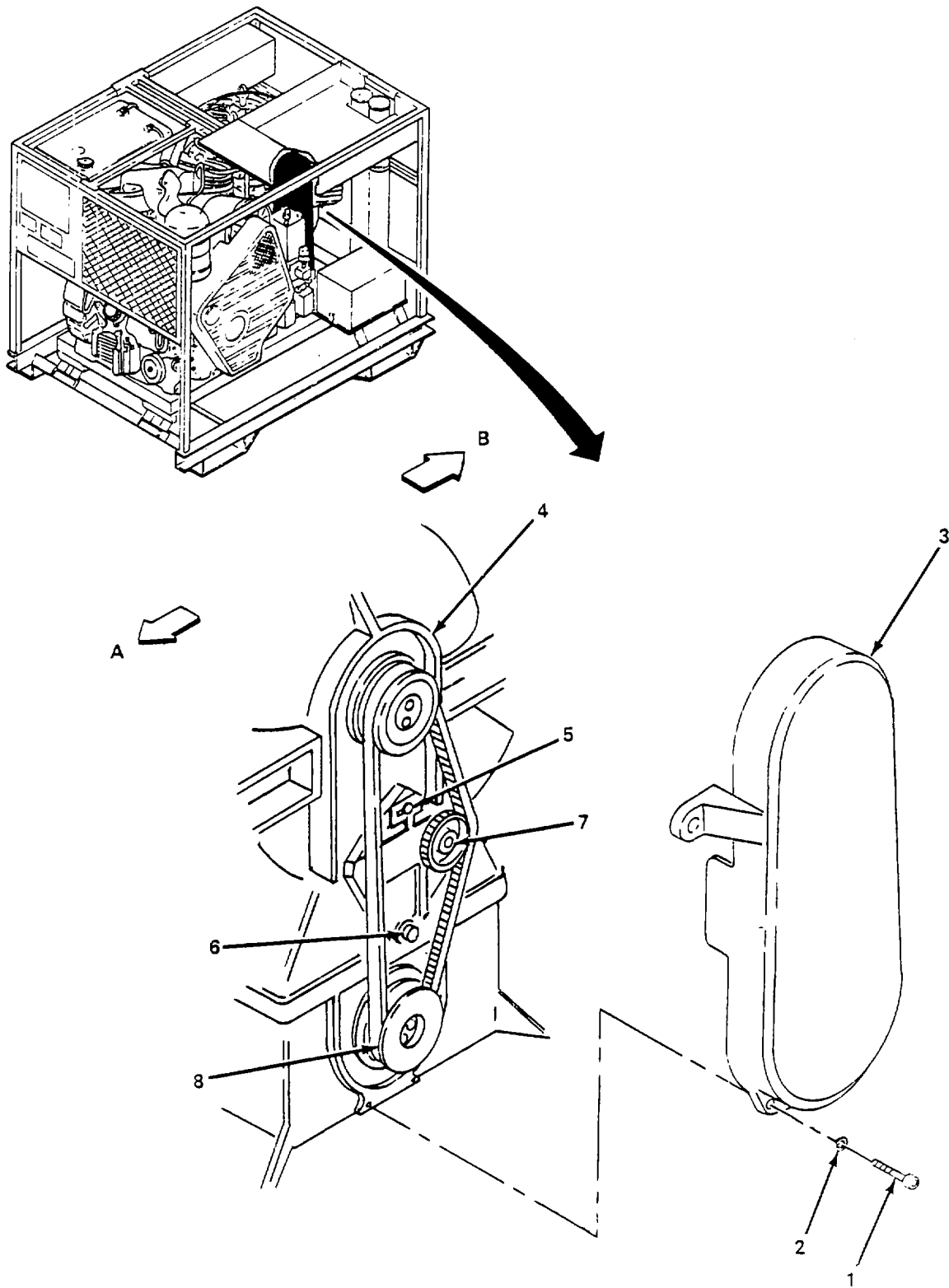


Figure 4-29. Compressor Drive Belt, Adjust.

4-25. **Compressor Drive Belt and Guard (Cont).**b. Replace.(1) *Beltguard.* (figure 4-30)

- (a) Remove four alien screws (1) and lockwashers (2).
- (b) Remove beltguard (3) from compressor (4).
- (c) Install beltguard (3) and secure with four alien head screws (1) and lockwashers (2).

(2) *Belt.* (figure 4-30)

- (a) Remove beltguard (para. (1) above). I'
- (b) Loosen alien screws (5) and (6) and push the middle tension pulley (7) in the direction of arrow A.
- (c) Remove two alien screws (8) and lockwashers (9) from eccentric shaft drive gear (10).
- (d) Remove eccentric shaft drive gear (10) and belt (11).

CAUTION

The following is mandatory when replacing the tension COG belt for it is part of the timing for the proper injection point of the oil pump.

- (e) Install eccentric shaft drive gear (10) and secure with two lockwashers (9) and alien screws (8).
- (f) Turn eccentric shaft drive gear (10) in clockwise direction until greatest resistance is felt.
- (g) Have Direct Support personnel remove 4th stage valve head and ensure piston is at top dead center.
- (h) Have Direct Support personnel install 4th stage valve head.
- (i) Remove two alien screws (8), lockwashers (9), and eccentric shaft drive gear (10).
- (j) Install belt (11) over top tension pulley (12).
- (k) Place eccentric shaft drive gear (10) on belt (11) and secure with two lockwashers (8) and allen screws (9).
- (l) Pull middle tension pulley (7) outward in direction of arrow B at a force of 5. 166 lb-ft (7 NM).
- (m) Tighten alien screws (5) and (6).

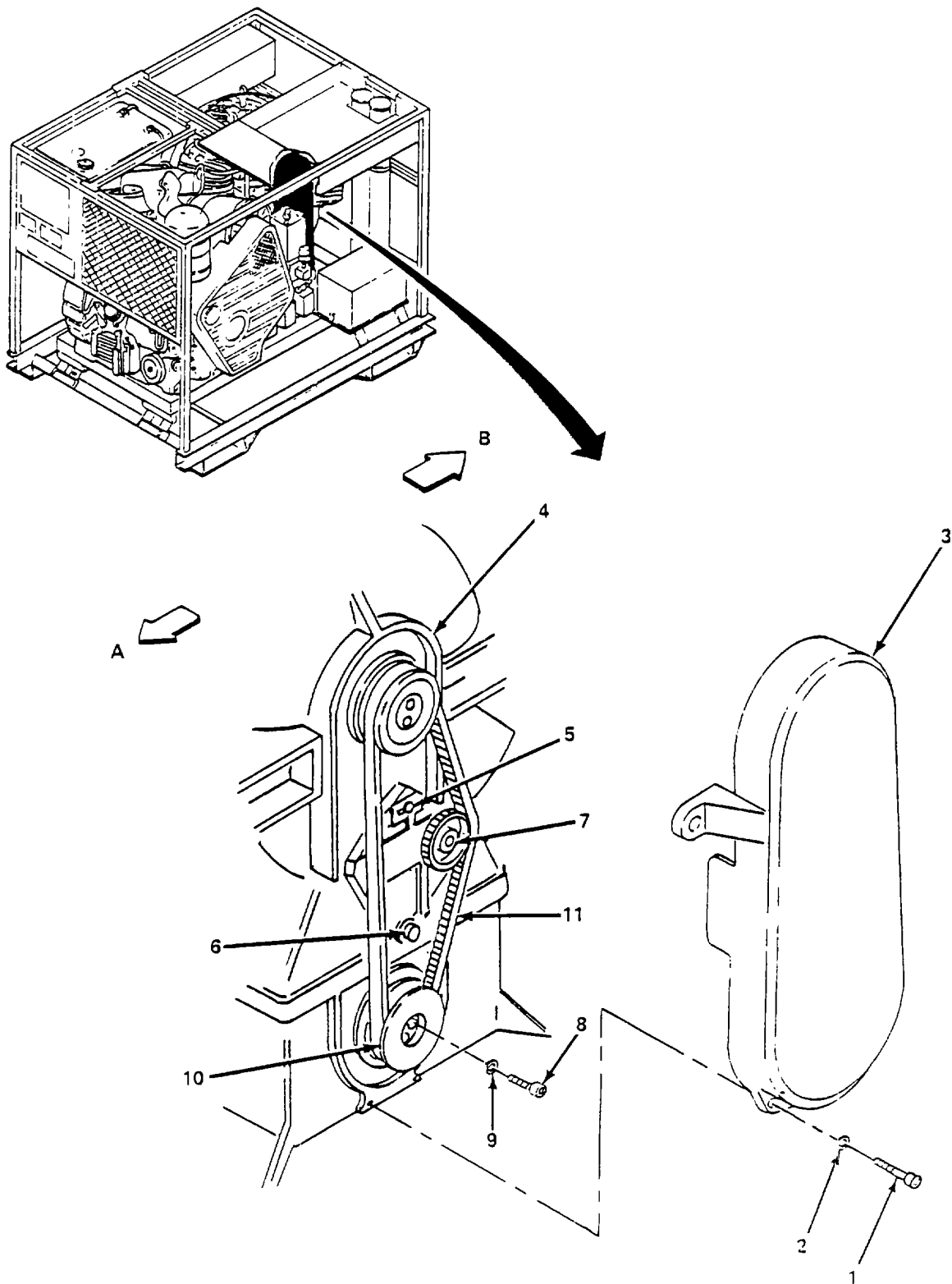


Figure 4-30. Compressor Drive Belt and Guard, Replace.

4-26. Fuel Tank

This task covers:

- a. Replace
-

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Materials/Parts

Fuel Tank
Tape, Teflon (Item 26, Appendix E)

Personnel Required

Two

Equipment Condition

Compressor unit shut down (para. 2-13).

Replace. (figure 4-31)

- (1) Place suitable container under fuel tank (1).
- (2) Loosen screw (2) on clamp (3) of fuel supply line (4).
- (3) Tag and remove supply line (4) from fitting (5) and drain fuel into container.
- (4) Loosen screw (6) on clamp (7) of fuel return line (8).
- (5) Tag and remove return line (8) from fitting (9) and drain fuel into container.
- (6) Remove screw (10), lockwasher (11), and remove ground wire (12) from frame (13).
- (7) Remove four screws (14), lockwashers (15), and washer (16) and remove two bottom straps (17), top straps (18), and fuel tank (1).
- (8) Install two top straps (18) and bottom straps (17) around fuel tank (1) and install on frame (13) and secure with four screws (14), lockwashers (15), and washers (16).
- (9) Install ground wire (12) and secure with screw (10) and washers (11).

CAUTION

Leave 1 1/2 threads exposed on fitting when applying teflon tape. This will ensure that no teflon tape will hang down inside the fuel system. Teflon tape should be wrapped in such a manner that when the fitting is tightened the tape will not loosen. Failure to wrap teflon tape correctly may result in blockage of the fuel system.

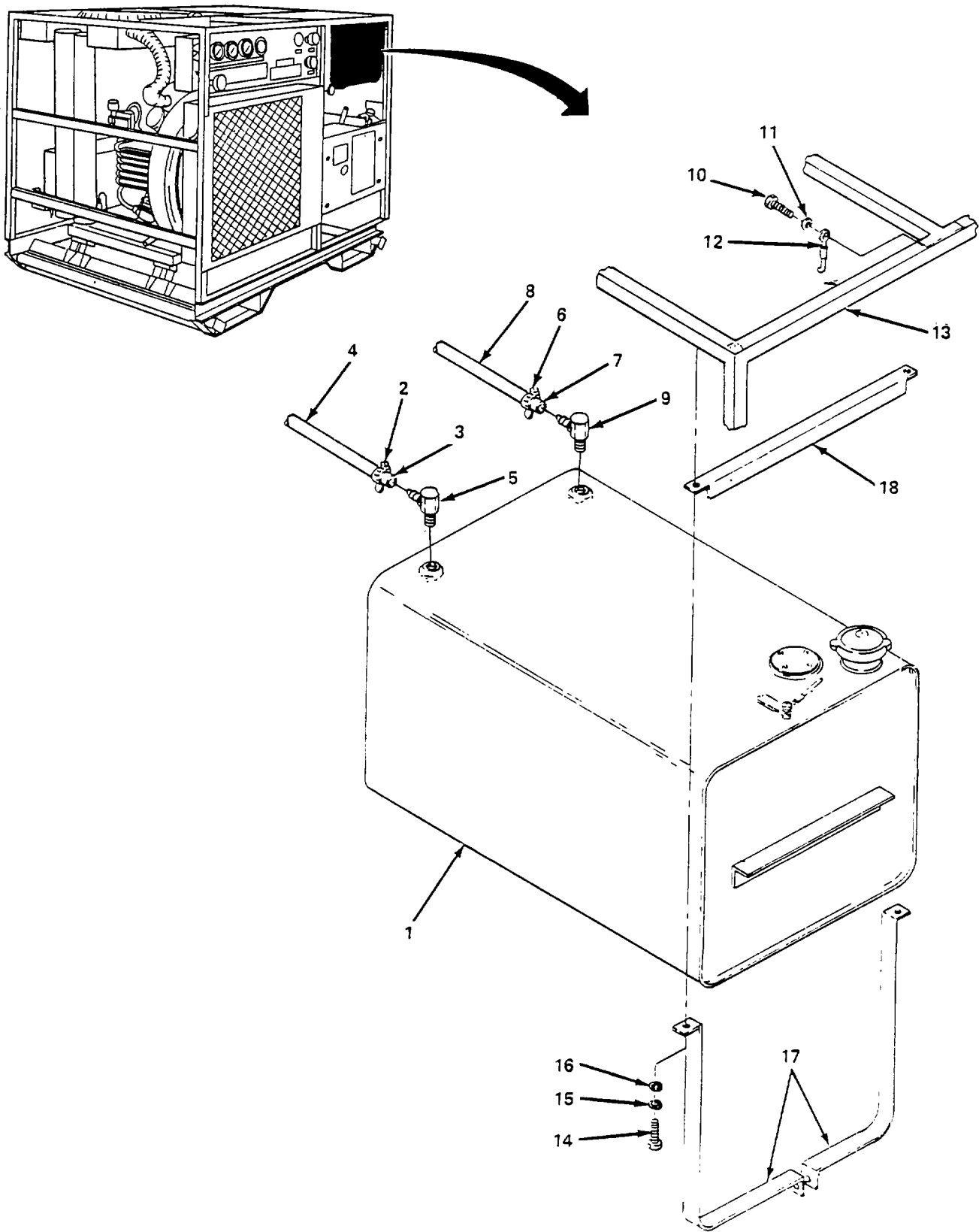


Figure 4-31. Fuel Tank, Replace.

4-75(4-76 blank)

- (10) Apply teflon tape to pipe threads on fittings (5) and (9).
- (11) Install fuel return line (8) on fitting (9) and tighten screw (6) on clamp (7).
- (12) Install fuel supply line (4) on fitting (5) and tighten screw (2) on clamp (3).

FOLLOW-ON MAINTENANCE
Service fuel system, refer to para. 4-30.

4-27. Top Strap Assembly

This task covers:

- a. Replace
-

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Materials/Parts

Top Strap Assembly

Personnel Required

Two

Equipment Condition

Compressor unit shut down (para. 2-13).

Replace. (figure 4-32)

NOTE

There are two top strap assemblies. Replacement of each strap assembly is the same.

- (1) Support the fuel tank while removing strap assembly.
- (2) Remove two screws (1), lockwashers (2), and washers (3).
- (3) Remove bottom strap assembly (4).
- (4) Lower fuel tank (5) just enough to remove top strap assembly (6).
- (5) Remove top strap assembly (6).
- (6) Install top strap assembly (6), position fuel tank (5).
- (7) Install bottom strap assembly (4) and secure with two washers (3), lockwashers (2), and screws (1).

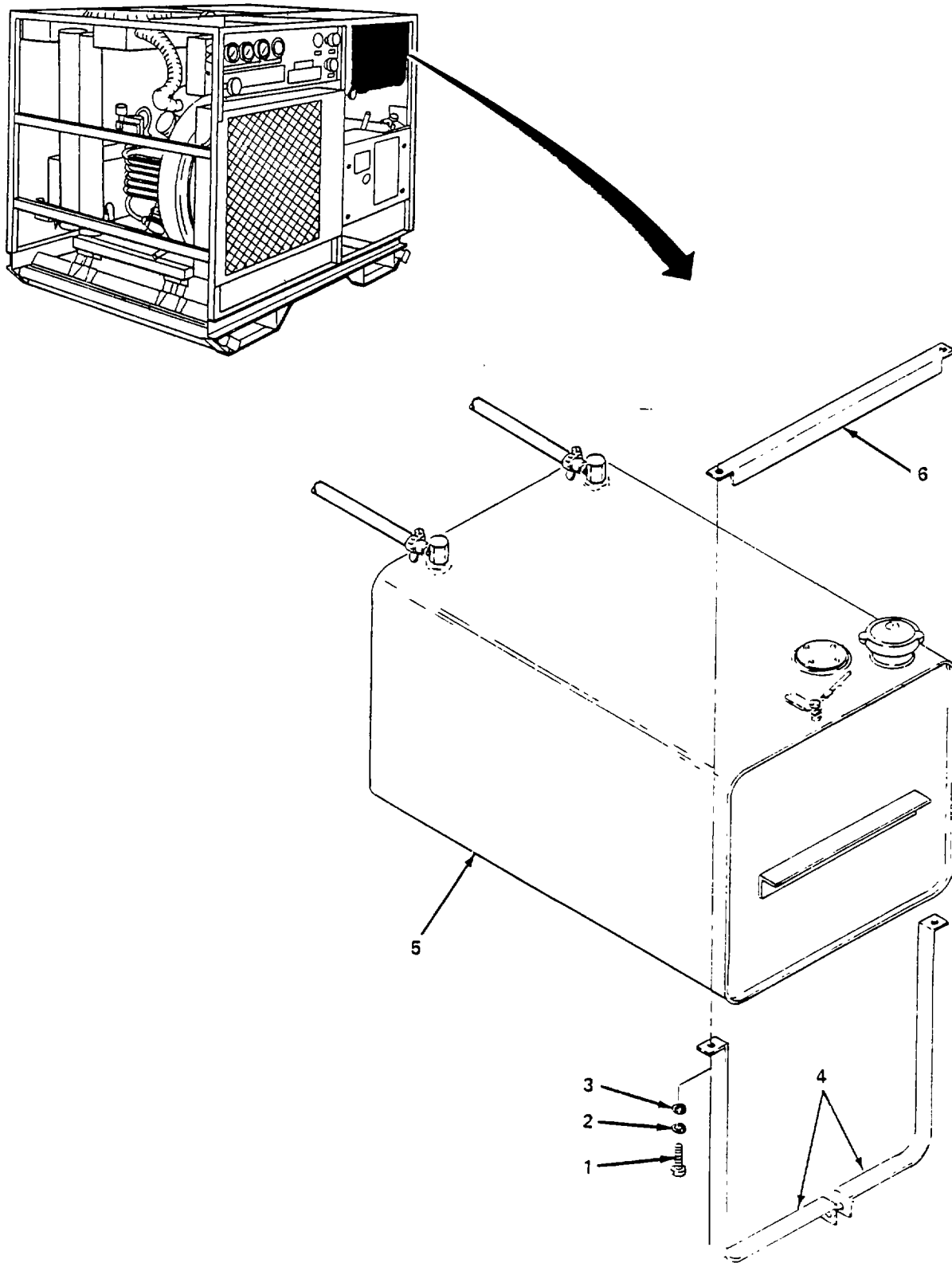


Figure 4-32. Top Strap Assembly, Replace.

4-28. Bottom Strap Assembly

This task covers:

- a. Replace
-

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Materials/Parts

Bottom Strap Assembly

Personnel Required

Two

Equipment Condition

Compressor unit shut down (para. 2-13).

Replace. (figure 4-33)

NOTE

There are two bottom strap assemblies. Replacement of each strap assembly is the same.

- (1) Support the fuel tank while removing strap assembly.
- (2) Remove nut (1), two washers (2), and bolt (3).
- (3) Remove two screws (4), lockwashers (5), and washers (6).
- (4) Remove strap assembly (7).
- (5) Install strap assembly (7) on frame (8) and secure with two washers (6), lockwasher (5), and screws (4).
- (6) Install bolt (3), two washers (2), and nut (1).

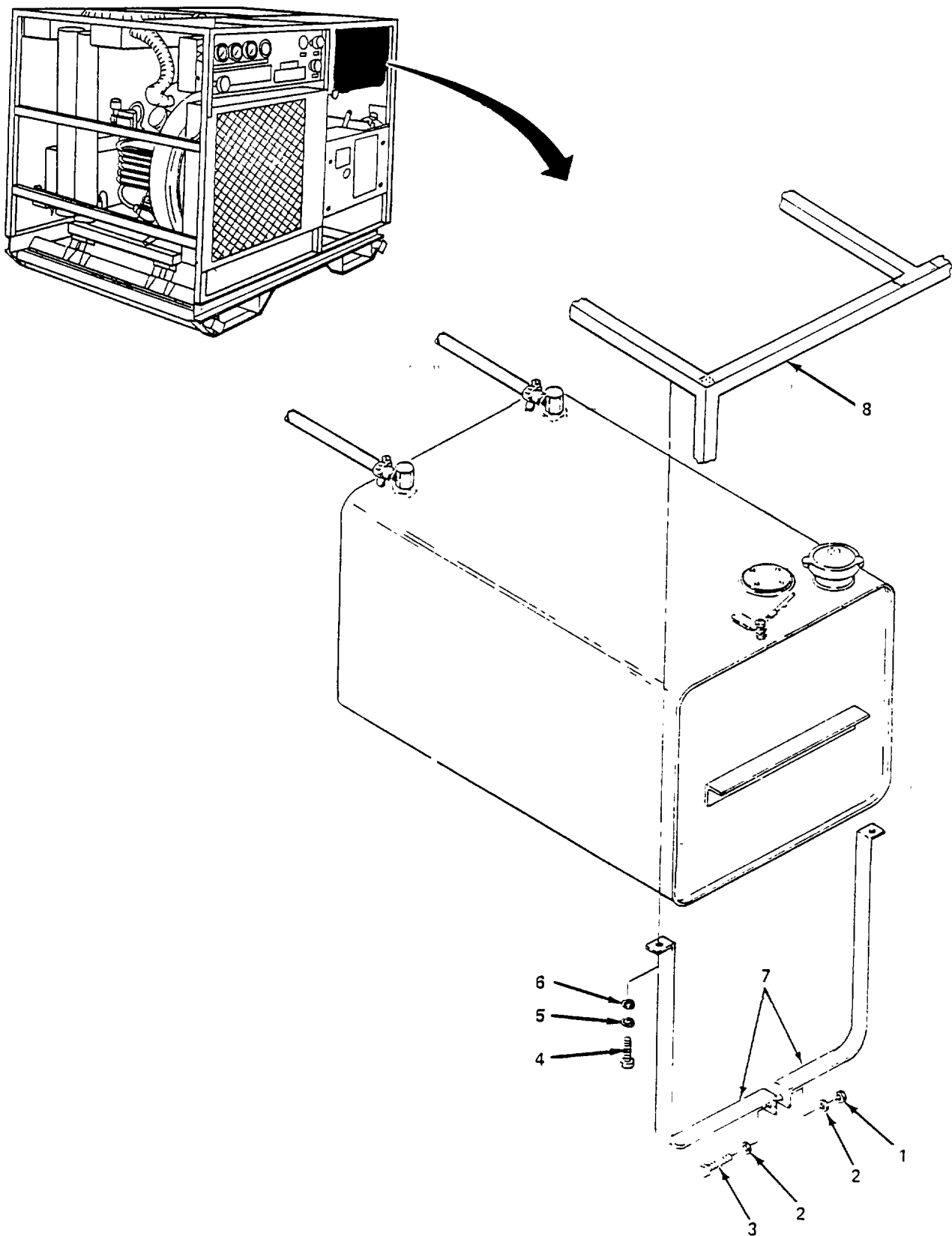


Figure 4-33. Bottom Strap Assembly, Replace.

4-29. Engine Assembly.

This task covers:

a. Service

b. Replace

*Tools*General Mechanic's Tool Kit
(NSN 5180-00-177-7033)*Equipment Condition*Compressor unit shut down (para. 2-13).
Engine V-belt guard removed (para. 4-15).
Top tray removed (para. 4-18).*Materials/Parts*

Oil, Engine (Item 16, Appendix E)

Compressor drive belts removed (para. 4-20).
Fuel tank removed (para. 4-26).

a. Service. (figure 4-34)

- (1) Remove drain plug (1) and washer (2) and drain oil into suitable container.
- (2) Clean off drain plug (1).
- (3) Install drain plug (1).
- (4) Remove filler cap (3) and fill engine with proper grade and viscosity oil to max mark on dipstick (4).
- (5) Install filler cap (3).

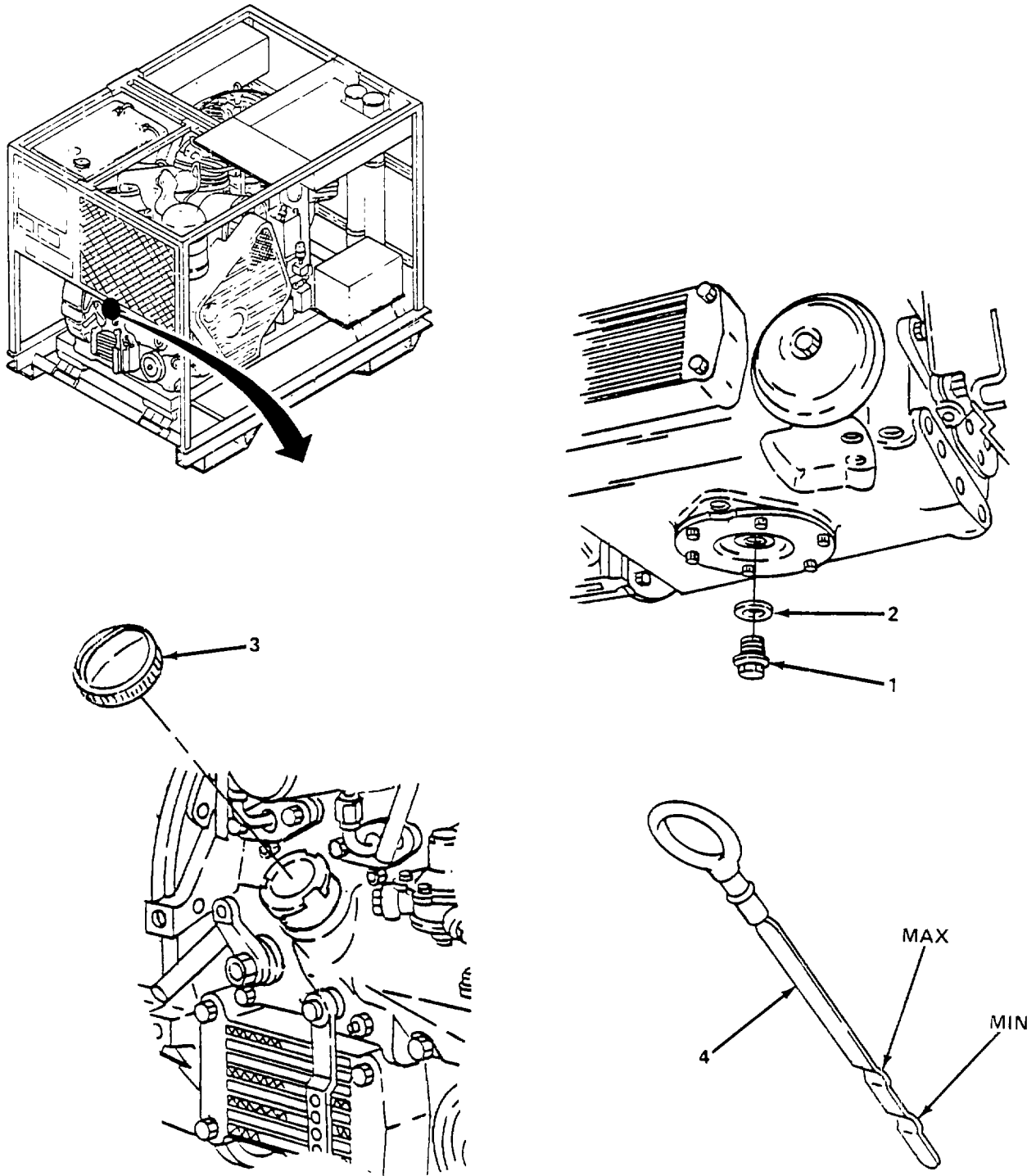


Figure 4-34. Engine Assembly, Service.

4-29. Engine Assembly (Cont).b. Replace.

(1) Removal. (figure 4-35)

- (a) Remove two bolts (1) and washers (2) securing throttle control (3) to outer frame (4) and remove throttle control.
- (b) Remove bolt (5), lockwashers (6), washer (7), ground wire (8), and washer (9).
- (c) Remove nine bolts (10), lockwashers (11), and 18 washers (12) and remove top frame bars (13) and (14) from outer frame (4).
- (d) Remove two screws (15) and tag and remove three wires (16) from shutdown device (17).
- (e) Loosen screw (18) on clamp (19) and remove line (20).
- (f) Loosen fitting nut (21) and remove line (22).
- (g) Remove nut (23) and tag and remove wire (24), and battery cable (25) from starter (26).
- (h) Remove screw (27) and tag and remove wire (28) from starter(26).
- (i) Loosen five screws (29) and pull off cover (30) from alternator (31).
- (j) Remove nut (32), lockwashers (33), and tag and remove wire (34).
- (k) Remove nut (35), washer (36), and tag and remove wire (37).
- (l) Remove nut (38), washer (39), and tag and remove wire (40).
- (m) Remove wire (41) from connector on alternator (31).
- (n) Attach suitable lifting device to engine.
- (o) Remove two bolts (42), lockwashers (43), and nuts (44).
- (p) Remove engine (45) from inner frame (46).
- (q) Remove 12 screws (47) and lockwashers (48) and remove PTO and clutch assembly (49).
- (r) Remove eight screws (50) and lockwashers (51) and remove drive ring (52).

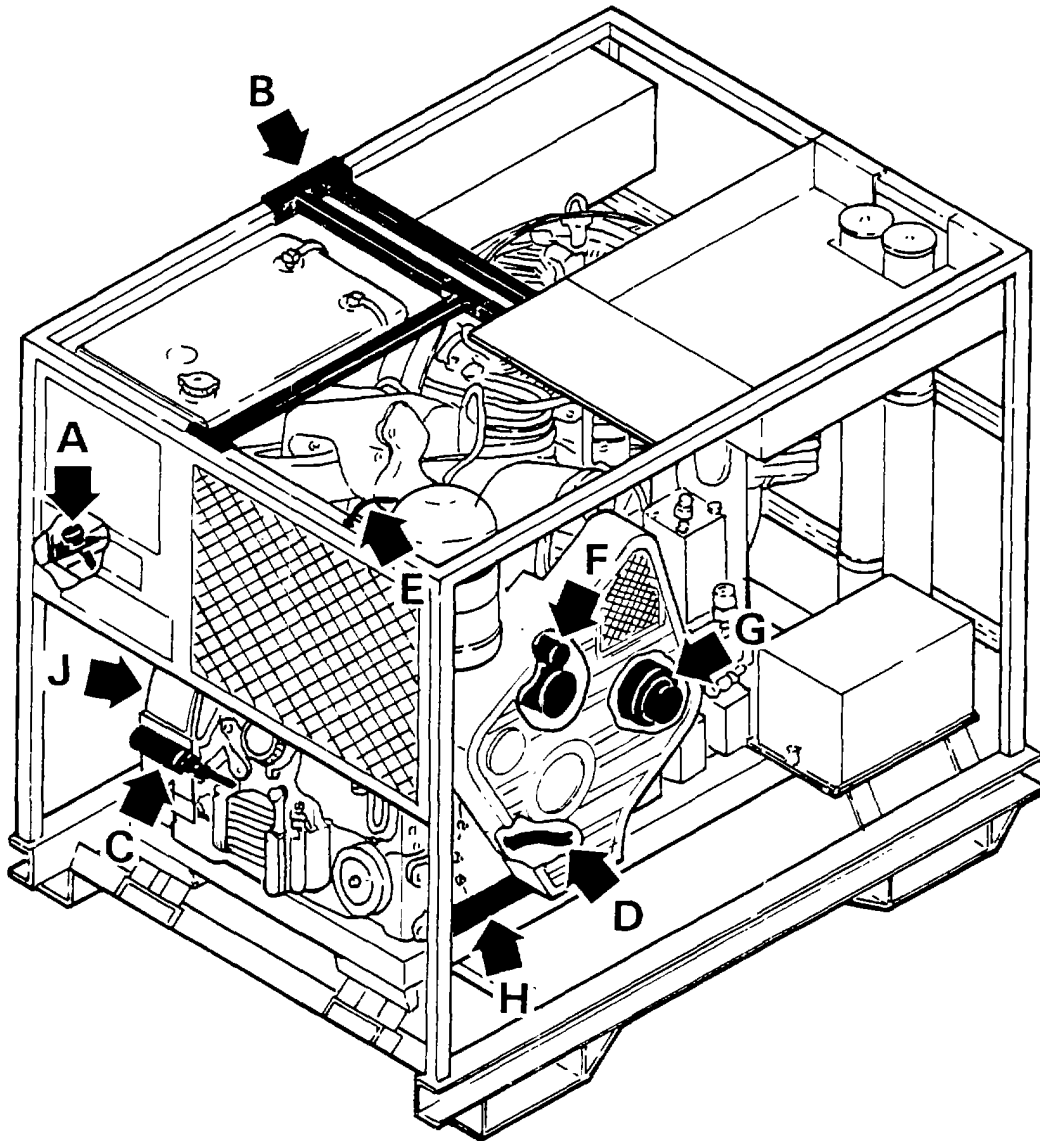


Figure 4-35. Engine Assembly, Removal (Sheet 1 of 5).

4-29. Engine Assembly (Cont).

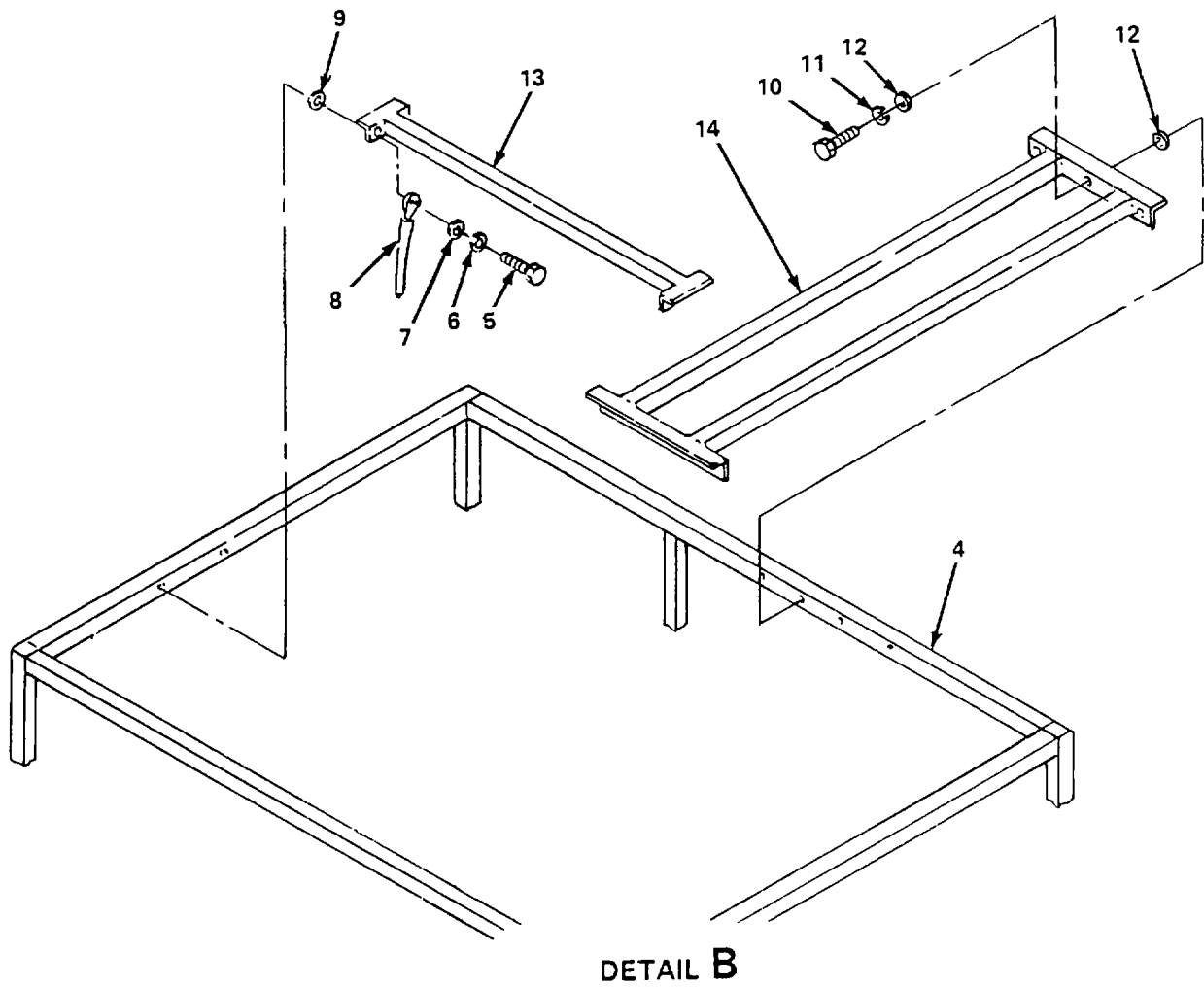
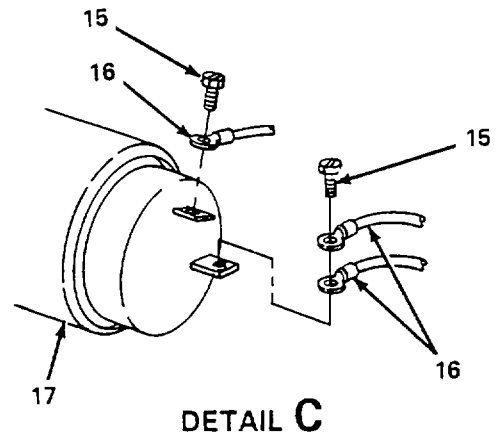
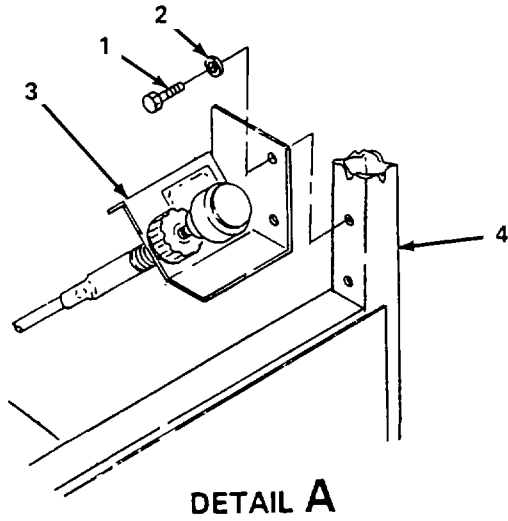


Figure 4-35. Engine Assembly, Removal (Sheet 2 of 5).

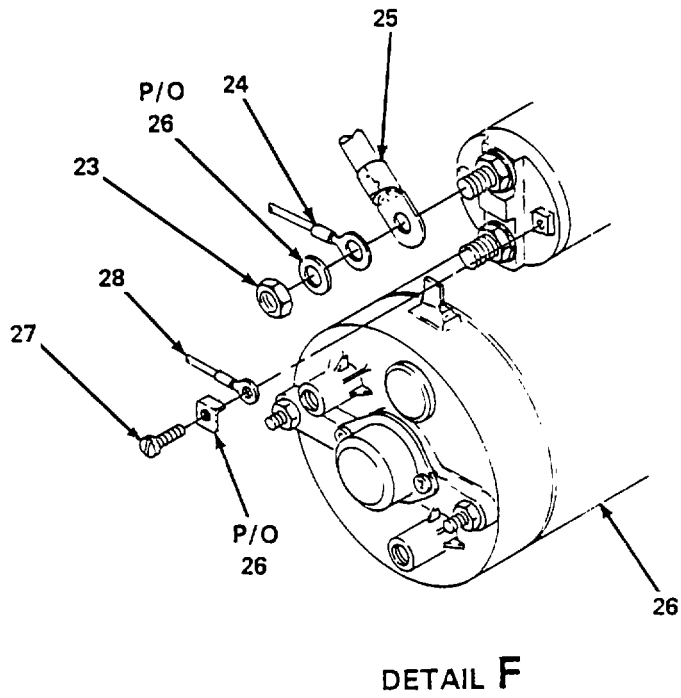
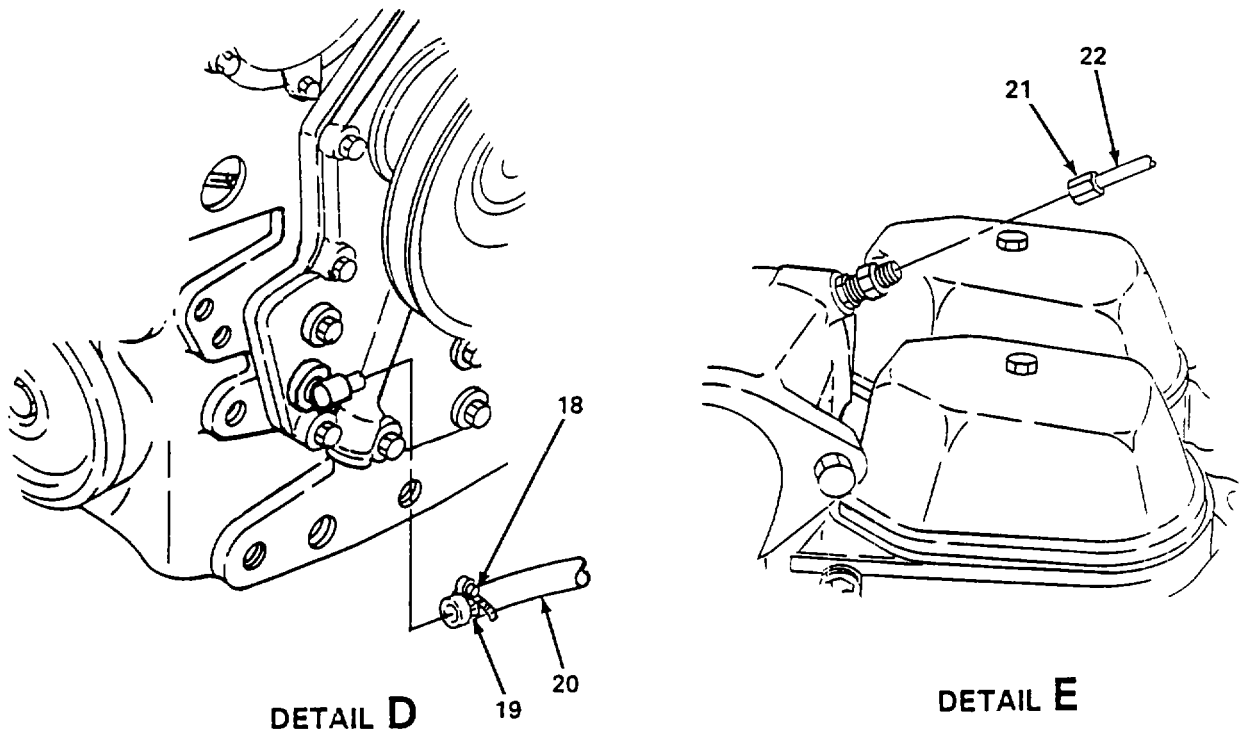


Figure 4-35. Engine Assembly, Removal (Sheet 3 of 5).

4-29. Engine Assembly (Cont).

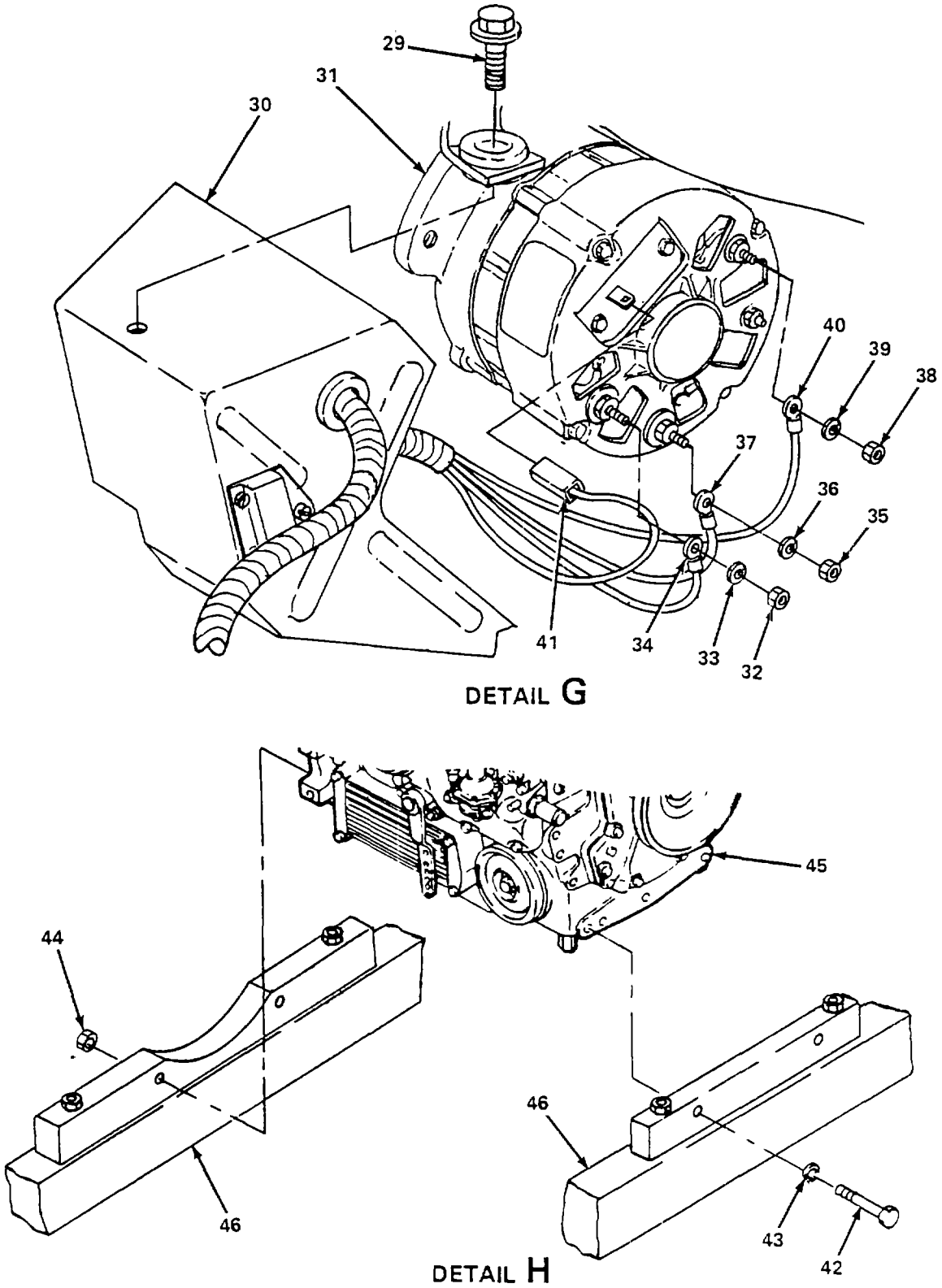
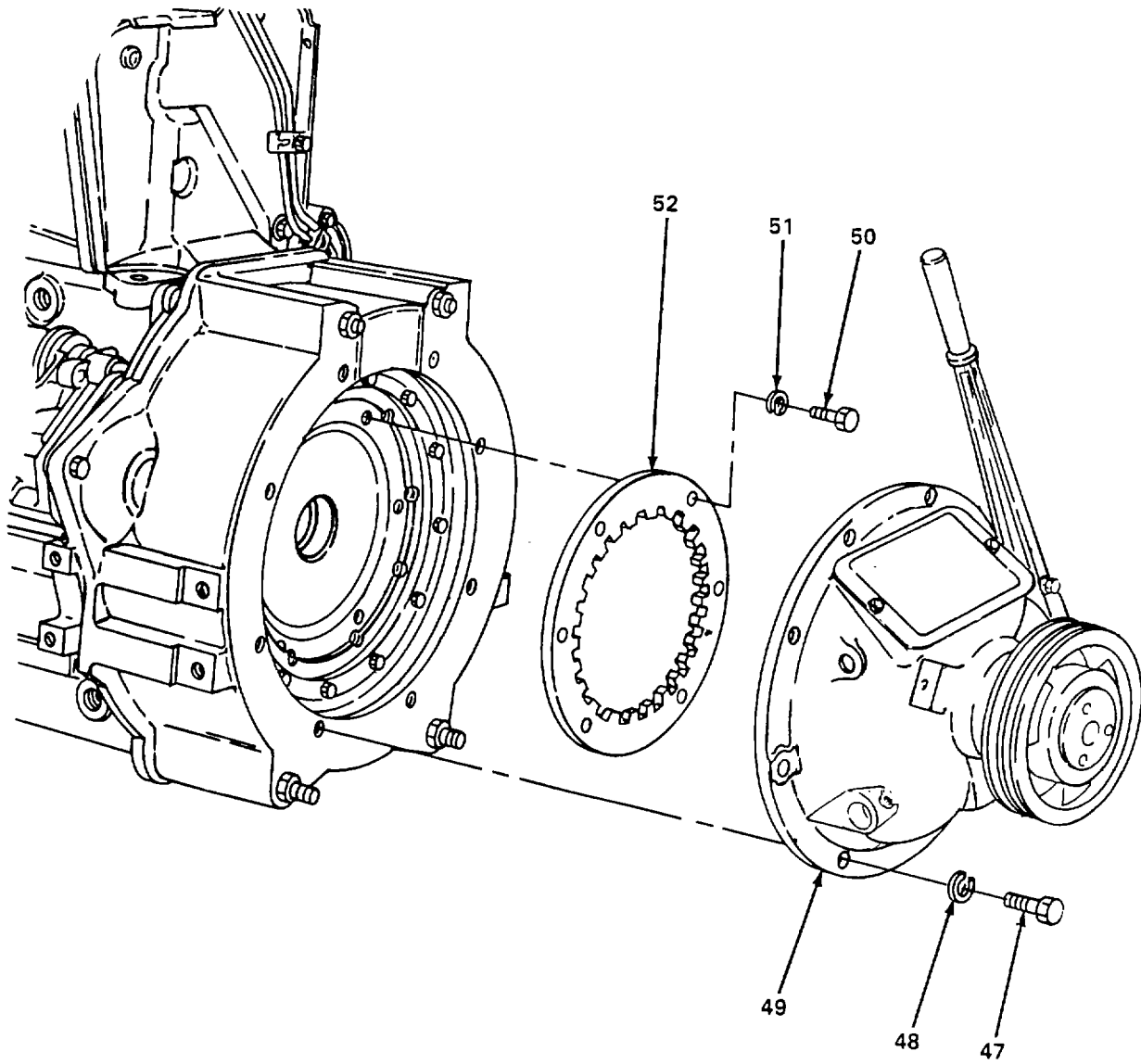


Figure 4-35. Engine Assembly, Removal (Sheet 4 of 5).



DETAIL J

Figure 4-35. Engine Assembly, Removal (Sheet 5 of 5).

4-29. Engine Assembly (Cont).

- (2) *Installation.* (figure 4-36)
- (a) Install drive ring (1) and secure with eight screws (2) and lockwashers (3).
 - (b) Install PTO and clutch assembly (4) and secure with 12 screws (5) and lockwashers (6).
 - (c) Install engine (7) on inner frame (8) and secure with two bolts (9), lockwasher (10), and nut (11).
 - (d) Install wire (12) on connector on alternator (13).
 - (e) Install wire (14) and secure with washer (15) and nut (16).
 - (f) Install wire (17) and secure with washer (18) and nut (19).
 - (g) Install wire (20) and secure with lockwasher (21) and nut (22).
 - (h) Install cover (23) on alternator (13) and tighten five screws (24).
 - (i) Install wire (25) on starter (26) and secure with screw (27).
 - (j) Install battery cable (28), wire (29) on starter (26) and secure with nut (30).
 - (k) Install line (31) and tighten fitting nut (32).
 - (l) Install line (33) and tighten screws (34) on clamp (35).
 - (m) Install three wires (36) on shutdown device (37), and secure with two screws (38).
 - (n) Install top frame bars (39) and (40) on outer frame (41) and secure with 18 washers (42), nine lockwashers (43) and bolts (44).
 - (o) Install washer (45), ground wire (46), washer (47), lockwashers (48), and bolts (49).
 - (p) Install throttle control (50) on outer frame (41) and secure with two washers (51) and bolts (52).

FOLLOW-ON MAINTENANCE

- (1) Install fuel tank (para. 4-26).
- (2) Install compressor drive belts (para. 4-20).
- (3) Install top tray (para. 4-18).
- (4) Install engine V-belt guard (para. 4-15).

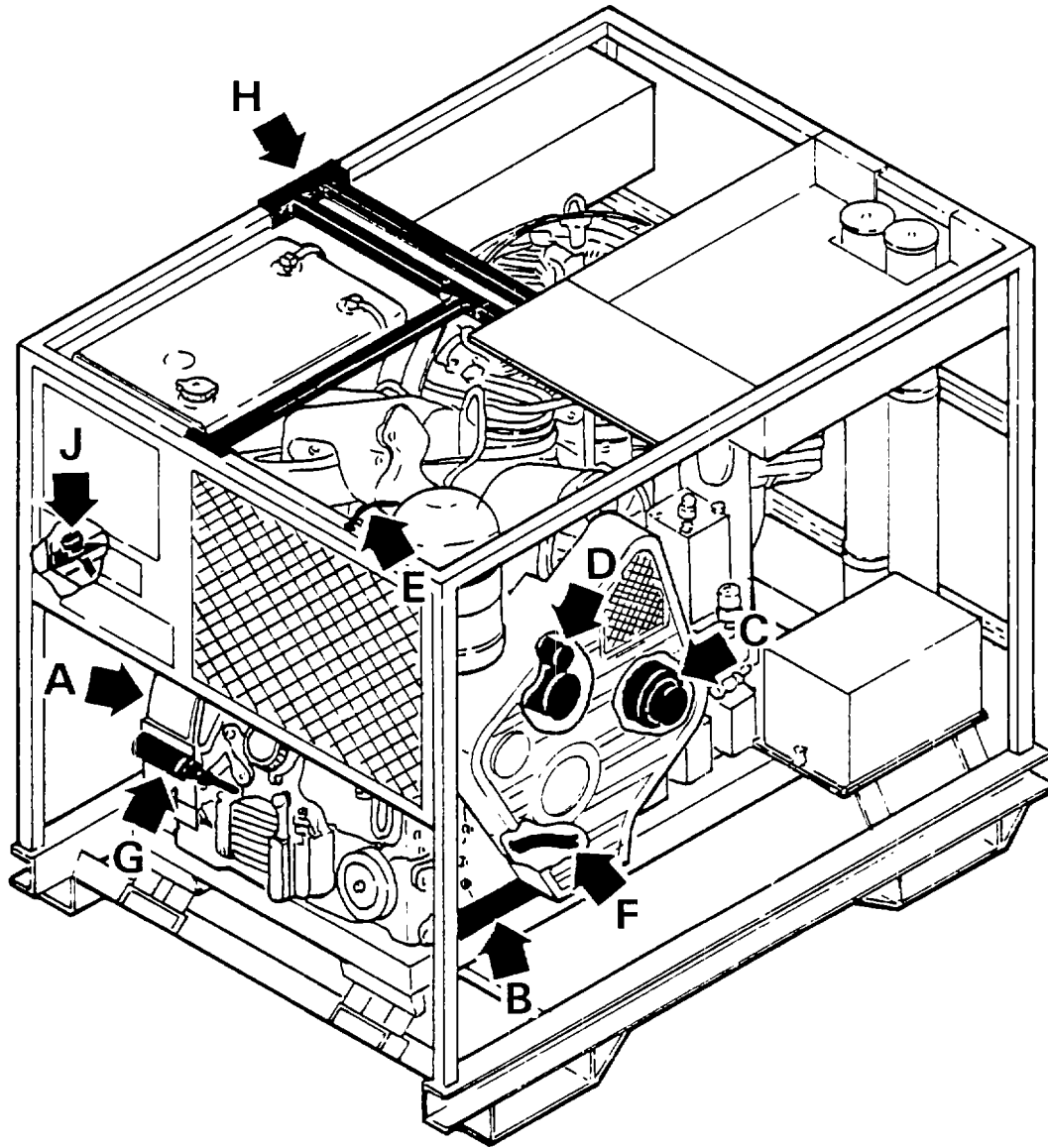


Figure 4-36. Engine Assembly, Installation (Sheet 1 of 5).

4-29. Engine Assembly (Cont).

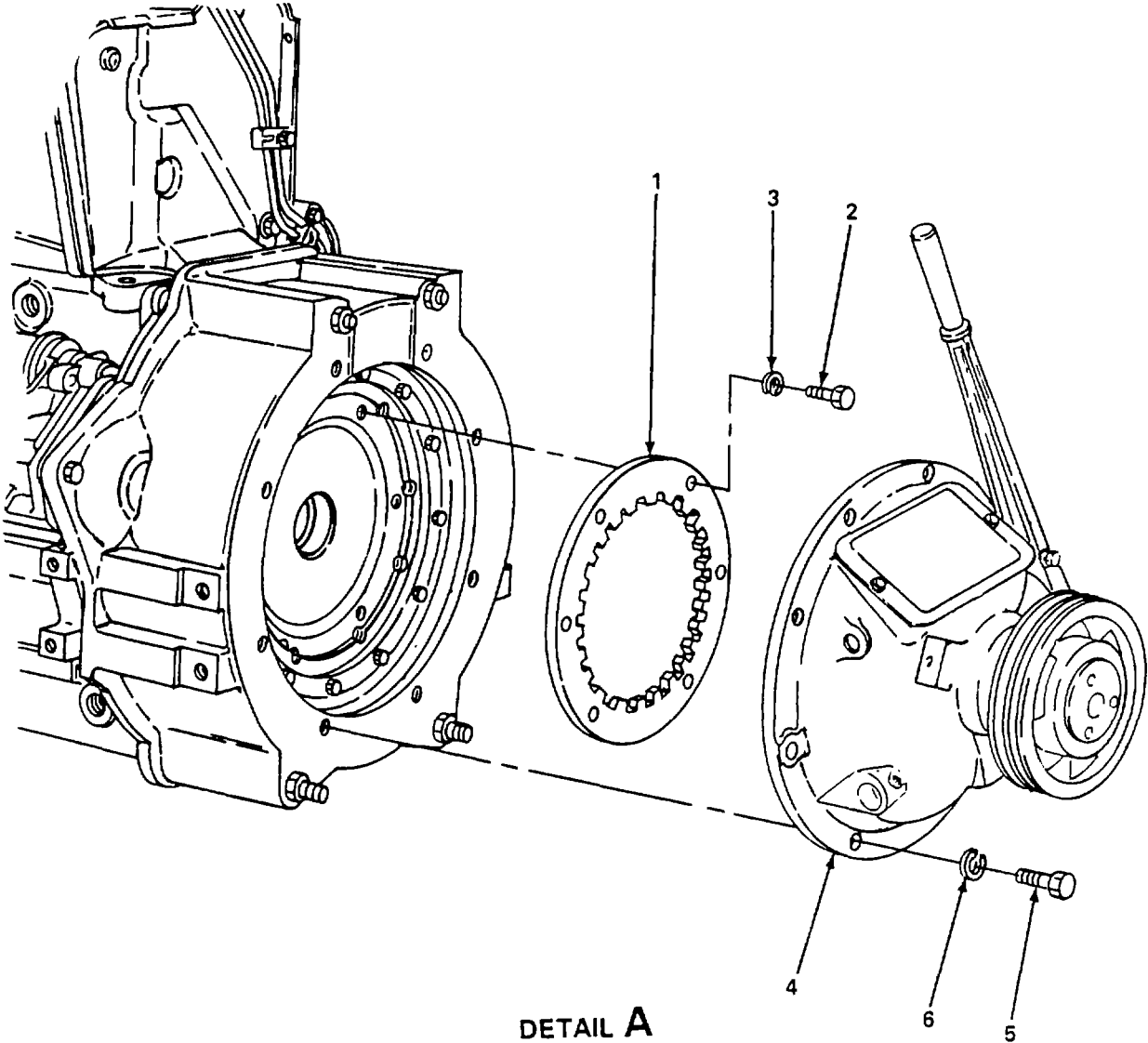


Figure 4-36. Engine Assembly, Installation (Sheet 2 of 5).

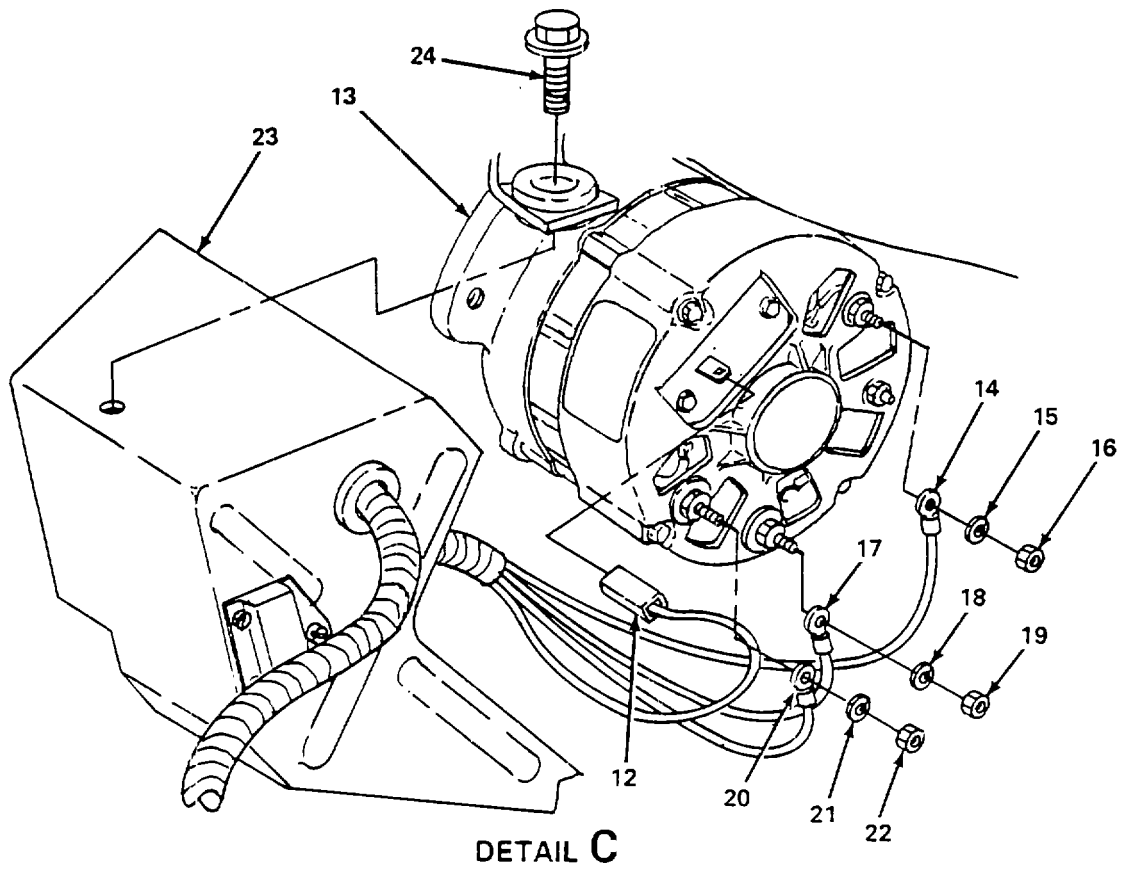
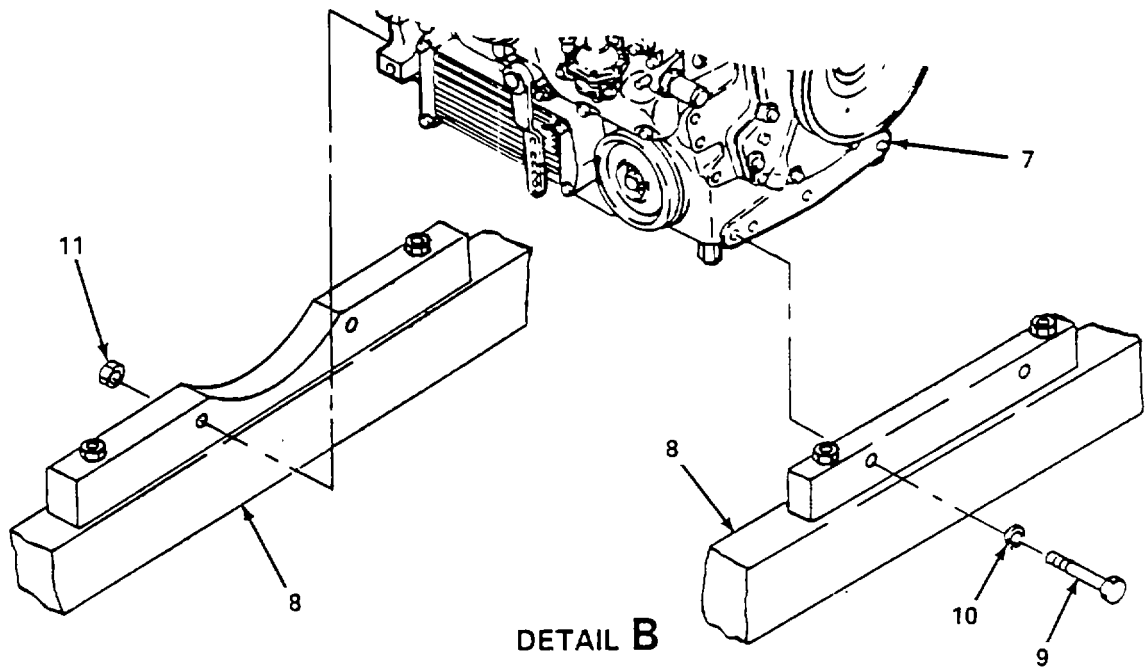


Figure 4-36. Engine Assembly, Installation (Sheet 3 of 5).

4-29. Engine Assembly (Cont).

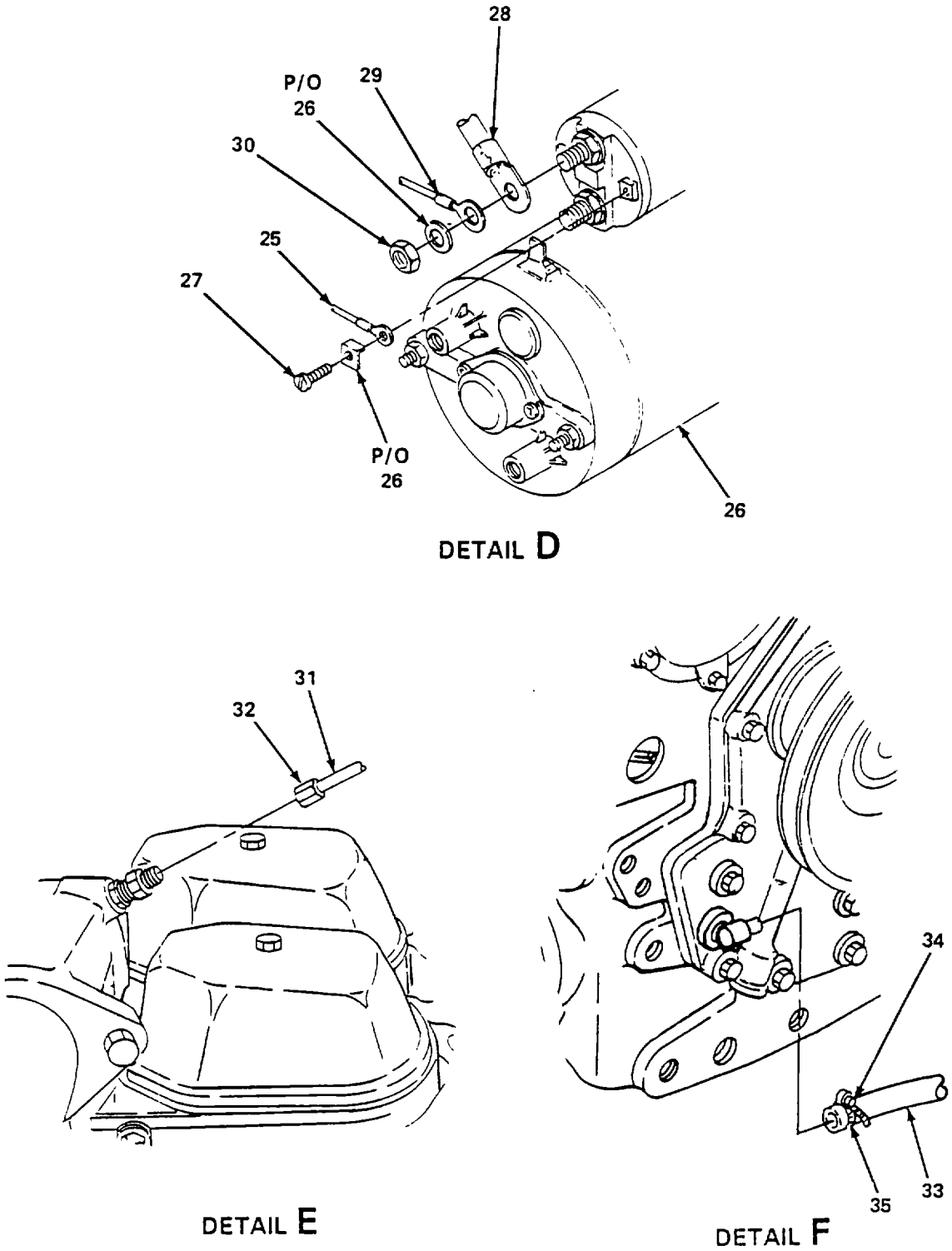
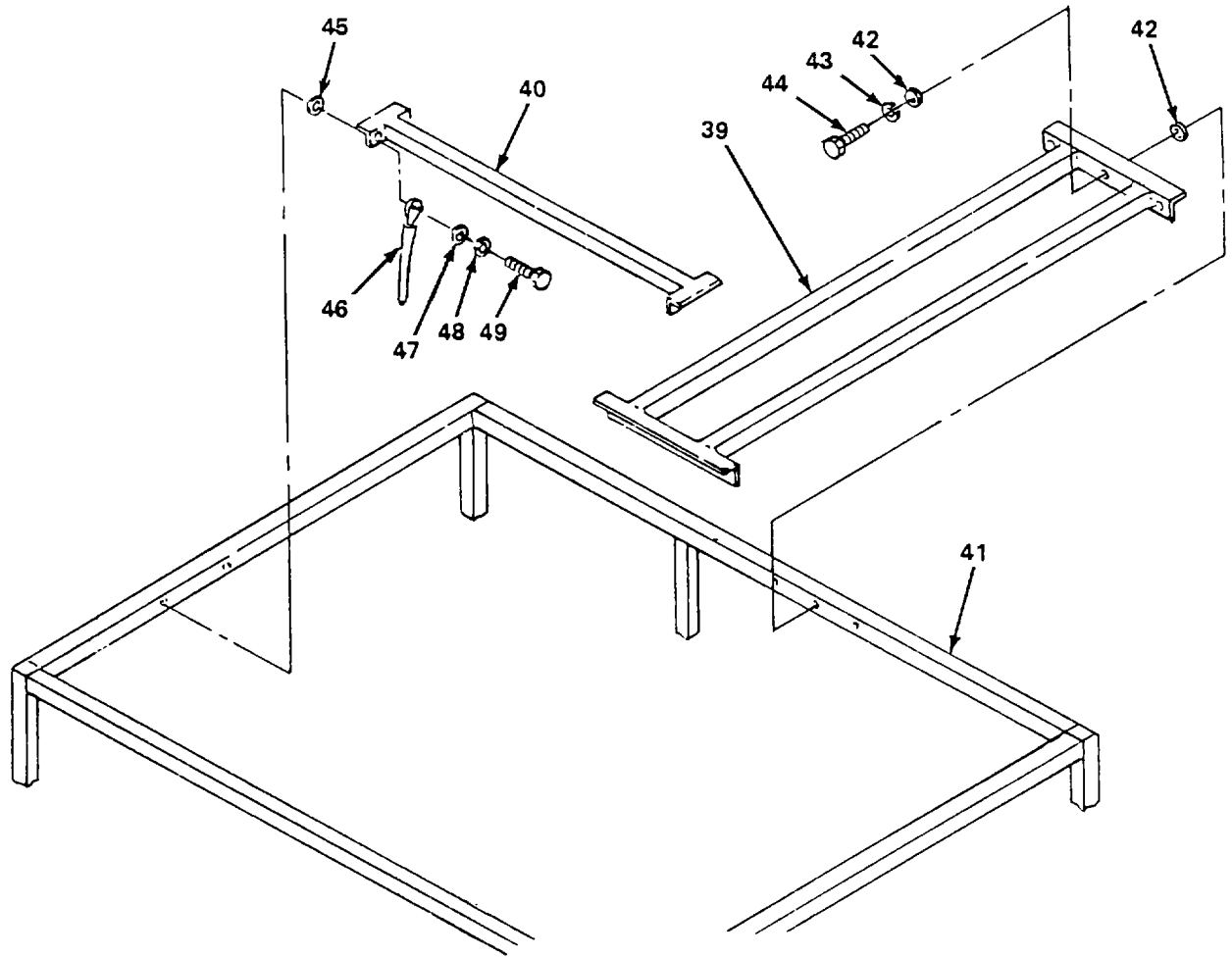
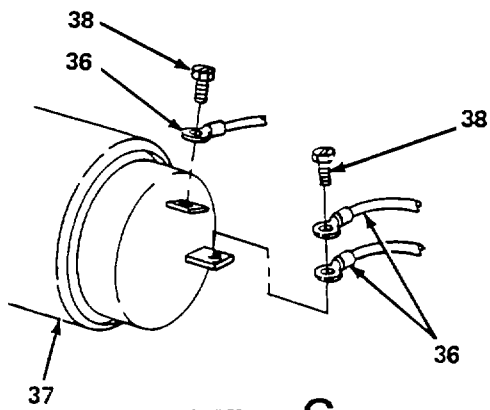


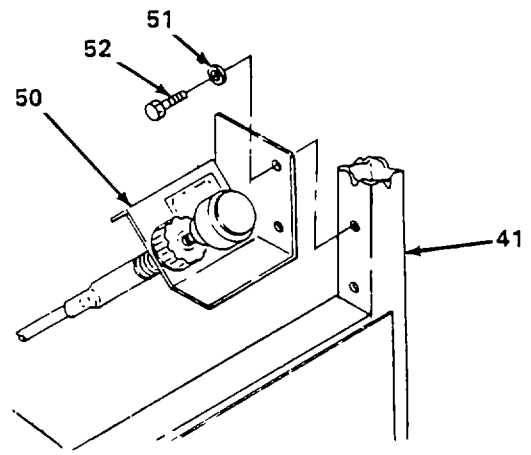
Figure 4-36. Engine Assembly, Installation (Sheet 4 of 5).



DETAIL H



DETAIL G



DETAIL J

Figure 4-36. Engine Assembly, Installation (Sheet 5 of 5).

4-30. Fuel System.

This task covers:

- a. Service
-

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Equipment Condition

Compressor unit shut down (para. 2-13).

Service. (figure 4-37)

NOTE

Following any work involving disconnection of any fuel piping and including replacing the fuel filter, it is essential to air-vent the fuel system.

- (1) Loosen venting screw (1) on the injection pump(2).
- (2) Actuate priming lever (3) by applying thumb pressure in upward direction until fuel free from air bubbles emerges at venting screw (1).
- (3) Tighten venting screw (1).
- (4) Loosen banjo bolt (4) and reducing screw (5).
- (5) Operate priming lever (3) until fuel free from air bubbles emerges at banjo bolt (4) and reducing screw (5).
- (6) Tighten banjo bolt (4) and reducing screw (5).

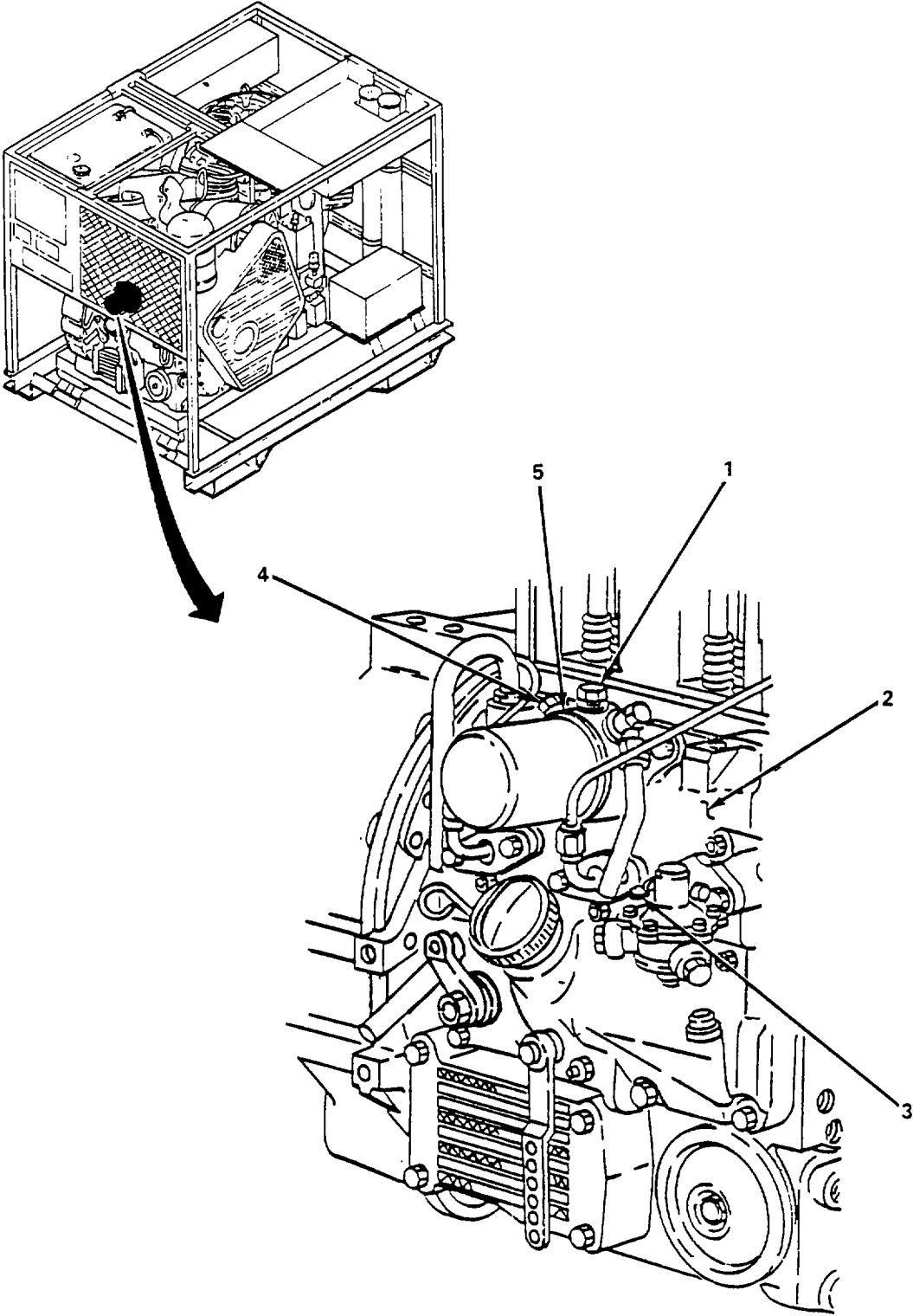


Figure 4-37. Fuel System, Service.

4-31. Fuel Lines and Fittings.

This task covers:

- a. Replace
-

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Equipment Condition

Compressor unit shut down (para. 2-13).

Materials/Parts

Fuel Hoses

Replace. (figure 4-38)

- (1) Remove two banjo bolts (1), four sealing rings (2) and remove hose (3).
- (2) Remove banjo bolt (4), two sealing ring (5) and fitting (6).
- (3) Remove fitting (6) from fitting (7).
- (4) Loosen screw (8) on clamp (9) and remove hose (10) from fitting (7).
- (5) Remove clamp (9) from hose (10).
- (6) Loosen screw (11) on clamp (12) and remove hose (10) from fitting (13).
- (7) Remove clamp (12) from hose (10).
- (8) Remove fitting (13) from fuel tank fitting (14) and remove fitting (14).
- (9) Remove bolt (15), washer (16), and fitting (17).
- (10) Loosen screw (18) on clamp (19) and remove hose (20) from injector fitting (17).
- (11) Remove clamp (19) from hose (20).
- (12) Loosen screw (21) on clamp (22) and remove hose (20) from fitting (23).
- (13) Remove clamp (22) from hose (20).
- (14) Remove fitting (23) from fuel tank fitting (24), and remove fuel tank fitting (24).
- (15) Install fuel tank fitting (24) and install fitting (23) on fuel tank fitting (24).
- (16) Install clamp (22) on hose (20).

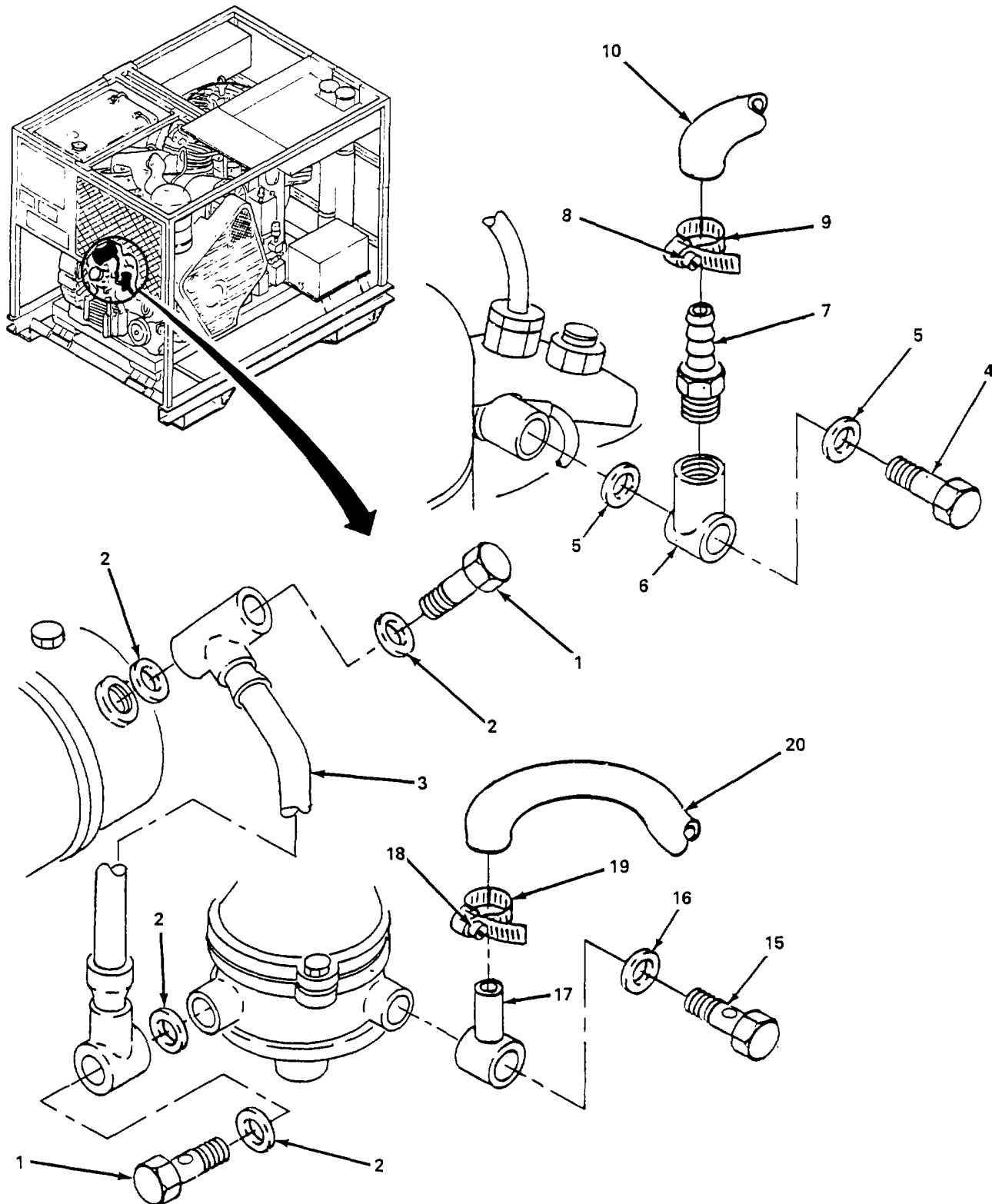


Figure 4-38. Fuel Lines and Fittings, Replace (Sheet 1 of 2).

4-31. Fuel Lines and Fittings (Cont).

- (17) Install hose (20) on fitting (23) and tighten screw (21).
- (18) Install clamp (19) on hose (20).
- (19) Install hose (20) on fitting (17) and tighten screw (18).
- (20) Install fitting (17) and secure with sealing ring (16) and bolt (15)
- (21) Install fuel tank fitting (14) and install fitting (13) on fuel tank fitting (14).
- (22) Install clamp (12) on hose (10).
- (23) Install hose (10) on fitting (13) and tighten screw (11).
- (24) Install fitting (7) on fitting (6).
- (25) Install fitting (6) and secure with two sealing ring (5) and bolt (4).
- (26) Install clamp (9) on hose (10).
- (27) Install hose (10) on fitting (7) and tighten screw (8).
- (28) Install hose (3) and secure with four sealing rings (2) and two banjo bolts (1).

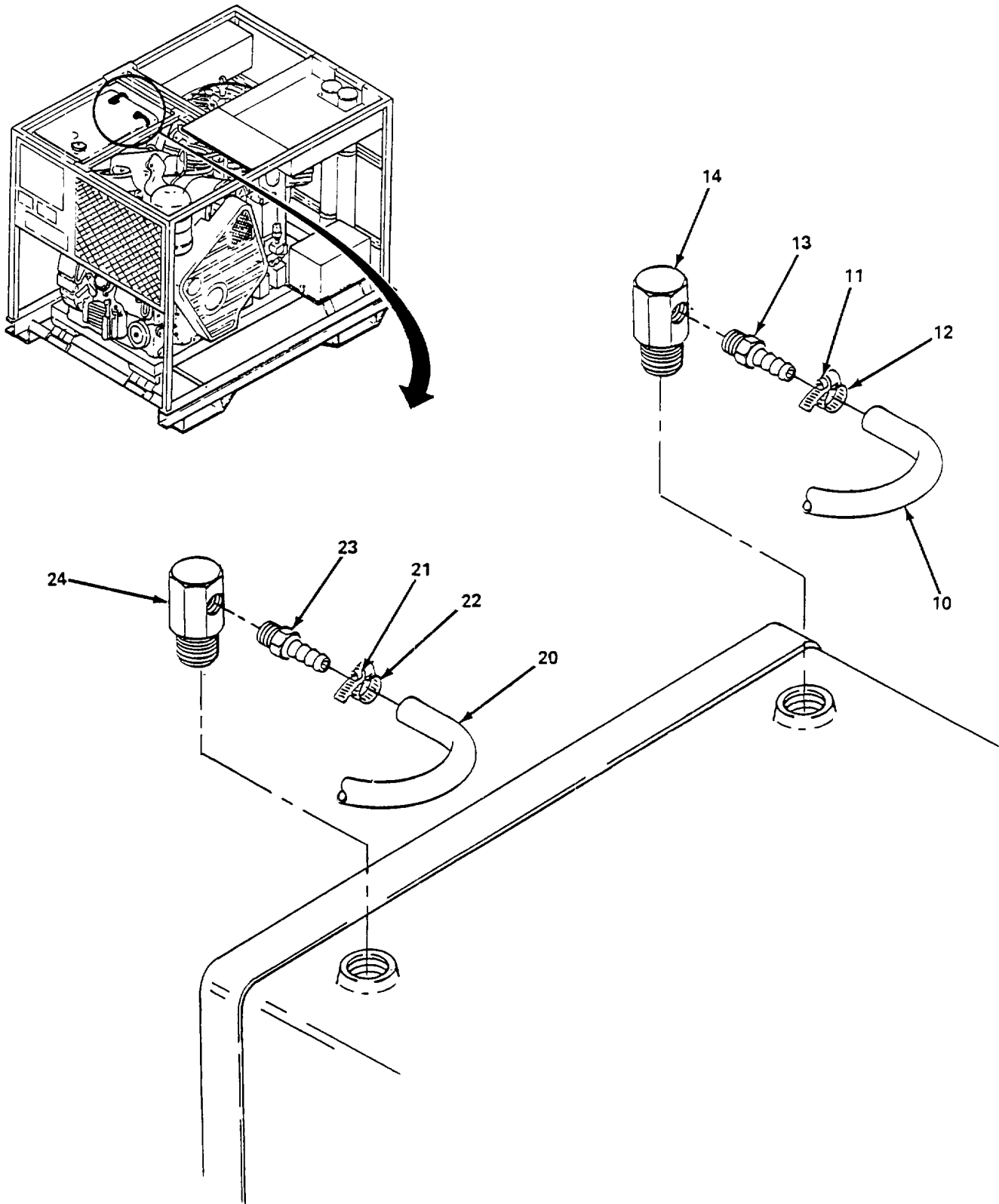


Figure 4-38. Fuel Lines and Fittings, Replace (Sheet 2 of 2).

4-32. Fuel Feed Pump.

This task covers:

a. Replace

b. Repair

INITIAL SETUP

*Tools*General Mechanic's Tool Kit
(NSN 5180-00-177-7033)*Equipment Condition*

Compressor unit shut down (para. 2-13).

*Materials/Parts*Fuel Feed Pump
Gasket Fuel Pump Mounting
Solvent, Dry Cleaning (Item 24, Appendix E)
Rags, Wiping (Item 21, Appendix E)

a. Replace. (figure 4-39)

- (1) Remove two banjo bolts (1), four sealing rings (2), and lines (3).
- (2) Remove two nuts (4) and washers (5).
- (3) Remove fuel feed pump (6) and gasket (7).
- (4) Ensure all gasket surfaces are clean and free of old gasket material.
- (5) Install gasket (7) and pump (6) on injector pump (8) and secure with two washers (5) and nuts (4).
- (6) Install two lines (3) and secure with four sealing rings (2) and two banjo bolts (1).

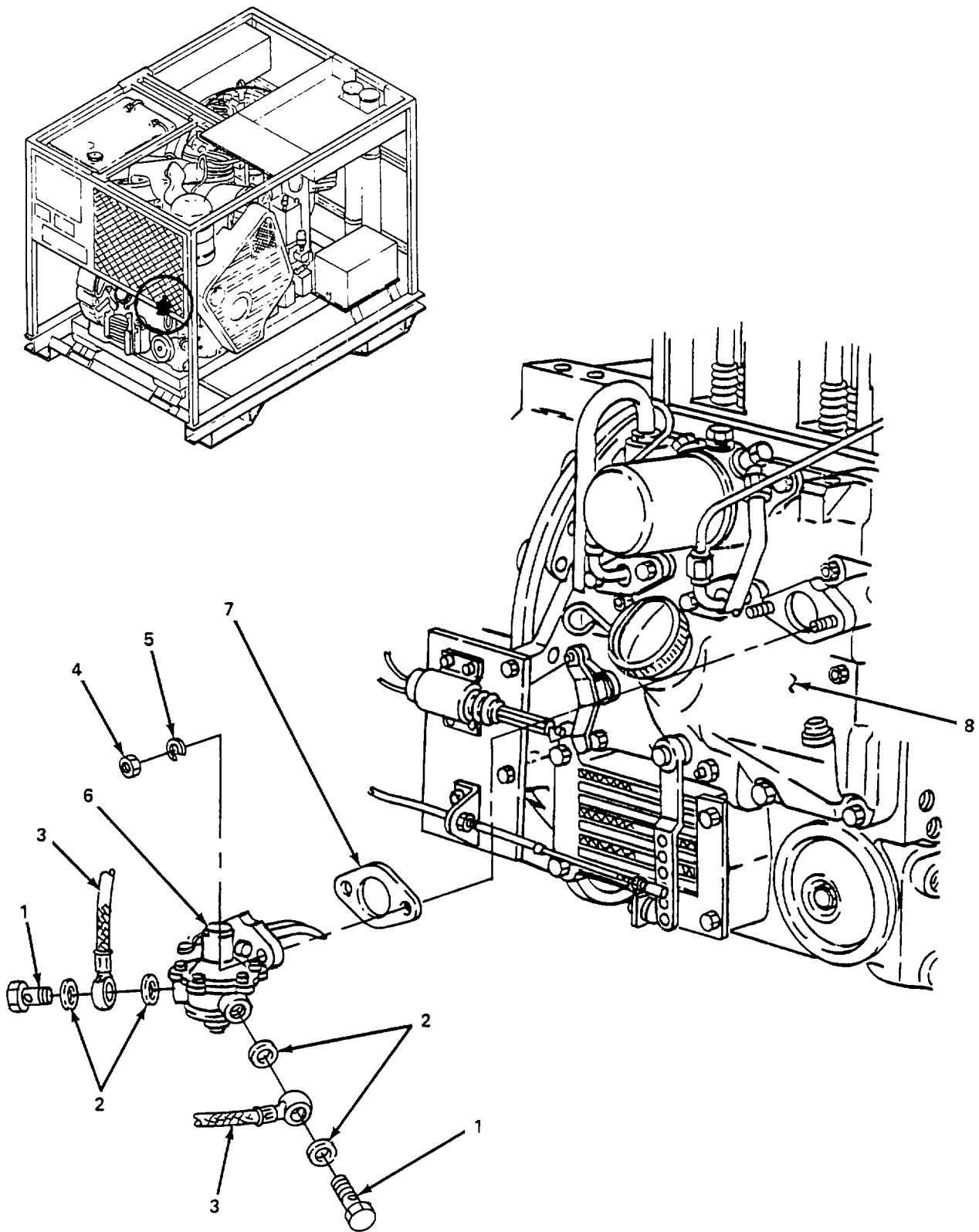


Figure 4-39. Fuel Feed Pump, Replace.

4-32. Fuel Feed Pump (Cont).b. Repair. (figure 4-40)

- (1) Remove fuel feed pump (para. a. above).
- (2) Remove bolt (1), sealing ring (2), and cover (3).
- (3) Remove gasket (4) and strainer (5) from pump bottom (6).
- (4) Remove five screws (7) and washers (8) and remove pump top (9) from pump bottom (6).
- (5) Remove screw (10), washer (11), gasket (12), strainer (13), and diaphragm (14) from pump top (9).

WARNING

Dry cleaning solvent PD-680 used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 138°F (60°C).

- (6) Clean all items with dry cleaning solvent and dry thoroughly.
- (7) Inspect all items and replace any item that is damaged.
- (8) Install diaphragm (14), strainer (13), gasket (12), washer (11), and screw (10) into pump top (9).
- (9) Install pump top (9) on pump bottom (6) and secure with five washers (8) and screws (7).
- (10) Install strainer (5), gasket (4), cover (3), and secure with sealing real (2) and bolt (1).

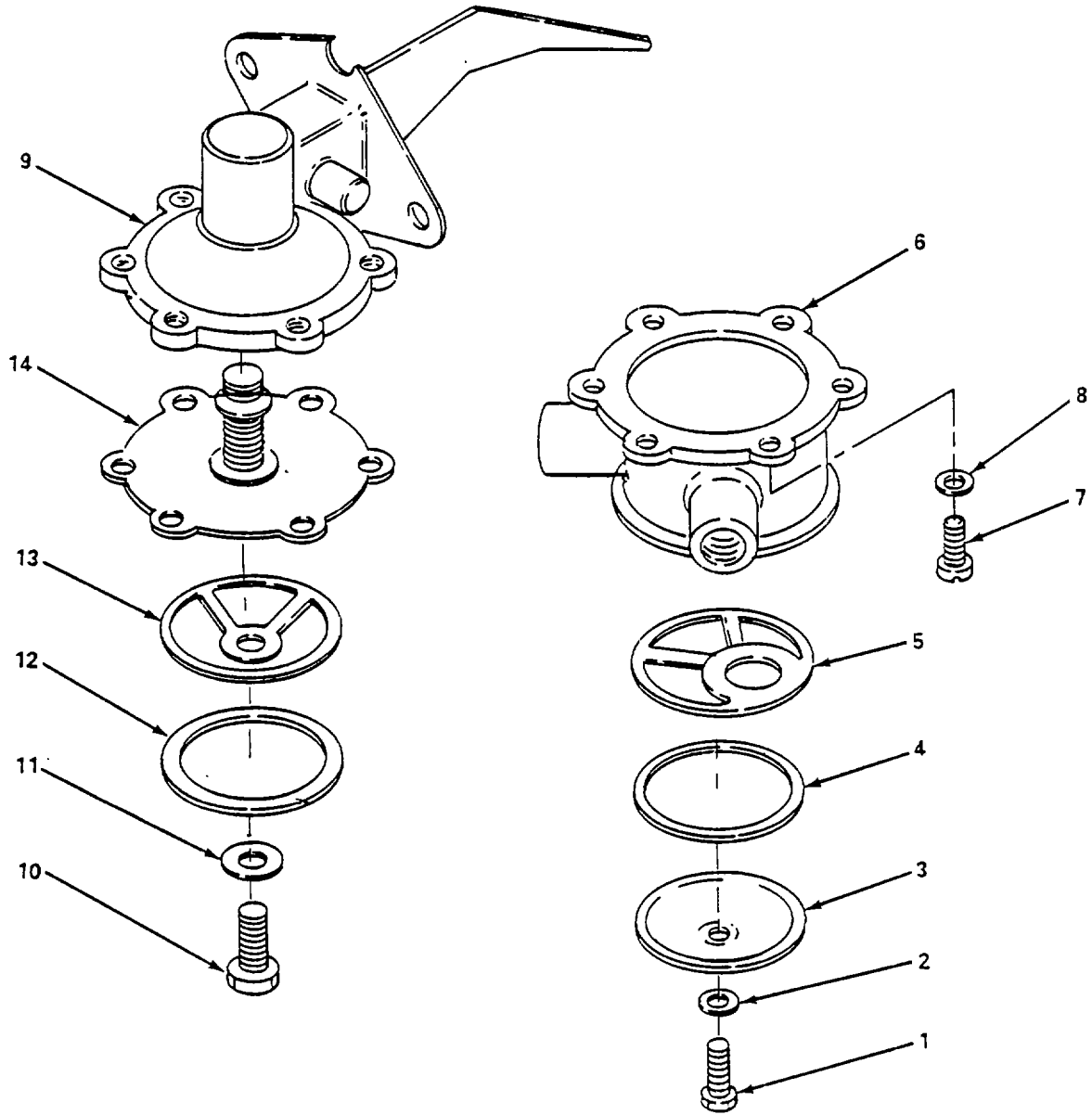


Figure 4-40. Fuel Feed Pump, Repair.

4-33. Fuel Filter.

This task covers:

- a. Replace
-

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)
Strap Wrench (NSN 5120-00-262-8491)

Equipment Condition

Compressor unit shut down (para. 2-13).

Materials/Parts

Fuel Filter
Cloth, Lint Free (Item 7, Appendix E)

Replace. (figure 4-41)

- (1) Place suitable container under fuel filter (1).
- (2) Using strap wrench, remove fuel filter (1) and gasket (2) and discard filter.
- (3) Clean sealing surface with lint free cloth.
- (4) Apply lubricant to gasket on new fuel filter (1).
- (5) Screw new fuel filter (1) in place by hand until gasket (2) is evenly seated.
- (6) Turn filter another half turn.

FOLLOW-ON MAINTENANCE
Service fuel system (para. 4-30).

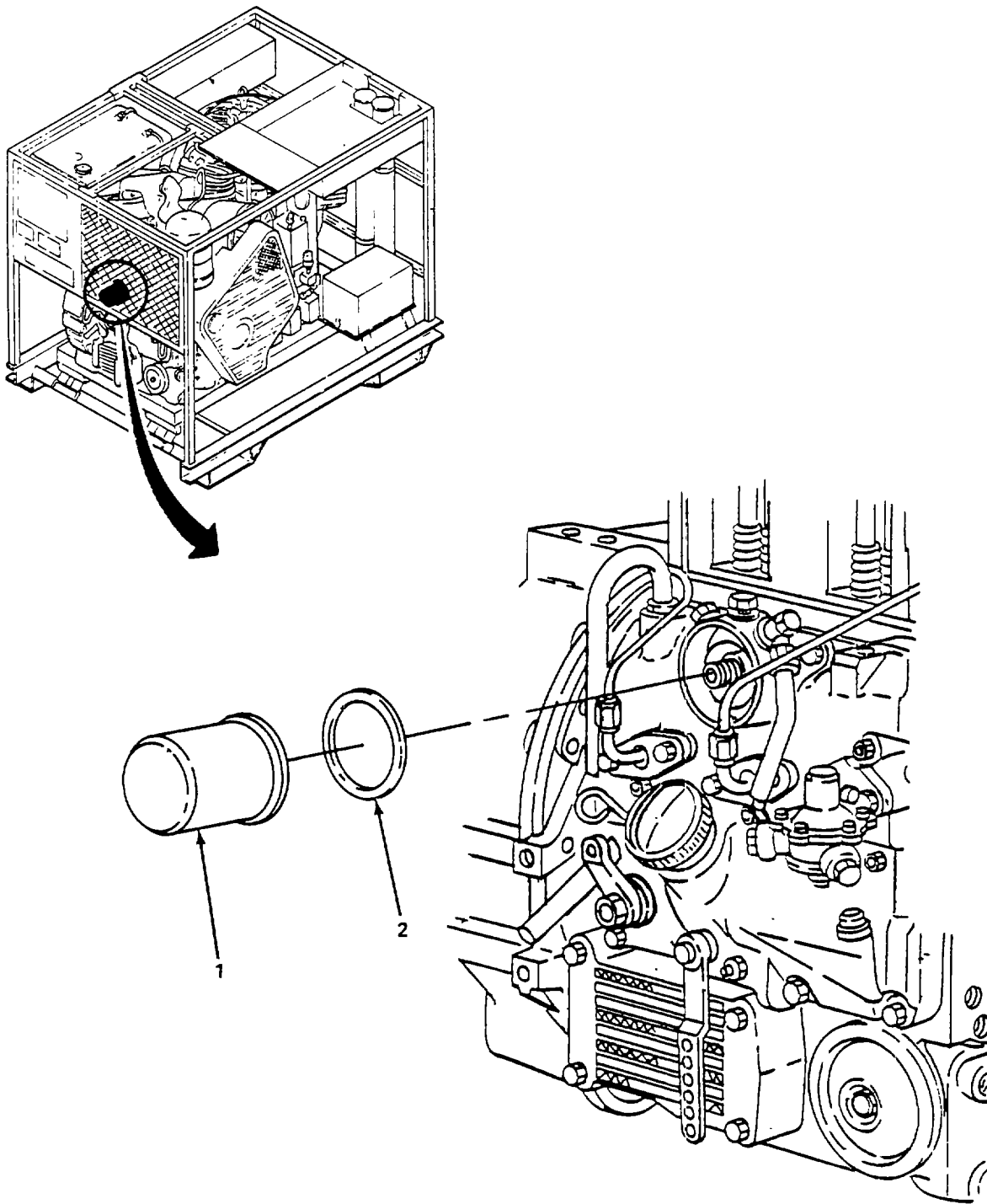


Figure 4-41. Fuel Filter, Replace.

4-34. Injector Lines.

This task covers: Replace

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Equipment Condition

Compressor unit shut down (para. 243).

*Materials/Parts***Injector Lines**

Replace. (figure 4-42)

- (1) Loosen fitting nut (1) and remove line (2) from injector pump (3).
- (2) Remove bolt (4), two washers (5), rubber sleeve (6), and pipe clip (7).
- (3) Loosen fitting nut (8) and remove line (2).
- (4) Loosen fitting nut (9) and remove line (10) from injector pump (3).
- (5) Remove bolt (11), two washers (12), rubber sleeve (13), and pipe clip (14).
- (6) Remove nut (15), washer (16), bolt (17), pipe clip (18), and rubber sleeve (19) from end plate (20).
- (7) Loosen fitting nut (21) and remove line (10).
- (8) Install line (10) and tighten fitting nut (21).
- (9) Install rubber sleeve (19), pipe clip (18), bolt (17), washer (16), and nut (15).
- (10) Install pipe clip (14), rubber sleeve (13), two washers (12), and bolt (11).
- (11) Install line (10) on injector pump (3) and tighten fitting nut (9).
- (12) Install line (2) and tighten fitting nut (8).
- (13) Install pipe clip (7), rubber sleeve (6), two washer (5)', and bolt (4).
- (14) Install line (2) on injector pump (3) and tighten fitting nut (1).

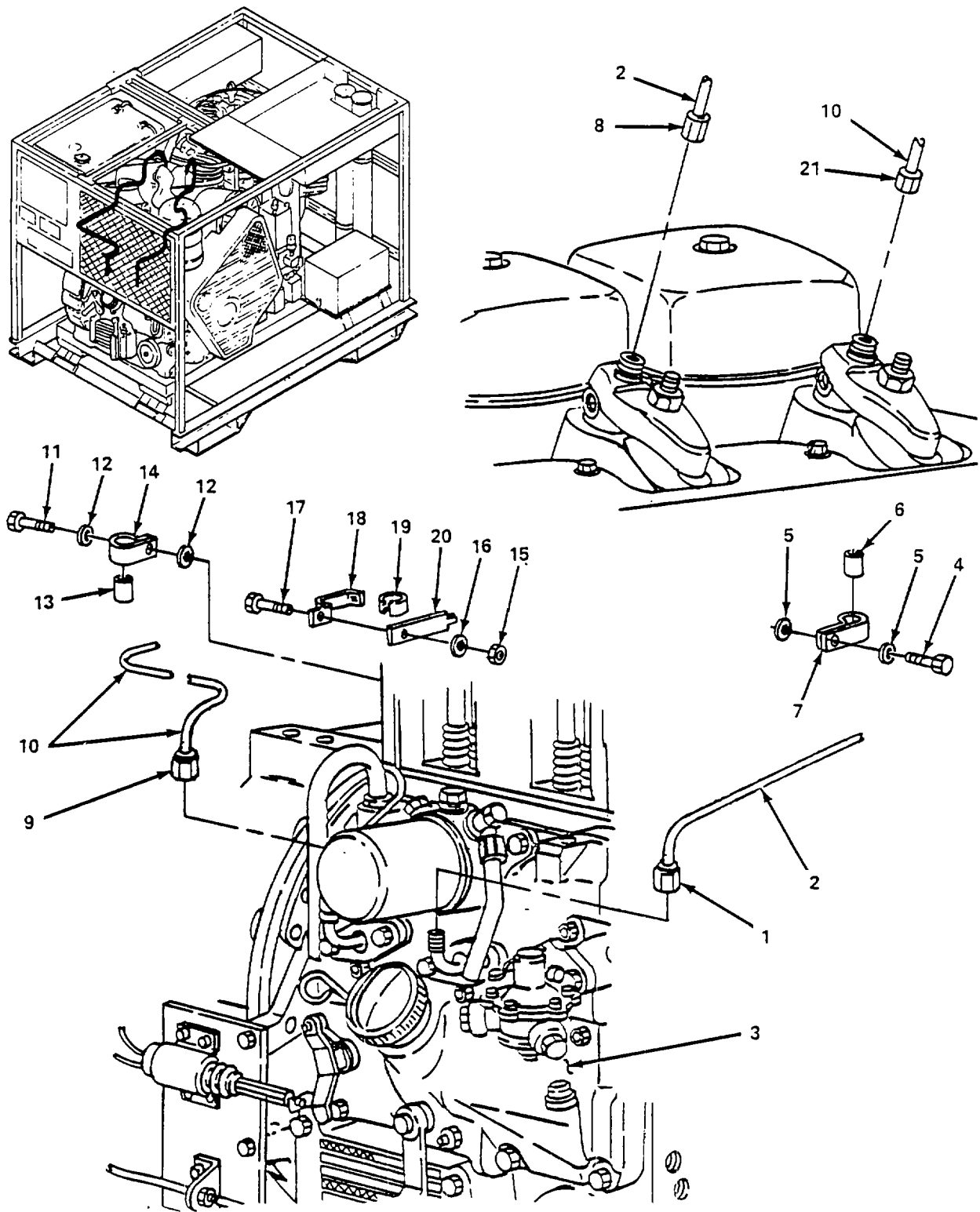


Figure 4-42. Injector Lines, Replace.

4-35. Over Flow Return Line.

This task covers:

- a. Replace
-

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Equipment Condition

Compressor unit shut down (para. 2-13).

*Materials/Parts***Over Flow Line**

Replace. (figure 4-43)

- (1) Remove banjo bolt (1), two washers (2), and remove line (3) from the fuel pump fitting (4).
- (2) Remove nut (5), washer (6), bolt (7), pipe clip (8), and rubber sleeve (9) from end plate (10).
- (3) Remove two banjo bolts (11), five washers (12), and remove line (3) and banjo nut (13) from injectors (14).
- (4) Loosen screw (15) on clamp (16), and remove line (17).
- (5) Install line (17) on banjo nut (13), and tighten screw (15).
- (6) Install line (3) and banjo nut (13) on injectors (14) and secure with five washers (12) and two banjo bolts (11).
- (7) Install rubber sleeve (9), pipe clip (8) on end plate (10) and secure with bolt (7), washer (6), and nut (5)
- (8) Install line (3) on fuel pump fitting (4) and secure with two washers (2) and banjo bolt (1).

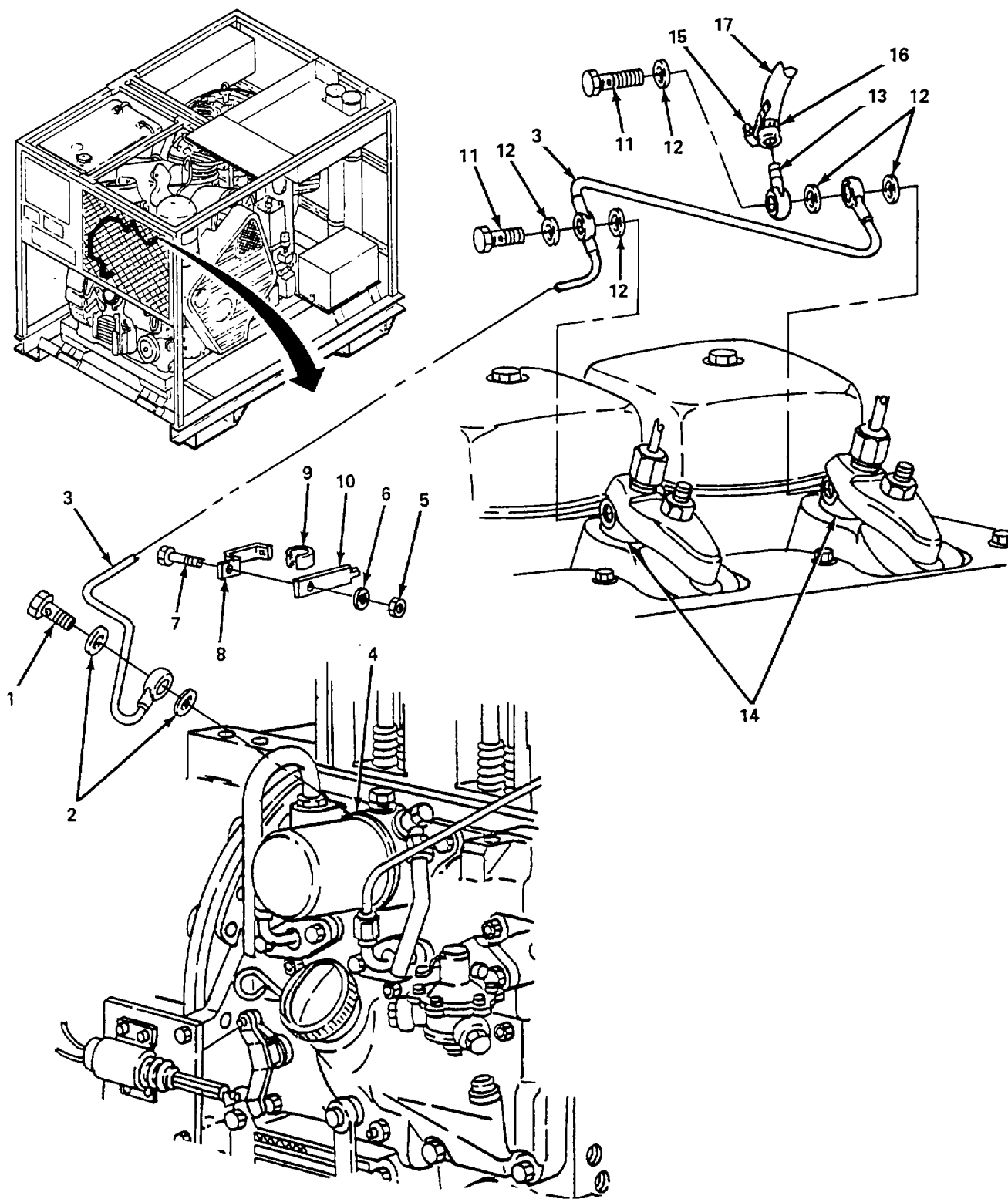


Figure 4-43. Over Flow Return Line, Replace.

4-36. Prefilter.

This task covers: Replace

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Equipment Condition

Compressor unit shut down (para. 2-13).

*Materials/Parts***Prefilter**

Replace. (figure 4-44)

- (1) Loosen screw (1) on clamp (2) securing prefilter (3) to oil bath air cleaner assembly (4).
- (2) Remove prefilter (3) from oil bath air cleaner assembly (4).
- (3) Install prefilter (3) on oil bath air cleaner assembly (4) and tighten screw (1) on clamp (2).

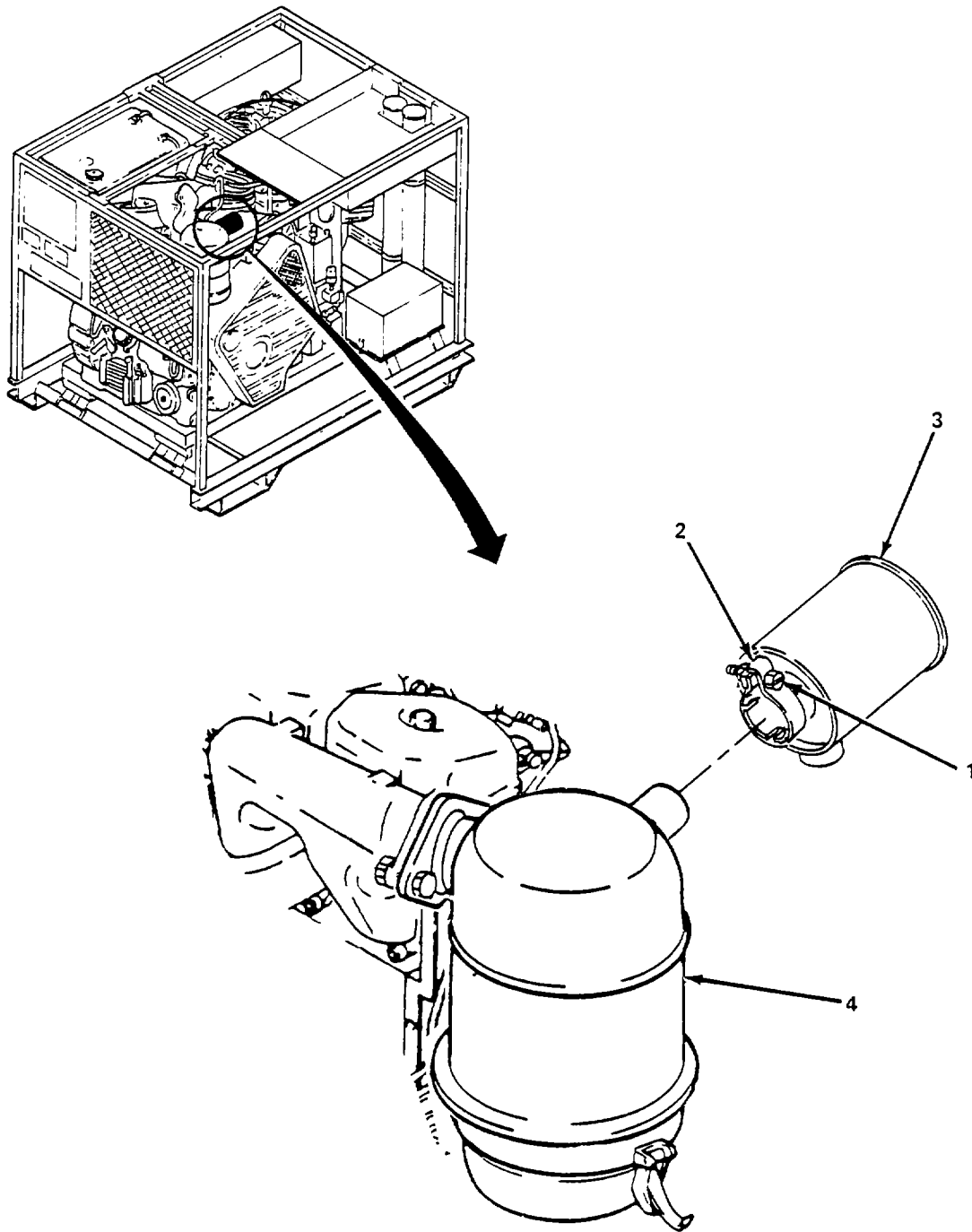


Figure 4-44. Prefilter, Replace.

4-37. Oil Bath Air Filter Assembly .

This task covers: a. Service b. Replace c. Repair

INITIAL SETUP*Materials/Parts*

Oil Bath Air Cleaner Assembly Filter
 Solvent, Dry Cleaning (Item 24, Appendix E)
 Rags, Wiping (Item 21, Appendix E)
 Oil (Item 16, Appendix E)
 Brush (Item 6, Appendix E)

Equipment Condition

Compressor unit shut down (para. 2-13).
 Prefilter removed (para. 4-36).

a. Service. (figure 4-45)

- (1) Release two clips (1) on filter housing (2) and remove bowl (3) and metal filter (4).
- (2) Remove metal filter (4) from bowl (3).
- (3) Pour oil from bowl (3) into suitable container.
- (4) Clean housing (2), bowl (3), and metal filter (4) with dry cleaning solvent and brush. Blow dry with compressed air.

WARNING

Dry cleaning solvent PD-680 used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 138°F (60°C).

Compressed air used for cleaning purposes will not exceed 30 psi (207 kPa). Use only with protective equipment (goggles/shields, gloves, etc.). Failure to do this may result in injury.

- (5) Fill bowl (3) with oil up to bead mark.
- (6) Install metal filter (4) in bowl (3).
- (7) Install bowl (3) on housing (2) and secure with two clips (1).

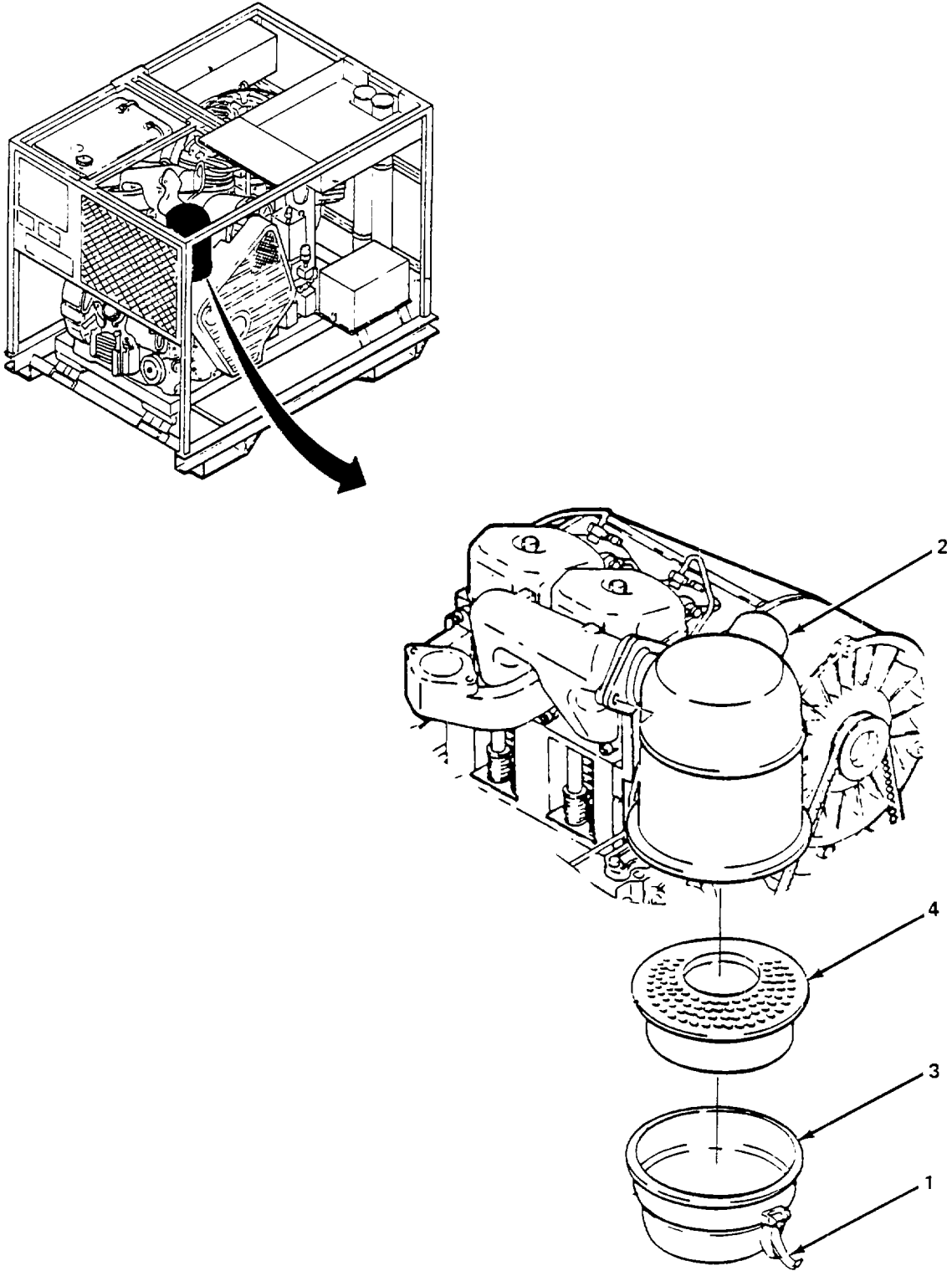


Figure 4-45. Oil Bath Air Filter Assembly, Service.

4-37. Oil Bath Air Filter Assembly (Cont).

b. Replace. (figure 4-46)

- (1) Remove two bolts (1), lockwashers (2), and remove oil bath air filter assembly (3) and gasket (4) from air intake manifold (5).
- (2) Install gasket (4), oil bath air filter assembly (3) on air intake manifold (5) and secure with two lockwashers (2) and bolts (1).

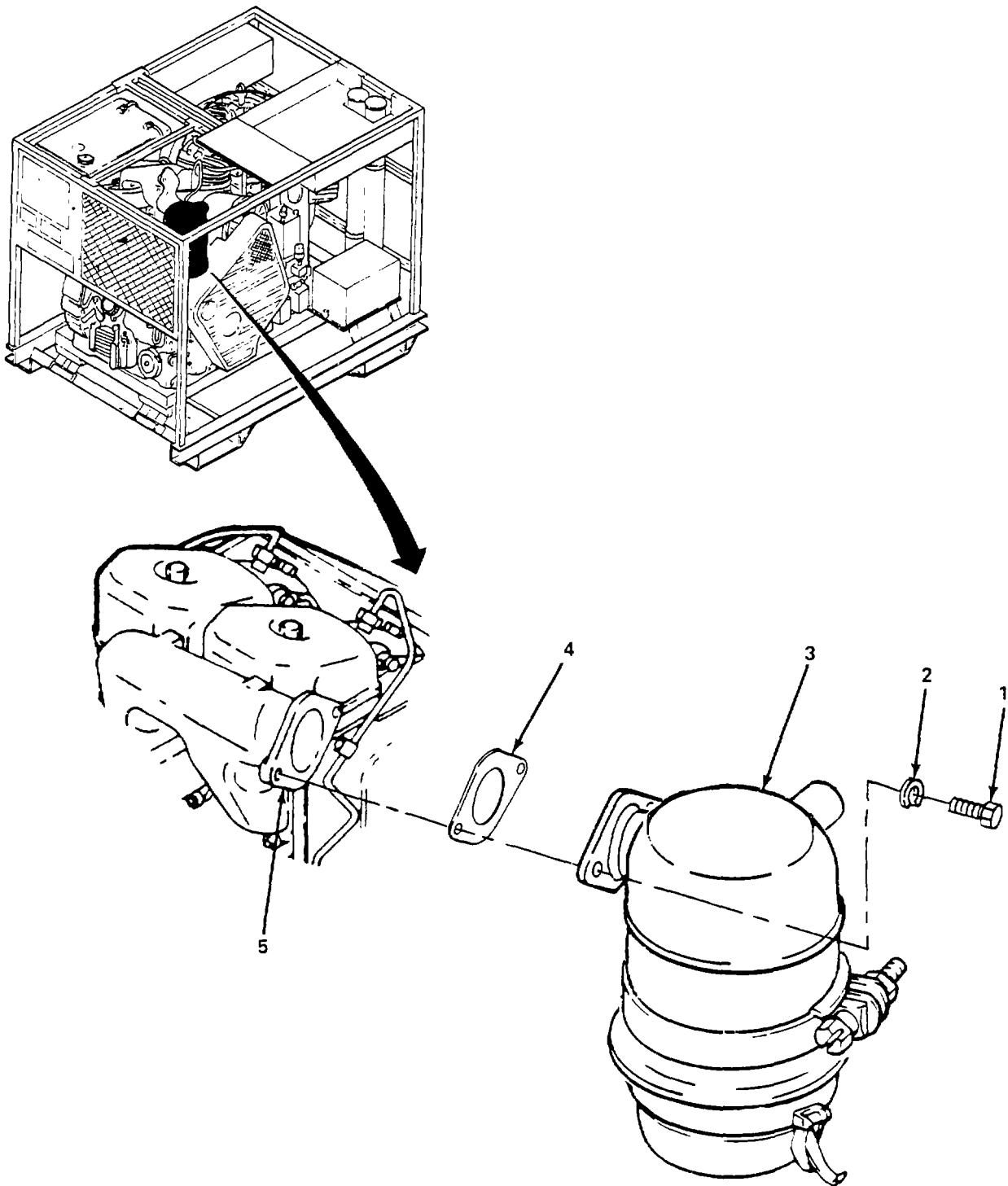


Figure 4-46. Oil Bath Air Filter Assembly, Replace.

4-37. Oil Bath Air Filter Assembly (Cont).c. Repair. (figure 4-47)

- (1) Remove oil bath air filter assembly (para. b. above).
- (2) Loosen screw (1) on clamp (2).
- (3) Slide clamp (2) and base pad (3) down off of plate support (4) and remove clamp (2) and base pad (3).
- (4) Remove plate support (4) and gasket (5).
- (5) Release two clips (6) on filter housing (7) and remove bowl (8) and metal filter (9).
- (6) Remove metal filter (9) from bowl (8).
- (7) Pour oil from bowl (8) into suitable container.
- (8) Remove gasket (10) and (11) from housing (7) and metal filter (9).

WARNING

Dry cleaning solvent PD-680 used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 138°F (60°C).

- (9) Clean all items with dry cleaning solvent and dry thoroughly.
- (10) Inspect all items and replace any item if crack or otherwise damaged.
- (11) Fill bowl (8) with oil up to bead mark.
- (12) Install gasket (11) on housing (7) and gasket (10) on metal filter (9).
- (13) Install metal filter (9) into bowl (8).
- (14) Install bowl (8) on housing (7) and secure with two clips (6).
- (15) Position plate support (4) and gasket (5) on housing (7).
- (16) Slide base pad (3) and clamp (2) upward over plate support (4) and tighten screw (1).
- (17) Install oil bath air filter assembly (para. b. above).

FOLLOW-ON MAINTENANCE
Install prefilter (para. 4-36).

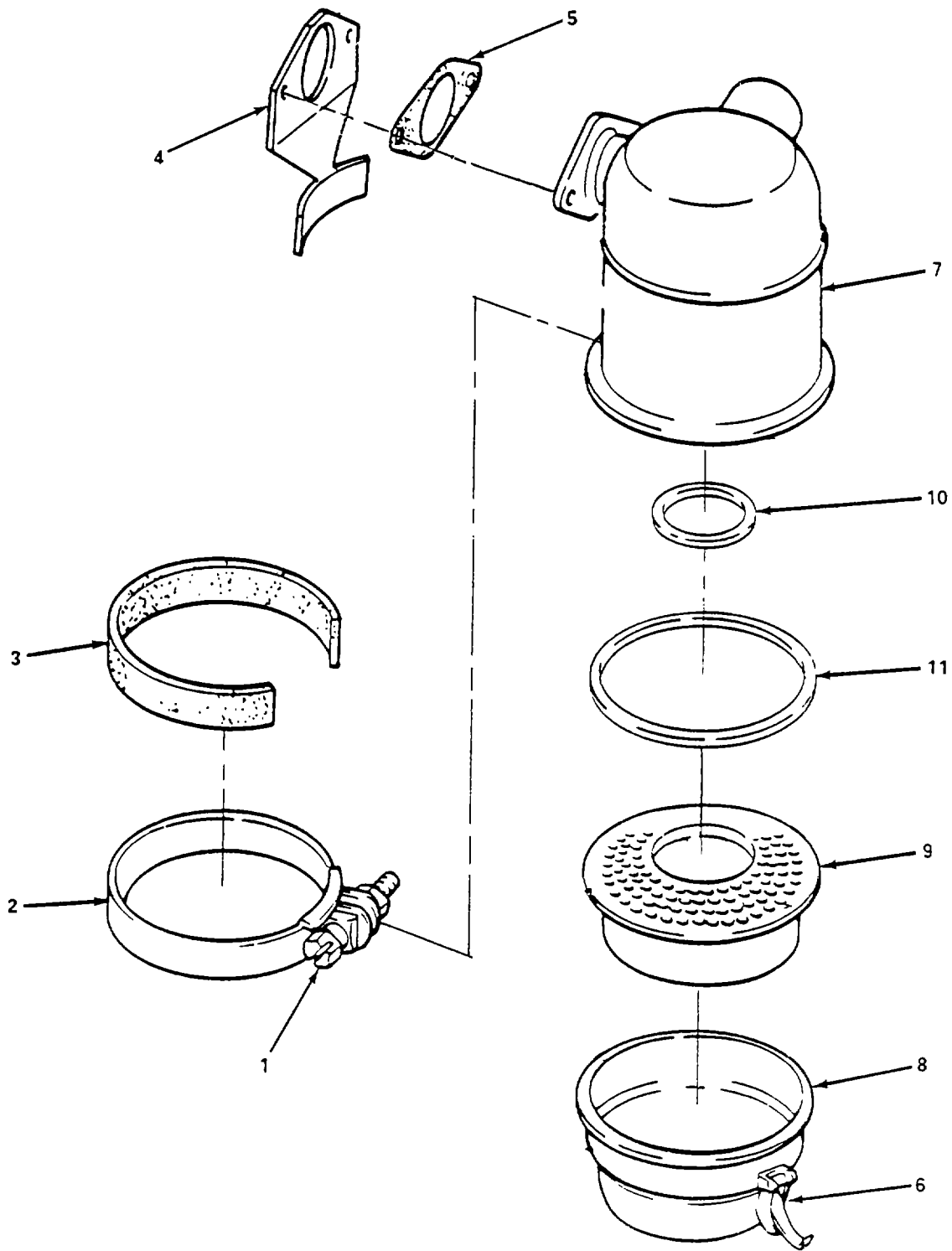


Figure 4-47. Oil Bath Air Filter Assembly, Repair.

4-38. Air Intake Manifold .

This task covers: Replace

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Equipment Condition

Compressor unit shut down (para. 2-13).
Prefilter removed (para. 4-36).
Oil bath air cleaner assembly removed (para. 4-37).

Materials/Parts

Air Intake Manifold
Gasket

Replace. (figure 4-48)

- (1) Loosen fitting nut (1) and remove line (2).
- (2) Remove four nuts (3), lockwashers (4), and remove manifold (5) and gasket (6) from engine (7).
- (3) Install gasket (6) and manifold (5) and secure with four lockwashers (4) and nuts (3).
- (4) Install line (2) and tighten fitting nut (1).

FOLLOW-ON MAINTENANCE

- (1) Install oil bath air cleaner assembly (para. 4-37).
- (2) Install prefilter (para. 4-36).

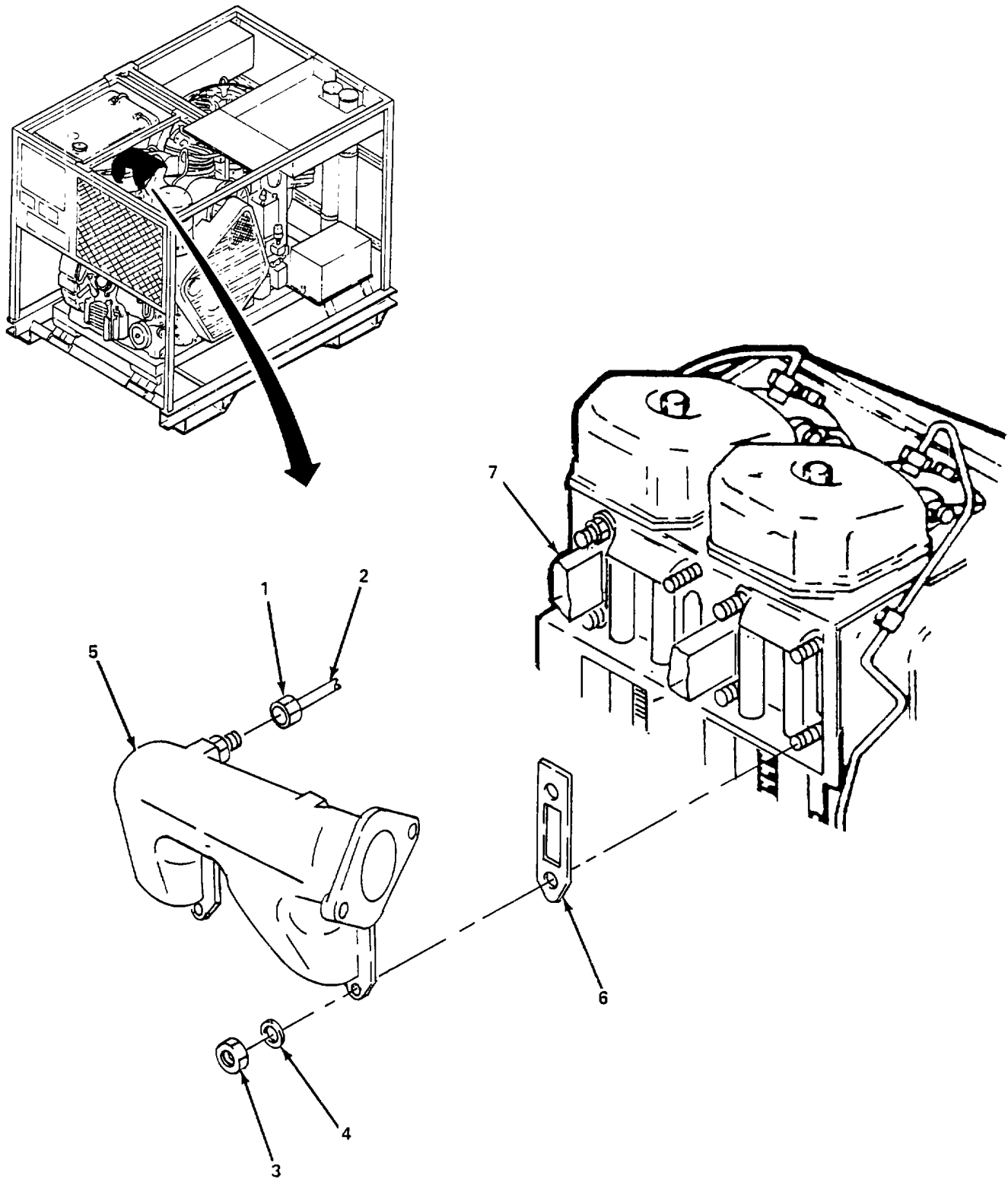


Figure 4-48. Air Intake Manifold, Replace.

4-39. Exhaust System.

This task covers: Replace

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Equipment Condition

Compressor unit shut down (para. 2-13).

Materials/Parts

Silencer
Muffler
Gasket

Replace. (figure 4-49)

- (1) Remove two nuts (1), lockwashers (2), and washers (3) and remove U-bolt (4).
- (2) Remove two nuts (5) and remove band clamp (6) from muffler (7).
- (3) Remove silencer (8) from muffler (7).
- (4) Remove exhaust pipe (9) from silencer (8).
- (5) Remove extension pipe (10) from muffler (7).
- (6) Remove four nuts (11), lockwashers (12), and remove muffler (7) and gasket (13) from engine (14).
- (7) Remove four studs (15) from engine (14).
- (8) Install four studs (15) from engine (14).
- (9) Install gasket (13) and muffler (7) on studs (15) and secure with four lockwashers (12) and nuts (11).
- (10) Install extension pipe (10) on muffler (7).
- (11) Install exhaust pipe (9) on silencer (8).
- (12) Install silencer (8) on muffler (7) and install band clamp (6) and secure with two nuts (5).
- (13) Install U-bolt (4) and secure with two washers (3), lockwashers (2), and nuts (1).

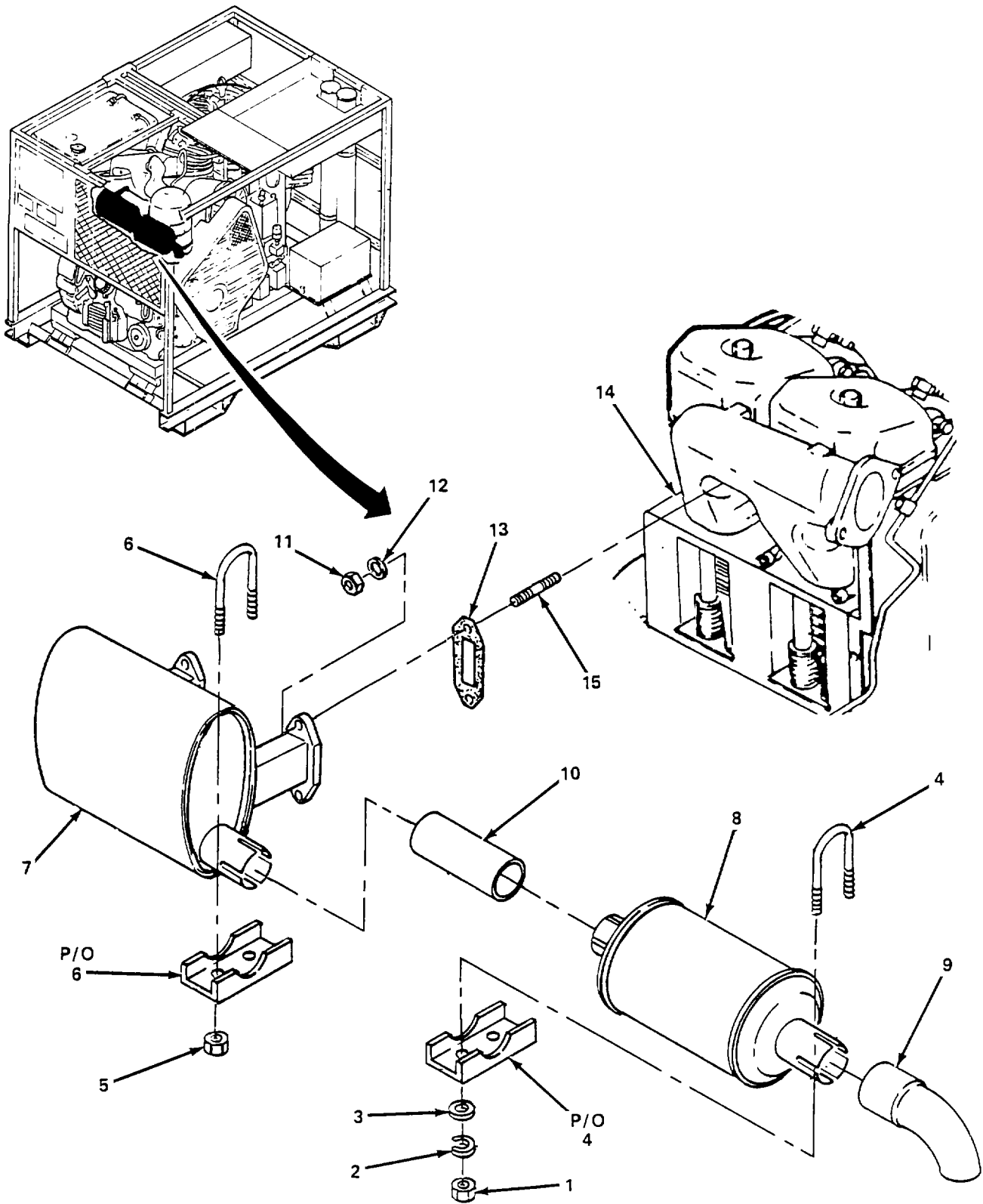


Figure 4-49. Exhaust System, Replace.

4-40. Engine V-Beltguard.

This task covers: Replace

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Equipment Condition

Compressor unit shut down (para. 2-13).

*Materials/Parts***V-Beltguard**

Replace. (figure 4-50)

- (1) Remove four hex bolts (1) and washers (2).
- (2) Remove five cap nuts (3), washers (4), and rubber grommets (5) and remove V-beltguard (6).
- (3) Install V-beltguard (6) on stud (7) and secure with five rubber grommets (5), washers (4), and cap nuts (3).
- (4) Install four washers (2) and hex bolts (1).

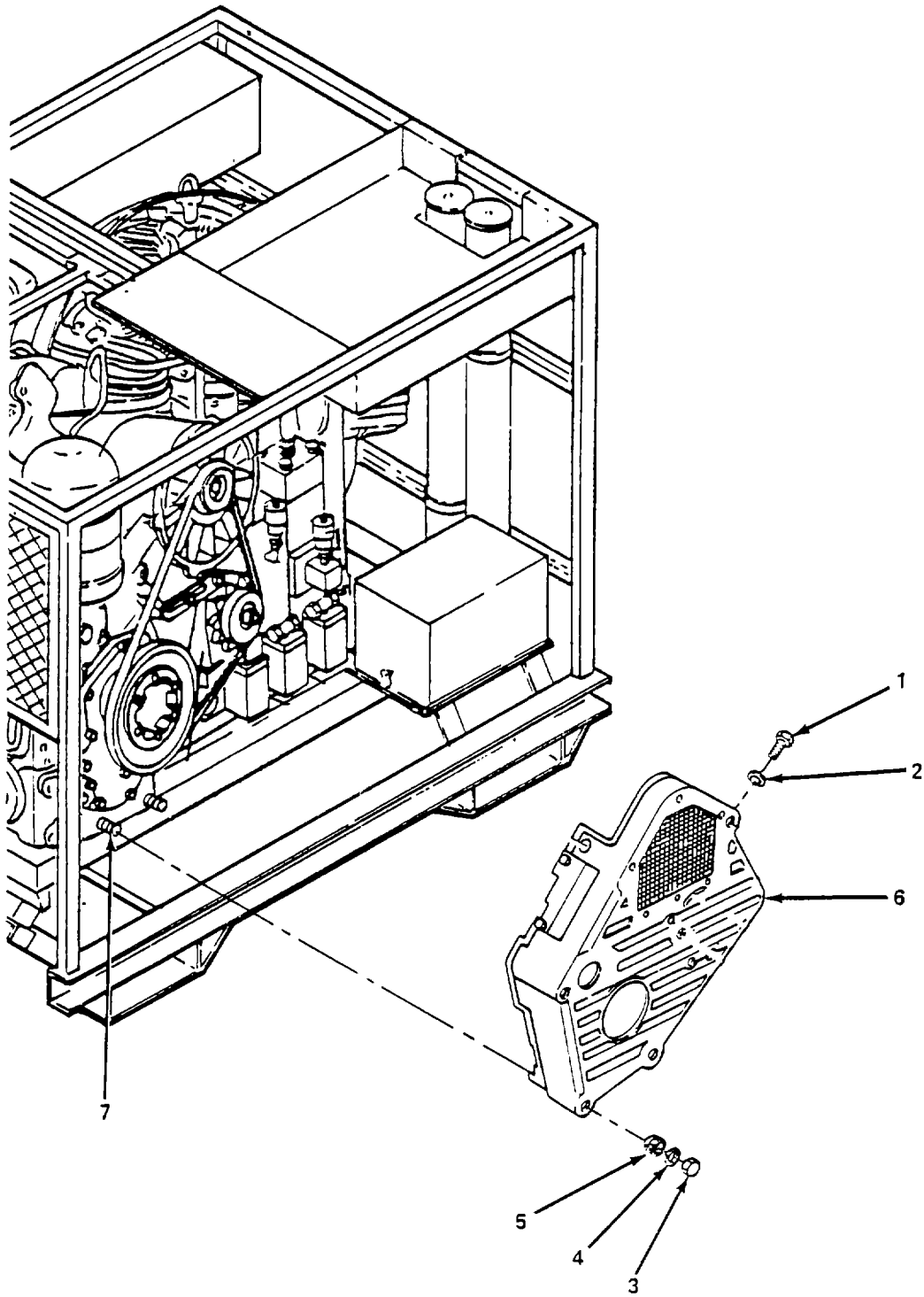


Figure 4-50. Engine V-Beltguard, Replace.

4-41. V-Belt.

This task covers: Replace

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Equipment Condition

Compressor unit shut down (para. 2-13).
V-Beltguard removed (para. 4-15).

*Materials/Parts**V-Belts*

Replace. (figure 4-51)

- (1) Loosen bolts (1), (2), and (3).
- (2) Push alternator (4) in direction of arrow B.
- (3) Remove belts (5).

NOTE

Always replace both belts when only one is worn or damaged.

- (4) Install belts over engine pulley (6), blower pulley (7), and alternator pulley (8).
- (5) Push alternator (4) in direction of arrow A.
- (6) Tighten bolts (1), (2), and (3).
- (7) Check fan belt tension by a firm push between blower pulley (7) and engine pulley (6), belts depress approximately 0.4 - 0.6 in. (10 - 15 cm).
- (8) If belts depress more than 0.4 - 0.6 in., loosen bolts (1), (2), and (3) and push alternator in direction of arrow A.
- (9) Tighten bolts (1), (2), and (3).

FOLLOW-ON MAINTENANCE
Install V-beltguard (para. 4-15).

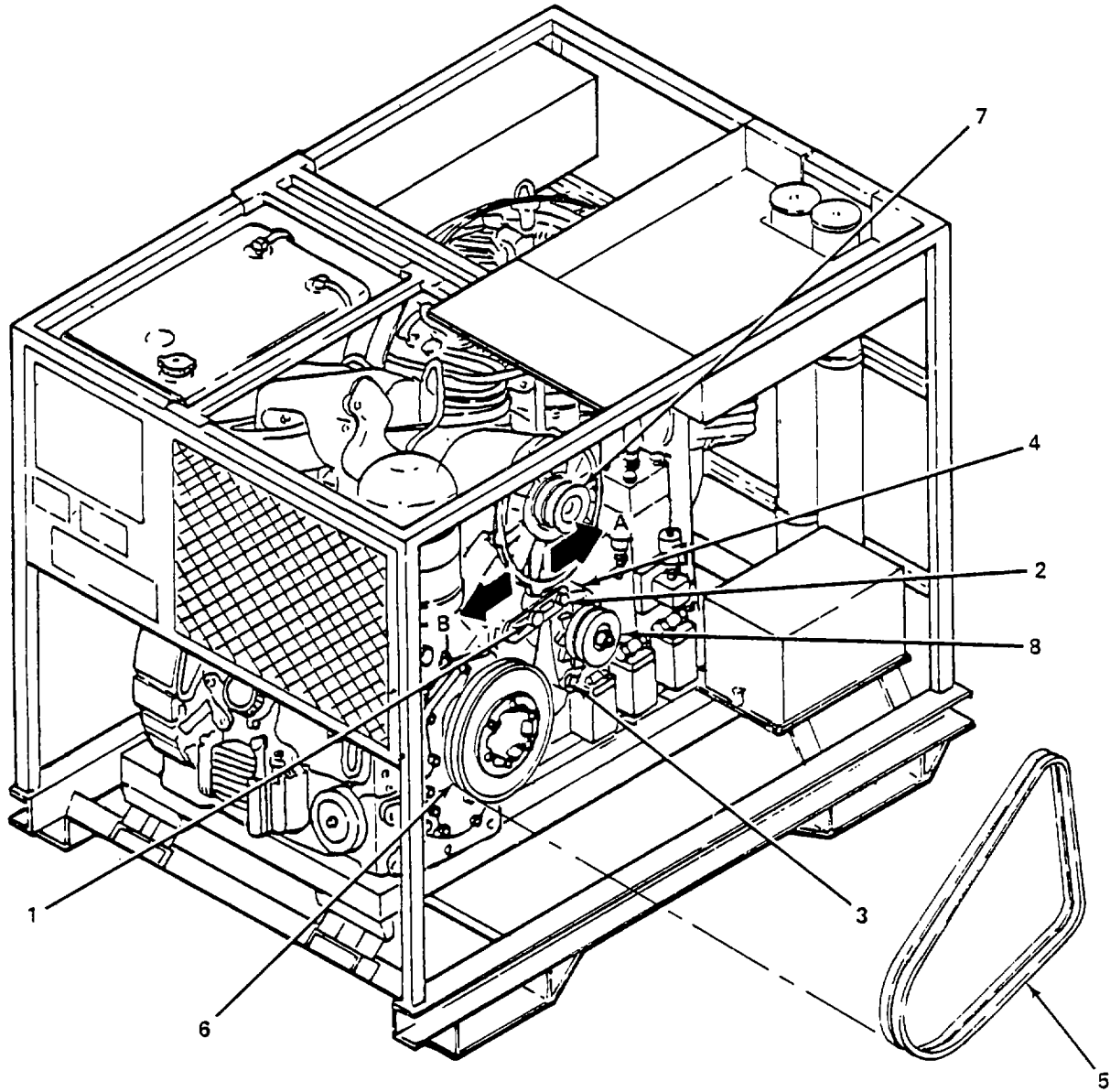


Figure 4-51. V-Belts, Replace.

4-42. Cooling Air Ducting .

This task covers: Replace

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Equipment Condition

Compressor unit shut down (para. 2-13).

*Materials/Parts**Cooling Air Ducting*

Replace. (figure 4-52)

- (1) Remove bolts (1) and washer (2), and remove cowling hood (3).
- (2) Remove four bolts (4) and lockwashers (5).
- (3) Remove bolt (6), lockwasher (7), and washer (8) and remove guide rail (9).
- (4) Remove bolt (10), washer (11), spacer (12), circlip (13), and pin bolt stud (14) and remove bottom plate (15).
- (5) Remove four bolts (16), lockwashers (17), and washer (18) and remove baffle (19).
- (6) Remove bolt (20), washer (21), and clamp (22).
- (7) Remove three bolts (23) and washers (24), and remove front plate (25).
- (8) Remove screw (26), washer (27), and clamp (28).
- (9) Remove bolt (29) and lockwasher (30).
- (10) Remove two bolt (31) and lockwashers (32).
- (11) Remove two bolts (33), lockwashers (34), and washers (35) and remove back plate (36).
- (12) Install back plate (36) and secure with two washers (35), lockwashers (34), and bolts (33).
- (13) Install two lockwashers (32) and bolts (31).
- (14) Install lockwasher (30) and bolt (29).
- (15) Install clamp (28), washer (27) and screw (26).

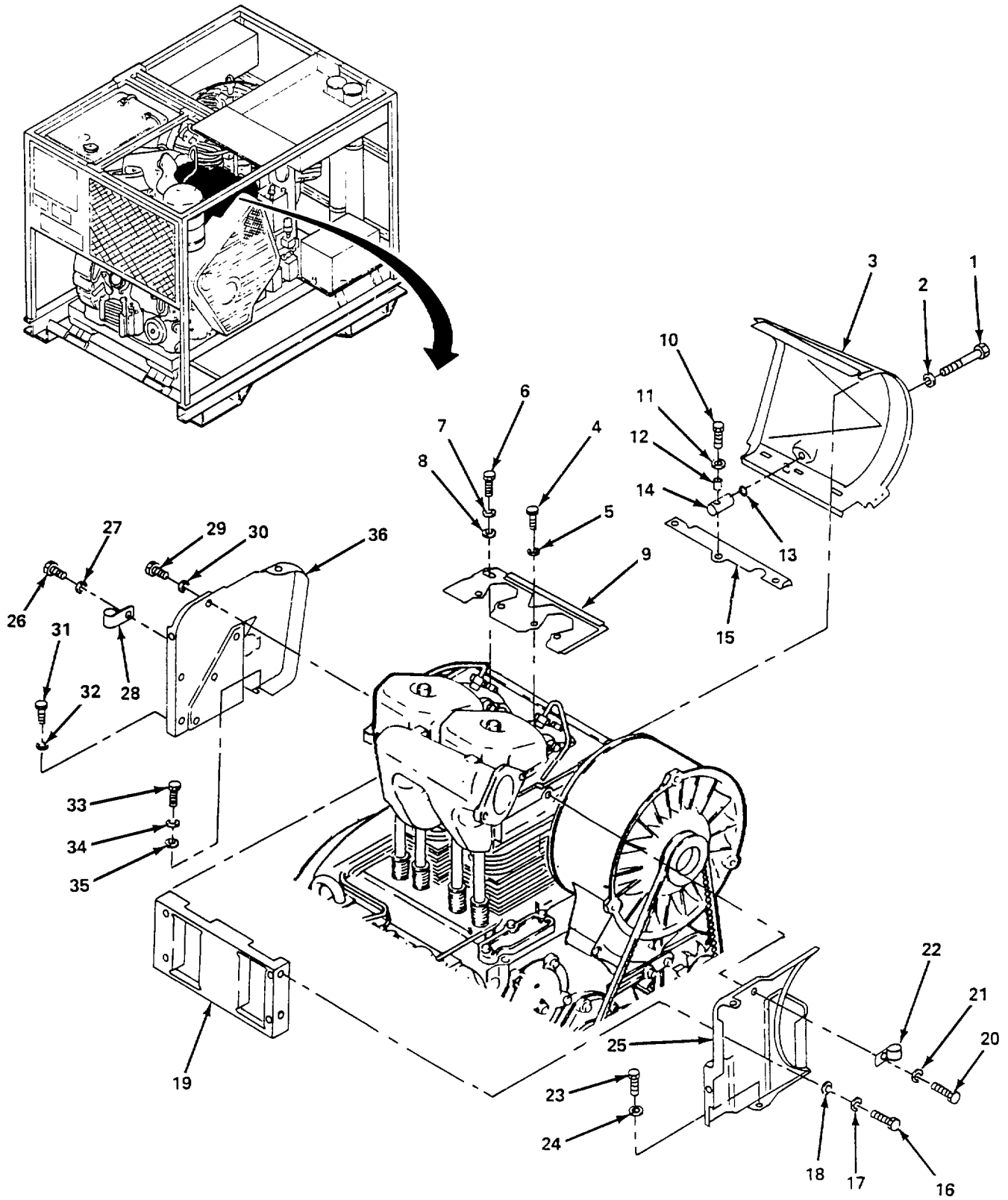


Figure 4-52. Cooling Air Ducting, Replace.

4-129/(4-130 blank)

- (16) Install front plate (25) and secure with three washers (24),and bolts (23).
- (17) Install clamp (22), washer (21), and bolt (20).
- (18) Install baffle (19) and secure with four washer (18), lockwashers (17), and bolts (16).
- (19) Install bottom plate (15) pin bolt stud (14), circlip (13), spacer (12), washer (11), and bolt (10).
- (20) Install guide rail (9) and secure with washer (8), lockwasher (7), and bolt (6).
- (21) Install four lockwashers (5) and bolts (4).
- (22) Install cowling hood (3) and secure with washer (2), and bolt (1).

4-43. Wiring Harness.

This task covers: a. Test b. Replace c. Repair

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)
Multimeter (NSN 6625-01-139-2512)

Materials/Parts

Wiring Harness

a. Test. (figure 4-53)

NOTE

Wiring harness removed for test. See para. b.

- (1) Perform point to point continuity test on wiring harness (1).
- (2) Replace or repair a defective wiring harness (1).

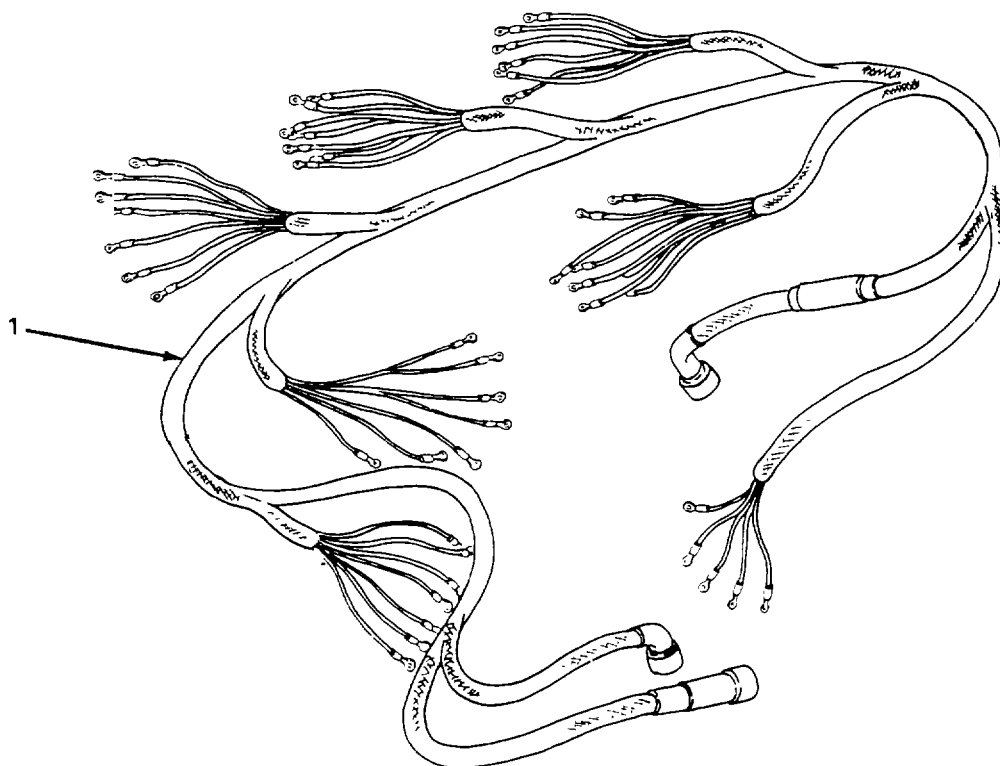


Figure 4-53. Wiring Harness. Test (Sheet 1 of 2).

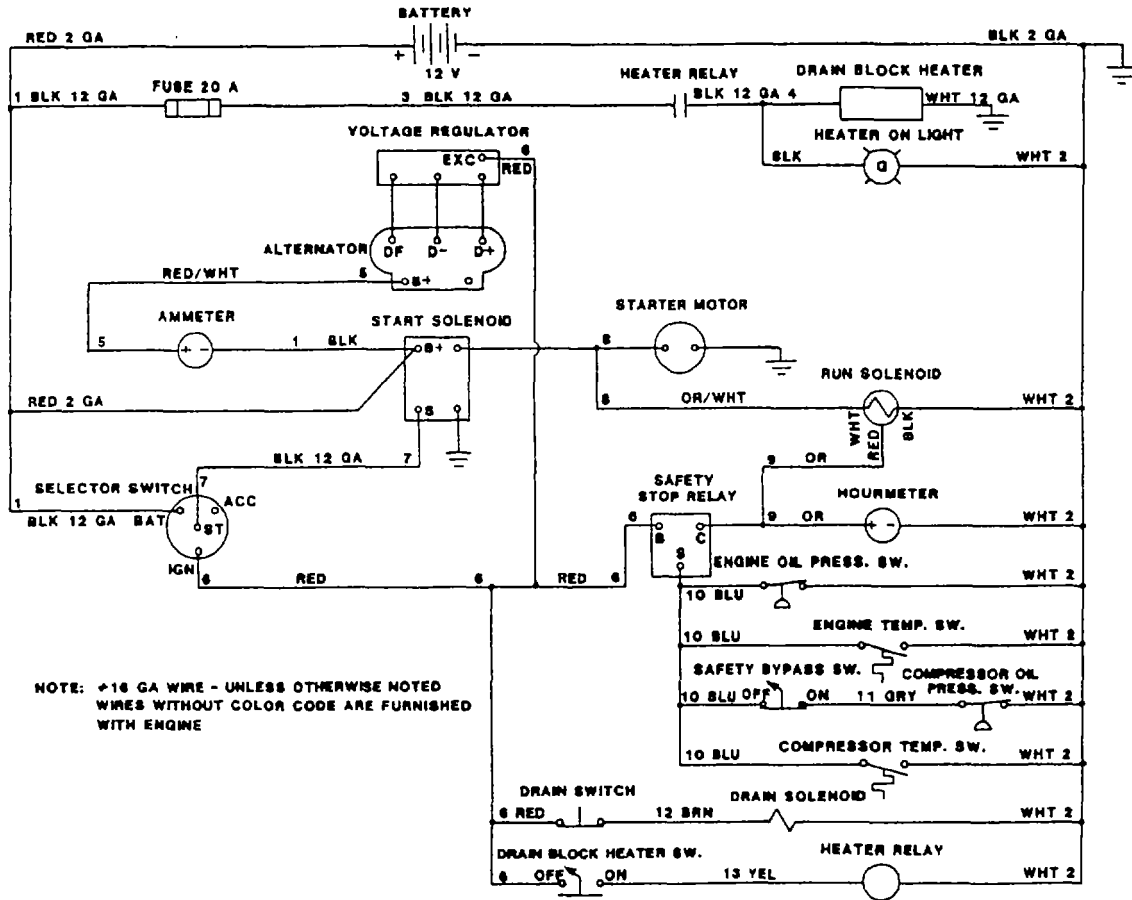


Figure 4-53. Wiring Harness. Test (Sheet 2 of 2).

4-43. **Wiring Harness (Cont).**b. Replace. (figure 4-54)

- (1) Loosen nut (1) and remove negative cable (2) and black wire (3).
- (2) Tag and remove wiring harness (4) from control panel (5), starter (6), alternator (7), shutdown device (8), pressure switch (9), interfilter block assembly (10), and 4th stage valve head (11).
- (3) Inspect wiring on back of control panel (5). Refer to Appendix F for procedures to manufacture control panel wiring.
- (4) Install wiring harness (4) as tagged to 4th stage valve head (11), interfilter block assembly (10), pressure switch (9), shutdown device (8), alternator (7), starter (6), and control panel (5).
- (5) Install black wire (3) and negative cable (2) and tighten nut (1).

c. Repair.

- (1) Inspect wiring harness.
- (2) Replace any terminal lugs or connectors that are missing or damaged.
- (3) Replace any wire that has burnt, cracked, or otherwise damaged insulation.

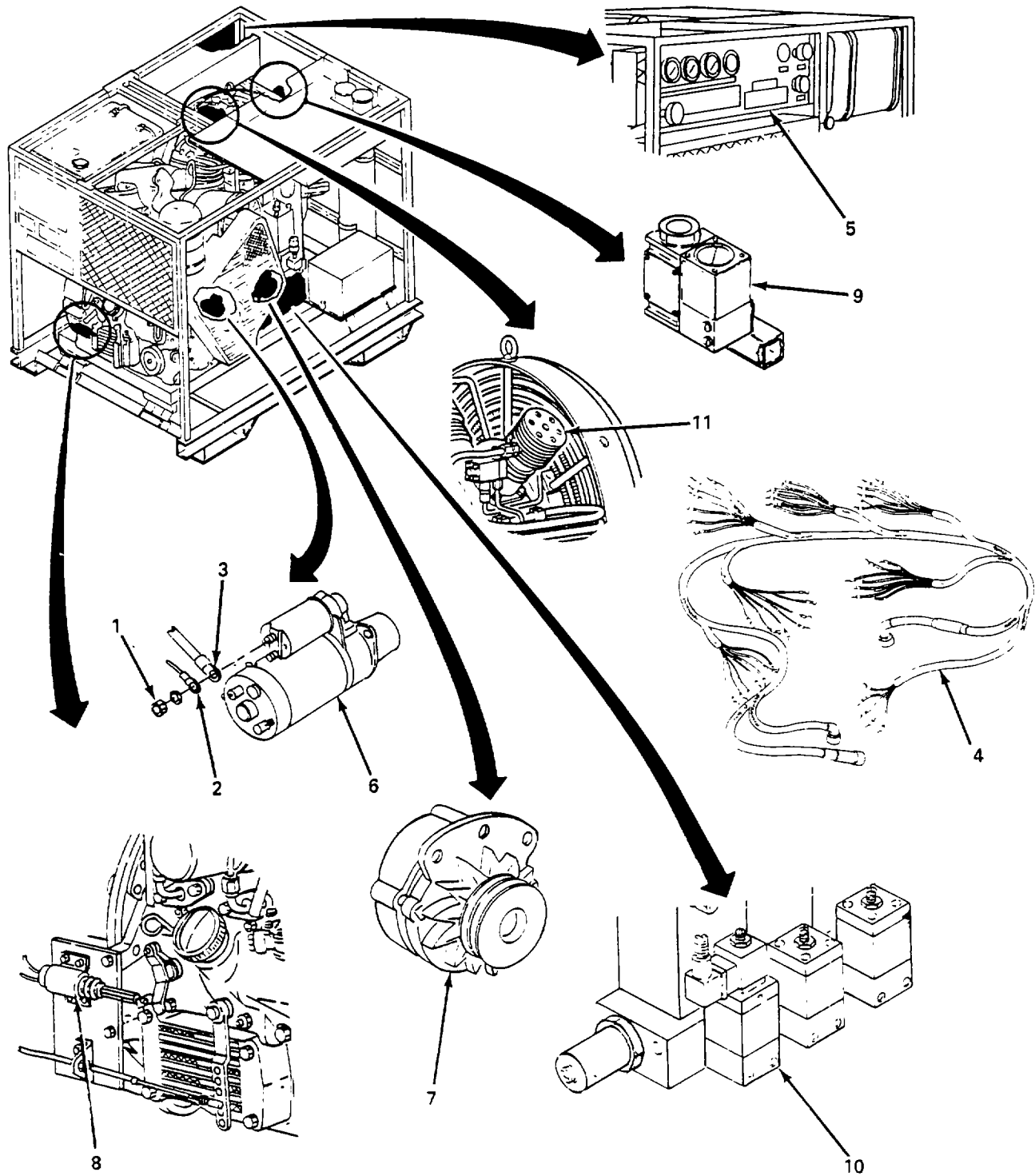


Figure 4-54. Wiring Harness, Replace.

4-44. Alternator.

This task covers: a. Test b. Adjust c. Replace

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)
Multimeter (NSN 6625-01-139-2512)

Equipment Condition

Compressor unit shut down (para. 2-13).
V-Beltguard removed (para. 4-15).

*Materials/Parts**Alternator*

a. Test. (figure 4-55)

- (1) Start engine (para. 2-12).
- (2) Connect positive lead of multimeter to BAT terminal (1) on alternator (2).
- (3) Connect negative lead of multimeter to case of alternator (2).
- (4) Voltage reading should be 12 - 14 volts. If reading is less than or more than specified, replace alternator.
- (5) Disconnect leads.
- (6) Stop engine (para. 2-13).

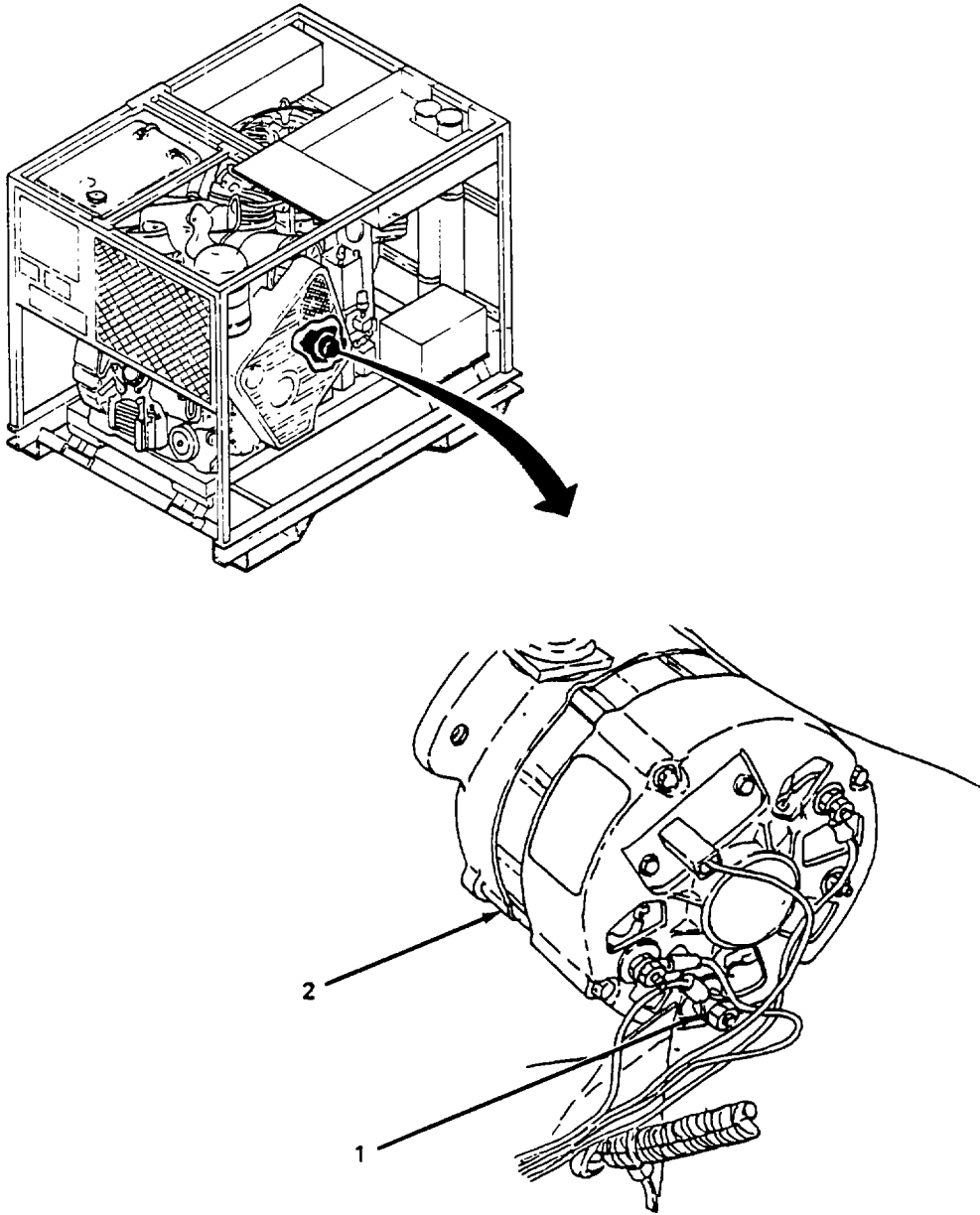


Figure 4-55. Alternator, Test.

4-44. **Alternator (Cont).**

b. Adjust. (figure 4-56)

- (1) Loosen screw (1).
- (2) Adjust belt tension so that a firm push midway between blower pulley (2) and engine pulley (3) will depress belts approximately 0.4 - 0.6 in. (10 - 15 cm).
- (3) Tighten screw (1).

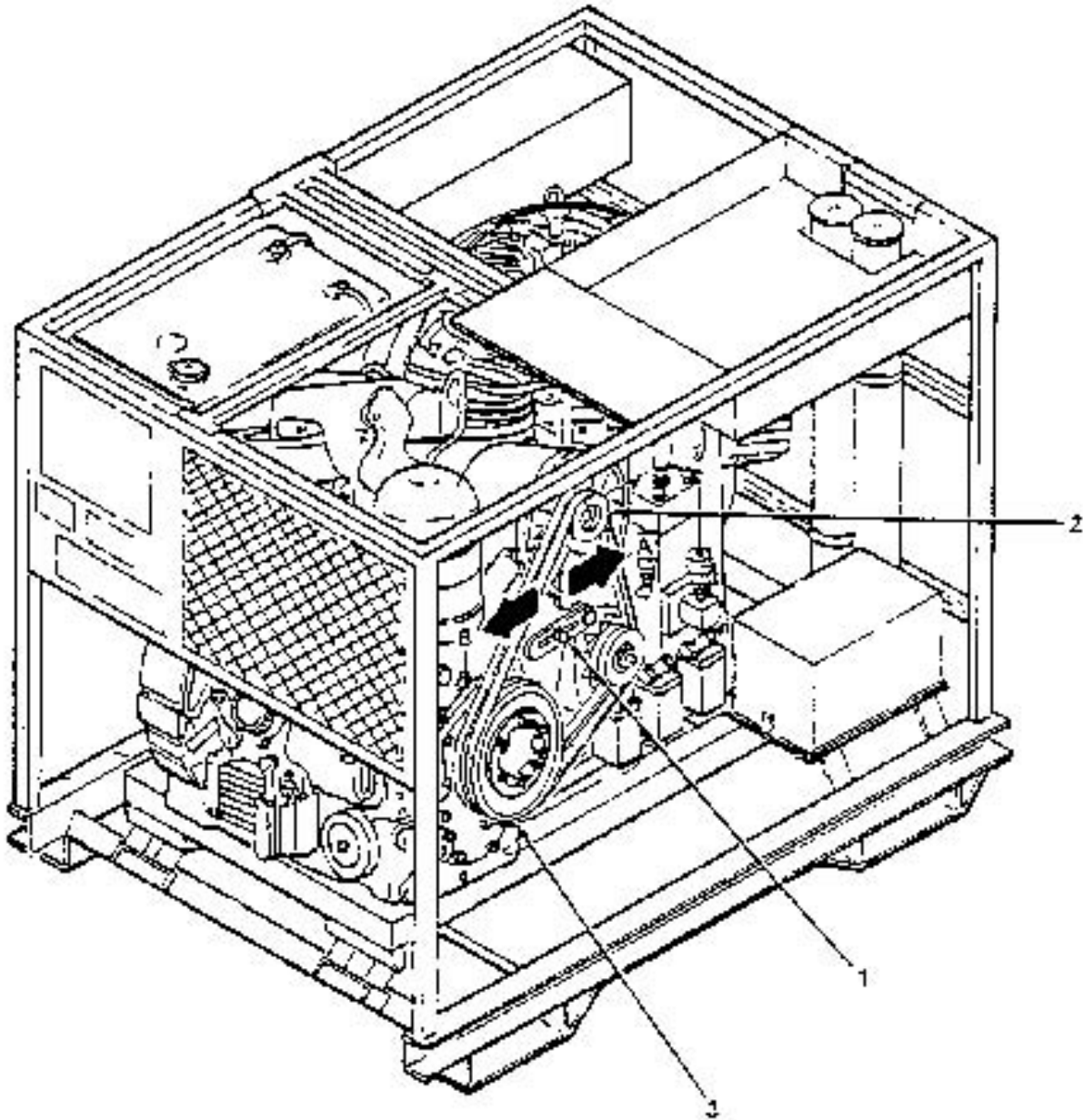


Figure 4-56. Alternator, Adjust.

4-44. **Alternator (Cont).**

c. Replace. (figure 4-57)

- (1) Remove wire (1) from alternator (2).
- (2) Remove three nuts (3), lockwashers (4), tag and remove wires (5) from alternator (2).
- (3) Remove bolt (6), securing alternator (2) to clamping plate (7).
- (4) Remove nut (8), two washers (9), and bolt (10) and remove alternator (2).
- (5) Install alternator (2) and secure with bolt (10), two washers (9), and nut (8) but do not fully tighten.
- (6) Ensure belts (11) are properly positioned.
- (7) Install bolt (6) but do not fully tighten.
- (8) Adjust belt tension so that a firm push midway between engine pulley (12) and blower pulley (13) will depress belts (11) approximately 0.50 - 0.75 in. (1.27- 1.90 cm).
- (9) Tighten nut (8) and bolt (6).
- (10) Install wires (5) as tagged and secure with three nuts (3) and lockwashers (4)
- (11) Install wire (1) on alternator (2).

FOLLOW-ON MAINTENANCE
Install V-beltguard (para. 4-15).

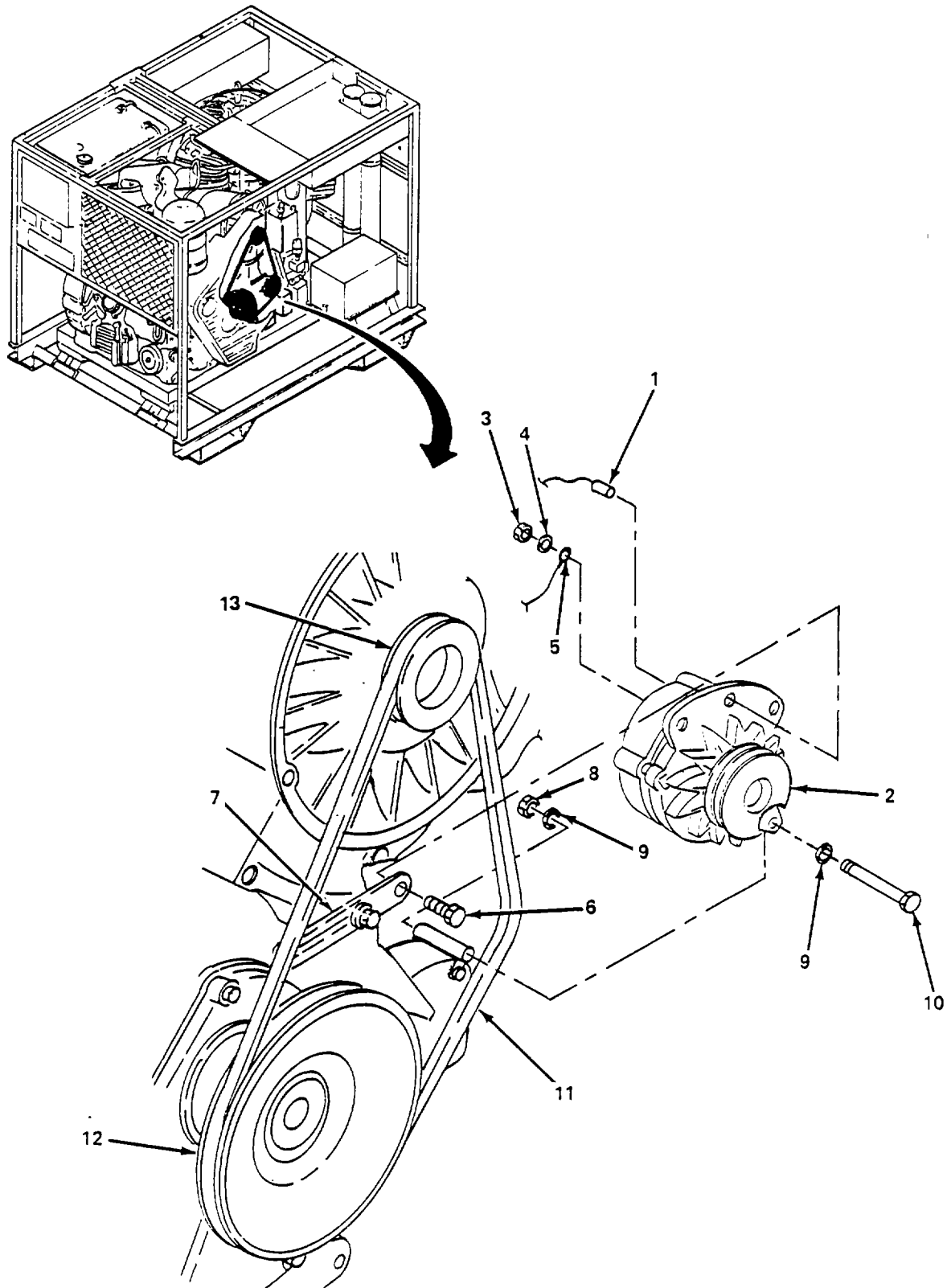


Figure 4-57. Alternator, Replace.

4-45. Battery, Cover, and Cables.

This task covers:

a. Test

b. Replace

INITIAL SETUP*Tools*General Mechanic's Tool Kit
(NSN 5180-00-177-7033)*Equipment Condition*

Compressor unit shut down (para. 2-13).

*Materials/Parts***Battery**Water, Distilled (Item 9, Appendix E)

a. Test. (figure 4-58)**WARNING**

Lead acid batteries contain a strong acid. This acid can cause severe skin burns. Handle battery only with proper lifting strap. Wear protective clothing and eye protection.

- (1) Unlatch two latches (1) and remove cover (2).
- (2) Remove cap (3) and check electrolyte condition with hydrometer.
- (3) Check level of electrolyte, and add distilled water if level is low.
- (4) Install cap (3).
- (5) Repeat steps 1 and 2 for remaining battery cells.
- (6) Install cover (2) and secure with two latches (1).

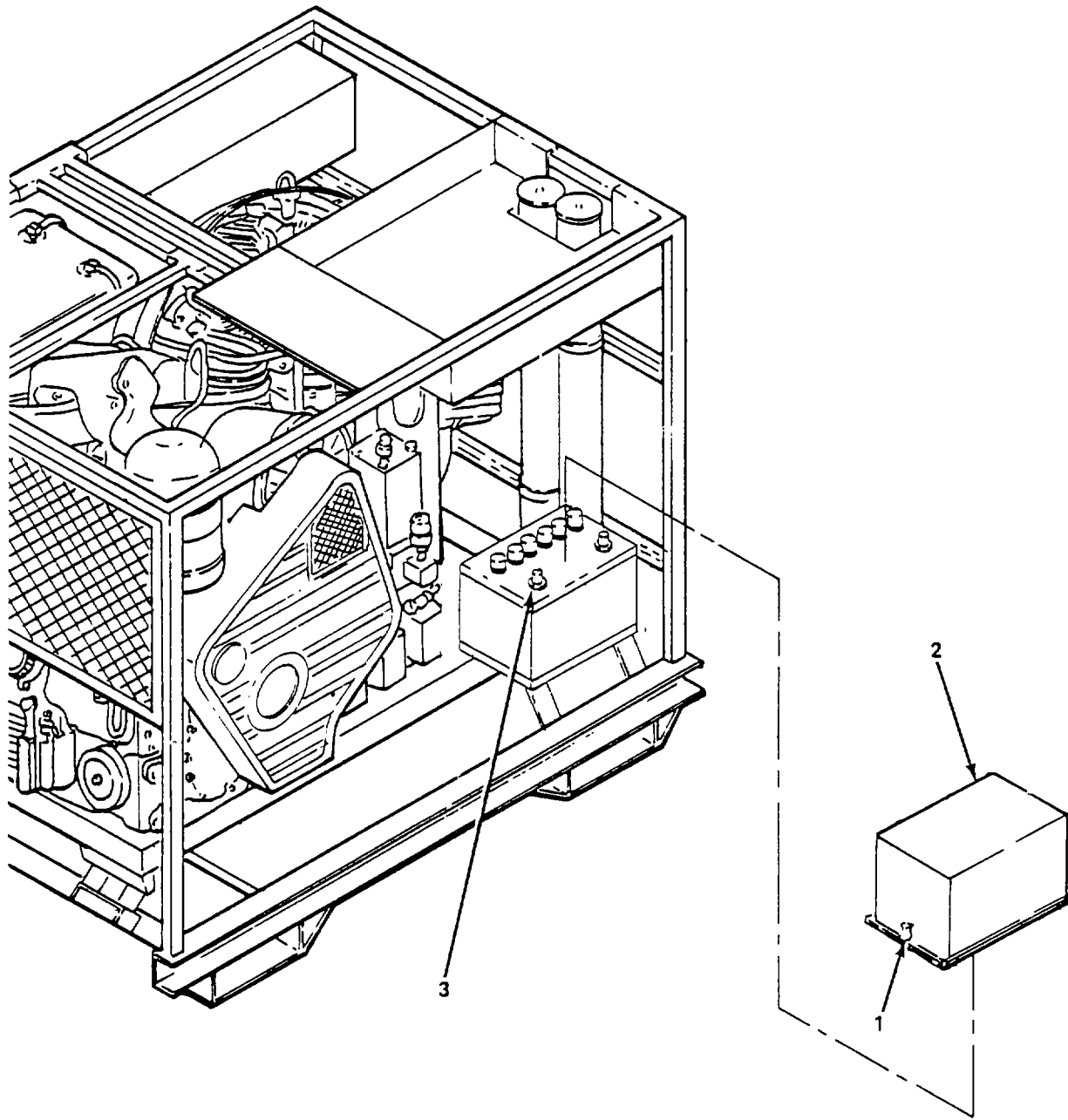


Figure 4-58. Battery, Test.

4-45. Battery, Cover, and Cables (Cont).**b. Replace.** (figure 4-59)

- (1) Unlatch two latches (1) and remove cover (2).
- (2) Remove two nuts (3), lockwashers (4), and remove battery holddown (5).
- (3) Loosen nut (6) and remove terminal (7).
- (4) Loosen nut (8) and remove terminal (9).

WARNING

Lead acid batteries contain a strong acid. This acid can cause severe skin burns. Handle battery only with proper lifting strap. Wear protective clothing and eye protection.

- (5) Remove battery (10).
- (6) Inspect cables on batteries and replace if insulation is cracked or burnt or cables are otherwise damaged.
- (7) Install battery (10).
- (8) Install cable (9) and tighten nut (8).
- (9) Install cable (7) and tighten nut (6).
- (10) Install battery holddown (5) and secure with two lockwashers (4) and nuts (3).
- (11) Install cover (2) and secure with two latches (1).

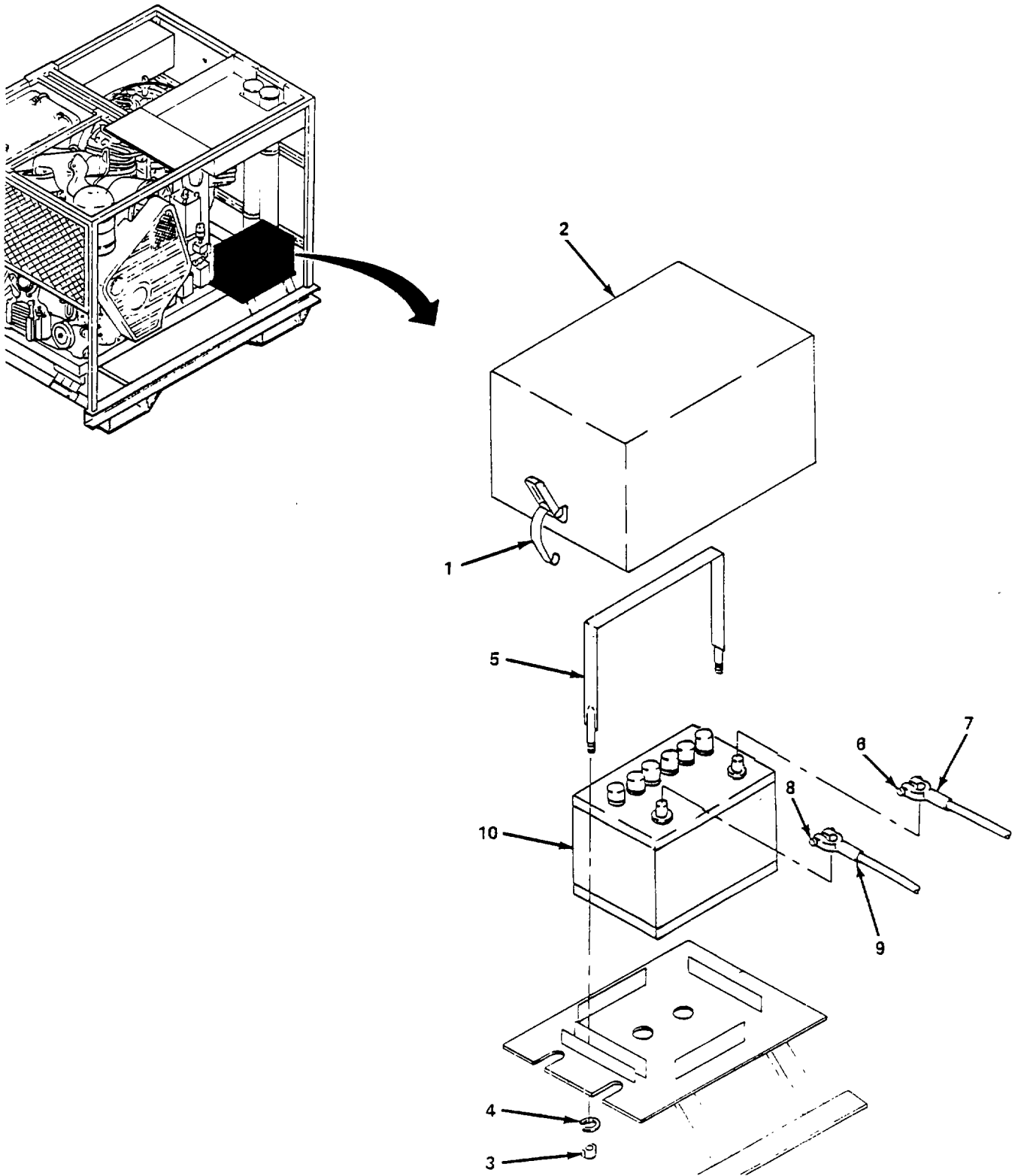


Figure 4-59. Battery and Cables, Replace.

4-46. Shutdown Device.

This task covers:

- a. Replace
-

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Equipment Condition

Compressor unit shut down (para. 2-13).

Materials/Parts

Shutdown Device

Replace. (figure 4-60)

- (1) Remove two screws (1) and tag and disconnect electrical leads (2) from shutdown device (3).
- (2) Remove four nuts (4), lockwashers (5), and bolts (6) and remove shutdown device (3).
- (3) Install shutdown device (3) and secure with four bolts (6), lockwashers (5), and nuts (4).
- (4) Connect electrical leads (2) on shutdown device (3) and secure with two screws (1).

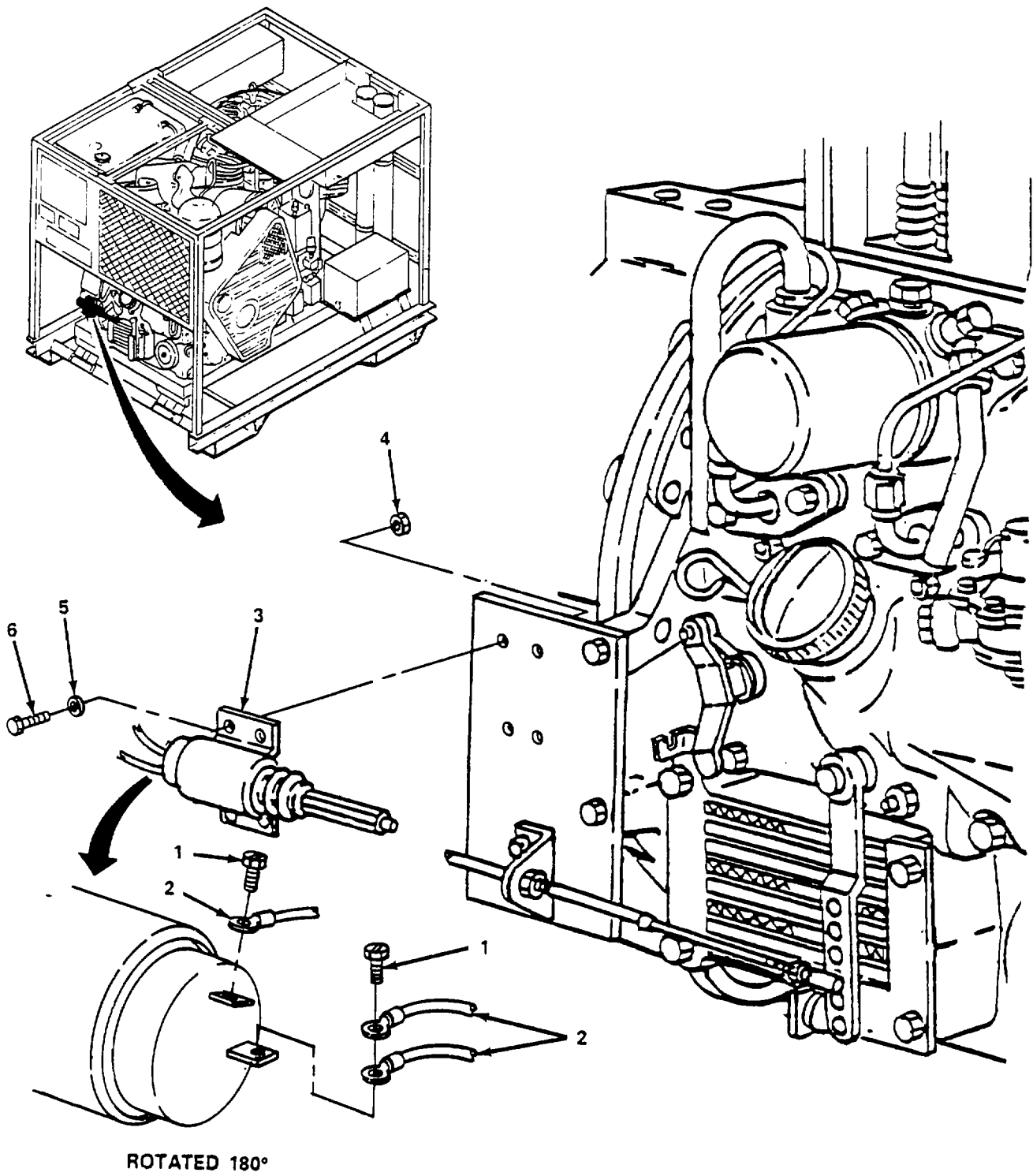


Figure 4-60. Shutdown Device, Replace.

4-47. Starter.

This task covers:

- a. Replace
-

INITIAL SETUP*Tools*General Mechanic's Tool Kit
(NSN 5180-00-177-7033)*Equipment Condition*Compressor unit shut down (para. 2-13).
Negative battery cable disconnected.*Materials/Parts*Starter

Replace. (figure 4-61)**WARNING**

Always remove negative cable before working on compressor to prevent possible injury to personnel.

- (1) Remove nut (1) and tag and remove wire (2), negative cable (3), two lockwashers (4), and nut (5).
- (2) Remove nut (6), lockwasher (7), and remove wire (8).
- (3) Remove screw (9) and tag and remove wire (10).
- (4) Remove two bolts (11), washers (12), and bracket (13) and remove starter (14) from engine (15).
- (5) Install starter (14) and secure with two bolts (11), washers (12), and one bracket (13).
- (6) Install wire (10) and secure with screw (9).
- (7) Install wire (8) and secure with lockwasher (7) and nut (6).
- (8) Install two lockwashers (4), nut (5), negative cable (3), wire (2), and secure with nut (1).

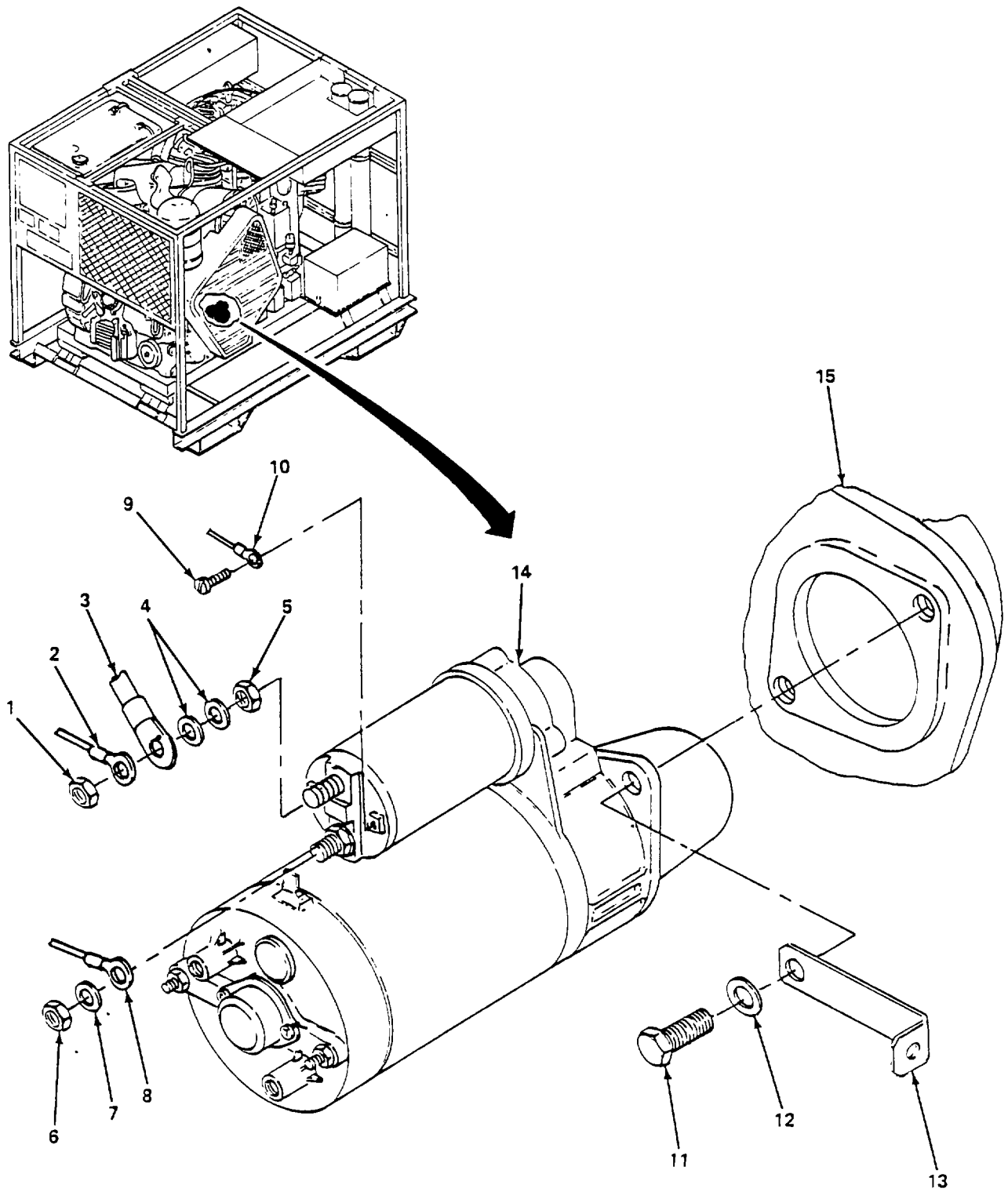


Figure 4-61. Starter, Replace.

4-48. Starting Aid.

This task covers:

a. Replace

b. Repair

INITIAL SETUP*Tools*General Mechanic's Tool Kit
(NSN 5180-00-177-7033)*Equipment Condition*

Compressor unit shut down (para. 2-13).

Materials/Parts

Starting Aid

Solvent, Dry Cleaning (Item 24, Appendix E)

Rags, Wiping (Item 21, Appendix E)

a. Replace. (figure 4-62)

- (1) Loosen fitting nut (1) and remove line (2).
- (2) Remove fitting (3) and (4), from intake manifold (5).
- (3) Loosen two fitting nuts (6) and remove lines (2) and (7).
- (4) Remove two fittings (8) and remove reservoir (9).
- (5) Remove knob (10) and locknut (11) and remove hand pump (12).
- (6) Loosen fitting nut (13) and remove line (7).
- (7) Install line (7) on pump (12) and tighten fitting nut (13).
- (8) Install hand pump (12) and secure with locknut (11).
- (9) Install knob (10).
- (10) Install reservoir (9) and secure with two fittings (8).
- (11) Install lines (2) and (7) and tighten two fitting nuts (6).
- (12) Install fitting (3) and (4) on intake manifold (5).
- (13) Install line (2) and tighten fitting nut (1).

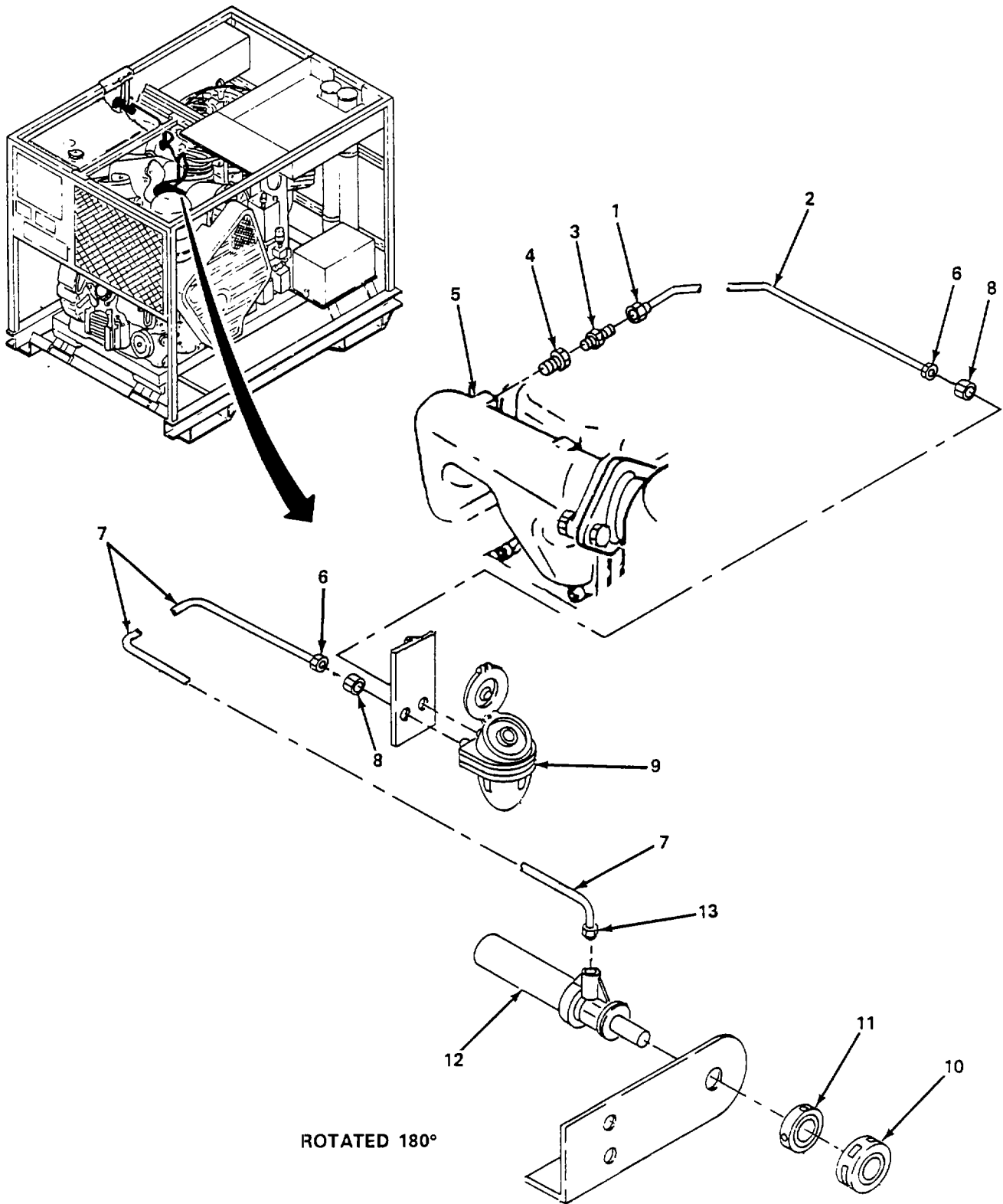


Figure 4-62. Starting Aid, Replace.

4-48. Starting Aid (Cont).**b. Repair.**

(1) *Replace hoses.* (figure 4-63)

- (a) Loosen fitting nut (1) and remove line (2) from manifold (3).
- (b) Loosen fitting nut (4) and remove line (2).
- (c) Loosen fitting nut (5) and remove line (6) from reservoir (7).
- (d) Loosen fitting nut (8) and remove line (6) from pump (9).
- (e) Install line (6) on pump (9) and tighten fitting nut (8).
- (f) Install line (6) on reservoir (7) and tighten fitting nut (5).
- (g) Install line (2) on reservoir (7) and tighten fitting nut (4).
- (h) Install line (2) on manifold (3) and tighten fitting nut (1).

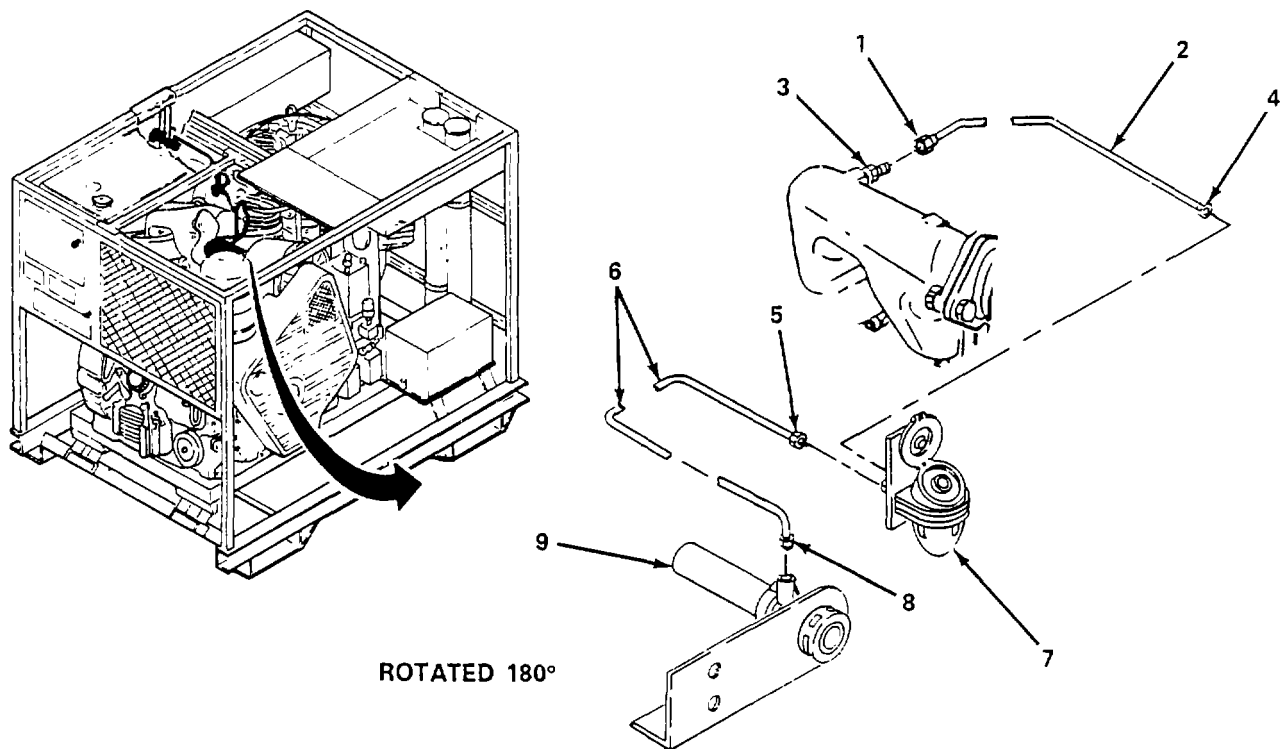


Figure 4-63. Hoses, Replace.

(2) *Replace reservoir.* (figure 4-64)

- (a) Loosen two fitting nuts (1) and remove lines (2) and (3).
- (b) Remove two fittings (4) and remove reservoir (5).
- (c) Install reservoir (5) and secure with two fitting (4).
- (d) Install lines (2) and (3) and tighten two fittings (1).

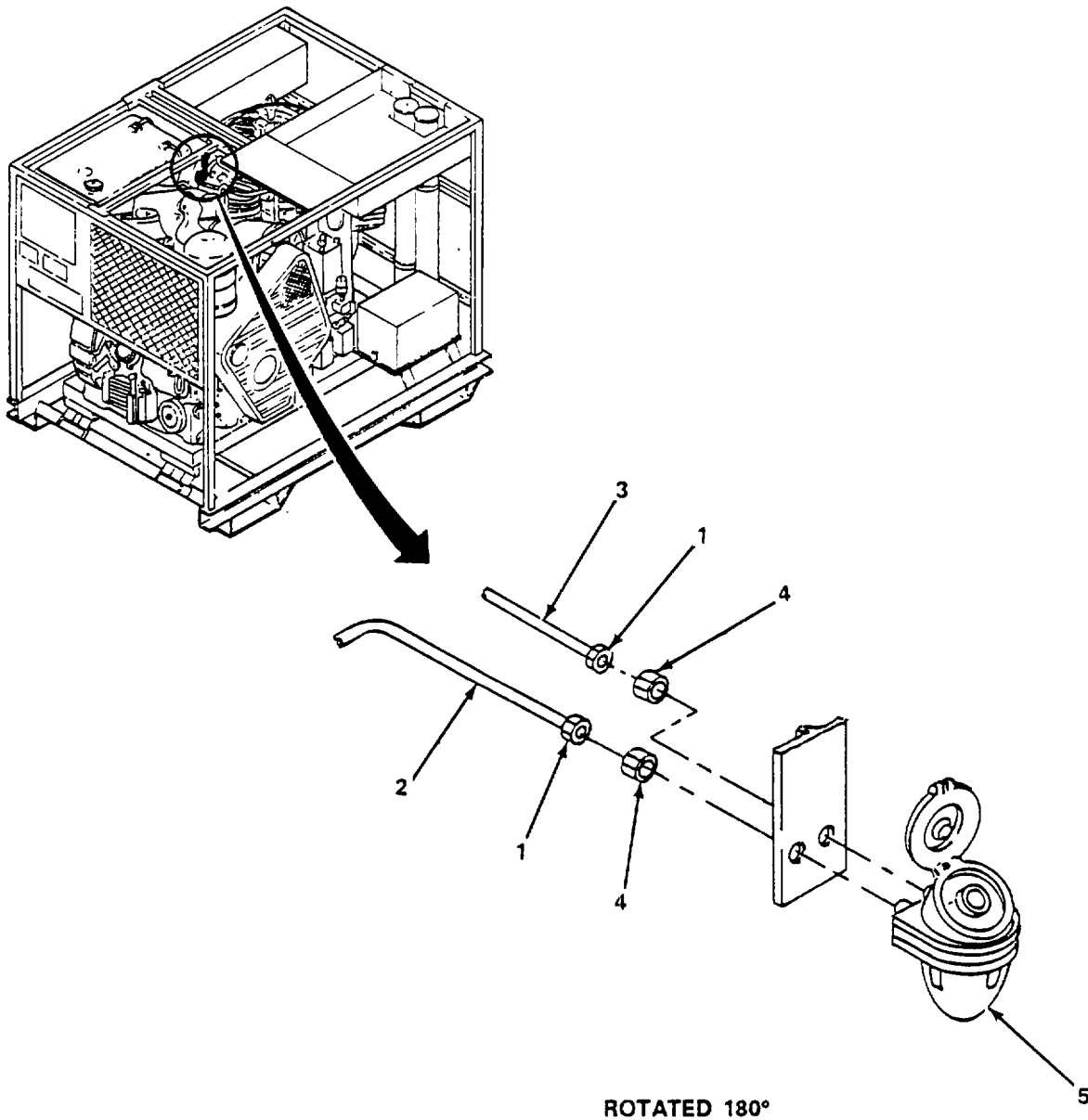


Figure 4-64. Reservoir, Replace.

4-48. **Starting Aid (Cont).**

- (3) *Replace hand pump.* (figure 4-65)
 - (a) Loosen fitting nut (1) and remove line (2).
 - (b) Remove knob (3) from hand pump (4).
 - (c) Remove locknut (5) and remove hand pump (4).
 - (d) Install hand pump (4) and secure with locknut (5).
 - (e) Install knob (3) on hand pump (4).
 - (f) Install line (2) and tighten fitting nut (1).

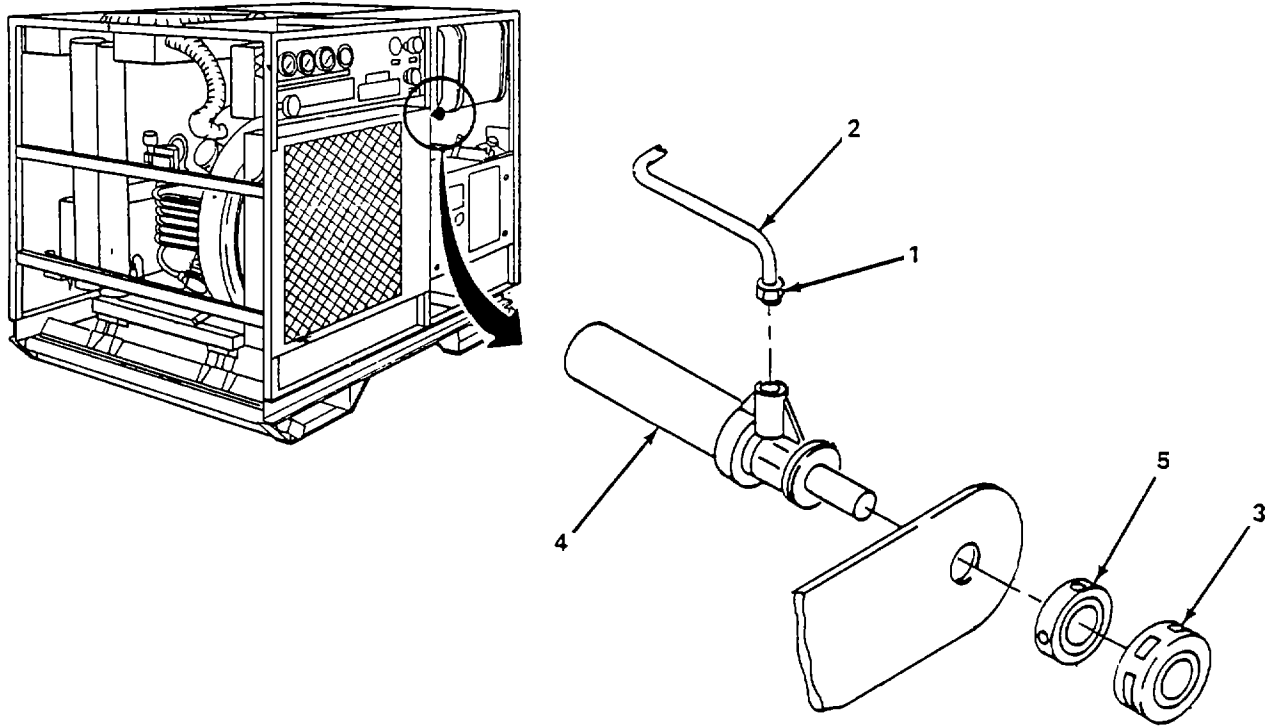


Figure 4-65. Hand Pump, Replace.

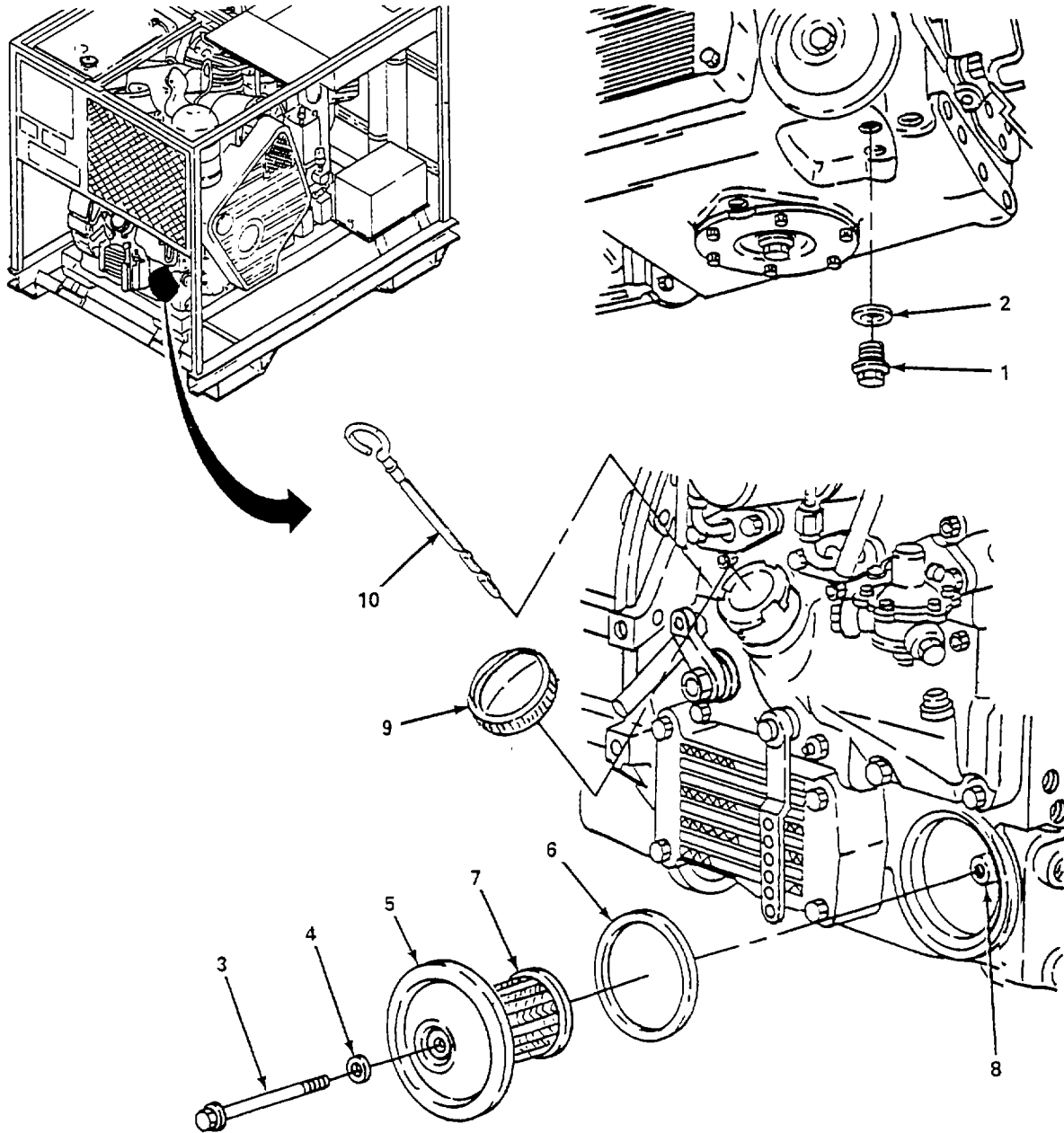


Figure 4-66. Oil Filter Assembly, Service.

4-49. Oil Filter Assembly (Cont).**b. Replace.** (figure 4-67)

- (1) Place suitable container under oil filter drain and remove drain plug (1) and gasket (2).
- (2) Drain oil completely and replace drain plug (1) and gasket (2).
- (3) Remove screw (3), sealing ring (4), cover (5), gasket (6), and filter (7).
- (4) Ensure all gasket surfaces are clean and free of old gasket material.
- (5) Install filter (7) into cavity of engine (8).
- (6) Lightly lubricate gasket (6) with clean engine oil.
- (7) Install gasket (6), cover (5), sealing ring (4), and tighten screw (3). Torque screw to 25 - 26 lb-ft(34 - 35 Nm).
- (8) Remove oil filler cap (9).
- (9) Fill crankcase with oil to the top mark on dipstick (10).
- (10) Install oil filler cap (9).

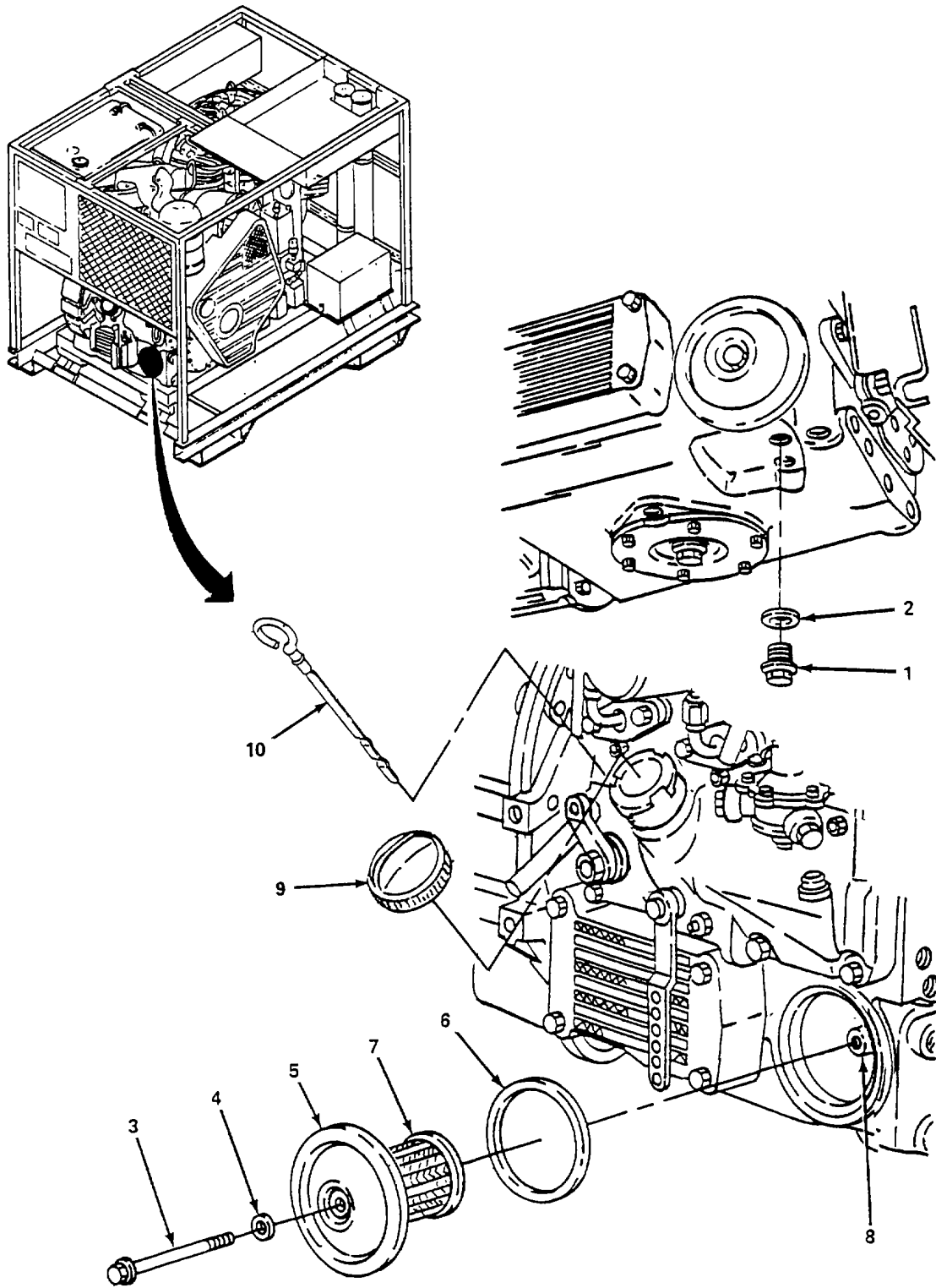


Figure 4-67. Oil Filter Assembly, Replace.

4-50. Dipstick and Filler Cap.

This task covers:

- a. Replace
-

INITIAL SETUP*Materials/Parts*

Dipstick
Filler Cap

Replace. (figure 4-68)

- (1) Twist and remove filler cap (1).
- (2) Pull dipstick (2) out of guide tube.
- (3) Insert dipstick (2) into guide tube.
- (4) Install filler cap (1).

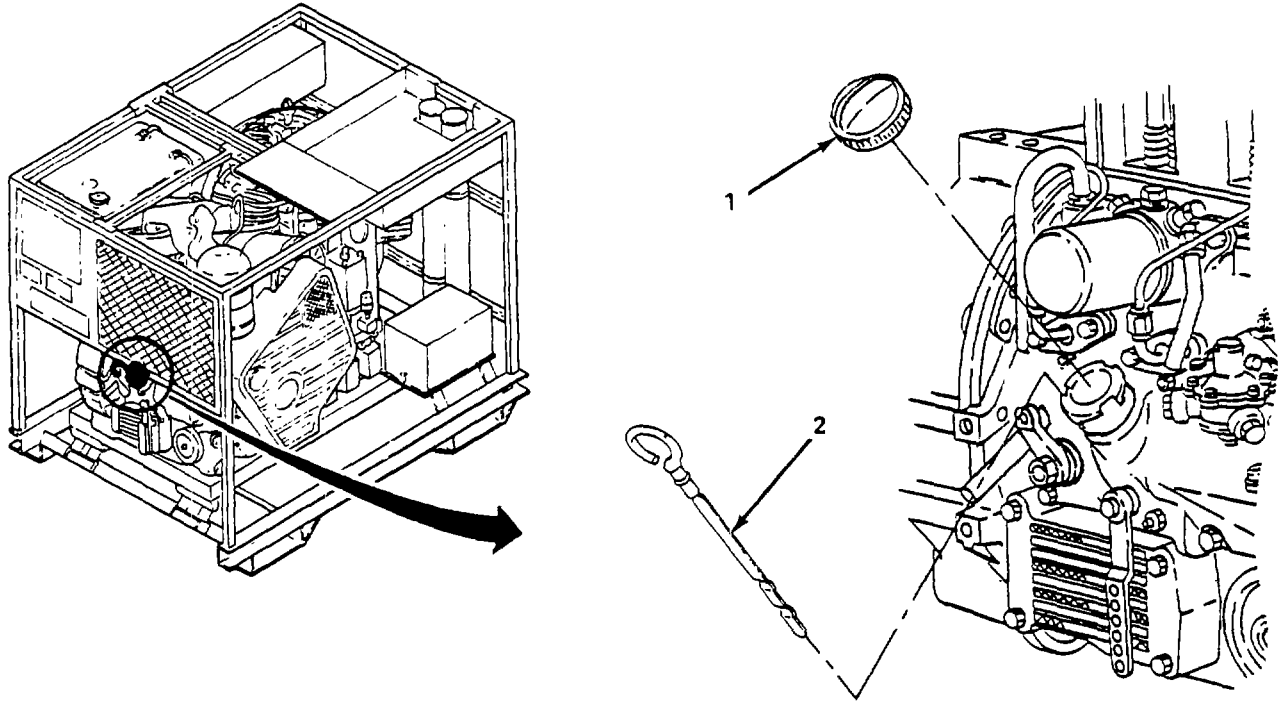


Figure 4-68. Dipstick and Filler Cap, Replace.

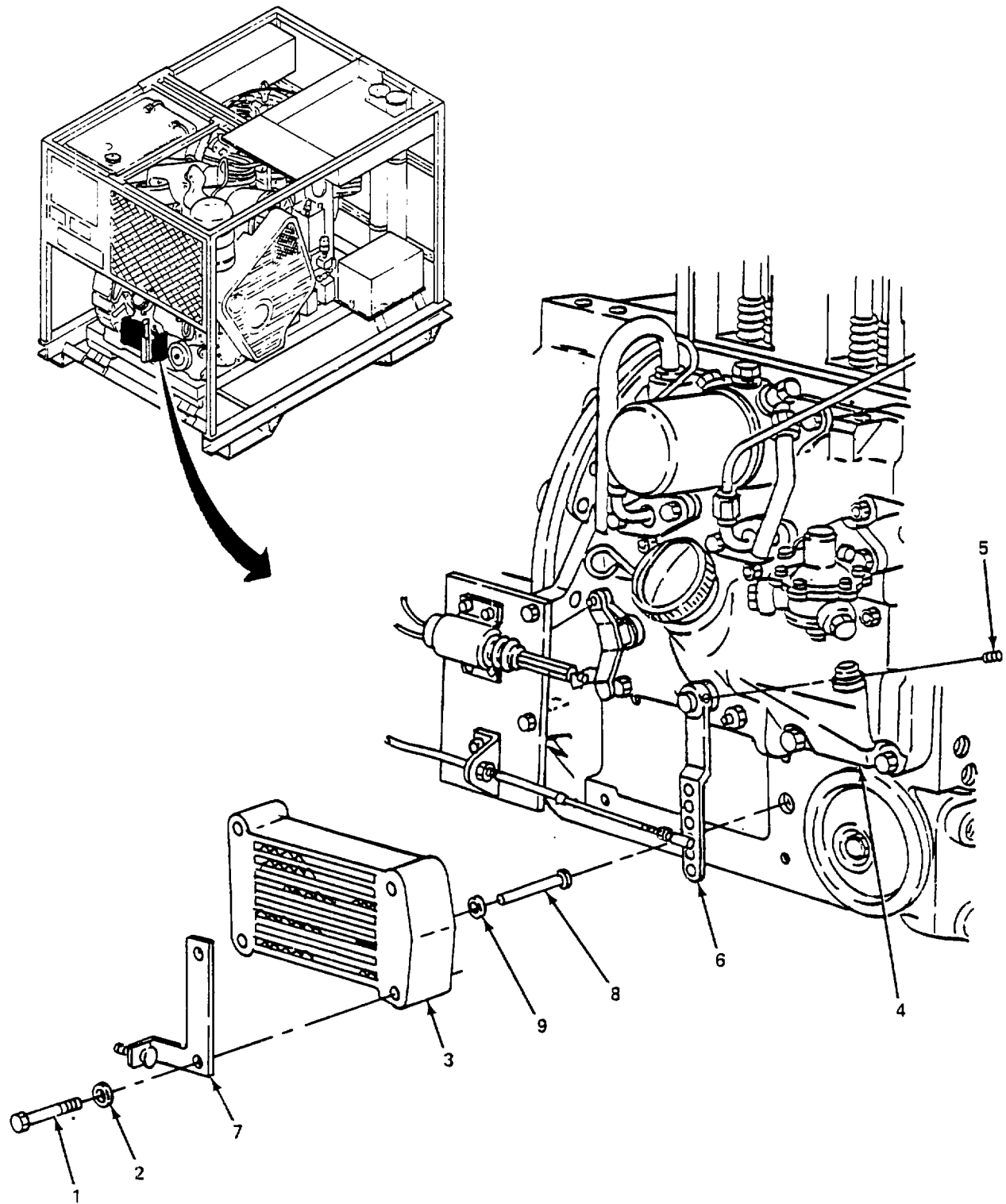


Figure 4-69. Engine Lube Oil Cooler, Service.

4-51. Engine Lube Oil Cooler (Cont).

b. Replace. (figure 4-70)

- (1) Remove four screws (1), washers (2), securing lube oil cooler (3) to engine (4).
- (2) Remove pin (5) from arm (6) and rotate arm until oil cooler (3) clears for removal.
- (3) Place suitable container under oil cooler (3) and remove oil cooler (3) and bracket (7) from engine (4).
- (4) Remove oil pipe (8) and preformed packing (9). Discard preformed packing.
- (5) Install preformed packing (9) coated with grease in the oil cooler (3).
- (6) Install oil pipe (8) into oil cooler (3).
- (7) Install oil cooler (3) on engine (4) so that oil pipe (8) enters the oilway in the crankcase.
- (8) Install bracket (7) and secure with four screws (1) and washers (2).
- (9) Position arm (6) and install pin (5) into arm.

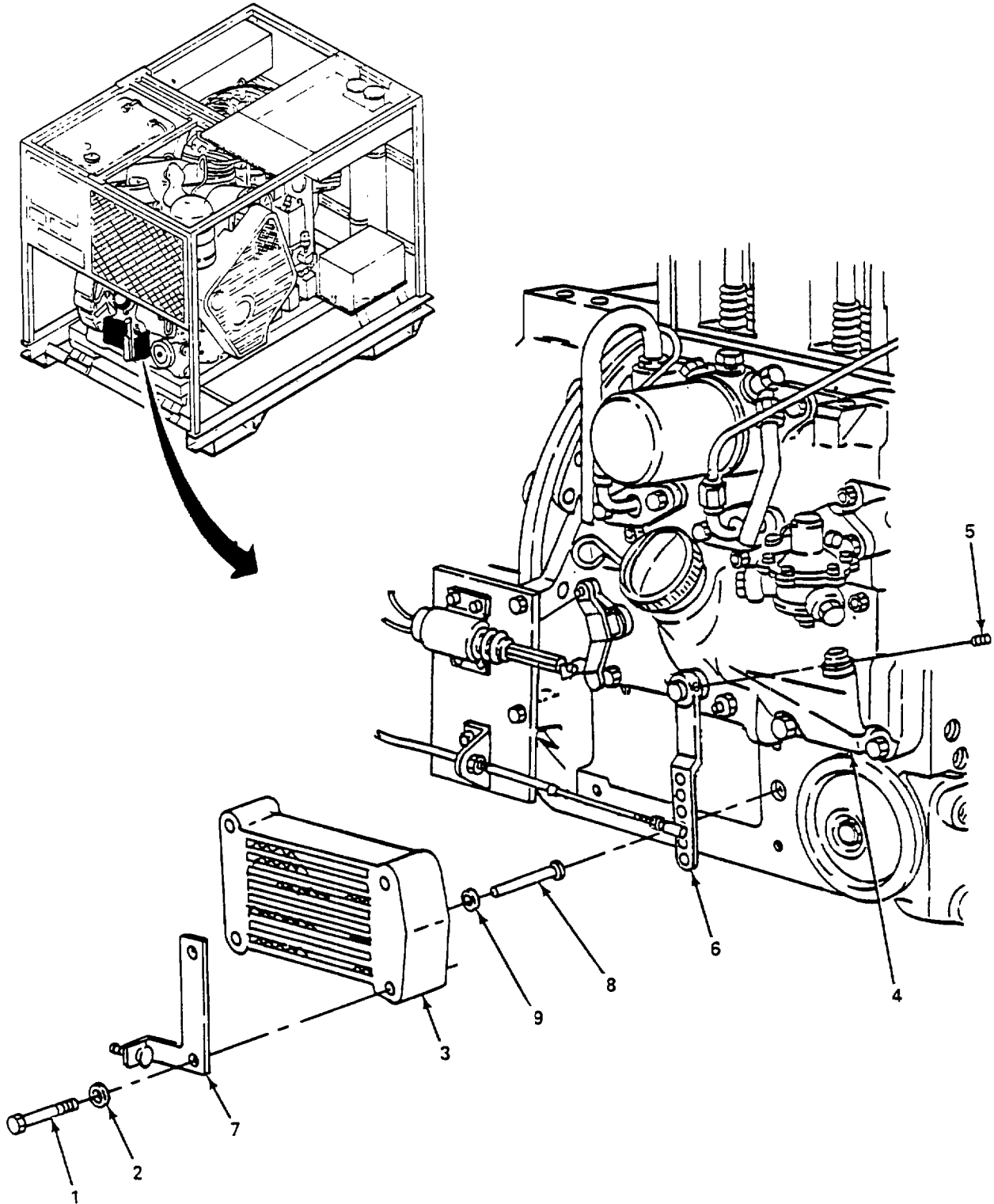


Figure 4-70. Engine Lube Oil Cooler, Replace

4-52. Rocker Covers.

This task covers:

- a. Replace
-

INITIAL SETUP*Tools*General Mechanic's Tool Kit
(NSN 5180-00-177-7033)*Equipment Condition*

Compressor unit shut down (para. 2-13).

*Materials/Parts*Rocker Cover
Gasket

Replace. (figure 4-71)**NOTE****There are two rocker covers. Replacement of each cover is the same.**

- (1) Remove bolt (1), lockwasher (2), and sealing ring (3).
- (2) Remove rocker cover (4) and gasket (5).
- (3) Ensure gasket surfaces are clean and old gasket material removed.
- (4) Install rocker cover (4) and gasket (5) and secure with bolt (1), lockwasher (2), and sealing ring (3).

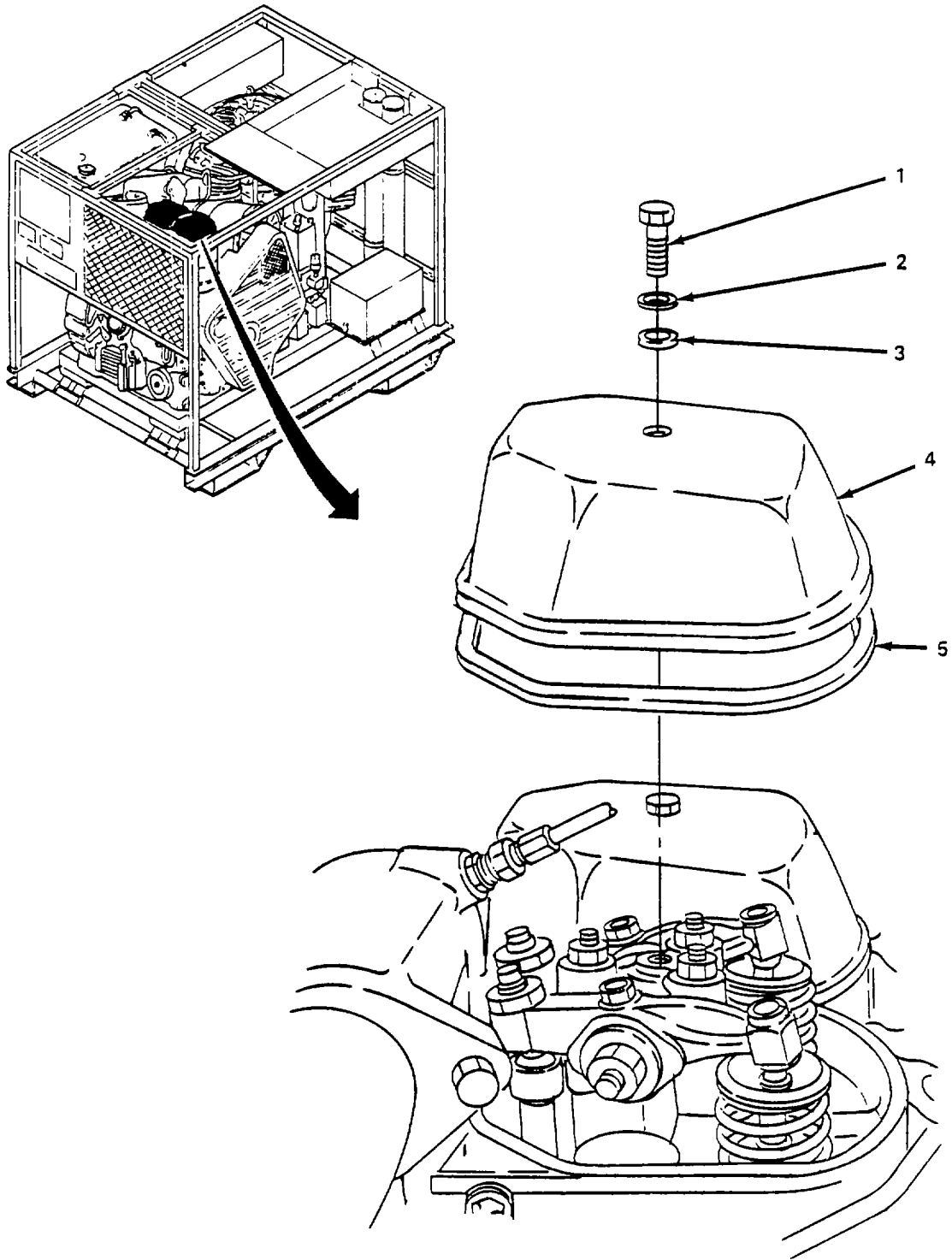


Figure 4-71. Rocker Cover, Replace.

4-53. Engine Mounts.

This task covers:

- a. Replace
-

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Equipment Condition

Compressor unit shut down (para. 2-13).
Beltguard removed (para. 4-15).
Drive belt removed (para. 4-20).

*Materials/Parts*Engine Mounts

Replace. (figure 4-72)

- (1) Support engine (1) with suitable lifting device.
- (2) Remove two nuts (2), lockwashers (3), washers (4), and bolts (5).
- (3) Remove two bolts (6) and washers (7).
- (4) Remove rear engine mount (8).
- (5) Remove two nuts (9), lockwashers (10), washers (11), and bolts (12).
- (6) Remove two nuts (13).
- (7) Remove front engine mount (14).
- (8) Install front engine mount (14).
- (9) Install two nuts (13).
- (10) Install two bolts (12), washers (11), lockwashers (10), and nuts (9).
- (11) Install rear engine mount(8).
- (12) Install two bolts (6) and washers (7).
- (13) Install two bolts (5), washers (4), lockwashers (3), and nuts (2).

FOLLOW-ON MAINTENANCE

- (1) Install drive belt (para. 4-15).
- (2) Install beltguard (para. 4-20).

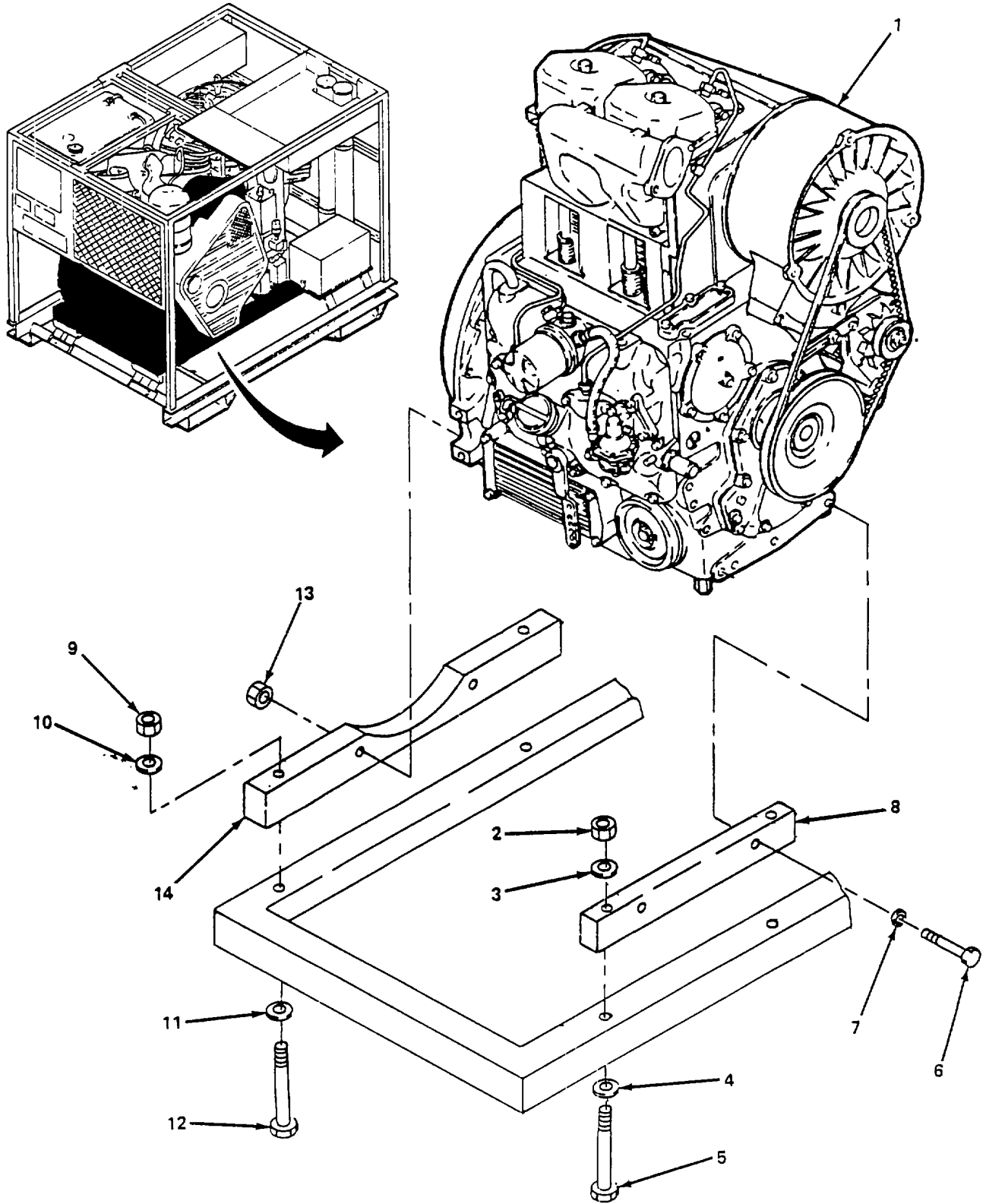


Figure 4-72. Engine Mounts, Replace.

Section VII. UNIT LEVEL CLEANING PROCEDURES

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4-54. **General.** This section covers the cleaning procedures for diving life support air systems. The importance of maintaining a diver's air breathing system in a clean and operable condition cannot be over emphasized. This procedure provides basic steps and methods for removing and installing components and piping, and provides the simplified methods for cleaning small components, pipes and hoses for air systems, and methods for cleaning component soft goods.

4-55. **Determining System Cleanliness.** A periodic inspection of the air system will verify system cleanliness. If a system is suspected of contamination, a hydrocarbon analysis, a particulate sample may be taken or a gas sample may be drawn to determine the level of system cleanliness. These samples can be coordinated through the U.S. Army Troop Command, ATTN: AMSTR-M, 4300 Goodfellow Blvd., St. Louis, Missouri 63120-1798.

4-56. **Clean Area.** All cleaning for life support air systems to be performed on components and piping shall be cleaned in a "clean area." This area shall be isolated from oil, grease, paper, lint particles and other airborne contaminants. It shall be as free as possible of dust and debris. Work benches shall be covered with easily cleaned surfaces such as stainless steel, synthetic rubber, vinyl linoleum or formica. Floor shall be non-dusting. Walls and ceiling shall be covered with washable vinyl, latex paint or polyurethane-based paint.

4-57. **Removing and Installing System Components or Piping .** The following steps are guidelines for the removal and installation of piping or components from or into a clean system. In general, common sense and clean work habits must prevail at all times to maintain system cleanliness. Prior to the removal of any pipe or component, appropriate maintenance forms are to be completed and approved.

a. **Removal.** Extreme care shall be used in the removal of any component or pipe from a clean system to avoid introducing any contamination. To eliminate any chance of contamination, the following steps shall be adhered to:

- (1) Secure the system by closing valves and controls both upstream and downstream of the component or pipe to be removed. The components shall be tagged to insure that gas is not brought on line.
- (2) Removal of all debris from the intended area of assembly or disassembly such as dirt, dust, loose paint, and grease is mandatory. This includes cleaning the pipe or component which is to be removed and the adjacent components or piping.

- (3) Wipe all of the external surfaces of components and piping with detergent or alcohol solvent to remove grease or dirt.
- (4) All personnel shall have clean hands.
- (5) All tools used in the removal must be clean and grease-free.
- (6) Remove component or piping.
- (7) Immediately bag or seal all exposed ends of system with plastic.

b. Installation or Reinstallation.

- (1) The new component or cleaned pipe shall be wrapped or doublebagged. If not, the item shall be returned for cleaning.
- (2) The component or piping shall be removed from bagging and shall be inspected for damage at the mating surfaces, threads, or connecting surfaces and any primary surface. Inspect for dust or minor particle contamination, and remove with lint-free rag.
- (3) Mating components and pipe shall have protection materials or plugs removed.
- (4) Mating surfaces, preformed packings and threads shall be coated lightly with an approved lubricant. Threaded surfaces must be coated to prevent galling of threads at assembly.
- (5) A pressure test shall be performed to verify that there are no leaks and that the correct fittings have been installed in the system.

4-58. **Pre-Cleaning of Components or Piping**. Upon receipt of new components not cleaned or components and pipe removed from the system for cleaning, the item shall be pre-cleaned. Doing this shall prepare the component for final cleaning. Pre-cleaning will be accomplished in an area separate from the clean area. The pre-cleaning will include but is not limited to the following:

- a. All wrapping shall be removed.
- b. Loose paint, rust, brackets, panels, tags, supports and other such items shall be removed.
- c. If hydrocarbons and/or other contaminants are known to have been introduced into the component or piping, a thorough degreasing procedure shall be initiated. Trisodium phosphate (TSP) or non-ionic detergent (NID) may be used.
- d. Visually inspect the pre-cleaned articles under bright light to ensure that all gross contamination has been removed.
- e. Bag all components and ends of pipe with plastic to await cleaning.

4-59. **Cleaning Method Non-Ionic Detergent**. This method outlines the cleaning procedures for oil-free cleaning of metallic/nonmetallic components or assemblies using non-ionic detergent. This procedure is only to be used if there is no equipment available to conduct the TSP cleaning method.

a. *Cleaning Components or Assemblies (excluding hose assemblies).*

CAUTION

Chemical protective gloves should be worn to prevent skin irritation from detergent and hot water.

- (1) Disassemble components down to the smallest parts. Separate soft goods and clean as specified in paragraph 4-61.
- (2) Clean each component by scrubbing with a non-ionic detergent solution (1/2 teaspoon 2.4mL) detergent to 1 gallon (3.8 L) water using a nylon bristle brush and clean cloths.
- (3) Rinse with distilled water at 125 degrees F (54 degrees C) until effluent shows no visible signs of detergent.
- (4) Collect some of the water rinsed over the items in a flask that can be fitted with a rubber stopper. Shake the flask for a few seconds and if any bubbles form and remain on the surface of the water in the flask, continue to rinse item until no bubbles form and remain in the sample flask.
- (5) Purge with dry, oil-free nitrogen until visually dry, or allow to air dry. The following dated and signed records shall be maintained:
 - (a) Identification of all parts cleaned.
 - (b) Results of shake test.
- (6) Reassemble as outlined on assembly or component drawing.
- (7) Double bag all components in plastic and close securely.

b. *Cleaning Hose Assemblies.*

- (1) Clean hose assemblies in accordance with the following steps using the specific materials and utilizing proper equipment. Pre-clean hose assemblies outside the clean area by rinsing externally with distilled water.
- (2) Most hose assemblies will not lend themselves to disassembly. Disassemble to maximum extent without removing fittings or clamps.
- (3) The cleaning solution shall be made by adding 1/2 ounce (14.7mL) non-ionic detergent to each 80 gallons (302.8 L) or distilled water.
- (4) Heat the cleaning solution to 120 degrees F (49 degrees C) and circulate through the hose assembly for 30 minutes at a flow rate of not less than 1 gallon (3.8 L) per minute.
- (5) Rinse the hose assembly with distilled water heated to 125 degrees F (52 degrees C) for 30 minutes minimum at a flow rate of not less than 1 gallon (3.8 L) per minute. Do not recirculate the water.

- (6) Perform a shake test by collecting a 1000 mL sample of rinse water in a flask that can be fitted with a rubber stopper. Shake the flask for a few seconds and if any bubbles form and remain on the surface of the water in the flask, continue to rinse the hose until no bubbles form and remain in the sample flask.
- (7) Purge hose assembly with clean, dry, oil-free nitrogen (preferably heated to 200 degrees F (93 degrees C)) until all visible signs of water are absent. Continue drying process for 1 to 2 hours after initial purge.

NOTE

At no time shall the upstream purge pressure for all hose assemblies exceed 100 psig (6895 millibars).

- (8) After drying, cover each hose end with a clean plastic bag to maintain internal cleanliness. Secure the bag with 1 inch (2.5 cm) wide tape.
- (9) When components and systems have been reassembled an air sample shall be taken to verify cleanliness.

4-60. **Cleaning Method Trisodium Phosphate (TSP).** This method is the preferred method if all equipment is available. A steam/hot water cleaner that has adjustable siphon control for cleaning applications works well.

a. For components the following steps should be followed:

WARNING

The TSP cleaning solution is harmful to eyes and skin. Wear chemical protective apron, gloves and goggles/face shield when handling or working with the solution.

- (1) Prepare a solution consisting of 2 pounds (0.9 kg) TSP, 0.5 ounces (14.7mL) non-ionic detergent and 80 gallons (302.8 L) of distilled or deionized water.
- (2) Heat solution to 165 degrees F (74 degrees C) mixing occasionally during the heating.
- (3) Disassemble components down to the smallest parts (separate and clean soft goods and aluminum parts as specified in paragraph 4-61) and soak in the solution for 10 minutes minimum, 30 minutes maximum.
- (4) After soaking, clean the parts in the ultrasonic cleaner until all visible traces of contaminate dirt or grease are gone.
- (5) For components too large for an ultrasonic cleaner, scrub the parts with a nylon bristle brush until all visible traces of contaminate dirt or grease are gone.
- (6) Rinse all parts in running hot distilled water or deionized water until all visual traces of cleaning solution are removed.
- (7) Draw 10 mL sample. Agitate or rinse water to observe for soap bubbles. If any soap bubbles are present, repeat steps (6) and (7) until no bubbles are observed.

- (8) Blow dry components with clean air, nitrogen or helium.
- (9) Reassemble components using an approved lubricant.
- (10) Bag and seal or tape closed all components and ends of pipe or hoses with plastic until ready for reinstallation.

b. For cleaning pipe or tubing the following procedures should be followed:

- (1) Determine the volume of cleaning solution estimating the length of pipe or hose to be cleaned and the size of the pipe to be cleaned. Look up the appropriate pipe/tube size and then the corresponding volume (in cubic inches) per one foot length in table 4-3. Multiply that volume by the estimated length to be cleaned. After the total volume is calculated, multiply the answer in cubic inches by .00433. After the total volume is calculated, multiply the answer in cubic inches by .00433 to obtain the number of gallons to fill the system. Determine applicable flow rate from table 4-4 and multiply flow rate by thirty (30) to compute number of gallons required to pump through the system. Add volume required to fill system and the volume required to pump through the system for the total volume of cleaning solution required.

Table 4-3. TSP Cleaning Solution Volume.

Pipe/Tube Size in (cm)	Volume of 1 Foot (30 cm) Length
1/4 (0.6 cm)	0.6 cubic inches (9.7 cm ³)
3/8 (1.0 cm)	1.3 cubic inches (21.7 cm ³)
1/2 (1.3 cm)	2.4 cubic inches (38.6 cm ³)
3/4 (1.9 cm)	5.3 cubic inches (86.9 cm ³)
1 (2.5 cm)	9.4 cubic inches (154.5 cm ³)
1-1/2 (3.8 cm)	21.2 cubic inches (347.6 cm ³)
2 (5.1 cm)	37.7 cubic inches (617.9 cm ³)

- (2) Prepare a solution at a ratio of 2 pounds (0.9 kg) of TSP, 0.5 ounces (14.7mL) non-ionic detergent for each 80 gallons (302.8 L) of distilled or deionized water as determined.
- (3) Heat solution to 165 degrees F (74 degrees C) mixing occasionally during the heating.
- (4) Pump the cleaning solution through the pipe/tubing for 30 minutes at a rate listed in table 4-4 using the solution pump, and maintain constant temperature at all times. It may be necessary with some piping configurations to cap or plug some openings and alternate with others to maintain even flow of cleaning solution to all segments of the pipe. If you run out of cleaning solution prior to the 30 minutes listed, prepare another volume of cleaning solution.

Table 4-4. Cleaning Solution Flow Rate.

Tube Size (inches)	GPM	Pipe Size (inches)	GPM
1/4 (0.6 cm)	1/2	1/4 (0.6 cm)	2
3/8 (1.0 cm)	2	3/8 (1.0 cm)	3
1/2 (1.3 cm)	3 3/4	1/2 (1.3 cm)	5 1/2
3/4 (1.9 cm)	6 3/4	3/4 (1.9 cm)	9 1/2
1 (2.5 cm)	12 1/2	1 (2.5 cm)	15 1/2
		1 1/4 (3.1 cm)	23
		1 1/2 (3.8 cm)	35
		2 (5.1 cm)	50

- (5) Pump hot distilled or deionized water through the system to rinse until all visible traces of cleaning solution are removed.
- (6) Draw 10 mL sample. Agitate to observe for soap bubbles. If any soap bubbles are present, repeat step (5) until no bubbles are observed.
- (7) Blow dry parts or components with clean, dry, oil-free nitrogen (preferably heated to 200 degrees F (93.3 degrees C)) until all visible signs of water are absent. Maintain process for 1 to 2 hours after initial purge.
- (8) Double bag and seal or tape closed all components and ends of pipe or hoses with plastic until ready for reinstallation.

c. Hoses shall be cleaned as specified in paragraph 4-59.

4-61. **Cleaning Component Soft Goods.** The following isopropyl alcohol method is provided for the cleaning of the soft goods and aluminum parts of system components. The method for non-ionic detergent is the same procedure as that in paragraph 4-59.

CAUTION

Ensure ventilation is adequate and avoid breathing vapors.

Personnel should wear chemical protective gloves to prevent skin irritation when contact with isopropyl alcohol is necessary.

CAUTION

Isopropyl alcohol shall be maintained in a covered container to preclude excess concentrations in the air for fire protection. The cover should be removed only for placement or removal of soft goods.

NOTE

Table 4-5 lists all compatible cleaning agents for general soft goods used in the Army diving systems. Only the isopropyl alcohol procedure is listed below.

- a. Soak component soft goods or aluminum parts in a tray of isopropyl alcohol for 10 minutes maximum.
- b. Wipe each piece of soft good individually with wipes soaked in isopropyl alcohol. Do this until all dirt and foreign matter is visually removed.
- c. Rinse soft goods with fresh isopropyl alcohol.
- d. Blow dry with air, nitrogen, or helium.

Table 4-5. Cleaning Agents Comparable with Soft Goods .

Soft Goods	Freon PCA MIL-C-81302B	TSP O-S-642	NID MIL-D-16791	IA TI-I-735A
Adiprene C	X		X	
Adiprene L	X		X	
Buna N	X	X	X	X
Buna S	X	X	X	X
Butyl			X	X
Delrin	X	X	X	
Epoxy Resin	X		X	
Kel-f	X	X	X	X
Hypalon 40	X		X	
Kralartic	X		X	
Lexan	X		X	
Lucite	X		X	
Neoprene W	X		X	
Nylon		X		X
Polyethylene 7050	X	X	X	X

Table 4-5. Cleaning Agents Comparable with Soft Goods (Cont).

Soft Goods	Freon PCA MIL-C-81302B	TSP O-S-642	NID MIL-D-16791	IA TI-I-735A
Polyethylene 9140	X	X	X	X
Polyvinyl Chloride	X	X	X	X
Surlyn A	X		X	
Teflon TFE	X	X	X	X
Teflon FEP	X	X	X	X
Thiokol FA	X		X	X
Viton A	X	X	X	X
Viton B	X	X	X	X
Zytel 101	X		X	
Ethylene Propylene		X	X	X

X - Solvent is compatible with soft goods.

Blank - Solvent is not compatible with soft goods.

4-62. Hydrocarbon Inspection and Analysis.

a. Visual Method. By definition, visibly clean is the absence of all particulate and non-particulate matter visible to the normal, unaided (except for corrected vision) eye. Particulate is identified as matter of miniature size with observable length, width and thickness. Non-particulate is film matter without definite dimension. Examples of visual inspection are:

- (1) A clean cloth placed over the discharge end may collect particulates and debris when air or nitrogen is blown through the system.
- (2) A component that has been "in service" may have visible signs of grease, dirt, etc.
- (3) Absorption of oil or grease on a clean filter paper from a surface wipe.

b. Ultraviolet Light Method. The ultraviolet method for detecting hydrocarbons may be employed in different ways.

WARNING

Most ultraviolet lamps contain mercury. Extreme caution should be taken not to break the mercury vapor lamp which will contaminate the component or pipe being inspected and may also cause human injury.

- (1) Direct inspection: The component may be examined directly with the ultraviolet light. By passing the component under the ultraviolet light, hydrocarbon surface contamination may exhibit fluorescence where some hydrocarbons exist.
- (2) Inspection of cleaning solution when detergent is used. Used cleaning solution collected in a clean beaker when agitated will form bubbles. These bubbles, under ultraviolet light, may exhibit fluorescence.

4-63. Documentation and Record Keeping.

- a. This diving system must retain certain records and documents to substantiate safety standards. The individual operating the clean area being directly involved with system maintenance should therefore be required to maintain records documenting cleaning operations in a systematic manner.
- b. The purpose of this section is to set forth a guide for documentation and record keeping involved in cleaning operations and in no way intends to impose restrictions on the amount of paperwork a unit feels it requires to operate safely.
- c. A sequential record should be maintained of components cleaned (i.e., regulators, pipe, and/or any component) affecting reentry into a certified system. It should include a written record of all cleaning analyses and testing accomplished as per this procedure. A data sheet should be completed for items cleaned and tested per this procedure. All other information which pertains to the cleaning and/or testing of a particular item shall be attached to or referenced on the data sheet. Such information should include, but not be limited to outside laboratory reports, vendor data, etc. The completed data sheet(s) will then be attached to the REC Report and referenced in the remarks column on the Reentry Control Log.
- d. It is possible that certain data and results will apply to more than one data sheet. For example, it is possible that a sample for gaseous contaminants will be taken by sampling an entire system. This system will consist of numerous items, each having its own data sheet. To assure complete documentation, reference the results of the gaseous contamination analysis on each affected data sheet.
- e. As a minimum the data sheet should reflect the following information:
 - (1) Unit
 - (2) Date
 - (3) Name of Point of Contact
 - (4) Description of Cleaning Performed
 - (5) Person Performing the Cleaning
 - (6) Results of any Analysis
 - (7) Description of Item Being Cleaned
 - (8) Part Number/NSN
 - (9) Remarks

Section VIII. PREPARATION FOR STORAGE OR SHIPMENT

Paragraph	Page
4-64 Short Term Storage	4-179
4-65 Long Term Storage	4-179
4-66 Preparation for Shipment	4-180

4-64. **Short Term Storage.** Routine storage of the compressor for a period of less than six months requires no specific maintenance actions. For storage of periods of six months and longer, follow the instructions in paragraph 4-65.

4-65. **Long Term Storage.** The unit must be checked and serviced if it is to be stored for a period longer than six months:

- a. Drain the engine and fill with preservative P-10, grade 10.
- b. Drain the compressor and fill with clean compressor oil (Item 15, Appendix E).
- c. Start and operate the unit for five minutes and shut the compressor down.
- d. Drain fuel tank. Spray the inside of the fuel tank with preservative P-10, grade 10.
- e. Connect a two-chamber fuel source to the auxiliary fuel connection. One chamber to be filled with diesel and the other to be filled with preservative. Start and run the engine on diesel fuel for 2 minutes, then switch to P-9. Run the engine until white smoke starts to come from the engine exhaust and stop engine.
- f. After the engine cools, remove the injectors and add 1 oz of preservative P-9 to each cylinder. Replace injectors.
- g. Loosen all drive belts and apply primer to drive sheave surfaces.
- h. Apply preservative P-9 to the engine exhaust manifolds, pipes and muffler.
- i. Close all valves.
- j. Disconnect and remove battery.
- k. Cover the compressor and engine air intakes with duct tape.
- l. Cover the unit with a tarpaulin and secure using the draw rope furnished.
- m. Store in a fully protected area.

4-66. **Preparation for Shipment.**

a. Boxed or Crated Shipment.

(1) Prepare the unit for storage in accordance with paragraph 4-64 and 4-65.

(2) Box or crate the complete unit in accordance with local S.O.P.

b. Uncrated Shipment. The compressor may be shipped by securing the unit directly to the load surface of a vehicle such as a truck.

**CHAPTER 5
DIRECT SUPPORT MAINTENANCE**

	Page
OVERVIEW	5-1
Section I. Repair Parts; Special Tools, Test, Measurement and Diagnostic Equipment (TMDE); and Support Equipment	5-1
Section II. Direct Support Troubleshooting	5-1
Section III. Direct Support Maintenance Procedures	5-9

OVERVIEW

This chapter contains information for troubleshooting and maintenance of the Compressor Unit by direct support maintenance personnel.

Section I. REPAIR PARTS; SPECIAL TOOLS, TEST, MEASUREMENT AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

Paragraph	Page
5-1 Common Tools and Test Equipment	5-1
5-2 Special Tools and Support Equipment	5-1
5-3 Repair Parts	5-1

5-1. **Common Tools and Equipment.** For authorized common tools and equipment, refer to the modified Table of Organization and Equipment (MTOE) applicable to your unit.

5-2. **Special Tools and Support Equipment.** For a listing of special tools, TMDE, and support equipment authorized for use on this equipment, refer to the Repair Parts and Special Tools List of this manual, and the maintenance allocation chart (MAC), Appendix B of this manual.

5-3. **Repair Parts.** Repair parts are listed and illustrated in the Repair Parts and Special Tools List for Compressor Unit, TM 5-4310-386-24P.

Section II. DIRECT SUPPORT TROUBLESHOOTING

Paragraph	Page
5-4 General	5-1
5-5 Direct Support Troubleshooting procedures.....	5-2

5-4. **General.** This section contains troubleshooting procedures to determine the probable cause of observed equipment malfunctions. Test or inspections are provided to isolate the faulty component and corrective actions are provided to eliminate the malfunction.

5-5. **Direct Support Troubleshooting Procedures.** Table 5-1 lists the common malfunctions that may be found during operation. Refer to symptom index to locate the troubleshooting procedures for the malfunction. This manual cannot list all malfunctions that may occur, nor all test or inspections and corrective actions. If a malfunction is not corrected by listed corrective actions, notify your supervisor.

SYMPTOM INDEX

Symptom	Page
1. Compressor will not load	5-3
2. Compressor output low.....	5-3
3. Low compressor oil pressure.....	5-3
4. Compressor air has oily taste	5-3
5. Sight glass exhibits air bubbles	5-4
6. Compressor does not attain final pressure	5-4
7. Excessive vibration of unit	5-4
8. Condensate drain not draining (cold weather)	5-5
9. No compressor oil pressure	5-5
10. Compressor output insufficient	5-5
11. Safety valves between stages releasing pressure	5-6
12. Compressor overheats (shutdown activates).....	5-6
13. Automatic interfilter drain does not unload	5-6
14. Automatic interfilter drain leaks and blows off continuously	5-6
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22. Engine does not run smoothly.....	5-8
23. Engine overheats or backfires.....	5-9

Table 5-1. Direct Support Troubleshooting Procedures.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
COMPRESSOR		
1. COMPRESSOR WILL NOT LOAD.	Step 1. Check first stage safety valves.	Replace defective first stage safety valve (para. 5-14).
	Step 2. Check cartridges in purifiers.	Change cartridges if service life is exceeded (para. 5-26).
2. COMPRESSOR OUTPUT LOW.	Step 1. Check compressor rpm for rated speed.	Increase engine speed.
	Step 2. Check cartridges in purifiers.	Change cartridges if service life is exceeded (para. 5-26).
3. LOW COMPRESSOR OIL PRESSURE.	Check oil pressure regulator for proper setting.	Adjust, repair, or replace as needed (para. 5-12).
4. COMPRESSOR AIR HAS OILY TASTE.	Step 1. Check purification cartridge service life.	Replace purification cartridges if service life is exceeded (para. 5-26).
	Step 2. Check oil pressure regulator adjustment.	Adjust oil pressure regulator (para. 5-12).

Table 5-1. Direct Support Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
5. SIGHT GLASS EXHIBITS AIR BUBBLES.	Step 1. Check oil pressure regulator.	Clean and adjust regulator (para. 5-12).
	Step 2. Check oil pump final pressure.	Clean or replace (para. 5-11).
	Step 3. Check 4th stage valve head assembly.	Replace or repair 4th stage valve head assembly (para. 5-23).
6. COMPRESSOR DOES NOT AT-AIN FINAL PRESSURE.	Step 1. Check fourth stage safety valve.	Replace a defective fourth stage safety valve (para. 5-24).
	Step 2. Check interfilter drain valves.	Clean, repair, or replace (para. 5-17).
	Step 3. Check interfilter safety valves.	Replace any safety valve that is defective (para. 5-16).
7. EXCESSIVE VIBRATION OF UNIT.	Step 1. Fuel injection pump timing off.	Check, adjust if necessary (para. 5-30).
	Step 2. Frame cracked.	Weld, replace as necessary (para. 5-49).

Table 5-1. Direct Support Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
8. CONDENSATE AUTOMATIC DRAIN NOT DRAINING (COLD WEATHER).	Interfilter heater block inoperative.	Replace element if necessary (para. 5-15).
9. NO COMPRESSOR OIL PRESSURE.	Step 1. Check oil supply lines.	Tighten or replace oil supply lines as needed (para. 5-11).
	Step 2. Check compressor oil pump.	Replace compressor oil pump (para. 5-11).
	Step 3. Check oil pressure regulator.	Adjust or replace oil pressure regulator (para. 5-12).
10. COMPRESSOR OUTPUT INSUFFICIENT.	Step 1. Check engine rpm.	Adjust as required.
	Step 2. Check interfilter safety valves.	Replace interfilter safety valves if damaged (para. 5-16).
	Step 3. Check interfilter drain valves.	Replace or repair interfilter drain valves (para. 5-17).
	Step 4. Check first stage safety valve.	Replace first stage safety valve if damaged (para. 5-14).
	Step 5. Check fourth stage safety valve.	Replace fourth stage safety valve if damaged (para. 5-24).

Table 5-1. Direct Support Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
11. SAFETY VALVES BETWEEN STAGES RELEASING PRESSURE.	Step 1. Check first stage safety valve.	Replace first stage safety valve (para. 5-14).
	Step 2. Check fourth stage safety valves.	Replace fourth stage safety valve (para. 5-24).
12. COMPRESSOR OVERHEATS (SHUTDOWN ACTIVATES).	Check oil pressure.	Adjust oil pressure regulator (para. 5-12).
13. AUTOMATIC INTERFILTER DRAIN DOES NOT UNLOAD.	Check interfilter drain circuit and solenoid.	Repair or replace as necessary (para. 5-17).
14. AUTOMATIC INTERFILTER DRAIN LEAKS AND BLOWS OFF CONTINUOUSLY.	Check automatic interfilter drain.	Replace or repair automatic interfilter drain (para. 5-17).
15. COMPRESSOR SPEED LOW.	Check engine rpm.	Adjust engine rpm.
16. ENGINE GIVES POOR PERFORMANCE.	Step 1. Check fuel system.	Clean fuel system.
	Step 2. Check injection pump timing.	Adjust timing as required (para. 5-30).

Table 5-1. Direct Support Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
16. ENGINE GIVES POOR PERFORMANCE (Cont).	Step 3. Check exhaust back pressure.	Replace muffler or spark arrestor if required.
	Step 4. Check fuel injectors.	Replace damaged or defective fuel injectors (para. 5-31).
17. ENGINE OIL PRESSURE ZERO OR TOO LOW.	Step 1. Check lube oil line for blockage or leakage.	Replace damaged lube oil line (para. 5-34).
	Step 2. Check oil pump.	Replace damaged or defective oil pump (para. 5-33).
18. ENGINE OIL CONSUMPTION EXCESSIVE.	Step 1. Check rocker arm metering screws.	Adjust (para. 5-38).
	Step 2. Check valve guides.	Replace worn valve guides (para. 5-40).
	Step 3. Check engine piston.	Replace worn piston and rings (para. 5-43).
	Step 4. Check engine cylinder.	Replace worn engine cylinder (para. 5-42).

Table 5-1. Direct Support Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
19. ENGINE SMOKES WHITE.	Step 1. Check for defective fuel injector.	Replace a damaged or defective injector (para. 5-31).
	Step 2. Check injector sealing washer.	Replace if necessary (para. 5-31).
	Step 3. Check injection pump timing.	Adjust if necessary (para. 5-30).
20. ENGINE SMOKE BLUE.	Step 1. Check valve guides.	Replace worn valve guides (para. 5-40).
	Step 2. Check piston and piston rings.	Replace rings and piston if required (para. 5-43).
	Step 3. Check cylinder.	Replace worn cylinder (para. 5-42).
21. ENGINE SMOKES BLACK.	Step 1. Check engine injector.	Replace defective injector (para. 5-31).
	Step 2. Check injection pump timing.	Adjust as required (para. 5-30).
22. ENGINE DOES NOT RUN SMOOTHLY.	Engine/compressor vibration mounts broken or loose.	Tighten or replace as required (para. 5-49).

Table 5-1. Direct Support Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
23. ENGINE OVERHEATS OR BACKFIRES.		
	Fuel delivery wrong (fuel timing). Refer to para. 5-30.	
		Adjust as required.

Section III. DIRECT SUPPORT MAINTENANCE PROCEDURES

Paragraph		Page
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5-7	Control Panel Assembly	5-10
5-8	Controls and Indicators	5-14
5-9	Compressor Assembly	5-24
5-10	Lines and Fittings	5-30
5-11	Compressor Oil Pump and Supply Line	5-50
5-12	Oil Pressure Regulator Valve and Oil Return Line	5-52
5-13	Compressor Intercoolers and Aftercooler	5-58
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5-47 Power Take-Off Assembly	5-196
5-48 Clutch Assembly	5-200
5-49 Inner Frame	5-202
5-50 Outer Frame	5-206

5-6. **General.** This section contains direct support maintenance procedures as authorized by the maintenance allocation chart in Appendix B of this manual.

5-7. Control Panel Assembly.

This task covers:

a. Replace

b. Repair

INITIAL SETUP

Tools

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Equipment Condition

Compressor unit shut down (para. 2-13).
Controls and indicators removed (para. 4-19).
Controls and indicators removed (para. 5-8)

Materials/Parts

Control Panel
Solvent, Dry Cleaning (Item 24, Appendix E)
Rags, Wiping (Item 21, Appendix E)

a. Replace. (figure 5-1)

- (1) Remove four nuts (1), ground wire (2), washers (3), and bolts (4) and remove control panel (5).
- (2) Install control panel (5) and secure with four bolts (4), washers (3), ground wire (2), and nuts (1).

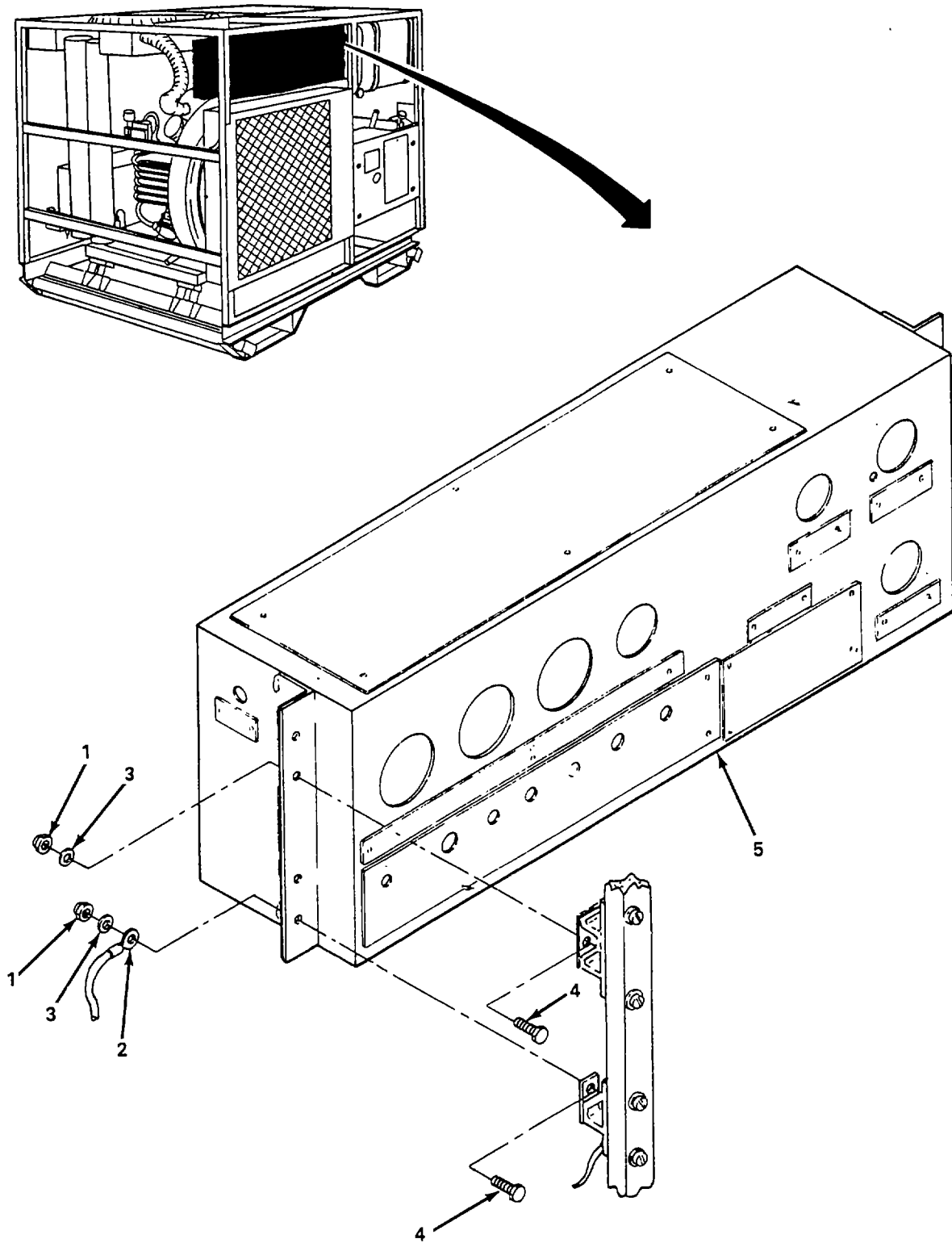


Figure 5-1. Control Panel, Replace.

5-7. Control Panel Assembly (Cont).*b. Repair.* (figure 5-2)

- (1) Remove nut (1), washers (2), ground wire (3), washer (4), and screw (5).
- (2) Remove five nuts (6), washers (7), absorbers (8), washer (9), and screws (10).
- (3) Remove nut (11), washer (12), ground wire (13), and screw (14).
- (4) Remove three nuts (15), washers (16), and screws (17).

NOTE

There are eight placards on the control panel. The number of rivets holding each placard varies. Replacement of each placard is the same.

- (5) Remove rivets (18) and remove placards (19) from control panel (20).

WARNING

Dry cleaning solvent PD-680 used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 138°F (60°C).

- (6) Clean all items with dry cleaning solvent and dry thoroughly.
- (7) Inspect all components and replace any component that is damaged.
- (8) Install placards (19) and secure with rivets (18).
- (9) Install three screws (17), washers (16), and nuts (15).
- (10) Install screw (14), ground wire (13), washer (12), and nut (11).
- (11) Install five screws (10), washers (9), absorbers (8), washers (7), and nuts (6).
- (12) Install screw (5), washers (4), ground wire (3), washer (2), and nut (1).

FOLLOW-ON MAINTENANCE

- (1) Install controls and indicators (para. 5-8).
- (2) Install controls and indicators (para. 4-19).

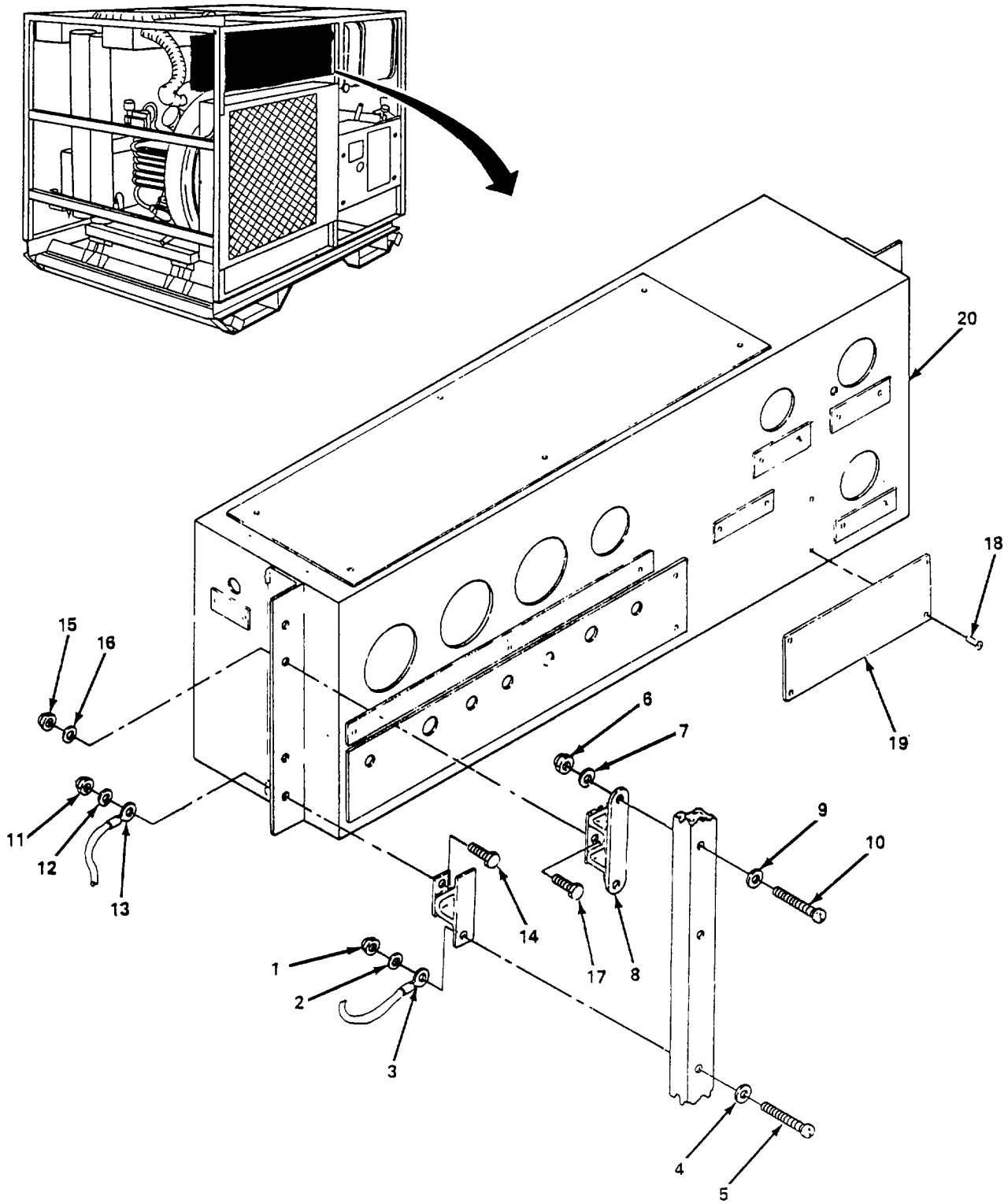


Figure 5-2. Control Panel, Repair.

5-8. Controls and Indicators.

This task covers:**a. Replace**

INITIAL SETUP

*Tools*General Mechanics Tool Kit
(NSN 5180-00-177-7033)*Materials/Parts (Cont.)*Tape, Teflon (Item 26, Appendix E)
Tape (Item 25, Appendix E)*Materials/Parts*Service Line Pressure Gage
Pressure Gage
Oil Pressure Gage
Service Line Control Valve
Service Outlet Valve
Band, Rubber (Item 4, Appendix E)*Equipment Condition*

Compressor unit shut down (para. 2-13)

*Reference*Cleaning procedures, Chapter 4, Section VII

Replace. (figure 5-3)**WARNING**

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

(1) *Service line control valve.* (figure 5-3)

- (a) Loosen fitting nut (1) and remove line (2).
- (b) Loosen fitting nut (3) and remove line (4).
- (c) Loosen fitting nut (5) and remove line (6).
- (d) Remove knob (7) and nut (8), and remove control valve (9) from control panel (10).
- (e) Remove tee (11) from fitting (12) and elbow (13).

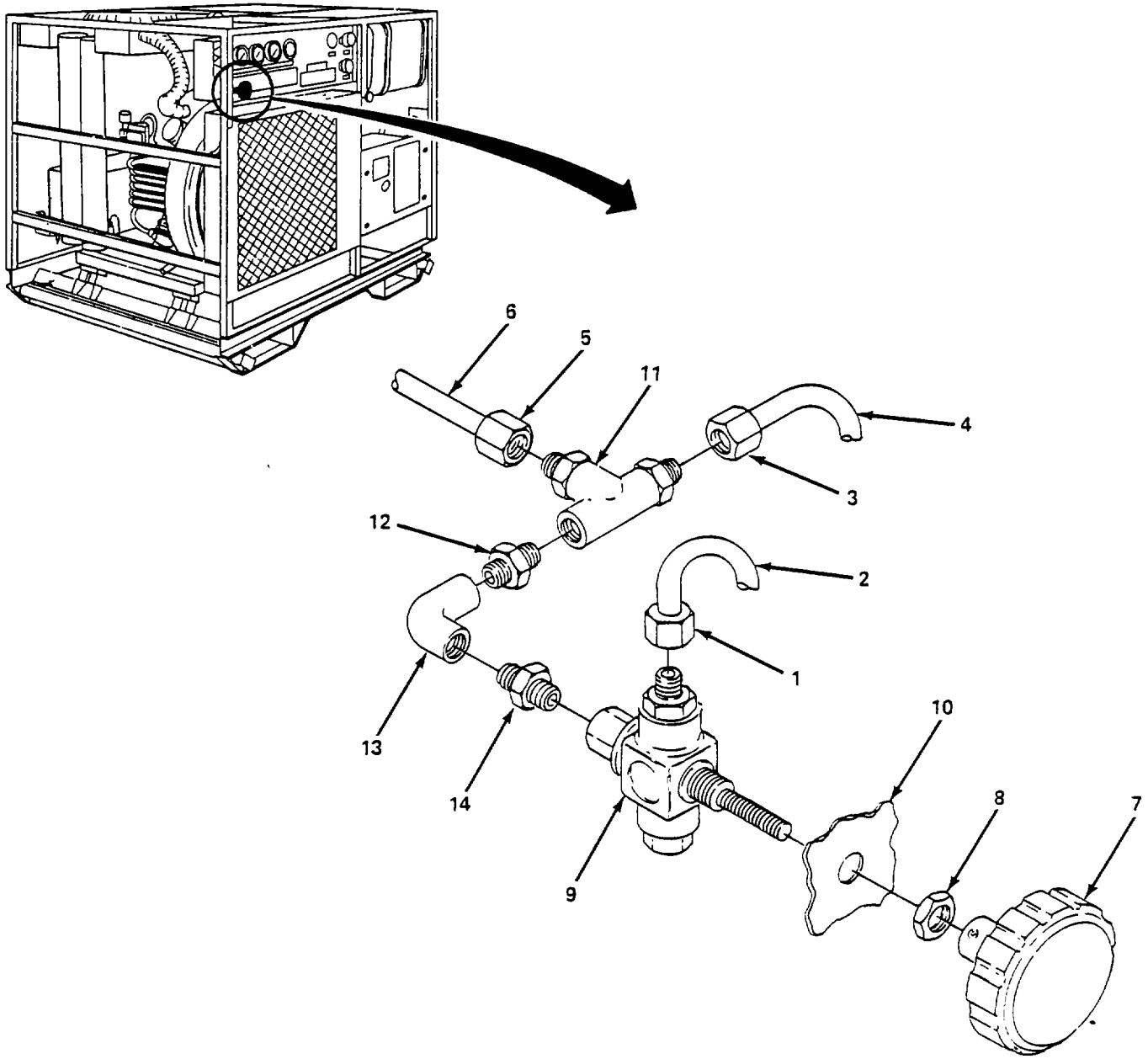


Figure 5-3. Service Line Control Valve, Replace.

5-8. Controls and Indicators (Cont).

- (f) Remove elbow (13) and fitting (14) from control valve (9).

WARNING

Leave 1 1/2 threads exposed on fitting when applying teflon tape. This will ensure that no teflon tape will hang down inside the air system. Teflon tape should be wrapped in such a manner that when the fitting is tightened the tape will not loosen. Failure to wrap teflon tape correctly may result in contamination or blockage of the air system and subsequent possible injury or death to the diver.

- (g) Apply teflon tape to all pipe threads.
- (h) Install fitting (14) and elbow (13) on control valve (9).
- (i) Install fitting (12) and tee (11) on elbow (12).
- (j) Install control valve (9) and secure with nut (8).
- (k) Install knob (7) on control valve (9).
- (l) Install line (6) and tighten fitting nut (5).
- (m) Install line (4) and tighten fitting nut (3).
- (n) Install line (2) and tighten fitting nut (1).

(2) *Service line pressure gage.* (figure 5-4)

- (a) Loosen fitting nut (1) and remove line (2) from pressure gage (3).
- (b) Remove two nuts (4) and lockwashers (5) and remove two brackets (6).
- (c) Remove pressure gage (3) from control panel (7).

WARNING

Leave 1 1/2 threads exposed on fitting when applying teflon tape. This will ensure that no teflon tape will hang down inside the air system. Teflon tape should be wrapped in such a manner that when the fitting is tightened the tape will not loosen. Failure to wrap teflon tape correctly may result in contamination or blockage of the air system and subsequent possible injury or death to the diver.

- (d) Install pressure gage (3) and two brackets (6) and secure with two lockwashers (5) and nuts (4).
Apply teflon tape to pipe threads on pressure gage (3).
- (e) Install line (2) and tighten fitting nut (1).

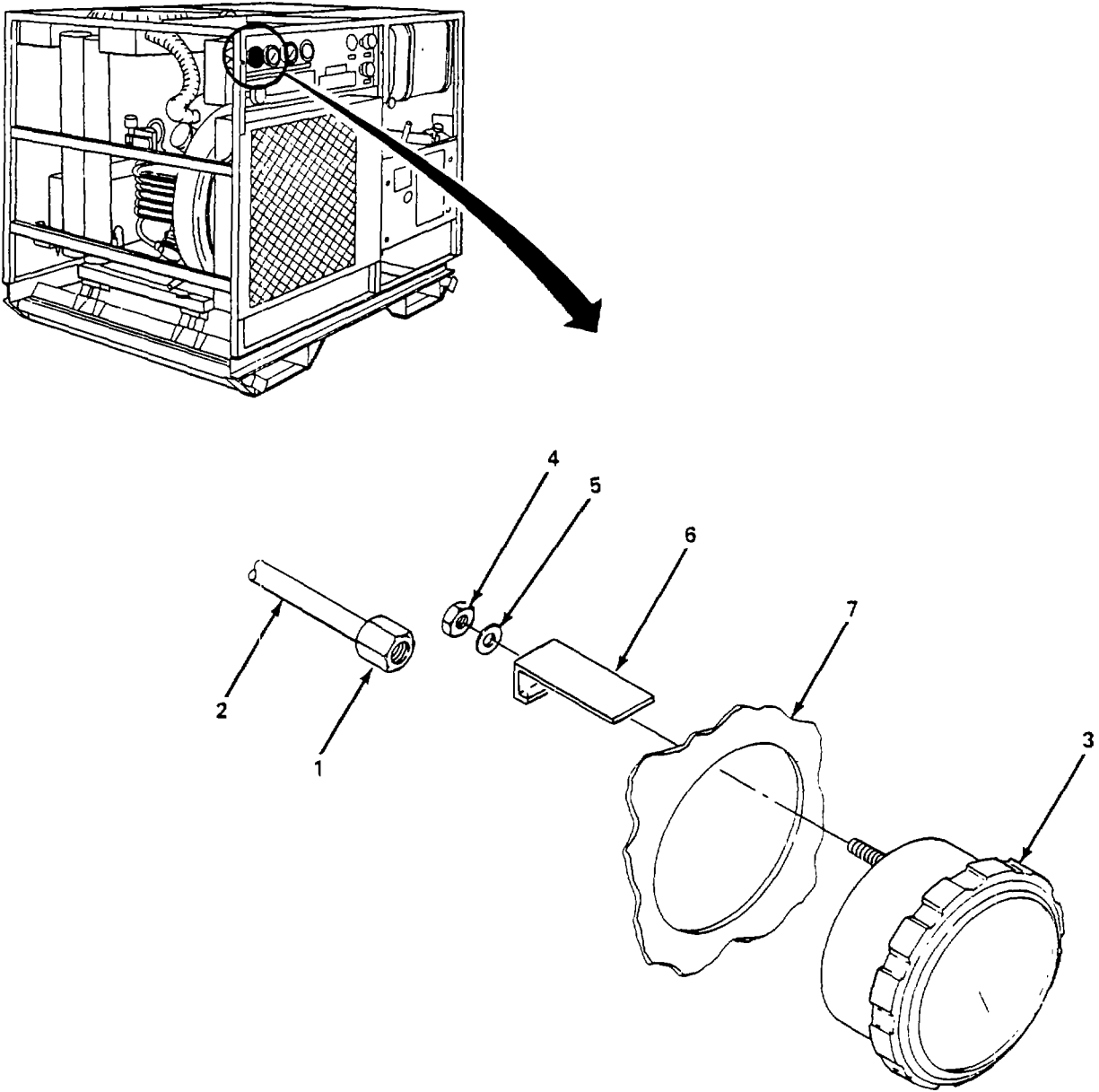


Figure 5-4. Service Line Pressure Gage, Replace.

5-8. Controls and Indicators (Cont).

(3) Pressure gage. (figure 5-5)

- (a) Loosen fitting nut (1) and remove line (2) from pressure gage (3).
- (b) Remove two nuts (4) and lockwashers (5) and remove two brackets (6).
- (c) Remove pressure gage (3) from control panel (7).

WARNING

Leave 1 1/2 threads exposed on fitting when applying teflon tape. This will ensure that no teflon tape will hang down inside the air system. Teflon tape should be wrapped in such a manner that when the fitting is tightened the tape will not loosen. Failure to wrap teflon tape correctly may result in contamination or blockage of the air system and subsequent possible injury or death to the diver.

- (d) Install pressure gage (3) and two brackets (6) and secure with two lockwashers (5) and nuts (4).
Apply teflon tape to threads on pressure gage (3).
- (e) Install line (2) and tighten fitting nut (1).

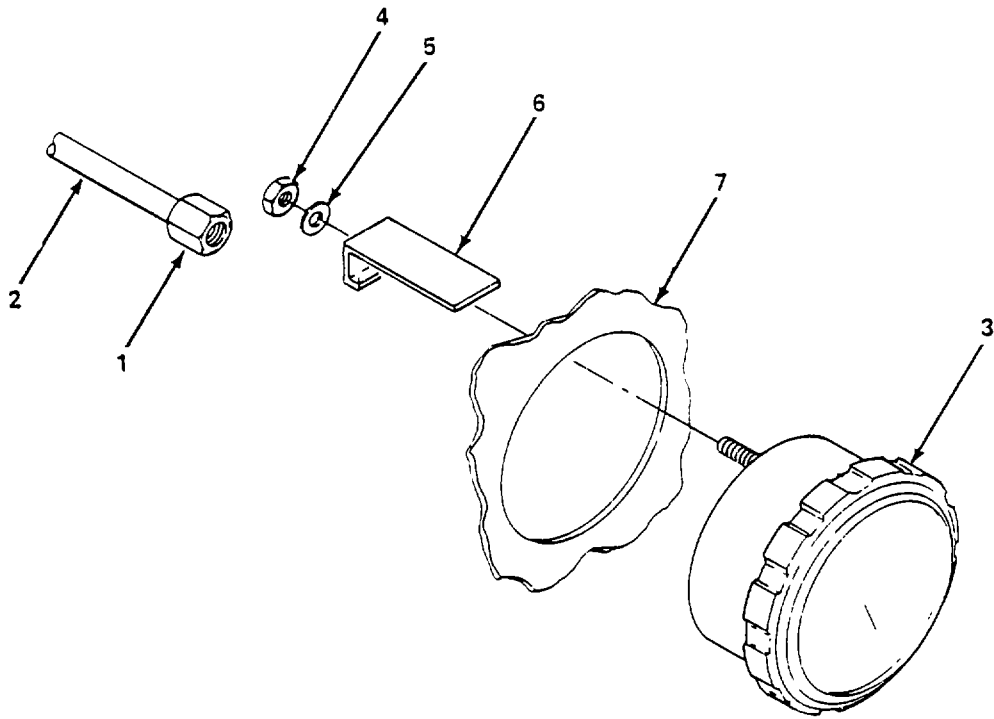
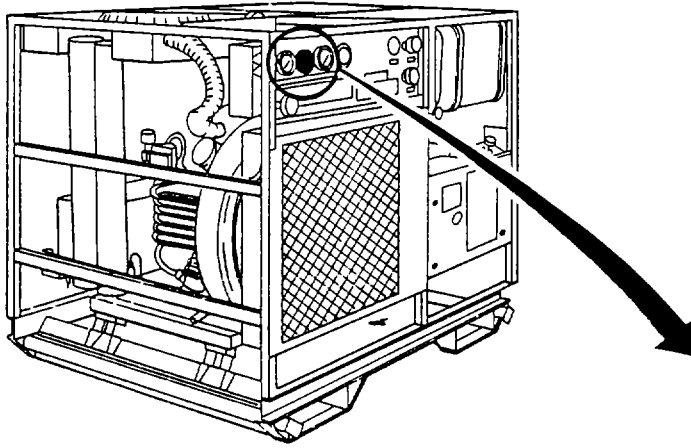


Figure 5-5. Pressure Gage, Replace.

5-8. **Controls and Indicators (Cont).**

(4) *Oil pressure gage.* (figure 5-6)

(a) Loosen fitting nut (1) and remove line (2) from oil pressure gage (3).

(b) Remove two nuts (4) and lockwashers (5) and remove two brackets (6).

(c) Remove oil pressure gage (3) from control panel (7).

(d) Install oil pressure gage (3) and two brackets (6) and secure with two lockwashers (5) and nuts (4).

(e) Install line (2) and tighten fitting nut (1).

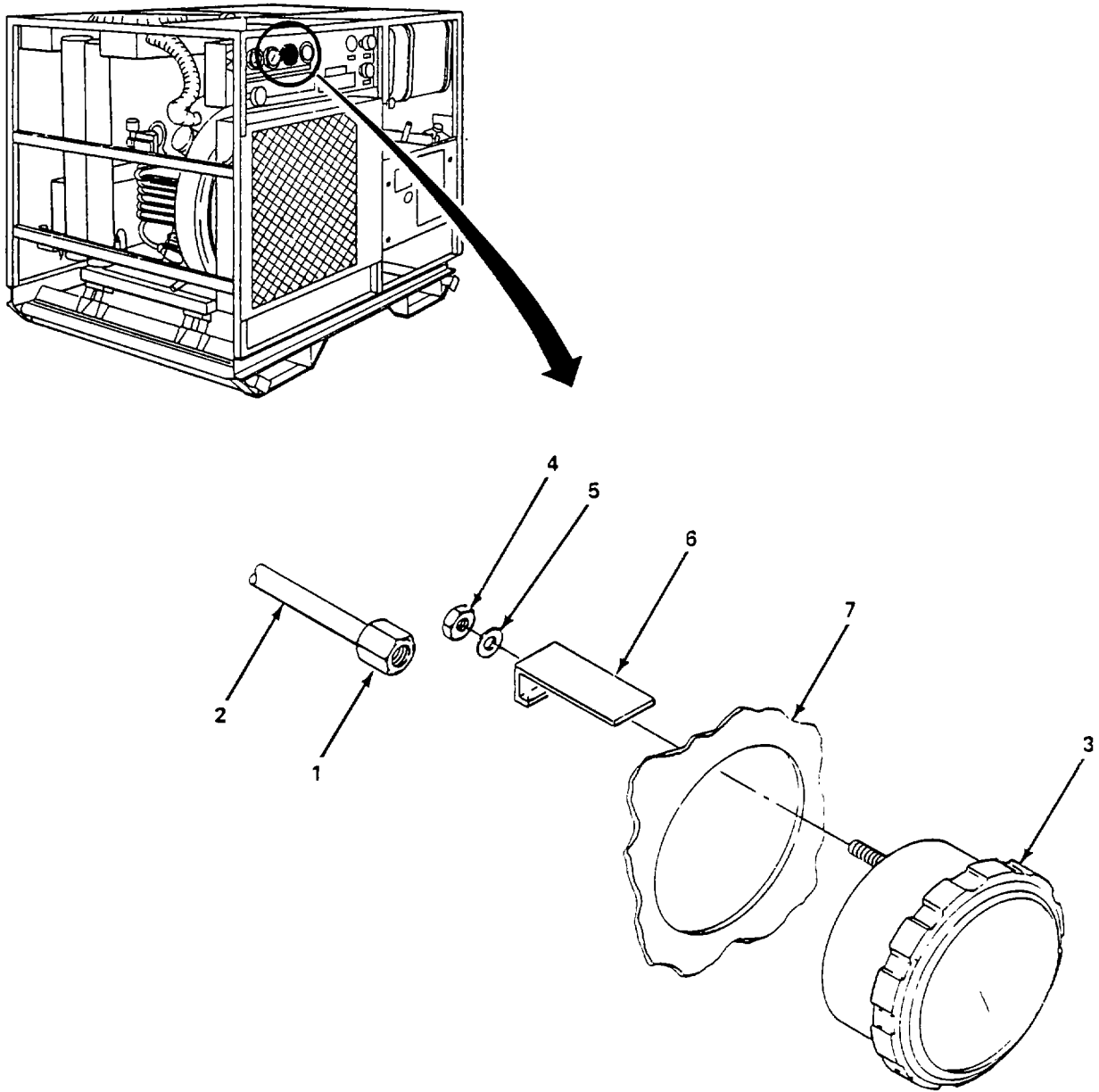


Figure 5-6. Oil Pressure Gage, Replace.

5-8. Controls and Indicators (Cont).

- (5) *Service outlet.* (figure 5-7)
 - (a) Loosen two fittings (1) from tee (2).
 - (b) Remove tee (2) from fitting (3).
 - (c) Remove fitting (3) and (4) from control panel (5).
 - (d) Install fitting (4) and (3) on control panel (5).
 - (e) Install tee (2) on fitting (3).
 - (f) Install two fittings (1) on tee (2).

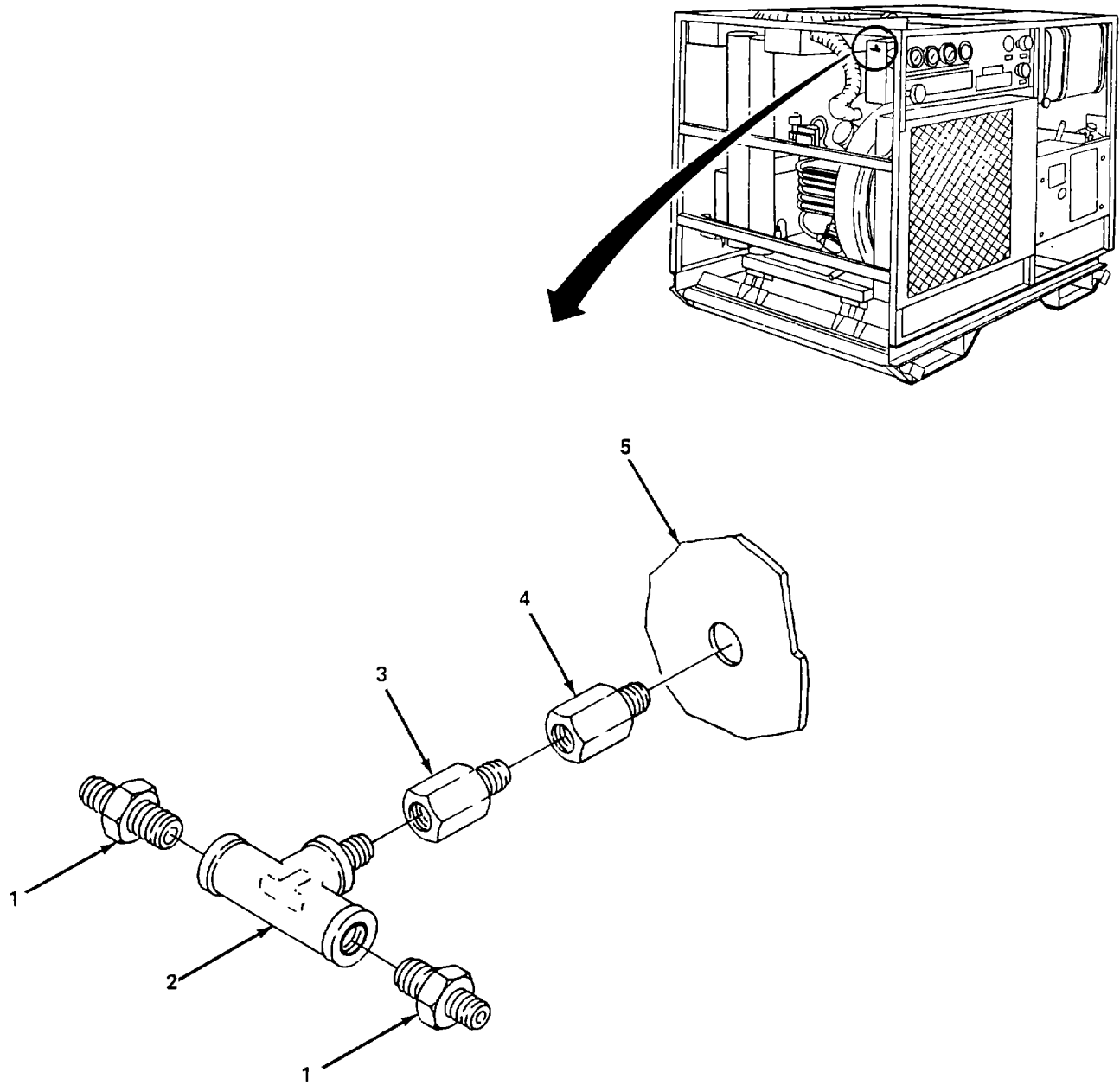


Figure 5-7. Service Outlet, Replace.

5-9. Compressor Assembly.

This task covers:

- a. Replace
-

INITIAL SETUP

Tools

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Materials/Parts

Compressor Assembly
Band, Rubber (Item 4, Appendix E)
Bags, Plastic (Item 3, Appendix E)
Tape, Teflon (Item 26, Appendix E)
Tape (Item 25, Appendix E)

Equipment Condition

Compressor unit shut down (para. 2-13)
Beltguard removed (para. 4-15).
Top tray removed (para. 4-18)
Compressor drive belts removed (para. 4-20)

Reference

Cleaning procedures, Chapter 4, Section VII

Replace. (figure 5-8)

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

NOTE

Ensure bleed valve has been opened releasing all pressure from system.

- (1) Loosen two coupling nuts (1) and remove line (2).
- (2) Loosen two coupling nuts (3) and remove line (4).
- (3) Loosen two coupling nuts (5) and remove line (6).
- (4) Loosen two coupling nuts (7) and remove line (8).
- (5) Loosen two coupling nuts (9) and remove line (10).

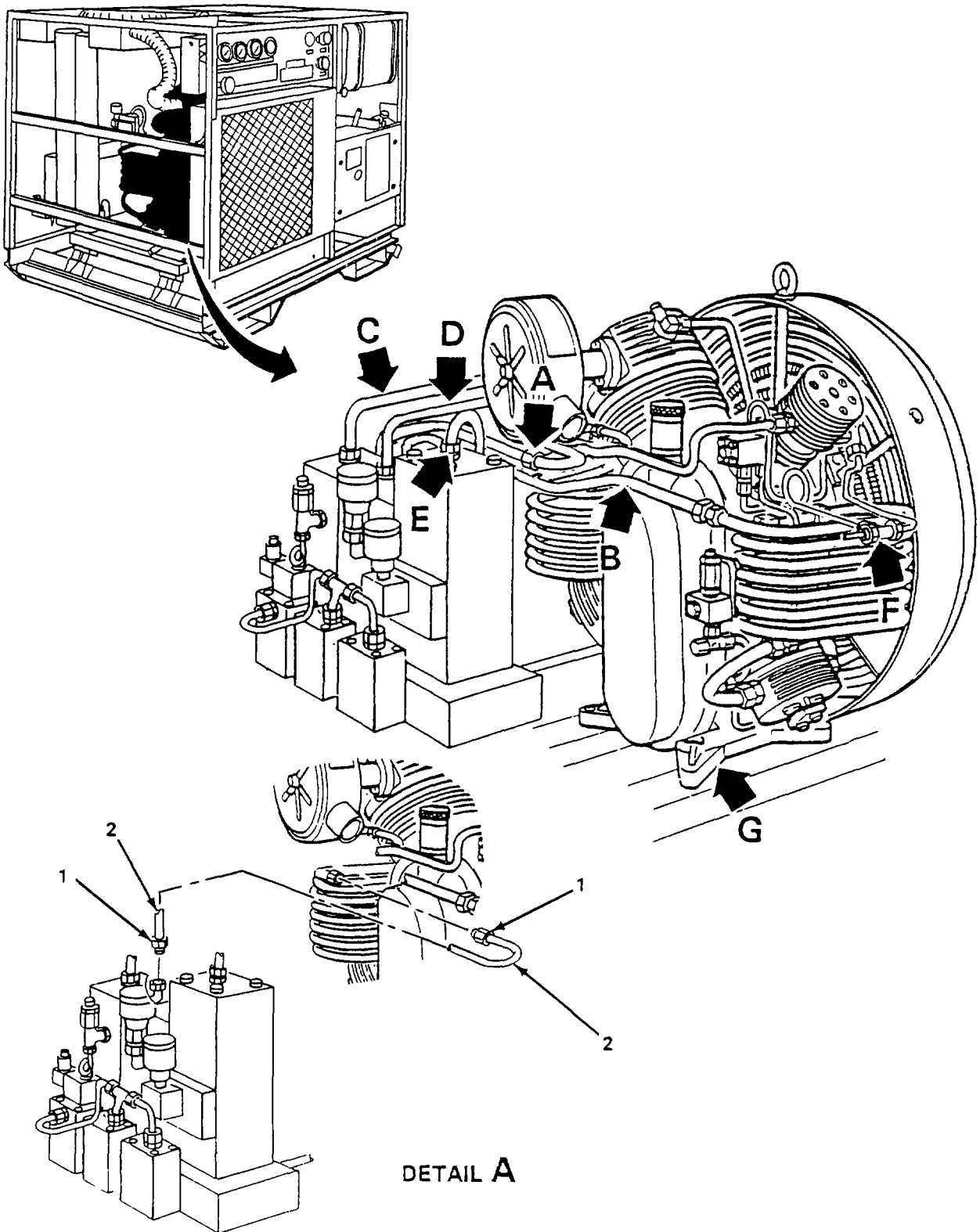


Figure 5-8. Compressor Assembly, Replace (Sheet 1 of 3).

5-9. Compressor Assembly (Cont).

- (6) Loosen two coupling nuts (11) and remove line (12).
- (7) Loosen two coupling nuts (13) and remove line (14).
- (8) Remove four nuts (15), washers (16), lockwashers (17), and screws (18) securing compressor (19) to inner frame (20).

CAUTION

Before lifting compressor, ensure that all air lines, hoses, and parts are clear of obstruction. Failure to do so will result in damage to the compressor.

- (9) Attach suitable lifting device to compressor and remove compressor (19).
- (10) Attach lifting device to compressor (19) and install compressor on inner frame (20).
- (11) Install four screws (18), lockwashers (17), washers (16), and nuts (15).
- (12) Install line (14) and tighten two coupling nuts (13).
- (13) Install line (12) and tighten two coupling nuts (11).
- (14) Install line (10) and tighten two coupling nuts (9).
- (15) Install line (8) and tighten two coupling nuts (7).
- (16) Install line (6) and tighten two coupling nuts (5).
- (17) Install line (4) and tighten two coupling nuts (3).
- (18) Install line (2) and tighten two coupling nuts (1).

FOLLOW-ON MAINTENANCE

- (1) Install compressor drive belts (para. 4-20).
- (2) Install top tray (para. 4-18).
- (3) Install beltguard (para. 4-15).

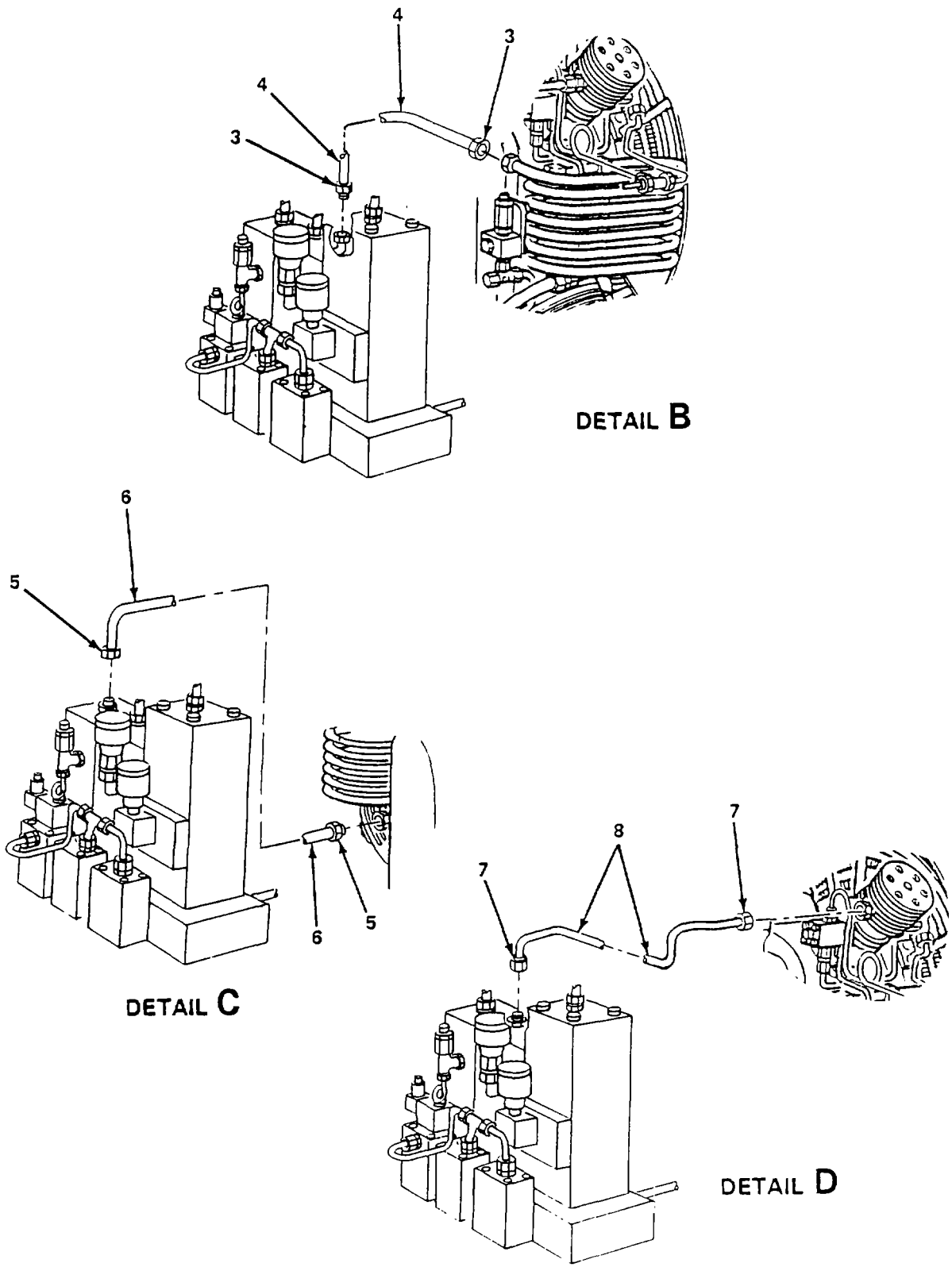


Figure 5-8. Compressor Assembly, Replace (Sheet 2 of 3).

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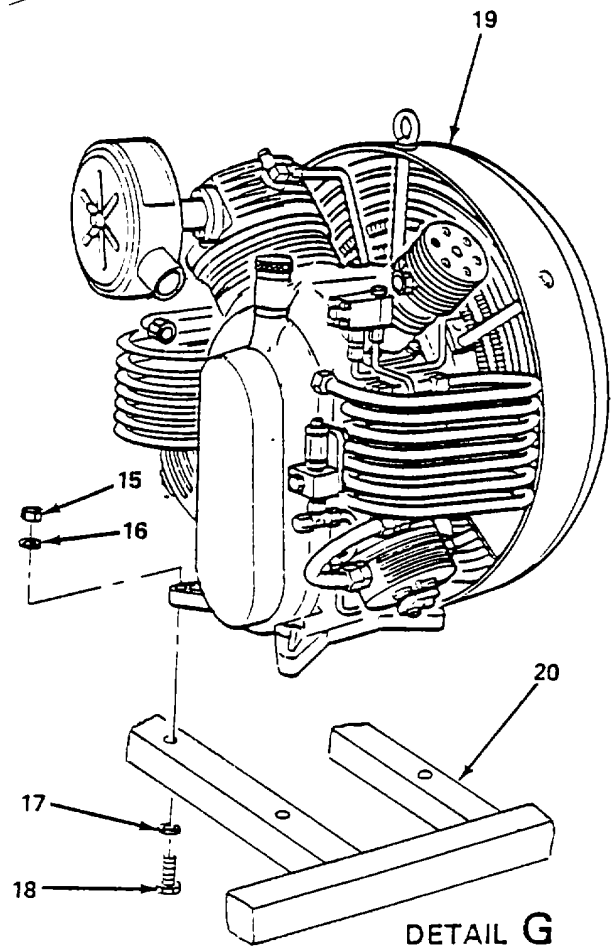
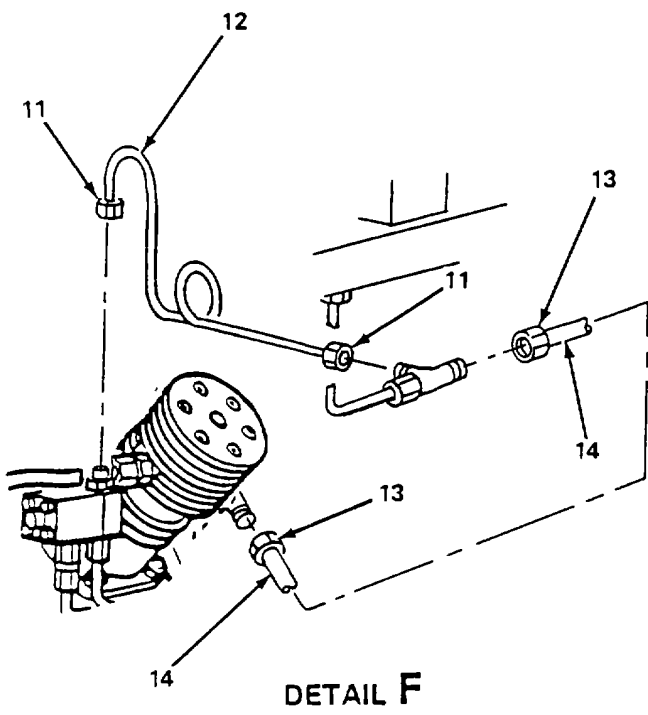
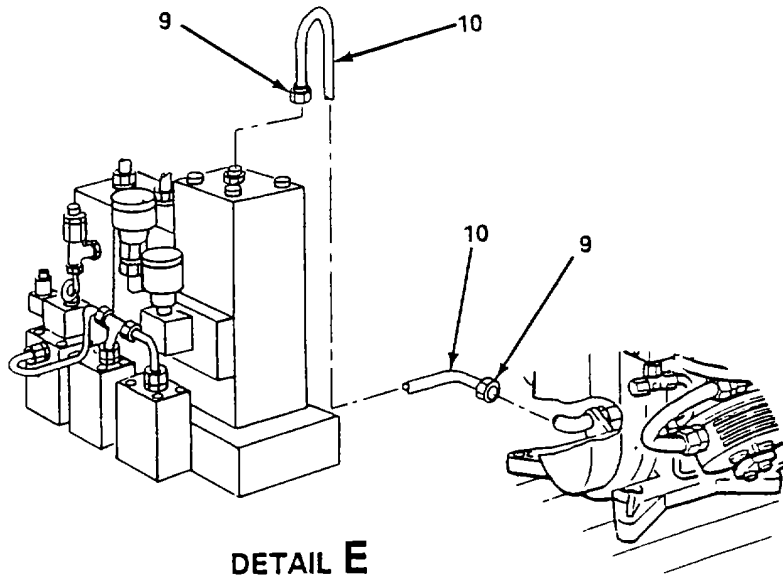


Figure 5-8. Compressor Assembly, Replace (Sheet 3 of 3).

5-10. Lines and Fittings.

This task covers:

- a. Replace

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Materials/Parts

Tape (Item 25, Appendix E)
Bands, Rubber (Item 4, Appendix E)
Bags, Plastic (Item 3, Appendix E)

Equipment Condition

Compressor unit shut down (para. 2-13).

Reference

Cleaning procedures, Chapter 4, Section VII

Replace.

- (1) Removal. (figure 5-9)

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (a) Remove bolt (1) and loosen coupling nut (2) securing line (3) to filter block fitting (4) and remove line.
- (b) Remove filter block fitting (4) from filter block (5).
- (c) Loosen coupling nut (6) securing line (7) to elbow (8) on separator housing (9).
- (d) Loosen coupling nut (10) securing line (7) to fitting (11) and remove line.
- (e) Remove elbow (8) from fitting (12) and remove fitting (12) from separator housing (9).
- (f) Remove fitting (11) from fitting (13) and remove fitting (13) from elbow (14).
- (g) Remove elbow (14) from fitting (15) and remove fitting (15) from purification assembly (16).

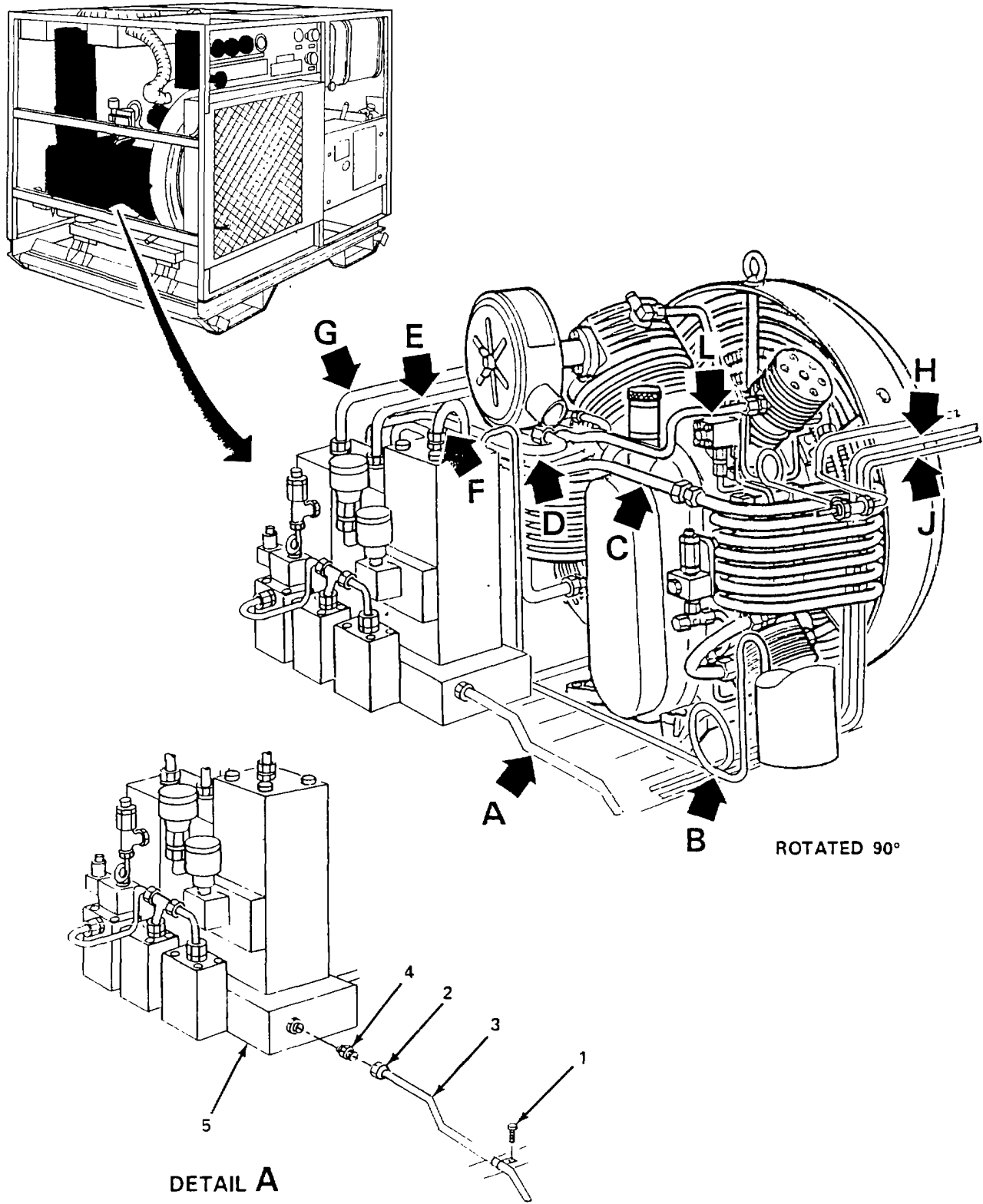
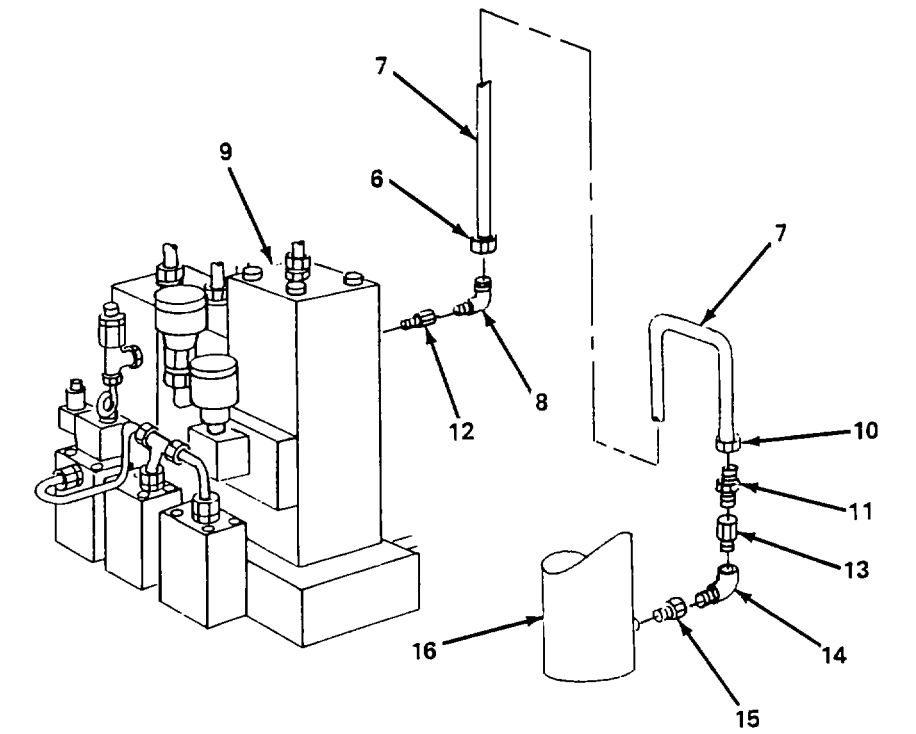


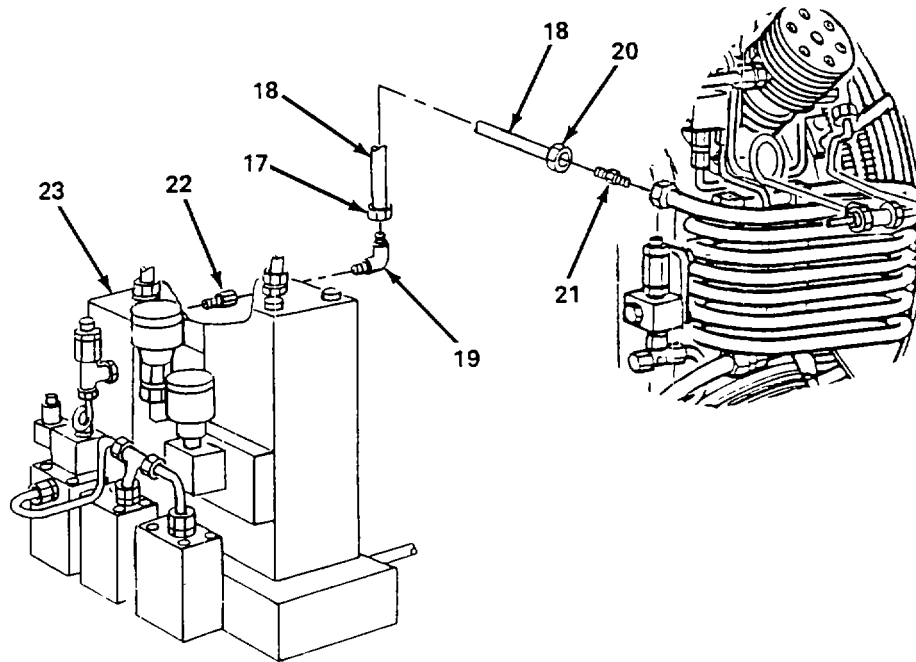
Figure 5-9. Lines and Fittings, Removal (Sheet 1 of 6).

5-10. Lines and Fittings (Cont).

- (h) Loosen coupling nut (17) securing line (18), and elbow (19).
- (i) Loosen coupling nut (20) securing line (18) to fitting (21) and remove line
- (j) Remove elbow (19) from fitting (22) and remove fitting (22) from third stage separator inlet (23).
- (k) Loosen coupling nut (24) securing line (25) to elbow (26).
- (l) Loosen coupling nut (27) securing line (25) to fitting (28) and remove line.
- (m) Remove elbow (26) from fitting (29) and remove fitting (29) from second stage separator inlet fitting (30).
- (n) Loosen coupling nut (31) securing line (32) to fitting (33).
- (o) Loosen coupling nut (34) securing line (32) to fitting (35) and remove line.
- (p) Remove fitting (33) from third stage separator outlet (36).
- (q) Remove fitting (35) from fourth stage valve head inlet (37).
- (r) Loosen coupling nut (38) securing line (39) to fitting (40).
- (s) Loosen coupling nut (41) securing line (39) to elbow (42) and remove line.
- (t) Remove fitting (40) from separator housing inlet (43).
- (u) Loosen coupling nut (44) and remove line (45).
- (v) Remove adapter (46) from elbow (42) and remove elbow.
- (w) Loosen coupling nut (47) securing line (48) to fitting (49).
- (x) Loosen coupling nut (50) securing line (48) to fitting (51) and remove line.
- (y) Remove fitting (49) from second stage separator outlet (52).
- (z) Remove fitting (51) from second stage valve head inlet (53).
- (aa) Loosen coupling nut (54) securing line (55) to fitting (56).
- (ab) Loosen coupling nut (57) securing line (55) to fitting (58) and remove line.
- (ac) Remove fitting (56) from pressure maintaining valve (59).
- (ad) Remove fitting (58) from service line valve (60).



DETAIL B

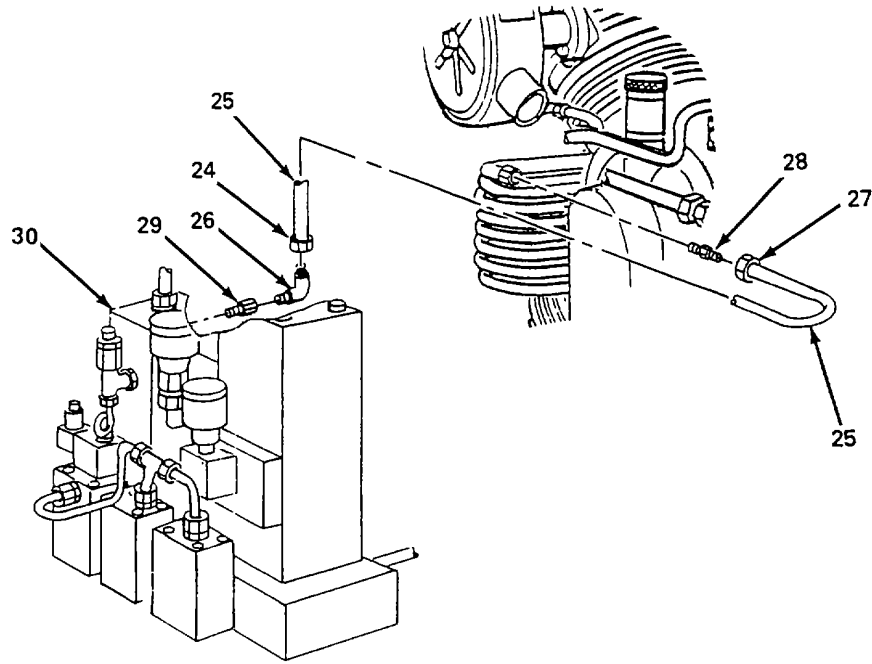


DETAIL C

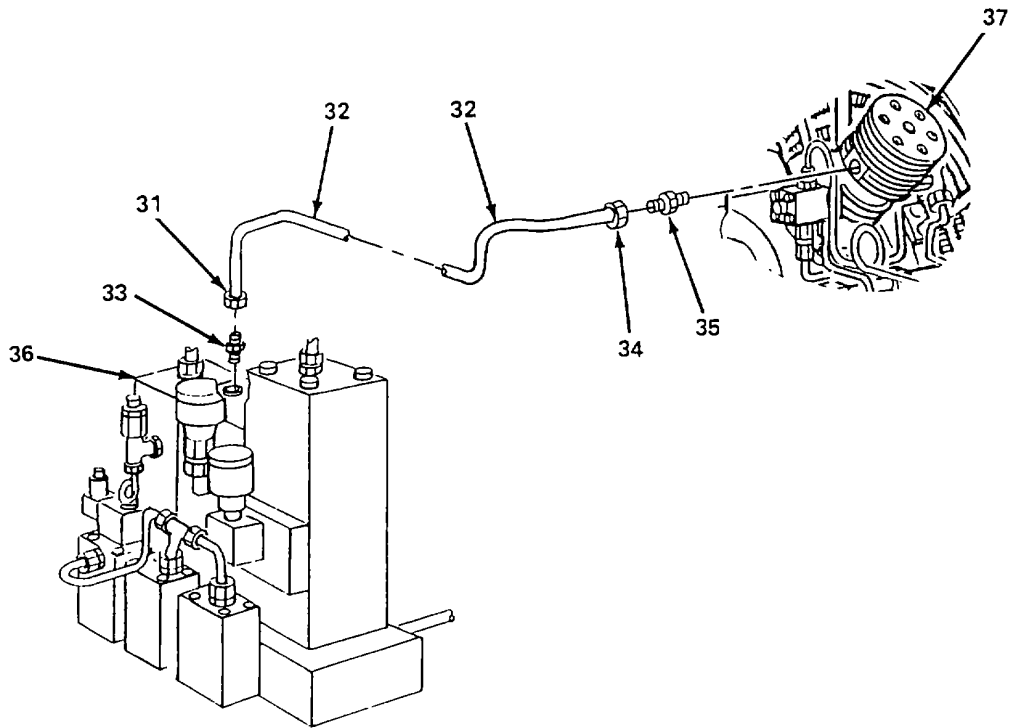
Figure 5-9. Lines and Fittings, Removal (Sheet 2 of 6).

5-10. Lines and Fittings (Cont).

- (ae) Loosen coupling nut (61) securing line (62) to fitting (63).
- (af) Loosen coupling nut (64) securing line (62) to fitting (65) and remove line.
- (ag) Remove fitting (63) from four way fitting (66).
- (ah) Remove fittings (67) and (68) from four way fitting (66).
- (ai) Remove fitting (65) from final pressure gauge (69).
- (aj) Remove pressure maintaining valve (59) from fitting (70) and remove fitting (70) from four way fitting (66).
- (ak) Remove four way fitting (66) from fitting (71) and remove fitting (71) from cylinder fitting (72).
- (al) Remove two fittings (73) from service outlet tee (74) and remove service outlet tee from fitting (75).
- (am) Remove fitting (75) from fitting (76) and remove fitting (76) from fitting nut (77).
- (an) Loosen coupling nut (78) securing line (79) to tee (80).
- (ao) Loosen coupling nut (81) securing line (79) to fitting (82) and remove line.
- (ap) Remove fitting (82) from service line gauge (83).
- (aq) Loosen coupling nut (84) securing line (85) to fitting (86) and remove line.
- (ar) Remove fitting (86) from tee (80).
- (as) Remove tee (80) from elbow (87) and remove elbow from fitting (88).
- (at) Remove fitting (88) from service line valve (60).
- (au) Loosen coupling nut (89) securing line (90) to fitting (91).
- (av) Loosen coupling nut (92) securing line (90) to tee (93) and remove line.
- (aw) Remove fitting (91) from oil pressure switch (94).
- (ax) Loosen coupling nut (95) securing line (96) to tee (93).
- (ay) Loosen coupling nut (97) securing line (96) to fitting (98) and remove line.
- (az) Remove fitting (98) from oil pressure regulator valve (99).



DETAIL D

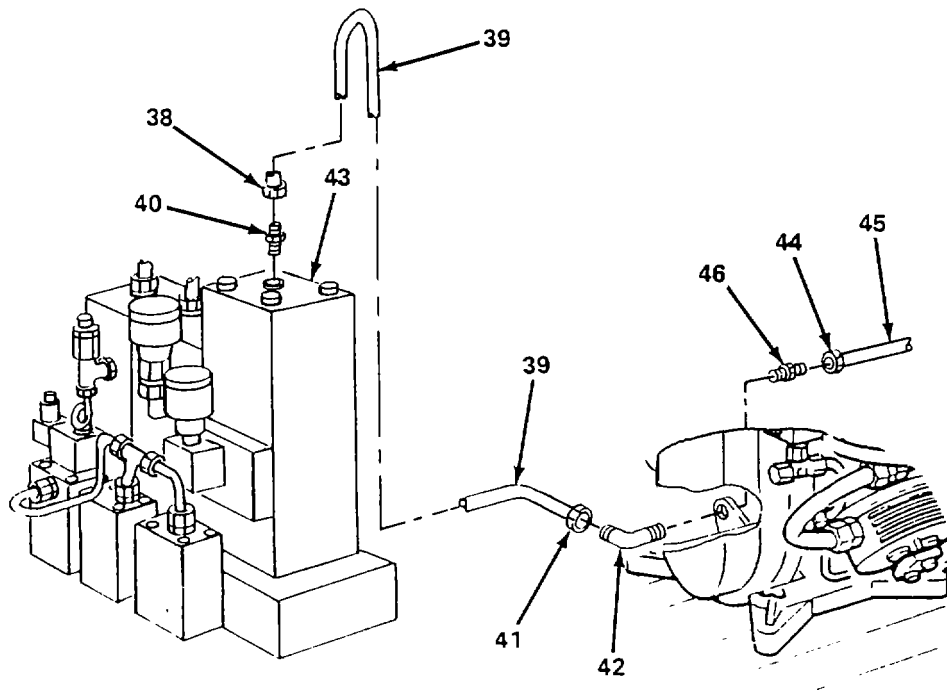


DETAIL E

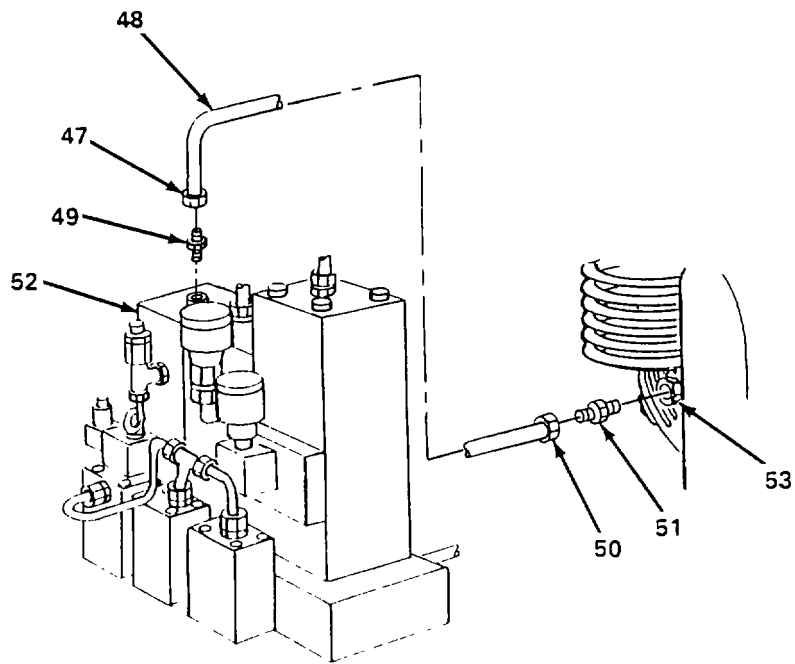
Figure 5-9. Lines and Fittings, Removal (Sheet 3 of 6).

5-10. Lines and Fittings (C ont).

- (ba) Loosen coupling nut (100) securing line (101) to fitting (102).
- (bb) Loosen coupling nut (103) securing line (101) to tee (93) and remove line.
- (bc) Remove fitting (102) from oil pressure gauge (104).



DETAIL F



DETAIL G

Figure 5-9. Lines and Fittings, Removal (Sheet 4 of 6).

5-10. Lines and Fittings (Cont).

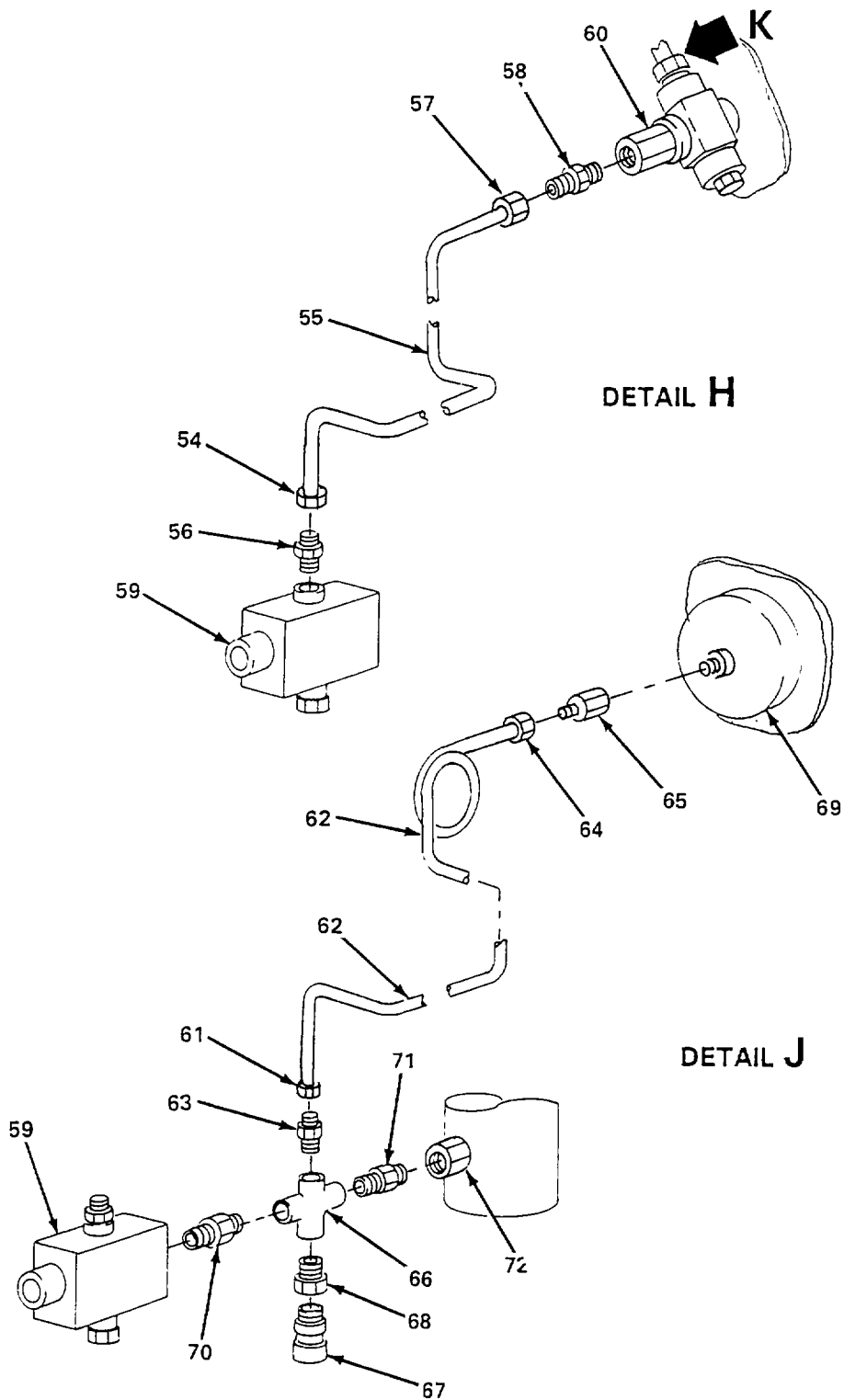
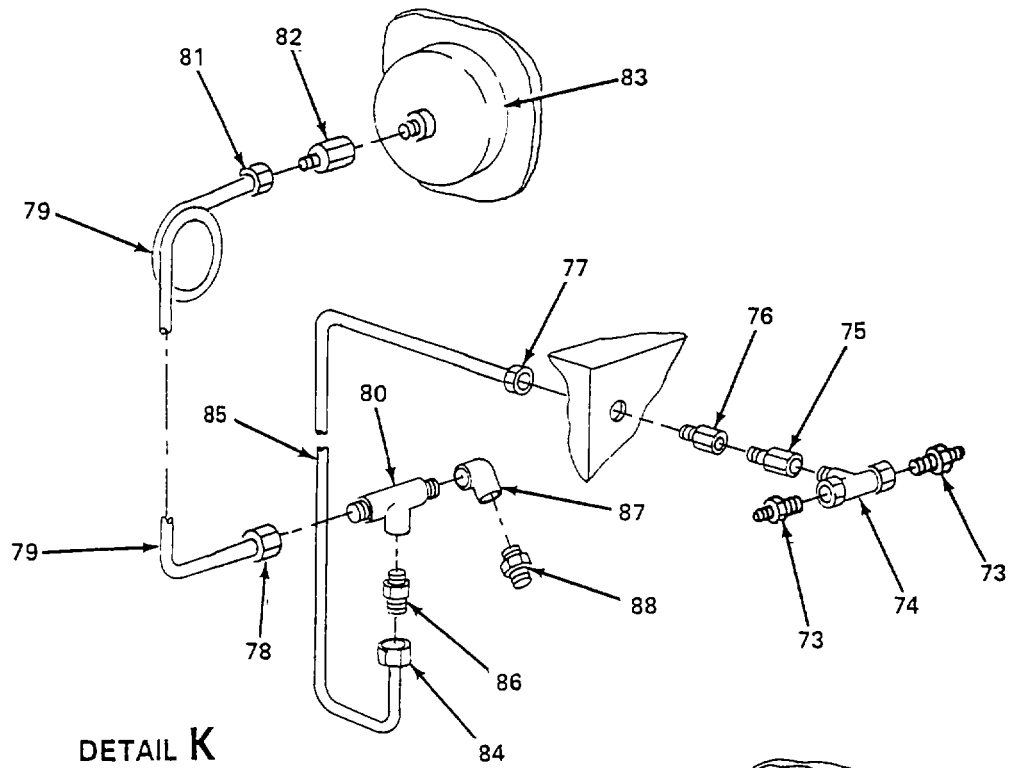
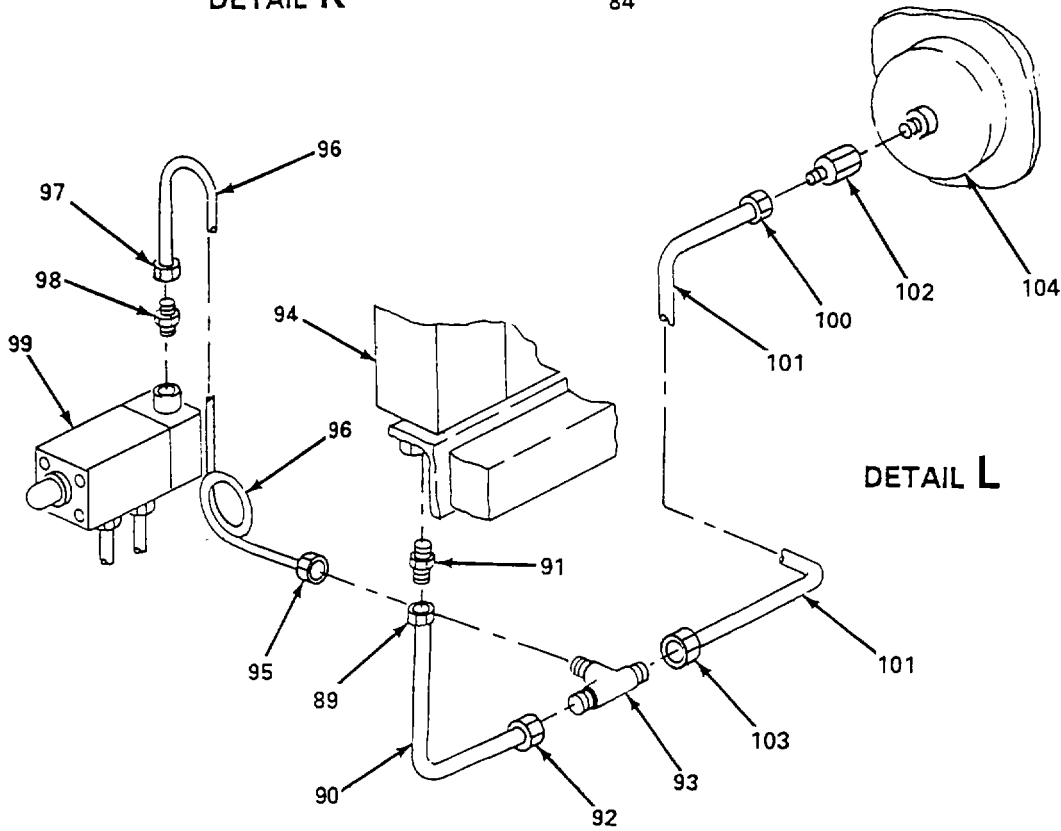


Figure 5-9. Lines and Fittings, Removal (Sheet 5 of 6).



DETAIL K



DETAIL L

Figure 5-9. Lines and Fittings, Removal (Sheet 6 of 6).

5-10. Lines and Fittings (Cont).

- (2) Installation. (figure 5-10)

WARNING

Leave 1 1/2 threads exposed on fitting when applying teflon tape. This will ensure that no teflon tape will hang down inside the air system. Teflon tape should be wrapped in such a manner that when the fitting is tightened the tape will not loosen. Failure to wrap teflon tape correctly may result in contamination or blockage of the air system and subsequent possible injury or death to the diver.

- (a) Apply teflon tape to pipe threads on pressure gage (2).
- (b) Install fitting (1) on oil pressure gauge (2).
- (c) Install line (3) on tee (4) and tighten coupling nut (5).
- (d) Install line (3) on fitting (1) and tighten coupling nut (6).
- (e) Apply teflon tape to pipe threads on fitting (7) and install fitting (7) in oil pressure regulator valve (8).
- (f) Install line (9) on fitting (7) and tighten coupling nut (10).
- (g) Install line (9) on tee (4) and tighten coupling nut (11).
- (h) Install line (12) on tee (4) and tighten coupling nut (13).
- (i) Apply teflon tape to pipe threads on fitting (14) and install fitting (14) on oil pressure switch (15).
- (j) Install line (12) on fitting (14) and tighten coupling nut (16).
- (k) Apply teflon tape to pipe threads on fitting (17) and install fitting (17) on service line valve (18).
- (l) Install elbow (19) on fitting (17).
- (m) Apply teflon tape to pipe threads on tee (20) and install tee (20) on elbow (19).
- (n) Apply teflon tape to pipe threads on service outlet tee (21) and install service outlet tee (21) through side on control panel and secure with fitting (22).
- (o) Apply teflon tape to pipe threads on fitting (22) and install fitting (23) on fitting (22).
- (p) Install two fittings (24) on service outlet tee (21).
- (q) Install line (25) on fitting (23) and tighten coupling nut (26).
- (r) Apply teflon tape to pipe threads on fitting (27) and install fitting (27) on tee (20).
- (s) Install line (25) on fitting (27) and tighten coupling nut (28).
- (t) Apply teflon tape to pipe threads on service line gage (30) and install fitting (29) on service line gage (30).

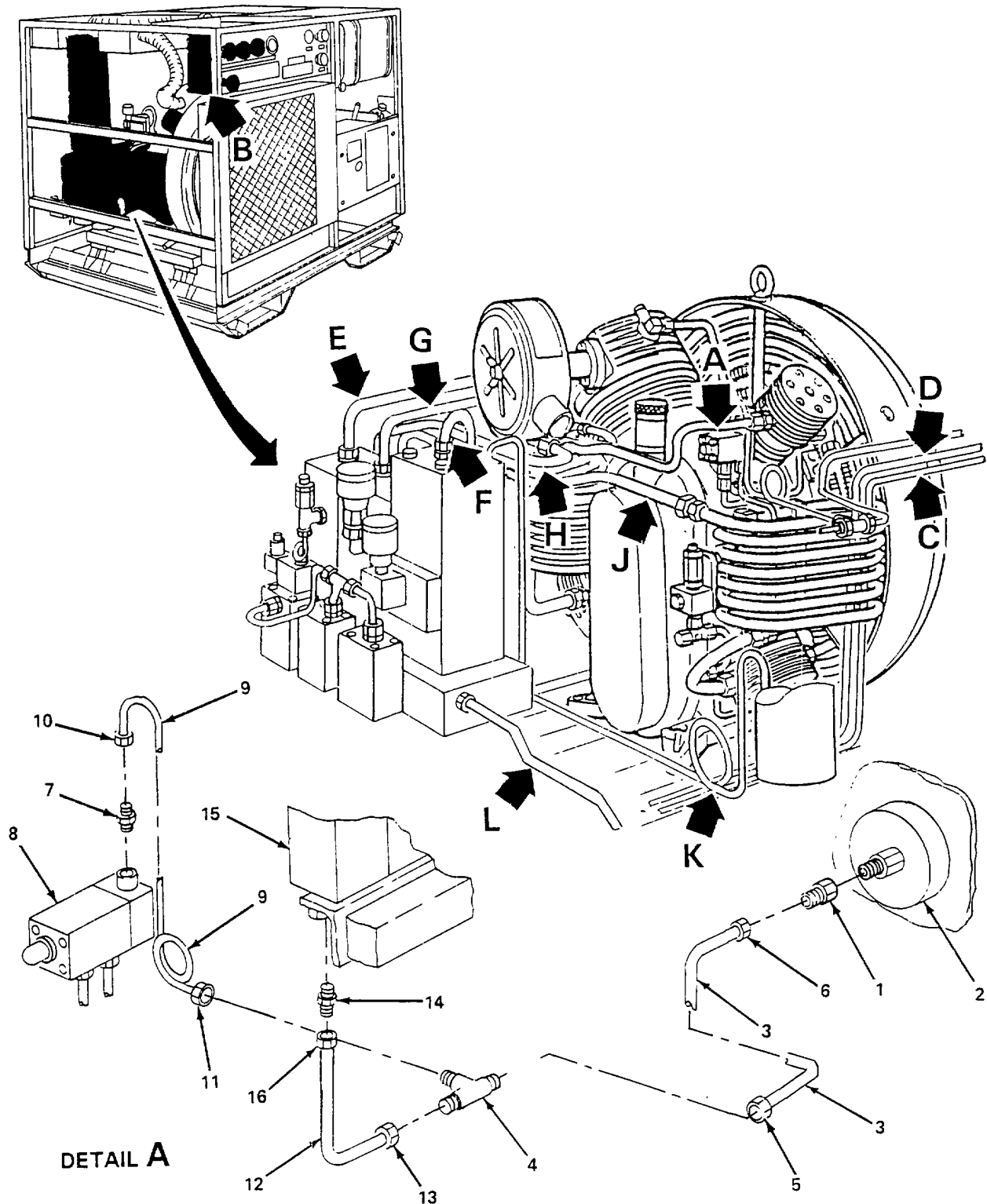


Figure 5-10. Lines and Fittings, Installation (Sheet 1 of 6).

5-10. Lines and Fittings (Cont).

- (u) Install line (31) on tee (20) and tighten coupling nut (32).
- (v) Install line (31) on fitting (29) and tighten coupling nut (33).
- (w) Apply teflon tape to pipe threads on fitting (34) and install fitting (34) on cylinder fitting (35).
- (x) Apply teflon tape to pipe threads on fitting (34) and install four way fitting (36) on fitting (34).
- (y) Apply teflon tape to pipe threads on fitting (37) and install fitting (37) on four way fitting (36).
- (z) Install fitting (38) on fitting (37).
- (aa) Apply teflon tape to pipe threads on fitting (39) and install fitting (39) on four way fitting (36).
- (ab) Install fitting (39) on pressure maintaining valve (40).
- (ac) Apply teflon tape to pipe threads on fitting (41) and install fitting (41) on four way fitting (36).
- (ad) Install line (42) on fitting (41) and tighten coupling nut (43).
- (ae) Apply teflon tape to pipe threads on pressure gage (45) and install fitting (44) on final pressure gage (45).
- (af) Install line (42) on fitting (44) and tighten coupling nut (46).
- (ag) Install fitting (47) on pressure maintaining valve (40).
- (ah) Install line (48) on fitting (47) and tighten coupling nut (49).
- (ai) Apply teflon tape to pipe threads on fitting (50) and install fitting (50) on service line valve (18).
- (aj) Install line (48) on fitting (50) and tighten coupling nut (51).
- (ak) Install fitting (52) on third stage intercooler inlet (53).
- (al) Install line (54) on fitting (52) and tighten coupling nut (55).
- (am) Install fitting (56) on second stage separator outlet (57).
- (an) Install line (54) on fitting (56) and tighten coupling nut (58).
- (ao) Install elbow (59) on compressor block fitting (60) and secure with adapter (61).
- (ap) Install line (62) on elbow (59) and tighten coupling nut (63).
- (aq) Install line (64) on elbow (59) and tighten coupling nut (65).
- (ar) Install fitting (66) on separator housing inlet (67).
- (as) Install line (64) on fitting (66) and tighten coupling nut (68).

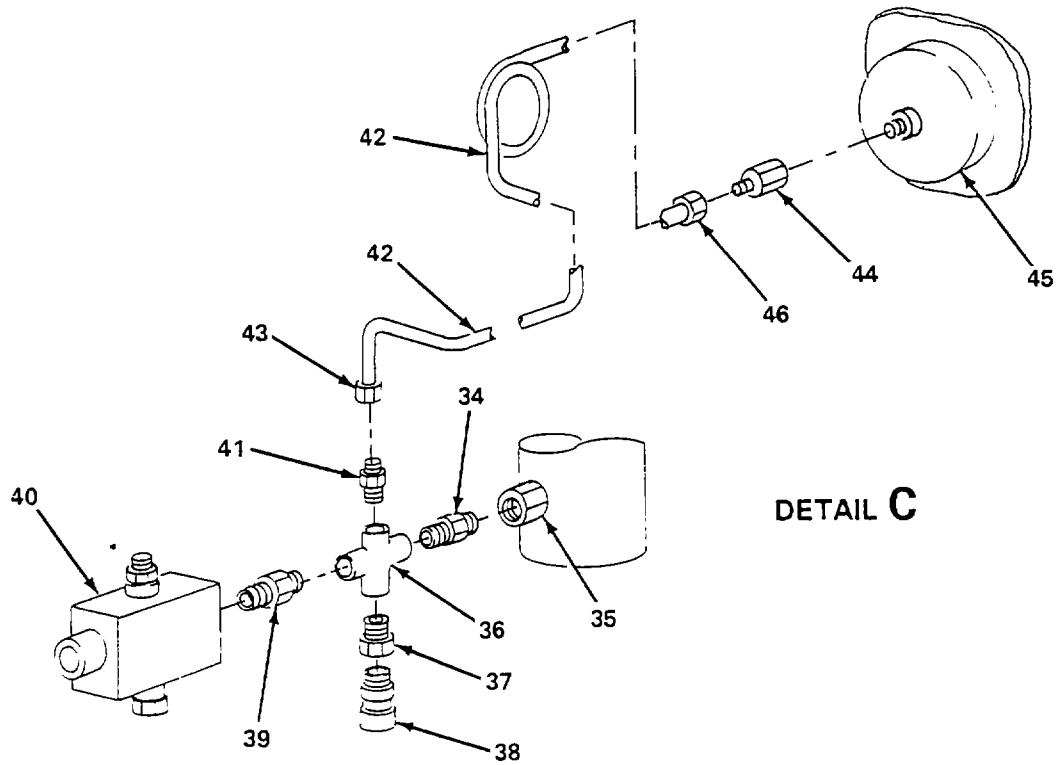
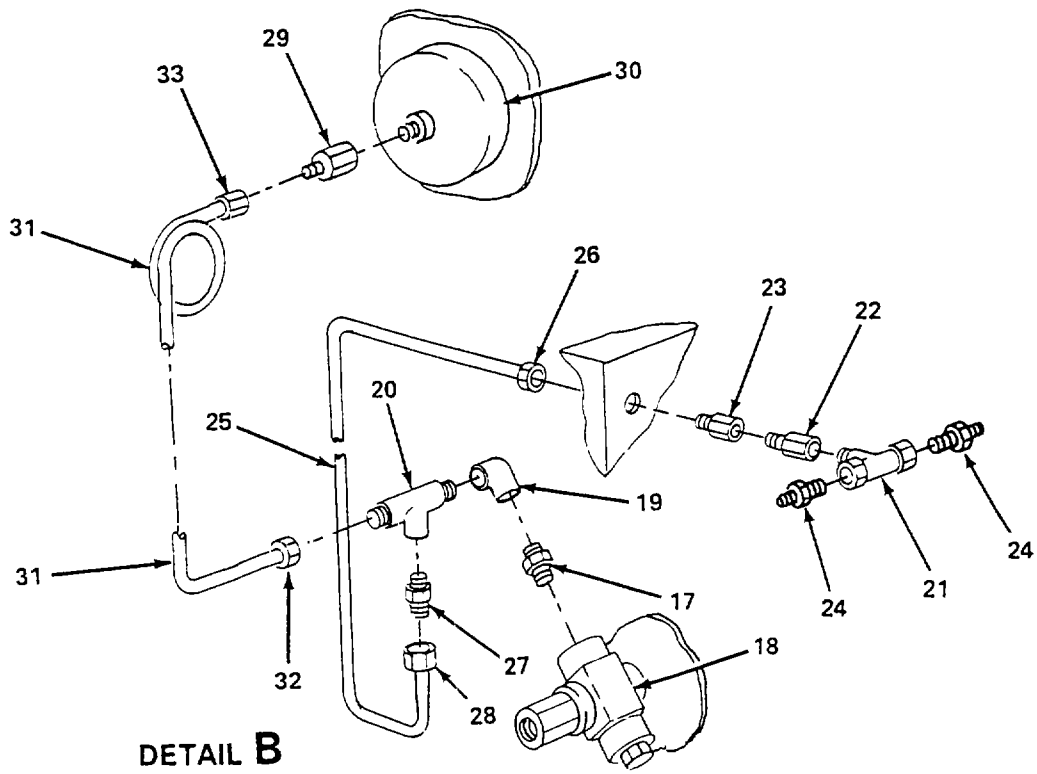


Figure 5-10. Lines and Fittings, Installation (Sheet 2 of 6).

5-10. Lines and Fittings (Cont).

- (at) Install fitting (69) on fourth stage valve head inlet (70).
- (au) Install line (71) on fitting (69) and tighten coupling nut (72).
- (av) Install fitting (73) on third stage separator outlet (74).
- (aw) Install line (71) on fitting (73) and tighten coupling nut (75).
- (ax) Install fitting (76) on second stage separator inlet (77).
- (ay) Install elbow (78) on fitting (76).
- (az) Install line (79) on elbow (78) and tighten coupling nut (80).
- (ba) Install fitting (81) on second stage intercooler outlet (82).
- (bb) Install line (79) on fitting (81) and tighten coupling nut (83).
- (bc) Install fitting (84) on third stage separator inlet (85).
- (bd) Install elbow (86) on fitting (84).
- (be) Install line (87) on elbow (86) and tighten coupling nut (88).
- (bf) Install fitting (89) on third stage intercooler outlet (90).
- (bg) Install line (87) on fitting (89) and tighten coupling nut (91).
- (bh) Install fitting (92) on purifier cylinder (93).
- (bi) Apply teflon tape to pipe threads on elbow (94) and install elbow (94) on fitting (92).
- (bi) Apply teflon tape to pipe threads on fitting (95) and install fitting (95) on elbow (94).
- (bk) Apply teflon tape to pipe threads on fitting (96) and install fitting (96) on fitting (95).
- (bl) Install line (97) on fitting (96) and tighten coupling nut (98).
- (bm) Install fitting (99) on separator housing (100).
- (bn) Install elbow (101) on fitting (99).
- (bo) Apply teflon tape to pipe threads on elbow (101) and install line (97) on elbow (101) and tighten coupling nut (102).
- (bp) Install fitting (103) on filter block (104).
- (bq) Install line (105) on fitting (103) and tighten coupling nut (106).
- (br) Install screw (107) and secure line (105).

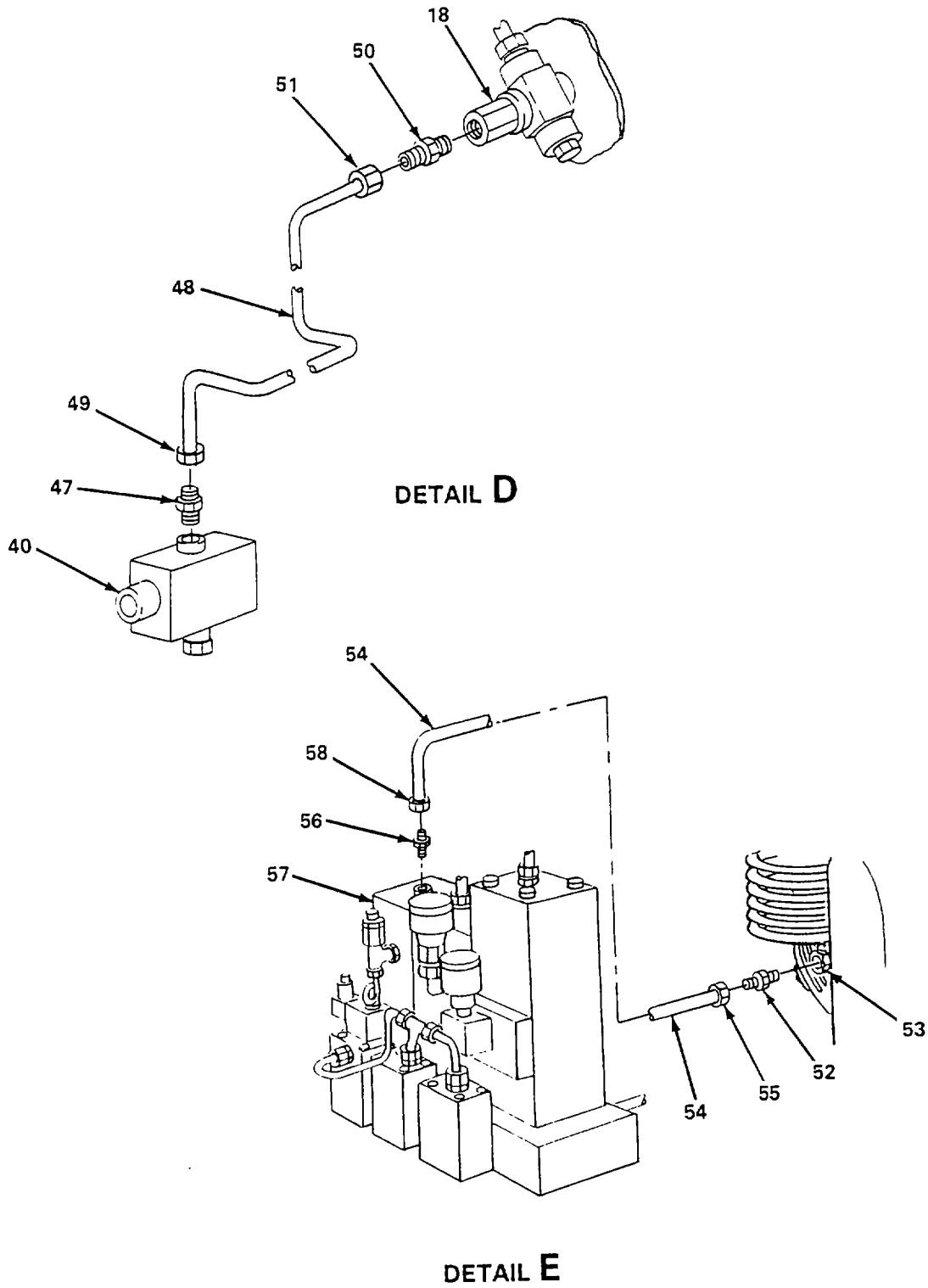


Figure 5-10. Lines and Fittings, Installation (Sheet 3 of 6).

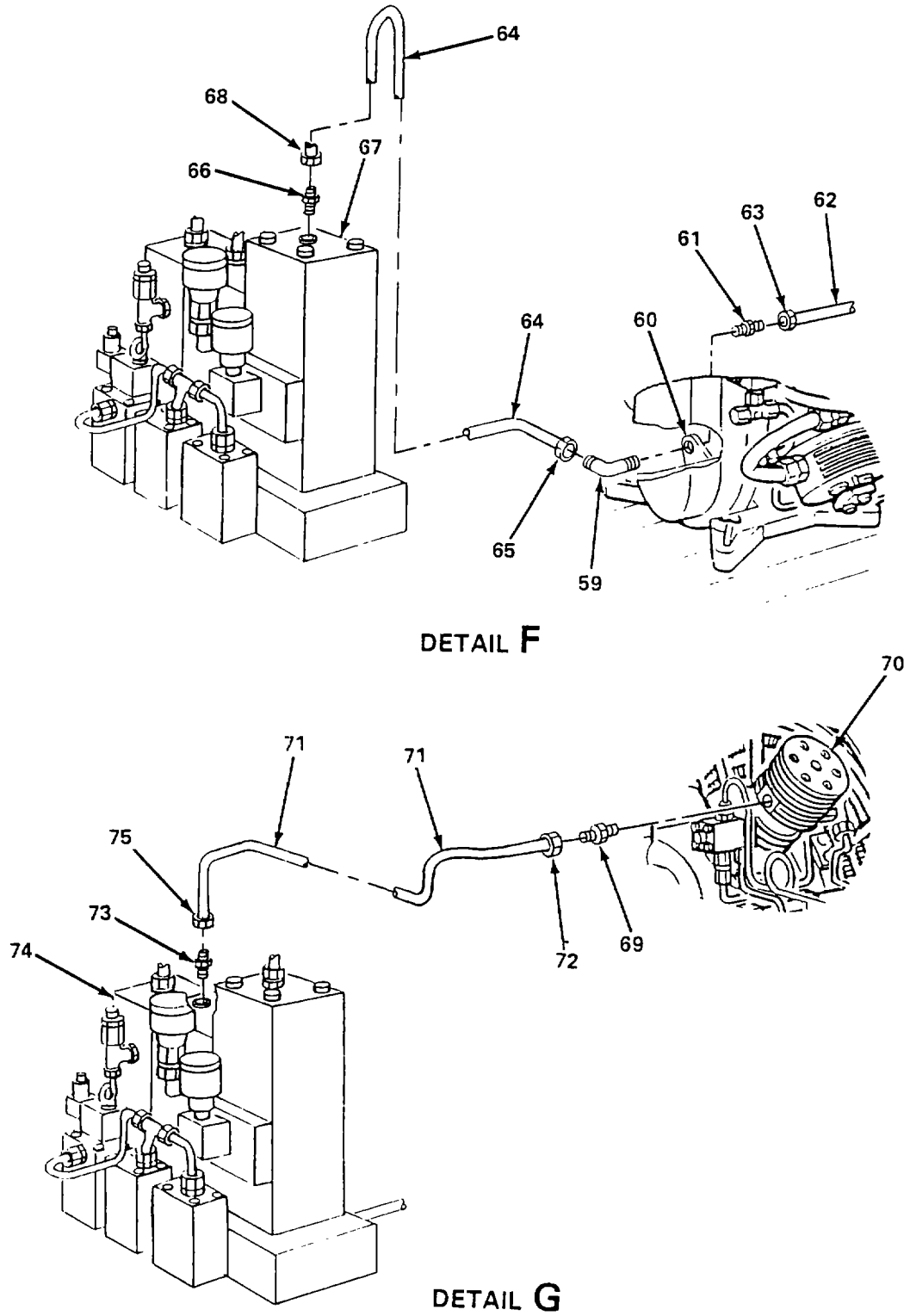


Figure 5-10. Lines and Fittings, Installation (Sheet 4 of 6).

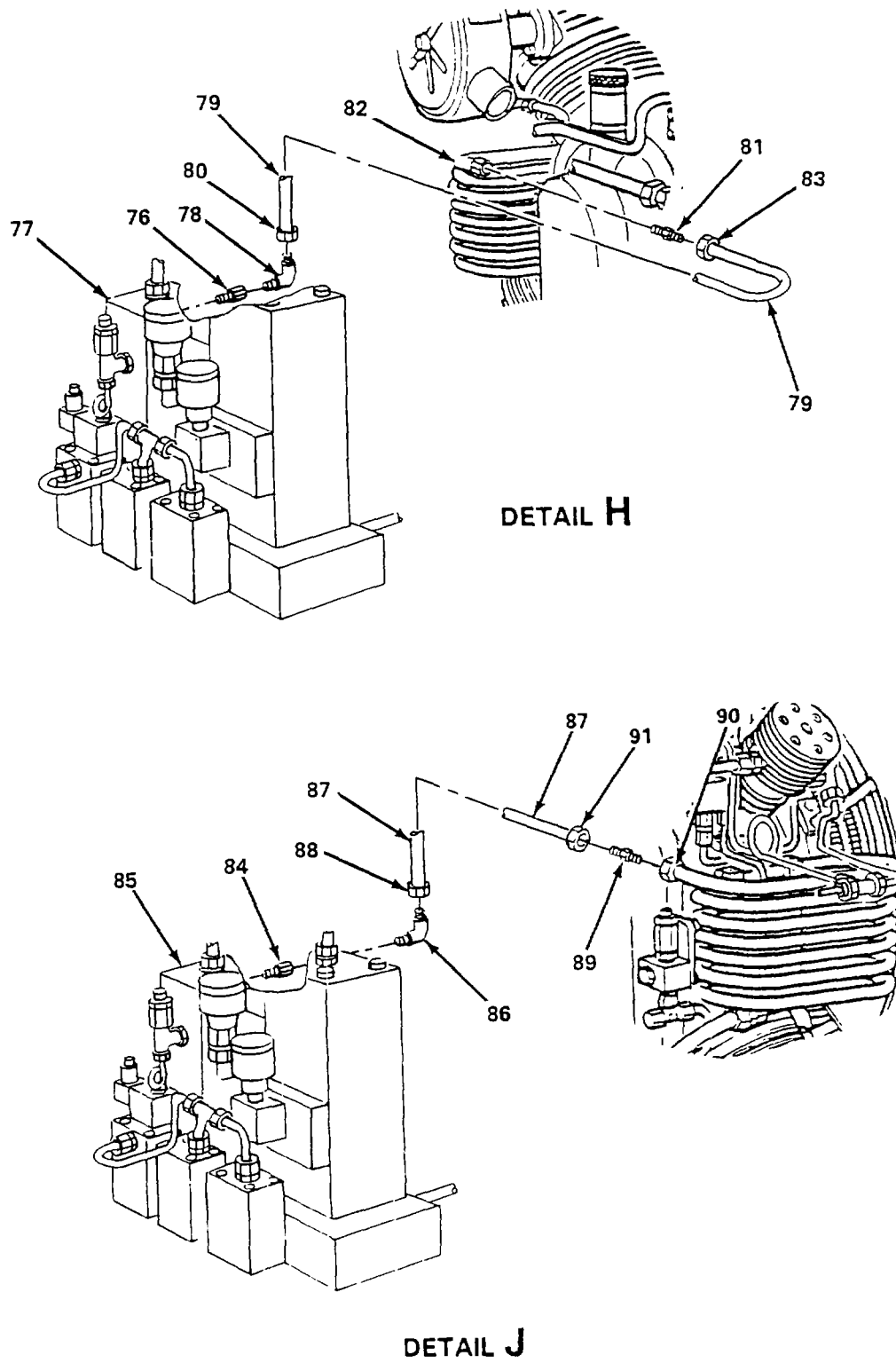
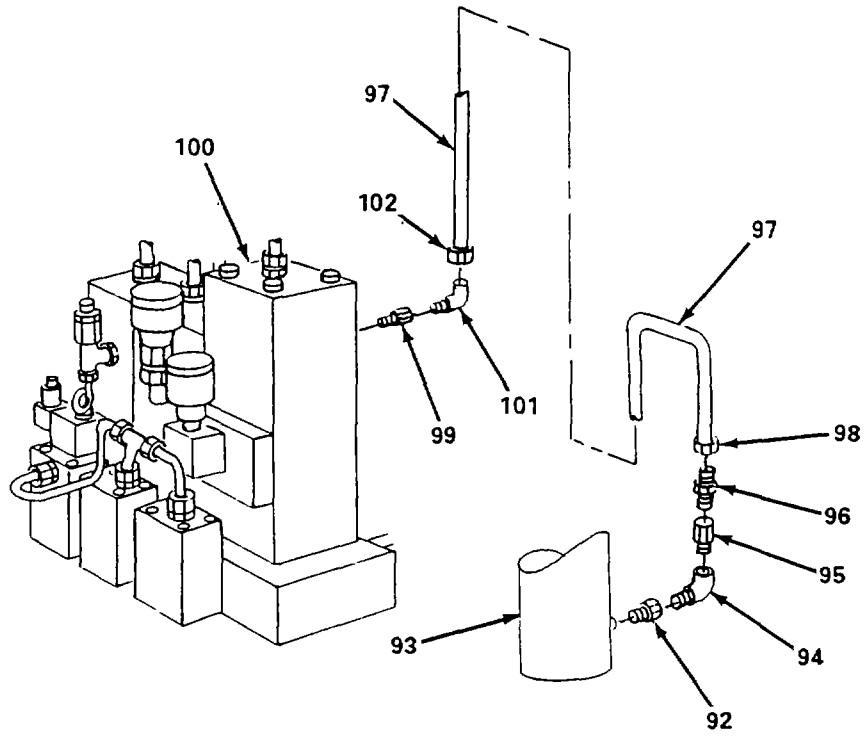
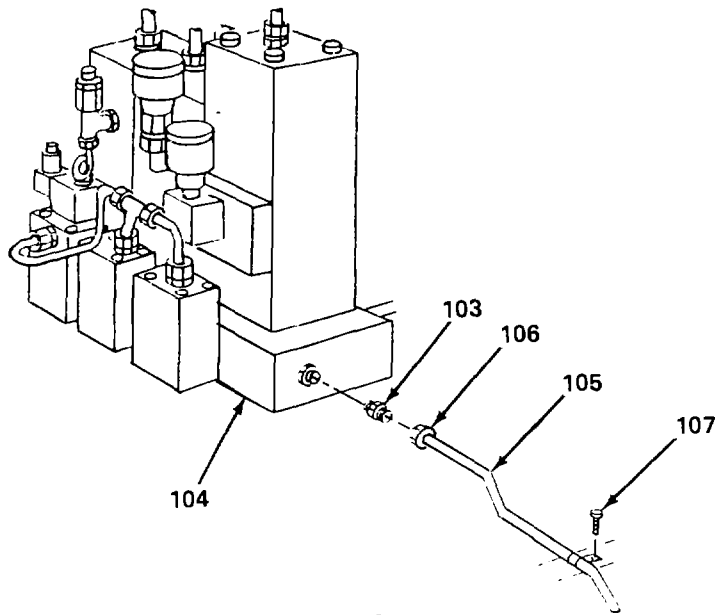


Figure 5-10. Lines and Fittings, Installation (Sheet 5 of 6).

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DETAIL K



DETAIL L

Figure 5-10. Lines and Fittings, Installation (Sheet 6 of 6).

5-11. Compressor Oil Pump and Supply Line.

This task covers:

- a. Replace
-

INITIAL SETUP*Tools*General Mechanic's Tool Kit
(NSN 5180-00-177-7033)*Equipment Condition*Compressor unit shut down (para. 2-13).
Compressor oil drain (para. 4-8f.).*Materials/Parts*Oil Pump
Oil Pump Gasket
Oil Pump Supply Line
Cloth, Lint Free (Item 7, Appendix E)*Reference*

Refer to Appendix F for torque values.

Replace. (figure 5-11)

- (1) Loosen fitting nut (1) and remove line (2) from oil pump (3).
- (2) Loosen fitting nut (4) and remove line (2) from regulator valve (5).
- (3) Remove three allen screws (6) and washers (7).
- (4) Remove oil pump (3) and gasket (8), and discard gasket.
- (5) Ensure that all gasket material is removed from crankcase and oil pump. Wipe area with lint free cloth.
- (6) Install oil pump (3) and gasket (8), and secure with three alien screws (6) and washers (7).
- (7) Install line (2) on regulator valve (5) and tighten fitting nut (4).
- (8) Install line (2) on oil pump (3) and tighten fitting nut (1).

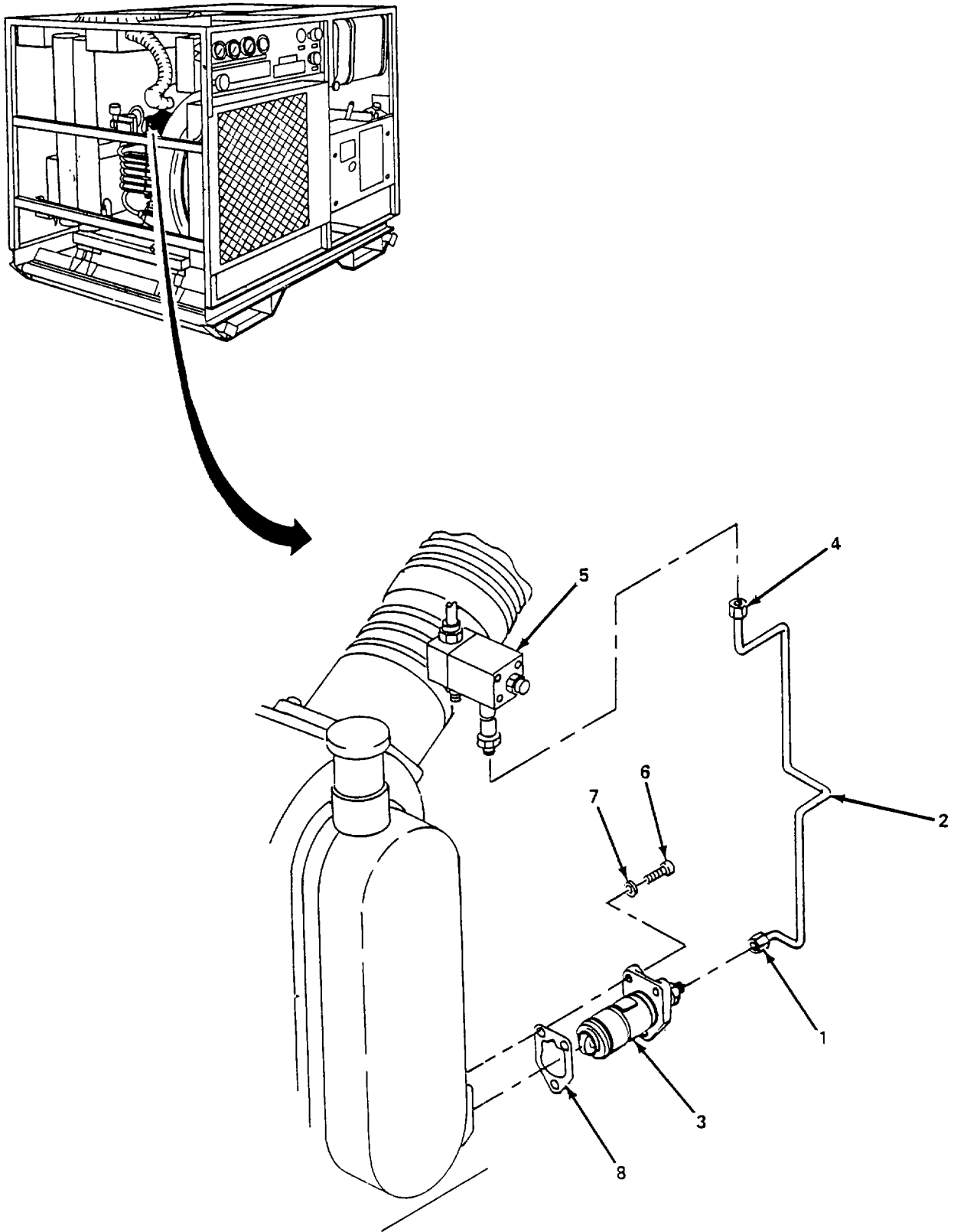


Figure 5-11. Compressor Oil Pump and Supply Line, Replace.

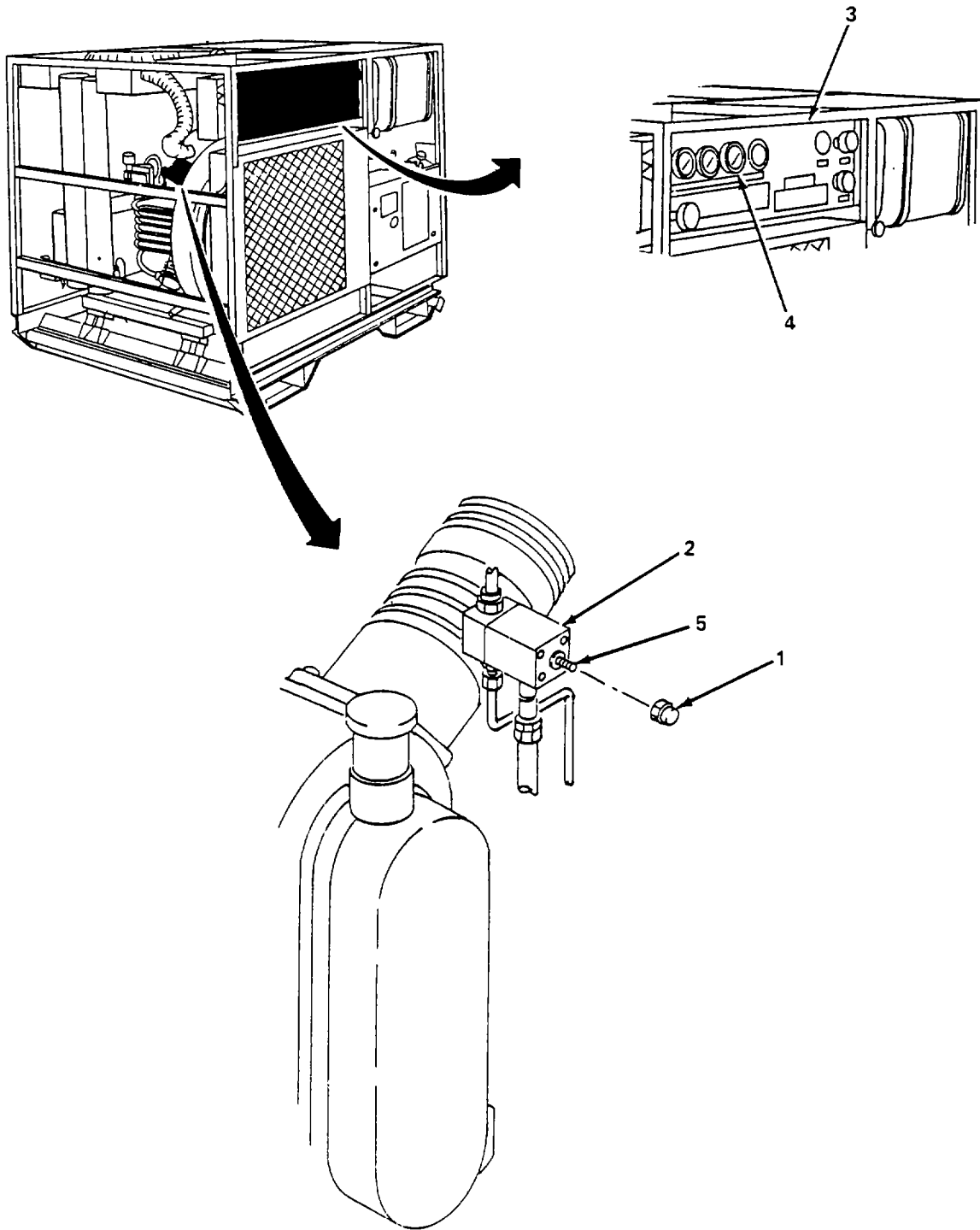


Figure 5-12. Oil Pressure Regulator Valve and Oil Return Line, Adjust.

5-12. Oil Pressure Regulator Valve and Oil Return Line (Cont).b. Replace. (figure 5-13)

- (1) Loosen three fitting nuts (1) and remove lines (2), (3), and (4).
- (2) Loosen fitting nut (5) on 4th stage cylinder (6) and remove line (4).
- (3) Remove two alien screws (7) and remove regulator valve (8).
- (4) Install regulator valve (8) and secure with two alien screws (7).
- (5) Install line (4) on 4th stage cylinder (6) and tighten fitting nut (5).
- (6) Install three lines (2), (3), and (4) on regulator valve (8) and tighten three fitting nuts (1).
- (7) Adjust the regulator valve (8) if required (para. a. above).

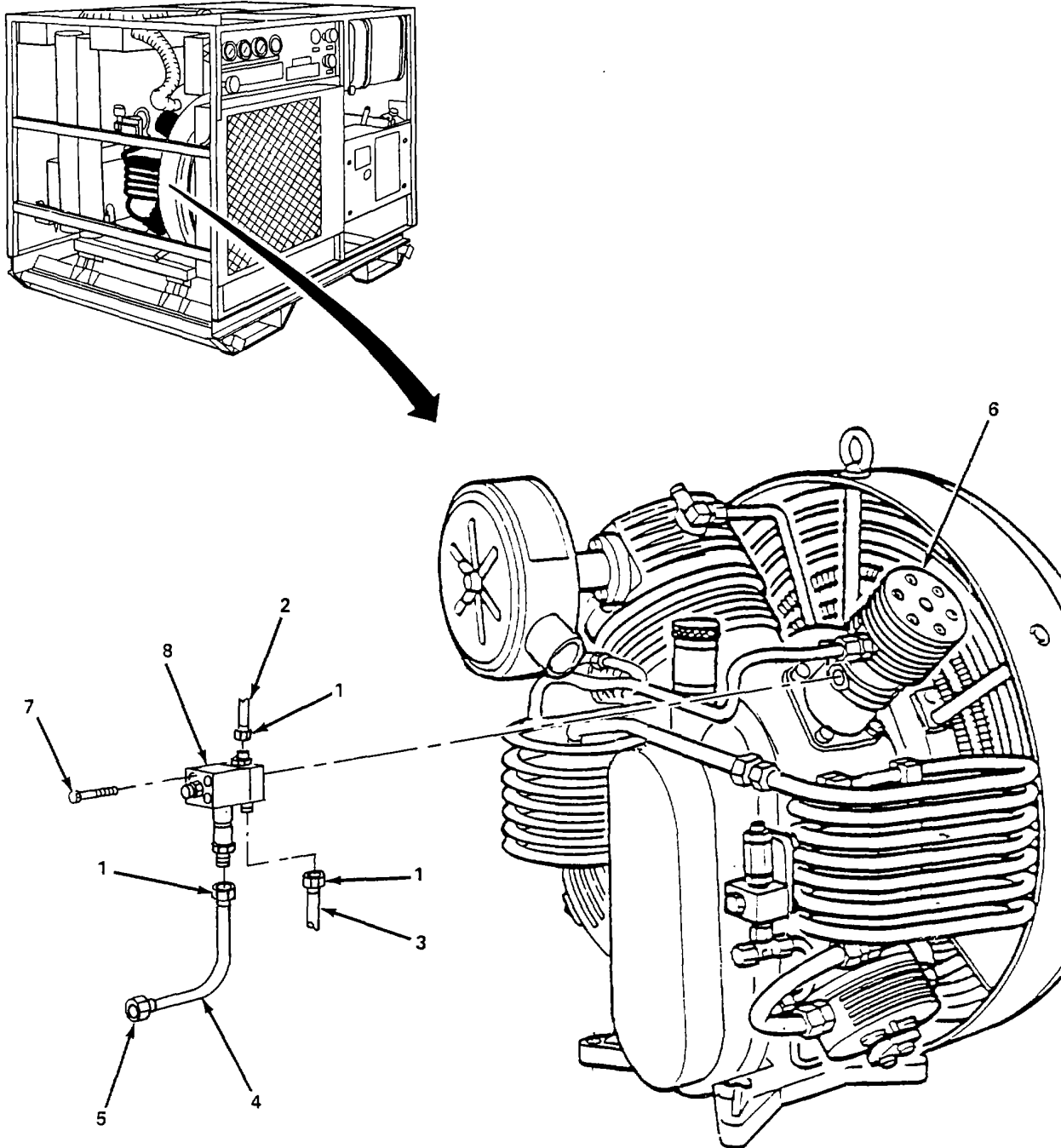


Figure 5-13. Oil Pressure Regulator Valve and Oil Return Line, Replace.

5-12. Oil Pressure Regulator Valve and Oil Return Line (Cont).c. Repair. (figure 5-14)

- (1) Remove oil pressure regulator valve (para. b. above).
- (2) Remove four allen screws (1) and (2) and remove flange (3) from valve housing (4).
- (3) Remove preformed packing (5), valve seat (6), ball (7), ball guide (8), spring (9), and washer (10).
- (4) Remove acorn nut (11), stud (12), and gasket (13).
- (5) Remove oil gauge retainer (14), two preformed packings (15), gasket (16), and oil gauge glass (17).
- (6) Remove two male connectors (18) and (19) and preformed packing (20).
- (7) Clean all components using nonionic detergent cleaner and rinse with clean distilled water.
- (8) Install preformed packing (20) and two male connectors (19) and (18).
- (9) Install oil gauge glass (17), gasket (16), two preformed packings (15), and oil gauge retainer (14).
- (10) Install gasket (13), stud (12), and acorn nut (11).
- (11) Install washer (10), spring (9), ball guide (8), ball (7), valve seat (6), and preformed packing (5).
- (12) Install flange (3) on valve housing (4) and secure with four allen screws (2) and (1).
- (13) Install oil pressure regulator valve (para. b. above).

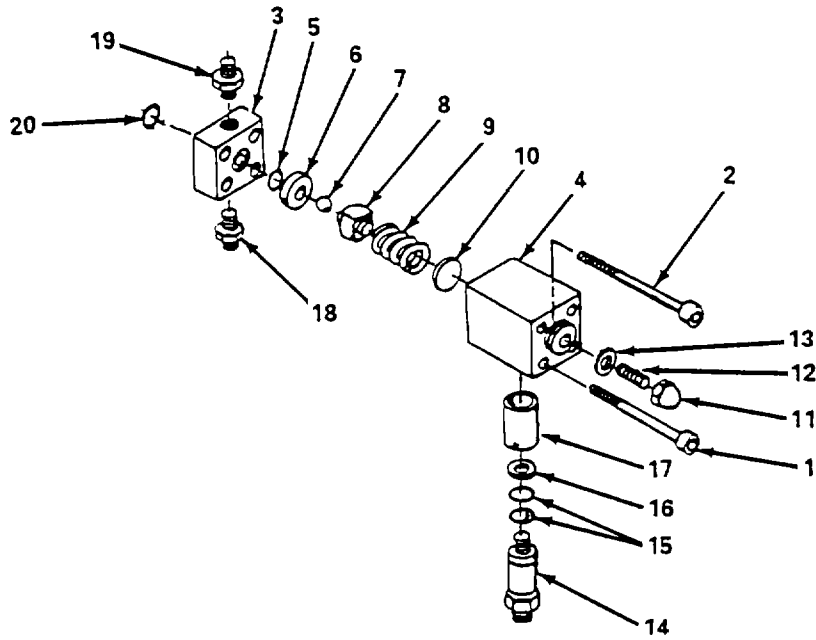


Figure 5-14. Oil Pressure Regulator Valve and Oil Return Line, Repair.

5-13. Compressor Intercoolers and Aftercooler.

This task covers:

- a. Replace
-

INITIAL SETUP
Tools

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Materials/Parts

1st Stage Intercooler
2nd Stage Intercooler
3rd Stage Intercooler
Aftercooler
Tape (item 25, Appendix E)
Bands, Rubber (Item 4, Appendix E)
Bags, Plastic (Item 3, Appendix E)

Equipment Condition

Compressor unit shut down (para. 2-13).
Beltguard removed (para. 4-15).
Compressor drive belts removed (para. 4-20).
Compressor fanwheel guard removed (para. 4-23).
Compressor flywheel/fanwheel assembly removed
(para. 4-24).

Reference

Cleaning Procedures, Chapter 4, Section VII.

Replace. (figure 5-14)

- (1) 1st stage intercooler. (figure 5-15)

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (a) Disconnect two coupling nuts (1) on intercooler (2).
- (b) Remove eight nuts (3), washers (4), bolts (5), and remove eight brackets (6) and two spacers (7).
- (c) Remove intercooler (2) from compressor (8).
- (d) Position intercooler (2) on compressor (8).
- (e) Install two spacers (7) and eight brackets (6), and secure with eight bolts (5), washers (4), and nuts (3).
- (f) Connect and tighten two coupling nuts (1).

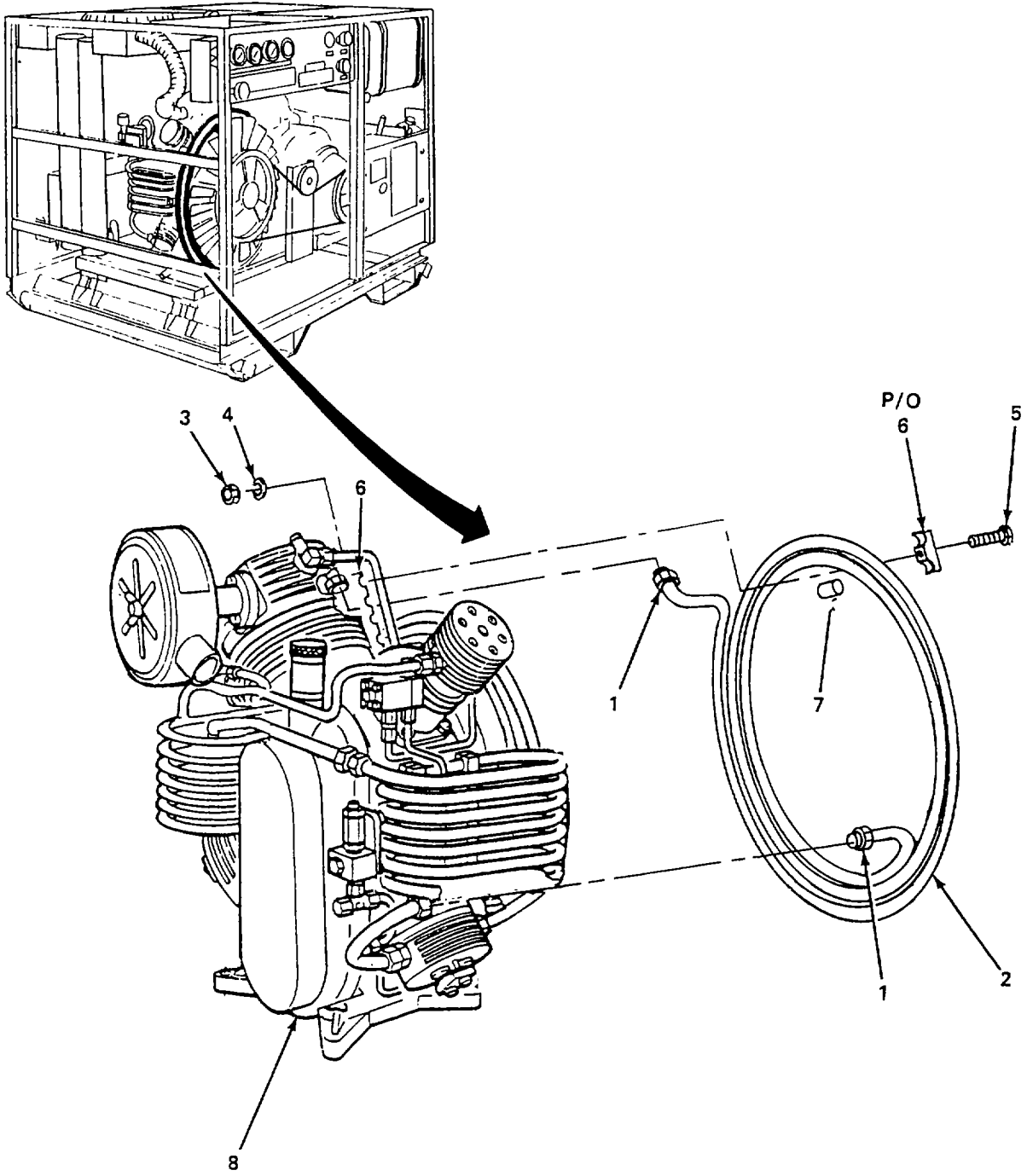


Figure 5-15. Compressor 1st Stage Intercooler, Replace.

5-13. Compressor Intercoolers and Aftercooler (Cont).

(2) 2nd stage intercooler. (figure 5-16)

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

NOTE

The 2nd stage intercooler is located on the left side of compressor when viewing compressor from rear.

- (a) Disconnect coupling nut (1) on 3rd stage cylinder head (2).
- (b) Disconnect coupling nut (3) on 2nd stage intercooler (4).
- (c) Remove nut (5), washer (6), and bolt (7) and remove bracket (8).
- (d) Remove four nuts (9), washers (10), and two brackets (11).
- (e) Remove intercooler (4) from mounting bracket studs (12).
- (f) Install intercooler (4) on mounting bracket studs (12) and secure with two brackets (11), four washers (10), and nuts (9).
- (g) Install bracket (8) and secure with bolt (7), washer (6), and nut (5).
- (h) Connect and tighten coupling nut (3) onto 2nd stage intercooler (4).
- (i) Connect and tighten coupling nut (1) onto 3rd stage cylinder head (2).

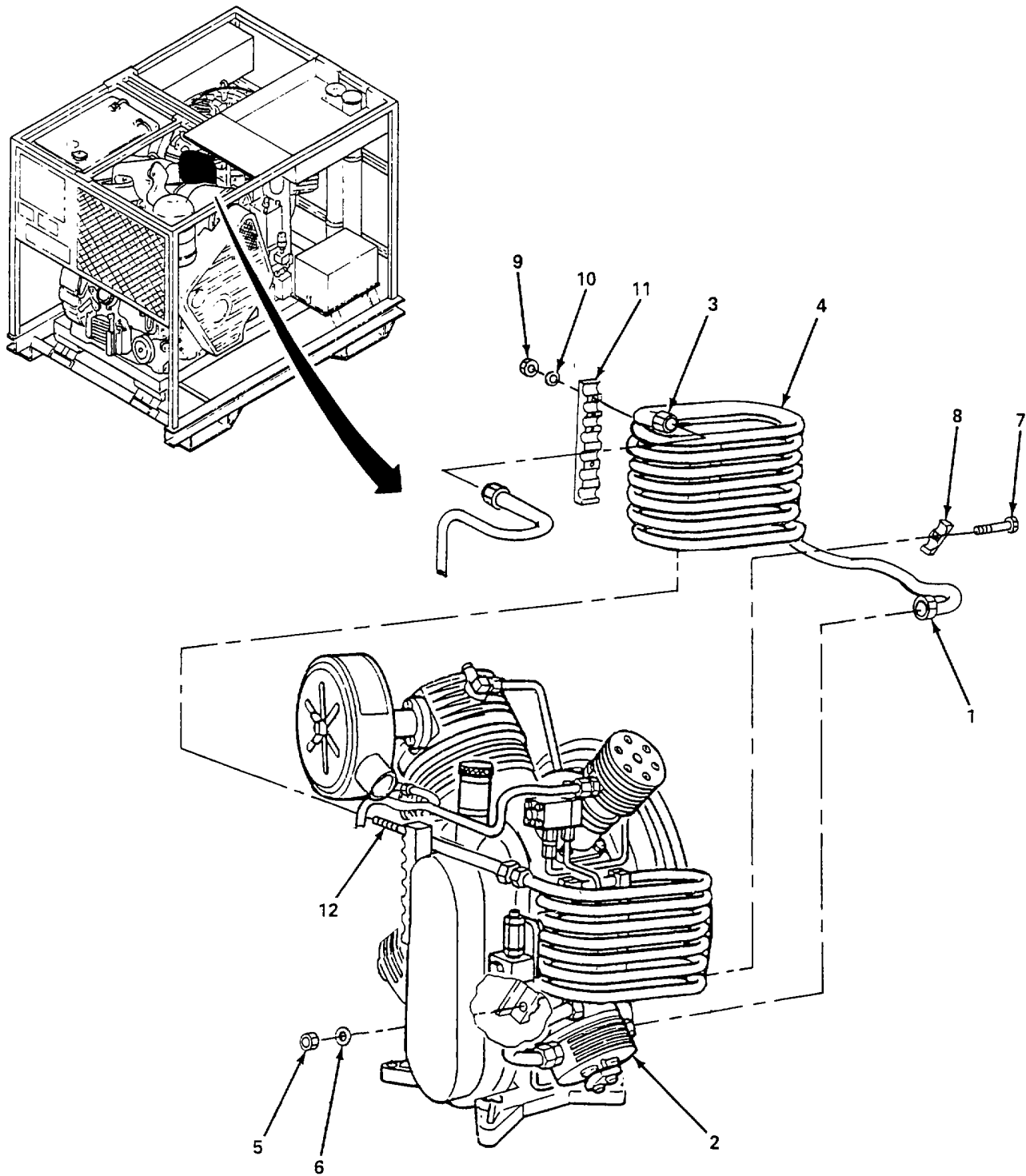


Figure 5-16. Compressor 2nd Stage Intercooler, Replace.

5-13. Compressor Intercoolers and Aftercooler (Cont).

- (3) 3rd stage intercooler. (figure 5-17)

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

NOTE

The 3rd stage intercooler is located on the right side of compressor when viewing compressor from rear.

- (a) Disconnect coupling nut (1) on intercooler (2).
- (b) Disconnect coupling nut (3) on cylinder head (4).
- (c) Remove two nuts (5), washers (6), and bolts (7) and remove brackets (8).
- (d) Loosen fitting nuts (9) and (10), and tag and remove line (11).
- (e) Loosen fitting nuts (12) and (13).
- (f) Loosen fitting nuts (14) and (15).
- (g) Remove ty-wraps securing pressure lines (16) and (17) to frame.
- (h) Remove pressure lines (16) and (17).
- (i) Remove four nuts (18), washers (19), and two brackets (20).
- (j) Remove intercooler (2) from mounting bracket studs (21).
- (k) Install intercooler (2) on mounting bracket studs (21), and secure two brackets (20) with four washers (19) and nuts (18).
- (l) Install pressure lines (16) and (17).
- (m) Tighten fitting nuts (14) and (15).

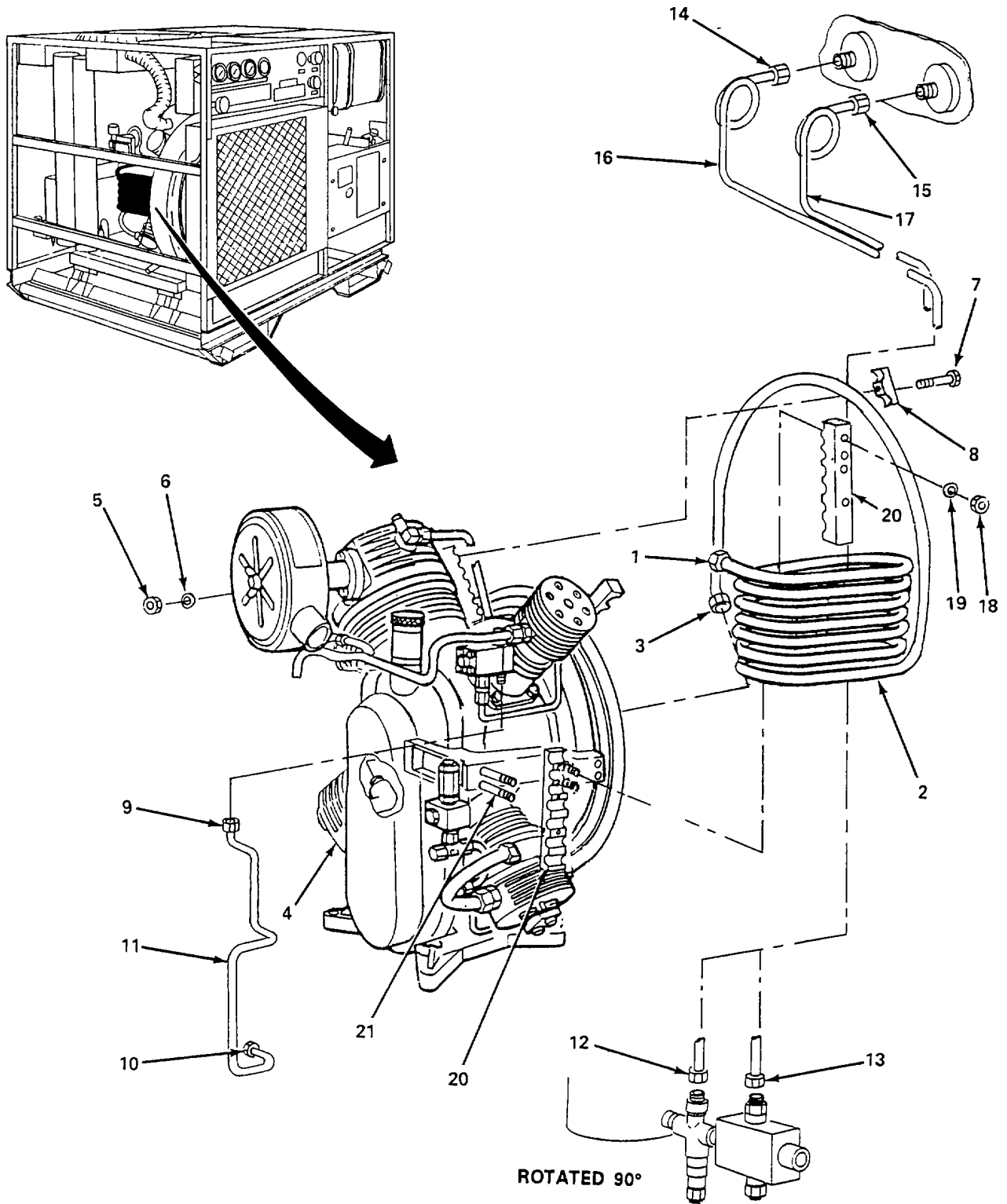


Figure 5-17. Compressor 3rd Stage Intercooler, Replace.

5-13. Compressor Intercoolers and Aftercooler (Cont).

- (n) Tighten fitting nuts (12) and (13).
 - (o) Secure pressure lines (16) and (17) to frame withty-wraps.
 - (p) Install line (11) and tighten fitting nuts (9) and (10).
 - (q) Install two brackets (8) and secure with bolts (7), washers (6), and nuts (5).
 - (r) Connect and tighten coupling nut (3) on cylinder head (4).
 - (s) Connect and tighten coupling nut (1) on intercooler (2).
- (4) Aftercooler. (figure 5-18)

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (a) Disconnect two coupling nuts (1) on intercooler (2).
- (b) Remove five nuts (3), washers (4), and bolts (5) and remove brackets (6).
- (c) Remove aftercooler (2) from compressor (7).
- (d) Position aftercooler (2) on compressor (7).
- (e) Install five brackets (6) and secure with five bolts (5), washers (4), and nuts (3).
- (f) Connect and tighten two couplings nuts (1).

FOLLOW-ON MAINTENANCE

- (1) Install compressor flywheel/fanwheel assembly (para. 4-24).
- (2) Install compressor fanwheel guard (para. 4-23).
- (3) Install compressor drive belts (para. 4-20).
- (4) Install beltguard (para. 4-15).

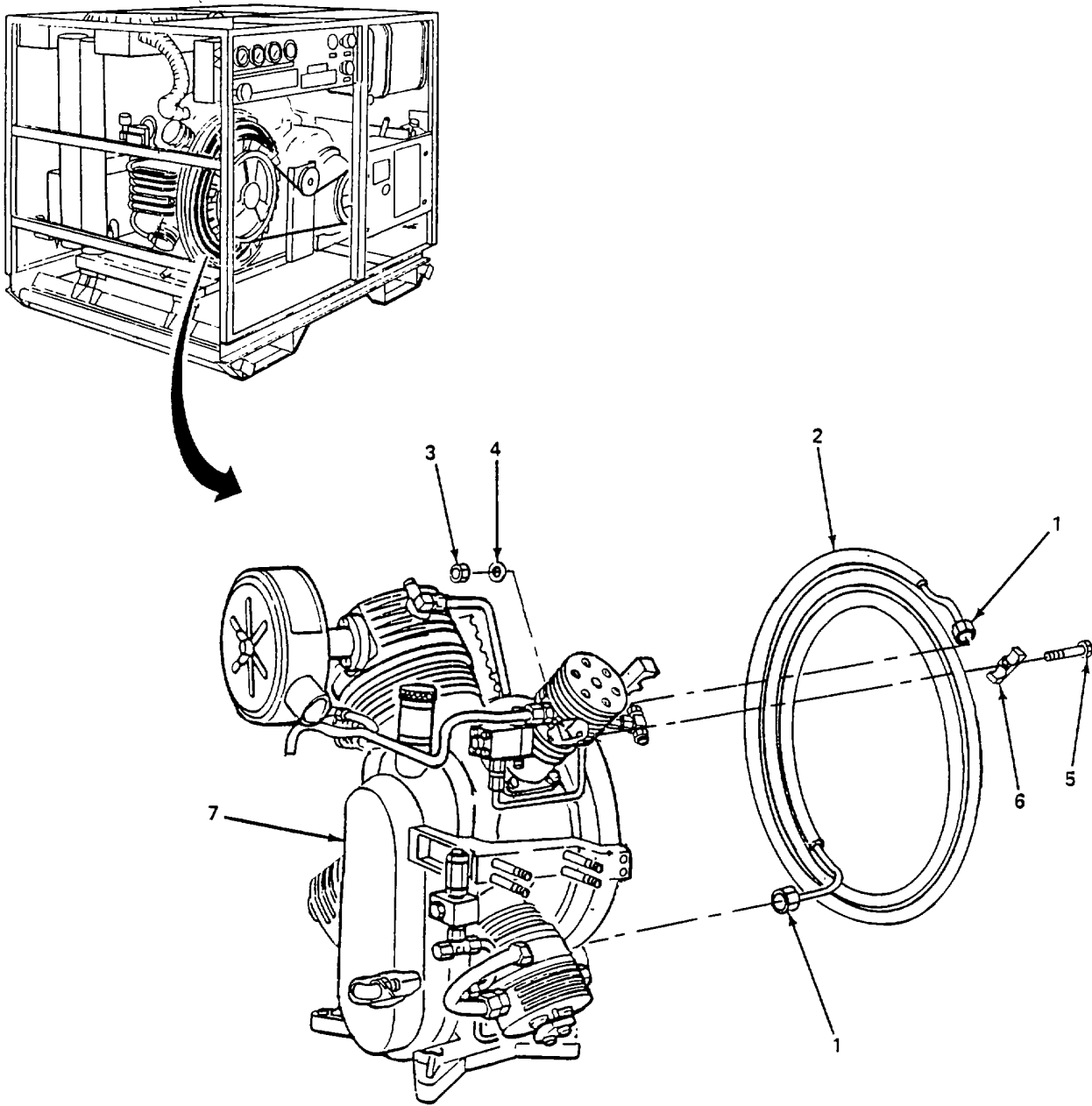


Figure 5-18. Compressor Aftercooler, Replace.

5-14. Manifold and Safety Valve.

This task covers:

- a. Replace
-

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Materials/Parts

Manifold
Safety valve
Gasket
Tape (item 25, Appendix E)
Bands, Rubber (Item 4, Appendix E)
Bags, Plastic (Item 3, Appendix E)

Equipment Condition

Compressor unit shut down (para. 2-13).

References

Cleaning Procedures, Chapter 4, Section VII.
Refer to Appendix F for torque values.

Replace. (figure 5-19)

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (1) Loosen coupling nut (1) and remove tee (2) from manifold (3).
- (2) Remove two allen screws (4) and remove manifold (3).
- (3) Remove safety valve (5), gasket (6), male connector (7) and gasket (8) from manifold (3).
- (4) Remove male connector (9) and gasket (10) from manifold (3).
- (5) Install gasket (10) and male connector (9).
- (6) Install gasket (8), male connector (7), gasket (6), and safety valve (5) on manifold (3).
- (7) Install manifold (3) and secure with two allen screws (4).
- (8) Install tee (2) on male connector (9) and tighten coupling nut (1).

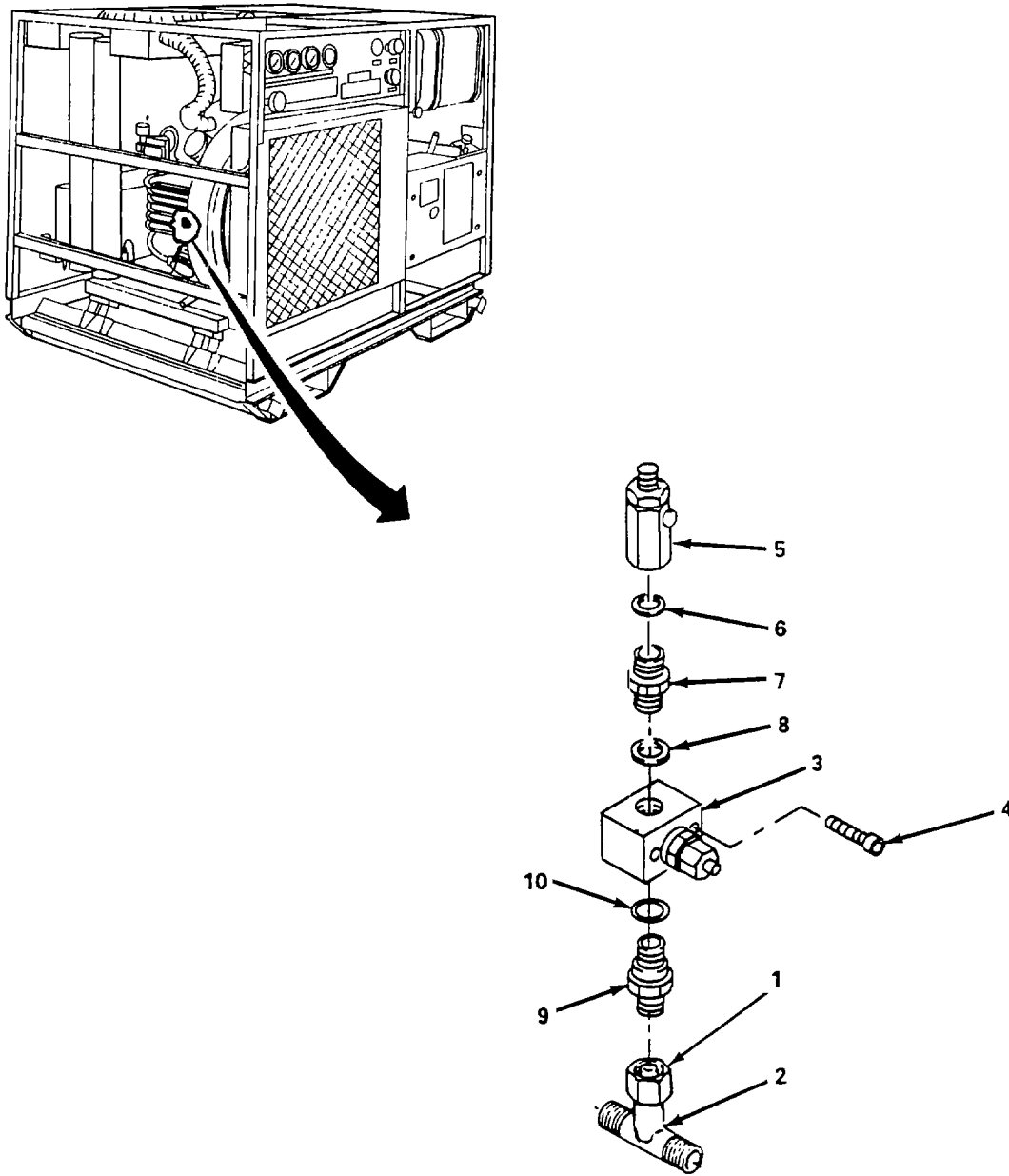


Figure 5-19. Manifold and Safety Valve (1st Stage), Replace.

5-15. Interfilter Heater Block Assembly.

This task covers:

Replace

INITIAL SETUP*Tools*General Mechanic's Tool Kit
(NSN 5180-00-177-7033)*Materials/Parts*Interfilter Heater Block Assembly
Tape (item 25, Appendix E)
Bands, Rubber (Item 4, Appendix E)
Bags, Plastic (Item 3, Appendix E)*Equipment Condition*Compressor unit shut down (para. 2-13).
Battery removed (para. 4-45).*Reference*Cleaning Procedures, Chapter 4, Section VII.
Refer to Appendix F for torque values.

Replace. (figure 5-20)**WARNING**

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (1) Remove screw (1) and disconnect electrical lead (2) from solenoid (3).
- (2) Disconnect electrical lead (4) to heater block assembly (5).
- (3) Loosen six fitting nuts (6) and remove six lines (7).
- (4) Loosen fitting nut (8) and remove line (9).
- (5) Remove four bolts (10) and lockwashers (11) securing heater block assembly (5) to mounting base (12), and remove heater block assembly.
- (6) Install heater block assembly (5) and secure with four bolts (10) and lockwashers (11).
- (7) Install line (9) and tighten fitting nut (8).

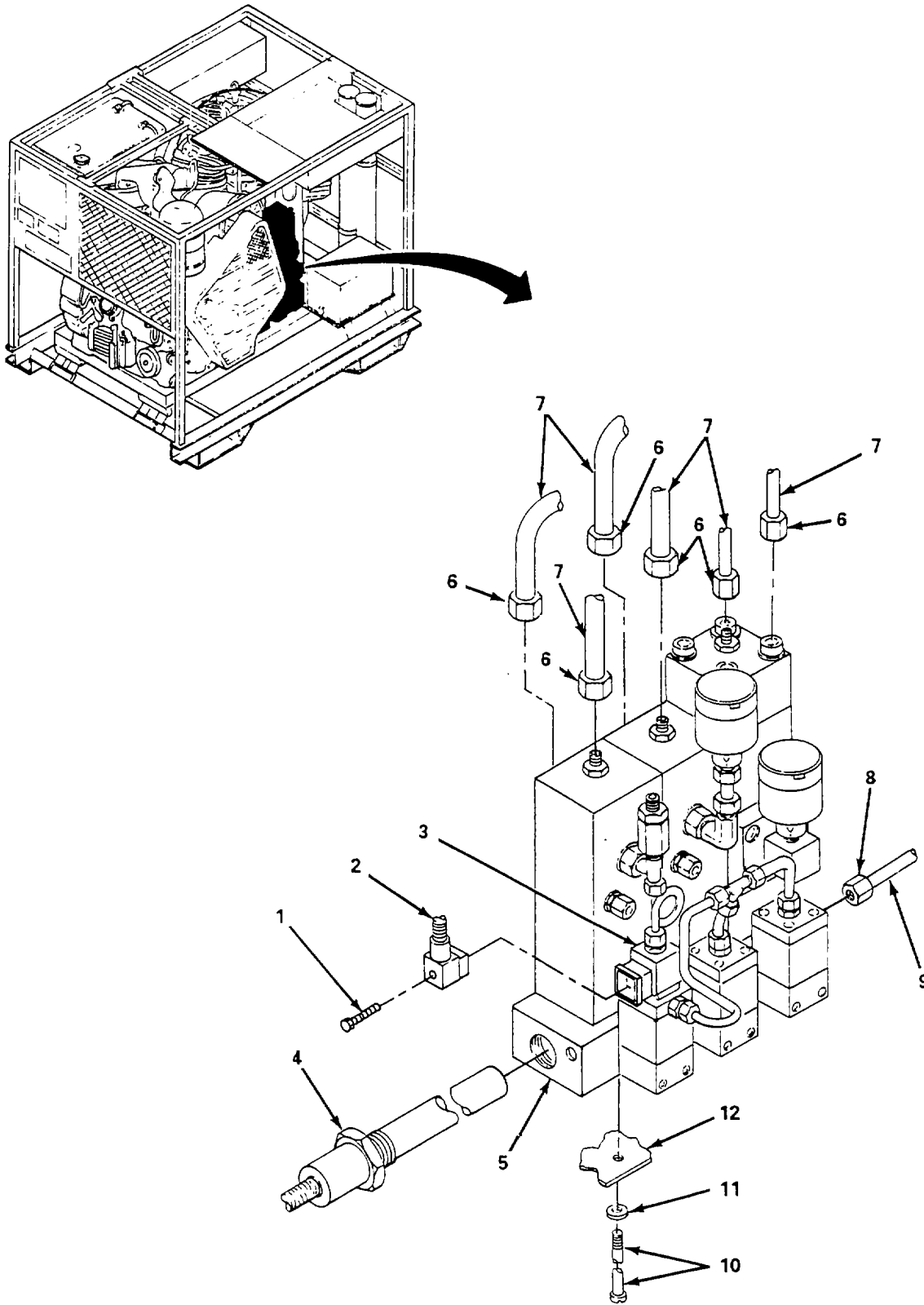


Figure 5-20. Interfilter Heater Block Assembly, Replace.

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- (8) Install six lines (7) and tighten six fitting nuts (6).
- (9) Control electrical lead (4) to heater block assembly (5).
- (10) Connect electrical lead (2) to solenoid (3) and secure with screw (1).

FOLLOW-ON MAINTENANCE
Install battery (para. 4-45).

5-16. Interfilter Safety Valve.

This task covers:

Replace

INITIAL SETUP

*Tools*General Mechanic's Tool Kit
(NSN 5180-00-177-7033)*Equipment Condition*

Compressor unit shut down (para. 2-13).

Reference

Materials/Parts

Cleaning Procedures, Chapter 4, Section VII.

Safety Valves

Tape (Item 25, Appendix E)

Bands, Rubber (Item 4, Appendix E)

Bags, Plastic (Item 3, Appendix E)

Replace. (figure 5-21)**WARNING**

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (1) Unscrew and remove safety valves (1) and (2) from heater block assembly (3).
- (2) Unscrew and remove safety valve (4). Remove and discard sealing ring (5).
- (3) Install sealing ring (5) on safety valve (4) and install safety valve (4) into seat.
- (4) Install safety valves (1) and (2).

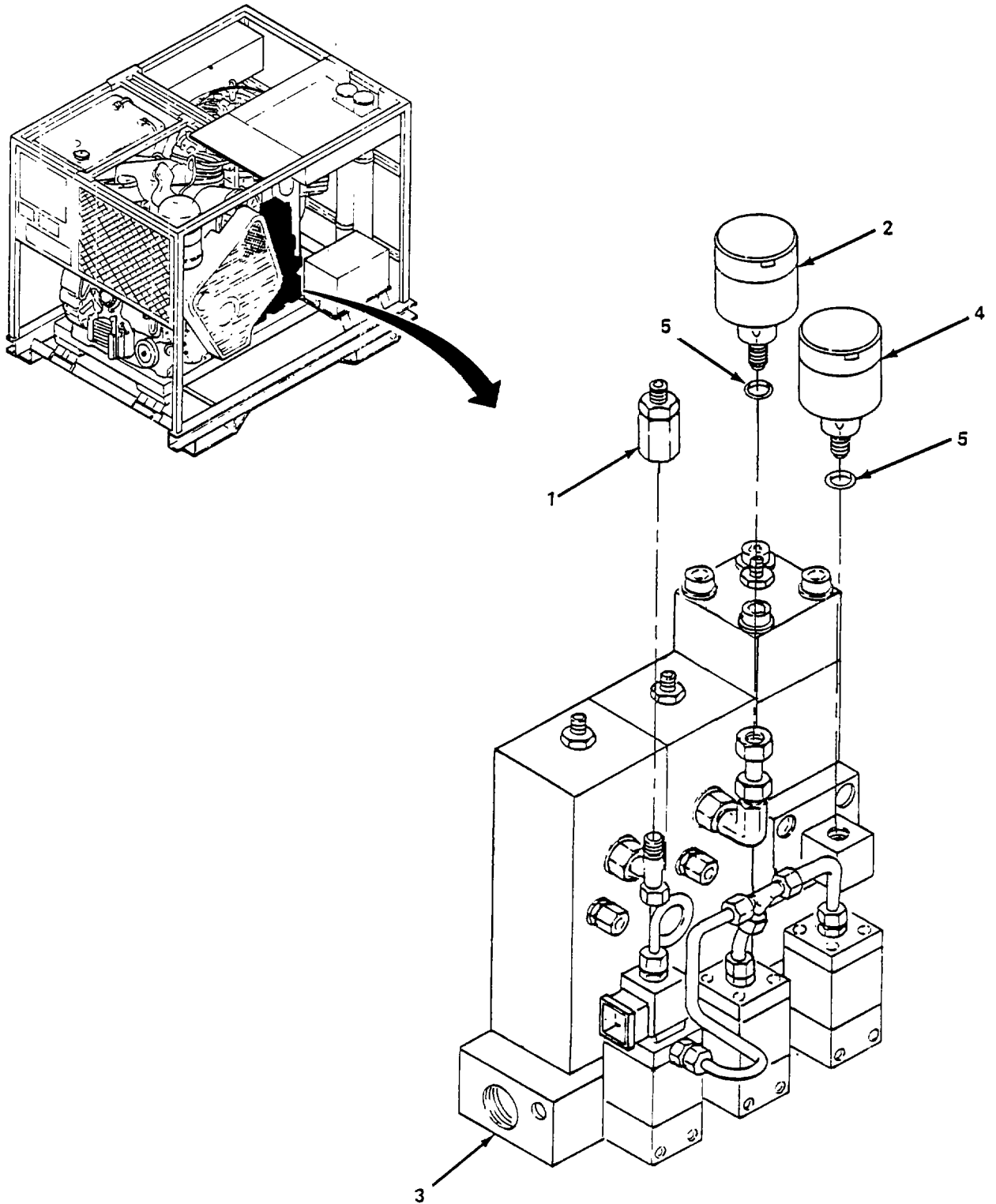


Figure 5-21. Interfilter Safety Valves, Replace.

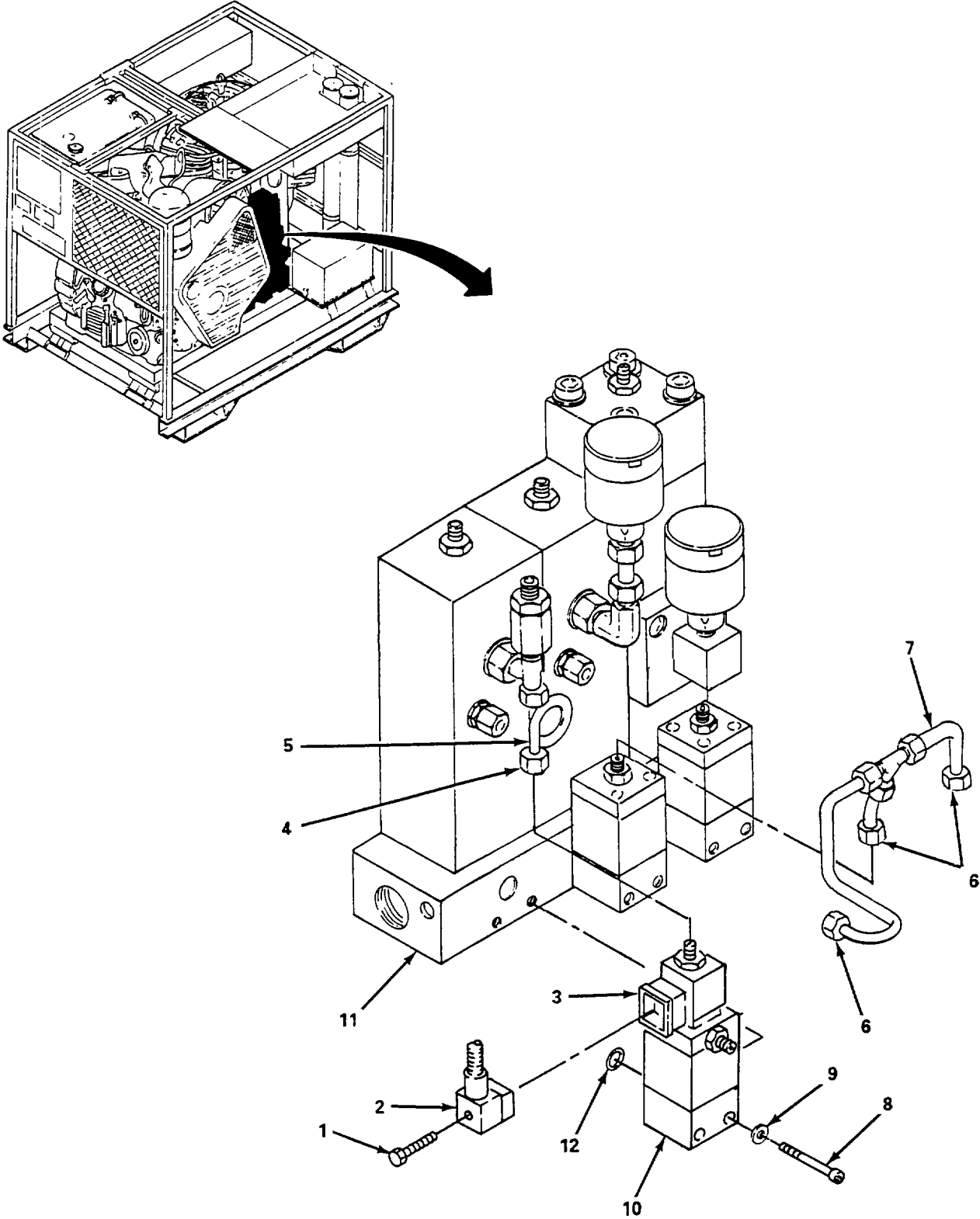


Figure 5-22. Interfilter Drain Valves, Replace.

5-17. Interfilter Drain Valves (Cont).

- (6) Apply petroleum jelly to preformed packing (12).
- (7) Install drain valve (10) and preformed packing (12), and secure with two allen screws (8) and washers (9).
- (8) Install line (7) and tighten three fitting nuts (6).
- (9) Install line (5) and tighten fitting nuts (4).
- (10) Connect electrical lead (2) to solenoid (3) and secure with screw (1).

b. Repair. (figure 5-23)

- (1) Remove drain valve (para. a. above).

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (2) Remove four allen screws (1).
- (3) Separate base (2), valve body (3), and cylinder flange (4).
- (4) Remove valve piston (5) from valve body (3).
- (5) Remove and discard preformed packing (6).
- (6) Remove valve seat (7).
- (7) Remove and discard preformed packing (8).
- (8) Remove nut ring (9) from valve piston (5).
- (9) Remove valve piston (5) and preformed packing (10). Discard preformed packing.
- (10) Remove nut (11) and remove adjusting screw (12) from flange (4)
- (11) Clean all components in accordance with Chapter 4, Section VII of this manual.

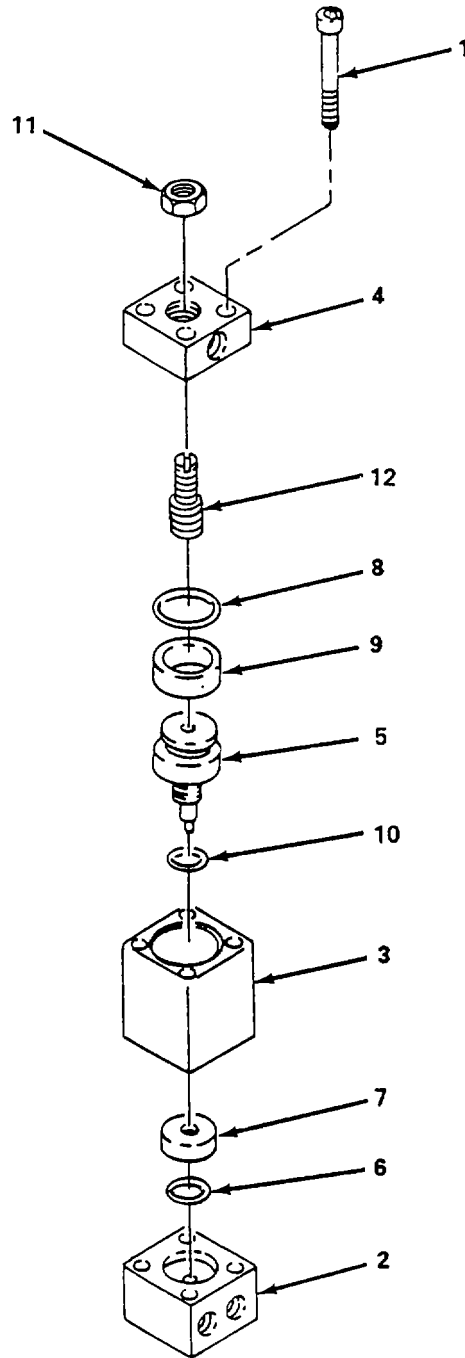


Figure 5-23. Interfilter Drain Valves, Repair.

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- (12) Inspect valves for cracks, stripped threads or other damage.
- (13) Apply petroleum jelly to preformed packings (6), (8), and (10).
- (14) Adjust screw (12) and secure with nut (11).
- (15) Install preformed packing (10) in valve body (3).
- (16) Install valve piston (5) in body (3).
- (17) Install nut (9) and preformed packing (8) on valve piston (5).
- (18) Install preformed packing (6) and valve seat (7) in base (2).
- (19) Install body (3) on base (2) and flange (4) on body (3).
- (20) Install four alien screws (1).
- (21) Install drain valve (para. a. above).

FOLLOW-ON MAINTENANCE
Install battery (para. 4-45).

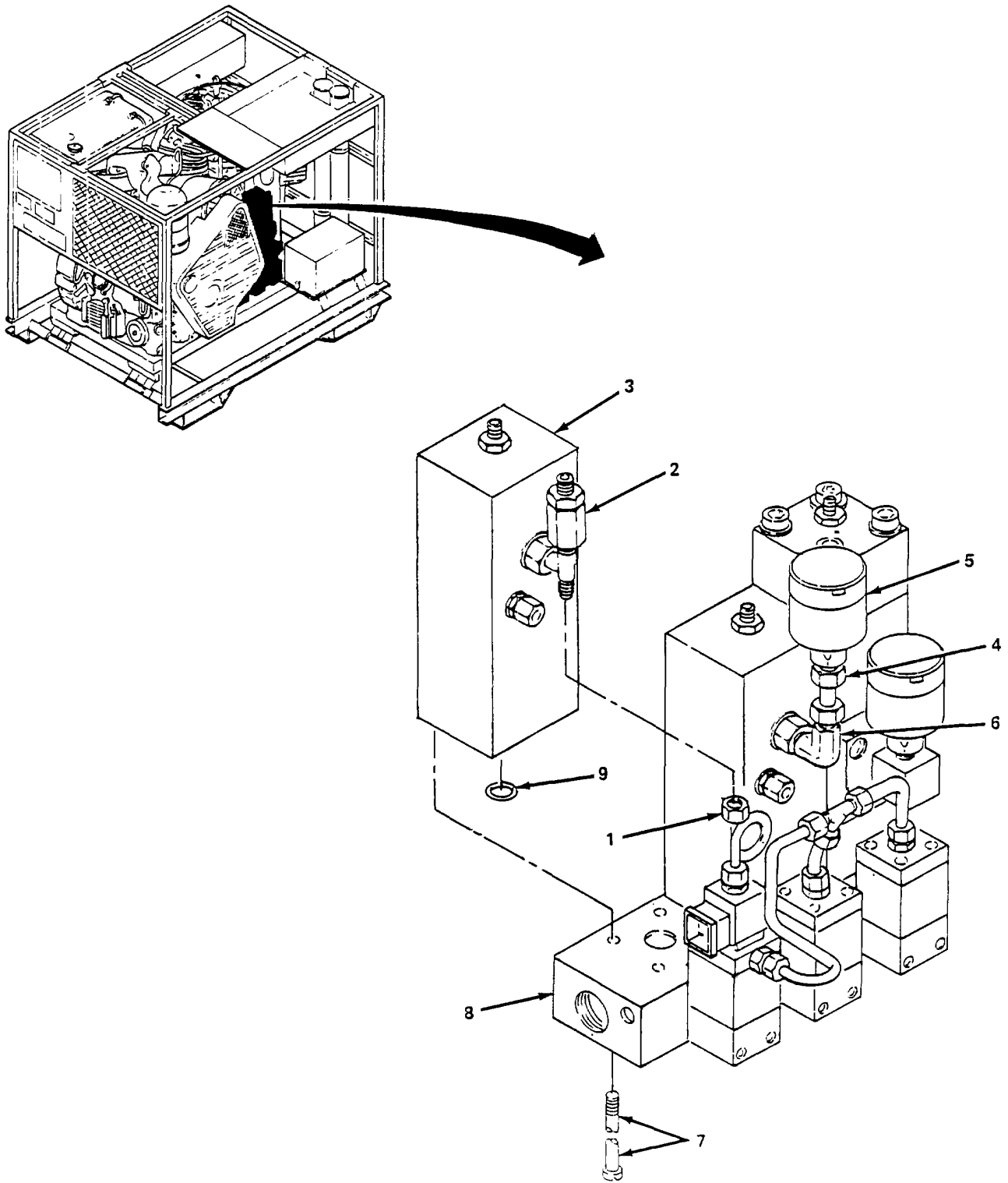


Figure 5-24. Interfilter 2nd and 3rd Stage Housing, Replace.

5-18. Interfilter 2nd and 3rd State Housing (Cont).

- (5) Apply petroleum jelly to preformed packing (9).
- (6) Install preformed packing (9) and housing (3) and secure with four screws (7).
- (7) Install safety valve (5) and tighten fitting nut (4).
- (8) Install safety valve (2) and tighten fitting nut (1).

b. Repair. (figure 5-25)**WARNING**

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (1) Remove interfilter 2nd and 3rd stage housing (para. a. above).
- (2) Remove screw (1), pressure spring (2), funnel (3), and preformed packing (4) from housing (5).
- (3) Remove reducer (6) and seal ring (7) with inspection pipe from housing (5).
- (4) Remove male connector (8) and seal ring (9) from housing (5).
- (5) Remove seal ring (10) and intermediate piece (11) from housing (5).
- (6) Clean all components in accordance with Chapter 4, Section VI.
- (7) Inspect housing for cracks, stripped threads, or other damage.
- (8) Install seal ring (10) and intermediate piece (11) on housing (5).
- (9) Install seal ring (9) and male connector (8) on housing (5).
- (10) Install reducer (6) and seal ring (7) with inspection pipe in housing (5).
- (11) Install preformed packing (4), funnel (3), pressure spring (2), and screw (1) into housing (5).
- (12) Install interfilter 2nd and 3rd stage housing (para. a. above).

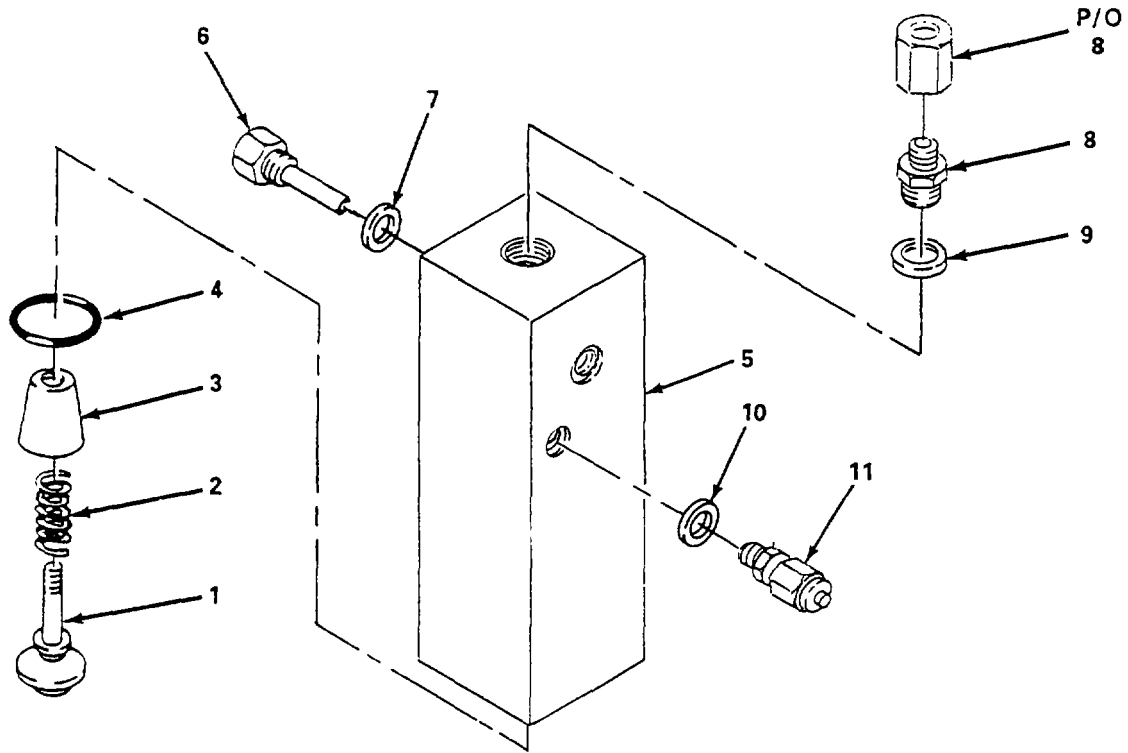


Figure 5-25. Interfilter 2nd and 3rd Stage Housing, Repair.

FOLLOW-ON MAINTENANCE

- (1) Install interfilter heater block assembly (para. 5-15).
- (2) Install battery (para. 4-45).

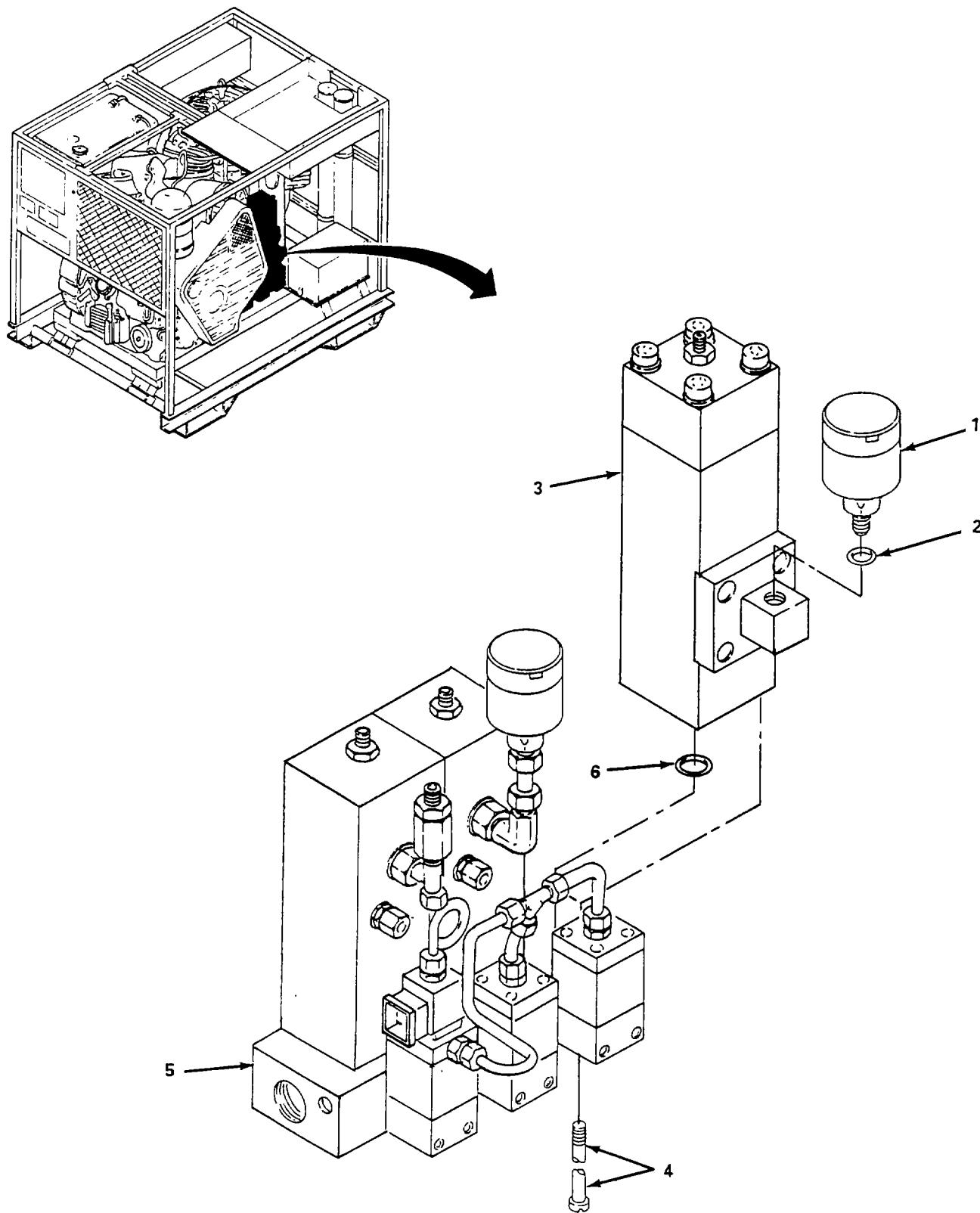


Figure 5-26. Oil Water Separator, Replace.

5-19. Oil Water Separator Housing (Cont).

- b. Repair. (figure 5-27)

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (1) Remove oil water separator housing (para. a. above).
- (2) Remove four alien screws (1) and washers (2).
- (3) Remove cover (3) and preformed packing (4) from housing (5) and discard preformed packing (4).
- (4) Remove centrifical insert (6) and preformed packing (7) and discard preformed packing (7).
- (5) Clean all components in accordance with Chapter 4, Section VII.
- (6) Inspect housing for cracks, stripped threads, or other damage.
- (7) Apply petroleum jelly to two preformed packings (4) and (7).
- (8) Install preformed packing (7) and centrifical insert (6).
- (9) Install cover (3) and preformed packing (4) on housing (5) and secure with four alien screws (1) and washers (2).
- (10) Install oil water separator housing (para. a. above).

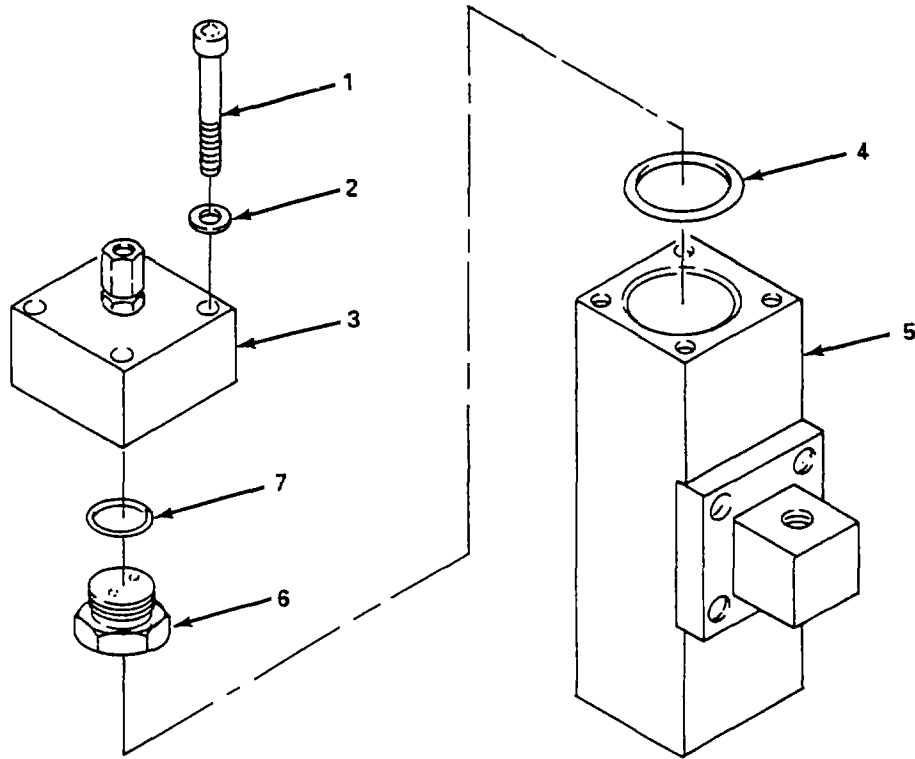


Figure 5-27. Oil Water Separator Housing, Repair.

5-20. Interfilter Heater Block.

This task covers:

Replace

INITIAL SETUP*Tools*General Mechanic's Tool Kit
(NSN 5180-00-177-7033)*Materials/Parts*Interfilter heater block
Tape (Item 25, Appendix E)
Bands, Rubber (Item 4, Appendix E)
Bags, Plastic (Item 3, Appendix E)*Equipment Condition (Cont)*Interfilter heater block assembly removed (para. 5-15).
Interfilter drain valves removed (para. 5-17).
Interfilter 2nd and 3rd stage housing removed
(para. 5-18).
Oil water separator housing removed (para. 5-19).*Reference*

Cleaning Procedures, Chapter 4, Section VII.

*Equipment Condition*Compressor unit shut down (para. 2-13).
Battery removed (para. 4-45).

Replace. (figure 5-28)**WARNING**

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (1) Remove heating rod bar (1) and seal ring (2) from heater block (3).
- (2) Remove locking screw (4) and seal ring (5) from block (3).
- (3) Remove two nozzles (6) from block (3).
- (4) Remove connecting piece (7) and preformed packing(8) from block (3).
- (5) Install preformed packing (8) and connecting piece (7) on block (3).

- (6) Install two nozzles (6) on block (3).
- (7) Install seal ring (5) and locking screw (4) on block (3).
- (8) Install seal ring (2) and heating rod bar (1) on block (3).

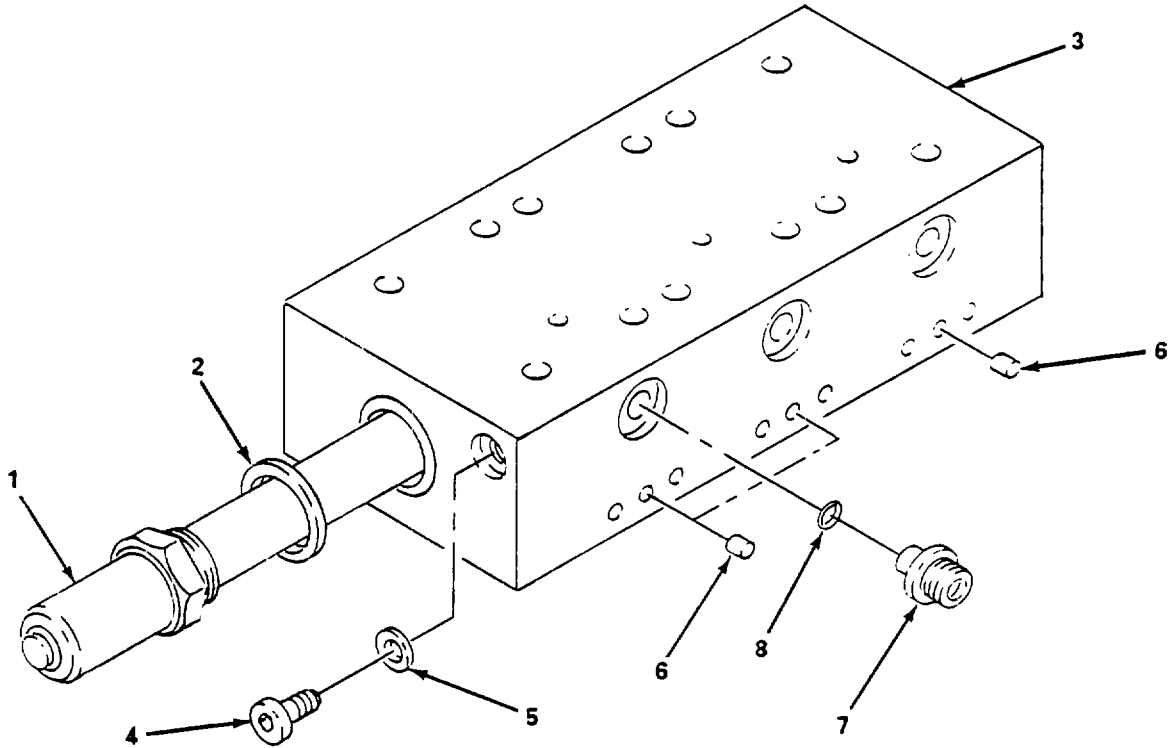


Figure 5-28. Interfilter Heater Block, Replace.

FOLLOW-ON MAINTENANCE

- (1) Install oil water separator housing (para. 5-19).
- (2) Install interfilter 2nd and 3rd stage housing (para. 5-18).
- (3) Install interfilter drain valves (para. 5-17).
- (4) Install interfilter heater block assembly (para. 5-15).
- (5) Install battery (para. 4-45).

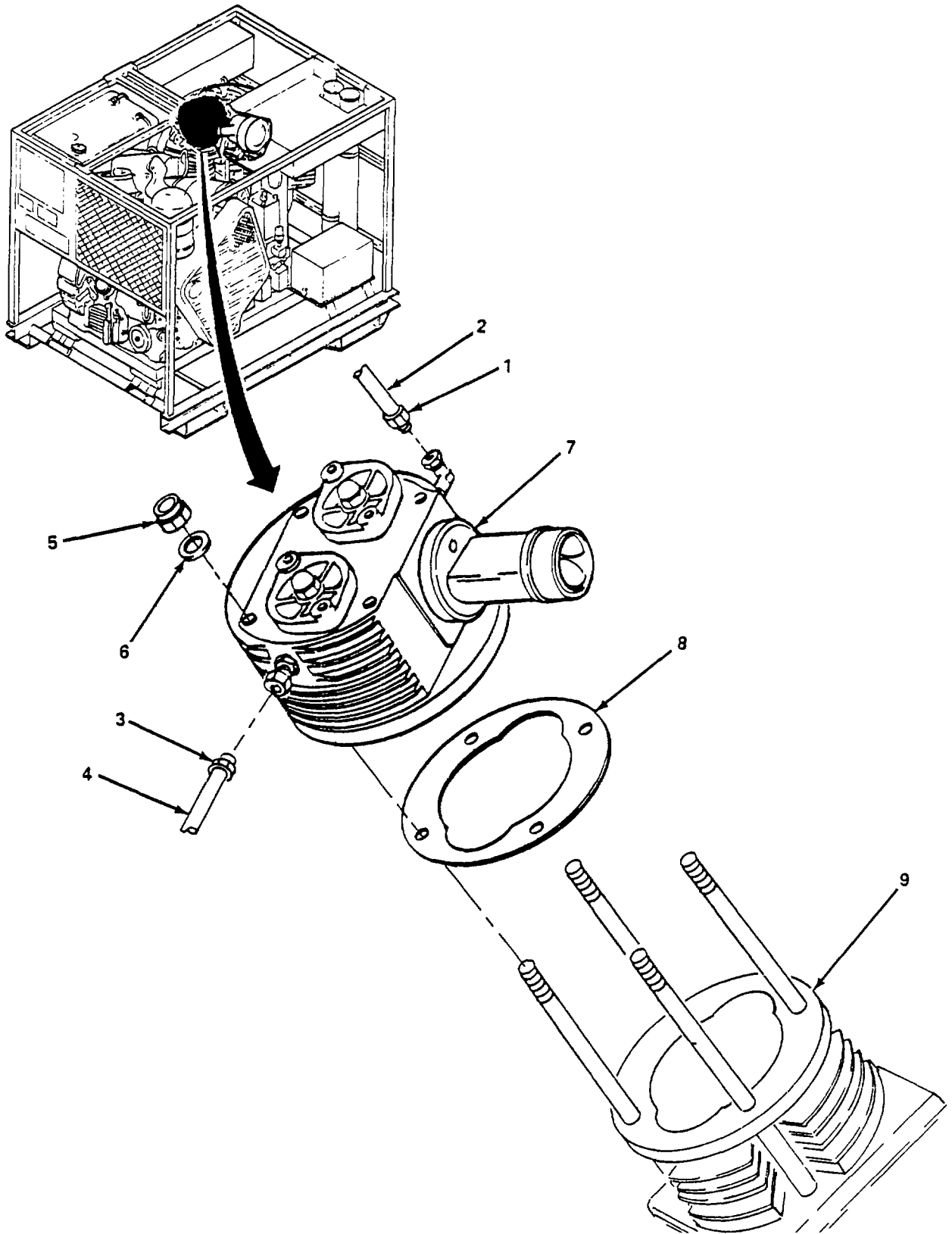


Figure 5-29. 1st Stage Valve Head Assembly, Replace.

5-21. 1st Stage Valve Head Assembly (Cont).

- b. Repair. (figure 5-30)

NOTE

Suction valves are different sizes. Mark or tag to insure proper installation. Replacement of each valve is the same.

- (1) Remove 1st stage valve head assembly (para. a. above).

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (2) Remove elbow (1) from valve head (2).
- (3) Remove connector (3) and gasket (4) from valve head (2).
- (4) Remove acorn nut (5), hex head stud (6), and gasket (7).
- (5) Remove two nuts (8) and washers (9).
- (6) Remove flange (10), preformed packing (11), hood (12), discharge valve (13), and gasket (14) from valve head (2).
- (7) Remove two stud (15) from valve head (2).
- (8) Remove two allen screws (16) and remove tube (17), gasket (18) from valve head (2).
- (9) Inspect valve head for cracks, stripped threads, or other damage.
- (10) Install gasket (18) and tube (17), and secure with two allen screws (16).
- (11) Install two studs (15) on valve head (2).
- (12) Install gasket (14), discharge valve (13), hood (12), preformed packing (11), and flange (10) in valve head (2).
- (13) Install two washers (9) and nuts (8).

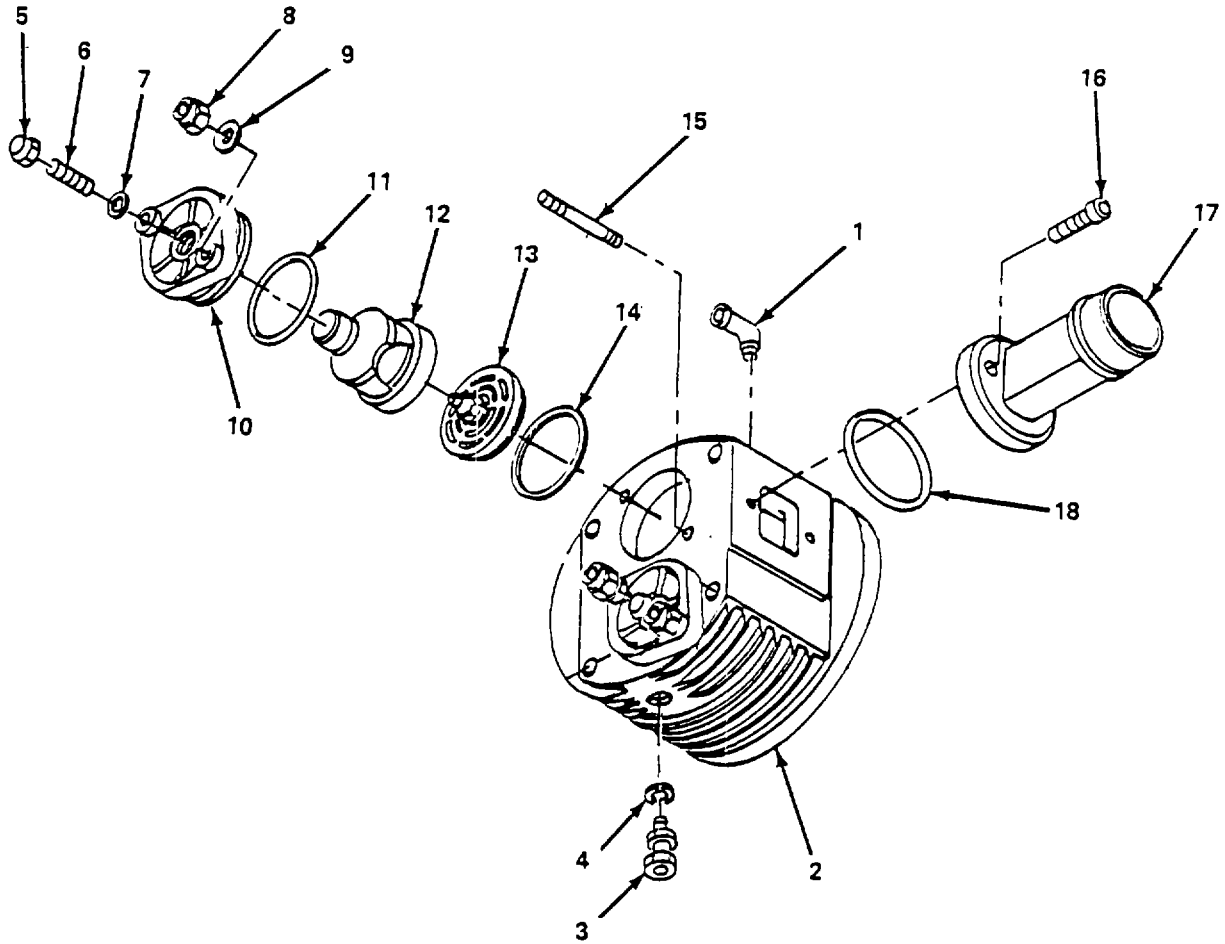


Figure 5-30. 1st Stage Valve Head Assembly, Repair.

FOLLOW-ON MAINTENANCE
Install air filter assembly (para. 4-21).

5-93/(5-94 blank)

- (14) Install gasket (7), hex head stud (6), and secure with acorn nut (5).
- (15) Install gasket (4) and connector (3) on valve head (2).

WARNING

Leave 1 1/2 threads exposed on fitting when applying Teflon tape. This will ensure that no Teflon tape will hang down inside the air system. Teflon tape should be wrapped in such a manner that when the fitting is tightened the tape will not loosen. Failure to wrap Teflon tape correctly may result in contamination or blockage of the air system and subsequent possible injury or death to the diver.

- (16) Apply Teflon tape to threads on elbow (1) and install elbow (1) on valve head (2).
- (17) Install 1st stage valve head assembly (para. a. above).

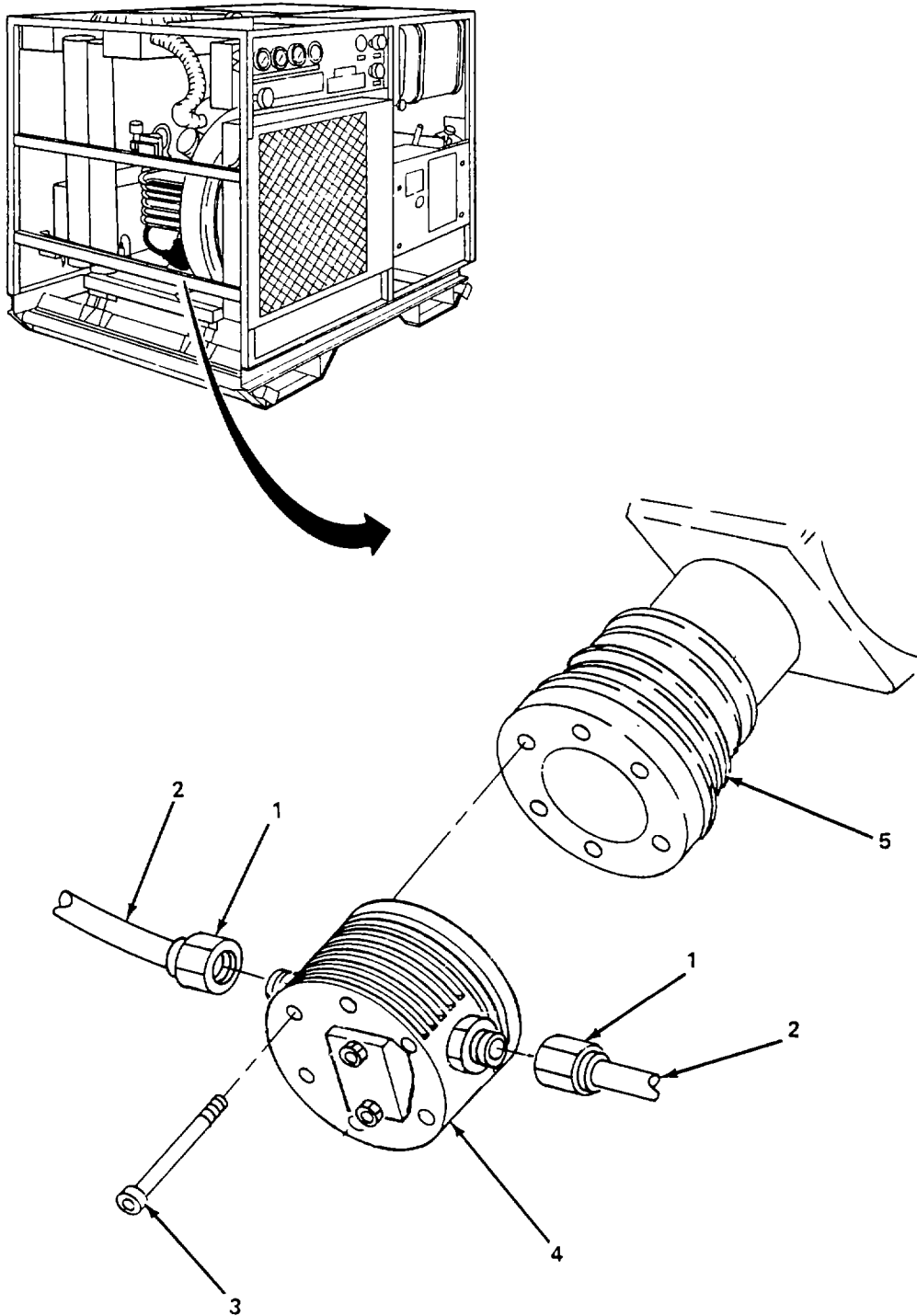


Figure 5-31. 2nd and 3rd Stage Valve Head Assembly, Replace.

5-22. 2nd and 3rd Stage Valve Head Assembly (Cont).b. Repair. (figure 5-32)

- (1) Remove 2nd or 3rd stage valve head assembly (para. a. above).
- (2) Remove connector (1) and gasket (2) from valve head (3).
- (3) Remove connector (4) or elbow (5) and gaskets (6) from valve head (3).
- (4) Remove two hex nuts (7), washers (8), and press pad (9).
- (5) Remove two studs (10) from valve head (3).
- (6) Insert two flat tip screwdrivers into the grooves of two valve caps (11) and lift out of chamber.
- (7) Remove two preformed packing (12) from valve cap (11) and discard preformed packing.
- (8) Remove discharge valve (13) and suction valve (14).
- (9) Remove two gaskets (15).
- (10) Clean all components in accordance with Chapter 4, Section VII.
- (11) Inspect all components for cracks, dents, or other damage.
- (12) Install two gaskets (15).

CAUTION

Do not interchange suction or discharge valves. The valve cap of the inlet-valve (suction valve) protrudes 2.5 mm (0.98 in.) out of the valve head more than the cap for the discharge valve. (Cap holder is designed accordingly.)

- (13) Install suction valve (14) and discharge valve (13).
- (14) Install two preformed packings (12) on valve caps (11).
- (15) Install two valve caps (11) into chamber.
- (16) Install two studs (10) on valve head (3).
- (17) Install press pad (9), two washers (8), and hex nuts (7).

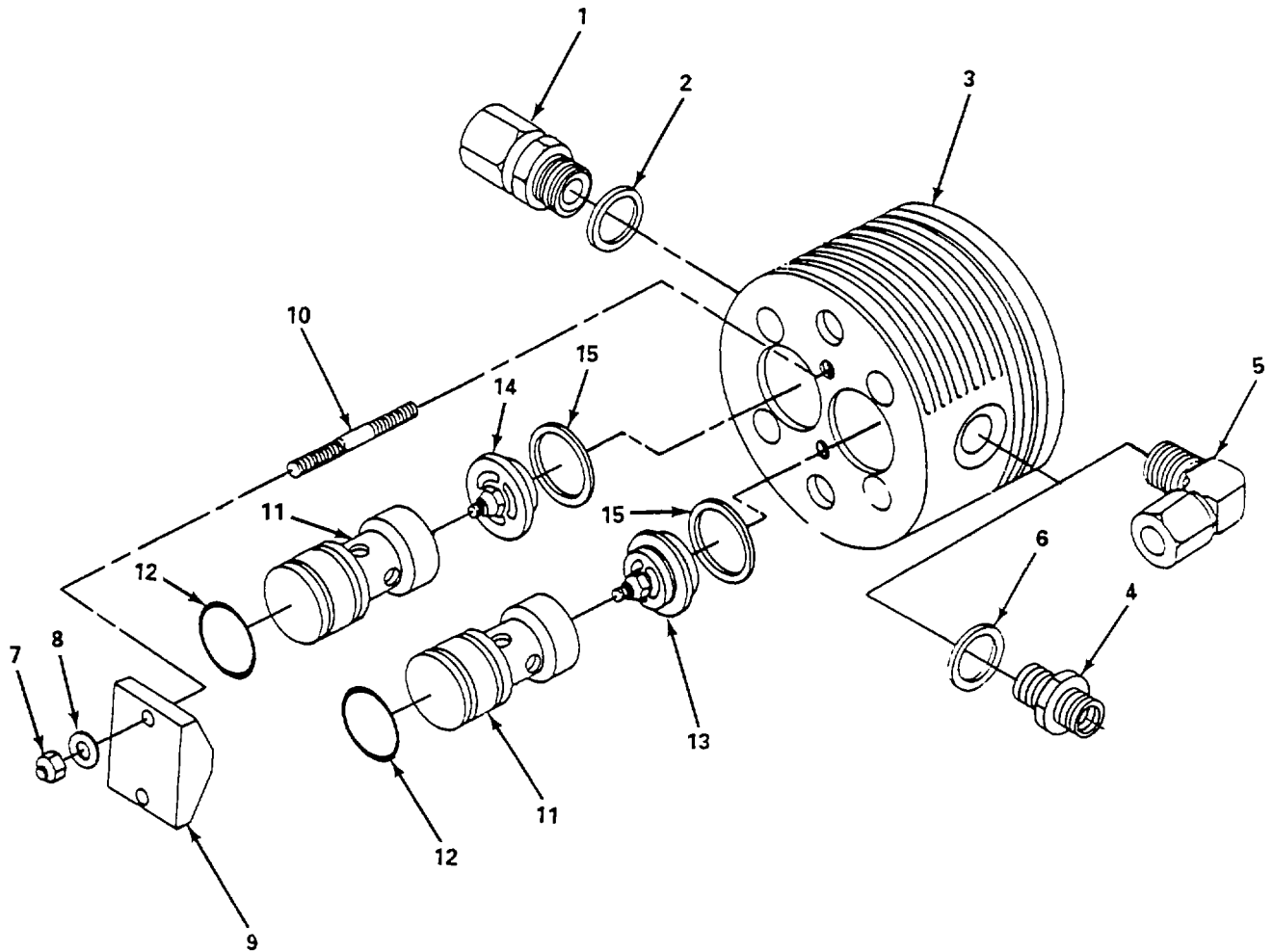


Figure 5-32. 2nd and 3rd Stage Valve Head Assembly, Repair.

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WARNING

Leave 1 1/2 threads exposed on fitting when applying Teflon tape. This will ensure that no Teflon tape will hang down inside the air system. Teflon tape should be wrapped in such a manner that when the fitting is tightened the tape will not loosen. Failure to wrap Teflon tape correctly may result in contamination or blockage of the air system and subsequent possible injury or death to the diver.

- (18) Apply Teflon tape to elbow (5).
- (19) Install gasket (6) and connector (4) on elbow (5).
- (20) Install connector (1) and gasket (2).
- (21) Install 2nd or 3rd stage valve head assembly (para. a. above).

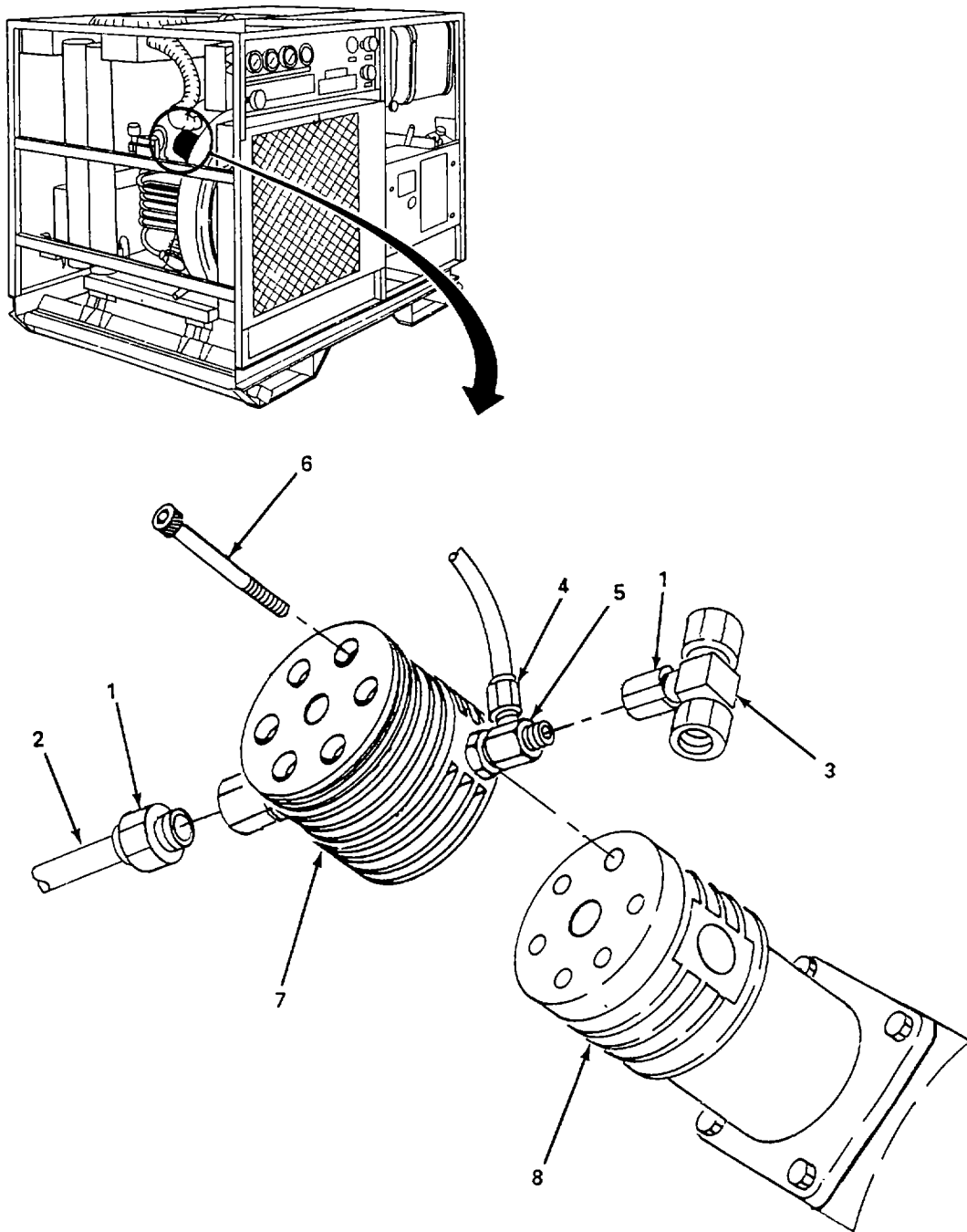


Figure 5-33. 4th Stage Valve Head Assembly, Replace.

5-23. 4th Stage Valve Head Assembly (Cont).

b. Repair. (figure 5-34)

- (1) Remove 4th stage valve head assembly (para. a. above).

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (2) Remove stroke limiter (1) from upper part of valve head (2).
- (3) Remove preformed packing (3), spring (4), and discharge valve plate (5). Discard preformed packing (3).
- (4) Remove upper part of valve head (2) from lower part of valve head (6).
- (5) Remove back-up ring (7), preformed packing (8), discharge valve seat (9), spring plate (10), and suction valve plate (11). Discard preformed packing (8).
- (6) Remove compression nut (12), compression ring (13), intermediate piece (14), and gasket (15) from upper part of valve head (2).
- (7) Remove connector (16) and gasket (17) from lower part of valve head (6).
- (8) Clean all components using nonionic detergent cleaner and rinse with clean distilled water.
- (9) Inspect all components for cracks, dents, or other damage.
- (10) Install gasket (17) and connector (16).
- (11) Install gasket (15), intermediate piece (14), compression ring (13), and compression nut (12).
- (12) Turn flywheel on compressor manually until piston protrudes from the cylinder liner.
- (13) Install suction valve plate (11), and spring plate (10) on piston.
- (14) Install in grooves of discharge valve seat (9), preformed packing (8) in bottom, and backup ring (7) in top.

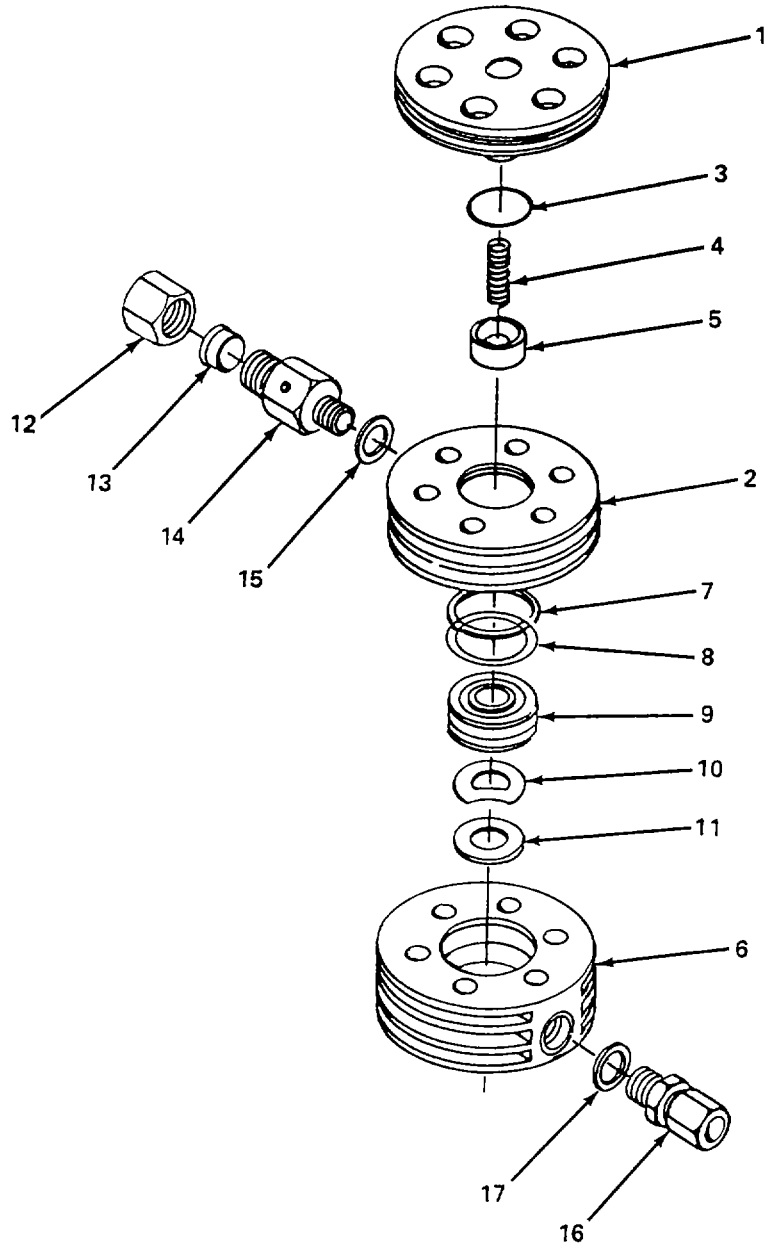


Figure 5-34. 4th Stage Valve Head Assembly, Repair.

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- (15) Install discharge valve seat (9) over suction valve plate (11), and spring plate (10) on piston.
- (16) Place lower part of valve head (6) over discharge valve seat (9), and onto cylinder.
- (17) Position upper part of valve head (2) on lower part of valve head (6).
- (18) Install discharge valve plate (5), spring (4), preformed packing (3), and stroke limiter (1) on upper part of valve head (2).
- (19) Install 4th stage valve head assembly (para. a. above).

5-24. Safety Valve.

This task covers:

Replace

INITIAL SETUP*Tools*General Mechanic's Tool Kit
(NSN 5180-00-177-7033)*Materials/Parts*Safety Valve
Tape (item 25, Appendix E)
Bands, Rubber (Item 4, Appendix E)
Bags, Plastic (Item 3, Appendix E)*Equipment Condition*

Compressor unit shut down (para. 2-13).

*Reference*Cleaning Procedures, Chapter 4, Section VII.

Replace. (figure 5-35)**WARNING**

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (1) Loosen coupling nut (1) and remove two screws (2) and lockwashers (3).
- (2) Remove safety valve (4) and fitting (5).
- (3) Remove safety valve (4) and gasket (6) from fitting (5).

WARNING

Ensure safety valve is rated for compressor output (3200 psi).

- (4) Install gasket (6) and safety valve (4) on fitting (5) and secure to bracket (7) with two lockwashers (3) and screws (2).
- (5) Tighten coupling nut (1).

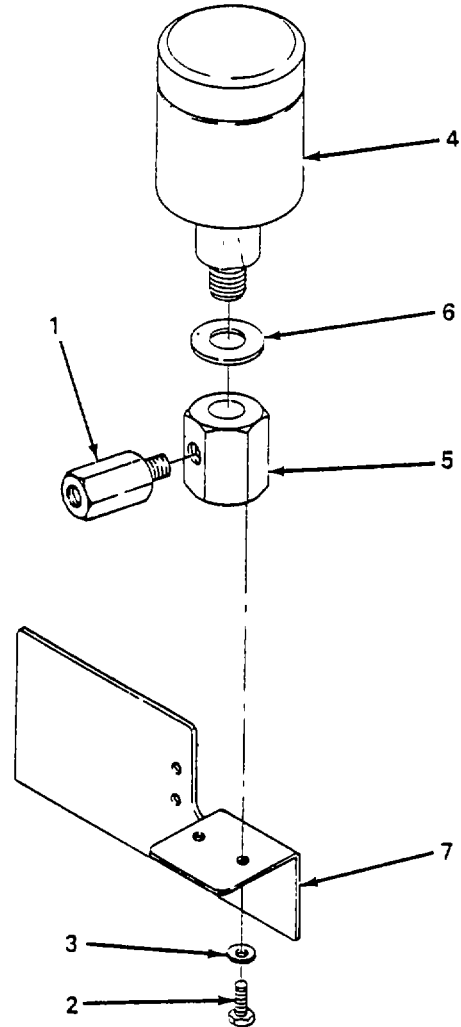
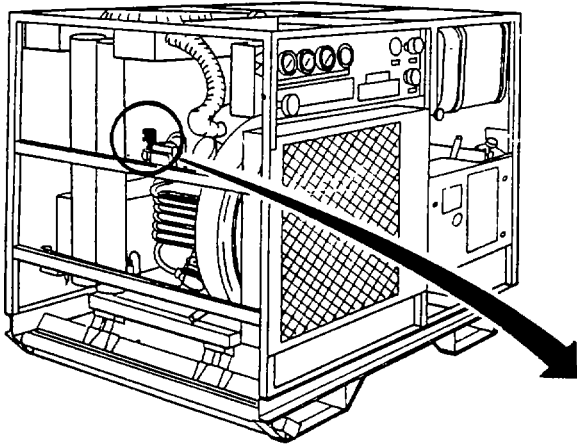


Figure 5-35. Safety Valve, Replace.

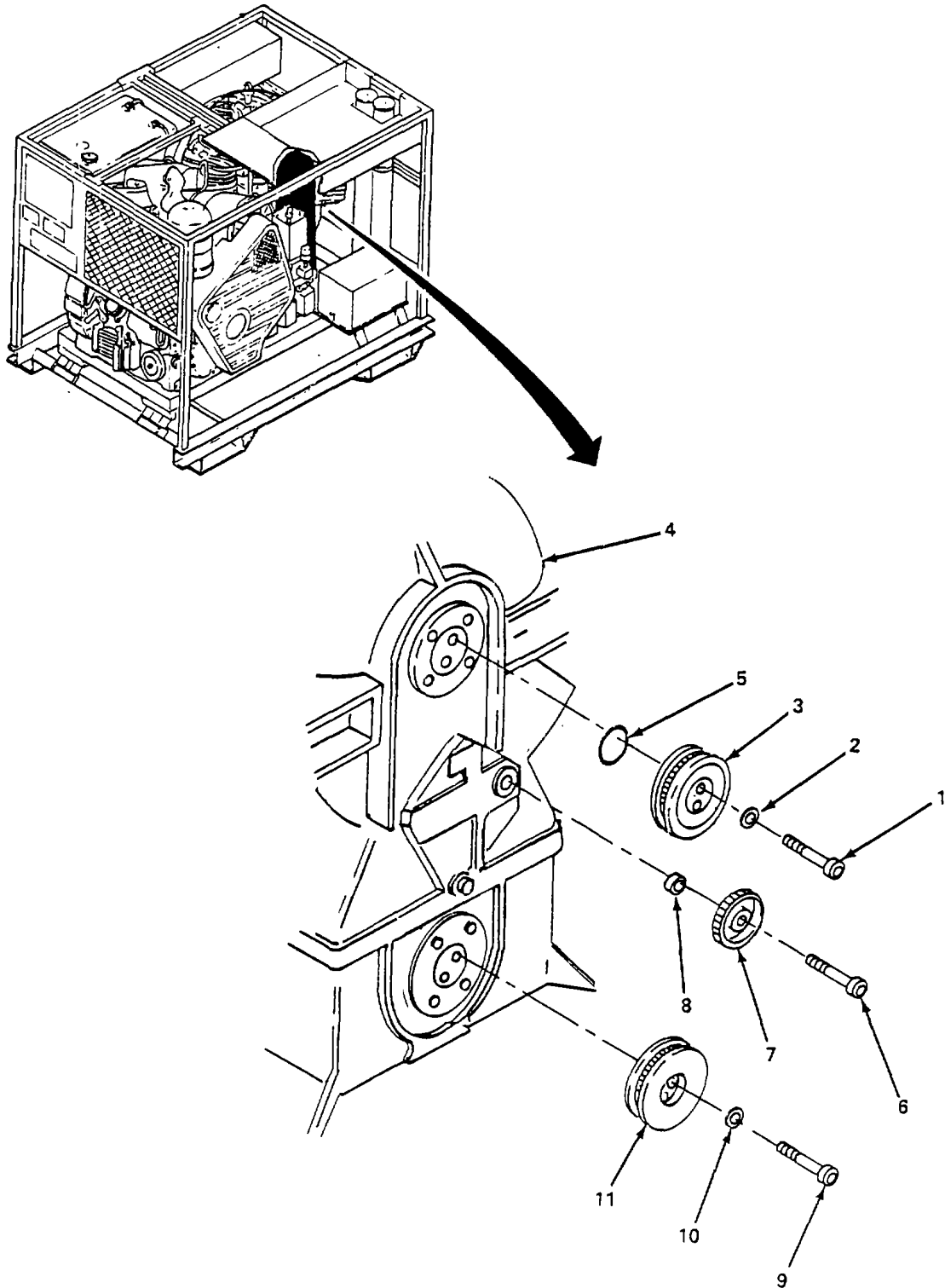


Figure 5-36. Tension Pulley Assembly, Driving Gear and Eccentric Shaft Drive Gear, Replace.

5-25. Tension Pulley Assembly, Driving Gear and Eccentric Shaft Drive Gear (Cont).b. Repair. (figure 5-37)

- (1) Remove tension pulley assembly (para. a. above).
- (2) Using circlip pliers, remove circlip (1).
- (3) Remove ball bearing seat (2), ball bearing (3) from tension pulley (4).

WARNING

Dry cleaning solvent PD-680 used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 138°F (60°C).

- (4) Clean all items with dry cleaning solvent and dry thoroughly.
- (5) Inspect tension pulley (4), ball bearing (3), and ball bearing seat (2) for damage. Replace any item if damaged.
- (6) Install ball bearing (3) and ball bearing seat (2) in tension pulley (4).
- (7) Using circlip pliers, install circlip (1).
- (8) Install tension pulley assembly (para. a. above).

FOLLOW-ON MAINTENANCE
Install drive belt and beltguard (para. 4-20).

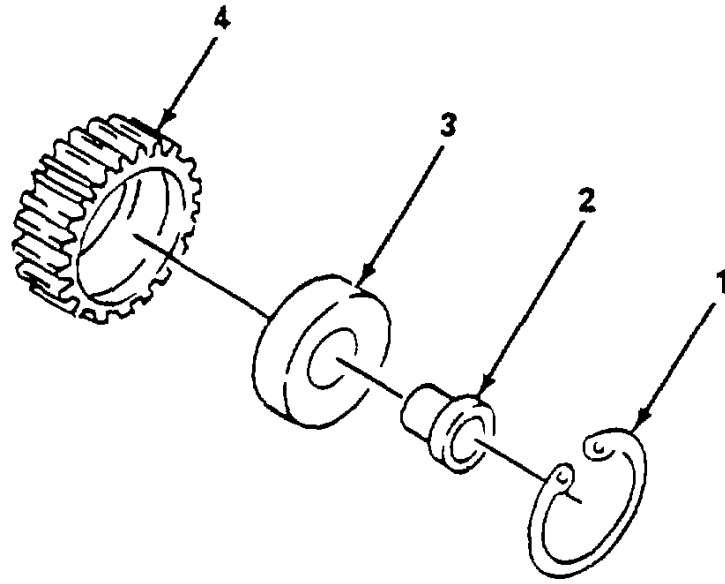


Figure 5-37. Tension Pulley Assembly, Driving Gear and Eccentric Shaft Drive Gear, Repair.

5-26. Air Purification Group.

This task covers:

Service

INITIAL SETUP*Tools*

Purification Wrench (WHR-2)

*Materials/Parts*Cartridges
Preformed Packings*Equipment Condition*

Compressor unit shut down (para. 2-13).

*Reference*Cleaning Procedures, Chapter 4, Section VII.

Replace. (figure 5-38)**WARNING**

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

NOTE

There are two cartridges PN 058827-410, and 058825-410, and both must be replaced at same time. Replacement of each cartridges is the same.

- (1) Unscrew top plug (1) from cylinder (2).
- (2) Remove and discard preformed packing (3) from top plug (1).
- (3) Remove and discard cartridge (4).

CAUTION

Cartridges must be protected from absorbing moisture. Do not remove wrapper from new cartridge until ready to install. Do not handle new cartridge with bare hands; use lint free cloth or plastic cartridges wrapping.

- (4) Install cartridge (4) into cylinder (2).
- (5) Install preformed packing (3) on top plug (1).
- (6) Install top plug (1) on cylinder (2).

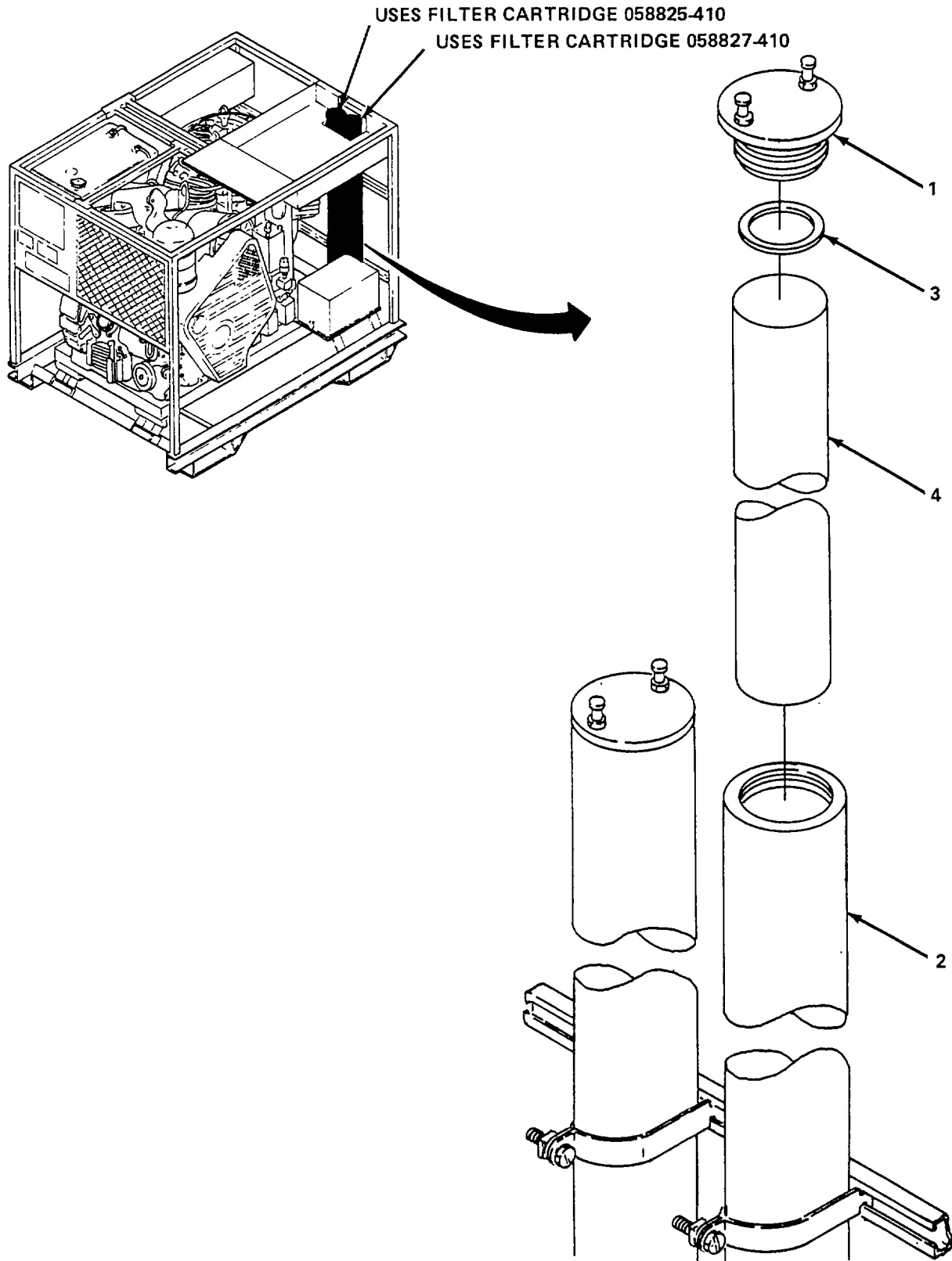


Figure 5-38. Air Purification group, Service.

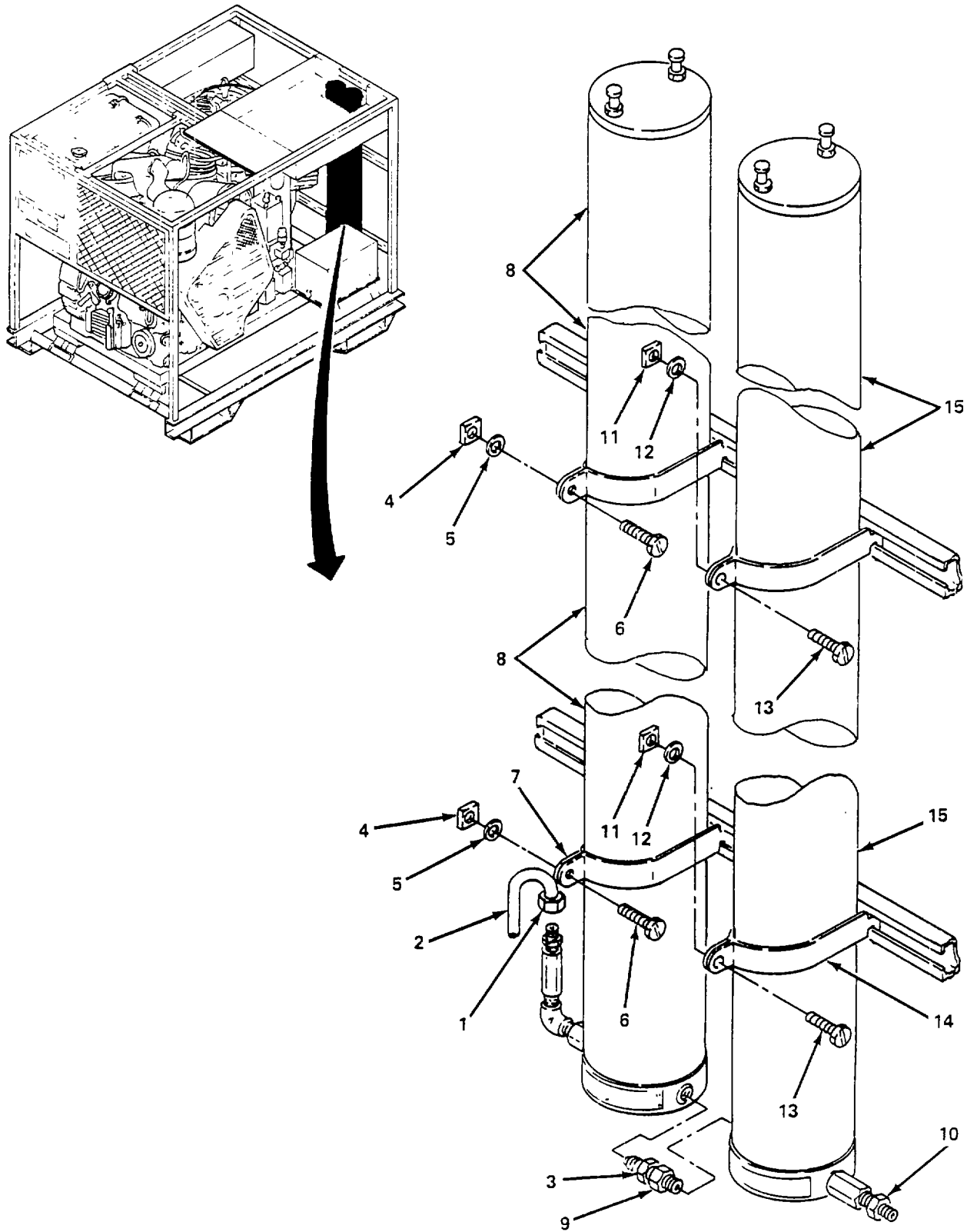


Figure 5-39. Purification Cylinders, Replace.

5-27. **Purification Cylinders (Cont).**

- (8) Remove cylinder (15).
 - (9) Position cylinder (15) in top and bottom split brackets (14) and secure with two screws (13), washers (12), and nuts (11).
 - (10) Tighten union (10).
 - (11) Install union (3) on coupling (9).
 - (12) Position cylinder (8) in top and bottom split brackets (7), and secure with two screws (6), washers (5), and nuts (4).
 - (13) Tighten union (3).
 - (14) Install line (2) and tighten coupling (1).
- b. Repair. (figure 5-40)

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with accepted army diving cleaning procedures. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (1) Remove purification cylinders (para. a. above).
- (2) Remove top filter plug (1), top filter cover (2) from filter housing (3).
- (3) Remove filter top (4), support ring (5) and preformed packing (6) from filter housing (3).
- (4) Remove filter bottom (7), support ring (8), and preformed packing (9) from filter housing (3).
- (5) Clean all components in accordance with Chapter 4, Section VII.
- (6) Install preformed packing (9), support ring (8), and filter bottom (7) in filter housing (3).
- (7) Install preformed packing (6), support ring (5), and filter top (4) in filter housing (3).
- (8) Install top filter cover (2) and top filter plug (1) in filter housing (3).

FOLLOW-ON MAINTENANCE
Install purification cartridges (para. 5-26).

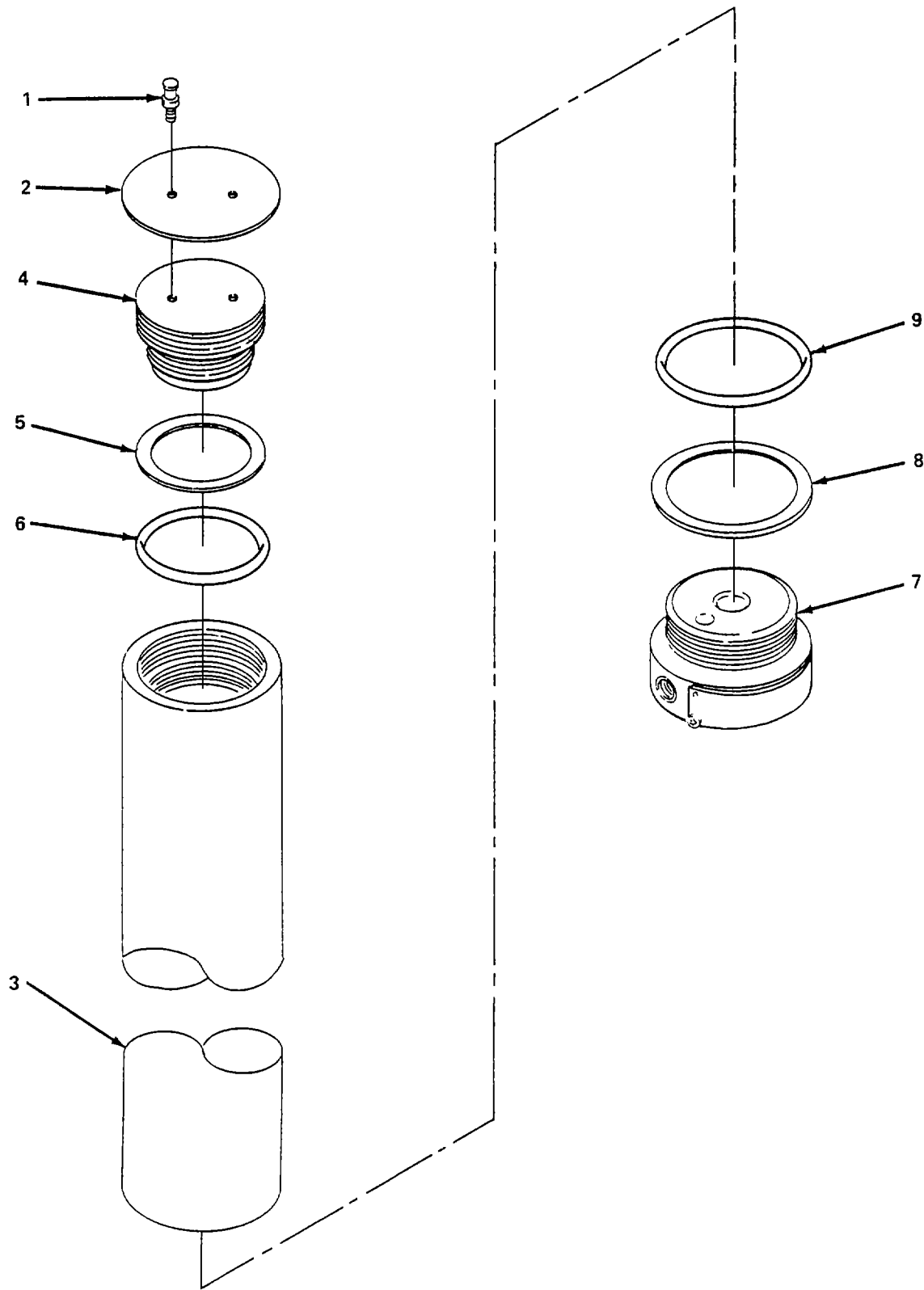


Figure 5-40. Purification Cylinders, Repair.

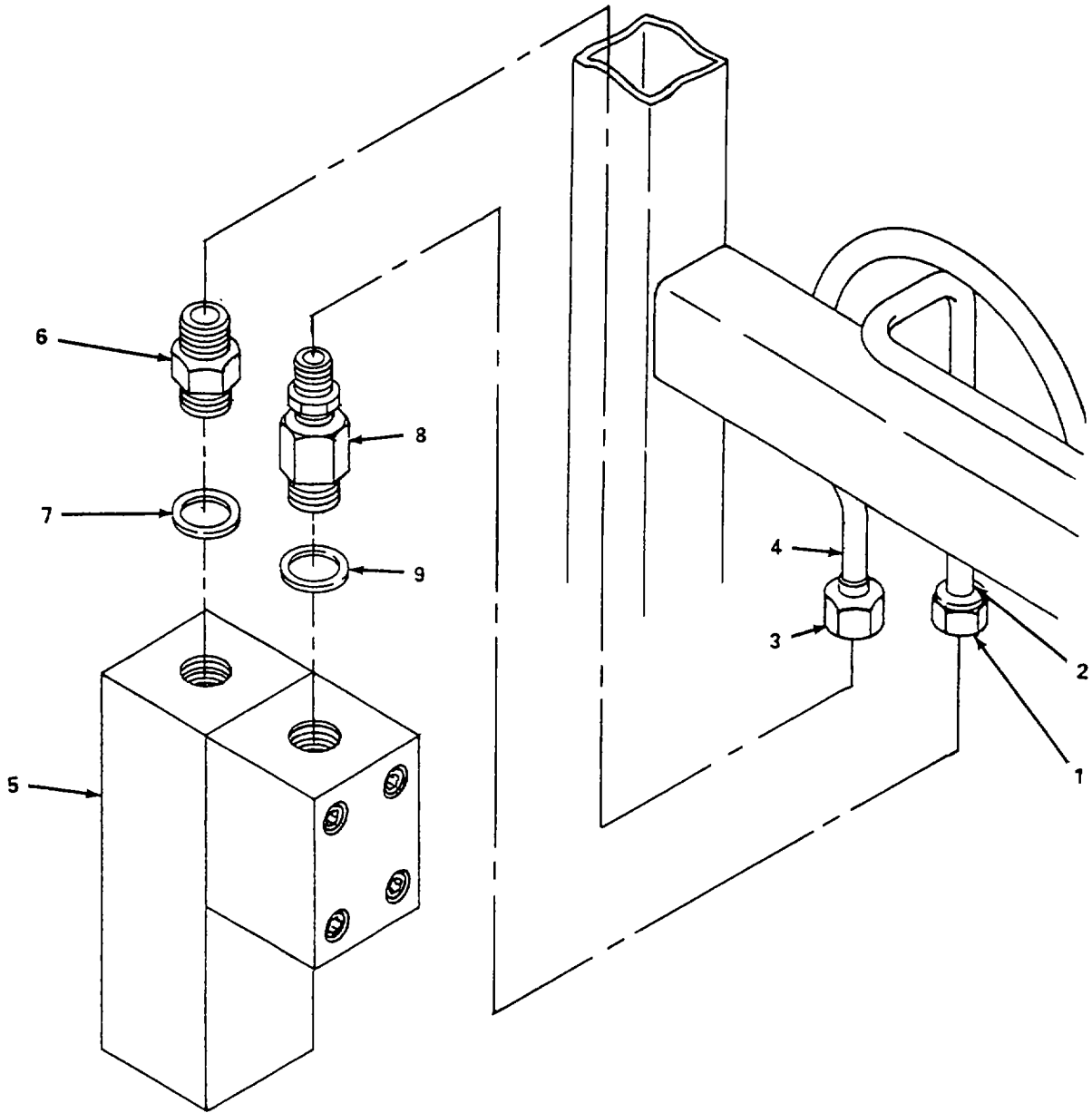


Figure 5-41. Pressure Maintaining Valve, Replace.

5-28. Pressure Maintaining Valve.*b. Repair.* (figure 5-42)

- (1) Remove pressure maintaining valve (para. a.).
- (2) Remove four screws (1).
- (3) Separate two blocks (2) and (3) and remove piston (4), two preformed packings (5), cup (6) and spring (7).
- (4) Remove disc (8) from block (3).
- (5) Clean all components, except preformed packings, in accordance with cleaning procedures in Chapter 4, Section VII of this manual.
- (6) Inspect spring (7) and cup (6) and replace pressure maintaining valve if either item is defective.
- (7) Inspect piston (4) and replace if corroded.
- (8) Inspect blocks (2) and (3) and replace if cracked or corroded.
- (9) Inspect disc (8) and replace pressure maintaining valve if disc (8) is cracked or otherwise damaged.
- (10) Install two preformed packings (5) in piston (4).
- (11) Install spring (7) and cup (6) in block (2). Ensure spring (7) is properly seated in block (2).
- (12) Install piston (4) in block (2).
- (13) Install block (3) and secure with four screws (1).
- (14) Install disc (8) in block (3).
- (15) Install pressure maintaining valve (para. a.).

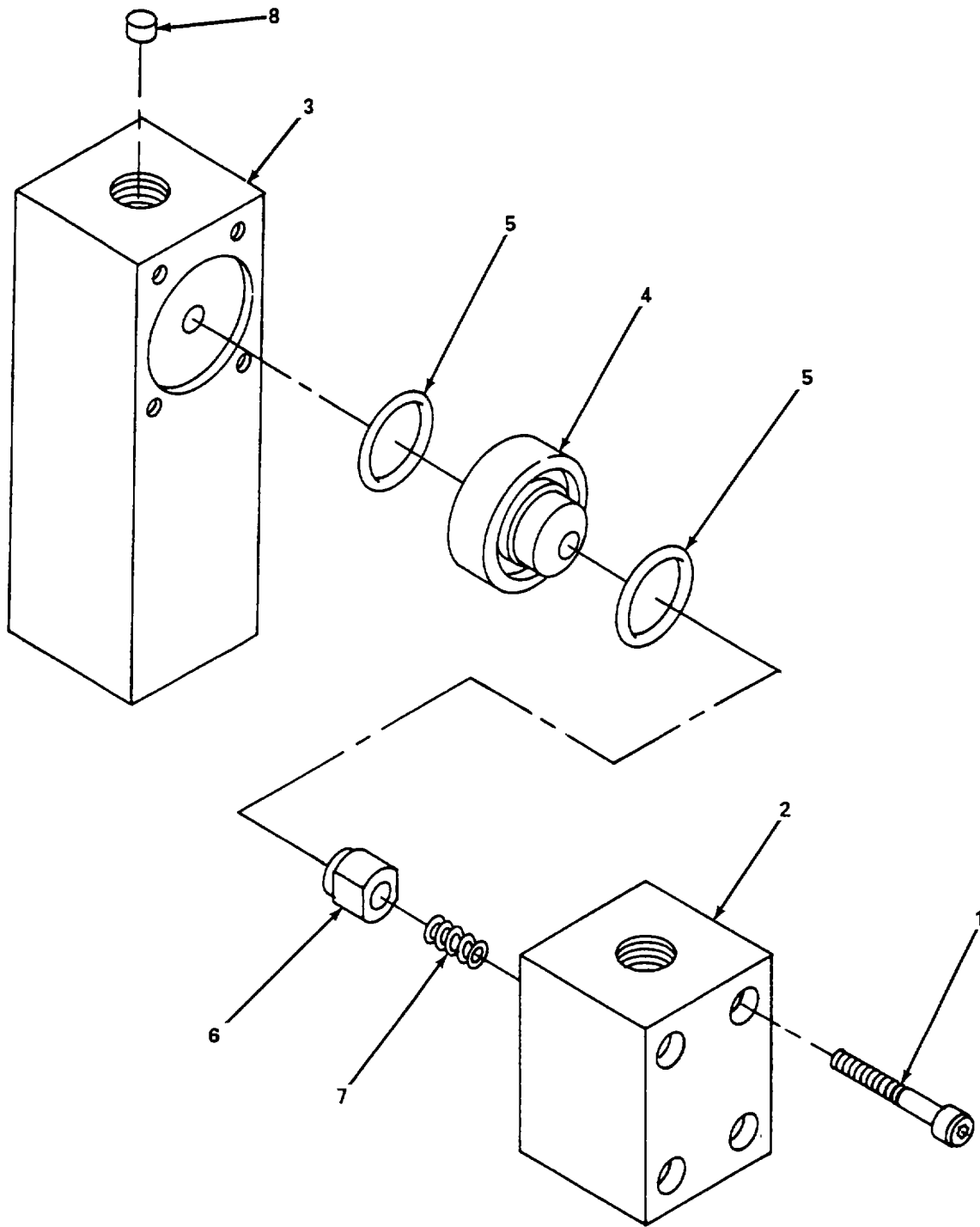


Figure 5-42. Pressure Maintaining Valve, Repair

5-29. Fuel Tank.

This task covers:

Repair

INITIAL SETUP

Tools

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)
Torch Outfit, Cutting and Welding
(NSN 3433-00-026-4718)

Materials/Parts

Tape, Teflon (Item 26, Appendix E)

*Equipment Condition*Fuel tank removed (para. 4-26).

Repair. (figure 5-43)

- (1) Remove filler cap (1) and fittings (2) and (3) from fuel tank (4).
- (2) Inspect fittings (2) and (3) and replace if threads are stripped or fittings are otherwise damaged.
- (3) Repair cracks in fuel tanks (4) by welding. Refer to TM 9-237 for welding instructions.
- (4) Inspect grounding strap (5) and cover (6) and replace if damaged.

CAUTION

Leave 1 1/2 threads exposed on fitting when applying teflon tape. This will ensure that no teflon tape will hang down inside the fuel system. Teflon tape should be wrapped in such a manner that when the fitting is tightened the tape will not loosen. Failure to wrap teflon tape correctly may result in contamination or blockage of the fuel system .

- (5) Apply teflon tape to pipe threads on fittings (2) and (3).
- (6) Install fittings (2) and (3).
- (7) Install filler cap (1).

FOLLOW-ON MAINTENANCE
Install fuel tank (para. 4-22).

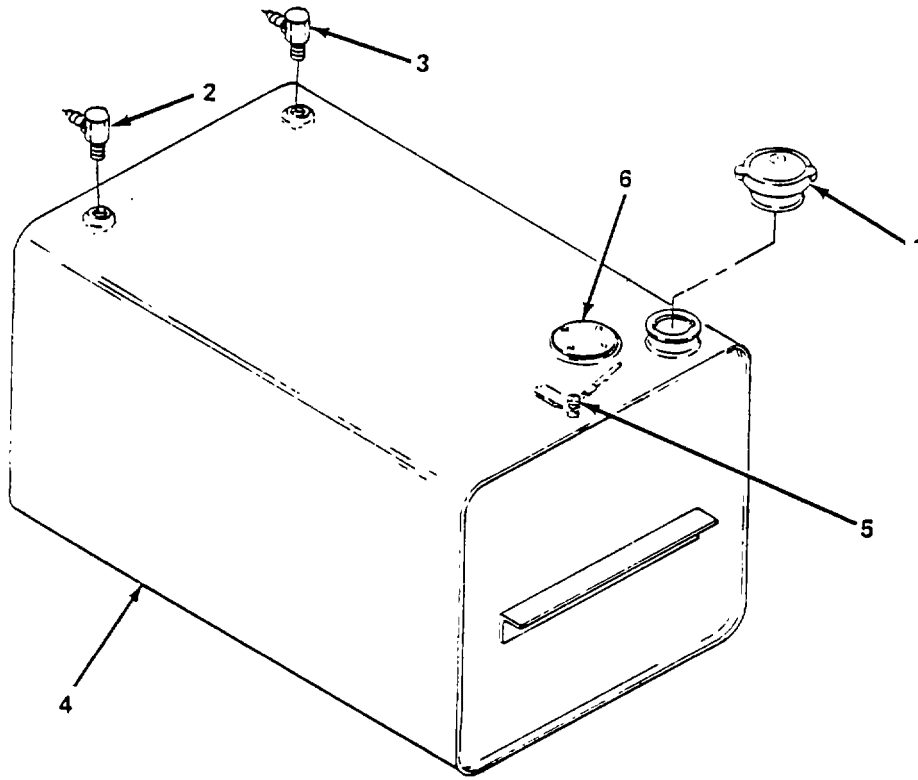


Figure 5-43. Fuel Tank, Repair.

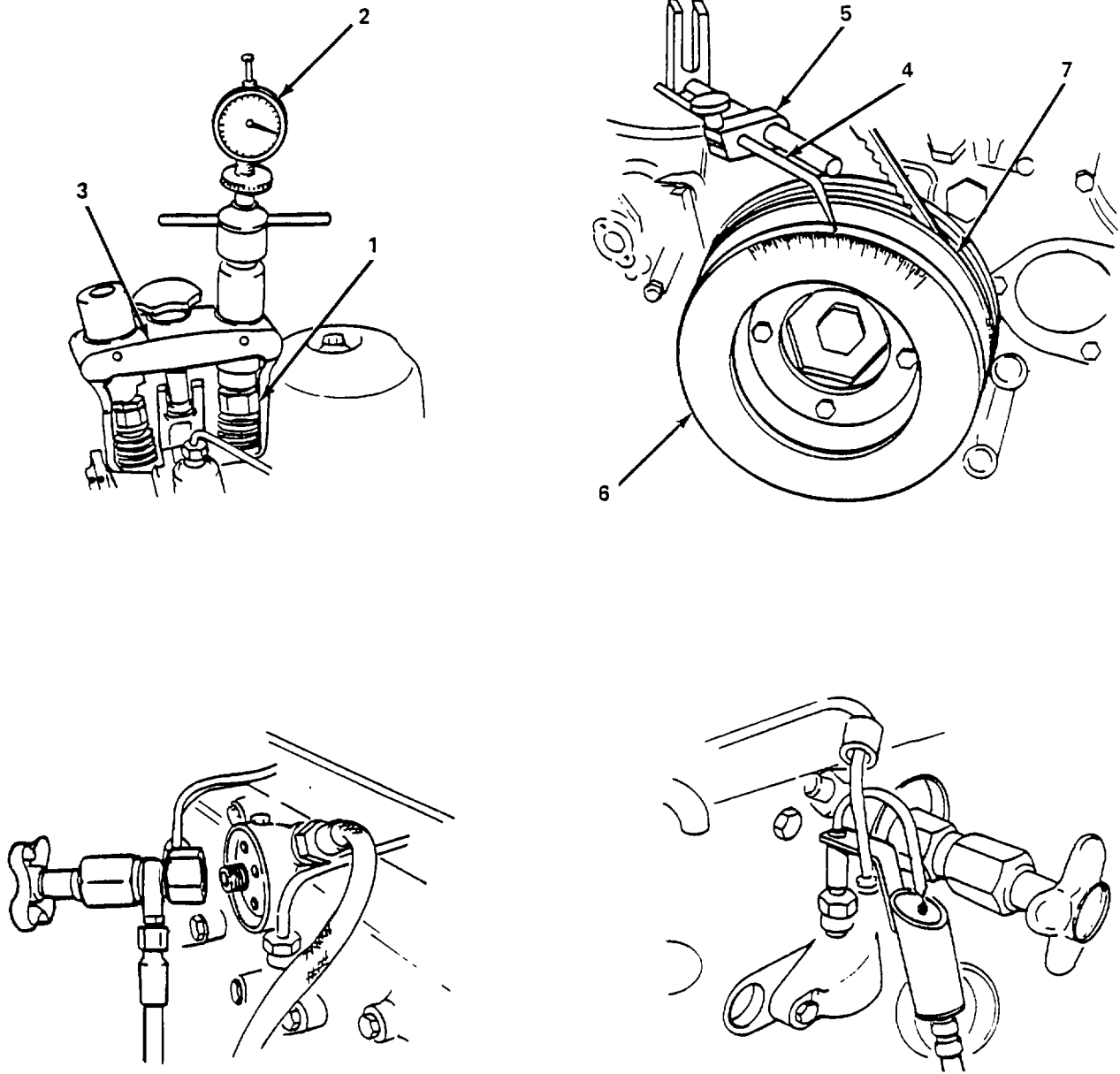


Figure 5-44. Fuel Injection Pump, Adjust (Sheet 1 of 2).

5-30. Fuel Injection Pump (Cont).

- (9) Turn back crankshaft through about one revolution of gage pointer (4), then again in original direction up to 0.1 mm (10 graduations) from O-position on gage. Read crankshaft position from magnetic scale on pulley and record. This is the fuel break point.
- (10) Turn crankshaft in running direction (clockwise) beyond "O" through about one revolution of the gage and turn backup to 0.1 mm (10 graduations) before "O" on gage. This is the combustion point.
- (11) Read crankshaft position from magnetic scale (6) on pulley and record. The middle of the two crankshaft positions is the TDC(=OT) mark.
- (12) Turn crankshaft so that the TDC(=OT) mark found lines up with the pointer (4).
- (13) Remove setting device and dial gage.
- (14) Install rocker cover (para. 4-52).
- (15) Turn the crankshaft backwards through 90 degrees, then in the direction of engine rotation until the pointer (4) lines up with the fuel break point as recorded in 9 above.
- (16) Remove fuel filter (para. 4-33).
- (17) Remove injector line to cylinder 1 (para. 4-34).
- (18) Connect the high pressure line of the high pressure tester to the threaded sleeve for the fuel filter.
- (19) Connect the overflow pipe with funnel and return line to the stub on the injector pump where the injector line was disconnected.
- (20) Turn the crankshaft in the direction opposite that of the engine rotation through 90 degrees from the fuel break point.
- (21) Turn on the high pressure pump.
- (22) Turn crankshaft very slowly in normal direction, until only droplets come out of the overflow pipe into the funnel at intervals of 5 to 8 seconds.
- (23) Check the pointer (4) and magnetic scale (6) on the crankshaft pulley (7). The reading should be the fuel break point as previously recorded.
- (24) If fuel delivery is correct, no further action is required. If fuel delivery is not correct, proceed to next step.
- (25) Turn off high pressure tester.
- (26) Turn crankshaft in direction opposite that of engine rotation through 90 degrees from the fuel break setting and then in direction of engine rotation until fuel break setting is reached.

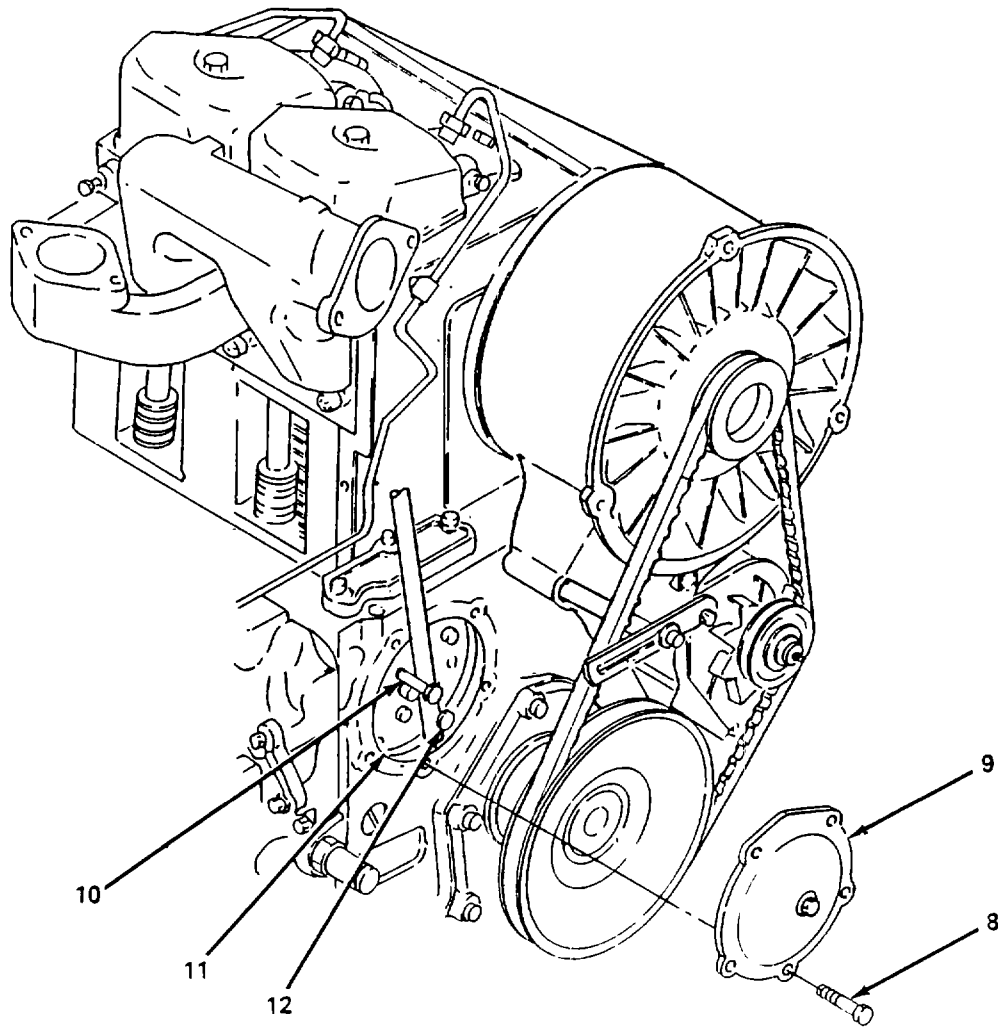


Figure 5-44. Fuel Injection Pump, Adjust (Sheet 2 of 2).

5-30. Fuel Injection Pump (Cont).

- (27) Remove five screws (8) and remove camshaft cover (9).
- (28) Remove two diagonally located screws (10) securing gearwheel (11) on camshaft.
- (29) Install two screws (M8 x 80 mm) in place of screws removed above.
- (30) Loosen, but do not remove the other two screws (12), securing the gearwheel (11) to camshaft.
- (31) Turn on high pressure tester.
- (32) By means of the two long screws, turn camshaft in direction of engine rotation until injector pump starts to deliver fuel in droplets into funnel at intervals of 5 to 8 seconds.
- (33) The pointer (4) on crankshaft should be pointing to fuel break point on magnetic scale (6).
- (34) Tighten two screws (12) securing the camshaft gearwheel (11).
- (35) Check again the point of delivery and if necessary, correct.
- (36) Turn off high pressure tester.
- (37) Remove high pressure tester line from threaded sleeve for fuel filter.
- (38) Install fuel filter (para. 4-33).
- (39) Remove overflow pipe with funnel from the injector pump.
- (40) Install injector line between injector pump and cylinder 1 (para. 4-34).
- (41) Remove pointer (4) from dowel sleeve (5).
- (42) Remove graduated scale (6) from crankshaft.

b. Replace. (figure 5-45)

- (1) Remove fuel filter (para. 4-33).
- (2) Remove injector lines (para. 4-34).
- (3) Remove nut (1) and lockwashers (2) and remove clamp (3).
- (4) Remove breather line (4).
- (5) Remove two nuts (5) and lockwashers (6).
- (6) Remove allen head screw (7) and lockwasher (8).

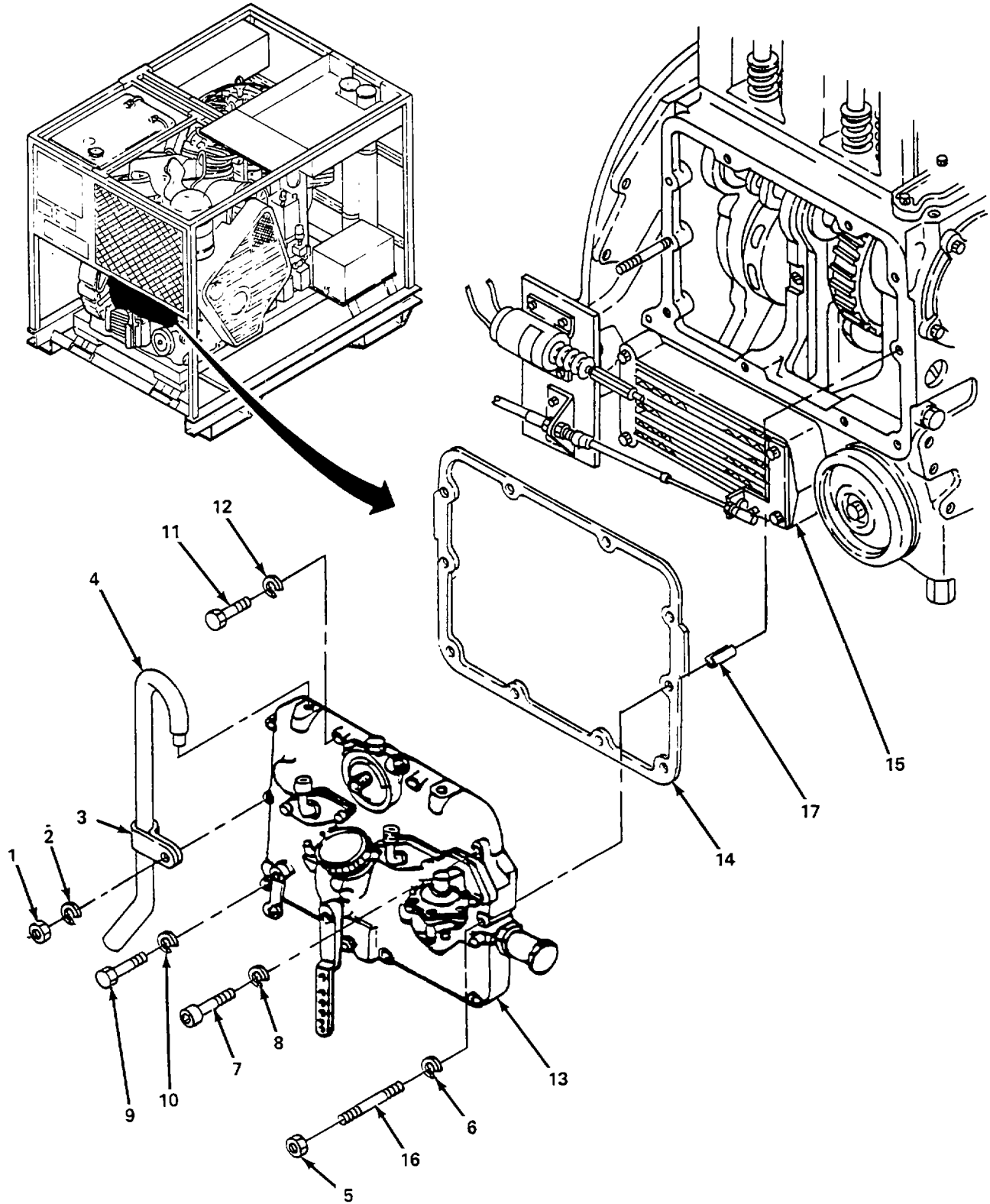


Figure 5-45. Fuel Injection Pump, Replace.

5-30. **Fuel Injection Pump (Cont).**

- (7) Remove five bolts (9) and lockwashers (10).
- (8) Remove two bolts (11) and lockwashers (12).
- (9) Remove injector pump (13) and gasket (14) from engine (15).
- (10) Remove two studs (16) and bushings (17).
- (11) Turn engine crankshaft so that fuel cams face in direction of crankcase.
- (12) Apply grease to gasket (14) and place in position on injector pump (13).
- (13) Install two bushings (17) and studs (16).
- (14) Install injector pump (13) on engine (15) so that gears are in mesh.

NOTE

Two of the seven bolts to be installed are shorter than others. They are installed at the top center of injector pump.

- (15) Install fingertight two short bolts (11) and lockwashers (12).
- (16) Install fingertight five bolts (9) and lockwashers (10).
- (17) Install fingertight allen head screw (7) and lockwashers (8).
- (18) Install fingertight two nuts (5) and lockwashers (6).
- (19) Tighten uniformly in diagonal sequence nuts, bolts, and allen head screw securing injector pump (13) to engine (15).
- (20) Install breather line (4) and secure with clamp (3), lockwasher (2), and nut (1).
- (21) Install injector lines (para. 4-34).
- (22) Install fuel filter (para. 4-33).

c. Repair. (figure 5-46)

- (1) Remove injector pump (para. b. above).
- (2) Remove sealing ring (1), throttle screw (2) and sealing ring (3).
- (3) Remove screw plug (4), sealing ring (5), and screw plug (6).
- (4) Remove screw-in nipple (7), plug (8) and clamping bushing (9).

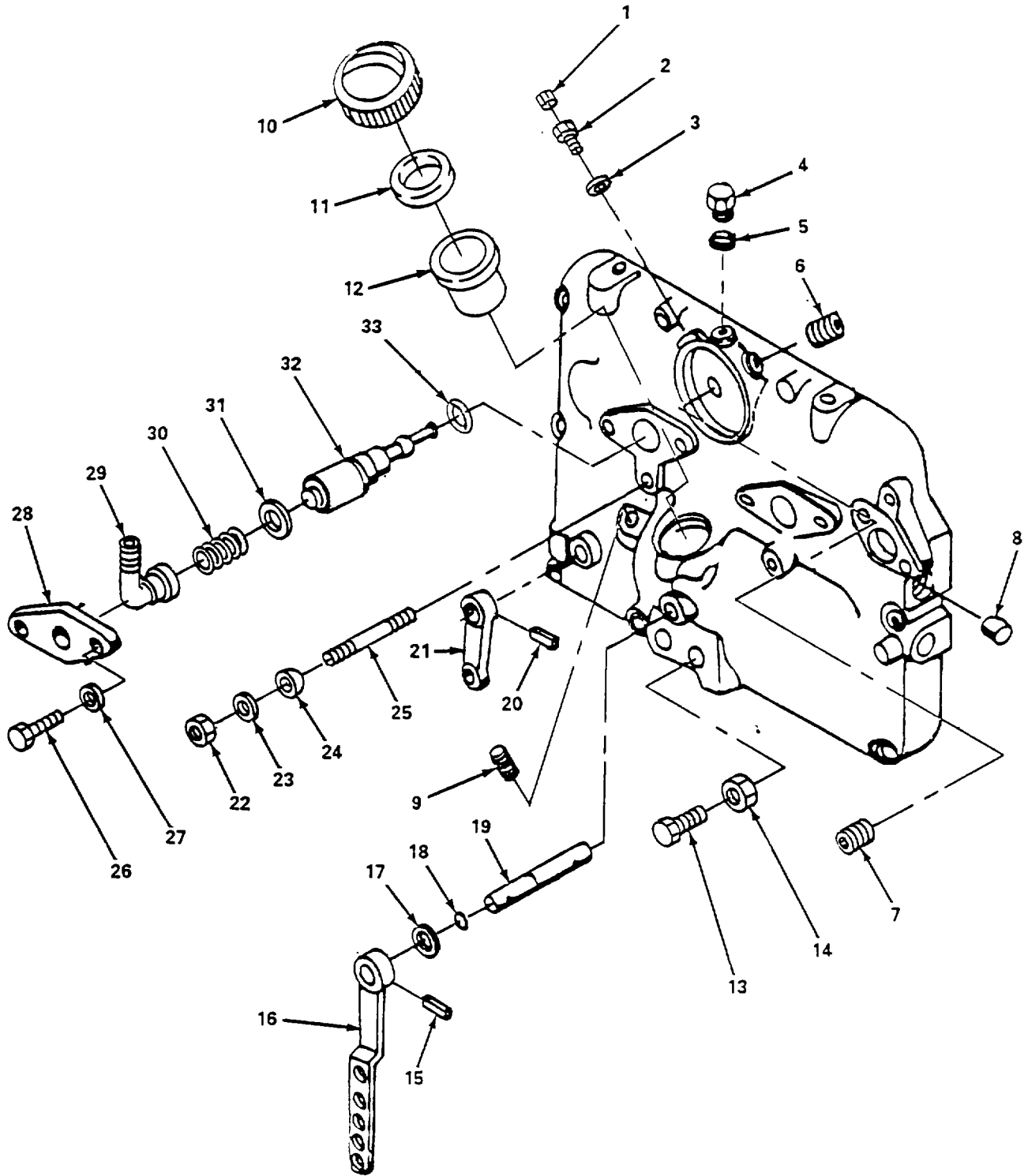


Figure 5-46. Injection Pump, Repair (Sheet I of 3).

5-30. Fuel Injection Pump (Cont).

- (5) Remove cover (10), sealing ring (11), and base (12).
- (6) Remove bolt (13) and nut (14).
- (7) Remove dowel pin (15), lever arm (16), lockwasher (17), seal (18), and shaft (19).
- (8) Remove dowel pin (20) and shutdown lever (21).
- (9) Remove nut (22), washer (23), ball socket (24), and stud (25).
- (10) Remove two bolts (26), lockwashers (27), and flange (28).
- (11) Remove angle piece (29), compression spring (30), sealing ring (31), pump element (32), and sealing ring (33).
- (12) Remove alien screw (34) and sealing ring (35).
- (13) Remove notched nail (36) and cover plate (37).
- (14) Remove notched pin (38), shutdown shaft (39), yoke spring (40), and seal (41).
- (15) Remove cap nut (42), sealing ring (43), nut (44), sealing ring (45), half-moon ring (46), and pin spigot (47).
- (16) Remove dowel pin (48), forked lever (49), spring cap (50), spring (51), and sleeve (52).
- (17) Remove spring cap (53), lockwasher (54), circlip (55), and guide (56), from pin/bolt/stud (57).
- (18) Remove ball bearing (58), lockwasher (59), and ball bearing (60) from pin/bolt/stud (57).
- (19) Remove retaining ring (61), gear (62), and plate (63) from pin/bolt/stud (57).
- (20) Remove half-moon ring (64), bushing (65), flyweight (66), and ball bearing (67) from pin/bolt/stud (57).
- (21) Remove two nuts (68), lockwashers (69), washers (70), from studs (71).
- (22) Remove roller pivot pin (72), roller (73), locking spring (74), and roller tappet bushing (75).
- (23) Remove tappet guide (76), four shims (77), spring cap (78), taper spring (79), support plate (80), piston guide (81), and two studs (71).
- (24) Remove draw spring (82), nut (83), lockwasher (84), and bolt (85).
- (25) Remove control lever (86), dowel pin (87), spring (88), lever arm (89), and seal (90) from injection pump housing (91).

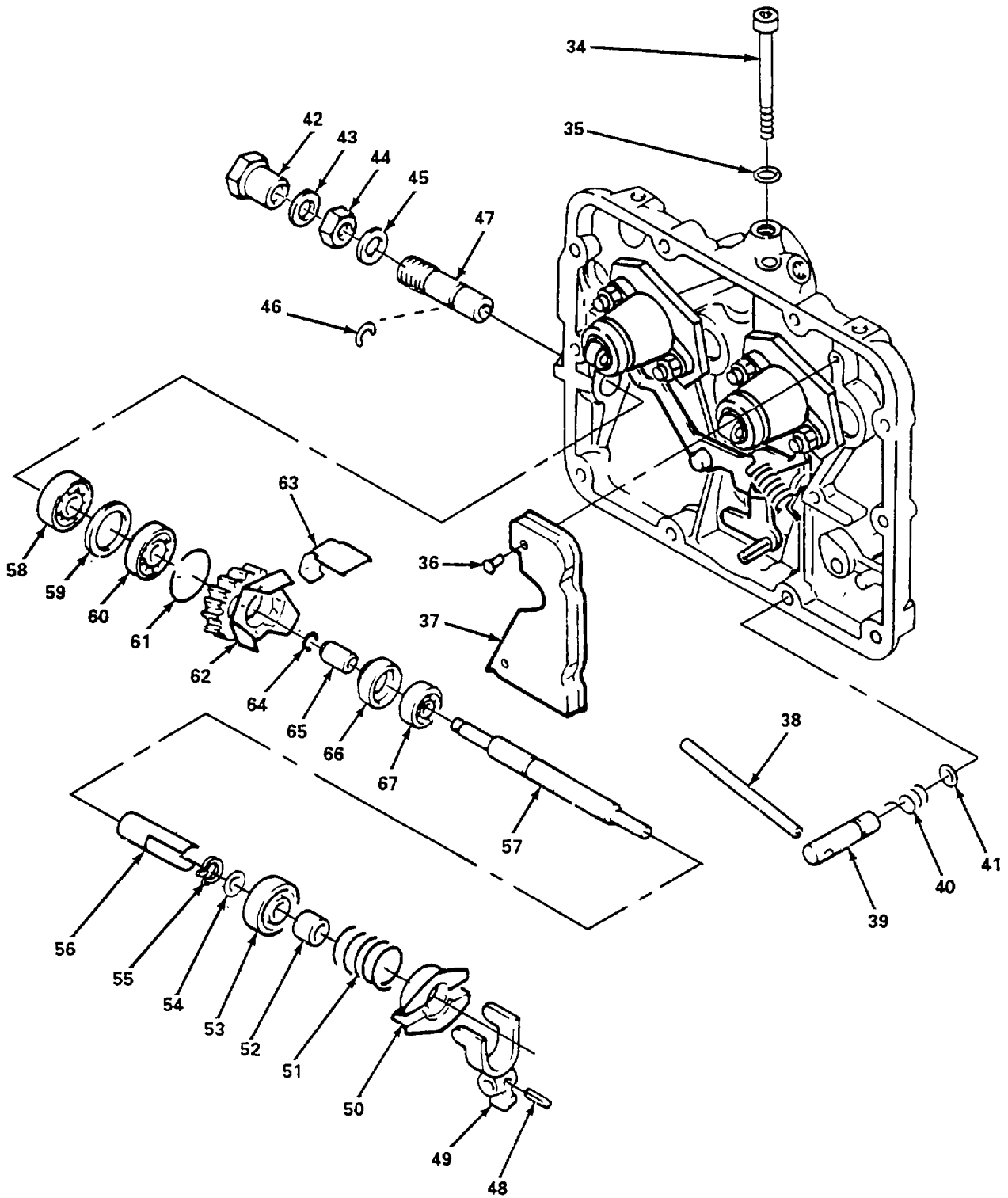


Figure 5-46. Injection Pump, Repair (Sheet 2 of 3).

5-30. Fuel Injection Pump (Cont).

WARNING

Dry cleaning solvent PD-680 used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 138°F (60°C).

- (26) Clean all components with dry cleaning solvent and dry thoroughly.
- (27) Inspect all components and replace any items that are bent, cracked, or otherwise damaged.
- (28) Install seal (90), dowel pin (87), and spring (88) in lever arm (89).
- (29) Install lever arm (89) on control lever (86) and secure with bolt (85), lockwasher (84), and nut (83).
- (30) Install draw spring (82) on control lever (86).
- (31) Install stud (71), piston guide (81), support plate (80) on injection pump (91).
- (32) Install taper spring (79), spring cap (78), four shims (77), and tappet guide (76).
- (33) Install roller tappet bushing (75), locking spring (74), roller (73), and roller pivot pin (72).
- (34) Install two washers (70), lockwashers (69), and nuts (68).
- (35) Install ball bearing (67), flyweight (66), bushing (65) on pin/bolt/stud (57) and secure with half-moon ring (64).
- (36) Install gear (62) and plate (63) on pin/bolt/stud (57), and secure with retaining ring (61).
- (37) Install ball bearing (60), lockwasher (59), and ball bearing (58).
- (38) Install guide (56), circlip (55), lockwasher (54), spring cap (53) on pin/bolt/stud (57).
- (39) Install sleeve (52), spring (51), spring cap (50), forked lever (49), and dowel pin (48).
- (40) Install pin spigot (47), half-moon ring (46), sealing ring (45), nut (44), sealing ring (43), and cap nut (42).
- (41) Install seal (41), yoke spring (40), shutdown shaft (39), and notched pin (38).
- (42) Install cover plate (37) and secure with notched nail (36).
- (43) Install sealing ring (35) and allen screw (34).
- (44) Install sealing ring (33), pump element (32), sealing ring (31), compression spring (30), and angle piece (29).
- (45) Install flange (28) and secure with two lockwashers (27) and bolts (26).

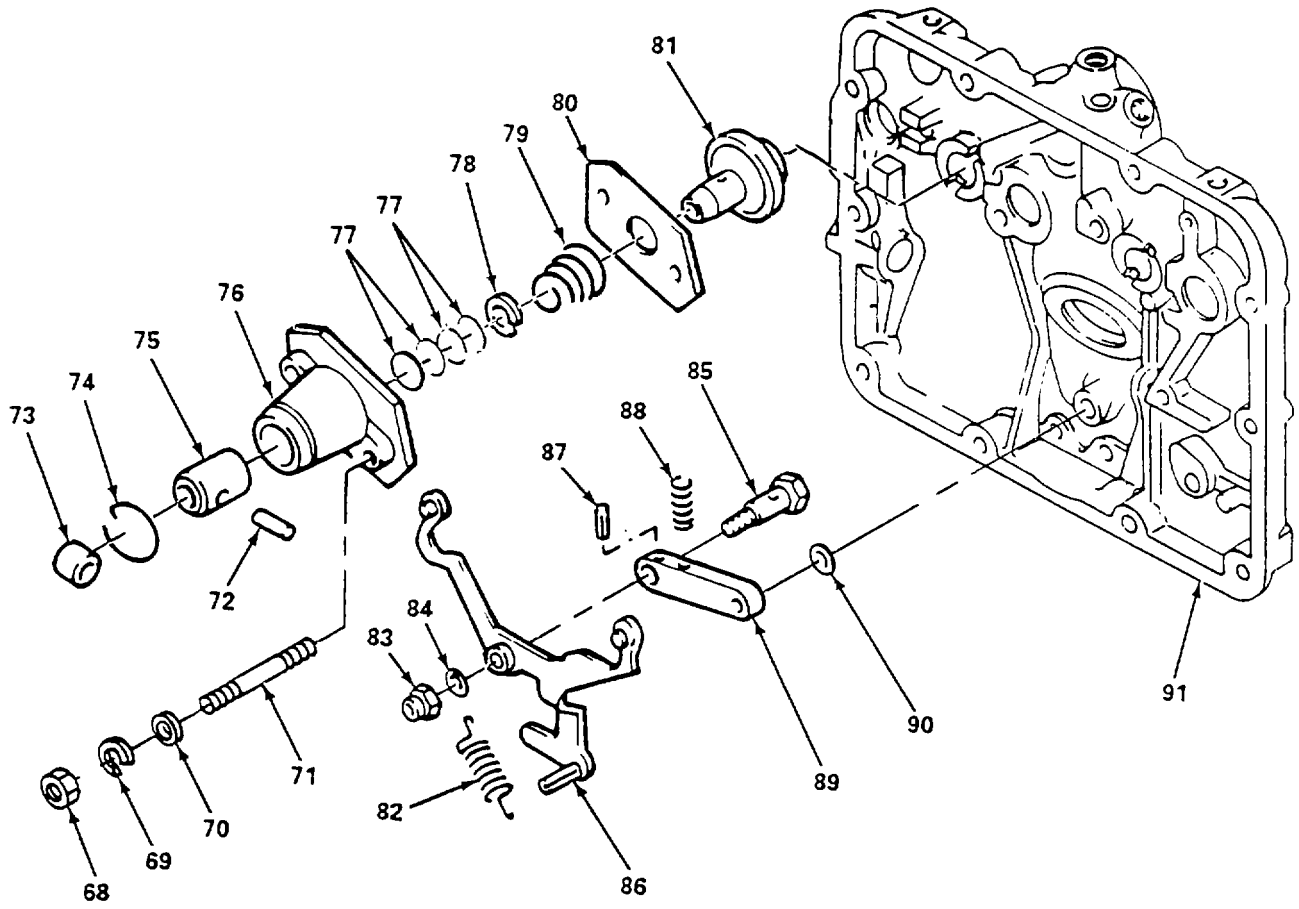


Figure 5-46. Injection Pump, Repair (Sheet 3 of 3).

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- (46) Install stud (25), ball socket (24), washer (23), and nut (22).
- (47) Install shutdown lever (21) and dowel pin (20).
- (48) Install shaft (19), seal (18), lockwasher (17), lever arm (16), and dowel pin (15).
- (49) Install nut (14) and bolt (13).
- (50) Install base (12), sealing ring (11), and cover (10).
- (51) Install compression bushing (9), plug (8), screw-in nipple (7), and screw plug(6).
- (52) Install sealing ring (5) and screw plug (4).
- (53) Install sealing ring (3), throttle screw (2), and sealing ring (1).
- (54) Install injection pump (para. b. above).

FOLLOW-ON MAINTENANCE

- (1) Install rocker cover (para. 4-52).
- (2) Install fuel supply hose (para. 4-32).
- (3) Install V-belt guard (para. 4-15).

5-31. Engine Injectors

This task covers:

Replace

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)
Spanner (PN 0030586)
Double Socket Insert (PN 0030581)

Equipment Condition

Compressor unit shut down (para 2-13).
Injector lines removed (para. 4-34).
Over flow line removed (para. 4-35).

*Materials/Parts***Engine Injectors**

Replace. (figure 5-47)

NOTE

There are two injectors. Replacement of each injector is the same.

- (1) Remove nut (1), yoke retainer (2), and thrust piece (3).
- (2) Using spanner and double socket insert, remove injector (4) and bushing (5).
- (3) Remove sealing ring (6) from injector chamber (7).
- (4) Install sealing ring (6) in injector chamber (7).
- (5) Install bushing (5) on injector (4).
- (6) Using spanner and double socket insert, install injector (4) with bushing (5) into chamber (7).
- (7) Install thrust piece (3), yoke retainer (2), and nut (1).

FOLLOW-ON MAINTENANCE

- (1) Install over flow line (para. 4-35).
- (2) Install injector lines (para. 4-34).

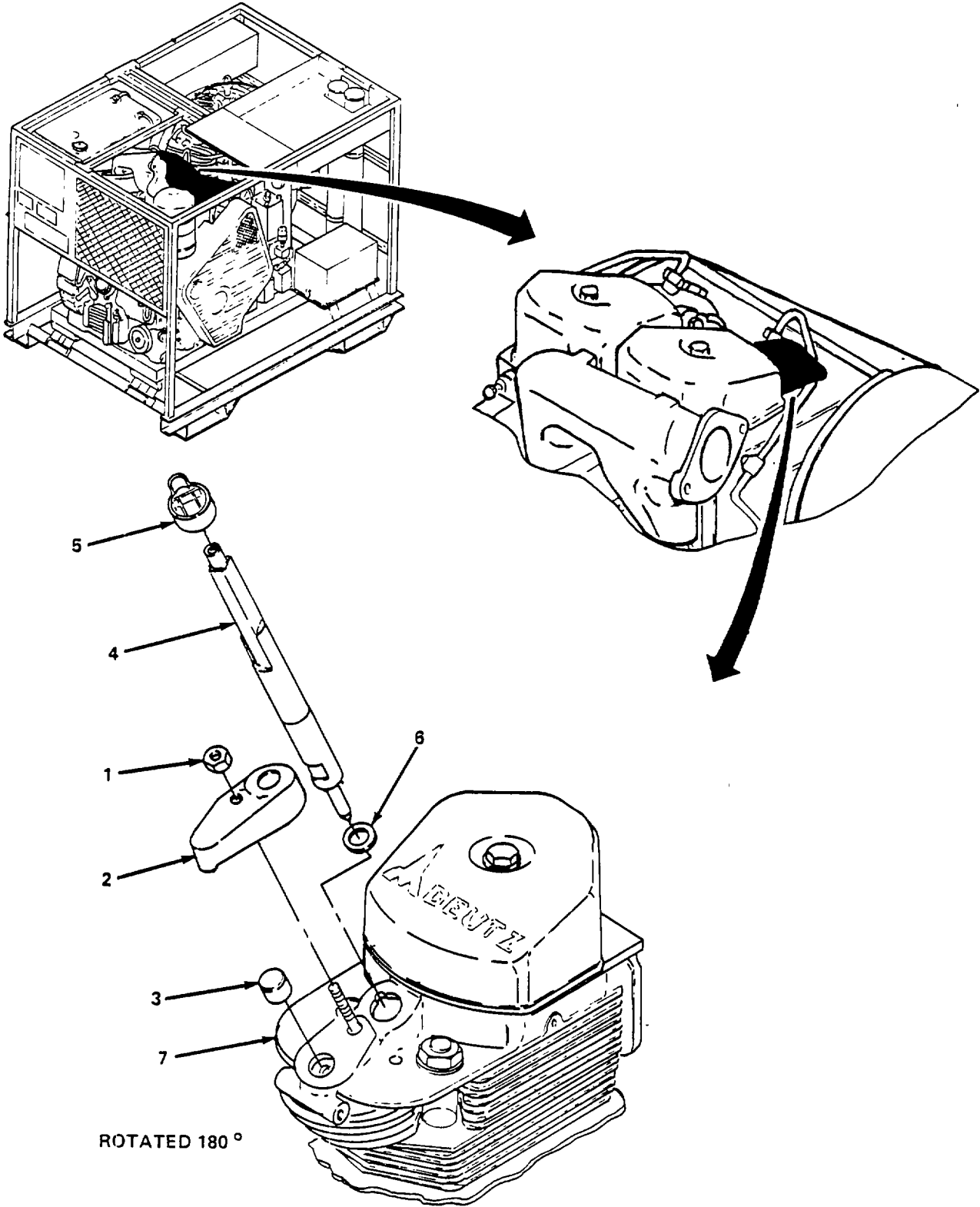


Figure 5-47. Engine Injectors, Replace.

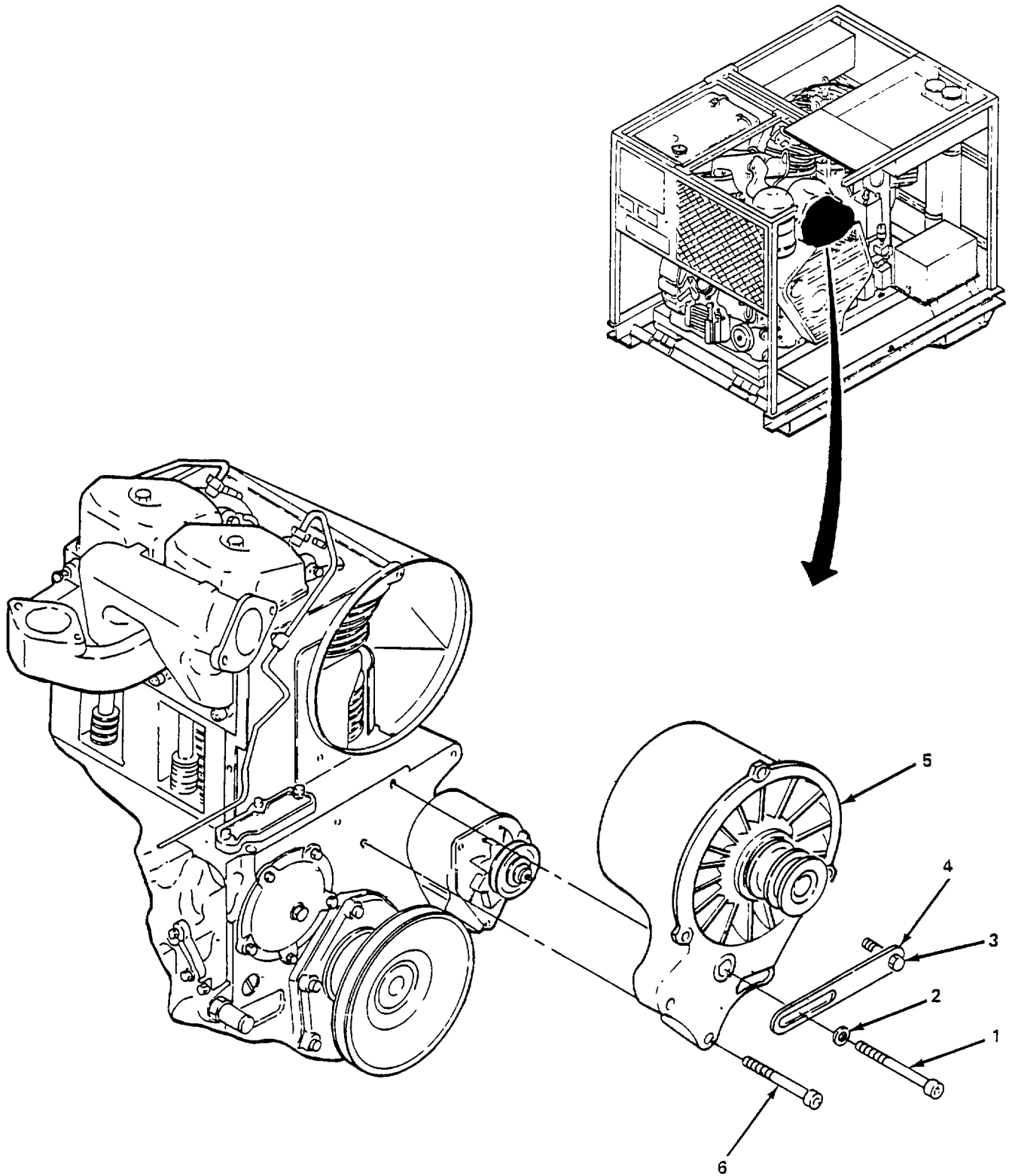


Figure 5-48. Cooler Air Blower, Replace.

5-32. **Cooler Air Blower (Cont).**b. Repair. (figure 5-49)

- (1) Remove cooler air blower (para. a. above).
- (2) Remove bolt (1), washer (2), and nut (3).
- (3) Remove pulley (4), impeller (5), thrust washer (6), and bearing shaft (7).
- (4) Remove circlip (8) and press out the two grooved ball bearings (9) and (10) and spacer sleeve (11) from housing (12).

WARNING

Dry cleaning solvent PD-680 used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 138°F (60°C).

- (5) Clean all items, except bearing, with dry cleaning solvent and dry thoroughly.
- (6) Inspect ball bearing (9) and (10) for any corrosion or pitting and replace if worn or otherwise damaged.
- (7) Inspect housing (12) for scoring or burred and replace if cracked or otherwise damaged.
- (8) Inspect impeller for cracks and replace if damaged.
- (9) Pack bearing (9) and (10) with wheel bearing grease.
- (10) Install bearing (9) with the enclosed side to the front.
- (11) Install bearing shaft (7) in groove ball bearing (10) and slide spacer sleeve (11) on bearing shaft (7).
- (12) Half fill the space between spacer sleeve (11) and casing wall with wheel bearing grease.
- (13) Press in the second ball bearing (10) so that enclosed side seats against spacer sleeve (11).
- (14) Install circlip (8) in groove.
- (15) Install the thrust washer (6) on bearing shaft (7).
- (16) Install pulley (4) and impeller (5) and secure with bolt (1), washer (2), and nut (3).
- (17) Install cooler air blower (para. a. above).

FOLLOW-ON MAINTENANCE
Install V-belts (para. 4-41).

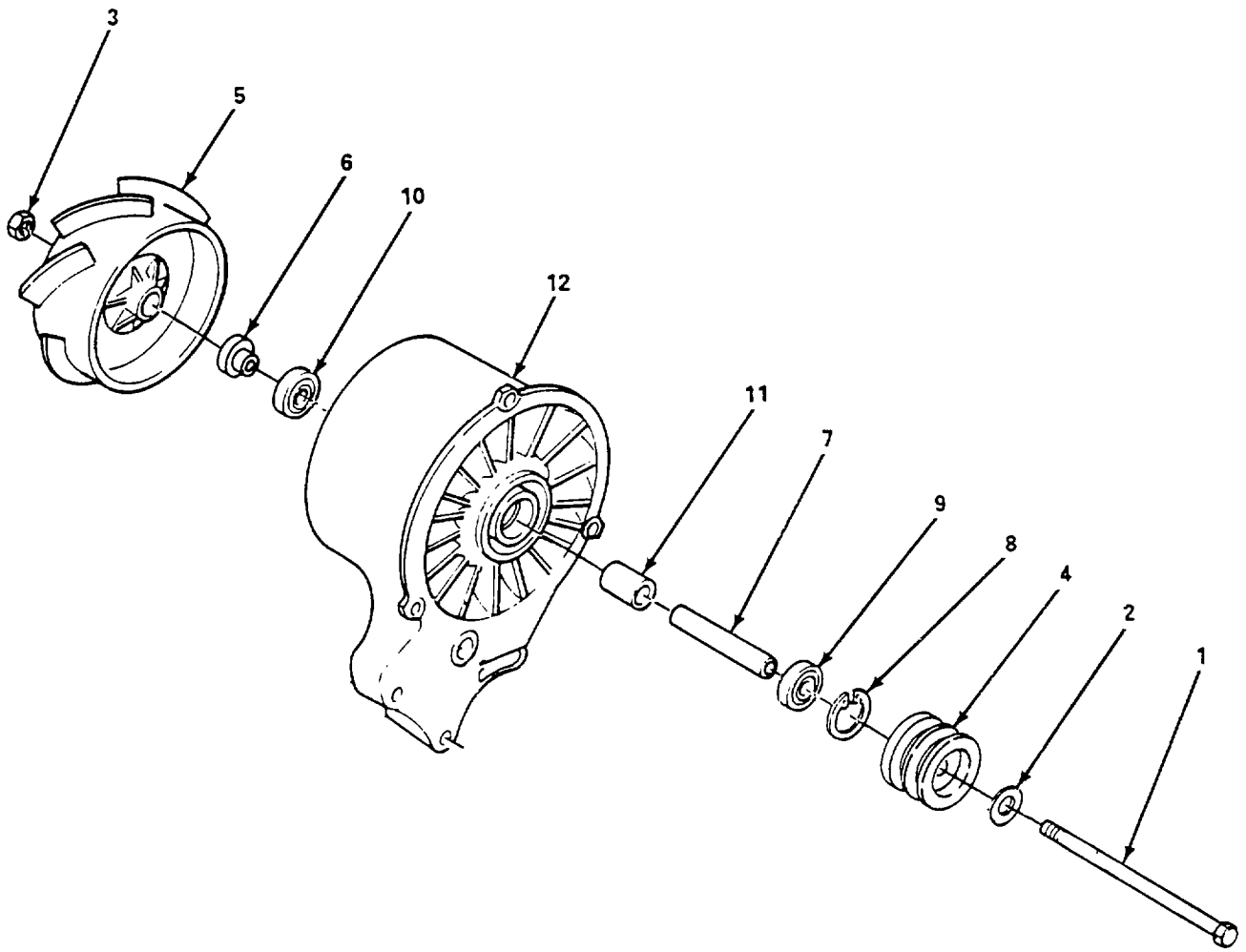


Figure 5-49. Cooler Air Blower, Repair.

5-33. Oil Pump

This task covers:

Replace

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)
Retainer (PN 0030446)
Angle-of-Turn Indicator (PN 0031102)

Equipment Condition

Compressor unit shut down (para. 2-13).
V-belts removed (para. 4-41).

*Reference**Materials/Parts*

Refer to Appendix F for torque values.

Sealing Rings

Replace. (figure 5-50)

- (1) Remove nut (1) from V-belt pulley (2).
- (2) Using retainer, remove V-belt pulley (2).
- (3) Remove 10 bolts (3) and sealing rings (4) from front cover (5). Discard sealing rings (4).
- (4) Remove front cover (5) with oil pump (6) and suction pipe (7) attached from engine (8).
- (5) Remove two bolts (9) and sealing rings (10) and remove oil pump (6) with suction pipe (7) from front cover (5).
- (6) Remove suction pipe (7), cap screw nut (11) and duplex ring (12) from oil pump (6).
- (7) Install duplex ring (12), cap screw nut (11) and suction pipe (7) on oil pump (6).
- (8) Install oil pump (6) on front cover (5) and secure with two sealing rings (10) and bolts (9).
- (9) Install front cover (5) on engine (8) and secure ten sealing rings (4) and bolts (3).
- (10) Using retainer, install V-belt pulley (2).
- (11) Install nut (1) on end of crankshaft and using angle-of-turn indicator, tighten nut (1) per Appendix F.

FOLLOW-ON MAINTENANCE

Install V-belts (para. 4-41).

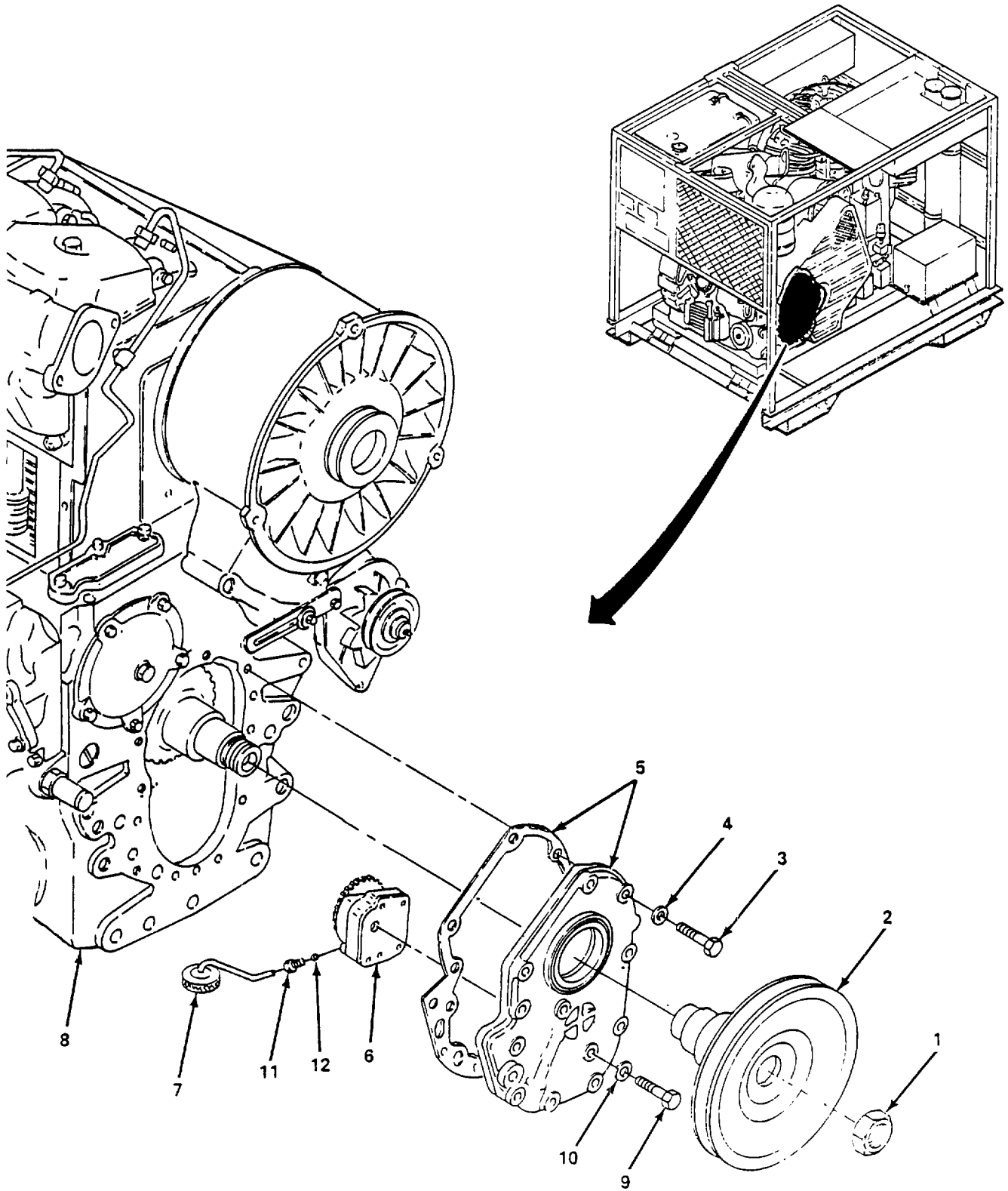


Figure 5-50. Oil Pump, Replace.

5-34. Lube Oil Line.

This task covers:

Replace

INITIAL SETUP

Tools

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)
Retainer (PN 0030446)
Angle-of-Turn Indicator (PN 0031102)

Equipment Condition

Compressor unit shut down (para. 2-13).
V-belts removed (para. 4-41).

*Reference**Materials/Parts*

Refer to Appendix F for torque values.

Lube Oil Line Assembly
Sealing Rings

Replace. (figure 5-51)

- (1) Remove nut (1) from V-belt pulley (2).
- (2) Using retainer, remove V-belt pulley (2).
- (3) Remove ten bolts (3) and sealing rings (4) from front cover (5). Discard sealing rings (4).
- (4) Remove front cover (5) with oil pump (6) attached.
- (5) Remove suction pipe (7), cap screw (8), and duplex ring (9) from oil pump (6).
- (6) Install duplex ring (9), cap screw (8), and suction pipe (7) on oil pump (6).
- (7) Install front cover (5) with oil pump (6) in engine (10) and with ten sealing rings (4) and bolts (3).
- (8) Using retainer, install V-belt pulley (2).
- (9) Install nut (1) on end of crankshaft and using angle-of-turn indicator tighten nut (1) per Appendix F.

FOLLOW-ON MAINTENANCE
Install V-belts (para. 4-41).

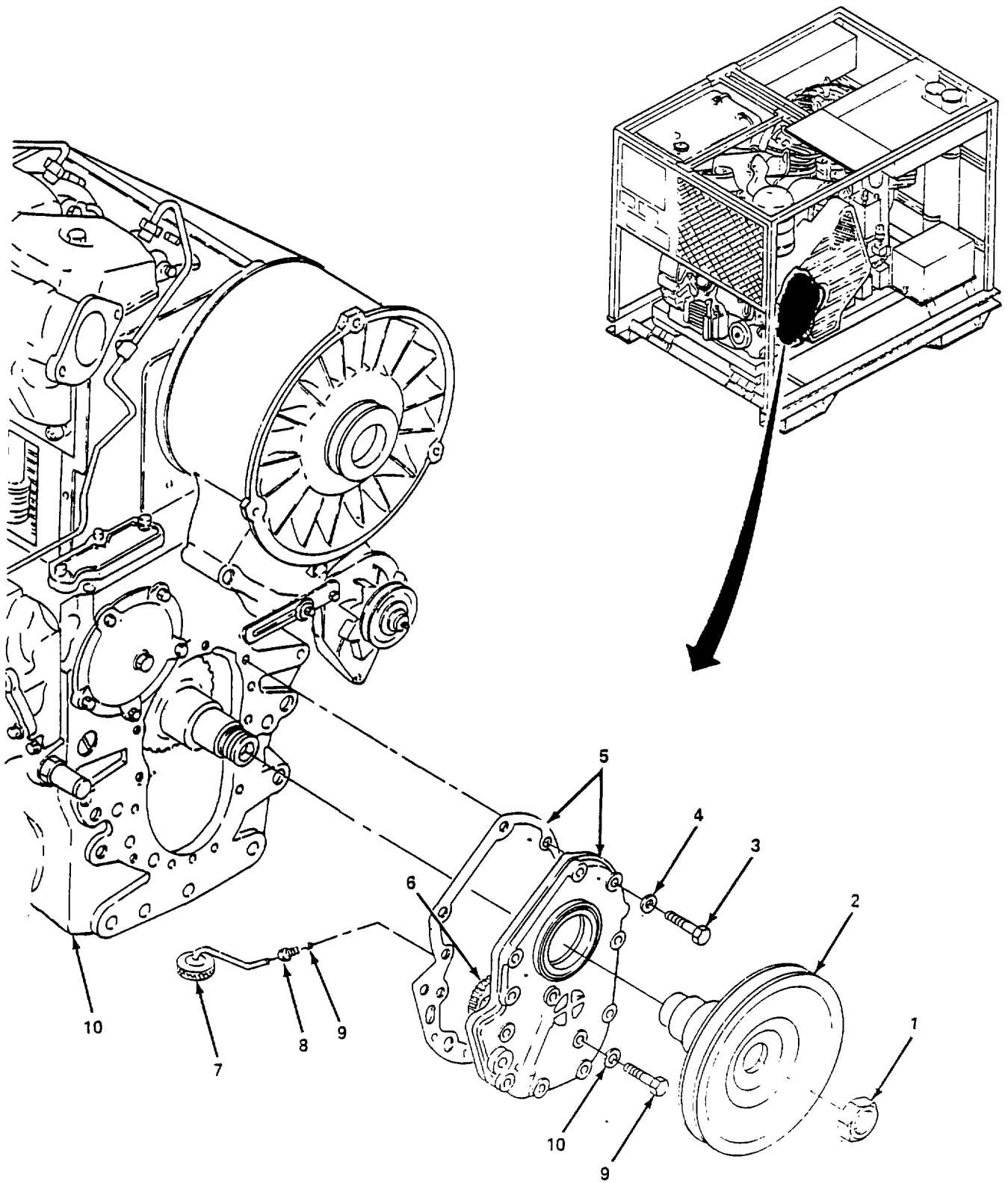


Figure 5-51. Lube Oil Line Assembly, Replace.

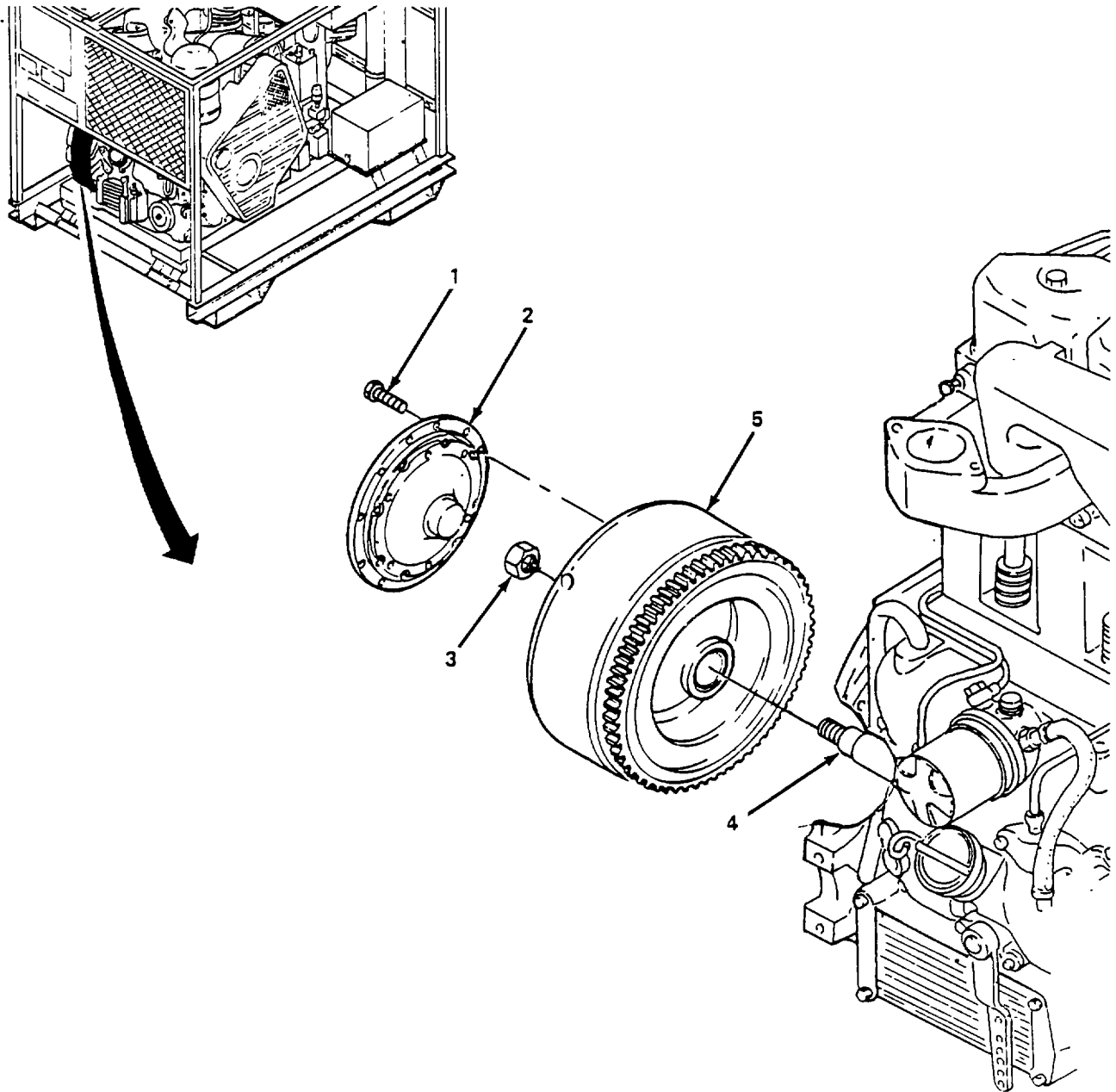


Figure 5-52. Flywheel and Clutch Carrier, Replace.

5-35. Flywheel and Clutch Carrier (Cont).b. Repair. (figure 5-53)

- (1) Remove flywheel and clutch carrier (para. a. above).
- (2) Inspect flywheel (1) and ring gear (2) and replace if teeth are worn, missing, or otherwise damaged.
- (3) Cut through ring gear (2) with hand chisel and remove.
- (4) Install ring gear (2) on flywheel (1) with beveled side of teeth facing away from flywheel.
- (5) Place ring gear (2) on flat metal surface.

CAUTION

Do not heat ring over 250°F (120°C) under any circumstances. Heating ring gear over 250°F (120°C) may destroy the original heat treatment.

- (6) Heat ring (2) uniformly using torch. Move torch completely around ring gear to avoid hot spots. Use heat indicating compound to determine temperature of ring gear.
- (7) Use tongs to place ring gear (2) on flywheel (1).
- (8) Tap the ring gear (2) in place against the shoulder on the flywheel (1).

NOTE

If ring gear can not be readily tapped into place, remove it and apply more heat, observing the above caution.

- (9) Install flywheel and clutch carrier (para. a. above).

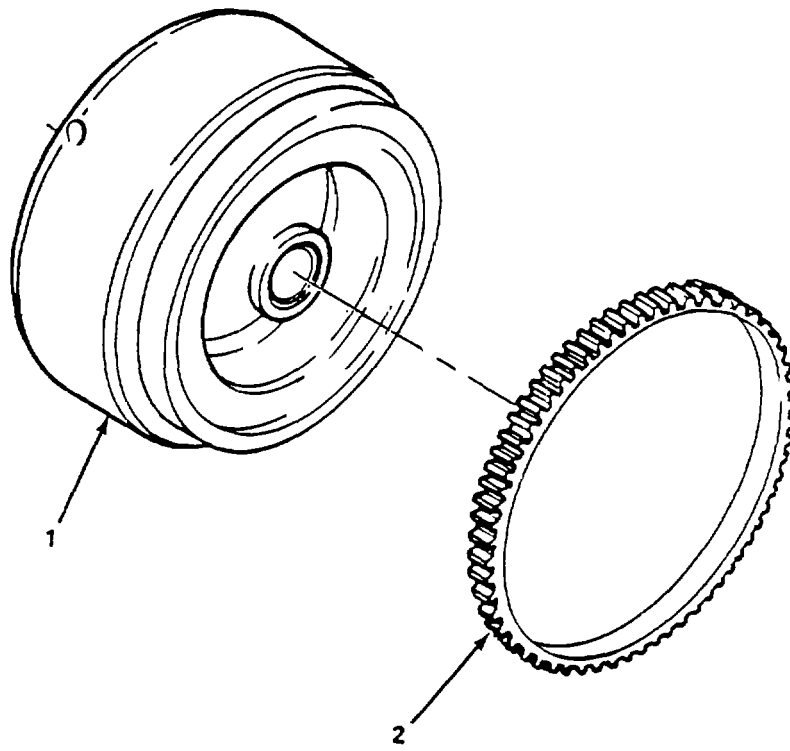


Figure 5-53. Flywheel and Clutch Carrier, Repair.

5-36. Flywheel Housing Assembly .

This task covers: Replace

INITIAL SETUP*Tools*General Mechanic's Tool Kit
(NSN 5180-00-177-7033)*Materials/Parts*Flywheel Housing Assembly

*Equipment Condition*Compressor unit shut down (para. 2-13).
Shutdown device removed (para. 4-46).
Starter removed (para. 4-47).
Rear engine mount removed (para. 4-53).
Remove clutch assembly (para. 5-48).**Replace.** (figure 5-54)

- (1) Remove bolt (1) and lockwasher (2).
- (2) Remove two bolts (3) and lockwashers (4),.
- (3) Remove nut (5) and lockwasher (6).
- (4) Remove four nuts (7).
- (5) Remove housing (8) from engine studs (9).
- (6) Install housing (8) on engine studs (9).
- (7) Install four nuts (7).
- (8) Install lockwasher (6) and nut (5).
- (9) Install two lockwashers (4) and bolts (3).
- (10) Install lockwasher (2) and bolt (1).

FOLLOW-ON MAINTENANCE

- (1) Install rear engine mount (para. 4-53).
- (2) Install starter (para. 4-47).
- (3) Install clutch assembly (para. 5-48).
- (4) Install shutdown device (para. 4-46).

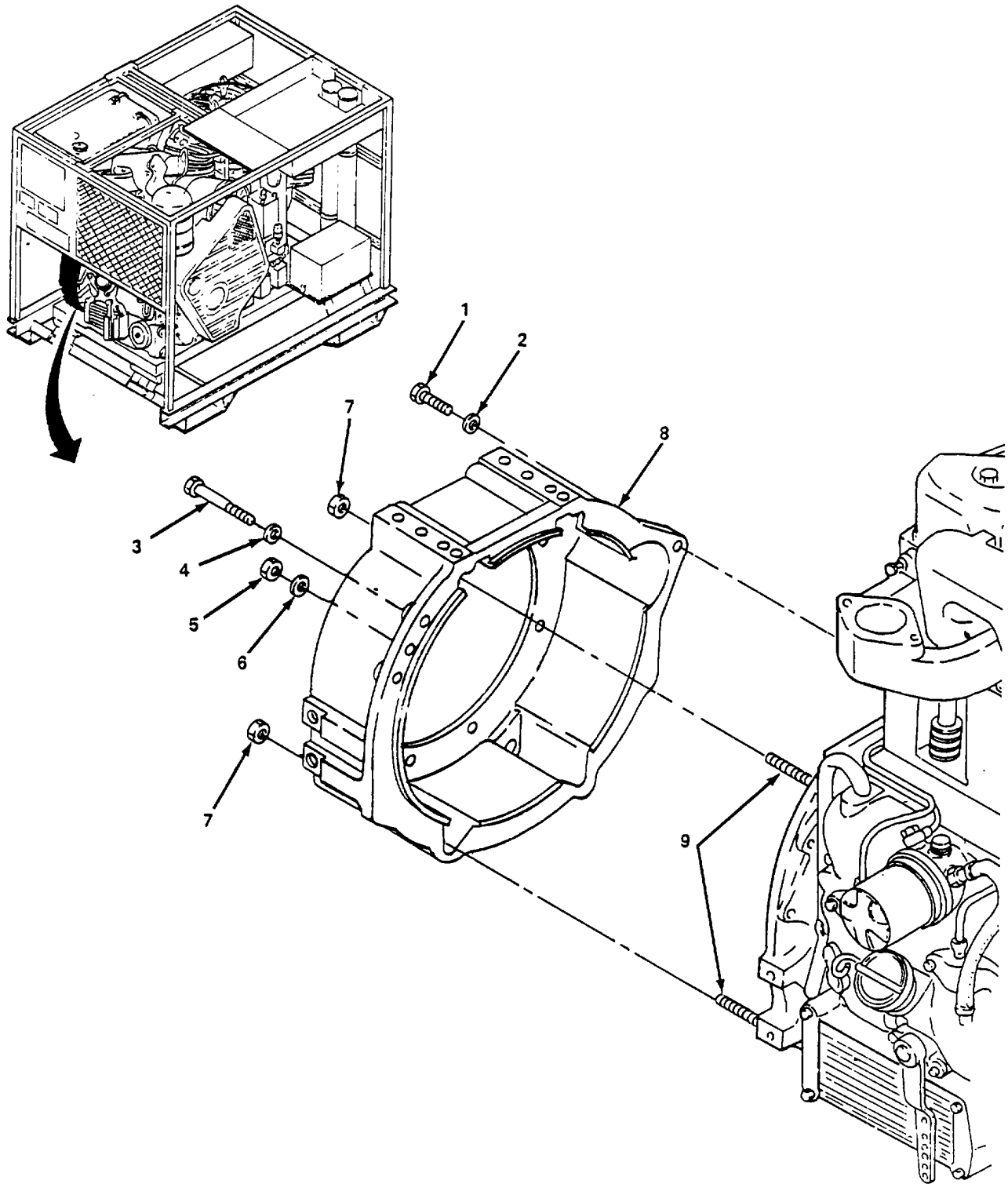


Figure 5-54. Flywheel Housing Assembly, Replace.

5-37. Rear Cover.

This task covers: Replace

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

*Materials/Parts***Rear Cover**

Equipment Condition

Compressor unit shut down (para. 2-13).
Flywheel and ring gear removed (para. 5-35).
Starter removed (para. 4-47).

Replace. (figure 5-55)

- (1) Remove two bolts (1) and lockwashers (2).
- (2) Remove four bolts (3) and lockwashers (4).
- (3) Remove two bolts (5) and lockwashers (6).
- (4) Remove rear cover (7) from engine (8).
- (5) Install rear cover (7) on engine (8).
- (6) Install two lockwashers (6) and bolts (5).
- (7) Install four lockwashers (4) and bolts (3).
- (8) Install two lockwashers (2) and bolt (1).

FOLLOW-ON MAINTENANCE

- (1) Install flywheel and ring gear (para. 5-35).
- (2) Install starter (para. 4-47).

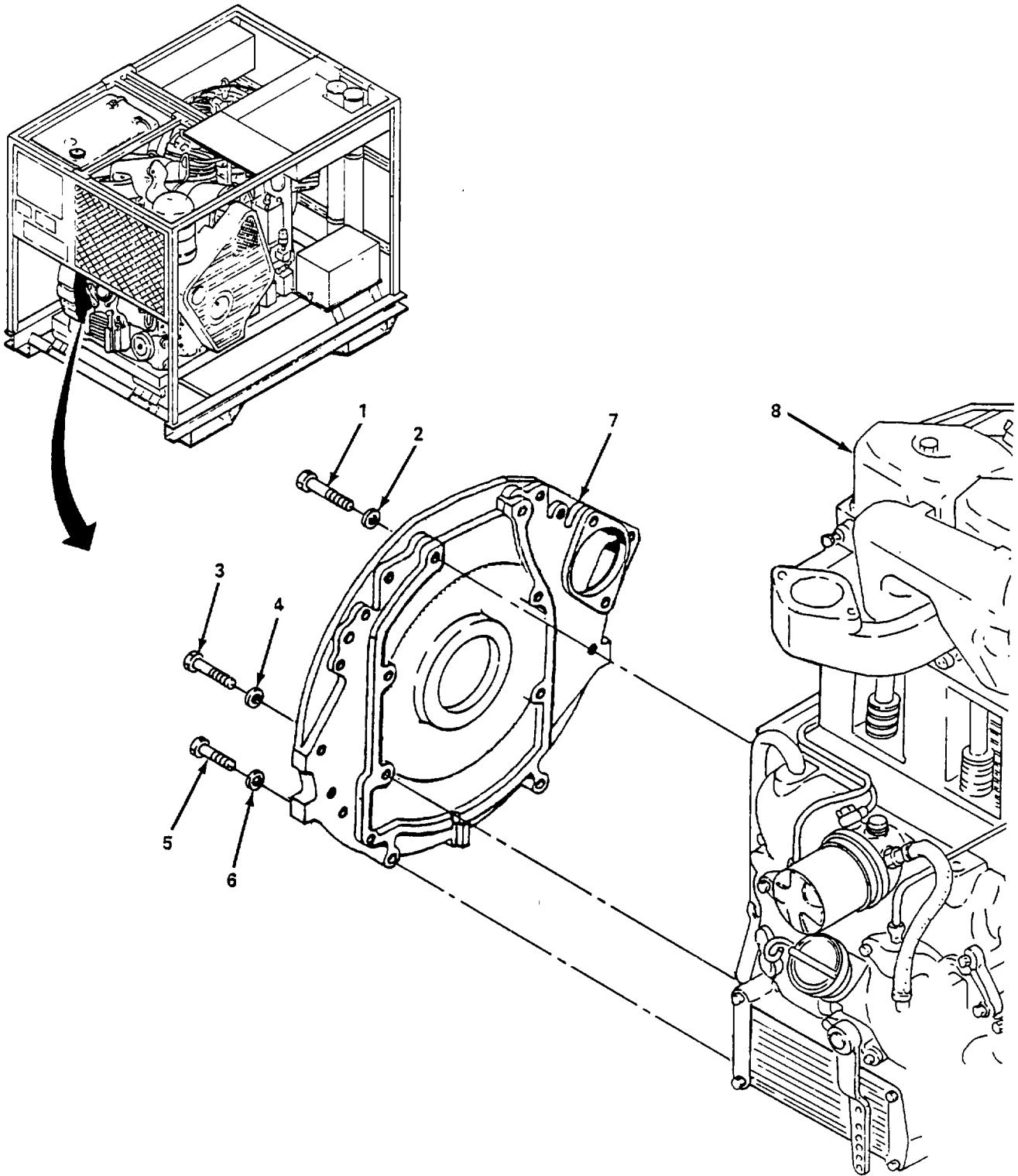


Figure 5-55. Rear Cover, Replace.

5-38. Rocker Arms and Push Rods.

This task covers: Replace

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Materials/Parts

Rocker Arm and Push Rod

Equipment Condition

Compressor unit shut down (para. 2-13).
Rocker covers removed (para. 4-52).

Reference

Refer to Appendix F for torque values.

Replace. (figure 5-56)

NOTE

There are four rocker arms and four push rods. Replacement of each rocker arm and push rod is the same.

- (1) Remove three nuts (1) and remove rocker arm bracket (2).
- (2) Remove pushrod (3) from housing (4).
- (3) Remove nut (5), lockwasher (6), washer (7), rocker arm (8), spacer (9), and stud (10) from rocker arm bracket (2).
- (4) Remove nut (11), adjusting screw (12) from rocker arm (8).
- (5) Remove nut (13) and oil metering screw (14) from rocker arm (8).
- (6) Remove thrust pad (15) from rocker arm (8).
- (7) Remove bushing (16) from rocker arm (8).
- (8) Inspect thrust pad (15) and bushing (16) for wear.
- (9) Inspect push rod (3) ends for wear, oil hole is open and rods are straight.
- (10) Install bushing (16) into rocker arm (8) ensuring the lubricating holes in the bushing are lined up with grooves in rocker arm.

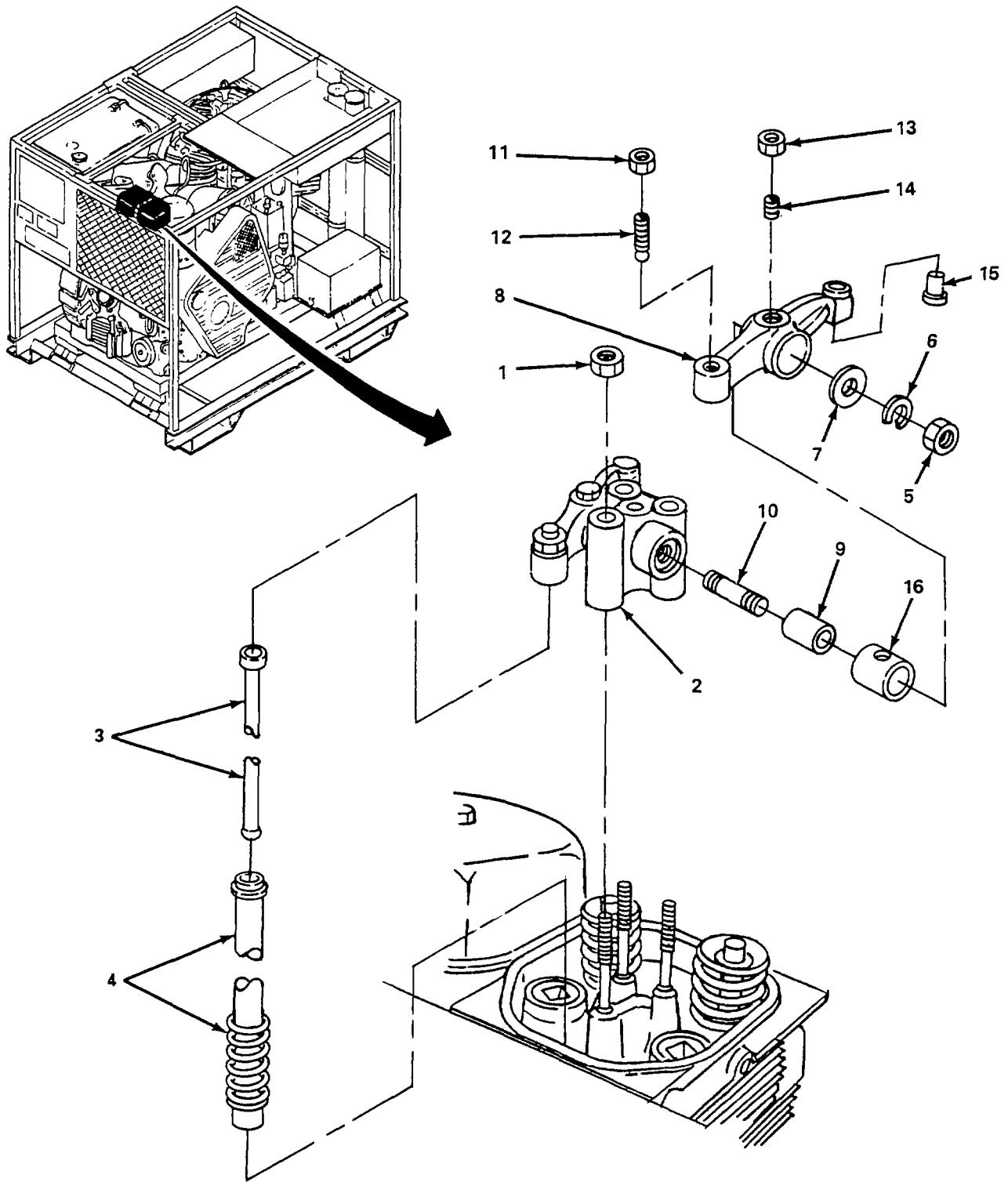


Figure 5-56. Rocker Arms and Push Rods, Replace.

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NOTE

The rocker arms are provided with an oil metering screw (14). The chamfered face of which should point to the thrust pad (15) and one thread of the oil nozzle projects beyond the locknut when installed.

- (11) Install thrust pad (15), oil metering screw (14), nut (13), adjusting screw (12) and nut (11) on rocker arm (8).
- (12) Install push rod (3) in housing.
- (13) Install stud (10) and spacer (9) on rocker arm bracket (2).
- (14) Install rocker arm (8), washer (7), lockwasher (6), and nut (5) on rockerarm bracket (2).
- (15) Position rocker arm bracket (2) on housing (4) and install three nuts (1).

FOLLOW-ON MAINTENANCE
Install rocker covers (para. 4-52).

5-39. Push Rod Tubes.

This task covers: Replace

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)
Tensioning Tool (P/N 003 0501)

Equipment Condition

Compressor unit shut down (para. 2-13).
Cylinder head assembly removed (para. 5-39).

Materials/Parts

Push Rod Tubes

Replace. (figure 5-57)

NOTE

There are two push rod tubes for each head. Replacement of each is the same.

- (1) Remove top seal (1), push rod tube (2), spring (3), profile washer (4), and bottom sealing ring (5).
- (2) Using tensioning tool, install spring (3), on push rod tube (2).
- (3) Install profile washer (4) on bottom of push rod tube (2) with domed side facing spring (3).
- (4) Install sealing ring (5) on bottom of push rod tube (2) with flat side facing toward the end (bottom) of push rod tube.
- (5) Install top seal (1) on top of push rod tube (2) with flat side facing toward the shoulder.
- (6) Install spring end of push rod tube in the crankcase.

FOLLOW-ON MAINTENANCE

Install cylinder head assembly (para. 5-40).

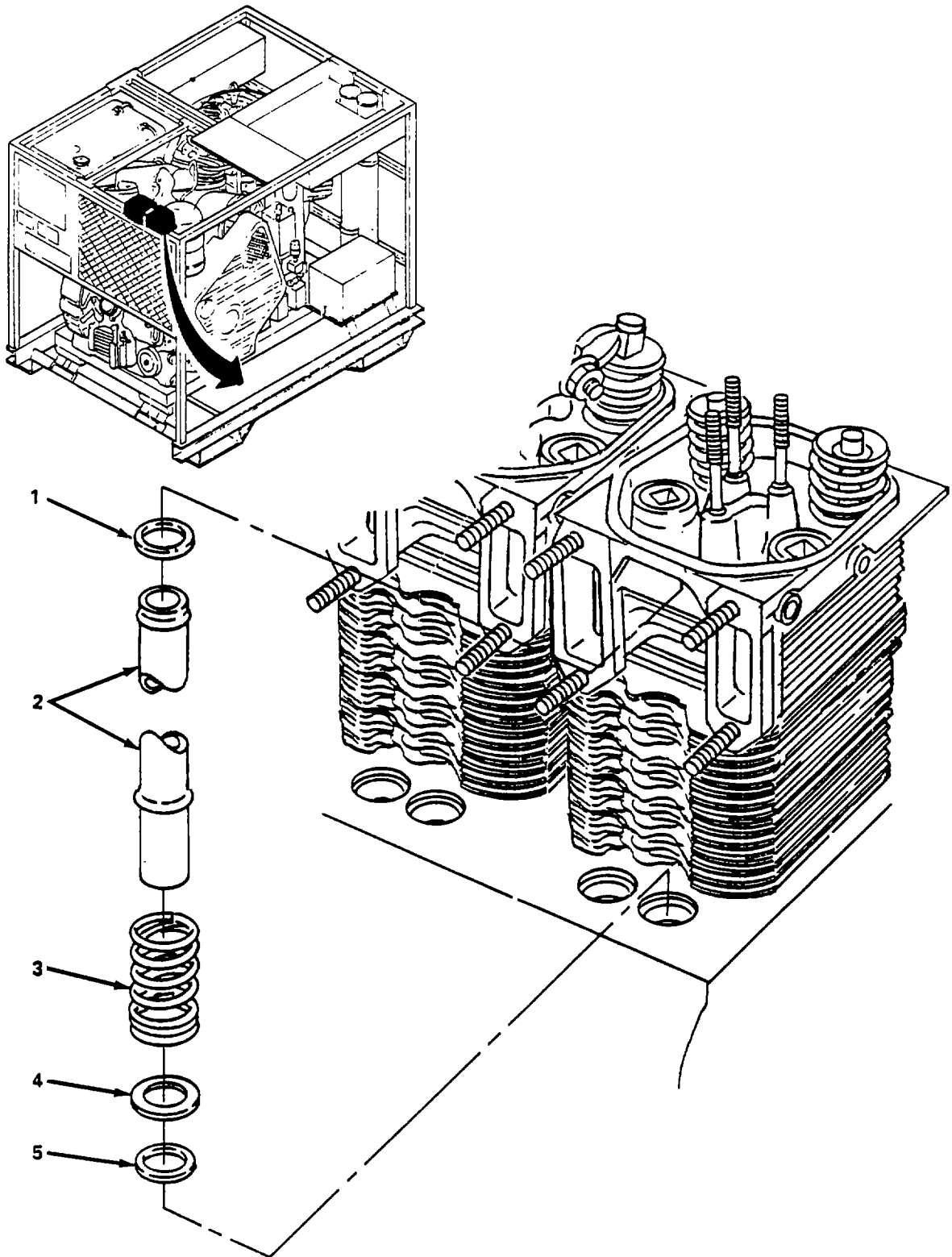


Figure 5-57. Push Rod Tubes, Replace.

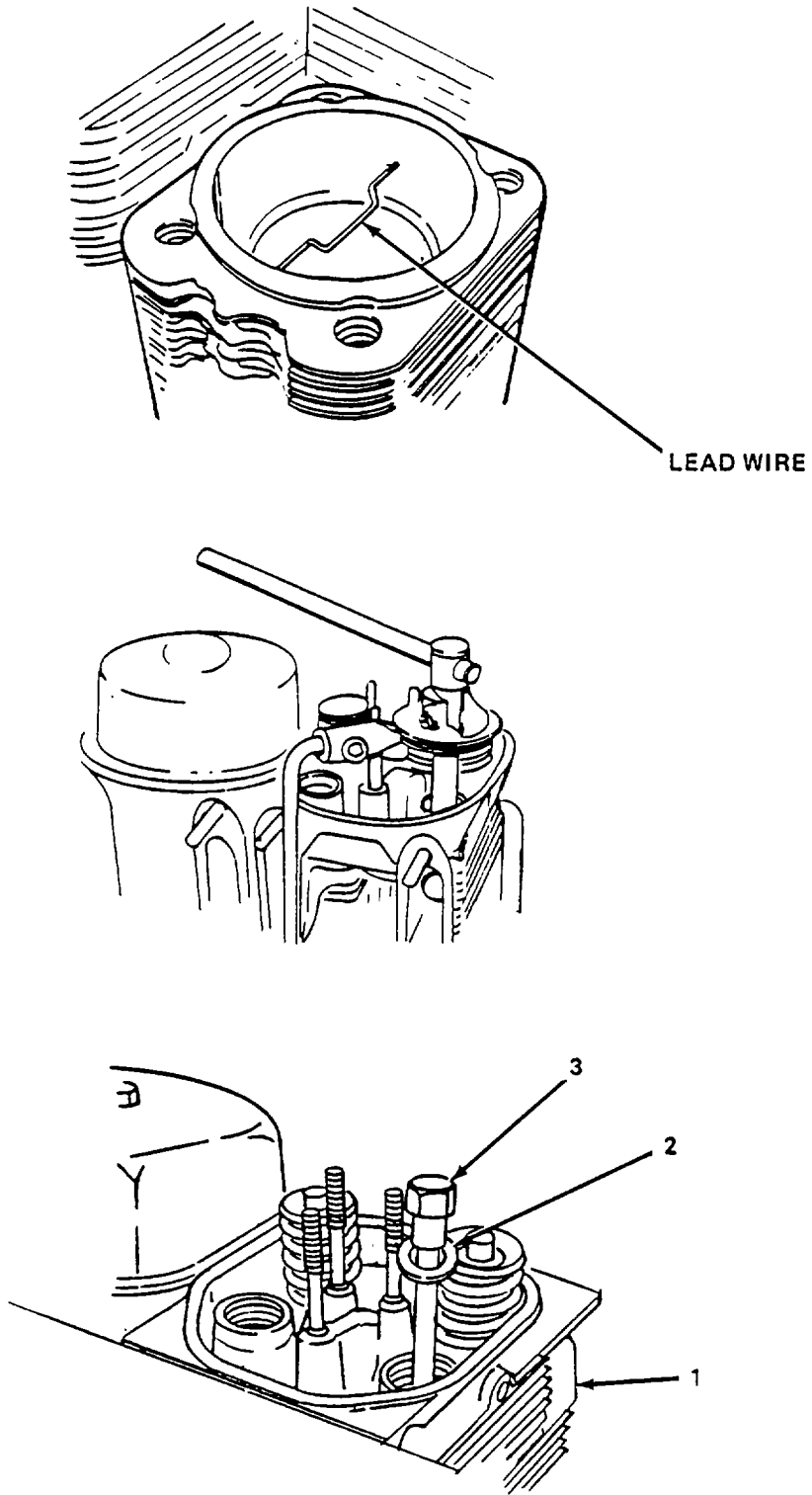


Figure 5-58. Cylinder Head, Adjust.

5-40. **Cylinder Head Assembly (Cont).**

- (4) Preload head bolts to 21 ft. pounds (30 Nm).
- (5) Tighten head bolts (3) through one stage (45°) using socket wrench and torquing device.
- (6) Rotate crankshaft by one revolution (360 degrees).
- (7) Remove head bolts (3) and cylinder head (1). Mark cylinder heads relative to cylinders if both cylinder heads were removed.
- (8) Remove wire from top of piston and measure at the weakest (most compressed) point.
- (9) Piston crown clearance should be .03937 to .04724 inches (1.0 to 1.2 mm).
- (10) If clearance is too large, raise cylinder, and remove shims as needed to obtain proper clearance (para. 5-42).
- (11) If clearance is too small, remove cylinder (refer to para. 5-42), place number of shims required below cylinder and replace cylinder.

b. Replace. (figure 5-59)

- (1) Install cap (1) on fuel injector intakes and plugs in fuel injector pump bore studs where injector lines were removed.
- (2) Place plugs in fuel injector overflow bores where overflow lines were removed.
- (3) Using socket wrench and square-recessed socket, remove two brass screwplugs (2) and gaskets (3).
- (4) Remove four head bolts (4) and washers (5).
- (5) Remove cylinder head (6) and gasket (7).
- (6) Checking/adjust piston crown clearance (para. a. above).
- (7) Install gasket (7) and cylinder head (6) on cylinder (8).
- (8) Install four washers (5) and bolts (4) and slightly tighten.
- (9) Align induction and exhaust flanges of cylinder heads without disturbing alignment of cylinders.
- (10) Preload head bolts to 21 ft. pounds (30 Nm).
- (11) Tighten head bolts through stage one (45°), stage two (45°), stage three (45°) and stage four (30°)
- (12) Install gaskets (3) and brass screwplugs (2) into cylinder head (6).

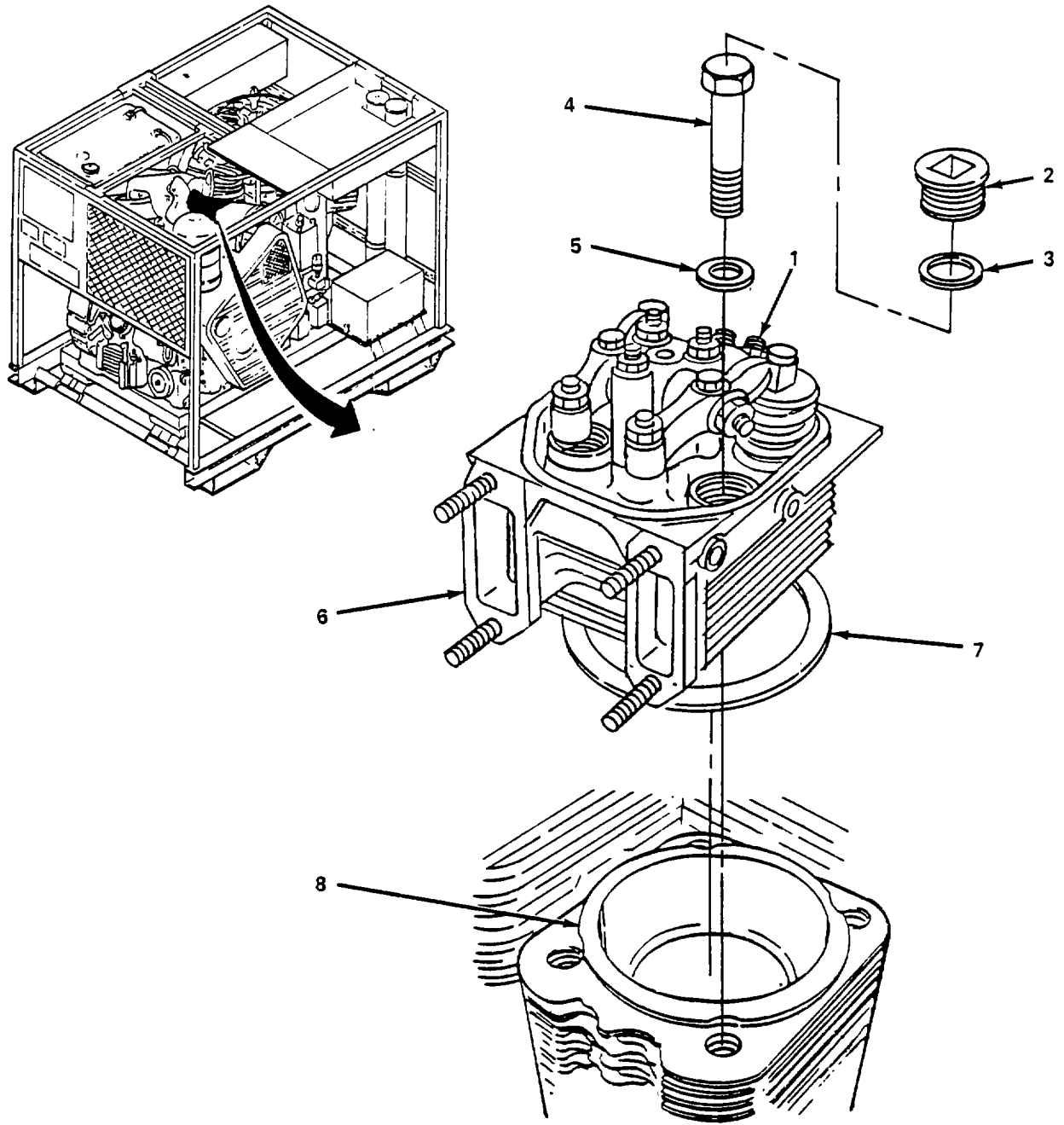


Figure 5-59. Cylinder Head, Replace.

5-39. Cylinder Head Assembly (Cont).

(13) Tighten screwplugs (2) to 59.04 to 66.42 ft. pounds (80 to 90 Nm).

c. Repair. (figure 5-60)

- (1) Clean cylinder head (1) in diesel fuel. Using brush to remove dirt and grime from fins and ridges. Blow dry with compressed air.
- (2) Check the cylinder head seating (2) surface. It must be flat and square. The seating surface (3) can be refaced provided the distance from the seating surface to the sealing surface (3) is not less than .03937 inches (1 mm). If cylinder head seating surface was refaced, the cylinder head adjust procedures (para. a.) must be performed prior to head installation.
- (3) Slight damage to cylinder head seating (2) surface can be removed by grinding cylinder head (1) on cylinder with fine abrasive paste. If cylinder head seating surface was refaced, the cylinder head adjust procedures (para. a.) must be performed prior to head installation.
- (4) If cylinder head seating area is more severely damaged, recut with hand operated plate mill or rework on lathe using turning fixture attached to cylinder head. If cylinder head seating surface was refaced, the cylinder head adjust procedures (para. a.) must be performed prior to head installation.
- (5) Install new valve in valve seat ring and install intermediate ring (4) on cylinder head sealing surface (3).
- (6) Measure distance between valve plate and cylinder head seating surface. Should measure .09999 to .22047 inches (5.08 to 5.6 mm).
- (7) If measurement is within specifications, reface valve seat rings. If measurement is greater than .22047 inches (5.6 mm), replace valve seat rings.
- (8) Reface valve seat rings with drift and holder for inlet valve seat ring and drift and holder for exhaust valve seat ring. When refacing do not exceed .22047 inches (5.6 mm) distance between valve plate and cylinder head sealing surface.
- (9) Reface valve seat rings by installing cylinder head on mandrel, and chucking mandrel with cylinder head on lathe.
- (10) Drill out valve seat rings by fitting drilling device to drilling machine for cutting out rings. Place on cylinder head and insert pilot pin with drilling bushings.
- (11) Drill out valve seat rings by means of hard metal special cutter.

NOTE

To replace valve seat rings and valve guides, cylinder head should be heated up only once.

- (12) Heat cylinder head uniformly in heating cabinet or oven to a temperature of 428°F (220°C).

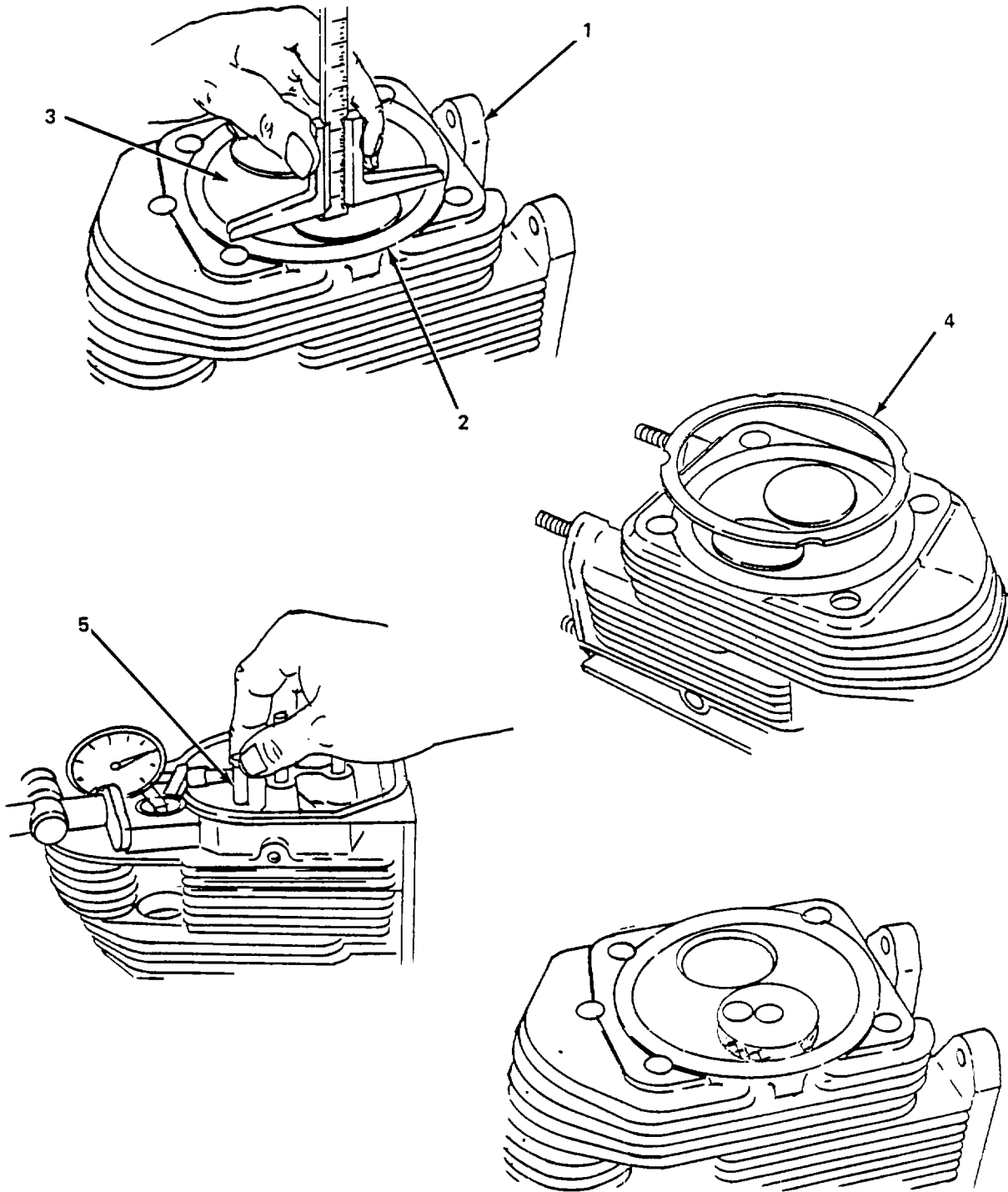


Figure 5-60. Cylinder Head, Repair.

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- (13) Slip new valve seat ring, chamfered side first on drive and seat it. (Use drift for inlet valve ring and drive for exhaust valve ring.)
- (14) Check clearance between valve stems and guides of both valves. Inlet valve clearance should be .00157 to .00590 inches (0.04 to 0.15 mm) and exhaust valve clearance should be .00236 to .00787 inches (0.06 to 0.2 mm).
- (15) If measurements exceed maximum tolerance, replace valve guides.
- (16) Heat cylinder head uniformly in heating cabinet or oven to a temperature of 428°F (220°C).
- (17) Drive out valve guide (5), from the seating ring side, using arbor.
- (18) Install snap ring on new valve guide (5).
- (19) With cylinder head heated to 428°F (220°C) drive in valve guide (5) from rocker arm support side, the longer end of the valve guide until it seats on the snap ring.
- (20) Allow cylinder head to cool, then ream the valve guide with reamer.

FOLLOW-ON MAINTENANCE

- (1) Install intake manifold (para. 4-38).
- (2) Install muffler and silencer (para. 4-39).
- (3) Install cooling air ducting (para. 4-42).
- (4) Install valves (para. 5-41).
- (5) Install rocker arms and push rods (para. 5-38).
- (6) Install fuel injectors (para. 5-31).

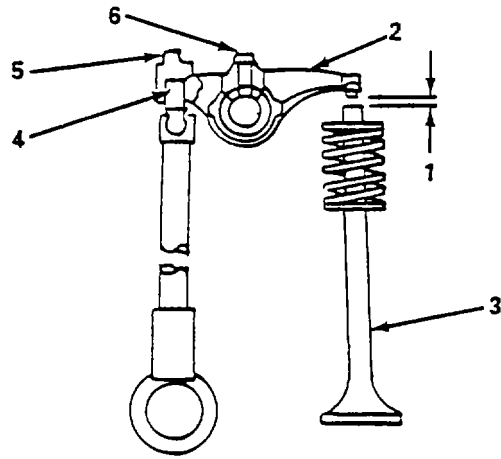


Figure 5-61. Valves, Adjust.

5-41. **Valves (Cont).**

- b. Replace. (figure 5-62)

NOTE

There are two valves, one exhaust valve and one intake valve. Replacement of each valve is the same.

- (1) Secure cylinder head (1) in clamp stand and clamping plate.
- (2) Using valve spring compressor, compress valve spring (2).
- (3) Remove taper collets (3) and spring cap (4).
- (4) Remove valve spring compressor.
- (5) Remove valve (5) and valve spring (2).
- (6) Remove stem seal (6) and valve rotator (7).
- (7) Remove valve seat insert (8).
- (8) Using circlip pliers, remove circlip (9) and valve guide (10).
- (9) Measure length of valve spring, length unloaded, fatigue limit 2.2 inches (56 mm) and length, normal 2.32 ± 0.07 inches (59 ± 1.9 mm).
- (10) Install valve guide (10).
- (11) Using circlip pliers, install circlip (9) on valve guide (10).
- (12) Install valve seat insert (8).
- (13) Install stem seal (6) and valve rotator (7).
- (14) Install valve (5) and using valve spring compressor, compress valve springs (2).
- (15) Install spring cap (4) and taper collets (3).
- (16) Remove valve spring compressor.
- (17) Remove cylinder head (1) from clamp stand and clamping plate.

FOLLOW-ON MAINTENANCE

- (1) Install cylinder head (para. 5-40).
- (2) Install push rod tubes (para. 5-39).
- (3) Install rocker arms and push rods (para. 5-38).

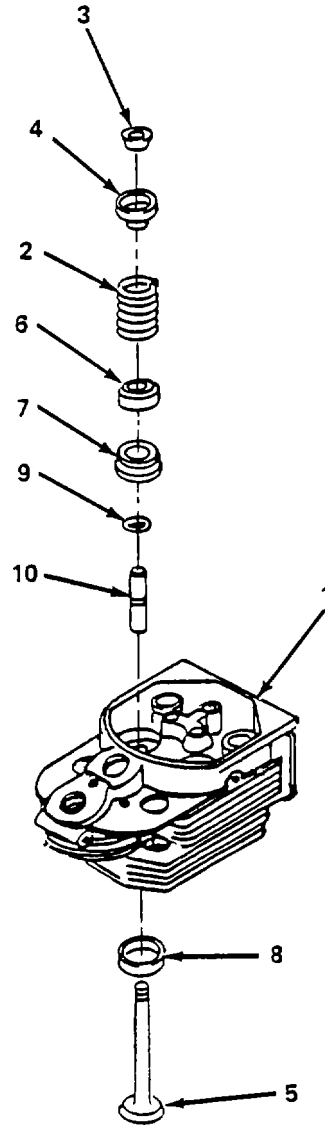


Figure 5-62. Valves, Replace.

5-42. Engine Cylinders.

This task covers: Replace

INITIAL SETUP**Tools**

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)
Piston Ring Squeezer (PN 0030430)

*Materials/Parts*Cylinder, Engine

Equipment Condition

Compressor unit shut down (para. 2-13).
Cooler air blower removed (para. 5-31).
Cylinder head removed (para. 5-40).
Push rod tubes removed (para. 5-39).

Replace. (figure 5-63)**NOTE****Both cylinders must be removed in order to remove pistons.**

- (1) Turn crankshaft. Cylinder (1) will lift out of crankcase when piston passes bottom dead center and starts to rise.

NOTE**Do not knock piston against crankcase or connecting rod when removing cylinder.**

- (2) Remove cylinder (1) from crankcase (2).
- (3) Remove seal (3) and shims (4) from cylinder (1).
- (4) Inspect wall of cylinder (1) for scratches and/or grooves. Replace cylinder (1) if excessively scratched or grooved.
- (5) Apply grease to one 0.00787 inch (0.2 mm) shim (4) and place on bottom seating surface of cylinder (1).
- (6) Lubricate working face of cylinder (1).
- (7) Install cylinder (1) with cutouts facing push rods bores.
- (8) Remove piston ring squeezer.

FOLLOW-ON MAINTENANCE

- (1) Install push rod tube (para. 5-39).
- (2) Install and adjust cylinder head (para. 5-40).
- (3) Install cooler air blower (para. 5-32).

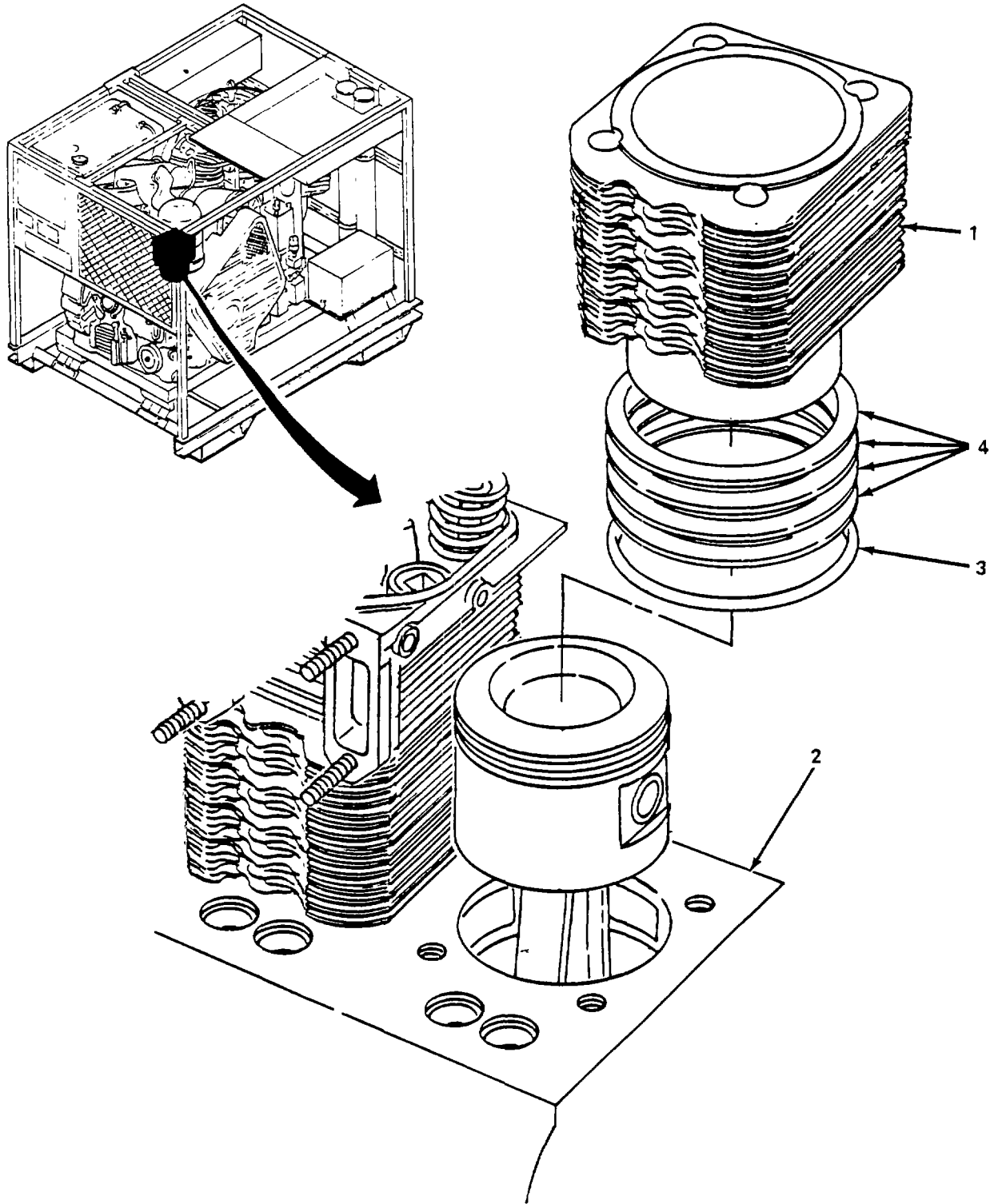


Figure 5-63. Engine Cylinder, Replace.

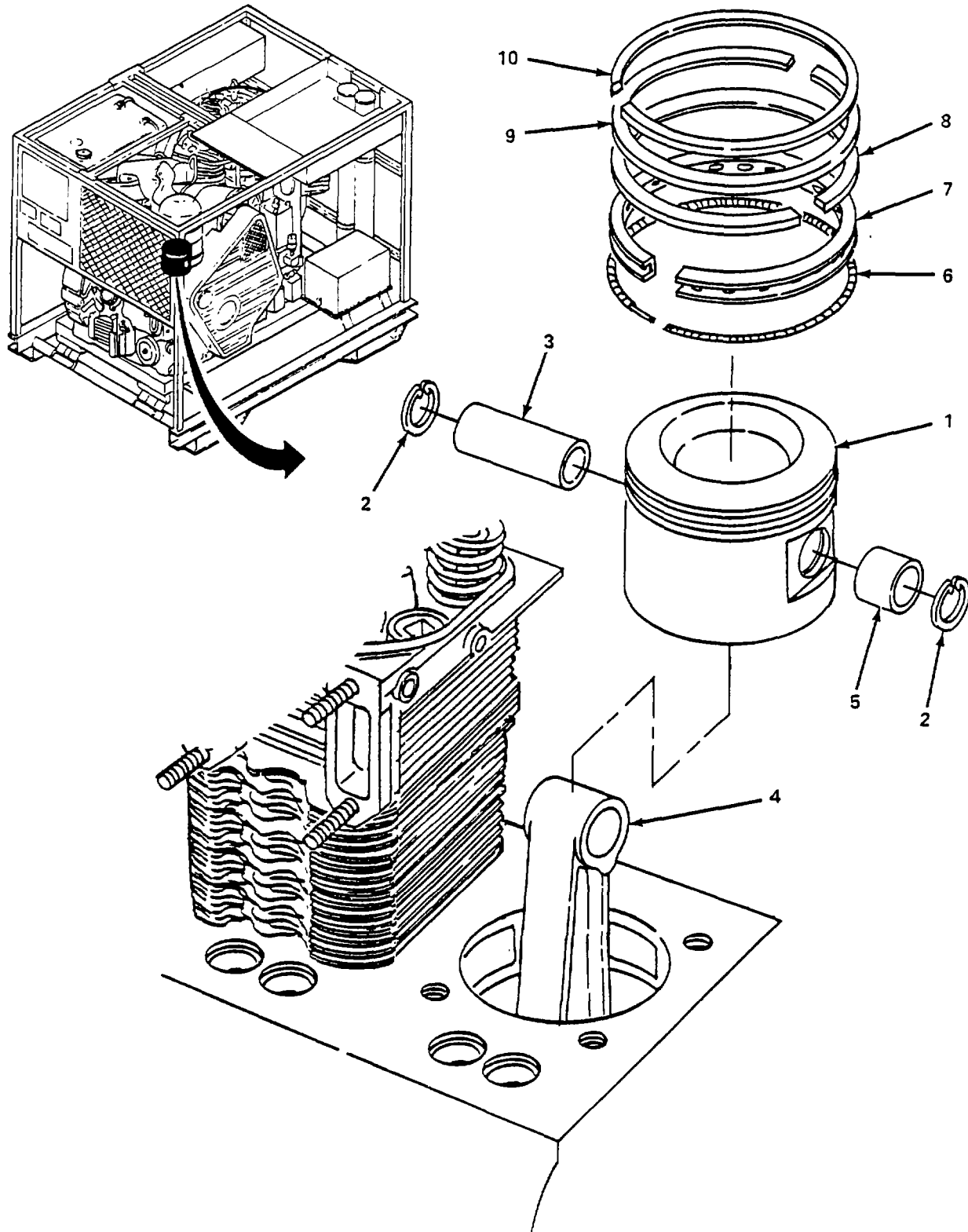


Figure 5-64. Engine Piston and Rings, Replace.

5-43. **Engine Piston and Rings (Cont).**b. Repair. figure 5-65).

- (1) Remove piston and rings (para. a. above).

WARNING

Dry cleaning solvent PD-680 used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 138°F (60 °C).

- (2) Clean all items with dry cleaning solvent, and dry thoroughly.
- (3) Measure first (top) piston ring groove (1) using feeler gage. If when measured a gap S is found to exist between inserted gage and piston, this means the axial piston clearance is within specifications and piston is fit for further use. If gage contacts side of piston without gap, replace piston.
- (4) Measure second ring groove (2) with depth gage. Should measure .09842 inches (2.5 + 0.090 mm).
- (5) Measure third ring groove (3) with depth gage. Should measure .19685 inches (5.0 + 0.030 mm).
- (6) If measurements for second or third groove is not within specifications, replace piston.
- (7) Using piston ring expander, install middle compression rings (4) and (5) and bottom oil control ring (6).
- (8) Install expander spring (7) on bottom oil control ring.
- (9) Measure axial piston ring clearance of middle compression ring using feeler gage. Should measure .003937 to .005196 inches (.1 to .132 mm).
- (10) Measure axial piston ring clearance of bottom oil control ring using feeler gage. Should measure .00157 to .00283 inches (0.04 to 0.072 mm).
- (11) If axial ring clearance for either ring is not within specifications, replace piston.
- (12) Using piston ring expander, remove rings from piston.
- (13) Insert three piston rings singly in cylinder and press down with piston to a distance of approximately 1.181 inches (30 mm).
- (14) Measure the gap clearance of the piston rings. Should measure as follows: top ring gap .01181 to .01771 inches (.3 to .45 mm), middle ring gap. .00787 to .01771 inches (.20 to .45 mm), and bottom ring .00984 to .01575 inches (.25 to .40 mm).
- (15) If ring gap clearances are not within specifications, replace rings.

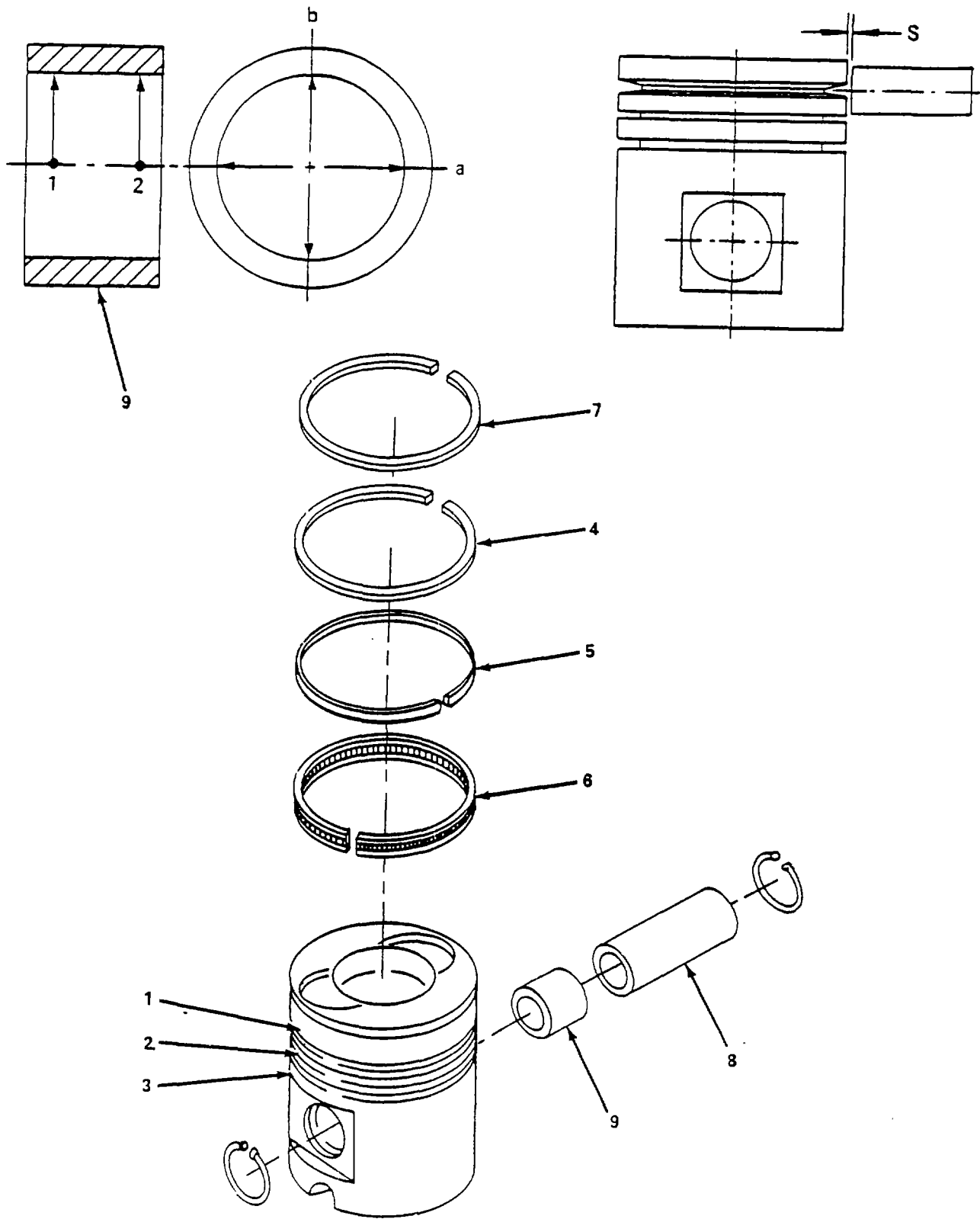


Figure 5-65. Engine Piston and Rings, Repair.

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- (16) Measure the outside diameter of piston pin with outside micrometer. Should measure 1.3779 to 1.3777 inches (35 to 34.994 mm).
- (17) Inspect piston pin (8) for wear using a beveled steel straight edge.
- (18) Measure inside diameter of piston pin bushing (small end of connecting rod) with inside micrometer. Measure at points 1 and 2 in planes a and b. Should measure maximum 1.3835 inches (35.19 mm).
- (19) Inspect piston bushing (9) for cracks or excessive wear. Replace if cracked or worn excessively.
- (20) Inspect piston rings for cracks, or excessive wear. Replace if cracked or worn excessively.

FOLLOW-ON MAINTENANCE
Install engine cylinder (para. 5-42).

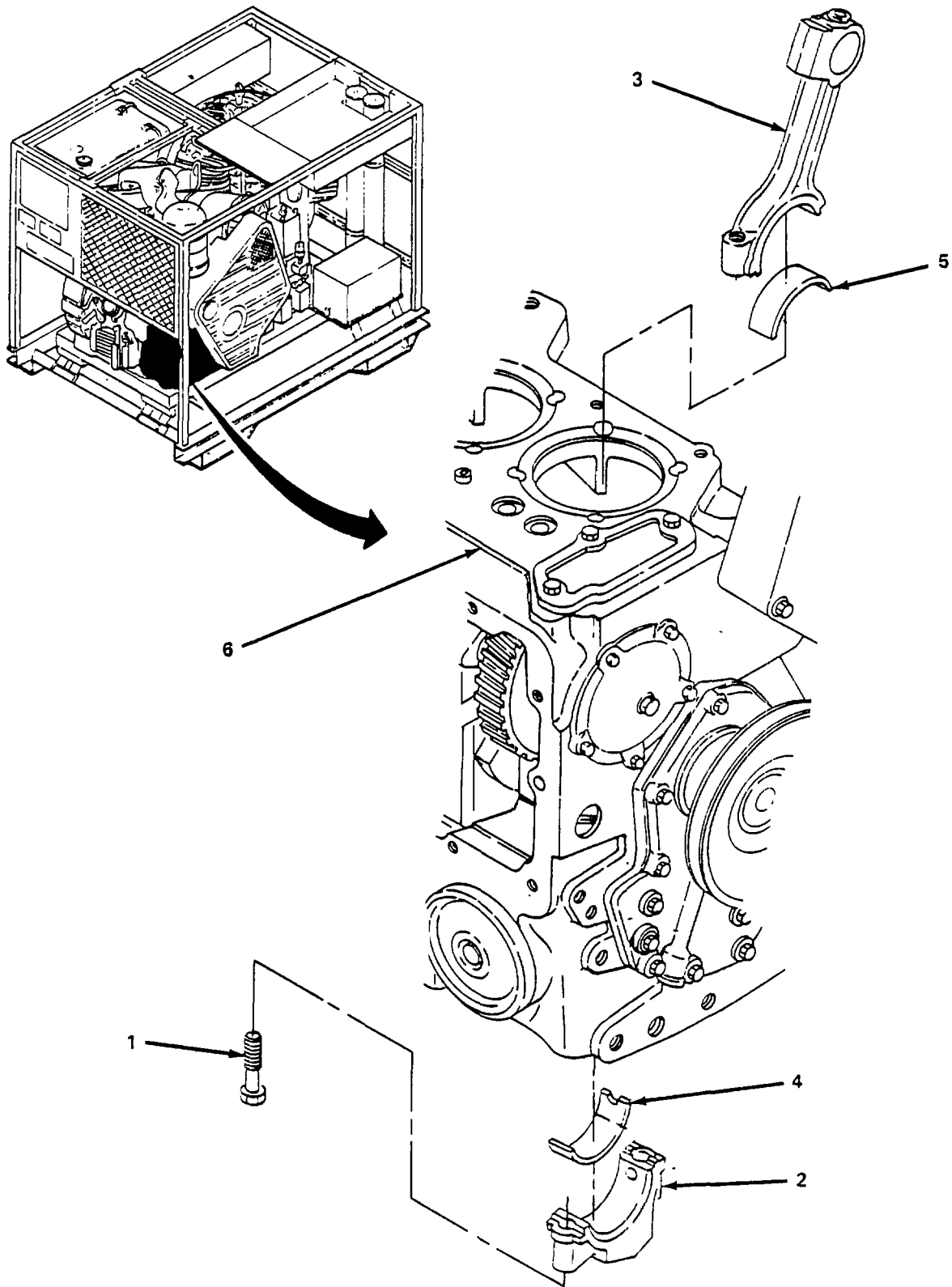


Figure 5-66. Engine Connecting Rod, Replace.

5-44. **Engine Connecting Rod (Cont).**b. *Repair.* (figure 5-67)

- (1) Remove connecting rod (para. a. above).

WARNING

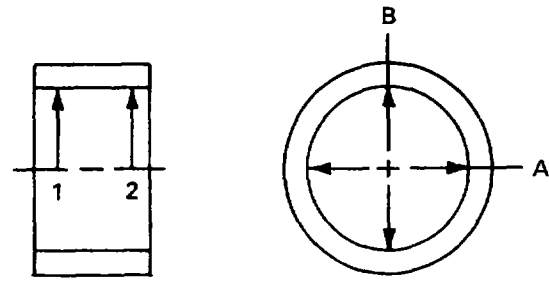
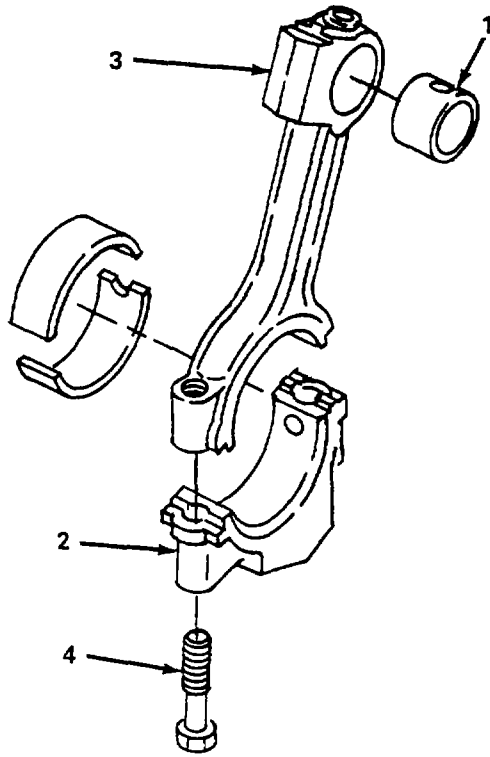
Dry cleaning solvent PD-680 used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 138°F (60°C).

- (2) Clean all items with dry cleaning solvent, and dry thoroughly.
- (3) Inspect bushing (1) and bearing shell (2) for excessive wear or damage.
- (4) Measure inside diameter of piston pin bushing (1) (small end of connecting rod) with inside micrometer. Measure at points 1 and 2 in planes a and b. Should measure maximum 1.3835 inches (35.19 mm). If measurement is greater than specified, replace bushing.
- (5) Pull out piston pin bushing (1) with fixture.
- (6) Pull in piston pin bushing with same fixture making sure oil bores in bushing and connecting rod are perfectly aligned.
- (7) Position big-end bearing cap (2) on connecting rod (3) making sure they bear same identification number.
- (8) Install two bolts (4) and tighten per Appendix F.
- (9) Measure inside diameter of big-end bore at points 1 and 2 in planes a and b using inside micrometer.
- (10) If measurement is less than 2.3047 inches (58.539 mm) replace connecting rod (3) and big-end caps (2).

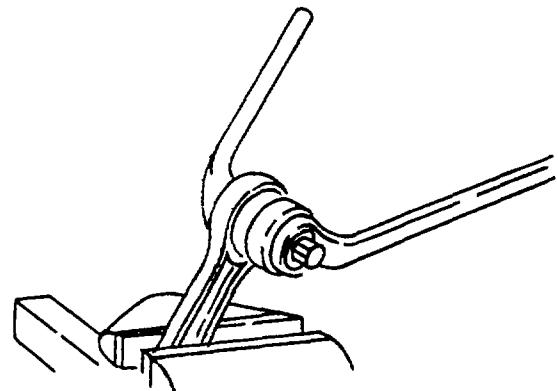
NOTE

The big-end bearings are available in six sizes (in increments of .0098 inches (0.25 mm) and cannot be reconditioned.

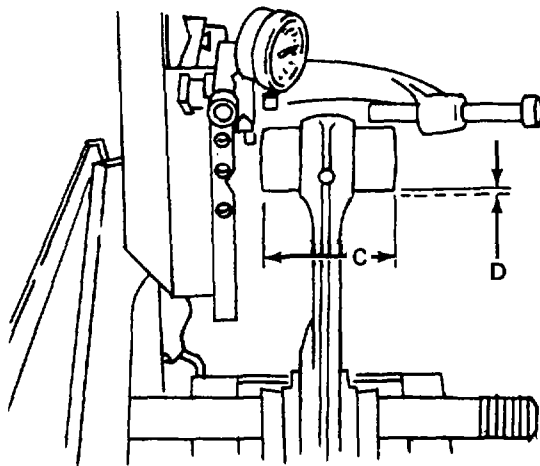
- (11) If measurement is between 2.3046 to 2.3538 inches (58.539 to 59.789 mm) install new big-end bearings.
- (12) Remove bearing cap, install new big-end bearings and retighten per Appendix F.
- (13) Remeasure inside diameter of big-end bore with inside micrometer. Should measure not greater than 2.3637 inches (60.039 mm).
- (14) Remove big-end caps and bearings.



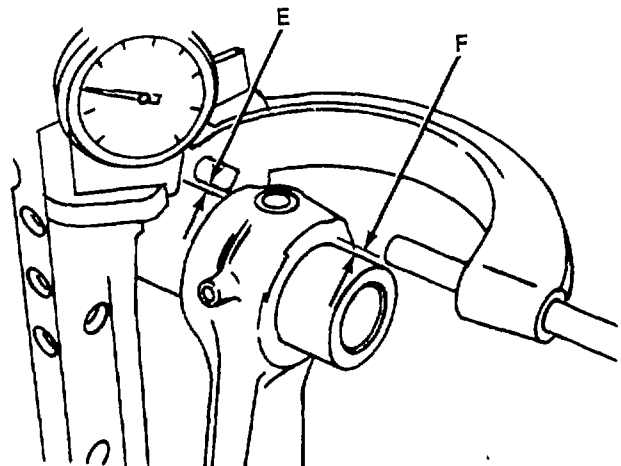
MEASURING PISTON PIN BUSHING/
BIG END BEARING BORE



REMOVING/INSTALLING
PISTON PIN BUSHING



CHECKING CONNECTING
ROD FOR PARALLELISM



CHECKING CONNECTING
ROD FOR SQUARENESS

Figure 5-67. Engine Connecting Rod, Repair.

- (15) Install connecting rod (3) on connecting rod tester for parallelism as shown.
- (16) Measure the parallelism with plug gage, the deviation may not exceed $C = .00314$ inches (0.08 mm) over a distance of $D = 3.937$ inches (100 mm).
- (17) Check connecting rod (3) for squareness. E and F should be equal.
- (18) Install connecting rod (para. a. above).

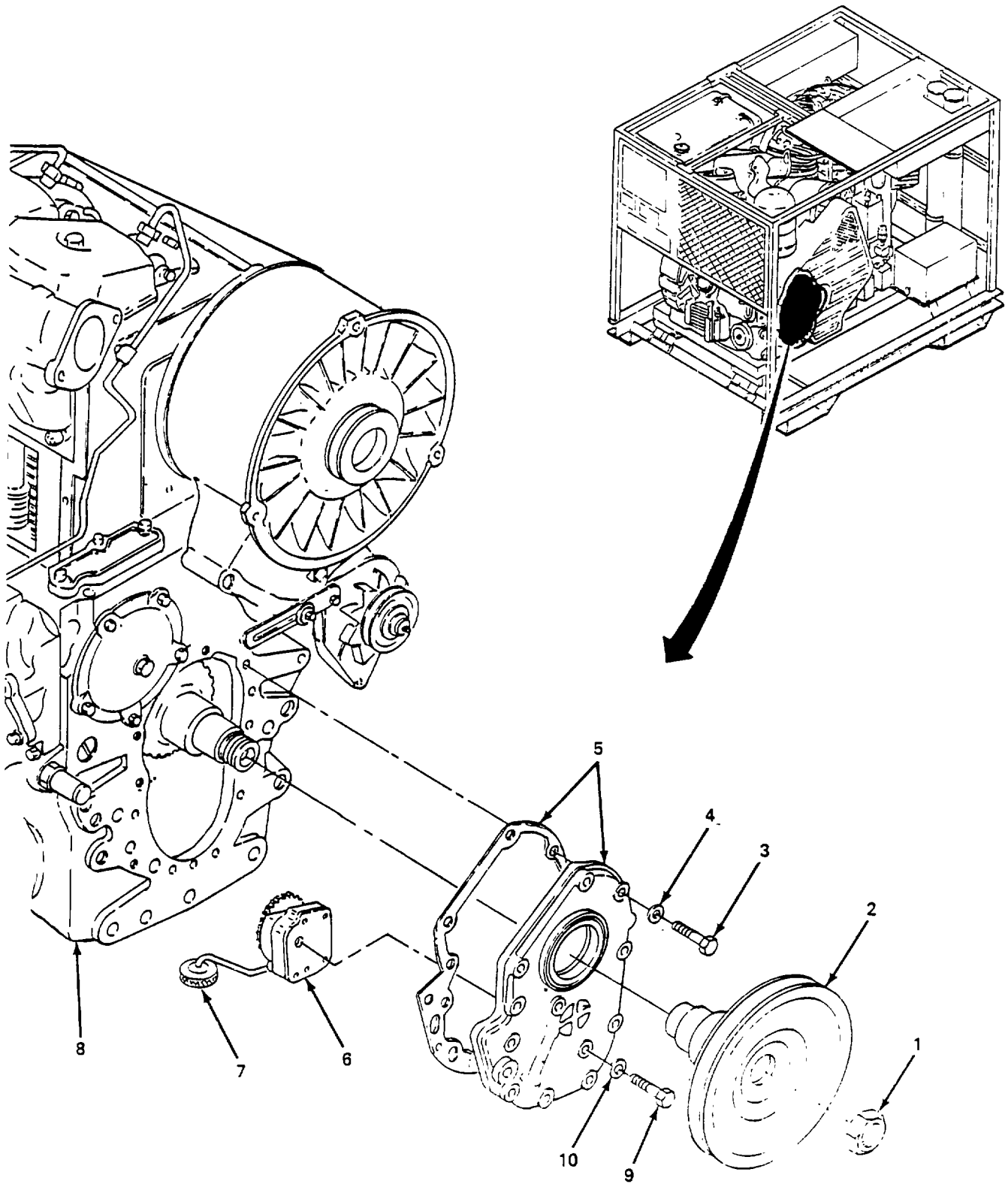


Figure 5-68. Engine Front Cover, Replace.

5-45. Engine Front Cover (Cont).

- b. *Repair.* (figure 5-69)
- (1) Remove front cover (para. a. above).
 - (2) Remove shaft seal (1) from front cover (2).
 - (3) Remove screw plug (3) and sealing ring (4).

WARNING

Dry cleaning solvent PD-680 used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 138°F (60°C).

- (4) Clean all items with dry cleaning solvent and dry thoroughly.
- (5) Inspect all items and replace any item if crack or otherwise damaged.
- (6) Install sealing ring (4) and screw plug (3).
- (7) Install shaft seal (1) on front cover (2).
- (8) Install front cover (para. a. above).

FOLLOW-ON MAINTENANCE
Install V-belts (para. 4-41).

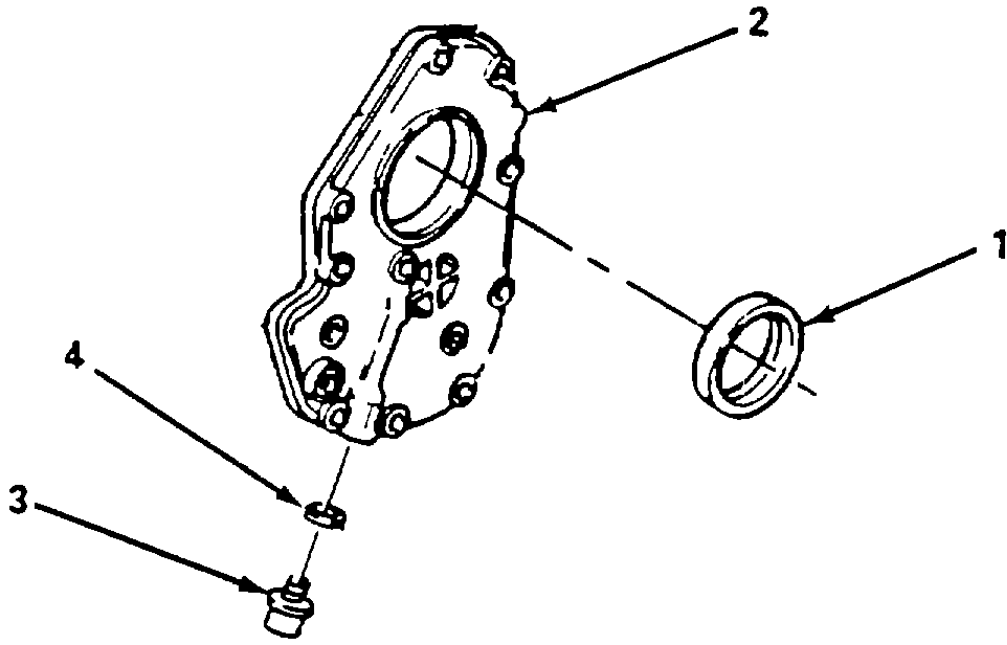


Figure 5-69. Engine Front Cover, Repair.

5-46. Access Covers

This task covers:

- a. Replace
-

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Equipment Condition

Compressor unit shut down (para. 2-13).

Replace. (figure 5-70)

- (1) Remove three bolts (1), sealing ring (2) and remove cover (3).
- (2) Remove six bolts (4), lockwasher (5) and remove cover (6).
- (3) Remove plug screw (7) and sealing ring (8) from cover (6).
- (4) Install sealing ring (8) and plug screw (7) on cover (6).
- (5) Install cover (6) and secure with six lockwashers (5) and bolts (4).
- (6) Install cover (3) and secure with three sealing ring (2) and bolts (1).

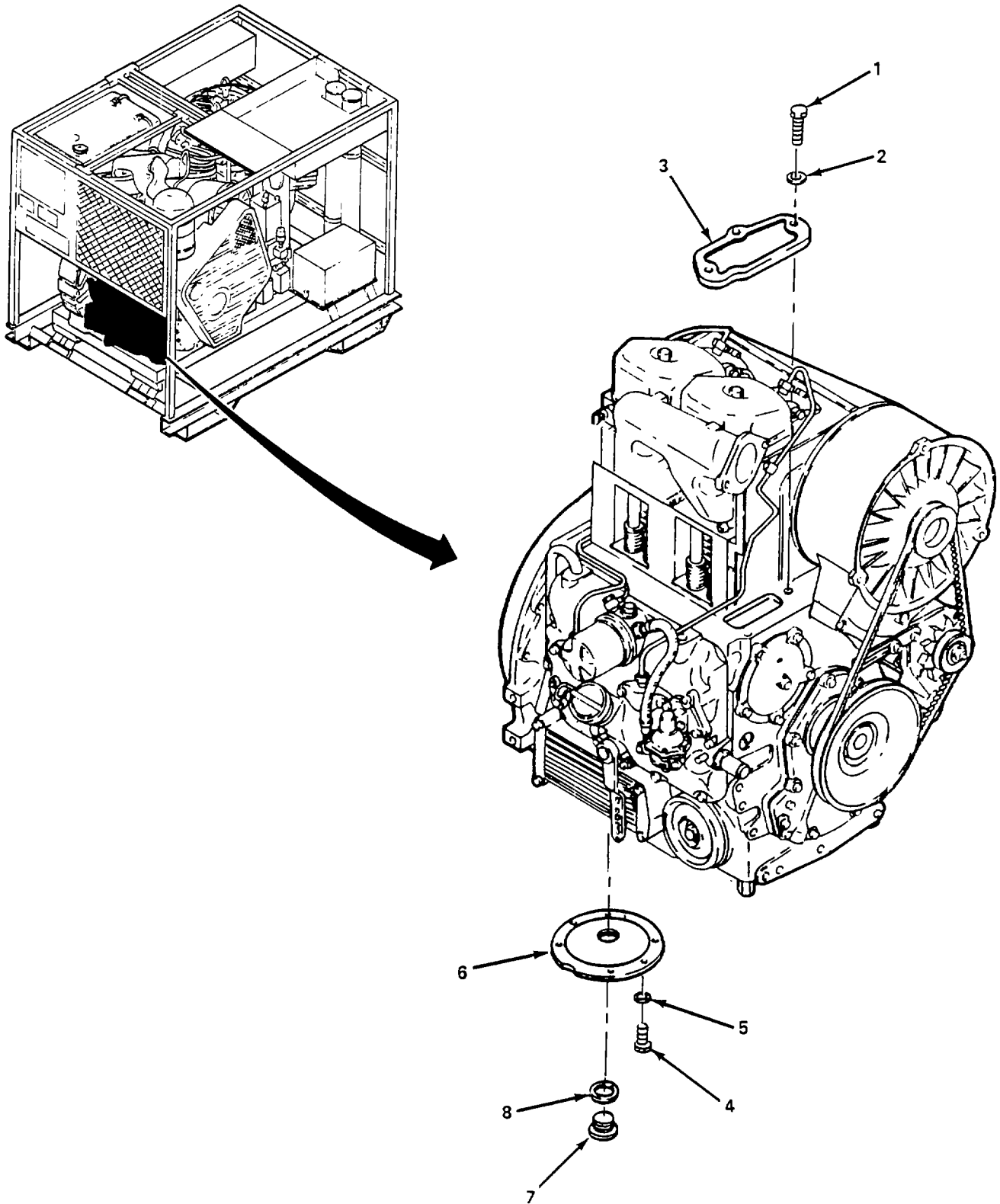


Figure 5-70. Access Cover, Replace.

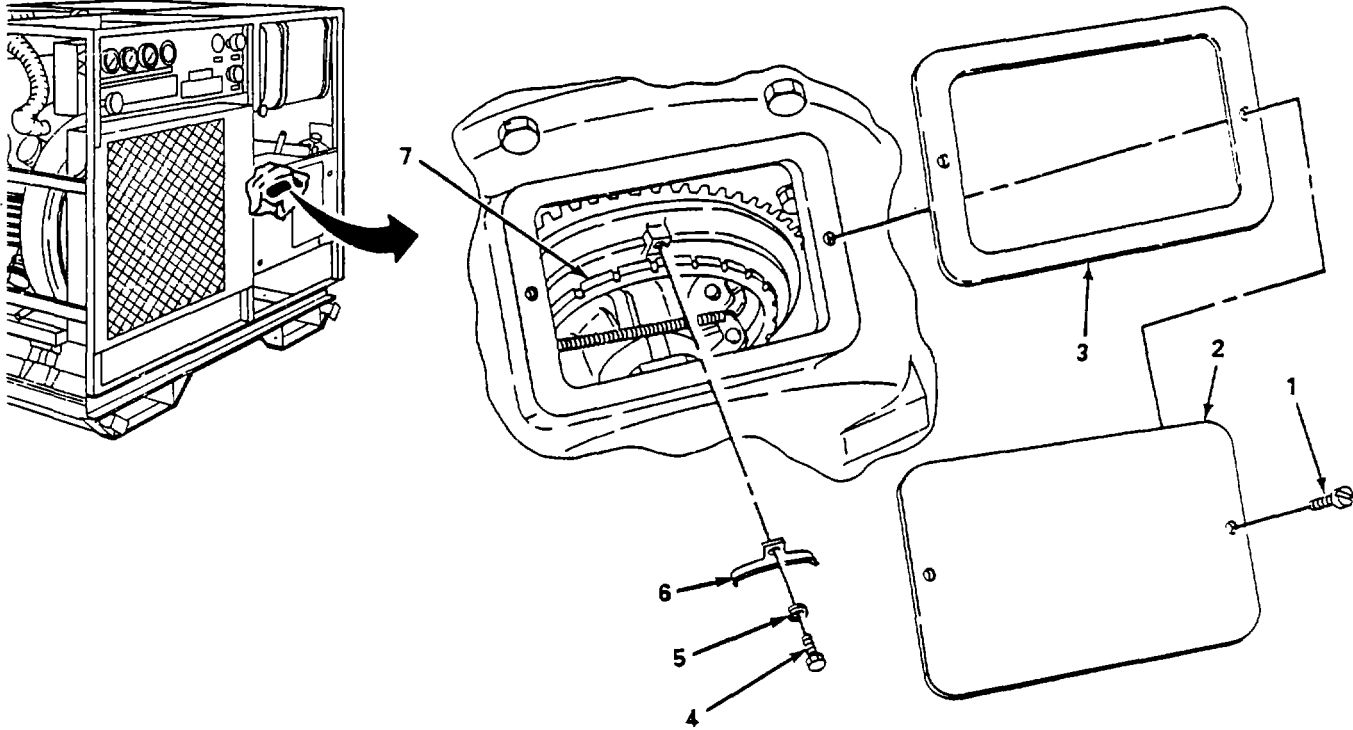


Figure 5-71. PTO Clutch, Adjust.

5-47. Power Take-Off Assembly (Cont).

Replace. (figure 5-72)

- (1) Connect suitable lifting device to PTO (1).
- (2) Remove 12 screws (2) and lockwashers (3) and remove PTO (1) and clutch assembly (4).
- (3) Using puller, remove pilot bearing (5).
- (4) Loosen fitting nut (6) and remove grease line (7).
- (5) Bend out lockwasher (8) and remove nut (9), lockwasher (8), and clutch assembly (4).
- (6) Install clutch assembly (4) and secure with lockwasher (8) and nut (9).
- (7) Install pilot bearing (5).
- (8) Install grease line (7) and tighten fitting nut (6).
- (9) Install PTO (1) and clutch assembly (4) and secure with 12 screws (2) and lockwasher (3).

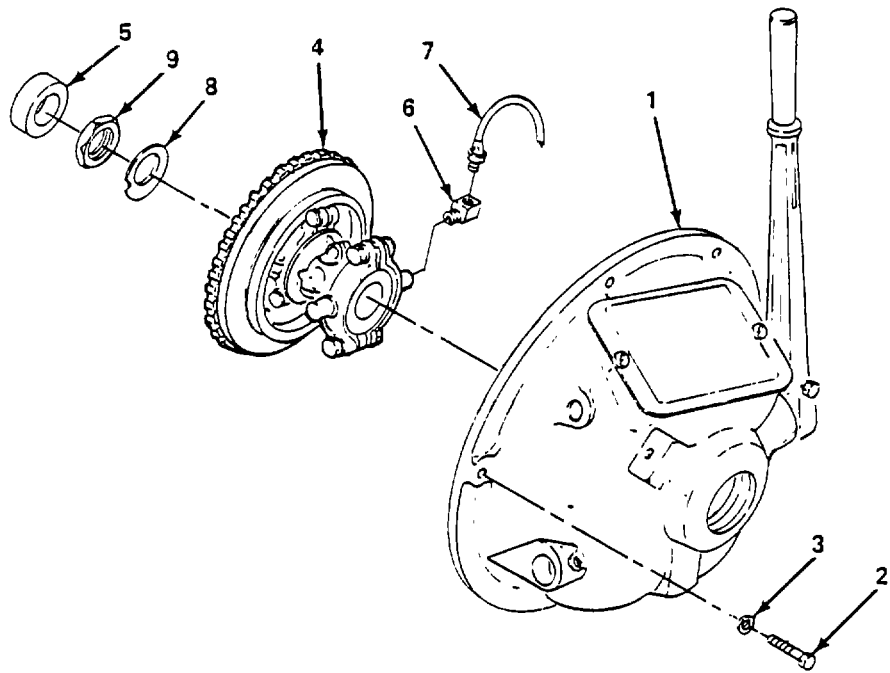
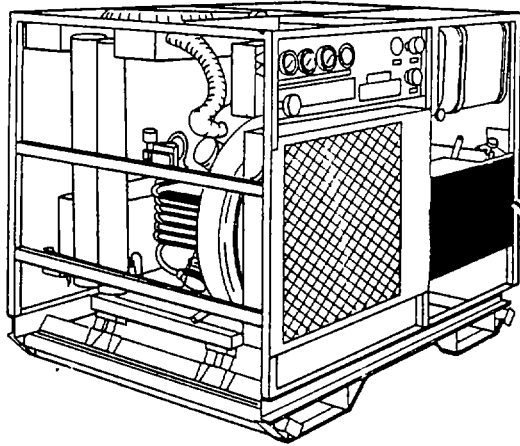


Figure 5-72. PTO, Replace.

5-48. Clutch Assembly

This task covers:

- a. Replace
-

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)
Puller Kit, Mechanical (NSN 5120-00-033-5606)

Equipment Condition

Compressor unit shut down (para. 2-13).
Compressor drive belts and pulley removed
(para. 4-20).

Materials/Parts

Clutch Assembly

Replace. (figure 5-73)

- (1) Connect suitable lifting device to PTO housing (1).
- (2) Remove 12 screws (2) and lockwashers (3) and remove PTO housing (1) and clutch assembly (4).
- (3) Using puller, remove pilot bearing (5).
- (4) Loosen fitting nut (6) and remove grease line (7).
- (5) Bend out lockwasher (8) and remove nut (9), lockwasher (8), and clutch assembly (4).
- (6) Install clutch assembly (4) and secure with lockwasher (8) and nut (9) and bend up lockwasher (8).
- (7) Install grease line (7) and tighten fitting nut (6).
- (8) Install pilot bearing (5).
- (9) Install PTO housing (1) and secure with 12 screws (2) and lockwasher (3).

FOLLOW-ON MAINTENANCE

Install drive belts and pulley (para. 4-20).

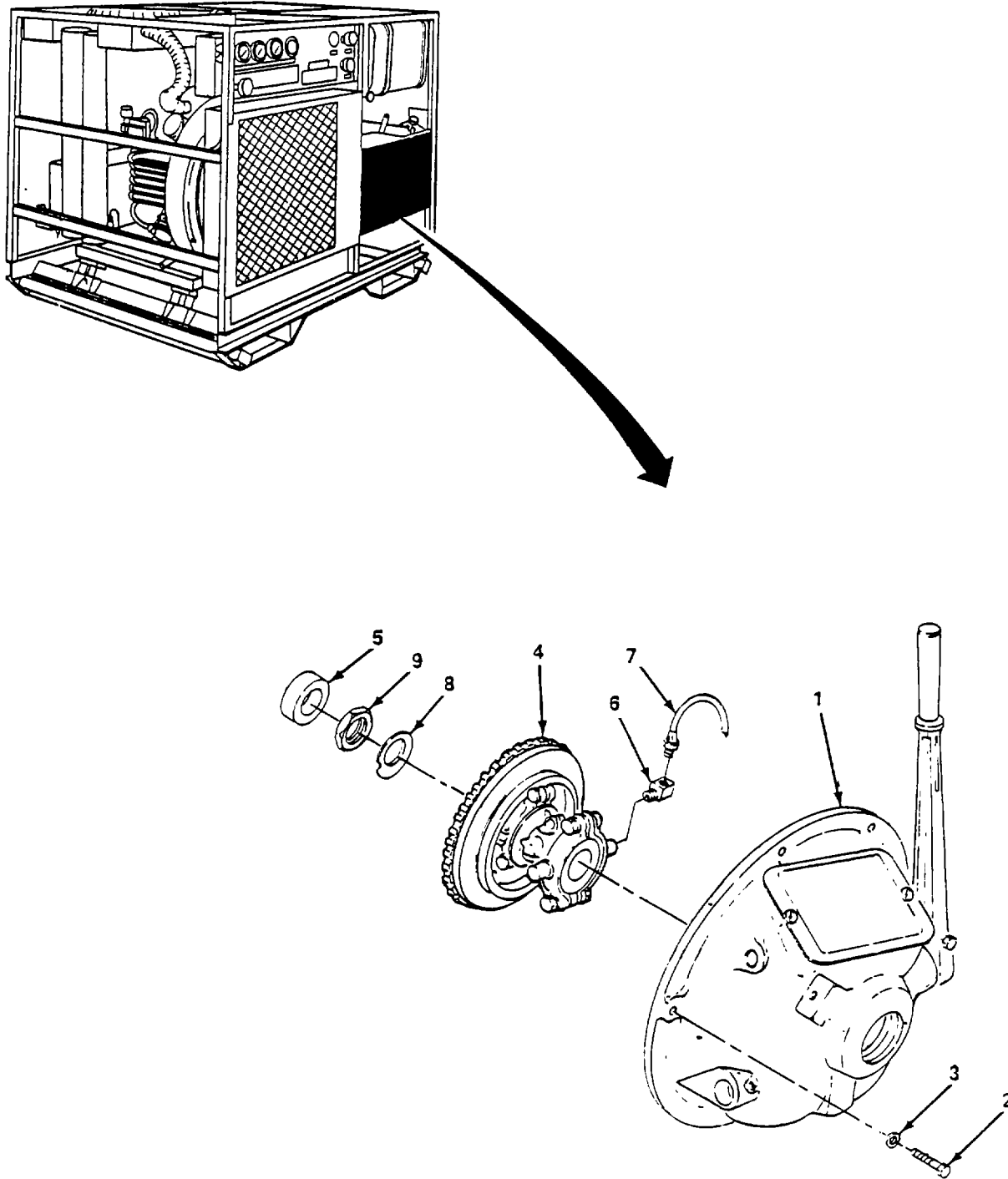


Figure 5-73. Clutch Assembly, Replace.

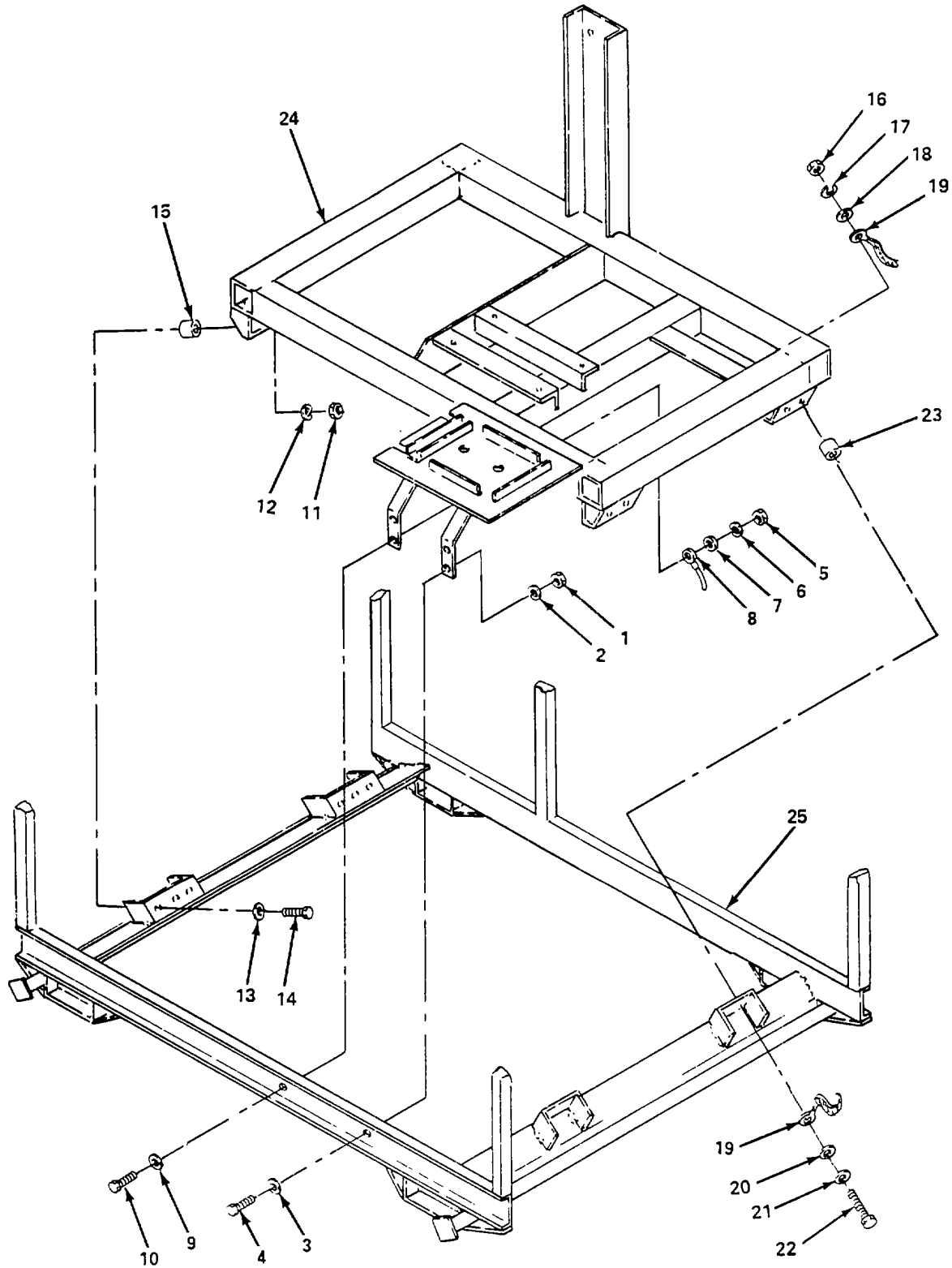


Figure 5-74. Inner Frame, Replace.

5-49. Inner Frame (Cont).

b. Repair. (figure 5-75)

- (1) Remove inner frame (para. a. above).

WARNING

Dry cleaning solvent PD-680 used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 138°F (60°C).

- (2) Clean all items with dry cleaning solvent and dry thoroughly.
- (3) Inspect frame (1) for cracks, broken welds, or other damage.
- (4) Repair minor cracks and broken welds by welding.
- (5) Replace frame (1) if excessively damaged.
- (6) Install inner frame (para. a. above).

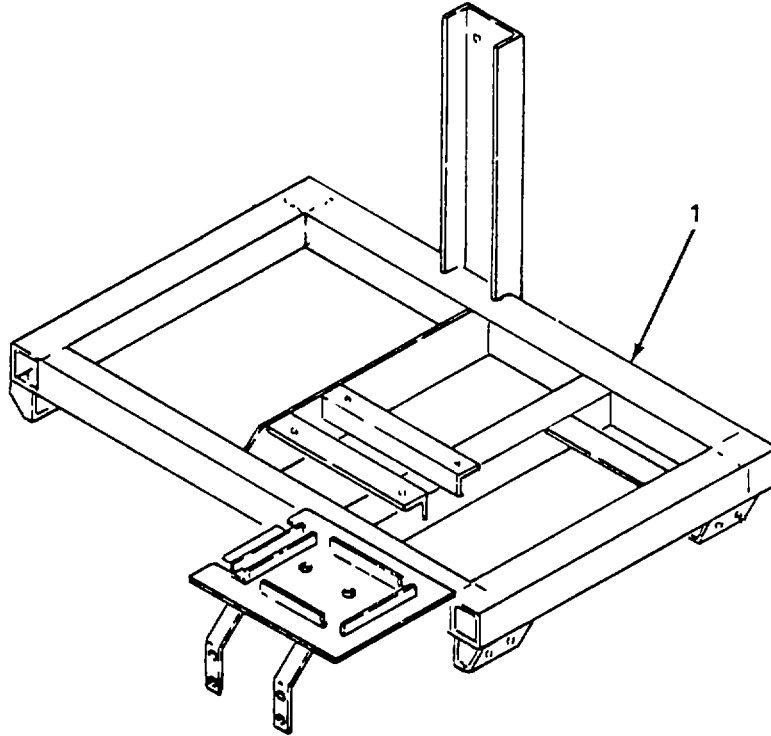


Figure 5-75. Inner Frame, Repair.

5-50. Outer Frame

This task covers:

a. Replace

b. Repair

INITIAL SETUP*Tools*General Mechanic's Tool Kit
(NSN 5180-00-177-7033)*Equipment Condition*Engine assembly removed (para. 4-29).
Air compressor assembly removed (para. 5-9).*Equipment Condition (Cont)*Battery removed (para. 4-45).
Interfilter block assembly removed (para. 5-15).
Control panel assembly removed (para. 5-7).
Purification cylinders removed (para. 5-27).
Inner frame removed (para. 5-49).a. Replace. (figure 5-76)

- (1) Remove bolt (1), lockwasher (2), washer (3), ground wire (4), and washer (5).
- (2) Remove nine bolts (6), lockwashers (7), and 18 washers (8), and remove top frame bars (9) and (10) from outer frame (11).
- (3) Install top frame bars (9) and (10) and secure with 18 washers (8), nine lockwashers (7), and bolts (6).
- (4) Install washer (5), ground wire (4), washer (3), lockwasher (2), and bolt (1).

FOLLOW-ON MAINTENANCE

- (1) Install inner frame (para. 5-49).
- (2) Install purification cylinders (para. 5-27).
- (3) Install control panel assembly (para. 5-7).
- (4) Install interfilter block assembly (para. 5-15).
- (5) Install battery (para. 4-45).
- (6) Install air compressor assembly (para. 5-9).
- (7) Install engine assembly (para. 4-29).

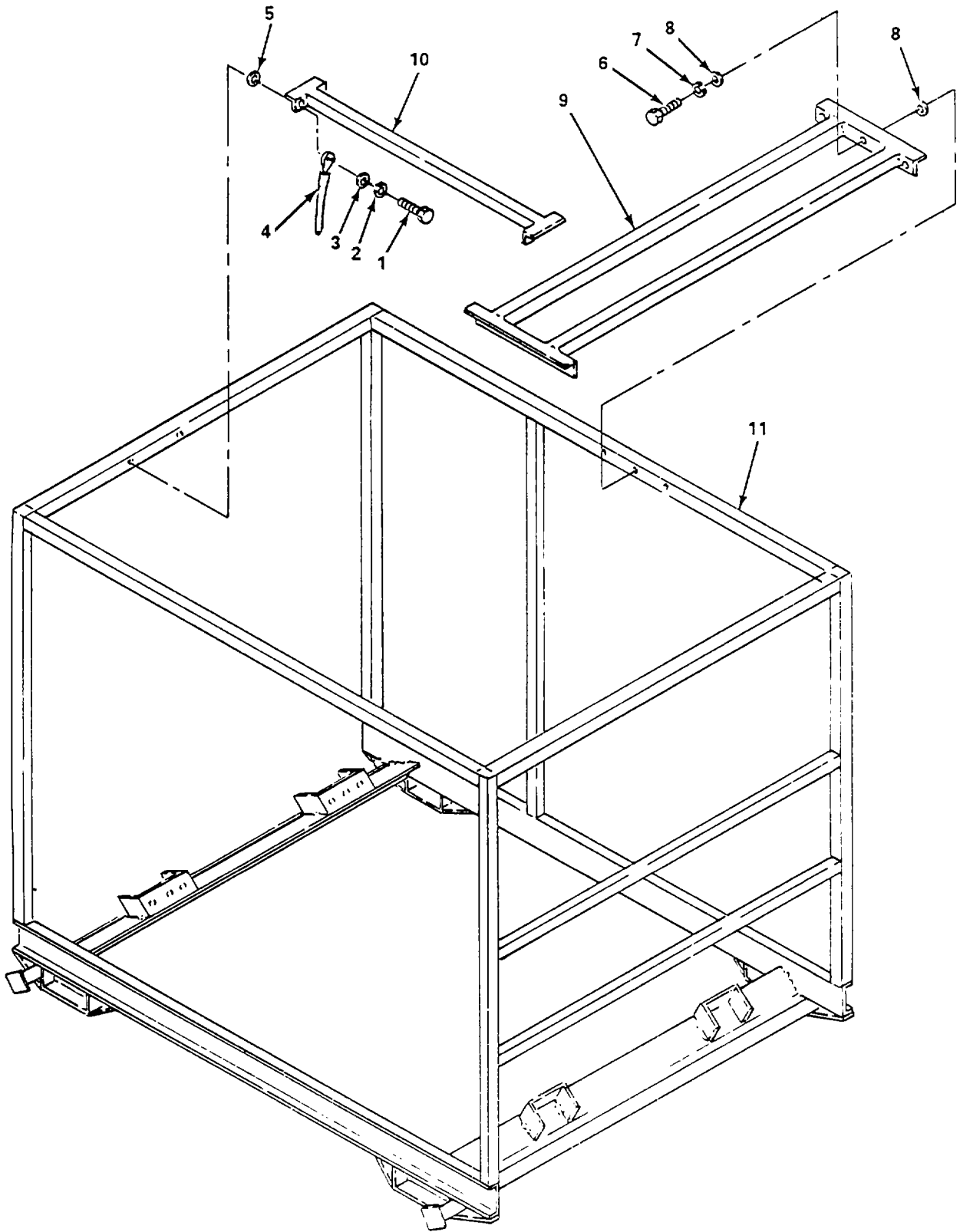


Figure 5-76. Outer Frame, Replace.

5-50. **Outer Frame (Cont).**

- b. Repair. (figure 5-75)

WARNING

Dry cleaning solvent PD-680 used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 138°F (60°C).

- (1) Clean all items with dry cleaning solvent and dry thoroughly.
- (2) Inspect all threaded inserts (1) for stripped threads.
- (3) Inspect frame (2) for cracks, broken welds, or other damage.
- (4) Repair minor cracks and broken welds by welding.
- (5) Replace frame (2) if excessively damaged.

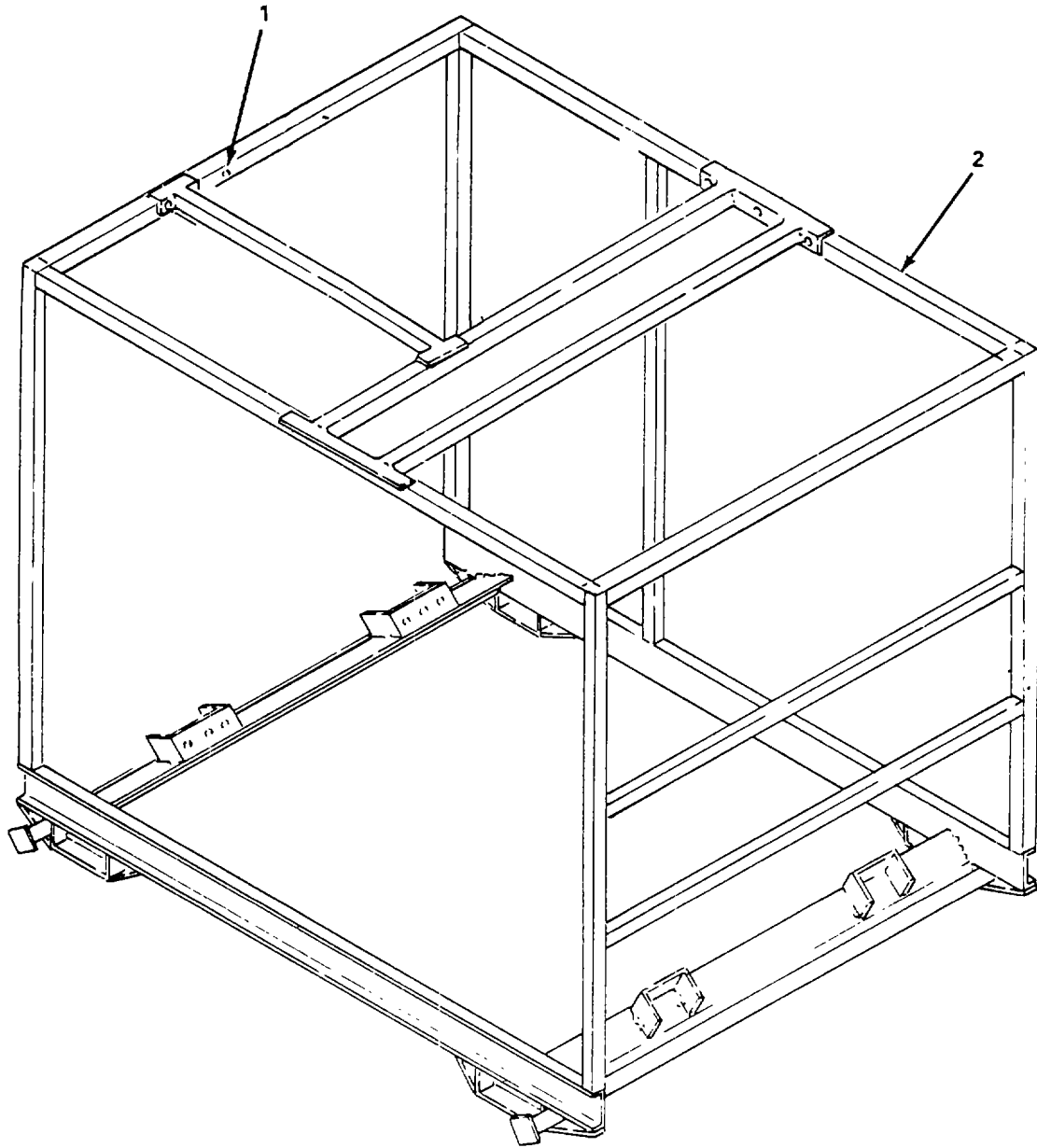


Figure 5-77. Outer Frame, Repair.

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**CHAPTER 6
GENERAL SUPPORT MAINTENANCE**

	Page
OVERVIEW	6-1
Section I. Repair Parts and Special Tools List (RPSTL), Test Measurement and Diagnostic Equipment (TMDE) and Support Equipment.....	6-1
Section II. General Support Troubleshooting.....	6-2
Section III. General Support Maintenance Procedures.....	6-5

OVERVIEW

This chapter provides procedures for troubleshooting and maintenance of the compressor unit by general support maintenance personnel.

**Section I. REPAIR PARTS; SPECIAL TOOLS; TEST, MEASUREMENT,
DIAGNOSTIC EQUIPMENT (TMDE); AND
SUPPORT EQUIPMENT**

Paragraph		Page
6-1	Common Tools and Equipment.....	6-1
6-2	Special Tools, TMDE, and Support Equipment.....	6-1
6-3	Repair Parts	6-1

6-1. **Common Tools and Equipment.** For authorized common tools and equipment refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

6-2. **Special Tools, TMDE, and Support Equipment.** Refer to RPSTL and the Maintenance Allocation Chart pertaining to organizational maintenance.

6-3. **Repair Parts.** Repair parts are listed and illustrated in the Repair Parts and Special Tools List for compressor unit TM 5-4310-386-24P.

Section II. GENERAL SUPPORT TROUBLESHOOTING

Paragraph		Page
6-4	General	6-2
6-5	General Support Troubleshooting Procedures.....	6-2

6-4. **General.** This section contains troubleshooting procedures to determine the probable cause of observed equipment malfunctions. Test or inspections are provided to isolate the faulty component and corrective actions are provided to eliminate the malfunction.

6-5. **General Support Troubleshooting Procedures.** Table 6-1 lists the common malfunctions that may be found during operation. This manual cannot list all malfunctions that may occur, nor all test or inspections and corrective actions. If a malfunction is not corrected by listed corrective actions, notify your supervisor.

SYMPTOM INDEX

Symptom	Page
1. Sight glass exhibits air bubbles.....	6-2
2. Compressor does not attain final pressure.....	6-3
3. Compressor air delivery is insufficient	6-3
4. Engine fails or is difficult to start.....	6-3
5. Temperature shutdown activates warning.....	6-3
6. Engine gives poor performance.....	6-3
7. Engine oil pressure zero or too low.....	6-4
8. Engine Smokes blue.....	6-4
9. Engine smokes white.....	6-4
10. Engine smokes black.....	6-4
11. Engine does not run smoothly.....	6-5
12. Engine Oil Consumption Excessive.....	6-5

Table 6-1. General Support Troubleshooting Procedures.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
--------------------	---------------------------	--------------------------

1. SIGHT GLASS EXHIBITS AIR BUBBLES.

Check to see if oil relief valve is defective.

Replace oil relief valve (para. 5-12).

2. COMPRESSOR DOES NOT ATTAIN FINAL PRESSURE.

Check to see if there is excessive piston clearance.

Replace (para. 6-10).

Table 6-1. General Support Troubleshooting Procedures.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
3. COMPRESSOR AIR DELIVERY IS INSUFFICIENT.	Step 1. Check to see if intake/discharge valve of 1st stage is malfunctioning. Replace or repair, as required (para. 5-21).	
	Step 2. Check the intake/discharge valves of 2nd, 3rd, or 4th stage if intermediate pressure of any stage is too high. Examine intake/exhaust valves of 2nd, 3rd, and 4th stage, replace or repair as required (para. 5-22 and 5-23).	
	Step 3. Intermediate pressure is too low, there is leakage in the piping system or automatic condensate drain system. Locate and repair leak.	
	Step 4. Check to see if final pressure rises only to operating pressure of prefinal safety valve. Examine free floating piston of final stage and replace, as required (para. 6-10).	
4. ENGINE FAILS OR IS DIFFICULT TO START.	Step 1. Check to see if fuel feed pump diaphragm is defective. Disassemble and replace diaphragm (para. 4-32).	
	Step 2. Check to see if commencement of delivery setting is incorrect. Adjust valve timing (para. 5-41).	
	Step 3. Check to see if compression pressure is too low. Replace valves, piston rings, or cylinder, as required (para. 5-43).	
	Step 4. Check to see if cylinders and/or piston rings are worn. Replace, as required (para. 5-42).	
	Step 5. Check to see if the piston crown clearance is excessive. Adjust as needed (para. 5-40).	
5. TEMPERATURE SHUTDOWN ACTIVATES WARNING.	Step 1. Check to see if fuel delivery timing is incorrect. Adjust timing (para. 5-30).	
	Step 2. Check to see if amount of fuel injected is excessive. Adjust timing (para. 5-30).	
6. ENGINE GIVES POOR PERFORMANCE.	Step 1. Check to see if commencement of delivery setting is incorrect. Adjust timing (para. 5-30).	
	Step 2. Check to see if compression pressure is too low. Replace or adjust valves, piston rings, or cylinder liner (para. 5-40, 5-42, and 5-43).	

Table 6-1. General Support Troubleshooting Procedures.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
6. ENGINE GIVES POOR PERFORMANCE (Cont).	Step 3. Check to see if cylinders and/or piston rings are worn.	Replace cylinder or piston rings (para. 5-42 and 5-43).
	Step 4. Check to see if piston crown clearance is excessive.	Adjust clearance (para. 5-40).
7. ENGINE OIL PRESSURE ZERO OR TOO LOW.	Step 1. Check to see if lube oil pump is defective.	Repair lube oil pump (para. 5-33).
	Step 2. Check to see if main and/or connecting rod bearings are defective.	Replace bearings (para. 5-44).
	Step 3. Check to see if cylinder and/or piston rings are worn.	Replace cylinders or rings, as required (para. 5-42 and 5-43).
8. ENGINE SMOKES BLUE.	Check to see if cylinders and/or piston rings are worn.	Replace cylinders or piston rings (para. 5-42 and 5-43).
9. ENGINE SMOKES WHITE.	Step 1. Check to see if commencement of delivery setting is incorrect.	Adjust timing (para. 5-30).
	Step 2. Check to see if compression pressure is too low.	Replace piston rings, valves or cylinders, as required (para. 5-41, 5-42, and 5-43).
	Step 3. Check to see if piston crown clearance is excessive.	Adjust clearance (para. 5-40).
10. ENGINE SMOKES BLACK.	Step 1. Check to see if commencement of delivery setting is incorrect.	Adjust timing (para. 5-30).
	Step 2. Check to see if amount of fuel being injected is excessive.	Adjust timing (para. 5-30).
	Step 3. Check to see if valve clearance is incorrect or valves are worn.	Adjust valve clearance or replace valve (para. 5-41).
	Step 4. Check to see if compression pressure is too low.	Replace piston rings, valves or cylinders, as required (para. 5-41, 5-42, and 5-43).

Table 6-1. General Support Troubleshooting Procedures.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
11. ENGINE DOES NOT RUN SMOOTHLY.		
	Step 1. Check to see if fuel feed pump is defective (diaphragm).	Repair, as required (para. 4-32).
	Step 2. Check to see if commencement of delivery setting is incorrect.	Adjust timing (para. 5-30).
	Step 3. Check to see if compression pressure is too low.	Replace piston rings, cylinders, or valves (para. 5-41, 5-42, and 5-43).
	Step 4. Check to see if cylinders and/or piston rings are worn.	Replace cylinders or piston rings (para. 5-42 and 5-43).
12. ENGINE OIL CONSUMPTION EXCESSIVE.		
	Step 1. Check valve guides.	Repair or replace (para. 5-40).
	Step 2. Check cylinder and piston clearance.	Replace a worn cylinder or piston (para. 5-42 and 5-43).

Section III. GENERAL SUPPORT MAINTENANCE PROCEDURES

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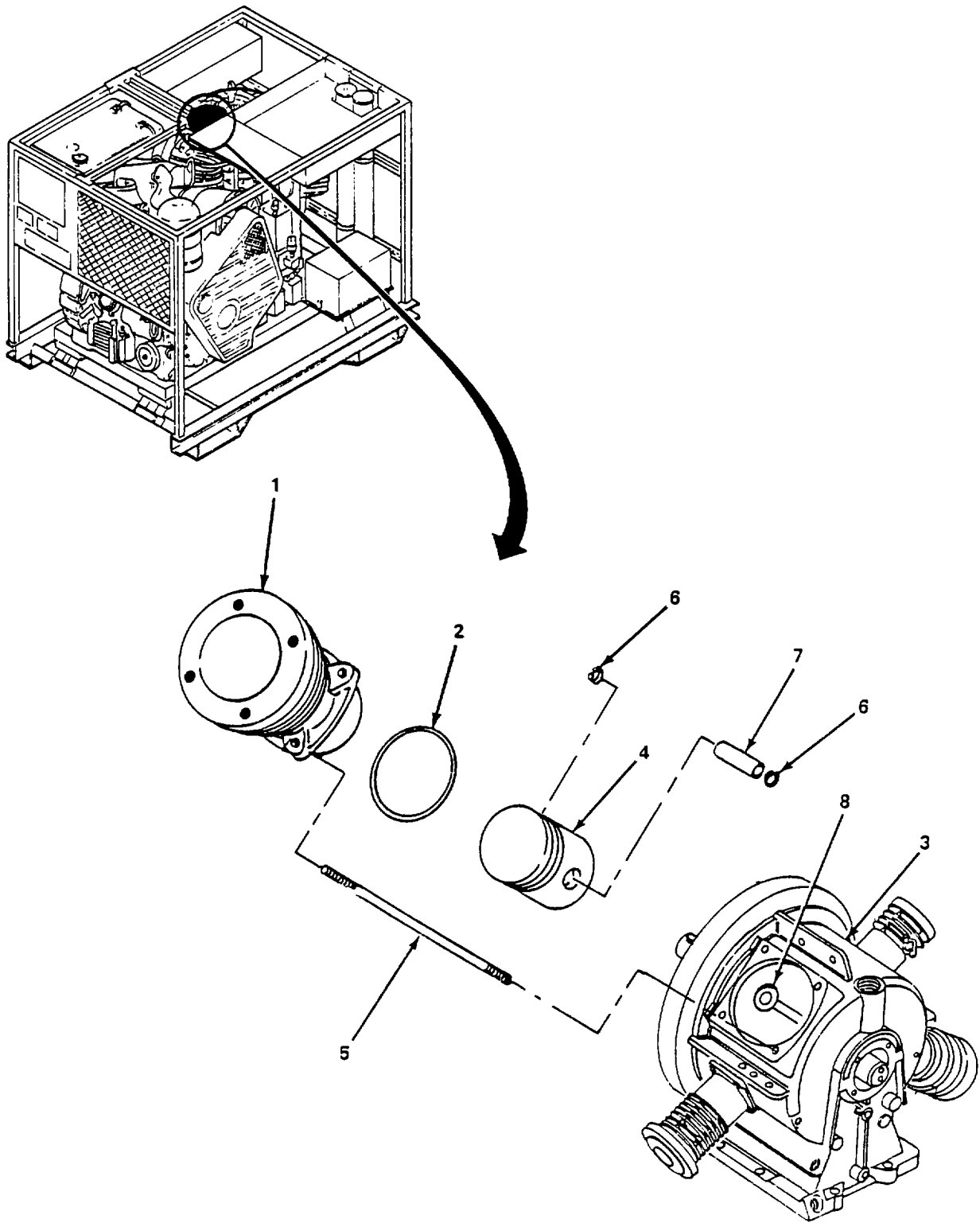


Figure 6-1. 1st Stage Cylinder and Piston, Replace.

6-7. 1st Stage Cylinder and Piston (Cont).

- (1) Lift cylinder (1) and gasket (2) off upper crankcase (3) and piston (4).
- (2) Remove four studs (5) from crankcase (3).
- (3) Turn crankshaft until piston (4) can be seen.
- (4) Using circlip pliers, remove two snap rings (6) securing piston pin (7).
- (5) Remove piston pin (7) from piston (4) and connecting rod (8).
- (6) Remove piston (4).
- (7) Position piston (4) over connecting rod (8) and install piston pin (7).
- (8) Using circlip pliers, install two snap rings (6).
- (9) Install four studs (5) on crankcase (3).
- (10) Install gasket (2) on crankcase (3).
- (11) Apply lubricating oil to cylinder walls.
- (12) Position cylinder (1) on piston (4) using ring clamps.
- (13) Slide cylinder down until it seats on gasket (2) on crankcase (3).

b. Repair. (figure 6-2)

- (1) Remove 1st stage cylinder and piston (para. a. above).

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (2) Using piston ring removal tool, remove three rings (1) from piston.
- (3) Clean cylinder (3) and piston (2) in accordance with Chapter 4, Section VII.

- (4) Inspect cylinder walls for cracks, scoring or damage. Replace if cracked, scored or damaged.
- (5) Inspect piston rings (1) for cracks, or excessive wear. Replace if cracked or worn excessively.

NOTE

Maximum wear limit of cylinder diameter is 5.123 inches (130.3 mm).

- (6) Using micrometer, measure cylinder diameter in four places A, B, C and D.
- (7) Place each piston ring in cylinder and measure piston ring gap with feeler gage. Gap must be between 0.0256 to 0.0315 (0.65 to 0.80 mm).
- (8) Install three piston rings (1) on piston (2).
- (9) Measure piston ring clearance in the groove. The clearance should be between 0.00196 to 0.00393 inches (0.05 to 0.1 mm).
- (10) Install 1st stage cylinder and piston (para.a. above).

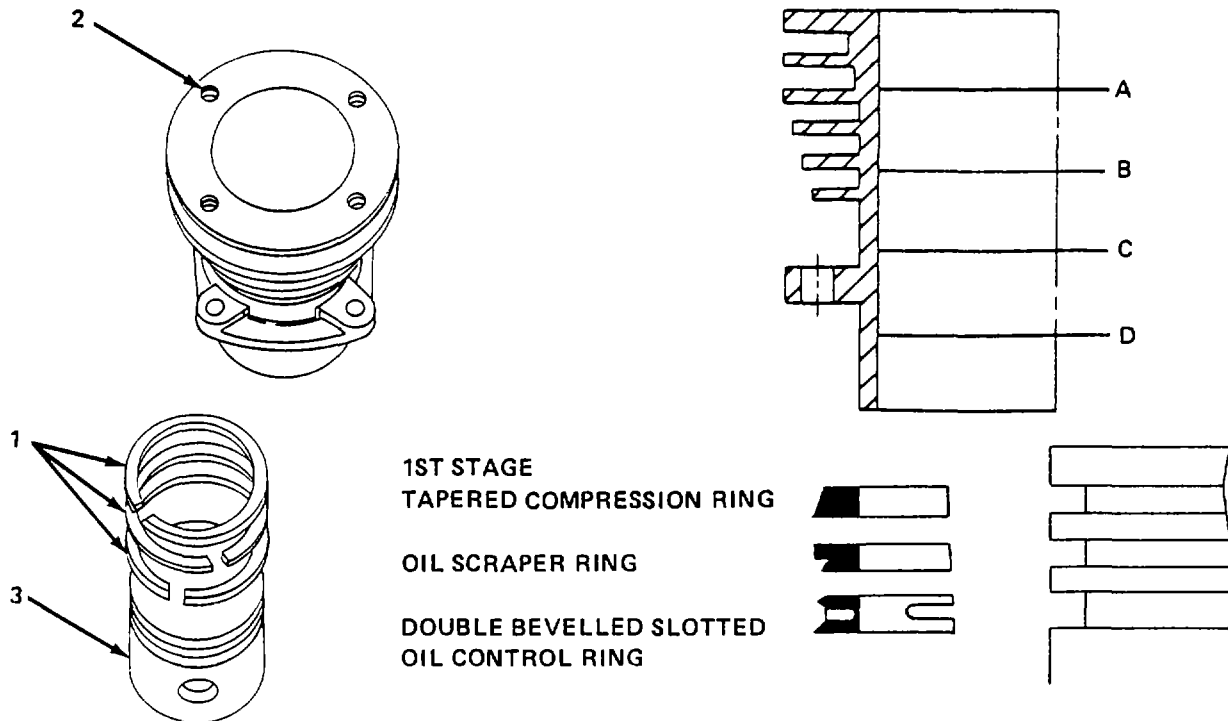


Figure 6-2. 1st Stage Cylinder and Piston, Repair.

FOLLOW-ON MAINTENANCE

Install 1st stage compressor valve head assembly (para. 5-21).

6-8. 2nd Stage Cylinder and Piston.

This task covers: a. Replace b. Repair

INITIAL SETUP
Tools

General Mechanic's Tool Kit
 (NSN 5180-00-177-7033)
 Caliper Set, Micrometer (NSN 5210-00-554-7134)
 Circlip Pliers (NSN 5120-00-789-0492)
 Piston Ring Removal Tool (PN N4453)
 Piston Ring Clamps (PN 57495-645)

Materials/Parts

Cylinder, Compressor
 Piston, 2nd Stage
 Gasket, Crankcase
 Tape (Item 25, Appendix E)
 Band, Rubber (Item 4, Appendix E)
 Bags, Plastic (Item 3, Appendix E)

Materials/Parts (Cont)

Detergent, Nonionic (Item 8, Appendix E)
 Water, Distilled (Item 9, Appendix E)
 Lubricating Oil (Item 15, Appendix E)

Equipment Condition

Compressor unit shutdown (para.2-13).
 2nd stage compressor valve head assembly
 removed (para. 5-22).

References

Refer to Appendix F, for torque values.
 Cleaning Procedures, Chapter 4, Section VII.

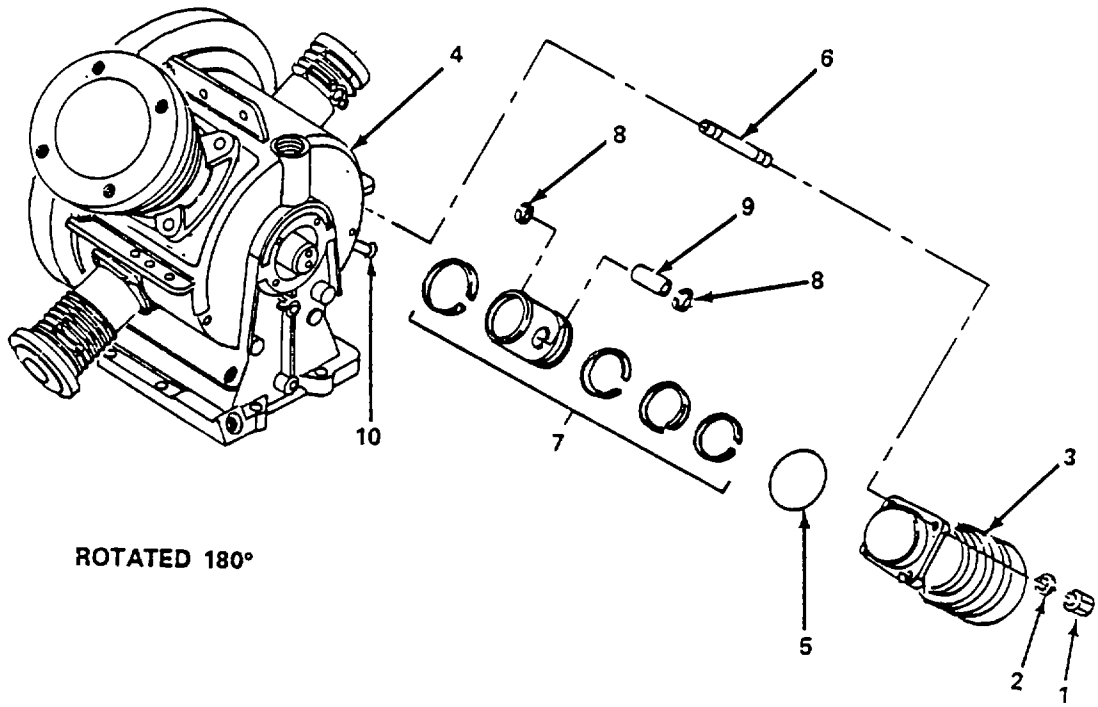
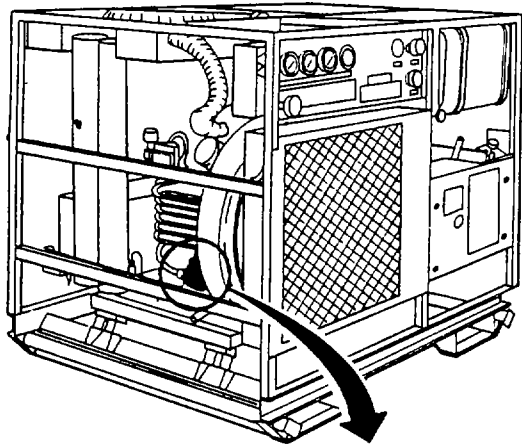
a. *Replace.* (figure 6-3)

WARNING

Cleanliness is imperative in maintaining and handling diving air system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (1) Remove four nuts (1) and washers (2)securing cylinder (3) to upper crankcase (4).
- (2) Remove cylinder (3) and gasket (5) from upper crankcase (4).
- (3) Remove four studs (6) from crankcase (4).
- (4) Turn crankshaft until piston (7) can be seen.



ROTATED 180°

Figure 6-3. 2nd Stage Cylinder and Piston, Replace.

6-8. 2nd Stage Cylinder and Piston (Cont).

- (5) Using circlip pliers, remove two snap rings (8).
- (6) Remove piston pin (9) from piston (7) and connecting rod (10).
- (7) Remove piston (7).
- (8) Position piston (7) over connecting rod (10) and install piston pin (9).
- (9) Using circlip pliers, install two snap rings (8).
- (10) Install four studs (6) on crankcase (4).
- (11) Install gasket (5) on crankcase (4).
- (12) Apply lubricating oil to cylinder walls.
- (13) Position cylinder (3) on piston (7) using piston ring clamp.
- (14) Slide cylinder (3) down until it seats on gasket (5) on upper crankcase (4).
- (15) Install four washers (2) and nuts (1).

b. Repair. (figure 6-4)

- (1) Remove 2nd stage cylinder and piston (para. a. above).

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (2) Remove four rings (1) from piston (2) using piston ring removal tool.
- (3) Clean cylinder (3) and piston (2) in accordance with Chapter 4, Section VII.
- (4) Inspect cylinder walls for cracks, scoring or damage. Replace if cracked, scored or damaged.
- (5) Inspect piston rings (1) for cracks, or excessive wear. Replace if cracked or worn excessively.

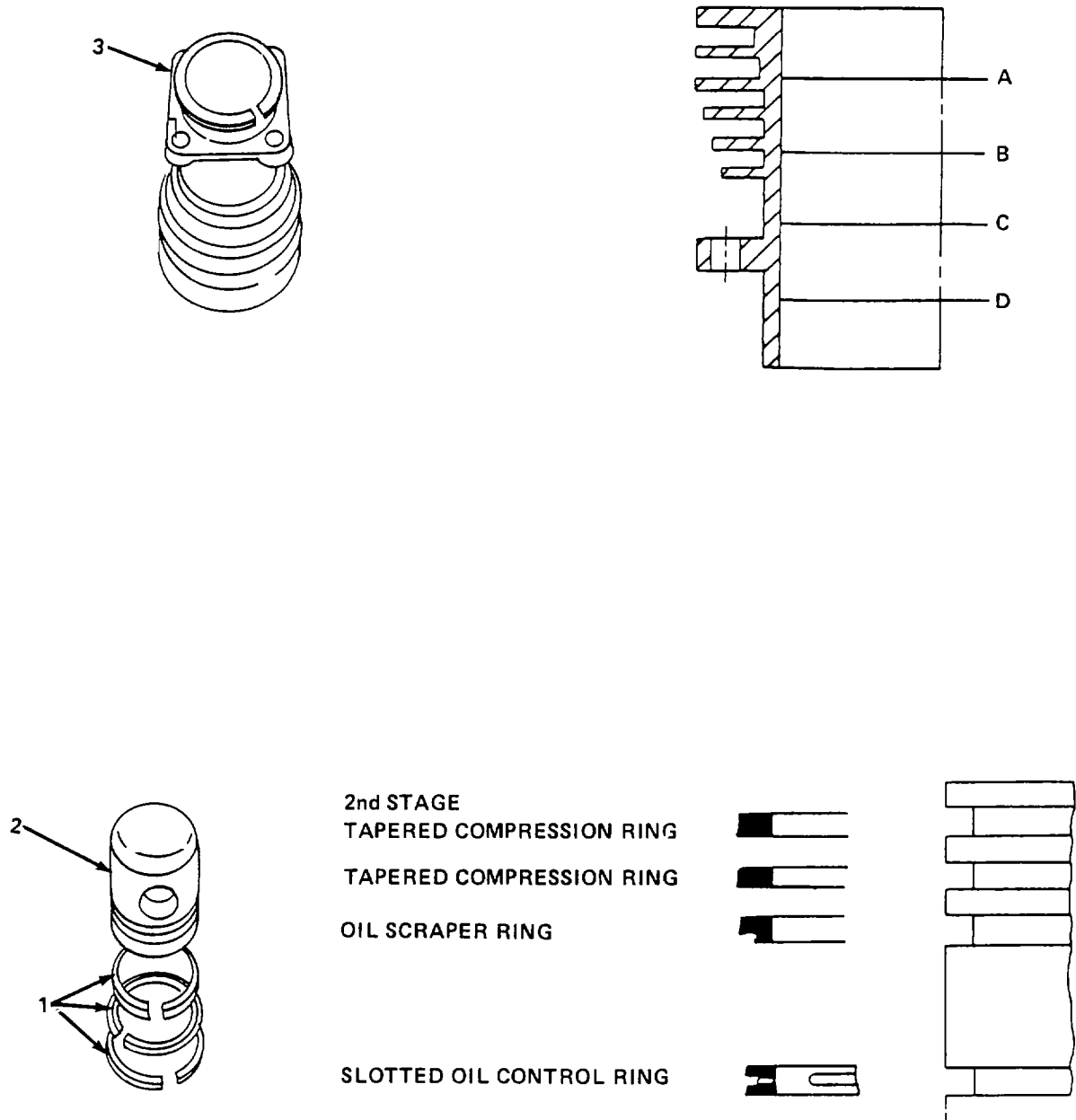


Figure 6-4. 2nd Stage Cylinder and Piston, Repair.

NOTE

Maximum wear limit of cylinder is 2.365 inches (60.08 mm)

- (6) Using micrometer, measure cylinder diameter in four places A, B, C and D.
- (7) Place each piston ring in cylinder and measure piston gap with feeler gage. Gap must be between 0.0137 to 0.0196 inches (0.35 to 0.50 mm).
- (8) Install four piston rings (1) on piston (2).
- (9) Measure piston ring clearance in groove. The clearance should be between 0.00197 to 0.00393 inches (0.05 to 0.1 mm).
- (10) Install 2nd stage cylinder and piston (para. a. above).

FOLLOW-ON MAINTENANCE

Install 2nd stage compressor valve head assembly (para. 5-22).

6-9. 3rd Stage Cylinder and Piston.

This task covers: a. Replace b. Repair

INITIAL SETUP
Tools

General Mechanic's Tool Kit
 (NSN 5180-00-177-7033)
 Caliper Set, Micrometer (NSN 5210-00-554-7134)
 Circlip Pliers (NSN 5120-00-789-0492)
 Piston Ring Removal Tool (PN N4453)
 Piston Ring Clamps (PN 57495-645)

Materials/Parts

Cylinder, Compressor
 Piston, 3rd Stage
 Gasket, Crankcase
 Tape (Item 25, Appendix E)
 Band, Rubber (Item 4, Appendix E)
 Bags, Plastic (Item 3, Appendix E)

Materials/Parts (Cont)

Detergent, Nonionic (Item 8, Appendix E)
 Water, Distilled (Item 9, Appendix E)
 Lubricating Oil (Item 15, Appendix E)

Equipment Condition

Compressor unit shutdown (para. 2-13).
 3rd stage compressor valve head assembly removed (para.5-22).

References

Refer to Appendix F for torque values.
 Cleaning Procedures, Chapter 4, Section VII.

a. Replace. (figure 6-5)

WARNING

Cleanliness is imperative in maintaining and handling diving air system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (1) Remove four nuts (1) and washers (2) securing cylinder (3) to upper crankcase (4).

NOTE

The floating piston will come off when the cylinder is removed.

- (2) Remove cylinders (3), preformed packing (5), and floating piston (6).

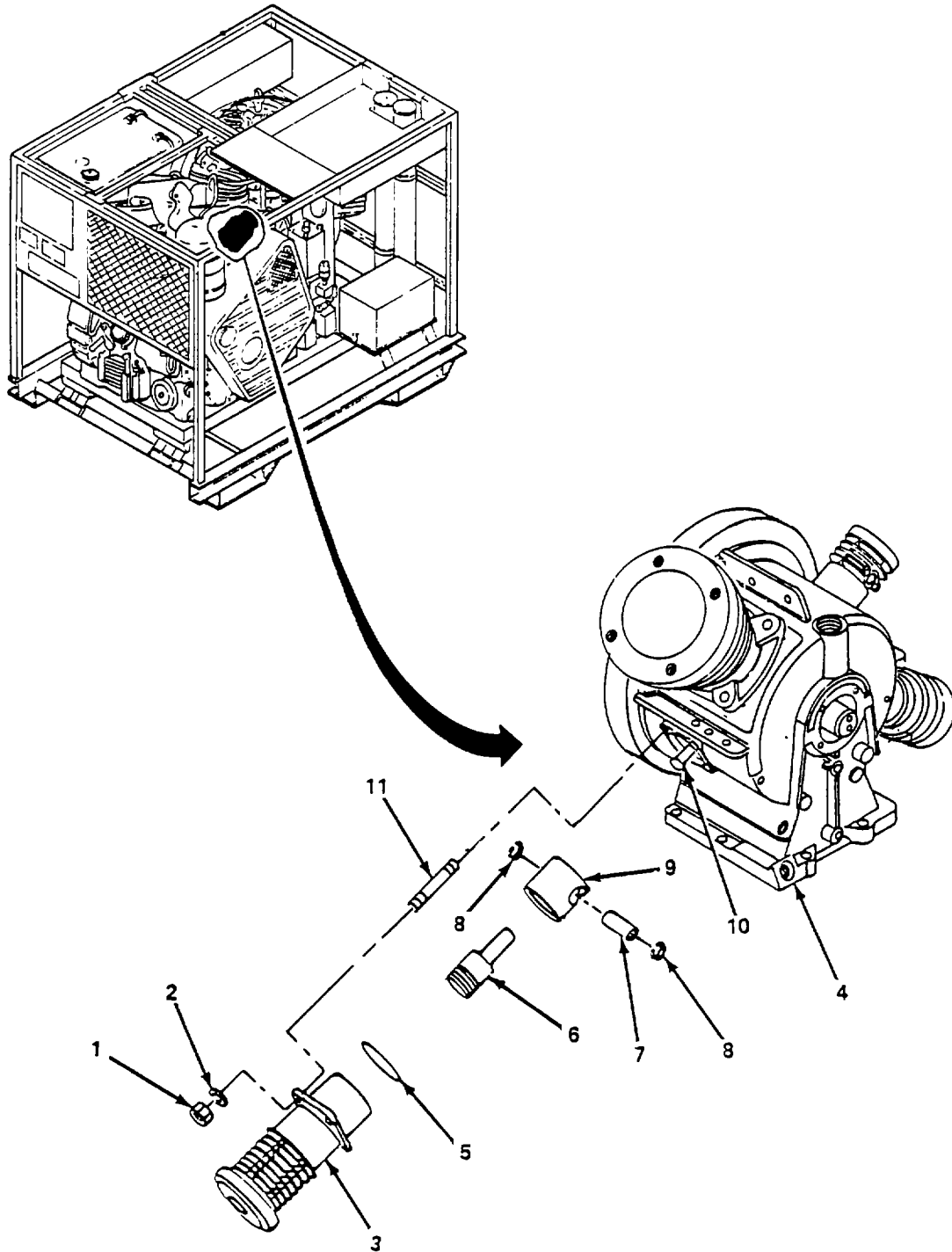


Figure 6-5. 3rd Stage Cylinder and Piston, Replace.

6-9. 3rd Stage Cylinder and Piston (Cont).

- (3) Remove piston (6) from cylinder (3).
- (4) Turn crankshaft until piston pin (7) can be seen.
- (5) Using circlip pliers, remove two circlips (8) and push piston pin (7) out of guide piston (9) and connectingrod (10).
- (6) Remove four studs (11) from crankcase (4).
- (7) Install four studs (11) on crankcase (4).
- (8) Position guide piston (9) over connecting rod (10) and insert piston pin (7).
- (9) Using circlip pliers, install two circlips (8).
- (10) Position preformed packing (5) on crankcase (4).
- (11) Lubricate cylinder wall with oil.
- (12) Insert cylinder (3) down over floating piston (6) using piston ring clamp.
- (13) Insert cylinder (3) and floating piston (6) onto guide piston (9).
- (14) Position cylinder (3) down until it seats on preformed packing (5) on upper crankcase (4).
- (15) Install four washers (2) and nuts (1).

b. Repair. (figure 6-6)

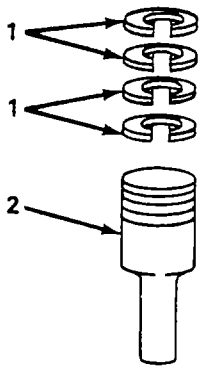
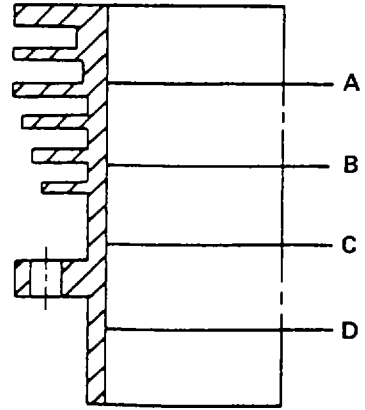
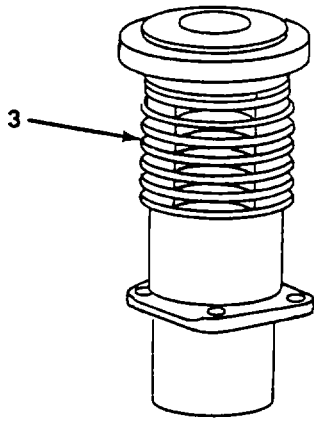
- (1) Remove 3rd stage cylinder and piston (para. a. above).

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (2) Using piston ring removal tool, remove four rings (1) from piston (2).
- (3) Clean cylinder (3) and piston (2) in accordance with Chapter 4, Section VII.



3RD STAGE
PLAIN COMPRESSION RING
PLAIN COMPRESSION RING
PLAIN COMPRESSION RING
PLAIN COMPRESSION RING

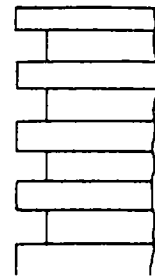


Figure 6-6. 3rd Stage Cylinder and Piston, Repair.

6-19/(6-20 blank)

- (4) Inspect cylinder walls for cracks, scoring or damage. Replace if cracked, scored or damaged.
- (5) Inspect piston rings (1) for cracks, or excessive wear. Replace if cracked or worn excessively.

NOTE

Maximum wear limit of cylinder diameter is 1.2634 inches (32.09 mm).

- (6) Using micrometer, measure cylinder diameter in four places A, B, C, and D.
- (7) Place each piston ring in cylinder and measure piston ring gap with feeler gage. Gap must be between 0.01 to 0.25 mm.
- (8) Install four piston rings (1) on piston (2).
- (9) Measure piston ring clearance in the groove. The clearance should be between 0.00197 to 0.00393 (0.05 to 0.1 mm).
- (10) Install 3rd stage cylinder and piston (para. a. above).

FOLLOW-ON MAINTENANCE

Install 3rd stage compressor valve head assembly (para. 5-22).

6-10. 4th Stage Cylinder and Piston.

This task covers: a. Replace b. Repair

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
 (NSN 5180-00-177-7033)
 Caliper Set, Micrometer (NSN 5210-00-554-7134)
 Circlip Pliers (NSN 5120-00-789-0492)
 Piston Ring Removal Tool (PN N4453)

Materials/Parts

Cylinder, Compressor
 Piston, 4th Stage
 Gasket, Crankcase
 Tape (Item 25, Appendix E)
 Bands, Rubber (Item 4, Appendix E)
 Bags, Plastic (Item 3, Appendix E)

Materials/Parts (Cont)

Detergent, Nonionic (Item 8, Appendix E)
 Water, Distilled (Item 9, Appendix E)
 Lubricating Oil (Item 15, Appendix E)

Equipment Condition

Compressor unit shutdown (para. 2-13).
 4th stage compressor valve head assembly
 removed (para. 5-23).

References

Refer to Appendix F for torque values.
 Cleaning Procedures, Chapter 4, Section VII.

a. Replace. (figure 6-7)

WARNING

Cleanliness is imperative in maintaining and handling diving air system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (1) Remove four nuts (1) and washers (2) securing cylinder (3) to upper crankcase (4).
- (2) Lift cylinder (3), piston and sleeve assembly (5) and preformed packing (6) from upper crankcase (4).
- (3) Remove piston and sleeve assembly (5) from cylinder (3).
- (4) Turn crankshaft until guide piston pin (7) can be seen.

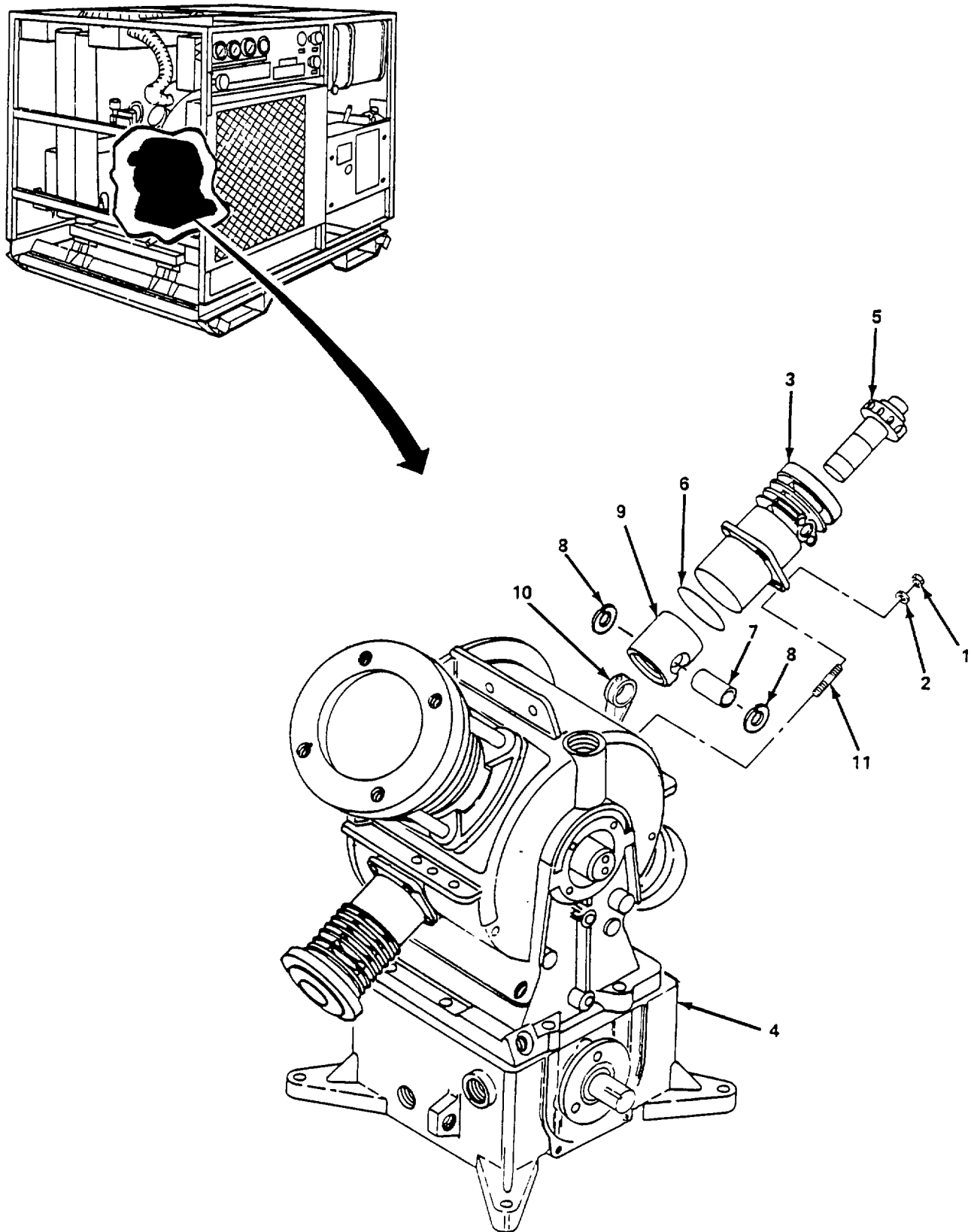


Figure 6-7. 4th Stage Cylinder and Piston, Replace.

6-10. **4th Stage Cylinder and Piston (Cont).**

- (5) Using circlip pliers, remove two circlips (8) and push guide piston pin (7) out of guide piston (9) and connecting rod (10).
- (6) Remove guide piston (9).
- (7) Remove four studs (11).
- (8) Install four studs (11).
- (9) Install guide piston (9) on connecting rod (10).
- (10) Install guide piston pin (7) through guide piston (9) and connecting rod (10).
- (11) Using circlip pliers, install two circlips (8).
- (12) Position preformed packing (6) on upper crankcase (4).
- (13) Install piston and sleeve assembly (5) into cylinder (3).
- (14) Install piston and sleeve assembly (5) onto to guide piston (9).
- (15) Position cylinder (3) down until it seats on preformed packing (6) and crankcase (4).
- (16) Install four washers (2) and nuts (1).

b. Repair. (figure 6-8)

- (1) Remove 4th stage cylinder and piston (para. a. above).

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (2) Remove piston (1) from sleeve (2).
- (3) Clean cylinder (3) and piston (1) and sleeve (2) in accordance with Chapter 4, Section VII.
- (4) Inspect cylinder (3) walls for cracks, scoring or damage. Replace if cracked, scored or damaged.

- (5) Inspect piston (1) and sleeve (2) for scoring.
- (6) Lubricate piston (1) with oil and insert piston into sleeve (2) with tapered end first.
- (7) Install 4th stage cylinder and piston (para. a. above).

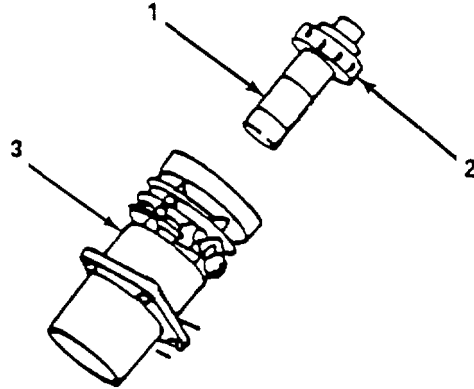


Figure 6-8. 4th Stage Cylinder and Piston, Repair.

FOLLOW-ON MAINTENANCE

Install 4th stage compressor valve head assembly (para. 5-23).

6-11. Compressor Upper Crankcase.

This task covers: Replace

INITIAL SETUP
Tools

General Mechanic's Tool Kit

Materials/Parts

Compressor, Upper Crankcase
Gasket, Crankcase

Equipment Condition

Compressor unit shut down (para. 2-13).
Compressor crankshaft assembly removed (para. 6-13).

References

Refer to Appendix F for torque values.
Cleaning Procedures, Chapter 4, Section VII.

Replace. (figure 6-9)

WARNING

Cleanliness is imperative in maintaining and handling diving air system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

- (1) Remove four nuts (1) and washers (2).
- (2) Remove upper crankcase (3) and gasket (4) from studs (5) on lower crankcase (6).
- (3) Install gasket (4) and upper crankcase (3) on studs (5) of lowercrankcases (6) and secure with four washers (2) and nuts (1).

FOLLOW-ON MAINTENANCE

Install compressor crankshaft assembly (para. 6-13).

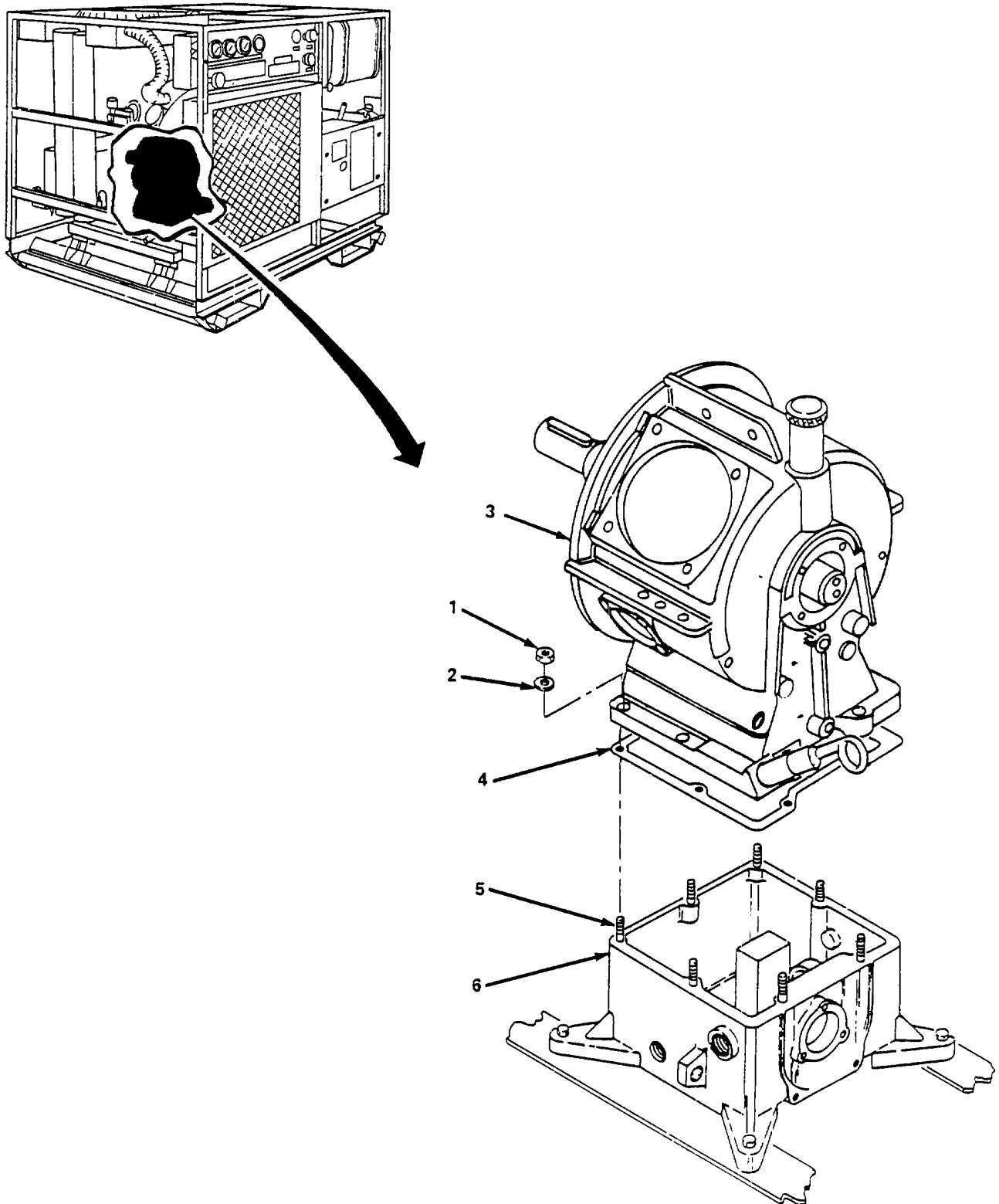


Figure 6-9. Upper Crankcase, Replace.

6-12. Crankcase Cover.

This task covers: a. Replace b. Repair

INITIAL SETUP
Tools

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Materials/Parts

Crankcase Cover
Detergent, Nonionic (Item 8, Appendix E)
Distilled Water (Item 9, Appendix E)

Equipment Condition

Compressor unit shut down (para. 2-13).
Flywheel/fanwheel assembly removed (para. 4-24).

Equipment Condition (Cont)

Intercooler 1st stage removed (para. 5-13).
Intercooler 2nd stage removed (para. 5-13).
Intercooler 3rd stage removed (para. 5-13).
Aftercooler removed (para. 5-13).

References

Refer to Appendix F for torque values.
Cleaning Procedures, Chapter 4, Section VII.

 a. Replace. (figure 6-10)

- (1) Remove four nuts (1), lockwashers (2), washers (3), and alien screws (4) and remove two brackets (5).
- (2) Remove eight nuts (6), lockwashers (7), washers (8) and alien screws (9) and remove four brackets (10).

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (3) Loosen fitting nut (11) and remove line (12).
- (4) Remove six screws (13) and remove front cover (14) and gasket (15).
- (5) Install gasket (15) and front cover (14) and secure with six screws (13).

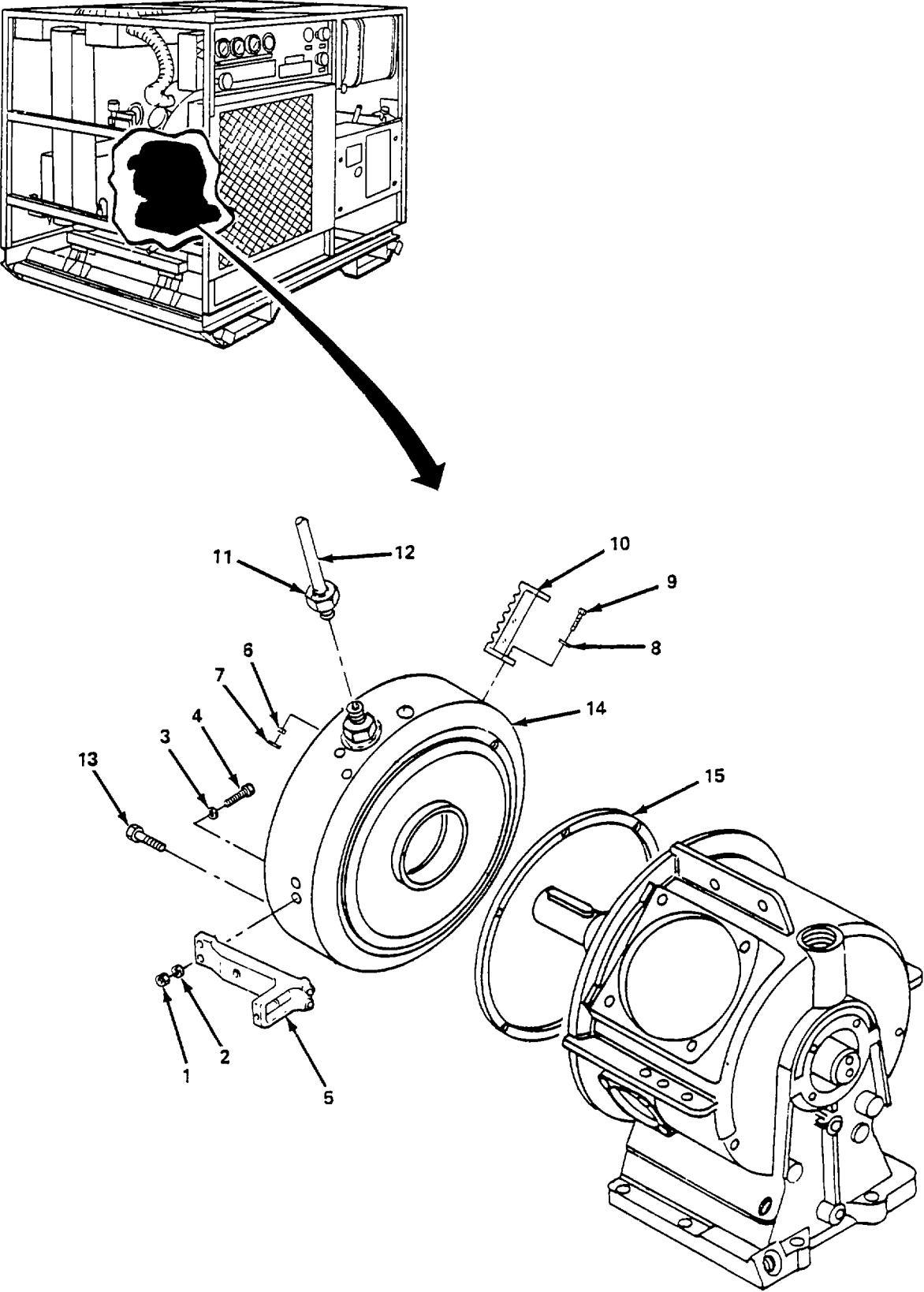


Figure 6-10. Crankcase Front Cover Assembly, Replace.

6-12. Crankcase Cover (Cont).

- (6) Install line (12) and tighten fitting nut (11).
- (7) Install four brackets (10) and secure with eight alien screws (9), washers (8), lockwashers (7), and nuts (6).
- (8) Install two brackets (5) and secure with four alien screws (4), washers (3), lockwashers (2), and nuts (1).

b. Repair. (figure 6-11)

- (1) Remove crankcase front cover assembly (para. a. above).

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

Ensure that all air lines and components removed or openings into the air system that provides breathing air are covered with a plastic bag and secured with a rubber band or taped shut. Small components should be stored in a plastic bag and sealed. Failure to do so will cause air system to become contaminated and could result in injury or death to the diver.

- (2) Remove screw (1), washer (2), and lifting stud (3).
- (3) Remove connector (4) and gasket (5).
- (4) Clean front cover (6) in accordance with Chapter 4, Section VII.
- (5) Inspect front cover for cracks or dents. Replace if cracked or dented.
- (6) Install gasket (5) and connector (4) on front cover (6).
- (7) Install lifting stud (3) and secure with washer (2) and screw (1).
- (8) Install crankcase front cover assembly (para. a. above).

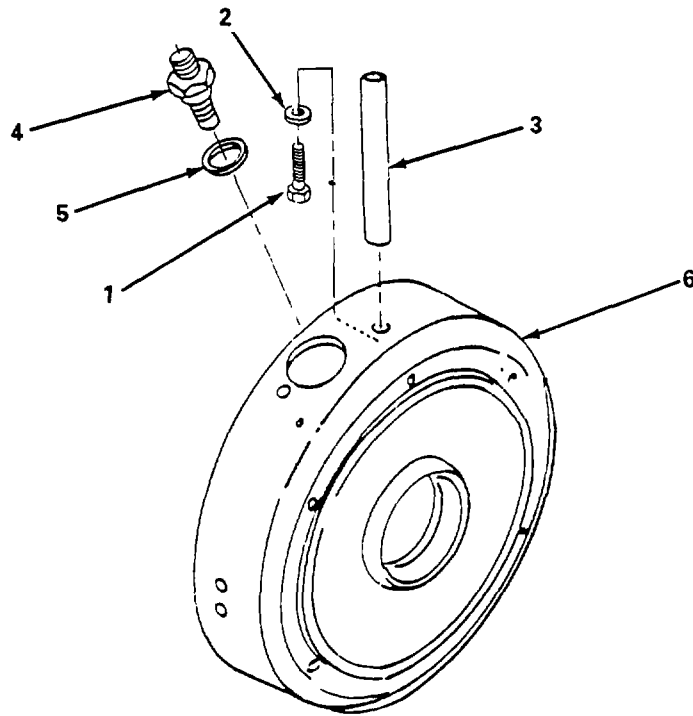


Figure 6-11. Crankcase Front Cover Assembly, Repair.

FOLLOW-ON MAINTENANCE

- (1) Install aftercooler (para. 5-13).
- (2) Install intercooler 3rd stage (para. 5-13).
- (3) Install intercooler 2nd stage (para. 5-13).
- (4) Install intercooler 1st stage (para. 5-13).
- (5) Install flywheel/fanwheel assembly (para. 4-24).

6-13. Compressor Crankshaft Assembly.

This task covers: a. Replace b. Repair

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Materials/Parts

Crankshaft, Compressor
Detergent, Nonionic (Item 8, Appendix E)
Distilled Water (Item 9, Appendix E)

Equipment Condition

Compressor unit shut down (para. 2-13).
Flywheel/fanwheel assembly removed (para. 4-22).
Compressor front cover assembly removed (para. 6-12).

Equipment Condition (Cont)

Compressor COG belt guard and belt removed
(para. 4-25).
Tension pulley assembly, driving gear and eccentric
shaft driving gear removed (para. 5-25).
1st stage cylinder and piston removed (para. 6-7).
2nd stage cylinder and piston removed (para. 6-8).
3rd stage cylinder and piston removed (para. 6-9).
4th stage cylinder and piston removed (para. 6-10).

References

Refer to Appendix F for torque values.
Cleaning Procedures, Chapter 4, Section VII.

a. Replace. (figure 6-12)

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

- (1) Remove four bolts (1) and remove cover (2), gasket (3), seal (4), and roller bearing (5).
- (2) Remove ball bearings (6) and (7).
- (3) Remove nut (8), lockwasher (9), and bolt (10) and remove counterweight (11) from crankshaft (12).
- (4) Remove connecting rods (13), (14), (15), and (16) from crankshaft (12), while removing crankshaft from upper crankcase (17).

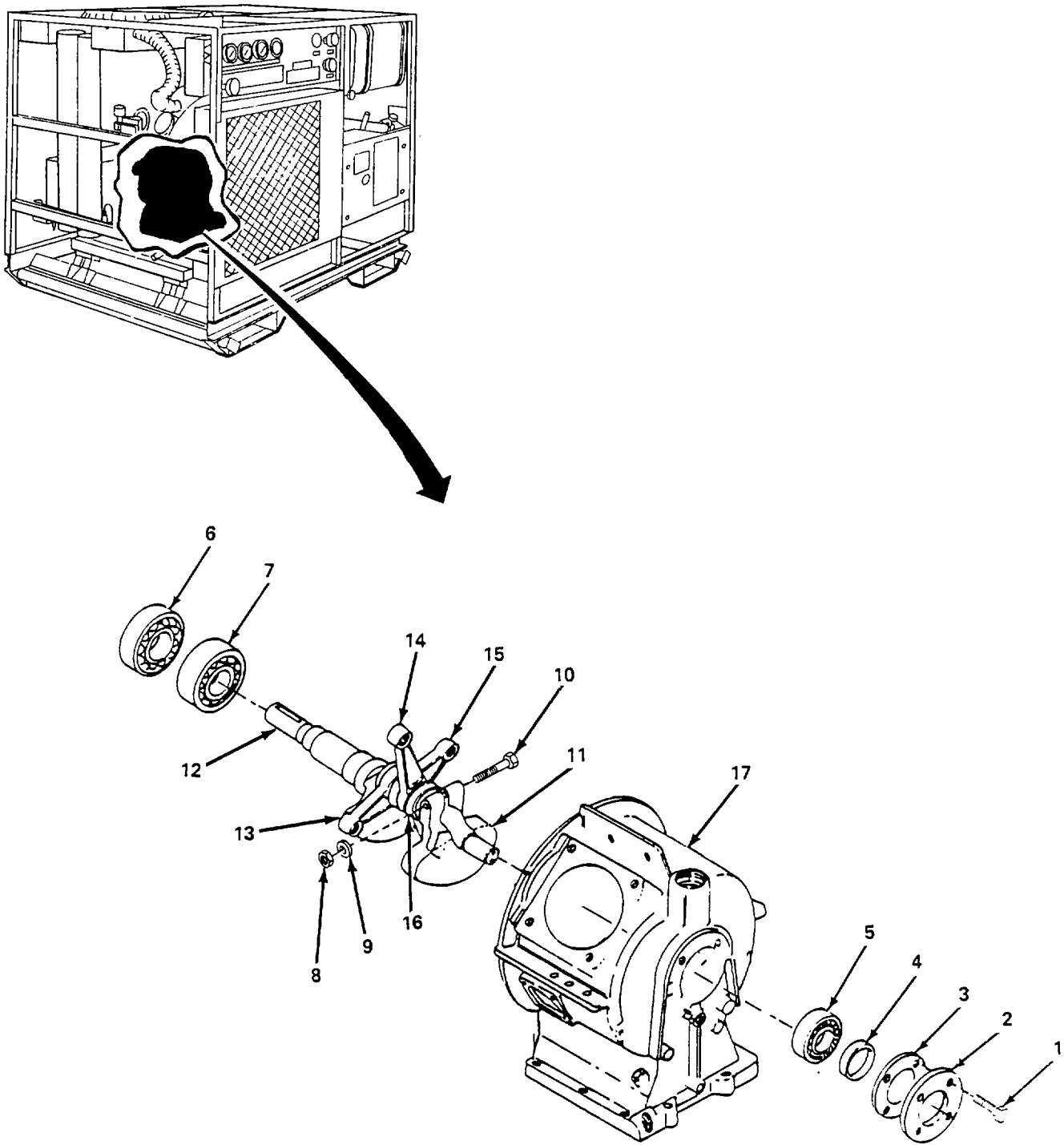


Figure 6-12. Compressor Crankshaft Assembly, Replace.

6-13. **Compressor Crankshaft Assembly (Cont).**

- (5) Install connecting rods (13), (14), (15), and (16) on crankshaft (12), while pushing crankshaft (12) into upper crankcase (17).
- (6) Install counterweight (11) and secure with bolt (10), lockwasher (9), and nut (8).
- (7) Install ball bearings (6) and (7) on crankshaft (12).
- (8) Install roller bearing (5), seal (4), gasket (3), cover (2) and secure with four bolts (1).

b. Repair. (figure 6-13)

- (1) Remove crankshaft assembly (para. a. above).

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

- (2) Clean crankshaft (1) in accordance with Chapter 4, Section VII.
- (3) Inspect crankshaft (1) for scoring, pitting, cracks, bent or broken shaft and signs of excessive heat.
- (4) Inspect connecting rods (2), (3), (4), and (5) and counterweight (6) for damage.
- (5) Inspect ends of crankshaft for damage to keyway (7).
- (6) If crankshaft (1) is worn, bent, or cracked, replace crankshaft.

FOLLOW-ON MAINTENANCE

- (1) Install 4th stage cylinder and piston (para. 6-10).
- (2) Install 3rd stage cylinder and piston (para. 6-9).
- (3) Install 2nd stage cylinder and piston (para. 6-8).
- (4) Install 1st stage cylinder and piston (para. 6-7).
- (5) Install tension pulley assembly, driving gear, and eccentric shaft driving gear (para. 5-25).
- (6) Install compressor COG belt guard and belt (para. 4-25).
- (7) Install compressor front cover assembly (para. 6-12).
- (8) Install flywheel/fanwheel assembly (para. 4-24).

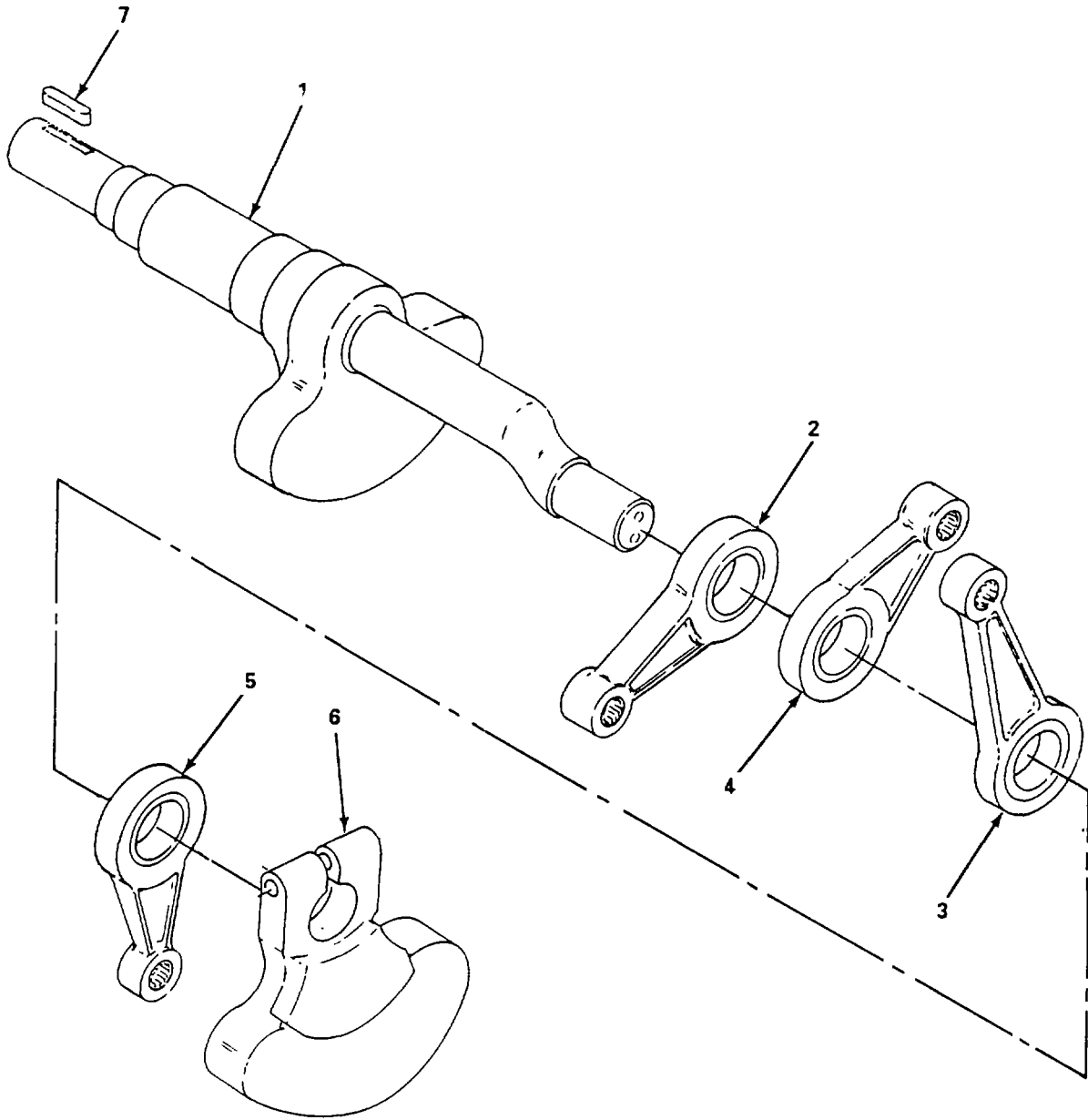


Figure 6-13. Compressor Crankshaft Assembly, Repair.

6-14. Compressor Lower Crankcase.

This task covers: a. Replace b. Repair

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)

Materials/Parts

Compressor, Lower Crankcase
Detergent, Nonionic (Item 8, Appendix E)
Distilled Water (Item 9, Appendix E)

Equipment Condition

Compressor unit shut down (para. 2-13).
Upper crankcase removed (para. 6-11).
Eccentric shaft removed (para. 6-15).
Oil pump removed (para. 5-33).

References

Cleaning Procedures, Chapter 4, Section VII.
Refer to Appendix F for torque values.

a. Replace. (figure 6-14)

WARNING

Cleanliness is imperative in maintaining and handling diving air system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

- (1) Remove four nuts (1), eight washers (2), and four bolts (3) securing crankcase (4) to frame (5) and remove crankcase.
- (2) Position crankcase (4) on frame (5) and secure with four bolts (3), eight washers (2), and nuts (1).

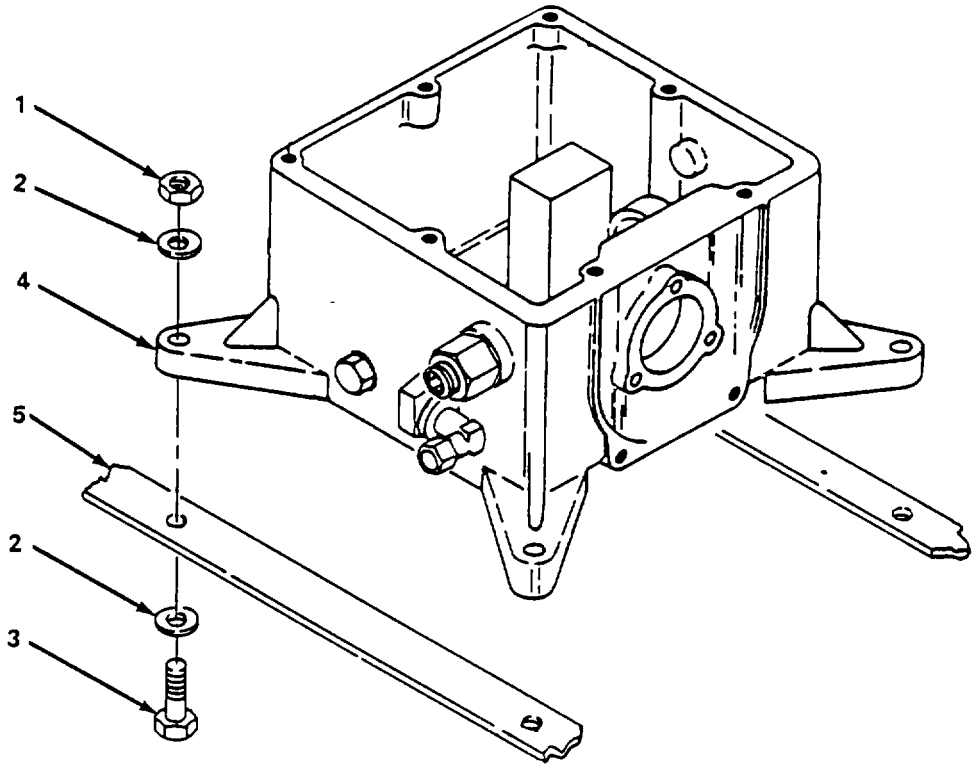
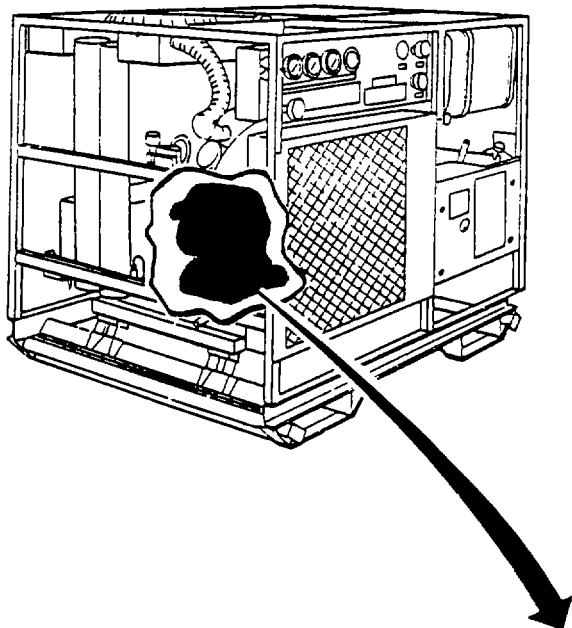


Figure 6-14. Compressor Lower Crankcase, Replace.

6-14. Compressor Lower Crankcase (Cont).b. Repair. (figure 6-15)

- (1) Remove compressor lower crankcase (para. a. above).

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

- (2) Remove nut (1) and remove fitting elbow (2) from crankcase (3).
- (3) Remove plug (4).
- (4) Remove two plugs (5), reducer (6), and gaskets (7).
- (5) Remove oil drain plug (8) and gasket (9).
- (6) Clean lower crankcase (3) in accordance with Chapter 4, Section VII of this manual.
- (7) Inspect lower crankcase (3) for cracks or damaged fittings. Replace crankcase if cracked.
- (8) Install gasket (9) and oil drain plug (8).
- (9) Install two gaskets (7), reducers (6), and plugs (5).
- (10) Install plug (4).
- (11) Install fitting elbow (2) and secure with nut (1).
- (12) Install compressor lower crankcase (para. a. above).

FOLLOW-ON MAINTENANCE

- (1) Install oil pump (para. 5-33).
- (2) Install eccentric shaft (para. 6-15).
- (3) Install upper crankcase (para. 6-11).

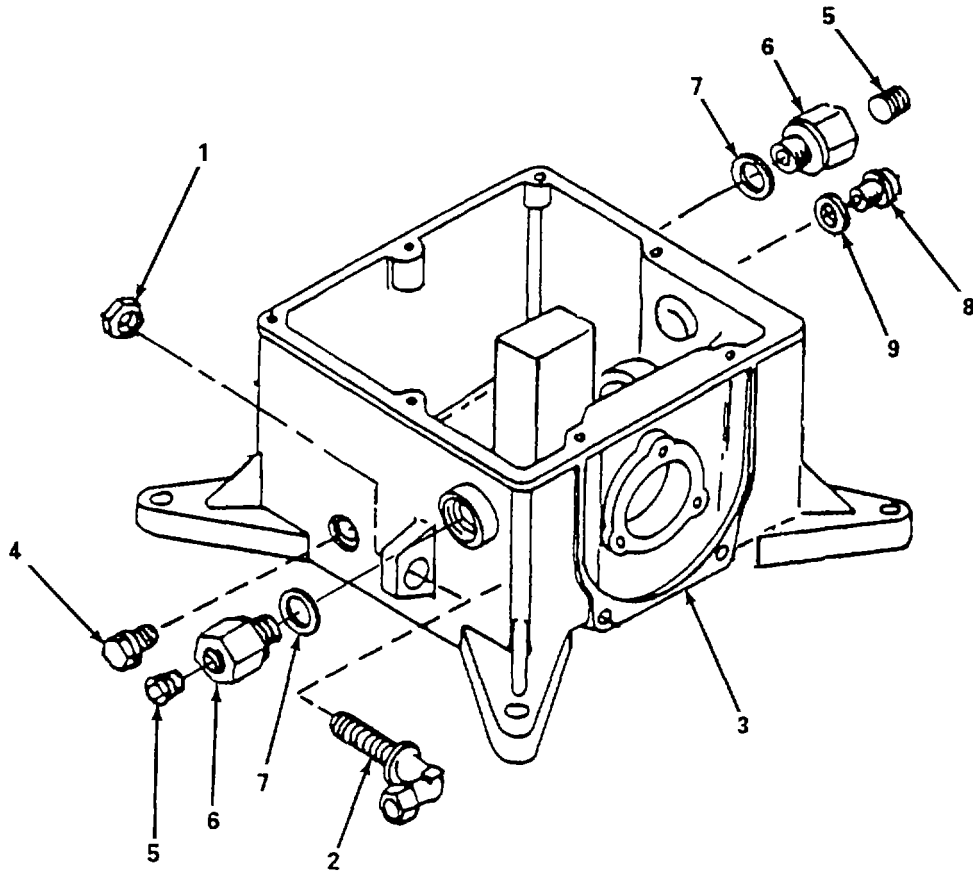


Figure 6-15. Compressor Lower Crankcase, Repair.

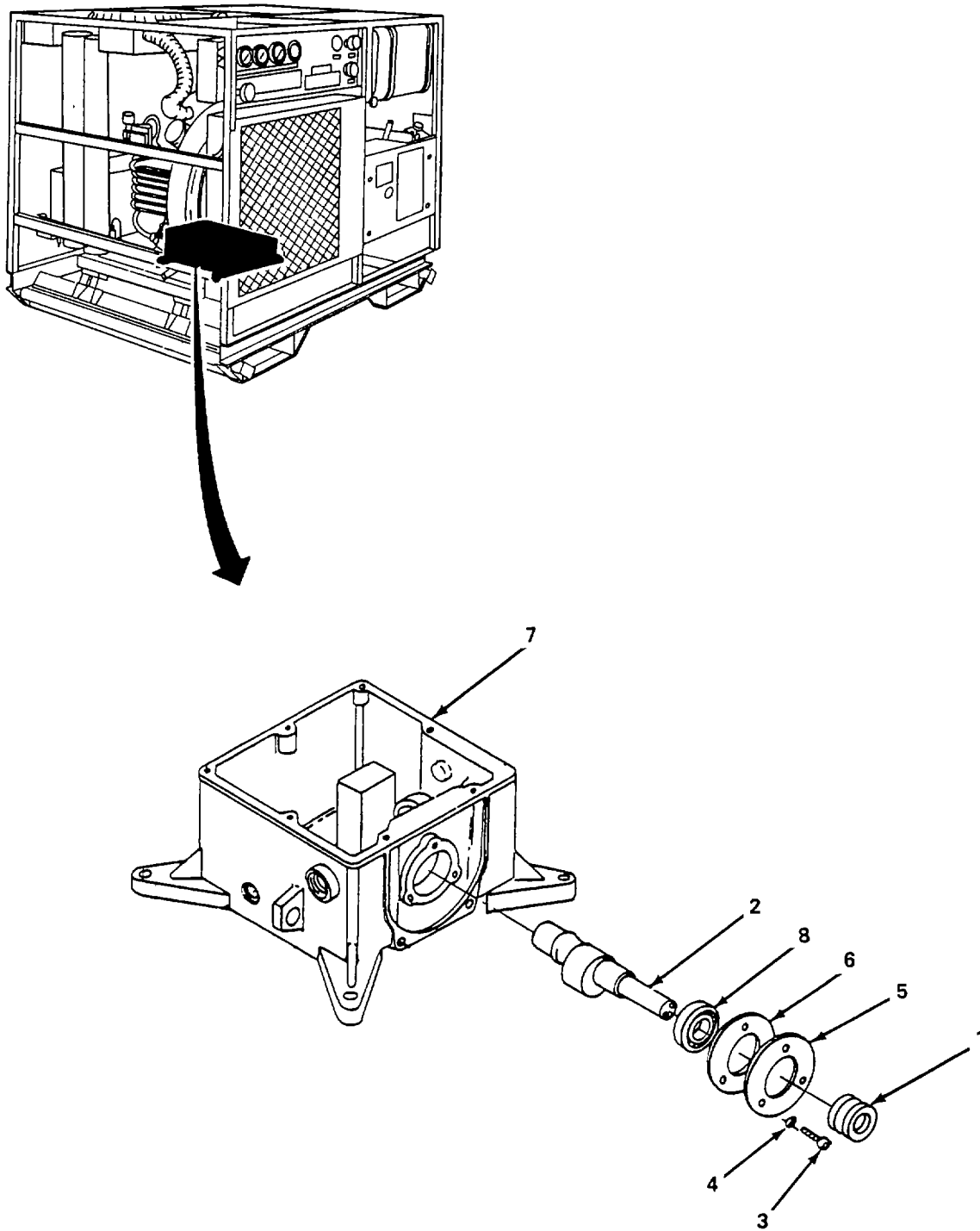


Figure 6-16. Compressor Eccentric Shaft, Replace.

6-15. Compressor Eccentric Shaft (Cont).b. *Repair.* (figure 6-17)

- (1) Remove compressor eccentric shaft (para. a. above).

WARNING

Cleanliness is imperative in maintaining and handling diving system components. All tools and parts must be kept free of oil, grease, rust, or other contamination in accordance with Chapter 4, Section VII of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.

- (2) Clean eccentric shaft (1) in accordance with Chapter 4, Section VII.
- (3) Inspect eccentric shaft (1) for scoring or pitting and wear on bearing (2).
- (4) Replace eccentric shaft (1) if scored or pitted and if bearing is worn excessively.
- (5) Install compressor eccentric shaft (para. a. above).

FOLLOW-ON MAINTENANCE

- (1) Install oil pump (para. 5-33).
- (2) Install compressor upper crankcase (para. 6-11).

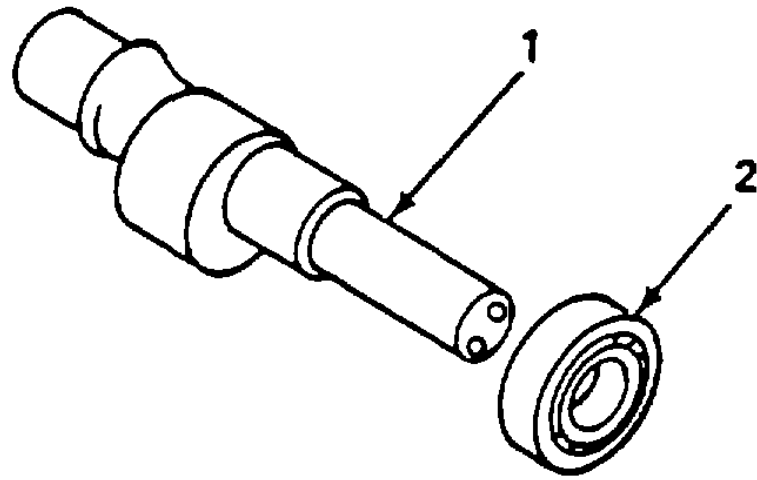


Figure 6-17. Compressor Eccentric Shaft, Repair.

6-16. Alternator.

This task covers:

Repair

INITIAL SETUP*Tools*General Mechanic's Tool Kit
(NSN 5180-00-177-7033)*Equipment Condition*Compressor unit shut down (para. 2-13).
Alternator removed (para 4-44).*Materials/Parts*Alternator

Repair.

- (1) Disassemble. (figure 6-18)
 - (a) Remove nut (1) and lockwasher (2).
 - (b) Remove pulley (3), fan (4), and spacer (5).
 - (c) Remove four nuts (6) and bolts (7).
 - (d) Remove front housing (8) from rear housing (9).
 - (e) Remove front bearing (10) and front bearing retainer (11).
 - (f) Remove woodruff key (12), rotor assembly (13), rear bearing (14), and stator assembly (15).
 - (g) Remove bolt (16), insulator sleeve (17), diode (18), and diode (19).
 - (h) Remove rear bearing (20), insulator washer (21), and insulator sleeve (22).
 - (i) Remove two screws (23), terminal ground (24), capacitor output (25), and bush assemble (26).
 - (j) Remove nut (27) and washer (28).
 - (k) Remove nut (29), washer (30), and insulator washer (31).
 - (l) Remove three nuts (32), washer (33), insulator washer (34), and insulator sleeve (35).
 - (m) Inspect front housing (8) and rear housing (9) and replace entire alternator if either housing is cracked or otherwise damaged.
 - (n) Inspect stator assembly (15) and replace if wiring is burnt or stator assembly (15) is otherwise damaged.

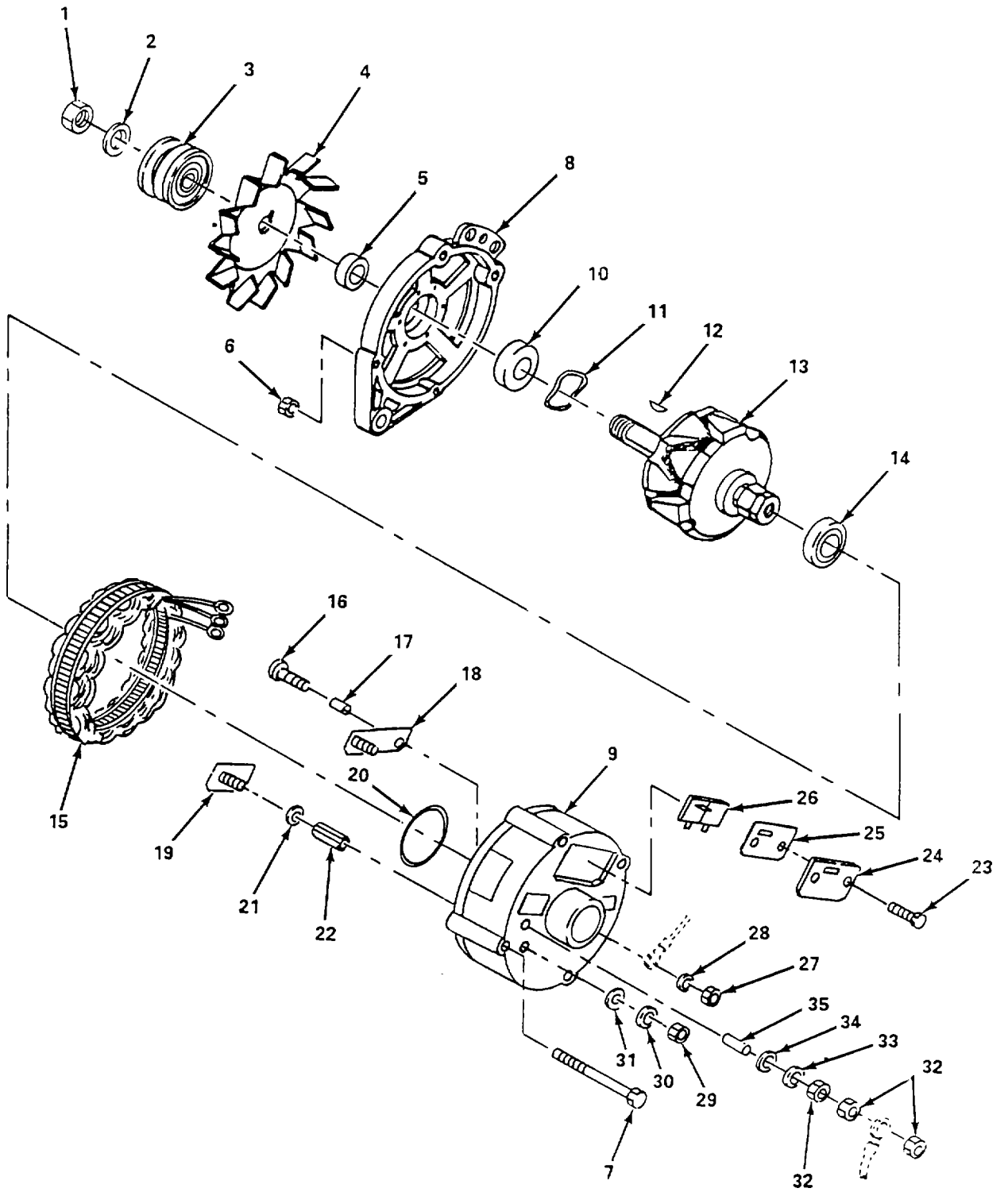


Figure 6-18. Alternator, Disassemble.

6-16. Alternator (Cont).

- (o) Inspect rotor assembly (13) and replace if wiring is burnt or rotor assembly is otherwise damaged.
 - (p) Inspect diodes (18) and (19), bush (26) and replace any item that has signs of burnt wire, body is cracked, or item is otherwise damaged.
 - (q) Inspect front bearings (10) and (14) and replace if worn or otherwise damaged.
 - (r) Inspect fan (4), pulley (3), and replace any item that is bent, cracked, or otherwise damaged.
 - (s) Inspect bolt (7), spacer (5), insulator washers (21), (31), and (34), insulator sleeves (17), (22), and (35), terminal ground (24), and washers (28), (30), and (33), and nut (29) and (32) ,and replace all items if any one is cracked, worn, stripped, or otherwise damaged.
- (2) Assemble. (figure 6-19)
- (a) Install insulator sleeve (1), insulator washer (2), washer (3), and three nuts (4).
 - (b) Install insulator washer (5), washer (6), and nut (7).
 - (c) Install bush assembly (8), capacitor output (9), terminal ground (10), and secure with two screws (11).
 - (d) Install washer (12) and nut (13).
 - (e) Install insulator sleeve (14), insulator washer (15), and rear bearing (16).
 - (f) Install diode (17) and (18) into rear housing (19) and secure with insulator sleeve (20) and bolt (21).
 - (g) Install stator assembly (22), rear bearing (23), rotor assembly (24), and woodruff key (25).
 - (h) Install front bearing retainer (26), front bearing (27), and front housing (28), and secure with four bolts (29) and nuts (30).
 - (i) Install spacer (31), fan (32), pulley (33), and secure with lockwasher (34) and nut (35).

FOLLOW-ON MAINTENANCE
Install alternator (para. 4-44).

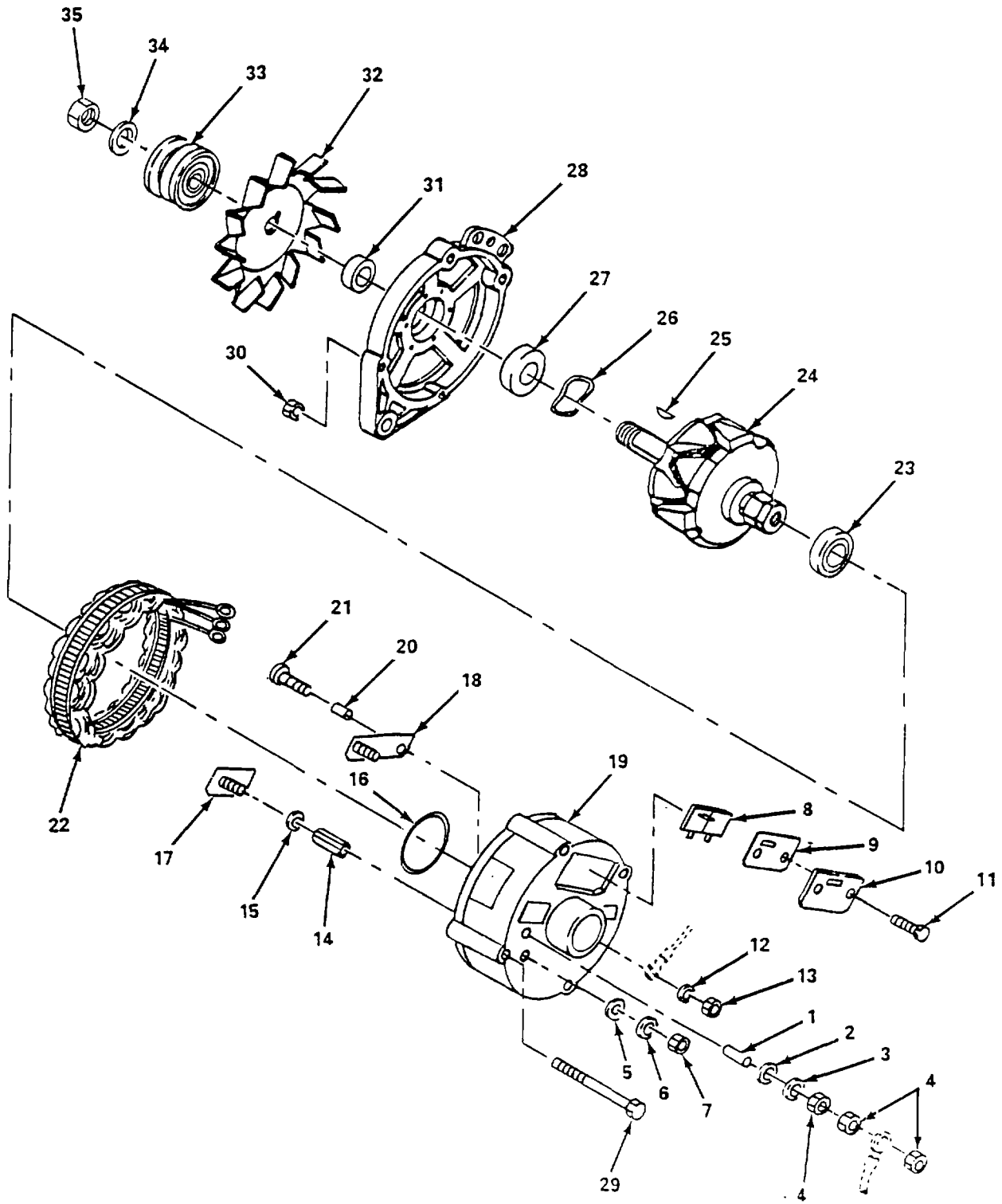


Figure 6-19. Alternator, Assemble.

6-17. Starter.

This task covers:

Repair

INITIAL SETUP*Tools*General Mechanic's Tool Kit
(NSN 5180-00-177-7033)*Equipment Condition*Compressor unit shut down (para. 2-13).
Starter removed (para. 4-47).

Repair.

- (1) *Disassemble.* (figure 6-20)
 - (a) Remove nut (1), lockwasher (2), and screw (3).
 - (b) Remove three screws (4) and remove relay (5).
 - (c) Remove two nuts (6) and washers (7).
 - (d) Remove two screws (8) and cap (9).
 - (e) Remove seal (10), half-moon ring (11), and two washers (12).
 - (f) Remove four screws (13).
 - (g) Remove commutator bearing (14), bearing bushing (15), four brushes (16), compression springs (17), and brush holders (18).
 - (h) Remove two threaded pins (19), armature (20), and winding (21).
 - (i) Remove bearing bushing support (22), pinion (23), bearing bushing (24), seal (25), washer (26), shaft lever (27), drive bearing (28), and bearing bushing (29).
 - (j) Inspect brushes (16) and replace if worn, cracked, or otherwise damaged.
 - (k) Inspect drive bearing (28), winding (21), and commutator bearing (14), and replace all items that are cracked or otherwise damaged.
 - (l) Inspect armature (20) and replace if wires are burnt or armature (20) is otherwise damaged.
 - (m) Inspect pinion (23) and replace if teeth are worn, chipped, missing or pinion (23) is otherwise damaged.
 - (n) Inspect bushings (15), (24), and (29) and replace if cracked, worn, or otherwise damaged.
 - (o) Inspect shaft lever (27) and replace if cracked, bent, or otherwise damaged.
 - (p) Inspect ignition switch (5) and replace if damaged.

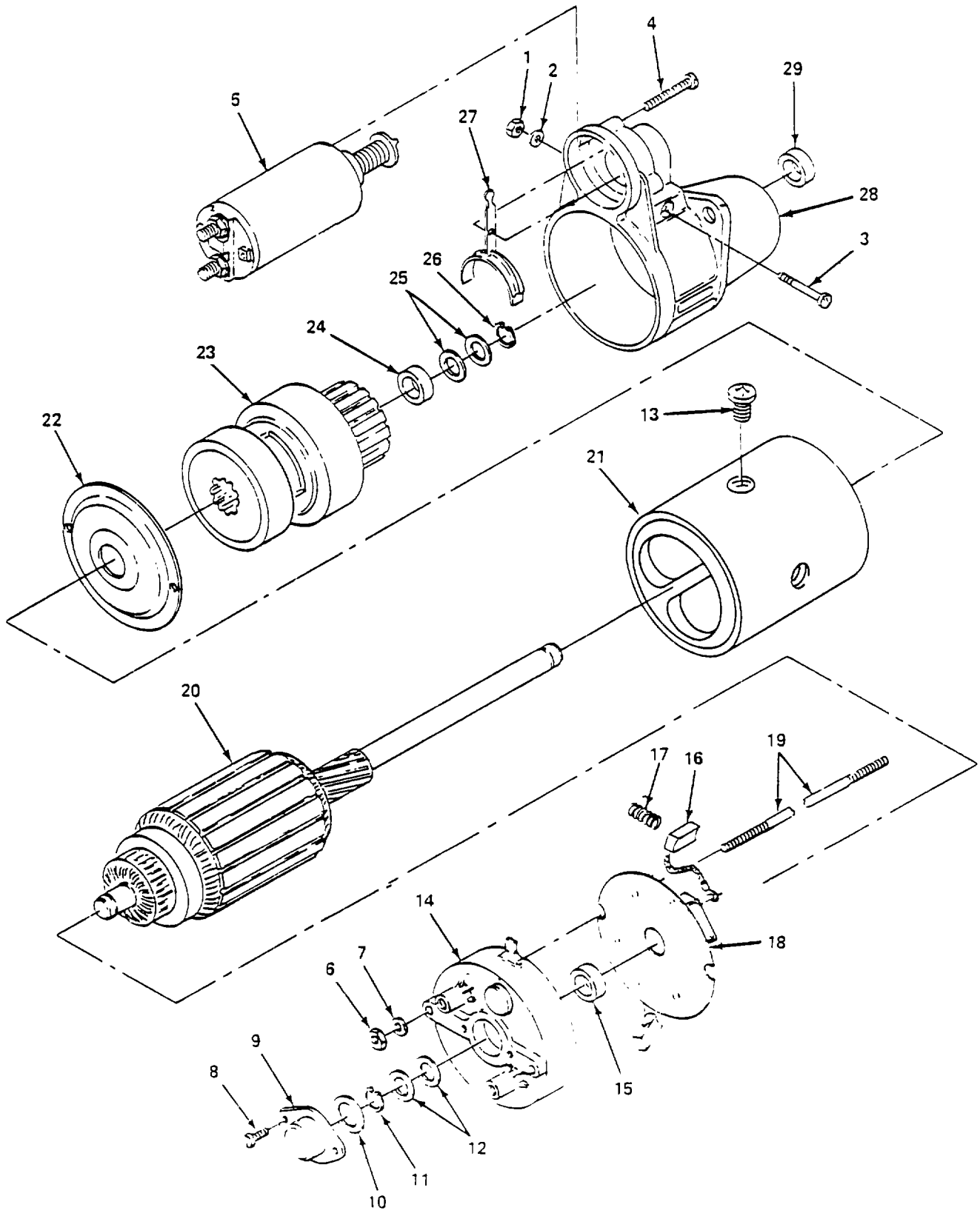


Figure 6-20. Starter, Disassembly.

6-17. Starter (Cont).

(2) *Assemble.* (figure 6-21)

- (a) Install bearing bushing (1), shaft lever (2), washer (3), seal (4), bearing bushing (5), pinion (6), bearing bushing support (7) into drive bearing (8).
- (b) Install winding (9), armature (10), and two threaded pins (11).
- (c) Install brush holders (12), four compression spring (13), brushes (14), bearing bushing (15), and commutator bearing (16).
- (d) Install two washers (17), half-moon ring (18), and seal (19).
- (e) Install cap (20) and secure with two screws (21).
- (f) Install two washers (22) and nuts (23).
- (g) Install four screws (24).
- (h) Install ignition switch (25) and secure with three screws (26).
- (i) Install screw (27), washer (28), and nut (29).

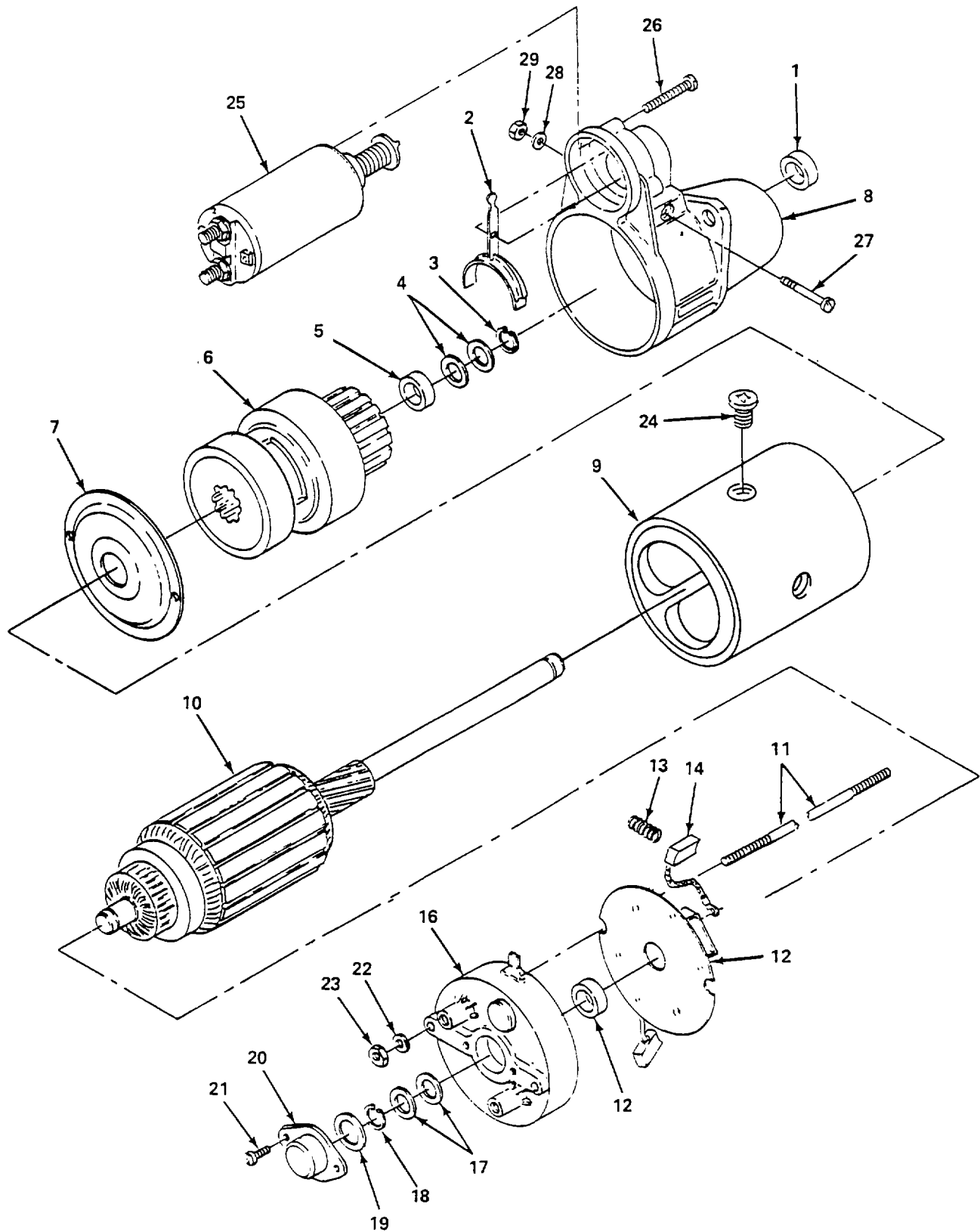


Figure 6-21. Starter, Assembly.

6-18. Crankshaft.

This task covers:

Repair

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)
Puller device (PN 0030672)
Puller (PN 0030733)
Dial Indicator (PN 0030408)
Gage (PN 0031102)
Press-in-Device (PN 0030670)

Materials/Parts

Crankshaft
Solvent, Dry Cleaning (Item 24, Appendix E)
Rags, Wiping (Item 21, Appendix E)
Compound, Sealing (Item 29, Appendix E)

Equipment Condition

Compressor unit shut down (para. 2-13).
Intake manifold removed (para. 4-38).

Equipment Condition

Connecting rods removed (para. 5-44).
Engine camshaft and cover removed (para. 6-19).
Muffler removed (para. 4-39).
Fuel injector pump removed (para. 5-30).
Lube oil cooler removed (para. 4-51).
Alternator removed (para. 4-44).
Starter removed (para. 4-47).
Cooler air blower removed (para. 5-32).
Flywheel and clutch carrier removed (para. 5-36).
Rear cover removed (para. 5-38).
Front cover removed (para. 5-45).
Rocker arm and push rod removed (para. 5-38).

Reference

Refer to Appendix F for torque values.

Repair.

- (1) Removal. (figure 6-22)
 - (a) Remove two bolts (1), washers (2), and remove counterweight (3).
 - (b) Remove gear (4) and key (5) from crankshaft (6).
 - (c) Remove three bolts (7), washers (8) and remove bearing (9) and bearing housing (10) using puller device.
 - (d) Using puller, remove sealing ring (11).
 - (e) Remove four bolts (12), lockwashers (13) from bearing housing (14).
 - (f) Using puller device, remove bearing housing (14) and bearing (15).
 - (g) Remove two gaskets (16).
 - (h) Remove two bolts (17), lockwasher (18), and bearing cap (19).

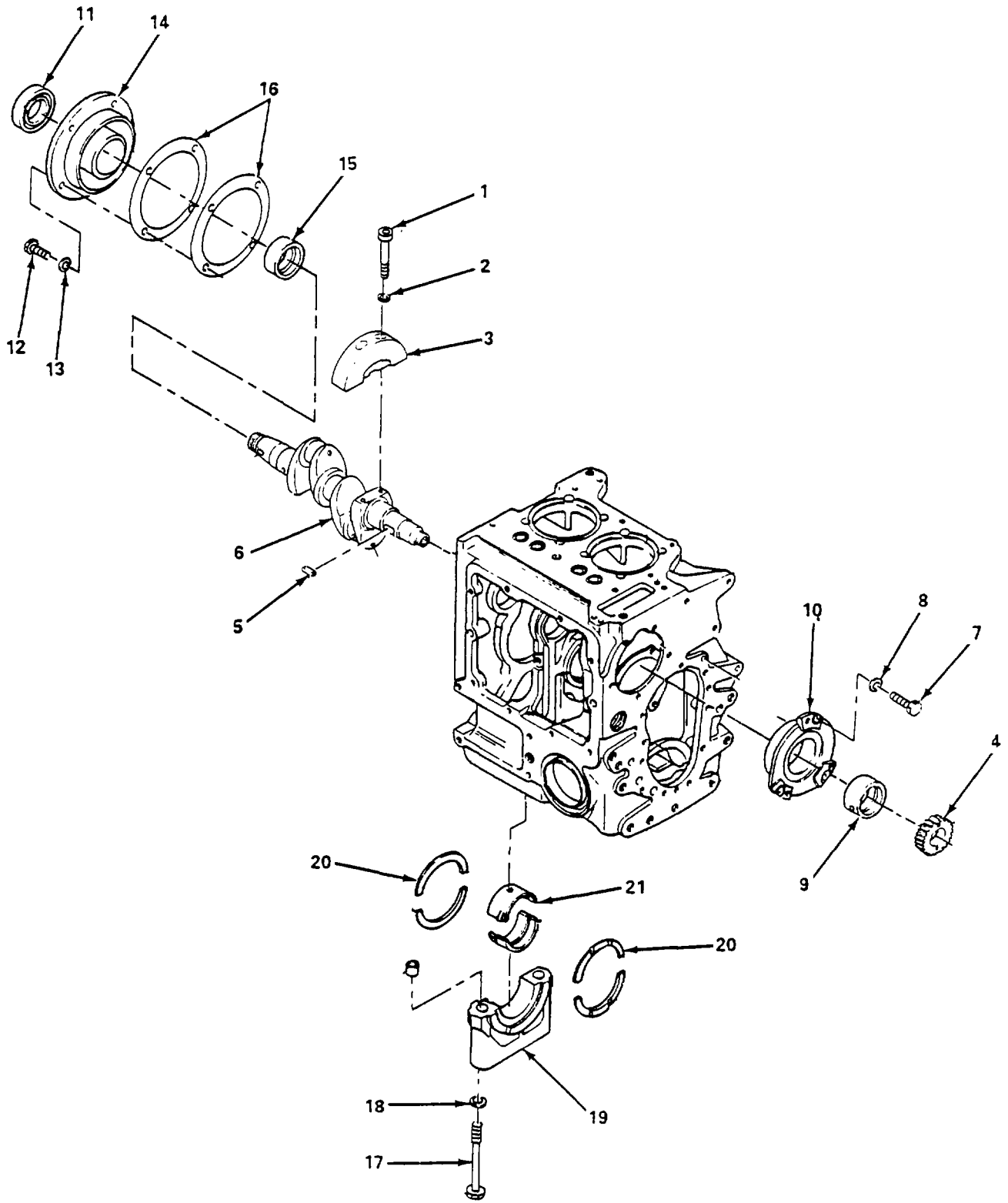


Figure 6-22. Crankshaft, Removal.

6-18. Crankshaft (Cont).

- (i) Remove two sets of stop rings (20). Ensure that main bearings (21) do not get damaged and mark them (main bearing) on the back.
 - (j) Remove crankshaft (6) from the flywheel end of the engine.
- (2) Inspect. (figure 6-23)

WARNING

Dry cleaning solvent PD-680 used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 138°F (60°C).

- (a) Clean all items with dry cleaning solvent and dry thoroughly.
- (b) Inspect crankshaft (1) and components for wear, cracks or scoring.
- (c) Inspect crankshaft for cracks by magnaflux method.
- (d) Support crankshaft (1) at outer main journals on prism-shaped blocks.
- (e) Measure all journals at point "1" and "2" in vertical and horizontal, as indicated by "a" and "b".

NOTE

Width of 3 inches should be measured on the journal for a locating bearing.

Maximum deviations from roundness, straightness, true run, and parallelism of all shaft journals and crank pins, also wear limit is .00079 inch (0.02 mm).

- (f) Inspect with dial indicator, the other journals for out of roundness.
- (g) Replace the crankshaft if defective.
- (h) Inspect the locating pin on the camshaft gearwheel (2). The pin should extend .67 inch (17 mm) from the side opposite the bearing identification mark.

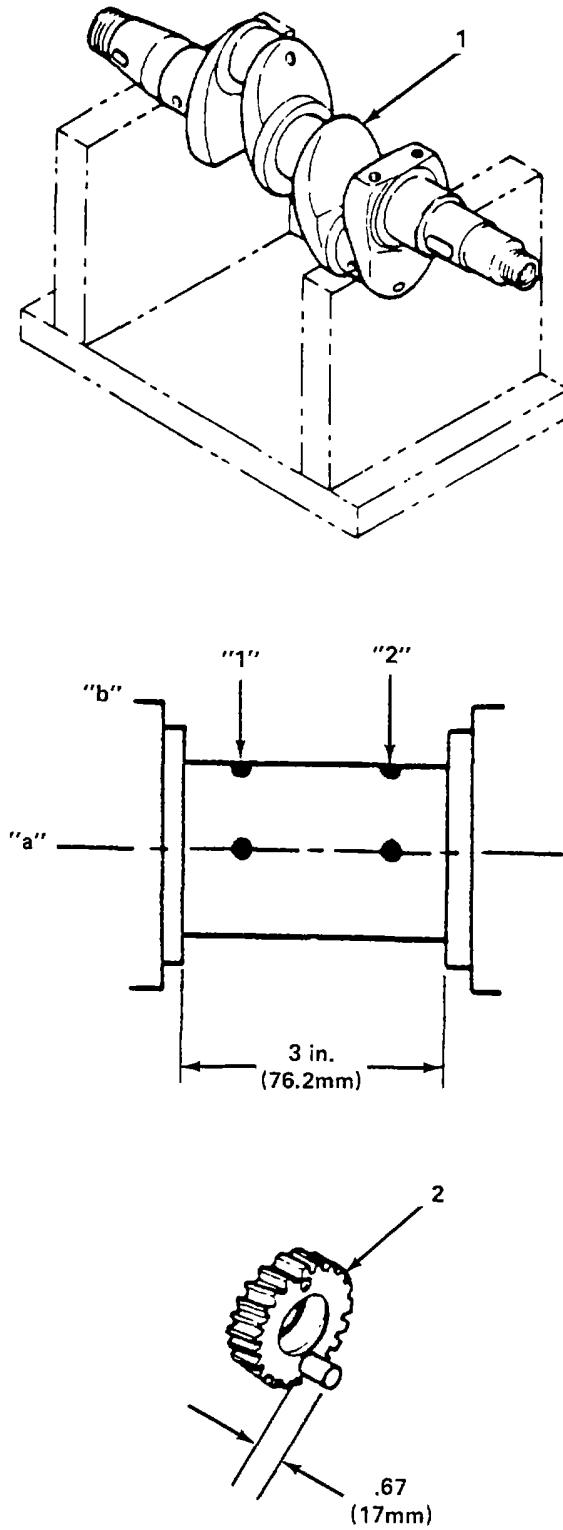


Figure 6-23. Crankshaft, Inspections.

6-18. Crankshaft (Cont).

(3) *Installation.* (figure 6-24)

- (a) Install bearing bushing (1) and (2) on crankshaft (3).
- (b) Install key (4) in crankshaft (3) and install gear (5) on crankshaft (3).
- (c) Install half of main bearing (6) in crankcase (7), ensuring the identification marks are correct.
- (d) Apply grease to thrust ring halves (8) and install them by the smooth faces to the bearing web and bearing cap (9).
- (e) Apply oil to crankshaft (3) journals and install crankshaft in crankcase (7) from flywheel end of engine.
- (f) Install the other half of bearing (6) on bearing cap (9).
- (g) Install two washers (10) and bolts (11). Tighten bolts using gage per appendix F.
- (h) Apply sealing compound to gaskets (12) and install on bearing housing (13).
- (i) Apply oil to rear journals on crankshaft (3).
- (j) Using press-in-device, install bearing housing (13) on crankshaft (3).
- (k) Install four lockwashers (14) and bolts (15) on tighten per appendix F.
- (l) Apply oil to crankshaft front journal.
- (m) Position bearing (1) so that the oil hole points toward the injector pump cover side.
- (n) Using tool press, install bearing housing (16).
- (o) Install three washers (17) and bolts (18) and tighten bolts per appendix F.
- (p) Press crankshaft (3) toward flywheel end and measure end clearance on flywheel side of bearing web. The clearance must be within .059 - .124 inch (.15 - .314 mm).
- (q) Install balance weight (19) on crankshaft (3), taking care that the balance weight line up with mark on crankshaft.
- (r) Using gage, install two washers (20) and bolts (21) and tighten per appendix F.
- (s) Using puller, install sealing ring (22).

FOLLOW-ON MAINTENANCE

- (1) Install engine camshaft and cover (para. 6-19).
- (2) Install connecting rods (para. 5-44).
- (3) Install rocker arm and push rods (para. 5-38).
- (4) Install front cover (para. 5-45).
- (5) Install rear cover (para. 5-37).
- (6) Install flywheel and clutch carrier (para. 5-35).
- (7) Install cooler air blower (para. 5-32).
- (8) Install starter (para. 4-47).
- (9) Install Alternator (para. 4-44).
- (10) Install lube oil cooler (para. 4-51).
- (11) Install fuel injector pump (para. 5-30).
- (12) Install muffler (para. 4-39).
- (13) Install intake manifold (para. 4-38).

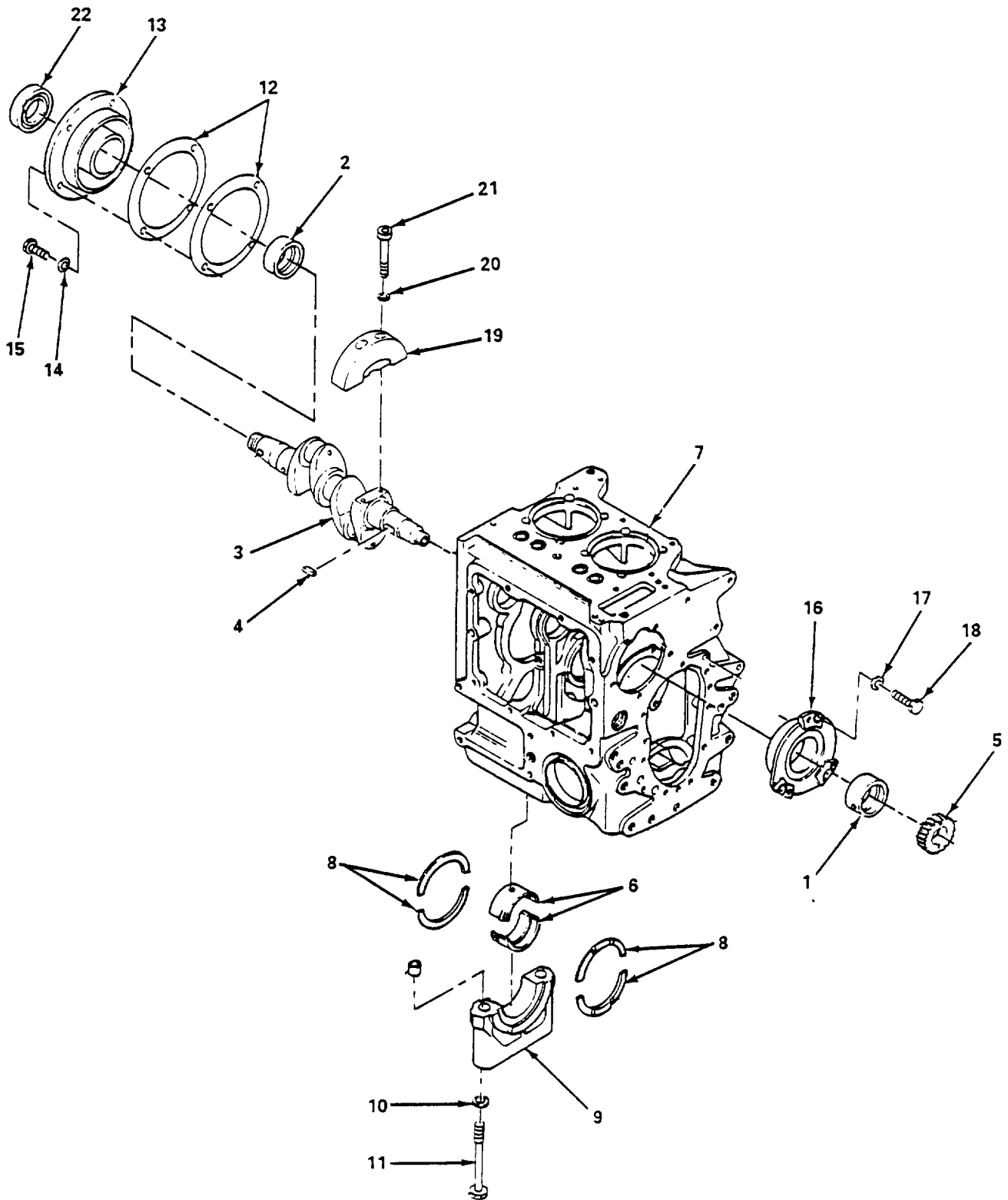


Figure 6-24. Crankshaft, Installation.

6-19. Camshaft and Cover.

This task covers:

Replace

INITIAL SETUP*Tools*

General Mechanic's Tool Kit
(NSN 5180-00-177-7033)
Removal Tool (PN 0030433)
Micrometer (NSN 5120-00-554-7134)

Materials/Parts

Camshaft
Cover
Lubricating Oil (Item 15, Appendix E)
Grease (Item 12, Appendix E)
Gasket, Cover
Solvent, Dry Cleaning (Item 24, Appendix E)
Rags, Wiping (Item 21, Appendix E)

Equipment Condition

Compressor unit shut down (para. 2-13).
Engine removed (para. 4-29).
Alternator removed (para. 4-44).
Fuel injector pump removed (para. 5-30).
Rocker arm and push rod removed (para. 5-38).

References

Refer to Appendix F for torque values.

Replace. (figure 6-25)

- (1) Remove five bolts (1), lockwashers (2) from cover (3).
- (2) Remove cover (3) and gasket (4). Discard gasket.
- (3) Remove five screws (5), lockwashers (6) and remove eccentric disc (7).
- (4) Remove six screws (8), lockwashers (9), and washers (10) from gear (11).
- (5) Remove gear (11) and thrust ring (12).
- (6) Remove drive pin (13) from gear (11).
- (7) Hold up tappets (14) and remove camshaft (15).
- (8) Remove tappets (14).

WARNING

Dry cleaning solvent PD-680 used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 138°F (60°C).

- (9) Clean all items with dry cleaning solvent and dry thoroughly.

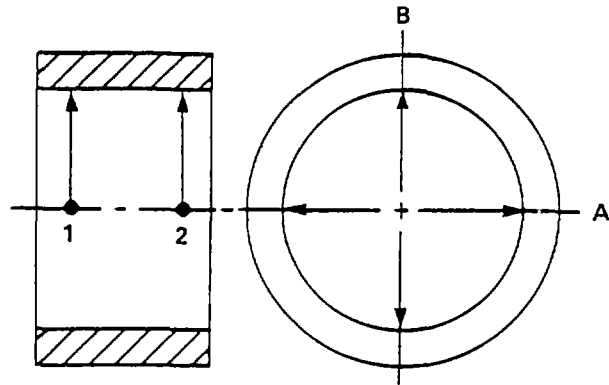
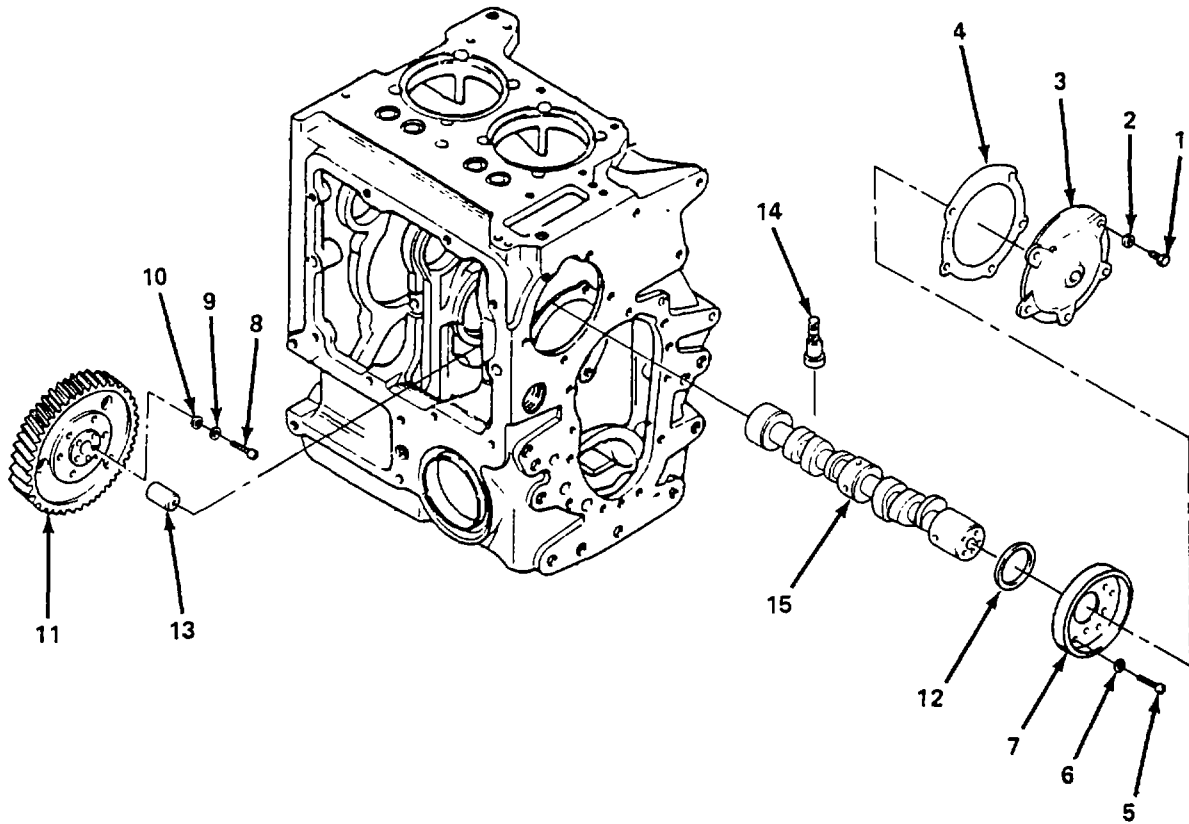


Figure 6-25. Engine Camshaft and Valve Lifter Tappets, Replace.

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- (10) Inspect gear (11) and camshaft (15) for damage and visible signs of wear.
- (11) Measure journal at drive end of camshaft with outside micrometers. Outside diameter should not be smaller than 1.57382 inches (40-0.025 mm).
- (12) Inspect bearing bushings in crankcase for damage and visible sign of wear.
- (13) Set dial indicator of inside micrometer to normal inside diameter of camshaft bearing bushing 2.046 + .002 inches (51.97 + 0.06 mm).
- (14) Measure the bearing bore at points 1 and 2 in planes A and B.
- (15) Slightly oil tappets (14) with lubricating oil and install and retain in position.
- (16) Install camshaft (15) from front of engine in bearing bores.
- (17) Install thrust ring (12) on end of camshaft (15).
- (18) Install pin (13) of gear (11) about .079 inches (2 mm) in the direction of the marked side.
- (19) Install gear (11) so that tooth marked 1 engages in gap between teeth marked 15 and 16 of crankshaft gear. Note camshaft gear (11) must be installed from injection pump side of crankcase.
- (20) Rotate camshaft (15) and align holes in camshaft (15) and gear (11).
- (21) Install six screws (8), lockwasher (9), and washers (10) to secure gear (11) to camshaft (15).
- (22) Position eccentric disc (7) on gear (11).
- (23) Install five screws (5) and lockwashers (6) to secure eccentric disc (7) to gear(11). Torque per Appendix F.
- (24) Measure distance from front face of cover (3) to surface.
- (25) Drive pin (13) into gear (11) so that pin (13) clears joint surface by distance from front face of cover plus .039 to .079 inches (1 to 2 mm).
- (26) Apply grease to gasket (4), and install on cover (3).
- (27) Install cover (3) and secure with five bolts (1) and lockwashers (2).Torque bolts per Appendix F.
- (28) Check end clearance of camshaft (15). The end clearance must be within .0078 to .0118 inches(2-3 mm). If on the low side, correct by driving the gear (11) in the direction of the camshaft cover (3). If the end clearance is on the high side, dismantle gear and drive pin (13) outward by corresponding amount.

FOLLOW-ON MAINTENANCE

- (1) Install rocker arm and pushrod (para. 5-38).
- (2) Install fuel injector pump (para. 5-30).
- (3) Install alternator (para. 4-44).
- (4) Install engine (para. 4-29).

6-20. Crankcase.

This task covers:

Replace

INITIAL SETUP

*Tools*General Mechanic's Tool Kit
(NSN 5180-00-177-7033)*Materials/Parts*Crankcase

*Equipment Condition*Compressor unit shut down (para. 2-13).
Engine camshaft removed (para. 6-19).
Engine crankshaft removed (para. 6-18).Replace. (figure 6-26)

- (1) Remove disked plug (1) from crankcase (2).
- (2) Remove slotted plug (3) from crankcase (2).
- (3) Remove two slotted plugs (4) from crankcase (2).
- (4) Remove two screw plugs (5) and sealing rings (6).
- (5) Remove screw plug (7), sealing ring (8) and proportioning plug (9).
- (6) Inspect crankcase (2) for cracks or damage and replace if cracked or damaged.
- (7) Install proportioning plug (9), sealing ring (8), and screw plug (7).
- (8) Install two sealing ring (6) and screw plug (5).
- (9) Install two slotted plugs (4) in crankcase (2).
- (10) Install slotted (3) in crankcase (2).
- (11) Install disked plug (1) in crankcase (2).

FOLLOW-ON MAINTENANCE

- (1) Install engine crankshaft (para. 6-18).
- (2) Install engine camshaft (para. 6-19).

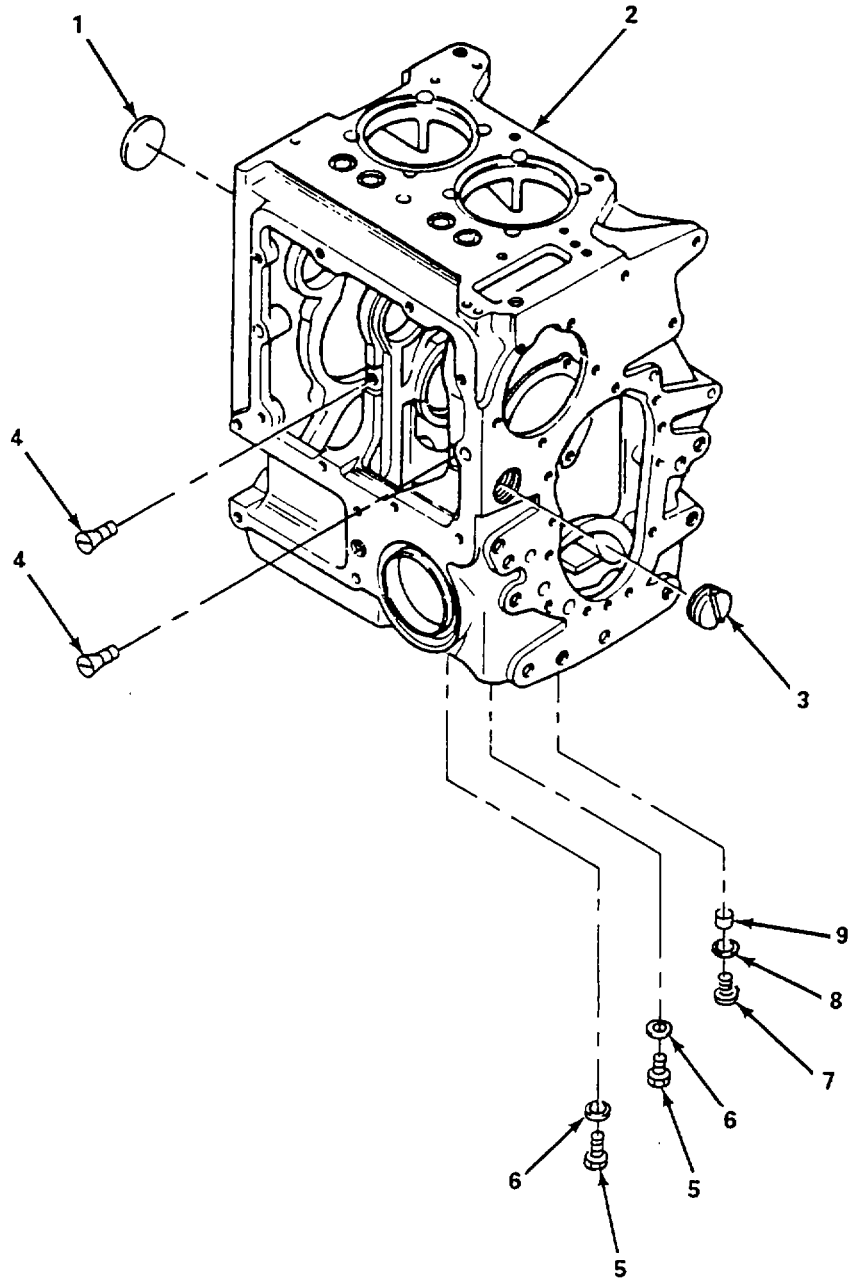


Figure 6-26. Engine Crankcase, Replace.

6-21. Power Take-Off Assembly.

This task covers:

Repair

INITIAL SETUP*Tools*General Mechanic's Tool Kit
(NSN 5180-00-177-7033)*Equipment Condition*Compressor unit shut down (para. 2-13).
Power take-off removed (para. 5-47).*Materials/Parts*Solvent, dry cleaning (Item 24, Appendix E)
Rags, Wiping (Item 21, Appendix E)*Reference*Refer to Appendix F for torque values.

Repair. (figure 6-27)

- (1) Remove grease fitting (1), jam nut (2), and lockwasher (3).
- (2) Remove fitting (4) from clutch assembly (5).
- (3) Remove fitting (4) and (6) from flexible hose (7).
- (4) Remove driving ring (8), pilot bearing (9), nut (10), and lockwasher (11) and remove clutch assembly (5).
- (5) Remove four screws (12), lockwashers (13), and bearing retainer (14).
- (6) Remove snap ring (15) and shaft clutch ball bearing (16) from clutch shaft (17).
- (7) Remove two keys (18) and fitting (19) from clutch shaft (17).
- (8) Remove two bolts (20), lockwasher (21) from throwout yoke (22).
- (9) Remove screw (23) from hand lever (24) and remove lever.
- (10) Remove two woodruff keys (25) from shaft (26) and remove shaft.
- (11) Remove two screws (27) and remove cover (28).
- (12) Remove grease fitting (29) and two fittings (30) from housing (31).

WARNING

Dry cleaning solvent PD-680 used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 138°F (60°C).

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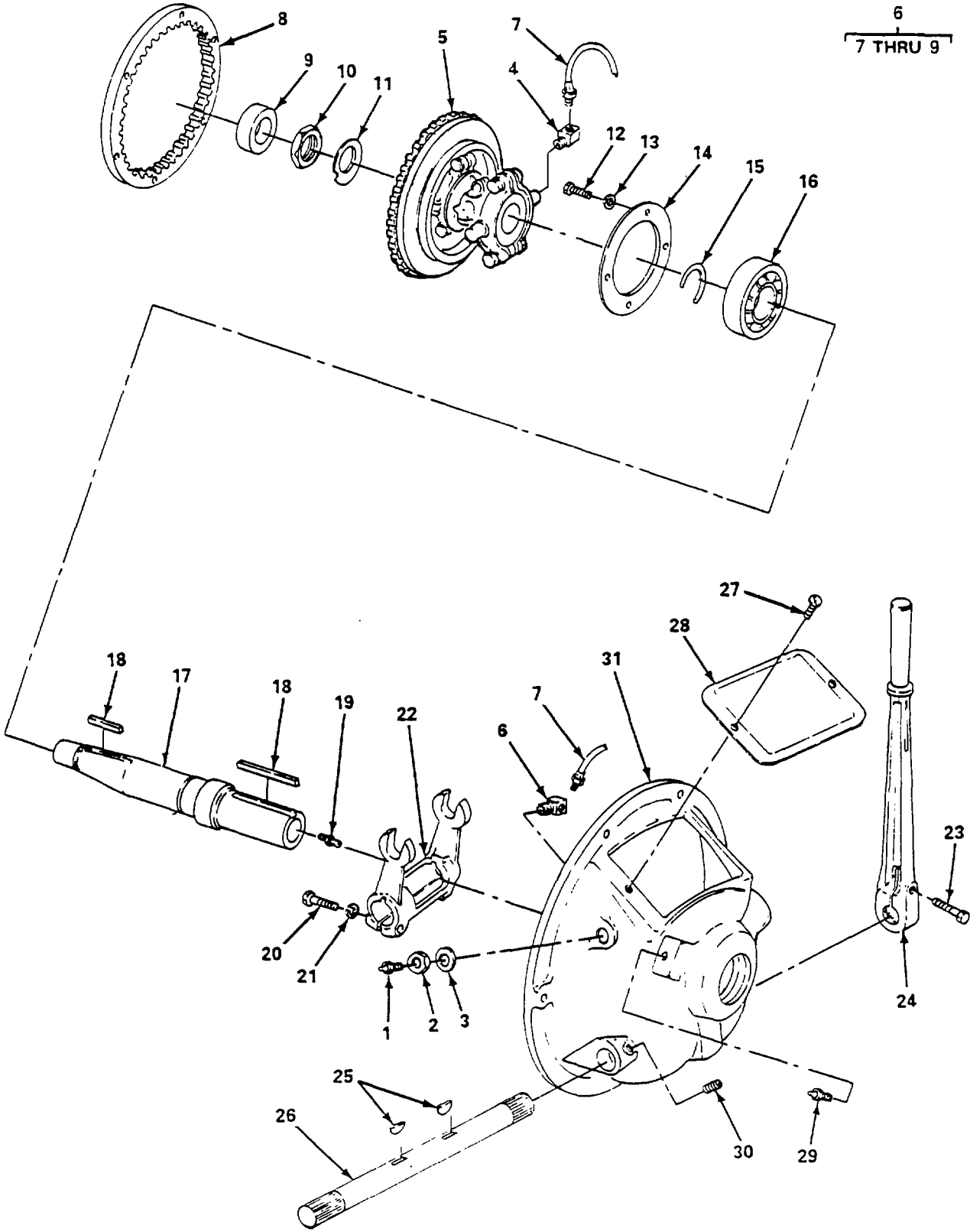


Figure 6-27. Power Take-Off Assembly, Repair.

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- (13) Clean all parts with dry cleaning solvent, and dry thoroughly.
- (14) Inspect yoke (22) and replace if cracked, worn, or otherwise damaged.
- (15) Inspect shaft (26) and replace if bent, worn, or otherwise damaged.
- (16) Inspect clutch shaft (17) and replace if bent, worn, threads are stripped, keyway groove is worn, or shaft (17) is otherwise damaged.
- (17) Inspect pilot bearing (9) and clutch ball bearing (16), and replace if worn, scored, or otherwise damaged.
- (18) Install two fittings (30) and fitting (29) on housing (31).
- (19) Install cover (28) and secure with two screws (27).
- (20) Install shaft (26) and two woodruff keys (25).
- (21) Install hand lever (24) and secure with screw (23).
- (22) Install throwout yoke (22) and secure with two lockwashers (21) and bolts (20).
- (23) Install fitting (19) in clutch shaft (17), and two keys (18).
- (24) Install clutch ball bearing (16) on shaft (17) and secure with snap ring (15).
- (25) Install bearing retainer (14) and secure with four screws (12) and lockwashers (13).
- (26) Install clutch assembly (5) on shaft (17).
- (27) Install lockwasher (11), nut (10), pilot bearing (9), and driving ring (8).
- (28) Install flexible hose (7) on fittings (6) and (4).
- (29) Install fitting (6) in housing (31) and install lockwashers (3), jam nut (2) and grease fitting (1).
- (30) Install fitting (4) on clutch assembly (5).

FOLLOW-ON MAINTENANCE
 Install power take-off (para. 5-47).

6-22. Clutch Assembly.

This task covers:

Repair

INITIAL SETUP*Tools*General Mechanic's Tool Kit
(NSN 5180-00-177-7033)*Materials/Parts*Solvent, Dry Cleaning (Item 24, Appendix E)
Rags, Wiping (Item 21, Appendix E)

Equipment Condition

Clutch assembly removed (para. 5-48).

Reference

Refer to Appendix F for torque values.

Repair. (figure 6-28)

- (1) Remove two nuts (1), bolts (2), split collar (3), and spacers (4).
- (2) Remove eight cotter pins (5), lever link pins (6), lever link (7), and sliding sleeve (8).
- (3) Remove adjusting lock pin (9) and adjusting lock pin spring (10).
- (4) Remove four cotter pins (11), finger lever pins (12), finger levers (13), and adjusting yoke (14).
- (5) Remove floating plate (15) and driving split plates (16).
- (6) Remove hub-and-back plate pin (17), six release springs (18), and hub-and-back plate (19).

WARNING

Dry cleaning solvent PD-680 used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 138°F (60°C).

- (7) Clean all parts with dry cleaning solvent, and dry thoroughly.
- (8) Inspect driving split plate (16) and replace if worn, cracked, excessively scored, or missing teeth.
- (9) Inspect face of hub-and-back plate (19) and replace hub-and-back plate (19) if face is cracked, worn, warped, or plate (19) is otherwise damaged, especially at outer edge of plate (19).
- (10) Inspect floating plate (15) and replace if worn, cracked, warped, or otherwise damaged, especially at outer edge of floating edge (15).
- (11) Inspect the adjusting yoke (14) and replace if threads are stripped or yoke (14) is otherwise damaged.

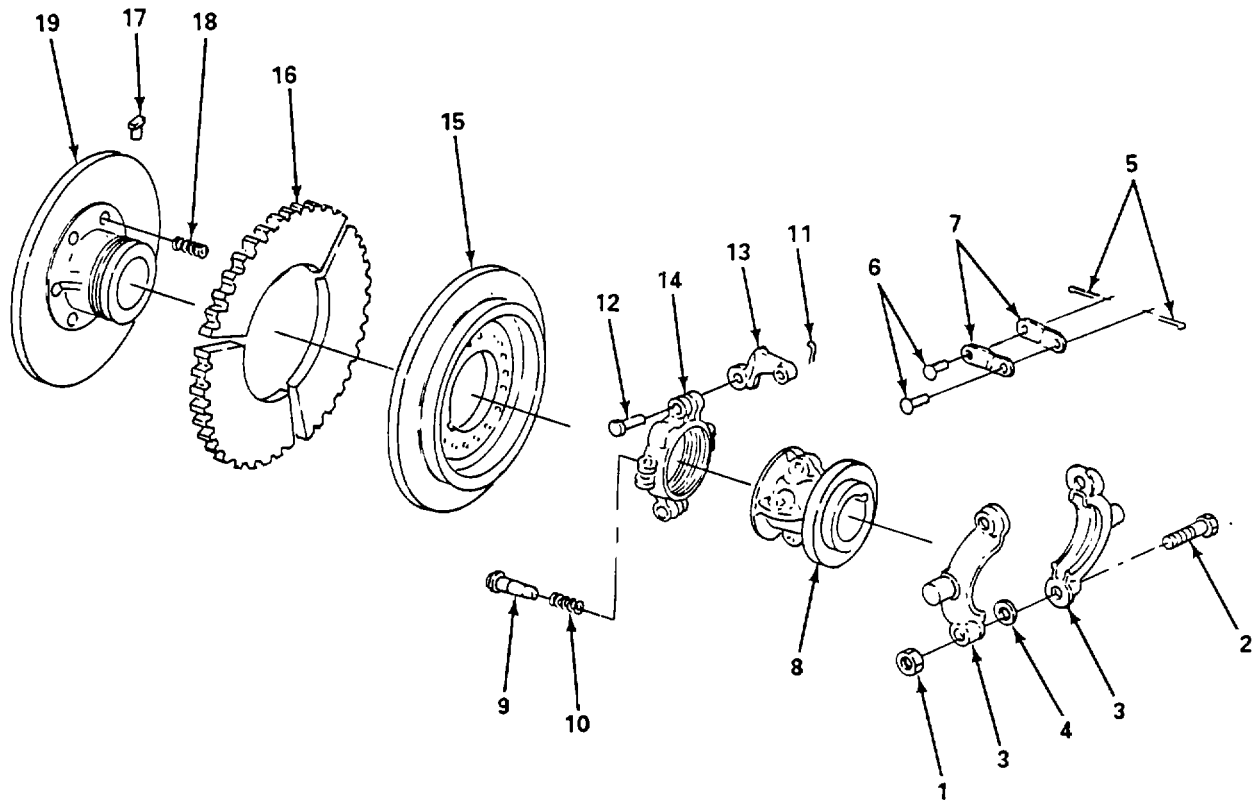


Figure 6-28. Clutch Assembly, Repair.

6-18. Clutch Assembly (Cont).

- (12) Inspect sliding sleeve (8) and split collar (3) mating surfaces and replace if either piece is cracked, shows excessive wear, or are otherwise damaged.
- (13) Inspect all other items and replace all items that are worn or otherwise damaged.
- (14) Install six release springs (18) and hub-and-back plate pin (17) on hub-and-back plate (19).
- (15) Install driving split plates (16) and floating plate (15) on hub-and-back plate (19).
- (16) Install adjusting yoke (14), four finger levers (13), finger lever pins (12), and cotter pins (11).
- (17) Install adjusting lock pin spring (10) and adjusting lock pin (9).
- (18) Install sliding sleeve (8), eight lever links (7), lever link pins (6), and cotter pins (5).
- (19) Install two spacers (4), split collar (3), and secure with two bolts (2) and nuts (1).

FOLLOW-ON MAINTENANCE
Install clutch assembly (para. 5-48).

APPENDIX A

REFERENCES

A-1. **Scope.** This appendix contains all forms, lubrication orders, pamphlets and technical manuals referenced in this manual.

A-2. **Forms.**

Equipment Inspection and Maintenance Worksheet	DA Form 2404
Recommended Changes to Publications and Blank Forms.....	DA Form 2028-2
Transportation Discrepancy Report (TDR)	SF 361
Report of Discrepancy (ROD)	SF 364
Quality Deficiency Report (QDR)	SF 368
Packaging Improvement Report)	DD Form 6

A-3. **Pamphlets.**

The Army Maintenance Management System (TAMMS)	DA Pam 738-750
Consolidated Index of Army Publications and Blank Forms	DA Pam 25-30

A-4. **Technical Manuals.**

Operator's Manual for Welding Theory and Application	TM 9-237
Preservation, Packaging, and Packing of Military Supplies and Equipment.....	TM 38-230
Procedures for Destruction of Equipment to Prevent Enemy Use	TM 750-244-3
Repair Parts and Special Tools List for 20 CFM Compressor Unit.....	TM 5-4310-386-24P

A-5. **Technical Bulletins.**

Calibration Procedure for Pressure Gages used with Diving Equipment (General)	TB 9-4220-216-35
Inspection and Test of Air and Other Gas Compressors.....	TB 43-0151

A-6. **Other Publications.**

Military Diving	FM 20-11-1
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APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

B-1. General

This appendix provides a summary of the maintenance operations for the Compressor Unit 20 CFM, 3200 psi. It authorizes levels of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

B-2. Maintenance Functions

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/components.

B-3. Column Entries

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

d. Column 4, Maintenance Level. Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate "work time" figures will be shown for each level. The number of task-hours specified by the "work time" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows:

UNIT

C - Operator/Crew
O - Unit

INTERMEDIATE

F - Direct Support
H - General Support

DEPOT

D - Depot

e. Column 5, Tools and Equipment. Column 5 specifies by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. Column 6, Remarks. Column 6 contains an alphabetic code which leads to the remark in section IV, Remarks, which is pertinent to the item opposite the particular code.

B-4. Tool and Test Equipment Requirements (Sect. III and IV)

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. Maintenance Level. The codes in this column indicate the maintenance level allocated the tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. National/NATO Stock Number. This column lists the National/NATO stock number of the specific tool or test equipment.

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5-digit) in parentheses.

B-5. Remarks (Sect. IV)

a. Reference Code. This code refers to the appropriate item in section II, column 6.

b. Remarks. This column provides the required explanatory information necessary to clarify items appearing in sections II and V.

**Section II. MAINTENANCE ALLOCATION CHART
FOR
COMPRESSOR UNIT 20 CFM, 3200 PSI**

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equip	(6) Remarks
			Unit		Intermediate		Depot		
			C	O	F	H	D		
01	GUARD PANELS AND TRAY	Inspect Replace Repair		0.1 4.0 3.5					
0101	BELT GUARD	Inspect Replace		0.1 0.1				1	
0102	CLUTCH PANEL	Replace		0.2				1	
0103	SIDE PANEL	Replace		0.2				1	
0104	TOP TRAY	Replace		0.2				1	
02	CONTROL PANEL ASSEMBLY	Replace Repair			0.5 1.0			1 1	
0201	CONTROLS AND INDICATORS	Inspect Replace Calibrate		0.5 2.0	1.0 1.0			1	
0202	PANEL ASSEMBLY	Inspect Replace			0.5 1.0				F
03	DRIVE BELTS AND PULLEYS	Inspect Adjust Replace		0.1 0.2 0.5					
04	AIR COMPRESSOR ASSEMBLY	Inspect Service Adjust Replace Repair		2.0 0.3	1.9 1 4.4 4.3			1 1 1	A B
0401	LINES AND FITTINGS	Inspect Replace		0.3	2.0	1		24 0	
0402	AIR INTAKE FILTER ASSEMBLY	Inspect Service Replace		0.1 0.3 0.5				1	

**Section II. MAINTENANCE ALLOCATION CHART
FOR
COMPRESSOR UNIT 20 CFM, 3200 PSI**

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equip	(6) Remarks
			Unit		Intermediate		Depot		
			C	O	F	H	D		
0403	OIL PUMP AND SUPPLY LINE	Inspect Replace			0.3 0.3			1	
0404	OIL PRESSURE REGULATOR VALVE AND OIL RETURN LINE	Inspect Adjust Replace Repair			0.1 0.1 0.2 1.0			1	
0405	FANWHEEL GUARD	Replace		0.2				1	
0406	FLYWHEEL/ FANWHEEL ASSEMBLY	Inspect Replace Repair		0.1 0.5 0.5				1 1	
0407	INTERCOOLERS AND AFTERCOOLER	Replace			2.0			1	
0408	MANIFOLD AND SAFETY VALVE (1 ST STAGE)	Replace			0.1				
0409	INTERFILTER BLOCK ASSEMBLY	Replace Repair			1.8 5.0			1 1	C
040901	INTERFILTER SAFETY VALVE	Replace			0.3				
040902	INTERFILTER DRAIN VALVES	Replace Repair			0.3 1.0			1 1	
040903	INTERFILTER 2ND AND 3RD STAGE HOUSING	Replace Repair			0.6 2.0			1 1	
040904	OIL, WATER SEPARATOR HOUSING	Replace Repair			0.3 1.0			1 1	
040905	INTERFILTER HEATER BLOCK	Replace			0.3			1	

**Section II. MAINTENANCE ALLOCATION CHART
FOR
COMPRESSOR UNIT 20 CFM, 3200 PSI**

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equip	(6) Remarks
			Unit		Intermediate		Depot		
			C	O	F	H	D		
0410	VALVE HEAD 1ST STAGE ASSEMBLY	Replace Repair			0.2 0.5			1 1	
0411	VALVE HEAD 2ND STAGE ASSEMBLY	Replace Repair			0.2 0.5			1 1	
0412	VALVE HEAD 3RD STAGE ASSEMBLY	Replace Repair			0.2 0.5			1 1	
0413	VALVE HEAD 4TH STAGE ASSEMBLY	Replace Repair			0.2 0.5			1 1	
0414	1ST STAGE CYLINDER AND PISTON	Inspect Replace Repair				0.1 2.5 5.0		1, 21, 22, 92, 93 1	
0415	2ND STAGE CYLINDER AND PISTON	Inspect Replace Repair				0.1 2.5 5.0		1, 21, 22, 92, 93 1	
0416	3RD STAGE CYLINDER AND PISTON	Inspect Replace Repair				0.1 2.5 5.0		1, 21, 22, 92, 93 1	
0417	4TH STAGE CYLINDER AND PISTON	Inspect Replace Repair				0.1 2.5 5.0		1, 21, 22, 92, 93 1	
0418	SAFETY VALVE	Inspect Replace			0.2 0.5				
0419	DRIVE BELT AND GUARD	Inspect Adjust Replace		0.1 0.5 0.3				1	

**Section II. MAINTENANCE ALLOCATION CHART
FOR
COMPRESSOR UNIT 20 CFM, 3200 PSI**

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equip	(6) Remarks
			Unit		Intermediate		Depot		
			C	O	F	H	D		
0420	TENSION PULLEY ASSEMBLY	Inspect Replace Repair			0.1 0.3 0.5			1 1, 92	
0421	CRANKCASE UPPER	Inspect Replace				0.2 0.3		1	
042101	CRANKCASE COVER	Inspect Replace Repair				0.1 0.2 0.4		1 1	
042102	CRANKSHAFT ASSEMBLY	Inspect Replace Repair				0.2 0.2 0.3		1 1	
0422	CRANKCASE, LOWER	Inspect Replace Repair				0.5 0.5 0.8		1 1	
042201	ECCENTRIC SHAFT	Inspect Replace				0.2 0.2		1	
05	AIR PURIFICATION GROUP	Service Replace Repair			0.4 0.2 1.0			1, 89	C
0501	PURIFICATION CYLINDER	Replace Repair			0.2 1.0			1, 89	
0502	PRESSURE MAINTAINING VALVE	Replace Repair			0.5 1.0			1 1	
06	FUEL TANK	Inspect Replace Repair		0.1 0.5	1.0			1 1, 91	D
0601	TOP STRAP ASSEMBLIES	Replace		0.2				1	
0602	BOTTOM STRAP ASSEMBLIES	Replace		0.2				1	

**Section II. MAINTENANCE ALLOCATION CHART
FOR
COMPRESSOR UNIT 20 CFM, 3200 PSI**

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equip	(6) Remarks
			Unit		Intermediate		Depot		
			C	O	F	H	D		
07	ENGINE	Inspect Service Replace Repair		2.3 1.0 4.5 0.5	1.9		10.4		1 1 - 93 B
0701	FUEL SYSTEM	Service		0.5					1, 2
070101	FUEL LINES AND FITTINGS	Inspect Replace		0.2 0.5					1
070102	FUEL FEED PUMP	Replace Repair		0.5 1.0					1 1
070103	FILTER, FUEL	Replace		0.2					1, 2
070104	INJECTION PUMP	Adjust Replace Repair			0.5 1.2 2.5				1, 32, 34, 36 1 1
070105	INJECTORS	Inspect Replace			0.5 0.2				1
070106	INJECTOR LINES	Inspect Replace		0.1 0.5					1
070107	OVER FLOW RETURN LINE	Inspect Replace		0.1 0.5					1
0702	AIR FILTRATION SYSTEM	Inspect Service Replace Repair		0.1 0.2 0.1 0.3					1 1 B
070201	PREFILTER, AIR	Replace		0.1					1

**Section II. MAINTENANCE ALLOCATION CHART
FOR
COMPRESSOR UNIT 20 CFM, 3200 PSI**

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equip	(6) Remarks
			Unit		Intermediate		Depot		
			C	O	F	H	D		
070202	AIR FILTER ASSEMBLY, OIL BATH	Inspect Service Replace Repair		0.1 0.2 0.1 0.3					
070203	INTAKE MANIFOLD	Inspect Replace		0.1 0.5				1	
0703	EXHAUST SYSTEM	Inspect Replace Repair		1.0 1.0 1.0				1 1	B
0704	V-BELT GUARD	Inspect Replace		0.1 0.2				1	
0705	V-BELT	Inspect Adjust Replace		0.1 0.5 0.6				1	
0706	DUCTING, COOLING AIR	Inspect Replace		0.2 1.0				1	
0707	BLOWER ASSEMBLY, COOLER AIR	Replace Repair			2.0 2.0			1 1	
0708	ELECTRICAL SYSTEM								
070801	WIRING HARNESS	Inspect Test Replace Repair		0.2 1.0 1.0 2.0				13 1 1	
070802	ALTERNATOR	Inspect Test Adjust Replace Repair		0.3 0.2 1.0			2.0	13 1 1	E

**Section II. MAINTENANCE ALLOCATION CHART
FOR
COMPRESSOR UNIT 20 CFM, 3200 PSI**

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equip	(6) Remarks
			Unit		Intermediate		Depot		
			C	O	F	H	D		
070803	BATTERY, COVER, AND CABLES	Inspect Test Replace		0.1 0.1 0.2				3 1	
070804	SHUT DOWN DEVICE (SOLENOID)	Replace		0.5				1	
0709	STARTING SYSTEM								
070901	STARTER	Inspect Replace Repair		0.1 0.3		2.0		1 1	
070902	STARTING AID	Inspect Replace Repair		0.1 0.5 1.0				1 1	
0710	LUBRICATION SYSTEM								
071001	OIL PUMP	Inspect Replace			0.1 0.3			1, 38, 88	
071002	OIL FILTER ASSEMBLY	Inspect Service Replace		0.1 0.2 0.2				1, 6 1, 6	
071003	DIPSTICK AND FILL CAP	Replace		0.1					
071004	LUBE OIL COOLER	Inspect Service Replace		0.2 0.2 0.5				1 1	
071005	LUBE OIL LINE	Replace			1.0			1	

**Section II. MAINTENANCE ALLOCATION CHART
FOR
COMPRESSOR UNIT 20 CFM, 3200 PSI**

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equip	(6) Remarks
			Unit		Intermediate		Depot		
			C	O	F	H	D		
0711	FLYWHEEL AND CLUTCH CARRIER	Inspect Replace Repair			0.1 0.5 1.0			1, 70, 74 1	
0712	FLYWHEEL HOUSING ASSEMBLY	Replace			1.0			1	
0713	REAR COVER	Inspect Replace			0.1 0.4			1	
0714	ROCKER COVERS	Replace		0.2				1	
0715	ROCKER ARM/PUSH ROD	Inspect Service Replace			0.2 0.2 0.6			1	
0716	PUSH ROD TUBES	Inspect Replace			0.1 0.5			1, 61	
0717	CYLINDER HEAD ASSEMBLY	Inspect Replace			0.1 0.5			1, 37, 44, 45, 46, 50, 53 thru 60	
		Repair			1.0			62, 93 1	
071701	VALVES	Inspect Adjust Replace			0.1 0.3 0.5			1, 47, 48, 49, 43	
0718	CYLINDERS	Inspect Replace			1.0 0.5			1, 65	
0719	PISTON AND RINGS	Inspect Replace			1.0 0.3			1, 63, 64, 65, 66, 69, 92	
		Repair			0.5			1	

**Section II. MAINTENANCE ALLOCATION CHART
FOR
COMPRESSOR UNIT 20 CFM, 3200 PSI**

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equip	(6) Remarks
			Unit		Intermediate		Depot		
			C	O	F	H	D		
0720	CONNECTING RODS	Inspect Replace Repair			1.0 0.3 1.5			1, 6, 66, 67, 68 1	
0721	CAMSHAFT AND COVER	Inspect Replace				0.1 0.4		1, 79, 93	
0722	COVER, FRONT	Inspect Replace Repair			0.2 0.3 0.3			1, 38, 88 1	
0723	BEARING HOUSING	Inspect Replace				0.1 0.4		1	
0724	ACCESS COVERS	Inspect Replace			0.1 0.5			1	
0725	CRANKSHAFT	Inspect Repair				0.2 0.6		1, 33, 38, 70, 71, 77	
0726	CRANKCASE	Inspect Replace				0.1 0.3		1	
08	POWER TAKE OFF ASSEMBLY	Inspect Service Adjust Replace Repair		0.1 0.2	0.5 1.0		2.0	1 1, 16 1, 16	
09	CLUTCH ASSEMBLY	Replace Repair			0.2		2.0	1, 16 1, 93	
10	ENGINE MOUNTS	Replace		1.0				1	

**Section II. MAINTENANCE ALLOCATION CHART
FOR
COMPRESSOR UNIT 20 CFM, 3200 PSI**

(1) Group Number	(2) Component/ Assembly	(3) Maintenance Function	(4) Maintenance Level					(5) Tools and Equip	(6) Remarks
			Unit		Intermediate		Depot		
			C	O	F	H	D		
011	FRAME	Inspect Replace			0.1 1.0				
01101	INNER FRAME	Inspect Replace Repair			0.1 0.5 2.0			1 1	
01102	OUTER FRAME	Inspect Replace Repair			0.1 0.5 2.0			1 1	

**Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
COMPRESSOR UNIT 20 CFM, 3200 PSI**

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	O	General Mechanic's Tool Kit	5180-00-177-7033	
2	O	Wrench, Strap	5120-00-262-8491	
3	O	Hydrometer, Battery	6630-00-171-5126	
4	O	Puller, Gear 3 Jaw	5120-00-516-3120	
5	O	Compressor, Piston Ring	5120-00-250-6055	
6	O	Wrench Torque 0-2400 Inch Pounds	5120-00-910-3350	
7	O	Cleaner, Ultrasonic	4940-00-164-8997	
8	O	Hone, Cylinder, Portable	5130-00-222-3905	
9	O	Hone, Cylinder, Electric	5130-00-540-0152	
10	O	Gun, Heat	4940-00-357-1369	
11	O	Tool, Clutch Aligning	5120-01-053-3118	
12	O	Adjustment Tool, Clutch	5120-01-053-6122	
13	O	Multimeter, Digital	6625-01-139-2512	
14	O	Growler, Armature	6625-00-093-7797	
15	O	Test Stand, High Pressure Air End	4310-01-054-4780	
16	O	Puller Kit Mechanical	5120-00-033-5606	
17	F	Tee Handle Square Drive		N4446 (57328)
18	O	Socket Wrench		N4447 (57328)
19	F	Valve Head Wrench		4555 b-645 (57328)

**Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
COMPRESSOR UNIT 20 CFM, 3200 PSI**

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
20	F	Assembly Jig		11365-645 (57328)
21	F	Piston Ring Clamp		57495-645 (57328)
22	F	Piston Ring Remover		N4453 (57328)
23	F	Tee Wrench		57478-645 (57328)
24	F	Tee Wrench		57408-645 (57328)
25	F	Piston Ring Bush		57406-645 (57328)
26	F	Piston Ring Bush		58197-645 (57328)
27	F	Reduction Piece		N3120 (56328)
28	O	Test Pressure Gauge		057491-645 (57328)
29	O	Test Pressure Gauge		057492-645 (57328)
30	O	Adjustable Wrench		N3408 (57328)
31	F	Compressor Pressure Recorder Fitting		0030602 (62445)
32	F	Gauge, Dial 0.01 mm for Adjusting and Measuring Device		0030543 (62445)
33	F	Adjusting Device for Determining Top Dead Center with Dial Gauge		0030498 (62445)

**Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
COMPRESSOR UNIT 20 CFM, 3200 PSI**

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
34	F	Magnetic Graduation for Checking Injection Pump		0031189 (62445)
35	F	Dial Segments for V-Belt Pulleys		0030677 (62445)
36	F	Pointer for Dial Segments		0030678 (62445)
37	F	Gauge for Reading Tightening Degrees for Cylinder Head Bolts		0030500 (62445)
38	F	Gauge for Reading Tightening Degrees for Big-End-Main Bearing and Flywheel Bolts		0031102 (62445)
39	F	Spanner (Special) Wrench for Nozzle Holder in Connection with 100020 and 120050		0030586 (62445)
40	F	Double Socket Inserts in Connection with 110010 and 120050		0030581 (62445)
41	F	Special Spanner Wrench for Rear Fixing Nut of Distributor-Type Injection Pump		0030761 (62445)
42	F	Double Spanner for Slotted Nuts of Injection Times		0031114 (62445)
43	F	Universal Device for Pulling Off the Advance Retard Unit and Regid Drivers		0030762 (62445)
44	F	Socket Spanner for Cylinder Head Nuts		0030512 0030192 (62445)
45	F	Square Socket Insert for Plug on Cylinder Head		0030511 (62445)

**Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
COMPRESSOR UNIT 20 CFM, 3200 PSI**

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
46	F	Device for Removing the Gasket Under the Injector		0030434 (62445)
47	F	Swiveling Clamping Stand for Cylinder Head		0030562 (62445)
48	F	Clamping Plate for 120900		0030794 (62445)
49	F	Valve Spring Compressor		0030504 (62445)
50	F	Cutter for Valve Seat Ring		0030784 (62445)
51	F	VLV St. Adj		122303 0301016 (62445)
52	F	Holder		0031043 (62445)
53	F	Guide Mandrel 0.8 mm Accessories		0030764 0031044 (62445)
54	F	Mandrel for Turning off the Valve Seat Rings on a Lathe		0031234 (62445)
55	F	Upright Drill for Cutting Valve Seat Insert Rings		0030649 (62445)
56	F	Pilot Pin with Drilling Bushing. Extra for Drilling Device No. 122460		0030650 (62445)
57	F	Mandrel for Valve Guide 0.8 mm		0030453 (62445)
58	F	Reamer for Valve Guide 0.8 mm		0030452 (62445)

**Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
COMPRESSOR UNIT 20 CFM, 3200 PSI**

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
59	F	Mandrel for Valve Seat Rings		0030620 0030441 (62445)
60	F	Cutting Device for Cylinder Head		0030426 (62445)
61	F	Compression Tool for Fitting the Protective Tubes of the Push Rods		0030501 (62445)
62	F	Lathe Fixtures for Cylinder Heads, for Remaching the Seat Face on 9 Turning Lathe		0030621 (62445)
63	F	Piston Ring Pliers		0030496 (62445)
64	F	Gauge for Measuring Wear of Keystone-Ring Groove in Piston		0030438 (62445)
65	F	Piston Ring Compression Device 0100 mm		0030430 (62445)
66	F	Device for Inserting and Removing the Bushes of the Gudgeon Pin		0031079 (62445)
67	F	Socket Spanner for Main Bearing Bolts		0030572 (62445)
68	F	Bent Socket Spanner for Big-End Bearings Bolts		0030425 (62445)
69	F	Piston Heater		0030414 (62445)

**Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
COMPRESSOR UNIT 20 CFM, 3200 PSI**

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
70	F	Puller Device for with Drawing Gear, Flywheel and Hub from Crankshaft and Bearing Out of Crankcase		0030672 (62445)
71	H	Special Device for Inserting Bearing Housing into Crankcase and Oil Seal into Bearing Housing		0030670 (62445)
72	H	Special Device for Inserting Inner Bearing Housing into Crankcase		0030671 (62445)
73	F	Hammer Spanner for Flywheel Nut		0030503 (62445)
74	F	Assembly Device to Insert Oil Seal of Crankshaft (Front)		0032498 (62445)
75	F	Assembly Device to Insert Oil Seal of Crankshaft (Rear)		0032499 (62445)
76	F	Mandrel for Mounting Flywheel on Crankshaft		0030674 (62445)
77	F	Removing Device for the Front and Rear Gasket Ring of the Crankshaft		0030733 (62445)
78	F	Press in Device for Camshaft Hole Cover		0030448 (62445)
79	F	Device for Inserting and Removing the Bearing-Bush of the Camshaft		0030433 (62445)
80	F	Refacing Device for Cylinder Seat Face on Camshaft		0031133 (62445)

**Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
COMPRESSOR UNIT 20 CFM, 3200 PSI**

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
81	F	Pulling Device		0030536 (62445)
82	F	Compressograph		0301056 (62445)
83	F	Special Outfit		0031077 (62445)
84	F	Assembly Stand for Clamping Down Air-Cooled Engine on One Side Only		0301067 (62445)
85	F	Pump		0030714 (62445)
86	F	Tank		0030777 (62445)
87	F	Kit for 912 Pumps		0030645 (62445)
88	F	Retainer, V-Belt Pulley		0030446 (62445)
89	O	Wrench, Plug Purification		WHR-1 (57328)
90	O	Tool Case		N4492 (57328)
91	O	Torch Outfit, Cutting Welding Oxy Acetylene	3433-00-026-4718	
92	O	Circlip Pliers	5120-00-789-0492	
93	O	Micrometer	5120-00-554-7134	

Section IV. REMARKS

REFERENCE CODE	REMARKS
A	Adjustment is limited to adjustment of subcomponents.
B	Repair is limited to replace or repair of major assemblies.
C	Repair is by replacement of subcomponent.
D	Repair is by welding/brazing.
E	Adjust is limited to belt adjustment.
F	Calibrate every 540 days in accordance with TB 9-4220-216-35.

☆U.S. GOVERNMENT PRINTING OFFICE: 1996 - 755-025/40157

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APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS

Section I. INTRODUCTION

C-1. **Scope.** This appendix lists components of end item and basic issue items for the 20 CFM Compressor Unit to help you inventory items required for safe and efficient operation.

C-2. **General.** The Components of End Item and Basic Issue Items Lists are divided into the following sections.

a. Section II. Components of End Item. This listing is for informational purposes only, and is not authority to requisition replacements. The items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between properly accounts. Illustrations are furnished to assist you in identifying the items.

b. Section III. Basic Issue Items. These are the minimum essential items required to place the 20 CFM Compressor Unit in operation. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of the end item.

C-3. **Explanation of Columns.** The following provides an explanation of columns found in the tabular listings:

a. Column (1). Illustration Number (Illus Number). This column indicates the number of the illustration in which the item is shown.

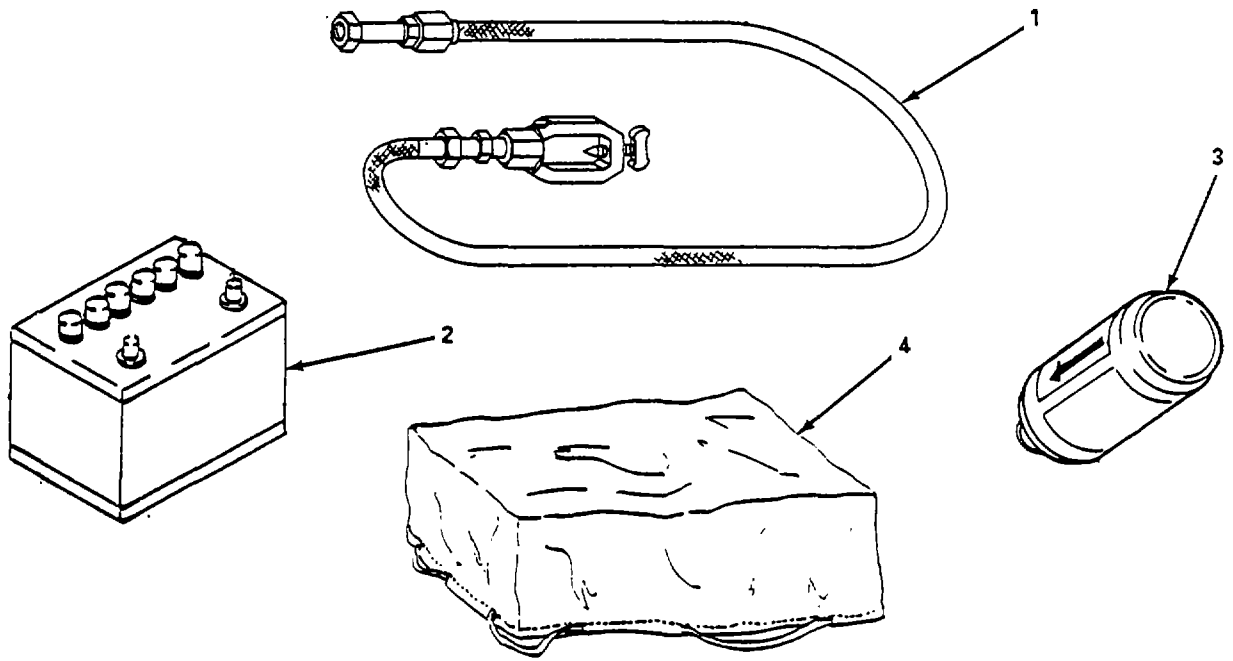
b. Column (2). National Stock Number. Indicates the National Stock Number assigned to the item and will be used for requisitioning purposes.

c. Column (3). Description. Indicates the Federal item name, and, if required, a minimum description to identify and locate the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number.

d. Column (4). Unit of Measure (U/M). Indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in., pr).

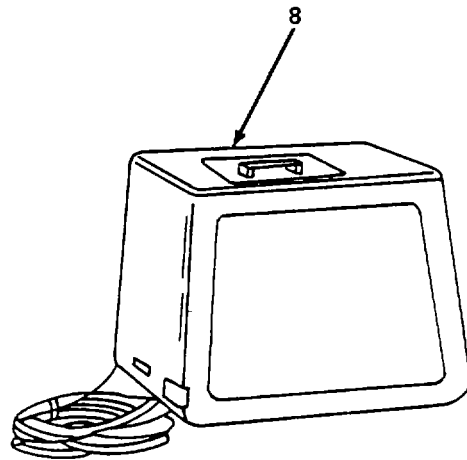
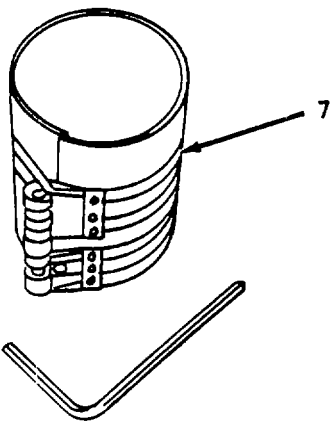
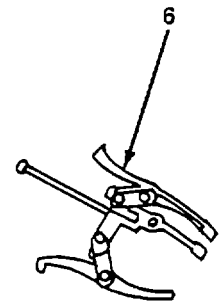
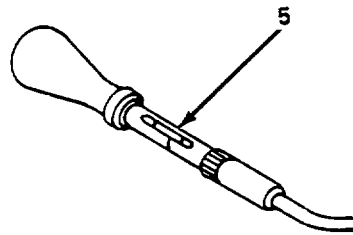
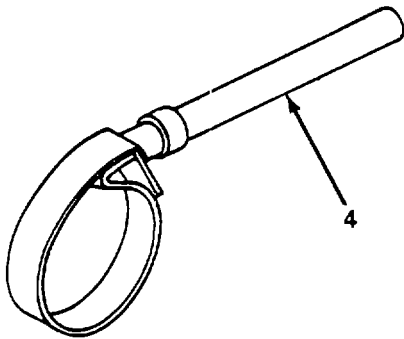
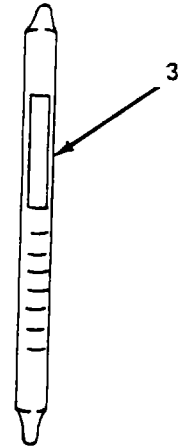
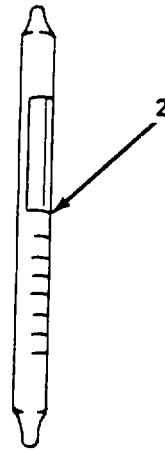
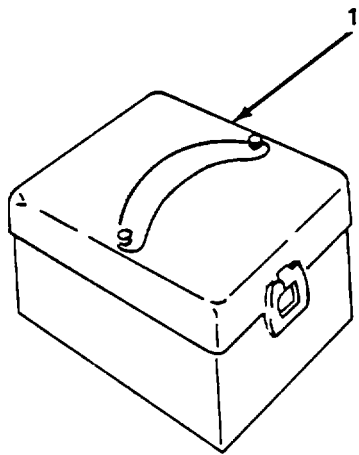
e. Column (5). Quantity Required (QTY RQR). Indicates the quantity of the item authorized to be used with/on the equipment.

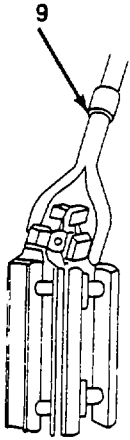
Section II. COMPONENTS OF END ITEMS



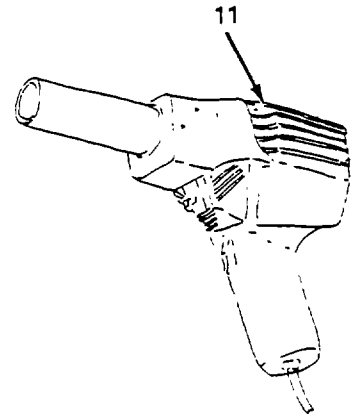
(1) Illus Number	(2) National Stock Number	(3) Description CAGE And Part Number	(4) Usable On Code	(5) Qty Rqr
1		Whip, Charging (14819) HP778A-12	ea	1
2		Battery, 12 Volt (90660) Exide 4-27	ea	1
3		Ether Bottle (53203) 20011	pk	12
4		Tarp (80824) CVR-15	ea	1

Section III. BASIC ISSUE ITEMS





10
ELECTRIC
CYLINDER
HONE



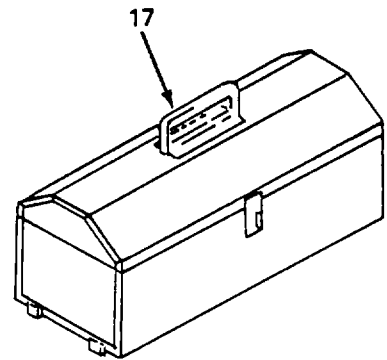
12
CLUTCH
ALIGNING
TOOL

13
CLUTCH
ADJUSTMENT
TOOL

14
DIGITAL
MULTIMETER

15
ARMATURE
GROWLER

16
HIGH PRESSURE AIR
END TEST
STAND



(1) Illus Number	(2) National Stock Number	(3) Description CAGE And Part Number	(4) Usable On Code U/M	(5) Qty Rqr
1	6665-00-567-0221	Detector Kit, Multi-Gas	ea	1
2	4220-01-006-1529	Tubes, Test: CO ₂	ea	3
3	4220-01-005-8733	Tubes, Test: CO	ea	3
4	5120-00-262-8491	Wrench, Strap	ea	1
5	6630-00-171-5126	Hydrometer, Battery	ea	1
6	5120-00-516-3120	Puller, Gear 3 JAW	ea	1
7	5120-00-250-6055	Compressor, Piston Ring	ea	1
8	4940-00-164-8997	Cleaner, Ultrasonic	ea	1
	5130-00-222-3905	Hone, Cylinder, Portable	ea	1
10	5310-00-540-0152	Hone, Cylinder, Electric	ea	1
11	4940-00-357-1369	Gun, Heat	ea	1
12	5120-01-053-3118	Tool, Clutch Aligning	ea	1
13	5120-01-053-6122	Adjustment Tool, Clutch	ea	1
14	6625-01-139-2512	Multimeter, Digital	ea	1
15	6625-00-093-7797	Growler, Armature	ea	1
16	4310-01-054-4780	Test Stand, High Pressure Air End	ea	1
17	5180-00-177-7033	Tool Kit, General Mechanic's	ea	1
18		TM 5-4310-386-14	ea	1
19		TM 5-4310-386-24P	ea	1

APPENDIX D

ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

D-1. **Scope.** This appendix lists additional items you are authorized for the support of the 20 CFM Compressor Unit.

D-2. **General.** This list identifies items that do not have to accompany the Compressor Unit and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

D-3. **Explanation of Listing.** National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name under the type document (i.e., CTA, MTOE, TDA, or JTA) which authorizes the item(s) to you.

Section II. ADDITIONAL AUTHORIZATION LIST

National Stock Number	Description FSCM and Part Number	Usable On Code	U/M	Qty Auth
4240-00-022-2946	Protector, Aural	DCW	Pr	1

D-1/(D-2 blank)

APPENDIX E

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTIONS

E-1. **Scope.** This appendix lists expendable supplies and materials you need to operate and maintain the 20 CFM Compressor Unit. These items are authorized to you by CTA 50-970, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

E-2. **Explanation of Columns.**

a. Column (1) Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use Oil, Item 1, App. E").

b. Column (2) Level. This column identifies the lowest level of maintenance that requires the listed item. (Enter as applicable).

- C - Operator/Crew
- O - Unit Maintenance
- F - Direct Support Maintenance - Intermediate Maintenance
- H - General Support Maintenance - Intermediate Maintenance
- D - Depot Maintenance

c. Column (3) National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column (4) Description. Indicates the Federal item name, and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for manufacturer (FSCM) in parentheses followed by the part numbers.

e. Column (5) Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	O	6810-00-286-5435	Alcohol, Isopropyl (81348) TT1735	gal.
	O	6810-00-983-8551	Alcohol, Isopropyl (81348) TT1735	qt
2	O	8415-00-281-7813	Apron, Rubber, Small (81349) MIL-A-2334	ea
	O	8415-00-281-7814	Apron, Rubber, Medium (81349) MIL-A-2334	ea
	O	8415-00-281-7815	Apron, Rubber, Large (81349) MIL-A-2334	ea
3	O	8105-00-837-7757	Bag, Plastic, 12 in. x 12 in. Interlocking Seal (58536) A-A-1 779	bx
4	O	7510-00-243-3434	Bands, Rubber (81349) ZZ-R-1415	bx
5	O	7530-00-222-3524	Book, Record, Ruled	ea
6	O	8030-00-205-6511	Brush, Soft Bristle	ea
7	O	7920-00-044-9281	Cloth, Lint Free (81349) MIL-C-85043	bd
8	F	7930-00-282-9699	Detergent, Nonionic, MIL-D-16791, Type 1 (80244)	pt
	F	7930-00-985-6911	Detergent, Nonionic, MIL-D-16791, Type 1 (80244) 5-Gal Can	cn
9	O	6810-00-297-9540	Distilled Water, Technical (96906) MS36300-5	5 gal.
10	O	9140-00-286-5294	Fuel, Diesel (81348) VV-F-800 Grade F2RE	gal.
11	O		Funnel, 1 qt, Strainer, 8 in. Flex Spout	ea
12	O	9150-00-190-0905	Grease, Automotive and Artillery (81349) MIL-G-10924	cn
13	O	4240-00-764-5152	Goggles	ea
14	O	8415-00-266-8677	Gloves, Rubber (81349) ZZ-G-381 Size 10	pr
15	O	9150-00-235-9061	Lubricating Oil (81348) MIL-L-17331	5 gal.
	O	9150-00-235-9062	Lubricating Oil (81348) MIL-L-17331	55 gal.

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
16	O	9150-01-152-4119	Oil, Crankcase, OE/HDO 15 W40 MIL-L-2104D	qt
17	O		Oil, Anti-corrosive, MIL-C-21260	qt
18	O	6810-00-141-6078	Phosphate, Trisodium (81348) O-S-642	lb
19	O		Preservative, P-10, Grade 10	qt
20	O		Preservative, P-10, Grade 30	qt
21	F	7920-00-205-1711	Rag, Wiping, 50/G (58536) A-A-531	ea
22	O	4240-00-240-5141	Shield, Face (81349) MIL-S-3126	ea
23	O	6850-00-763-5402	Silicon Lubricant	tb
24	O	6850-00-281-1985	Solvent, Dry Cleaning, PD-680 (81348)	
25	O	7510-00-914-1040	Tape, Pressure Sensitive Adhesive	gal.
26	O	8030-00-889-3535	Tape, Teflon, MIL-T-27730 (81348), 1/2 In.	ea
	O	8030-00-889-3534	Tape, Teflon, MIL-T-27730 (81348), 1/4 In.	ea
27	F	6685-00-275-9000	Temperature Indicating Compound	ea
28	F	6505-01-283-1331	Jelly, Petroleum	tb
29	F	8030-00-252-3391	Compound, Sealing	oz

APPENDIX F

TORQUE LIMITS

F-1. **Scope.** The following should be used when performing maintenance on the compressor and engine.

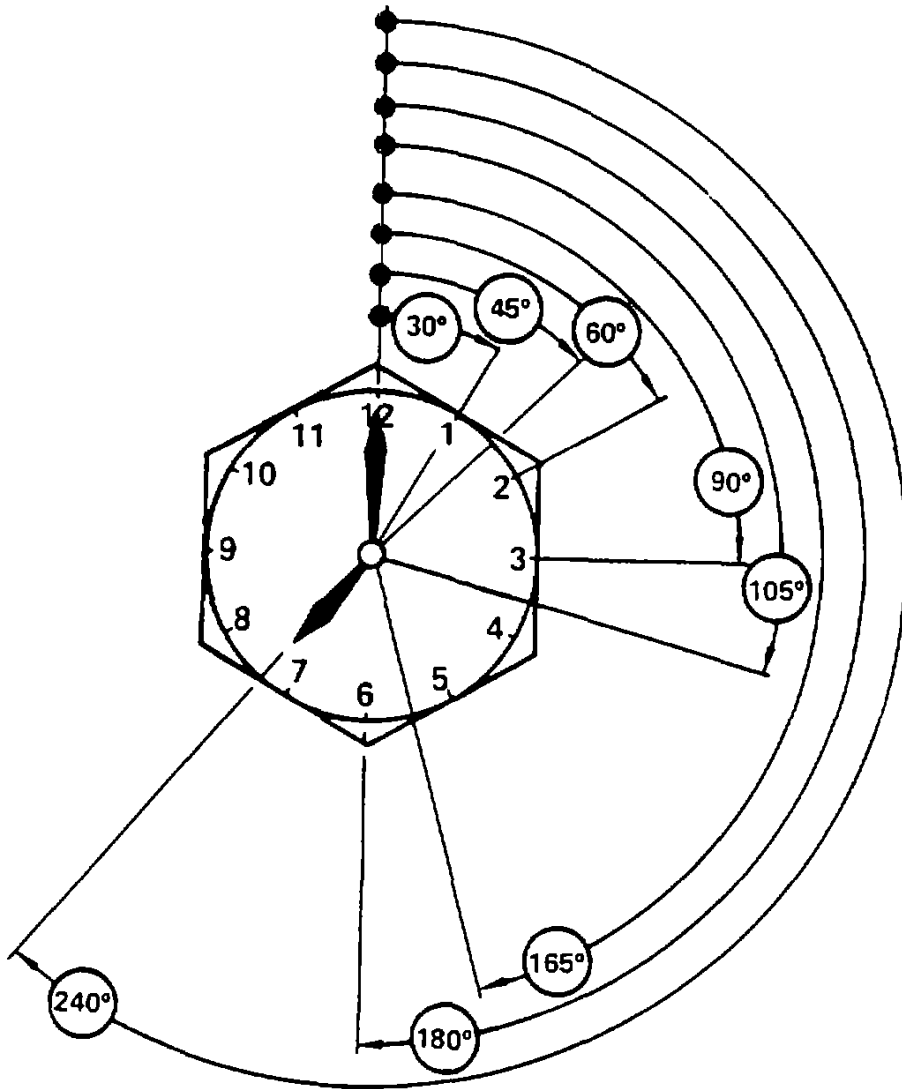
a. Compressor. Unless otherwise specified in text, the following tightening torques should be used for the compressor. All valve head screws require torque wrench tightening.

Table F- 1. Torque Specifications for Compressor.

Bolt or Screw	Thread	Maximum Torque
Hex and allen head	M 6	10 Nm (7 ft. lbs)
Hex and allen head	M 8	25 Nm (18 ft. lbs)
Hex and allen head	M 10	45 Nm (32 ft. lbs)
Hex and alien head	M 12	75 Nm (53 ft. lbs)
Hex and alien head	M 14	120 Nm (85 ft. lbs)

Pipe connections (swivel nuts): Finger-tight + 1/2 turn.

b Engine. To prevent faulty assembly on the Deutz Engine, the following information includes instructions on tightening of heavy-duty bolts, because the procedure differs from that normally employed. The tightening angle is particularly important and, for this reason, the following indicates how various angles can be readily obtained by comparison with a clock face. To obtain desired angle all that has to be done is for a T-Bar on the socket (special wrench No. 120040 or No. 120050) to be turned by the same angle as formed by the hour and minute hands of a clock. The 60° angles of a hex bolt can also be a help.

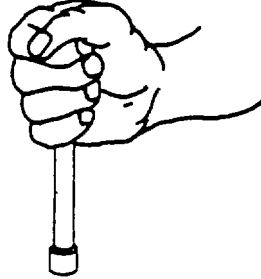


F-2

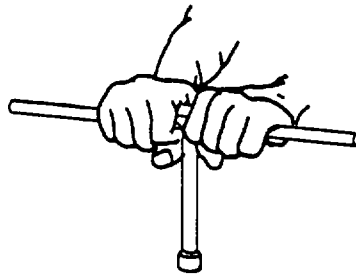
c. Tightening Heavy-Duty Bolts (Screws and Nuts) on Deutz Engine.

(1) Wet threads and seatings with motor oil before fitting. Do not use molybdenum disulphide products.

(2) Screw bolts in initially until they are squarely seated, using a socket wrench without T-Bar and tighten without using any leverages shown.



(3) Preload the bolts using socket wrench with T-Bar. Hold the T-Bar in such a manner that both hands are in contact with the socket shaft as shown below. Without repositioning hands, turn T-Bar until tight. When using a box end or open-end wrench for preloading, the tip of your straight thumb holding the wrench must touch the head of the bolt or nut.



(4) Tightening the bolts or nuts is accomplished by extending the T-Bar and holding as shown. Tighten in accordance with table F-2.

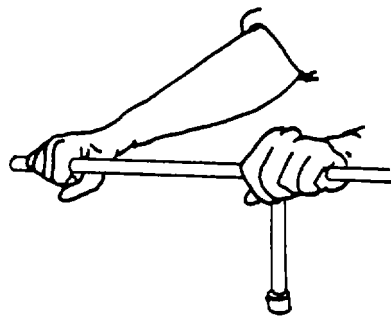


Table F-2. Torque Specification for Bolts and Nuts on Deutz Engine.

Designation		Preloading ft/lb (Nm)	Tightening Angles				Total
			1 st Stage	2 nd Stage	3 rd Stage	4 th Stage	
Cylinder Head	210 1681	22.14 ft/lb (30)	45°	45°	45°	30°	1650
Connecting Rod	M12 x 1.5 x 55	22.14 ft/lb (30)	30°	60°			90°
Bearing Cap	M14x110	22.14 ft/lb (30)	45°	60°			105°
Rocker Bracket	M8 x 55						20.66 ft/lb (28 Nm)
Balance Weight	M12 x 70	22.14 ft/lb (30)	30°	30°			60°
Flywheel		36.9 ft/lb (50)	90°	90°			180°
Injectors	M10						18.45 ft/lb (25 Nm)
V-Belt Pulley	M35 x 1.5	36.9 ft/lb (50)	60°				60°
Cooling Blower	M12 x 140	22.14 ft/lb (30)	30°	60°			90°
Adapter Housing	2164062	22.14 ft/lb (30)	60°	90°	90°		240°
Oil Filter Cover	3371962						25.83 ft/lb (35 Nm)

NOTE

When replacing main and big-end bearings or after piston seizures, be sure to replace the bearing bolts as well.

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By Order of the Secretary of the Army:

DENNIS J. REIMER
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Chief of Staff

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
 1 decimeter = 10 centimeters = 3.94 inches
 1 meter - 10 decimeters = 39.37 inches
 1 dekameter = 10 meters = 32.8 feet
 1 hectometer = 10 dekameters = 328.08 feet
 1 kilometer = 10 hectometers = 3,280.8 feet

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
 1 dcileter = 10 centiliters = 3.28 fl. ounces
 1 liter = 10 deciliters = 33.81 fl. ounces
 1 dekaliter = 10 liters = 2.64 gallons
 1 hectoliter = 10 dekaliters = 26.42 gallons
 1 kiloter = 10 hectoliters = 264.18 gallons

Weights

1 centigram = 10 milligrams = .15 grain
 1 decigram = 10 centigrams = 1.54 grains
 1 gram = 10 decigram = .035 ounce
 1 dekagram = 10 grams = .35 ounce
 1 hectogram = 10 dekagrams = 3.52 ounces
 1 kilogram = 10 hectograms = 2.2 pounds
 1 quintal = 100 kilograms = 220.46 pounds
 1 metric ton = 10 quintals = 1.1 short tons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
 1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
 1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
 1 cu. meter = 100 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

<i>To change</i>	<i>To</i>	<i>Multiply by</i>	<i>To change</i>	<i>To</i>	<i>Multiply by</i>
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

