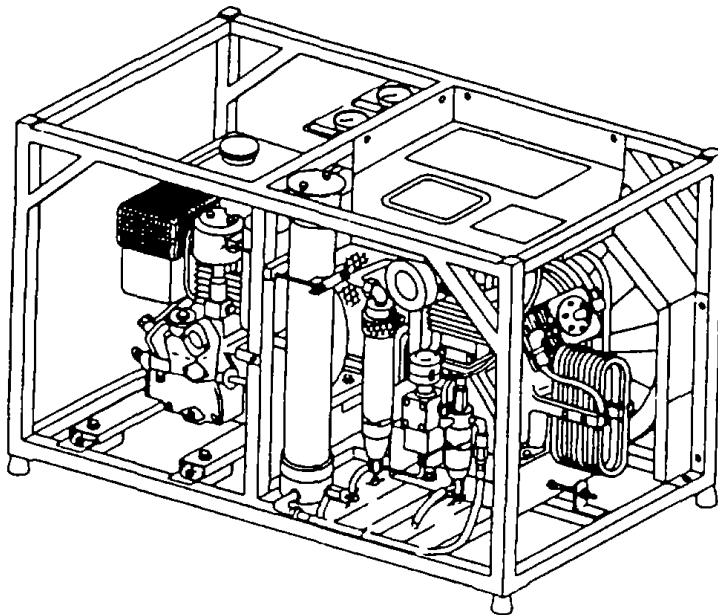


TECHNICAL MANUAL  
OPERATOR, UNIT, DIRECT SUPPORT, AND GENERAL  
SUPPORT MAINTENANCE MANUAL  
**AIR COMPRESSOR, 5.1 CFM DIESEL  
ENGINE DRIVEN  
MODEL KA7-DA  
(NSN 4310-01-220-7262)**



DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

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\*This manual, together with TM 5-4310-387-24P, supersedes TM 5-4220-212-12&P dated March 1986, in its entirety.

CHANGE

NO. 1

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

Operator, Unit, Direct Support and General Support  
Maintenance Manual

**AIR COMPRESSOR, 5.1 CFM  
DIESEL ENGINE DRIVEN  
MODEL KA7-DA  
(NSN 4310-01-220-7262)**

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**WARNING**

THE FOLLOWING WARNINGS, ALTHOUGH NUMEROUS SHOULD BE STRICTLY ADHERED TO FOR SAFE OPERATION OF THE EQUIPMENT

Shut down the compressor if 3260 psi pressure in the final stage is exceeded. Refer to the troubleshooting tables 4-2, 5-1 and 6-1. Do not operate the compressor until the problem has been identified and corrected.

Do not fill any cylinder if the cylinder inspection date has expired, i.e., five years.

Charge cylinders at a slow rate to prevent excessive heat buildup. Charging rate should not exceed 200 psi/ minute or 400 psi/minute if cylinders are submerged in water.

Never perform maintenance or repairs on a cylinder valve while the cylinder is charged.

Handle cylinders carefully. Avoid having the cylinders slip or drop. Do not lift or carry cylinders by the manifold.

Store cylinders in an upright position in a cool, shady place to prevent overheating.

Secure cylinders properly. This includes blocking and strapping them. The enormous potential energy of a fully charged SCUBA cylinder necessitates that special stowage maintenance and handling precautions be observed.

Internal inspections, hydrostatic tests, and repair work on cylinders should be accomplished only by those trained to do so.

Have cylinders inspected for interior deterioration annually.

Inspect cylinders externally before and after each use for signs of deterioration, corrosion, dents, cracks, or other damage. Never use a dented, welded or scarred cylinder.

Never fill a cylinder designated for another gas or which was previously filled with another gas. Never fill an oxygen tank. Danger of explosion exists.

The filler adapter and recharge connection should be thoroughly inspected prior to servicing and any trace of oil, grease, or foreign material carefully removed. Use only those adapters and connections supplied and designed for this equipment. Secure the dust cap between the handle-screw and the adapter seat when the filling adapter is not in use.

Never open filling valve when under pressure and not connected, as highly compressed air emerging can cause serious injury.

Check air tightness of compressor from time to time by brushing all fittings and couplings with soapy water to detect air bubbles, indicating and air leak. Repair all air leaks.

Filling hose must always be in satisfactory condition and threads undamaged. Discard worn or damaged hose.

Permit only qualified personnel to use this equipment. Complete familiarity is a basic prerequisite to safe operation techniques. The operator must always be in attendance when equipment is in use.

Dry cleaning solvent, PD-680 used to dean 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 degrees F (60 degrees C).

**WARNINGS**

Dry cleaning solvent, PD-680, should not be used to clean any parts which come in contact with the divers' air, i.e., compressor and/or charging whip, failure to follow this warning may result in contaminating the divers' air

Before starting engine or operating any of the components insure that no loose bars, tools, or parts are lying in or on any part of the equipment, as they could cause serious damage to equipment or bodily injury to personnel.

Never wear loose clothing, or hanging appendages from person or clothing, while inspecting running engine, moving shaft, or like machinery.

Always provide metal-to metal contact between fuel container and fuel tank, while refueling, to avoid igniting fuel vapors with a static spark

Do not refuel while engine is in operation.

Before refueling, insure that adequate fire fighting equipment is serviceable and is standing by for immediate use in event of fire or explosion.

During engine operation, proper fire fighting equipment should be serviceable and kept near in the event that fire develops.

Never touch engine accessories with bare hands during operation, or before they have cooled sufficiently. Severe burns can be caused through carelessness.

**b Change 1**

**WARNING**

Operation of the equipment presents a noise hazard to personnel in the area. The noise level exceeds the allowable limits for unprotected personnel. Wear ear muffs or ear plugs which were fitted by a trained professional. Post area as a noise hazard.

**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.

**WARNING**

If in doubt about the serviceability of a part, repair or replace it immediately. Use only approved replacement parts.

**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**

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.

**WARNING**

Blow down air system from air compressor out to diver when setting up for diving operations. Failure to do so may result in foreign material in the breathing system and subsequent injury or death to the diver.

**WARNING**

This manual is not intended to dictate safe diving operation or procedures. Diving supervisors are ultimately responsible for conducting safe diving operations in accordance with NAVSEA 0994-2P-001-9010, U.S. Navy Diving manual and all other applicable military diving safety and operational references.

**FIRST AID**

For first aid treatment, refer to FM 21-11.

**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 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.

Operator, Unit, Direct Support, and General Support Maintenance Manual  
for  
**AIR COMPRESSOR UNIT, 5.1 CFM DIESEL ENGINE DRIVEN  
MODEL KA7-DA  
(NSN 4310-01-220-7262)**

**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 the 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-MTS, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished directly to you.

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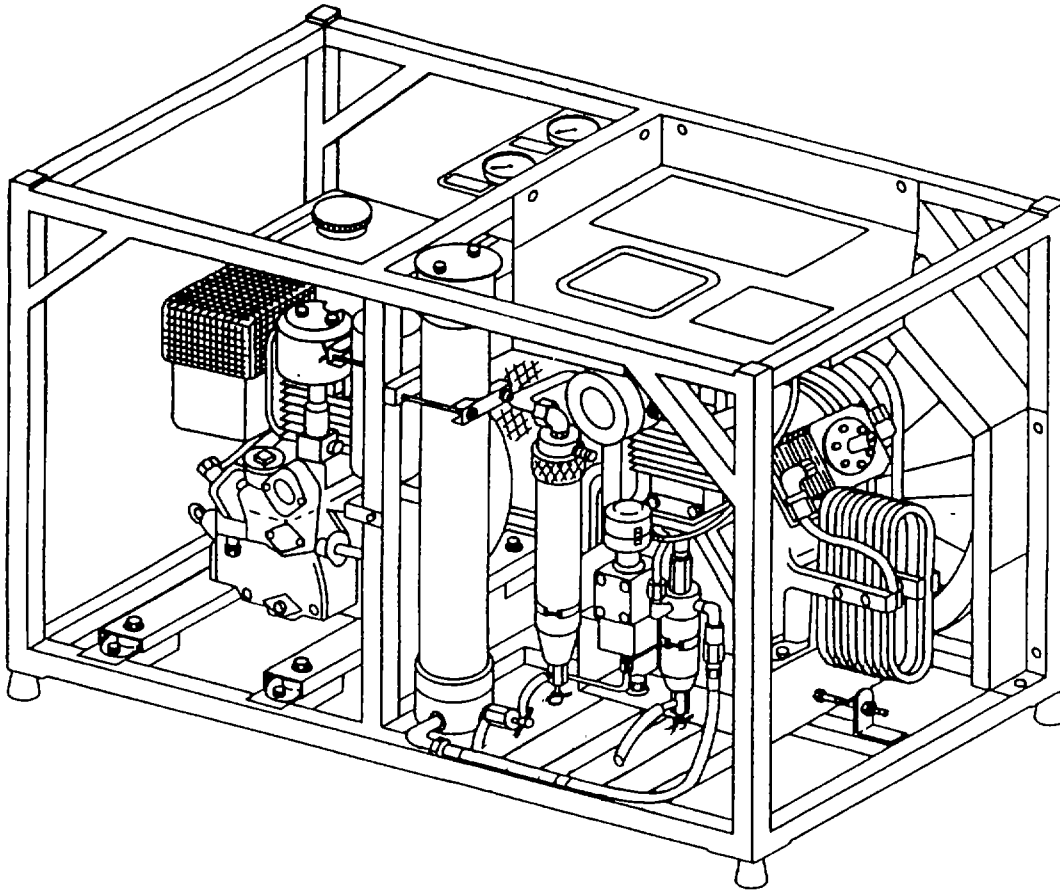


Figure 1-1. 5.1 CFM Air Compressor Model KA7-DA.

CHAPTER 1

INTRODUCTION

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OVERVIEW

This chapter contains general information pertaining to 5.1 CFM air compressor, and its components.

Section I. GENERAL INFORMATION

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1-1. **Scope.** This manual contains descriptive data, operating instructions, operator, unit, direct support, and general support maintenance instructions for the 5.1 CFM air compressor, Model KA7-DA (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 750-244-2 and TM 750-244-3 for instructions covering the destruction of Army material to prevent enemy use.

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

1-5. **Reporting Equipment Improvement Recommendations (EIRs).** If your air compressor 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 (Quality Deficiency Report). Mail it to us at: Commander, U.S. Army Aviation and Troop Command, ATTN: AMSAT-I-MDC, 4300 Goodfellow Boulevard, St. Louis, Missouri 63120-1798. We will send you a reply.

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

BHP	Brake Horse Power
DIA	Diameter
FSW	Feet of sea water
NEDU	Naval Experimental Diving Unit
PSI	Pounds per square inch
RPM	Revolutions Per-Minute
SCFM	Standard cubic feet per minute
SCUBA	Self-contained underwater breathing apparatus
TSP	Trisodium phosphate

**Section II. EQUIPMENT DESCRIPTION**

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**1-7. Equipment Characteristics, Capabilities, and Features.** The air compressor provides purified high pressure, compressed air for charging self-contained underwater breathing apparatus (SCUBA). The air compressor raises atmospheric air to a pressure of about 3200 psig. The compressed air is purified by the purification chamber and is then used to fill the SCUBA diver tank block. The air compressor is a portable, three stage, three cylinder, reciprocating, air cooled machine which is capable of supplying purified breathing air to fill air bottles. The compressor is driven by an air cooled, single cylinder, manually started diesel engine. A conventional V-belt drive is used to connect the diesel engine to the compressor. The maximum brake horsepower of the engine is 6.2 BHP at 3600 RPM. A welded construction tubular steel frame provides appropriate mounting points for the instruments, purification chamber and all major components. A resilient mounting system is used to minimize transmission of engine vibration into other components. The compressor and purification chamber are interconnected.

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

**ENGINE FUEL TANK (1).** The engine fuel tank has a capacity of approximately 4 quarts (3.7 liters). This is sufficient fuel for about 3 1/2 hours of operation at full load.

**DIESEL ENGINE (2).** Supplies power to drive the air compressor.

**AIR COMPRESSOR (3).** Takes atmospheric air and compresses it for use in SCUBA tanks.

**COMPRESSOR PREFILTER AND INLET HOSE (4).** The compressor prefilter and air inlet hose provides a means of separating the air compressor from the point from which the air being compressed is actually taken. This insures that the cleanest possible air is being compressed.

**COMPRESSOR INTERSTAGE SEPARATOR (5).** The compressor interstage separator is located in the compressed air path downstream of the second to third stage intercooler. The oil and water vapor condensed

from the compressed air by the intercooler are removed from the air by a combination of centrifugal force, air baffles and a sintered metallic filter element.

COMPRESSOR FINAL SEPARATOR (6). The compressor final separator is located in the compressed air path downstream of the third stage aftercooler. The oil and water vapor condensed from the compressed air are removed from the air by the means of the air passing through two separate tubes of different lengths within final separator. This insures that adequately precleaned air is delivered to the purification chamber.

AIR PURIFICATION CHAMBER (7). The air purification chamber is located immediately downstream of the final separator. The precleaned air passes through a combination of chemicals intended to remove any remaining oil, water vapor and other contaminants. This insures that the resulting air is clean, dry, and free of odor and taste. The purifier chamber is furnished with a replaceable purification filter cartridge which is intended for regular replacement.

COMPRESSOR GAUGES (8). The compressor gauges are used to give a continuous indication of the compressor final stage discharge pressure and the pressure entering the fill manifold hose.

FRAME ASSEMBLY (9). Provides a mounting base for all the components.

1-9. **Difference Between Models.** There is only one model of the 5.1 CFM covered in this manual.

1-10. **Equipment Data.**

a. Compressor.

Weight .....	275 lbs. (125 KG)
Length .....	42 in. (1066.8 mm)
Width .....	18 in. (457.2 mm)
Height .....	24 in.(609.6 mm)
No. of Cylinders .....	3
No. of Stages .....	3
Speed .....	1300 RPM (max.)
Delivery Rate .....	5 SCFM (min.) @ 3200 PSIG (220 BAR)
Minimum Ambient Temperature .....	-25°F (-32°C)
Maximum Ambient Temperature.....	110°F (43°C)
Discharge Air Temperature .....	135°F (57°C) (max.)
Maximum Allowable Compressor Inclination .....	150 in any direction

b. Diesel Engine.

No. of Cylinders.....	1
Bore .....	3.23 in. (82 mm)
Stroke .....	2.17 in. (55 mm)
Displacement .....	17.7 cu. in. (290 cc)
Horsepower .....	6.2 max. @ 3600 RPM
Torque (lbs-ft) .....	10.8 max. @ 2500 RPM
Intake valve gap .....	004 in. (0.1 mm)
Exhaust valve gap .....	004 in. (0.1 mm)



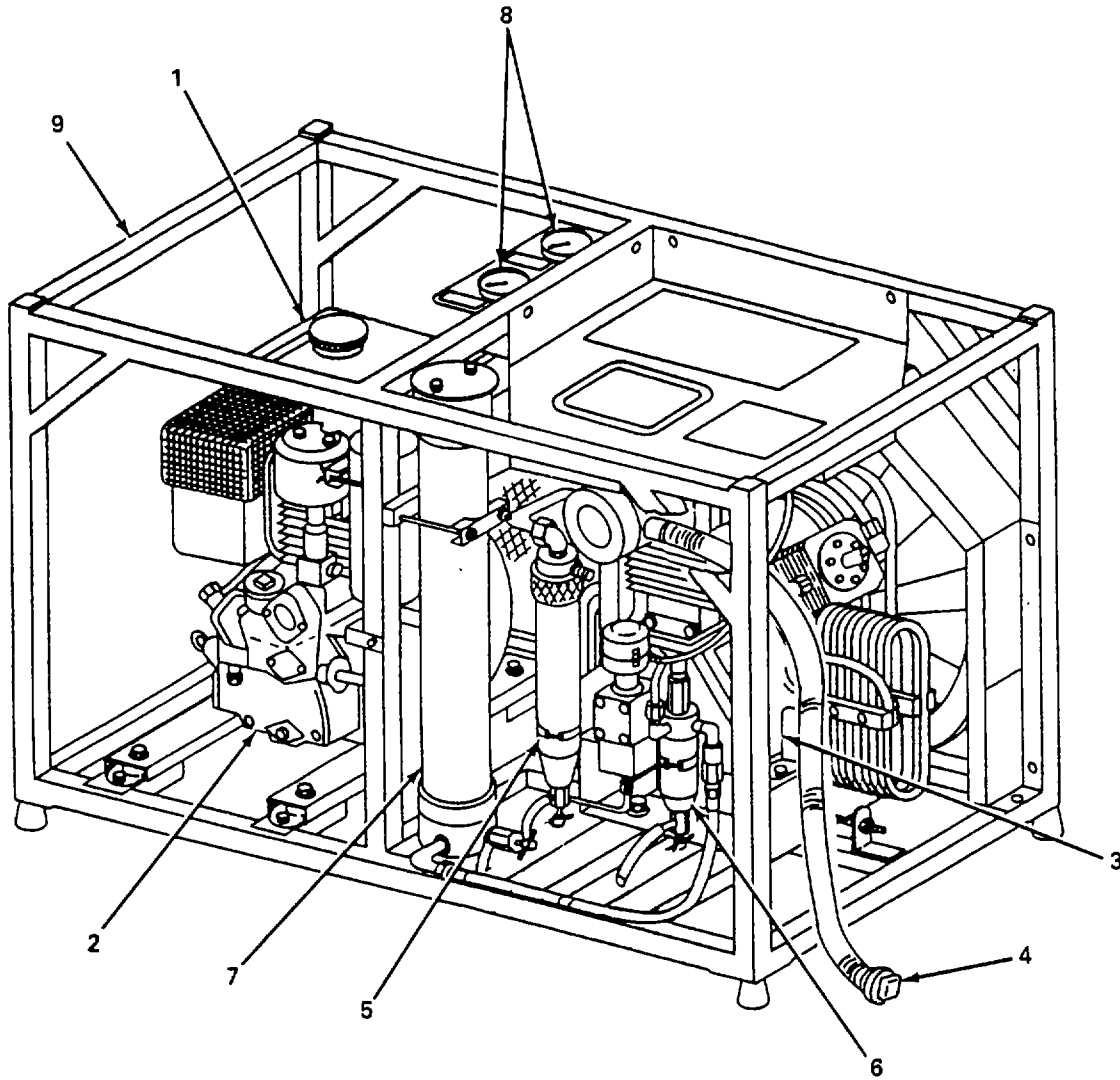


Figure 1-2. Air Compressor Major Components.

1-11. **Safety, Care, and Handling.** To prevent personal injuries and equipment damage, strictly observe and comply with all warnings and cautions in this manual during operation, maintenance, and movement of the compressor unit.

Stay clear of the unit when it is hoisted with a lifting device and slings.

The unit weight is approximately 275 pounds (125 kilograms). If moving the unit by hand becomes necessary, at least four persons are required for lifting the unit.

The following warnings should be strictly adhered to for safe operation of the equipment.

**WARNING**

**When compressor unit(s) are operating, the operator(s) and other personnel in the area should wear sound attenuators. The area must be posted as a noise hazard.**

**WARNING**

**Shut down the compressor if 3260 psi pressure in the final stage is exceeded.**

**Do not fill any cylinder if the cylinder inspection data has expired, i.e., five years.**

**Charge cylinders at a slow rate to prevent excessive heat buildup. Charging rate should not exceed 200 PSI/minute or 400 PSI/minute if cylinders are submerged in water. Never perform maintenance or repair on a cylinder or valve when the cylinder is charged. Handle cylinders carefully. Avoid having the cylinders slip or drop. Do not lift or carry cylinders by the manifold.**

**Store cylinders in an upright position in a cool, shady place to prevent overheating.**

**Secure cylinders properly. This includes blocking and strapping them. The enormous potential energy of a fully charged SCUBA cylinder necessitates that special stowage maintenance and handling precautions be observed.**

**Internal inspections, hydrostatic tests, and repair work on cylinders should be accomplished only by those trained to do so.**

**Have cylinders inspected for interior deterioration annually.**

**WARNING**

**Inspect cylinders externally before and after each use for signs of deterioration, corrosion, dents, cracks or other damage. Never use a dented, welded or scarred cylinder.**

**Never fill a cylinder designated for another gas or which was previously filled with another gas. Never fill an oxygen tank. Danger of explosion exists.**

**WARNING**

The filter adapter and recharge connection should be thoroughly inspected prior to servicing and any trace of oil, grease, or foreign material carefully removed. Use only those adapters and connections supplied and designed for this equipment. Secure the dust cap between the handlescrew and the adapter seat when the filling adapter is not in use.

Never open filling valve when under pressure and not connected, as highly compressed air emerging can cause serious accidents.

Check air tightness of compressor from time to time by brushing all fittings and couplings with soapy water to detect air bubbles, indicating an air leak. Repair all air leaks.

Filling hose must always be in satisfactory condition and threads undamaged. Discard worn or damaged hose.

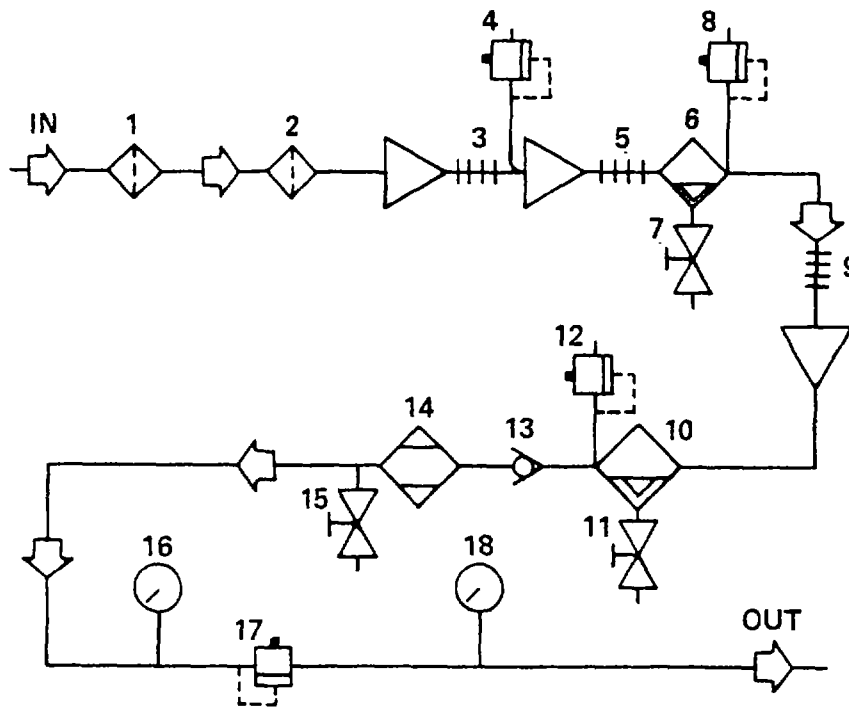
**WARNING**









Permit only qualified personnel to use this equipment. Complete familiarity is a basic prerequisite to safe operation techniques. The operator must always be in attendance when equipment is in use.

**Section III. PRINCIPLES OF OPERATION**

Paragraph		Page
1-12	Compressor Air Flow .....	1-6
1-13	Compressor Lubrication System .....	1-8
1-14	Detailed Principles of Operation for Engine Assembly .....	1-8

1-12. **Compressor Air Flow.** (Figure 1-3) Air is taken into the first stage of the compressor by way of the prefilter and the inlet air filter. The movement of the piston within the first stage cylinder compresses the incoming air to about 70 PSIG (4.8 BAR). The air leaving the first stage is cooled by the first to second stage intercooler. Both the first stage cylinder and the first to second stage intercooler are protected from overpressure by the first stage safety valve. The compressed air entering the second stage is compressed to a pressure of about 550 PSIG (38 BAR). The air leaving the second stage is cooled by the second to third stage intercooler. The cooled compressed air enters the interstage separator. Inside the interstage separator, a sintered metal filter removes any solid contaminants from the air. A series of air directing vanes and baffles cause the air flowing through the separator to spin. The resulting centrifugal force causes the water vapor and oil vapor which was condensed by the intercooler to collect on the inside surface of the separator housing and flow down into the sump area at the bottom of the separator. The accumulated condensate may then be drained by means of the separator drain valve. The second stage cylinder, second to third stage intercooler and the interstage separator are all protected from overpressure by the second stage safety valve. The compressed air entering the third stage is compressed to a pressure of about 3260 PSIG (225 BAR). The high pressure air leaving the third stage is cooled to within about 25°F (14°C) of ambient temperature by the aftercooler. It should be noted that the interstage coolers and the aftercooler are located directly in the air blast from the compressor cooling fan. The cooled compressed air



-  PRE AND INLET FILTER
-  CYLINDER
-  SAFETY OR PRESSURE MAINT. VALVE
-  CONDENSATE SEPARATOR
-  PURIFIER
-  CHECK VALVE
-  MANUAL VALVE
-  PRESSURE GAUGE

- |   |  |
|---|--|
| 1. Prefilter                                  | 10. Final Separator                              |
| 2. Inlet Air Filter                           | 11. Separator Drain Valve                        |
| 3. Intercooler, 1st-2nd Stage                 | 12. Safety Valve, 3rd Stage, 3260 PSIG (225 BAR) |
| 4. Safety Valve, 1st Stage, 116 PSIG (8 BAR)  | 13. Check Valve                                  |
| 5. Intercooler, 2nd-3rd Stage                 | 14. Purifier Chamber                             |
| 6. Interstage Separator                       | 15. Purifier Drain Valve                         |
| 7. Separator Drain Valve                      | 16. Discharge Pressure Gauge'                    |
| 8. Safety Valve, 2nd Stage, 725 PSIG (50 BAR) | 17. Pressure Maintaining Valve                   |
| 9. Aftercooler                                | 18. Fill Pressure Gauge                          |

Figure 1-3. Compressor Air Flow Diagram.

from the aftercooler enters the final separator. The final separator removes the condensed oil and water vapor by air passing through two separate tubes of different lengths within the separator. The accumulated condensate may be discharged by the separator drain valve. The final safety valve protects the third stage, aftercooler and final separator from over pressures. The compressed air leaving the final separator flows into the purifier chamber by way of a check valve. The function of the check valve is to prevent a reverse flow of air from the purifier chamber back into the final separator whenever the condensate in the separator is drained. such a reverse flow of air could damage the chemicals in the purifier chamber cartridge. Any accumulated moisture collecting in the purifier chamber may be drained by the purifier chamber drain valve. This drain valve is also used to relieve any pressure within the purifier chamber so that the chamber may be opened for cartridge servicing. The pressure maintaining valve prevents passage of air through the chemicals in the purifier chamber until the pressure rises above about 2000 PSIG (135 BAR). This is done to insure the purifier operates at peak efficiency. The final pressure gauge and fill pressure gauge indicate the air pressure inside the purification chamber and the air pressure being delivered to the diver tank block respectively.

1-13. **Compressor Lubrication System.** The compressor is equipped with a positive pressure lubricating oil system. The oil pump is driven by a cam which is bolted to the end of the crankshaft. The oil pump supplies oil to a pressure regulating valve which controls the oil pressure. The pressure regulating valve also controls the oil flow rate to the third stage cylinder. The surplus oil not required for the third stage is delivered to be base of the second stage cylinder to provide lubrication for the second stage and the crankshaft. The oil then drains back into the crankcase sump where it is picked up by the oil pump for recirculation. The first stage is lubricated by an oil vapor drawn from the crankcase into the intake of the first stage. This high pressure lubrication system insures adequate oil delivery to all wear points resulting in minimum wear and maximum service life.

#### 1-14. Detailed Principles of Operation for Engine Assembly.

a. Starting System. A hand crank is connected to the camshaft which in turn is connected to the crankshaft. When the hand crank is turned the crankshaft rotates at twice the starting crank speed.

b. Diesel Engine. In the diesel engine, air alone is compressed in the cylinder. After the air has been drawn into the cylinder through the intake valve during the intake stroke the intake valve closes and the piston rises in the cylinder and compresses the air. A charge of fuel is sprayed into the cylinder and the heat of compression is sufficient to ignite the fuel air mixture and force the piston downward on its power stroke. The exhaust valve opens during the pistons upward travel and allows the exhaust gases to escape. As the piston starts downward again, the exhaust valve closes, the intake valve opens and the cycle starts again.

c. Fuel System. The fuel system is comprised of a four quart (3.7 L) fuel tank, fuel filter, fuel pump, and injector. The fuel tank is located above the fuel pump and fuel is gravity fed to the pump. The fuel filter is located between the fuel tank and fuel pump and removes dirt from entering the fuel pump. The fuel pump is mechanically driven and supplies high pressure fuel to the fuel injector. All excess fuel is delivered back to the fuel tank.

d. Air System. Air enters the engine through an oil bath air cleaner, which is designed to remove foreign matter from the air. The air is drawn into the engine by the piston when the air intake valve is open.

e. Cooling System. The cooling system is comprised of a cooling fan and air baffles. The fan is connected to the flywheel on the end of the crankshaft. When the engine is running the fan provides a flow of air that passes around the cylinder and cylinder head and removes heat.

f. Exhaust System. The exhaust system consists of a muffler covered by a wire mesh. The muffler bolts right to cylinder head and is designed to reduce the noise of combustion and to carry the exhaust gasses away from the engine.

g. Lubrication System. The lubrication system provides lubrication to all moving parts within the engine. A gear driven oil pump draws oil from the oil sump through a filter screen. The oil is then pumped through the crankshaft main bearing, crankshaft and delivered to the connecting rod bearing.

h. Speed Control. Speed is controlled by a speed control lever and mechanical governor. As engine speed increases the flyweights in the governor are forced away from each other. This movement moves the governor pin outward causing the governor lever to move the pump rack towards the idling position. When the speed control lever is moved from the idler position, a gap is created between the throttle shaft extension screw and the governor lever. Spring action moves the governor lever toward the full open position on the pump rack, which causes the engine to increase speed. When equilibrium is obtained, the engine will run at that speed as determined by the position of the speed control lever. When a load is applied to the engine, the speed decreases which brings the flyweights together. As the flyweights come together, the governor lever moves the pump rack towards the full open position and engine speed increases. Placing the speed control lever to the stop position, the pump rack is forced to the closed position and stops the engine.

**CHAPTER 2**  
**OPERATING INSTRUCTIONS**

	Page
OVERVIEW .....	2-1
Section I. Controls and Indicators .....	2-1
Section II. Operator Preventive Maintenance Checks and Services (PMCS) .....	2-5
Section III. Operation Under Usual Conditions .....	2-10
Section IV. Operation Under Unusual Conditions .....	2-18

**OVERVIEW**

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

**Section I. CONTROLS AND INDICATORS**

Paragraph		Page
2-1	General .....	2-1
2-2	Compressor .....	2-2
2-3	Engine Assembly . .....	2-4

2-1. **General.** This section contains information to familiarize the operator and the diver with his equipment.

2-2. Compressor. (Figure 2-1)

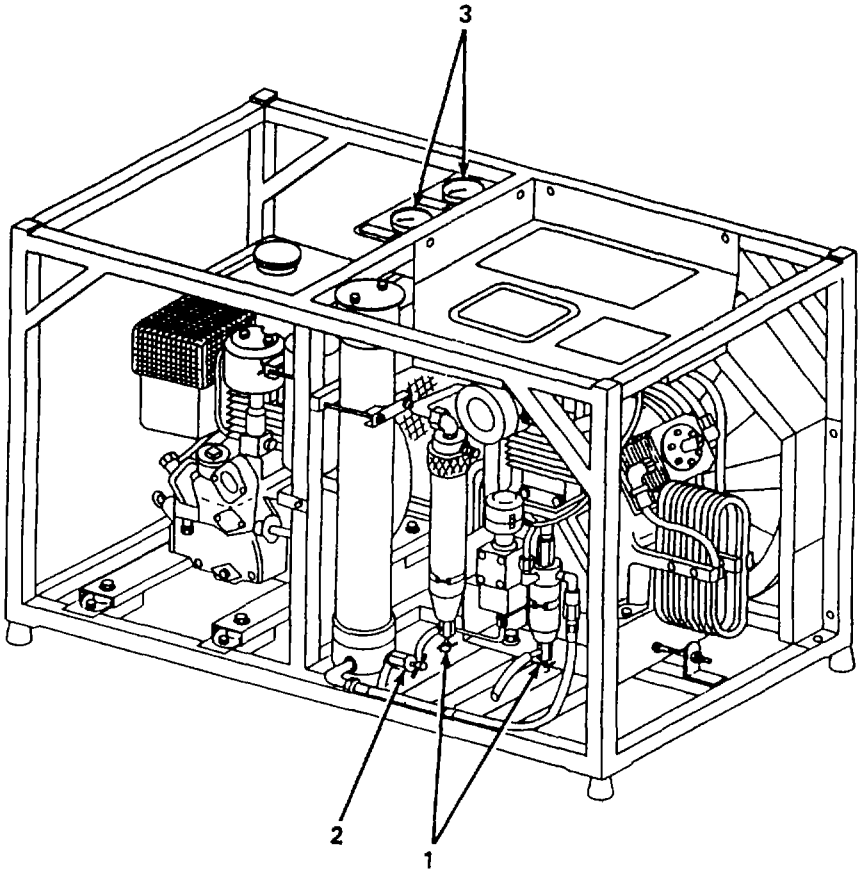


Figure 2-1. Air Compressor Assembly, Controls and Indicators.



Key	Control or Indicator	Function or Use
1	Separator Drain Valves	Used to drain condensation from the separators.
2	Purifier Drain Valve	Used to drain condensation from the purifier.
3	Pressure Gage	Used to monitor output pressure of compressor and supply pressure to manifold block.

2-3. Engine Assembly. (Figure 2-2)

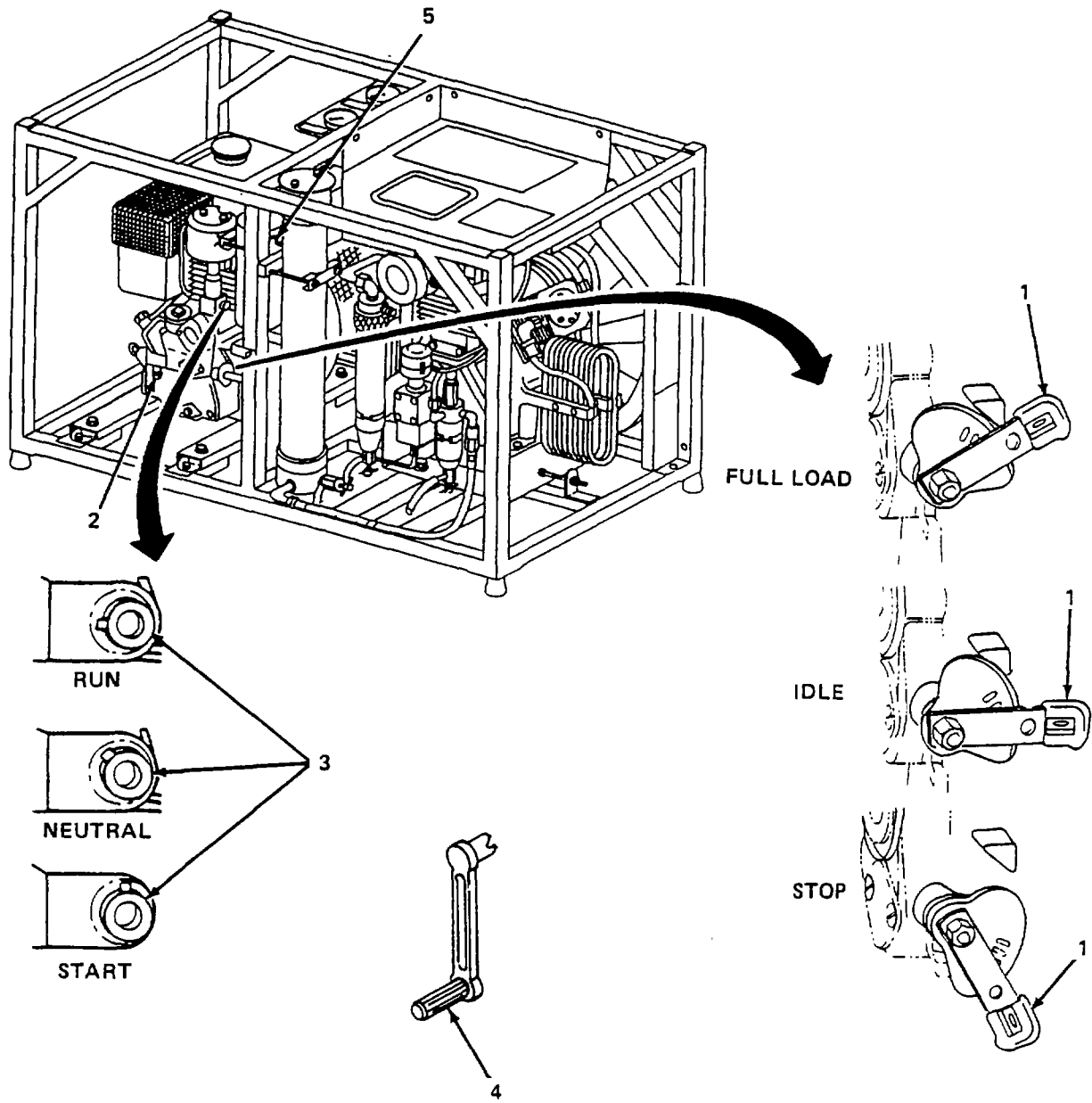


Figure 2-2. Engine Assembly, Controls and Indicators.

Key	Control or Indicator	Function or Use
1	Speed Control Lever	Used to start and stop the engine and to regulate engine speed.
2	Cold Start Primer	Used when starting a cold engine. It supplies extra fuel for the start up cycle.
3	Automatic Compression Release	Used when starting the diesel engine. When set to "START" position it releases the compression in the cylinder and makes cranking the engine easier.
4	Crank Handle	Used to crank start the engine, and to set the automatic compression release.
5	Cold Start System (Optional)	Used when starting the engine in an extreme cold weather area. Provides a fast burning gas to the cylinder to aid in combustion

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

Paragraph		Page
2-4	General .....	2-5
2-5	Purpose of PMCS Table.....	2-6
2-6	Explanation of Columns .....	2-6
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 5.1 CFM air compressor 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 keep 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. Perform your after (A) PMCS after the equipment has been taken out of its mission mode or returned to its containment area.

d. If Equipment Fails to Operate. Perform proper troubleshooting procedures. Report deficiencies on the proper forms as described in DA PAM 738-750, The Army Maintenance Management System.

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. Intervals. This column shows a (.) when each check is to be accomplished.
- c. Item to be Inspected/Procedure. 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 4 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 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).**

**Dry cleaning solvent, PD-680, should not be used to clean any parts which come in contact with the divers' air, i.e., compressor and/or charging whip, failure to follow this warning may result in contaminating the divers' air.**

- 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 Cable 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 you 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.**

**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. Procedure	Equipment is not Ready/Available If			
	B	D	A	W					
1.	•		•		Frame Assembly.	Frame is cracked or has broken welds.			
					•		•	•	a. Inspect frame assembly for loose bolts and missing hardware. b. Inspect frame, belt guard, and storage tray for damage.
2.	•		•		Compressor Assembly.	Drain valves are broken or inoperable.  Pressure gages are damaged, inoperable or not calibrated.  <b>NOTE</b>  To obtain proper oil level reading, the dipstick must be screwed back in, then removed and oil level checked.  Oil level is below add oil mark.			
					•		•	•	a. Inspect compressor assembly for damaged or missing components. b. Inspect drain valves for damage and proper operation.
					•		•	•	c. Inspect pressure gages for damage and current calibration.
					•		•	•	d. Check oil level in compressor. Add oil if necessary.
							•		e. Open drain valves every 15 minutes and drain condensation.

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

Item No.	Interval				Item to be Inspected. Procedure	Equipment is not Ready/Available If
	B	D	A	W		
3.	●		●		f. Check all lines and fittings for tightness, cracks, deterioration, and wear at points subject to vibration.	Lines are deteriorated, cracked or otherwise damaged.
				●	g. Check drive belts for wear and adjustment. Notify unit maintenance if wear or out of adjustment is present.	
				●	h. Check inlet air filter. Notify unit maintenance to service inlet air filter after 20 hours of operation.	
	●	●	●		i. Inspect inlet air filter hose for cracks.	Air inlet hose is cracked or otherwise damaged.
	●		●		j. Inspect intercooler coils for damage, loose connectors and excessive dirt. Clean coils of dirt as needed.	Intercooler coils are loose or damaged.
	●				k. Inspect filler hose for current pressure test.	Filler hose pressure test out of date.
	●				l. Check compressor for date of last test in accordance with TB 43-0151.	Compressor test date is out of date.
					Engine Assembly.	
	●		●		a. Check engine assembly for damaged or missing components.	
	●		●		b. Check engine oil level and add oil as needed.	Oil level is below add oil mark.
	●		●		c. Check air cleaner oil level and add oil as needed.	
	●	●	●		d. Check fuel lines for leaks or damage.	Class I or greater fuel leak is present.
	●		●		e. Check fuel tank and replenish with clean diesel fuel if low.	

**Section III. OPERATION UNDER USUAL CONDITIONS**

Paragraph		Page
2-10	General .....	2-10
2-11	Set Up and Preparation for Use .....	2-10
2-12	Operating Procedures .....	2-10

2-10. **General.** This section contains procedures for placing the air compressor into operation and for servicing SCUBA cylinders.

**2-11. Set Up and Preparations for Use.**

- a. Test ambient air for carbon monoxide and carbon dioxide contamination in accordance with FM 20-11-1 for air purity standards.
- b. Make certain that no exhaust from running vehicle engines are in the vicinity of the unit.
- c. Position compressor unit so that exhaust fumes from the engine are blown away from the unit.
- d. Connect plastic hose of pre-filter (1) to the compressor air intake filter (2) and locate pre-filter (3) on ground upwind from compressor exhaust (figure 2-3).
- e. Reposition unit accordingly as the wind changes direction.

**2-12. Operating Procedures.** (Refer to warnings and cautions, para 1-11).

a. Prior to Start Up.

- (1) Perform your before operations (B) preventive maintenance checks and services (PMCS table 2-1).

**WARNING**

**Diesel fuel is highly flammable. Do not store or use diesel fuel near open flame or extreme heat emitting devices such as heaters, welders torches, lanterns, etc. Use diesel fuel only in a well ventilated area. Do not fill tank with engine running.**

- (2) Fill the engine fuel tank with clean, fresh diesel fuel, type #2, or 2D. Do not mix oil with diesel fuel. Do not use gasoline fuel additives or other starting fluids in fuel tank. Do not overfill or spill. If fuel is spilled, wipe up immediately.



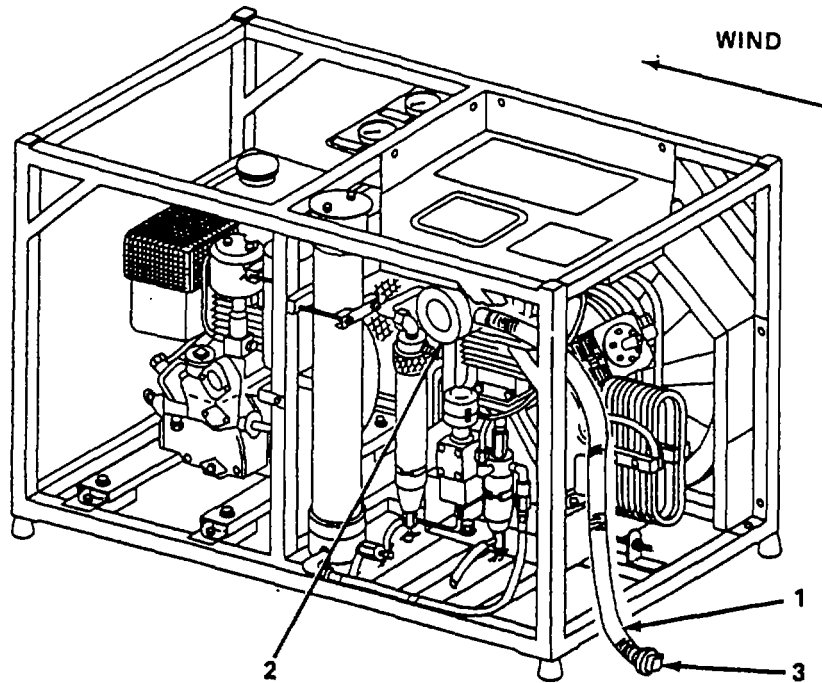


Figure 2-3. Compressor Orientation.

b. Start Up. (figure 2-4)

- (1) Open separator drain valves (1) and (2).
- (2) Connect an air tank charging whip assembly (3) and close fill valve (4).
- (3) Move speed control lever (5) to FAST position.
- (4) Pull cold start primer (6).
- (5) Use hand crank (7) to rotate automatic compression release (8) clockwise two positions to the START position.

**WARNING**

**Hand and thumb must be positioned as shown in figure 2-5 to prevent injury if kickback should occur.**

- (6) Insert hand crank (7) into starter crank guide (9). Rotate hand crank (7) slightly clockwise to engage. After engaging, rotate counterclockwise to start engine.
- (7) Rapidly crank engine. After about eight (8) revolutions of the crank, compression will be felt and the engine should start.

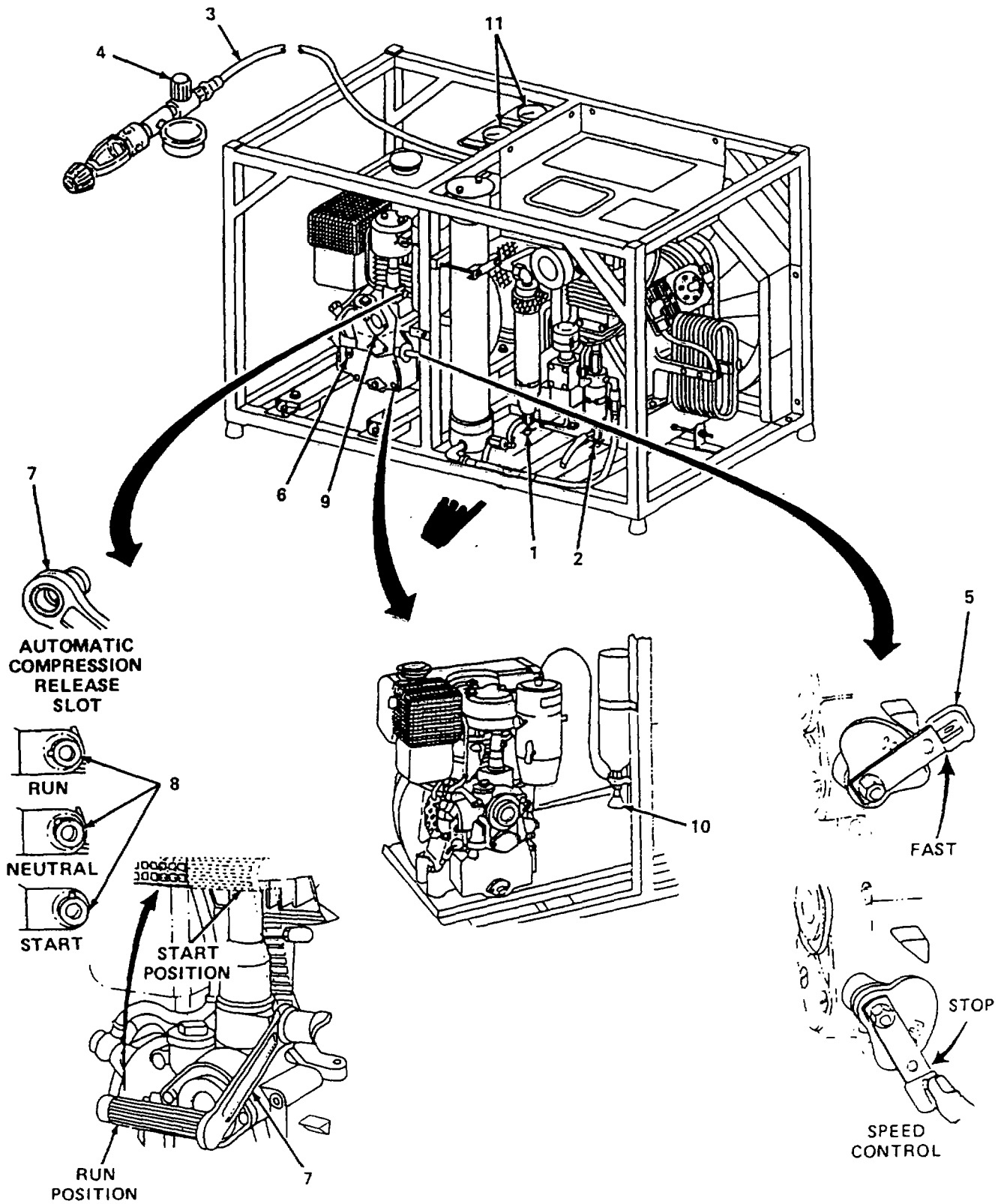


Figure 2-4. Starting Procedures

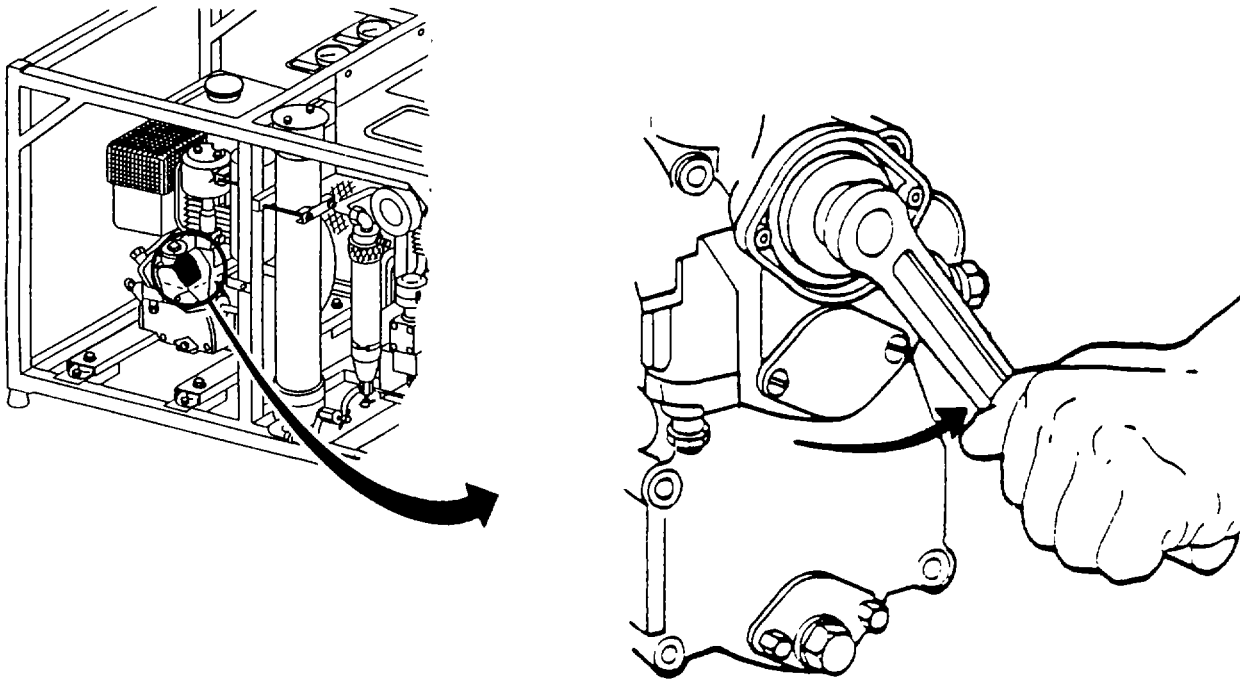


Figure 2-5. Hand Position.

**WARNING**

**Always keep hands, feet and clothing clear of moving parts of other rotating machinery.**

- (8) If engine fails to start, repeat steps (4), (5), (6) and (7) above.
- (9) For cold weather starting, prior to step (4) above, rotate the automatic compression release (8) clockwise one position to the NEUTRAL position. Engage the hand crank (7) and turn the engine a minimum of thirty (30) turns of the crank. Then continue the normal starting sequence of steps (4), (5), (6) and (7) noting the following: The compressor release mechanisms should only be moved one position clockwise at this point.

**NOTE**

**If compressor unit is equipped with cold start primer system, activate primer system by pushing knob (10) prior to step (7) above.**

**For operation below 32°F (0°C), diesel fuel marked #1 or #1 D will provide easier starting. Do not use #1 or #1 D diesel fuel at temperature higher than 32°F (0°C).**

- (10) After the engine starts, remove and store the hand crank (7).

- (11) After the engine speed stabilizes at about 3200 RPM, close separator drain valves (1) and (2). Air pressure will then begin to rise in each compressor stage.

#### NOTE

**During initial start-up, a knocking sound will be generated by the floating piston in the third stage. This knocking sound will continue for several seconds until the air pressure in the third stage is high enough to hold the floating piston against the third stage guide piston. This knocking sound is completely normal and is not a cause for alarm.**

- (12) Check for final stage safety operating by listening for air discharging from the safety valve. Also note blow off pressure on pressure gauges (11).

c. Servicing SCUBA Cylinders. (figure 2-6)

- (1) Review warning page as instructed in para. 1-11.
- (2) Refer to FM 20-11-1 and check air purity standards.
- (3) Start the air compressor (para. a.).

#### WARNING

**SCUBA cylinders with valves that have been left open must not be charged without first being properly purged to avoid contamination.**

- (3) Check that the SCUBA cylinder shutoff valve (1) is closed prior to servicing.
- (4) Remove the charging whip (2) from the compressor and remove the dust cap from the filler adapter (3).
- (5) Orient the filler adapter (3) on the SCUBA cylinder manifold (4) and screw down the handle-screw (5) sufficiently to create a seal.
- (6) Open the filling valve (6).
- (7) Place the reserve valve knob (7) in the down position and open the SCUBA tank shutoff valve (1).

#### NOTE

**During the filling procedure the SCUBA cylinders will warm up and then cool down after being detached from the compressor. The cylinders will then need topping-off to the required nominal filling pressure. However, this tedious procedure can be avoided by using a water tank for submerging the SCUBA cylinders while filling them.**

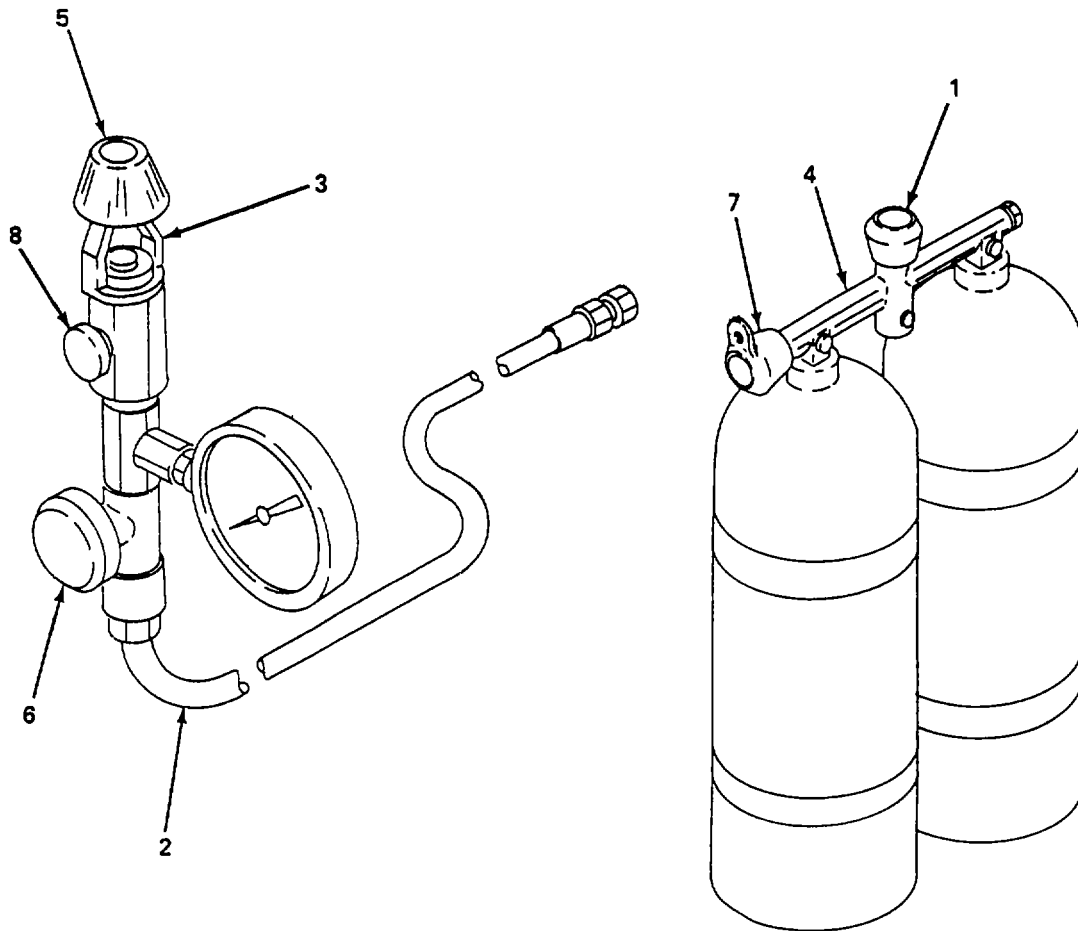


Figure 2-6. Servicing SCUBA cylinders.

(8) Charge the SCUBA cylinders to the proper pressure (table 2-2).

**NOTE**

**Monitor the unit at all times during the filling procedure.**

(9) Close the SCUBA tank shutoff valve (1) and filling valve (6).

**Table 2-2. SCUBA Cylinder Charging Capacities.**

Open-Circuit Cylinder Description	Rated Working Pressure (psig)	Internal Volume (cu ft)	Air Capacity at Rated Pressure (cu ft)	Reserve Pressure <sup>2</sup> (psig)	Outside Dimensions inches	
					(dia.)	(length)
Steel 72	2250	0.422	65.0	500	6.80	25.00
Aluminum 50	3000	0.281	48.5	500	6.8	19.00
Aluminum 63	3000	0.319	65.5	500	7.2	21.75
Aluminum 80	3000	0.392	80.4	500	7.2	26.00
Aluminum 90	3000	0.398	81.6	500	7.7	26.50
Aluminum 92	3200	0.434	95.0	500	8.0	24.75
Aluminum 100	3300	0.467	105.3	500	8.0	26.20

<sup>1</sup> Numerals refer to approximate air capacity in cubic feet at rated working pressure. Fifty cubic feet is the minimum size SCUBA cylinder authorized.

<sup>2</sup> Single cylinder equivalent. Acceptable reserve actuation pressure ranges are:

- a. Single cylinder minimum of 450 psig.
- b. Double cylinder minimum of 225 psig.

#### NOTE

**Before use, the reserve valve knob should be in the up position.**

(10) Open the vent valve (8) to relieve pressure.

(11) Loosen screw handle (5) and remove filler adapter (3).

(12) If more cylinders are to be refilled, repeat steps 3 through 11.

(13) Install duct cap in filler adapter (3) and tighten.

(14) Shut down compressor (para. d.).

d. Compressor Shutdown Procedures. (figure 2-7)

(1) Push the speed control lever (1) down to IDLE position.

(2) Vent the unit, by means of the bleed valve (2) on the filler adapter (3), until the pressure is reduced to approximately 700 PSI. Close bleed valve (2).

- (3) Push the speed control lever (1) down to STOP position and hold lever down until engine stops.
- (4) After engine has completely stopped, move speed control lever (1) to fast position.
- (5) Release condensate and depressurize unit by means of condensate drain valves (4).
- (6) Close drain valves (4).
- (7) Pull cold start primer (5).
- (8) Perform after operation PMCS (table 2-1).

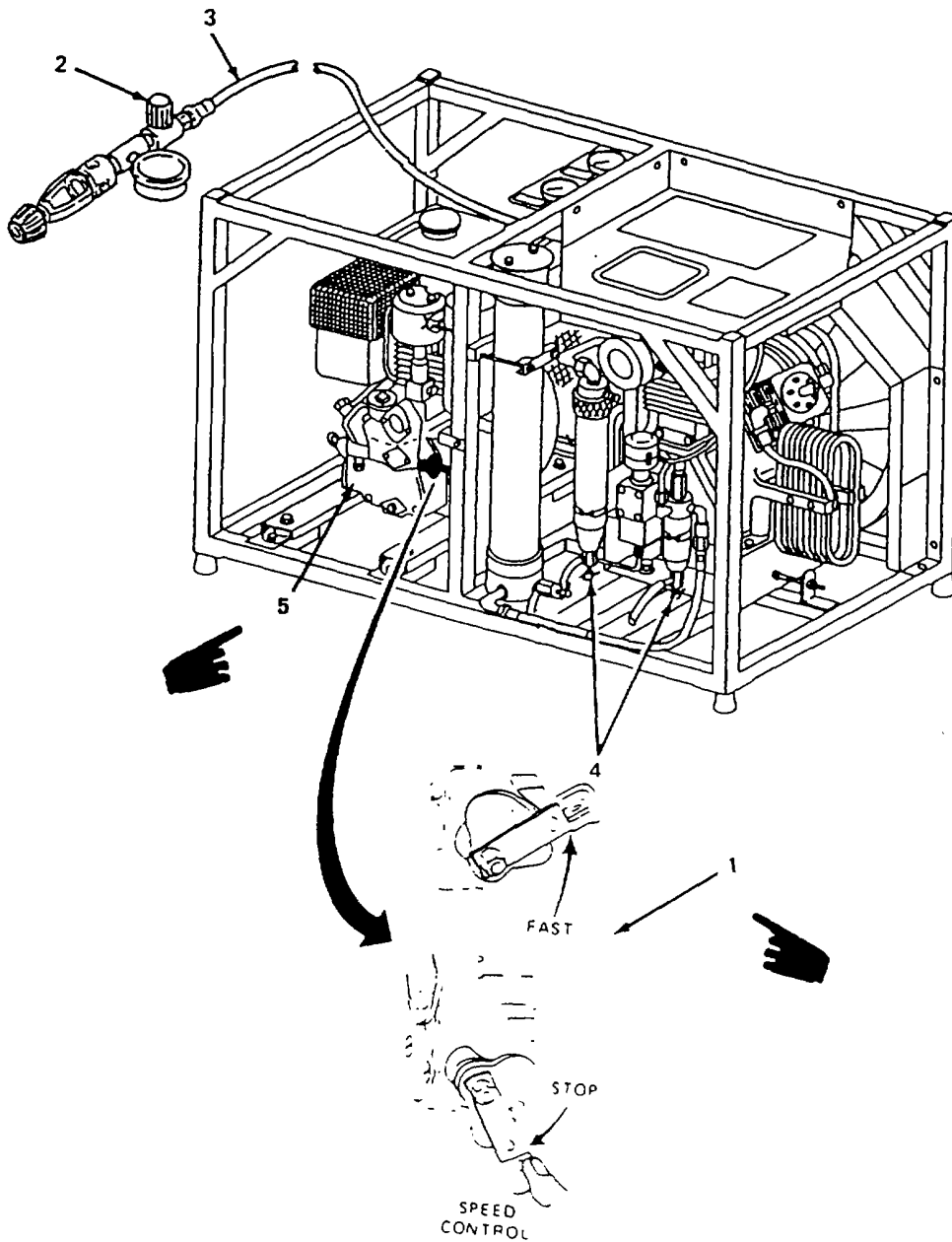


Figure 2-7. Shutdown Procedures.

## Section IV. OPERATION UNDER UNUSUAL CONDITIONS

Paragraph		Page
2-13	General .....	2-18
2-14	Operation in Dusty or Sandy Areas .....	2-18
2-15	Operation in Rainy, Humid or Salt Air Conditions .....	2-18
2-16	Operation in Extreme Heat .....	2-18
2-17	Operation in Different Altitudes .....	2-19
2-18	Operation In Extreme Cold .....	2-19

2-13. **General.** This section contains special operating procedures and precautions that should be used when operating the equipment in unusual weather conditions.

2-14. **Operation in Dusty or Sandy Areas.** The procedures for operating the Diving Air Compressor are the same as under usual conditions including the following special instructions.

- a. Protect the equipment from dust and sand. Take advantage of all natural barriers which could protect the equipment from blowing dust or sand. Install a canvas cover when the unit is not in operation.
- b. Keep fuel clean. Strain the fuel before adding it to the tank. Make sure fuel storage and transfer cans are clean.
- c. Check and service the engine and compressor air cleaners often.
- d. Clean the engine, compressor and compressor cooling fan often. Wipe with clean cloth dampened with an approved cleaning solvent.

2-15. **Operation in Rainy, Humid, or Salt Air Conditions .** The procedures for operating the Diving Air Compressor are the same as under usual conditions including the following special instructions.

- a. Store equipment in a sheltered area when it is not in use.
- b. Keep fuel clean and free of water. Keep fuel tank full when the unit is not in use to minimize condensation.
- c. Whenever possible protect the equipment from direct rain fall when it is operating. Cover the equipment with a tarpaulin suspended about 3 feet above the equipment.
- d. Avoid direct contact with salt water. If salt water does come in contact with the equipment, rinse the equipment with clean fresh water.
- e. 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.

2-16. **Operation in Extreme Heat.** The procedures for operating the Diving Air Compressor are the same as under usual conditions including the following special instructions.

- a. Do not operate the equipment if the ambient temperature exceeds 125°F (50°C).



- b. When possible, provide shade to protect the equipment from direct sunlight.
- c. A slight power loss will be experienced as temperature increases.

2-17. **Operation in Different Altitudes**. The procedures for operating the Diving Air Compressor are the same as under usual conditions including the following special instructions.

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

2-18. **Operation In Cold.**

- a. Keep fuel tank full to minimize moisture.
- b. Check hoses and lines for cracks or other cold weather damage.
- c. Service engine with oil conforming to MIL-L-46167, Grade Arctic.
- d. Service compressor with oil conforming to MIL-H-17672, MIL SYM 2135-TH (below 20°F (-7°C)).
- e. When cranking over engine, activate the valve lever on starting aid for two seconds.

**CHAPTER 3  
OPERATOR MAINTENANCE INSTRUCTIONS**

OVERVIEW .....	3-1
Section I. Lubrication Instructions .....	3-1
Section II. Operator Troubleshooting Procedures .....	3-2

**OVERVIEW**

This chapter contains operator maintenance instructions for the air compressor.

**Section I. LUBRICATION INSTRUCTIONS**

Paragraph		Page
3-1	General.....	3-1
3-2	Lubrication Procedures.....	3-1

3-1. **General.** This section contains lubrication procedures for the air compressor.

3-2. **Lubrication Procedures.** Lubrication of the air compressor is limited to oiling the pivot points on the engine controls. Keep all lubricants in sealed containers. Wipe away dirt and debris from the area being lubricated and wipe away excess lubricants. Refer to table 3-1 for engine and compressor oil requirements.

**Table 3-1. Engine and Oil Requirements.**

Temperature Range	Oil Viscosity
Engine	
70-120°F (21.9-48.8°C)	SAE 30W
30-70°F (-1.1-21.9°C)	SAE 20W
Below 30°F (Below -1.1°C)	SAE 10W
Compressor	
50-120°F (10-48.8°C)	SAE 30
5-50°F (-15-10°C)	SAE 20
Below 5°F (-15°C)	SAE 5W

**Section II. OPERATOR TROUBLESHOOTING PROCEDURES**

Paragraph		Page
3-3	General .....	3-2
3-4	Operator Troubleshooting Procedures .....	3-2

3-3. **General.** This section contains troubleshooting procedures to determine the probable cause of observed malfunctions. Tests or Inspections are provided to isolate the faulty component and corrective actions are provided to eliminate the malfunction.

3-4. **Operator Troubleshooting Procedures.** Refer to the symptom index to locate the troubleshooting procedure for the observed malfunction. The table lists the common malfunctions that may occur during the operation or maintenance of the compressor. 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. If the malfunction is not corrected by the listed corrective actions, notify your supervisor or unit maintenance.

a. Table 3-2 lists the common malfunctions which you may encounter during operation of the equipment.

b. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions, notify your supervisor if the corrective actions do not correct the malfunction.

**SYMPTOM INDEX**

Symptom		Page
1.	Engine does not start .....	3-3
2.	Engine starts then stops .....	3-3
3.	Engine stalls when warm .....	3-3
4.	Engine runs unevenly/low output .....	3-3
5.	Engine exhaust excessively black .....	3-4
6.	Engine exhaust excessively blue .....	3-4
7.	Engine runs excessively hot .....	3-4
8.	Excessive oil consumption .....	3-4
9.	Engine excessively noisy .....	3-5
10.	Compressor noisy .....	3-5
11.	Compressor runs excessively hot .....	3-5
12.	Compressor output too low .....	3-6
13.	Compressor vibrates .....	3-6
14.	Abnormal drivebelt wear .....	3-6

Table 3-2. Operator Troubleshooting Procedures.

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

**1. ENGINE DOES NOT START.**

Step 1. Check fuel level.

Add fuel if needed.

Step 2. Check speed control lever.

Set speed control lever to start position.

Step 3. Check engine primer button.

Engage engine primer button.

**2. ENGINE STARTS THEN STOPS.**

Step 1. Check engine primer button.

Pull down button.

Step 2. Check for load.

Remove load.

**3. ENGINE STALLS WHEN WARM.**

Check ambient temperature.

Move compressor to cooler area.

**4. ENGINE RUNS UNEVENLY/LOW OUTPUT.**

Step 1. Check fuel tank.

Add fuel if low.

Step 2. Check quality of fuel.

Replace if fuel is contaminated.

Table 3-2. Operator Troubleshooting Procedures (Cont).

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

**5. ENGINE EXHAUST EXCESSIVELY BLACK.**

Step 1. Check load.

Lighten load if too high.

Step 2. Check primer button.

Disengage primer button.

Step 3. Check engine speed

Raise engine speed if too low.

Step 4. Check oil level.

Notify unit maintenance if engine oil is too high.

**6. ENGINE EXHAUST EXCESSIVELY BLUE.**

Check compressor inclination.

Move compressor to level ground.

**7. ENGINE RUNS EXCESSIVELY HOT.**

Step 1. Check cooling baffles.

Notify unit maintenance if baffles are damaged or missing.

Step 2. Check oil level.

Add oil if low.

**8. EXCESSIVE OIL CONSUMPTION.**

Step 1. Check engine for leaks.

Notify unit maintenance of any leaks.

Step 2. Check oil grade.

Replace oil if wrong grade.

Table 3-2. Operator Troubleshooting Procedures (Cont).

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

**9. ENGINE EXCESSIVELY NOISY.**

Step 1. Check mounting hardware.

Tighten loose hardware.

Step 2. Check load.

Reduce load if too high.

Step 3. Check engine oil.

Add oil if low.

**10. COMPRESSOR NOISY.**

Step 1. Check oil level.

Add oil if low.

Step 2. Inspect drive belts.

Notify unit maintenance if belts are worn.

Step 3. Check mounting hardware.

Tighten hardware if loose.

**11. COMPRESSOR RUNS EXCESSIVELY HOT.**

Step 1. Check ambient temperature.

Move compressor to cooler area.

Step 2. Check cooling fan and fins.

Move obstructions from around fan and clean fins.

Step 3. Check intercooler.

Clean off fins or intercooler.

Table 3-2. Operator Troubleshooting Procedures (Cont).

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
<b>11. ENGINE RUNS EXCESSIVELY HOT (Cont).</b>		
	Step 4. Check aftercooler.	Clean off fins on aftercooler.
	Step 5. Check drive belt tension.	Adjust belt tension.
<b>12. COMPRESSOR OUTPUT TOO LOW.</b>		
	Step 1. Check drain valve.	Close valve.
	Step 2. Check air line fittings.	Tighten loose fittings.
	Step 3. Check engine speed.	Raise speed if too low.
	Step 4. Check drivebelt tension.	Adjust belt tension.
<b>13. COMPRESSOR VIBRATES.</b>		
	Check mounting hardware.	Tighten loose hardware.
<b>14. ABNORMAL DRIVEBELT WEAR.</b>		
	Step 1. Check drive belt tension.	Adjust drivebelt tension.
	Step 2. Inspect belts for oil or grease.	Clean off belts.
	Step 3. Check pulley alinement.	Notify your supervisor if pulleys are out of alinement.

**CHAPTER 4  
UNIT MAINTENANCE INSTRUCTIONS**

OVERVIEW .....	4-1
Section I. Repair Parts; Special Tools; Test Measurement, and Diagnostic Equipment (TMDE); and Support Equipment .....	4-1
Section II. Service Upon Receipt .....	4-1
Section III. Unit Preventive Maintenance Checks and Services (PMCS) .....	4-3
Section IV. Unit Troubleshooting Procedures.....	4-4
Section V. Unit Maintenance Procedures .....	4-9
Section VI. Unit Level Cleaning Procedures for Diving Life Support Air Systems.....	4-78
Section VII. Preparation for Shipment or Storage .....	4-87

**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** . Special tools are listed in Appendix B Maintenance Allocation Chart (MAC), of this manual.

4-3. **Repair Parts**. Repair parts are listed and illustrated in the Repair Parts and Special Tools List TM 5-4310-387-24P covering Unit, Direct Support, and General Support Maintenance for the 5.1 CFM Air Compressor Assembly.

**Section II. SERVICE UPON RECEIPT**

Paragraph		Page
4-4	General .....	4-2
4-5	Checking Unpacked Equipment .....	4-2
4-6	Location of Equipment .....	4-2
4-7	Preliminary Servicing and Adjustment of Equipment .....	4-2



4-4. **General.** This section contains service upon receipt instructions. All information required to inspect, service, and adjust the equipment and ready it for operation.

4-5. **Checking Unpacked Equipment.**

- a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6, Packaging Improvement Report.
- b. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA PAM 738-750.
- c. Check to see whether the equipment has been modified.

4-6. **Location of Equipment.** To avoid contaminants that are sometimes found in free air, it is essential that the air compressor intake is not exposed to the contaminating effects of internal combustion engine exhaust, ship engine or ventilator exhaust, unventilated rooms or ships compartments, areas of high dust levels, or areas where excessive moisture is present. It is also not advisable to fill SCUBA cylinders when an air pollution alert is in effect. The method of avoiding contamination is given below.

**WARNING**

**The location of the compressor intake with respect to possible sources of contamination is fully as important as any single factor in assuring satisfactory air quality. The compressor should not be operated near exhausts of internal combustion engines, sewer manholes, sandblasting, painting, electric arcs, or sources of smoke.**

- a. The compressor is diesel engine powered, and must be located outdoors, never indoors
- b. Place compressor on level surface. Refer para. 1-10 for permissible inclination.

4-7. **Preliminary Servicing and Adjustment of Equipment.** The air compressor is shipped fully assembled with two exceptions, the drive belt is loosened and the purifier cartridge has not been installed. To prepare the equipment for use, carefully unpack all components and perform the following inspections and servicing.

- a. Remove all dust caps and plugs.
- b. Drain oil from compressor crankcase. Refill with proper lubricating oil (para. 4-16).
- c. Drain preservative from engine crankcase. Refill with proper lubricating oil (para. 4-23).
- d. Fill engine fuel tank with diesel fuel.
- e. Drain preservative from engine inlet air cleaner. Fill with proper lubricating oil.
- f. Notify direct support maintenance and have purifier assembly cartridge installed.
- g. Install and adjust drive belts (para. 4-14).
- h. Operate compressor five minutes with filling valve open.

- i. Check return oil flow and vent the oil pump if necessary.
- j. Close filling valve after five minutes of operation and run compressor until final pressure is achieved, as indicated by the final safety valve blowing off.
- k. Check air tightness of complete unit by brushing all fittings and couplings with soapy water to detect escaping air, i.e., bubbles. Tighten all connections and couplings at leaks and recheck.
- l. Shut off compressor and open all three condensate drain valves. Close drain valves. Air compressor is now ready for operation.

**Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)**

Paragraph	Page
4-8 General .....	4-3
4-9 PMCS Procedures .....	4-3

4-8. **General.** Unit level maintenance PMCS are done to ensure that the Diving Air Compressor is in top operating condition. A comprehensive PMCS program reduces equipment downtime and increases the operational readiness of the equipment.

4-9. **PMCS Procedures.** Unit level PMCS are table 4-1. The numbers in the Item No. column show the order in which the checks or services should be performed. These numbers should be used when recording deficiencies and shortcomings on DA Form 2404, Equipment Inspection and Maintenance Worksheet. The dot (•) in the interval column indicates when a check or service should be performed.

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

Item No.	Interval				Item to be Inspected.	Procedures
	W - Weekly	M - Monthly	H - Hourly	A - Annually		
1.	●	150	250 80	● ●	Compressor Assembly	1. Change compressor oil (para. 4-16). 2. Replace inlet air filter assembly (para. 4-17). 3. Inspect all air lines and fittings for damage, wear, or deterioration. Use a soapy water solution to check for air leaks. Notify direct support maintenance if leaks are found. 4. Clean intercooler and aftercooler coils.

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

W - Weekly

M - Monthly

H - Hourly

A - Annually

Item No.	Interval				Item to be Inspected.	Procedures
	W	M	H	A		
1		● ●		● ●	Compressor Assembly (cont.)	<ol style="list-style-type: none"> <li>5. Check Compressor assembly for loose or missing components. Repair or replace damaged or missing components.</li> <li>6. Service crankcase breather (para. 4-22).</li> <li>7. Have compressor inspected and tested in accordance with TB 43-0151.</li> <li>8. Have gages inspected, and calibrated in accordance with TB 9-4220-216-35.</li> </ol> <p style="text-align: center;"><b>NOTE</b>  <b>Calibrate every 540 days or whenever inaccuracies are noted. Equipment is declined if calibration due date has expired.</b></p> <ol style="list-style-type: none"> <li>9. Have air charging whip inspected and tested in accordance with FM 20-11-1.</li> </ol>
2.		●	100 250 100 300 250	● ● ● ● ●	Engine Assembly	<ol style="list-style-type: none"> <li>1. Check engine for damaged or missing components. Repair or replace damaged or missing components.</li> <li>2. Change engine oil (para. 4-23).</li> <li>3. Check fuel system for leaks.</li> <li>4. Replace fuel filter (para. 4-24).</li> <li>5. Service air cleaner assembly (para 4-26)</li> <li>6. Service filter screen (para. 4-31).</li> <li>7. Notify direct support maintenance to adjust engine valves</li> </ol>

**Section IV. UNIT TROUBLESHOOTING PROCEDURES**

Paragraph		Page
4-10	General .....	4-5
4-11	Unit Troubleshooting Procedures.....	4-5

4-10. **General.** This section contains troubleshooting and corrective action procedures authorized at the unit maintenance level.

4-11. **Unit Troubleshooting Procedures.** Refer to symptom index to locate the troubleshooting procedure for the observed malfunction. Table 4-2 lists malfunctions that may occur during operation or maintenance of the air compressor. Tests, checks, inspections, and corrective actions should be performed in the order listed. If a malfunction beyond the scope of unit maintenance is discovered, refer the malfunction to direct support maintenance.

**NOTE**

**This table is not intended to cover every possible symptom, but is rather a list of the more frequent problems and some of their causes.**

**SYMPTOM INDEX**

Symptom		Page
1.	Engine does not start .....	4-6
2.	Engine starts, then stops .....	4-6
3.	Engine runs unevenly; low output .....	4-6
4.	Engine exhaust emits excessive black smoke .....	4-6
5.	Engine runs hot .....	4-7
6.	Excessive engine oil consumption .....	4-7
7.	Compressor noisy .....	4-7
8.	Compressor runs hot .....	4-7
9.	Compressor output volume too low .....	4-8
10.	Compressor vibrates .....	4-8
11.	Abnormal drivebelt wear .....	4-8

Table 4-2. Unit Troubleshooting Procedures.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
<b>1. ENGINE DOES NOT START.</b>		
	Step 1. Inspect fuel system for clogged filter or lines.	Replace fuel lines (para. 4-24).
	Step 2. Test fuel system for air in fuel lines.	Bleed fuel lines.
	Step 3. Check governor assembly.	Adjust governor assembly (para. 4-29).
<b>2. ENGINE STARTS, THEN STOPS.</b>		
	Check governor adjustment.	Adjust governor (para. 4-29).
<b>3. ENGINE RUNS UNEVENLY; LOW OUTPUT.</b>		
	Step 1. Inspect fuel system for clogged filter.	Replace fuel filter (para. 4-24).
	Step 2. Check governor.	Adjust governor (para. 4-29).
<b>4. ENGINE EXHAUST EMITS EXCESSIVE BLACK SMOKE.</b>		
	Inspect oil level for excessive amount of oil.	Drain off and recheck oil level for correct level.

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

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
<b>5. ENGINE RUNS HOT.</b>		
	Step 1. Inspect cylinder shields and cooling fins for damage.	Clean shields and cooling fins.
	Step 2. Inspect oil level for excessive amount of oil.	Drain off and recheck oil for correct level.
<b>6. EXCESSIVE ENGINE OIL CONSUMPTION.</b>		
	Step 1. Inspect oil for low viscosity.	Replace oil with oil of proper viscosity.
	Step 2. Inspect for oil leaks.	Tighten fittings as needed.
<b>7. COMPRESSOR NOISY.</b>		
	Inspect drive belts for excessive wear.	Replace worn belts (para. 4-14).
<b>8. COMPRESSOR RUNS HOT.</b>		
	Step 1. Inspect for air obstructions around flywheel fan.	Remove obstructions.
	Step 2. Inspect cooling fins for damage and debris.	Remove debris from cooling fins.
	Step 3. Inspect intercooler and aftercooler tube fins for debris.	Remove debris from intercooler and aftercooler tube fins.
	Step 4. Inspect inlet air cleaner for excessive dirt.	Service air cleaner (para. 4-26).

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

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
<b>8. COMPRESSOR RUNS HOT (Cont).</b>		
	Step 5. Inspect drive belt tension.	Adjust drive belt tension (para. 4-14).
<b>9. COMPRESSOR OUTPUT VOLUME TOO LOW.</b>		
	Step 1. Inspect inlet air cleaner for clogged condition.	Service or replace air cleaner element (para. 4-17).
	Step 2. Inspect drivebelt tension.	Adjust or replace drivebelt (para. 4-14).
<b>10. COMPRESSOR VIBRATES.</b>		
	Step 1. Inspect for loose mounting bolts.	Tighten loose bolts.
	Step 2. Inspect drive sheaves for misalignment.	Align drive sheaves and adjust drive belt (para. 4-14).
<b>11. ABNORMAL DRIVEBELT WEAR.</b>		
	Step 1. Inspect drive sheaves (pulleys) for misalignment.	Align drive sheaves (pulleys) (para. 4-14).
	Step 2. Inspect drivebelt for correct tension either too loose or too tight.	Adjust drivebelts (para. 4-14).

**Section V. UNIT MAINTENANCE PROCEDURES**

Paragraph		Page
4-12	General .....	4-9
4-13	Drivebelt Guard .....	4-10
4-14	Compressor Drivebelt .....	4-12
4-15	Storage Tray .....	4-14
4-16	Air Compressor .....	4-16
4-17	Inlet Filter and Adapter Assembly .....	4-18
4-18	Pre-Filter and Hose Assembly .....	4-23
4-19	Oil Filler .....	4-26
4-20	Dipstick .....	4-28
4-21	Drain Tube .....	4-30
4-22	Compressor Crankcase Breather .....	4-32
4-23	Engine Assembly .....	4-36
4-24	Fuel Lines and Filter .....	4-40
4-25	Fuel Tank .....	4-50
4-26	Engine Air Cleaner Assembly .....	4-52
4-27	Engine Muffler .....	4-56
4-28	Engine Valve Cover .....	4-58
4-29	Governor Assembly .....	4-60
4-30	Gear Cover Assembly .....	4-62
4-31	Oil Filter Screen .....	4-66
4-32	Cold Start Assembly .....	4-70
4-33	Frame .....	4-72
4-34	Shock Mounts .....	4-74

4-12. **General.** This section contains unit maintenance instructions on the 5.1 CFM air compressor unit as authorized by the MAC (Appendix B) of this manual.



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**4-13. Drivebelt Guard.**

---

This task covers:        Replace

---

**INITIAL SETUP***Tools*

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

*Equipment Condition*

Compressor unit shutdown (para. 2-12).

*Materials/Parts*

Drivebelt guard

---

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

- (1) Remove seven bolts (1) and washer (2) and remove belt guard (3).
- (2) Install belt guard (3) and secure with seven bolts (1) and washers (2).

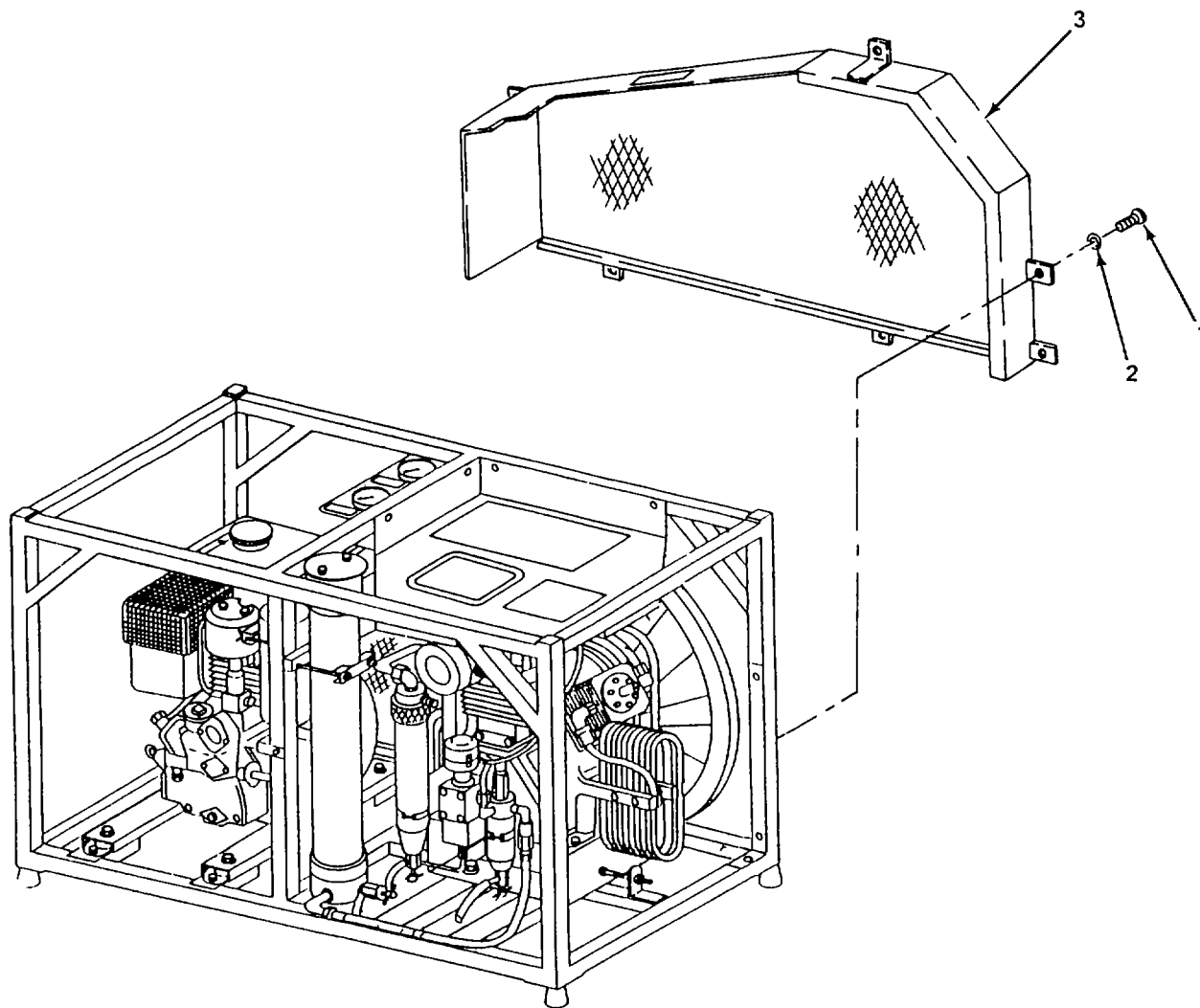


Figure 4-1. Drivebelt Guard, Replace.

---

**4-14. Compressor Drivebelt.**

---

**This task covers:**  
**Replace**

---

**INITIAL SETUP***Tools*

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

*Equipment Condition*

Drivebelt guard removed (para. 4-13).

*Materials/Parts*

Drivebelt

---

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

- (1) Loosen four nuts (1).
- (2) Loosen nut (2) and nut (3).
- (3) Slide compressor (4) toward engine (5) and remove belts (6).
- (4) Install two new belts (6).
- (5) Tighten nut (3) to move compressor (4) away from engine (5) until firm push at a point midway between engine pulley (7) and compressor pulley (8) deflects the belts (6) 0.50-0.75 in. (12.7-19.2 mm).
- (6) Place a straight edge across the face of compressor pulley (8) and engine pulley (7). Ensure the pulleys are parallel to within 1/16 in. (1.58 mm). Adjust position of compressor (4) to obtain the parallel condition.
- (7) Tighten nut (2).
- (8) Tighten four nuts (1).

FOLLOW-ON MAINTENANCE  
Install drivebelt guard (para. 4-13).

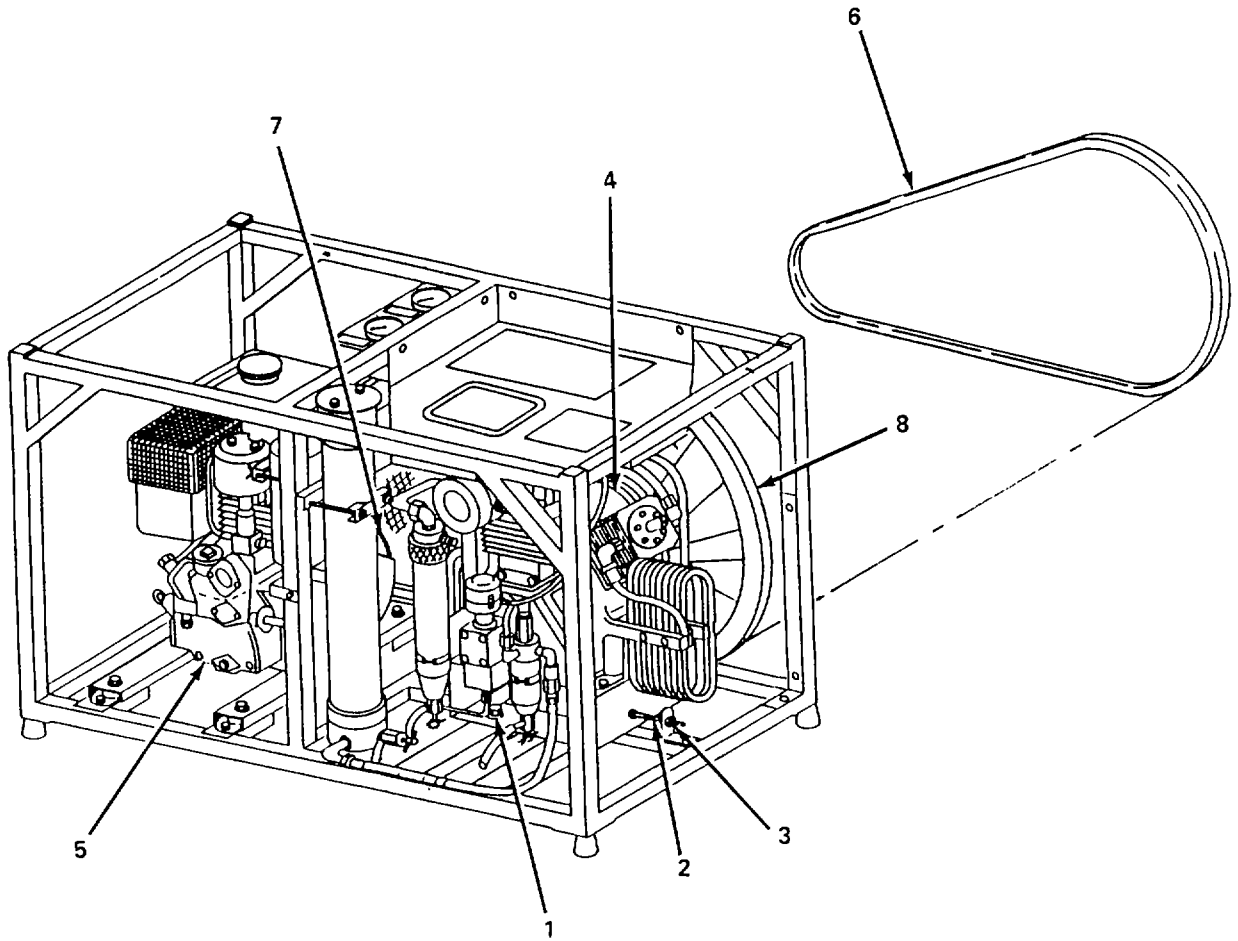


Figure 4-2. Compressor Drivebelt, Replace.

---

**4-15. Storage Tray.**

---

**This task covers:****Replace**

---

**INITIAL SETUP***Tools*

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

*Equipment Condition*

Compressor unit shutdown (para. 2-12).

*Materials/Parts*Storage Tray

---

**Replace.** (figure 4-3)

- (1) Remove six bolts (1) and washers (2), and remove storage tray (3).
- (2) Remove protective edging (4) from storage tray (3).
- (3) Install protective edging (4) on new storage tray (3).
- (4) Install storage tray (3) and secure with six bolts (1) and washers (2).

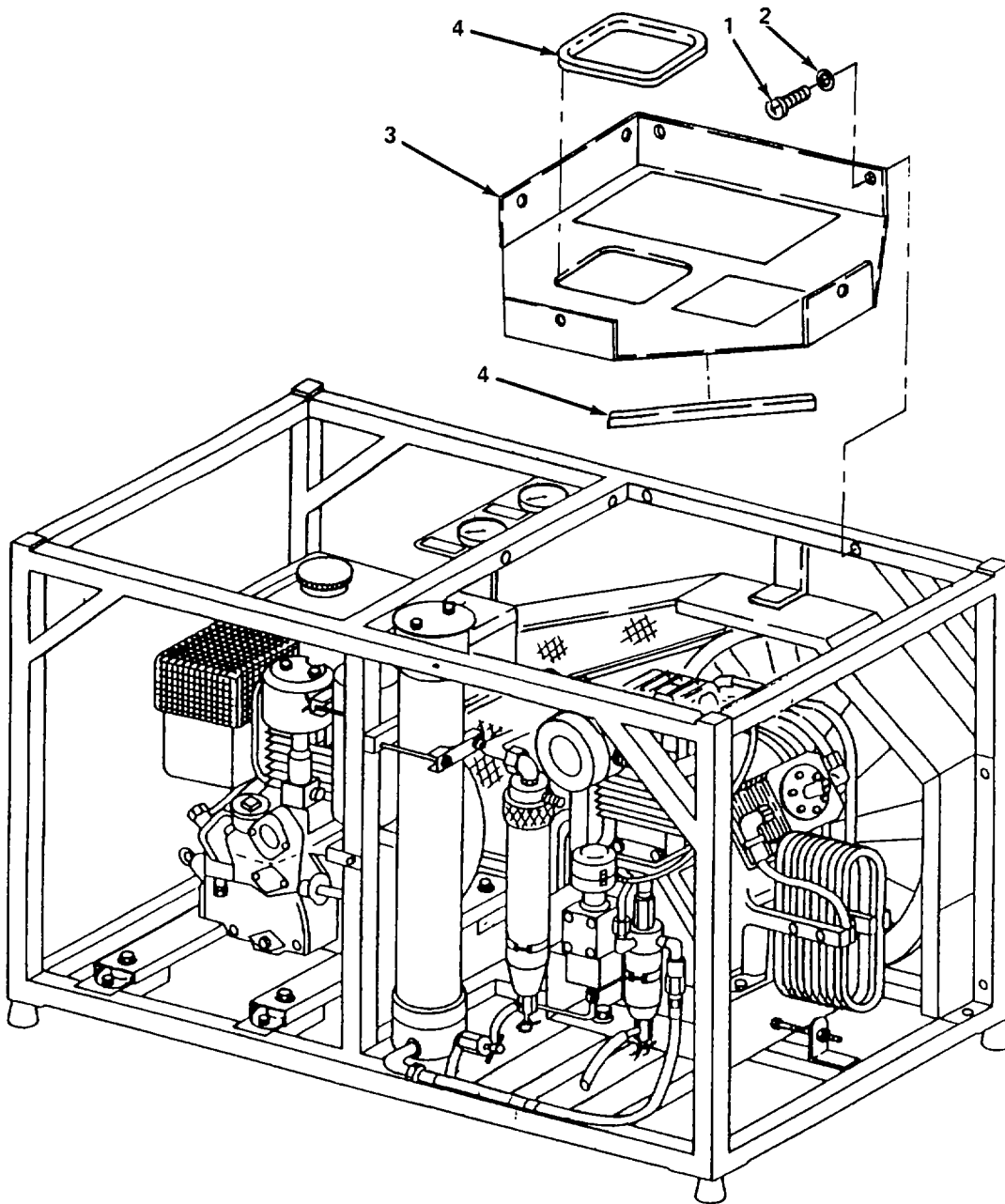


Figure 4-3. Storage Tray, Replace.

---

**4-16. Air Compressor.**

---

**This task covers:****a. Test****b. Service**

---

**INITIAL SETUP***Tools*

General Mechanic's Tool Kit (NSN 5180-00-177-7033)  
Multigas Detector Kit (NSN 6665-00-567-0221)

*Materials/Parts*

Lubricating Oil (Item 17, Appendix E)  
Rags, Wiping (Item 19, Appendix E)  
Preformed Packing

---

**a. Test.**

- (1) Start and operate compressor (para. 2-12).
- (2) Test air output of compressor with detector kit.
- (3) Compare results of test with specifications in FM 20-11-1 Air Purity Standards.
- (4) Shut down air compressor (para. 2-12).

**b. Service.** (figure 4-4)

- (1) Remove drain plug (1) and drain compressor oil into suitable container.
- (2) Install drain plug (1).
- (3) Remove filler tube plug (2) and preformed packing (3).
- (4) Fill compressor (4) with oil until oil level reaches mark on dipstick (5). Refer to table 3-1 for proper grade viscosity of compressor oil.
- (5) Install filler tube plug (2) and preformed packing (3).

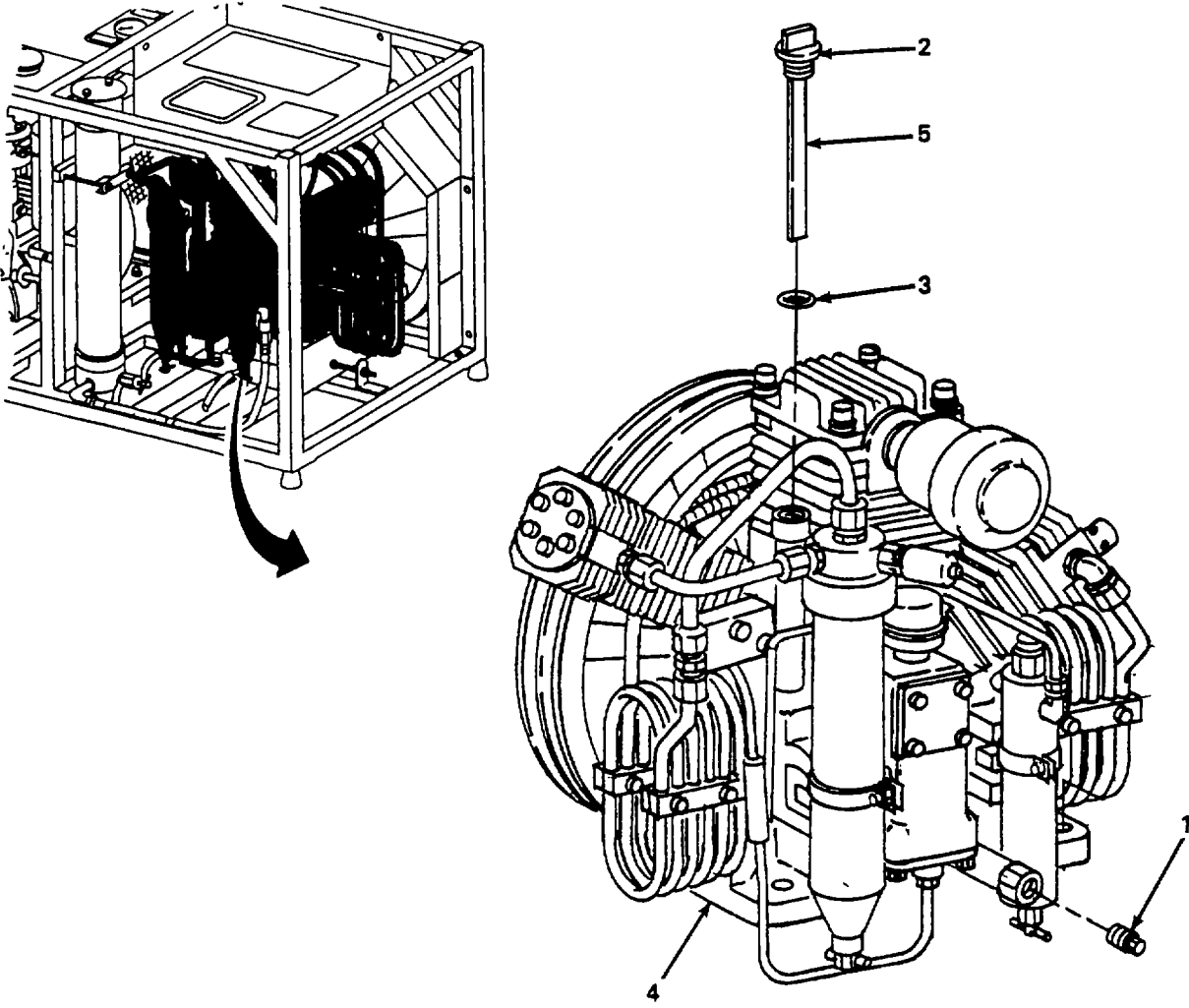


Figure 4-4. Air Compressor Assembly, Service.



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**4-17. Inlet Filter and Adapter Assembly.**


---

This task covers:

**a. Service**

**b. Replace**

**c. Repair**

---

**INITIAL SETUP**

*Tools*

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

*Materials/Parts (Cont)*

Cleaning Solvent (Item 21, Appendix E)  
Preformed Packing

*Materials/Parts*

Inlet Filter Assembly

*Equipment Condition*

Compressor unit shutdown and depressurized  
(para. 2-12).

Adapter Assembly

Cloth, Lint Free (Item 8, Appendix E)

---

a. **Service.** (figure 4-5)

- (1) Remove cover (1), spring (2), preformed packing (3), filter (4), and preformed packing (5). Discard preformed packings (3) and (5).
- (2) Loosen clamp (6) and remove air inlet hose (7).
- (3) Loosen clamp (8) and remove body (9).
- (4) Inspect body (9) and remove all dirt and debris from interior.
- (5) Inspect cover (1) and remove all debris from interior.
- (6) Install body (9) and tighten clamp (8).
- (7) Install air inlet hose (7) and tighten clamp (6).
- (8) Install new preformed packing (5), new filter (4), new preformed packing (3), spring (2), and cover (1).

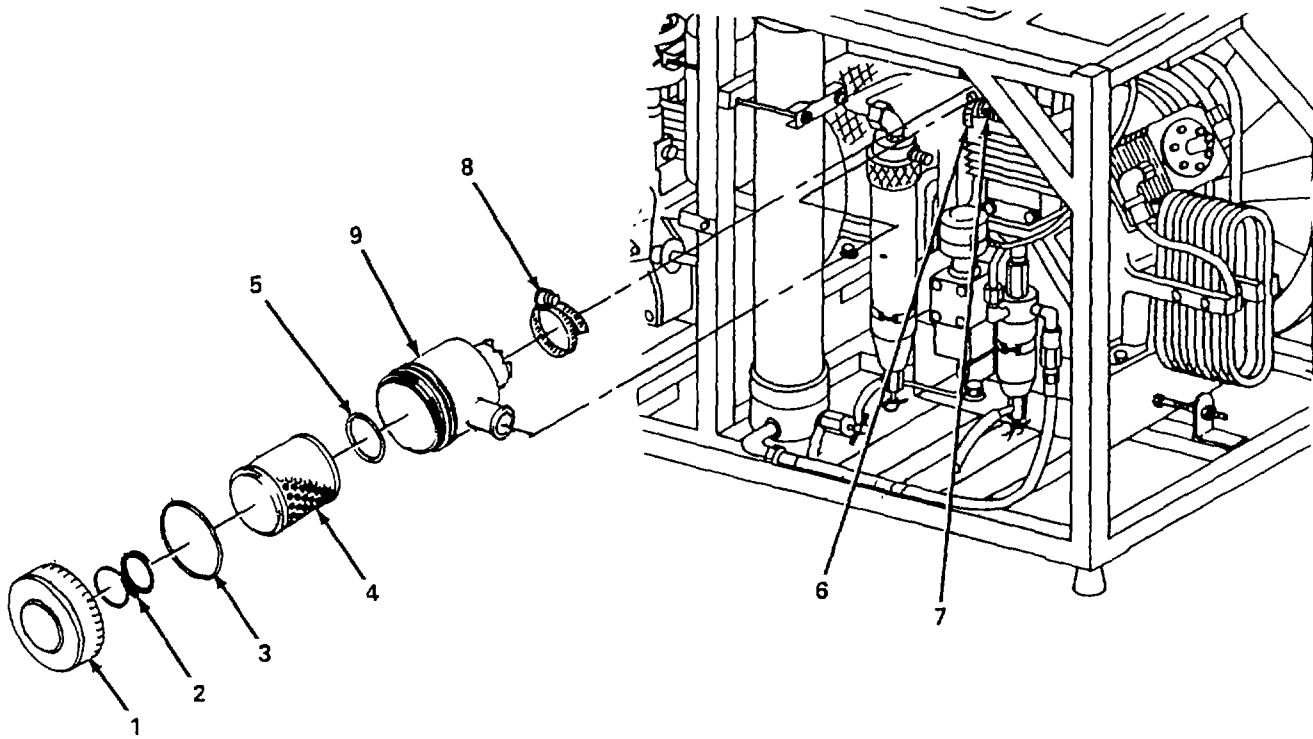


Figure 4-5. Inlet Filter and Adapter Assembly, Service.

**4-17. Inlet Filter and Adapter Assembly (Cont).****b. Replace.** (figure 4-6)

- (1 ) Remove cover (1), spring (2), preformed packing (3), element (4) and preformed packing (5) from filter housing (6). Discard preformed packings (3) and (5).
- (2) Loosen air inlet hose clamp (7) and remove air inlet hose (8) from housing (6).
- (3) Loosen clamp (9) and remove housing (6).
- (4) Remove preformed packing (10) and discard.
- (5) Remove adapter (11) and fiber washer (12).
- (6) Install new fiber washer (12) and adapter (11).
- (7) Install new preformed packing (10).
- (8) Install housing (6) and tighten clamp (9).
- (9) Install air inlet hose (8) and tighten clamp (7).
- (10) Install new preformed packing (5), element (4), new preformed packing (3), spring (2), and cover (1).

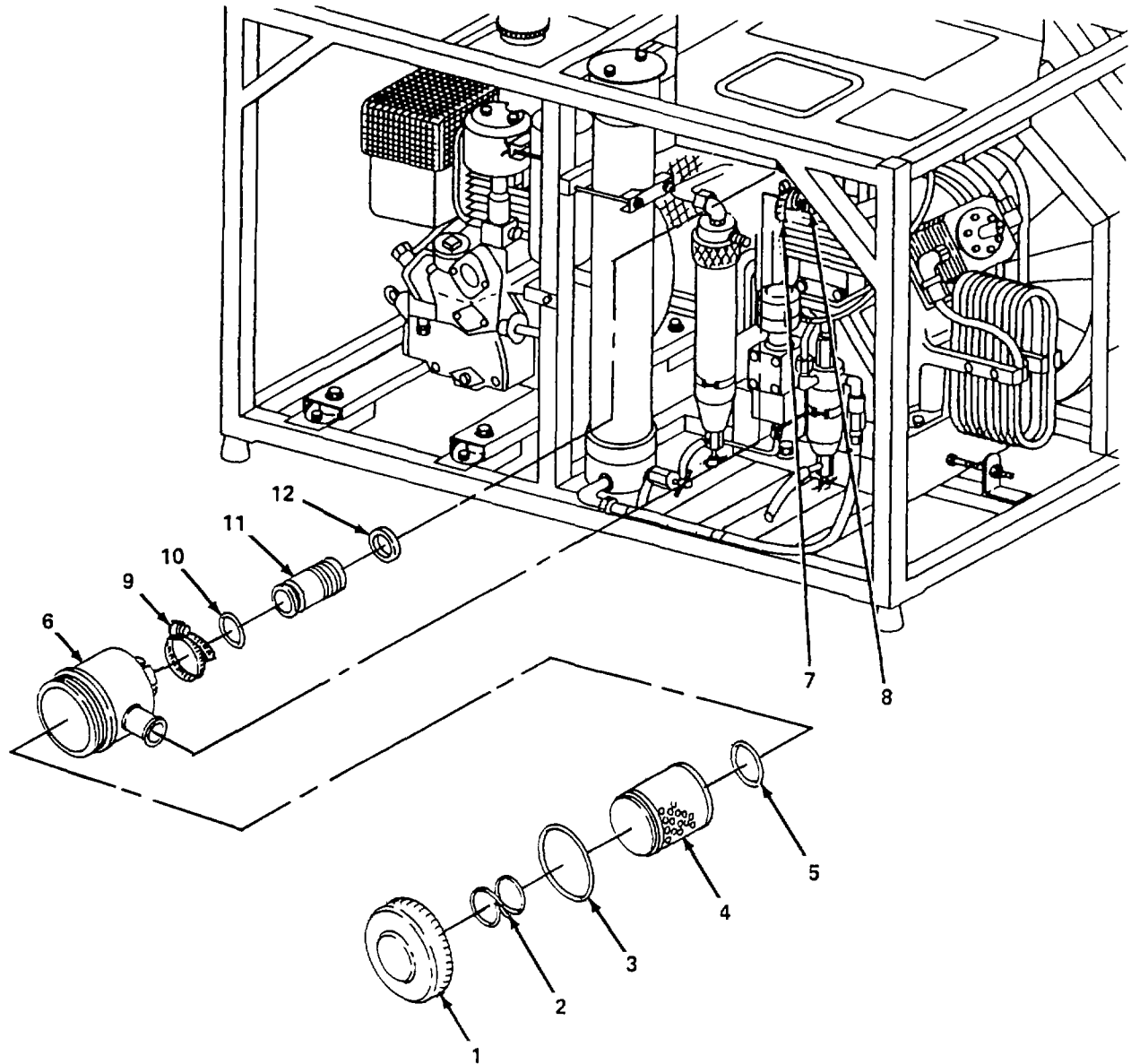
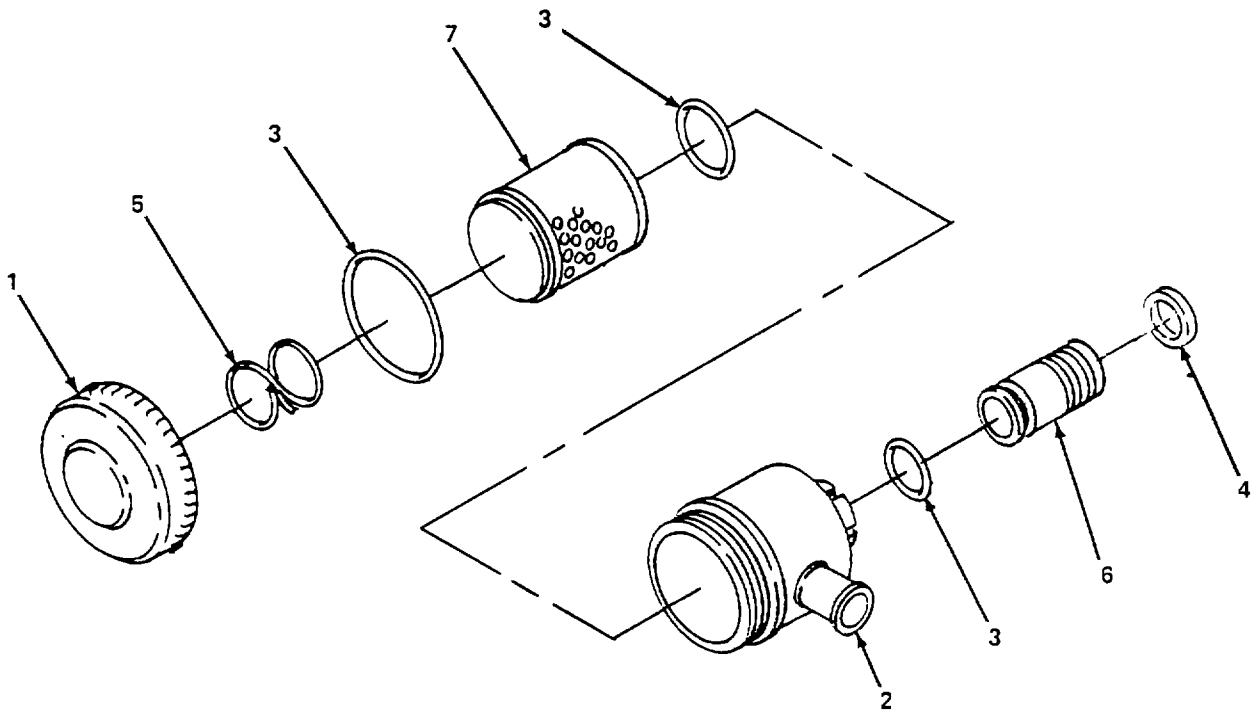


Figure 4-6. Inlet Filter and Adapter Assembly, Replace.

**4-17. Inlet Filter and Adapter Assembly (Cont).****c. Repair.** (figure 4-7)

- (1) Remove inlet filter and adapter assembly (para. a.).
- (2) Inspect cover (1) and replace if cracked.
- (3) Inspect housing (2) and replace if cracked.
- (4) Replace all preformed packings (3) and washer (4).
- (5) Inspect spring (5) and replace if cracked or deformed.
- (6) Inspect adapter (6) and replace if corroded, cracked, or threads are stripped.
- (7) Replace air filter element (7).
- (8) Install inlet air filter and adapter assembly (para. a.).

**Figure 4-7. Inlet Filter and Adapter Assembly, Repair.**

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**4-18. Pre-Filter and Hose Assembly.**

---

**This task covers:****a. Replace****b. Repair**

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**INITIAL SETUP***Tools**Materials/Parts*

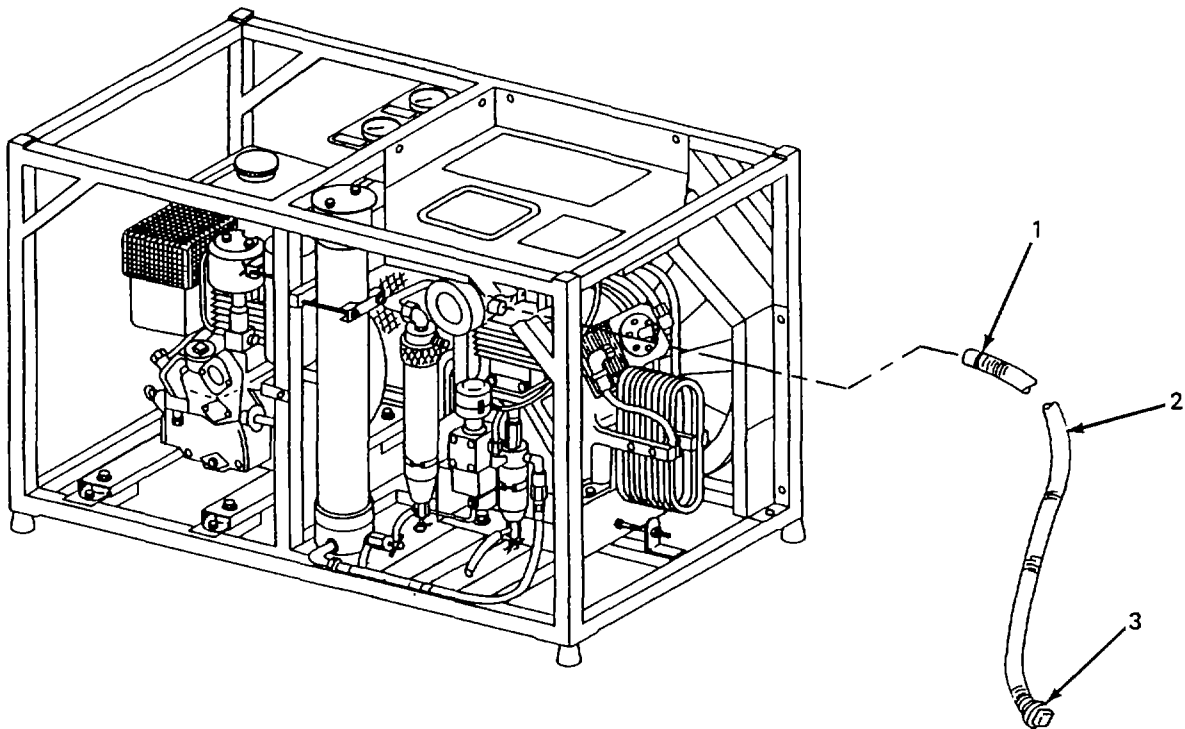
General Mechanic's Tools Kit (NSN 5180-00-177-7033)

Pre-Filter and Hose Assembly

---

**a. Replace.** (figure 4-8)

- (1) Loosen clamp (1) and remove hose (2) and pre-filter (3).
- (2) Install new pre-filter (3) and hose (2) and tighten clamp (1).

**Figure 4-8. Pre-Filter and Hose Assembly, Replace.**

**4-18. Pre-Filter and Hose Assembly (Cont)****b. Repair.** (figure 4-9)

- (1) Remove pre-filter and hose assembly (para. a.).
- (2) Loosen clamp (1) and remove pre-filter (2) and clamp (1).
- (3) Inspect hose (3) and replace if cracked.
- (4) Inspect clamps (1) and (4) and replace if bent or otherwise damaged.
- (5) Inspect pre-filter (2) and replace if cracked or otherwise damaged.
- (6) Install clamp (1) and pre-filter (2) and tighten clamp (1).
- (7) Install pre-filter and hose assembly (para. a.)

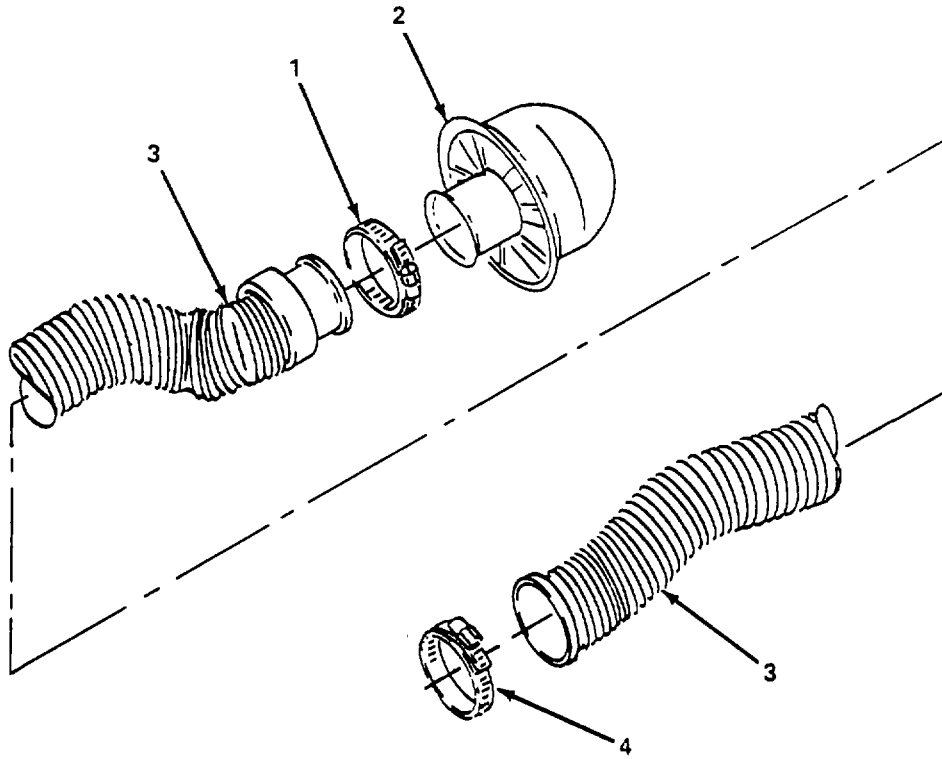


Figure 4-9. Pre-Filter and Hose Assembly, Repair.



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**4-19. Oil Filler.**

---

**This task covers:**  
**Replace**

---

**INITIAL SETUP***Tools**Materials/Parts*

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

Oil Filler  
Rags, Wiping (Item 19, Appendix E)  
Preformed Packing

---

**Replace.** (figure 4-10)

- (1) Remove filler cap (1) and preformed packing (2) with dipstick (3). Discard preformed packing (2).
- (2) Ensure area around mating surface of oil filler (4) and crankcase (5) is clean and all dirt and debris is removed.
- (3) Remove oil filler tube (4) with adapter (6).
- (4) Remove adapter (6) from oil filler tube (4).
- (5) Install adapter (6) on oil filler tube (4).
- (6) Install oil filler tube (4).
- (7) Install filler cap (1) and new preformed packing (2) with dipstick (3).

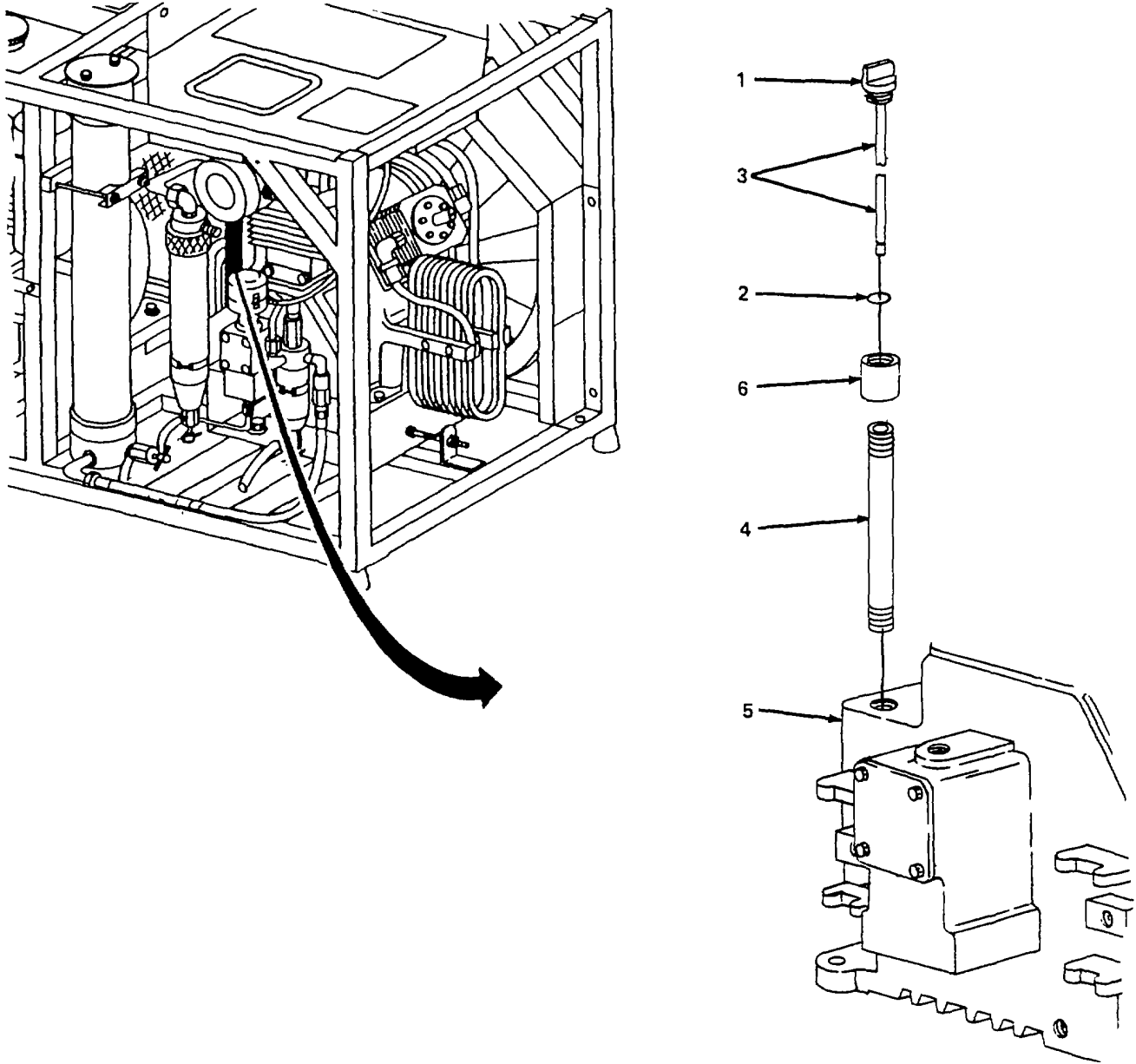


Figure 4-10. Oil Filler, Replace.

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**4-20. Dipstick.**

---

**This task covers:**  
**Replace**

---

**INITIAL SETUP***Tools*

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

*Materials/Parts*Dipstick  
Rags, Wiping (Item 19, Appendix E)  
Preformed Packing

---

**Replace.** (figure 4-11)

- (1) Remove filler cap (1), preformed packing (2), and dipstick (3). Discard preformed packing (2).
- (2) Remove dipstick (3) from filler cap (1).
- (3) Install dipstick (3) in filler cap (1).
- (4) Install filler cap (1), new preformed packing (2), and dipstick (3).

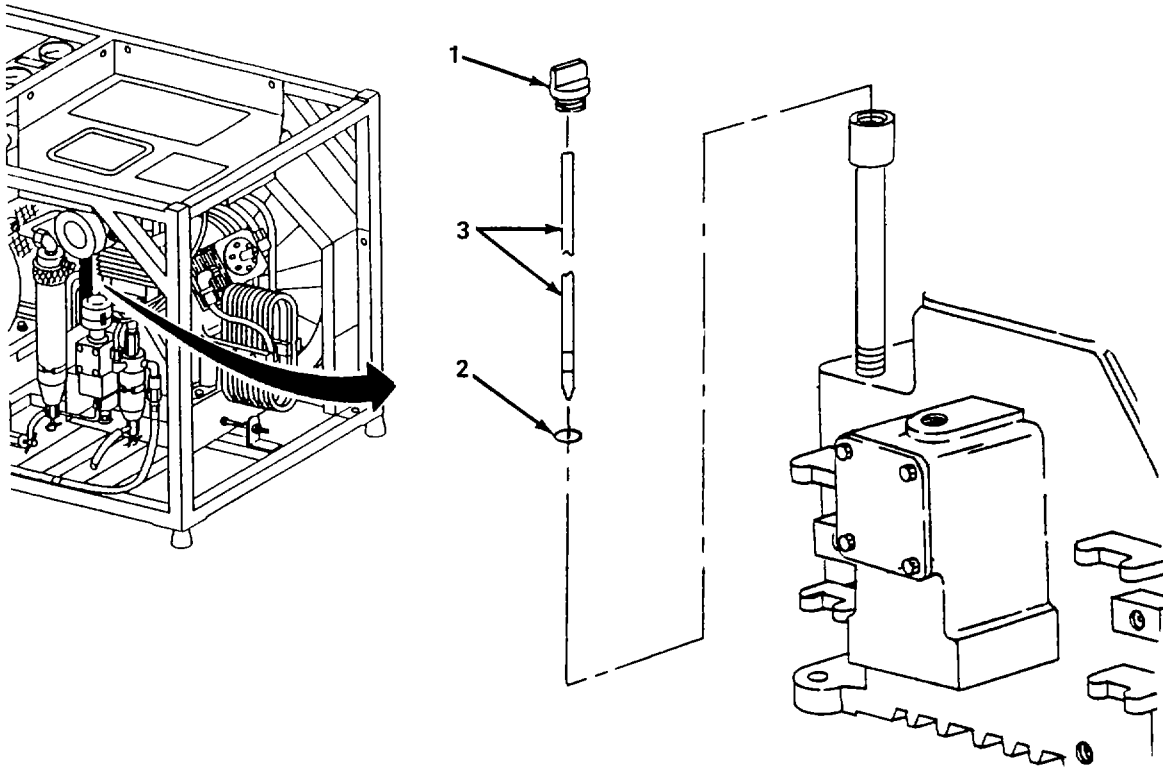


Figure 4-11. Dipstick, Replace.

---

**4-21. Drain Tube.**

---

**This task covers:**  
**Replace**

---

**INITIAL SETUP***Tools*

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

*Materials/Parts*

Drain Tube  
Lubricating Oil (Item 17, Appendix E)  
Rags, Wiping (Item 19, Appendix E)  
Preformed Packing

---

**Replace.** (figure 4-12)

- (1) Remove drain plug (1) and gasket (2) and drain oil into suitable container.
- (2) Ensure mating area between drain tube (3) and crankcase (4) is clean and all dirt and debris is removed.
- (3) Remove drain tube (3).
- (4) Install drain tube (3).
- (5) Install drain plug (1) and gasket (2).
- (6) Remove oil filler cap (4) and preformed packing (5).

**NOTE**

**To obtain proper level reading on dipstick, the dipstick must be screwed back in then removed and oil level checked.**

- (7) Fill compressor (6) with oil until oil level reaches full mark on dipstick. Refer to table 3-1 for proper grade viscosity of compressor oil.
- (8) Install oil filler cap (4) and preformed packing (5).

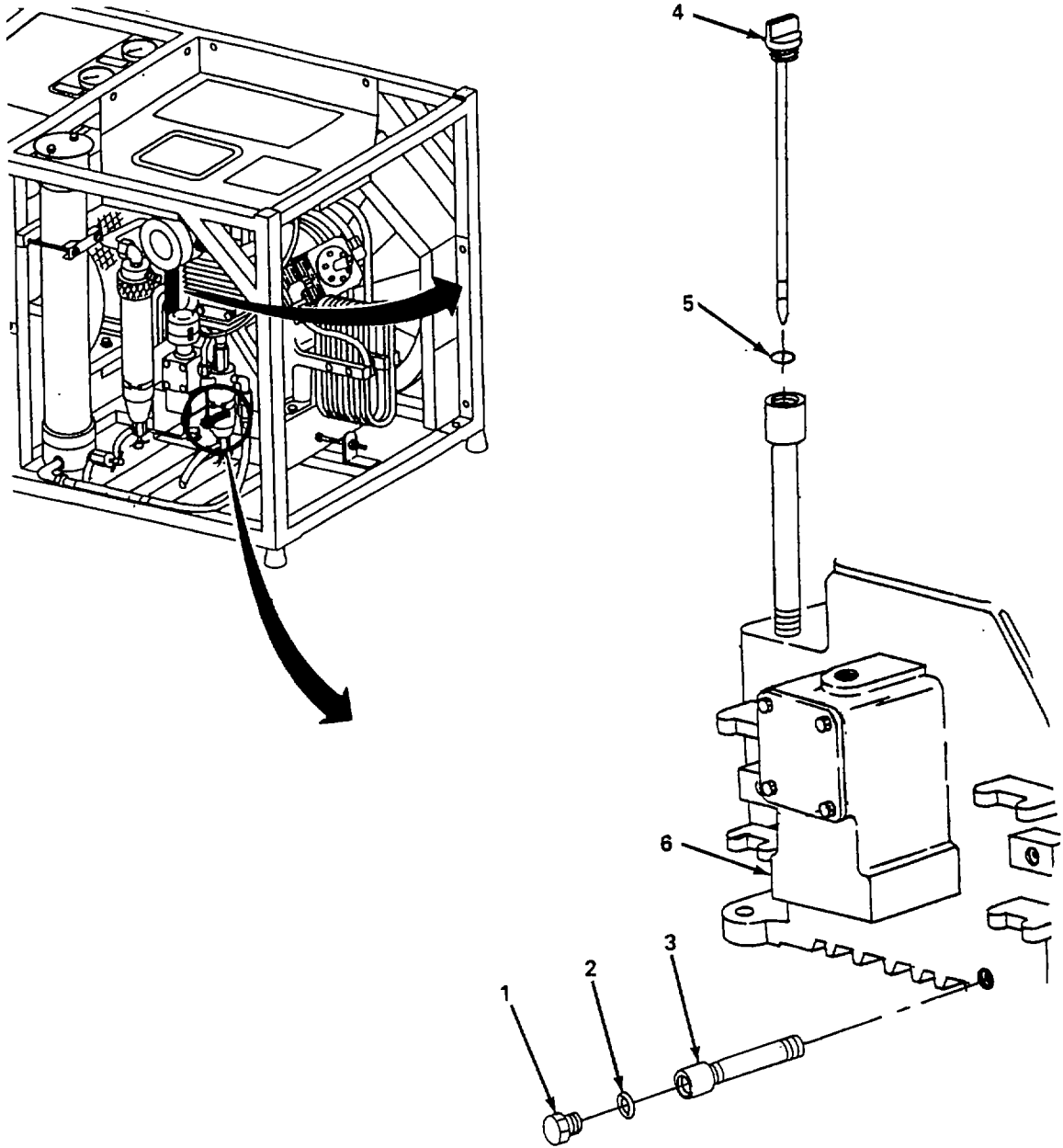


Figure 4-12. Drain Tube, Replace.

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**4-22. Crankcase Breather Assembly.**


---

This task covers:

**a. Service**

**b. Replace**

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**INITIAL SETUP**

*Tools*

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

*Materials/Parts (Cont)*

Solvent, Dry Cleaning (Item 21, Appendix E)  
Preformed Packing

*Materials/Parts*

Crankcase Breather  
Rags, Wiping (Item 19, Appendix E)

*Equipment Condition*

Compressor unit shutdown and depressurized  
(para. 2-12).

---

a. **Service**. (figure 4-13)

- (1) Loosen two connector nuts (1) and remove line (2).
- (2) Unsnap two clips (3) and remove cover (4) and preformed packing (5). Discard preformed packing (5).
- (3) Ensure mating area between base (6) and crankcase (7) is clean and all dirt and debris is removed.
- (4) Remove base (6) and gasket (8).

**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 base (6) and cover (4) with dry cleaning solvent and dry thoroughly.
- (6) Inspect cover (4) and replace if cracked.
- (7) Inspect base (6) and replace if screen is damaged or excessively dirty.
- (8) Install base (6) and gasket (8).
- (9) Install cover (4) and new preformed packing (5) and secure with two clips (3).
- (10) Install line (2) and tighten two connector nuts (1).

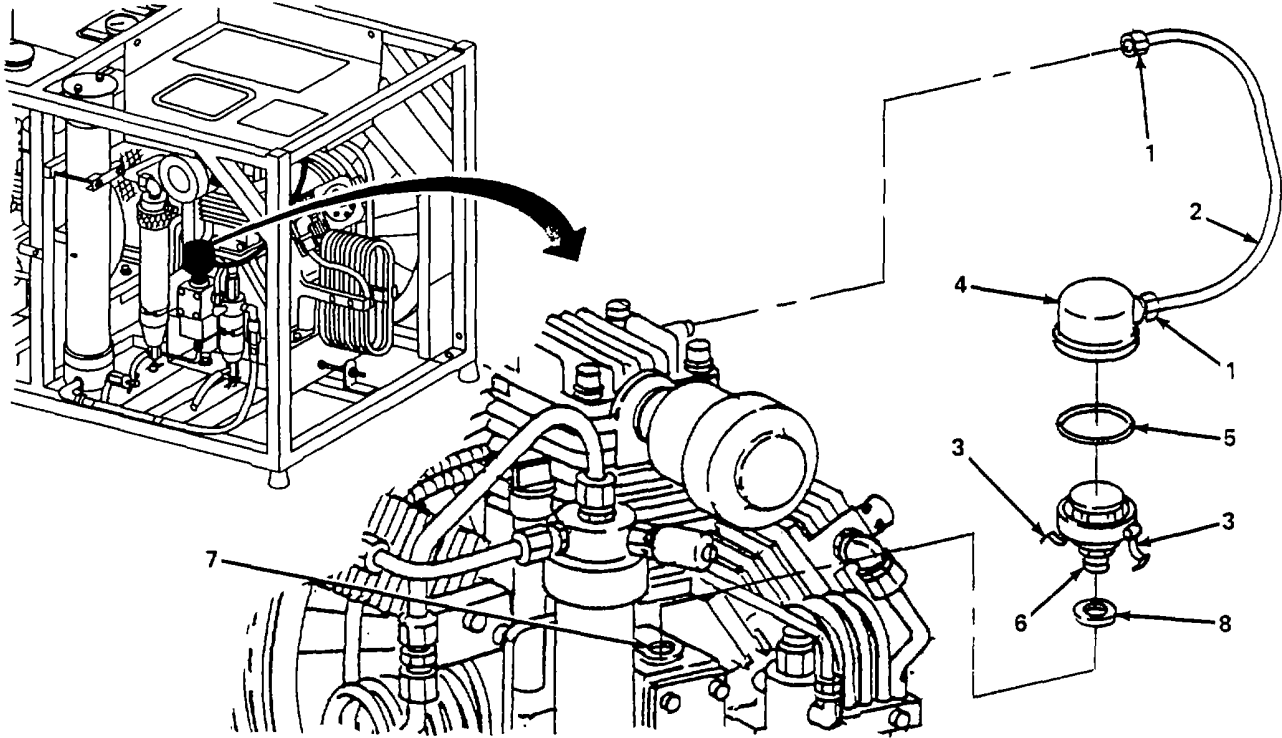


Figure 4-13. Crankcase Breather Assembly, Service.



**4-22. Crankcase Breather Assembly (Cont).****b. Replace.** (figure 4-14)

- (1) Loosen two connector nuts (1) and remove line (2).
- (2) Unsnap two clips (3) and remove cover (4) and preformed packing (5). Discard preformed packing (5). i\_
- (3) Ensure area between base (6) and crankcase (7) is clean and all dirt and debris is removed.
- (4) Remove base (6) and gasket (8).
- (5) Inspect line (2) and replace if cracked or punctured.
- (6) Install new base (6) and gasket (8).
- (7) Install new preformed packing (5) and cover (4) and secure with two clips (3).
- (8) Install line (2) and tighten two connector nuts (1).

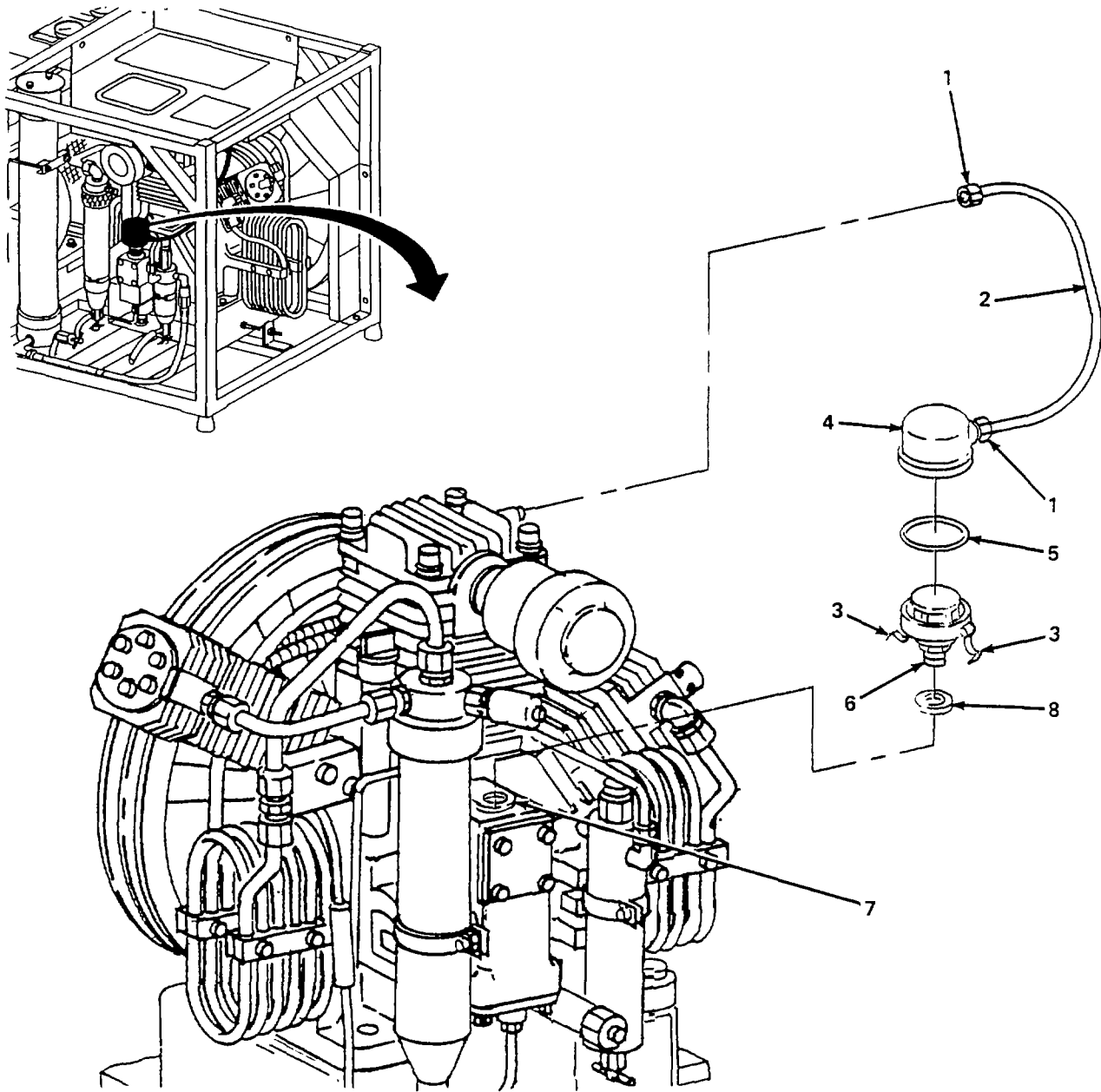


Figure 4-14. Crankcase Breather Assembly, Replace.

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**4-23. Engine Assembly.**

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**This task covers:****a. Service****b. Replace**

---

**INITIAL SETUP***Tools*

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

*Equipment Condition*Compressor unit shutdown (para. 2-12).  
Drivebelt removed (para. 4-14).*Materials/Parts*

Engine Assembly

Rags, Wiping (Item 19, Appendix E)

Solvent, Dry Cleaning (Item 21, Appendix E)

---

**a. Service.** (figure 4-15)

- (1) Remove drain plug (1) and drain engine oil into suitable container.
- (2) Remove two nuts (2), oil screen (3) and gasket (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 oil screen (3) with dry cleaning solvent and dry thoroughly.
- (4) Inspect oil screen (3) and replace if screen material is torn or oil screen (3) is otherwise damaged.
- (5) Install new gasket (4) and oil screen (3) and secure with two nuts (2).
- (6) Install drain plug (1).
- (7) Remove filler cap (5) and gasket (6).
- (8) Fill engine with oil until oil level reaches full mark on dipstick (7). Refer to table 3-1 for proper grade viscosity of oil.
- (9) Install filler cap (5) and gasket (6).

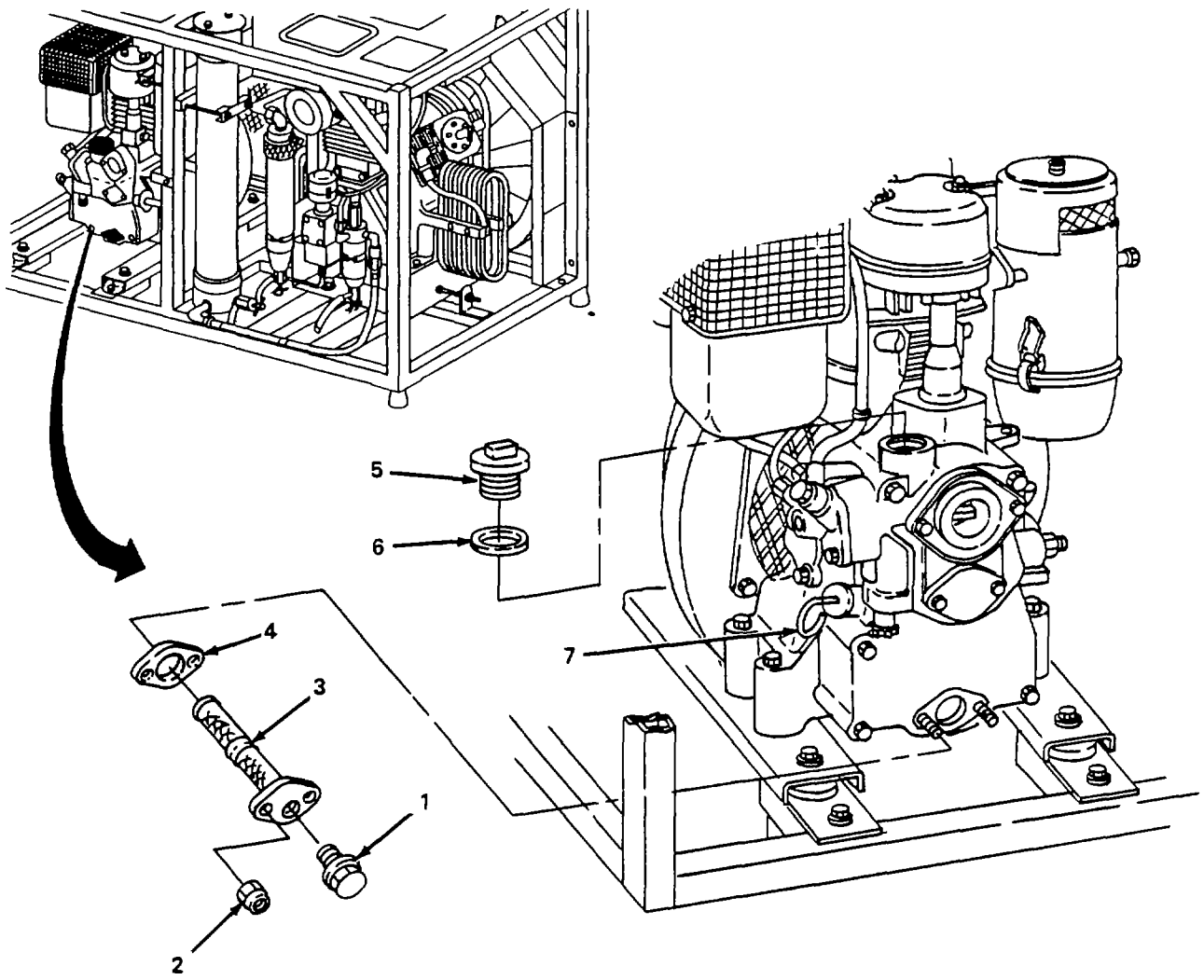


Figure 4-15. Engine Assembly, Service.

4-23. **Engine Assembly (Cont).**b. **Replace.** (figure 4-16)

- (1) Loosen connector nut (1) and disconnect line (2).
- (2) Remove atomizer (3) from air cleaner (4).
- (3) Remove four nuts (5), lockwashers (6), bolts (7), and washers (8) securing engine (9).
- (4) Remove engine (9).
- (5) Remove two bolts (10) and reinstall bolts (10) into threaded holes in collet (11).
- (6) Tighten bolts (10) and press collet (11) away from pulley (12) and remove bolts (10).
- (7) Remove collet (11), pulley (12), and key (13).
- (8) Install key (13), pulley (12), and collet (11) on new engine (9).
- (9) Install two bolts (10) in non-threaded holes in collet (11) and into threaded holes in pulley (12). Do not tighten bolts (10) fully, the pulley will have to be adjusted first.
- (10) Install engine (9) and secure with four bolts (7), washers (8), lockwashers (6), and nuts (5).
- (11) Note spray orifice opening in atomizer (3).
- (12) Install atomizer (3) in air cleaner (4). Ensure spray orifice in atomizer (3) is pointing directly at cylinder head (14).
- (13) Install line (2) and tighten connector nut (1).
- (14) Place straight edge against face of compressor pulley (15).
- (15) Adjust engine pulley (12) as needed until pulleys (12) and (15) are parallel within 1/16 in. (1.587 mm). Tighten two bolts (10).

FOLLOW-ON MAINTENANCE  
Install drivebelts (para. 4-14).

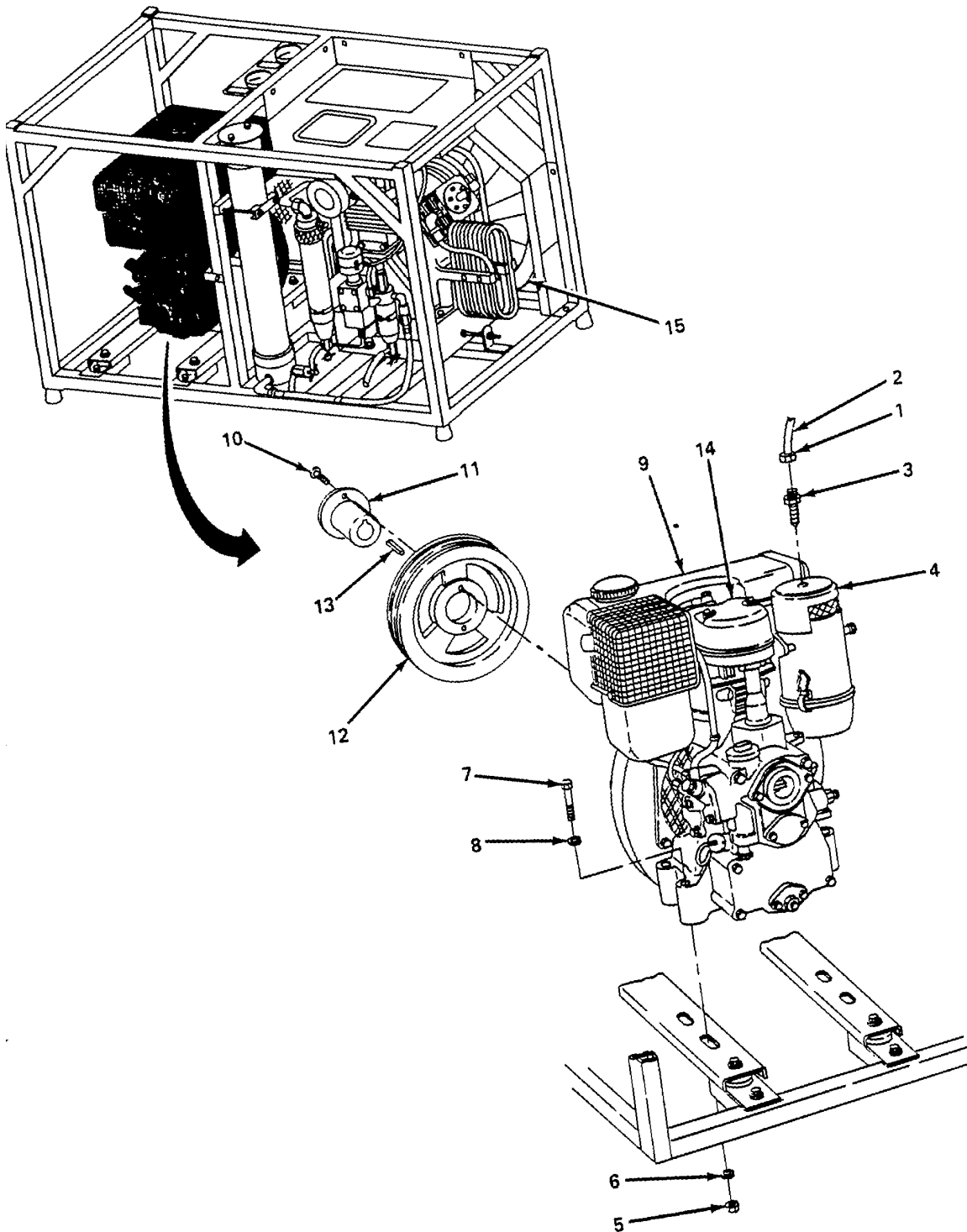


Figure 4-16. Engine Assembly, Replace.

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**4-24. Fuel Lines and Filter.**

---

**This task covers:**  
**Replace**

---

**INITIAL SETUP***Tools*

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

*Materials/Parts*Fuel Filter  
High Pressure Fuel Lines*Materials/Parts (Cont)*Fuel Supply Lines  
Injector Pump Overflow Line  
Injector Overflow Line  
Rags, Wiping (Item 19, Appendix E)**Replace.**

- (1) Fuel supply lines and filter assembly. (figure 4-17)
  - (a) Remove nut (1) securing wire bracket (2).
  - (b) Remove fuel line (3) from tank (4) and drain fuel into clean suitable container.
  - (c) Remove wire bracket (2) from fuel line (3).
  - (d) Remove fuel line (5) from pump (6).
  - (e) Remove two fuel lines (3) and (5) from filter (7).
  - (f) Replace filter (7) if more than 100 hours of operation have been placed on compressor.
  - (g) Install new fuel lines (3) and (5) on filter (7).
  - (h) Connect fuel line (5) to injector pump (6).
  - (i) Install wire bracket (2) on fuel line (3).
  - (j) Connect fuel line (3) to tank (4).
  - (k) Install wire bracket (2) and secure with nut (1).
  - (l) Replenish fuel supply.

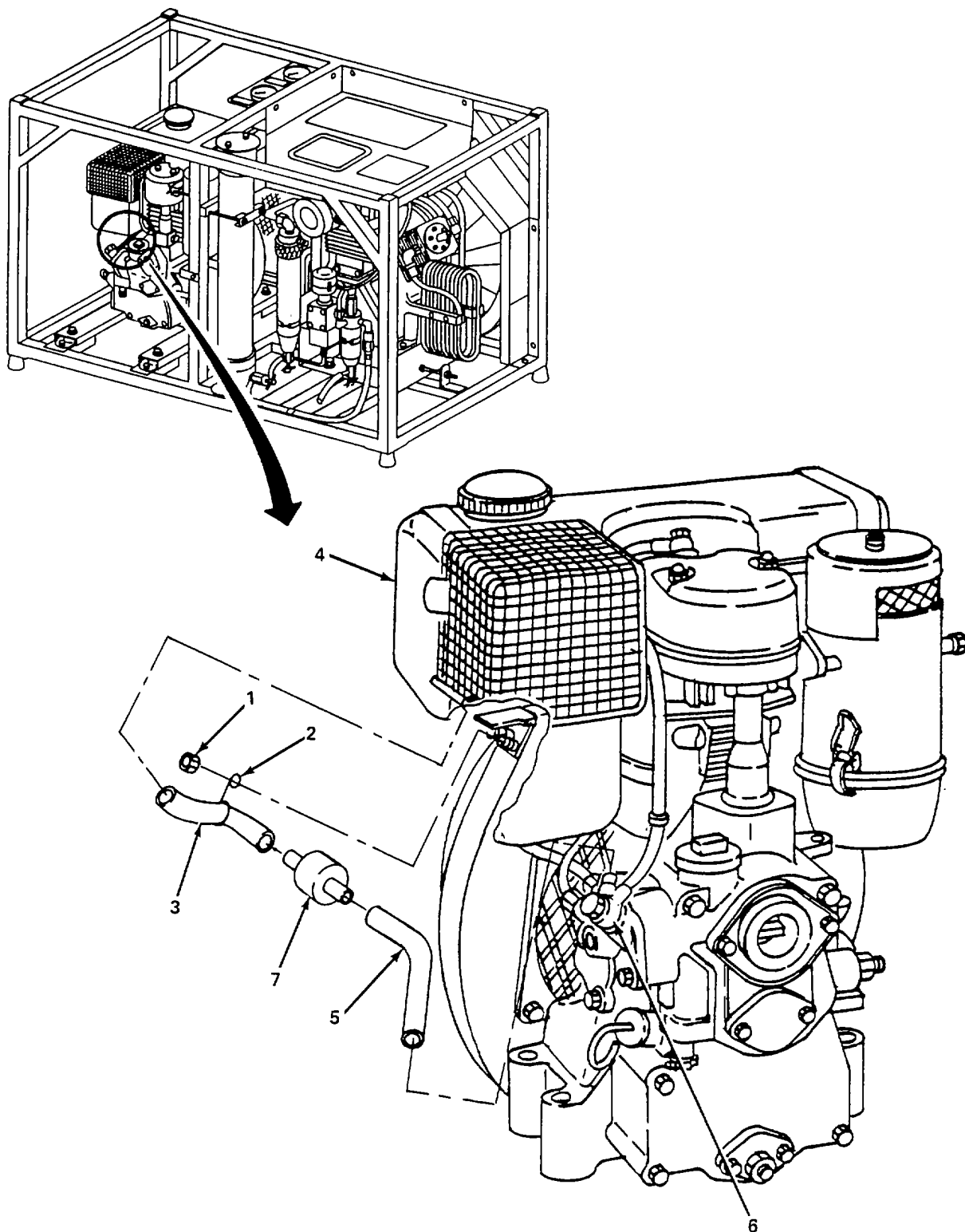


Figure 4-17. Fuel Supply Line and Filter, Replace



**4-24. Fuel Lines and Filter (Cont)**

(2) *High pressure fuel line.* (figure 4-18)

- (a) Loosen nut (1) and remove clamp (2) and seam protector (3).
- (b) Remove two nuts (4), muffler (5), bracket (6) and gasket (7).
- (c) Loosen two connector nuts (8) and remove high pressure fuel line (9).
- (d) Inspect gasket (7) and replace if cracked or missing pieces.
- (e) Install high pressure fuel line (9) and tighten two connector nuts (8).
- (f) Install gasket (7), bracket (6), muffler (5) and secure with two nuts (4).
- (g) Install seam protector (3), clamp (2) and tighten nut (1).

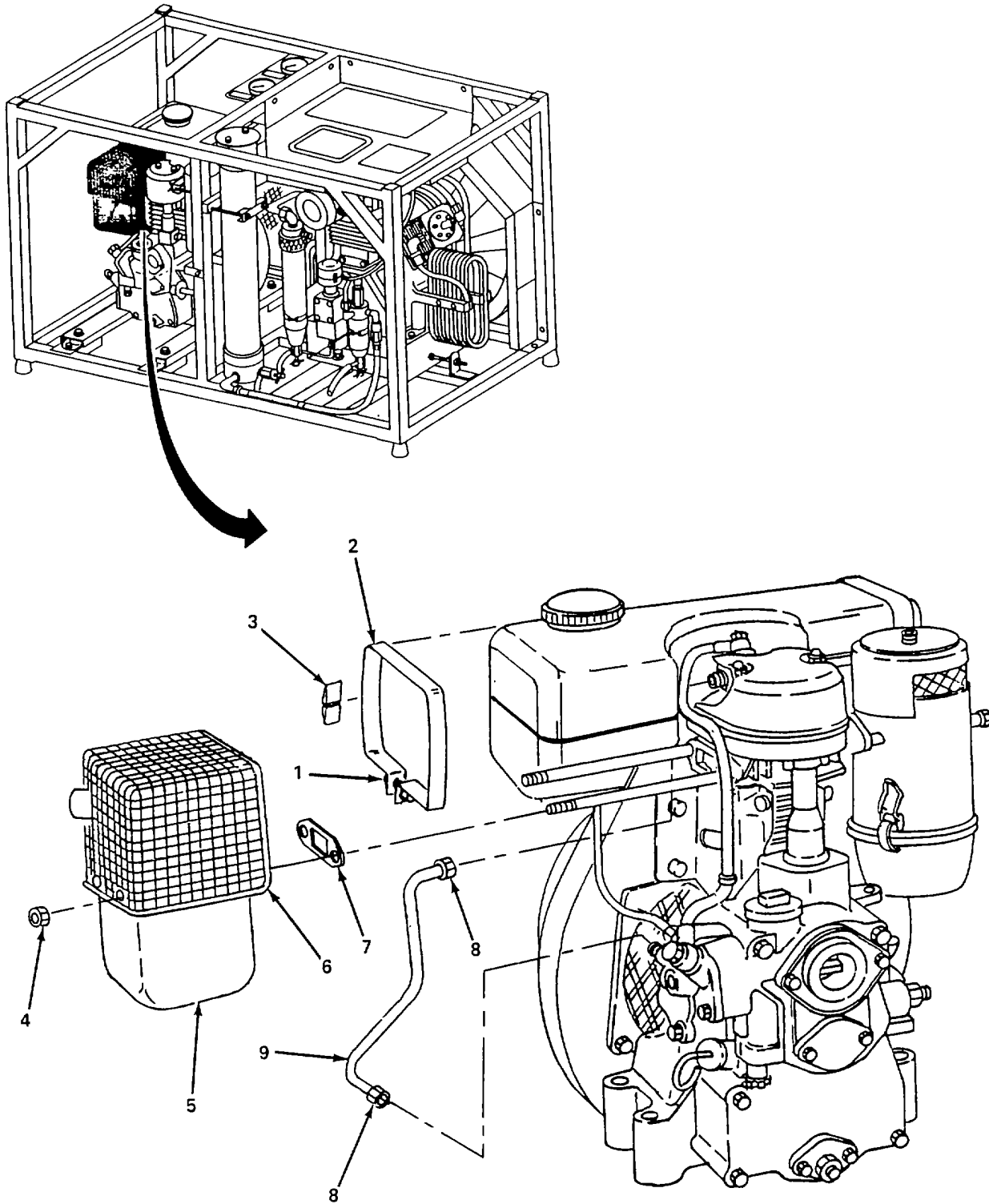


Figure 4-18. High Pressure Fuel Line, Replace

**4-24. Fuel Lines and Filter (Cont)**

(3) *Injector overflow line.* (figure 4-19)

(a) Disconnect fuel line (1) from injector (2).

(b) Disconnect fuel line (1) from fuel tank fitting (3) and remove fuel line (1).

(c) Connect fuel line (1) to fuel tank (3).

(d) Connect fuel line (1) to fuel injector (2).

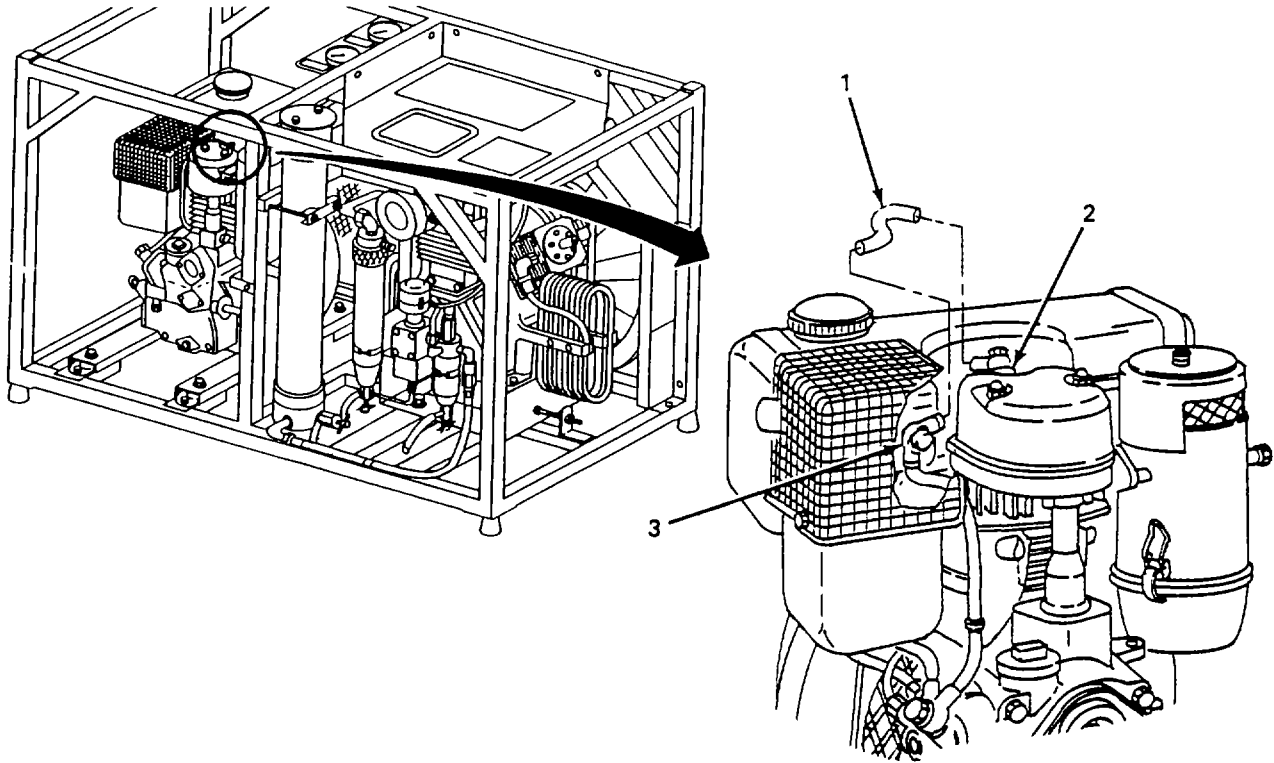


Figure 4-19. Injector Overflow Line, Replace.

**4-24. Fuel Lines and Filter (Cont)**

- (4) *Injector pump overflow line.* (figure 4-20)
  - (a) Disconnect fuel line (1) from fuel tank fitting (2).
  - (b) Bend tab (3), securing fuel line (1), out.
  - (c) Disconnect fuel line (1) from injector pump (4) and remove fuel line (1).
  - (d) Connect new fuel line (1) to injector pump (4).
  - (e) Route fuel line (1) up to tank (2) and connect fuel line (1).
  - (f) Bend tab (3) to secure fuel line (1).

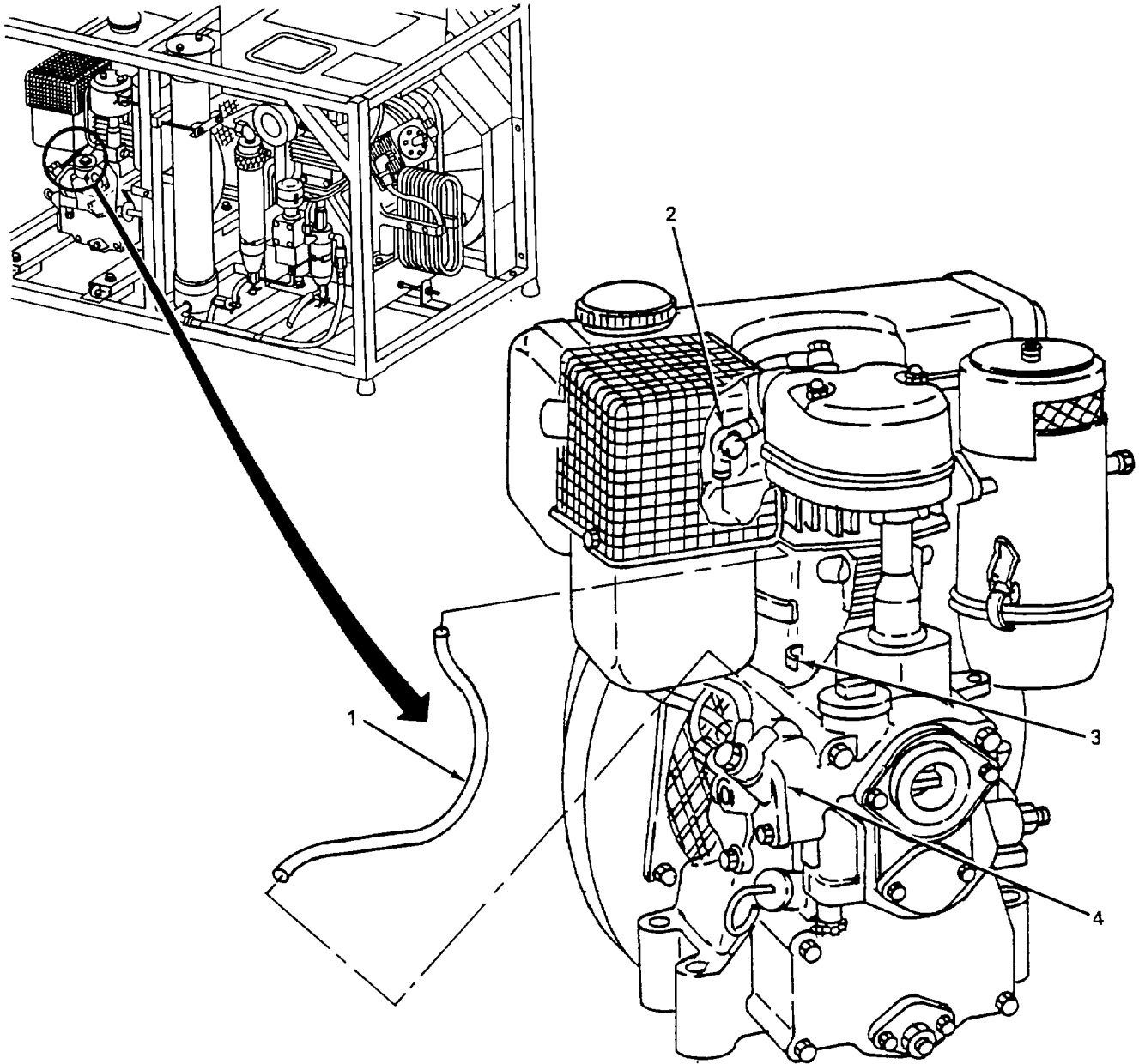


Figure 4-20. Injector Pump Overflow Line, Replace.

**4-24. Fuel Lines and Filter (Cont)**

- (5) *Fuel tank filter.* (figure 4-21)
  - (a) Remove fuel cap (1) and gasket (2).
  - (b) Remove bolt (3) and filter (4).
  - (c) Install new filter (4) and secure with bolt (3).
  - (d) Install fuel cap (1) and gasket (2).

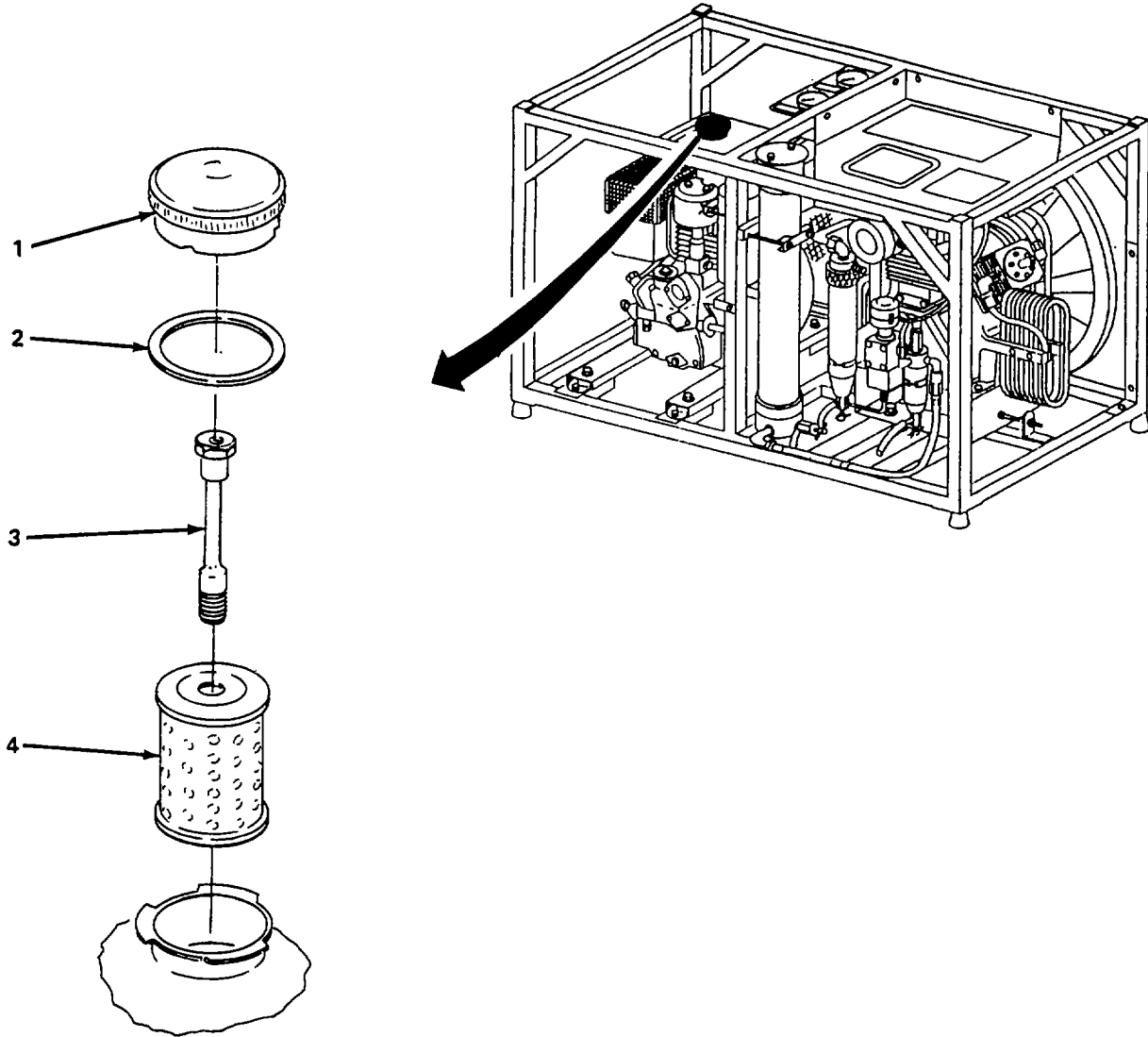


Figure 4-21. Fuel Tank Filter, Replace.



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**4-25. Fuel Tank.**

---

**This task covers:****a. Replace**

---

**INITIAL SETUP***Tools*

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

*Equipment Condition*

Compressor unit shutdown and depressurized (para. 2-12).

*Materials/Parts*

Fuel Tank

Fuel Diesel (Item 10, Appendix E)

---

Replace. (figure 4-22)

- (1) Drain fuel from tank (1).
- (2) Loosen nut (2) and remove clamp (3) and seam protector (4).
- (3) Loosen nut (5) and remove clamp (6) and seam protector (7).
- (4) Disconnect fuel line (8) from tank (1).
- (5) Remove banjo bolt (9), washer (10), fitting (11), and washer (12) and remove tank (1).
- (6) Remove edging (13) from tank (1).
- (7) Remove any protective pads stuck on tank (1).
- (8) Remove cap (14) and gasket (15) from tank (1).
- (9) Install edging (13) on new tank (1).
- (10) Install washer (12), fitting (11), washer (10) and secure with banjo bolt (9).
- (11) Connect fuel line (8) to fuel tank (1).
- (12) Ensure protective pads are positioned on engine.
- (13) Position fuel tank (1) on engine.
- (14) Install seam protector (7) and clamp (6).
- (15) Install seam protector (4) and clamp (3).
- (16) Tighten two nuts (5) and (2).
- (17) Replenish fuel supply.
- (18) Install cap (14) and gasket (15).

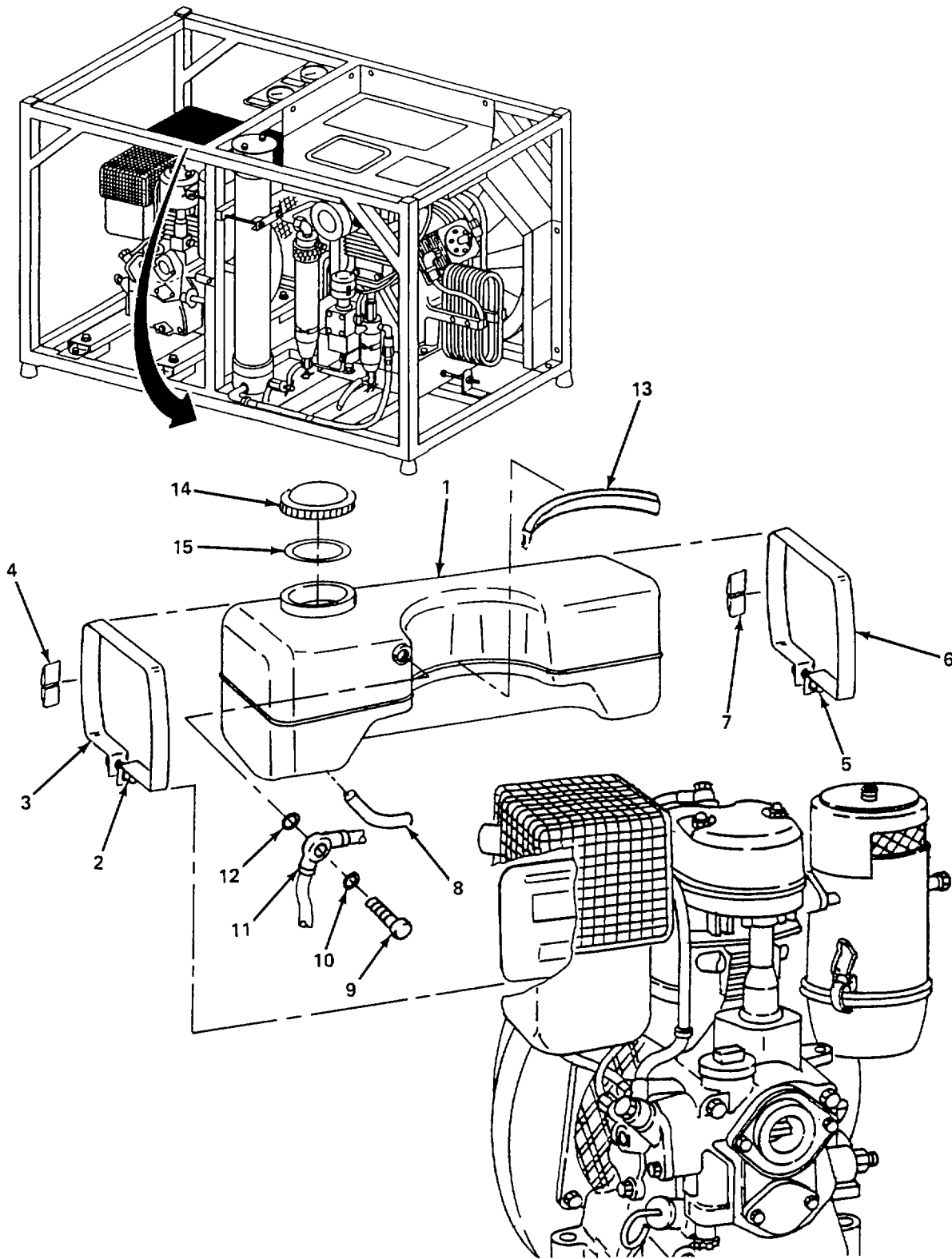


Figure 4-22. Fuel Tank, Replace.

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**4-26. Engine Air Cleaner Assembly.**

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**This task covers:****a. Service****b. Replace**

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**INITIAL SETUP***Tools*

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

*Equipment Condition*Compressor unit shutdown and depressurized  
(para. 2-12).*Materials/Parts*Air Cleaner Assembly  
Oil, Lubricating (Item 16, Appendix E)  
Rags, Wiping (Item 19, Appendix E)  
Gasket

---

**a. Service.** (figure 4-23)

- (1) Unsnap two clips (1) and remove cap (2) and gasket (3). Discard gasket (3).
- (2) Pour out oil from cup (2) into suitable container.

**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 cup (2) with dry cleaning solvent and dry thoroughly.
- (4) Fill cup (2), with clean engine oil, to OIL line.
- (5) Inspect gasket (3) and replace if cracked.
- (6) Install new gasket (3) and cup (2) and secure with two clips (1).

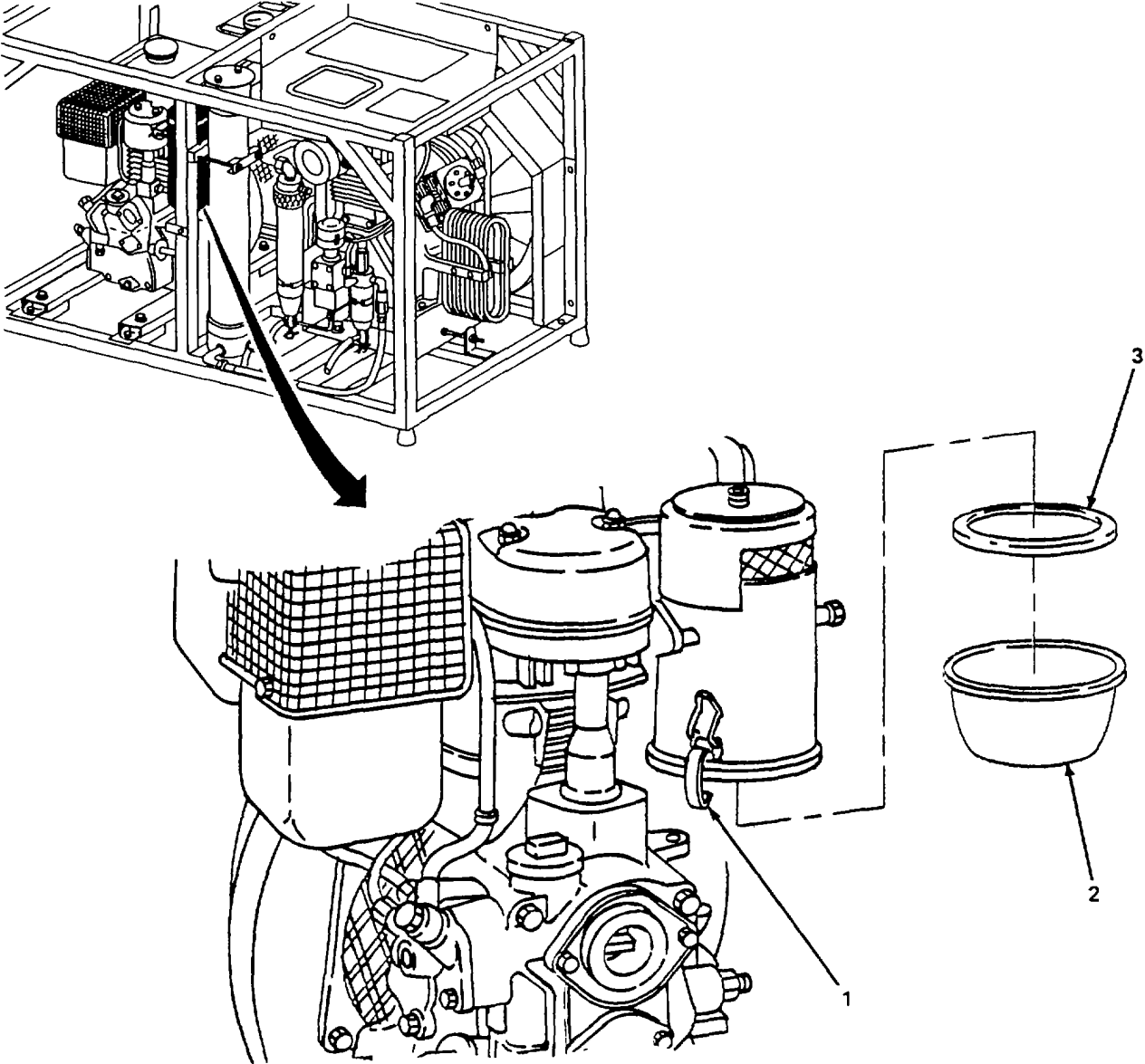


Figure 4-23. Air Cleaner, Service.

**4-26. Engine Air Cleaner Assembly (Cont).****b. Replace.** (figure 4-24)

- (1) Loosen connector nut (1) and disconnect line (2).
- (2) Remove atomizer (3) from air filter (4).

**NOTE**

**The air filter is an oil bath model. Keep air filter upright to prevent oil spillage.**

- (3) Remove two nuts (5), air filter (4), and gasket (6). Discard gasket (6).
- (4) Ensure gasket mounting surfaces are clean and old gasket material removed.
- (5) Install new gasket (6), air filter (4) and secure with two nuts (5).
- (6) Note orifice in atomizer (3).
- (7) Install atomizer (3) in air filter (4) ensure orifice is pointing directly at cylinder head (7).
- (8) Install line (2) and tighten connector nut (1).
- (9) Unsnap two clips (8) and remove cup (9) and gasket (10).
- (10) Fill cup (9) to "OIL" line with clean engine oil.
- (11) Install gasket (10) and cup (9) and secure with two clips (8).

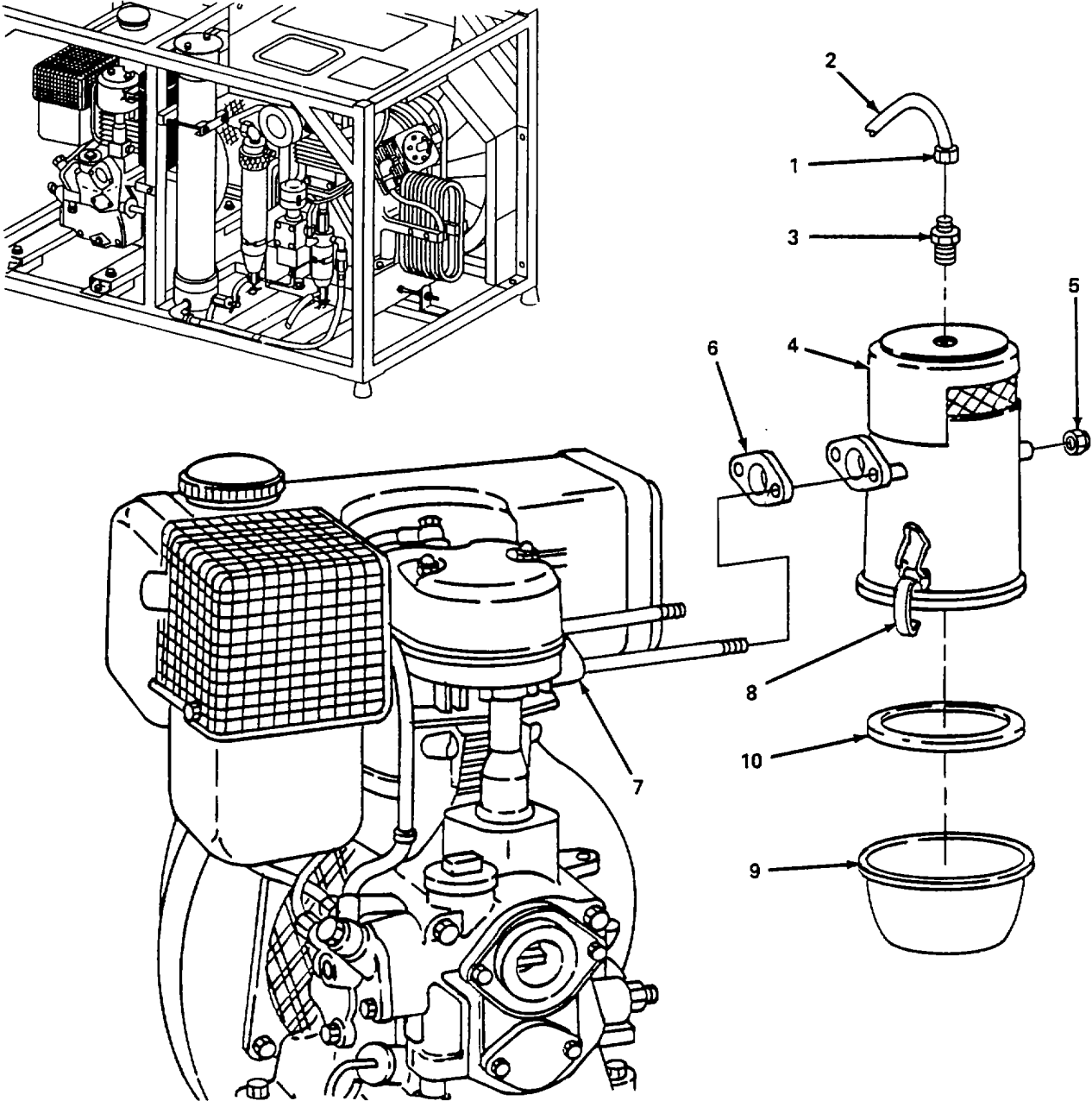


Figure 4-24. Air Filter, Replace.

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**4-27. Engine Muffler.**

---

**This task covers:****a. Replace**

---

**INITIAL SETUP***Tools*

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

*Equipment Condition*Compressor unit shutdown and depressurized  
(para. 2-12).*Materials/Parts*Muffler  
Gaskets

---

Replace. (figure 4-25)

- (1) Loosen nut (1) and remove clamp (2) and seam protector (3).
- (2) Remove nut (4).
- (3) Loosen clamp (5) and remove elbow (6) and spark arrestor (7).
- (4) Remove two nuts (8), muffler guard (9), muffler (10), gasket (11), bracket (12), and gasket (13). Discard gaskets (11) and (13).
- (5) Ensure all gasket surfaces are clean and old gasket material removed.
- (6) Install new gasket (13), bracket (12), new gasket (11), muffler (10), muffler guard (9) and secure with two nuts (8).
- (7) Install nut (4).
- (8) Install seam protector (3) and clamp (2) and tighten nut (1).
- (9) Install spark arrestor (7) and elbow (6) and tighten clamp (5).

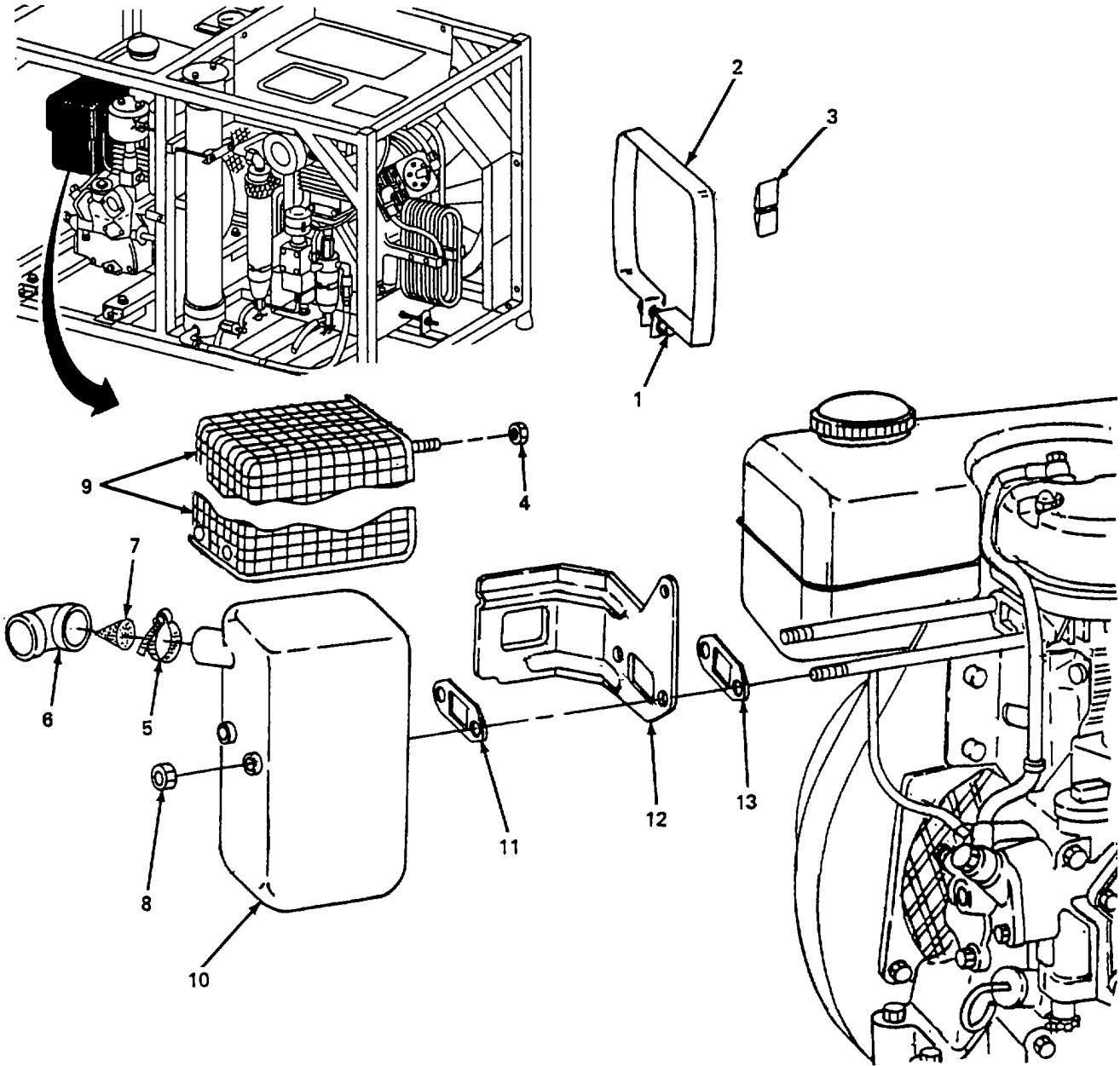


Figure 4-25. Muffler, Replace.



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**4-28. Engine Valve Cover.**

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**This task covers:****a. Replace**

---

**INITIAL SETUP***Tools*

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

*Equipment Condition*Compressor unit shutdown and depressurized  
(para. 2-12).*Materials/Parts*

Valve Cover

Gasket

Rags, Wiping (Item 19, Appendix E)

Preformed Packing

---

Replace. (figure 4-26)

- (1) Remove two nuts (1) and remove valve cover (2), gasket (3), and two preformed packings (4). Discard preformed packings (4).
- (2) Ensure gasket mounting surface on cylinder head (5) is clean and free of old gasket material.
- (3) Install two new preformed packings (4), new gasket (3), and new valve cover (2) and secure with two nuts (1).

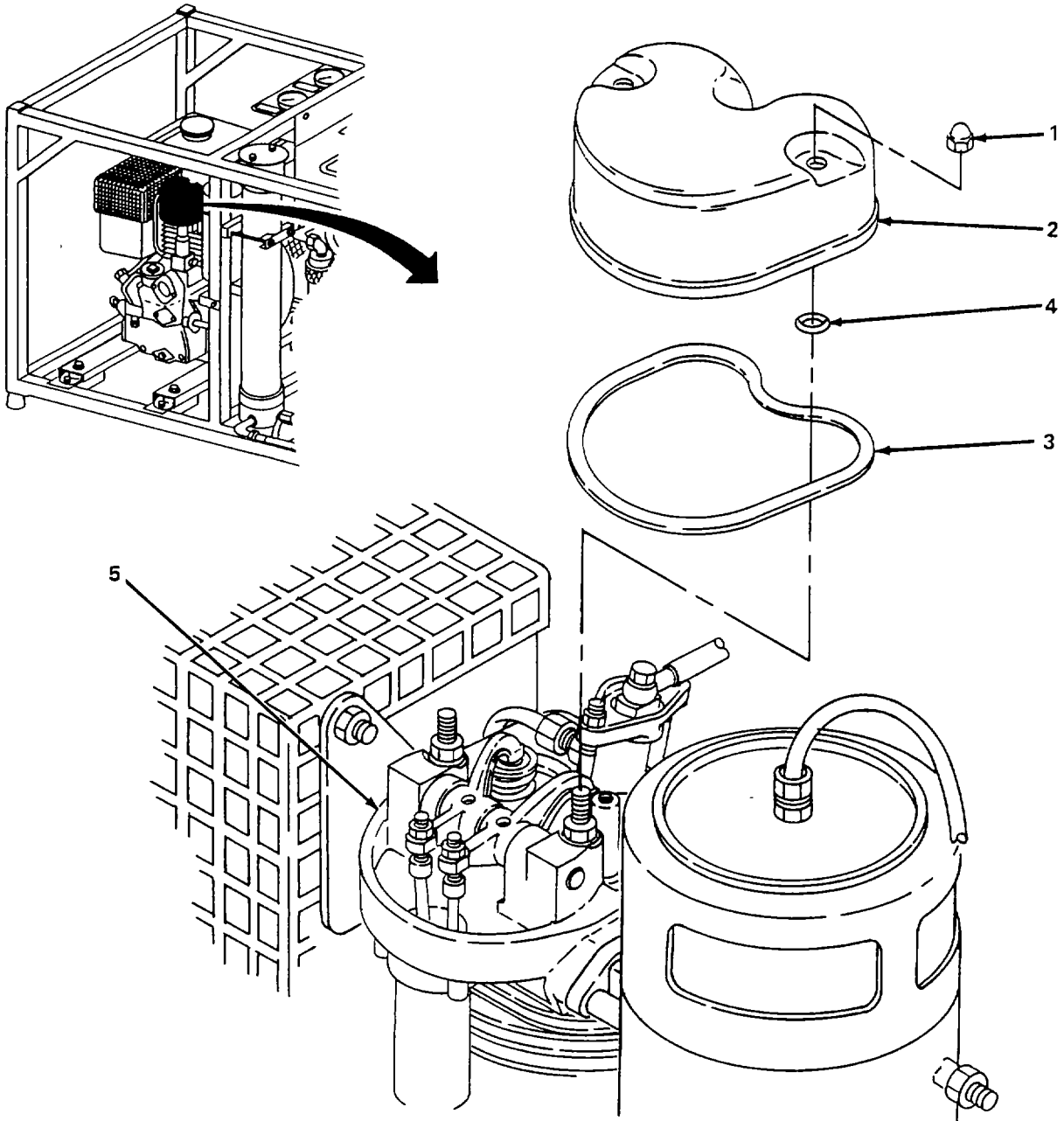


Figure 4-26. Engine Valve Cover, Replace.

---

**4-29. Governor Assembly.**

---

**This task covers:****a. Adjust**

---

**INITIAL SETUP***Tools*

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

Revolution Counter (P/N 84348)

Revolution Counter Insert (P/N 84349)

---

*Adjust.* (figure 4-27)

- (1) Remove two screws (1), washers (2), plate (3), and gasket (4).
- (2) Rotate flywheel (5) until weights (6) are split in the vertical position.
- (3) Bend locking tab (7) away from nut (8).
- (4) Loosen nut (8).
- (5) Pry weights (6) as far apart as they will go.
- (6) Screw in screw (9) until it contacts governor pin (10).
- (7) Allow weights to come together.
- (8) Turn screw (9) an additional 1/2 turn in.
- (9) Hold screw (9) and tighten nut (8).
- (10) Bend locking tab (7) to secure nut (8).
- (11) Install plate (3) and gasket (4), and secure with two screws (1) and washers (2).
- (12) Start engine (para. 2-12), allow to reach operating temperature and speed and check speed. Repeat steps 1 through 11 if speed is incorrect.
- (13) Shut engine down (para. 2-12).

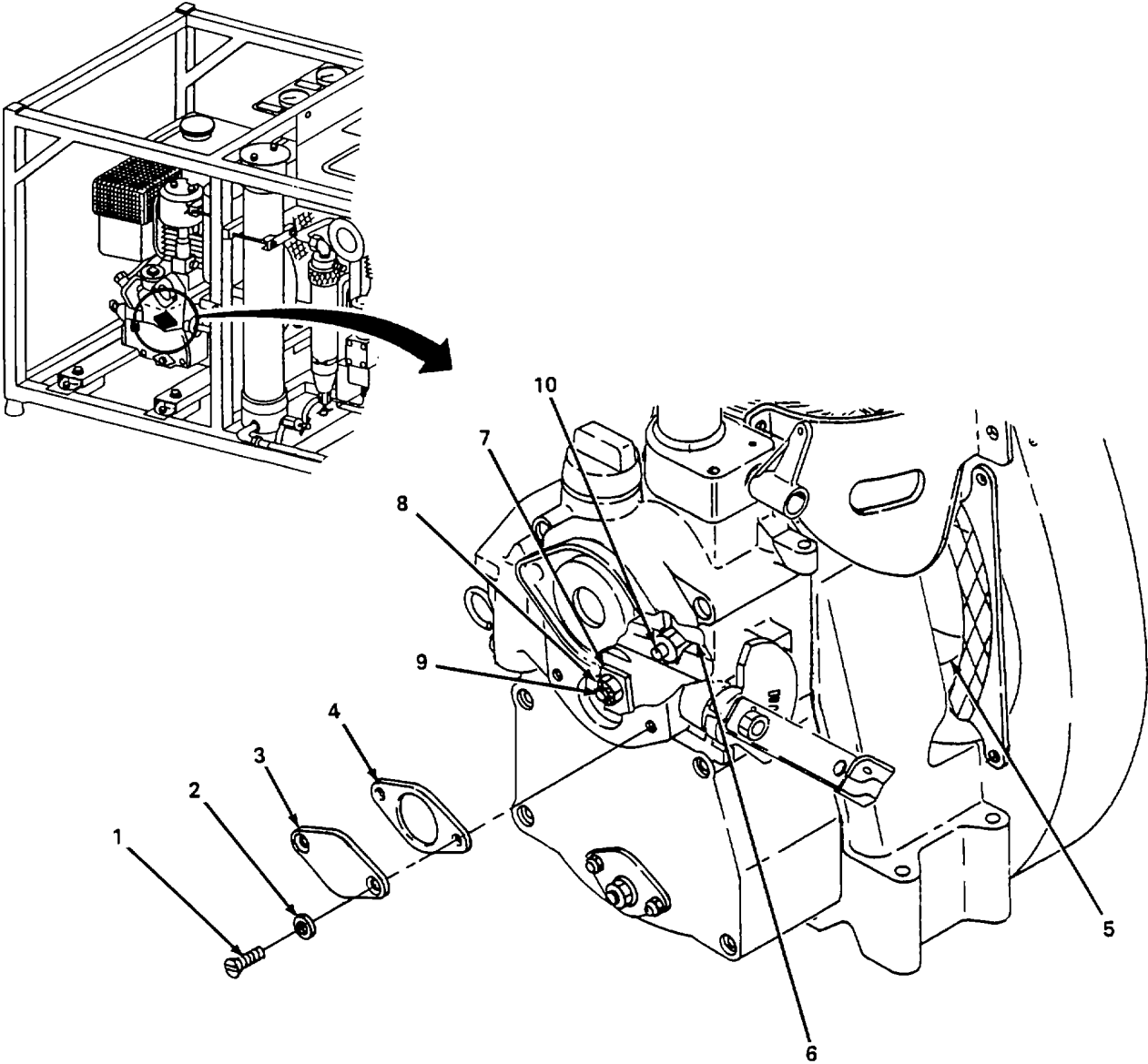


Figure 4-27. Governor Assembly, Adjust.

---

**4-30. Gear Cover Assembly.**

---

**This task covers:****a. Repair**

---

**INITIAL SETUP***Tools*

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

*Materials/Parts*Preformed Packing  
Oil Seal*Materials/Parts (Cont)*Crank Handle Guide Assembly  
Filler Cap  
Cover Plate  
Gasket

---

*Repair.*

- (1) *Replace crank handle guide assembly.* (figure 4-28).
  - (a) Remove two screws (1), washers (2), crank handle guide (3), and oil seal (4).
  - (b) Remove preformed packing retainer (5) and preformed packing (6). Discard preformed packing (6).
  - (c) Install new preformed packing (6) and preformed packing retainer (5).
  - (d) Install oil seal (4), crank handle guide (3), and secure with two screws (1) and washers (2).

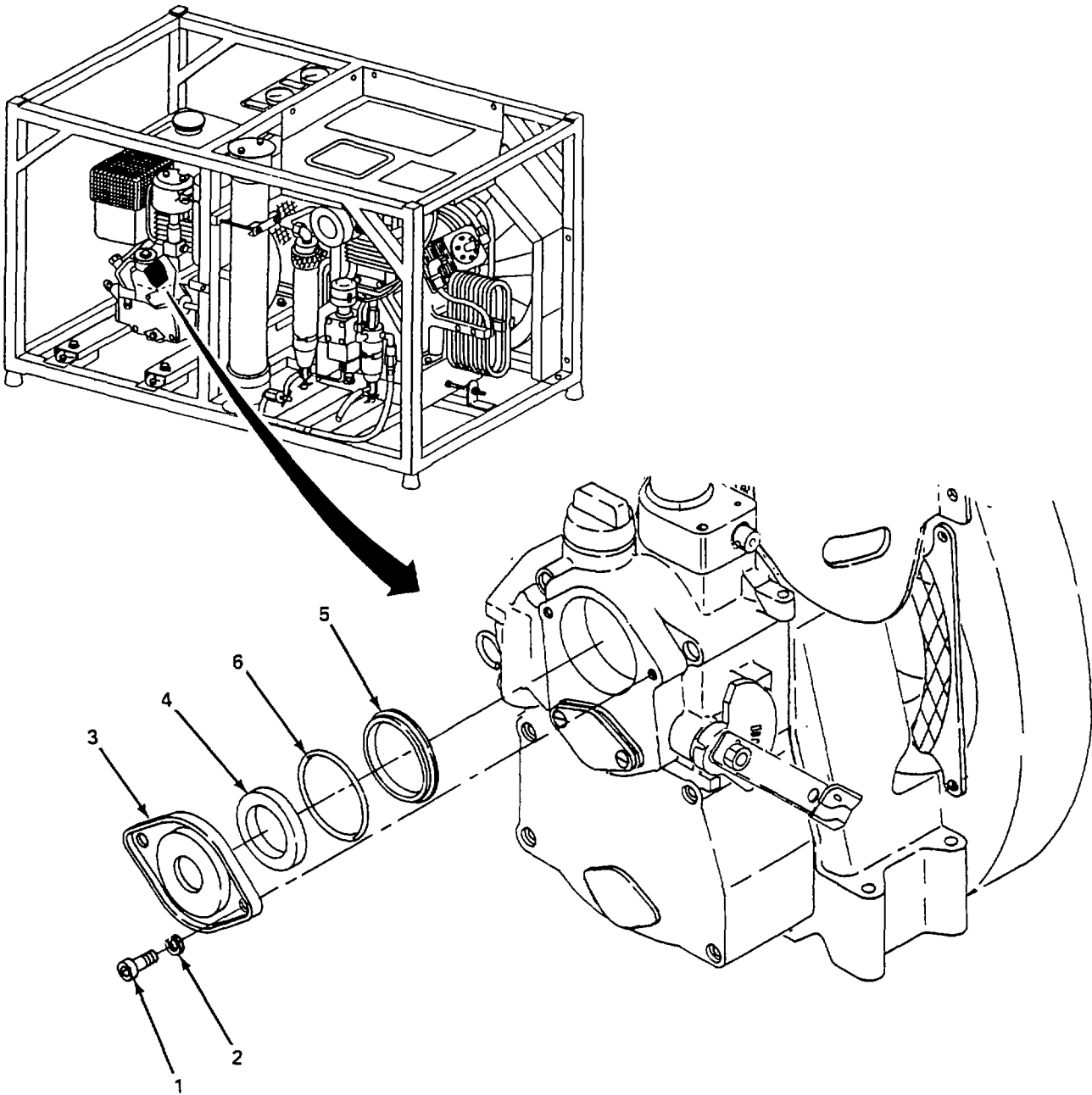


Figure 4-28. Crank Handle Guide, Replace.

## 4-30. Gear Cover Assembly (Cont).

(2) *Replace coverplate.* (figure 4-29).

- (a) Remove two screws (1), washers (2), plate (3), and gasket (4). Discard gasket (4).
- (b) Ensure gasket surfaces are clean and old gasket material is removed.
- (c) Install new gasket (4) and plate (3) and secure with two screws (1), and washers (2).

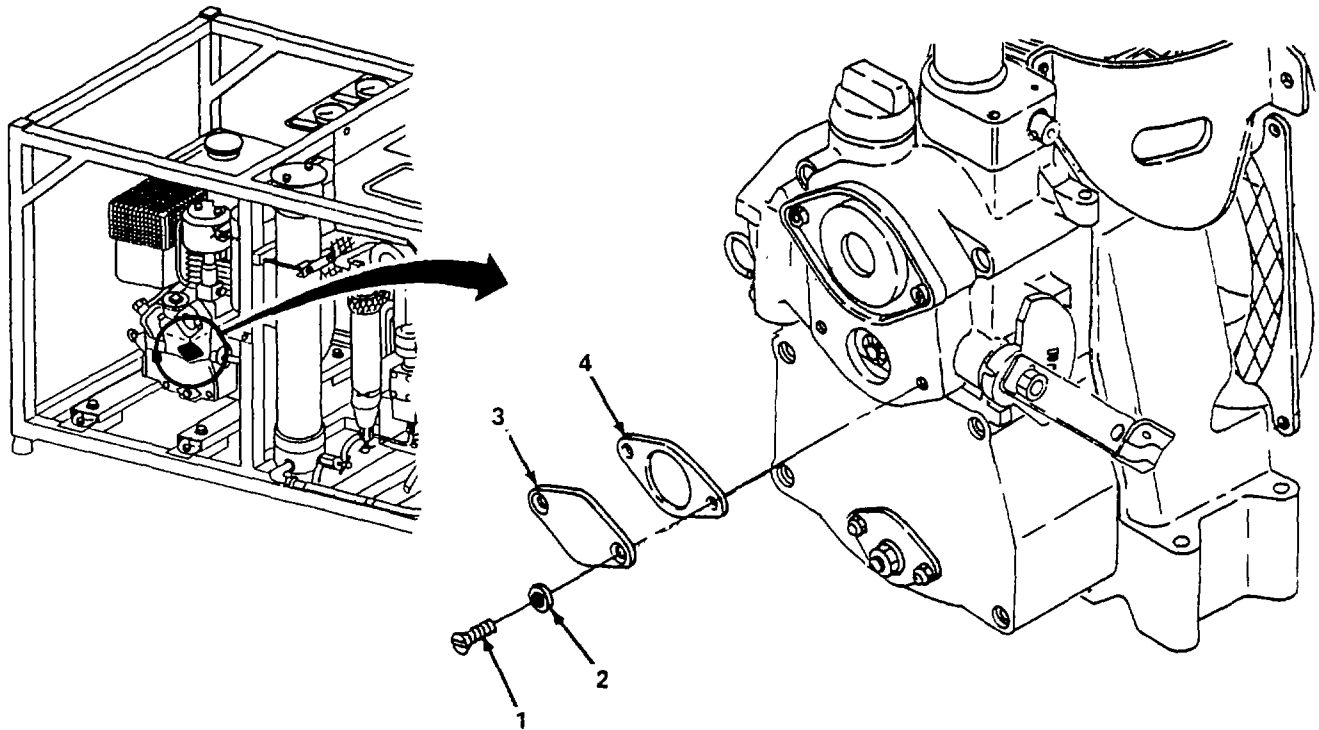


Figure 4-29. Cover Plate, Replace.

- (3) *Replace filler cap.* (figure 4-30).
- (a) Clean area around filler cap (1) and ensure all dirt and debris is removed.
  - (b) Remove filler cap (1) and gasket (2).
  - (c) Ensure gasket mounting surface is clean.
  - (d) Install filler cap (1) and gasket (2).

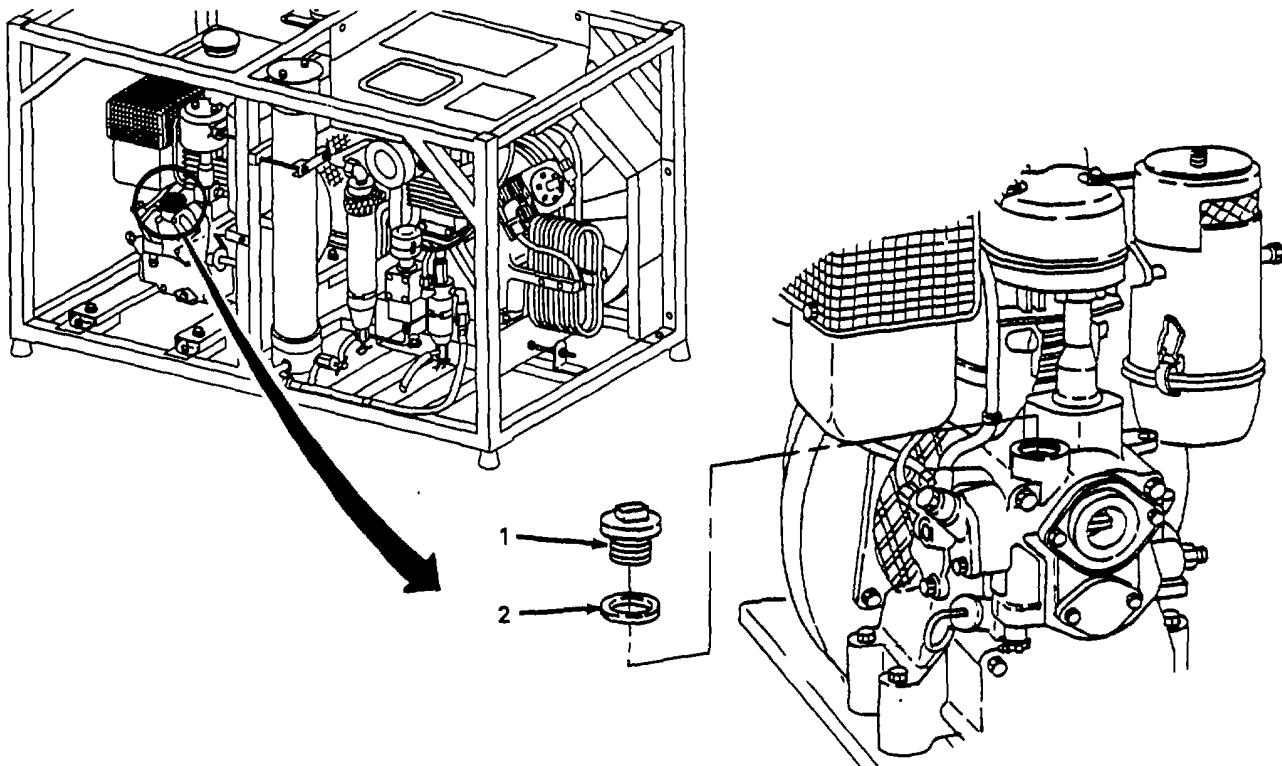


Figure 4-30. Filler Cap, Replace.



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**4-31. Oil Filter Screen.**


---

This task covers:

**a. Service**

**b. Replace**

---

**INITIAL SETUP**
*Tools*

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

*Equipment Condition*

Compressor unit shutdown and depressurized (para. 2-12).

*Materials/Parts*

Rags, Wiping (Item 19, Appendix E)  
 Solvent, Dry Cleaning (Item 21, Appendix E)  
 Brush (Item 6, Appendix E)  
 Gasket

---

a. Service. (figure 4-31)

- (1) Remove drain plug (1) and drain oil into suitable container.
- (2) Remove two nuts (2), oil screen (3), and gasket (4). Discard gasket (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 oil screen (3) with dry cleaning solvent and dry thoroughly.
- (4) Inspect oil screen (3) and replace if screen material is ripped or oil screen is otherwise damaged.
- (5) Install new gasket (4) and oil screen (3) and secure with two nuts (2).
- (6) Install oil drain plug (1).
- (7) Remove filler plug (5).
- (8) Fill engine with oil until oil level reaches full mark on dipstick (6). Refer to table 3-1 for proper grade viscosity of oil.
- (9) Install filler plug (5).

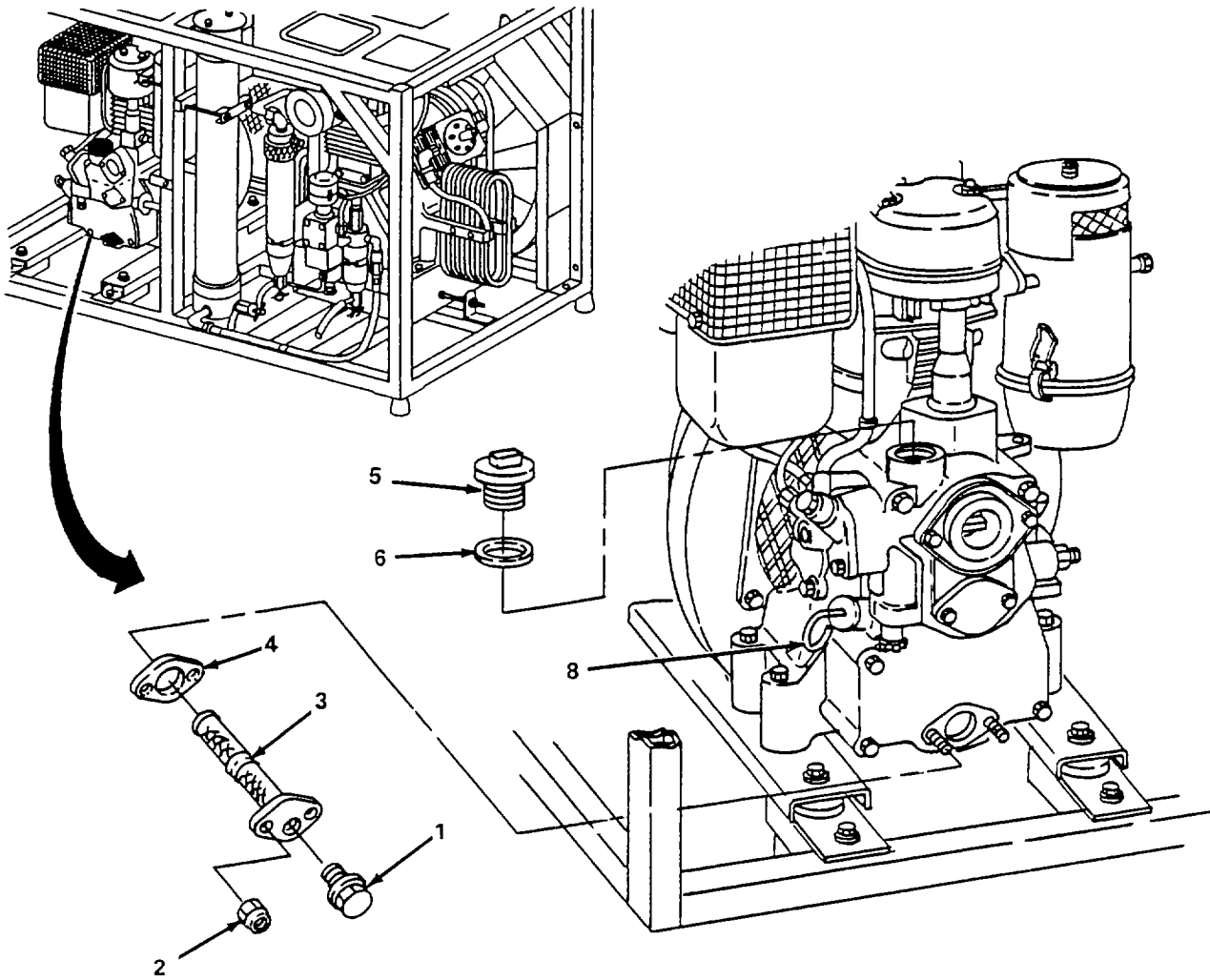


Figure 4-31. Oil Filter Screen, Service.

**4-31. Oil Filter Screen (Cont).***b. Replace.* (figure 4-32)

- (1) Remove drain plug (1) and gasket (2), and drain engine oil into suitable container. Discard gasket (2).
- (2) Remove two nuts (3) and remove oil screen (4) and gasket (5). Discard gasket (5).
- (3) Ensure all gasket mounting surfaces are clean and free of old gasket material.
- (4) Install new gasket (5) and new oil screen (4) and secure with two nuts (3).
- (5) Install new gasket (2) on drain plug (1) and install drain plug (1).
- (6) Remove oil filler cap (6) and gasket (7).
- (7) Add oil to engine until oil level reaches full mark on dipstick (8). Refer to table 3-1 for proper grade viscosity of oil.
- (8) Install oil filler cap (6).

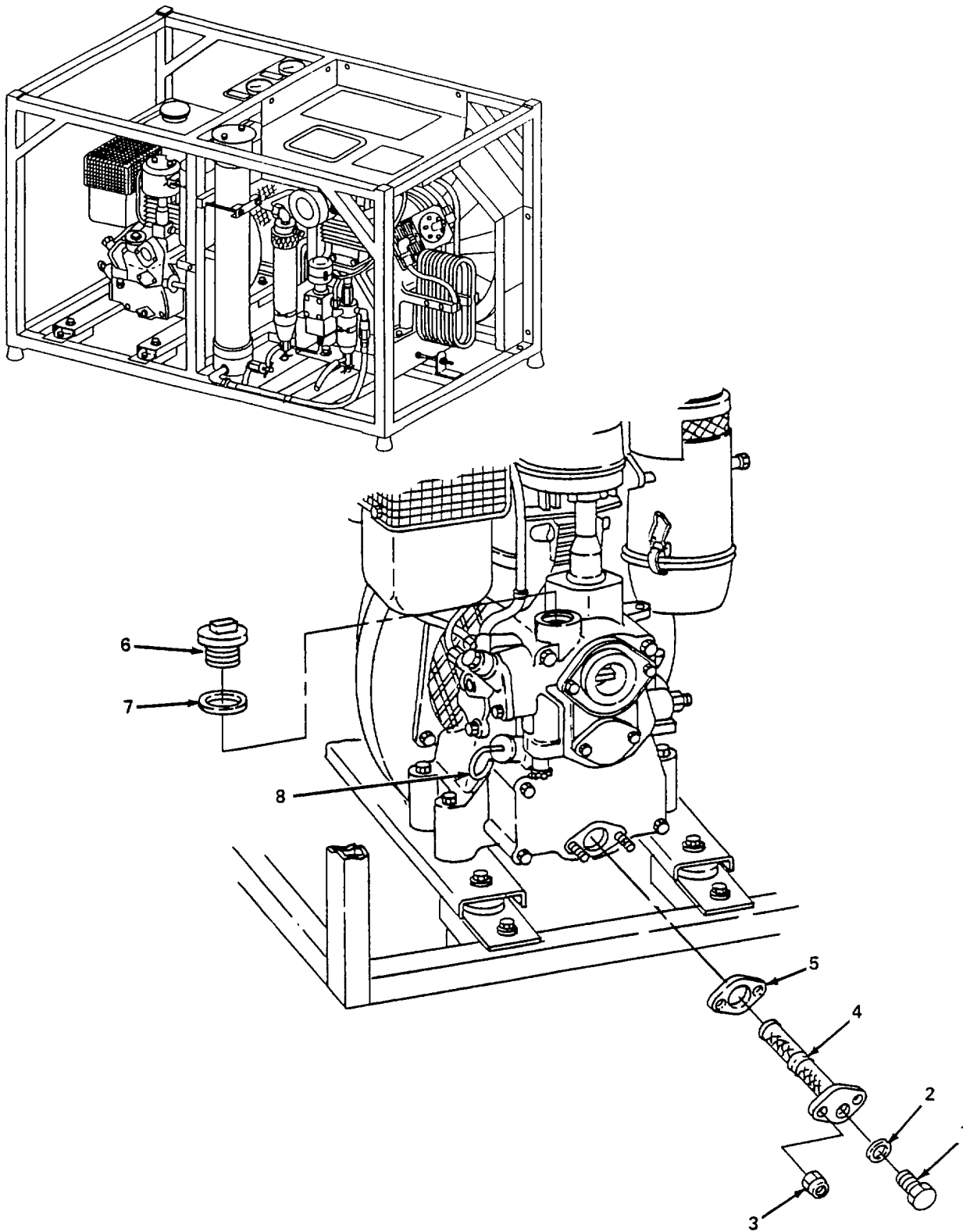


Figure 4-32. Oil Screen, Replace.

---

**4-32. Cold Start Assembly.**

---

**This task covers:****a. Replace**

---

**INITIAL SETUP***Tools**Materials/Parts*General Mechanic's Tool Kit (NSN 5180-00-177-7033) Cold Start Assembly

---

Replace. (figure 4-33)

- (1) Remove two wing nuts (1) and bracket (2).
- (2) Unscrew tank (3) from base (4).
- (3) Remove gasket (5).
- (4) Loosen two connector nuts (6) and remove line (7).
- (5) Remove two nuts (8), bolts (9), lockwashers (10), cap and chain (11), bracket (12), and base (4).
- (6) Remove atomizer (13) from air cleaner (14).
- (7) Remove two screws (15), washers (16), and bracket (17).
- (8) Install bracket (17) and secure with two screws (15) and washers (16).
- (9) Note position of orifice in atomizer (13).
- (10) Install atomizer (13) in air cleaner (14). Ensure orifice points at cylinder head (18).
- (11) Install base (4), bracket (12), cap and chain (11), two lockwashers (10), bolts (9), and nuts (8).
- (12) Install line (7) and tighten two connector nuts (6).
- (13) Install gasket (5) and tank (3).
- (14) Install bracket (2) and secure with two wing nuts (1).

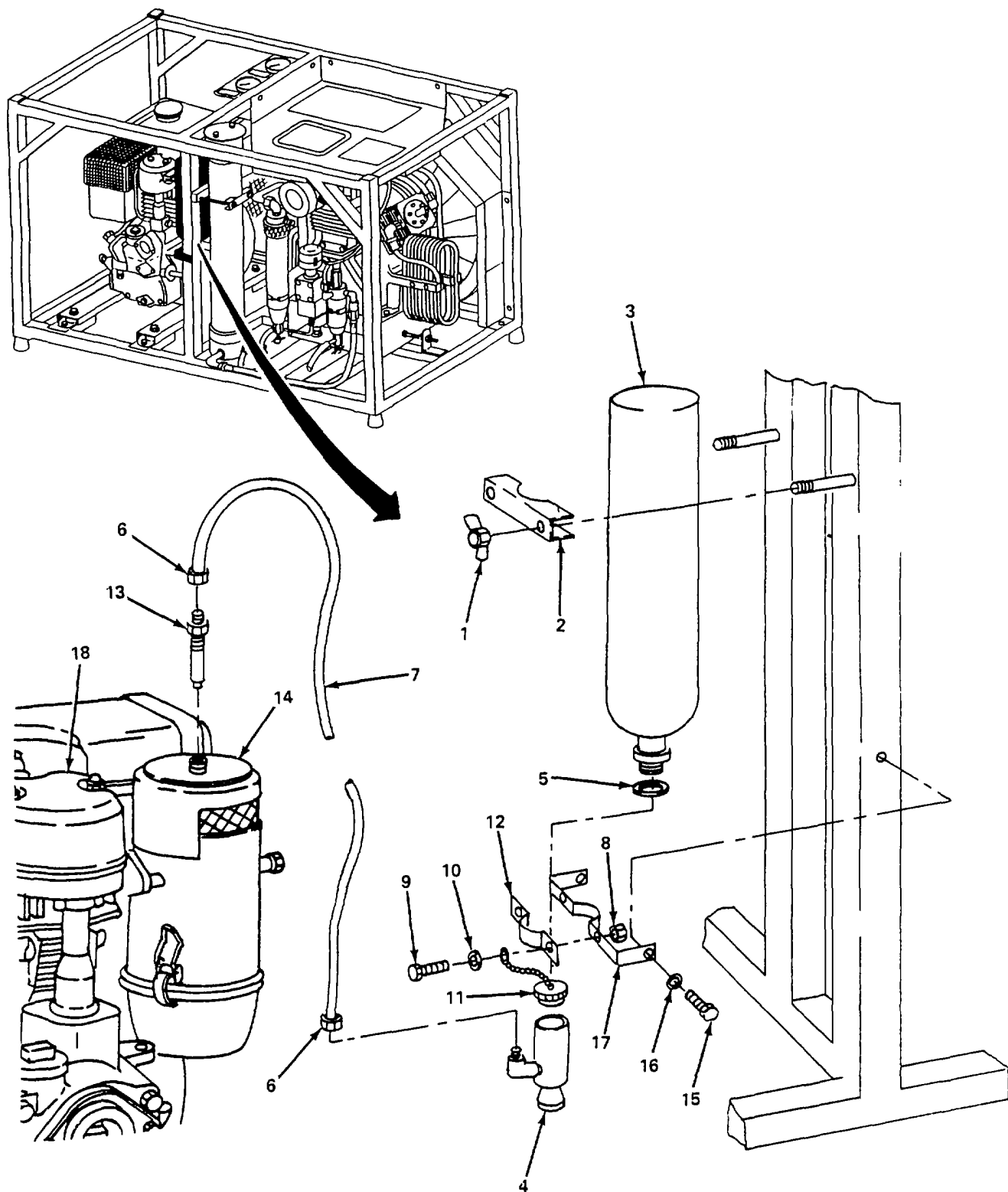


Figure 4-33. Cold Start Assembly, Replace.

---

**4-33. Frame.**

---

**This task covers: a. Repair**

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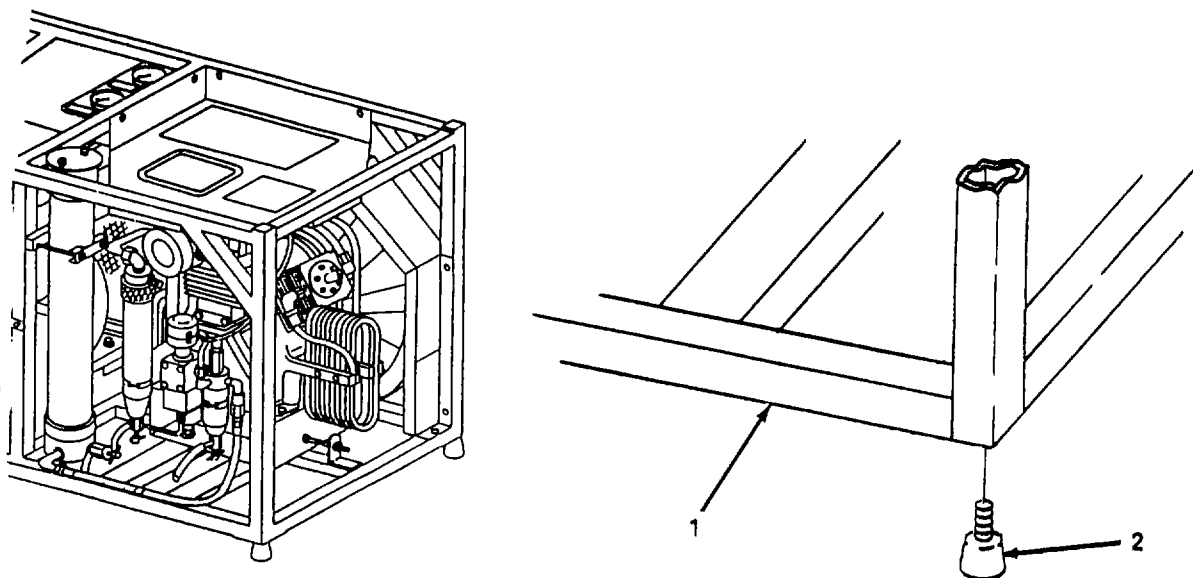
**INITIAL SETUP***Tools**Materials/Parts*

General Mechanic's Tool Kit (NSN 5180-00-177-7033) Rubber Foot  
Plastic Plug

---

Repair.

- (1) *Replace rubber foot.* (figure 4-34)
  - (a) Support end of air compressor frame (1) to be worked on.
  - (b) Remove rubber foot (2) from frame (1).
  - (c) Install new rubber foot (2).
  - (d) Remove supports from frame (1).



**Figure 4-34. Rubber Foot, Replace.**

(2) *Replace plug.* (figure 4-35)

(a) Remove plug (1) from frame (2).

(b) Install new plug (1)

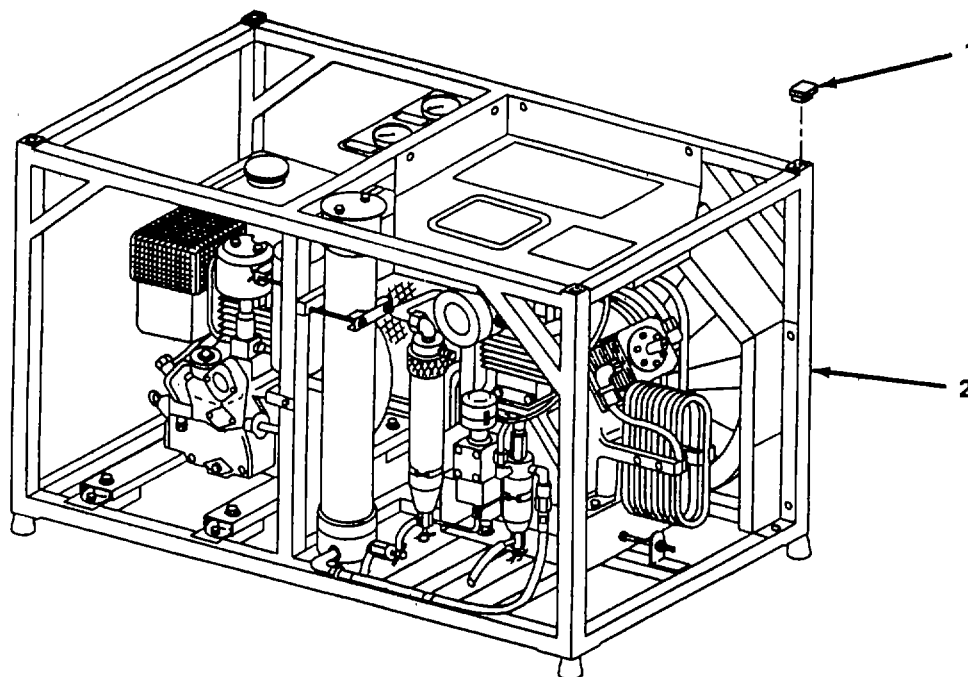


Figure 4-35. Plug, Replace



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**4-34. Shock Mounts.**

---

**This task covers:****a. Replace**

---

**INITIAL SETUP***Tools**Equipment Condition*

General Mechanic's Tool Kit (NSN 5180-00-177-7033) Engine removed (para. 4-23).

*Materials/Parts*Shock Mount

---

Replace. (figure 4-36)

- (1) Remove two nuts (1), bolts (2), washers (3), support bracket (4), and two springs (5).
- (2) Remove two nuts (6), washers (7), and bolts (8) and remove shock mount (9).
- (3) Repeat steps 1 and 2 for remaining shock mounts.
- (4) Install shock mount (9) and secure with two bolts (8), washers (7) and nuts (6).
- (5) Install two springs (5), support bracket mount (4) and secure with two washers (3), bolts (2), and nuts (1).
- (6) Repeat steps 4 and 5 for remaining shock mounts.

**FOLLOW-ON MAINTENANCE**

Install engine (para. 4-23).

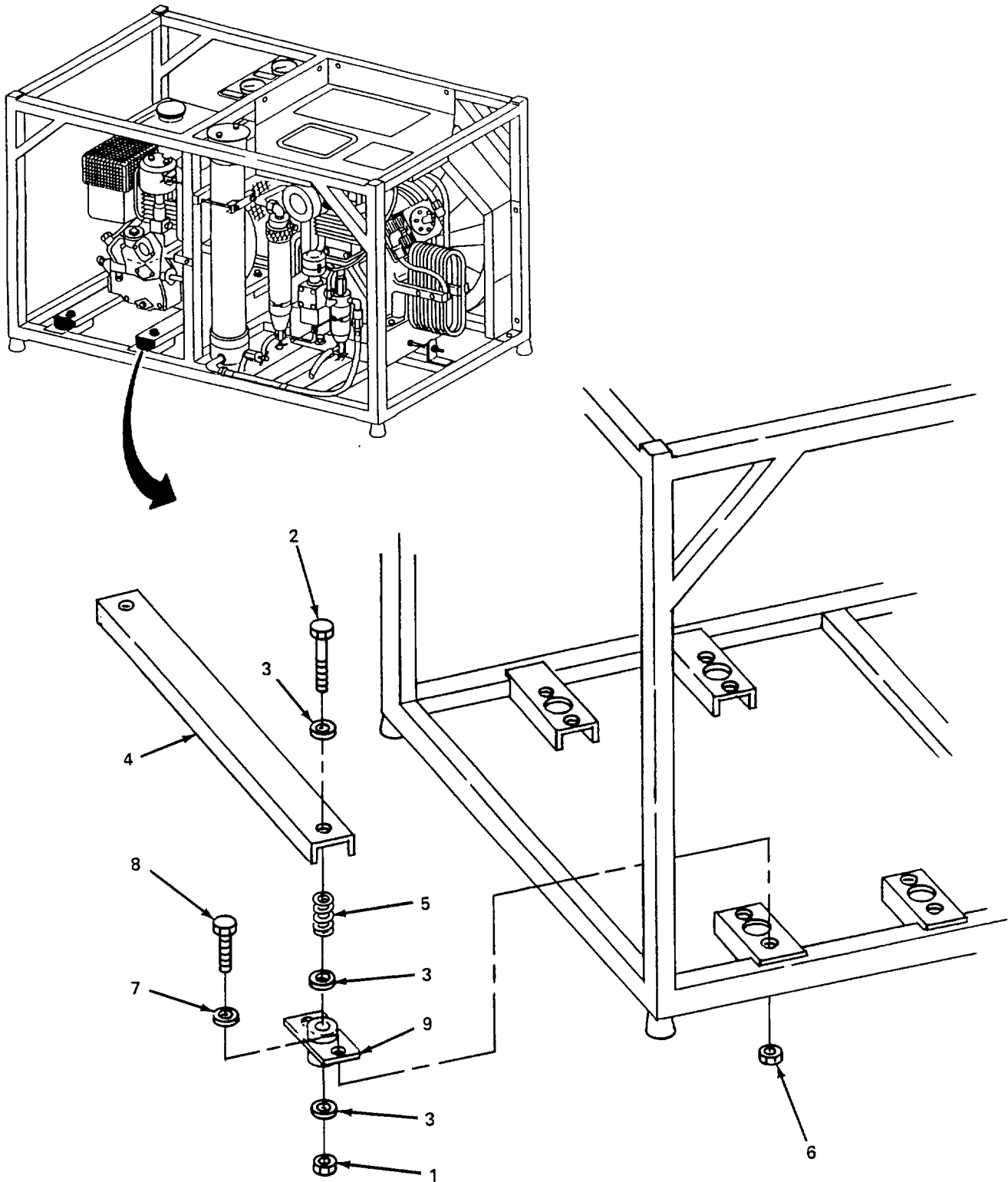


Figure 4-36. Shock Mounts, Replace.

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**4-35. Support Brackets.**

---

**This task covers:****a. Replace**

---

**INITIAL SETUP***Tools**Equipment Condition*

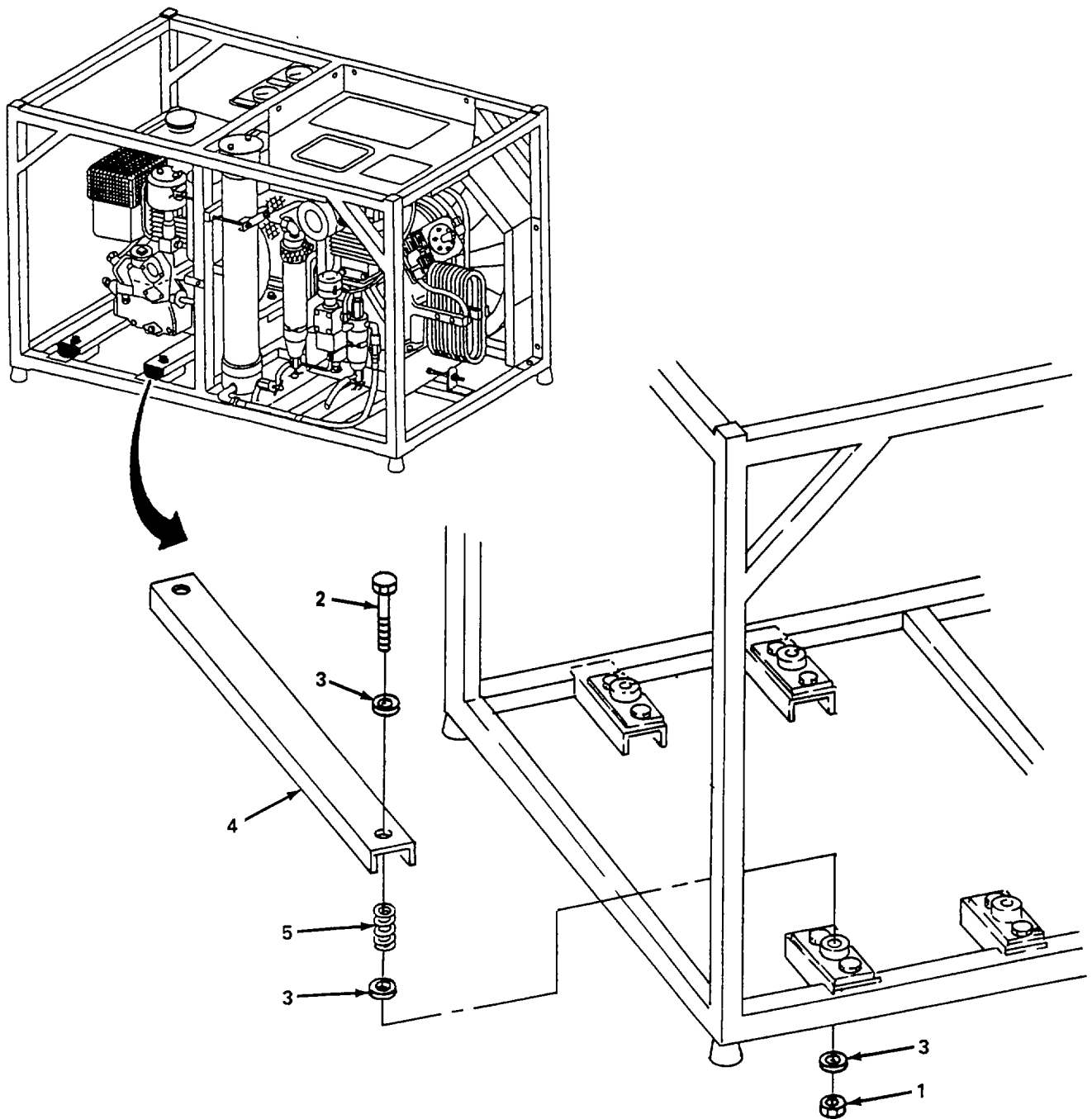
General Mechanic's Tool Kit (NSN 5180-00-177-7033) Engine removed (para. 4-23).

*Materials/Parts*Support Bracket

---

*Replace.* (figure 4-37)

- (1) Remove two nuts (1), bolts (2), six washers (3), support bracket (4) and two springs (5).
- (2) Install new support bracket (4) and two springs (5) and secure with two bolts (2), six washers (3) and two nuts (1).



**Figure 4-37. Support Bracket, Replace.**

FOLLOW-ON MAINTENANCE  
Install engine (para. 4-23).

**Section VI. UNIT LEVEL CLEANING PROCEDURE FOR DIVING LIFE SUPPORT AIR SYSTEMS**

Paragraph		Page
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4-38	Clean Area .....	4-78
4-39	Removing and Installing System Components or Piping .....	4-78
4-40	Pre-Cleaning of Components or Piping .....	4-79
4-41	Cleaning Method - Non-Ionic Detergent.....	4-80
4-42	Cleaning Method - Trisodium Phosphate (TSP) .....	4-81
4-43	Cleaning Component Soft Goods .....	4-83
4-44	Hydrocarbon Inspection and Analysis .....	4-85
4-45	Documentation and Record Keeping .....	4-86

4-36. **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.

4-37. **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.

4-38. **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.

4-39. **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.

4-40. **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.

4-41. **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 4-43.
  - (2) Clean each component by scrubbing with a non-ionic detergent solution 1/2 teaspoon (2.4 mL) 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 (14.7 mL) 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.

4-42. **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 (14.7 mL) 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 4-43) 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 <sup>3</sup> )
3/8 (1.0 cm)	1.3 cubic inches (21.7 cm <sup>3</sup> )
1/2 (1.3 cm)	2.4 cubic inches (38.6 cm <sup>3</sup> )
3/4 (1.9 cm)	5.3 cubic inches (86.9 cm <sup>3</sup> )
1 (2.5 cm)	9.4 cubic inches (154.5 cm <sup>3</sup> )
1-1/2 (3.8 cm)	21.2 cubic inches (347.6 cm <sup>3</sup> )
2 (5.1 cm)	37.7 cubic inches (617.9 cm <sup>3</sup> )

- (2) Prepare a solution at a ratio of 2 pounds (0.9 kg) of TSP, 0.5 ounces (14.7 mL) 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 4-41.

4-43. **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 4-41.

**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-1-735A
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	4 X	X	X
Polyvinyl Chloride	X	X	X	X
Surlyn A	X		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.

#### 4-44. 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.

#### 4-45. 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 VII. PREPARATION FOR STORAGE OR SHIPMENT**

Paragraph		Page
4-46	General .....	4-87
4-47	Short Term Storage .....	4-87
4-48	Long Term Storage .....	4-88
4-49	Preparation for Shipment .....	4-89

4-46. **General.** This section contains procedures to prepare and place the compressor into short term storage. Instructions and procedures are also provided to prepare the equipment for shipment.

4-47. **Short Term Storage.** Short term storage of the compressor, that is storage of about 6 months or less, may be accomplished by performing the following steps.

**WARNING**

All work performed on the compressor must be accomplished only while the unit is depressurized.

- a. Run the compressor at operating pressure and temperature for approximately 10 minutes.
- b. Check the unit for leaks at all pipe connections, filter, purifier, separator and valves. Tighten couplings and connections as required.
- c. After 10 minutes of operation, open the fill valve and allow the compressed air to escape to the atmosphere. The compressor will then be maintained at about 2000 PSIG (138 BAR) by the pressure maintaining valve.
- d. Shut down the unit after five more minutes of operation and drain off the filter, purifier and separator by opening their condensate cocks. Close the cocks after compressor has been reduced to zero pressure.
- e. Unscrew separator collars and apply a thin film of silicone grease to the male threads on the separator cover and reinstall collar.
- f. Remove top plug from purifier cylinder. Coat threads and preformed packing seals with a thin coat of halo carbon grease. Notify direct support maintenance to replace the purifier cartridge.
- g. Service engine oil bath air cleaner (para. 4-26).
- h. Install new compressor inlet air cleaner element (para. 4-18).
- i. Remove prefilter hose and seal opening in air filter housing with plastic bags and secure with tape (Items 3 and 22, Appendix E).
- j. Drain fuel from fuel tank. Spray interior of tank with a small quantity of preservation oil.
- k. Change engine oil (para. 4-23).
- l. Change compressor oil (para. 4-16).

- m.* Loosen drivebelt tension (para. 4-14).
- n.* Seal all openings in air compressor and engine.
- o.* Clean dirt and debris from engine cooling fins.
- p.* Store air compressor in a dry, dust-free room and cover with a plastic film that does not "sweat". Remove cover from time to time and clean off the unit.

4-48. **Long Term Storage** Long term storage of the compressor, that is storage without time limit, may be accomplished only by means of the following special Instructions:

- a.* Run the compressor at operating pressure and temperature for approximately 10 minutes.
- b.* Check the unit for leaks at all pipe connections, filter purifier, separator and valves. Tighten couplings and connections as required.
- c.* After 10 minutes of operation, open the fill valve and allow the compressed air to escape to the atmosphere. The compressor will then be maintained at about 2000 PSIG (138 BAR) by the pressure maintaining valve.
- d.* Shut down the unit after five more minutes of operation and drain off the filter, purifier and separator by opening their condensate cocks. Close the cocks after compressor has been reduced to zero pressure.
- e.* While still warm, drain compressor crankcase and refill with the proper lubricating oil as specified in table 3-1.
- f.* While still warm, drain engine crankcase and refill with preservative P-10, grade 10.
- g.* Start compressor and run under load for about 5 minutes to circulate the proper lubricating oil.
- h.* Spray about one fluid ounce of preservative P-9 into the engine air Inlet.
- i.* Shut down the compressor.
- j.* Loosen drive belts in accordance with paragraph 4-14.
- k.* Apply primer TT-P-664 to the groove surfaces of both the engine and compressor pulleys.

#### NOTE

Do not rotate either engine or compressor after the primer has been applied.

- l.* Unscrew separator collar nut and apply a thin film of silicone grease to the male threads on the separator cover. Reinstall collar nut.
- m.* Remove top plug from purifier cylinder. Coat threads and preformed packings with a thin coat of silicone grease. Have direct support maintenance replace purifier cartridge.
- n.* Install new compressor inlet air cleaner element (para. 4-17).

- o.* Remove prefilter hose. Seal opening in air filter housing with tape (Item 22, Appendix E).
- p.* Service engine inlet air cleaner and refill with preservatives P-10, grade 10 in lieu of engine oil.
- q.* Seal engine air cleaner inlet with tape (Item 22, Appendix E).
- r.* Drain all fuel from engine fuel tank. Spray interior of fuel tank with 2 to 3 fluid ounces of preservative P-10, grade 30.
- s.* Clean dirt and debris from compressor cooling fins.
- t.* Apply preservation P-9 to the exterior surfaces of the engine exhaust manifold, pipe and muffler.
- u.* Tag engine with a red tag stating "Caution: Crankcase filled with preservative P-10. Drain and refill with proper lubricating oil prior to use."
- v.* Store in a dry, dust-free room and cover with a plastic film that does not "sweat". Remove cover from time to time and clean off the unit.

**4-49. Preparation for Shipment.**

- a.* Boxed or Crated Shipment.
  - (1) Prepare the unit for storage in accordance with paragraph 4-47 and 4-48.
  - (2) Box or crate the complete unit in accordance with local packaging procedures.
- b.* Uncrated Shipment. The compressor may be shipped by securing the unit directly to the load surface of a vehicle such as a truck. The units should be lifted and tied down in accordance with figure 4-38. The approximate center of gravity of the unit is shown in figure 4-39.



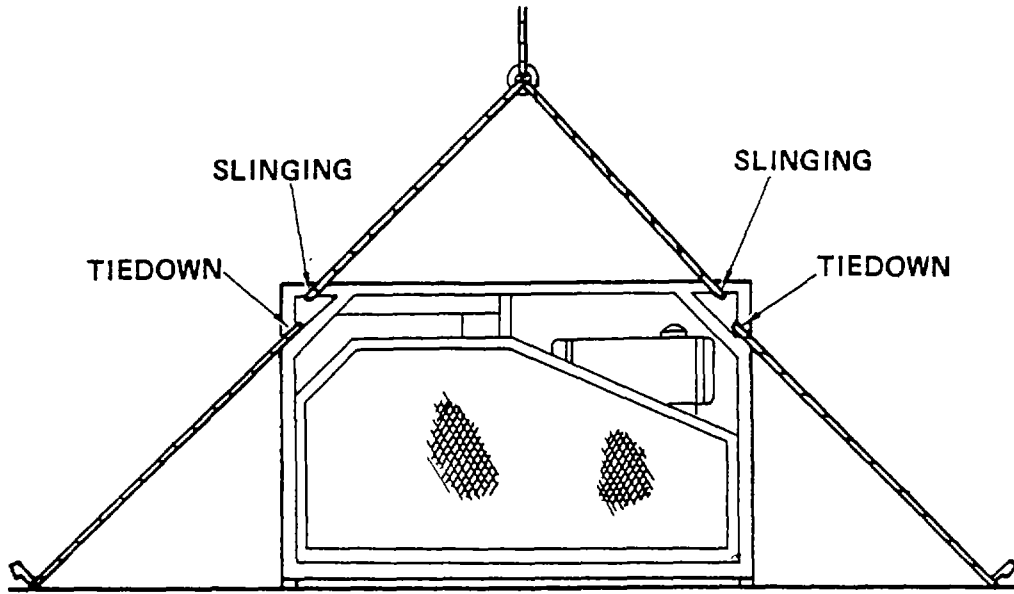


Figure 4-38. Compressor Unit Sling and Tie Down Arrangement.

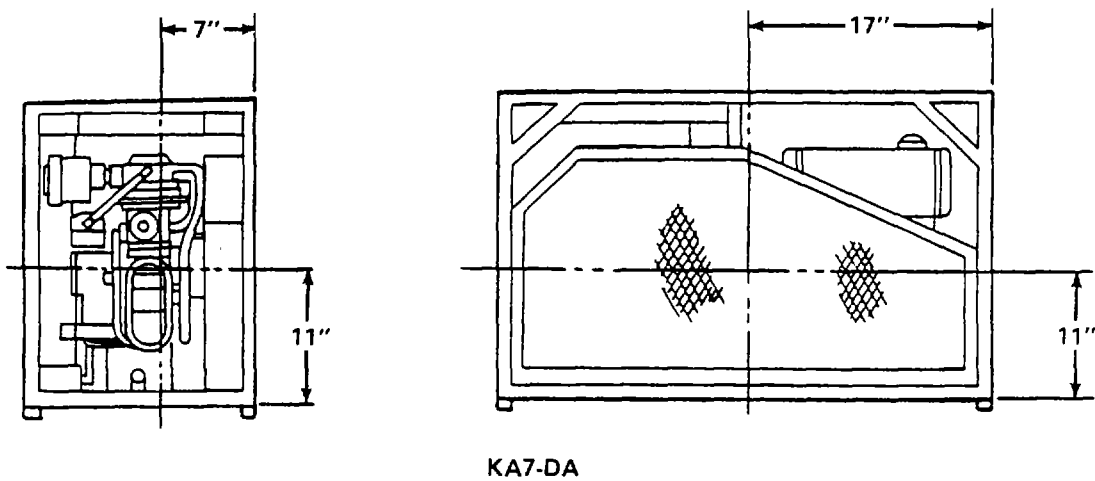


Figure 4-39. Compressor Unit Center of Gravity.

CHAPTER 5

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

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 Procedures .....	5-1
Section III. Direct Support Maintenance Instructions .....	5-7

OVERVIEW

This chapter contains information for troubleshooting and maintenance of the air compressor 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 Equipment .....	5-1
5-2	Special Tools, TMDE, 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, TMDE, and Support Equipment.** For a listing of special tools and support equipment authorized for use on this equipment, refer to the Repair Parts and Special Tools List for this equipment, and refer to 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 Air Compressor, TM 5-4310-387-24P.

**Section II. DIRECT SUPPORT TROUBLESHOOTING PROCEDURES**

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. Tests or inspections are provided to isolate the faulty component and corrective actions are provided to eliminate the malfunction.

5-5. **Direct Support Troubleshooting Procedures.** Refer to symptom index to locate the troubleshooting procedure for the observed malfunction. Table 5-1 lists malfunctions that may occur during operation or maintenance of the air compressor. Tests, inspections, and corrective actions should be performed in the order listed. If a malfunction beyond the scope of direct support maintenance is discovered, refer the malfunction to general support maintenance.

**NOTE**

This table is not intended to cover every possible symptom, but is rather a list of the more frequent problems and some of their causes.

**SYMPTOM INDEX**

Symptom	Page
1.Engine does not start .....	5-2
2.Engine runs unevenly: low output .....	5-3
3.Engine races .....	5-3
4.Engine exhaust emits excessive blue smoke.....	5-3
5.Engine runs hot .....	5-4
6.Excessive oil consumption .....	5-4
7.Unusual engine knocks and noises .....	5-4
8.Compressor noisy .....	5-4
9.Compressor pressure low .....	5-5
10. Compressor output volume low .....	5-5

**Table 5-1. Direct Support Troubleshooting Procedures.**

---

<b>MALFUNCTION</b>	<b>TEST OR INSPECTION</b>	<b>CORRECTIVE ACTION</b>
--------------------	---------------------------	--------------------------

---

**1. ENGINE DOES NOT START.**

- Step 1. Test for low compression.
  - Proceed to step 2 if compression is low.
- Step 2. Inspect valves condition.
  - Replace worn valves (para. 5-29).
- Step 3. Inspect head gasket for ruptured (blown) condition.
  - Replace blown gasket (para. 5-29).
- Step 4. Test for faulty fuel injector and feed rate of pump.
  - Replace faulty fuel injector (para. 5-27).

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

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

**1. ENGINE DOES NOT START (CONT)**

Step 5. Check fuel injector pump

Adjust/tune or replace a faulty pump (para. 5-28).

**2. ENGINE RUNS UNEVENLY: LOW OUTPUT.**

Step 1. Inspect injection pump for excessive wear, also test for correct timing.

Replace worn pump or adjust timing as necessary (para. 5-28).

Step 2. Check fuel injector.

Replace a faulty fuel injector (para. 5-27).

Step 3. Check speed control assembly.

Replace damaged speed control assembly (para. 5-30).

**3. ENGINE RACES.**

Inspect speed control assembly.

Replace damaged speed control assembly (para. 5-30).

**4. ENGINE EXHAUST EMITS EXCESSIVE BLUE SMOKE.**

Step 1. Inspect for worn valves and valve guides.

Replace worn valves and guides (para. 5-29).

Step 2. Inspect cylinder.

Replace a damaged or worn cylinder (para. 5-33).

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

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

**5. ENGINE RUNS HOT.**

Step 1. Inspect fuel injector for defects.

Replace defective fuel injector (para. 5-27).

Step 2. Test injection pump for erratic feed rate.

Adjust/time or repair pump (para. 5-28).

**6. EXCESSIVE OIL CONSUMPTION.**

Step 1. Inspect cylinder walls for a scratched or scuffed condition.

Replace a worn or damaged cylinder (para. 5-33).

Step 2. Check cylinder head valve guides.

Replace or repair damaged cylinder head (para. 5-29).

**7. UNUSUAL ENGINE KNOCKS AND NOISES.**

Step 1. Inspect pulley for loose mounting hardware.

Tighten loose hardware (para. 5-26).

Step 2. Inspect flywheel for loose mounting bolts.

Tighten mounting bolts (para. 5-35).

Step 3. Inspect injection pump for incorrect timing.

Adjust/time injection pump (para. 5-28).

**8. COMPRESSOR NOISY.**

Step 1. Inspect for loose fanwheel.

Tighten fanwheel (para. 5-11).

Step 2. Check oil pump.

Replace damaged oil pump (para. 5-21).

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

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

**9. COMPRESSOR PRESSURE LOW.**

- Step 1. Check second stage separator safety valve.  
 Replace faulty safety valve (para. 5-13).
- Step 2. Check final separator safety valve.  
 Replace faulty safety valve (para. 5-15).
- Step 3. Check second stage cylinder head safety valve.  
 Replace faulty safety valve (para. 5-24).
- Step 4. Check first stage valve head and valve assembly.  
 Replace or repair first stage valve assembly (para. 5-22).
- Step 5. Check second stage valve head assembly.  
 Replace or repair second stage valve head assembly (para. 5-23).
- Step 6. Check third stage valve head assembly.  
 Replace or repair third stage valve head assembly (para. 5-25).

**10. COMPRESSOR OUTPUT VOLUME LOW.**

- Step 1. Check purifier assembly.  
 Service purifier assembly (para. 5-9).
- Step 2. Check second stage separator assembly.  
 Service second stage separator assembly (para. 5-12).
- Step 3. Check fuel separator assembly.  
 Service fuel separator assembly (para. 5-14).
- Step 4. Check air tank charging whip assembly.  
 Repair or replace a damaged air tank charging whip assembly (para. 5-38).

---

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

---

**10. COMPRESSOR OUTPUT VOLUME LOW (CONT)**

Step 5. Check second stage safety valve.

Replace faulty safety valve (para. 5-13).

Step 6. Check final separator safety valve.

Replace faulty safety valve (para. 5-15).

Step 7. Check second stage cylinder head safety valve.

Replace faulty safety valve (para. 5-24).

Step 8. Check first stage valve head and valve assembly.

Replace or repair first stage valve assembly (para. 5-22).

Step 9. Check second stage valve head assembly.

Replace or repair second stage valve head assembly (para. 5-23).

Step 10. Check third stage valve head assembly.

Replace or repair third stage valve head assembly (para. 5-25).

---

## Section III. DIRECT SUPPORT MAINTENANCE PROCEDURES

Paragraph		Page
5-6	General.....	5-7
5-7	Gages .....	5-8
5-8	Gage Panel .....	5-10
5-9	Purifier Assembly .....	5-12
5-10	Air Compressor .....	5-18
5-11	Fanwheel Assembly .....	5-20
5-12	Second Stage Separator Assembly .....	5-22
5-13	Safety Valve .....	5-28
5-14	Final Separator Assembly .....	5-30
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5-16	First Stage Intercooler Coil .....	5-36
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5-19	Lines and Fittings .....	5-42
5-20	Oil Pressure Regulator .....	5-56
5-21	Oil Pump .....	5-60
5-22	First Stage Valve Head and Valve Assembly .....	5-62
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5-24	Safety Valve .....	5-70
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5-26	Sheave (Pulley) .....	5-78
5-27	Fuel Injector .....	5-80
5-28	Fuel Injection Pump .....	5-84
5-29	Engine Cylinder Head Assembly .....	5-88
5-30	Speed Control Assembly .....	5-96
5-31	Compression Release Assembly .....	5-100
5-32	Gear Cover Assembly .....	5-102
5-33	Cylinder .....	5-104
5-34	Oil Pump Assembly .....	5-106
5-35	Flywheel .....	5-108
5-36	Fanwheel .....	5-110
5-37	Pressure Maintaining Valve .....	5-112
5-38	Air Tank Charging Whip Assembly .....	5-116
5-39	Frame .....	5-120

5-6. **General.** This section contains the direct support maintenance procedures for the 5.1 CFM air compressor as authorized by the maintenance allocation chart in Appendix B of this manual. Disassemble the compressor unit only to the extent necessary to service, repair or replace a defective component of the compressor. Ensure all tools and parts are clean and free of oil, dirt, grease, rust, or other contaminants when performing maintenance on air compressor. After working on engine assembly clean all tools thoroughly before performing maintenance on air compressor. Contaminants in the air system can be extremely hazardous to diving personnel.



---

5-7. **Gages.**

**This task covers:    Replace**

---

**INITIAL SETUP**

<i>Tools</i>	<i>Equipment Condition</i>
<i>General Mechanic's Tools Kit (NSN 5180-00-177-7033)</i>	Compressor unit shutdown and depressurized (para. 2-12).
<i>Materials/Parts</i>	<i>Reference</i>
Pressure Gages	
Tape, Teflon (Item 23, Appendix E)	Cleaning Procedures, Chapter 4, Section VI.
Bags, Plastic (Item 3, Appendix E)	
Bands, Rubber (Item 4, Appendix E)	
Tape, Adhesive (Item 22, Appendix E)	

---

Replace. (figure 5-1)

**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 VI 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 pressure gages mounted to the gage panel. The maintenance procedures are the same for both.

- (1) Loosen two connector nuts (1) and remove line (2).
- (2) Remove two nuts (3), brackets (4), and gage (5).
- (3) Remove elbow and union (6) from gage (5).

**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.

- (4) Apply teflon tape to threads on gage (5).
- (5) Install elbow and union (6) on gage (5).
- (6) Install gage (5) and secure with two brackets (4) and nuts (3).
- (7) Apply teflon tape to threads on union (6).
- (8) Install line (2) and tighten two connector nuts (1).

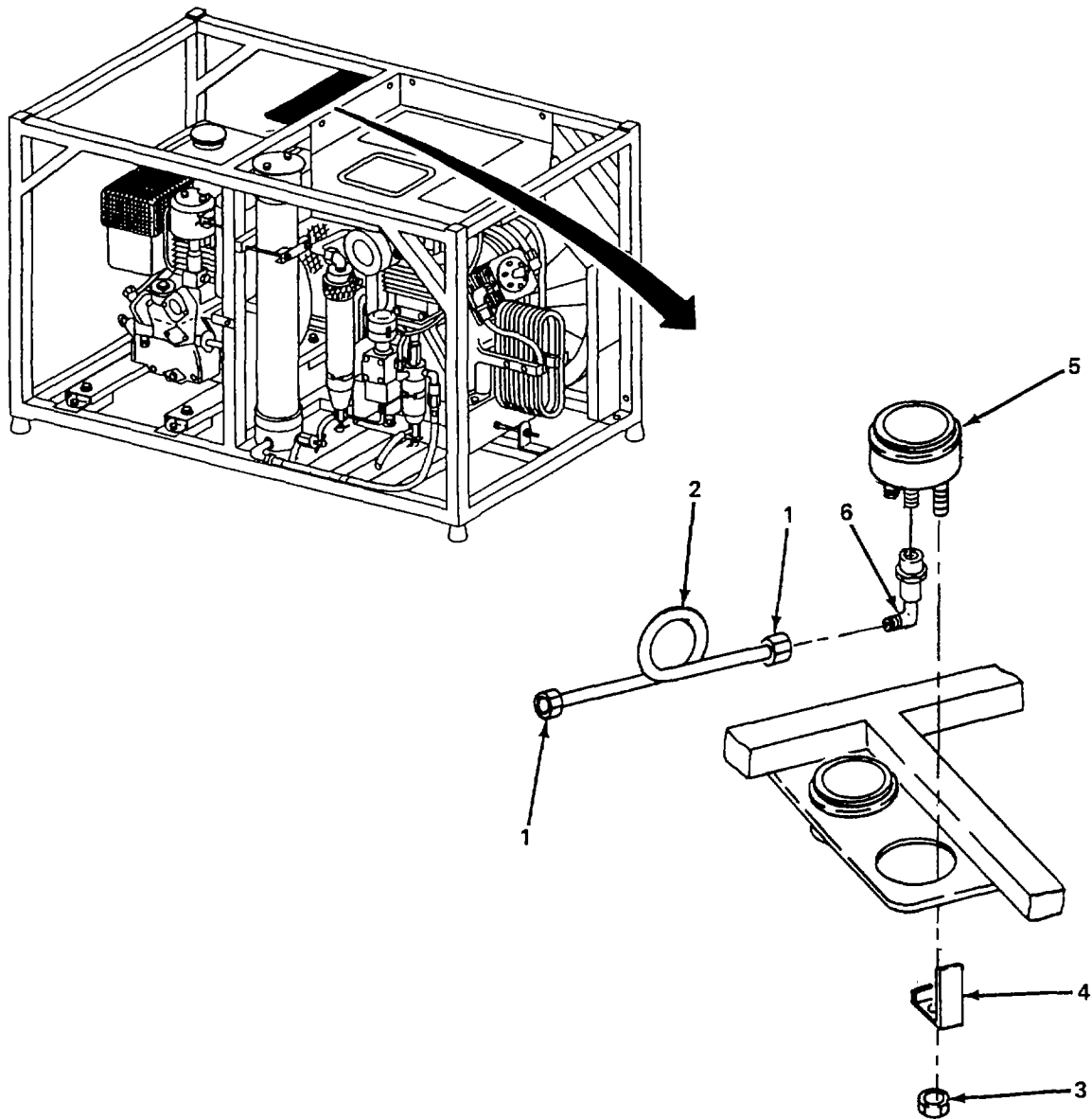


Figure 5-1. Pressure Gages, Replace.

---

**5-8. Gage Panel.**

---

**This task covers:    Replace**

---

**INITIAL SETUP***Tools**Equipment Condition*

General Mechanic's Tools Kit (NSN 5180-00-177-7033) Gages removed (para. 5-7).

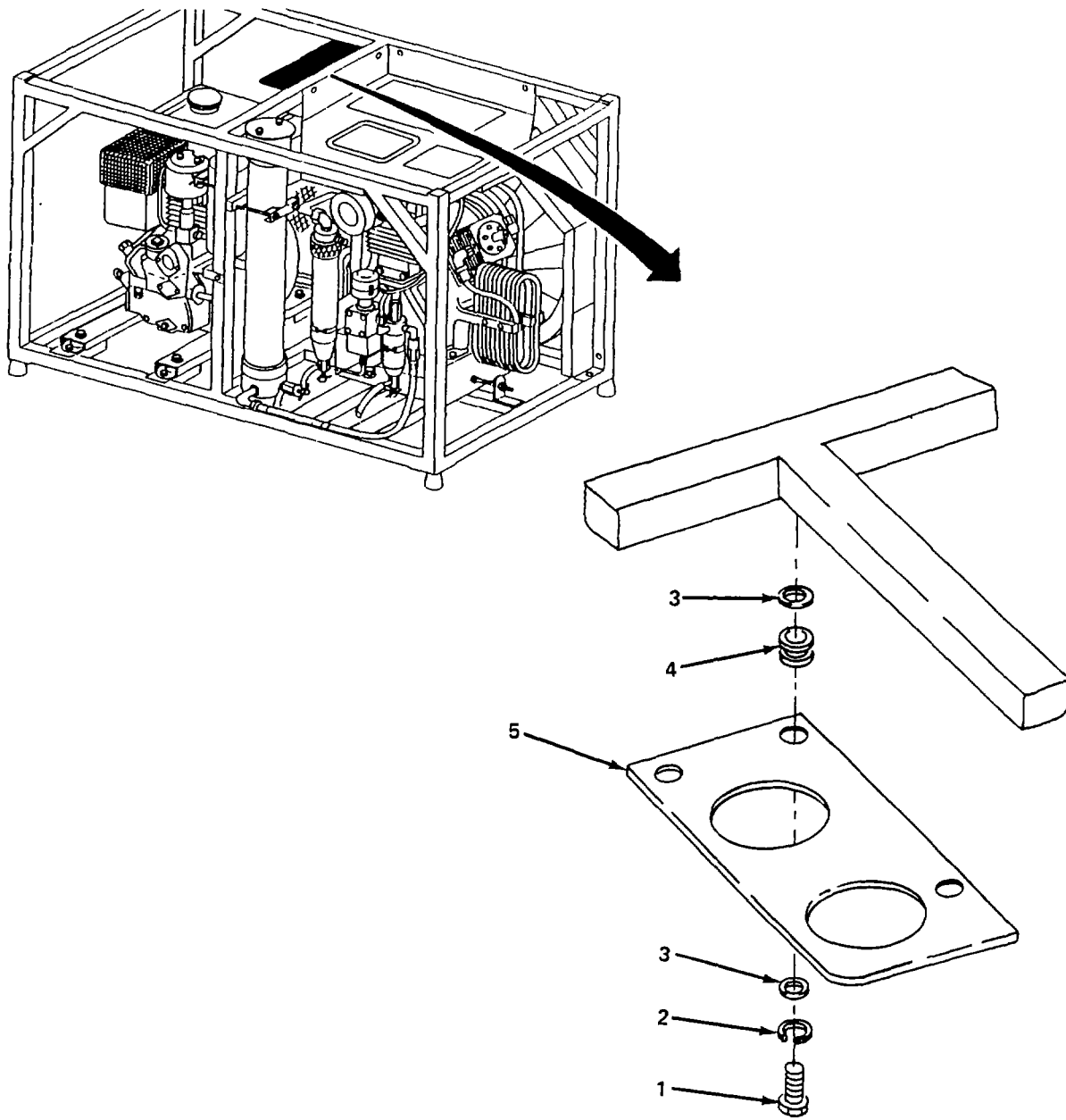
*Materials/Parts*

Panel

---

*Replace.* (figure 5-2)

- (1) Remove three bolts (1), lockwashers (2), flat washers (3), grommets (4), and panel (5).
- (2) Install three lockwashers (2), flat washers (3), and grommets (4) on bolts (1) and insert them into panel (5).
- (3) Install panel (4) and secure with three bolts (1).



**Figure 5-2. Gage Panel, Replace.**

FOLLOW-ON MAINTENANCE  
Install pressure gages (para. 5-7)

---

5-9. **Purifier Assembly.**

---

This task covers:

a. **Service**

b. **Replace**

c. **Repair**

---

**INITIAL SETUP**

*Tools*

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

*Materials/Parts*

Purifier Assembly  
 Purifier Cartridge  
 Cloth, Lint Free (Item 8, Appendix E)  
 Grease, Halo Carbon (Item 14, Appendix E)  
 Bags, Plastic (Item 3, Appendix E)  
 Preformed Packing

*Materials/Parts (Cont)*

Bands, Rubber (Item 4, Appendix E)  
 Tape, Pressure Sensitive (Item 22, Appendix E)

*Equipment Condition*

Compressor unit shutdown (para. 2-12).

*Reference*

Cleaning Procedures, Chapter 4, Section VI.

---

a. Service. (figure 5-3)

- (1) Open drain valve (1) and remove pressure from air system.

**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 VI 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 cap (2), preformed packing (3), backup ring (4) and purifier cartridge (5). Discard preformed packing (3).

**WARNING**

**Do not touch new purifier cartridge with bare hand. Use a clean lint free cloth to install purifier cartridge.**

- (3) Install purifier cartridge (5).
- (4) Perforate seal on top of cartridge (5).
- (5) Apply halo carbon grease to preformed packings.
- (6) Install backup ring (4) and new preformed packing (3) and secure with cap (2).
- (7) Close valve (1).

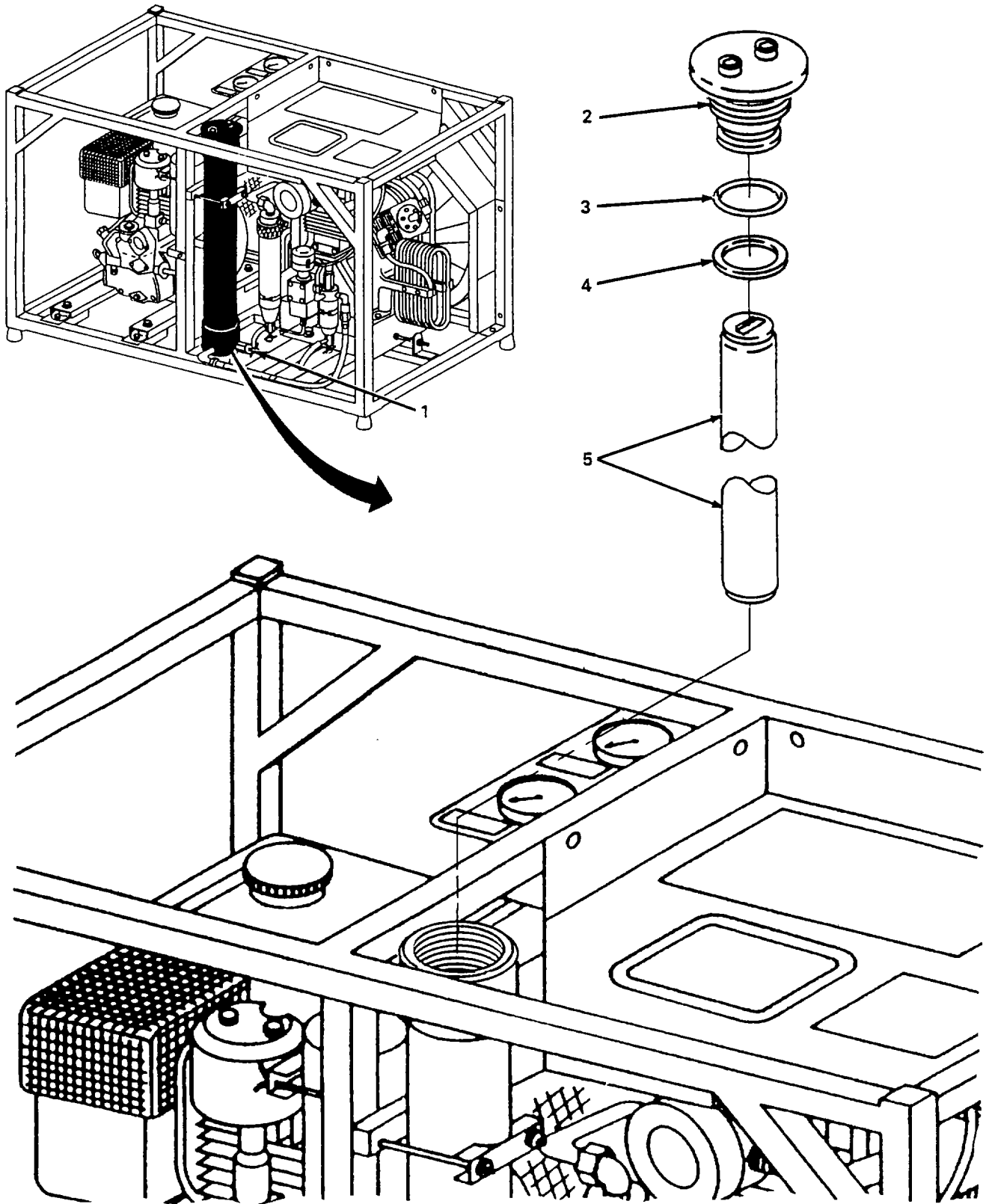


Figure 5-3. Purifier Assembly, Service.

## 5-9. Purifier Assembly (Cont).

b. Replace. (figure 5-4)

**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 VI 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) Open drain valve (1) and relieve pressure.
- (2) Loosen connector nut (2) and disconnect line (3).
- (3) Loosen connector nut (4) and disconnect line (5).
- (4) Remove two bolts (6) and lockwashers (7).
- (5) Remove two wing nuts (8) and bracket (9).
- (6) Remove purifier assembly (10), two grommets (11), and bracket (12).
- (7) Remove drain valve (1), elbow (13), and elbow (14).
- (8) Install elbow (14), elbow (13), and drain valve (1) on new purifier assembly (10).
- (9) Install two grommets (11), bracket (12), and purifier assembly (10) and secure with bracket (9) and two wing nuts (8).
- (10) Install two bolts (6) and lockwashers (7).
- (11) Connect line (5) and tighten connector nut (4).
- (12) Connect line (3) and tighten connector nut (2).
- (13) Close drain valve (1).

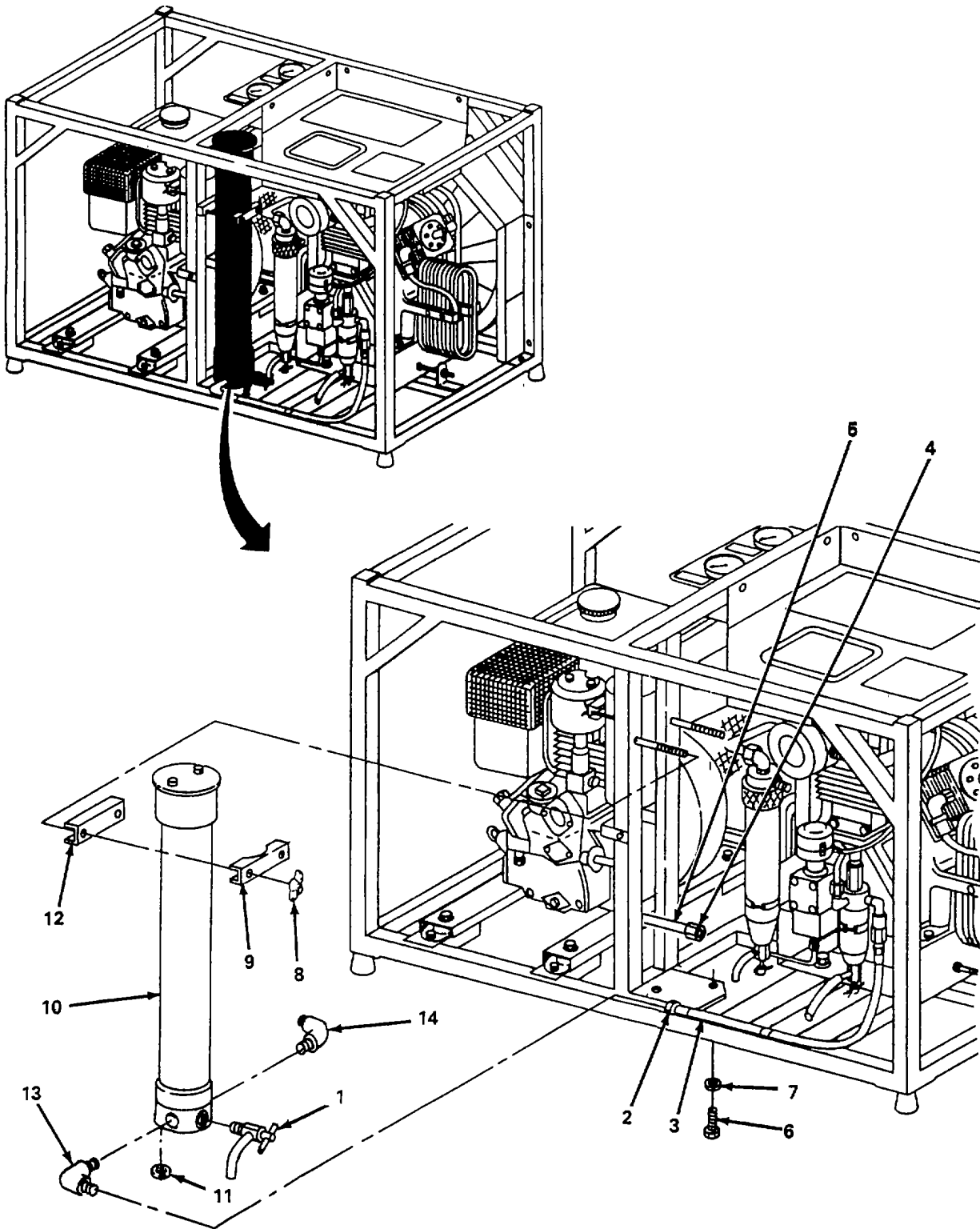


Figure 5-4. Purifier Assembly, Replace.



## 5-9. Purifier Assembly (Cont).

c. *Repair.* (figure 5-5)**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 VI 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 purifier assembly (para. b.).
- (2) Unscrew cylinder (1) from base (2) and remove preformed packing (3), backup ring (4), and purifier piston (5).
- (3) Remove cap (6) from cylinder (1).
- (4) Remove two bolts (7) and plate (8) from cap (6).
- (5) Inspect cylinder (1) and replace if cracked or threads are stripped.
- (6) Inspect base (2) and replace if threads are stripped.
- (7) Inspect cap (6) and replace if threads are stripped.
- (8) Inspect purifier piston (5) and replace if cracked, scored, worn, or otherwise damaged.
- (9) Discard preformed packings (3) and (10):
- (10) Inspect backup rings (4) and (9) and replace if bent or cracked.
- (11) Discard purifier cartridge (11).
- (12) Install plate (8) on cap (6) and secure with two bolts (7).
- (13) Apply halo carbon grease to new preformed packing (3).
- (14) Install backup ring (4), preformed packing (3), and base (2).
- (15) Install new purifier cartridge (11).
- (16) Install cap (6) on cylinder (1) and tighten.
- (17) Install purifier assembly (para. b.).

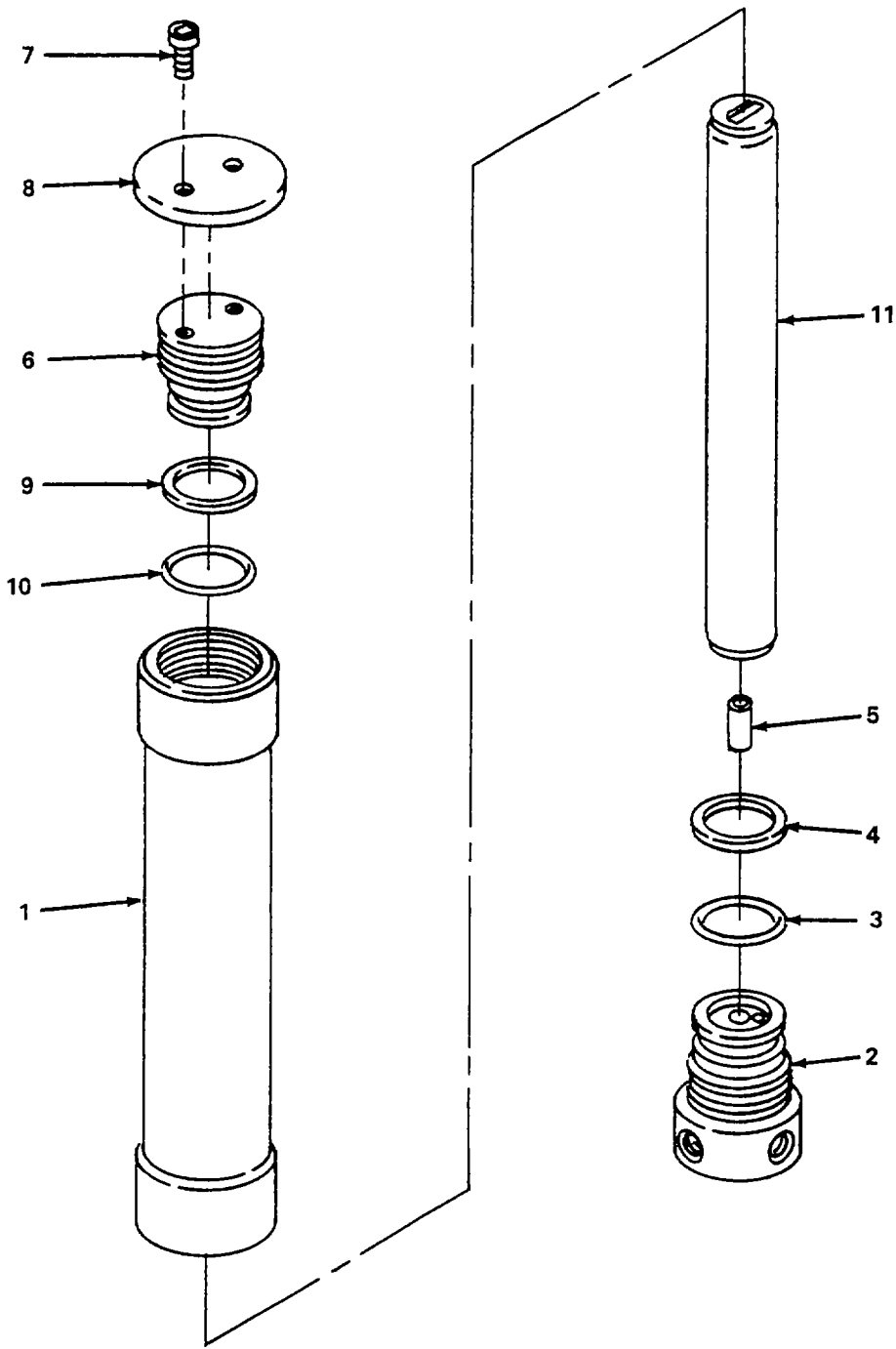


Figure 5-5. Purifier Assembly, Repair.

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**5-10. Air Compressor.**


---

**This task covers:**

**a. Replace**

---

**INITIAL SETUP**

*Tools*

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

*Materials/Parts*

Compressor  
 Bags, Plastic (Item 3, Appendix E)  
 Bands, Rubber (Item 4, Appendix E)  
 Tape, Pressure Sensitive (Item 22, Appendix E)

*Equipment Condition*

Compressor unit shutdown and depressurized (para. 2-12).  
 Drivebelt removed (para. 4-14).  
 Pre-filter and hose assembly removed (para. 4-18).  
 Storage tray removed (para. 4-15).

*Reference*

Cleaning Procedures, Chapter 4, Section VI.

---

Replace. (figure 5-6)

**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 VI 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.**

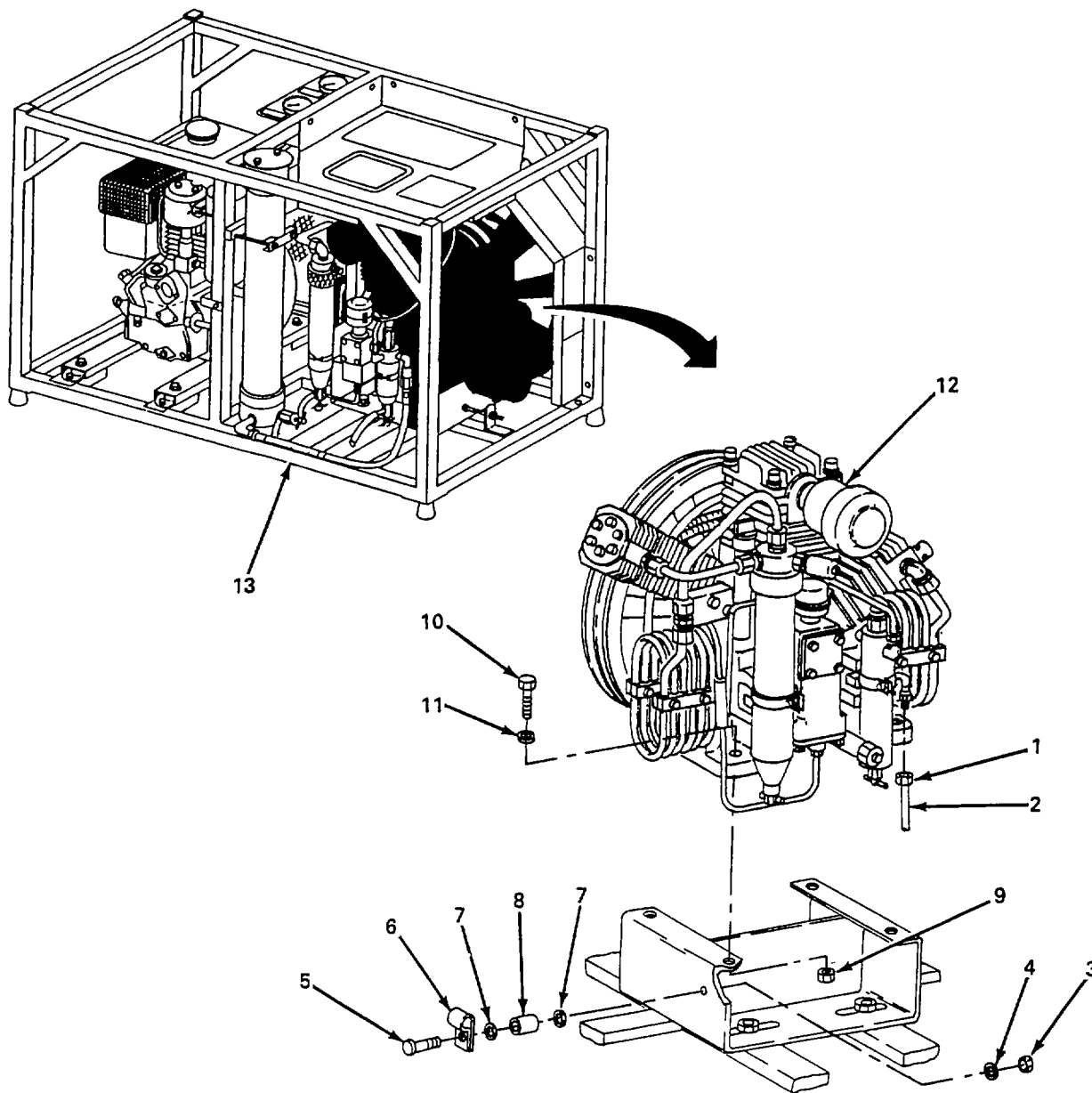
- (1) Loosen connector nut (1) and disconnect line (2).
- (2) Remove nut (3), lockwasher (4), screw (5), clamp (6), two washers (7), and spacer (8).
- (3) Remove four nuts (9), bolts (10), and flat washer (11) securing air compressor assembly (12).
- (4) Remove air compressor assembly (12) from frame (13).

**NOTE**

**Air compressor is heavy. Use a suitable lifting device to remove compressor from frame.**

- (5) Install new air compressor assembly (12) in frame (13) and secure with four bolts (10), flat washers (11) and nuts (9).
- (6) Connect line (2) and tighten connector nut (1).

- (7) Install clamp (6), two washers (7), and spacer (8) and secure with screw (5), nut (3), and lockwashers (4)



**Figure 5-6. Air Compressor, Replace.**

**FOLLOW-ON MAINTENANCE**

- (1) Install storage tray (para. 4-15).
- (2) Install pre-filter and hose assembly (para. 4-18).
- (3) Install drivebelt (para. 4-13).

---

**5-11. Fanwheel Assembly.**

---

**This task covers:****a. Replace**

---

**INITIAL SETUP***Tools*

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

*Materials/Parts*

Fanwheel Assembly

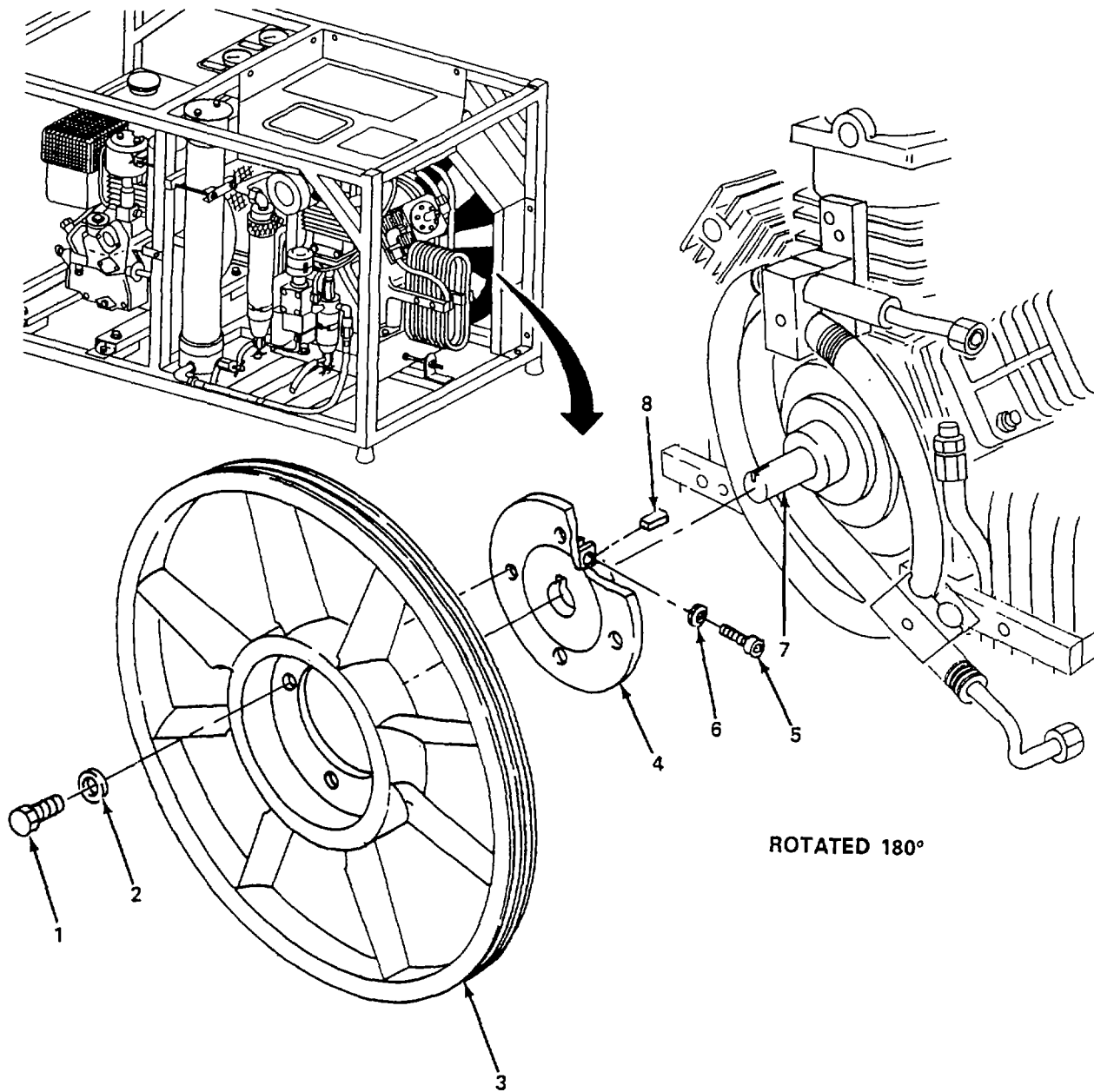
*Equipment Condition*

Compressor drive belt removed (para. 4-14).

---

**Replace.** (figure 5-7)

- (1) Remove four bolts (1) and washers (2), and remove fanwheel (3) from hub (4).
- (2) Remove pinch bolt (5) and washer (6) and remove hub (4) from crankshaft (7). Inspect hub (4) for damage and replace if needed.
- (3) Remove key (8) from crankshaft (7).
- (4) Insert key (8) in crankshaft (7).
- (5) Install hub (4) onto crankshaft (7) and secure with pinch bolt (5) and washer (6).
- (6) Install fanwheel (3) and secure with four bolts (1) and washers (2).



**Figure 5-7. Fanwheel Assembly, Replace.**

FOLLOW-ON MAINTENANCE  
Install compressor drive belt (para. 4-14).

---

**5-12. Second Stage Separator Assembly.**


---

This task covers:

**a. Replace**

**b. Repair**

---

**INITIAL SETUP**

*Tools*

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

*Materials/Parts*

Separator Assembly  
 Bags, Plastic (Item 3, Appendix E)  
 Preformed Packing  
 Grease, Halo Carbon (Item 14, Appendix E)  
 Tape, Teflon (Item 23, Appendix E)  
 Bands, Rubber (Item 4, Appendix E)  
 Tape, Pressure Sensitive (Item 22, Appendix E)

*Equipment Condition*

Compressor unit shutdown and depressurized (para. 2-12).

*Reference*

Cleaning Procedures, Chapter 4, Section VI.

---

- a. Replace. (figure 5-8)

**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 VI 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 two connector nuts (1) and remove discharge tube (2).
- (2) Loosen two connector nuts (3) and remove separator inlet tube (4).
- (3) Remove bolt (5) and nut (6) and remove separator (7) from compressor (8).
- (4) Remove bolt (9), plate (10) and remove clamp (11).
- (5) Remove safety valve (12) and seal (13).
- (6) Remove drain valve (14) and seal (15).

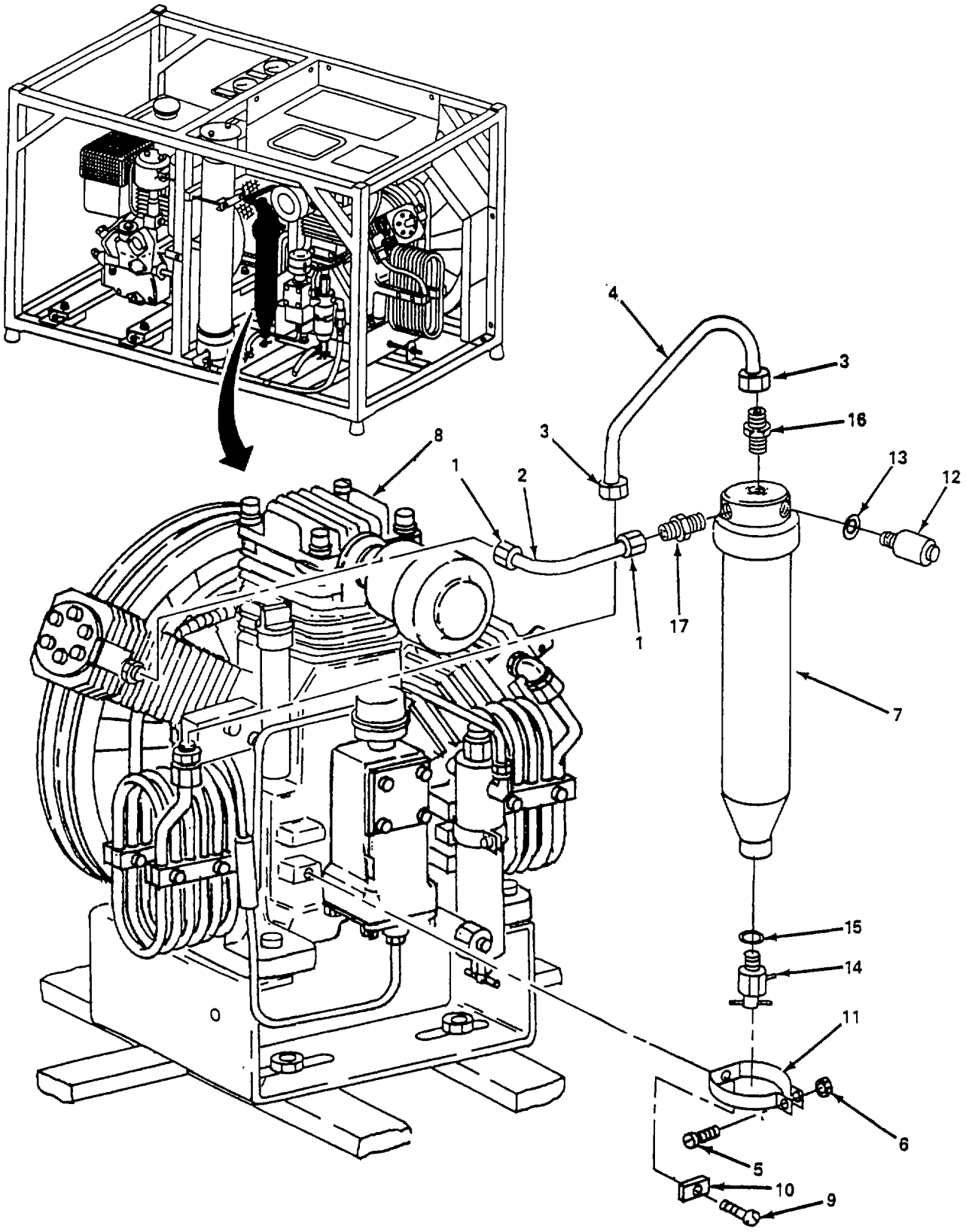


Figure 5-8. Second Stage Separator Assembly, Replace.



**5-12. Second Stage Separator Assembly (Cont).**

- (7) Remove fitting (16).
- (8) Remove fitting (17).

**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.

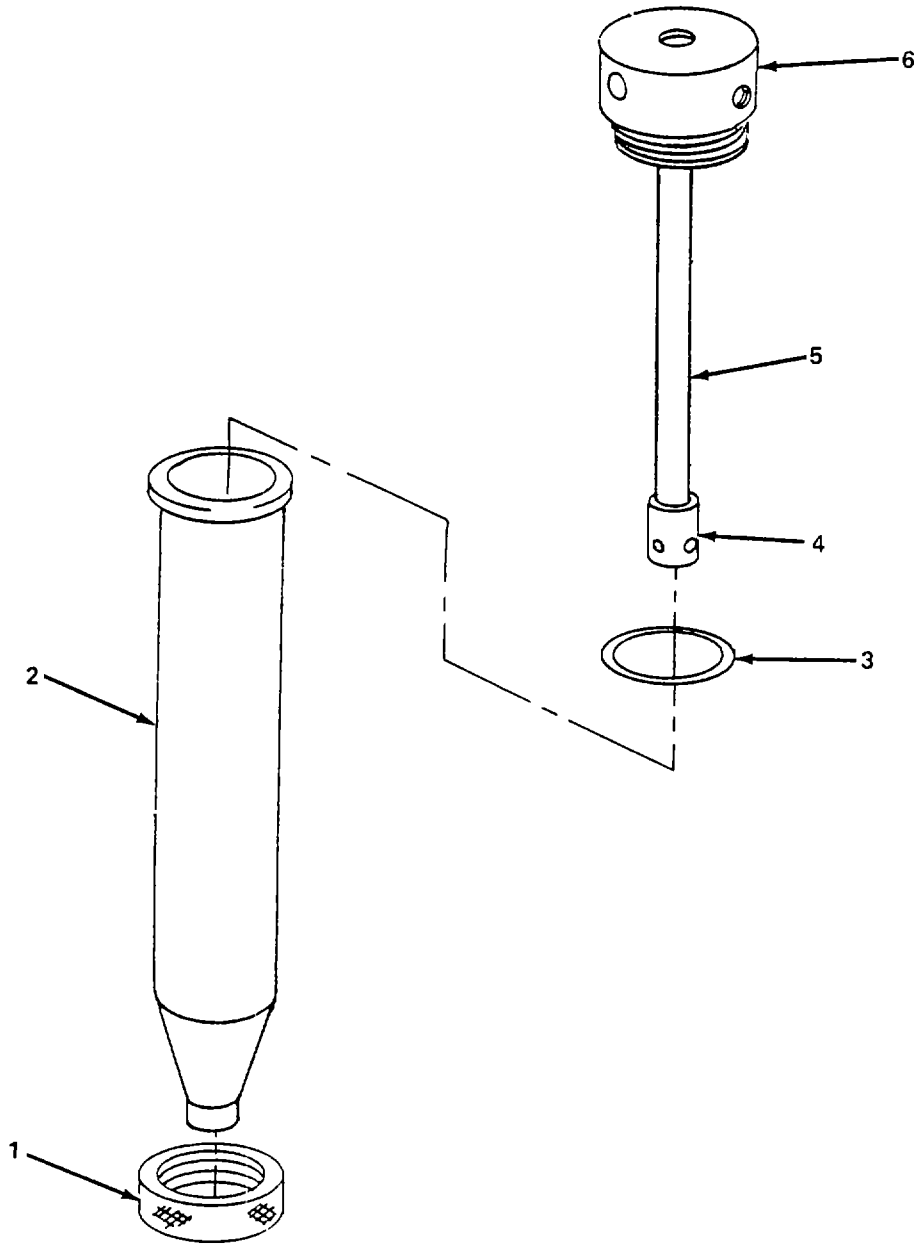
- (9) Apply teflon tape to pipe threads on fittings (16) and (17).
- (10) Install fitting (17).
- (11) Install fitting (16).
- (12) Install drain valve (14) and seal (15).
- (13) Install clamp (11) and secure with plate (10) and bolt (9).
- (14) Install safety valve (12) and seal (13).
- (15) Install separator (7) on compressor crankcase (8) and secure with strap (11), bolt (5) and nut (6).
- (16) Connect inlet tube (4) and tighten two connector nuts (3).
- (17) Connect discharge tube (2) and tighten two connector nuts (1).

**b. Repair.** (figure 5-9)**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 VI 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 interstage separator (para. a.).



**Figure 5-9. Second Stage Separator Assembly, Repair.**

- (2) Remove collar (1) and remove separator body (2) and preformed packing (3). Discard preformed packing (3).
- (3) Remove separator deflector (4) from pipe (5).
- (4) Remove pipe (5) from separator cover (6).
- (5) Inspect separator deflector (4) and replace if cracked or otherwise damaged.

---

**5-13. Safety Valve.**

---

**This task covers:****a. Replace**

---

**INITIAL SETUP***Tools*

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

*Materials/Parts*

Safety Valve

Bags, Plastic (Item 3, Appendix E)

*Materials/Parts (Cont)*

Bands, Rubber (Item 4, Appendix E)

Tape, Adhesive (Item 22, Appendix E)

*Equipment Condition*

Compressor unit shutdown and depressurized (para. 2-12).

Replace. (figure 5-10)**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 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 safety valve (1) and seal (2) from interstage separator assembly (3).
- (2) Install new safety valve (1) and seal (2).

- (6) Inspect pipe (5) and replace if bent, cracked, or otherwise damaged.
- (7) Inspect separator body (2) and replace if dented, cracked, or otherwise damaged.
- (8) Inspect separator cover (6) and replace if cracked or threads are stripped.
- (9) Install pipe (5).
- (10) Install separator deflector (4).
- (11) Apply halo carbon grease to new preformed packing (3).
- (12) Install new preformed packing (3) and separator body (2) and secure with collar (1).
- (13) Install interstage separator (para. a.).

---

**5-13. Safety Valve.**

---

**This task covers:****a. Replace**

---

**INITIAL SETUP***Tools*

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

*Materials/Parts*

Safety Valve

Bags, Plastic (Item 3, Appendix E)

Bands, Rubber (Item 4, Appendix E)

Tape, Pressure Sensitive (Item 22, Appendix E)

*Equipment Condition*

Compressor unit shutdown and depressurized (para. 2-12).

*Reference*

Cleaning Procedures, Chapter 4, Section VI.

---

*Replace.* (figure 5-10)**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 VI 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 safety valve (1) and seal (2) from interstage separator assembly (3).
- (2) Install new safety valve (1) and seal (2).

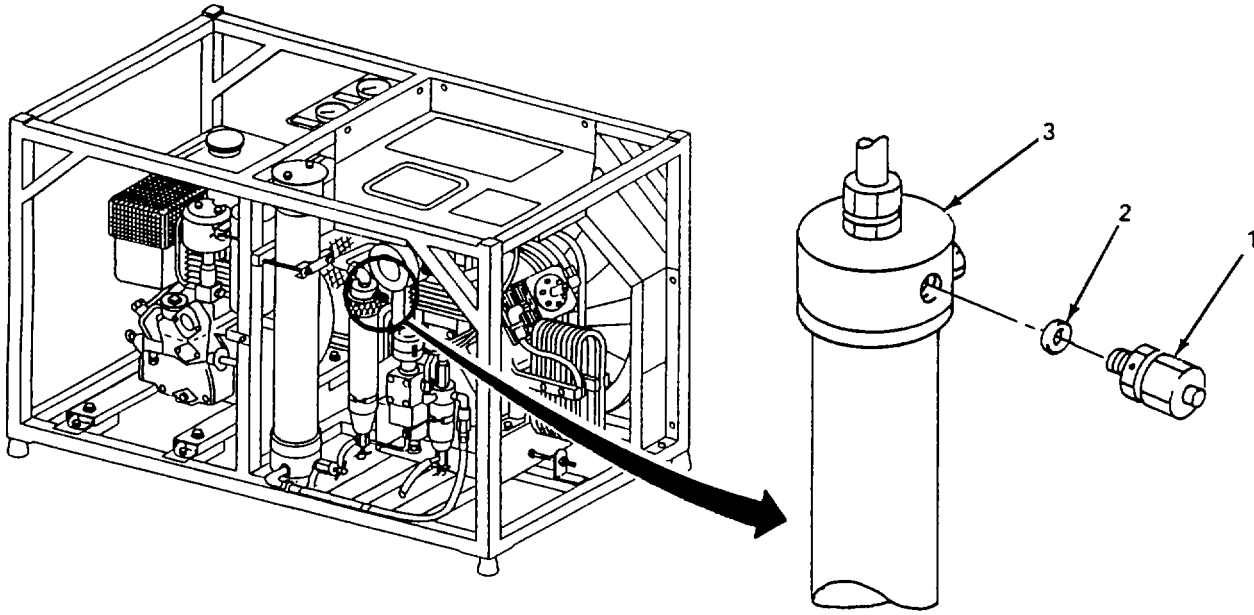


Figure 5-10. Safety Valve, Replace.

---

**5-14. Final Separator Assembly..**


---

This task covers:

**a. Replace**

**b. Repair**

---

**INITIAL SETUP**

*Tools*

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

*Materials/Parts*

Final Separator Assembly  
 Bags, Plastic (Item 3, Appendix E)  
 Grease, Halo Carbon (Item 14, Appendix E)  
 Bands, Rubber (Item 4, Appendix E)  
 Tape, Pressure Sensitive (Item 22, Appendix E)

*Equipment Condition*

Compressor unit shutdown and depressurized (para. 2-12).

*Reference*

Cleaning Procedures, Chapter 4, Section VI.

---

- a. Replace. (figure 5-11)

**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 VI 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 two connector nuts (1) and remove inlet line (2).
- (2) Loosen connector nut (3) and disconnect outlet line (4).
- (3) Loosen bolt (5) and nut (6) and remove separator (7).
- (4) Remove bolt (8), plate (9), and clamp (10).
- (5) Remove safety valve (11) and seal (12).
- (6) Remove two elbows (13) and drain valve (14).
- (7) Install drain valve (14) and two elbows (13).
- (8) Install clamp (10), plate (9) and bolt (8).
- (9) Install seal (12) and safety valve (11).

(10) Install inlet line (2) and tighten two connector nuts (1).

(11) Connect outlet line (4) and tighten connector nut (3).

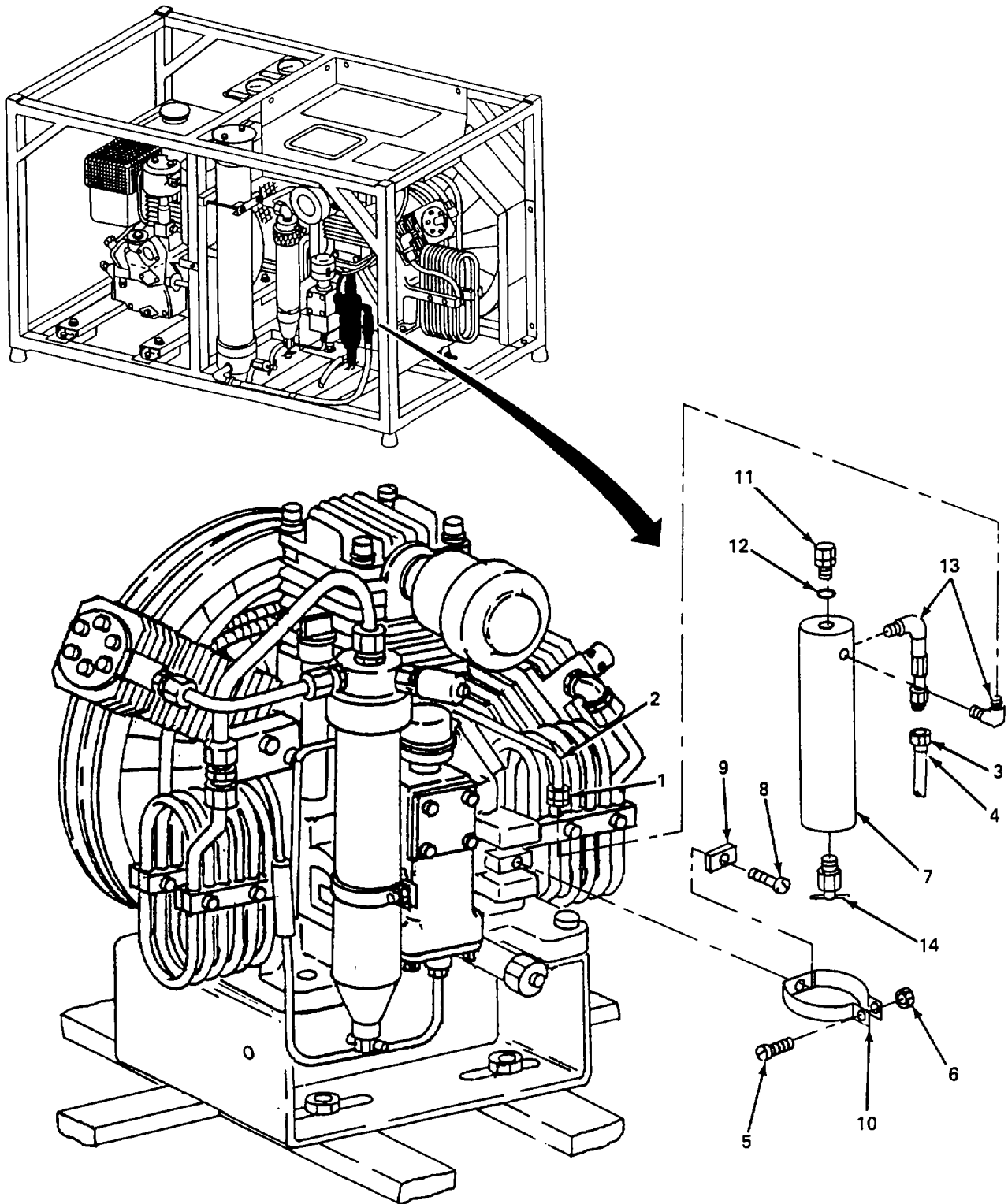


Figure 5-11. Final Separator Assembly, Replace.



**5-14. Final Separator Assembly (Cont).**

- b. Repair. (figure 5-12)

**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 VI 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 final separator (para. a.).
- (2) Unscrew filter bowl cylinder (1) and remove.
- (3) Remove preformed packing (2). Discard preformed packing (2).
- (4) Remove tube assembly (3).
- (5) Inspect filter bowl cylinder (1) and replace if dented, cracked, or threads are stripped.
- (6) Inspect tube assembly (3) and replace if bent, cracked, or other damaged.
- (7) Inspect end cap (4) and replace if cracked, or threads are damaged.
- (8) Install tube assembly (3).
- (9) Apply halo carbon grease to new preformed packing (2).
- (10) Install new preformed packing (2) and filter bowl cylinder (1).
- (11) Install final separator (para. a.).

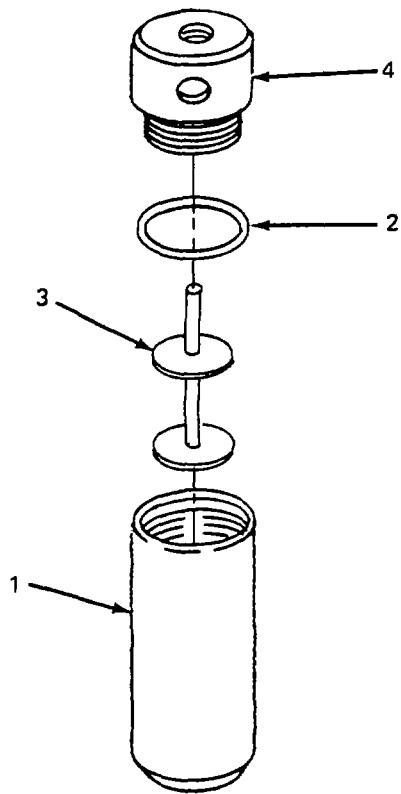


Figure 5-12. Final Separator, Repair.

---

**5-15. Safety Valve.**

---

**This task covers:****a. Replace**

---

**INITIAL SETUP***Tools*

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

*Materials/Parts*

Safety Valve

Bags, Plastic (Item 3, Appendix E)

Tape, Teflon (Item 23, Appendix E)

Bands, Rubber (Item 4, Appendix E)

Tape, Pressure Sensitive (Item 22, Appendix E)

*Equipment Condition*

Compressor unit shutdown and depressurized (para. 2-12).

*Reference*

Cleaning Procedures, Chapter 4, Section VI.

Replace. (figure 5-13)**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 VI 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 safety valve (1) from separator assembly (2).
- (2) Apply teflon tape to pipe threads on safety valve (1).

**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.**

- (3) Install new safety valve (1).

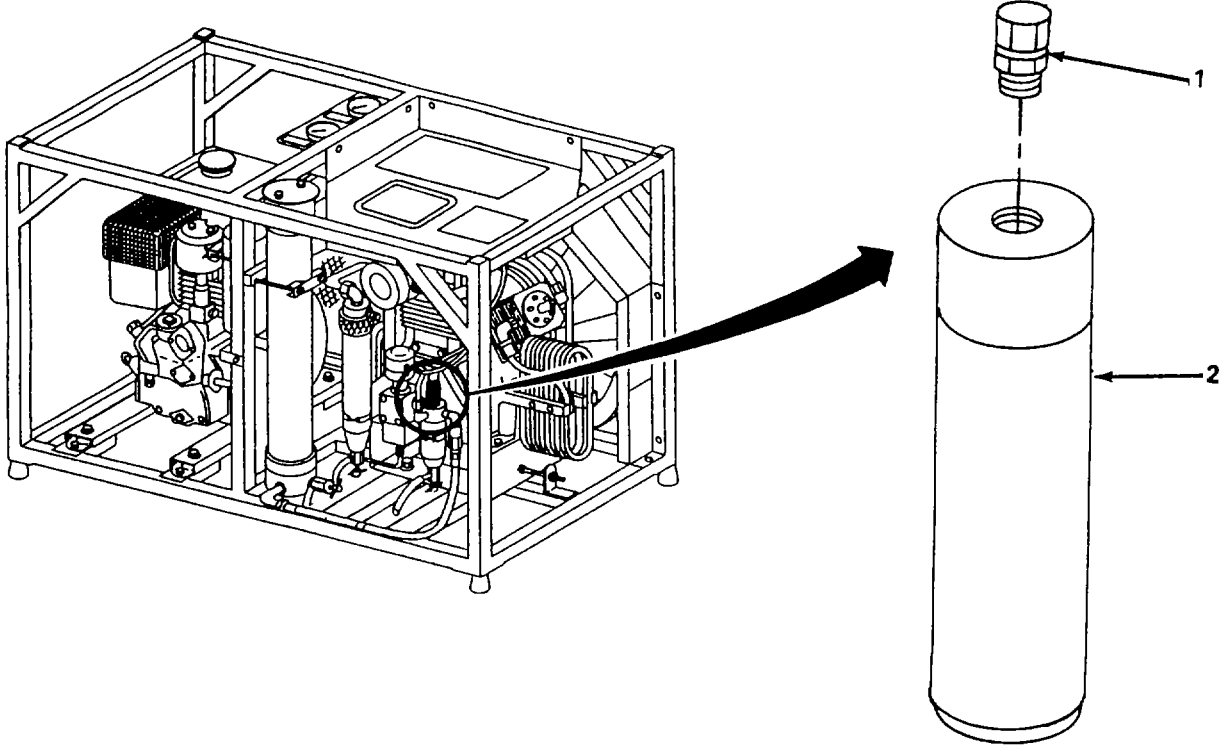


Figure 5-13. Safety Valve, Replace.

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**5-16. First Stage Intercooler Coil.**

---

**This task covers:****Replace**

---

**INITIAL SETUP***Tools*

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

*Materials/Parts*

Second Stage Coil  
 Bags, Plastic (Item 3, Appendix E)  
 Bands, Rubber (Item 4, Appendix E)  
 Tape, Pressure Sensitive (Item 22, Appendix E)

*Equipment Condition*

Drivebelt guard removed (para. 5-10).

*Reference*Cleaning Procedures, Chapter 4, Section VI.

---

**Replace.** (figure 5-14)**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 VI 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 two connector nuts (1).
- (2) Remove nut (2), washer (3), bolt (4), washer (5), two blocks (6), and spacer (7).
- (3) Remove two nuts (8), washers (9), bolts (10), washers (11), and brackets (12).
- (4) Remove nut (13), washer (14), bolt (15), washer (16), two brackets (17), and intercooler coil (18).
- (5) Position intercooler coil (18) and tighten two connector nuts (1).
- (6) Install two brackets (17) and secure with washer (16), bolt (15), washer (14), and nut (13).
- (7) Install two brackets (12) and secure with two washers (11), bolts (10), washers (9), and nuts (8).
- (8) Install spacer (7) and two blocks (6), and secure with washer (5), bolt (4), washer (3), and nut (2).

**FOLLOW-ON MAINTENANCE**  
 Install drivebelt guard (para. 5-10).

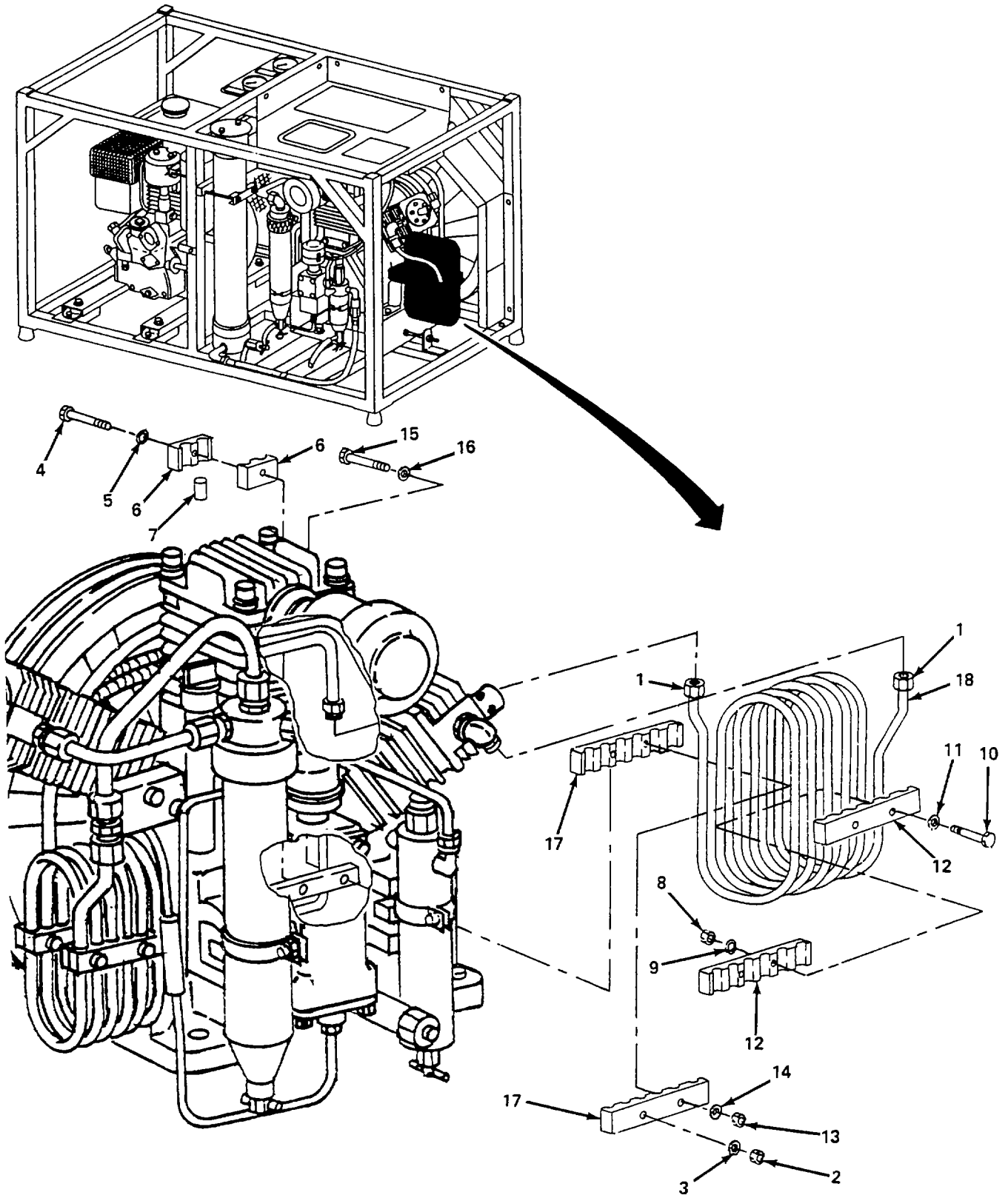


Figure 5-14. First Stage Intercooler Coil, Replace.

---

**5-17. Second Stage Intercooler Coil.**

---

**This task covers:****a. Replace**

---

**INITIAL SETUP***Tools*

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

*Materials/Parts*

Intercooler Coil

Bags, Plastic (Item 3, Appendix E)

Bands, Rubber (Item 4, Appendix E)

Tape, Pressure Sensitive (Item 22, Appendix E)

*Equipment Condition*Compressor unit shutdown and depressurized  
(para. 2-12)*Reference*

Cleaning Procedures, Chapter 4, Section VI.

Replace. (figure 5-15)**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 VI 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 two connector nuts (1).
- (2) Remove two nuts (2), washers (3), bolts (4), washers (5), and brackets (6).
- (3) Remove nut (7), washer (8), two blocks (9), and spacer (10).
- (4) Remove nut (11), washer (12), bolt (13), washer (14), two brackets (15), and intercooler coil (16).
- (5) Install intercooler coil (16) and tighten two connector nuts (1).
- (6) Install two brackets (15), washer (14), bolt (13), washer (12), and nut (11).
- (7) Install spacer (10), two blocks (9), washer (8) and nut (7).
- (8) Install two brackets (6) and secure with two washers (5), bolts (4), washers (3), and nuts (2).

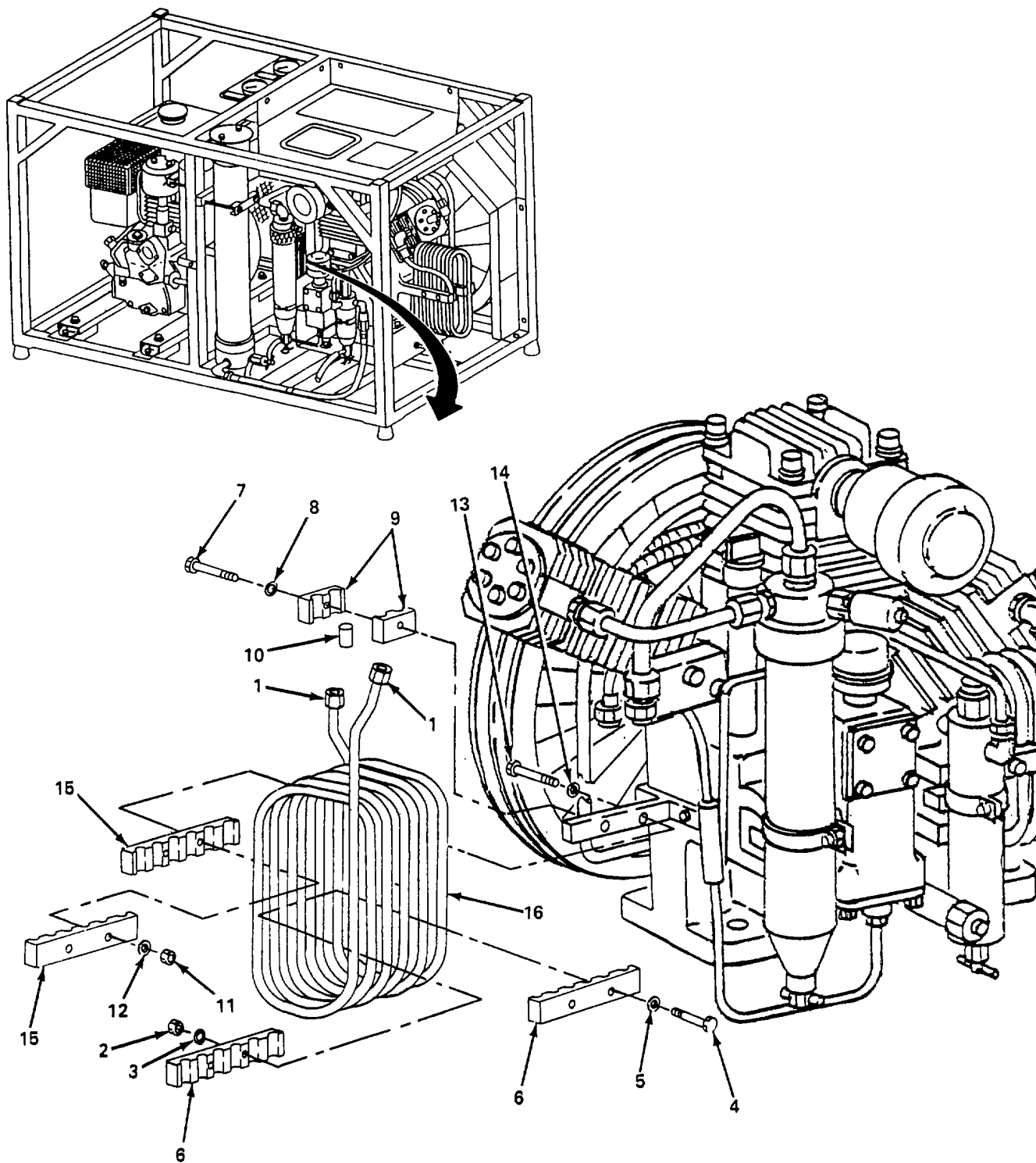


Figure 5-15. Second Stage Intercooler Coil, Replace.



---

**5-18. Aftercooler.**

---

**This task covers:****a. Replace**

---

**INITIAL SETUP***Tools*

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

*Materials/Parts*

Aftercooler

Bags, Plastic (Item 3, Appendix E)

Bands, Rubber (Item 4, Appendix E)

Tape, Pressure Sensitive (Item 22, Appendix E)

*Equipment Condition*

Fanwheel assembly removed (para. 5-11).

*Reference*

Cleaning Procedures, Chapter 4, Section VI.

---

*Replace.* (figure 5-16)**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 VI 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 two connector nuts (1).
- (2) Remove nut (2), lockwasher (3), flat washer (4), bolt (5), flat washer (6), spacer (7), and clamp (8).
- (3) Remove three bolts (9), lockwashers (10), six blocks (11), one spacer (12), and aftercooler (13).
- (4) Install aftercooler (13) and tighten two connector nuts (1).
- (5) Install six blocks (11), one spacer (12) and secure with three bolts (9), and lockwashers (10).
- (6) Install clamp (8) and secure with spacer (7), flat washer (6), bolt (5), flat washer (4), lockwasher (3) and nut (2).

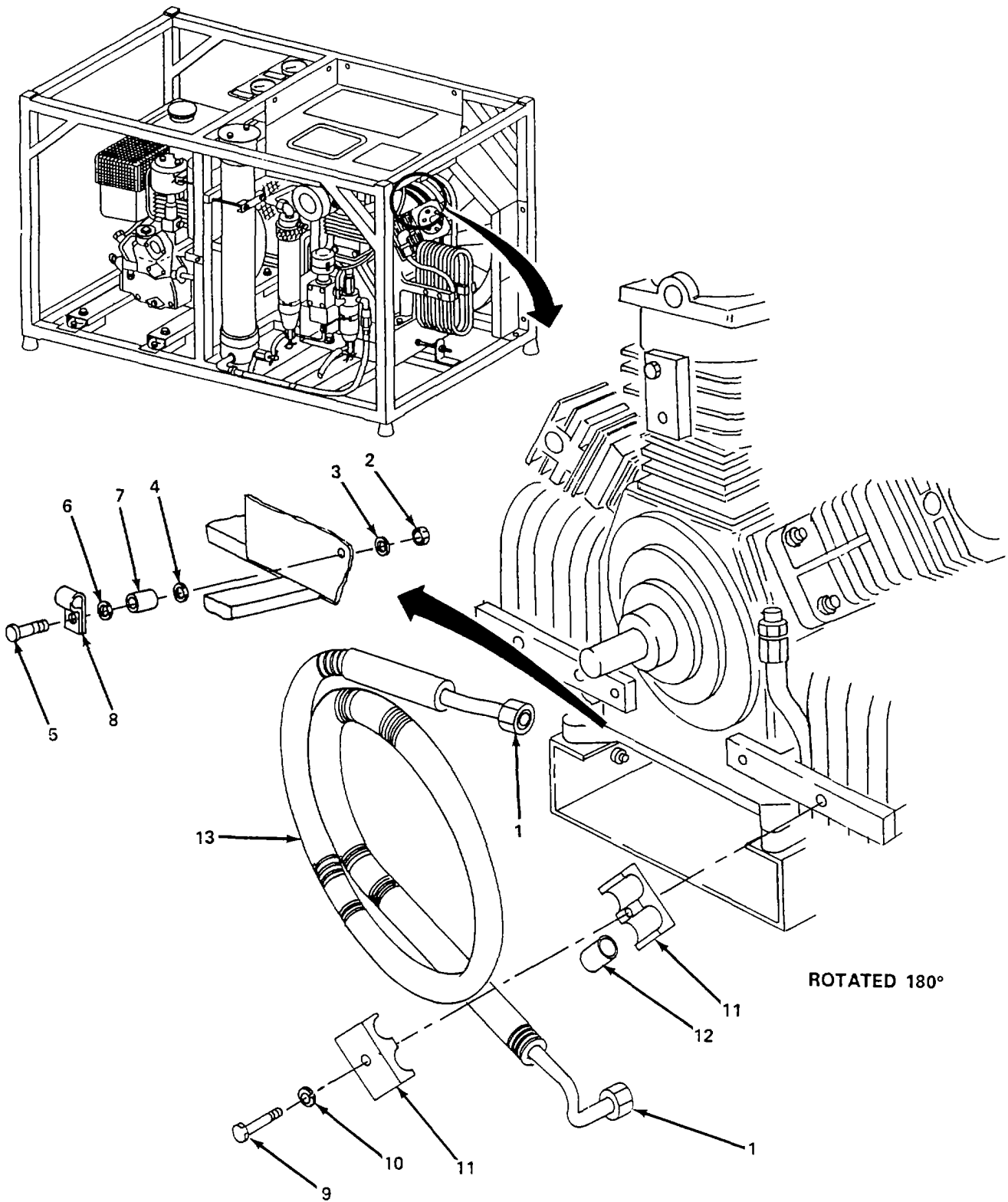


Figure 5-16. Aftercooler, Replace.

5-19. Lines and Fittings.

This task covers:

- |                                       |  |
|---------------------------------------|--|
| a. Replace (First Stage Cooler Line)  | e. Replace (Tube Assembly)                 |
| b. Replace (Second Stage Cooler Line) | f. Replace (Intercooler to Separator Line) |
| c. Replace (Oil Feed Line).           | g. Replace (Third Stage Inlet Line)        |
| d. Replace (Oil and Filter line)      | h. Replace (Final Separator to Purifier)   |

**INITIAL SETUP**

*Tools*

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

*Materials/Parts*

First Stage Cooler Line  
 Second Stage Cooler Line  
 Oil Feed Line  
 Oil and Filter Line  
 Tube Assembly  
 Intercooler to Separator Line

*Materials/Parts (Cont)*

Tape, Pressure Sensitive (Item 22, Appendix E)  
 Bands, Rubber (Item 4, Appendix E)  
 Third Stage Inlet Line  
 Final Separator to Purifier Assembly Line  
 Bags, Plastic (Item 3, Appendix E)

*Reference*

Cleaning Procedures, Chapter 4, Section VI.

- a. Replace First Stage Cooler Line. (figure 5-17)

- (1) Remove flywheel fan (para. 5-11).

**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 VI 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) Loosen two connector nuts (1).
- (3) Remove three bolts (2), washers (3), six blocks (4), two spacers (5), and first stage cooler line (6).
- (4) Install first stage cooler line (6) and tighten two connectornuts (1).
- (5) Install two spacers (5), six blocks (4), three washers (3), and bolts (2).
- (6) Install flywheel fan (para. 5-11).

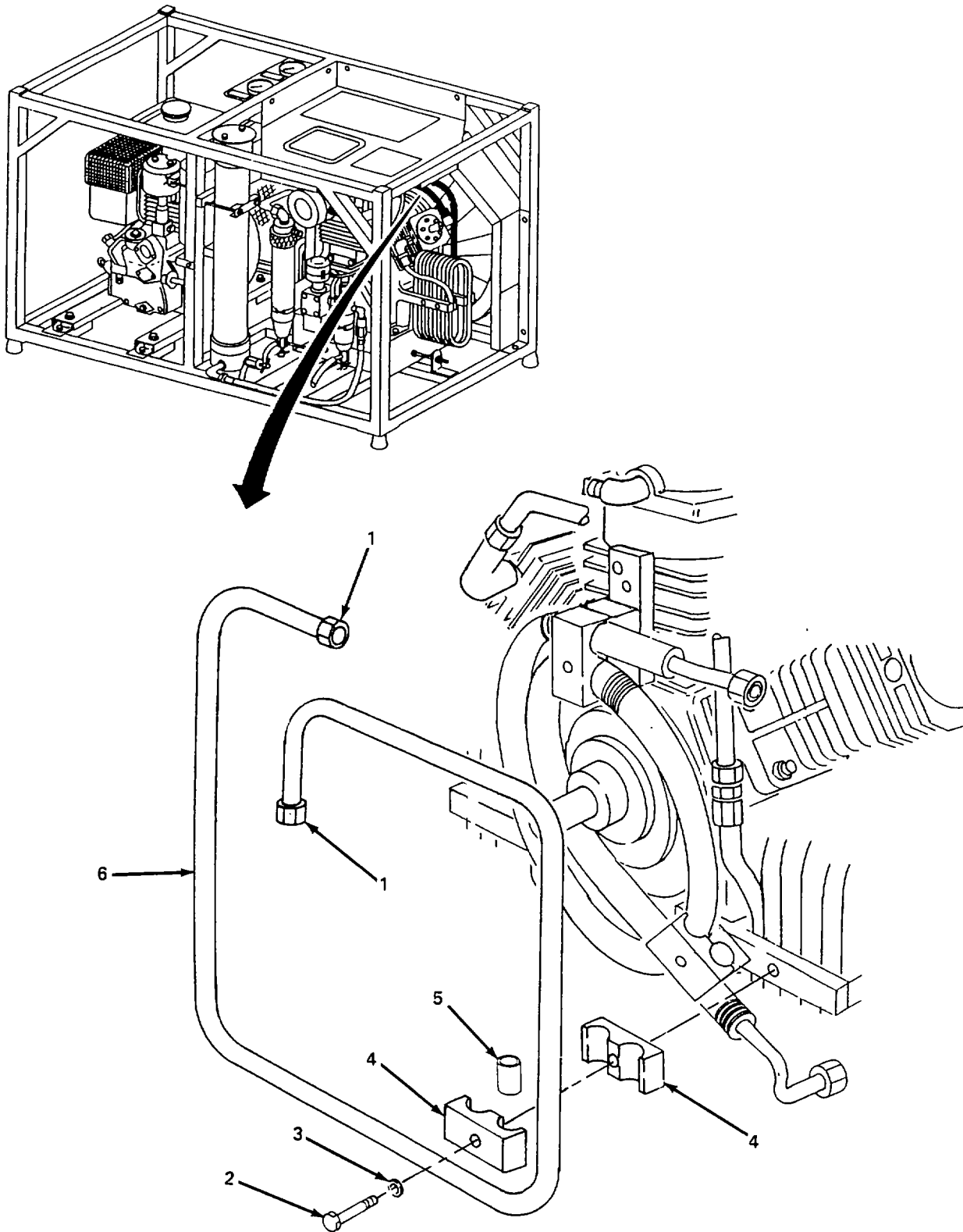


Figure 5-17. First Stage Cooler Line, Replace.

5-19. **Lines and Fittings (Cont).**b. *Replace Second Stage Cooler Line.* (figure 5-18)

- (1) Remove flywheel fan (para. 5-11).

**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 VI 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) Loosen two connector nuts (1).
- (3) Remove bolt (2), washer (3), two blocks (4), and second stage cooler line (5).
- (4) Install second stage cooler line(5) and tighten two connector nuts (1).
- (5) Install two blocks (4), washers (3), and bolt (2).
- (6) Install flywheel fan (para. 5-11).

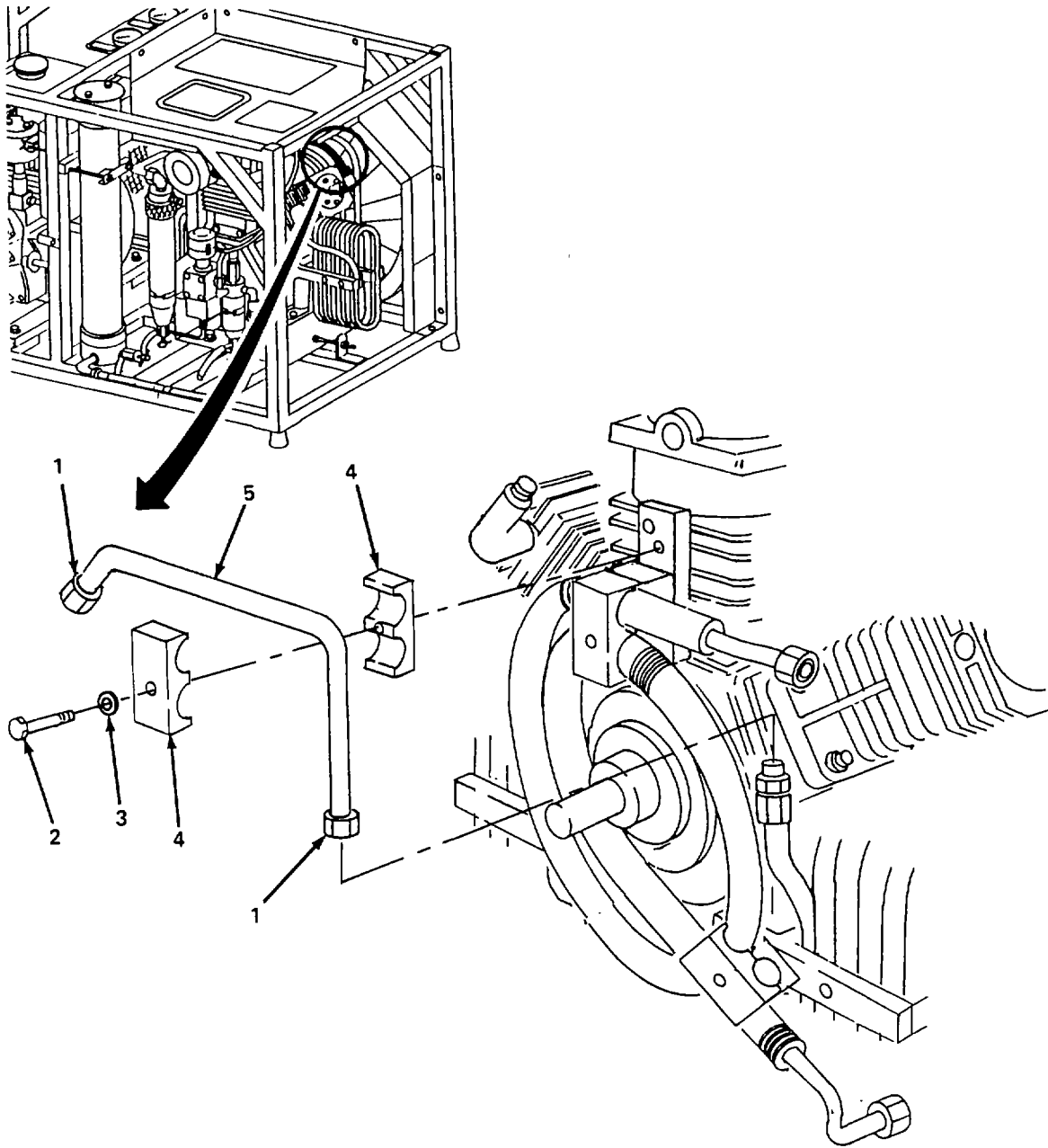


Figure 5-18. Second Stage Cooler Line, Replace.

5-19. **Lines and Fittings (Cont).**

c. Replace Oil Feed Line. (figure 5-19)

- (1) Remove flywheel fan (para. 5-11).
- (2) Loosen two connector nuts (1) and remove oil feed line (2).
- (3) Install oil feed line (2) and tighten two connector nuts (1).
- (4) Install flywheel fan (para. 5-11).

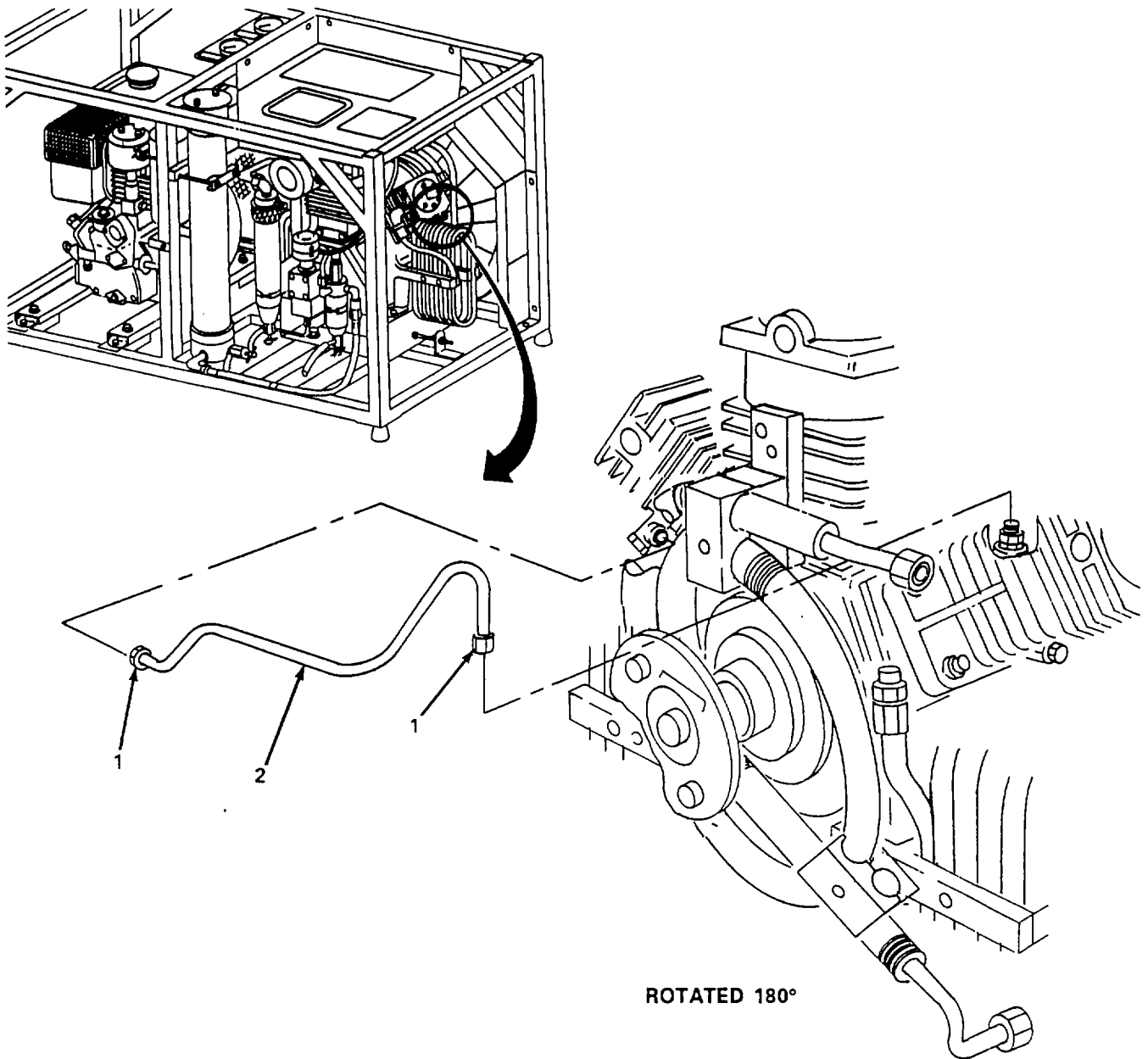


Figure 5-19. Oil Feed Line, Replace.



5-19. **Lines and Fittings (Cont).**

d. Replace Oil and Filter Line. (figure 5-20)

- (1) Loosen two connector nuts (1) and remove line (2), and drain excess oil into suitable container.
- (2) Install oil and filter line (2) and tighten two connector nuts (1).

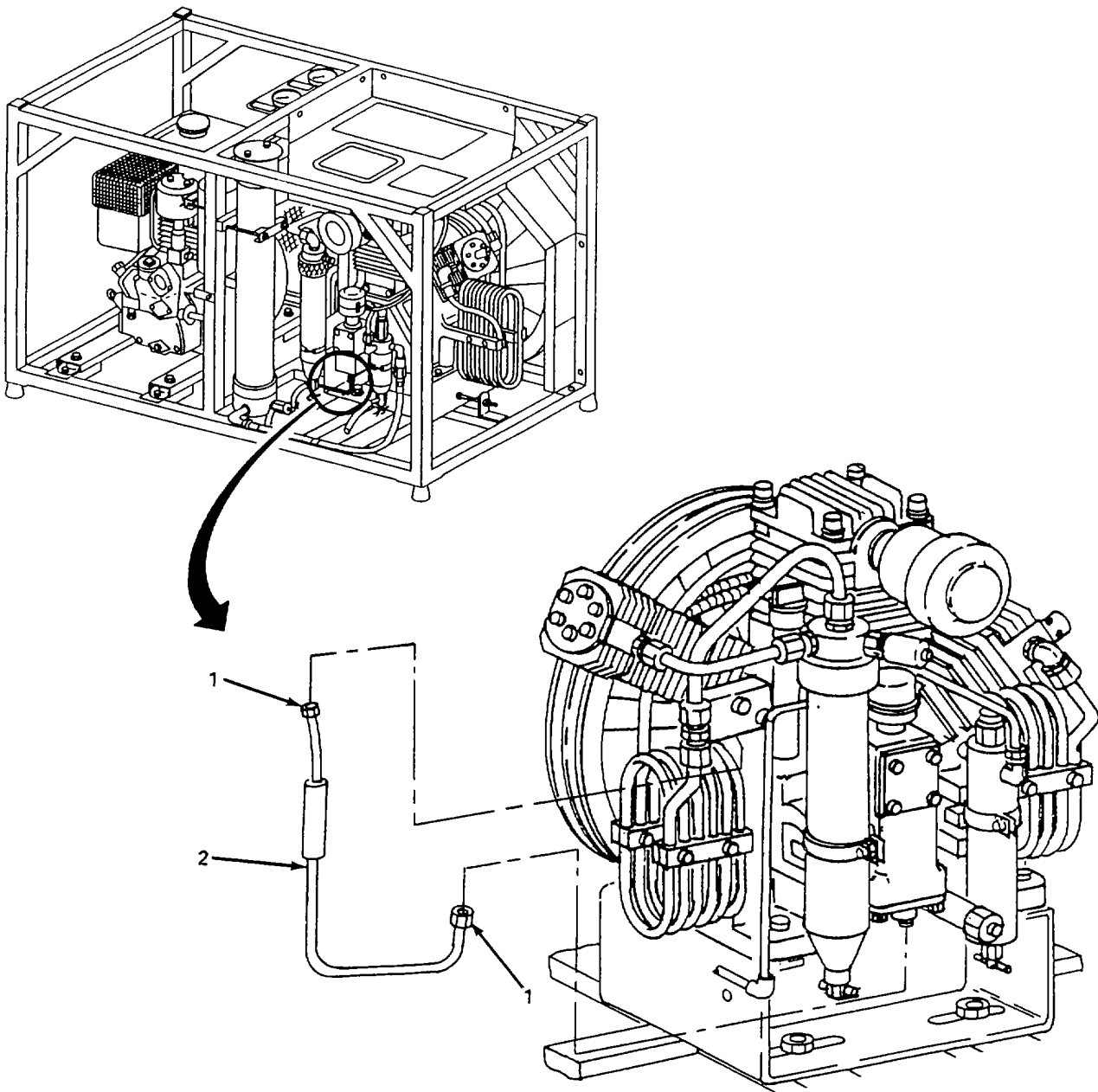


Figure 5-20. Oil and Filter Line, Replace.

5-19. **Lines and Fittings (Cont).**

d. Replace Tube Assembly. (figure 5-21)

**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 VI 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 two connector nuts (1) and remove line (2).
- (2) Install line (2) and tighten two connector nuts (1).

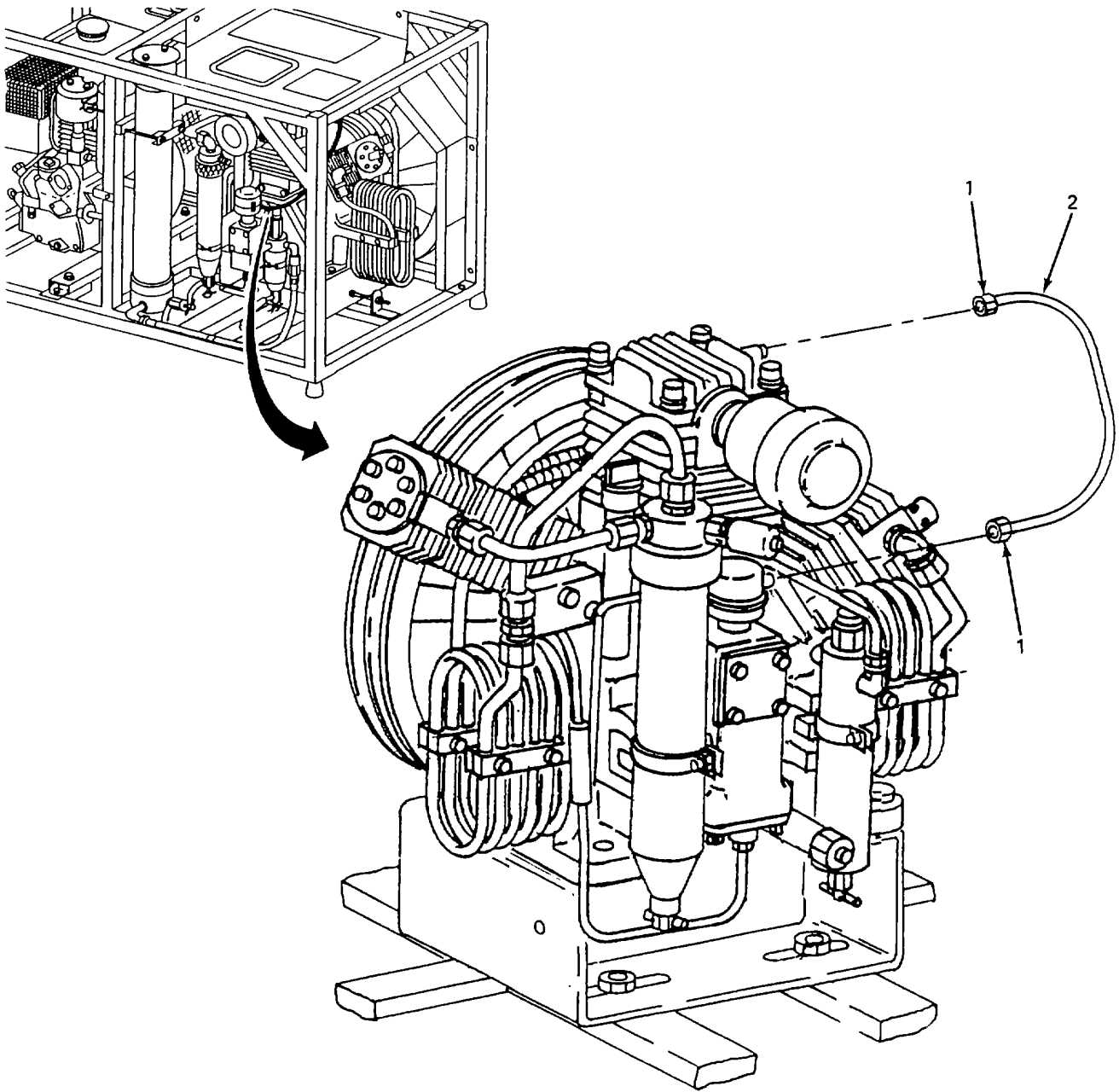


Figure 5-21. Tube Assembly, Replace.

## 5-19. Lines and Fittings (Cont).

- f. Replace Intercooler to Separator Line. (figure 5-22)

**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 VI 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 two connector nuts (1) and remove line (2).
- (2) Install line (2) and tighten two connector nuts (1).

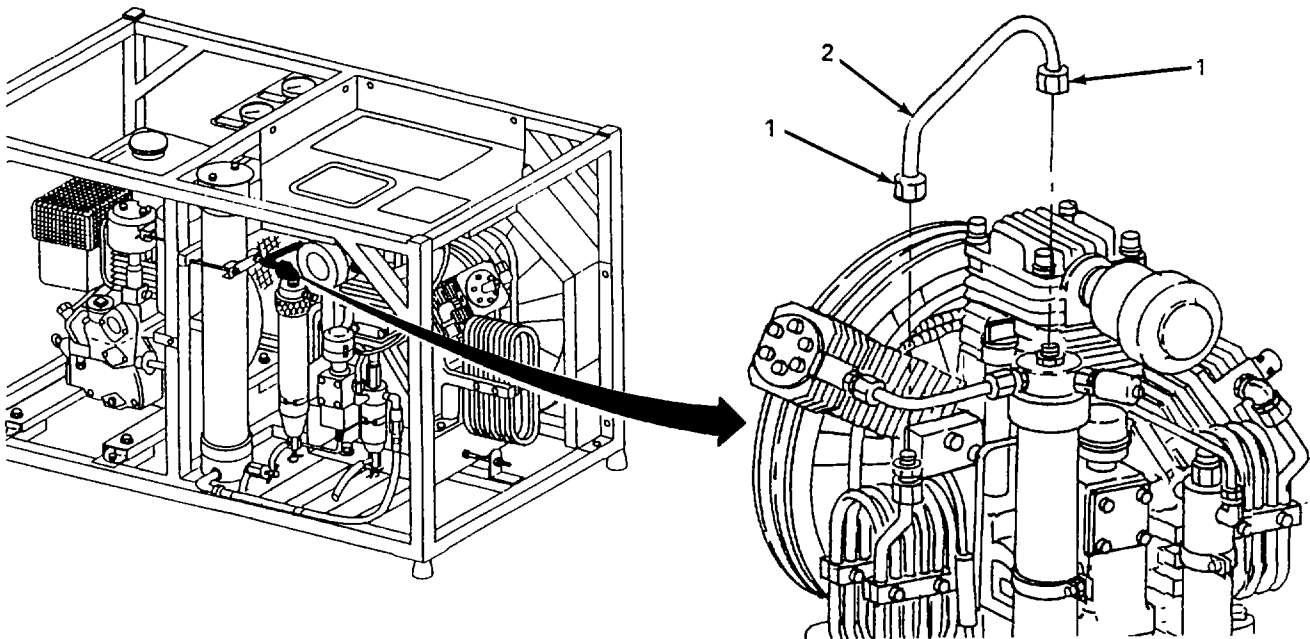


Figure 5-22. Intercooler to Separator Line, Replace.

## 5-19. Lines and Fittings (Cont).

- g. *Replace Third Stage Inlet Line.* (figure 5-23)

**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 VI 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 two connector nuts (1) and remove line (2).
- (2) Install line (2) and tighten two connector nuts (1).

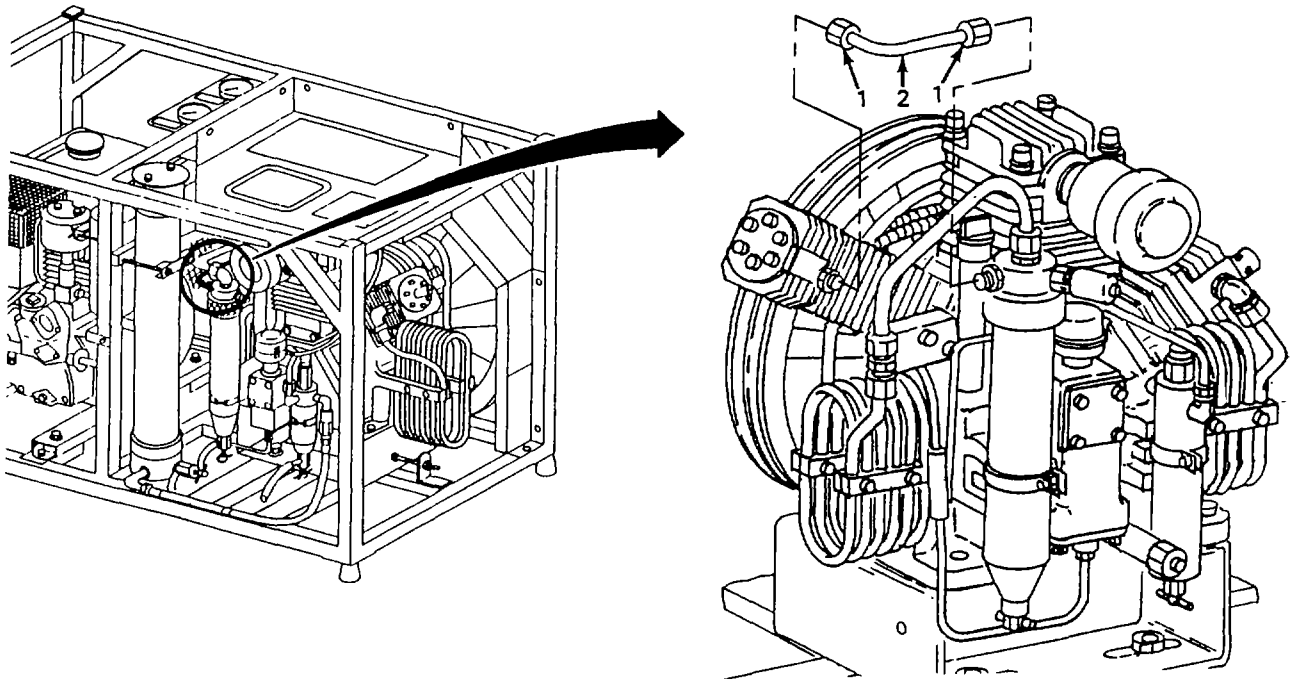


Figure 5-23. Third Stage Inlet Line, Replace.

## 5-19. Lines and Fittings (Cont).

h. Replace Final Separator to Purifier Assembly Line. (figure 5-24)

- (1) Remove bolt (1), washer (2), and clamp (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 VI 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) Loosen two connector nuts (4) and remove final separator to purifier assembly line (5).
- (3) Install final separator to purifier assembly line (5) and tighten two connector nuts (4).
- (4) Install clamp (3), washer (2), and bolt (1).

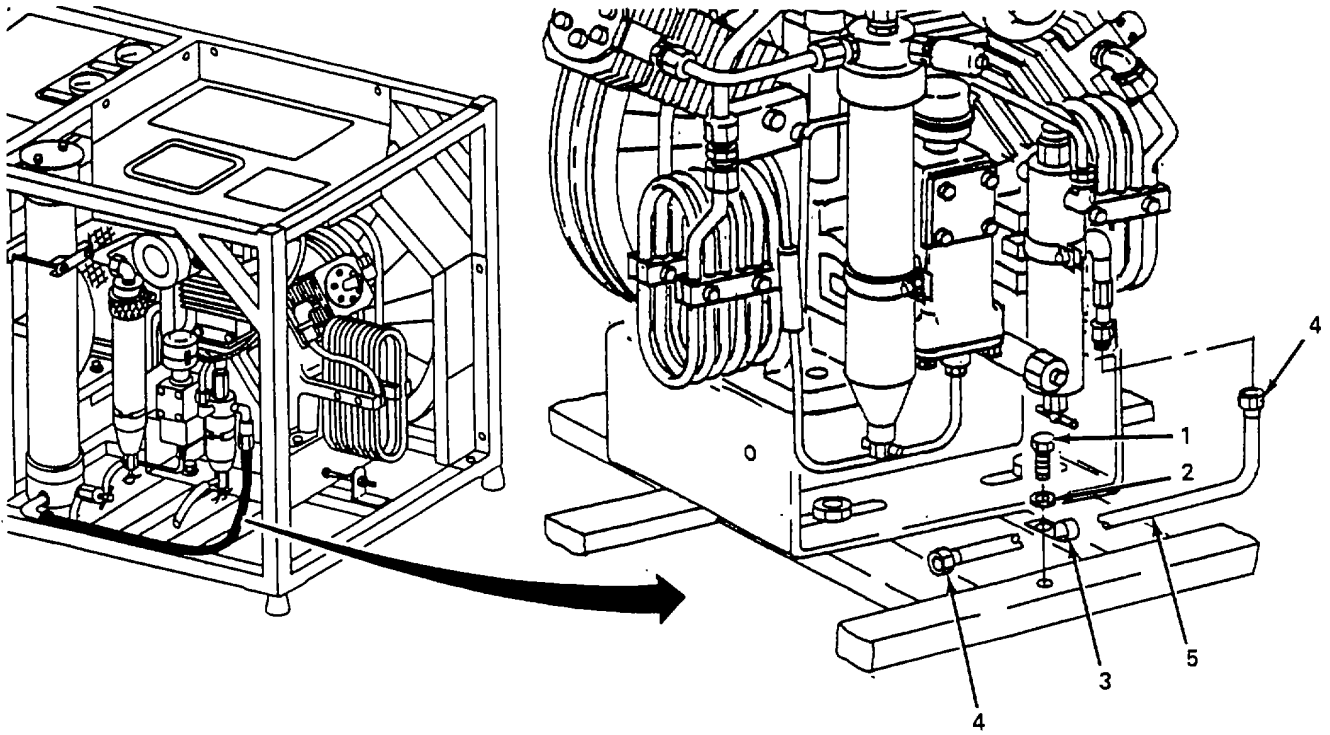


Figure 5-24. Final Separator to Purifier Assembly Line, Replace.



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**5-20. Oil Pressure Regulator.**

---

**This task covers:****a. Replace****b. Repair**

---

**INITIAL SETUP***Tools**Materials/Parts*

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

Preformed Packing  
Oil Pressure Regulator  
Rags, Wiping (Item 19, Appendix E)

---

*a. Replace.* (figure 5-25)

- (1) Loosen connector nut (1).
- (2) Loosen connector nut (2).
- (3) Remove two bolts (3), pressure regulator (4), and preformed packing (5). Discard preformed packing (5).
- (4) Remove coupling (6).
- (5) Remove fitting (7), sight glass (8), two preformed packings (9), and washer (10). Discard preformed packings (9).
- (6) Remove oil relief valve (11) and preformed packing (12). Discard preformed packing (12).
- (7) Install oil relief valve (11) and new preformed packing (12).
- (8) Install washer (10), two new preformed packings (9), and sight glass (8) on fitting (7).
- (9) Install fitting (7).
- (10) Install coupling (6).
- (11) Install pressure regulator (4), new preformed packing (5), and secure with two bolts (3).
- (12) Tighten connector nut (2).
- (13) Tighten connector nut (1).

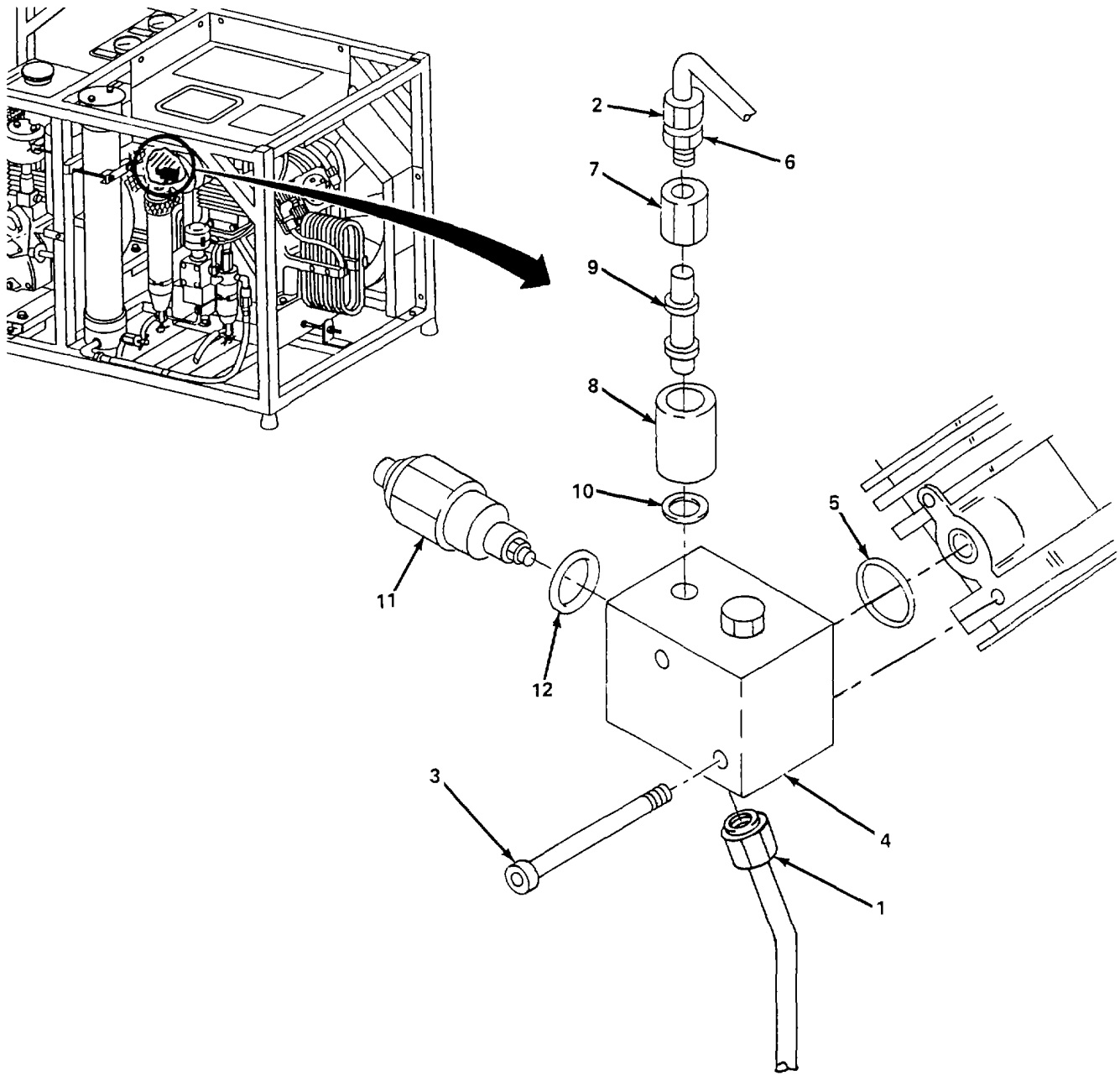


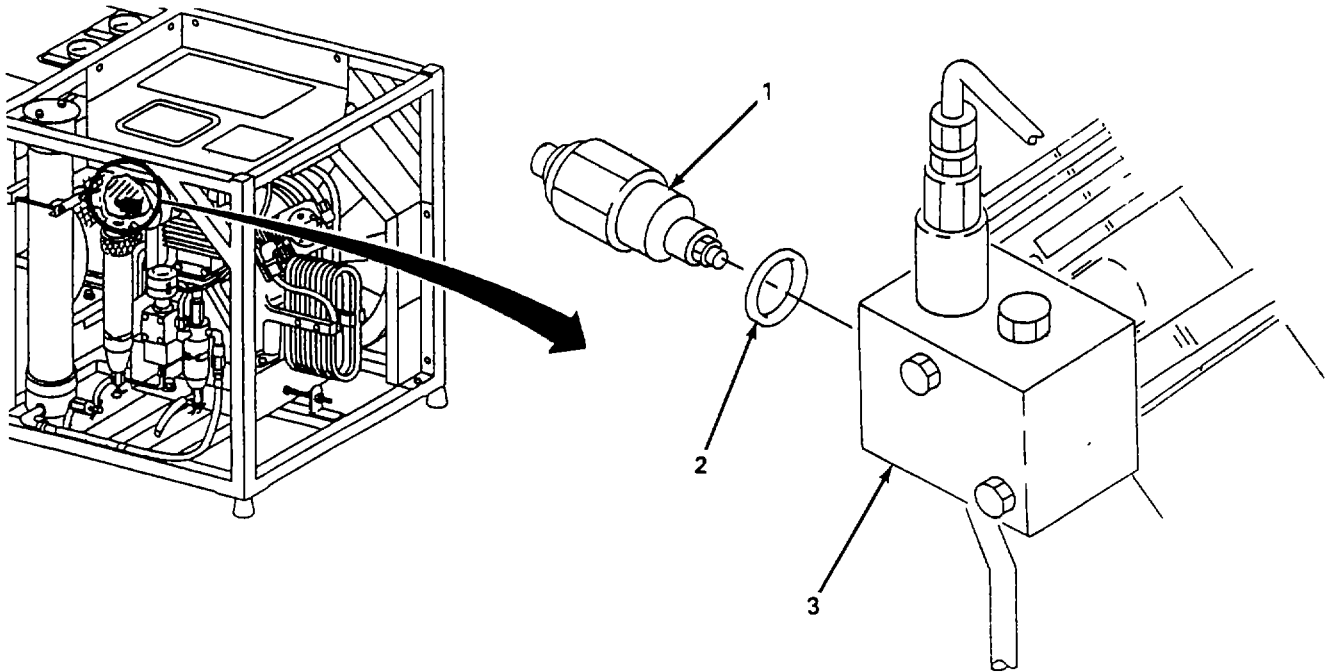
Figure 5-25. Oil Pressure Regulator, Replace.

## 5-20. Oil Pressure Regulator (Cont).

b. Repair.

(1) Replace oil relief valve. (figure 5-26)

- (a) Ensure mating area between oil relief valve (1) and oil pressure regulator (3) is clean and all dirt and debris is removed.
- (b) Remove oil relief valve (1) and preformed packing (2) from oil pressure regulator (3). Discard preformed packing (2).
- (c) Install new oil relief valve (1) and new preformed packing (2).



**Figure 5-26. Oil Relief Valve, Replace.**

(2) Replace sightglass. (figure 5-27)

- (a) Loosen two connector nuts (1) and move line (2) out of way.
- (b) Remove coupling (3).
- (c) Remove fitting (4), sight glass (5), two preformed packings (6), and washer (7). Discard preformed packing (6).

- (d) Install washer (7), two new preformed packings (6), sight glass (5), and fitting (4).
- (e) Install coupling (3).
- (f) Install line (2) and tighten two connector nuts (1).

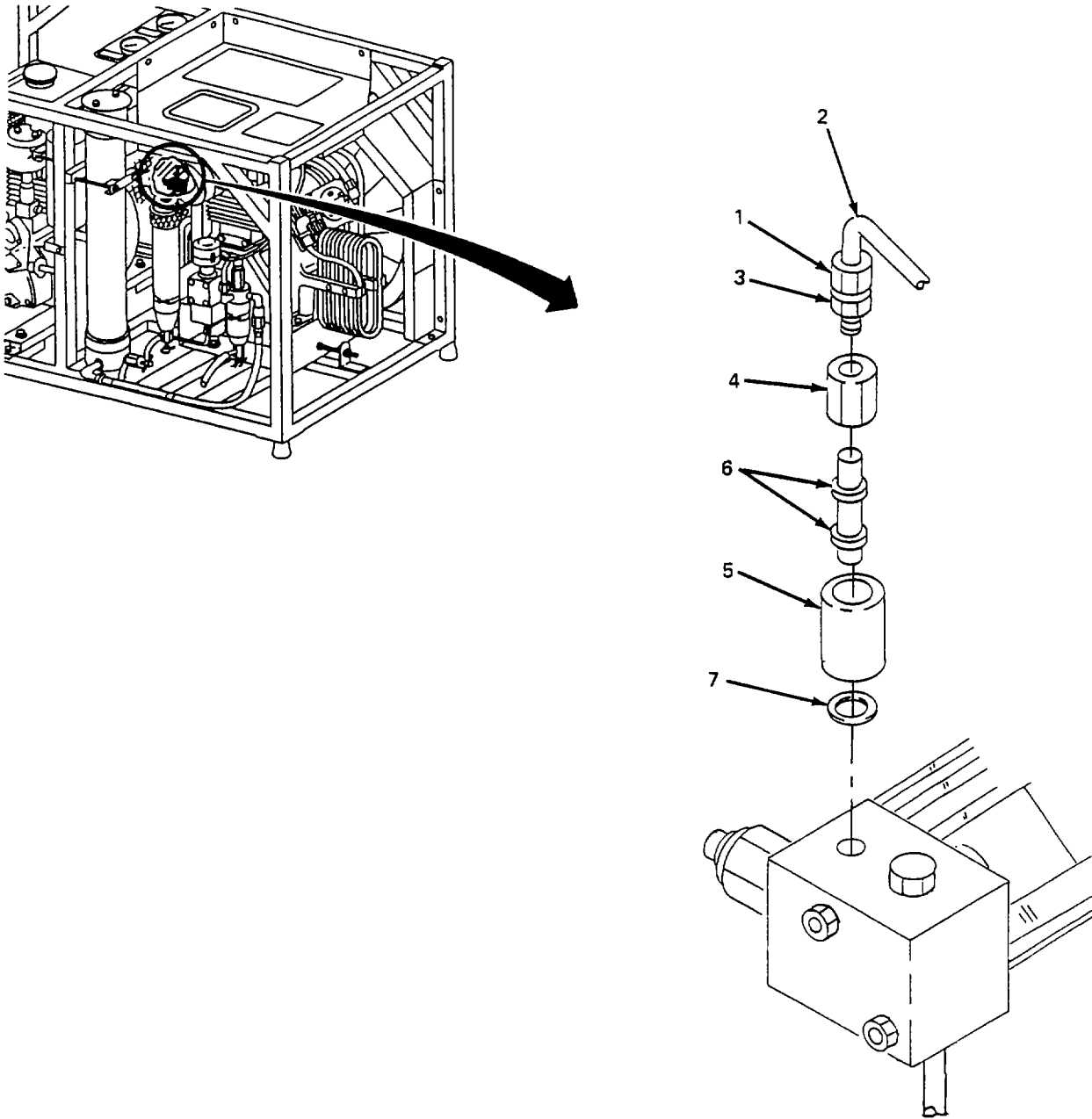


Figure 5-27. Sight Glass, Replace.

---

**5-21. Oil Pump.**

---

**This task covers:****a. Replace**

---

**INITIAL SETUP***Tools*

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

*Materials/Parts*Oil Pump  
Rags, Wiping (Item 19, Appendix E)  
Oil, Lubricating (Item 16, Appendix E)  
Gasket

---

Replace. (figure 5-28)

- (1) Remove drain plug (1) and drain compressor oil into suitable container.
- (2) Loosen two connector nuts (2) and remove discharge line (3).
- (3) Remove three bolts (4) and remove oil pump (5) and gasket (6). Discard gasket (6).
- (4) Ensure all gasket mounting surfaces are clean and free of old gasket material.
- (5) Install new gasket (6) on new oil pump(5) and install oil pump (5) and secure with two bolts (4).
- (6) Install discharge line (3) and tighten two connector nuts (2).
- (7) Install drain plug (1).

**NOTE**

**To obtain proper oil level reading on dipstick, the dipstick must be screwed back in fully then removed and oil level checked.**

- (8) Remove oil filler (7) and fill compressor with oil until oil level reaches full mark on dipstick (8). Refer to table 3-1 for proper grade viscosity of compressor oil.
- (9) Install oil filler (7).

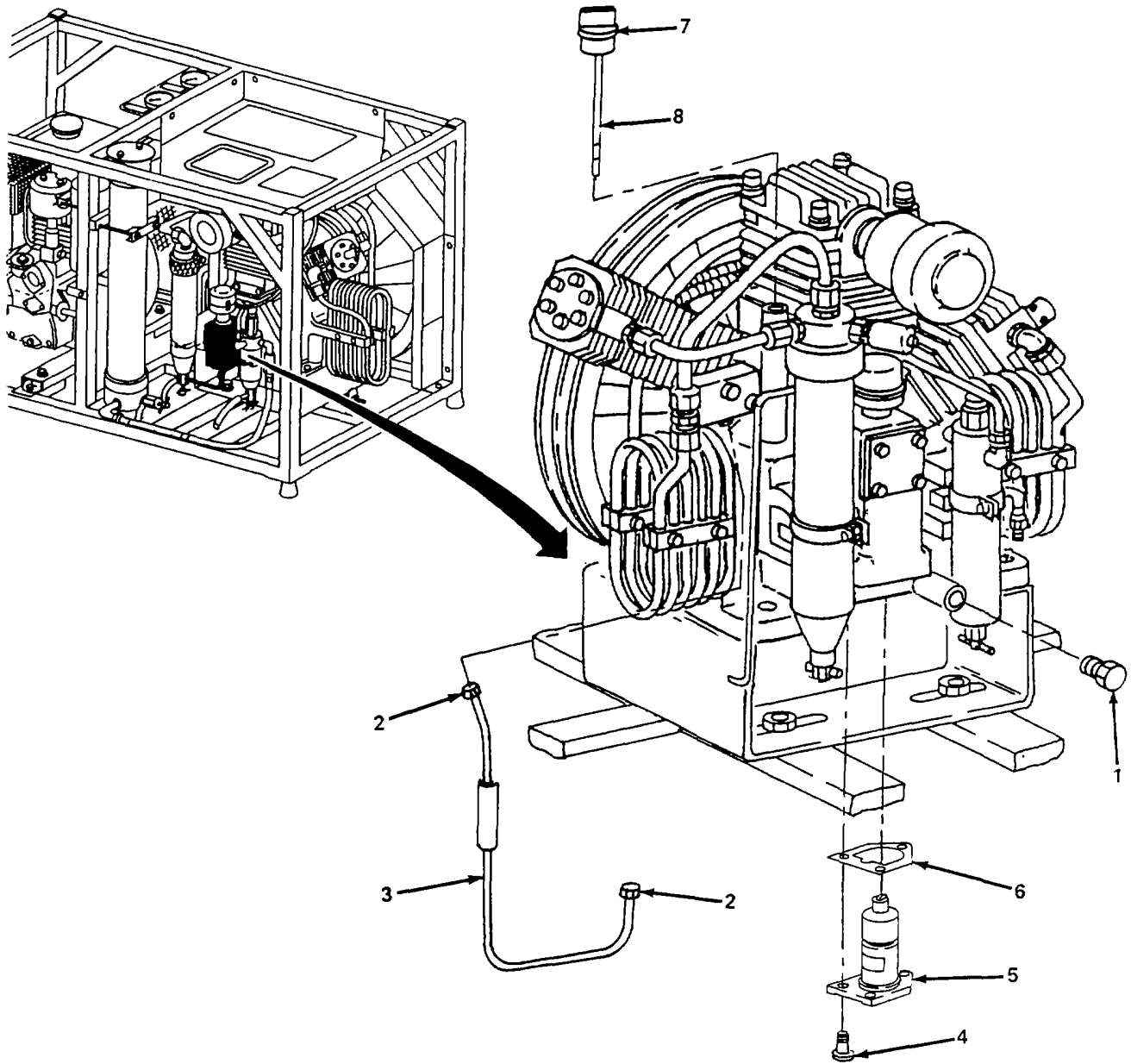


Figure 5-28. Oil Pump, Replace.

---

**5-22. First Stage Valve Head and Valve Assembly.**


---

This task covers:

a. **Replace**

b. **Repair**

---

**INITIAL SETUP**
*Tools*

General Mechanic's Tools Kit (NSN 5180-00-177-7033)  
 Torque Wrench (NSN 5120-00-247-2540)  
 TSP Ultrasonic Cleaner (NSN 4940-00-164-8997)

*Materials/Parts*

Preformed Packing  
 Valve Assembly  
 Valve, Head  
 Cloth, Lint Free (Item 8, Appendix E)

*Equipment Condition*

Compressor unit shutdown and depressurized (para. 2-12).  
 Inlet filter and adapter assembly removed (para. 4-17).  
 Storage tray removed (para. 4-15).

*References*

Cleaning Procedures, Chapter 4, Section VI.  
 Appendix F Torque Values.

---

- a. Replace. (figure 5-29)

**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 VI 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 connector nut (1) and disconnect line (2).
- (2) Loosen connector nut (3) and disconnect line (4).
- (3) Remove four bolts (5) and lockwashers (6), and remove valve head (7) and two preformed packings (8).
- (4) Remove valve assembly (9) and preformed packing (10). Discard preformed packing.
- (5) Install valve assembly (9) and new preformed packing (10).
- (6) Install valve head (7), two preformed packings (8), and secure with four bolts (5) and lockwashers (6). Refer to Appendix F for torque values.
- (7) Install line (4) and tighten two connector nuts (3).

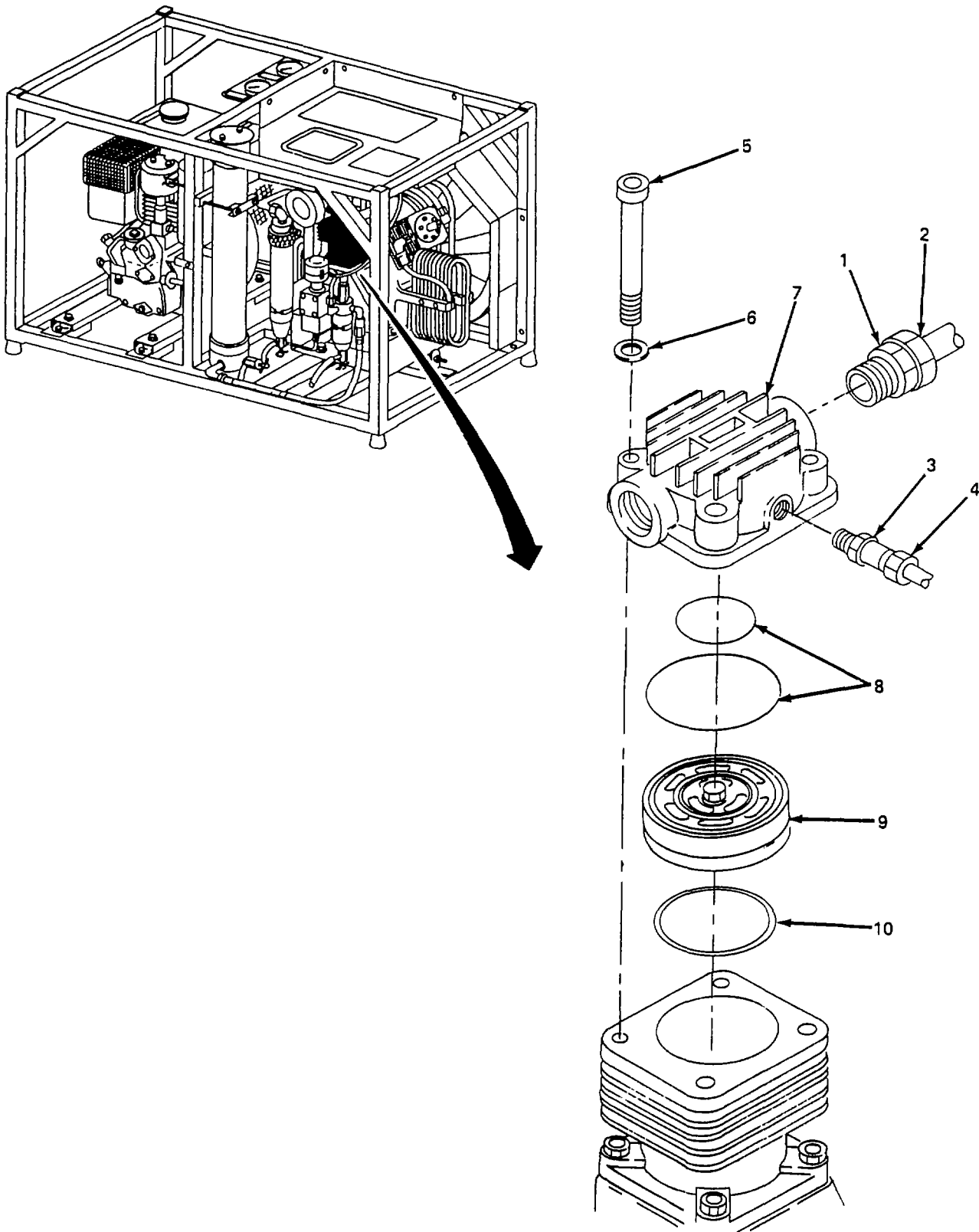


Figure 5-29. Valve Head and Valve Assembly, Replace.



5-22. **First Stage Valve Head and Valve Assembly (Cont).**

- (8) Install line (2) and tighten two connector nuts (1).

## FOLLOW-ON MAINTENANCE

- (1) Install inlet filter and adapter assembly (para. 4-17).
- (2) Install storage tray (para. 4-15).

b. Repair. (figure 5-30)

- (1) Remove valve head and valve assembly (para. a.).

**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 VI 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 bolt (1), upper valve body (2), preformed packing (3), two plates (4), rings (5), two plates (6), and rings (7) from lower valve body (8). Discard preformed packing (3).
- (3) Clean all items with TSP ultrasonic cleaner. Ensure all carbon and dirt deposits are removed. Dry all components thoroughly.
- (4) Inspect valve head (9) and replace if cracked.
- (5) Inspect upper (2) and lower (8) valve bodies and replace if cracked, worn, or otherwise damaged.
- (6) Inspect plates (4) and (6) and replace if scored, excessively worn, bent, or otherwise damaged.
- (7) Inspect rings (5) and (7) and replace if scored, excessively worn, bent, or otherwise damaged.
- (8) Install two rings (7), plates (6), rings (5), and plates (4). Ensure concave plates oppose one another.
- (9) Install new preformed packing (3), upper valve body (2) and bolt (1). Torque bolt to 20 lb-ft (27 Nm).
- (10) Install valve head and valve assembly (para. a.).

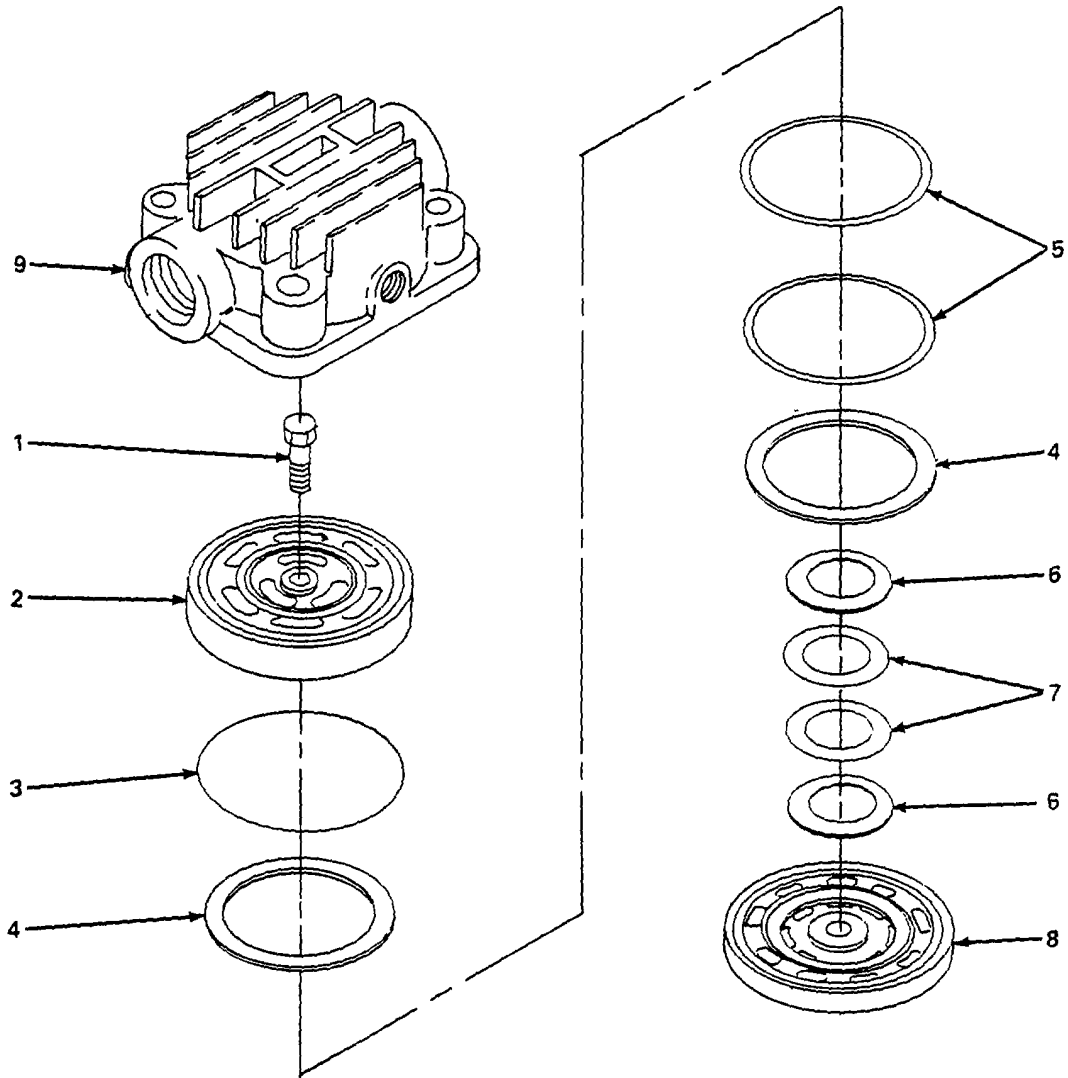


Figure 5-30. Valve Head and Valve Assembly, Repair.

---

**5-23. Second Stage Valve Head Assembly.**


---

This task covers:

a. **Replace**

b. **Repair**

---

**INITIAL SETUP**
*Tools*

General Mechanic's Tools Kit (NSN 5180-00-177-7033)  
 Torque Wrench (NSN 5120-00-247-2540)  
 TSP Ultrasonic Cleaner (NSN 4940-00-164-8997)

*Equipment Condition*

Compressor unit shutdown and depressurized (para. 2-12).

*Materials/Parts*

Preformed Packing  
 Second Stage Valve Head Assembly  
 Cloth, Lint Free (Item 7, Appendix E)  
 Bands, Rubber (Item 4, Appendix E)  
 Tape, Teflon (Item 23, Appendix E)  
 Bags, Plastic (Item 3, Appendix E)  
 Tape, Pressure Sensitive (Item 22, Appendix E)

*References*

Cleaning Procedures, Chapter 4, Section VI.  
 Appendix F Torque Values.

---

a. Replace. (figure 5-31)

**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 VI 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 connector nut (1).
- (2) Loosen connector nut (2).
- (3) Remove safety valve (3) and preformed packing (4). Discard preformed packing (4).
- (4) Remove six bolts (5), washers (6), second stage valve assembly (7), and preformed packing (8). Discard preformed packing (8).
- (5) Remove two elbows (9).

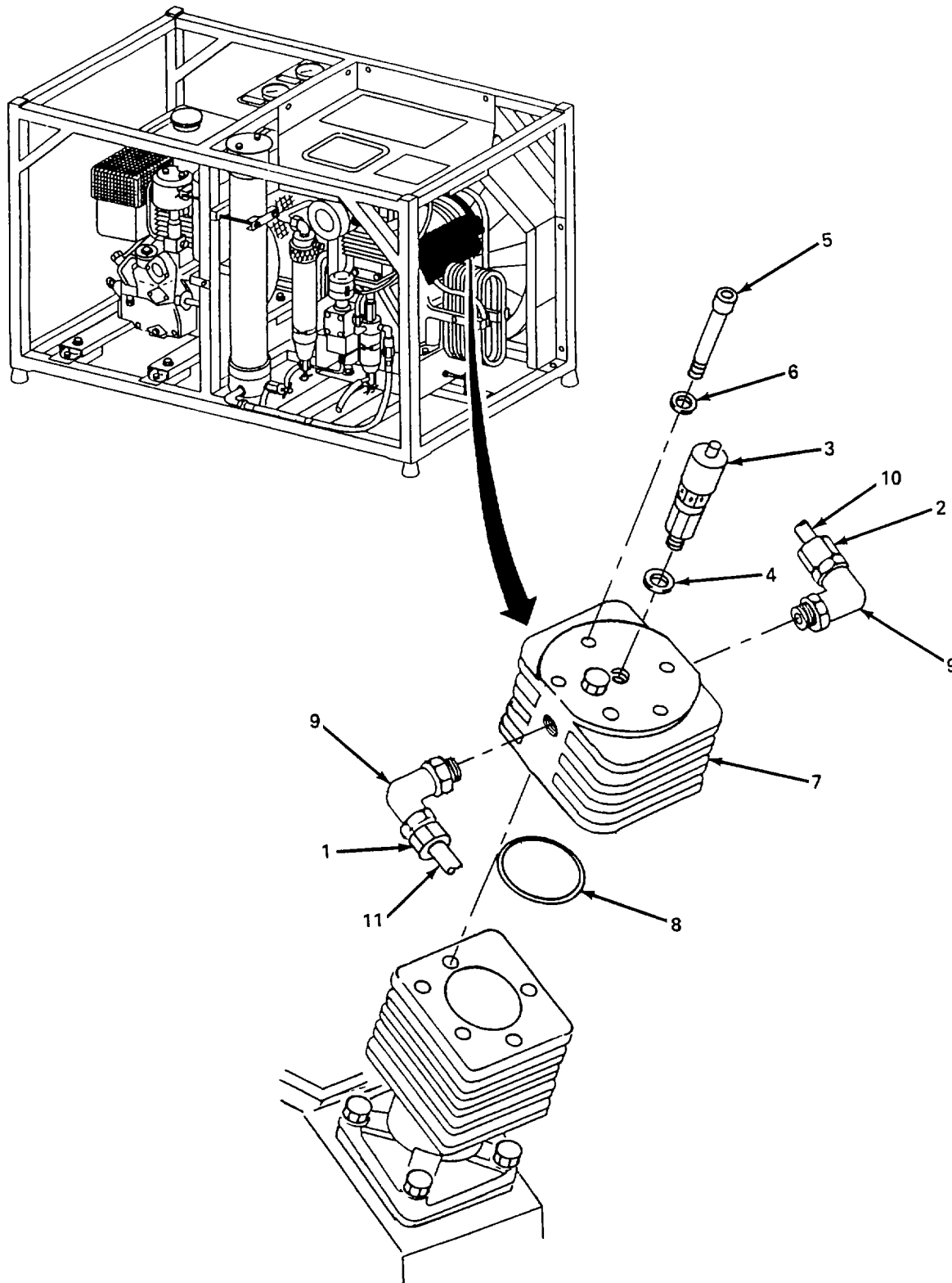


Figure 5-31. Second Stage Valve Head Assembly, Replace.

5-23. **Second Stage Valve Head Assembly.****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.

- (6) Apply teflon tape to pipe threads on two elbows (9) and install two elbows (9).
- (7) Ensure all seating surfaces are clean.
- (8) Install new preformed packing (8) and second stage valve assembly (7), and secure with six bolts (5) and washers (6). Torque bolts (5) to 8 lb-ft (11 Nm).
- (9) Connect line (10) and tighten connector nut (2).
- (10) Connect line (11) and tighten connector nut (1).

b. Repair. (figure 5-32)

- (1) Remove second stage valve assembly (para. a.).

**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 VI 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 two retaining screws (1), lower plate (2), preformed packing (3), two valve plates (4), spring rings (5), valve plates (6), and spring rings (7). Discard preformed packing (3).
- (3) Clean all items with TSP ultrasonic cleaner and dry all parts thoroughly.
- (4) Inspect lower plate (2) and head (8) and replace if cracked, scored, or otherwise damaged.
- (5) Inspect valve plates (4) and (6) and replace if scored, bent, or cracked.
- (6) Inspect spring rings (5) and (7) and replace if cracked, bent or scored.
- (7) Install two spring rings (7), valve plates (6), spring rings (5), and valve plates (4) in head (8). Ensure concave plates and ring oppose one another.

- (8) Install new preformed packing (3) in head (8).
- (9) Install lower plate (2), ensure plates and rings are aligned, and secure lower plate (2) with two retaining screws (1). Torque screws (1) to 7 lb-ft (10 Nm).
- (10) Install second stage valve head assembly (para. a.).

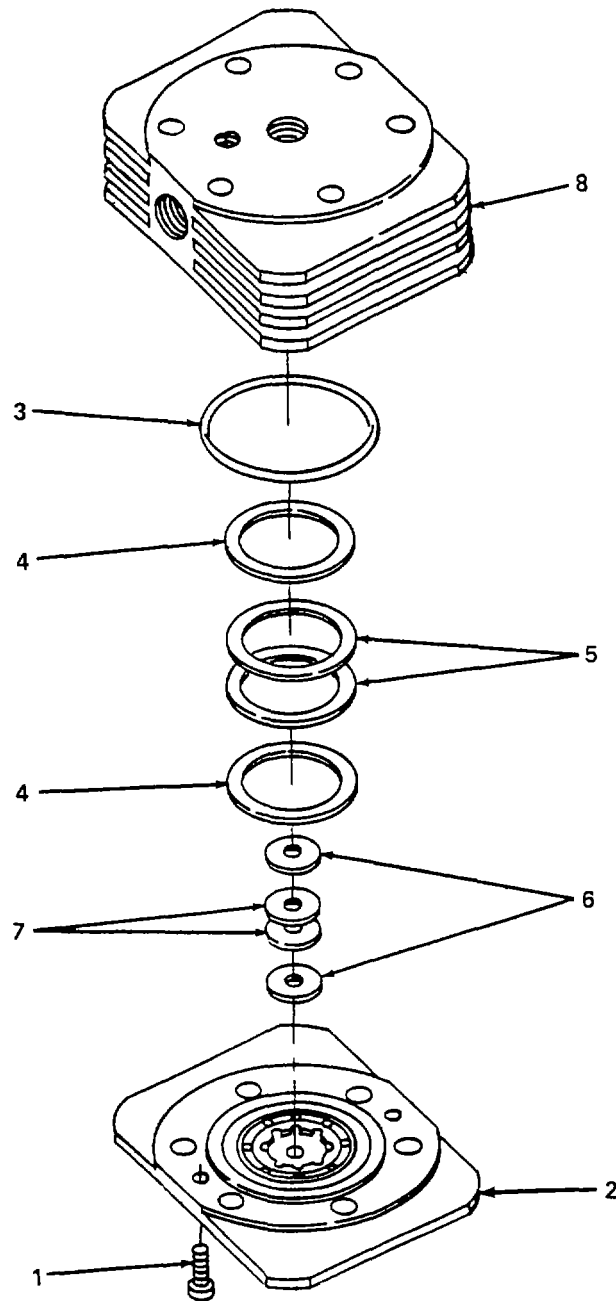


Figure 5-32. Second Stage Valve Head Assembly, Repair.

---

**5-24. Safety Valve (Second Stage Valve Head).**

---

**This task covers:****a. Replace**

---

**INITIAL SETUP***Tools*

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

*Materials/Parts*

Safety Valve  
Rags, Wiping (Item 19, Appendix E)  
Bags, Plastic (Item 3, Appendix E)  
Tape, Pressure Sensitive (Item 22, Appendix E)

---

Replace. (figure 5-33)**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 VI 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 safety valve (1) and seal (2).
- (2) Install new safety valve (1) and seal (2).

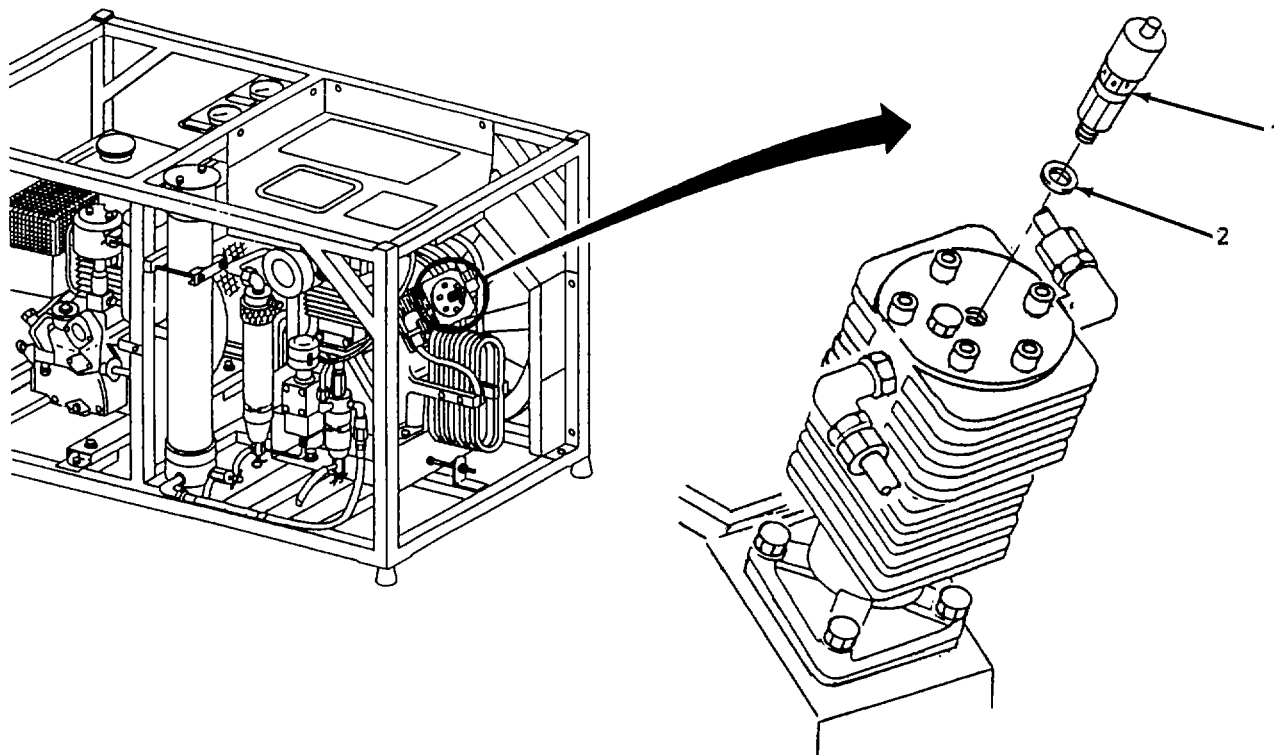


Figure 5-33. Safety Valve, Replace.



---

**5-25. Third Stage Valve Head Assembly.**


---

This task covers:

a. **Replace**

b. **Repair**

---

**INITIAL SETUP**
*Tools*

General Mechanic's Tools Kit (NSN 5180-00-177-7033)  
 Torque Wrench (NSN 5120-00-247-2540)  
 TSP Ultrasonic Cleaner (NSN 4940-00-164-8997)

*Equipment Condition*

Compressor unit shutdown and depressurized  
 (para. 2-12).

*Materials/Parts*

Preformed Packing  
 Valve Assembly  
 Cloth, Lint Free (Item 8, Appendix E)  
 Bands, Rubber (Item 4, Appendix E)  
 Tape, Teflon (Item 23, Appendix E)  
 Bags, Plastic (Item 3, Appendix E)  
 Tape, Pressure Sensitive (Item 22, Appendix E)

*References*

Cleaning Procedures, Chapter 4, Section VI.  
 Appendix F Torque Values.

---

- a. Replace. (figure 5-34)

**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 VI 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 two connector nuts (1) securing line (2).
- (2) Loosen connector nuts (3).
- (3) Remove six nuts (4) and washers (5) and remove valve assembly (6), cooling ring (7), and preformed packing (8). Discard preformed packing (8).
- (4) Remove fittings (9) and (10).

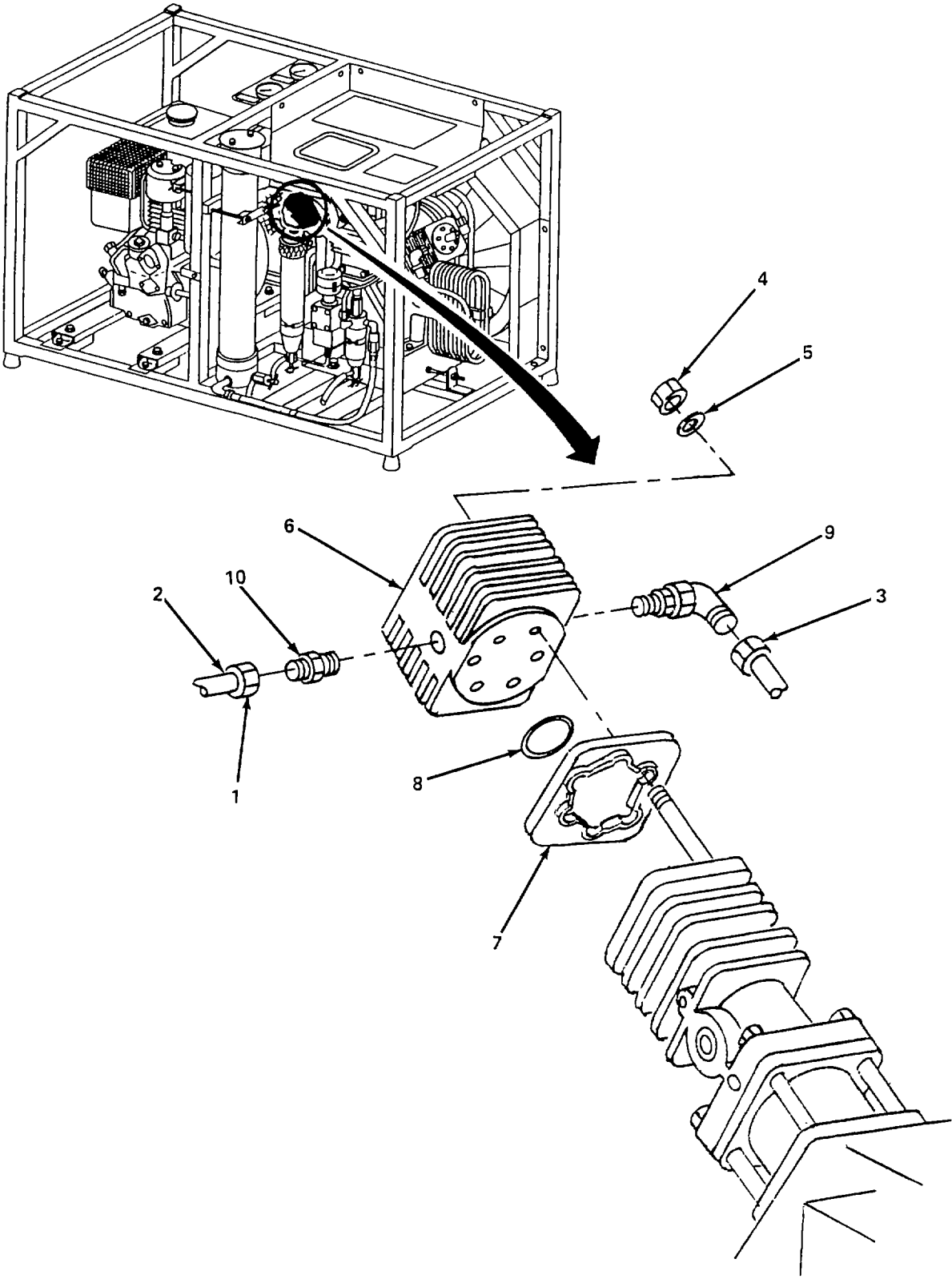


Figure 5-34. Third Stage Valve Head Assembly, Replace.

## 5-25. Third Stage Valve Head Assembly (Cont).

**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.

- (5) Apply teflon tape to pipe threads on fittings (9) and (10) and install fittings (9) and (10).
- (6) Ensure all sealing surfaces are clean.
- (7) Install cooling ring (7) and new preformed packing (8).
- (8) Install valve assembly (6) and secure with six nuts (4) and washers (5).
- (9) Tighten connector nut (3).
- (10) Tighten connector nuts (1).

b. Repair. (figure 5-35)**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 VI 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 two screws (1), bottom plate (2), preformed packing (3), valve plate (4), valve spring ring (5), center plate (6), valve spring ring (7), and valve plate (8). Discard preformed packing (3).
- (2) Separate lower valve head (9) from upper valve head (10) and remove preformed packing (11), valve plate (12), valve spring ring (13), center plate (14), valve spring ring (15), and valve plate (16). Discard preformed packing (11).
- (3) Clean all components in TSP ultrasonic cleaner and dry thoroughly.
- (4) Inspect bottom plate (2), lower valve head (9) and upper valve head (10) and replace if any component is cracked or otherwise damaged.

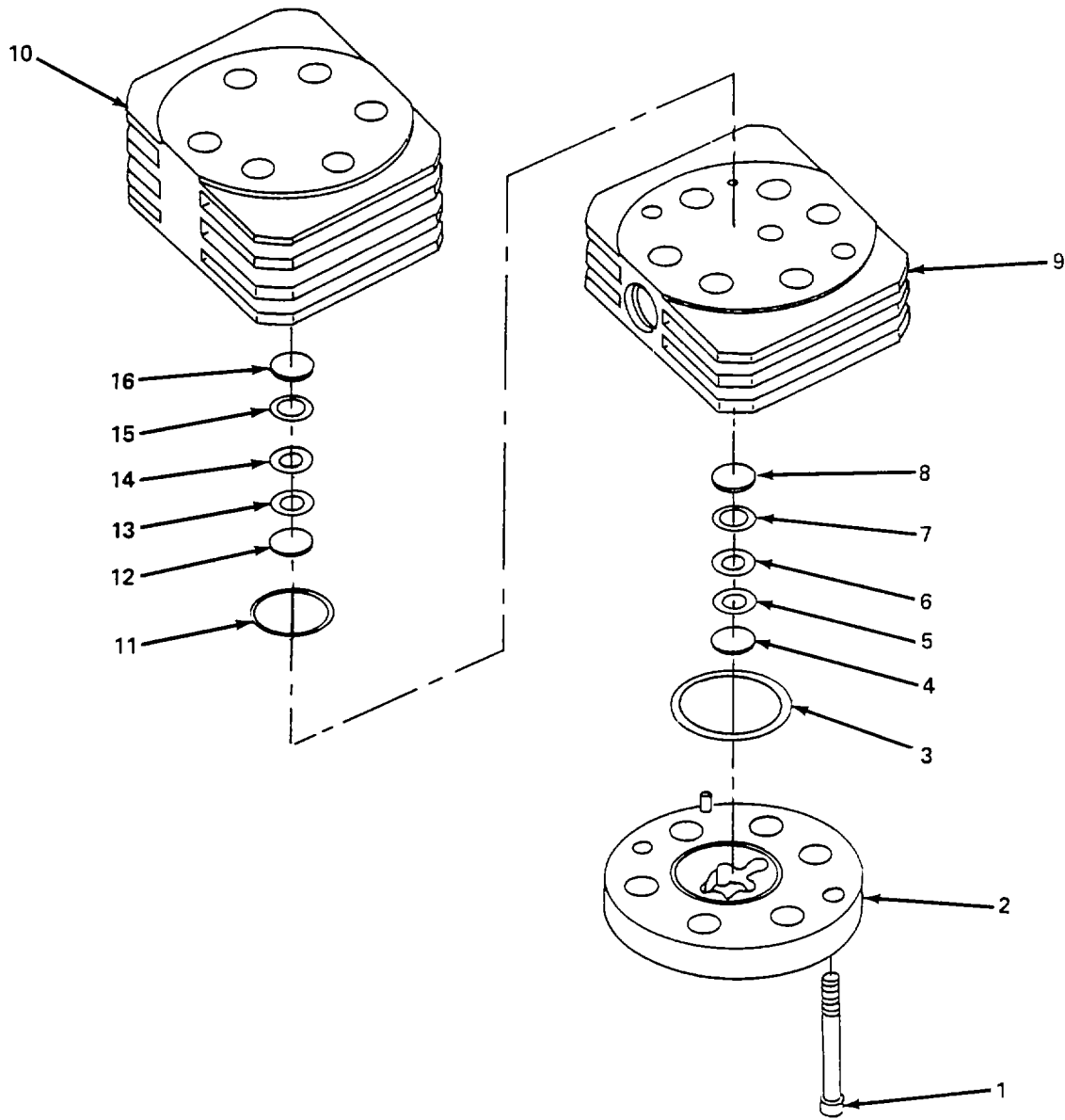


Figure 5-35. Third Stage Valve Head Assembly, Repair.

5-75/(5-76 blank)

- (5) Inspect valve plates (4), (8), (12), and (16) and replace if scored, bent, cracked, or otherwise damaged.
- (6) Inspect valve spring rings (5), (7), (13), and (15) and replace if cracked, scored, bent, or otherwise damaged.
- (7) Inspect center plates (6) and (14), and replace if cracked, bent, scored, or otherwise damaged.
- (8) Install valve plate (16), valve spring ring (15), center plate (14), valve spring ring (13), and valve plate (12). Ensure valve spring rings (15) and (13) curved sides face one another.
- (9) Install new preformed packing (11) and lower valve head (9). Ensure all holes align properly.
- (10) Install valve plate (8), valve spring ring (7), center plate (6), valve spring ring (5), and valve plate (4). Ensure curved sides of valve spring rings (7) and (5) face one another.
- (11) Install new preformed packing (3), bottom plate (2) and secure with two screws (1). Torque screws to 7 lb-ft (10 Nm).

---

**5-26. Sheave (Pulley).**

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**This task covers:****Replace**

---

**INITIAL SETUP***Tools*

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

*Equipment Condition*

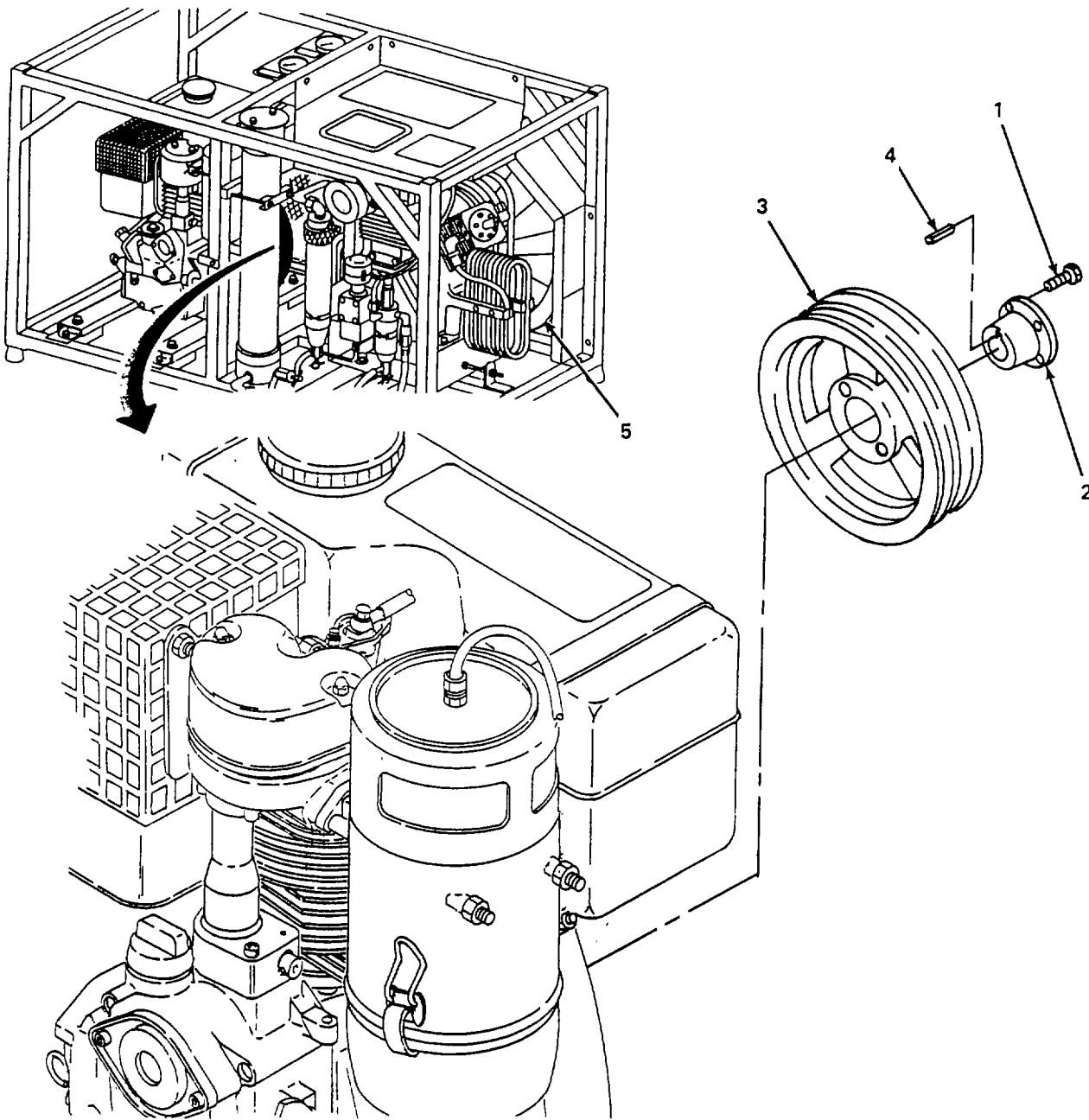
Drivebelt removed (para. 4-14).

*Materials/Parts*Sheave (Pulley)

---

Replace (figure 5-36)

- (1) Remove two bolts (1).
- (2) Reinstall two bolts (1) into threaded holes in collet (2).
- (3) Tighten bolts (1) and press pulley (3) off collet (2).
- (4) Remove collet (2), pulley (3), and key (4).
- (5) Remove bolts (1) from collet (2).
- (6) Install key (4), pulley (3), and collet (2).
- (7) Place a long straight edge across the face of compressor pulley (5).
- (8) Adjust the position of pulley (3) until pulleys (3) and (5) are parallel within 1/16 in. (1.58 mm). Tighten two bolts (1).



**Figure 5-36. Sheave (Pulley), Replace.**

FOLLOW-ON MAINTENANCE  
Install drivebelts (para. 4-14).

---

**5-27. Fuel Injector.**

---

**This task covers:****a. Test****b. Replace**

---

**INITIAL SETUP***Tools*

General Mechanic's Tools Kit (NSN 5180-00-177-7033)  
Injector Nozzle Tester (P/N 0031077)  
Wrench, Torque (NSN 5120-00-554-7292)

*Equipment Condition*

Fuel lines removed from injector (para. 4-24).

*Materials/Parts*

Gasket  
Fuel Injector  
Rags, (Wiping, (Item 19, Appendix E)

*Reference*

Appendix F Torque Values.

---

- a. Test. (figure 5-37)
- (1) Remove fuel injector (para. b.).
  - (2) Connect fuel injector (1) to tester (2).
  - (3) Place drip pan under injector (1).
  - (4) Close tester valve.
  - (5) Pump the tester until the fuel injector (1) opens and sprays fuel.
  - (6) Observe the pressure at which fuel injector (1) opens. Pressure should be 2845 psi (19616 Kpa).
  - (7) Replace fuel injector (1) if pressure required to open fuel injector (1) is higher than 2845 psi (19616 Kpa).
  - (8) Pump the tester to 2551 psi (17589 Kpa) and hold for 10 seconds. If pressure drops steadily or injector leaks, replace injector.
  - (9) Open valve, remove injector from tester.
  - (10) Install fuel injector (para. b.).



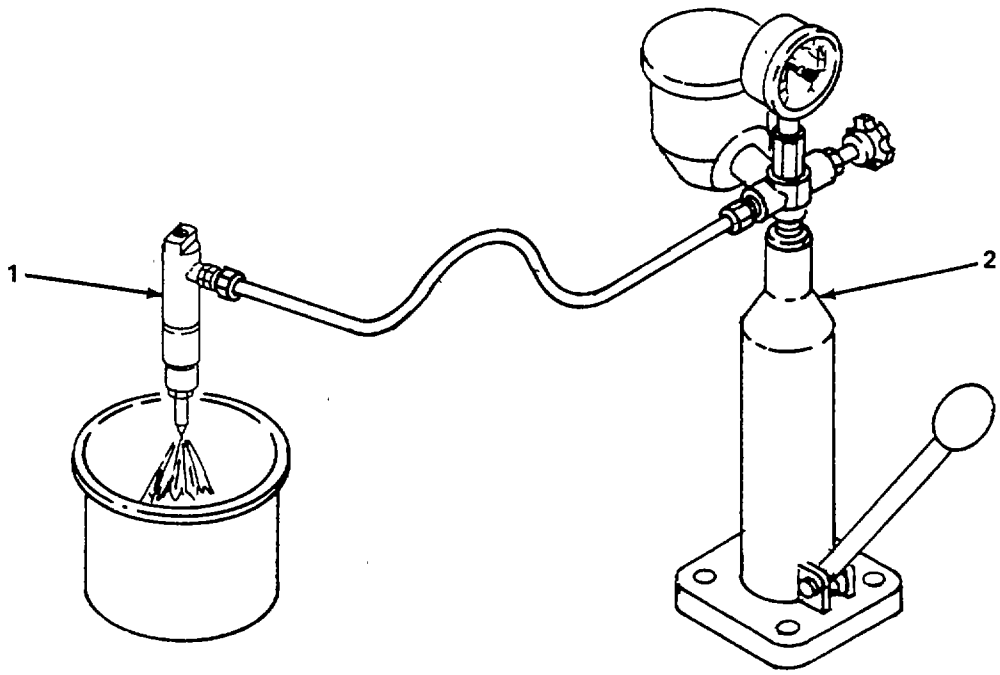


Figure 5-37. Fuel Injector, Test.

**5-27. Fuel Injector (Cont).**

- b. *Replace.* (figure 5-38)
- (1) Remove two nuts (1) and lockwashers (2) and remove injector clamp (3).

**CAUTION**

**Do not allow any dirt or debris to fall down inside injector hole after injector has been removed. The engine must be disassembled to remove dirt from cylinder. Do not run engine if any dirt or debris fell into injector hole.**

- (2) Remove fuel injector (4) and gasket (5). Discard gasket (5).
- (3) Install new gasket (5) and fuel injector (4).
- (4) Install injector clamp (3) and secure with two nuts (1) and lockwashers. Torque nuts to 42-50 lb-in. (5-6 Nm).

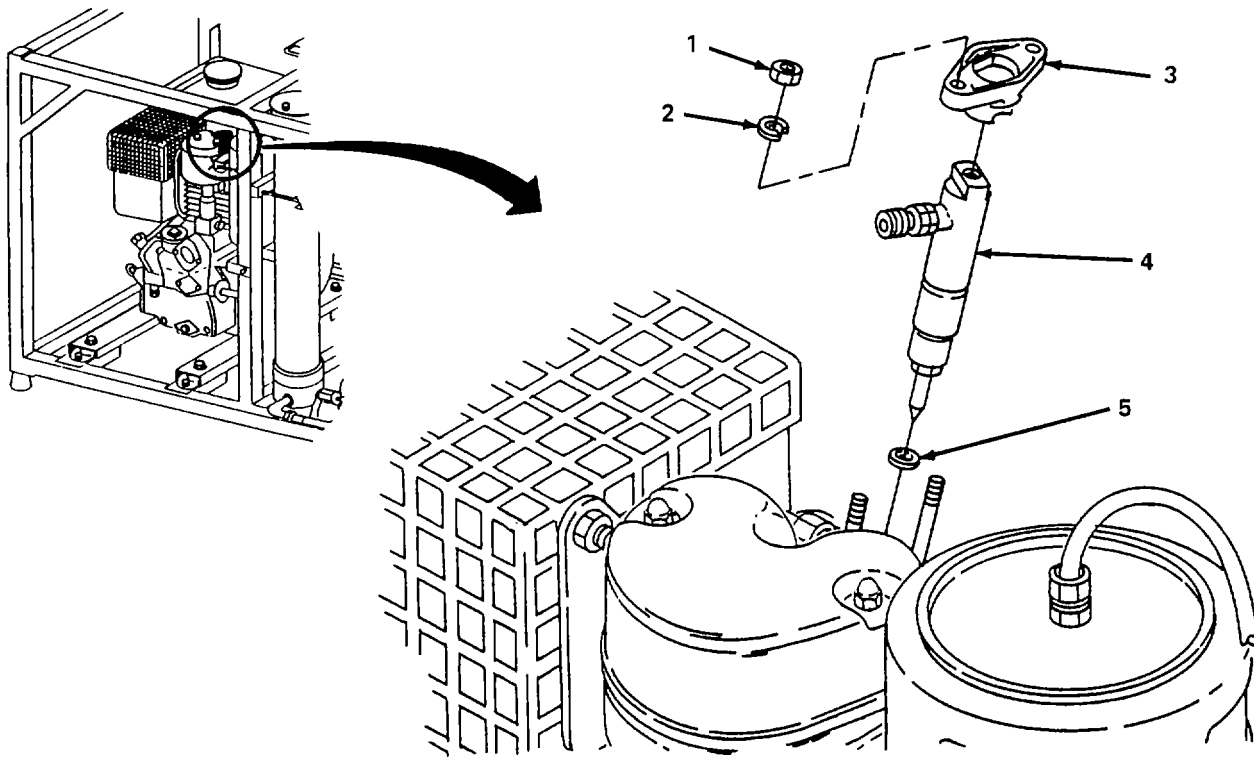


Figure 5-38. Fuel Injector, Replace.

---

**5-28. Fuel Injection Pump.**


---

**This task covers:**

**a. Adjust**

**b. Replace.**

---

**INITIAL SETUP**

*Tools*

General Mechanic's Tools Kit (NSN 5180-00-177-7033)  
Wrench, Torque (NSN 5120-00-554-7292)

*Equipment Condition*

Fuel lines removed from injection pump (for replace only) (para. 4-24).

*Materials/Parts*

Roller Tappet  
Gasket  
Fuel Injection Pump  
Rags, (Wiping, (Item 19, Appendix E)  
Equipment Condition

*Reference*

Appendix F Torque Values.

---

a. Adjust. (figure 5-39)

- (1) Ensure fuel tank (1) has fuel.
- (2) Set speed control lever (2) to mid-range.
- (3) Ensure primer button (3) is not pulled out.
- (4) Clamp off fuel supply line (4) from fuel tank (1) to injector pump (5).
- (5) Remove plug (6) and washer (7).
- (6) Install washer (8), banjo bolt (9) (with drip tube), and washer (10).
- (7) Open fuel supply line (4).
- (8) Set compression release mechanism (11) to neutral position.
- (9) Rotate flywheel (12) counterclockwise until fuel flows freely from drip tube (13).
- (10) Continue turning flywheel (12) until fuel stops dripping.
- (11) Slowly turn flywheel (12) clockwise until fuel starts to drip from drip tube (13) and stop turning flywheel (12).
- (12) Measure distance between timing marks (14) and compare with figures in table 5-2.
- (13) Remove fuel pump (para. b.) and add shims to retard (lower engine speed) or remove shims to advance (increase engine speed).
- (14) Install pump (para. b.) and recheck timing.

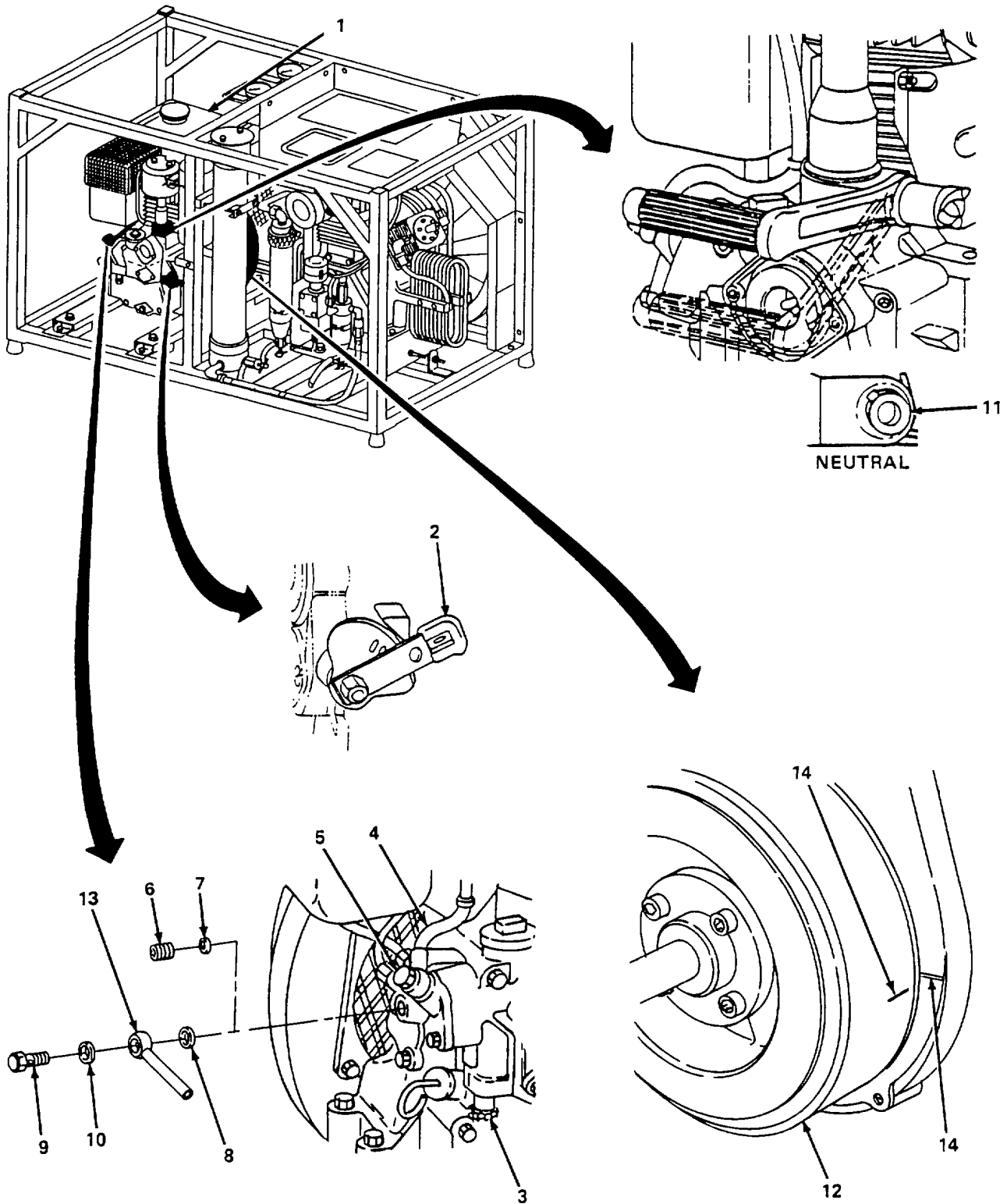


Figure 5-39. Fuel Injector Pump, Adjust.

## 5-28. Fuel Injection Pump (Cont).

Table 5-2. Fuel Injection Timing-Millimeters BTDC (+2 mm).

Model No.	Flywheel Dia.	Governor Maximum RPM							
		1500	1800	2000	2500	2800	3000	3300	3600
15A430	258 mm	-	18	18	21	21	21	27	27

(15) Remove banjo bolt (9), washer (8), and washer (10).

(16) Install plug (6) and washer (7).

b. Replace. (figure 5-40)

(1) Remove two nuts (1) and lockwashers (2) and remove fuel injection pump (3), shims (4), and gasket (5). Discard gasket (5).

(2) Remove filler cap (6) and gasket (7).

**NOTE**

**Replace roller tappet only if fuel pump is being replaced.**

(3) Remove roller tappet (10) and discard.

(4) Ensure all gasket seating surfaces are clean and old gasket material is removed.

(5) Inspect shims (4) and replace with same sized ones if worn or cracked.

(6) Install new roller tappet (10), with slot facing up, and install bolt (8) and washer (9).

(7) Install filler cap (6) and gasket (7).

(8) Place speed control lever (11) in horizontal position.

(9) Set injector pump rack pin (12) to midpoint of its travel.

(10) Install shims (4), gasket (5), and pump (3).

(11) Install lockwashers (2) and nuts (1). Torque nuts (1) to 175 lb-in. (20 Nm).

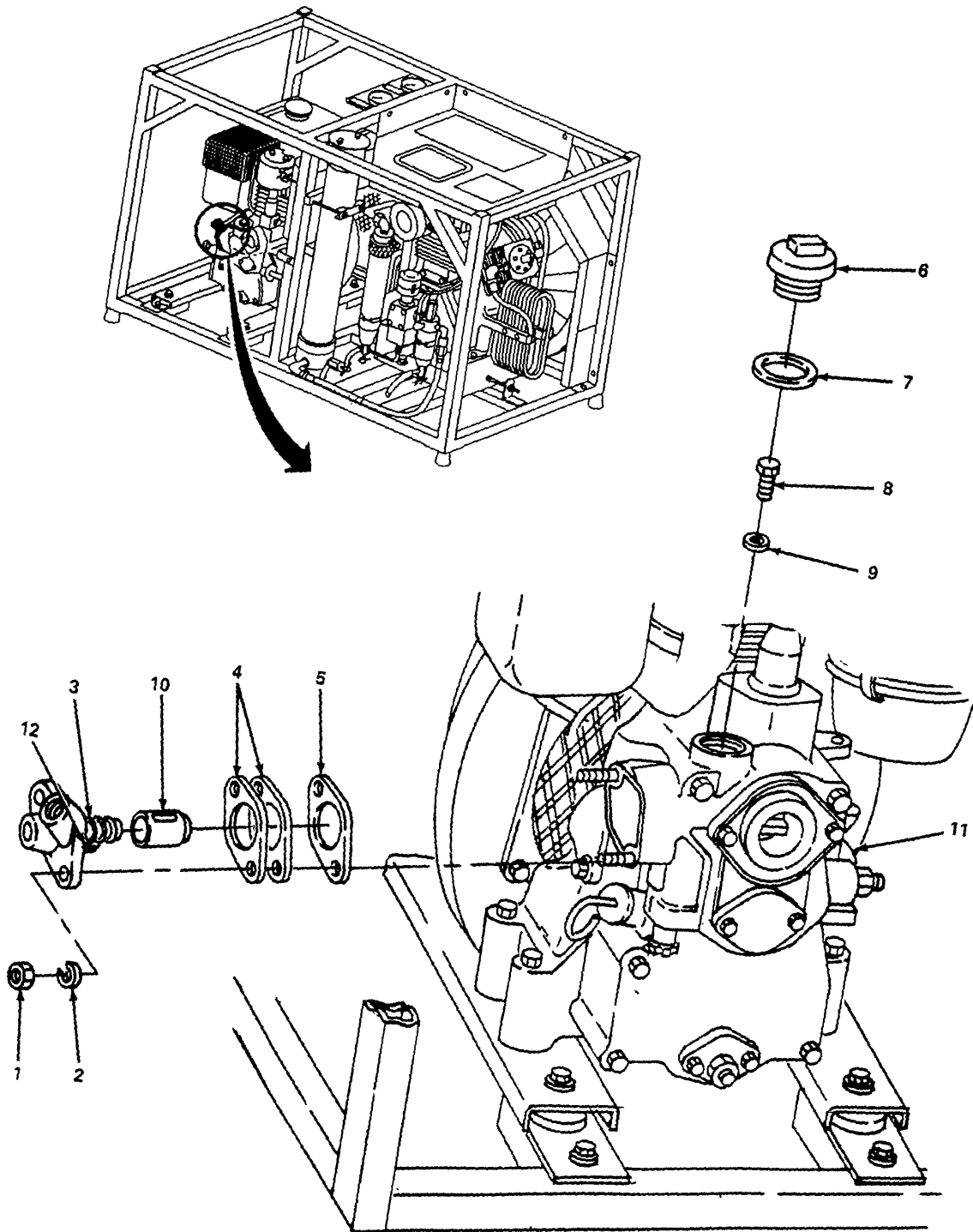


Figure 5-40. Fuel Injection Pump, Replace

---

**5-29. Engine Cylinder Head Assembly**


---

This task covers:

**a. Adjust**

**b. Replace.**

**c. Repair**

---

**INITIAL SETUP**
*Tools*

General Mechanic's Tools Kit (NSN 5180-00-177-7033)  
 Valve Spring Compressor (NSN TBD)  
 Valve Seat Reamer Tool (P/N 69604)  
 Valve Seat Reamer (45°) (P/N 84343)  
 Wrench, Torque (NSN 5120-00-554-7292)

*Equipment Condition*

Air cleaner removed (para. 4-26).  
 Muffler removed (para. 4-27).  
 Fuel injector removed (para. 5-27)

*Reference*
*Materials/Parts*

Appendix F Torque Values

Gasket  
 Cylinder Head Assembly  
 Rags, (Wiping, (Item 19, Appendix E)  
 Solvent, Dry Cleaning (Item 21, Appendix E)

---

a. Adjust. (figure 5-41)

- (1) Remove two nuts (1), valve cover (2), and gasket (3). Discard gasket (3).
- (2) Set compression release mechanism (4) to run position.
- (3) Rotate engine until exhaust valve rocker (5) is fully open.
- (4) Measure gap between intake rocker (6) and valve stem (7). Measurement should be 0.004 in. (0.1 mm).
- (5) Loosen locknut (8) and turn adjuster (9) until there is a slight drag felt on feeler gage.
- (6) Hold adjuster (9) and tighten locknut (8). Recheck measurement and readjust if necessary.
- (7) Rotate engine until intake valve rocker (6) is fully open.
- (8) Measure gap between exhaust valve rocker (5) and valve stem (10). Measurement should be 0.004 in. (0.1 mm).
- (9) Loosen locknut (11) and turn adjuster (12) until there is a slight drag felt on feeler gage.
- (10) Hold adjuster (12) and tighten locknut (11). Recheck measurement and readjust if necessary.
- (11) Install valve cover (2) and new gasket (3) and secure with two nuts (1).



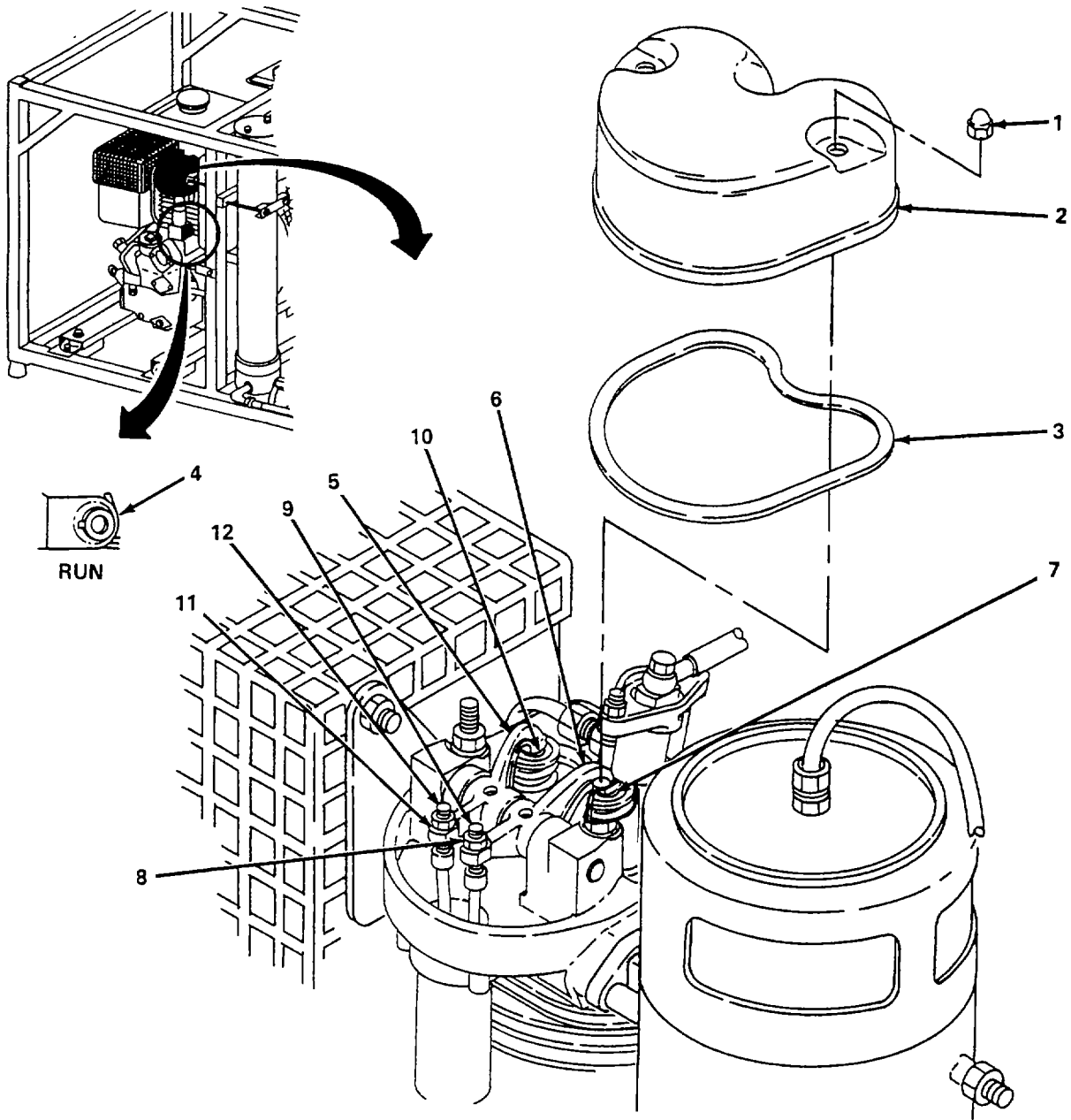


Figure 5-41. Valves, Adjust.

## 5-29. Engine Cylinder Head Assembly (Cont)

- b. Replace. (figure 5-42)
- (1) Remove two nuts (1) and remove valve cover (2), gasket (3), and two preformed packings (4). Discard preformed packing (4).
  - (2) Remove two nuts (5) and washer (6) and remove spring (7).
  - (3) Remove nut (8) and screw (9).
  - (4) Remove screw (10) and air shield (11).
  - (5) Remove screw (12) and air shield (13).
  - (6) Loosen two nuts (14) and unscrew adjusters (15) part way.
  - (7) Remove four nuts (16), washers (17), and bracket (18) and remove cylinder head (19), gasket (20), and preformed packing (21). Discard preformed packing (21).
  - (8) Remove four studs (22).
  - (9) Install four studs (22).
  - (10) Ensure all gasket surfaces are clean and free of old gasket material.
  - (11) When installing cylinder head (19), ensure pushrods (23) and (24) are properly positioned. The front pushrod (23) goes to exhaust rocker (25) and back pushrod (24) goes to intake rocker (26).
  - (12) Install new preformed packing (21) in cylinder head (19) and install cylinder head (19) and gasket (20) and secure with four nuts (16), washers (17), and bracket (18). Torque nuts to 25-28 lb-ft (34-39 Nm).
  - (13) Install air shield (13) and secure with screw (12).
  - (14) Install air shield (11) and secure with screw (10).
  - (15) Install screw (9) and nut (8).
  - (16) Install spring (7) and secure with two nuts (5) and washers (6).
  - (17) Adjust valves (para. a.).
  - (18) Install two new preformed packings (4), new gasket (3), and valve cover (2) and secure with two nuts (1).

## FOLLOW-ON MAINTENANCE

- (1) Install fuel injector (para. 5-27).
- (2) Install muffler (para. 4-27).
- (3) Install air cleaner (para. 4-26).

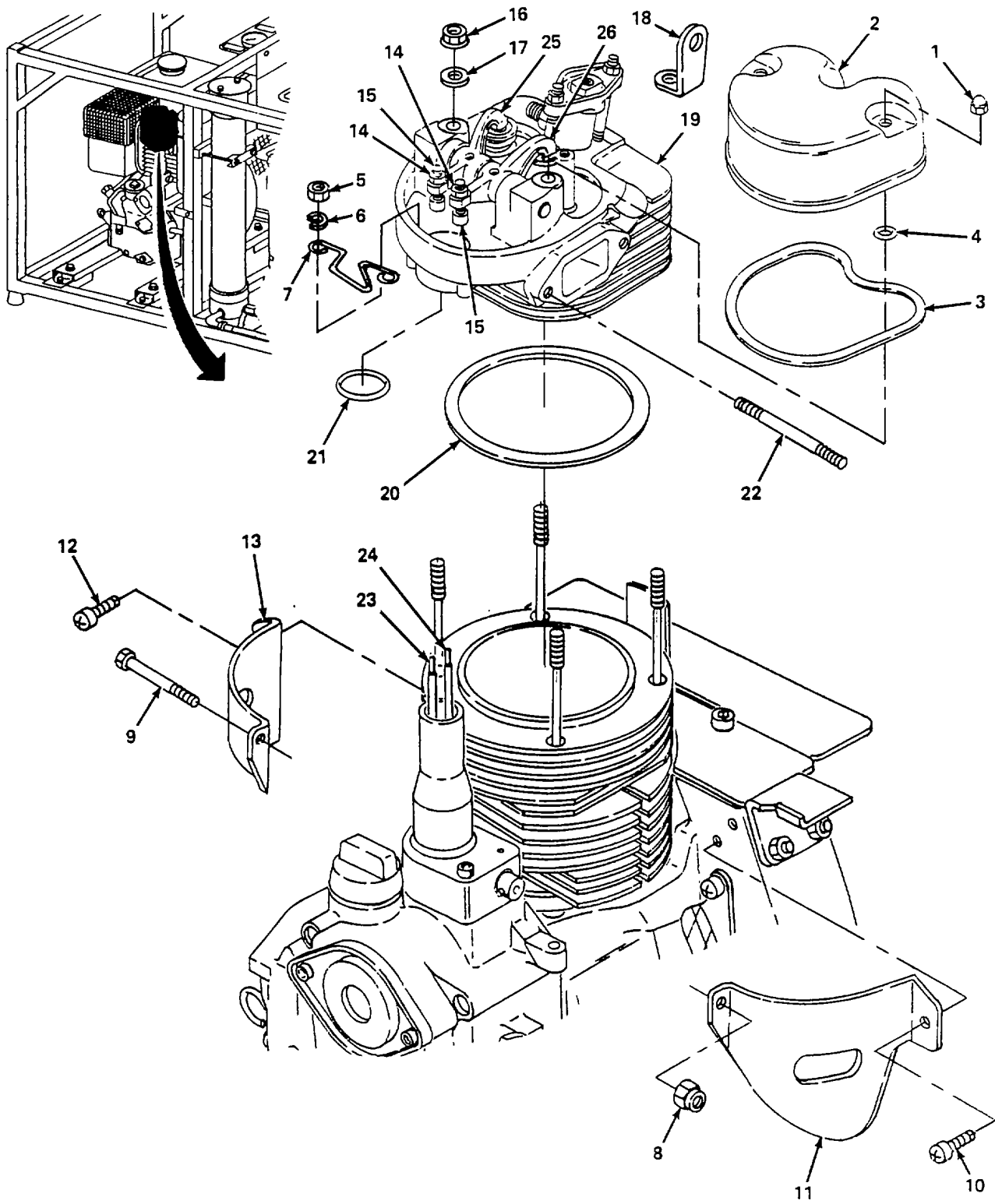


Figure 5-42. Cylinder Head Assembly, Replace.

## 5-29. Engine Cylinder Head Assembly (Cont)

- c. *Repair.* (figure 5-43)
- (1) Remove cylinder head assembly (para. b.).
  - (2) Press out rocker arm shaft (1) and remove intake rocker arm (2) and exhaust rocker arm (3).
  - (3) Using valve spring compressor, compress intake valve (4) and remove two retainer halves (5), collar (6), spring (7), seal (8), two washers (9), and valve (4).
  - (4) Using valve spring compressor, compress exhaust valve (10) and remove two retainer halves (11), collar (12), spring (13), roto cap (14), retaining ring (15), two washers (16), and valve (10).
  - (5) Remove check valve (17).
  - (6) Remove two studs (18).
  - (7) Remove two studs (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).**

- (8) Clean all items with dry cleaning solvent and dry thoroughly.
- (9) Inspect valves (4) and (10) and replace if stems are bent, seating surfaces are pitted or excessively worn, or head of valve stem is mushroomed
- (10) Inspect springs (7) and (13) and replace if deformed or cracked.
- (11) Inspect retainer halves (5) and (11) and replace if worn, cracked, or bent.
- (12) Inspect collars (6) and (12) and replace if worn, cracked, or bent.
- (13) Inspect washers (9) and (16) and replace if cracked or bent.
- (14) Inspect rockers (2) and (3) and replace if bent or cracked, press out worn bushings (20) or (21) if worn or excessively scored.
- (15) Inspect locknuts (22) and adjusters (23) and replace if threads are stripped or otherwise damaged.
- (16) Inspect roto cap (14) and replace if bent or otherwise damaged.
- (17) Inspect check valve (17) and replace if excessively dirty.
- (18) Inspect studs (18) and (19) and replace if threads are stripped.

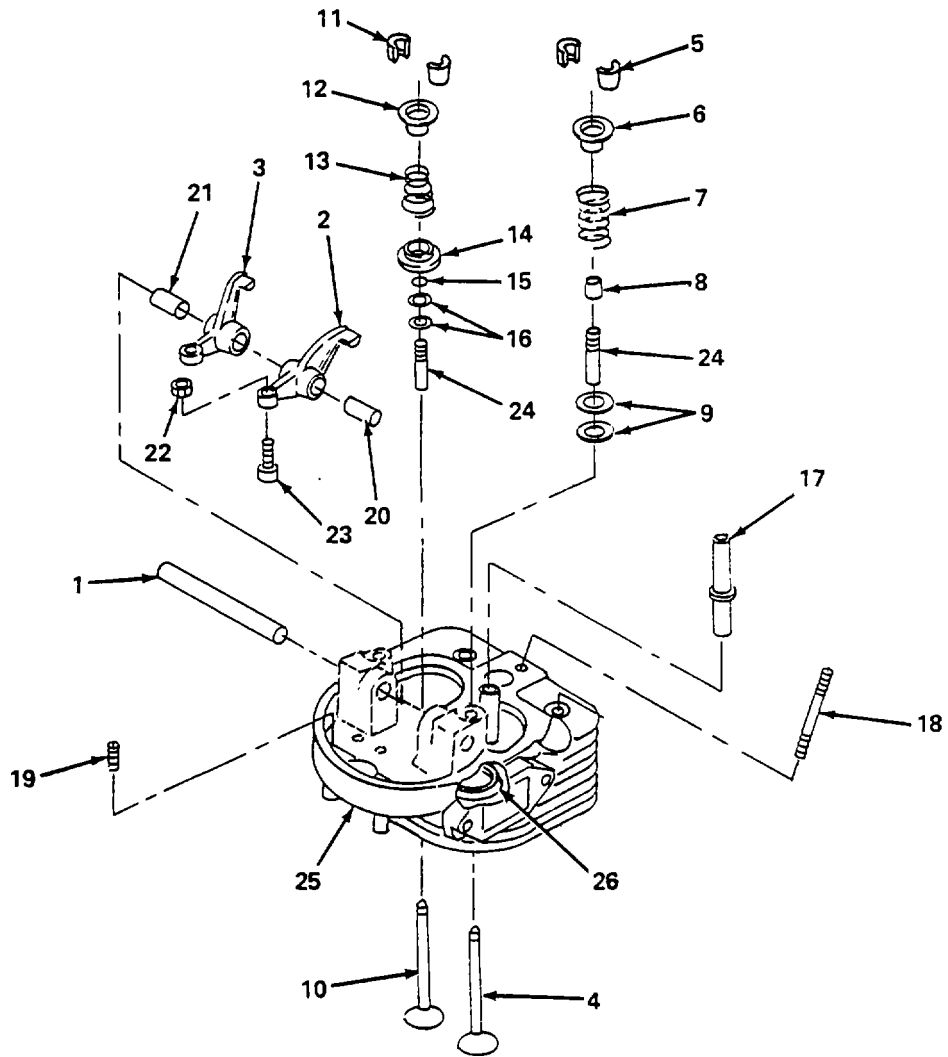


Figure 5-43. Cylinder Head Assembly, Repair.

5-93/(5-94 blank)

- (19) Inspect rocker arm shaft (1) and replace if bent or excessively scored.
- (20) Inspect valve guides (24) and replace if excessively worn, valve stems have excessive side play in guides, or cracked. Press out old guides and press in new ones.
- (21) Inspect cylinder head (25) and replace if cracked, warped, or other damaged
- (22) Inspect valve seats (26). Reface valve seats using valve seat reamer and reamer tool. Ensure valves (4) and (10) seat fully in seats (26).
- (23) Install check valve (17).
- (24) Install valve (10), two washers (16), retaining ring (15), roto cap (14), spring (13), and collar (12).
- (25) Using valve spring compressor, compress spring (13) and install two retainer halves (11). Ensure retainer halves are fully seated.
- (26) Install valve (4), two washers (9), new seal (8), spring (7), and collar (6).
- (27) Using spring compressor, compress spring (7) and install two retainer halves (5). Ensure retainer halves are fully seated.
- (28) Install intake rocker arm (2) and exhaust rocker arm (3).
- (29) Press in rocker arm shaft (1).
- (30) Install studs (19).
- (31) Install studs (18).
- (32) Install cylinder head assembly (para. b.).

---

**5-30. Speed Control Assembly.**

---

**This task covers:****Replace**

---

**INITIAL SETUP***Tools*

General Mechanic's Tools Kit (NSN 5180-00-177-7033)  
 Wrench, Torque (NSN 5120-00-554-7292)

*Materials/Parts*

Gasket  
 Locking Tab  
 Speed Control Assembly

*Equipment Condition*

Cylinder head removed (para. 5-29).  
 Fuel lines removed (para. 4-24).  
 Engine crankcase oil screen removed (para. 4-31).  
 Engine removed (para. 4-23).  
 Crank handle guide removed (para. 4-30).

*Reference*

Appendix F Torque Values

---

Replace. (figure 5-44)

- (1) Remove six bolts (1) and remove cover (2) and gasket (3).
- (2) Remove nut (4), washer (5), lever (6), plate (7), pin (8), and spring (9).
- (3) Remove two screws (10), plate (11), and gasket (12).
- (4) Remove nut (13), locking tab (14), and screw (15).
- (5) Remove spring retainer (16), shaft (17), washer (18), and spring (19).
- (6) Remove governor arm (20) and spring (21).
- (7) Install spring (21) in governor arm (20).
- (8) Position governor arm (20) in cover (2). Ensure rack pin (22) engages slot in governor arm (20).
- (9) Install spring (19), washer (18), shaft (17), and secure with retainer (16).
- (10) Install screw (15), new locking tab (14), and nut (13).
- (11) Install new gasket (12), plate (11), and two screws (10).
- (12) Install spring (9), pin (8), plate (7), lever (6), washer (5), and nut (4).
- (13) Remove two screws (22), compression release mechanism (23) and gasket (24).
- (14) Turn gear (25) and align timing mark on gear (25) with mark on cover (2).

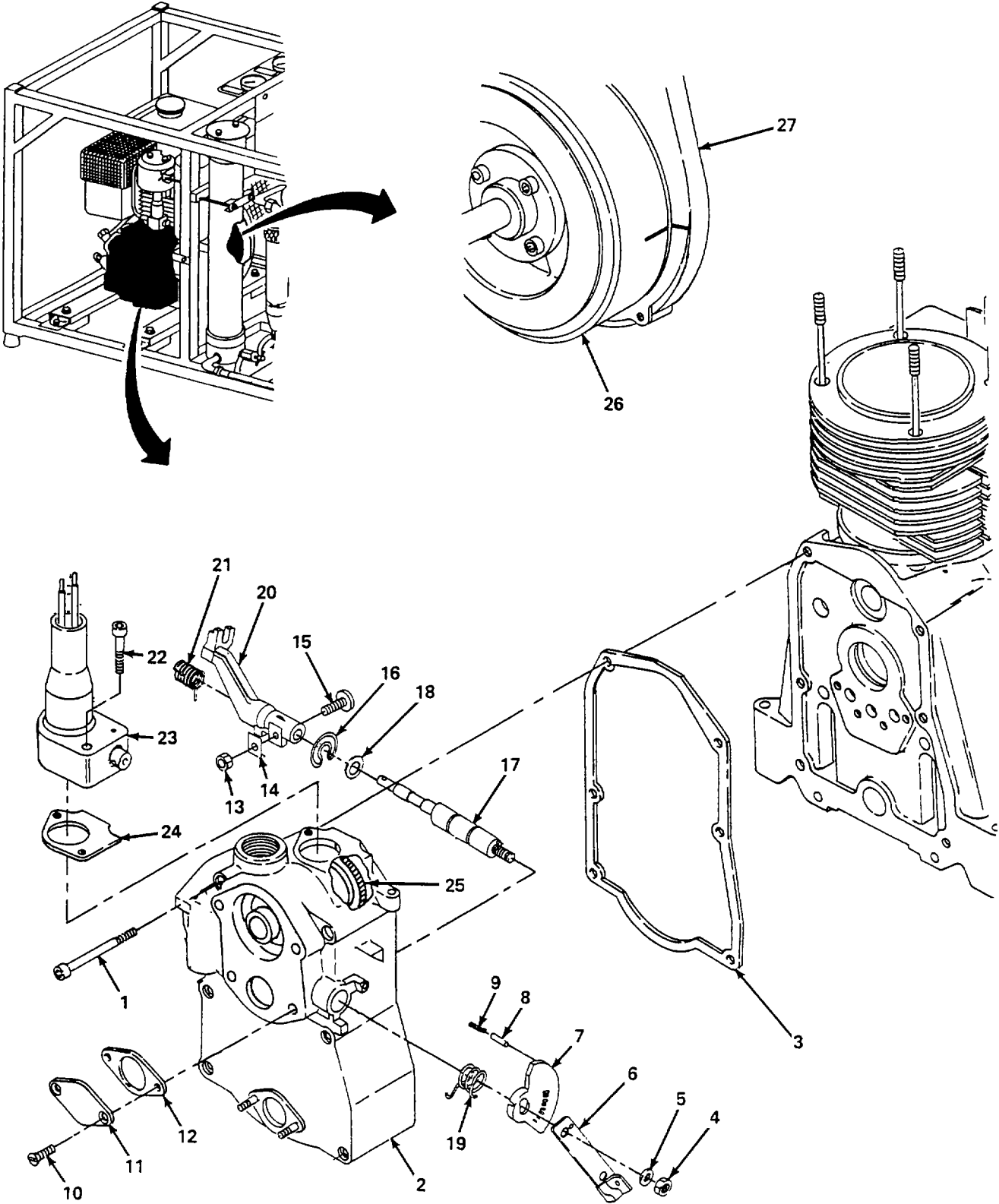


Figure 5-44. Speed Control Assembly, Replace.



- (15) Ensure gasket mounting surfaces are clean and old gasket material removed.
- (16) Rotate flywheel (26) counterclockwise and align timing mark on flywheel (26) with mark on crankcase (27).
- (17) Install cover (2) and gasket (3) and secure with six bolts (1). Torque bolts to 13-15 lb-ft (18-20 Nm).
- (18) Install gasket (24) and compression release mechanism (23) and secure with two screws (22).

**FOLLOW-ON MAINTENANCE**

- (1) Install cylinder head (para. 5-29).
- (2) Install fuel lines (para. 4-24).
- (3) Install engine crankcase oil screen (para. 4-31).
- (4) Install engine (para. 4-23).
- (5) Install crank handle guide (para. 4-30).
- (6) Adjust governor assembly (para 4-29).

---

**5-31. Compression Release Assembly..**

---

**This task covers:****Replace**

---

**INITIAL SETUP***Tools*

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

*Equipment Condition*

Cylinder head removed (para. 5-29).

*Materials/Parts*

Preformed Packing

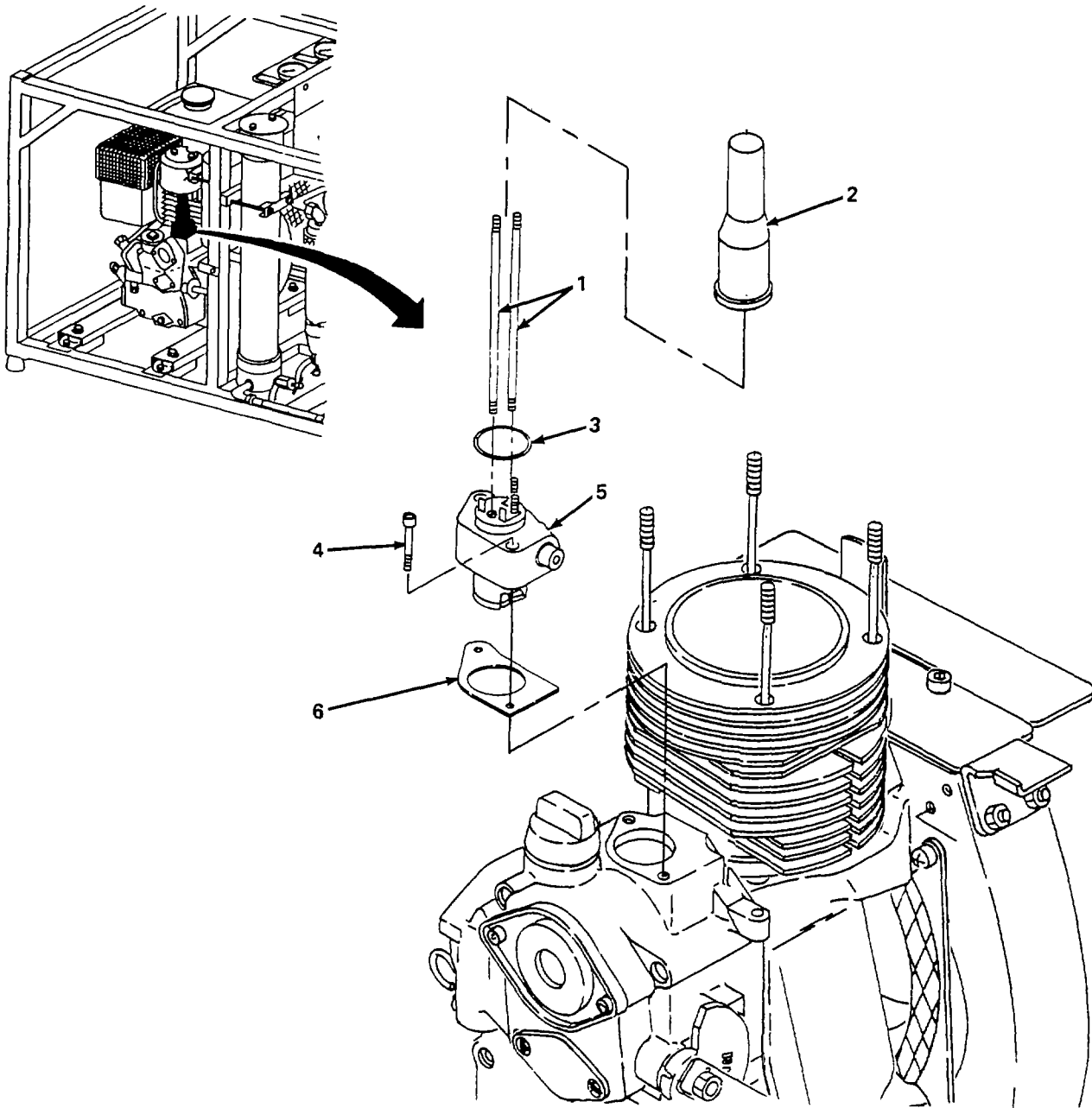
Gasket

Compression Release Mechanism

---

Replace. (figure 5-45)

- (1) Remove two push rods (1), push rod tube (2), and preformed packing (3). Discard preformed packing (3).
- (2) Remove two screws (4), compression release assembly (5), and gasket (6). Discard gasket (6).
- (3) Ensure all gasket mounting surfaces are clean and old gasket material removed.
- (4) Install new gasket (6) and compression release assembly (5) and secure with two screws (4).
- (5) Install new preformed packing (3), push rod tube (2) and two push rods (1).



**Figure 5-45. Compression Release Assembly, Replace.**

FOLLOW-ON MAINTENANCE  
 Install cylinder head assembly (para. 5-29).

---

**5-32. Gear Cover Assembly.**

---

**This task covers:****Replace**

---

**INITIAL SETUP***Tools*

General Mechanic's Tools Kit (NSN 5180-00-177-7033)  
Pliers, Retaining Ring (NSN 5210-00-789-0492)

*Equipment Condition*

Speed control assembly removed (para. 5-30).  
Compression release assembly removed  
(para. 5-31).

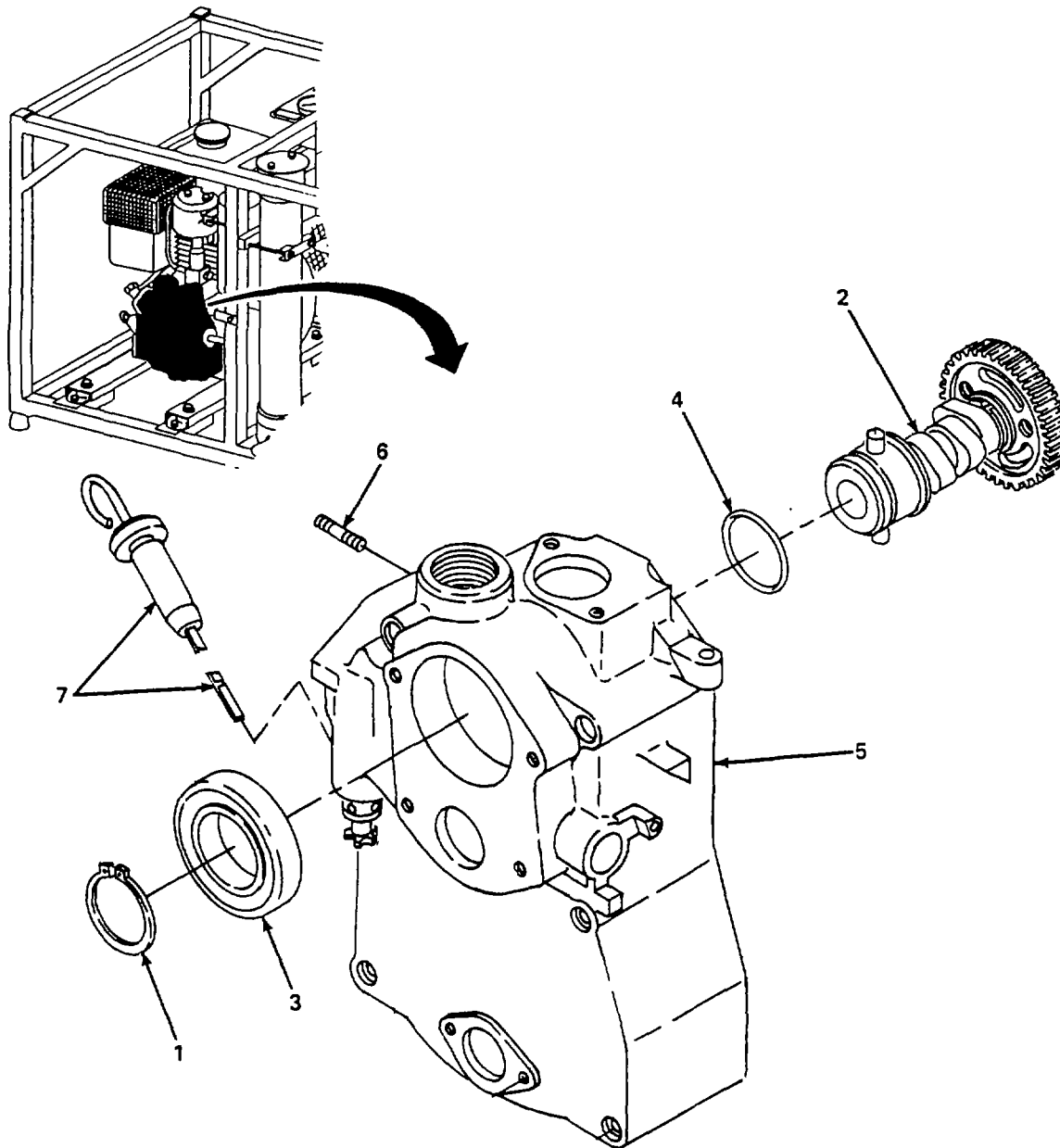
*Materials/Parts*

Prefomed Packing  
Gear cover assembly

---

Replace. (figure 5-46)

- (1) Remove retaining ring (1).
- (2) Press camshaft (2) out of bearing (3) and remove preformed packing (4). Discard preformed packing (4).
- (3) Press bearing (3) out of gear cover (5).
- (4) Remove two studs (6) and dipstick (7).
- (5) Install dipstick (7) and two studs (6) in new gear cover (5).
- (6) Press bearing (5) into new gear cover (6).
- (7) Install new preformed packing (4) and press camshaft (2) into bearing (3) and install retaining ring (1).



**Figure 5-46. Gear Cover Assembly, Replace.**

**FOLLOW-ON MAINTENANCE**

- (1) Install compression release assembly (para. 5-31).
- (2) Install speed control assembly (para. 5-30).

---

**5-33. Cylinder.**

---

**This task covers:****Replace**

---

**INITIAL SETUP***Tools*

General Mechanic's Tools Kit (NSN 5180-00-177-7033)  
Piston ring compressor (NSN 5120-00-223-8848)

*Equipment Condition*

Cylinder head removed (para. 5-29).

*Materials/Parts*

Cylinder  
Lubricating, Oil (Item 16, Appendix E)

---

Replace. (figure 5-47)

- (1) Rotate flywheel (1) until piston (2) reaches bottom of its stroke.
- (2) Carefully lift the cylinder (3) off the studs (4).
- (3) Remove retaining clip (5) and remove wrist pin (6) and piston (2) from connecting rod (7).
- (4) Coat inside of new cylinder (3) with clean engine oil.
- (5) Using ring compressor, compress piston rings and install piston (2) in cylinder (3).
- (6) Remove ring compressor from piston (2).
- (7) Ensure piston pin bore is fully uncovered.
- (8) Install cylinder (3) over studs (4). Ensure crescent shaped fins on cylinder (3) face governor side of engine.
- (9) Install wrist pin (6) in piston (2) and connecting rod (7) and secure with retaining clip (5).

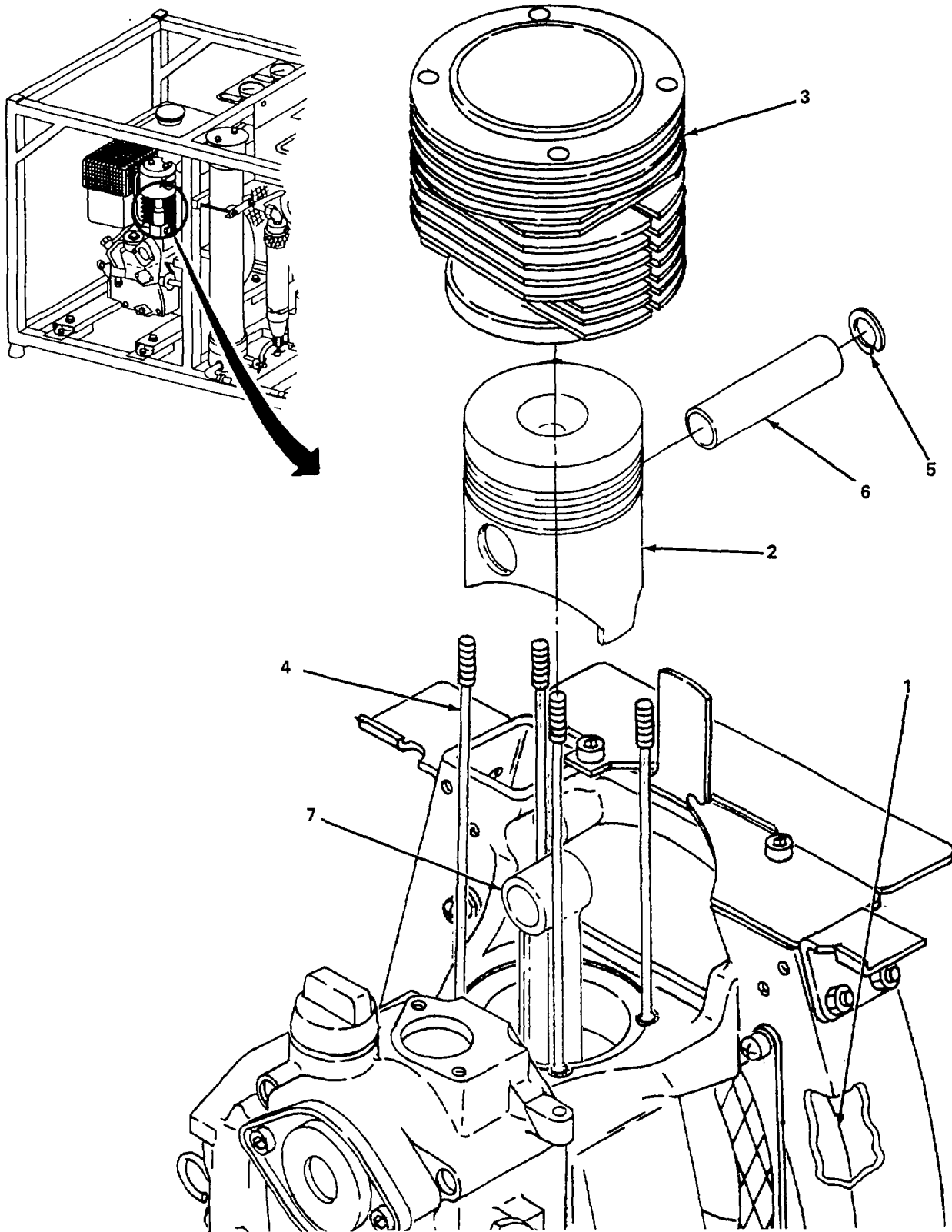


Figure 5-47. Cylinder, Replace.

---

**5-34. Oil Pump Assembly.**


---

**This task covers:**

**Replace**

---

**INITIAL SETUP**

*Tools*

General Mechanic's Tools Kit (NSN 5180-00-177-7033)  
Wrench, Torque (NSN 5120-00-247-2540)

*Equipment Condition*

Engine gear cover removed (para 5-32).

*Materials/Parts*

Gasket  
Oil Pump  
Rags, Wiping (Item 19, Appendix E)

*Reference*

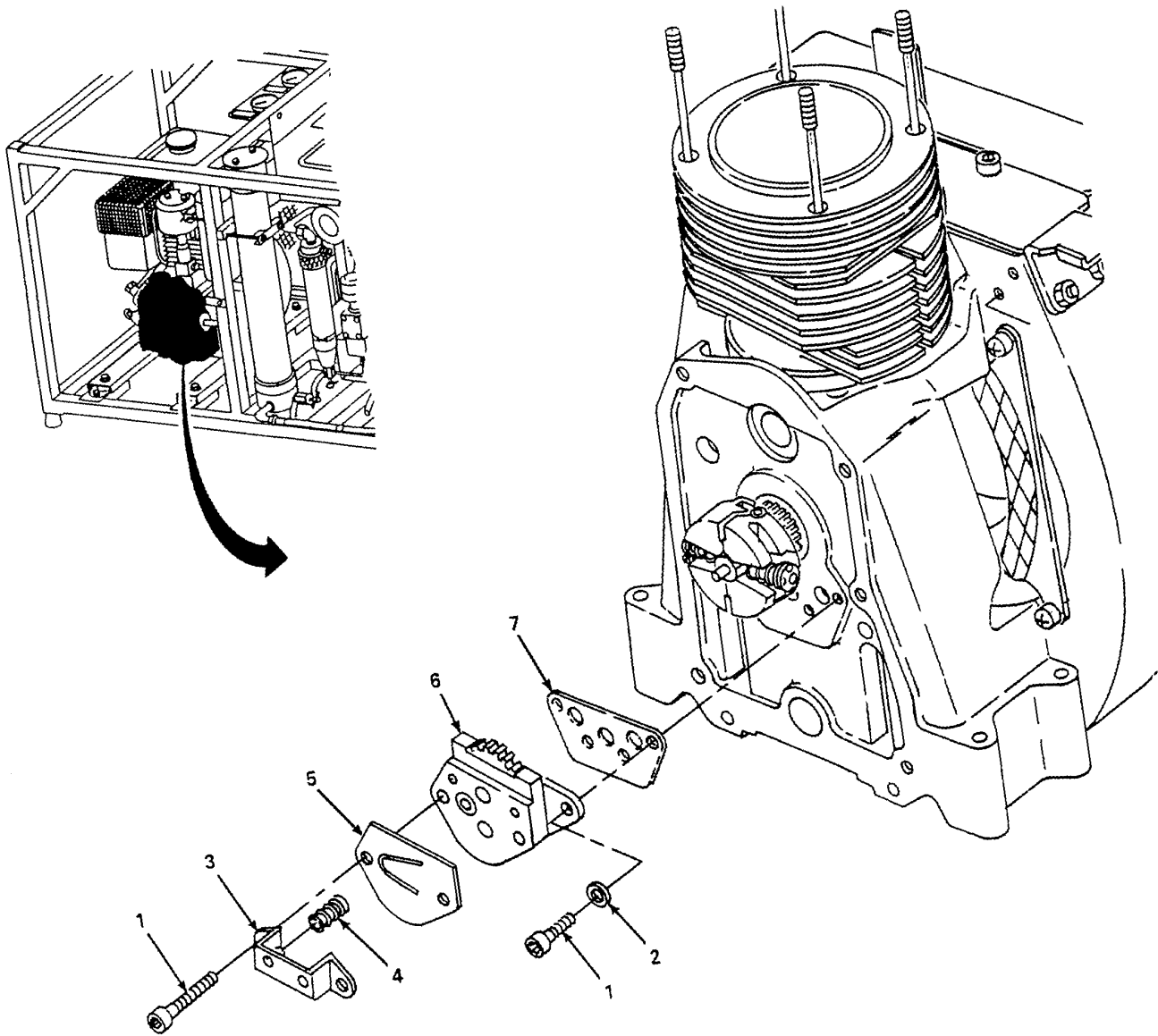
Appendix F Torque Values.

---

Replace. (figure 5-48)

- (1) Remove three screws (1), washers (2), bracket (3), spring (4), plate (5), oil pump (6), and gasket (7). Discard gasket (7).
- (2) Ensure all gasket surfaces are clean and old gasket material removed.
- (3) Install new gasket (7), oil pump (6), plate (5), spring (4), bracket (3), and secure with three screws (1) and washers (2). Torque screws (1) to 23-28 lb-ft (32-39 Nm).





**Figure 5-48. Oil Pump Assembly, Replace.**

FOLLOW-ON MAINTENANCE  
 Install gear cover assembly (para. 5-32).

---

**5-35. Flywheel.**

---

**This task covers:****a. Replace**

---

**INITIAL SETUP***Tools*

General Mechanic's Tools Kit (NSN 5180-00-177-7033)  
Puller Kit, Mechanical (NSN 5120-00-033-5606)  
Socket 1 7/16 (NSN 5120-01-278-1186)  
Adapter (NSN 5120-00-144-5207)

*Equipment Condition*

Pulley removed (para 5-26).

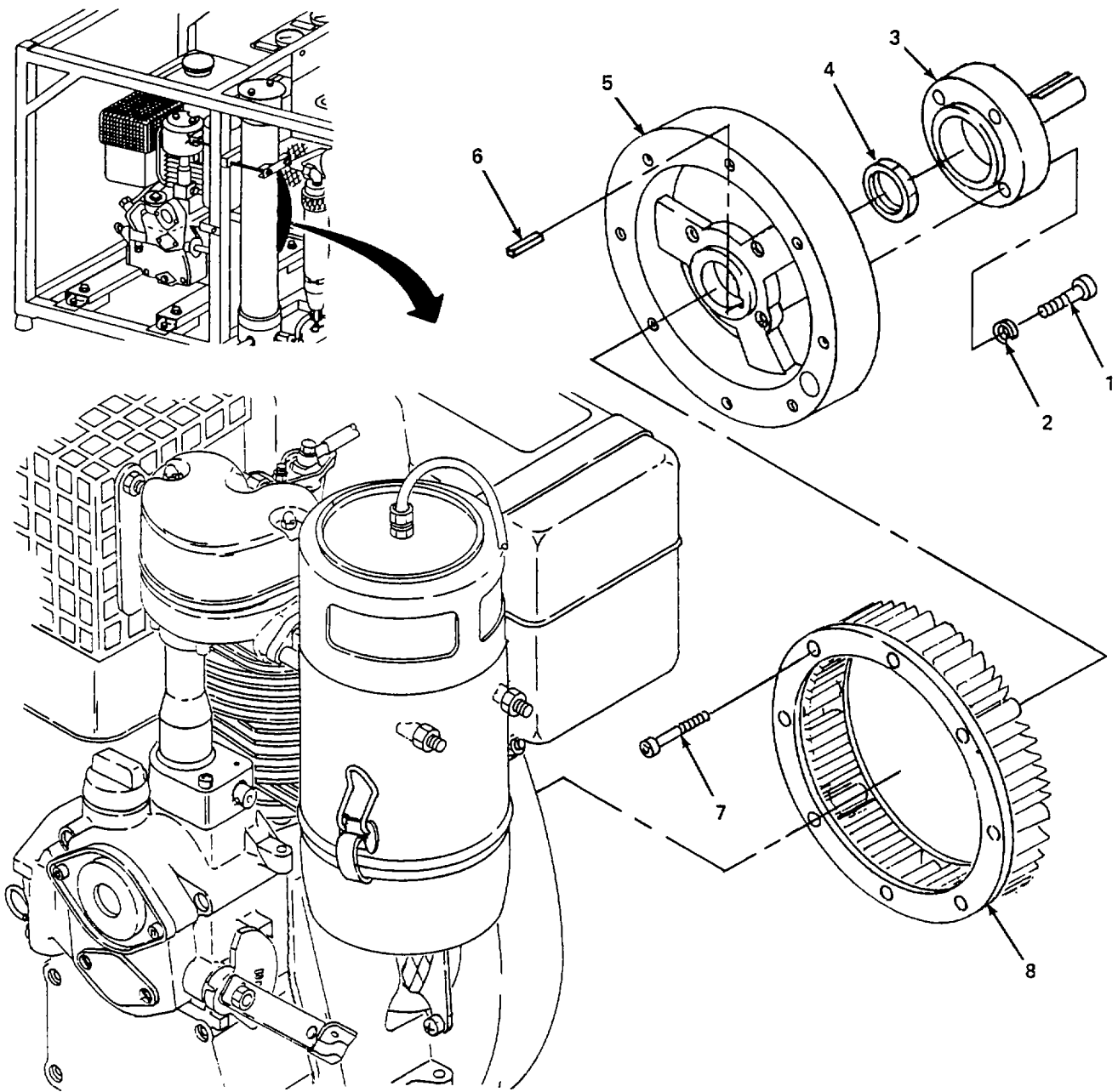
*Materials/Parts*

Flywheel  
Flywheel Key

---

**Replace.** (figure 5-49)

- (1) Remove four bolts (1), lockwasher (2), and stub shaft (3).
- (2) Loosen but do not remove nut (4).
- (3) Using puller, loosen flywheel (5).
- (4) Remove nut (4), flywheel (5), and key (6).
- (5) Remove eight screws (7) and fan (8).
- (6) Install fan (8) and secure with eight screws (7).
- (7) Install key (6), flywheel (5) and secure with nut (4).
- (8) Install stub shaft (3) and secure with four screws (1) and lockwasher (2).



**Figure 5-49. Flywheel, Replace.**

FOLLOW-ON MAINTENANCE  
 Install pulley (para 5-26).

---

**5-36. Fanwheel.**

---

**This task covers:****Replace**

---

**INITIAL SETUP***Tools*

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

Puller Kit, Mechanical (NSN 5120-00-033-5606)  
Wrench, Socket (NSN 5120-01-278-1186)  
Adapter, Socket (NSN 5120-00-144-5207)  
Torque Wrench (NSN 5120-00-230-6380)*Equipment Condition*

Pulley removed (para 5-26).

*Reference*

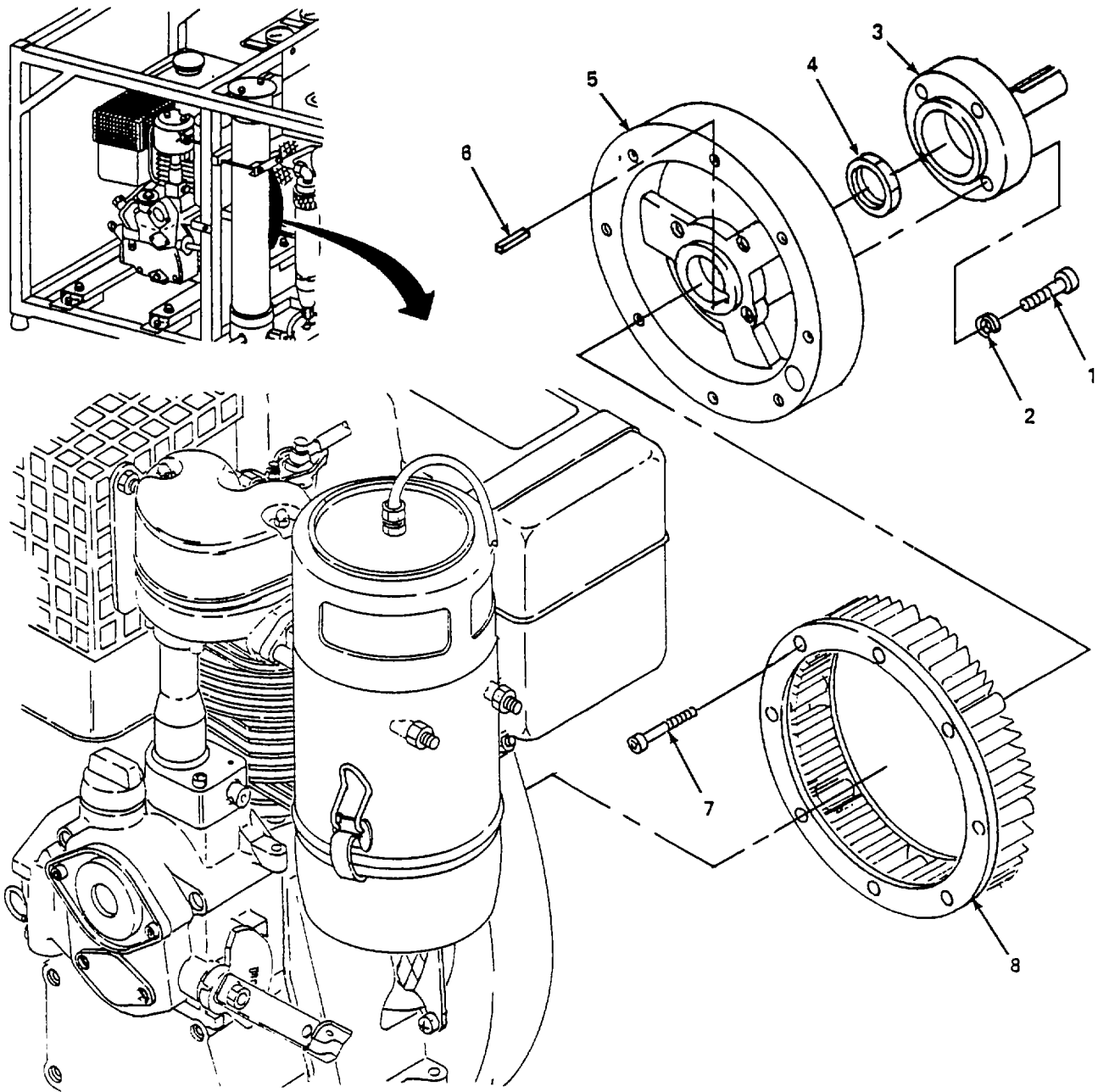
Appendix F Torque Values.

*Materials/Parts*Flywheel Fan

---

Replace. (figure 5-50)

- (1) Remove four screws (1), lockwashers (2), and stub shaft (3).
- (2) Loosen but do not remove nut (4).
- (3) Using puller, loosen flywheel (5).
- (4) Remove flywheel (5), nut (4), and key (6).
- (5) Remove eight screws (7) and fan (8).
- (6) Install fan (8) and secure with eight screws (7).
- (7) Install key (6), flywheel (5), and secure with nut (4).
- (8) Install stub shaft (3) and secure with four screws (1) and lockwashers (3). Torque screws to 35 lb-ft (48 Nm).



**Figure 5-50. Fanwheel, Replace.**

FOLLOW-ON MAINTENANCE  
Install pulley (para 5-26).

---

**5-37. Pressure Maintaining Valve.**

---

**This task covers:****Replace**

---

**INITIAL SETUP***Tools*

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

*Equipment Condition*

Compressor unit shutdown and depressurized (para 2-12).

*Materials/Parts*

Pressure Maintaining Valve

Tape, Teflon (Item 23, Appendix E)

Bags, Plastic (Item 3, Appendix E)

Bands, Rubber (Item 4, Appendix E)

Tape, Pressure Sensitive (Item 22, Appendix E)

*Reference*

Cleaning Procedures, Chapter 4, Section VI.

Replace. (figure 5-51)**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 VI 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 two connector nuts (1) and remove line (2).
- (2) Loosen two connector nuts (3) and remove line (4).
- (3) Loosen connector nut (5) and remove charging whip (6).
- (4) Loosen connector nut (7).
- (5) Remove two screws (8) and washers (9), and remove pressure maintaining valve (10).
- (6) Remove elbow (11) and two fittings (12).

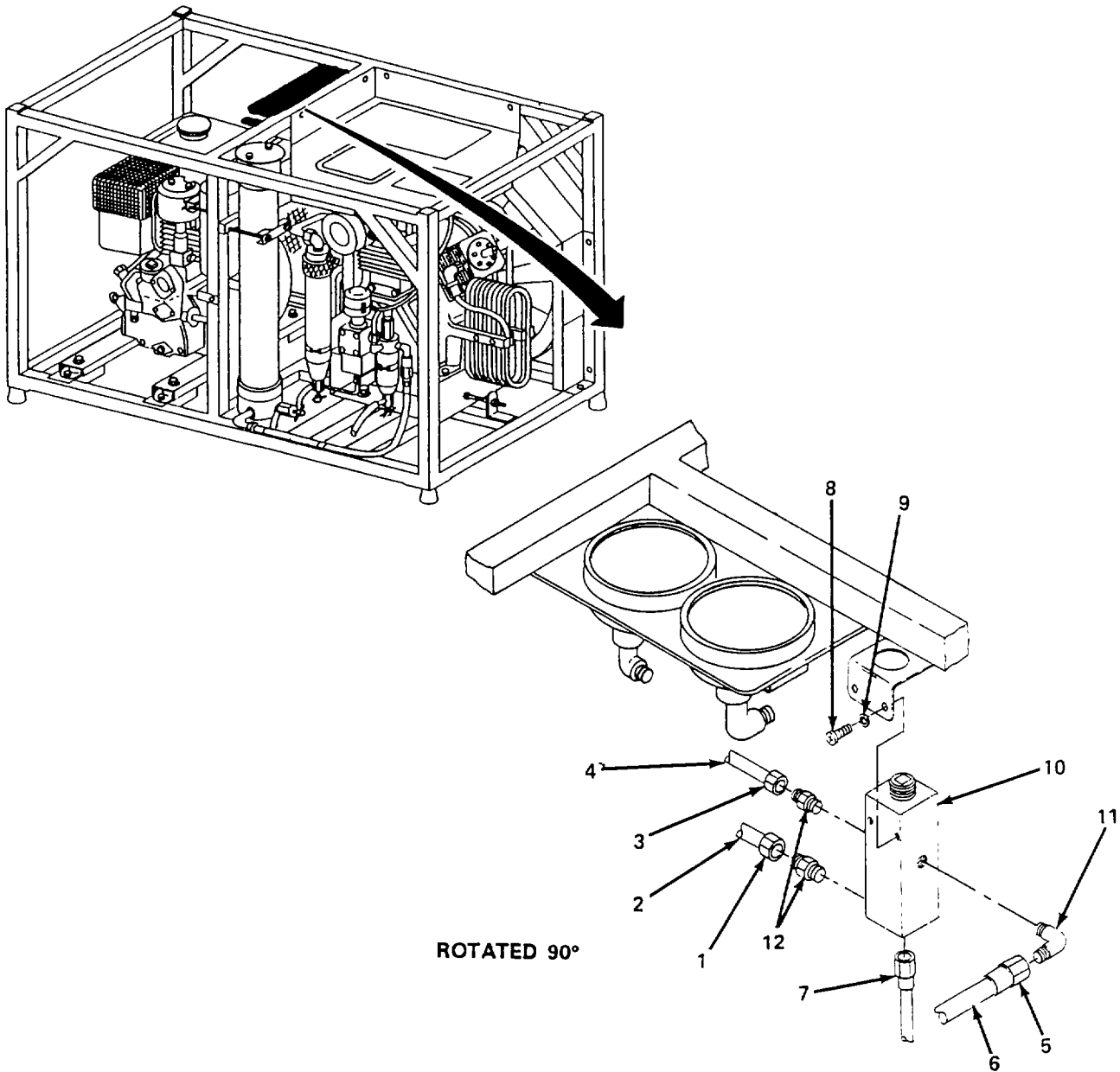


Figure 5-51. Pressure Maintaining Valve, Replace.

5-113/(5-114 blank)

**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.**

- (7) Apply teflon tape to threads on two fittings (12) and elbow (11).
- (8) Install elbow (11) and two fittings (12).
- (9) Install pressure maintaining valve (10) and secure with two screws (8) and washers (9).
- (10) Tighten connector nut (7).
- (11) Install charging whip (6) and tighten connector nut (5).
- (12) Install line (4) and tighten two connector nuts (3).
- (13) Install line (2) and tighten two connector nuts (1).



---

**5-38. Air Tank Charging Whip Assembly.**


---

This task covers:

**a. Replace**

**b. Repair**

---

**INITIAL SETUP**
*Tools*

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

*Materials/Parts*

Air Tank Charging Whip  
Tape, Teflon (Item 23, Appendix E)

*Materials/Parts (Cont)*

Bags, Plastic (Item 3, Appendix E)  
Bands, Rubber (Item 4, Appendix E)  
Tape, Pressure Sensitive (Item 22, Appendix E)

*Reference*

Cleaning Procedures, Chapter 4, Section VI.

---

a. *Replace*. (figure 5-52)

**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 VI 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 connector nut (1) and remove charging whip (2).
- (2) Install new charging whip (2) and tighten connector nut (1).

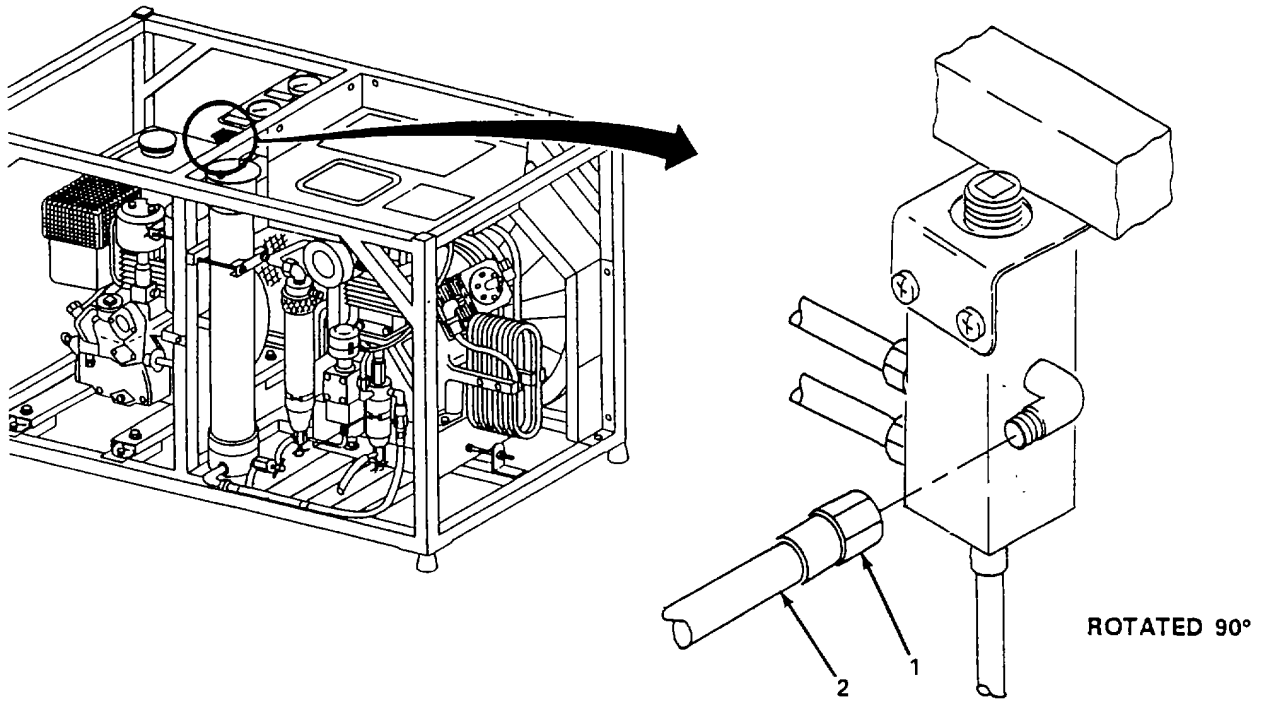


Figure 5-52. Air Tank Charging Whip Assembly, Replace.

**5-38. Air Tank Charging Whip Assembly (Cont).****b. Repair.** (figure 5-53)

- (1) Remove charging whip (para. a.)
- (2) Loosen connector nut (1) and remove line (2).
- (3) Remove valve (3) from tee (4).
- (4) Remove gage (5) from tee (4).
- (5) Remove tee (4) from air station adapter (6).
- (6) Inspect line (2) and replace if cracked, kinked, deformed in any way, or threads are stripped.
- (7) Inspect valve (3) and replace if it is inoperational, leaks, or threads are stripped.
- (8) Inspect tee (4) and replace if cracked or threads are stripped.
- (9) Inspect gage (5) and replace if cracked or otherwise damaged.
- (10) Inspect station adapter (6) and replace if cracked, inoperational, or threads are cracked.

**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.**

- (11) Apply teflon tape to threads on tee (4), valve (3), and gage(5).
- (12) Install air station adapter (6) on tee (4).
- (13) Install tee (4) on valve (3).
- (14) Install gage (5) on tee (4).
- (15) Install line (2) on valve (3) and tighten connector nut (1).

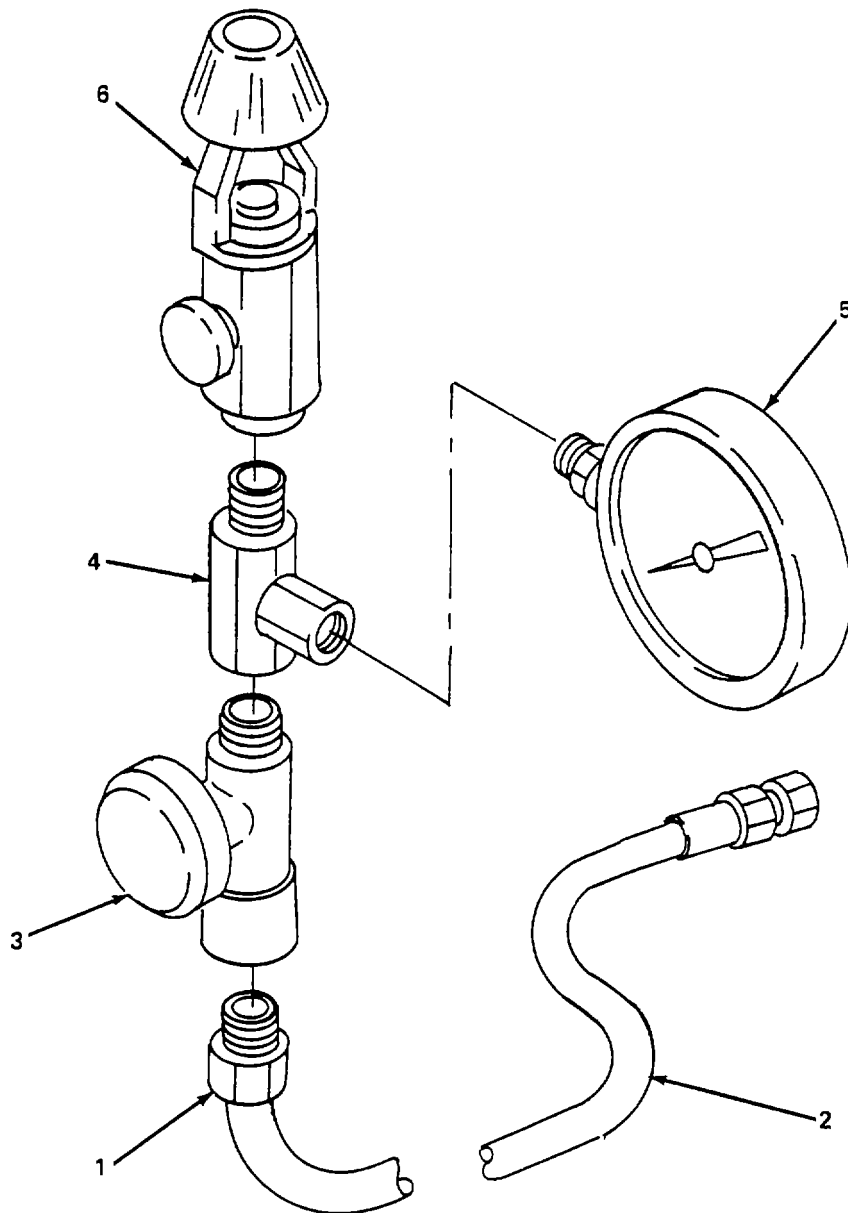


Figure 5-53. Air Tank Charging Whip Assembly, Repair.

---

**5-39. Frame.**

---

**This task covers:****a. Replace****b. Repair**

---

**INITIAL SETUP***Tools*

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

*Equipment Condition (Cont)*Compressor removed (para 5-10).  
Engine removed (para 4-23)*Equipment Condition*Storage tray removed (para 4-15).  
Gage panel removed (para 5-8).  
Shock mounts removed (para 4-34).  
Purifier assembly removed (para 5-9).  
Cold start system removed (para 4-32).  
Pressure maintaining valve removed (para 5-37).

---

**a. Replace.** (figure 5-54)

- (1) Remove three screws (1), washers (2), and guard (3).
- (2) Remove two nuts (4) and bolt (5).
- (3) Remove four nuts (6), washers (7), and compressor mounting bracket (8).
- (4) Remove four studs (9).
- (5) Remove two screws (10), washers (11), and bracket (12).
- (6) Install bracket (12) on new frame (13) and secure with two screws (10) and washers (11).
- (7) Install four studs (9) on new frame (13).
- (8) Install compressor mounting bracket (8) on new frame (13) and secure with four washers (7), and nuts (6).
- (9) Install bolt (5) and two nuts (4).
- (10) Install guard (3) on new frame (15) and secure with three screws (1) and washers (2).

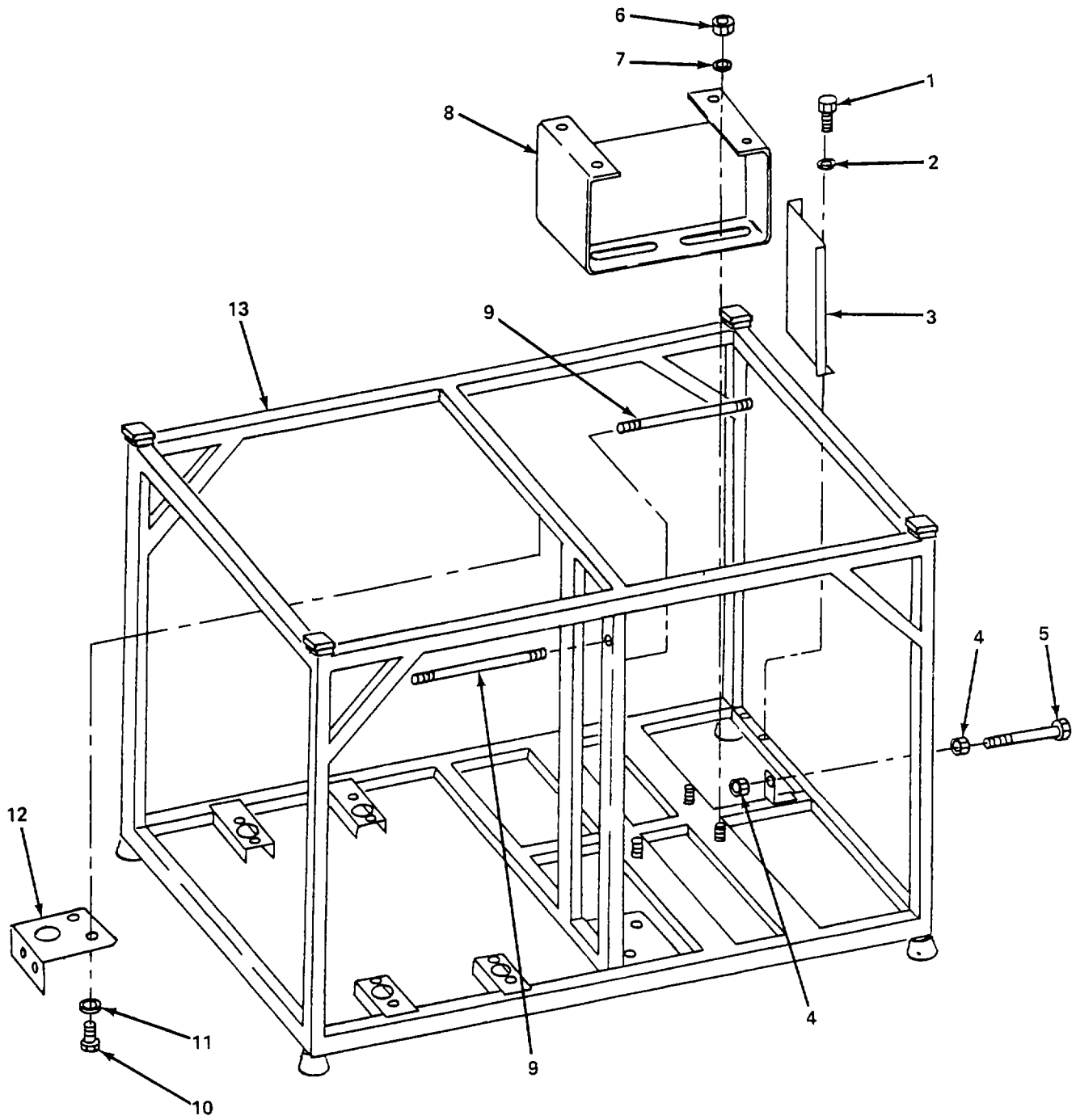
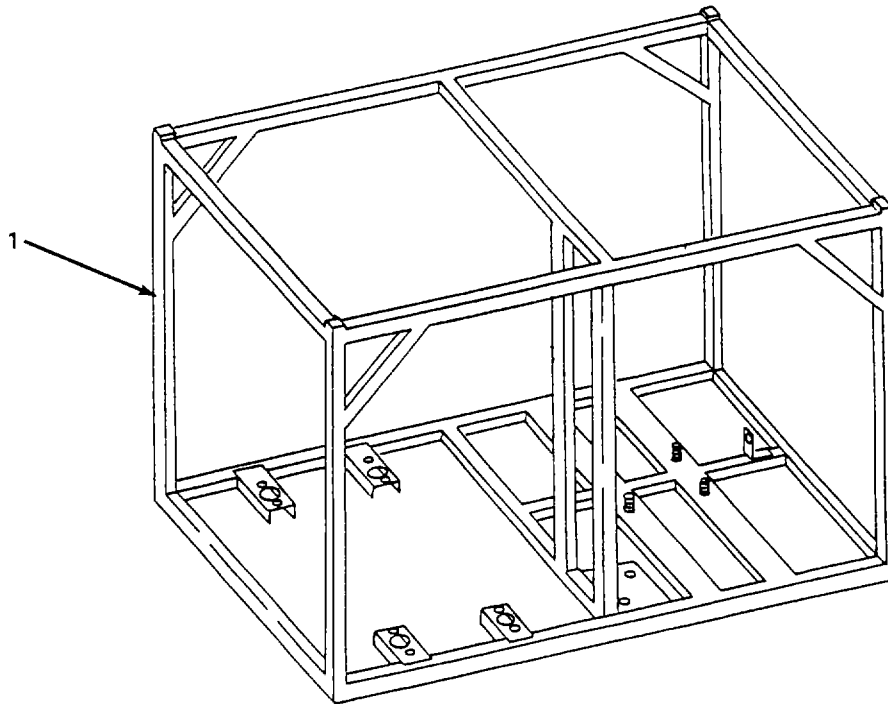


Figure 5-54. Frame, Replace.

**5-39. Frame (Cont).****b. Repair.** (figure 5-55)

- (1) Remove frame (para. a.).
- (2) Inspect frame (1) for cracked or broken welds and weld any cracks or broken welds found.
- (3) Inspect frame (1) for dents or bent frame members, and straighten any bent frame members.
- (4) Replace frame if damage is too extensive to fix.
- (5) Install frame (para. a.).

**Figure 5-55. Frame, Repair.**

CHAPTER 6

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

OVERVIEW .....	6-1
Section I. Repair Parts; Special Tools; Test, Measurement and Diagnostic Equipment (TMDE); and Support Equipment .....	6-1
Section II. General Support Troubleshooting Procedures.....	6-1
Section III. General Support Maintenance Procedures.....	6-6

OVERVIEW

This chapter contains information for troubleshooting and maintenance of the air compressor by general support maintenance personnel.

**Section I. REPAIR PARTS; SPECIAL TOOLS; TEST, MEASUREMENT AND 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.** For a listing of special tools and support equipment authorized for use on this equipment, refer to the Repair Parts and Special Tools List for this equipment, and refer to the maintenance allocation chart (MAC) Appendix B of this manual.

6-3. **Repair Parts.** Repair parts are listed and illustrated in the Repair Parts and Special Tools List, for Air Compressor, TM 5-4310-387-24P.

**Section II. GENERAL SUPPORT TROUBLESHOOTING PROCEDURES**

Paragraph		Page
6-4	General .....	6-1
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. Tests or inspections are provided to isolate the faulty component and corrective actions are provided to eliminate the malfunction.



6-5. **General Support Troubleshooting Procedures.** Refer to symptom index to locate the troubleshooting procedure for the observed malfunction. Table 6-1 lists malfunctions that may occur during operation or maintenance of the air compressor. Tests, inspections, and corrective actions should be performed in the order listed. If a malfunction is not corrected by the corrective actions listed, notify your supervisor.

**NOTE**

**This table is not intended to cover every possible symptom, but is rather a list of the more frequent problems and some of their causes.**

SYMPTOM INDEX

Symptom	Page
1. Engine does not start .....	6-2
2. Engine runs unevenly: low output .....	6-3
3. Engine races .....	6-3
4. Engine exhaust emits excessive blue smoke .....	6-3
5. Engine runs hot .....	6-3
6. Excessive oil consumption.....	6-4
7. Unusual engine knocks and noises.....	6-4
8. Compressor noisy .....	6-4
9. Compressor pressure low .....	6-5
10. Compressor output volume low .....	6-6

**Table 6-1. General Support Troubleshooting Procedures.**

---

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

---

**1. ENGINE DOES NOT START.**

Step 1. Check fuel injection pump.

Repair damaged fuel injection pump (para 6-16).

Step 2. Check governor assembly.

Replace or repair damaged governor assembly (para 6-17).

Step 3. Check camshaft assembly.

Replace a defective camshaft assembly (para 6-19).

Step 4. Check piston and connecting rod assemblies.

Replace or repair damaged piston and connecting rod assemblies (para 6-20).

**Table 6-1. General Support Troubleshooting Procedures (Cont).**

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
<b>2. ENGINE RUNS UNEVENLY: LOW OUTPUT.</b>		
Step 1. Check fuel injection pump.		Repair damaged fuel injection pump (para 6-16).
Step 2. Check governor assembly.		Replace or repair damaged governor assembly (para 6-17).
Step 3. Check camshaft assembly.		Replace a defective camshaft assembly (para 6-19).
Step 4. Check piston and connecting rod assemblies.		Replace or repair damaged piston and connecting rod assemblies (para 6-20).
<b>3. ENGINE RACES.</b>		
Check governor assembly.		Replace or repair governor assembly (para 6-17).
<b>4. ENGINE EXHAUST EMITS EXCESSIVE BLUE SMOKE.</b>		
Step 1. Check fuel injection pump.		Repair or replace fuel injection pump (para 6-16).
Step 2. Check piston and connecting rod assemblies.		Replace or repair piston and connecting rod assemblies (para 6-20).
<b>5. ENGINE RUNS HOT.</b>		
		Check fuel injection pump.
		Replace or repair fuel injection pump (para 6-16).

**Table 6-1. General Support Troubleshooting Procedures (Cont).**

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

**6. EXCESSIVE OIL CONSUMPTION.**

Check piston and connecting rod assemblies.

Replace or repair piston and connecting rod assemblies (para 6-20).

**7. UNUSUAL ENGINE KNOCKS AND NOISES.**

Step 1. Check governor assembly

Replace or repair governor assembly (para 6-17).

Step 2. Check piston and connecting rod assemblies.

Replace or repair piston and connecting rod assemblies (para 6-20).

Step 3. Check camshaft assembly.

Replace or repair camshaft assembly (para 6-19).

Step 4. Check crankshaft and main bearing support assembly.

Replace or repair crankshaft and main bearing support assembly (para 6-21).

**8. COMPRESSOR NOISY.**

Step 1. Check first stage cylinder.

Replace a damaged first stage cylinder (para 6-8).

Step 2. Check second stage cylinder.

Replace a damaged second stage cylinder (para 6-10).

Step 3. Check third stage cylinder.

Replace a damaged third stage cylinder (para 6-12).

Step 4. Check first stage piston and connecting rod assembly.

Replace or repair a damaged first stage piston and connecting rod assembly (para 6-9).

**Table 6-1. General Support Troubleshooting Procedures (Cont).**

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

**8. COMPRESSOR NOISY (CONT).**

Step 5. Check second stage piston and connecting rod assembly.

Replace or repair a damaged second stage piston and connecting rod assembly (para 6-11).

Step 6. Check third stage crosshead rod assembly.

Replace or repair a damaged crosshead and rod assembly (para 6-13).

Step 7. Check compressor crankshaft and main bearings.

Replace a damaged crankshaft and main bearings (para 6-14).

**9. COMPRESSOR PRESSURE LOW.**

Step 1. Check first stage cylinder.

Replace a damaged first stage cylinder (para 6-8).

Step 2. Check second stage cylinder.

Replace a damaged second stage cylinder (para 6-10).

Step 3. Check third stage cylinder.

Replace a damaged third stage cylinder (para 6-12).

Step 4. Check first stage piston and connecting rod assembly.

Replace or repair a damaged first stage piston and connecting rod assembly (para 6-9).

Step 5. Check second stage piston and connecting rod assembly.

Replace or repair a damaged second stage piston and connecting rod assembly (para 6-11).

Step 6. Check third stage crosshead rod assembly.

Replace or repair a damaged crosshead and rod assembly (para 6-13).

---

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

---

**10. COMPRESSOR OUTPUT VOLUME LOW.**

Step 1. Check first stage cylinder.

Replace a damaged first stage cylinder (para 6-8).

Step 2. Check second stage cylinder.

Replace a damaged second stage cylinder (para 6-10).

Step 3. Check third stage cylinder.

Replace a damaged third stage cylinder (para 6-12).

Step 4. Check first stage piston and connecting rod assembly.

Replace or repair a damaged first stage piston and connecting rod assembly (para 6-9).

Step 5. Check second stage piston and connecting rod assembly.

Replace or repair a damaged second stage piston and connecting rod assembly (para 6-11).

Step 6. Check third stage crosshead rod assembly.

Replace or repair a damaged crosshead and rod assembly (para 6-13).

**Section III. GENERAL SUPPORT MAINTENANCE PROCEDURES**

Paragraph		Page
6-6	General .....	6-7
6-7	Gages .....	6-7
6-8	First Stage Cylinder .....	6-8
6-9	First Stage Piston and Connecting Rod Assembly.....	6-12
6-10	Second Stage Cylinder .....	6-18
6-11	Second Stage Piston and Connecting Rod Assembly.....	6-22
6-12	Third Stage Cylinder .....	6-26
6-13	Third Stage Crosshead and Connecting Rod Assembly .....	6-28
6-14	Compressor Crankshaft and Main Bearings .....	6-34
6-15	Compressor Crankcase .....	6-38
6-16	Fuel Injection Pump .....	6-40

Paragraph		Page
6-17	Governor Assembly .....	6-42
6-18	Gear Cover Assembly .....	6-46
6-19	Camshaft Assembly .....	6-50
6-20	Piston and Connecting Rod Assemblies .....	6-54
6-21	Crankshaft and Mainbearing Support .....	6-58
6-22	Engine Crankcase .....	6-62
6-23	Air Tank Charging Whip Assembly .....	6-64

6-6. **General.** This section contains maintenance procedures for general support maintenance personnel as authorized by the Maintenance Allocation Chart (MAC), Appendix B, of this manual. Disassemble the compressor unit only to the extent necessary to repair or replace a defective component of the compressor. Ensure all tools and parts are clean and free of oil, dirt, grease, rust, or other contaminants when performing maintenance on air compressor. After working on engine assembly, clean all tools thoroughly before performing maintenance on air compressor. Contaminants in the air system can be extremely hazardous to diving personnel.

---

6-7. **Gages.**

---

**This task covers:**

**Calibrate**

---

**INITIAL SETUP**

*Equipment Condition*

Pressure gages removed (para 5-7).

---

Calibrate.

- (1) Inspect gage for date of last calibration.
- (2) **Have the gage calibrated if date of last calibration is more than 540 days. Ensure gage is calibrated in accordance with procedures in TB 9-4220-216-35, Section IV.**

---

**6-8. First Stage Cylinder.**


---

**This task covers:**

**Replace**

---

**INITIAL SETUP**
*Tools*

General Mechanic's Tool Kit (NSN 5180-00-177-7033)  
 Ring Compressor (NSN 5120-00-250-6055)  
 Pliers, Retaining Ring (NSN 5210-00-789-0492)

*Materials/Parts*

Bags, Plastic (Item 3, Appendix E)  
 Tape, Pressure Sensitive (Item 22, Appendix E)  
 Bands, Rubber (Item 4, Appendix E)  
 Gasket  
 Retaining Rings

*Materials/Parts (Cont)*

Cloth, Lint Free (Item 8, Appendix E)  
 Lubricating Oil (Item 17, Appendix E)

*Equipment Condition*

First stage valve head and valve assembly para 5-22).

*References*

Cleaning Procedures, Chapter 4, Section VI.  
 Appendix F Torque Values.

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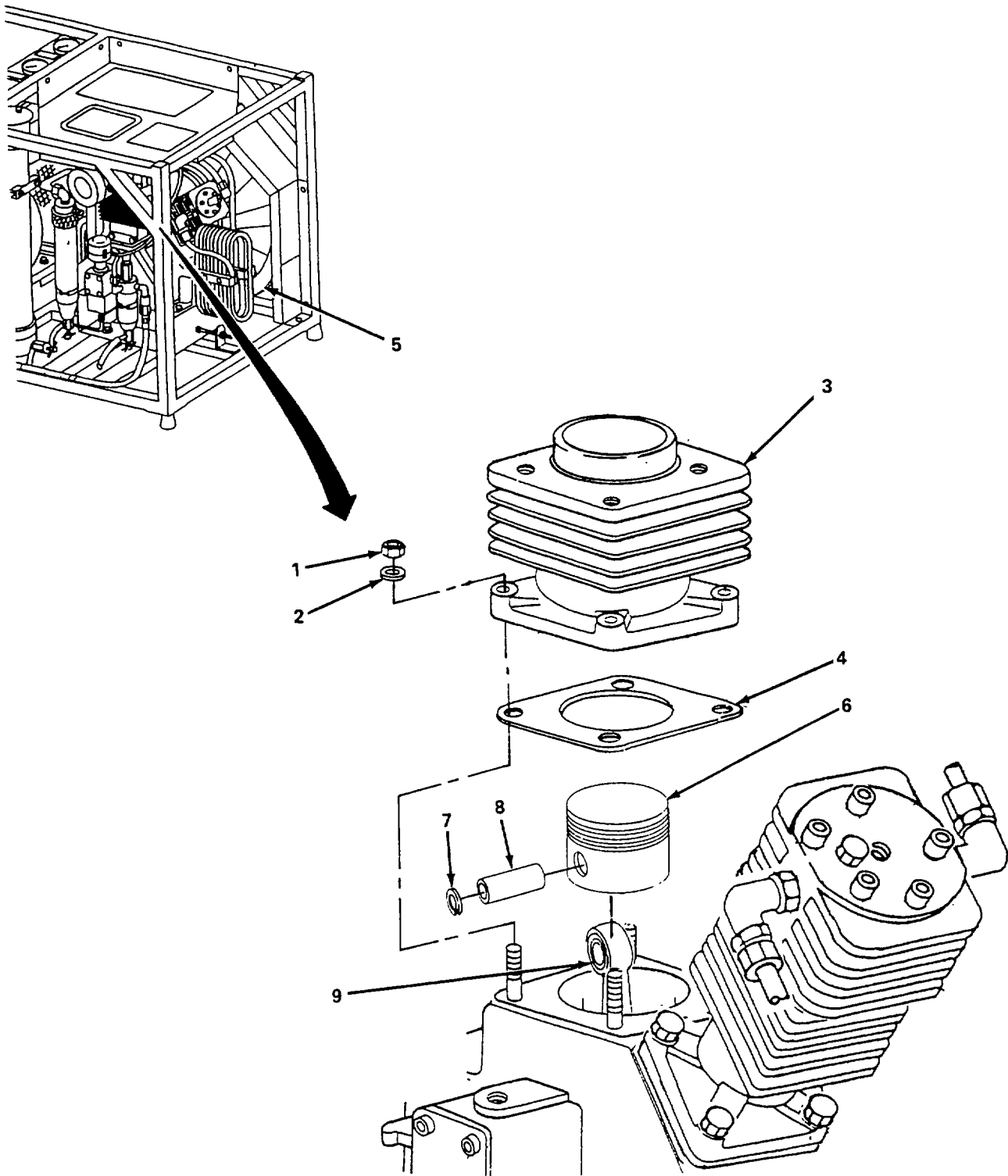
Replace. (figure 6-1)

**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 VI 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) and remove first stage cylinder (3) and gasket (4). Discard gasket (4).
- (2) Ensure all gasket surfaces are clean and old gasket material is removed.
- (3) Turn fanwheel (5) until piston (6) is at the top of its stroke. Wedge a piece of wood in fanwheel to prevent it from moving.
- (4) Remove retaining ring (7) and remove wrist pin (8) and piston (6).
- (5) Place ring compressor on piston (6).



**Figure 6-1. First Stage Cylinder, Replace.**

**FOLLOW-ON MAINTENANCE**

Install first stage valve head and valve assembly (para 5-22).

**6-9/(6-10 blank)**



- (6) Install piston (6) in cylinder (3) and remove ring compressor.
- (7) Ensure wrist pin bore in piston is fully exposed.
- (8) Install new gasket (4).
- (9) Install first stage cylinder (3) and piston (6) on connecting rod (9).
- (10) Install wrist pin (8) and secure with retaining ring (7).
- (11) Install four nuts (1) and washers (2).
- (12) Remove wood securing fanwheel (5).

---

**6-9. First Stage Piston and Connecting Rod Assembly.**


---

This task covers:

**a. Replace**

**b. Repair**

---

**INITIAL SETUP**
*Tools*

General Mechanic's Tool Kit (NSN 5180-00-177-7033)  
 Caliper Set (NSN 5210-00-554-7134)  
 TSP Ultrasonic Cleaner (NSN 4940-00-164-8997)  
 Pliers, Retaining Ring (NSN 5120-00-789-0492)

*Materials/Parts*

Preformed Packing  
 Piston  
 Piston Rings  
 Connecting Rod  
 Gasket  
 Retaining Rings  
 Bags, Plastic (Item 3, Appendix E)

*Materials/Parts (Cont)*

Tape, Pressure Sensitive (Item 22, Appendix E)  
 Bands, Rubber (Item 4, Appendix E)

*Equipment Condition*

Fanwheel removed (para 5-36).  
 First stage cylinder removed (para 6-8).  
 Second stage cylinder removed (para 6-10).  
 Third stage cylinder removed (para 6-12).

*References*

Cleaning Procedures, Chapter 4, Section VI.  
 Appendix F Torque Values.

---

a. Replace. (figure 6-2)

**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 VI 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 screws (1), washers (2), plate (3), and gasket (4). Discard gasket (4).
- (2) Remove two screws (5), plate (6), and oil pump cam (7).
- (3) Remove two retaining rings (8), wrist pin (9), and piston (10). Discard retaining rings (8).
- (4) Remove second stage piston assembly (para 6-11).
- (5) Remove third stage crosshead assembly (para 6-13).

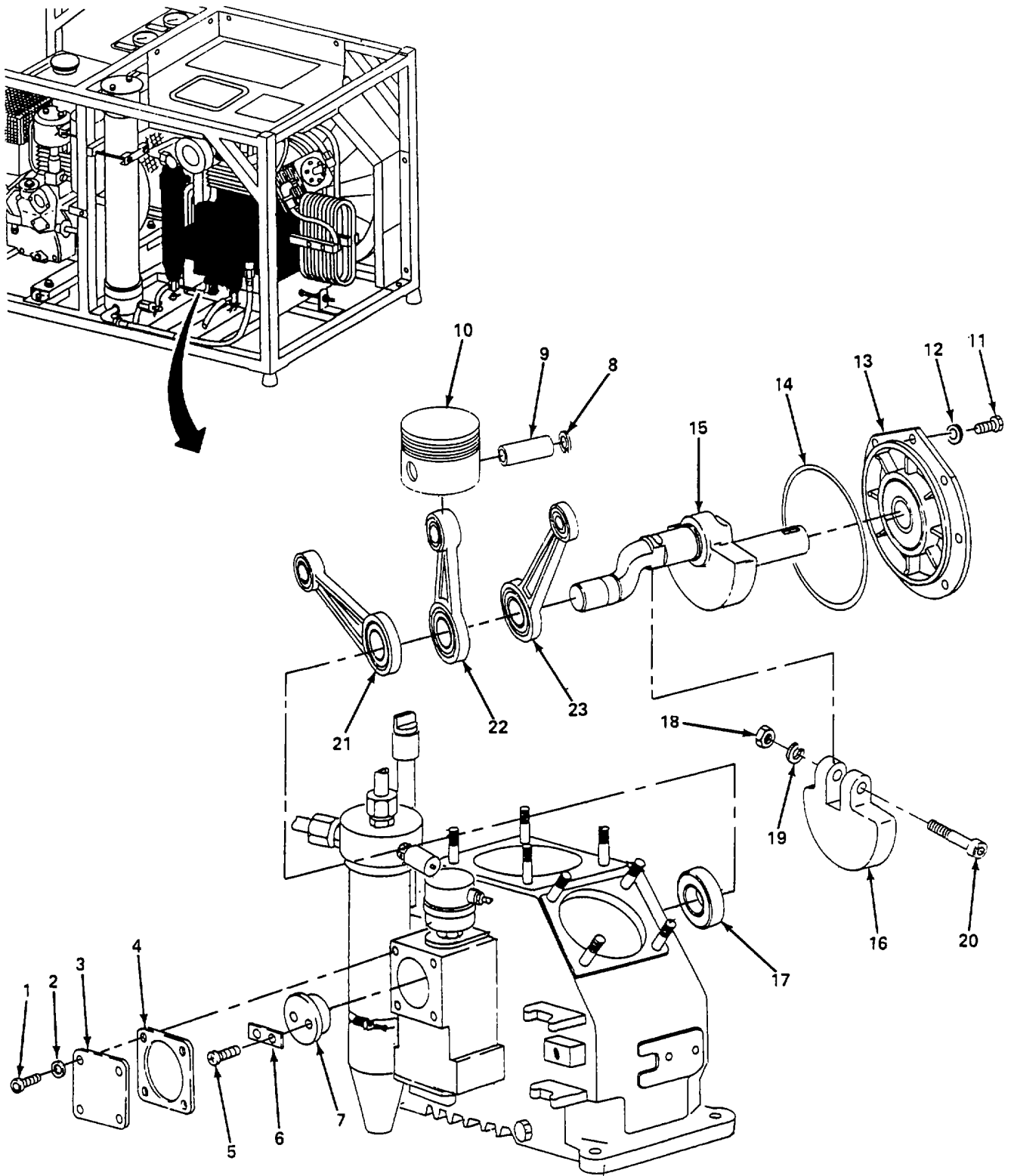


Figure 6-2. First Stage Piston and Piston Rod Assembly, Replace.

**6-9. First Stage Piston and Connecting Rod Assembly (Cont).**

- (6) Remove six bolts (11) and washers (12).
- (7) Remove housing (13) and preformed packing (14). Discard preformed packing (14).
- (8) Remove crankshaft (15), balance weight (16) and bearing (17).
- (9) Remove bearing (17) from crankshaft (15).
- (10) Remove nut (18), washer (19), bolt (20), and balance weight (16).
- (11) Note orientation of connecting rods (21), (22), and (23) and remove from crankshaft (15).
- (12) Install three connecting rods (23), (22), and (21) in the same position as noted during removal.
- (13) Install balance weight (16) and secure with bolt (20), washer (19), and nut (18).
- (14) Install bearing (17).
- (15) Install crankshaft (15), counterweight (16), and bearing (17).
- (16) Install housing (13) and new preformed packing (14) and secure with six bolts (11) and washers (12).
- (17) Install piston (10), wrist pin (9) and two new retaining rings (8).
- (18) Install oil pump cam (7) and secure with plate (6) and two screws (5).
- (19) Install new gasket (4) and plate (3) and secure with four screws (1) and washers (2).

**FOLLOW-ON MAINTENANCE**

- (1) Install third stage cylinder (para 6-12).
- (2) Install second stage cylinder (para 6-10).
- (3) Install first stage cylinder (para 6-8).
- (4) Install fanwheel (para 5-36).

**b. Repair.** (figure 6-3)

- (1) Remove first stage piston and connecting rod assembly (para. a.).

**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 VI 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 two tapered piston rings (1), one scraper piston ring (2), and plain ring (3).

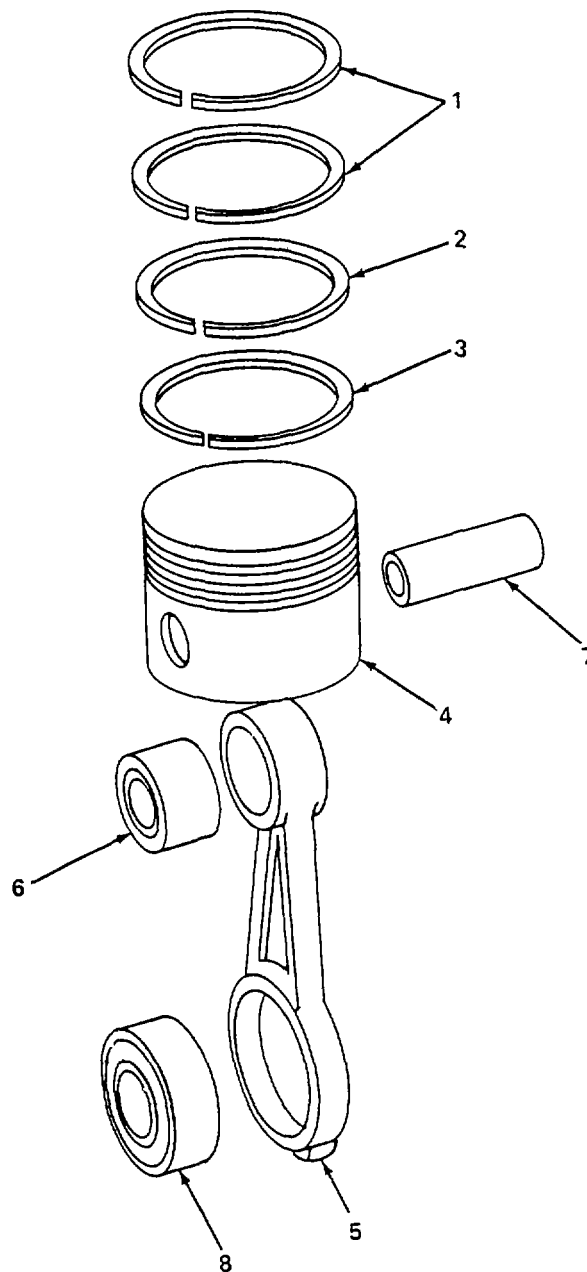


Figure 6-3. First Stage Piston and Connecting Rod Assembly, Repair.

6-15/(6-16 blank)

- (3) Clean piston (4) with TSP ultrasonic cleaner and dry thoroughly.
- (4) Inspect piston (4) and replace if scored or if measurements taken 90° apart differ by more than 0.01 in. (0.254 mm) or if diameter of piston is less than 3.450 in. (87.57 mm).
- (5) Inspect connecting rod (5) and replace if bent or cracked.
- (6) Inspect bushing (6) and replace if scored or clearance between wrist pin (7) is greater than 0.003 in. (0.0762 mm).
- (7) Inspect bushing (8) and replace if scored or clearance between crankshaft is greater than 0.001 in. (0.0254 mm).
- (8) Inspect wrist pin (7) and replace if scored or bent.
- (9) Install new plain piston ring (3), and scraper ring (2).
- (10) Install two new tapered piston rings (1) with taperfacing up.
- (11) Install first stage piston and connecting rod assembly (para. a.).

---

**6-10. Second Stage Cylinder.**


---

**This task covers:**

**Replace**

---

**INITIAL SETUP**
*Tools*

General Mechanic's Tool Kit (NSN 5180-00-177-7033)  
 Ring Compressor (NSN 5120-00-250-6055)  
 Pliers, Retaining Ring (NSN 5210-00-789-0492)

*Materials/Parts*

Bags, Plastic (Item 3, Appendix E)  
 Tape, Pressure Sensitive (Item 22, Appendix E)

*Materials/Parts*

Gasket  
 Retaining Rings  
 Lubricating Oil (Item 17, Appendix D)  
 Cloth, Lint Free (Item 22, Appendix E)  
 Bands, Rubber (Item 4, Appendix E)

*Equipment Condition*

Second stage valve head assembly removed  
 (para. 5-23).

*References*

Cleaning Procedures, Chapter 4, Section VI.  
 Appendix F Torque Values.

---

Replace. (figure 6-4)

**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 VI 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).
- (2) Remove cylinder (3) and gasket (4). Discard gasket (4).
- (3) Ensure all gasket surfaces are clean and old gasket material is removed.
- (4) Rotate fanwheel (5) until piston (6) is at its highest point and wedge a piece of wood in fanwheel (5) to prevent it from moving.
- (5) Remove retaining ring (7) and remove wrist pin (8) and piston (6). Discard retaining ring (7).
- (6) Place ring compressor on piston (6).

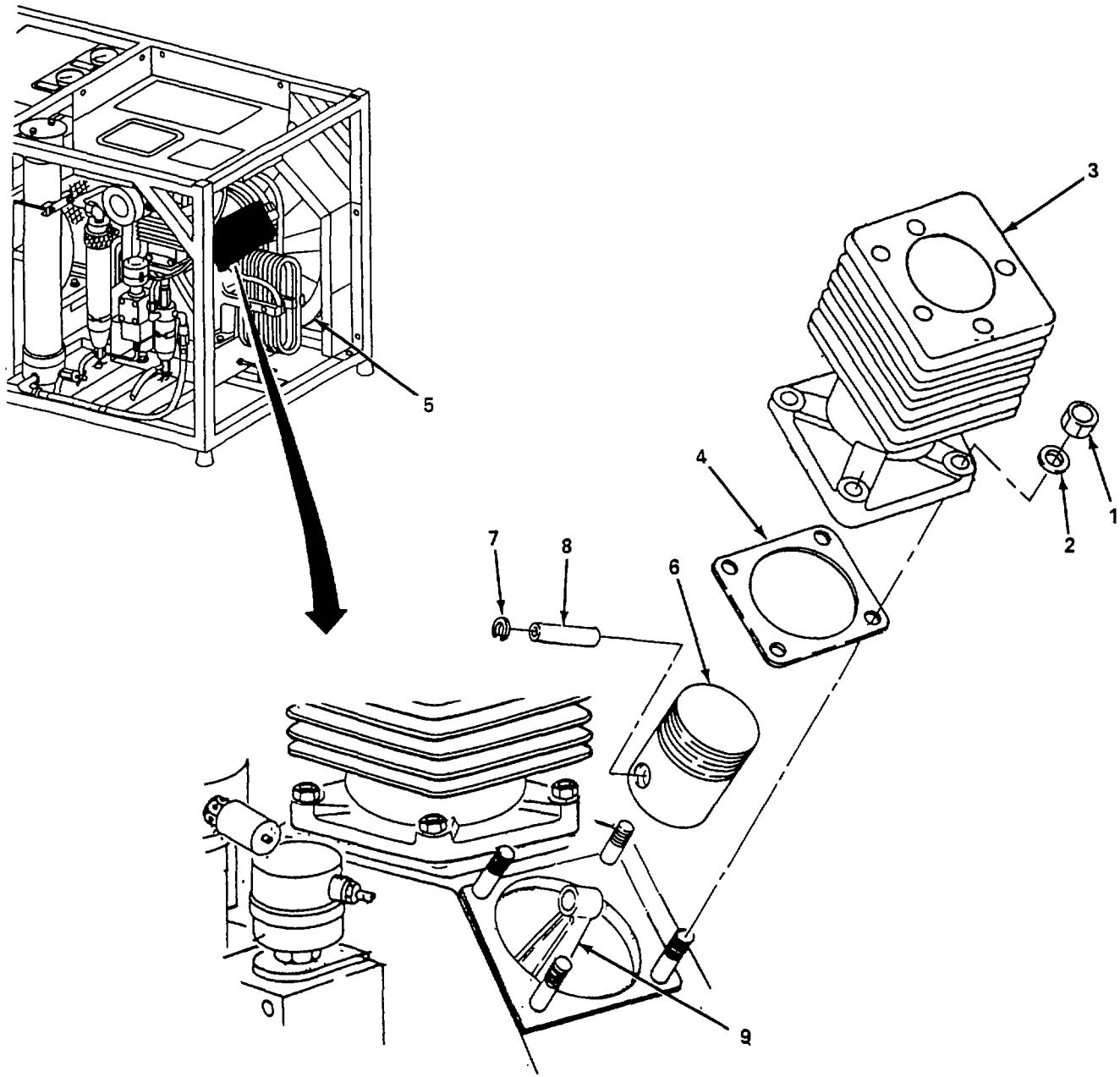


Figure 6-4. Second Stage Cylinder, Replace.

**FOLLOW-ON MAINTENANCE**

Install second stage valve head assembly (para. 5-23).

6-19/(6-20 blank)



- (7) Install piston (6) in cylinder (3).
- (8) Ensure wrist pin bore in piston (6) is fully exposed.
- (9) Install new gasket (4).
- (10) Install cylinder (3) and piston (6) on connector rod (9).
- (11) Install wrist pin (8) and secure with retaining ring (7).
- (12) Install four nuts (1) and washers (2).
- (13) Remove wood securing fanwheel (5).

---

**6-11. Second Stage Piston and Connecting Rod Assembly.**


---

This task covers:

a. **Replace**

b. **Repair**

---

**INITIAL SETUP**
*Tools*

General Mechanic's Tool Kit (NSN 5180-00-177-7033)  
 Caliper Set (NSN 5210-00-554-7134)  
 TSP Ultrasonic Cleaner (NSN 4940-00-164-8997)  
 Pliers, Retaining Ring (NSN 5210-00-789-0492)

*Materials/Parts*

Preformed Packing  
 Gasket  
 Retaining Rings  
 Piston  
 Piston Rings  
 Rags, Wiping (Item 19, Appendix E)  
 Bands, Rubber (Item 4, Appendix E)

*Materials/Parts (Cont)*

Bags, Plastic (Item 3, Appendix E)  
 Tape, Pressure Sensitive (Item 22, Appendix E)

*Equipment Condition*

First stage cylinder removed (para. 6-8).  
 Second stage cylinder removed (para. 6-10).  
 Third stage cylinder removed (para. 6-12).  
 Fanwheel removed (para. 5-36).

*References*

Cleaning Procedures, Chapter 4, Section VI.  
 Appendix F Torque Values.

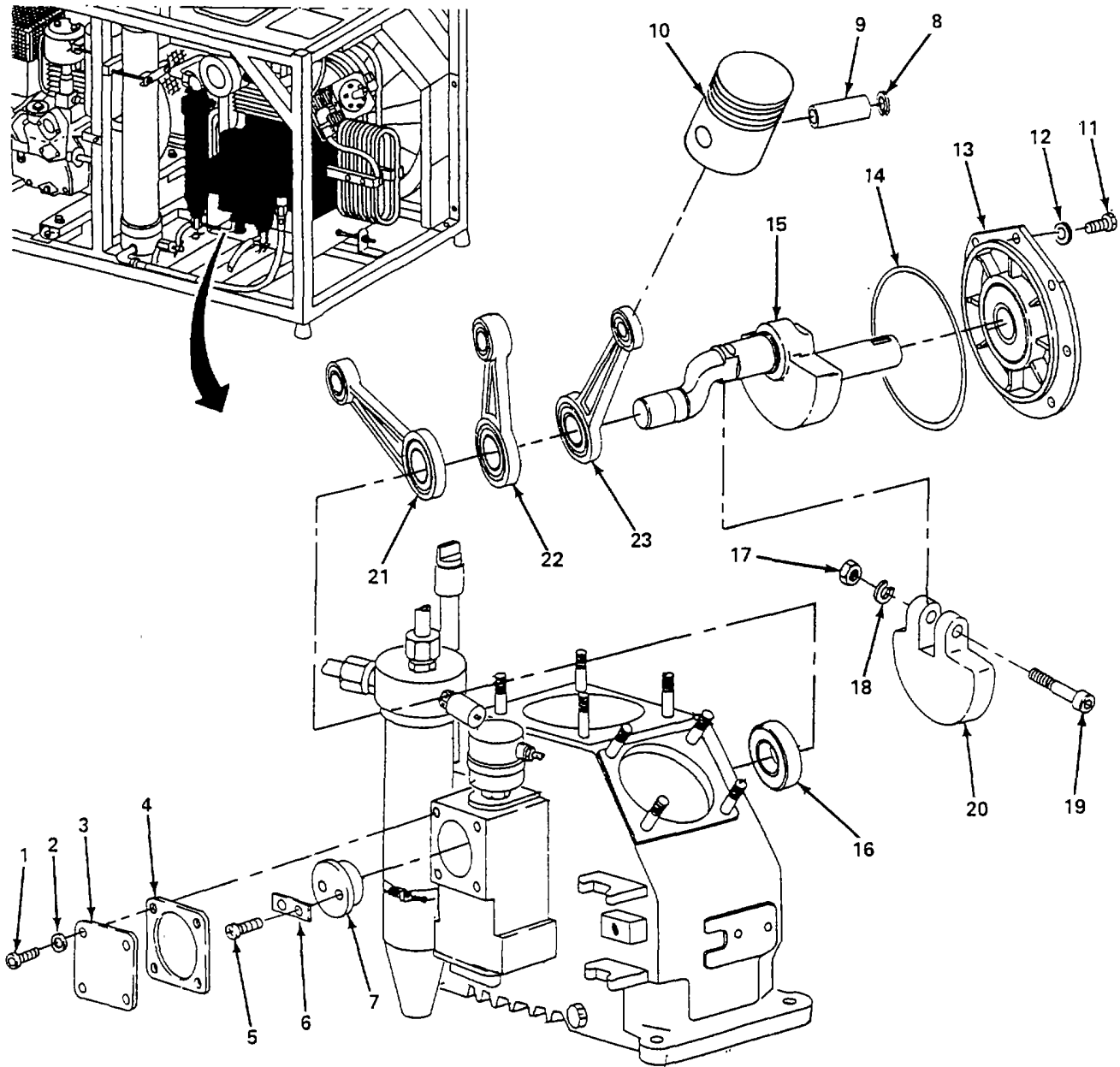
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- a. Replace. (figure 6-5)

**WARNING**

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- (1) Remove four screws (1), washer (2), plate (3), and gasket (4). Discard gasket (4).
- (2) Remove two screws (5), plate (6), and oil pump cam (7).
- (3) Remove two retaining rings (8), wrist pin (9), and piston assembly (10). Discard retaining rings (8).
- (4) Remove first stage piston assembly (para. 6-9).
- (5) Remove third stage crosshead assembly (para. 6-13).



**Figure 6-5. Second Stage Piston and Connecting Rod Assembly, Replace.**

- (6) Remove six bolts (11), washer (12), housing (13), and preformed packing (14). Discard preformed packing (14).
- (7) Remove crankshaft (15) and bearing (16).
- (8) Remove nut (17), washer (18), bolt (19), and balance weight (20).
- (9) Note position of three connecting rods (21), (22), and (23) and remove them from crankshaft (15).

6-11. **Second Stage Piston and Connecting Rod Assembly (Cont).**

- (10) Install connecting rod (23), new connecting rod (22), and connecting rod (21) on crankshaft (15) in the same position as noted during removal.
- (11) Install balance weight (20) and secure with bolt (19), washer (18), and nut (17).
- (12) Install bearing (16) and crankshaft (15).
- (13) Install new preformed packing (14) and housing (13) and secure with six bolts (11) and washers (12).
- (14) Install piston assembly (10) and secure with wrist pin (9) and two new retaining rings (8).
- (15) Install first stage piston assembly (para. 6-9).
- (16) Install third stage crosshead assembly (para. 6-13).
- (17) Install oil pump cam (7) and secure with plate (6) and two screws (5).
- (18) Install new gasket (4) and plate (3) and secure with four screws (1) and washers (2).

**FOLLOW-ON MAINTENANCE**

- (1) Install first stage cylinder (para. 6-8).
- (2) Install second stage cylinder (para. 6-10).
- (3) Install third stage cylinder (para. 6-12).
- (4) Install fanwheel (para. 5-36).

b. Repair. (figure 6-6)

- (1) Remove piston and connecting rod assembly (para.a.).

**WARNING**

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- (2) Remove three tapered rings (1) and one plain piston ring (2) from piston (3).
- (3) Inspect piston (3) and replace if scored or measurements taken 90° apart on piston differ by more than 0.03 in. (.762 mm) or diameter of piston (3) is less than 1.4173 in. (36 mm).

- (4) Inspect connecting rod (4) and replace if bent or cracked. Replace bushing (5) if scored or clearance between wrist pin (6) is greater than 0.003 in. (0.0762 mm) or clearance between crankshaft and bushing (7) is greater than 0.001 in. (0.0254 mm).
- (5) Clean out piston ring grooves thoroughly.
- (6) Install plain piston ring (2).
- (7) Install three tapered piston rings (1) with tapered area facing up.
- (8) Install piston and connecting rod assembly (para. a.).

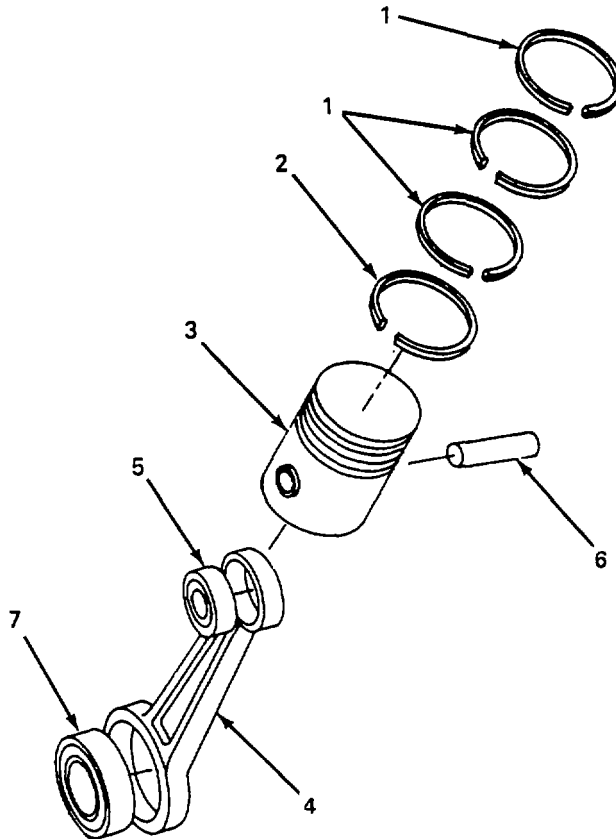


Figure 6-6. Second Stage Piston and Connecting Rod Assembly, Repair.

---

## 6-12. Third Stage Cylinder

---

This task covers:

**Replace**

---

### INITIAL SETUP

#### *Tools*

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

#### *Materials/Parts*

Gasket  
 Preformed Packing  
 Bands, Rubber (Item 4, Appendix E)  
 Bags, Plastic (Item 3, Appendix E)  
 Tape, Pressure Sensitive (Item 22, Appendix E)  
 Rags, Wiping (Item 19, Appendix E)  
 Lubricating Oil (Item 17, Appendix E)

---

#### *Equipment Condition*

Third stage valve head removed (para. 5-25)  
 Oil pressure regulator removed (para. 5-20)

#### *References*

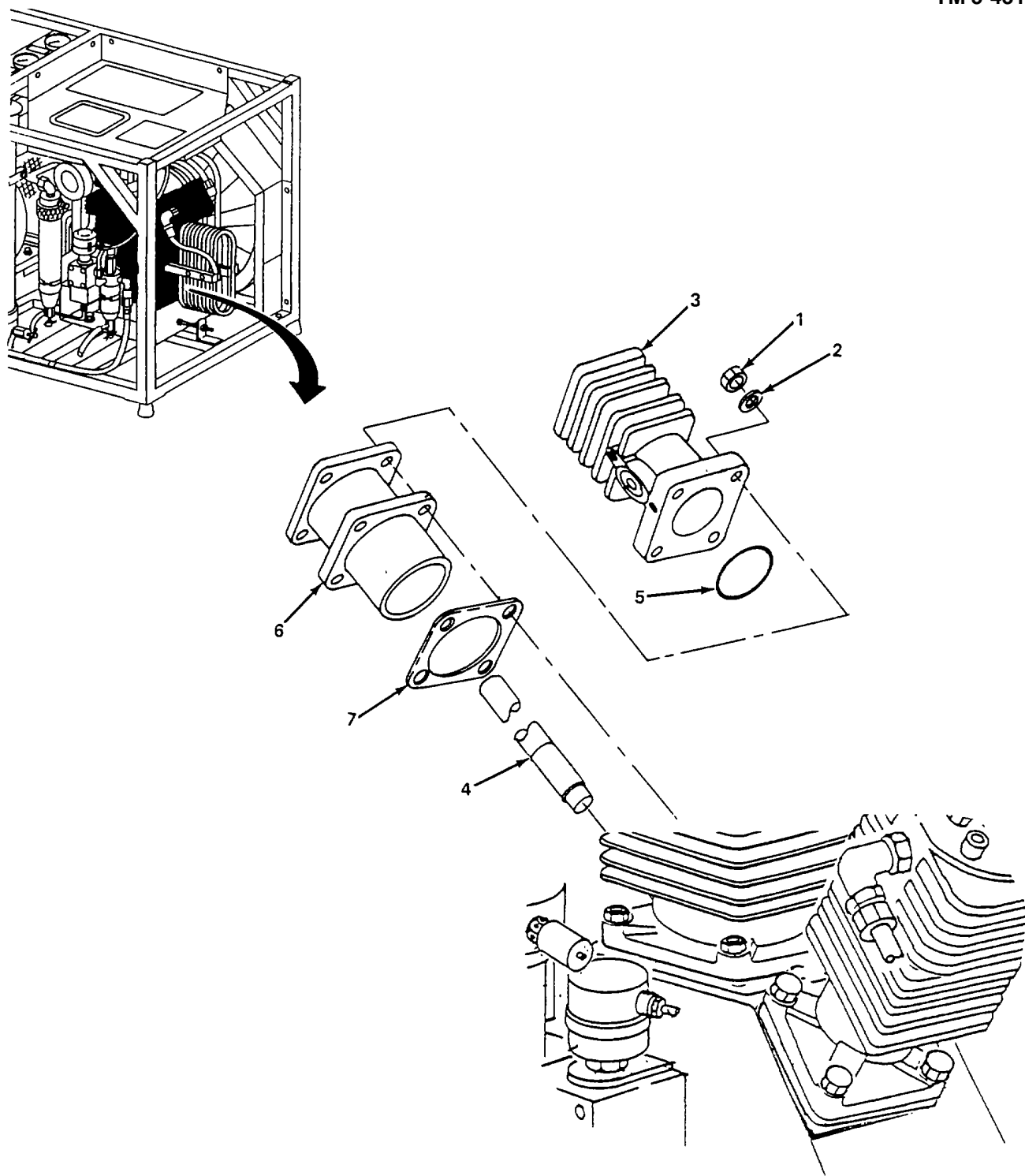
Cleaning Procedures, Chapter 4, Section VI.  
 Appendix F Torque Values.

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 VI 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) and remove third stage cylinder (3), plunger (4), and preformed packing (5). Discard preformed packing (5).
- (2) Remove third stage crosshead guide (6) and gasket (7). Discard gasket (7).
- (3) Ensure all gasket surfaces are clean and old gasket material removed.
- (4) Install new gasket (7) and crosshead guide (6).
- (5) Ensure all preformed packing seating surfaces are clean and free of all dirt and debris.
- (6) Install new preformed packing (5) in third stage cylinder (3).
- (7) Install third stage cylinder (3) and plunger (4) and secure with four nuts (1) and washers (2).



**Figure 6-7. Third Stage Cylinder and Crosshead Guide, Replace.**

**FOLLOW-ON MAINTENANCE**

- (1) Install third stage valve head (para. 5-25).
- (2) Install oil pressure regulator (para. 5-20).

---

**6-13. Third Stage Crosshead and Rod Assembly**


---

This task covers:

a. **Replace**

b. **Repair**

---

**INITIAL SETUP**
*Tools*

General Mechanic's Tool Kit (NSN 5180-00-177-7033)  
 Caliper Set (NSN 5210-00-554-7134)  
 TSP Ultrasonic Cleaner (NSN 4940-00-164-8997)  
 Pliers, Retaining Ring (NSN 5210-00-789-0492)

*Materials/Parts*

Retaining Rings  
 Gasket  
 Preformed Packing  
 Lubrication Oil  
 Third Stage Crosshead  
 Bands, Rubber (Item 4, Appendix E)  
 Bags, Plastic (Item 3, Appendix E)  
 Tape, Pressure Sensitive (Item 22, Appendix E)

---

*Equipment Condition*

Third stage cylinder removed (para. 6-12).  
 First stage cylinder removed (para. 6-8).  
 Second stage cylinder removed (para. 6-10).  
 Fanwheel removed (para. 5-36).

*References*

Cleaning Procedures, Chapter 4, Section VI.  
 Appendix F Torque Values.

- a. *Replace*. (figure 6-8)

**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 VI 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 screws (1), washer (2), plate (3), and gasket (4). Discard gasket (4).
- (2) Remove two screws (5), plate (6), and oil pump cam (7).
- (3) Remove two retaining rings (8), wrist pin (9), and crosshead (10). Discard retaining rings (8).
- (4) Remove first stage piston assembly (para. 6-9).



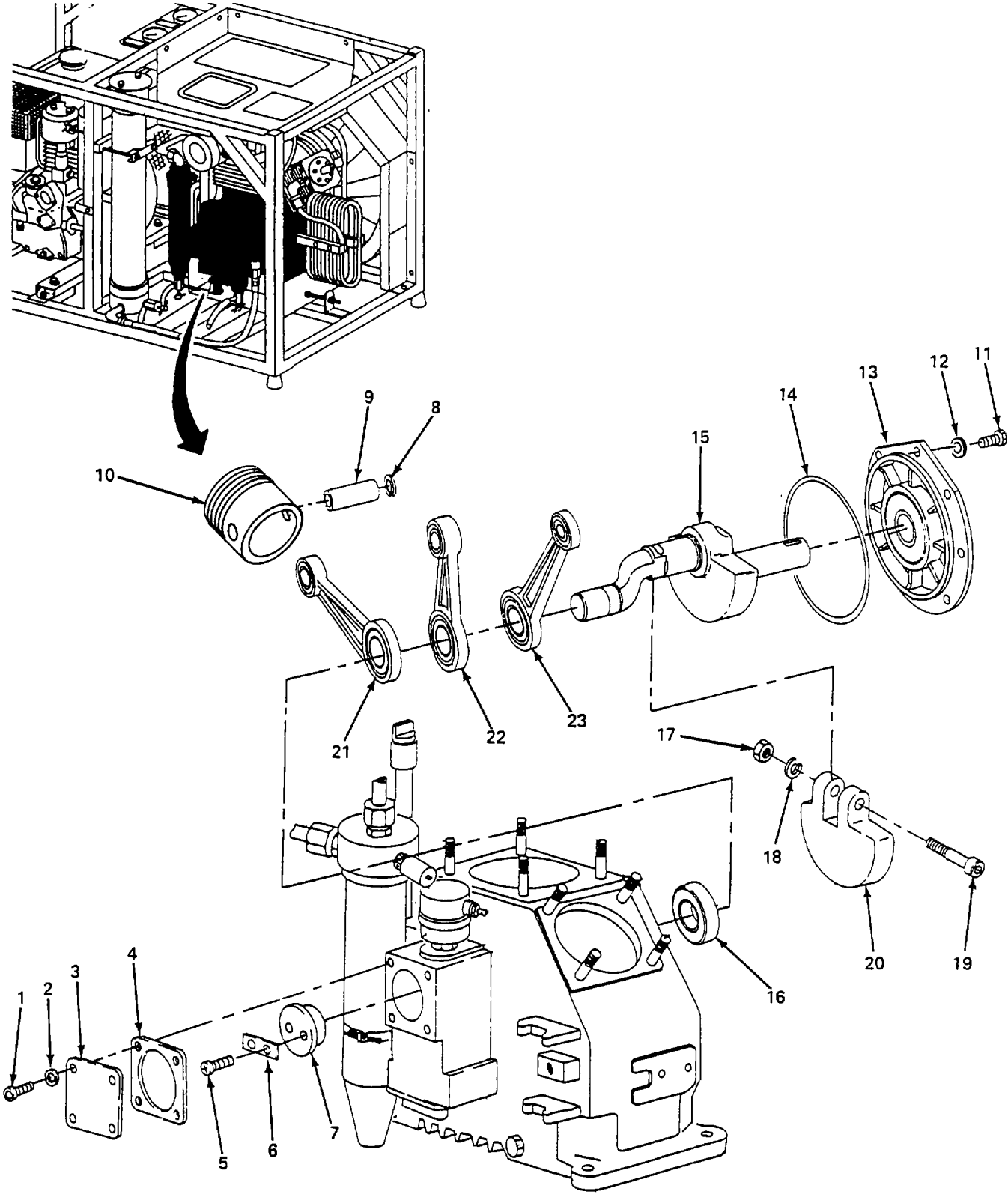


Figure 6-8. Third Stage Crosshead and Connecting Rod Assembly, Replace.

### 6-13. Third Stage Crosshead and Rod Assembly (Cont).

- (5) Remove second stage piston assembly (para. 6-11).
- (6) Remove six screws (11), washers (12), housing (13), and preformed packing (14). Discard preformed packing (14).
- (7) Remove crankshaft (15) and bearing (16).
- (8) Remove nut (17), washer (18), bolt (19), and balance weight (20).
- (9) Note position of connecting rods (21), (22), and (23) and remove them from crankshaft (15).
- (10) Install new connecting rod (21) and two connecting rods (22) and (23) on crankshaft (15) in the same orientation as noted during removal.
- (11) Install balance weight (20), bolt (19), washer (18), and nut (17).
- (12) Install bearing (16) and crankshaft (15).
- (13) Install housing (13) and new preformed packing (14) and secure with six screws (11) and washers (12).
- (14) Install crosshead (10), wrist pin (9), and two new retaining rings (8).
- (15) Install second stage piston assembly (para. 6-11).
- (16) Install first stage piston assembly (para. 6-9).
- (17) Install oil pump cam (7) and secure with plate (6) and two screws (5).
- (18) Install new gasket (4) and plate (3) and secure with four screws (1) and washers (2).

#### FOLLOW-ON MAINTENANCE

- (1) Install first stage cylinder (para. 6-8).
- (2) Install second stage cylinder (para. 6-10).
- (3) Install fanwheel (para. 5-36).

#### b. Repair. (figure 6-9)

- (1) Remove third stage crosshead and connecting rod assembly (para. a.).

#### **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 VI 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.**

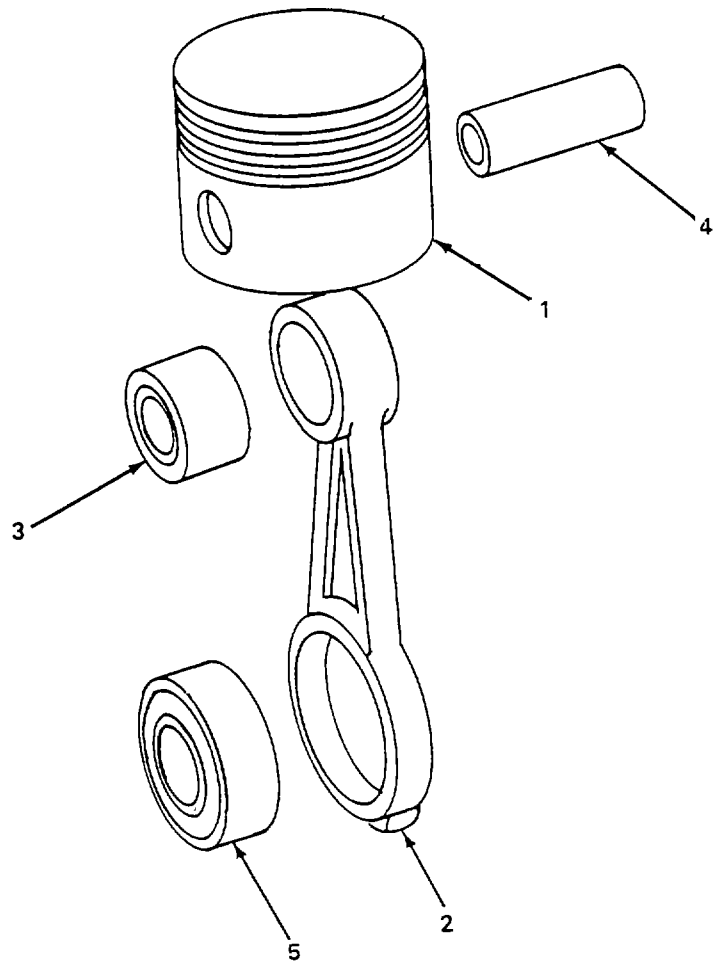


Figure 6-9. Third Stage Crosshead and Connecting Rod Assembly, Repair.

6-31/(6-32 blank)

- (2) Clean piston (1) with TSP ultrasonic cleaner and dry thoroughly.
- (3) Inspect crosshead (1) and replace if crosshead (1) is scored, or measurements taken at two places 90° from each other differ by more than 0.03 in. (0.762 mm), or crosshead diameter is less than 3.446 in. (87.530 mm).
- (4) Inspect connecting rod (2) and replace if bent or cracked. Replace connecting rod bushings (3) if scored or wrist pin (4) clearance is greater than 0.003 in. (0.0762 mm), or bushing (5) is scored or clearance with crankshaft is greater than 0.001 in. (0.0254 mm).
- (5) Install third stage crosshead and connecting rod assembly (para. a.).

---

**6-14. Compressor Crankshaft and Main Bearings**


---

**This task covers:**

**Replace**

---

**INITIAL SETUP**
*Tools*

General Mechanic's Tool Kit (NSN 5180-00-177-7033)  
Wrench, Torque (NSN 5120-00-247-2540)

*Materials/Parts*

Gasket  
Preformed Packing  
Bearing  
Lubricating Oil (Item 17, Appendix D)

*Equipment Condition*

First stage piston assembly removed (para. 6-9).  
Second stage piston assembly removed  
(para. 6-11).  
Crosshead assembly removed (para. 6-13).

*Reference*

Appendix F Torque Values.

---

Replace. (figure 6-10)

**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 VI of this manual. Foreign substances within an assembly could result in equipment failure and possible injury or death to personnel.**

- (1) Remove four screws (1), washers (2), plate (3), and gasket (4). Discard gasket (4).
- (2) Remove two screws (5), plate (6), and oil pump cam (7).
- (3) Remove six screws (8), washer (9), housing (10), and preformed packing (11). Discard preformed packing (11).
- (4) Remove crankshaft (12).
- (5) Remove bearing (13) from crankshaft (12).
- (6) Remove nut (14), washer (15), bolt (16), and balance weight (17).
- (7) Note orientation of connecting rods (18), (19), and (20) and two spacers (21) and (22) and remove from crankshaft (12).
- (8) Press bearing (23) out of housing (10).
- (9) Press new bearing (23) into housing (10).

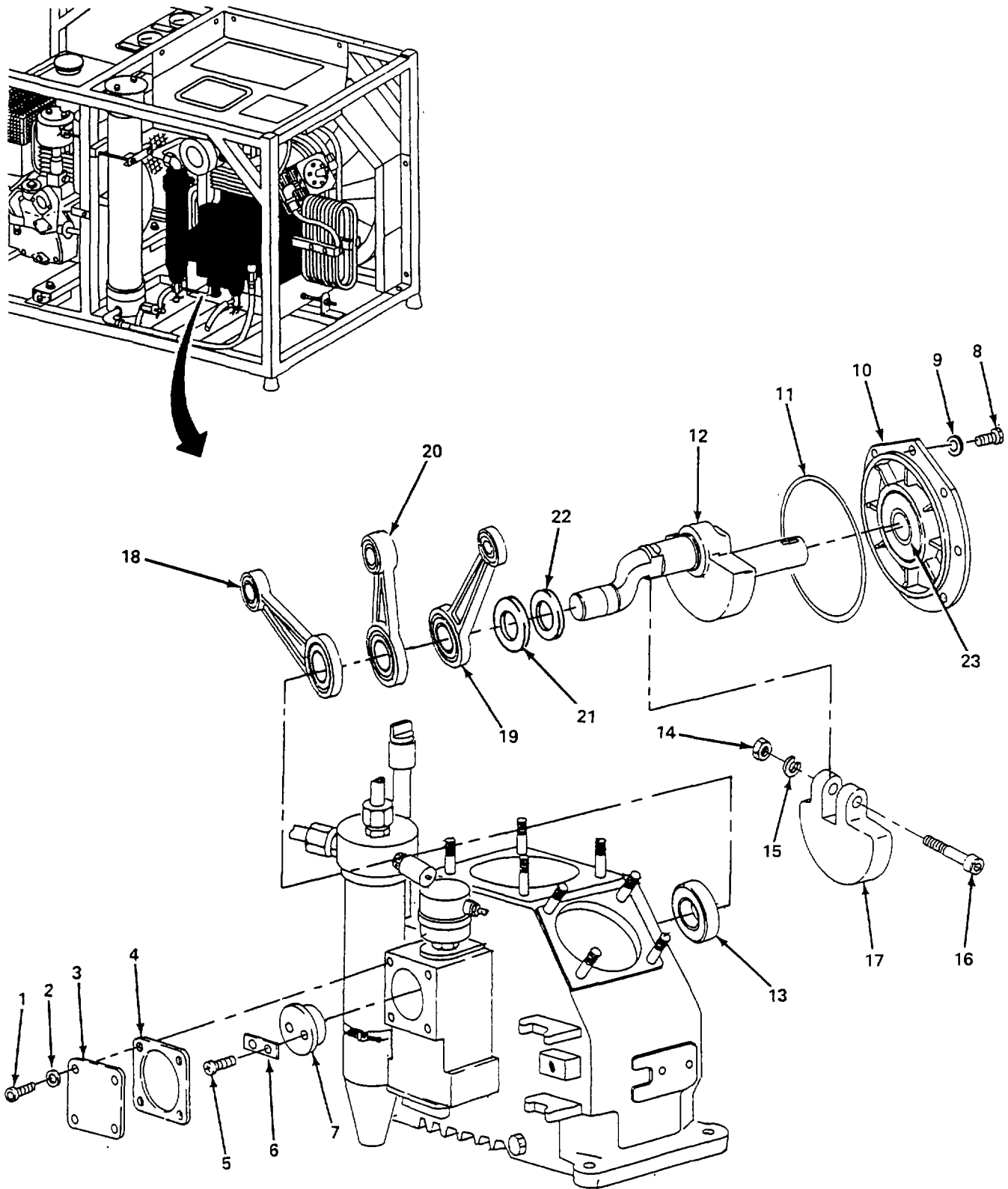


Figure 6-10. Compressor Crankshaft and Main Bearings, Replace.

- (10) Install two spacers (21) and (22), connecting rods (20), (19), and (18) on crankshaft (12) in the orientation noted during removal.
- (11) Install balance weight (17) and secure with bolt (16), washer (15), and nut (14).
- (12) Install new bearing (13) on crankshaft (12).
- (13) Install crankshaft (12).
- (14) Install housing (10) and new preformed packing (11) and secure with six screws (8) and washers (9).
- (15) Install oil pump cam (7) and secure with plate (6) and two screws (5).
- (16) Install new gasket (4) and note (3) and secure with four screws (1) and washers (2).

**FOLLOW-ON MAINTENANCE**

- (1) Install third stage crosshead assembly (para. 6-13).
- (2) Install second stage piston assembly (para. 6-11).
- (3) Install first stage piston assembly (para. 6-9).

---

**6-15. Compressor Crankcase**


---

**This task covers:**

**Replace**

---

**INITIAL SETUP**
*Tools*

General Mechanic's Tool Kit (NSN 5180-00-177-7033)  
 Stud Remover (NSN 5120-00-618-8948)

*Materials/Parts*

Crankcase

*Equipment Condition*

Crankcase breather removed (para. 4-22).  
 Oil filler removed (para. 4-19).

*Equipment Condition (Cont)*

Drain tube removed (para. 4-21).  
 First stage intercooler coil removed (para. 5-16).  
 Second stage intercooler coil removed (para. 5-17).  
 Aftercooler removed (para. 5-18).  
 Lines and fittings removed (para. 5-19).  
 Oil pump removed (para. 5-21).  
 Crankshaft removed (para. 6-14).  
 Second stage separator assembly removed (para. 5-12).  
 Final separator assembly removed (para. 5-14).

---

Replace. (figure 6-11)

- (1) Remove two bolts (1), washers (2), and intercooler coil bracket (3).
- (2) Remove two bolts (4), washers (5), and intercooler coil bracket (6).
- (3) Remove eight studs (7).
- (4) Remove four studs (8).
- (5) Install four studs (8) in new crankcase (9).
- (6) Install eight studs (7) in new crankcase (9).
- (7) Install intercooler coil bracket (6) and secure with two bolts (4) and washers (5).
- (8) Install intercooler coil (3) and secure with two bolts (1) and washers (2).

**FOLLOW-ON MAINTENANCE**

- (1) Install final separator assembly (para. 5-14).
- (2) Install second stage separator assembly (para. 5-12).
- (3) Install crankshaft (para. 6-14).
- (4) Install oil pump (para. 5-21).
- (5) Install lines and fittings (para. 5-19).
- (6) Install aftercooler (para. 5-18).
- (7) Install second stage intercooler coil (para. 5-17).
- (8) Install first stage intercooler coil (para. 5-16).
- (9) Install drain tube (para. 4-21).
- (10) Install oil filler (para. 4-19).
- (11) Install crankcase breather (para. 4-22).



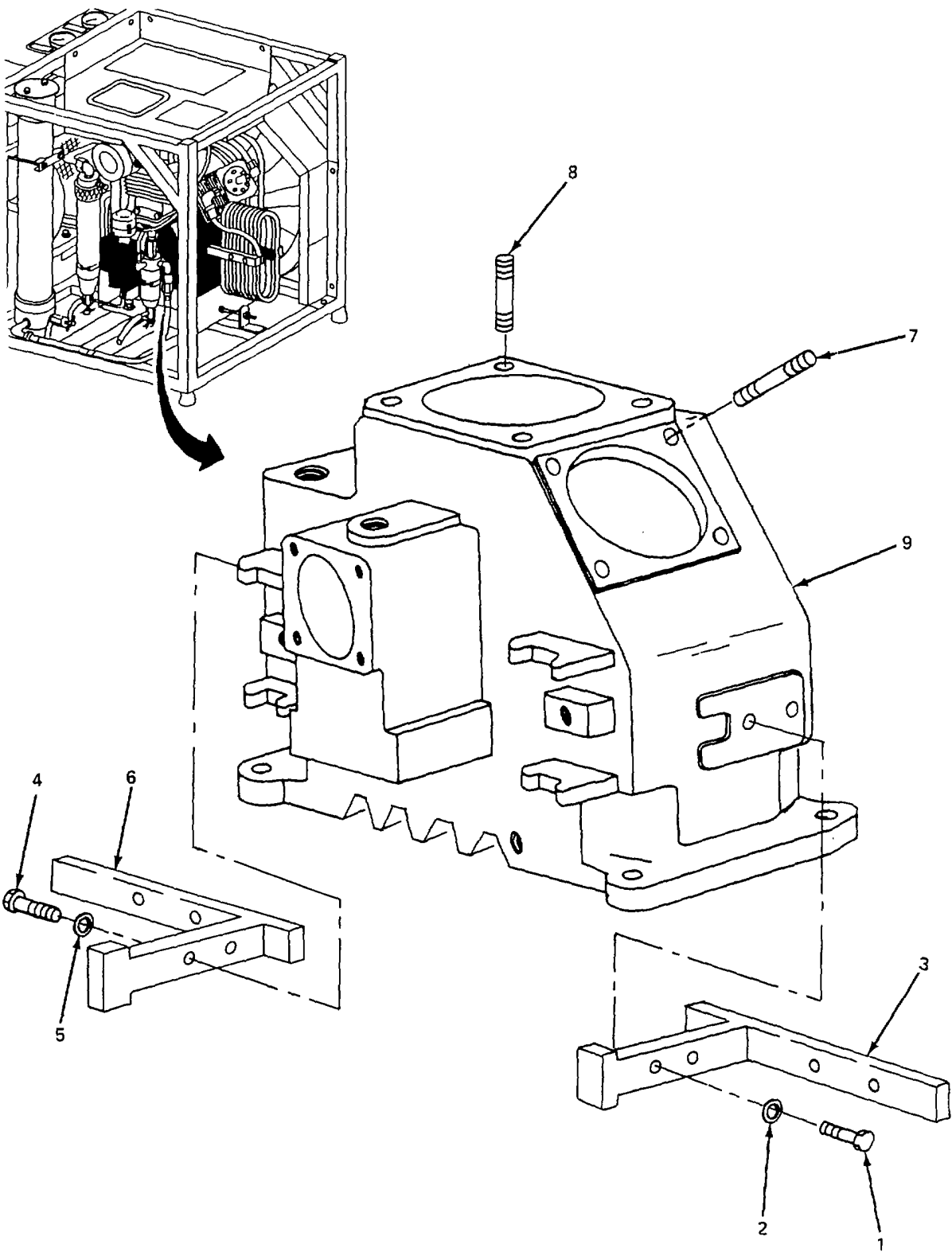


Figure 6-11. Compressor Crankcase, Replace.

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**6-16. Fuel Injection Pump**

---

**This task covers:****Repair**

---

**INITIAL SETUP***Tools*

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

*Equipment Condition*

Fuel injection pump removed (para. 5-28).

*Materials/Parts*

Washer, Delivery Valve

Dry Cleaning Solvent (Item 21, Appendix E)

Rags, Wiping (Item 19, Appendix E)

---

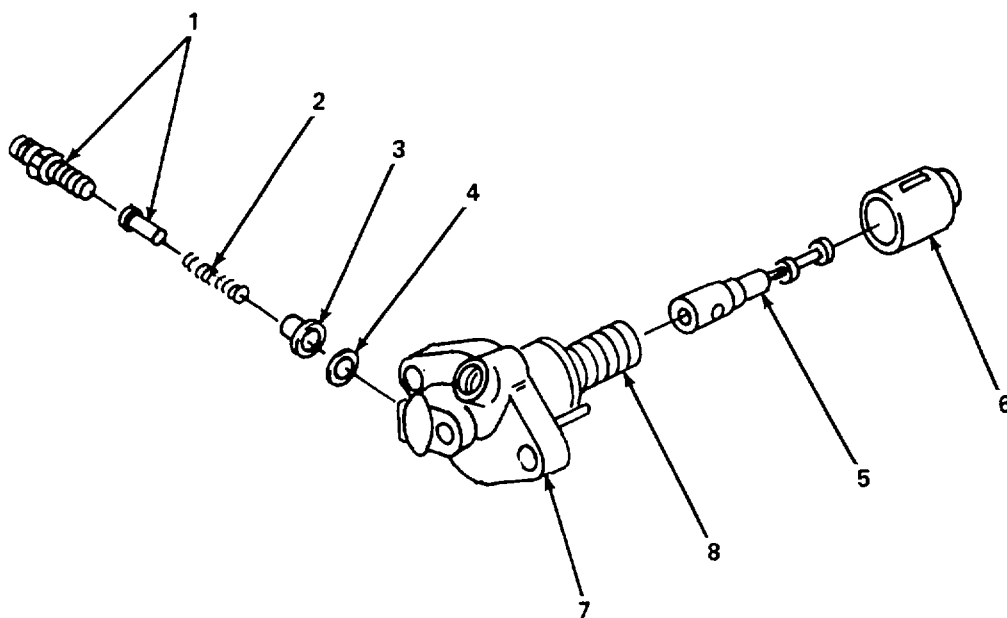
*Repair.* (figure 6-12)

- (1) Remove delivery valve holder (1), delivery valve spring (2), delivery valve (3), delivery valve washer (4), and pump element (5).

**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 pump element (5) and replace if bent, cracked or otherwise damaged.
- (4) Inspect delivery valve (3) and replace if cracked or bent.
- (5) Inspect delivery valve spring (2) and replace if cracked or deformed.
- (6) Inspect delivery valve holder (1) and replace if bent or cracked.
- (7) Inspect roller tappet (6) and replace if worn, scored, or roller has excessive play.
- (8) Inspect fuel pump (7) and replace if body is cracked or spring (8) is cracked or deformed.
- (9) Install pump element (5), new delivery valve washer (4), delivery valve (3), delivery valve spring (2) and delivery valve holder (1).



**Figure 6-12. Fuel Injection Pump, Repair.**

**FOLLOW-ON MAINTENANCE**

- (1) Install fuel injection pump (para. 5-28).
- (2) Adjust fuel injection pump (para. 5-28).

---

**6-17. Governor Assembly**

---

**This task covers:****a. Replace****b. Repair**

---

**INITIAL SETUP***Tools*

General Mechanic's Tool Kit (NSN 5180-00-177-7033)  
Wrench, Torque (NSN 5120-00-247-2540)

*Materials/Parts*

Governor Assembly

*Equipment Condition*

Gear cover assembly removed (para. 5-32).

*Reference*

Appendix F Torque Values.

---

- a. Replace. (figure 6-13)

**NOTE**

**Governor mounting screw has a left handed thread. To remove governor, turn clockwise.**

- (1) Remove governor pin (1).
- (2) Pry apart governor weights (2).
- (3) Unscrew governor (3) and remove.
- (4) Install governor (3), turn counterclockwise to tighten, and torque governor (3) to 25-29 lb-ft (35-40 Nm).
- (5) Install governor pin (1).

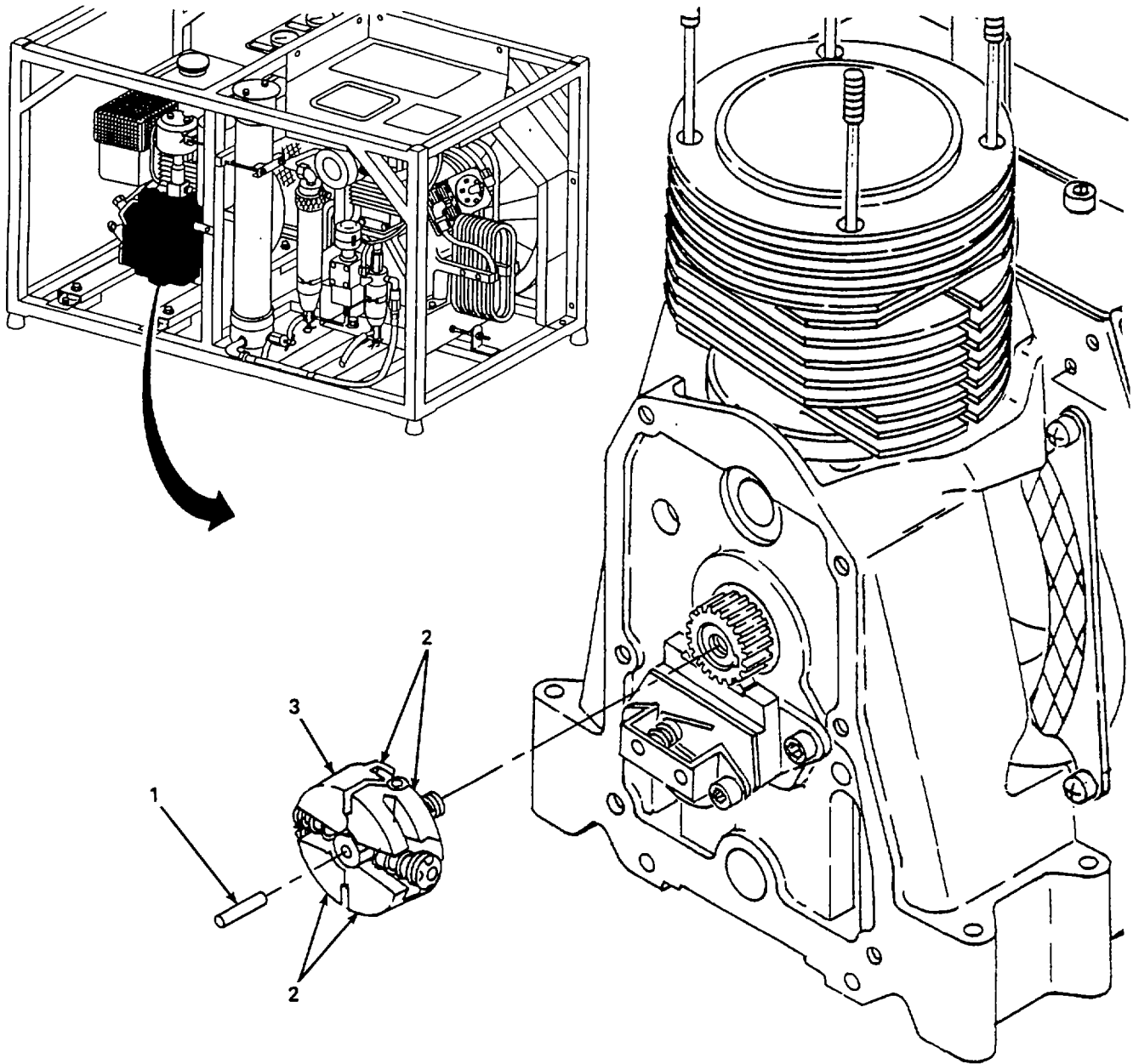


Figure 6-13. Governor Assembly, Replace.

FOLLOW-ON MAINTENANCE  
Install gear cover (para. 5-32).

## 6-17. Governor Assembly (Cont).

b. *Repair.* (figure 6-14)

- (1) Remove governor assembly (para. a.).
- (2) Remove locknut (1), spring (2), spring (3), lock tab (4), spring seat (5), and spring (6).
- (3) Remove locknut (7), spring (8), spring (9), lock tab (10), spring seat (11), and spring (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 100°F-138°F (38°C-60°C).**

- (4) Clean all items with dry cleaning solvent and dry thoroughly.
- (5) Inspect locknuts (1) and (7) and replace if bent, cracked or threads are stripped.
- (6) Inspect springs (2), (3), (6), (8), (9), and (12) and replace all springs if any one of them is cracked, bent, or deformed in any way.
- (7) Inspect weights (13) and body (14) and replace if weights are cracked, body is cracked, or threads are stripped.
- (8) Inspect pin (15) and replace if bent or ends are mushroomed.
- (9) Inspect locking tabs (4) and (10). Remove any burrs or deformations in locking tabs (4) and (10). Locking tabs (4) and (10) are not available as piece parts. Make every effort to reuse locking tabs (4) and (10).
- (10) Inspect spring seats (5) and (11). Spring seats are not available as piece parts. Make every effort to reuse spring seats (5) and (11).
- (11) Install spring (12), spring seat (11), lock tab (10), spring (9), spring (8) and secure with locknut (7).
- (12) Install spring (6), spring seat (5), lock tab (4), spring (3), spring (2) and secure with locknut (1).
- (13) Install governor assembly (para. a.).

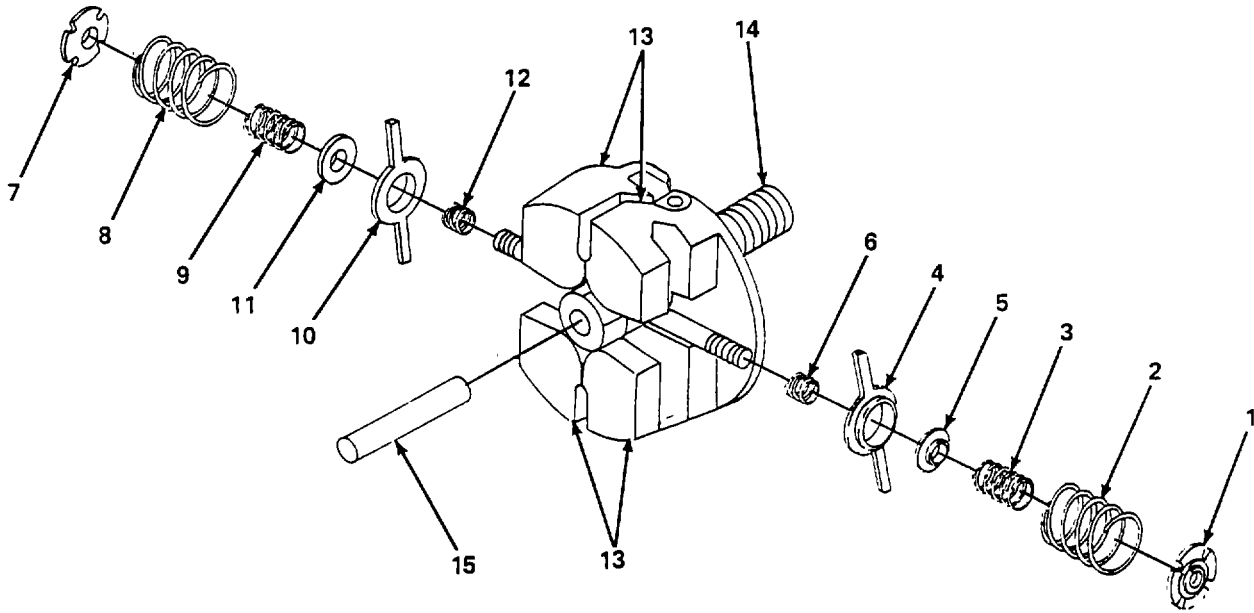


Figure 6-14. Governor Assembly, Repair.

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**6-18. Gear Cover Assembly**

---

**This task covers:****Repair**

---

**INITIAL SETUP***Tools*

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

*Materials/Parts*Oil, Lubricating (Item 16, Appendix E)  
Primer Assembly  
Shaft Bushing

---

Repair.

- (1) Replace shaft bushing. (figure 6-15)
  - (a) Remove speed control assembly (para. 5-30).
  - (b) Press shaft bushing (1) out of gear cover (2).
  - (c) Clean bore in gear cover (2) and ensure no scores or grooves are present.
  - (d) Coat new shaft bushing (1) with clean engine oil.
  - (e) Press new shaft bushing (1) into gear cover (2).
  - (f) Install speed control assembly (para. 5-30).



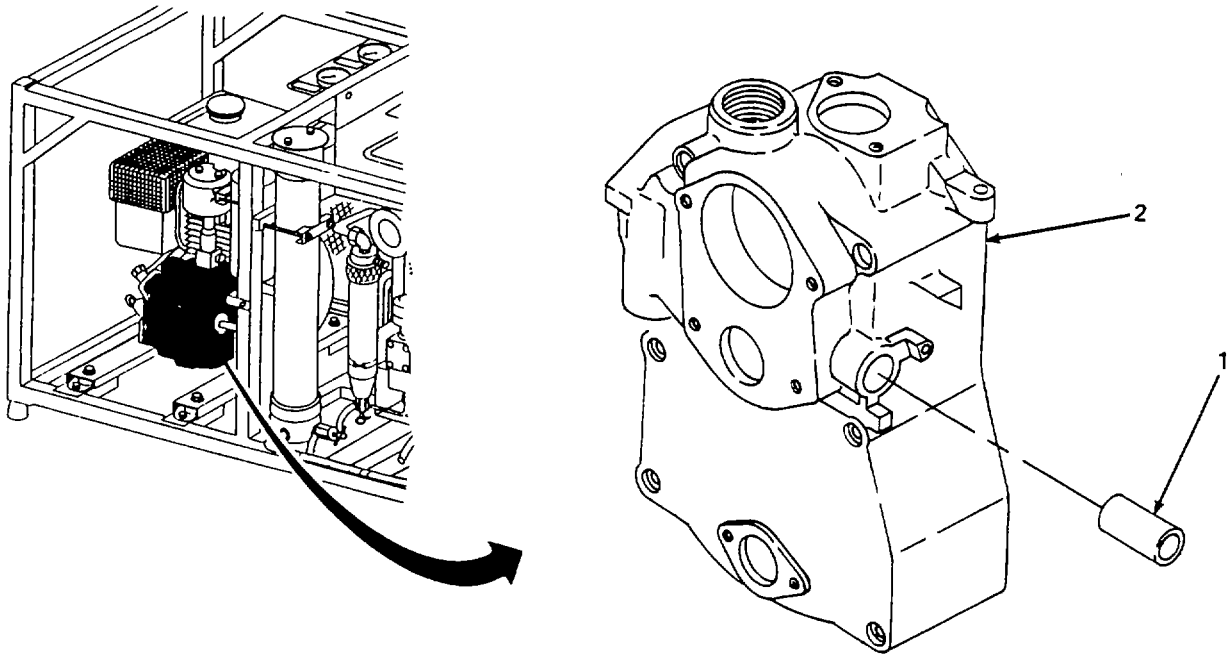


Figure 6-15. Shaft Bushing, Replace.

**6-18. Gear Cover Assembly (Cont).**

- (2) Replace primer assembly. (figure 6-16)
  - (a) Remove gear cover assembly (para. 5-32).
  - (b) Pull off knob (1) and remove pin (2), spring (3), washer (4), and preformed packing (5). Discard preformed packing (5).
  - (c) Install new spring (3), washer (4), and new preformed packing (5) on pin (2).
  - (e) Install gear cover assembly (para. 5-32).

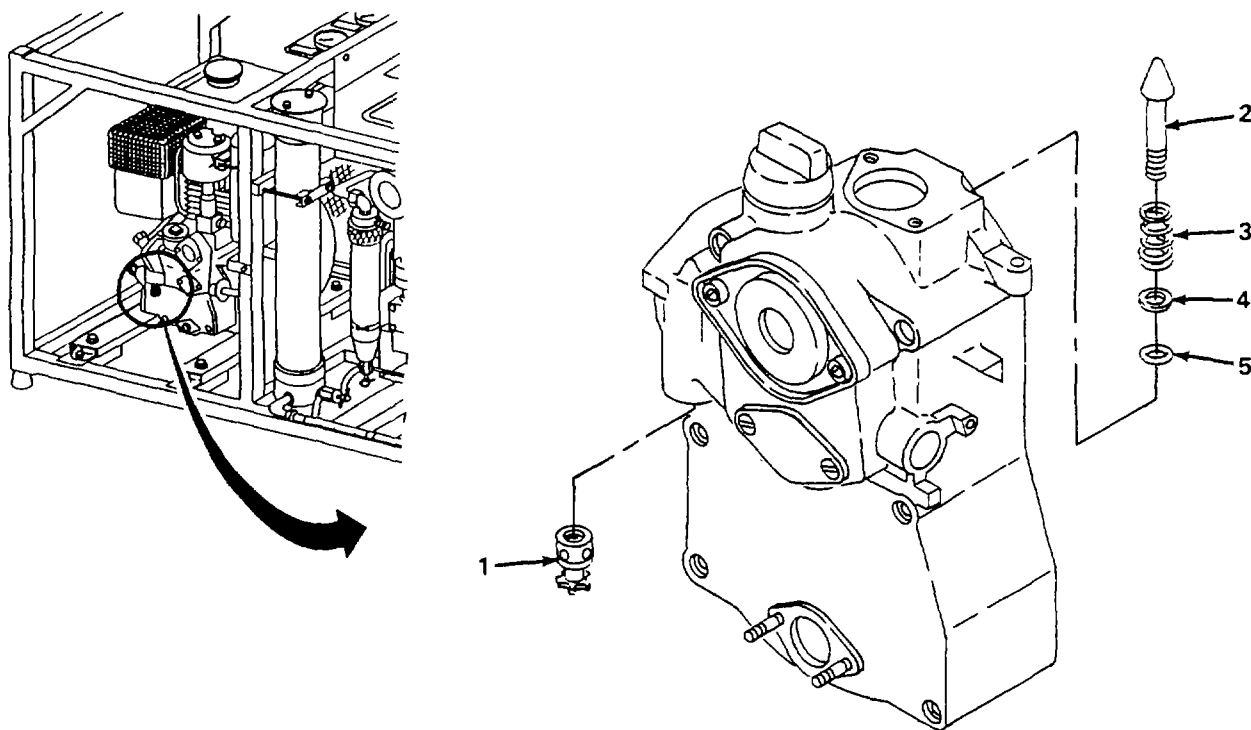


Figure 6-16. Primer Assembly, Replace.  
6-49

---

**6-19. Camshaft Assembly.**

---

**This task covers:****a. Replace****b. Repair**

---

**INITIAL SETUP***Tools*

General Mechanic's Tool Kit (NSN 5180-00-177-7033)  
Pliers, Retaining Ring (NSN 5210-00-789-0492)

*Materials/Parts*

Preformed Packing  
Bearing Gear cover assembly removed (para.

*Materials/Parts (Cont)*

Camshaft Assembly  
Dry Cleaning Solvent (Item 21, Appendix E)  
Rags, Wiping (Item 19, Appendix E)

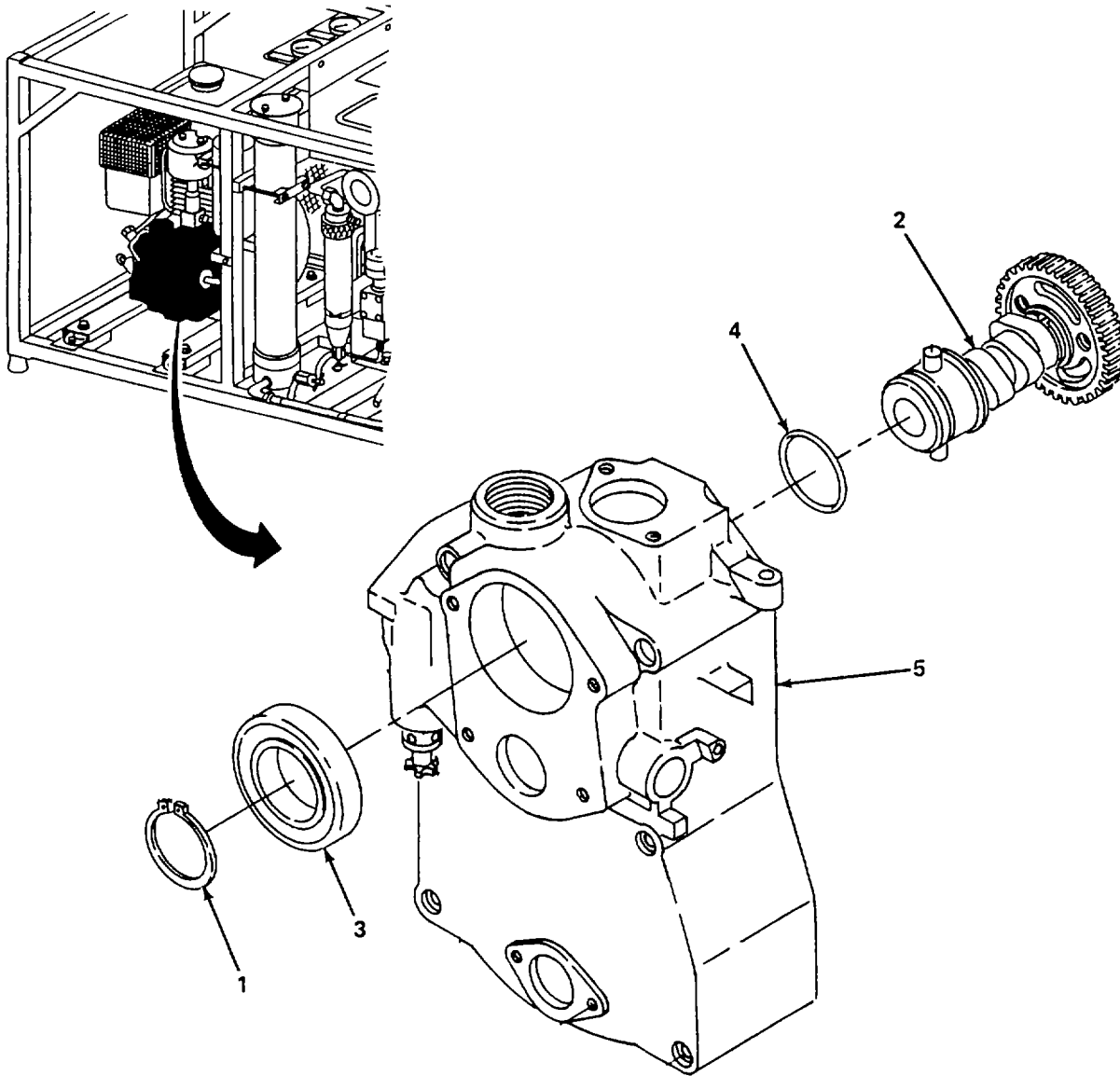
*Equipment Condition*

5-32).

---

**a. Replace.** (figure 6-17)

- (1) Remove retaining ring (1).
- (2) Press camshaft (2) out of bearing (3) and remove preformed packing (4). Discard preformed packing (4).
- (3) Press bearing (3) out of gear cover (5).
- (4) Press new bearing (3) into gear cover (5).
- (5) Install new preformed packing (4) and press new camshaft (2) into bearing (3) and secure with retaining ring (1).



**Figure 6-17. Camshaft Assembly, Replace.**

**FOLLOW-ON MAINTENANCE**  
Install gear cover assembly (para. 5-32).  
**6-51**

6-19. **Camshaft Assembly (Cont).**b. Repair. (figure 6-18)

- (1) Remove camshaft assembly (para. a.).
- (2) Press cam gear (1) off camshaft (2) and remove key (3).
- (3) Press pin (4) out of camshaft (2).

**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, except preformed packing, with dry cleaning solvent and dry thoroughly.
- (5) Inspect camshaft (2) and replace if lobes are scored, worn, or camshaft is otherwise damaged.
- (6) Inspect cam gear (1) and replace if teeth are worn, chipped, or gear is cracked or otherwise damaged.
- (7) Hold center of bearing (5) and turn outside ring. Replace bearing if rough or sticking areas are felt.
- (8) Install key (3) in camshaft (2).
- (9) Press cam gear (1) on camshaft (2).
- (10) Press new pin (4) into camshaft (2).
- (11) Install camshaft assembly (para. a.).

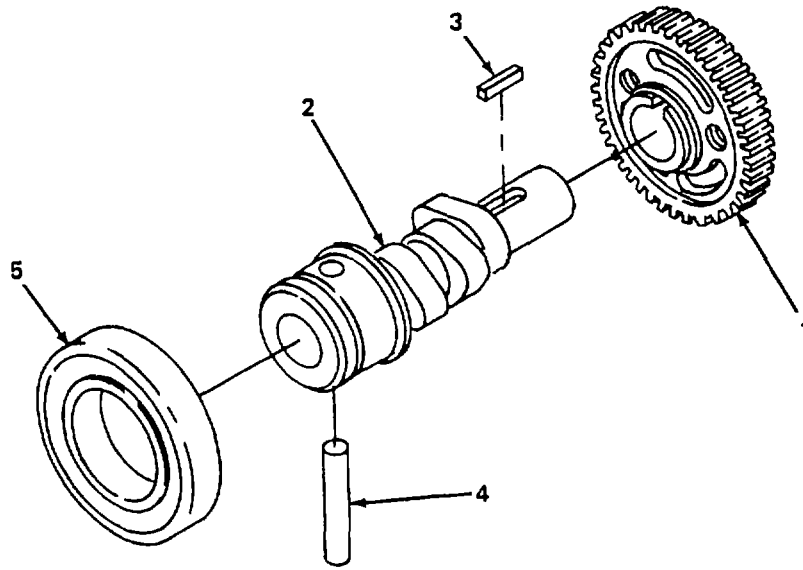


Figure 6-18. Camshaft Assembly, Repair.  
6-53

---

**6-20. Piston and Connecting Rod Assemblies.**


---

This task covers:

**a. Replace**

**b. Repair**

---

**INITIAL SETUP**
*Tools*

General Mechanic's Tool Kit (NSN 5180-00-177-7033)  
 Piston Ring Compressor (NSN 5120-01-191-4500)  
 Piston Ring Groove Cleaner (P/N RC-510)  
 Caliper Set (NSN 5210-00-554-7134)  
 Wrench, Torque (NSN 5120-00-247-2540)  
 Pliers, Retaining Rings (NSN 5210-00-789-0492)

*Materials/Parts (Cont)*

Dry Cleaning Solvent (Item 21, Appendix E)  
 Rags, Wiping (Item 19, Appendix E)  
 Connecting Rod  
 Connecting Rod Bearings

*Equipment Condition*
*Materials/Parts*

Cylinder head assembly removed (para.5-29).  
 Oil filter screen removed (para. 4-31).

Bearings

Piston

Piston Rings

Retaining Rings

*Reference*

Appendix F Torque Values.

---

a. Replace. (figure 6-19)

- (1) Remove six screws (1), cover (2), and gasket (3).
- (2) Remove two nuts (4) and bearing cap (5).
- (3) Push piston and connecting rod (6) out of cylinder (7).
- (4) Remove bearings (8), and discard.
- (5) Install new bearings (8) in new connecting rod (6) and bearing cap (5).
- (6) Install ring compressor on piston (6).
- (7) Install piston and connecting rod (6) in cylinder (7).
- (8) Ensure connecting rod seats completely on crankshaft (9).
- (9) Install bearing cap (5) and secure with two nuts (4). Torque nuts to 22 lb-ft (30 Nm).
- (10) Install gasket (3), cover (2), and secure with six screws (1).

**FOLLOW-ON MAINTENANCE**

- (1) Install cylinder head assembly (para. 5-29).
- (2) Install oil filter screen (para. 4-31).



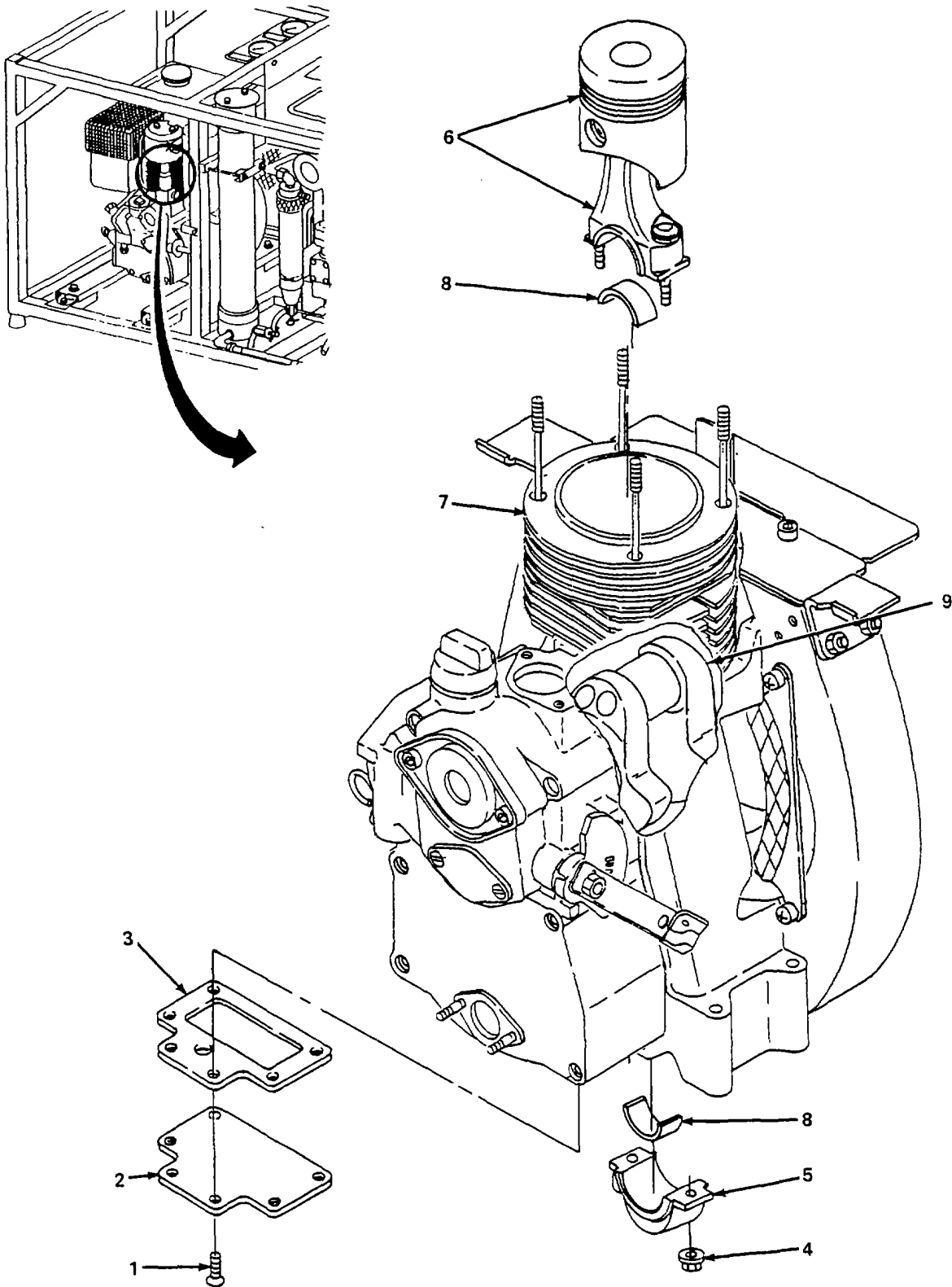


Figure 6-19. Piston and Connecting Rod Assemblies, Replace.  
6-55

**6-20. Piston and Connecting Rod Assemblies (Cont).****b. Repair.** (figure 6-20)

- (1) Remove piston and connecting rod assemblies (para. a.).
- (2) Remove two retaining rings (1), wrist pin (2), and piston (3) from connecting rod (4). Discard retaining rings (1).
- (3) Remove two compression rings (5) and oil ring (6) from piston (3).

**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) Clean out piston ring grooves.
- (6) Inspect piston (3) and replace if scored, top is pitted, or piston measurement is less than 3.198 in. (81.160 mm).
- (7) Inspect connecting rod (4) and bearing cap (7), and replace if cracked or bent.
- (8) Inspect wrist pin (2) and replace if bent or excessively worn.
- (9) Install oil ring (6) in bottom piston ring groove.
- (10) Install two compression rings (5) in top two piston ring grooves.
- (11) Position piston (3) on connecting rod (4).
- (12) Install wrist pin (2) and secure with two new

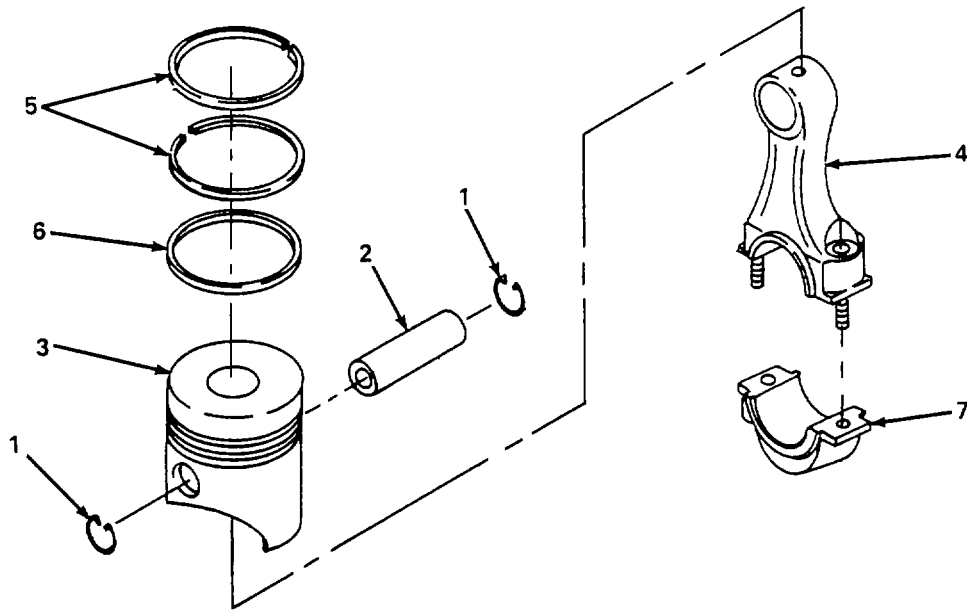


Figure 6-20. Piston and Connecting Rod Assemblies, Repair.

---

**6-21. Crankshaft and Mainbearing Support.**


---

This task covers:

**a. Replace**

**b. Repair**

---

**INITIAL SETUP**
*Tools*

General Mechanic's Tool Kit (NSN 5180-00-177-7033)  
 Caliper Set (NSN 5210-00-554-7134)  
 Pliers, Retaining Ring (NSN 5120-00-789-0492)  
 Wrench, Torque (NSN 5120-00-554-7292)

*Equipment Condition*

Flywheel removed (para. 5-35).  
 Piston and connecting rod assembly removed  
 (para. 6-20).  
 Oil filter screen removed (para. 4-31).  
 Governor assembly removed (para. 6-17).  
 Oil pump assembly removed (para. 5-34).

*Materials/Parts*

Preformed Packing  
 Gasket  
 Retaining Ring  
 Crankshaft Assembly  
 Dry Cleaning Solvent (Item 21, Appendix E)  
 Rags, Wiping (Item 19, Appendix E)  
 Oil, Lubricating (Item 16, Appendix E)

*Reference*

Appendix F Torque Values.

---

*a. Replace.* (figure 6-21)

- (1) Using puller, remove gear (1).
- (2) Remove key (2).
- (3) Remove four nuts (3) and washers (4).
- (4) Screw two screws (5) into threaded holes in bearing carrier (6) and tighten screws (5) evenly until carrier (6) breaks free and remove screws (5).
- (5) Remove carrier (6), two belleville washers (7), oil seal (8), preformed packing retainer (9), preformed packing (10), and gasket (11). Discard preformed packing (10) and gasket (11).
- (6) Remove retaining ring (12) and remove bearing (13) from carrier (6). Discard retaining ring (12).
- (7) Remove crankshaft (14).
- (8) Press bushing (15) out of crankcase (16).
- (9) Remove connecting rod bearings (17) from connecting rod (18) and bearing cap (19).
- (10) Install new connecting rod bearings (17) in connecting rod (18) and bearing cap (19).
- (11) Coat outside of bushing (15) with clean engine oil and press new bushing (15) into crankcase (16).

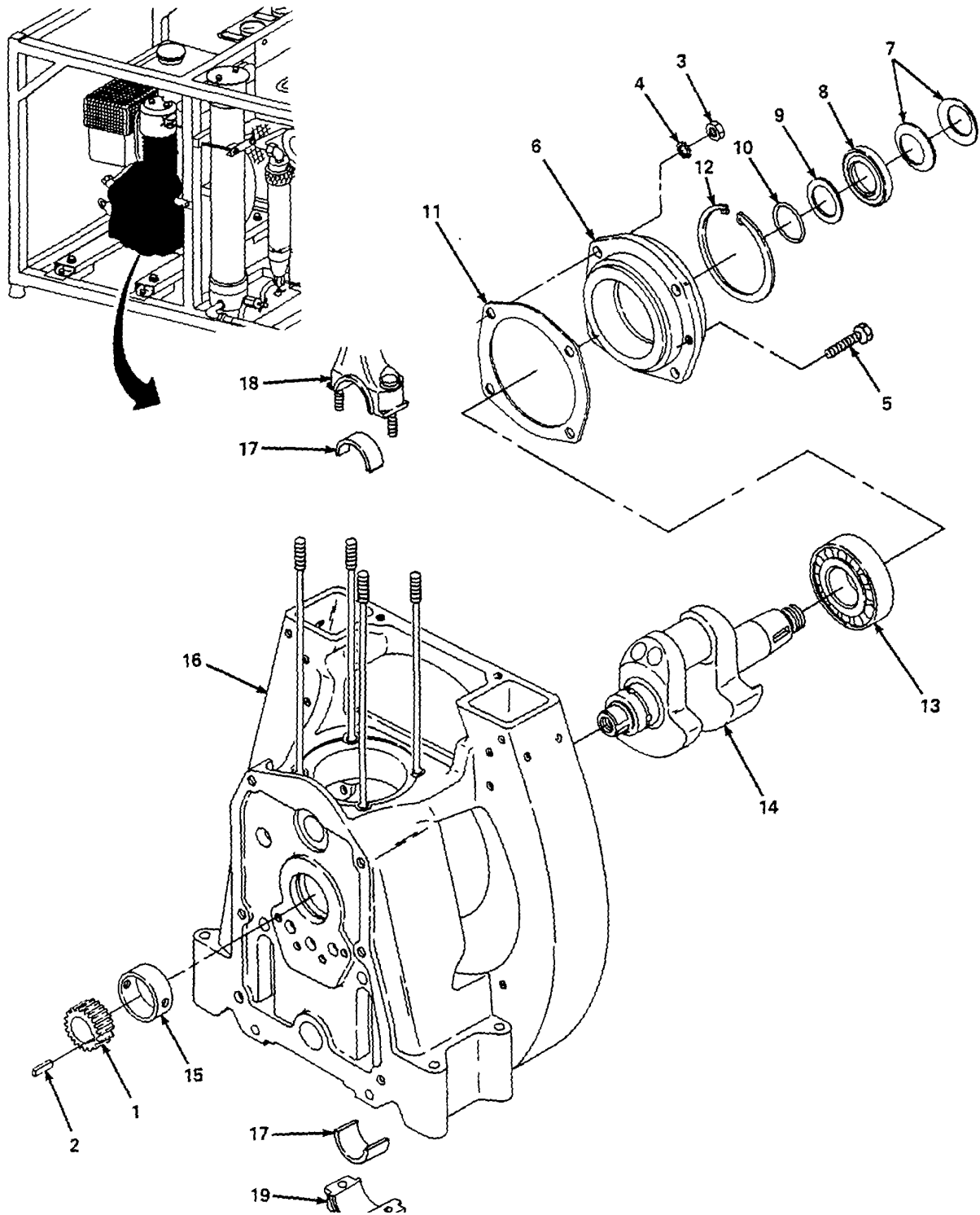


Figure 6-21. Crankshaft, Replace.

**6-21. Crankshaft and Mainbearing Support (Cont).**

- (12) Coat inside bore of bushing (15) with clean engine oil.
- (13) Install crankshaft (14).
- (14) Install new bearing (13) in carrier (6) and secure with snap ring (12).
- (15) Install new gasket (11), new preformed packing (10), preformed packing retainer (9), oil seal (8), and two belleville washers (7), ensure belleville washers (7) curved surfaces are away from each other, and carrier (6).
- (16) Tap carrier (6) with mallet, to seat carrier (6).
- (17) Secure carrier (6) with four nuts (3) and washers (4). Torque nuts to 22-25 lb-ft (30-34 Nm).
- (18) Install key (2) and gear (1).

**FOLLOW-ON MAINTENANCE**

- (1) Install oil pump assembly (para. 5-34).
- (2) Install governor assembly (para. 6-17).
- (3) Install oil filter screen (para. 4-31).
- (4) Install piston and connecting rod assemblies (para. 6-20).
- (5) Install flywheel (para. 5-35).

**b. Replace.** (figure 6-22)

- (1) Remove crankshaft (para. a.).

**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, except bearing (1), preformed packing (2) and oil seal (3) with dry cleaning solvent and dry thoroughly.
- (3) Hold inner race of bearing (1) and turn outer race slowly. Replace bearing (1) if rough or sticking spots are felt.
- (4) Inspect gear (4) and replace if teeth are worn, chipped, or gear is otherwise damaged.
- (5) Inspect bushing (5) and replace if bore diameter is greater than 1.579 in. (40.08 mm).
- (6) Inspect connecting rod bearings (6) and replace if diameter is greater than 1.577 in. (40.020 mm).
- (7) Inspect crankshaft (7) and replace if bearing surface diameter is less than 1.576 in. (39.99 mm) or main bearing surface diameter is less than 1.577 in. (40.02 mm).

- (8) Replace oil seal (3) and preformed packing (2).
- (9) Inspect bearing carrier (8) and replace if cracked or otherwise damaged.
- (10) Install crankshaft (para. a.).
- (11) Inspect belleville washers (9) and replace if cracked or bent.
- (12) Replace retaining ring (10).
- (13) Inspect preformed packing retainer (11) and replace if bent or cracked.

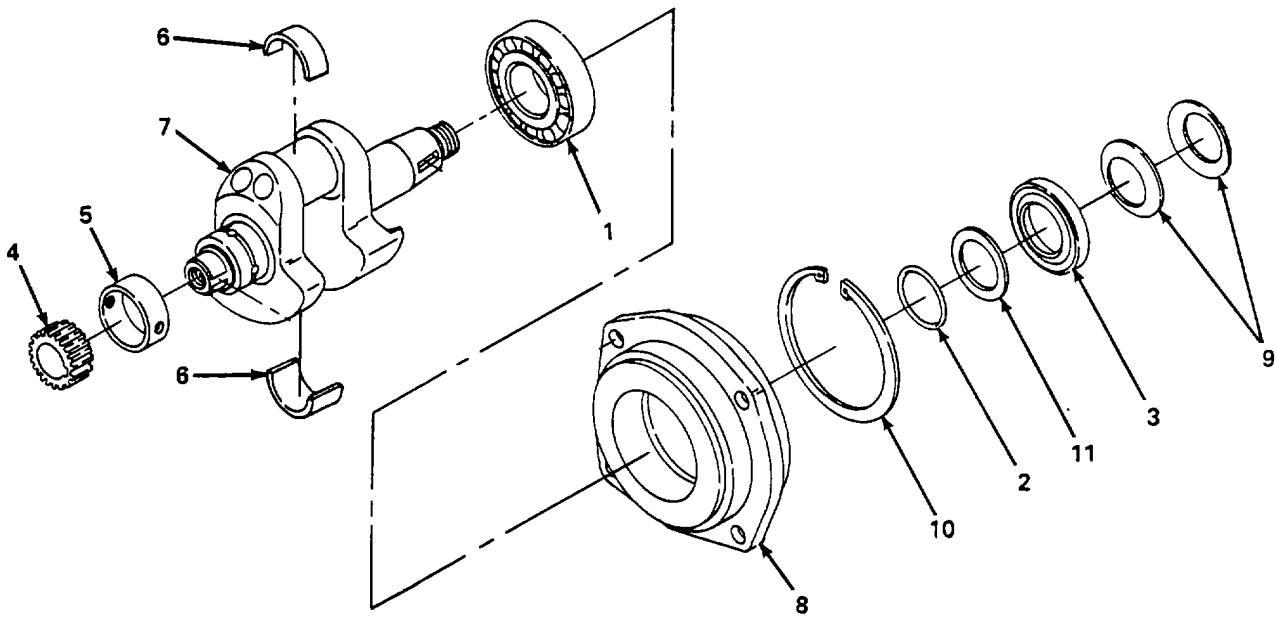


Figure 6-22. Crankshaft, Repair.

---

**6-22. Engine Crankcase.**

---

**This task covers:****Replace**

---

**INITIAL SETUP***Tools*

General Mechanic's Tool Kit (NSN 5180-00-177-7033)  
Remover, Stud (NSN 5120-00-618-8948)

*Equipment Condition*

Cylinder removed (para. 5-33).  
Crankshaft removed (para. 6-21).

*Materials/Parts*

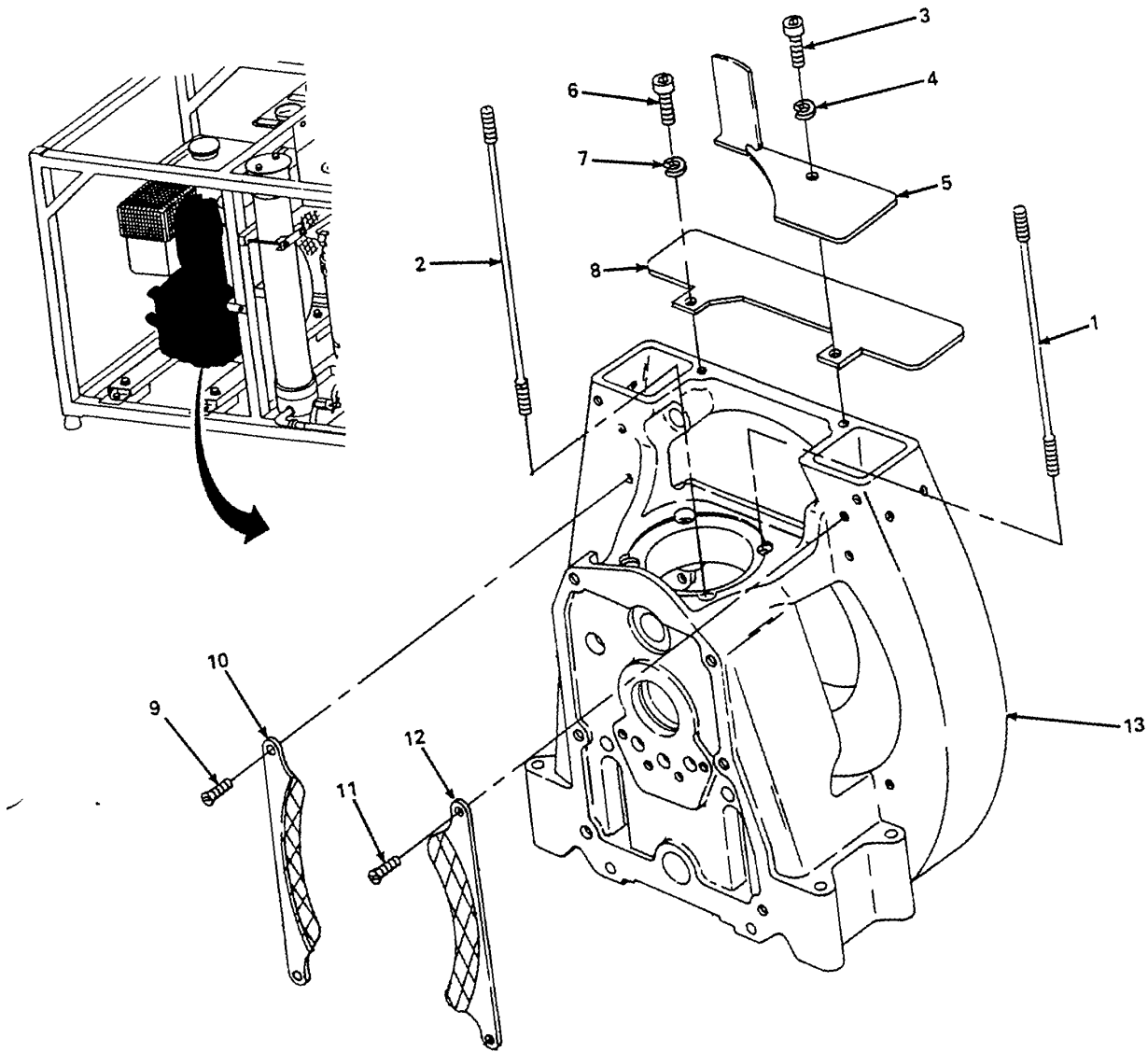
Crankcase

---

Replace. (figure 6-23)

- (1) Remove two studs (1).
- (2) Remove two studs (2).
- (3) Remove screw (3), washer (4), and air shield (5).
- (4) Remove screw (6), washer (7), and air shield (8).
- (5) Remove two screws (9) and remove guard (10).
- (6) Remove two screws (11) and remove guard (12).
- (7) Inspect studs (1) and (2) and replace if threads are stripped or shafts show signs of necking.
- (8) Inspect air shields (5) and (8) and replace if cracked.
- (9) Inspect guards (10) and (12) and replace if cracked.
- (10) Install guard (10) on new crankcase (13) and secure with two screws (9).
- (11) Install guard (12) on new crankcase (13) and secure with two screws (11).
- (12) Install air shield (8) on new crankcase (13) and secure with screw (6) and washer (7).
- (13) Install air shield (5) on new crankcase (13) and secure with screw (3) and washer (4).
- (14) Install two studs (2) in new crankcase (13).
- (15) Install two studs (1) in new crankcase (13).





**Figure 6-23. Crankcase, Replace.**

**FOLLOW-ON MAINTENANCE**

- (1) Install cylinder (para. 5-33).
- (2) Install crankshaft (para. 6-21).

---

**6-23. Air Tank Charging Whip Assembly.**

---

**This task covers:****Calibrate**

---

**INITIAL SETUP***Tools**Materials/Parts*

General Mechanic's Tool Kit (NSN 5180-00-177-7033)	Bags, Plastic (item 3, Appendix E) Bands, Rubber (Item 4, Appendix E) Tape, Pressure Sensitive (Item 22, Appendix E) Tape, Teflon (Item 23, Appendix E)
--	--

---

Calibrate. (figure 6-24)

- (1) Inspect gage (1) for date of last calibration.

**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 VI 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) Have the gage calibrated if date of last calibration is more than 540 days. Ensure gage is calibrated in accordance with procedures in TB 9-4220-216-35, Section IV.

**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.**

- (3) Apply teflon tape to threads on calibrated gage (1).
- (4) Install gage (1).

\*U.S. GOVERNMENT PRINTING OFFICE: 1996 - 755-025/40158

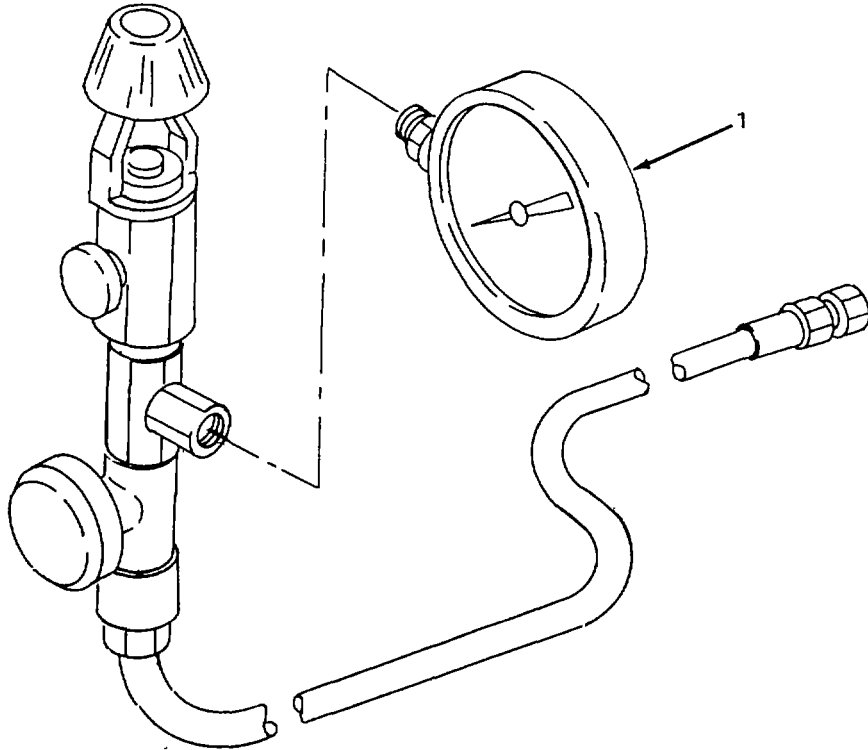


Figure 6-24. Air Tank Charging Whip Assembly, Calibrate.

6-65/(6-66 blank)

**APPENDIX A**

**REFERENCES**

**A-1. Scope.** This appendix lists all forms, field manuals, technical manuals and miscellaneous publications referred to in this manual.

**A-2. Forms.**

Recommended Changes to Publications .....	DA Form 2028-2
Maintenance Inspection Report .....	DA Form 2404
Packaging Improvement Report .....	DD Form 6
Quality Deficiency Report (QDR) .....	SF 368

**A-3. Field Manuals.**

Military Diving .....	FM 20-11-1
First Aid Instructions .....	FM 21-11

**A-4. Technical Manuals.**

Repair Parts and Special Tools List .....	TM 5-4310-387-24P
Destruction of Army Materiel to Prevent Enemy Use .....	TM 750-244-2
Destruction of Army Materiel to Prevent Enemy Use .....	TM 750-244-3
Painting Instructions for Field Use .....	TM 43-0139
Packaging and Preservation of Material .....	TM 38-230

**A-5. Miscellaneous Publications**

The Army Maintenance Management System (TAMMS) .....	DA PAM 738-750
Calibration Procedures for Pressure Gages Used for Diving Equipment (General) .....	TB 9-4220-216-35

**A-1/(A-2 blank)**

## APPENDIX B

## MAINTENANCE ALLOCATION CHART

## Section I. INTRODUCTION

**B-1. General.** This appendix provides a summary of the maintenance operations for Compressor Unit, 5.1 SCFM. 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, 5.1 SCFM**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS	(6) REMARKS
			UNIT		INTERMEDIATE		DEPOT		
			C	O	F	H	D		
00	COMPRESSOR UNIT, 5.1 SCFM W/DIESEL ENGINE	Inspect Test Service Adjust Align Calibrate Replace Repair							
01	BELT GUARD	Inspect Replace	0.1	0.3				1	
02	V-BELT	Inspect Adjust Replace	0.1	0.3 0.4				1 1	
03	STORAGE TRAY	Inspect Replace	0.1	0.2				1	
04	GAGES AND GAGE PANEL	Inspect Calibrate Replace	0.1		0.3	1.0		1 1	
05	PURIFIER ASSEMBLY	Inspect Service Replace Repair	0.2		0.3 0.3 0.6			1 1 1	
06	AIR COMPRESSOR	Inspect Test Service Replace Repair	0.1	0.5 0.5	2.5 2.5	5.5		15 1 1 1, 2, 7, 8, 9, 11, 18	A
0601	FAN WHEEL	Inspect Replace	0.2		0.5			1	



**Section II MAINTENANCE ALLOCATION CHART  
FOR  
COMPRESSOR UNIT, 5.1 SCFM**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS	(6) REMARKS
			UNIT		INTERMEDIATE		DEPOT		
			C	O	F	H	D		
0602	INLET FILTER AND ADAPTER ASSEMBLY	Service Replace Repair		0.1 0.1 0.6				1 1	
060201	PRE-FILTER HOSE ASSEMBLY	Inspect Replace Repair	0.1	0.1 0.2				1 1	
0603	2nd STAGE SEPARATOR ASSEMBLY	Inspect Replace Repair	0.2		1.5 0.7			1 1	
060301	SAFETY VALVE 725 PSIG	Replace			0.3			1	
0604	FINAL SEPARATOR ASSEMBLY	Inspect Replace Repair	0.2		1.5 0.7			1 1	
060401	SAFETY VALVE 3260 PSIG	Replace			0.3			1	
0605	1ST STAGE INTERCOOLER	Inspect Replace	0.2		1.5			1	
0606	2ND STAGE INTERCOOLER	Inspect Replace	0.2		1.5			1	
0607	AFTERCOOLER COIL	Inspect Replace	0.2		1.0			1	
0608	LINES AND FITTINGS	Inspect Replace	0.1		1.0			1	
0609	OIL PRESSURE REGULATOR	Inspect Replace Repair	0.1		0.5 1.0			1 1	
0610	OIL PUMP	Replace			1.2			1	

**Section II MAINTENANCE ALLOCATION CHART  
FOR  
COMPRESSOR UNIT, 5.1 SCFM**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS	(6) REMARKS
			UNIT		INTERMEDIATE		DEPOT		
			C	O	F	H	D		
0611	OIL FILLER, DIPSTICK AND DRAIN TUBE	Inspect Replace	0.1	0.5				1	
0612	CRANKCASE BREATHER ASSEMBLY	Inspect Service Replace	0.1	0.5 0.6				1 1	
0613	CYLINDER AND PISTON ASSEMBLY 1ST STAGE								
061301	1STSTAGE CYLINDER	Replace				1.5		1,2	
061302	VALVE HEAD AND VALVE ASSEMBLY, 1ST STAGE	Inspect Replace Repair	0.3		0.8 1.5			1 1, 12	
061303	PISTON AND PISTON ROD ASSEMBLY, 1ST STAGE	Replace Repair				3.5 2.0		1, 2 1, 2, 8	
0614	CYLINDER AND PISTON ASSEMBLY 2ND STAGE								
061401	2ND STAGE CYLINDER	Replace				1.5		1,2	
061402	VALVE HEAD ASSEMBLY 2ND STAGE	Inspect Replace Repair	0.3		0.8 1.5			1 1, 12	
061402 01	SAFETY VALVE 116 PSIG	Replace			0.3			1	
061403	PISTON AND PISTON ROD ASSEMBLY 2ND STAGE	Replace Repair				3.5 2.0		1, 2 1, 2, 8	

**Section II MAINTENANCE ALLOCATION CHART  
FOR  
COMPRESSOR UNIT, 5.1 SCFM**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS	(6) REMARKS
			UNIT		INTERMEDIATE		DEPOT		
			C	O	F	H	D		
0615	CYLINDER AND CROSSHEAD ASSEMBLY 3RD STAGE								
061501	3RD STAGE CYLINDER	Replace				1.5		1	
061502	VALVE HEAD ASSEMBLY 3RD STAGE	Inspect Replace Repair	0.3		0.8 1.5			1 1, 12	
061503	CROSSHEAD AND ROD ASSEMBLY 3RD STAGE	Replace Repair				3.5 2.0		1 1,8	
0616	COMPRESSOR CRANKSHAFT AND MAIN BEARINGS	Replace				5.0		1	
0617	CRANKCASE	Inspect Replace	0.2			6.0		1, 18	
07	ENGINE ASSEMBLY	Inspect Service Replace Repair		0.5 0.2 2.0	2.5	2.0		1 1 1 thru 17 19, 20	A
0701	SHEAVE (PULLEY)	Inspect Replace	0.1		0.3			1	
0702	FUEL LINES AND FILTER	Inspect Replace	0.2	0.3				1	
0703	FUEL TANK ASSEMBLY	Inspect Replace	0.1	0.3				1	

**Section II MAINTENANCE ALLOCATION CHART  
FOR  
COMPRESSOR UNIT, 5.1 SCFM**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS	(6) REMARKS
			UNIT		INTERMEDIATE	DEPOT			
			C	O	F	H	D		
0704	FUEL INJECTOR	Test Replace			1.0 0.2			3 1	
0705	FUEL INJECTION PUMP	Adjust Replace Repair			0.5 0.4	1.5		1 1	
0706	AIR CLEANER ASSEMBLY	Inspect Service Replace	0.1	0.2 0.2				1 1	
0707	MUFFLER ASSEMBLY	Inspect Replace	0.1	0.6				1	
0708	VALVE COVER	Inspect Replace	0.1	0.2				1	
0709	CYLINDER HEAD ASSEMBLY	Inspect Adjust Replace Repair	0.2		0.8 2.5 1.0			1 1 1,4, 16, 17	
0710	GOVENOR ASSEMBLY	Adjust Replace Repair		0.3		4.4 2.5		1, 13, 14 1 1	
0711	SPEED CONTROL ASSEMBLY	Inspect Replace	0.1		0.5			1	
0712	COMPRESSION RELEASE ASSEMBLY	Inspect Replace	0.1	0.6				1	
0713	GEAR COVER ASSEMBLY	Inspect Replace Repair	0.1	1.0	0.7	1.5		1, 10 1, 10	

**Section II MAINTENANCE ALLOCATION CHART  
FOR  
COMPRESSOR UNIT, 5.1 SCFM**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS	(6) REMARKS
			UNIT		INTERMEDIATE		DEPOT		
			C	O	F	H	D		
0714	CAMSHAFT ASSEMBLY	Replace Repair				1.5 2.0		1, 10	
0715	OIL FILTER SCREEN	Service Replace		0.1 0.2				1 1	
0716	CYLINDER	Replace			1.5			1,2	
0717	PISTON AND CONNECTOR ROD ASSEMBLIES	Replace Repair				3.5 2.0		1,2 1,5	
0718	OIL PUMP ASSEMBLY	Replace			2.0			1	
0719	FLYWHEEL	Inspect Replace	0.1		1.0			1,6,19, 20	
0720	FANWHEEL	Replace			1.0			1,6, 19 20	
0721	CRANKSHAFT ASSEMBLY	Replace Repair				4.5 2.5		1, 10 1,10	
0722	CRANKCASE ASSEMBLY	Inspect Replace	0.2			2.5		1	
08	COLD START SYSTEM	Replace		0.5				1	
09	PRESSURE MAINTAINING VALVE	Replace			0.8			1	
10	CHARGING WHIP ASSEMBLY, AIR TANK	Inspect Calibrate Replace Repair		0.1		0.2		1 1 1	
					0.3 0.5				

**Section II MAINTENANCE ALLOCATION CHART  
FOR  
COMPRESSOR UNIT, 5.1 SCFM**

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS	(6) REMARKS
			UNIT		INTERMEDIATE		DEPOT		
			C	O	F	H	D		
11	FRAME	Inspect Service Replace Repair	0.2 0.3		4.0 1.5			1 1	B
1101	SHOCK MOUNTS	Inspect Replace	0.2	0.5				1	
1102	SUPPORT BRACKET	Inspect Replace	0.1	0.5				1	

**Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS  
FOR  
COMPRESSOR UNIT, 5.1 SCFM**

<b>TOOL OR TEST EQUIPMENT REF CODE</b>	<b>MAINTENANCE CATEGORY</b>	<b>NOMENCLATURE</b>	<b>NATIONAL NATO STOCK NUMBER</b>	<b>TOOL NUMBER</b>
1	O	Tool Kit, General Mechanic's	5180-00-177-7033	
2	F	Piston Ring Compressor	5120-00-250-6055	
3	F	Fuel Injector Tester		0031077 (33742)
4	F	Valve Spring Compressor	5120-00-254-5049	
5	H	Piston Ring Groove Cleaner		RC-510 (55719)
6	F	Puller Kit, Mechanical	5120-00-033-5606	
7	O	Wrench, Torque 0-75 lb-ft	5120-00-554-7292	
8	O	Wrench, Torque 0-150 lb-ft	5120-00-230-6380	
9	H	Caliper Set, Micrometer, Outside Type 1, Class 1, 6 in. C/O: 0-1, 1-2, 2-3, 3-4, 4-5, 5-6	5210-00-554-7134	
10	F	Pliers, Retaining Ring Set (Sizes 1-9)	5210-00-789-0492	
11	F	Gage, Cylinder Bore 2 1/2-9 in.	5210-00-494-1774	
12	F	TSP Ultrasonic Cleaner w/Heater	4940-00-164-8997	
13	O	Revolution Counter		84348 (16004)
14	O	Insert, Revolution Counter		84349 (16004)
15	O	Multigas Detector Kit	6665-00-567-0221	
16	F	Valve Seat Reamer Tool Handle, Valve Seat Reamer		69604 (16004)
17	F	Valve Seat Reamer 450, 47.5 mm Dia		84353 (16004)

**Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS  
FOR  
COMPRESSOR UNIT, 5.1 SCFM**

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL NATO STOCK NUMBER	TOOL NUMBER
18	H	Remover, Stud	5120-00-618-8948	
19	F	Socket, Wrench	5120-01-278-1186	R-46 (30106)
20	F	Adapter, Socket	5120-00-144-5207	

**Section IV. REMARKS**

REFERENCE CODE	REMARKS
A	Repair is by replacement of subassemblies.
B	Service consists of painting.



**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 5. 1 CFM Air 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 Diving Air Compressor 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.

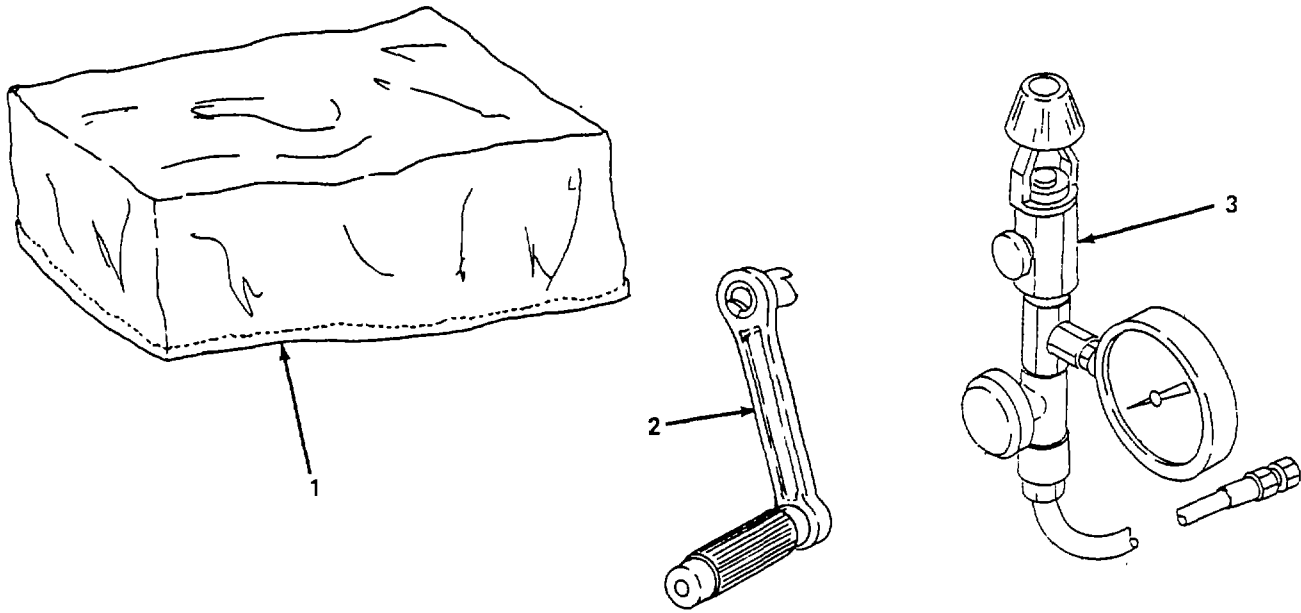
b. Column (2). National Stock Number. Indicates the National Stock Number assigned to the item and will be used for requisitioning purposes.

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).

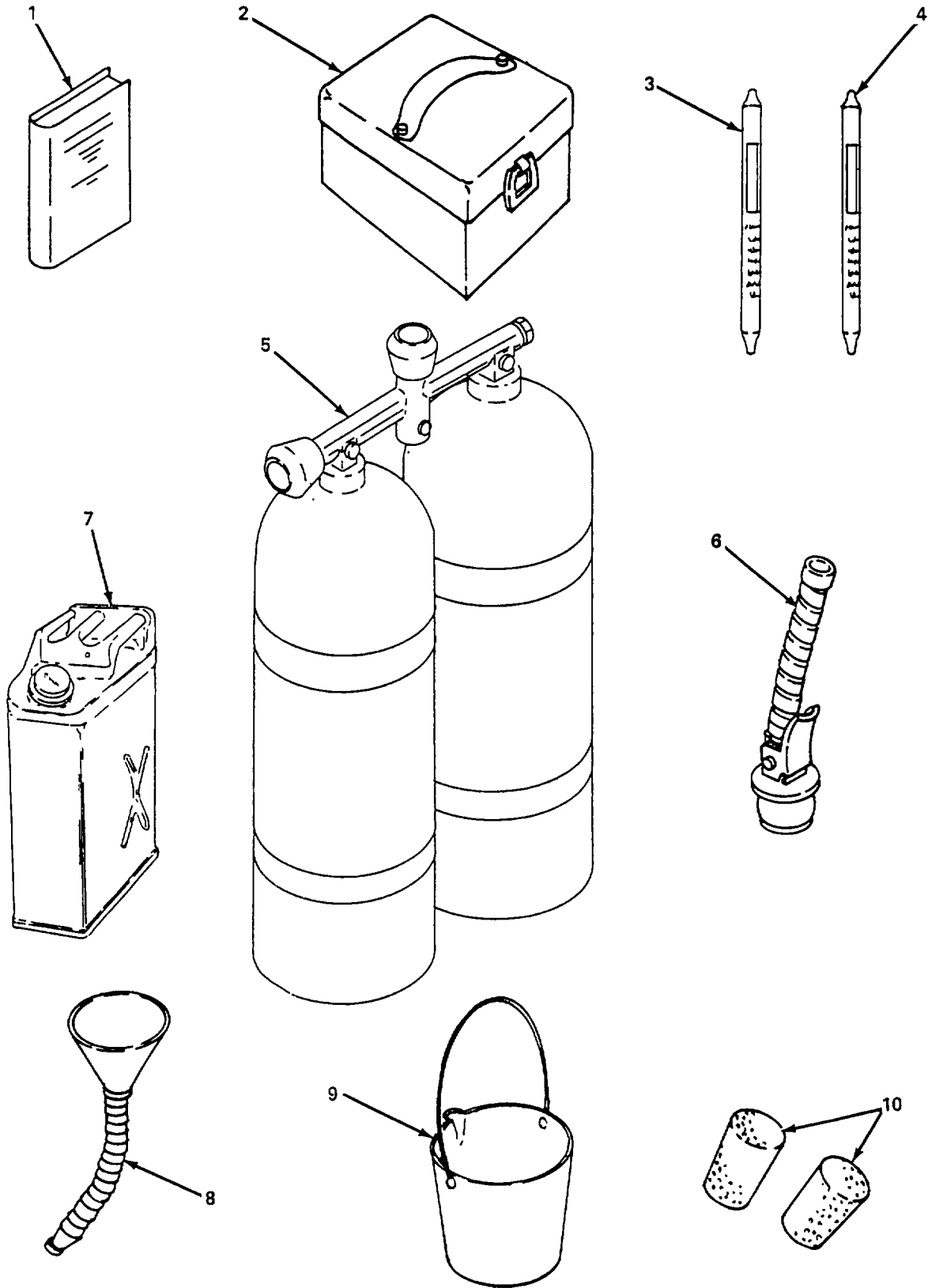
e. Column (5). Quantity Required (Qty Rqr). Indicates the quantity of the item authorized to be used with/on the equipment.

Section II. COMPONENTS OF END ITEMS



(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) Usable On Code	(5) Qty Rqr
1		Cover, Tarpaulin (33742) DES-1100-1	ea	1
2		Handle, Crank (08645) 110-1435	ea	1
3		Whip, Charging (14819) HP778A-12	ea	1

Section III. BASIC ISSUE ITEMS



(1) Illus Number	(2) National Stock Number	(3) Description CAGEC and Part Number	(4) Usable On Code U/M	(5) Qty Rqr
1		TM 5-4310-387-24P	ea	1
2	6665-00-567-0221	Detector Kit, Multi Gas	ea	1
3	4220-01-006-1529	Tube, Test, Carbon Dioxide (CO2) (9N865) CH30801	bx	3
4	4220-01-005-8733	Tube, Test, Carbon Monoxide (CO) (9N865) CH25601	bx	3
5	4220-01-130-1488	Tank, Diver's (94120) 0757-80	ea	4
	4220-01-130-1489	Cylinder, Air 2475 Opr. Press. 80 Cu. Ft. (94120) 0743-03	ea	2
		Harness, Double Tank (94120) 0834-00	ea	1
		Manifold, Air, 2-Cylinder with Air Reserve (94120) 2800-00	ea	1
6	7240-00-782-3501	Rod, Reserve (94120) 0743-05 Spout, Can 8 in. Flexible (74640) 4701	ea	1
7	7240-00-178-8286	Can, Fuel, Mill (58536) A-A-1702	ea	1
8	7240-00-559-7634	Funnel, Strainer 8-inch 0454 Flex, Spout	ea	1
9	7240-01-150-0716	Pail, Utility, Plastic 2274 3 Gallon (13147) B12R		1
10	4240-00-022-2946	Hearing Protectors (55799) 95635	ea	2

**APPENDIX D**

**ADDITIONAL AUTHORIZATION LIST**

**Section I. INTRODUCTION**

D-1. **Scope.** This appendix lists additional items you are authorized for the support of the 5.1 CFM Air 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
	Pad, Filter (33742) 34516		ea	1
	Preformed Packing (33742) M301		ea	2
	Backup Preformed Packing (33742) M305		ea	2
	Valve, Condensate, Drain (33742) A22-014		ea	3
	Gasket (33742) 98502-1015		ea	1
	Gasket (33742) 98502-1013		ea	1
	Gasket (33742) 98502-1014		ea	1
	Seal (45681) 250-8115-2		ea	3
	Preformed Packing (33742) 95600-0098		ea	1
	Element, Filter (33742) 98262-1037		ea	1
	V-Belt (71198) 2A78		ea	1
	Mount, Shock (76005) BAI2-100-50		ea	4
	Washer , Snub.(76005) J2049-58		ea	8
	Cartridge, Purifier (33742) PE1802		ea	1
6665-00-567-0221	Backup Preformed Packing (9N865) CH304		ea	_1

**D-1/(D-2 blank)**

## APPENDIX E

## EXPENDABLE SUPPLIES AND MATERIALS LIST

## Section I. INTRODUCTION

E-1. **Scope.** This appendix lists expendable supplies and materials you need to operate and maintain the 5.1 CFM Air Compressor. 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 Cloth, Abrasive Item 2, App. D").

b. Column (2) - Level. This column identifies the lowest level of maintenance that requires the listed item. (Enter as applicable).

C - Operator/Crew

O - Organizational Maintenance- 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.

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 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-1779	bx
4	O	7510-00-243-3434	Bands, Rubber (81349) ZZ-R-1415	bx
5	O	7530-00-222-3524	Book, Record	ea
6	O	9020-00-224-8021	Brush, Soft Bristle	ea
7	O	7920-00-292-9204	Cloth, Cleaning, Disp, Xtr Heavy 12 In.x 15 In. (58536) A-A-162	rnx
8	O	7920-00-044-9281	Cloth, Lint Free (81349) MIL-C-85043)	bx
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	
11	O	7240-00-559-7634	Funnel, 1 qt. Strainer, 8 in.Flex Spout	ea
12	O	8415-00-266-8677	Gloves, Rubber (81349) ZZ-G-381 Size 10	pr
13	O	9150-00-190-0905	Grease, Automotive and Artillery (6.5 lb) MIL-G-10924 (81349)	cn
14	O	9150-00-754-2760	Grease, Halo Carbon	lb
15	O	9150-00-985-7237	Lub Oil, Light Turbine, Noncorrosive, MIL-L-17672 (Artic Temp) (2135-TH) (81348)	5 gal
16	O	9150-00-188-9858	Lubricating Oil, Grd Equipment, MIL-L-2104 (81348)	5 gal

## Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST (Cont)

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
17	O	9150-00-235-9061	Lubricating Oil, Steam Turbine, Noncorrosive, Normal Temp (2190-TEP), M 1 L-L- 17331 (81348)	5 gal.
18	O	6810-00-141-6078	Phosphate, Trisodium (81348) O-S-642	lb
19	O	7920-00-205-1711	Rag, Wiping, 50/G (58536) A-A-531	ea
20	O	4240-00-240-5141	Shield, Face, MIL-S-3126 (81349)	ea
21	O	6850-00-281-1985	Solvent, Dry Cleaning, PD-680 (81348)	
22	O	7510-00-914-1640	Tape, Pressure Sensitive Adhesive	rl
23	O	8030-00-889-3535	Tape, Teflon, MIL-T-27730 (81348), 1/2 in.	
	O	8030-00-889-3534	Tape, Teflon, MIL-T-27730 (81348), 1/4 in.	ea

E-3/(E-4 blank)



## APPENDIX F

## TORQUE LIMITS

Compressor torque specifications are listed in table F-1. Breakaway torque valves are listed in table F-2.

**Table F-1. Torque Specifications for Compressor Units.**

Bolt Size	Torque
6 mm	8 lb/ft (11 Nm)
8 mm	20 lb/ft (28 Nm)
10 mm	40 lb/ft (56 Nm)
1/4 in.-20	6-9 lb/ft (8-13 Nm)
1/4 in.-28	6-9 lb/ft (8-13 Nm)
5/16 in.-18	12-15 lb/ft (17-21 Nm)
5/16 in.-24	15-18 lb/ft (21-25 Nm)
3/8 in.-16	23-28 lb/ft (32-39 Nm)
3/8 in.-24	30-35 lb/ft (42-47 Nm)
7/16 in.-14	45-50 lb/ft (63-70 Nm)
7/16 in.-20	50-60 lb/ft (70-84 Nm)
1/2 in.-13	60-70 lb/ft (84-98 Nm)
1/2 in.-20	70-80 lb/ft (98-112 Nm)

\*Unless otherwise specified.

**Table F-2. Self-Locking Nut Breakaway Torque Values.**

Thread Size	Minimum Breakaway Torque (In.-Lbs.)	Thread Size	Minimum Breakaway Torque (In.-Lbs.)
10-32	2.0	5/8 - 18	32.0
1/4-28	3.5	3/4-16	50.0
5/16-24	6.5	7/8-14	70.0
3/8-24	9.5	1-12	90.0
7/16-20	14.0	1-1/8-12	117.0
1/2-20	18.0	1-1/4-12	143.0
9/16-18	24.0		

**NOTE**

**To determine breakaway torque, thread nut onto screw or bolt until at least two threads stick out. Nut shall not make contact with a mating part. Stop the nut. Torque necessary to begin turning nut again is the breakaway torque. Do not reuse self-locking nuts that do not meet minimum breakaway torque.**

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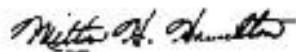
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## THE METRIC SYSTEM AND EQUIVALENTS

### 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

### Weights

1 centigram = 10 milligrams = .15 grain  
 1 decigram = 10 centigrams = 1.54 grains  
 1 gram = 10 decigrams = .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

### Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch  
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. in.  
 1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

### Square measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. in.  
 1 sq. decimeter = 100 sq. centimeters = 15.5 inches  
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 feet  
 1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. ft.  
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres  
 1 sq. kilometer = 100 hectometers = .386 sq. miles

### Liquid Measure

1 dekaliter = 10 liters = 2.64 gallons  
 1 hectoliter = 10 dekaliters = 26.42 gallons  
 1 kiloliter = 10 hectoliters = 264.18 gallons  
 1 liter = 10 deciliters = 33.81 fl. ounces  
 1 centiliter = 10 milliliters = .34 fl. ounce  
 1 deciliter = 10 centiliters = 3.38 fl. ounces  
 1 metric ton = 10 quintals = 1.1 short tons

### Approximate Conversion Factors

To change	To	Multiply by	To change	To	Multiply by
inches	centimeters	2.540	ounce inches	newton-meters	.0070062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
sq. inches	sq. centimeters	6.451	kilometers	miles	.621
sq. feet	sq. meters	.093	sq. centimeters	sq. inches	.155
sq. yards	sq. meters	.836	sq. meters	sq. yards	10.764
sq. miles	sq. kilometers	2.590	sq. kilometers	sq. miles	1.196
acres	sq. hectometers	.405	sq. hectometers	acres	2.471
cubic feet	cubic meters	.028	cubic meters	cubic feet	35.315
cubic yards	cubic meters	.765	milliliters	fluid ounces	.034
fluid ounces	milliliters	29.573	liters	pints	2.113
pints	liters	.472	liters	quarts	1.057
quarts	liters	.946	grams	ounces	.035
gallons	liters	3.785	kilograms	pounds	2.205
ounces	grams	28.349	metric tons	short tons	1.102
pounds	kilograms	.454	pound-feet	newton-meters	1.356
short tons	metric tons	.907			
pound inches	newton-meters	.11296			

### Temperature (Exact)

°F Fahrenheit temperature

5/9 ( after subtracting 32)

Celsius Temperature °C

