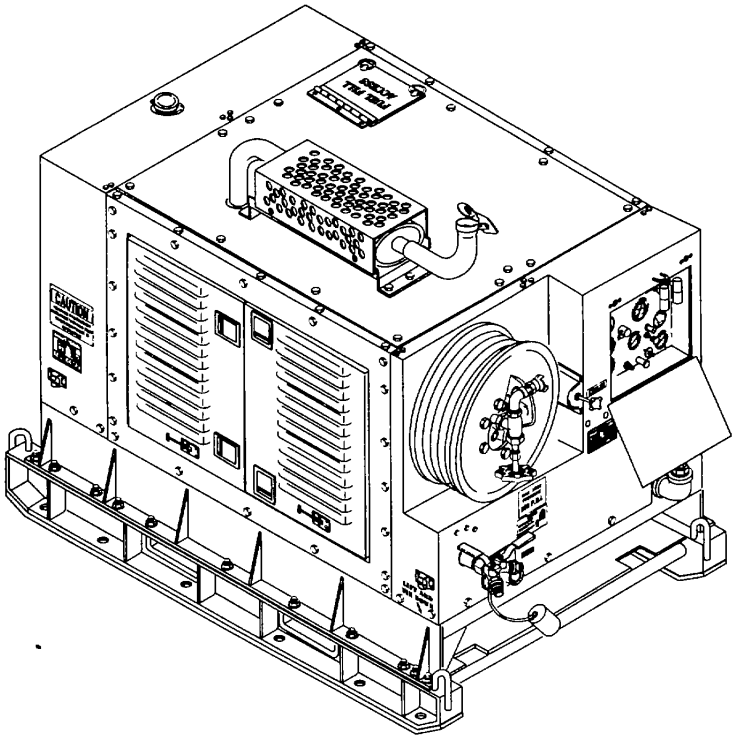
TECHNICAL MANUAL

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



COMPRESSOR, AIR, ROTARY,
DIESEL ENGINE DRIVEN,
SKID MOUNTED
125 cfm at 100 psi

(4310-01-384-6951)

MODEL 16MS125

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HEADQUARTERS, DEPARTMENT OF THE ARMY

16 JANUARY 1996

WARNING

Engines have fast moving parts that can injure hands, fingers, etc. Take special care while in operation.

Engine parts, particularly the exhaust system, can be very hot and cause severe burns. Do not touch until engine is shut down and cooled off. Avoid spilling fuel or oil on hot engine parts which could result in a fire.

Attempting to lift heavy objects without help can cause injury. Always get additional personnel as needed to help. Do not attempt to lift any of the major components, such as engine, compressor, radiator-cooler, by hand. Use adequate hoist, chains, or straps while removing heavy components and do not allow items to swing while suspended. Failure to observe warning may result in injury to personnel and damage to equipment.

Weigh down free hose ends and loops with sand bags. Place hose in a relatively straight stretched-out condition rather than coiled or tangled. Hose may tend to move rapidly or whip with pressure changes and can injure personnel.

Engines must be shut down when filling the fuel tank to minimize the risk of fire or explosion. Allow engine to cool. Hot engine surfaces, sparks, flames or excessive heat are potential safety hazards. Failure to observe this warning may result in severe personal injury or death.

Never use gasoline for cleaning parts, clothing, rags, or other items. Do not wash hands in fuels. Place all oily waste and rags in self-closing metal containers after use. Empty containers at an assigned disposal point frequently.

When using compressed air for any cleaning or drying operation, do not exceed 30 psig at the nozzle. Eyes can be permanently damaged by contact with liquid or large particles propelled by compressed air. Inhalation of air-blown particles or solvent vapor can damage lungs. When using air for drying or cleaning at an air-exhausted workbench, wear approved goggles or face shield. When using air for drying or cleaning at an unexhausted workbench, wear approved respirator and goggles. Failure to observe this warning may result in severe personal injury or death.

Provide adequate ventilation when using cleaning solvents. Avoid prolonged breathing of vapors and minimize contact with skin. When cleaning or air drying with compressed air, the air pressure must not exceed 30 psi (2.1 kg/cm2) at the nozzle to avoid personal injury. Wear eye protection.

Any mixture of fuel vapor or fuel droplets in air is potentially explosive, or as a minimum flammable. Treat such conditions as hazardous and eliminate the cause immediately. Promptly correct any fuel leakage that causes an accumulation of fuel on any surface. If it cannot be corrected safely while in operation, shut down and make corrections to stop the leak.

The accumulation of liquid fuel is a fire hazard. Wipe and wash down such areas or surfaces promptly. Dispose of any wiping rags in approved containers. Apply no smoking rules within 50 ft. of any fuel accumulation.

WARNING

Fuel saturated soil is a fire hazard. Do not allow unnecessary personnel in the area. Do not allow smoking within 50 ft. of the area. Remove saturated soil and replace with clean soil.

The fuels in this compressor are highly explosive. Do not make or use open flame when performing maintenance. Flames and explosion could result in severe personal injury or death.

Areas near diesel engine-driven equipment have a high noise level. Wear ear protection devices to avoid temporary or possibly permanent hearing damage.

Splashes and spills can cause eye injury and skin irritation. Wear face shield and approved gloves. Immediately remove any articles of clothing or shoes that have become soaked with fuels. This should be done in an area free from ignition sources.

Use only explosion-proof electrical equipment in and around all areas in which fuel is present.

Do not operate the unit in a building or any enclosed area unless exhaust gases are piped outside. Inhalation of exhaust gases can result in serious illness or death.

Do not attempt any repair, removal, or replacement of component parts until all air pressure has been relieved from the system to prevent injury to personnel.

If an injury occurs, refer to FM 21-11 for first aid procedures.

TECHNICAL MANUAL

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 16 January 1996

NO. 9-4310-397-14

OPERATOR'S, UNIT, DIRECT SUPPORT,

AND GENERAL SUPPORT MAINTENANCE MANUAL,

COMPRESSOR, AIR, ROTARY, DIESEL ENGINE DRIVEN, SKID MOUNTED

125 cfm at 100 psi

MODEL 16MS125

NSN 4310-01-384-6951

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes, or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to: Commander, US Army Aviation and Troop Command, ATTN: AMSAT-I-MP, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. You may also submit your recommended changes by E-mail directly to <mpmt/%avma28@st-louis-emh7.army.mil>. A reply will be furnished directly to you. Instructions for sending an electronic 2028 may be found at the back of this manual immediately preceding the hard copy 2028.

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HOW TO USE THIS MANUAL

Be sure to read all Warnings before using your equipment.

This manual contains instructions for operation and maintenance of the Air Compressor.

The front cover index of this manual lists the areas of the manual used most often and guides you to those sections. Follow the black mark on the cover index edge through the pages to the edge mark on the section you want. The subjects on the front cover index are also highlighted in the table of contents by boxes. A detailed alphabetical index is located at the back of this manual.

Chapter 1 - Introduces you to the equipment and gives you information such as weight and dimensions used and general theory of operation including technical principles of operation.

Chapter 2 - Provides the operator with information necessary to identify and service the equipment. Operating instructions in this chapter tell you how to use the equipment in usual and unusual conditions.

Chapter 3 - Provides operator troubleshooting procedures for identifying common equipment malfunctions and maintenance procedures for performing operator maintenance tasks.

Chapter 4 - Provides unit maintenance personnel with procedures for lubrication and service upon receipt of equipment and instructions for performing repairs on equipment as authorized by the maintenance allocation chart.

Chapter 5 - Provides direct support maintenance personnel with instructions for performing repairs on equipment as authorized by the maintenance allocation chart.

Chapter 6 - Provides general support maintenance personnel with instructions for performing repairs on equipment as authorized by the maintenance allocation chart.

Appendix A - Provides a list of frequently used forms and publications referenced or used in this manual.

Appendix B - The maintenance allocation chart identifies repairable components and the maintenance level authorized to perform the repairs.

Appendix C - Lists components of end item and basic issue items to help you inventory the equipment.

Appendix D - Lists additional items that you are authorized for the support of the air compressor.

Appendix E - Lists expendable and durable items needed to operate and maintain the air compressor.

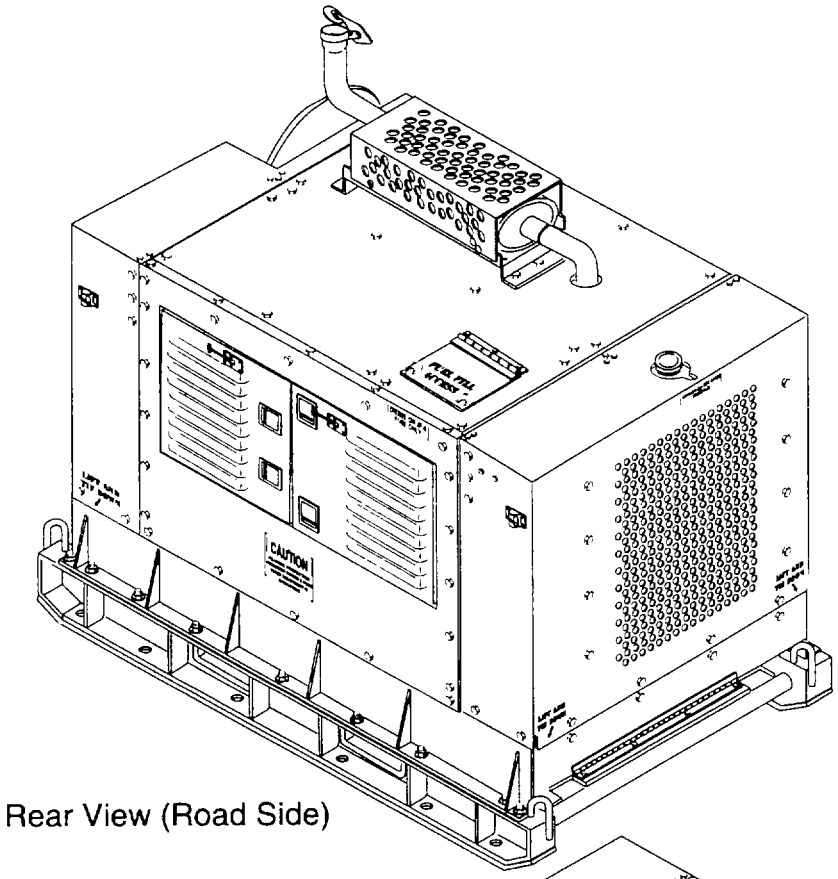
Appendix F - Provides you with instructions for making items authorized to be manufactured or fabricated at unit, direct support, or general support maintenance.

Appendix G - Lists maintenance procedures for specific component torque requirements.

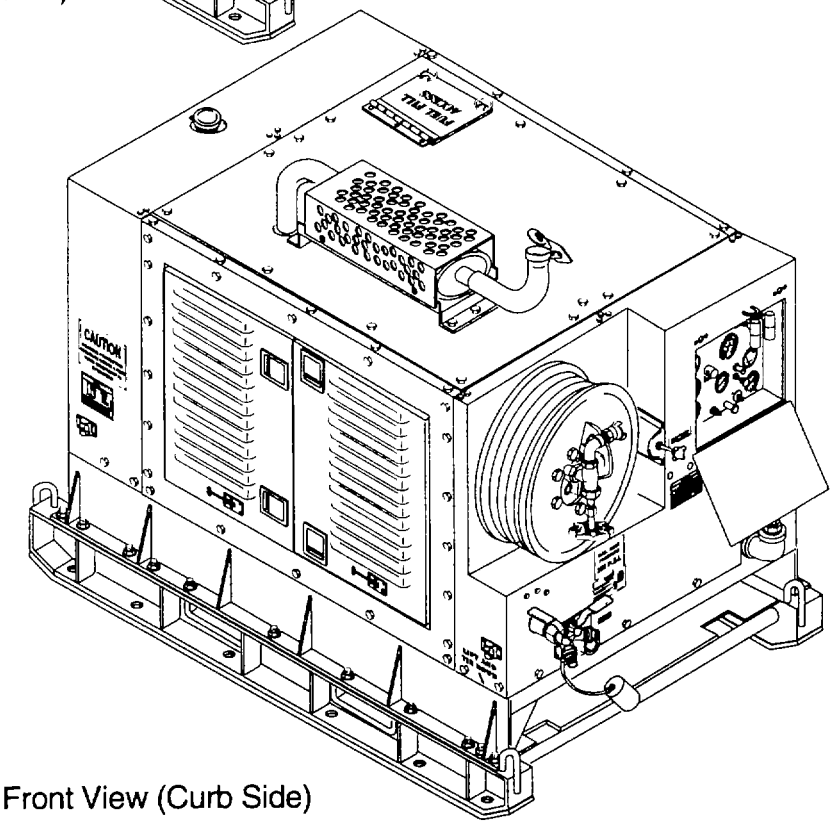
Appendix H - Lists all mandatory replacement parts.

Glossary - Lists terms and abbreviations used in this manual and their definitions.

Alphabetical Index - Lists subject matter contained in manual in alphabetical order with the paragraph number.



Rear View (Road Side)



Front View (Curb Side)

Figure 1-0. Rotary Air Compressor

CHAPTER 1

INTRODUCTION

SECTION I GENERAL INFORMATION

1-1. SCOPE.

a. Type of Manual. Operator's, Unit, Direct Support and General Support Maintenance Manual.

b. Model Number and Equipment Name. Model 16MS125, Skid Mounted, Diesel Engine Driven, 125 cfm at 100 psi, Rotary Air Compressor.

WARNING

Do not use compressed air from the equipment for breathing air. The compressor is designed for mechanical use only. Serious injury or death may result using the equipment for respiration air.

c. Purpose of Equipment. The unit is designed to supply compressed air to power pneumatic tools and charge low pressure air systems. Do not use on life support equipment or breathing apparatus.

1-2. MAINTENANCE FORMS. RECORDS. AND REPORTS.

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, The Army Maintenance Management System; DA Pam 738-751, Functional Users Manual for the Army Maintenance Management System-Aviation (TAMMS-A); or AR 700-138, Army Logistics Readiness and Sustainability.

1-3. DESTRUCTION OF ARMY MATERIAL TO PREVENT ENEMY USE.

Refer to TM 750-244-3 for instructions relating to destruction of equipment to prevent enemy use.

1-4. PREPARATION FOR STORAGE OR SHIPMENT.

Refer to Chapter 4 for instructions relating to the preparation for storage or shipment of equipment.

1-5. OFFICIAL NOMENCLATURE, NAMES, AND DESIGNATIONS.

a. Official Nomenclature. Shortened nomenclature is used in this manual to make procedures easier for you to read. A cross-reference between the shortened nomenclature and the official nomenclature is shown in the following table.

Nomenclature Cross Reference

Manual Nomenclature	Official Nomenclature
Air Compressor	Skid Mounted, Diesel Engine Driven, Rotary Air Compressor
Preformed Packing	O-ring

b. Abbreviations and Unusual Terms. See Glossary, located before index at the back of this manual.

1-6. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATION (EIR).

If your rotary 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 (Product Quality Deficiency Report). Mail it to us at Commander, U.S. Army Aviation and Troop Command, ATTN: AMSAT-I-MDO, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. We will send you a reply.

1-7. WARRANTY INFORMATION.

The Model 16MS125 Rotary Air, Diesel Engine Driven Compressor is warranted for a period of one year from date of shipment. The warranty starts on the date found in block 23, DA Form 2408-9 in the log book. Report all defects to your supervisor, who will take appropriate action.

1-8. SAFETY, CARE, AND HANDLING.

No special safety, care or handling procedures are required for this equipment.

1-9. CORROSION PREVENTION AND CONTROL (CPC).

Corrosion Prevention and Control (CPC) of Army material is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.

a. While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of the materials may be a corrosion problem.

b. If a corrosion problem is identified, it can be reported using Standard Form 368, Product Quality Deficiency Report. Use key words such as "rust," "deterioration," "corrosion," or "cracking" will ensure that the information is identified as a CPC problem. The form should be submitted to the address specified in DA Pam 738-750.

SECTION II EQUIPMENT DESCRIPTION

1-10. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

a. Characteristics. The unit is self contained, consisting of a diesel engine driving a sliding blade rotary air compressor. The air compressor and engine are enclosed in a sheet metal cabinet with access doors provided for the front panel controls and major internal components.

b. Capabilities. The unit produces compressed air at the rate of 125 cubic feet per minute (cfm) at 100 pounds per square inch (psi). The unit is capable of continuous operation under normal conditions for a period of eight hours without refueling.

c. Features. The unit is mounted on skids and can be dragged into position. Fork lift channels and lifting eyes are provided on the skids if it is necessary to lift the unit. The air discharge line is equipped with two individually controlled service outlets with 3/4 inch hose couplings. The unit is equipped with safety devices that automatically stop the fuel supply to the engine if a fault occurs.

1-11. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

The information that follows references the location and description of major components found in figure 1-1.

a. Control Panel (1). Houses the various operating controls and indicators for the unit.

b. Hose Reel (2). Stores the air hose when not in use.

c. Batteries (3). Provide power for starting the diesel engine and supply power to the auxiliary power connector.

d. Radiator (4). Ejects the heat created in the diesel engine and absorbed by the engine coolant.

e. Oil Cooler (5). Ejects the heat created in the compressor and absorbed by the compressor oil.

f. Thermal Bypass Assembly (6). Bypasses the oil cooler when the compressor oil temperature is below 150° F (66° C).

g. Compressor Oil Separator (7). Separates the oil from the air/oil mixture leaving the compressor.

h. Compressor (8). Compresses ambient air to a higher pressure and volume (velocity).

i. Fuel Tank (9). Stores the fuel used by the diesel engine.

j. Diesel Engine (10). Provides the power needed to operate the compressor.

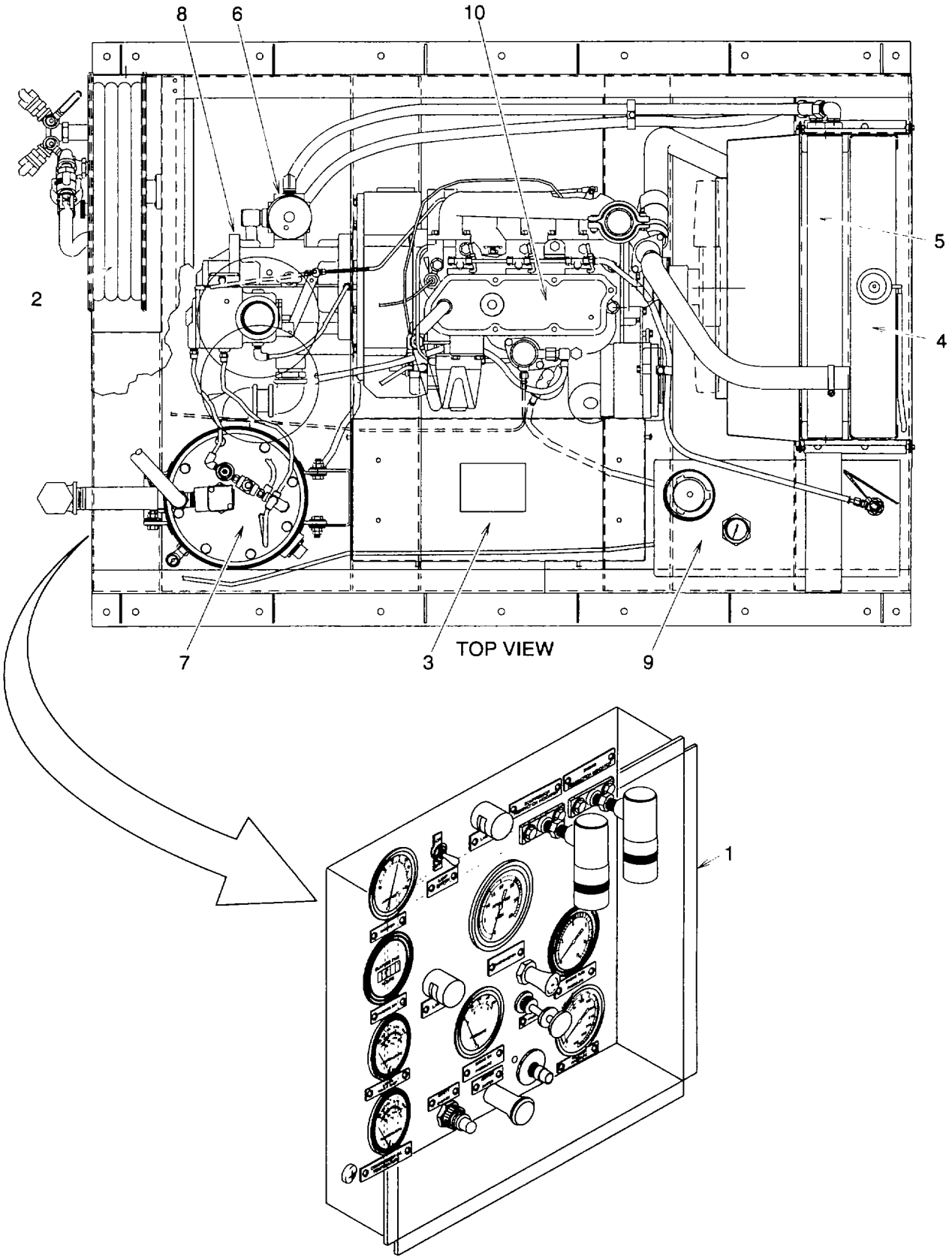


Figure 1-1. Location of Major Components

1-12. EQUIPMENT DATA.

Air Compressor: Davey Compressor Co. Division of Keco Industries, Inc.

Model and Type	Model 16MS125 Sliding Blade, Air, Rotary Type
Air volume	125 cfm to 130 cfm (3.54 cm/m to 3.68 cm/m)
Air pressure	100 psi to 105 psi (7.03 kgs cm^2 to 7.4kgs cm^2)
Prime mover	Diesel engine
Electrical requirements	Two 12VDC Batteries

Diesel Engine: John Deere

Model and Type	Model 3179DF 3 cylinder 4 cycle
Bore	4.16 in.(106 mm)
Stroke	4.33 in.(109.98 mm)
Basic weight	695 lb (315.25 kgs)
Displacement	179 cu. in.(2934 cm^3)
Firing Order	1-2-3
Fuel	Diesel Fuel (VV-F-800) Turbine Fuel JP-8 (MIL-T-83133)
Governed speed	2100 to 2250 RPM
Idle	1100 to 1300 RPM

Capacities

Fuel tank	25 Gal.(94.6 l)
Engine Crankcase	9 qts.(8.52 l)
Engine Cooling System	18 qts (17 l)
Compressor oil separator	20 qts.(18.9 l)

Dimensions and Weights

Length	82 in.(208 cm)
Width	50 in.(127 cm)
Height	51.45 in.(130.68 cm)
Shipping Volume	138 cu ft.(3.9 cm)
Total Weight	2447 lb Dry (1110 kgs) 2797 Wet (1269 kgs)

SECTION III PRINCIPLES OF OPERATION

1-13. PRINCIPLES OF OPERATION.

The rotary air compressor is diesel engine driven through a direct connected coupling. The compressor is capable of delivering 125 cfm (3.54 cm/m) compressed air at 100 psi (7.03 kgs cm). The information that follows references the air/oil flow found in figure 1-2.

a. Air Cleaner. Filters airborne particles from the incoming air to minimize equipment damage from contaminated air entering the inlet housing.

b. Inlet Housing. Provides control over the compressor intake and engine speed. The COMPRessor UNLOADER AND IDLE CONTROL can be used to manually close the compressor inlet or allow for the system pressure to automatically regulate the inlet. An external linkage controls the engine speed as necessary.

c. Compressor. Uses rotating vanes in an eccentric cylinder to compress atmospheric air up to the required 125 cfm (3.54 cm/m) compressed air at 100 psi. (7.03 kgs cm).

d. Oil Separator. Receives the compressed air/oil mixture from the compressor and separates the oil through a labyrinth and filter element. Oil that collects inside the filter element is drawn into the inlet housing. Oil that collects in the bottom of the oil separator is drawn into the thermal bypass.

e. Thermal Bypass. Senses the oil temperature as it enters and ports the flow directly to the oil filter if the temperature is below 150° F (66° C) or through the oil cooler first if it is above 150° F (66° C).

f. Oil Cooler. Cools the oil prior to being filtered and sent back to the compressor.

g. Oil Filter. Filters particles from the oil to minimize equipment damage from contaminated oil entering the compressor.

h. Pressure Regulator. Opens at pressures above 100 psi (7.03 kgs cm) and closes at pressures below 100 psi (7.03 kgs cm), this regulates the system pressure by automatically operating the inlet housing. When the pressure regulator is closed, the inlet housing opens the compressor inlet to raise system pressure. When the pressure regulator is open, the inlet housing closes the compressor inlet to lower system pressure.

i. Minimum Pressure Valve. Closes the discharge from the filter separator if the compressed air demand is great enough to drop the system pressure below 60 psi (4.2 kgs cm^2). Closing the discharge at pressures below 60 psig (4.2 kgs cm^2) prevents oil from being carried out of the oil separator and into the hose reel and double discharge valve.

j. Blowdown Valve. Relieves system pressure to atmosphere when the compressor stops. Suction from the inlet housing keeps this valve closed.

k. Safety Valve. Opens at 125 psi (8.79 kgs cm) to relieve system pressure to atmosphere.

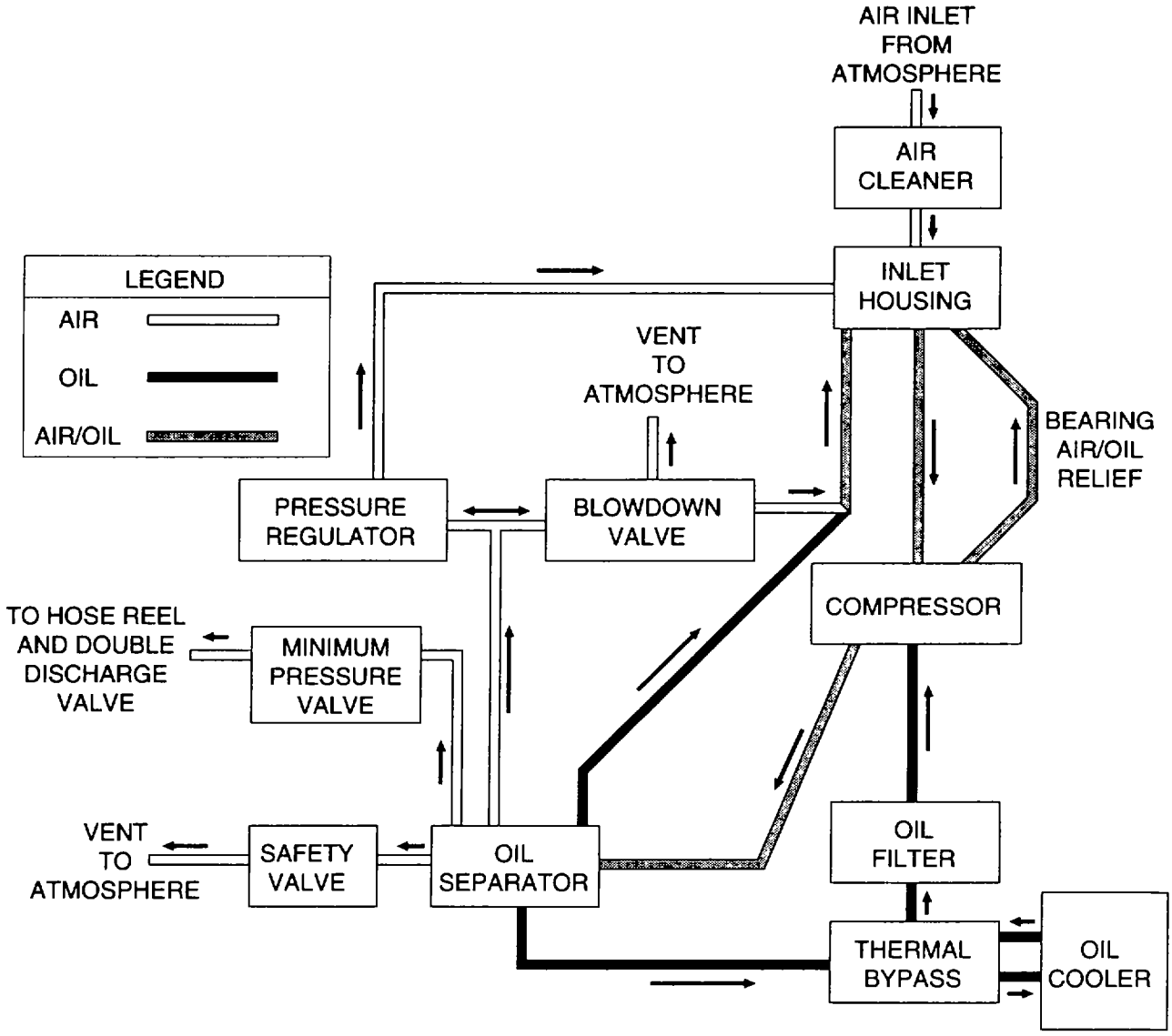


Figure 1-2. Air/Oil Flow Schematic

CHAPTER 2

OPERATING INSTRUCTIONS

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SECTION I DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

2-1. CONTROLS.

This section describes and illustrates the controls and indicators to ensure proper operation of the compressor. The information that follows references the control components found in Figure 2-1.

a. Diesel Aid Starting. The DIESEL AID STARTING Switch (1) is used in cool weather below 40° F (5°C). Ethyl ether will be injected into the engine and aids in the startup procedure.

b. Relay Reset Switch. Manual reset switch (2) that opens and shuts off fuel from the engine when either of the switches (compressor oil temperature, engine water temperature or tachometer) are tripped. Must be reset by pushing after conditions have dropped below trip point.

CAUTION

Operating the PRIMING PUMP when either ambient temperatures are below 100°F (38°C) or more than one time during a starting cycle will inject excessive fuel into the engine and can cause equipment damage.

c. Priming Pump. The PRIMING PUMP (3) is for hot starting whether it is from repeated engine starting or hot weather (100°F or above) (38°C). The hot day starting aid requires only one pumping stroke. Additional pumping strokes could cause engine damage.

d. Ignition Switch. The IGNITION SWITCH (4) uses three positions to make or break the electrical circuit. The switch is pulled outward through the run position for starting and when engine starts the spring loaded switch is released to return to the run position. Pushing the switch inward from the run position opens the circuit stopping the unit. The safety override switch must be pressed simultaneously with this switch in the start position.

CAUTION

Operating the engine with low or no oil pressure can cause serious equipment damage.

e. Safety Override Switch. The SAFETY OVERRIDE SWITCH (5) is pressed simultaneously with the start switch during starting only. It is used to override the engine low oil pressure safety switch. The switch must be held until oil pressure is greater than 10 psi (0.7 kg/cm^2); and then released.

f. Lamp Switch And Lamps. The LAMPs (6) illuminate the panel and are turned on or off using the toggle LAMP SWITCH (7) marked ON and OFF.

g. Compressor Unloader And Idle Control. The COMPRESSOR UNLOADER AND IDLE CONTROL (8) is used to manually close the compressor air intake by turning the knob fully clockwise. When the knob is turned fully counterclockwise the compressor intake is automatically controlled by system pressure.

h. Hose Reel Valve. The hose reel valve (9) is opened or closed to control air flow through the hose.

i. Double Discharge Valve. The double discharge valve (10) is used to control air flow through any additional equipment connected to the unit.

2-2. INDICATORS.

The information that follows references the indicator components found in Figure 2-1.

a. Ammeter. The AMMETER (11) measures the rate of charge or discharge of the battery, normal operating reading 0 to +15 amperes.

b. Hourmeter. HOURMETER (12) records operating time in hours and tenths of an hour.

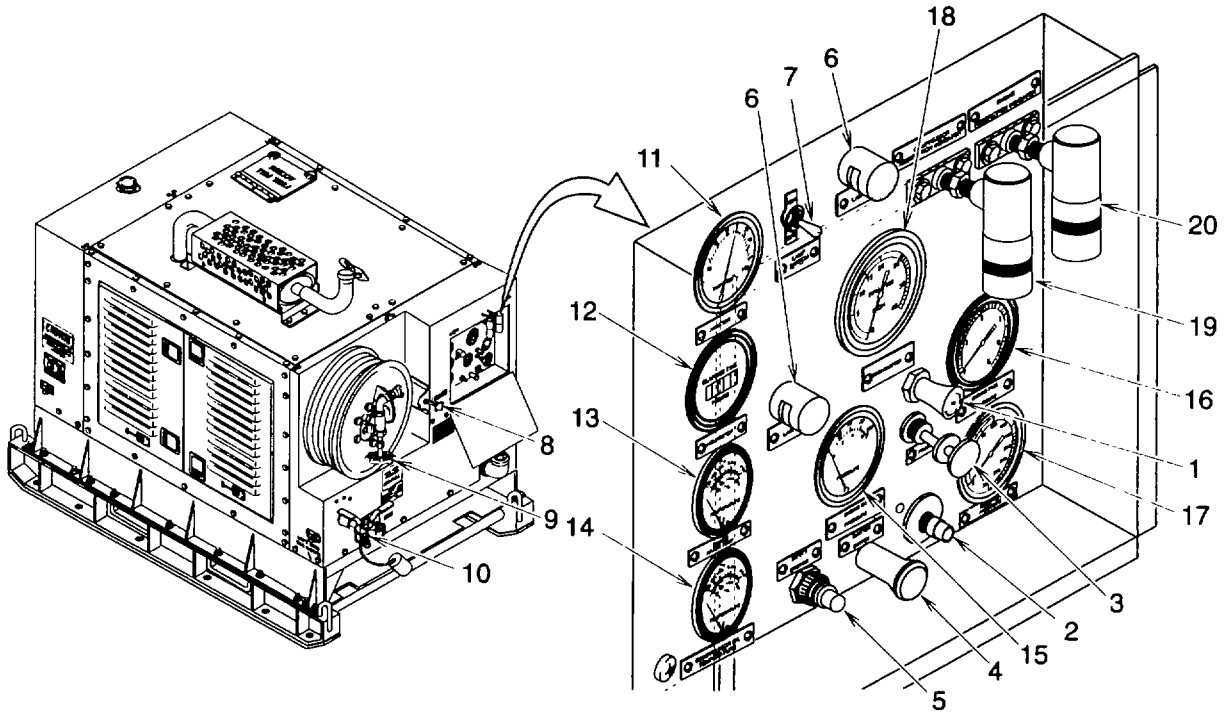


Figure 2-1. Operator's Controls and Indicators

c. Engine Water Temperature Gauge. ENGINE WATER TEMPerature gauge (13) indicates the temperature of the engine coolant. Normal operating range is 180°F to 200°F (82°C to 93°C) and the internal trip sensor is set at 220° F(105°C). The manual reset button must be pressed after temperature drops below this set temperature before engine restart.

d. Compressor Oil Temperature Gauge. The COMPRESSOR OIL TEMPERATURE gauge (14) indicates the temperature of the compressor system oil. Normal operating range is 160°F to 225°F (71°C to 107°C). The high temperature safety switch is set at 230°F (110°C) and will shut off fuel supply to the engine if that temperature is reached. The manual reset button must be pressed after the temperature has dropped before the unit can be restarted.

e. Engine Oil Pressure Gauge. The ENGINE OIL PRESSURE gauge (15) indicates the engine lubricating oil pressure. Normal reading is 60 psi to 100 psi (4.2 kg/cm^2 to 7.0 kg/cm^2).

f. Engine Fuel Pressure Gauge. The normal operating range for the ENGINE FUEL PRESSURE gauge (16) is 4 to 6 psi. (.28 kgs/cm^2 to .42 kgs/cm^2).

g. Receiver Pressure Gauge. The RECEIVER PRESSURE gauge (17) indicates the air pressure in the oil separator tank. Normal operating range is 70 to 120 psi. (4.9 kgs/cm^2 to 8.4 kgs/cm^2).

2-2. INDICATORS. - Continued

h. Tachometer. The TACHOMETER (18) indicates engine speed in revolutions per minute (RPM). Operating range is 1000 to 2250 RPM. An overspeed switch is built into the tachometer and is normally open. The switch closes if the engine speed reach 2350 RPM. This is factory set and not adjustable.

i. Compressor And Engine Restriction Indicators. The COMPRESSOR (19) and ENGINE RESTRICTION INDICATORS (20) monitor the air pressure drop through the compressor and engine air cleaner. The red indicator locks-up at maximum restriction with unit running at full load. Press reset after a new air cleaner is installed to restore indicator to green.

SECTION II PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-3. INTRODUCTION TO PMCS TABLE.

a. General. Preventive Maintenance Checks and Services (PMCS) means systematic caring, inspecting, and servicing of equipment to keep it in good condition and to prevent breakdowns. As the operator your mission is to:

(1) Be sure to perform your PMCS each time you operate the air compressor. Always do your PMCS in the same order, so it gets to be a habit. Once you've had some practice, you'll quickly spot anything wrong.

(2) Do your BEFORE (B) PMCS just before you operate the air compressor. Pay attention to WARNINGs, CAUTIONs, and NOTEs.

(3) Do your DURING (D) PMCS while you operate the air compressor. During operation means to monitor the air compressor and it's related components while it is actually being operated. Pay attention to WARNINGs, CAUTIONs, and NOTEs.

(4) Do your AFTER (A) PMCS right after operating the air compressor. Pay attention to WARNINGs, CAUTIONs, and NOTEs.

(5) Do your WEEKLY (W) PMCS once a week.

(6) Do your MONTHLY (M) PMCS once a month.

(7) Use DA Form 2404 (Equipment Inspection and Maintenance Worksheet) to record any faults that you discover before, during, or after operation, unless you can fix them. You DO NOT need to record faults that you fix.

(8) Be prepared to assist organizational maintenance when they lubricate the air compressor. Perform any other services when required by organizational maintenance.

b. PMCS Procedures. Your preventive maintenance checks and services, table 2-1, lists inspections and care required to keep your air compressor in good operating condition. It is set up so that you can make your BEFORE (B) OPERATION checks as you walk around the air compressor.

(1) The "INTERVAL" column of table 2-1 tells you when to do a certain check or service.

(2) The "PROCEDURE" column of table 2-1 tells you how to do required checks and services. Carefully follow these instructions. If you do not have tools, or if the procedure tells you to, notify your supervisor.

NOTE

Terms "ready/available" and "mission capable" refer to same status: Equipment is on hand and ready to perform its combat missions. (See DA Pam 738-750)

(3) The "EQUIPMENT IS NOT READY/AVAILABLE IF:" column in table 2-1 tells you when your air compressor is nonmission capable and why the air compressor cannot be used.

(4) If the air compressor does not perform as required, refer to Chapter 3, Section II, Troubleshooting.

(5) If anything looks wrong and you can't fix it, write it on your DA Form 2404. IMMEDIATELY, report it to your supervisor.

2-3. INTRODUCTION TO PMCS TABLE.

(6) When you do your PMCS, you will always need a rag or two. Following are checks that are common to the entire air compressor.

(a) Keep it clean. Wipe faces of gauges with clean, lint-free cloth.

(b) Check frame for rust and corrosion. If any bare metal or corrosion exists, clean and apply a thin coat of oil. Use MIL-L-2104, or equivalent.

(c) Check for obvious looseness, or missing, bent, broken bolts, nuts, and screws. If you find a bolt, nut, or screw you think is loose, tighten it or report it to your supervisor.

(d) Check for cracked, frayed or broken insulation, bare wires and loose or broken connectors. Tighten loose connectors. Report any damage to your supervisor.

(e) Look for wear, damage, and leaks on hoses and fluid lines. Make sure clamps and fittings are tight. Wet spots show leaks, but a stain around a fitting or connector can also mean a leak. If a leak comes from a loose fitting or connector, tighten it. If something is broken or worn out, report it your supervisor.

(f) When you check for "operating condition," you look at the component to see if it is serviceable.

NOTE

Only use those authorized solvents or agents listed in appendix E.

(g) Clean all metal parts with solvent. Wipe nonmetallic parts, with a clean lint-free cloth moistened slightly with solvent and air dry thoroughly.

(7) Leakage Definition for Operator PMCS. It is necessary for you to know how fluid leakage affects the status of your air compressor. The following are types/classes of leakage an operator needs to know to be able to determine the status of their unit. When in doubt notify your supervisor.

CAUTION

· Equipment will not be operated with an obvious fuel leak.

· Equipment operation is allowable with minor leakages (class I or II). Consideration must be given to fluid capacity in the item/system being checked/inspected.

· When operating with class I or II leaks continue to check fluid levels as required in your PMCS.

· Class III leaks should be reported immediately to your supervisor.

(a) Class I is defined as seepage of fluid as indicated by wetness or discoloration but not great enough to form drops.

(b) Class II is defined as leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked/inspected.

(c) Class III is defined as leakage of fluid great enough to form drops that fall from item being checked/inspected.

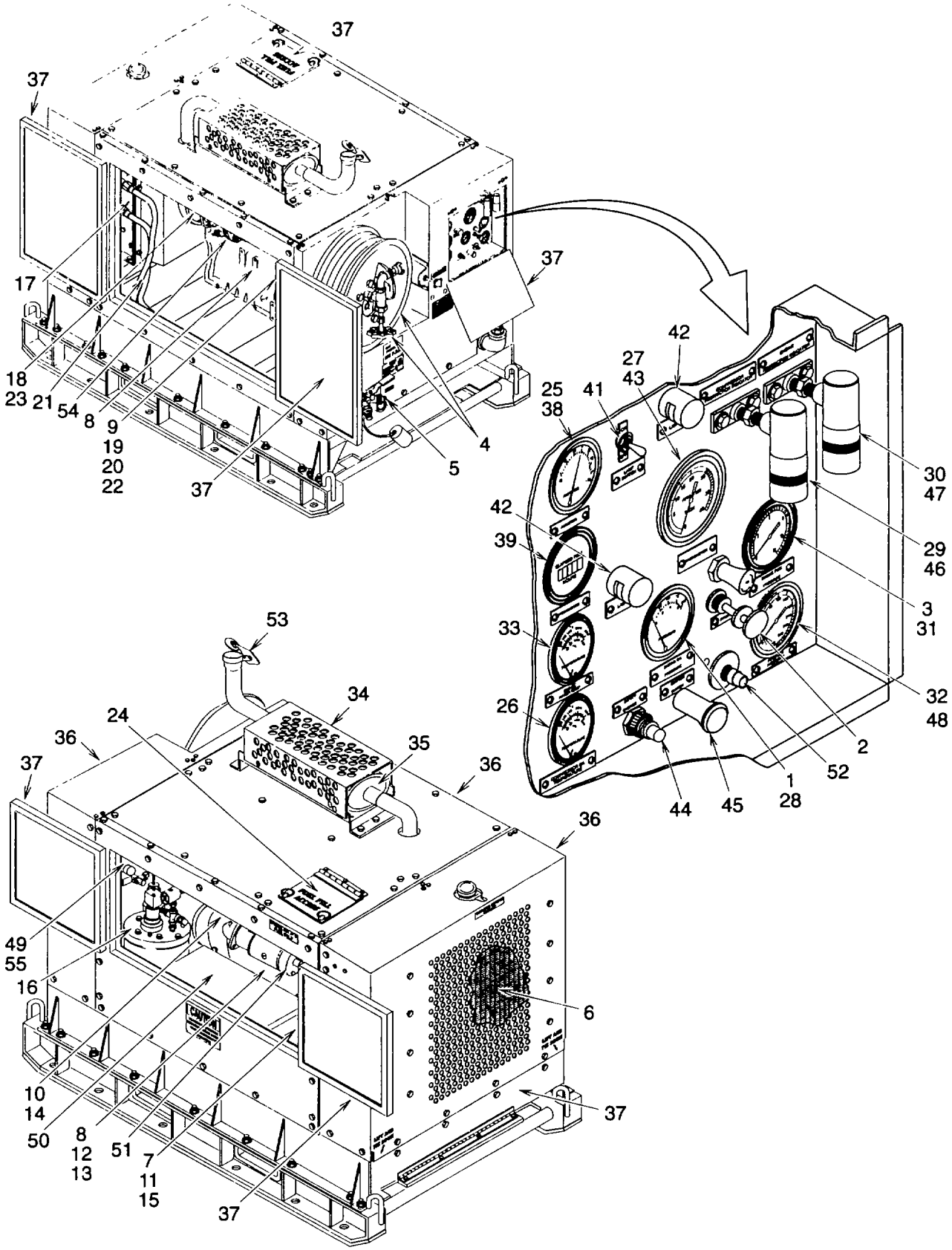


Figure 2-2. Operator PMCS Routing Diagram

Table 2-1. Preventive Maintenance Checks and Services for 16MS125

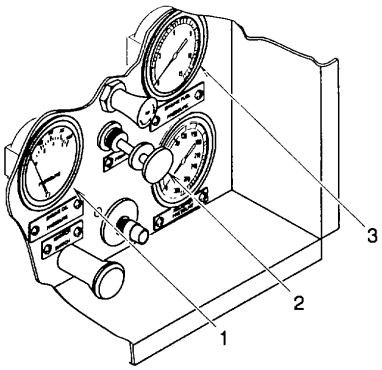
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
		EXTERIOR		
1	Before	ENGINE OIL PRESSURE Gauge	Inspect ENGINE OIL PRESSURE (gauge 1). a. Check for cracked or damaged cover lens. b. Check for cracks in case or leaks.  **CAUTION** **Operating the PRIMING PUMP when either ambient temperature is below 100° F (38 °C) (or more than one time during a starting cycle will inject excessive fuel into the engine and can cause equipment damage.**	Cover lens damaged to interfere with accurate reading. Crack in case, or class III leak found.
2	Before	PRIMING PUMP Control	Inspect PRIMING PUMP (2) control. a. Check for visible damage. b. Check for leaks.	Damage that would interfere with pump operation. Class III leak found.

Table 2-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

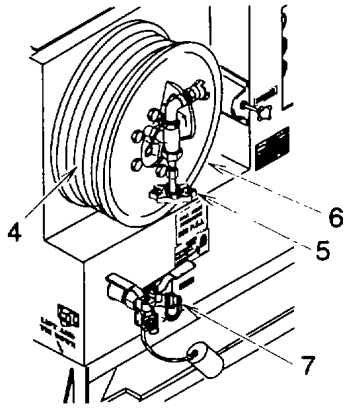
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
3	Before	ENGINE FUEL PRESSURE Gauge	Inspect ENGINE FUEL PRESSURE gauge (3). a. Check for cracked or damaged cover lens.	Cover lens damaged to interfere with accurate reading.
			b. Check for cracks in case or leaks. **WARNING** Operating the rotary air compressor with a damaged hose can result in a hose rupture that could cause serious personal injury.	Crack in case, or class III leak found.
4	Before	Hose Reel	Inspect air hose (4). a. Visually check hose for cuts, abrasions, cracks, and general condition of hose.	Air hose is cut, cracked or damaged to cause possibility of rupture.
			b. Open and close valve (5) for smooth operation.	Valve binds.
			c. Unroll hose from reel (6) and check for smooth operation.  	Hose reel binds or is excessively loose that would cause leakage at air seal.

Table 2-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

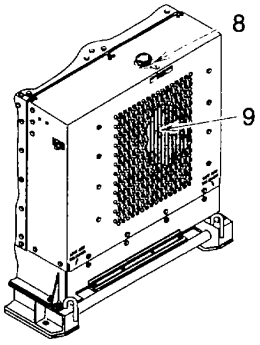
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
5	Before	Service Valves (Double Discharge Valve)	Inspect service valves (7). Check for smooth operation, cracks, and general condition. **WARNING** **Radiator may be hot to touch and can cause serious personal injury. Allow radiator to cool. Use a rag to unscrew cap.**	Valves are cracked, damaged, leak or bind.
6	Before	Radiator	Inspect radiator (8).  a. Check for obstruction, or damage to fins or tubes (9). fins, tubes are damaged. b. Check for leaks. c. Service radiator by checking coolant level. If coolant is below the core, top off with coolant to approximately midway between the core and fill neck as follows: (1) If operating at temperatures above 0° F (-18° C), mix a 60% antifreeze/water solution consisting of 77 oz antifreeze (item 7, section II, appendix E) with 51 oz water to yield one gallon of solution.	Radiator is obstructed by dirt and debris or bent Class III leak is found. Coolant level is below the core.

Table 2-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

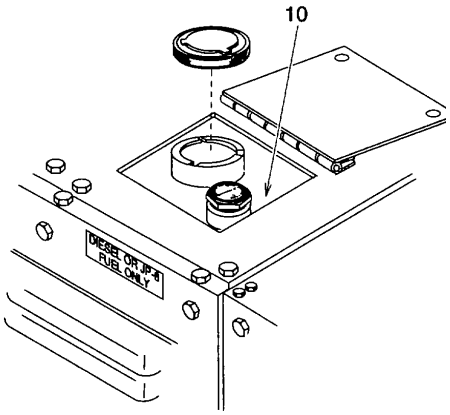
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
			(2) If operating at temperatures below 0° F (-18° C), use pre-mixed antifreeze (item 8, section II, appendix E) and do not dilute it.	
		INTERIOR		
			WARNING The fuels in this compressor are highly explosive. Do not make or use open flame when performing maintenance. Flames and explosion could result in severe personal injury or death.	
7	Before	Fuel Tank	Inspect fuel tank (10).	
			a. Check for cuts, dents, broken welds, cracks, or leaks.	Fuel tank is cut, cracked, has broken welds, or class III leak is found.
				
			b. Service fuel tank by checking fuel level. If level is less than 1/4 tank, top off with fuel (item 19, section II, appendix E) or (item 20, section II, appendix E).	Fuel level is less than 1/4 tank.

Table 2-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

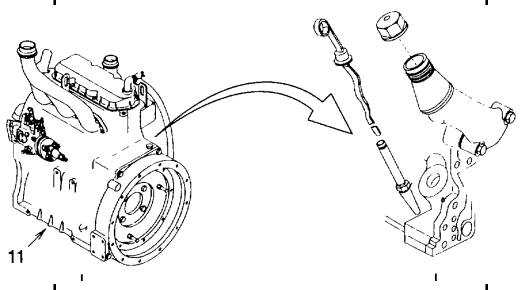
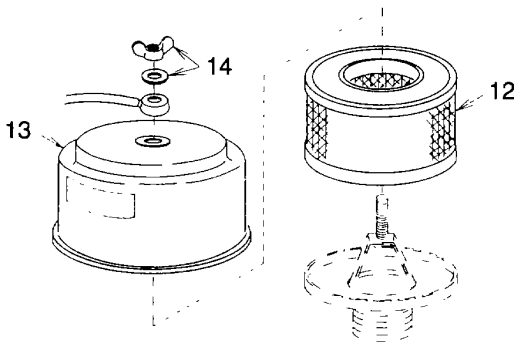
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
				
8	Before	Engine	Inspect engine (11).	
			a. Check for fluid leaks.	Any class III fluid leak is found.
			b. Service engine by checking oil level. Oil level is at the lower two marks (dots) or below on the dipstick. Add oil to second set of marks. If temperature is above 40° F (5° C) use (item 3, section II, appendix E)or (item 4, section II, appendix E) if temperature is below 40° F (5° C).	Oil level is below the two lower set of marks (dots) on the dipstick.
9	Before	Compressor Air Cleaner	Inspect compressor air cleaner (12).	
			a. Check for missing air cleaner, weather hood (13), or attaching hardware (14).	Missing air cleaner or attaching hardware.
				

Table 2-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

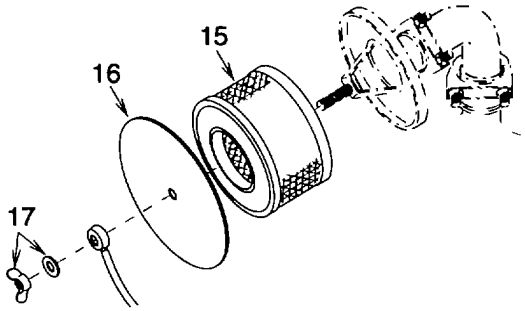
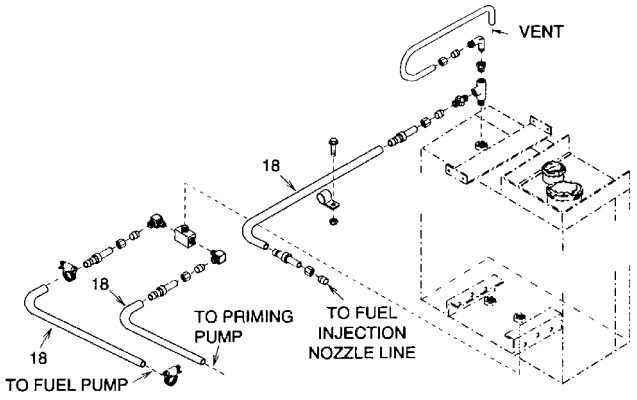
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
9-Cont			b. Inspect air cleaner weather hood (13) for any dents, cuts, and tears	Weather hood is crushed and blocking air cleaner.
10	Before	Engine Air Cleaner	Inspect for missing or damaged air cleaner (15), lid (16), and attaching hardware (17).	Damaged or missing air cleaner and attaching hardware.
				
11	Before	Fuel Lines	Inspect fuel lines (hoses) (18) for cuts, cracks, and any leaking.	If fuel lines (hoses) are cut, cracked, or any leak is found.
				

Table 2-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

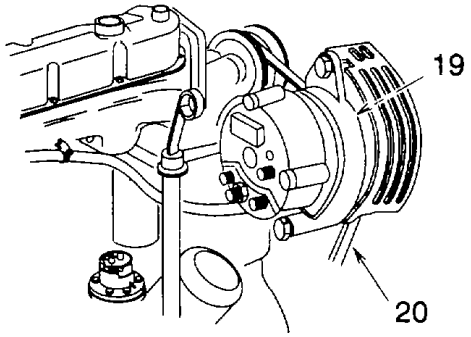
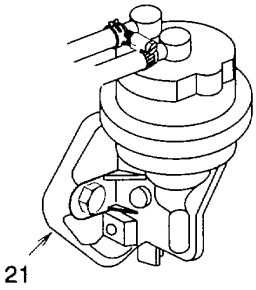
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
12	Before	Alternator and Belt	Inspect alternator (19). a. Check for any evidence of overheating such as discoloration of casing or bum marks.	Alternator shows evidence of overheating.
				
			b. Inspect belt (20) for cuts, cracks (particularly on the inside surface), or hard glaze on the inside surface.	Belt is cut, cracked, or glazed.
			c. Insure belt is tight.	
13	Before	Fuel Pump	Inspect fuel pump (21) for any cracks or leaks.	Fuel pump cracked or class III leak found.
				
14	Before	Engine Fuel Filter	Inspect fuel filter (22) for any dents, cuts, or leaks.	Fuel filter is dented, cut, or class III leak is found.

Table 2-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

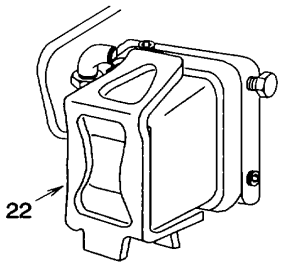
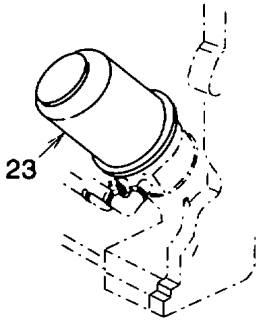
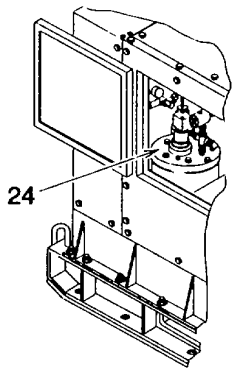
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
15	Before	Oil Filter	 Inspect oil filter (23) for any dents, cuts, or leaks.	Oil filter is dented, cut, or class III leak is found.
16	Before	Compressor Oil Separator	 Inspect oil separator (24) for any cracks, dents, missing or damaged hardware, damaged fittings, and leaks.	Oil separator cracked, hardware or fitting missing or damaged, or any class III leak found.
17	Before	Oil Cooler	 Inspect oil cooler (25) for damage such as dents, cracks, and leaks.	Oil cooler cracked or class III leak is found.

Table 2-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

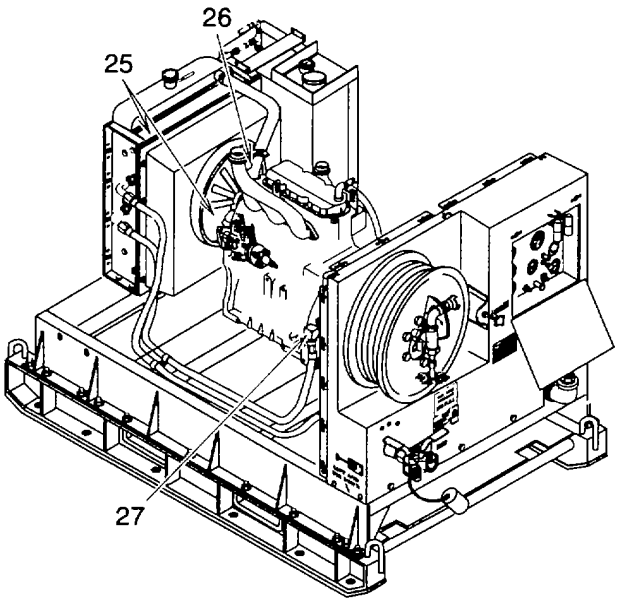
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
				
18	Before	Water Pump	Inspect water pump (26) for damage such as dents, cracks, and leaks.	Water pump cracked or class III leak is found.
19	Before	Compressor Oil Filter	Inspect oil filter (27) for any dents, cuts, or leaks.	Oil filter is dented, cut, or class III leak is found.
20	Before	Compressor	Inspect compressor (28) for damage such as dents, cracks, and leaks.	Compressor cracked or class III leak is found.

Table 2-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

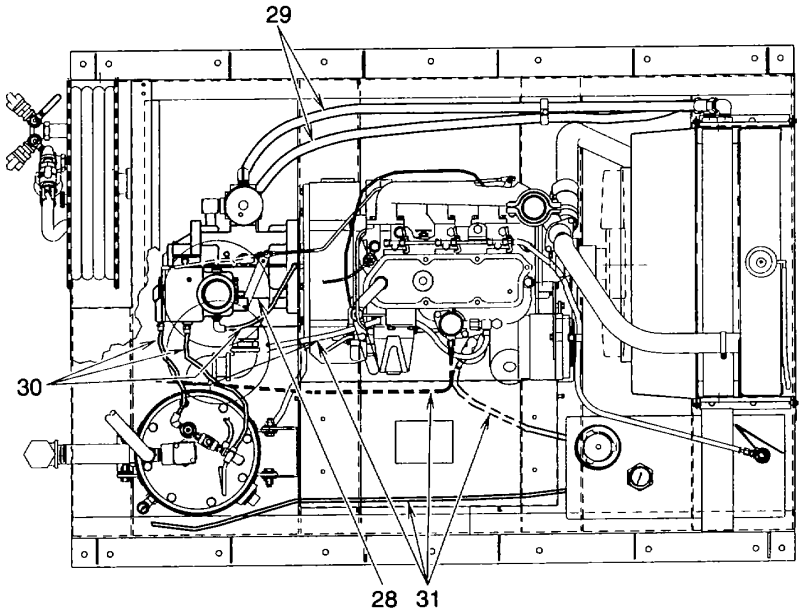
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
				
21	Before	Compressor Oil Lines	Inspect oil lines (hoses) (29) for cuts, cracks, and any leaking.	If oil lines (hoses) are cut, cracked, or class III leak is found.
22	Before	Compressor Air Lines (hoses)	Inspect air lines (hoses) (30) for cuts, cracks, or damaged fittings.	Air line (hose) is cut, cracked, or fitting is damaged.
23	Before	Hoses	Inspect hoses (31) for cuts, cracks, and any leaking.	If hoses are cut, cracked, or class III leak is found.

Table 2-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

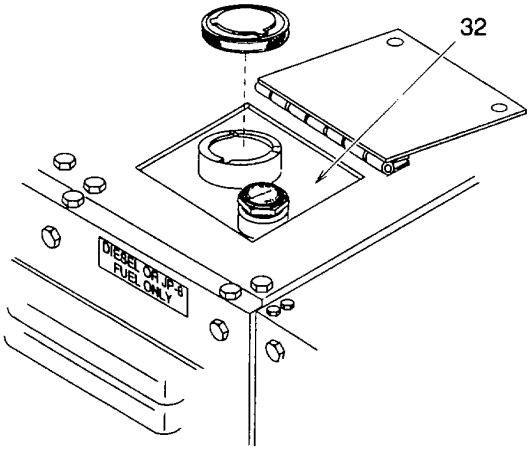
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
		EXTERIOR	**WARNING** The fuels in this compressor are highly explosive. Do not make or use open flame when performing maintenance. Flames and explosion could result in severe personal injury or death.	
24	During	Fuel Tank	Service fuel tank (32) by checking fuel level. If less than 1/4 tank, shut down engine. Top off with fuel (item 19, section II, appendix E) or (item 20, section II, appendix E) and re-start engine.	Fuel level is less than 1/4 tank.
				
25	During	AMMETER	Inspect AMMETER (33) indicator reading for normal operating range of 0 to +15 amperes.	Indicator reading outside normal operating range.

Table 2-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

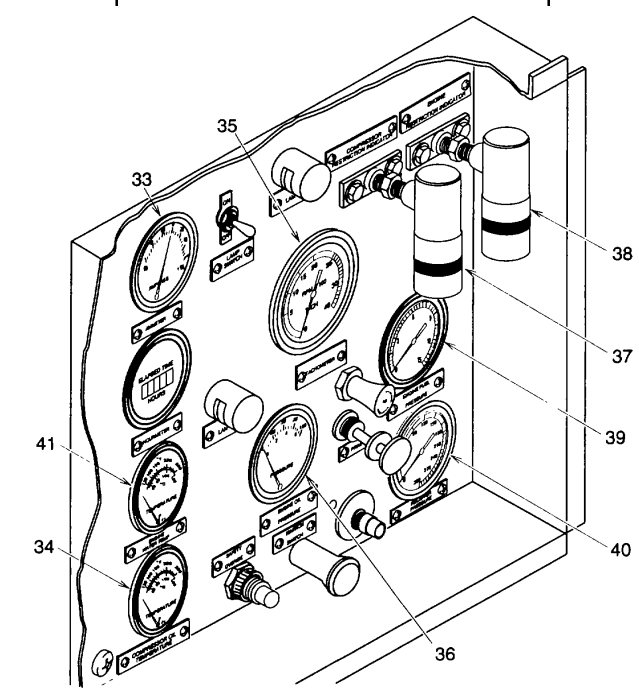
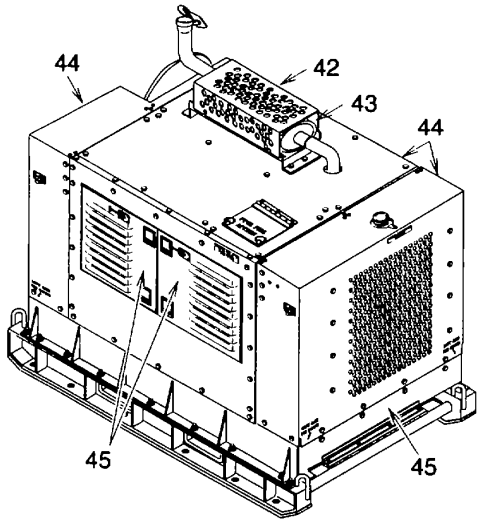
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
				
26	During	COMPRESSOR OIL TEMPERATURE Gauge	Inspect COMPRESSOR OIL TEMPERATURE gauge indicator (34) reading for normal operating range of 160 - 225° F (72 -107°C).	Indicator reading outside normal operating range.
27	During	TACHOMETER	Inspect indicator TACHOMETER (35) reading for normal operating range of 1000 - 2250 rpm.	Indicator reading outside normal operating range.
28	During	ENGINE OIL PRESSURE Gauge	Inspect ENGINE OIL PRESSURE gauge (36) indicator reading for normal operating range of 60 - 100 psi (4 - 7 kgs cm^2).	Indicator reading outside normal operating range.

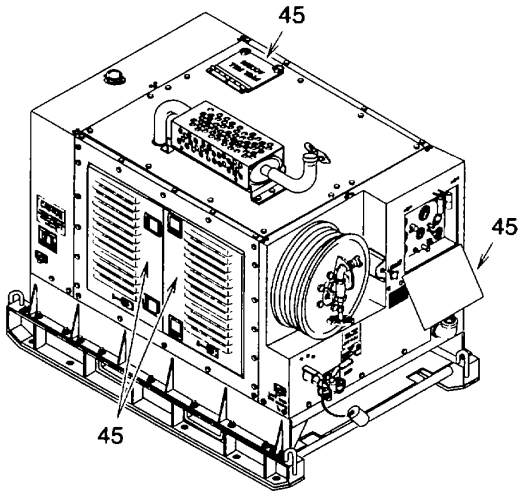
Table 2-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
29	During	COMPRESSOR RESTRICTION INDICATOR	Inspect COMPRESSOR RESTRICTION INDICATOR (37) for green band.	Red band is showing on restriction indicator.
30	During	ENGINE RESTRICTION INDICATOR	Inspect ENGINE RESTRICTION INDICATOR (38) for green band.	Red band is showing on restriction indicator.
31	During	ENGINE FUEL PRESSURE Gauge	Inspect ENGINE FUEL PRESSURE gauge indicator (39) reading for normal operating range of 4 - 6 psi (.3 -.4 kgs cm2).	Indicator reading outside normal operating range.
32	During	RECEIVER PRESSURE Gauge	Inspect RECEIVER PRESSURE gauge (40) indicator reading for normal operating range of 70 - 120 psi (5 - 9 kgs cm2).	Indicator reading outside normal operating range.
33	During	ENGINE WATER TEMPerature Gauge	Inspect ENGINE WATER TEMPerature gauge indicator (41) reading for normal operating range of 140 - 210° F (60- 99° C). **WARNING** **Cover may be hot to touch and can cause serious personal injury. Allow cover to cool.**	Indicator reading outside normal operating range.
34	Weekly	Cover	Inspect cover (42) for any missing or damaged attaching hardware, cuts, dents, and tears.	Cover is missing or damaged to interfere with safe operation.

Table 2-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:





35	Weekly	Muffler	Inspect muffler (43) for holes, dents, and cracks.	Muffler has a hole in it.
36	Weekly	Panels	Inspect panels (44) for any missing or damaged attaching hardware, cuts, dents, and tears.	Panel is missing or damaged to interfere with safe operation.
37	Weekly	Doors	Inspect doors (45) for any missing or damaged attaching hardware or fasteners, cuts, dents, and tears.	Door is missing or damaged to interfere with safe operation.
38	Weekly	AMMETER	Inspect AMMETER (46) for cracked or damaged cover lens and cracks in case.	Cover lens damaged to interfere with accurate reading or crack in case.

Table 2-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

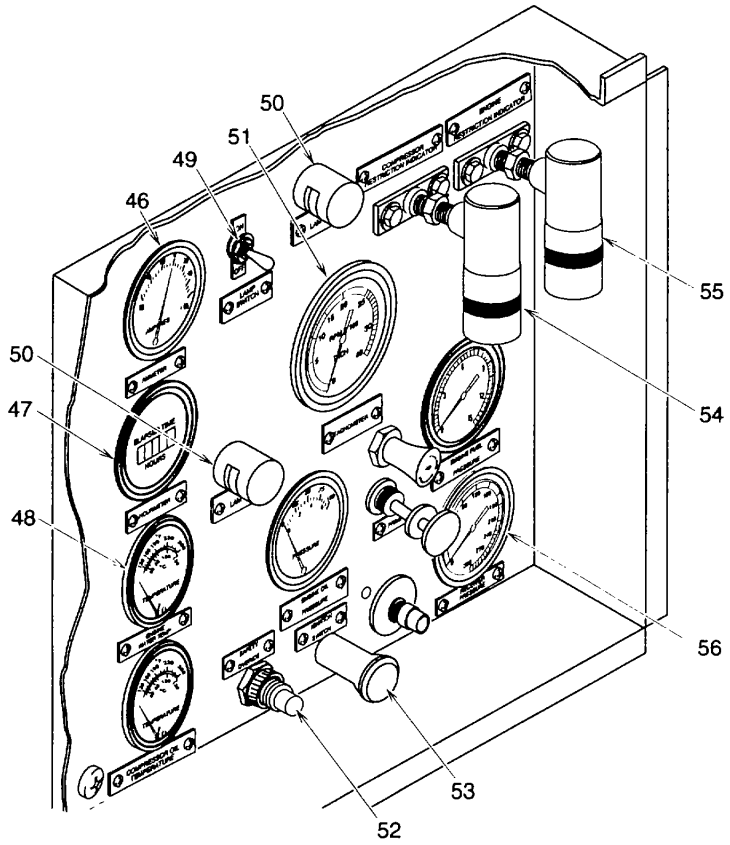
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
				
39	Weekly	HOURMETER	Inspect HOURMETER (47) for cracked or damaged cover lens and cracks in case.	Cover lens damaged to interfere with accurate reading or crack in case.
40	Weekly	ENGINE WATER TEMPerature Gauge	Inspect ENGINE WATER TEMPerature gauge (48) for cracked or damaged cover lens and cracks in case.	Cover lens damaged to interfere with accurate reading or crack in case.
41	Weekly	LAMP SWITCH	Operate LAMP SWITCH (49) and check for smooth operation.	Switch binds.
42	Weekly	LAMPs	Inspect LAMPs (50) for broken or missing bulbs and damaged or missing hood covers.	Bulbs broken or missing.

Table 2-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
43	Weekly	TACHOMETER	Inspect TACHOMETER (51) for cracked or damaged cover lens and cracks in case.	Cover lens damaged to interfere with accurate reading or crack in case.
44	Weekly	SAFETY OVERRIDE Switch	Operate SAFETY OVERRIDE switch (52) and check for binding when pushed.	Switch binds.
45	Weekly	IGNITION SWITCH	Operate IGNITION switch (53) and check for binding when pulled.	Switch binds.
46	Weekly	COMPRESSOR RESTRICTION INDICATOR	Inspect COMPRESSOR RESTRICTION INDICATOR (54) for cracked or damaged cover lens and cracks in case.	Cover lens damaged to interfere with accurate reading or crack in case.
47	Weekly	ENGINE RESTRICTION INDICATOR	Inspect ENGINE RESTRICTION INDICATOR (55) for cracked or damaged cover lens and cracks in case.	Cover lens damaged to interfere with accurate reading or crack in case.
48	Weekly	RECEIVER PRESSURE Gauge	Inspect RECEIVER PRESSURE gauge (56) for cracked or damaged cover lens and cracks in case.	Cover lens damaged to interfere with accurate reading or crack in case.
		INTERIOR		
49	Weekly	Instrument Control Panel Wiring Harness	Inspect wiring harness (57) for cut or frayed wires and missing or damaged terminals.	Wire lead cut or frayed or terminal missing or damaged.

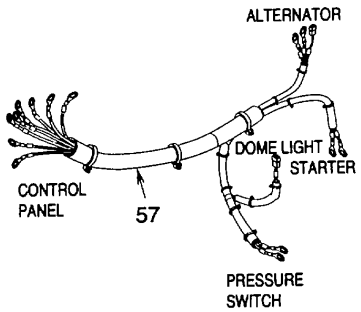


Table 2-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

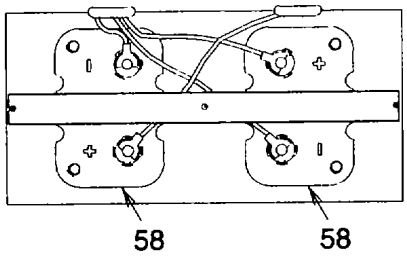
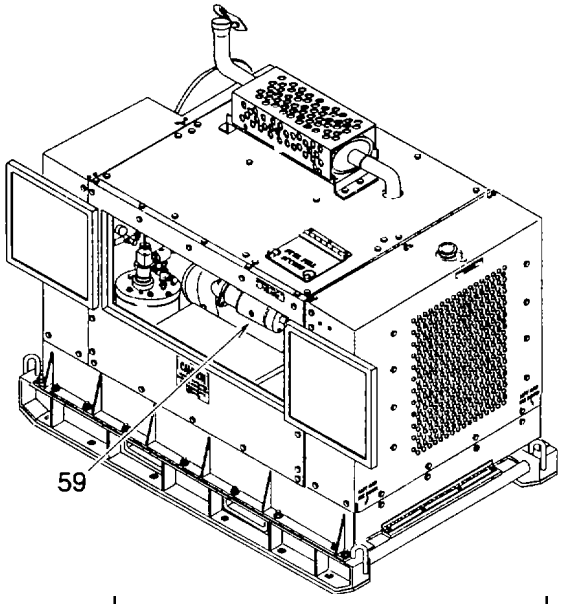
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
50	Weekly	Batteries	Inspect battery (58) for cracks, damaged terminal, and leaks.	Battery cracked, terminal damaged, or any evidence of leaking.
				
51	Weekly	Starter	Inspect starter (59) for any evidence of overheating such as discoloration of casing or burn marks.	Starter shows evidence of overheating.
				
52	Weekly	Relay Reset Switch	Inspect relay switch (60) case for cracks and operate to check for binding when reset.	Relay switch case is cracked or binds when reset.

Table 2-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

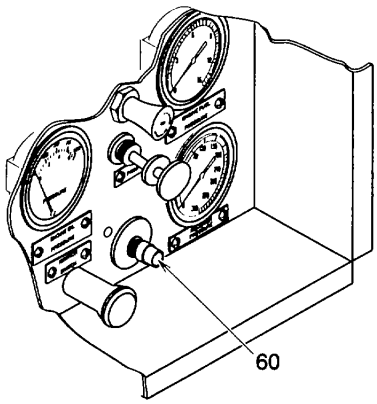
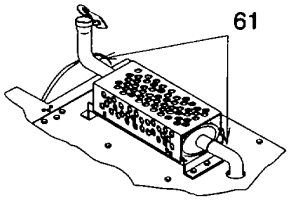
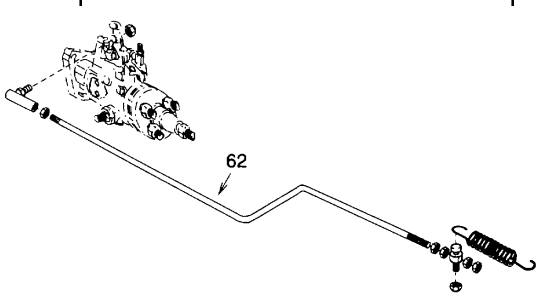
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
				
			WARNING Muffler may be hot to touch and can cause serious personal injury. Allow muffler to cool.	
53	Weekly	Exhaust Pipe and Fittings	Inspect pipe (61) for holes or dents and missing or damaged hardware.	Hole in pipe or hardware missing or damaged.
				
54	Weekly	Speed Control Linkage	Inspect Speed Control linkage (62) a. Check for missing or damaged connecting hardware. b. Operate linkage to check for binding.	Linkage hardware missing or damaged. Binding of linkage.

Table 2-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
				
55	Weekly	Miscellaneous Wires and Cables	Inspect for cut or frayed wires and cables and missing or damaged terminals.	Wire cut or frayed or terminal missing or damaged.

SECTION III OPERATION UNDER USUAL CONDITIONS

2-4. ASSEMBLY AND PREPARATION FOR USE.

Notify unit maintenance for assistance with unloading, unpacking, and initial assembly/preparation for use.

2-5. OPERATING PROCEDURES.

Usual operating conditions are when the ambient temperature is between 40° F and 100° F (5° C and 38° C).

a. Prior to Operating. Place unit on a fairly level surface with a maximum angle of 15° in any direction. Unit should be located in an area as free of dust and dirt as possible.

(1) Perform all of the BEFORE PMCS outlined in table 2-1.
(2) Connect hose reel hose to air tools or system for task to be performed. Additional air hoses connected to service outlets may also be used.

b. Starting Procedure. (See Figure 2-3.)

WARNING

Operating the unit in a building or any enclosed area without the exhaust gases piped outside can result in serious illness or death.

CAUTION

Operating the equipment unattended for prolonged periods of time can result in serious damage to the unit.

(1) Open hose reel valve (1) and double discharge valve (2) as necessary.
(2) Turn COMPRessor UNLOADER AND IDLE CONTROL knob (3) clockwise until it stops.
(3) Pull IGNITION-START switch (4) out to first (run) position.

NOTE

Engine water temperature and compressor oil temperature must be at or below normal readings before resetting relay reset switch.

(4) Push relay reset switch (5).

CAUTION

Operating the engine with low or no oil pressure can cause serious equipment damage.

(5) Pull IGNITION-START switch (4) all the way out to engage starter. Crank engine for three seconds to check for binding, then release switch.

2-5. OPERATING PROCEDURES. - Continued

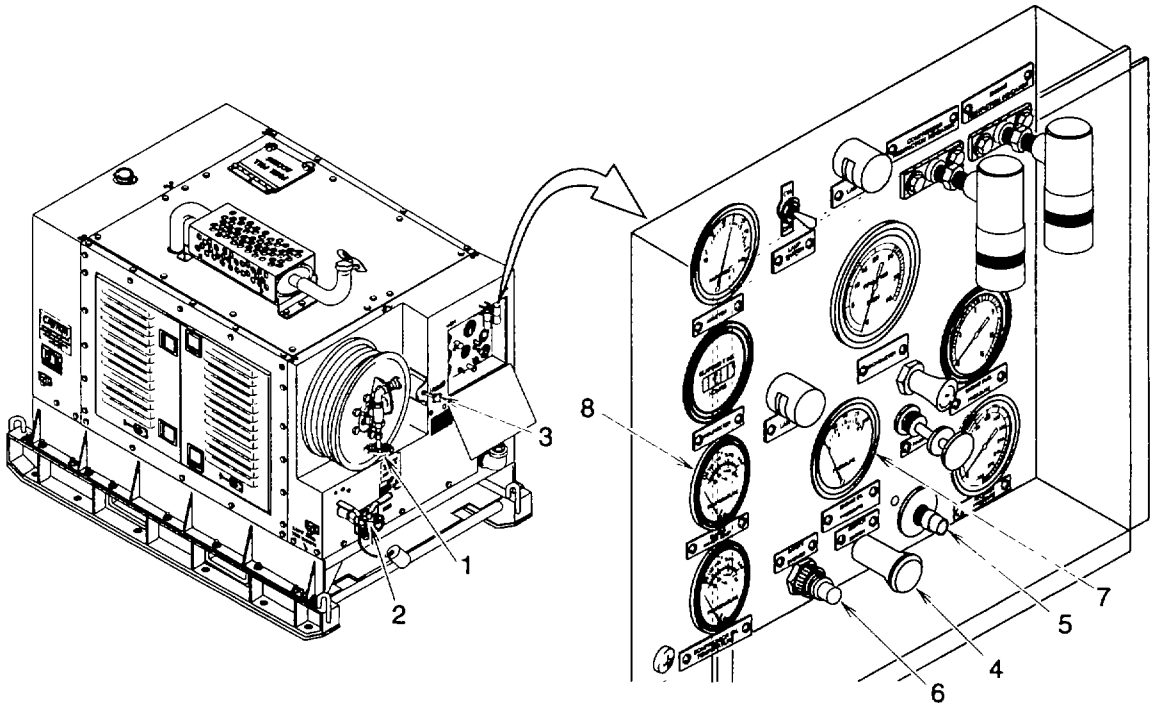


Figure 2-3. Unit Operation, Usual

(6) Depress SAFETY BYPASS switch (6) and hold. Pull IGNITION-START switch (4) and release when engine starts. When pressure is indicated on ENGINE OIL PRESSURE gauge (7) release SAFETY BYPASS switch (6).

(7) If engine oil pressure does not register within three seconds after engine starts, release SAFETY BYPASS switch (6), push IGNITION-START switch (4) in and notify supervisor.

(8) When engine water temperature reaches 140° F (60° C), as indicated on ENGINE WATER TEMPerature gauge (8), close the hose reel valve (1) and double discharge valve (2) and turn COMPRessor UNLOADER AND IDLE CONTROL knob (3) counterclockwise until it stops. This action increases engine speed and opens compressor intake valve to start compression.

CAUTION

Operating the equipment unattended for prolonged periods of time can result in serious damage to the unit.

(9) Unit is now ready for use and will cycle through load and unload automatically in relation to air demand. As demand increases, the engine will accelerate and the compressor will replenish compressed air supply in the separator tank. As demand decreases, or stops, engine will return to idle and compressor will run in an unloaded condition until demand for air again causes unit to load.

(10) Perform all the DURING PMCS as outlined in table 2-1.

c. Shutdown Procedure. (See Figure 2-3.)

(1) Turn COMPR UNLOADER AND IDLE CONTROL knob (3) clockwise until it stops.

(2) Close double discharge valve (2) and hose reel valve (1).

(3) When engine speed reduces to steady idle speed, push IGNITION-START switch (4) all the way in to stop the engine.

2-6. DECALS AND INSTRUCTION PLATES.

Several decals and instruction plates, illustrated below, are provided on the unit. These are located on, or near, the applicable control or device.

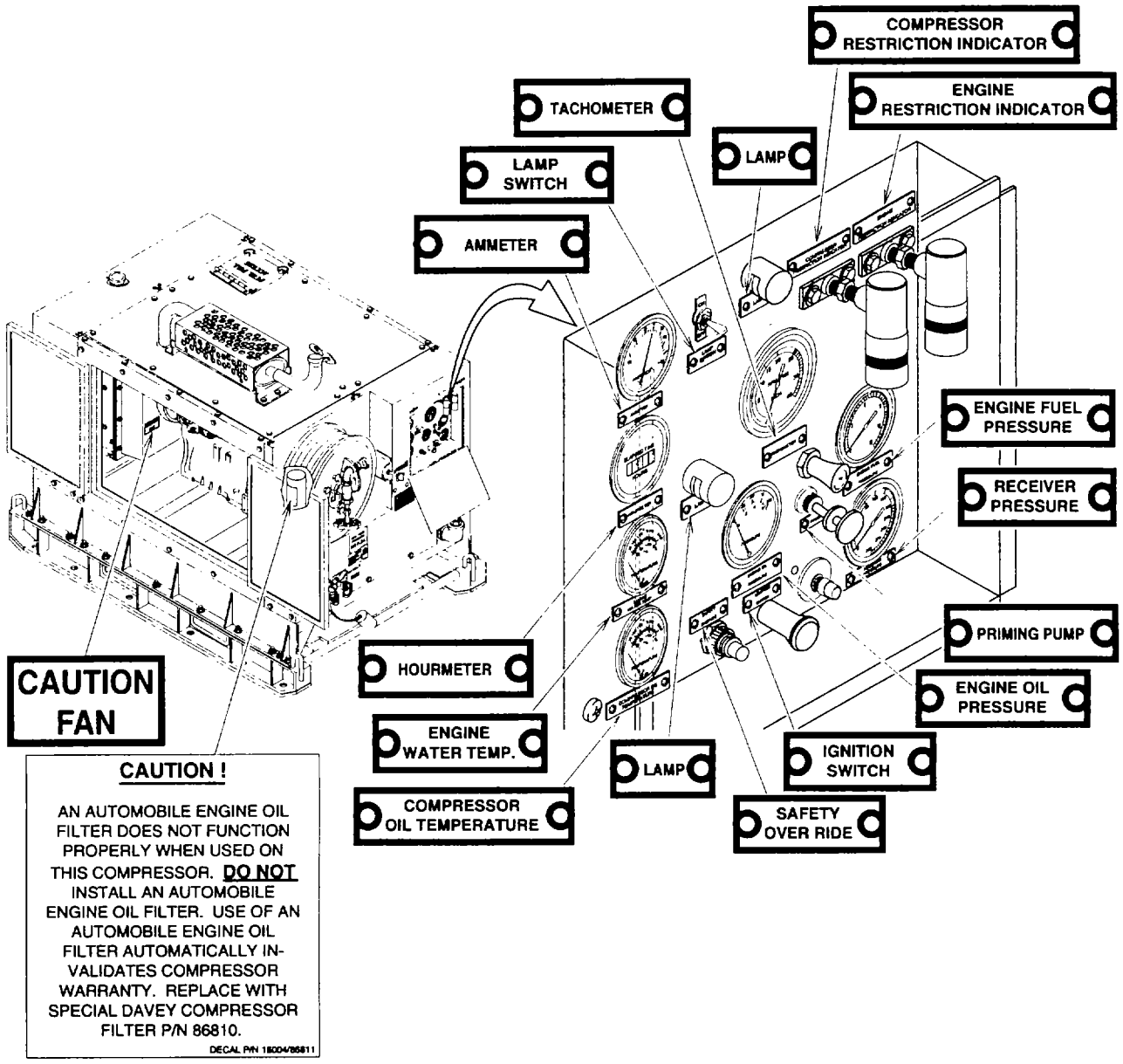
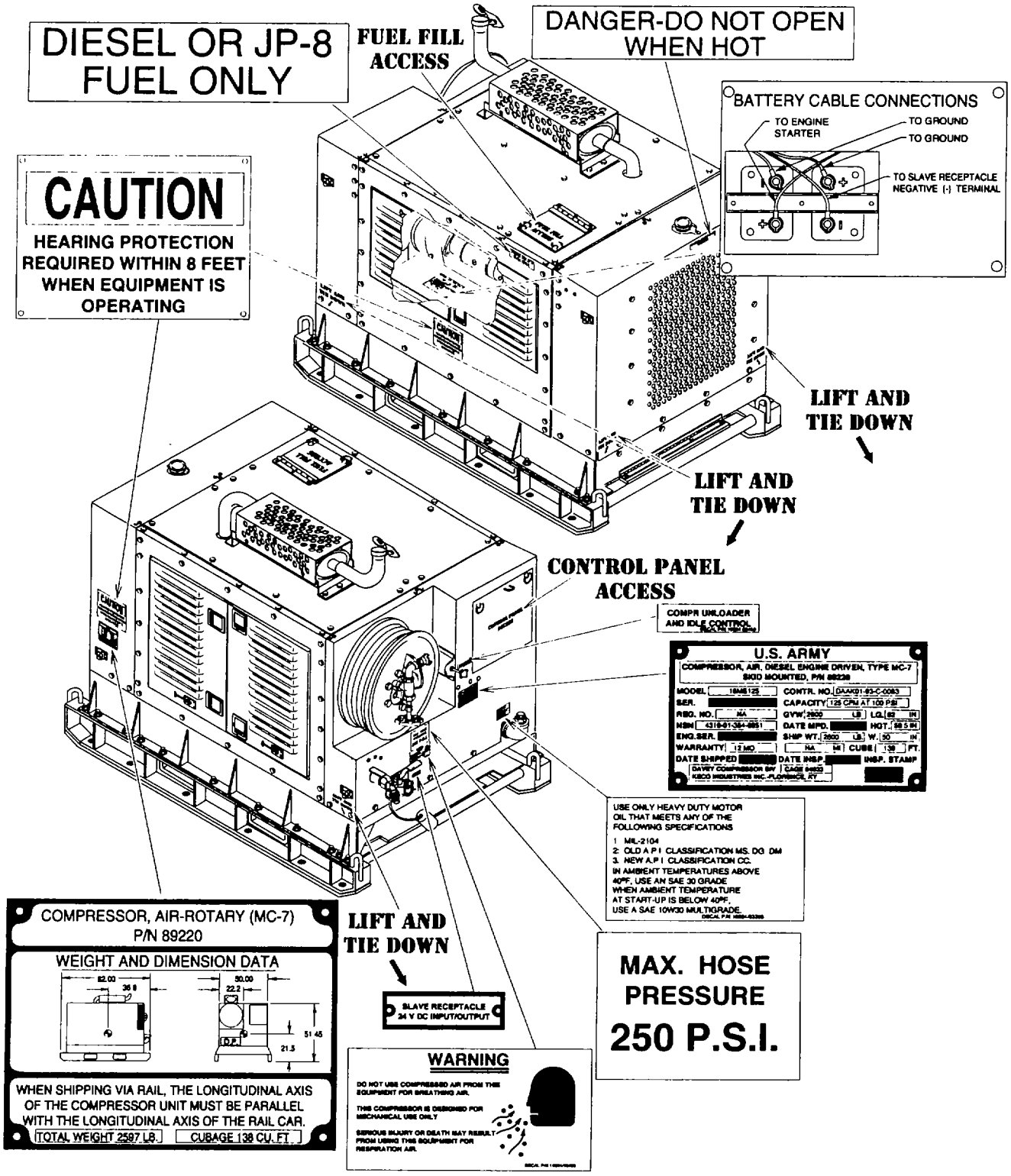


Figure 2-4. Decals and Information Plates (Sheet 1 of 2)



NOTE
OPERATING INSTRUCTIONS PLATE IS LOCATED ON INSIDE OF CONTROL PANEL DOOR.

Figure 2-4. Decals and Information Plates (Sheet 2 of 2)

2-7. PREPARATION FOR MOVEMENT.

Preparation for movement requires the following steps to be performed.

a. Shutdown unit and disconnect battery cables from terminals.

b. Check that all fluid caps are secure to prevent any spillage.

c. Check and secure all access doors and panels in the closed position.

d. Unit must be tied down to a carrier.

e. Notify unit maintenance for assistance in preparing unit for administrative storage or shipment.

SECTION IV OPERATION UNDER UNUSUAL CONDITIONS

2-8. UNUSUAL ENVIRONMENT/WEATHER.

Unusual operating conditions are when the ambient temperature is below 40° F (5° C) or above 100° F (38° C).

a. Blowing Sand and Dirt. Highly contaminated atmosphere such as blowing sand and dirt places abnormal load on air cleaners, oil filters and compressor.

(1) Locate unit in an area as free of blowing sand and dirt as possible.
(2) Check filters more often and replace as necessary.
(3) Increase frequency of all maintenance actions.

b. Cold Weather 40° F (5° C) or below. (See Figure 2-5.)

(1) Starting Procedure.

WARNING

Operating the unit in a building or any enclosed area without the exhaust gases piped outside can result in serious illness or death.

(a) Open hose reel valve (1) and appropriate double discharge valve (2).
(b) Turn COMPRessor UNLOADER AND IDLE CONTROL knob (3) clockwise until it stops.
(c) Pull IGNITION-START switch (4) out to first (run) position.

NOTE

Engine water temperature and compressor oil temperature must be at or below normal readings before resetting relay reset switch.

(d) Push relay reset switch (5).

CAUTION

Operating the COLD WEATHER STARTING AID when either ambient temperature is above 40° F (5° C) or more than one time during a starting cycle will inject excessive starting fluid into the engine and can cause equipment damage.

(e) Pull IGNITION-START switch (4) all the way out to engage starter. Crank engine for three seconds to check for binding, then release switch.

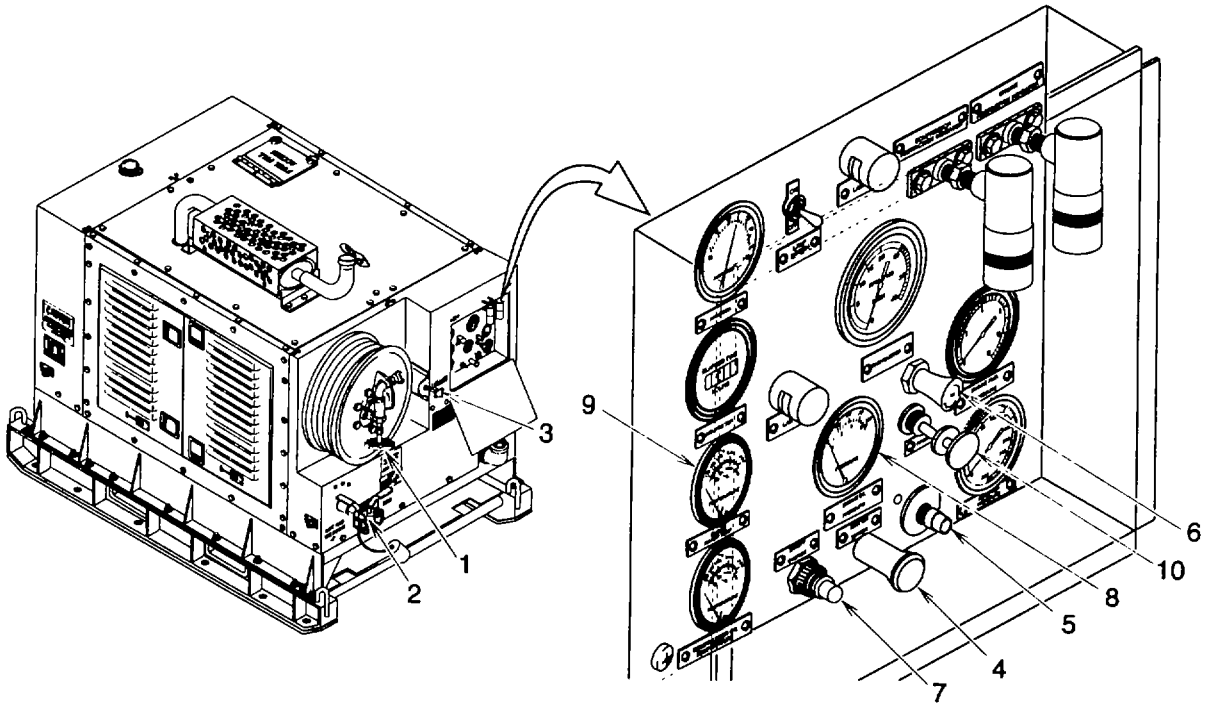


Figure 2-5. Unit Operation, Unusual

(f) Pull COLD WEATHER STARTING AID (6) cable out and wait for three seconds. Push cable in.

CAUTION

Operating the engine with low or no oil pressure can cause serious equipment damage.

(g) Depress SAFETY BYPASS switch (7) and hold. Pull IGNITION-START switch (4) and release when engine starts. When pressure is indicated on ENGINE OIL PRESSURE gauge (8) release SAFETY BYPASS switch (7).

(h) If engine oil pressure does not register within three seconds after engine starts, release SAFETY BYPASS switch (7), push IGNITION-START switch (4) in and notify supervisor.

2-8. UNUSUAL ENVIRONMENT/WEATHER. -Continued

(i) In cold weather it may be necessary to repeat the starting procedures. Do not repeat the procedures more than two times in succession. Allow two minutes for evaporation of starting fluid. If engine does not start after four attempts, push IGNITION-START switch (4) notify supervisor.

(j) When engine water temperature reaches 140° F (60° C), as indicated on ENGINE WATER TEMPerature gauge (9), close the hose reel valve (1) and appropriate double discharge valve (2) and turn COMPRessor UNLOADER AND IDLE CONTROL knob (3) counterclockwise until it stops. This action increases engine speed and opens compressor intake valve to start compression.

CAUTION

Operating the equipment unattended for prolonged periods of time can result in serious damage to the unit.

(k) Unit is now ready for use and will cycle through load and unload automatically in relation to air demand. As demand increases, the engine will accelerate and the compressor will replenish compressed air supply in the separator tank. As demand decreases, or stops, engine will return to idle and compressor will run in an unloaded condition until demand for air again causes unit to load.

(l) Perform all the DURING PMCS as outlined in Table 2-1.

(2) Shutdown Procedure. (See Figure 2-5.)

(a) Turn COMPR UNLOADER AND IDLE CONTROL knob (3) clockwise until it stops.

(b) Close hose reel valve (1) and appropriate double discharge valve (2).
(c) When engine speed reduces to steady idle speed, push IGNITION-START switch (4) all the way in to stop the engine.

c. Hot Weather (100° F or Above) (38° C or above). (See Figure 2-5.)

(1) Starting Procedure.

(a) Open hose reel valve (1) and appropriate double discharge valve (2).
(b) Turn COMPRessor UNLOADER AND IDLE CONTROL knob (3) clockwise until it stops.
(c) Pull IGNITION-START switch (4) out to first (run) position.

NOTE

Engine water temperature and compressor oil temperature must be at or below normal readings before resetting relay reset switch.

(d) Push relay reset switch (5).

(e) Rotate PRIMING PUMP knob (10) until detent pin releases.

CAUTION

Operating the PRIMING PUMP when either ambient temperature is below 100° F (38° C) or more than one time during a starting cycle will inject excessive fuel into the engine and can cause equipment damage.

(f) Pull PRIMING PUMP plunger (10) completely out until it stops; then, push in slowly, spraying atomized fuel into engine air intake.

(g) Lock PRIMING PUMP plunger (10) in rest position by rotating knob 90 degrees after detent pin engages.

WARNING

Operating the unit in a building or any enclosed area without the exhaust gases piped outside can result in serious illness or death.

CAUTION

Operating the engine with low or no oil pressure can cause serious equipment damage.

(h) Depress SAFETY BYPASS switch (7) and hold. Pull IGNITION-START switch (4) and release when engine starts. When pressure is indicated on ENGINE OIL PRESSURE gauge (8) release SAFETY BYPASS switch (7).

(i) If engine oil pressure does not register within three seconds after engine starts, release SAFETY BYPASS switch (7), push IGNITION-START switch (4) in and notify supervisor.

(j) In hot weather it may be necessary to repeat the starting procedures. If engine does not start after four attempts, push IGNITION-START switch (4) in and notify supervisor.

(k) When engine water temperature reaches 140° F (60° C), as indicated on ENGINE WATER TEMPerature gauge (9), close the hose reel valve (1) and appropriate double discharge valve (2) and turn COMPRessor UNLOADER AND IDLE CONTROL knob (3) counterclockwise until it stops. This action increases engine speed and opens compressor intake valve to start compression.

CAUTION

Operating the equipment unattended for prolonged periods of time can result in serious damage to the unit.

(l) Unit is now ready for use and will cycle through load and unload automatically in relation to air demand. As demand increases, the engine will accelerate and the compressor will replenish compressed air supply in the separator tank. As demand decreases, or stops, engine will return to idle and compressor will run in an unloaded condition until demand for air again causes unit to load.

(m) Perform all the DURING PMCS as outlined in Table 2-1.

(2) Shutdown Procedure. (See Figure 2-5.)

(a) Turn COMPR UNLOADER AND IDLE CONTROL knob (3) clockwise until it stops.

(b) Close hose reel valve (1) and appropriate double discharge valve (2).

2-8. UNUSUAL ENVIRONMENT/WEATHER. -Continued

(c) When engine speed reduces to steady idle speed, push IGNITION-START switch (4) all the way in to 'stop the engine.

2-9 EMERGENCY STOP PROCEDURES.

Should an emergency exist requiring immediate stopping, perform the following procedures in sequence. (See Figure 2-5.)

a. Push IGNITION-START switch (4) inward to off position.

b. Close hose reel valve (1) and appropriate double discharge valve (2), if necessary.

2-10. NBC PROCEDURES.

The following emergency procedures can be performed until field NBC decon facilities are available. If NBC attack is known or suspected, mask at once and continue mission. If outside, follow decon procedures below to avoid taking contamination into controlled area. Do not unmask until told to do so.

NOTE

Detailed decon procedures can be found in: FM 3-3, FM 3-4, and FM 3-5.

a. Nuclear Decontamination. Brush fallout from skin, clothing and equipment with available brushes, rags, and tree branches. Wash skin and have radiation check made as soon as tactical situation permits.

b. Biological Decontamination. Remain masked and continue mission until told to unmask.

c. Chemical Detection and Decontamination.

WARNING

Some decontamination sprays can cause personal injury and should not be used on personnel.

(1) Contact your local chemical detachment or unit for proper use of decontamination equipment.

(2) If exposure to liquid agent is known or suspected, clean exposed skin, clothing, personal gear, and equipment, in that order, using M258A1 kit. Use the buddy system. Wash exposed skin and thoroughly decontaminate as soon as tactical situation permits.

(3) Use M8 paper from the M256 Chemical Agent Detector Kit or M9 paper to determine if liquid agent is present on the equipment.

(4) If the M8 or M9 paper indicates that liquid chemical agent is present on the equipment, use the NBC-Mll decon apparatus to decon equipment.

CHAPTER 3

OPERATOR MAINTENANCE INSTRUCTIONS

SECTION I LUBRICATION INSTRUCTIONS

3-1. LUBRICATION INSTRUCTIONS.

Lubrication not required at operator maintenance level, all lubrication instructions occur at unit maintenance level.

SECTION II TROUBLESHOOTING PROCEDURES

3-2. INTRODUCTION.

a. Arrangement of Procedures. The procedures are arranged so that the most probable malfunctions appear first. The malfunction is stated first, followed by test or inspection procedure represented in logical order to isolate and identify the fault or action required to correct the fault.

b. Introductory Information.

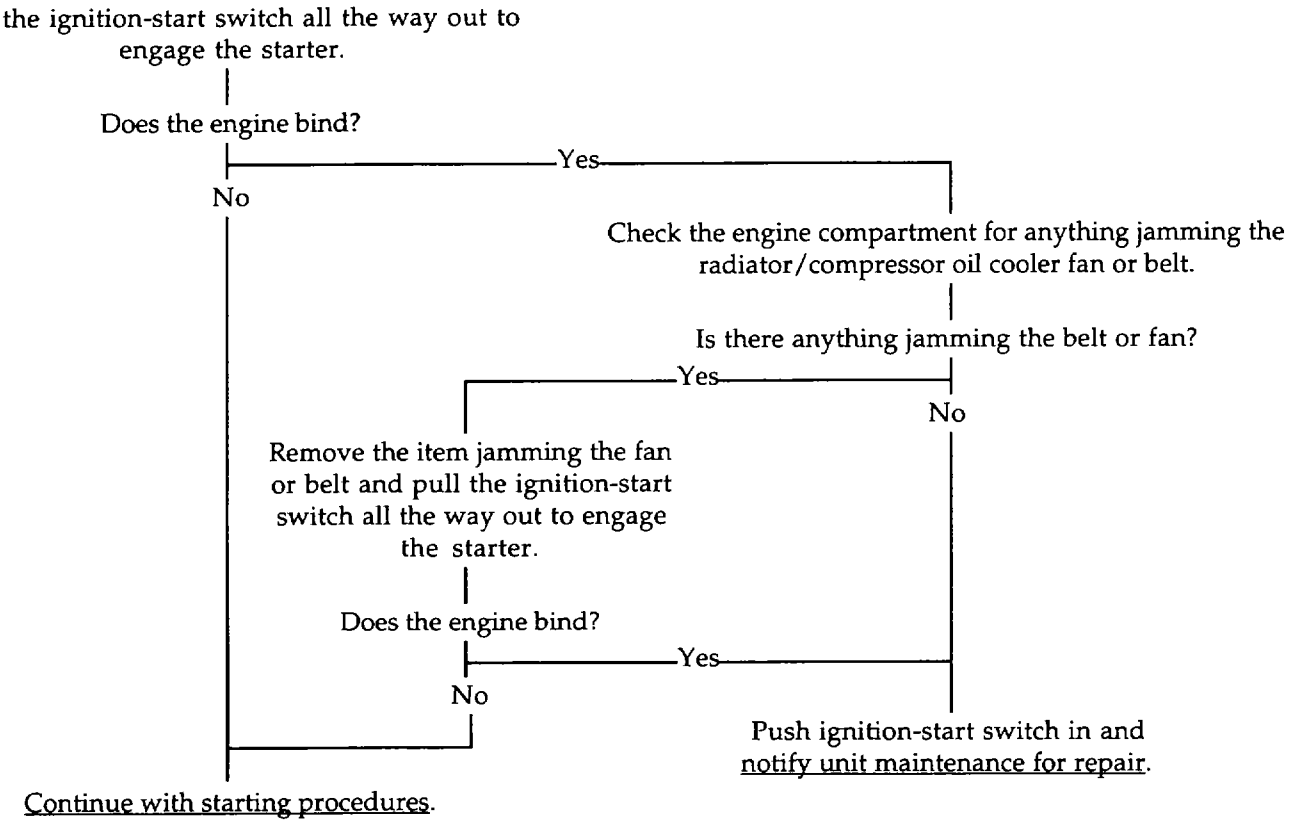
(1) This table lists common malfunctions that you may find with your equipment. Perform the tests, inspections, and corrective actions in the order they appear in the table.

(2) This table cannot list all the malfunctions that may occur, all the tests and inspections needed to find the fault, or all the corrective actions needed to correct the fault. If the equipment malfunction is not listed or actions listed do not correct the fault, notify your supervisor.

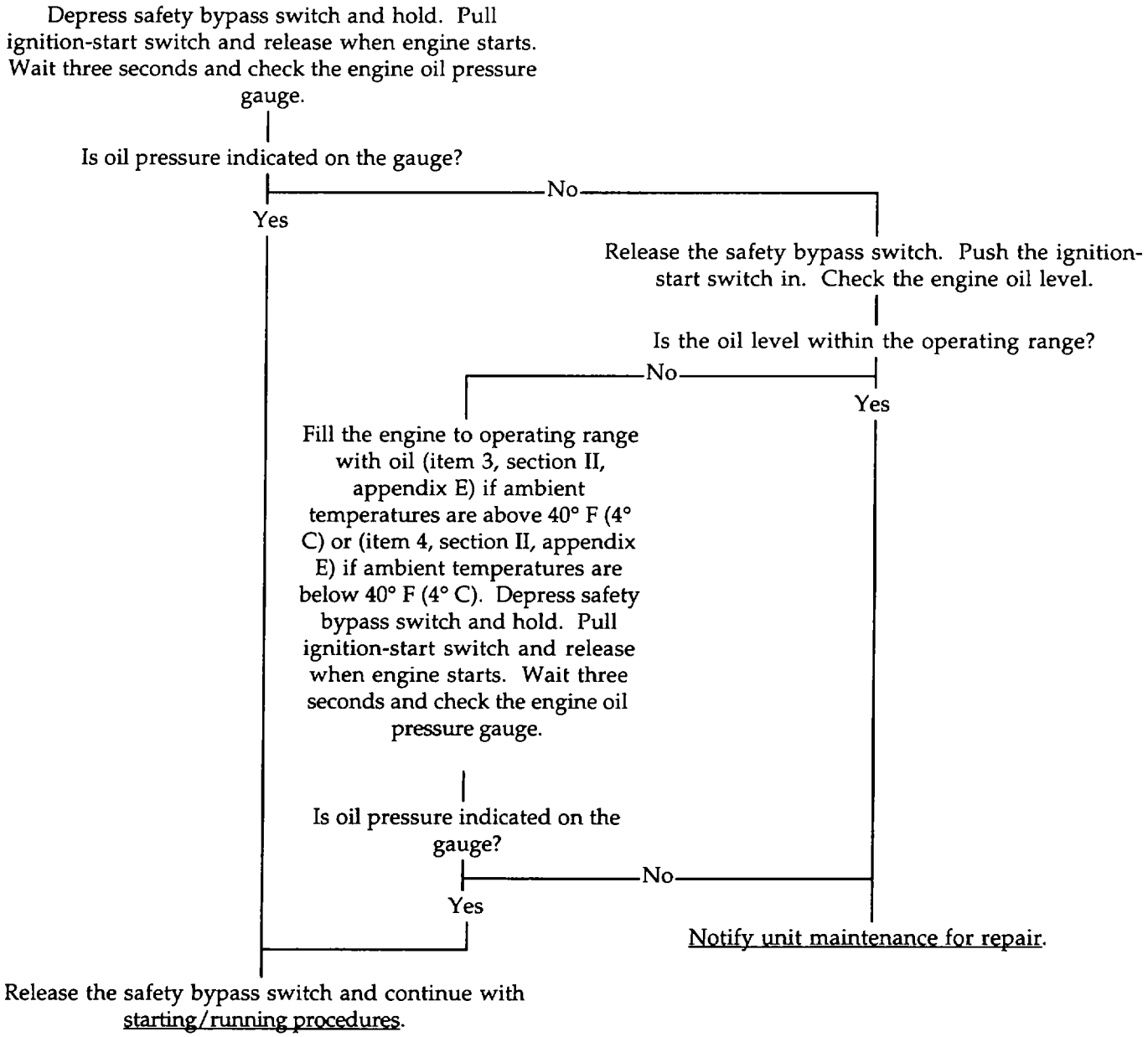
MALFUNCTION INDEX

	Troubleshooting Procedure Para
Engine Binds When Attempting Start	3-3
Engine Oil Pressure Does Not Register On Gauge When Starting	3-4
Engine Will Not Start In Low Temperatures	3-5
Engine Will Not Start In High Temperatures	3-6

3-3. ENGINE BINDS WHEN ATTEMPTING START.



3-4. ENGINE OIL PRESSURE DOES NOT REGISTER ON GAUGE WHEN STARTING.



3-5. ENGINE WILL NOT START IN LOW TEMPERATURES.

Pull cold weather starting aid cable out and wait for three seconds. Push cable in. Depress safety bypass switch and hold. Pull ignition-start switch and release when engine starts. Wait three seconds and release safety bypass switch.

Is engine running?

- No → Notify unit maintenance for repair.
- Yes → Continue with start/operation procedures.

3-6. ENGINE WILL NOT START IN HIGH TEMPERATURES.

Rotate priming pump knob until detent pin releases. Pull pump plunger completely out then push it back in slowly. Depress safety bypass switch and hold. Pull ignition-start switch and release when engine starts. Wait three seconds and release safety bypass switch.

Is engine running?

- No → Check fuel level in fuel tank.
  - Is fuel tank empty?
    - Yes → Fill fuel tank and repeat starting procedures.
    - No → Notify unit maintenance for repair.
- Yes → Continue with start/operation procedures.

SECTION III OPERATOR'S MAINTENANCE PROCEDURES

3-7. GENERAL.

With the exception of service and inspection procedures noted in the PMCS Table 2-1, the following procedure is the only maintenance procedure authorized to the operator by the MAC.

3-8. CLEANING.

This task covers:

a. Cleaning

INITIAL SETUP

Equipment Conditions:

Air compressor shutdown. (See para 24, c.)
Doors open as necessary.

Cleaning.

(1) Mix a small quantity of detergent (item 6, section II, appendix E) with clean water to make a wash solution.

(2) Dampen a rag (item 2, section II, appendix E) with wash solution and clean the equipment.

(3) Dampen a rag (item 2, section II, appendix E) with clean water and rinse the equipment. Rinse rag in clean water and continue until all detergent residue has been removed.

(4) Wipe the equipment with a clean dry rag (item 2, section II, appendix E) until it is thoroughly dry.

CHAPTER 4

UNIT MAINTENANCE INSTRUCTIONS

SECTION I REPAIR PARTS, SPECIAL TOOLS, TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE), AND SUPPORT EQUIPMENT

4-1. GENERAL.

a. Repair Part. Repair parts are listed and illustrated in the repair parts and special tools list TM 9-4310-39724P covering unit maintenance for this equipment.

b. Authorized Common Tools And Equipment. Refer to the Modified Table of Organization and Equipment (MTOE), CTA 50-970, or CTA 8-100, as applicable to your Air Compressor.

c. Special Tools. TMDE, And Support Equipment. There are no special tools or test equipment required for unit maintenance of the air compressor. Tools and test equipment found in Shop Equipment Automotive Maintenance and Repair, Organizational Maintenance, Common NO. 1 & 2 Less Power are adequate to accomplish the maintenance function required.

SECTION II SERVICE UPON RECEIPT

4-2. UNLOADING.

NOTE

The rotary air compressor is packed in a crate designed for shipment and handling with the cabinet in an upright position. The base of the crate is constructed as a shipping pallet with provisions for the insertion of forklift tongs.

a. Remove all blocking and tiedowns that may have been used to secure the container to the carrier.

CAUTION

Using an overhead lifting device and slings without appropriate spreader bars can result in container/equipment damage.

b. Using a forklift truck or other suitable material handling equipment, remove the crated Air Compressor from the carrier.

4-3. SITE AND SHELTER REOUIREMENTS.

CAUTION

Operating the rotary air compressor on a surface angled greater than 15 degrees in any direction can cause equipment damage.

Place the Air Compressor at or near the operating location on a surface within 15 degrees of level in any direction.

4-4. UNPACKING.

a. Remove all crating, blocking, and protective material.

CAUTION

Using an overhead lifting device and slings without appropriate spreader bars can result in container/equipment damage.

b. Using a forklift truck or other suitable material handling equipment, lift the Air Compressor and remove the crate base.

c. Store the container and packing material for future use.

4-5. PROCESSING UNPACKED EOUIPMENT.

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged in any way, report the damage on SF 364, Report of Discrepancy.

b. Check the equipment against the packing slip to see if the shipment is complete. Report any discrepancies in accordance with the instructions on DA Pam 738-750 or DA Pam 738-751.

4-6. INSTALLATION INSTRUCTIONS/PREPARATION FOR USE.

a. Connect Battery Cables. The Air Compressor is shipped with the battery cables disconnected from the battery posts.

(1) Open roadside access doors (Figure 4-1, 1).

(2) Unclip latches (2) and remove box cover (3).

(3) Connect wire leads (4) to battery terminals (5). Refer to wire lead tags and (Figure 4-2) for correct hookup. Wiring diagram (Figure 4-3) may also be used.

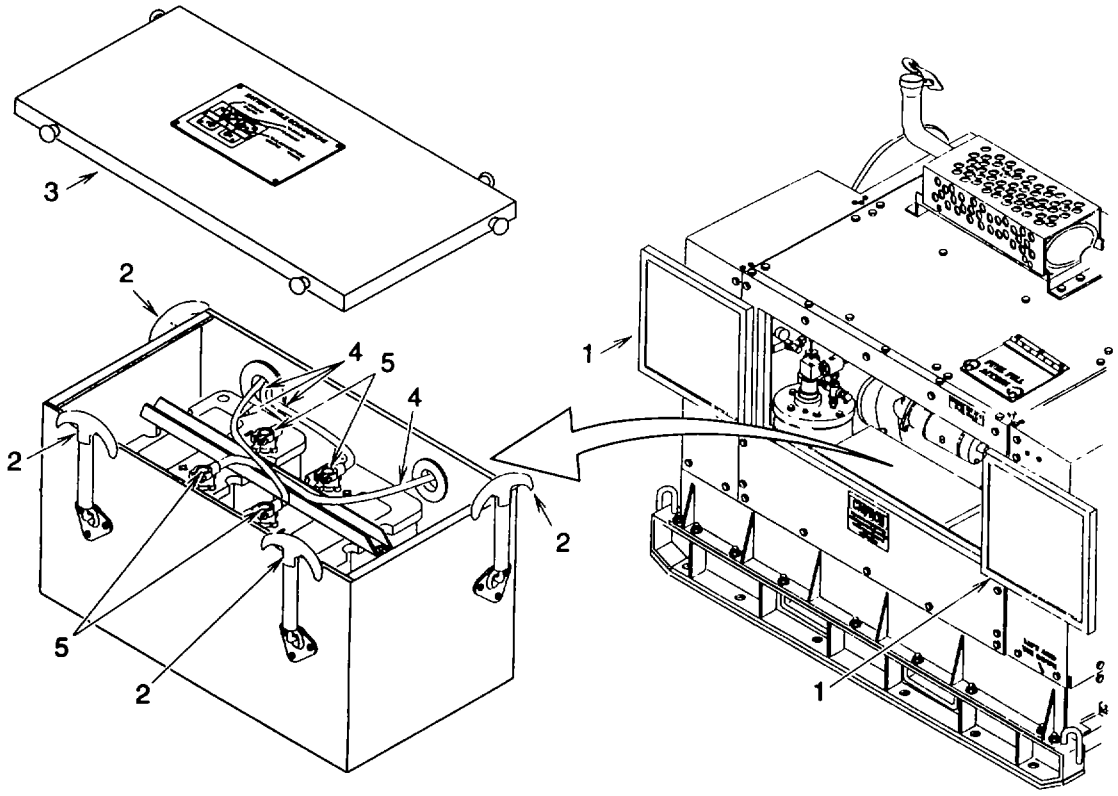


Figure 4-1. Battery Access

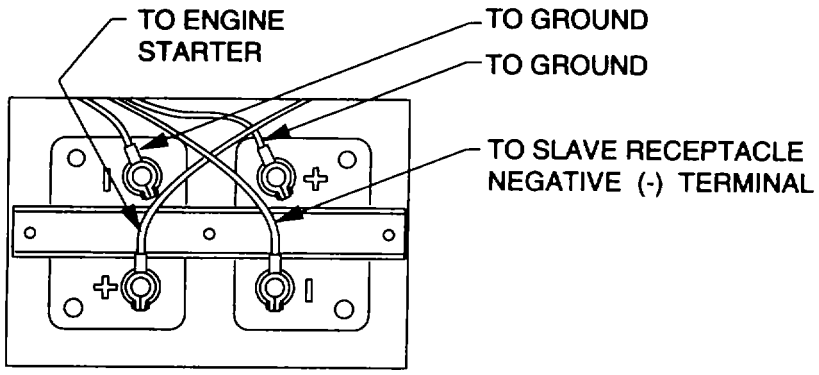


Figure 4-2. Battery Cable Connections

4-6. INSTALLATION INSTRUCTIONS/PREPARATION FOR USE. - Continued

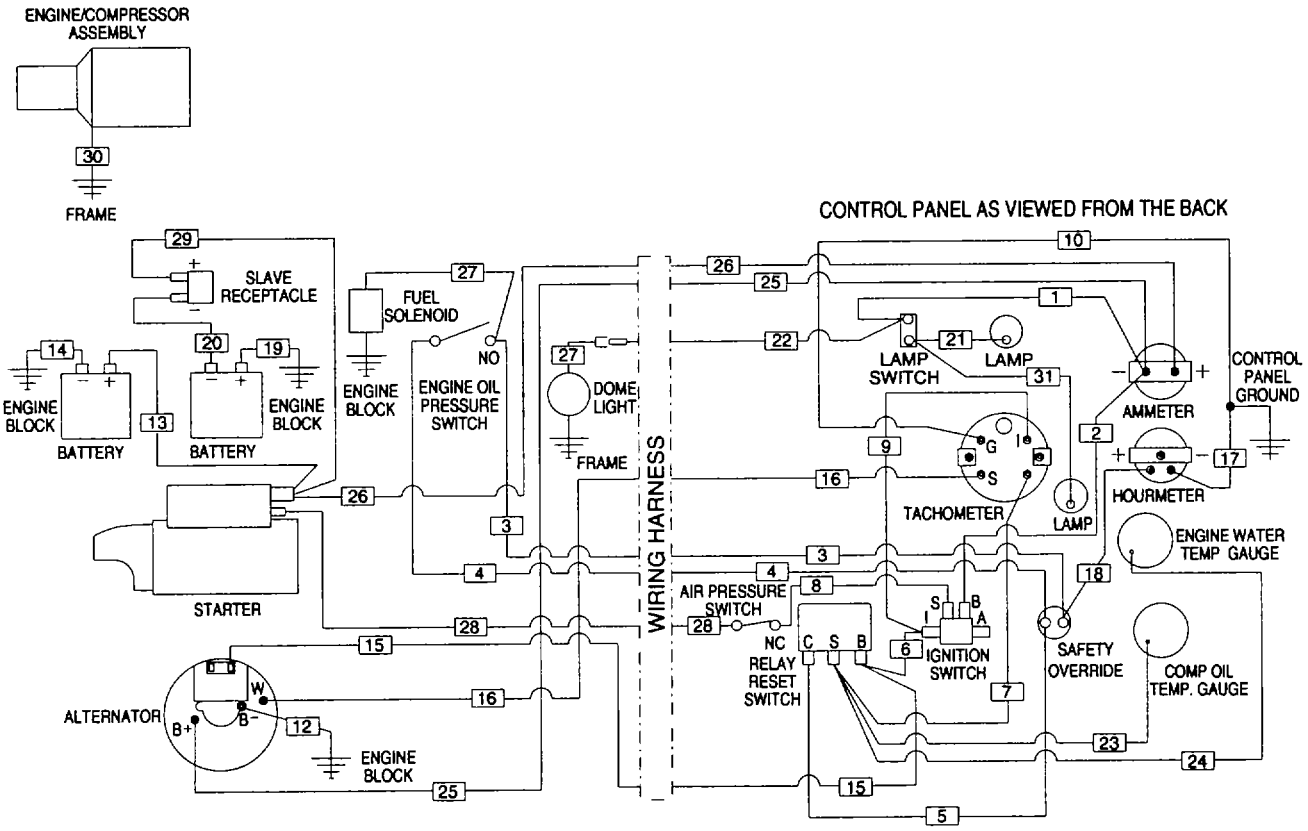


Figure 4-3. Wiring Diagram

(4) Install box cover (3) and clip latches (2) onto box cover.

(5) Close roadside access doors (1).

b. Drain Fuel Tank. The fuel tank may have residual P-10 preservative oil in it that must be removed.

(1) Remove four hex washer head bolts (Figure 4-4, 1) and lock washers (2). Dispose of lock washers.

(2) Open airblock (3).

(3) Place pan (section II, appendix D) under fuel tank (4).

(4) Remove fuel tank drain plug (5) and wait for all P-10 preservative to drain out. Contact your local environmental officer for guidance on how to properly dispose of P-10 preservative in accordance with local regulations.

(5) Wrap antiseize tape (item 1, section II, appendix E) around the drain plug (5) threads.

(6) Clean the fuel tank (4) drain with a wiping rag (item 2, section II, appendix E) and install the drain plug (5).

(7) Close airblock (3).

(8) Install four hex washer head bolts (1) and new lock washers (2) (item 4, appendix H).

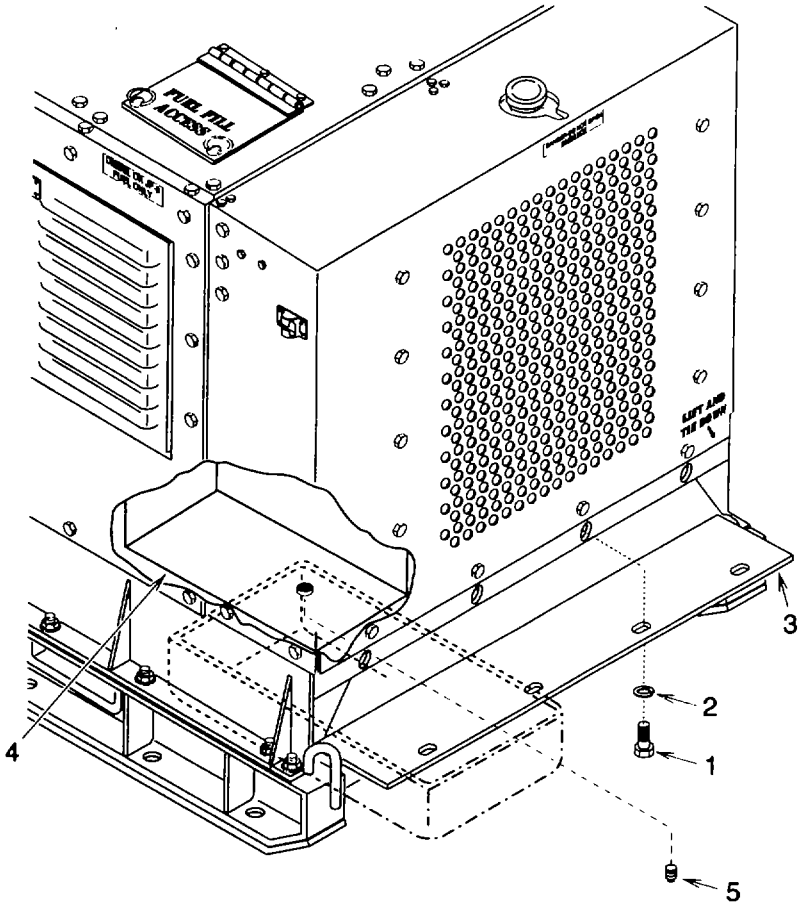


Figure 4-4. Fuel Tank Draining

c. Drain and Fill Engine Crankcase. The engine is preserved with P-10 preservative oil that must be drained and replace with the appropriate motor oil for the operating conditions.

(1) Drain.

(a) Open curbside access doors (Figure 4-5, 1).

(b) Place a pan (section II, appendix D) under engine (2).

(c) Remove drain plug (3) and wait for all P-10 preservative to drain out. Contact your local environmental officer for guidance on how to properly dispose of P-10 preservative in accordance with local regulations.

(d) Wrap antiseize tape (item 1, section II, appendix E) around the drain plug (3) threads.

4-6. INSTALLATION INSTRUCTIONS/PREPARATION FOR USE. -Continued

(e) Clean the engine (2) drain with a wiping rag (item 2, section II, appendix E) and install the drain plug (3).

(f) Close curbside access doors (1).

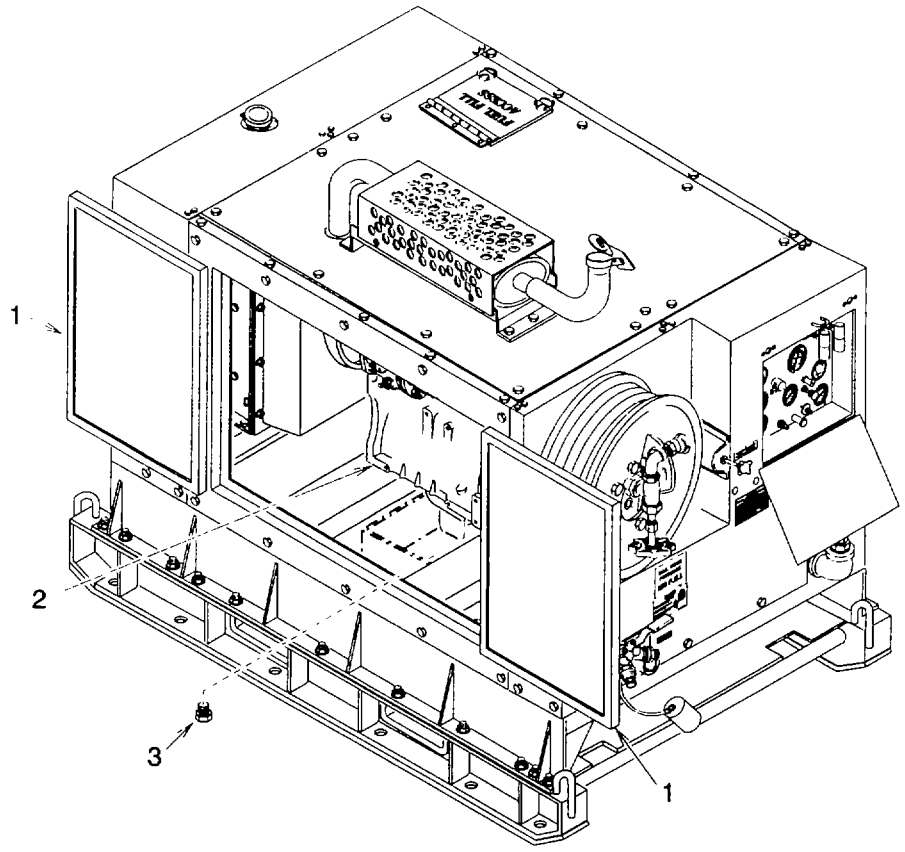


Figure 4-5. Engine Oil Draining

(2) Fill.

(a) Open roadside access doors (Figure 4-6, 1).

(b) Remove oil fill cap (2).

(c) Install 9 quarts of lubricating oil (item 3, section II, appendix E) if engine is being operated at temperatures above 40° F or (item 4, section II, appendix E) if operated at temperatures below 40° F.

(d) Install oil fill cap (2).

(e) Close roadside access doors (1).

d. Check Compressor Oil. Drain. and Fill. The compressor is shipped with the proper quantity of lubricating oil for operation but should be checked prior to operation. The lubricating oil supplied is intended for use at operating, temperatures above 40° F. If operating temperatures are below 40° F, the lubricating oil must be drained and filled with appropriate lubricating oil.

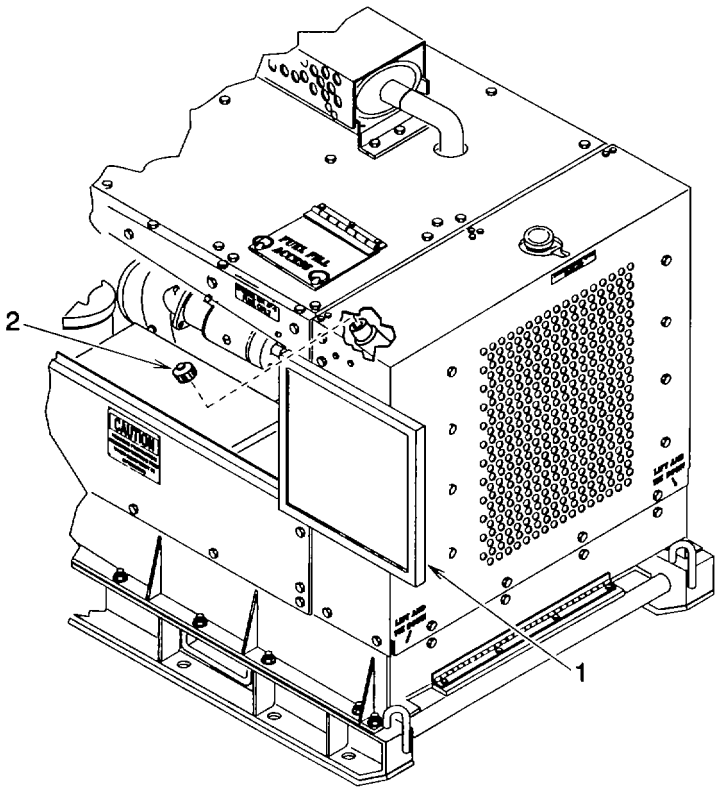


Figure 4-6. Engine Oil Filling

(1) Check.

(a) Remove oil filler cap (Figure 4-7, 1) and check oil level in pipe. Proper quantity is indicated by oil level being visible in elbow (2).

(b) If oil level is low and operating temperatures will be above 40° F, add oil (item 3, section II, appendix E).

(c) Check condition of preformed packing (3). If cut or damaged in any way, replace it.

(d) Clean the adapter (4) with a wiping rag (item 2, section II, appendix E) and install oil filler cap (1).

(2) Drain and Fill. If operating temperatures will be below 40° F it is necessary to drain and fill with appropriate lubricating oil (item 4, section II, appendix E).

(a) Remove oil filler cap (1).

(b) Remove drain valve plug (5).

(c) Install a pipe (section II, appendix D) into drain valve (6).

(d) Place a pan (section II, appendix D) under pipe end.

(e) Open drain valve (6) and wait for all lubricating oil to drain out. Contact your local environmental officer for guidance on how to properly dispose of lubricating oil in accordance with local regulations.

4-6. INSTALLATION INSTRUCTIONS/PREPARATION FOR USE. - Continued

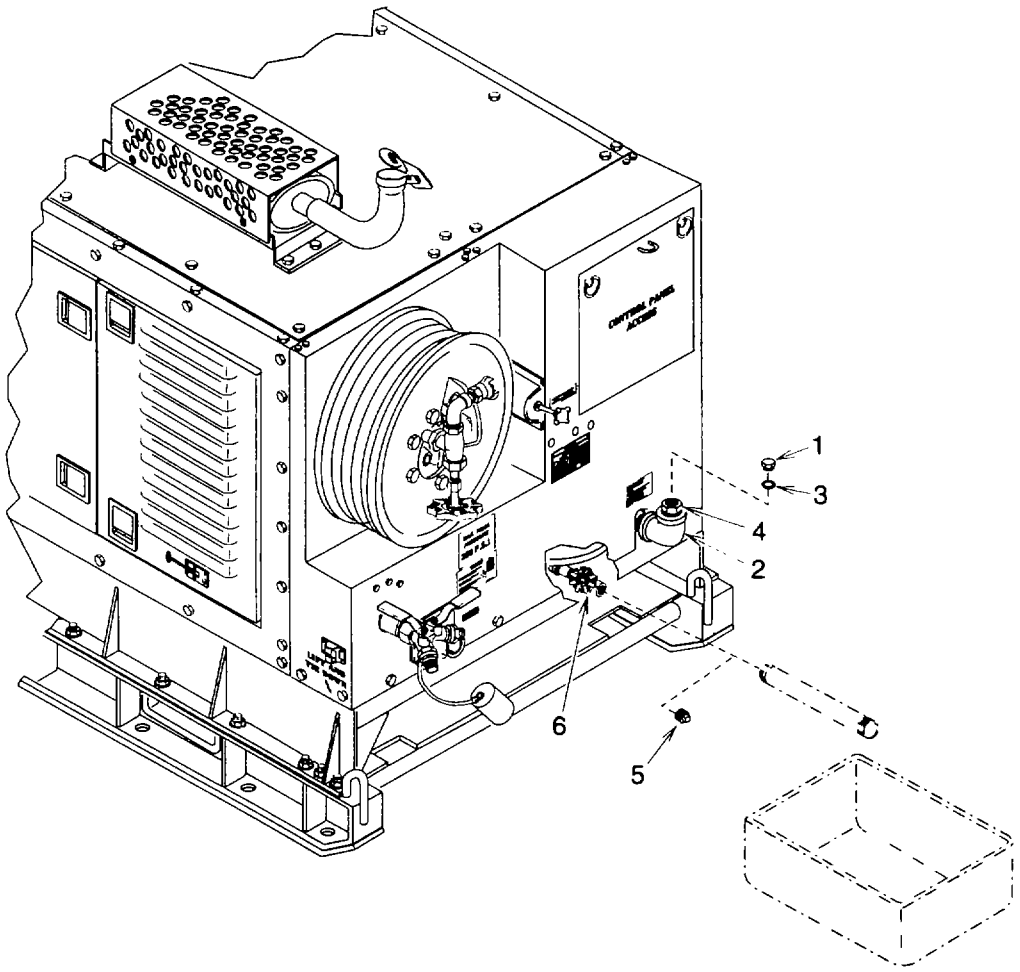


Figure 4-7. Compressor Oil Checking, Draining, and Filling

(f) Close drain valve (6) and remove pipe.

(g) Wrap antiseize tape (item 1, section II, appendix E) around the drain valve plug (5) threads.

(h) Clean the drain valve (6) with a wiping rag (item 2, section II, appendix E) and install the drain valve plug (5).

(i) Install approximately 20 quarts of lubricating oil (item 4, section II, appendix E) or until oil is visible in elbow (2).

(j) Check condition of preformed packing (3). If cut or damaged in any way, replace it.

(k) Clean the adapter (4) with a wiping rag (item 2, section II, appendix E) and install oil filler cap (1).

e. Drain and Fill Radiator. The engine cooling system is shipped with the proper mixture of coolant solution for operation at temperatures above 0° F. If operating temperatures are below 0° F, the coolant solution must be drained and filled. See step (7).

(1) Remove four hex washer head bolts (1) and lock washers (2). Discard lock washers.

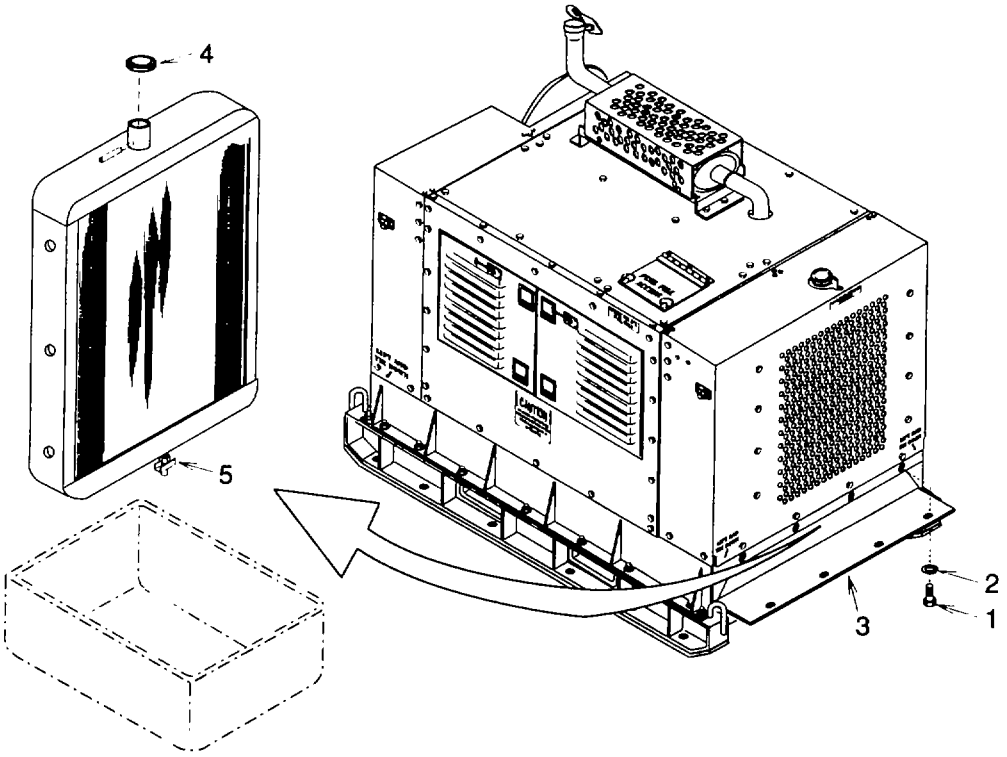


Figure 4-8. Coolant Draining and Filling

(2) Open airblock (3).

(3) Remove radiator filler cap (4).

(4) Place pan (section II, appendix D) under radiator drain cock (5).

(5) Open drain cock (5) and wait for all coolant solution to drain out. Contact your local environmental officer for guidance on how to properly dispose of coolant solution in accordance with local regulations.

NOTE

A drain cock is also provided on the curbside of the engine block. This drain cock is to be used only to ensure that engine has been totally drained of coolant should the unit be stored without proper antifreeze mix during freezing temperatures.

(6) Close drain cock (5).

4-6. INSTALLATION INSTRUCTIONS/PREPARATION FOR USE.- Continued

(7) Install approximately 18 quarts of antifreeze (item 8, section II, appendix E) or until antifreeze mixture is visible in top of radiator.

(8) Install radiator filler cap (4).

(9) Close airblock (3).

(10) Install four hex washer head bolts (1) and new lock washers (2) (item 4, appendix H).

SECTION III PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS), LUBRICATION AND MANDATORY REPLACEMENT PARTS

4-7. INTRODUCTION TO PMCS TABLE.

a. General. The PMCS table is provided to aid the user in performing all checks and services required to maintain equipment in optimum condition and prevent unnecessary equipment downtime.

b. PMCS Procedures. The PMCS procedures are arranged in groups according to their first intervals. Procedures done first or most frequently appear first. Intervals are determined by hours of operation and are expressed in decimals of an hour.

(1) Item No Column. Item numbers columns indicate assigned numbers to procedures (2) Interval Column. This column indicates when the checks and services are to be preformed.

(3) Item To Be Checked Or Serviced. This column identifies the part being checked.

(4) Procedure Column. The procedure column describes which checks are to be preformed first and will include lubrication procedures and lubrication points as required.

(5) Not Fully Mission Capable If Column. This column will contain a brief statement that would cause the equipment to be less than fully ready to perform its assigned mission.

c. Special Information Paragraphs.

(1) Lubrication. Lubrication instructions have been included in the table where applicable. Refer to LO 9-4310-397-12 for hardtime lubrication points and intervals.

(2) Corrosion Prevention and Control. If a corrosion problem is identified, it can be reported using Standard Form 368, Product Quality Deficiency Report. The form should be submitted to the address specified in DA Pam 738-750. This will result in more definitive actions be taken to prevent future occurrences.

(3) AOAP Sampling Interval. This rotary air compressor is not enrolled in the Army Oil Analysis Program. HARDTIME INTERVALS APPL. Refer to LO 9-4310-397-12 for hardtime lubrication points and intervals.

(4) Leakage Definition for Unit PMCS. It is necessary for you to know how fluid leakage affects the status of your air compressor. The following are types/classes of leakage a mechanic needs to know to be able to determine the status of their Air Compressor. When in doubt, notify your supervisor.

CAUTION

- **Equipment operation is allowable with minor leaks (Class I or II). Consideration must be given to fluid capacity in the item/system being checked/inspected.**
- **When operating with Class I or II leaks continue to check fluid levels as required in your PMCS.**
- **Class III leaks should be reported immediately to your supervisor.**

(a) Class I is defined as seepage of fluid as indicated by wetness or discoloration but not great enough to form drops.

(b) Class II is defined as leakage of fluid great enough to form drops but not enough to cause drops to drip from item being checked/inspected.

(c) Class HI is defined as leakage of fluid great enough to form drops that fall from item being checked/inspected.

Table 4-1. Preventive Maintenance Checks and Services for 16MS125

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
1	Quarterly	Compressor Air Intake, Compressor Air Cleaner	Service compressor air cleaner as follows: a. Open access doors (1).	
			b. Remove wing nut (2), flat washer (3), banjo fitting (4), weather hood (5), and filter (6).	
			c. Inspect filter (6) for any visible damage or restriction such as dirt accumulation.	Filter damaged or restricted.
			d. Clean or replace filter.	
			e. Install filter (6), weather hood (5), banjo fitting (4), flat washer (3), and wing nut (2). Be sure larger end of banjo fitting is toward weather hood. f. Close access doors (1).	

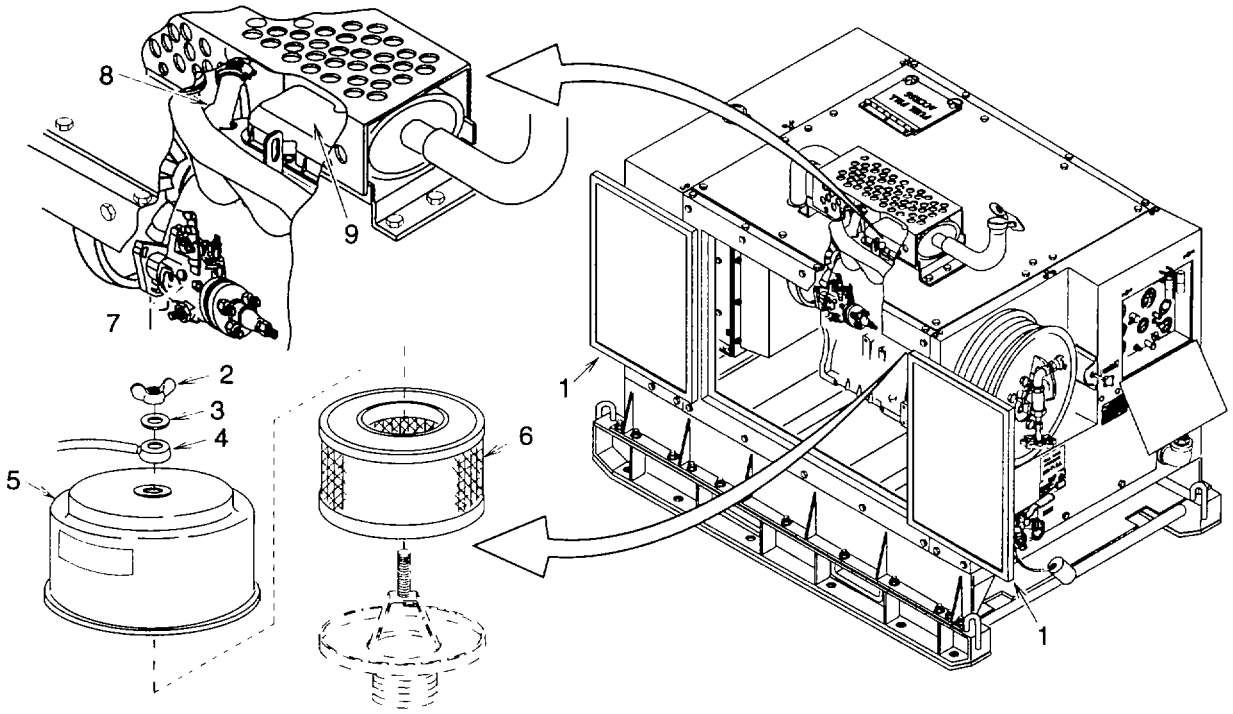


Table 4-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

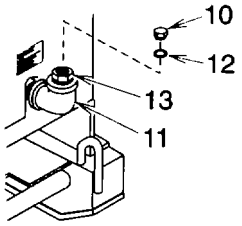
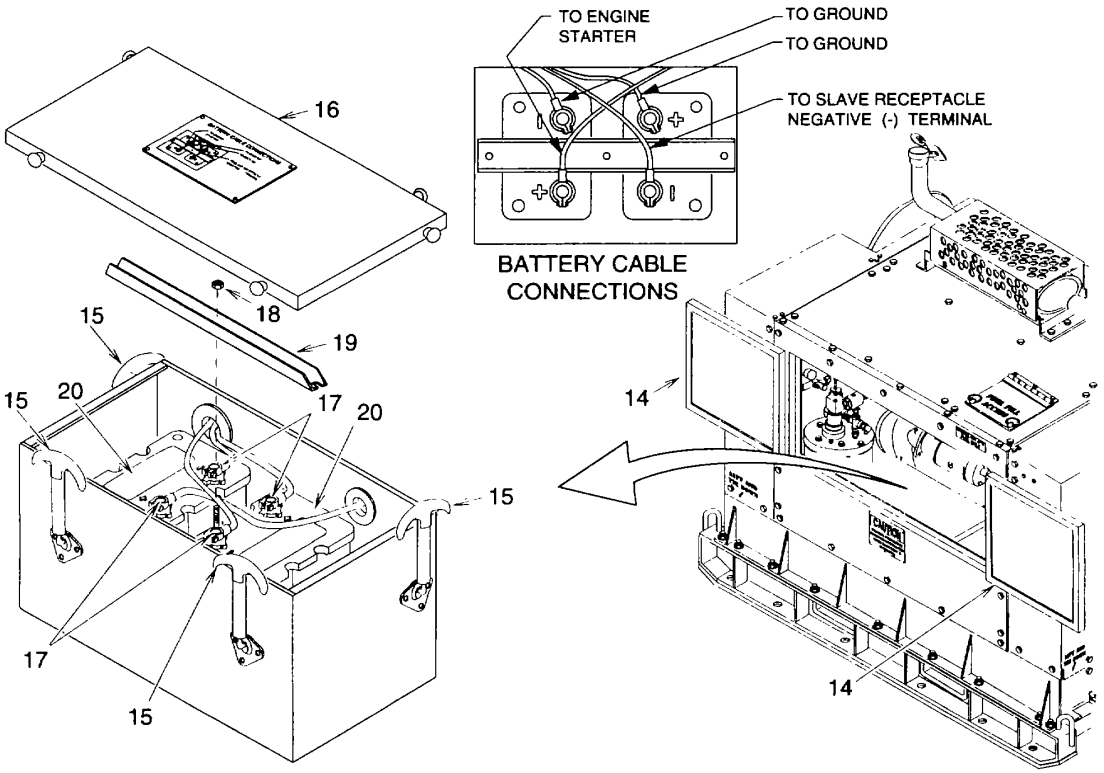
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
2	Quarterly	Engine, Fuel Injection Pump	a. Open access doors (1). b. Inspect fuel injection pump (7) for any visible damage or leaks. c. Close access doors (1).	Injection pump damaged or class III leak is found.
3	Quarterly	Engine, Thermostat	a. Open access doors (1). b. Inspect thermostat housing (8) for any visible damage or leaks. c. Close access doors (1).	Thermostat damaged or class III leak is found.
4	Quarterly	Engine, Rocker Arm Cover	a. Open access doors (1). b. Inspect valve cover (9) for any visible damage or leaks. c. Close access doors (1).	Valve cover damage that would interfere with rocker arm operation or class III leak is found.
5	Quarterly	Front, Compressor	Service compressor by checking lubricating oil as follows: a. Remove oil filler cap (10) and check oil level in pipe. Proper quantity is indicated by lubricating oil level being visible in elbow (11).  b. Check condition of preformed packing (12). c. Clean the adapter (13) with a wiping rag (item 2, section II, appendix E) and install oil filler cap (10).	Lubricating oil is not visible in elbow. Preformed packing damaged.

Table 4-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
6	Quarterly	Battery Box, Batteries	Service batteries by swapping positions in the battery box as follows: a. Open access doors (14).	



b. Unclip latches (15) and remove box cover (16).

c. Tag (item 18, section II, appendix E) and carefully disconnect battery cables (17). Disconnect the negative terminal connectors first, then the positive terminals connectors.

d. Remove hex nuts (18) and battery hold down (19).

Table 4-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

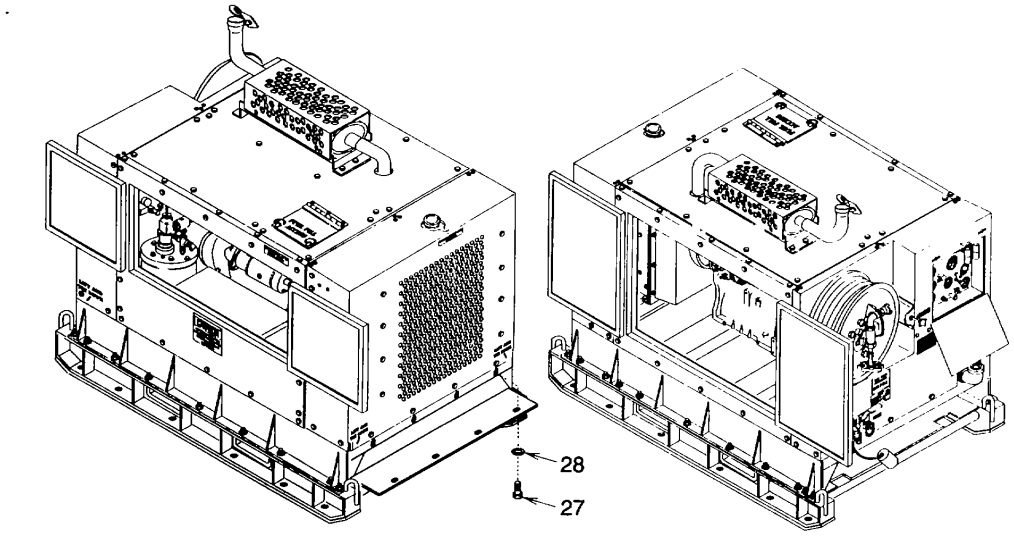
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
6- Cont			e. Swap batteries (20) being careful to place them with positive and negative terminals properly oriented per battery connection illustration. f. Install battery hold down (19) and hex nut (18). g. Carefully connect battery cables(17) using tags and connection illustration. Connect the positive terminal connections first, then the negative terminal connections. Remove tags. h. Install box cover (16) and clip latches (15) onto box cover. i. Close access doors (14).	
7	Quarterly	Engine Intake, Engine Air Cleaner	Service engine air cleaner as follows: a. Open access doors (21). b. Remove wing nut (22), flat washer (23), banjo fitting (24), air cleaner lid (25), and filter (26). c. Inspect filter (26) for any visible damage or restriction such as dirt accumulation. d. Clean or replace filter (26) e. Install filter (26), air cleaner lid (25), banjo fitting (24), flat washer (23), and wing nut (22). Be sure larger end of banjo fitting is toward air cleaner lid. f. Close access doors (21).	Filter damaged or restricted.

Table 4-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
8	Semi-annually	Exterior, Doors	Service doors by lubricating them as follows: a. Remove four hex washer head bolts (27) and lock washers (28). Discard lock washers. b. Open all doors. c. Lubricate hinges with lubricating oil (item 10, section II, appendix E). Clean any excess lubricating oil with a wiping rag (item 2, section II, appendix E). d. Close all doors. e. Install four hex washer head bolts (27) and new lock washers (28) (item 4, section IV, chapter 4).	

Table 4-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
9	Annually	Engine, Fuel Injection Nozzle	a. Open access doors (29). b. Inspect fuel injection nozzle (30) for any visible damage or leaks. c. Close access doors (29).	Fuel injection nozzle damaged or any fuel leak is found.



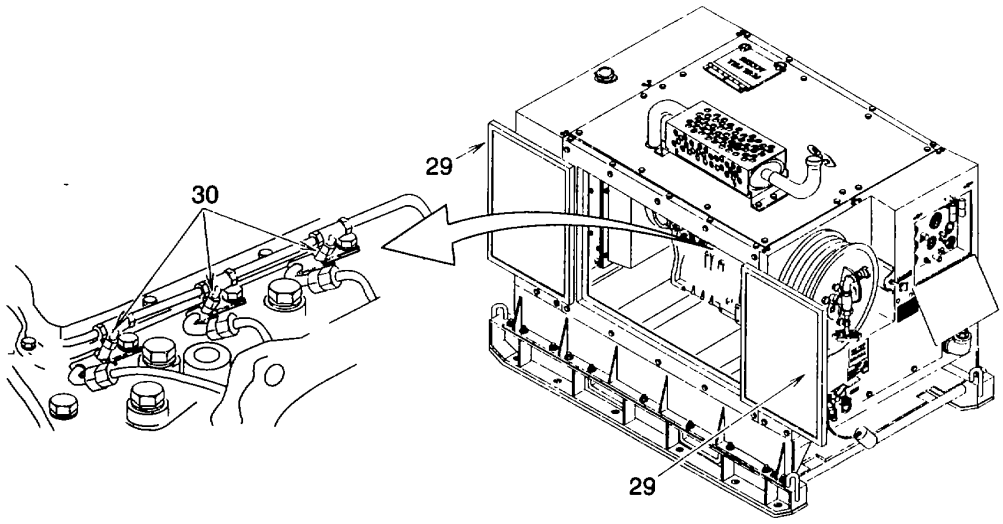


Table 4-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
10	At First 100 Service Hours (Initial Break-in)	Compressor, Compressor Oil Filter	Service compressor oil filter by replacing it as follows: a. Open access doors (31). b. Carefully remove compressor oil filter (32).	

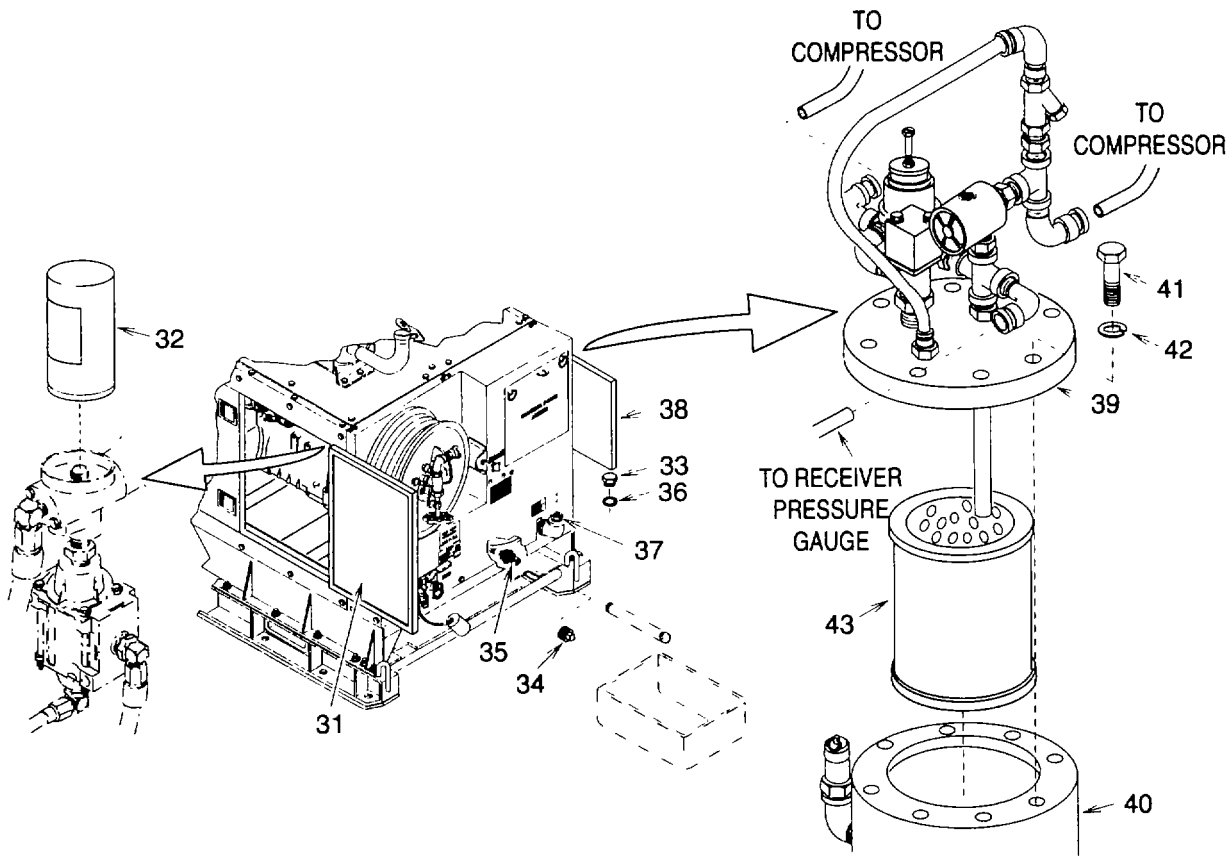


Table 4-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
10 - Cont			c. Inspect the old compressor oil filter (32) for any dark brown, sticky substance on the inside surface. This indicates that a varnish condition exists in the oil system and the following cleaning procedures must be performed. Discard oil filter. Contact your local environmental officer for guidance on how to dispose of oil filter in accordance with local regulations. (1) Remove oil filler cap (33). (2) Remove drain valve plug (34). (3) Install a pipe (section II, appendix D) into drain valve (35). (4) Place a pan (section II, appendix D) under pipe end. (5) Open drain valve (35) and wait for all lubricating oil to drain out. Contact your local environmental officer for guidance on how to properly dispose of lubricating oil in accordance with local regulations. (6) Close drain valve (35). (7) Install a mixture of two quarts Thermo-Solve concentrate (item 16, section II, appendix E) and approximately 18 quarts lubricating oil (item 4, section II, appendix E). (8) Check condition of preformed packing (36). Replace if damaged.	Preformed packing damaged.

Table 4-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
10- Cont			(9) Clean the adapter (37) with a wiping rag (item 2, section II, appendix E) and install oil filler cap (33). (10) Install new compressor oil filter (32) (item 2, section IV, chapter 4). (11) Operate the compressor under normal conditions for 40 to 60hours. This will allow the oil/solvent mixture sufficient time to dissolve and suspend the varnish in the system. (12) Place a pan (section II, appendix D) under pipe end. (13) Shut down the compressor and while the oil is still hot, open drain valve (35) and wait for all lubricating oil/solvent mixture to drain out. Contact your local environmental officer for guidance on how to properly dispose of lubricating oil/solvent mixture in accordance with local regulations. (14) Close drain valve (35) and remove pipe. (15) Carefully remove and discard oil filter (32). (16) Open access doors (38). (17) Tag (item 18, section II, appendix E) and disconnect hoses as necessary to remove oil separator cover (39).	

Table 4-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

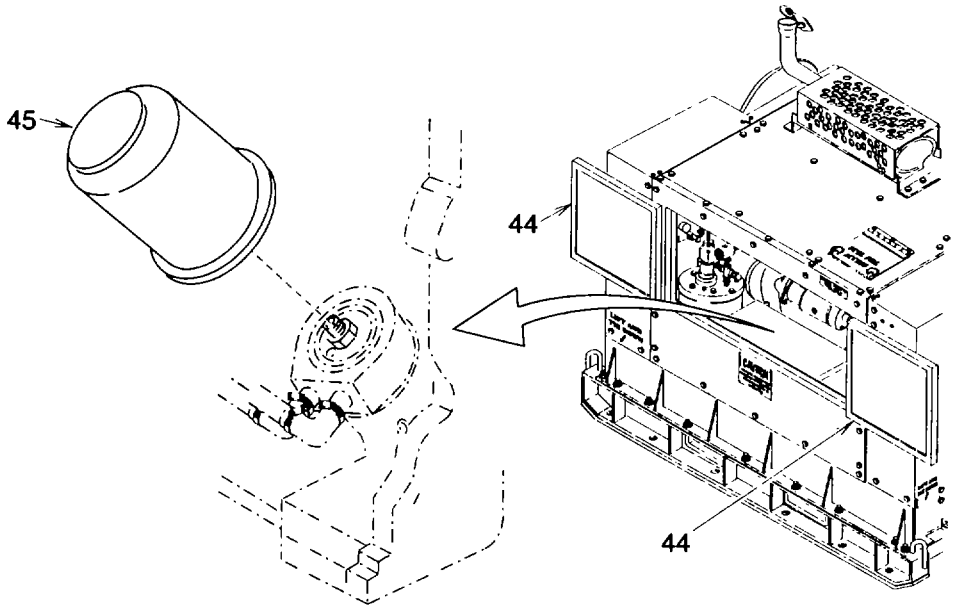
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
10- Cont			(18) Match mark the oil separator cover (39) with the oil separator tank (40). Remove eight hex head screws (41), lock washers (42), and oil separator cover. Discard lock washers. (19) Remove and discard separator element (43). (20) Install new separator element (43) (item 9, section IV, chapter 4). **CAUTION** **Using standard commercial hex head screws in place of high tensile hex head screws to secure the oil separator cover can result in damage or failure of the equipment during operation. The original, or correct replacement, high tensile hex head screws must be used to secure the oil separator cover to meet ASME standards for pressure vessels.** (21) Install oil separator cover (39) and align match marks. Install eight hex head screws (41) and new lock washers (42) (item 1, section IV, chapter 4). (22) Connect any loose hoses per tags. Remove tags. (23) Close access doors (38). (24) Wrap antiseize tape (item 1, section II, appendix E) around the drain valve plug (34) threads.	

Table 4-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
			(25) Clean the drain valve (35) with a wiping rag (item 2, section II, appendix E) and install the drain valve plug (34).	
			(26) Install approximately 20 quarts lubricating oil (item 4,section II, appendix E), or until oil is visible in elbow.	Oil level not visible in filler pipe elbow.
			(27) Check condition of preformed packing (36).	Preformed packing damaged.
			(28) Clean the adapter (37) with a wiping rag (item 2, section II, appendix E) and install oil filler cap (33). d. Clean any spills with a wiping rag (item 2, section II, appendix E). e. Install new compressor oil filter(32) (item 2, section IV, chapter 4). f. Close access doors (31)	
11	At First 100 Service Hours (Initial Break-in)	Engine, Engine oil Filter	Service engine oil filter by replacing it as follows: a. Open access doors (44). b. Carefully remove and discard engine oil filter (45). c. Clean any oil spills with a wiping rag (item 2, section II, appendix E). d. Install new engine oil filter (45) (item 8, section IV chapter 4). e. Close access doors (44).	

Table 4-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
12	250 Service Hours	Engine, Engine oil Filter	Service engine oil filter by replacing it as follows: a. Open access doors (46).	



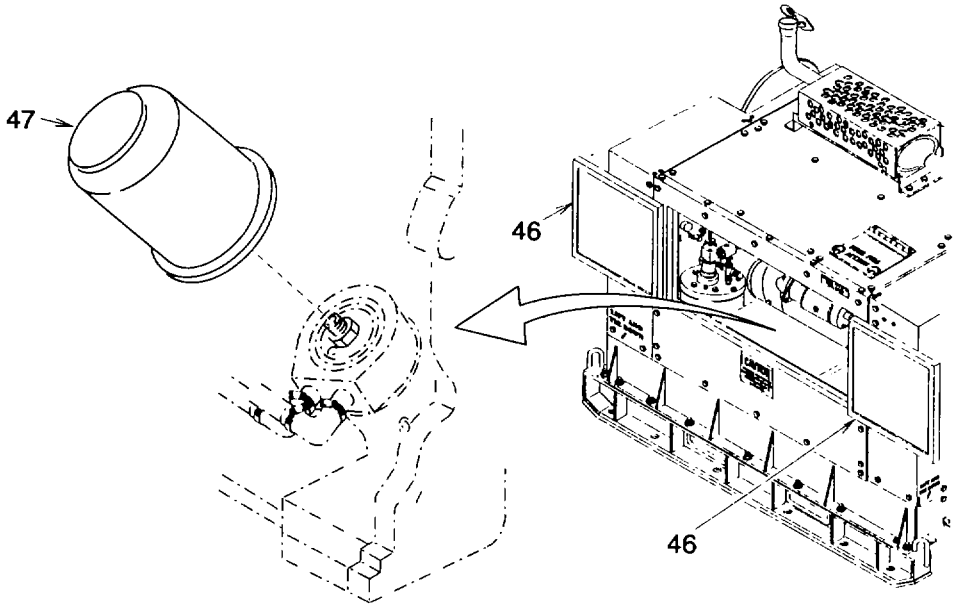


Table 4-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
12 - Cont			b. Carefully remove and discard engine oil filter (47). c. Clean any oil spills with a wiping rag (item 2, section II, appendix E). d. Install new engine oil filter (47) (item 8, section IV, chapter 4). e. Close access doors (46).	
13	250 Service Hours	Engine, Belt	Service belt by checking for proper tension and adjusting if necessary. a. Open access doors (48). b. Check belt for cracks, tears, or glazed appearance. c. Check belt tension using tension gauge (49) or tension gauge (50)with a straight edge (51).tension of 85-94 LB (378-423 N)should be indicated.	 Belt is cut, cracked, or glazed appearance. Tension indicated is above or below readings A listed.

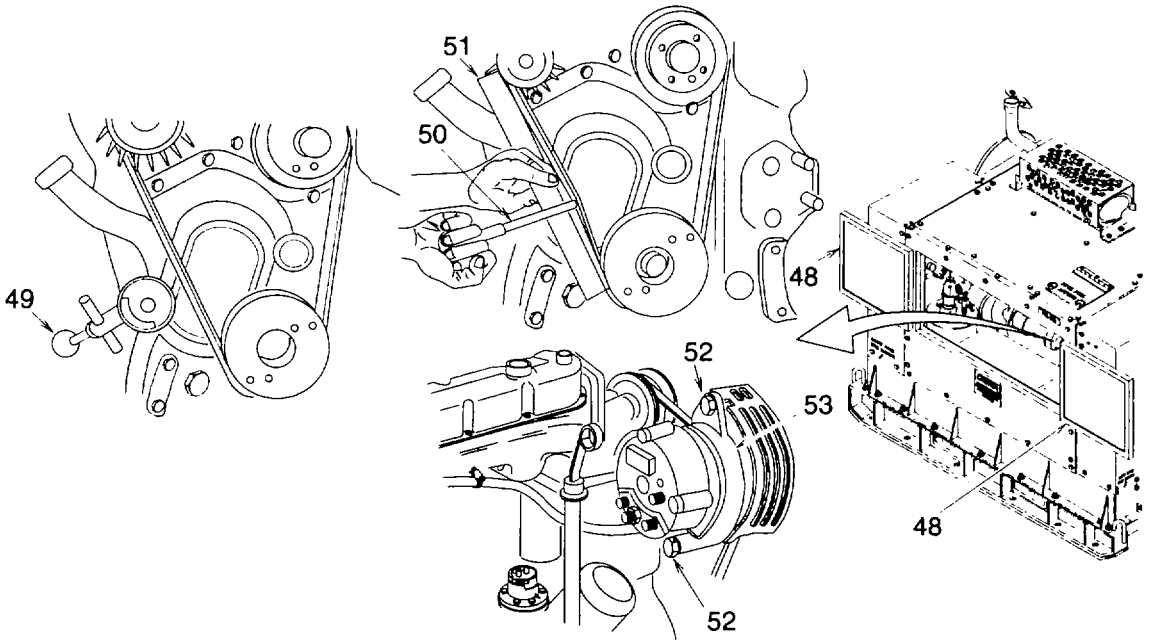
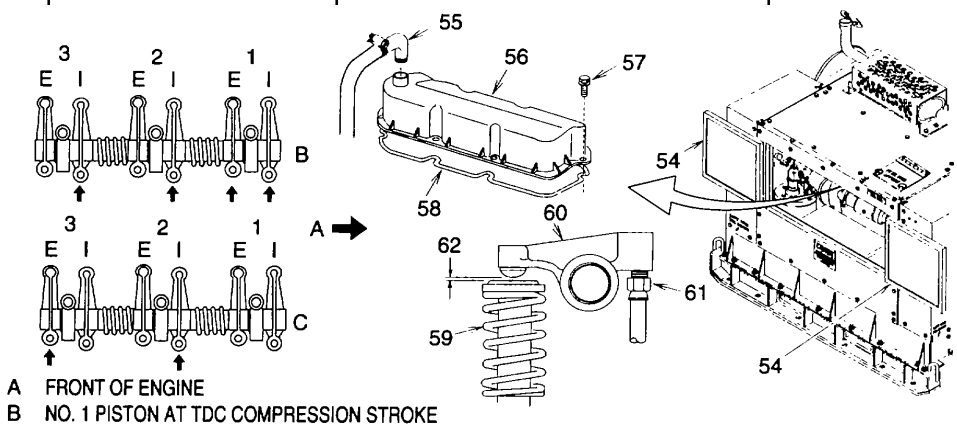


Table 4-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
13 - Cont			d. If necessary, adjust belt tension as follows: (1) Loosen two alternator bracket screws (52). (2) Apply outward pressure to alternator (53) front frame until proper tension is reached. (3) Tighten two alternator bracket screws (52). e. Close access doors (48).	
14	At First 400 Service Hours (Initial Break-in)	Engine, Valves	Service the valves by checking for proper valve to rocker arm clearance and adjusting if necessary. a. Open access doors (54). b. Carefully pull vent tube elbow (55) out of valve cover (56). c. Remove six hex washer head screws (57), valve cover (56), and O-ring (gasket) (58). Discard 0-ring (gasket).	



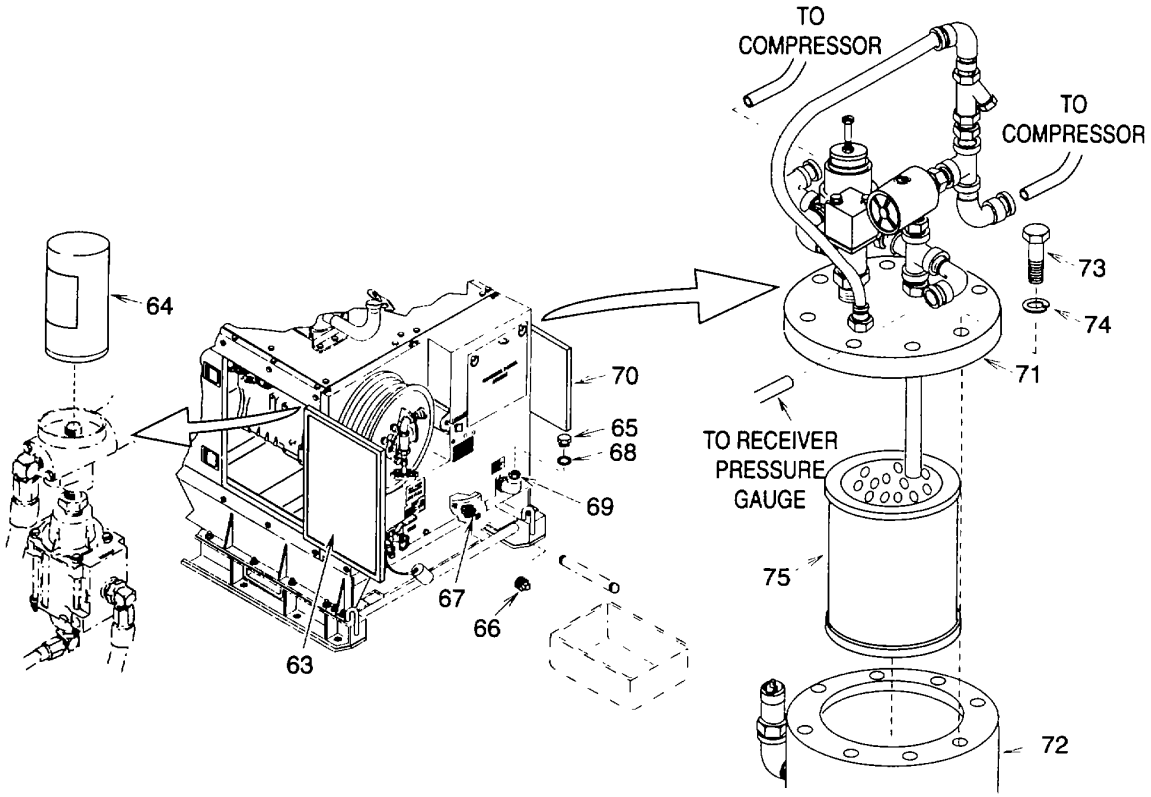
A FRONT OF ENGINE
B NO. 1 PISTON AT TDC COMPRESSION STROKE
C NO. 3 PISTON AT TDC COMPRESSION STROKE

Table 4-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
14 - Cont			d. Using engine rotation tool, rotate engine flywheel in running direction (clockwise viewed from water pump) until number one cylinder (front) reaches top dead center on the compression stroke. Valve springs (59) should not be compressed by rocker arm (60) when cylinder is in the proper position. e. Turn adjustment screw (61) to set the clearance gap (62) to the following: ● Cylinders, number one and two exhaust valves, 0.018 in. (0.45 mm). ● Cylinders, number one and three intake valves, 0.014 in. (0.35 mm). f. Using engine rotation tool, rotate engine flywheel in running direction (clockwise viewed from water pump) 360°. g. Turn adjustment screw (61) to set he clearance gap (62) to the following: ● Cylinder number three exhaust valve 0.018 in. (0.45 mm). ● Cylinder number two intake valve 0.014 in. (0.35 mm). h. Install new O-Ring (gasket) (58) (item 6, section IV, chapter 4), valve cover (56), and six hex washer head screws (57). Tighten screw to 96 in. lb (10.8 Nm) torque. i. Install vent tube elbow (55). j. Close access doors (54).	

Table 4-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
15	500 Service Hours	Compressor, Compressor Oil Filter	Service compressor oil filter by replacing it as follows: a. Open access doors (63).	



			b. Carefully remove compressor oil filter (64). c. Inspect the old compressor oil filter (64) for any dark brown, sticky substance on the inside surface. This indicates that a varnish condition exists in the oil system and the following cleaning procedures must be performed. Discard oil filter. (1) Remove oil filler cap (65).	

Table 4-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
15 - Cont			(2) Remove drain valve plug (66). (3) Install a pipe (section II, appendix D) into drain valve (67). (4) Place a pan (section II, appendix D) under pipe end. (5) Open drain valve (67) and wait for all lubricating oil to drain out. Contact your local environmental officer for guidance on how to properly dispose of lubricating oil in accordance with local regulations. (6) Close drain valve (67). (7) Install a mixture of two quarts Thermo-Solve concentrate (item 16, section II, appendix E) and approximately 18 quarts lubricating oil (item 4, section II, appendix E). (8) Check condition of preformed packing (68). Replace if damaged. (9) Clean the adapter (69) with a wiping rag (item 2, section II, appendix E) and install oil filler cap (65). (10) Install new compressor oil filter (64) (item 2, section IV chapter 4).	Preformed packing damaged.

Table 4-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
			(11) Operate the compressor under normal conditions for 40 to 60 hours. This will allow the oil/solvent mixture sufficient time to dissolve and suspend the varnish in the system. (12) Check that pan (section II, appendix D) is under pipe end. (13) Shut down the compressor and while the oil is still hot, open drain valve (67) and wait for all lubricating oil/solvent mixture to drain out. Contact your local environmental officer for guidance on how to properly dispose of lubricating oil/solvent mixture in accordance with local regulations. (14) Close drain valve (67) and remove pipe. (15) Carefully remove and discard oil filter (64). (16) Open access doors (70). (17) Tag (item 18, section II, appendix E) and disconnect hoses as necessary to remove oil separator cover (71). (18) Match mark the oil separator cover (71) with the oil separator tank (72). Remove eight hex head screws (73), lock washers (74), and oil separator cover. Discard lock washers. (19) Remove and discard separator element (75).	

Table 4-1. Preventive Maintenance Checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
15 - Cont			(20) Install new separator element (75) (item 9, section IV, chapter 4). **CAUTION** **Using standard commercial hex head screws in place of high tensile hex head screws to secure the oil separator cover can result in damage or failure of the equipment during operation. The original, or correct replacement, high tensile hex head screws must be used to secure the oil separator cover to meet ASME standards for pressure vessels.** (21) Install oil separator cover (71) and align match marks. Install eight hex head screws (73) and new lock washers (74) (item 1, section IV, chapter 4). (22) Connect any loose hoses per tags. Remove tags. (23) Close access doors (70). (24) Wrap antiseize tape (item 1, section II, appendix E) around the drain valve plug (66)threads. (25) Clean the drain valve (67) with a wiping rag (item 2, section II, appendix E) and install the drain valve plug (66). (26) Install approximately 20 quarts lubricating oil (item 4, section II, appendix E) or until oil is visible in elbow.	Oil level not visible in filler pipe elbow.

Table 4-1. Preventive Maintenance checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
15 - Cont			(27) Check condition of preformed packing (68). Replace if damaged. (28) Clean the adapter (69) with a wiping rag (item 2, section II, appendix E) and install oil filler cap (65). d. Clean any spills with a wiping rag (item 2, section II, appendix E). e. Install new compressor oil filter (64) (item 2, section IV, chapter 4). f. Close access doors (63)	Preformed packing damaged.
16	Shorter of; 600 Service Hours or Annually	Engine, Vent Tube Hose	Service vent tube hose by cleaning it per the following: a. Open access doors (76).	
			b. Loosen clamp (77) and pull hose (78) off elbow (79). Remove clamp.	

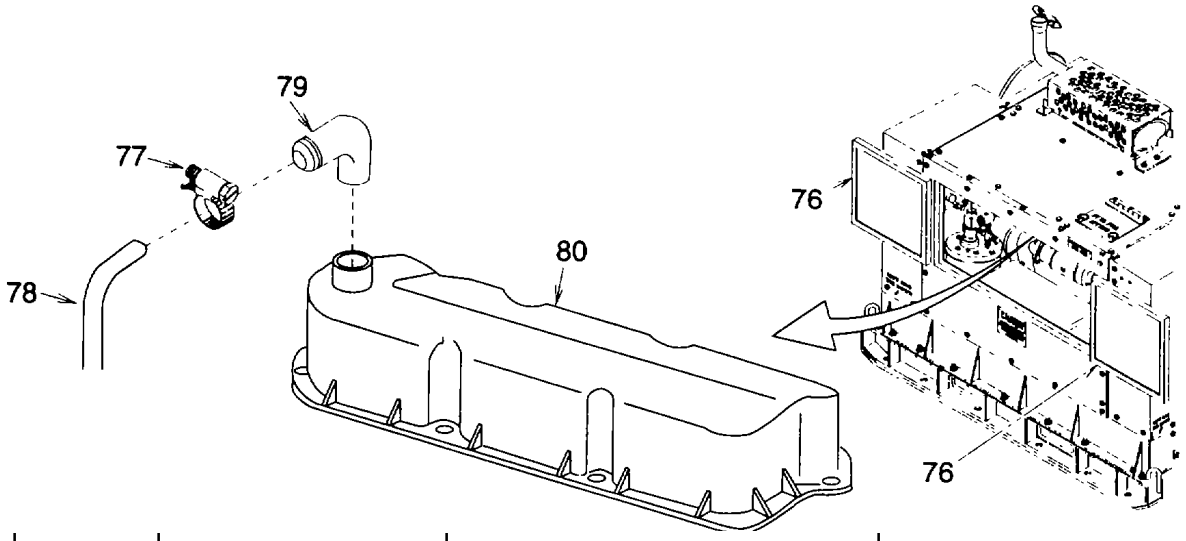


Table 4-1. Preventive Maintenance checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
16 - Cont			c. Insert a wire or similar object through hose (78) to remove any obstruction. d. Remove elbow (79). e. Insert a wire or similar object through elbow (79) to remove any obstruction. f. Install elbow (79) onto valve cover (80). g. Slip clamp (77) over hose (78). Install hose onto elbow (79) and tighten clamp. h. Close access doors (76).	
17	600 Service Hours	Engine, Engine Fuel Filter	Service engine fuel filter by replacing it as follows: a. Open access doors (81).	
			b. Remove vent plug (82). c. Place a small container under the drain plug (83). Remove drain plug (83).	

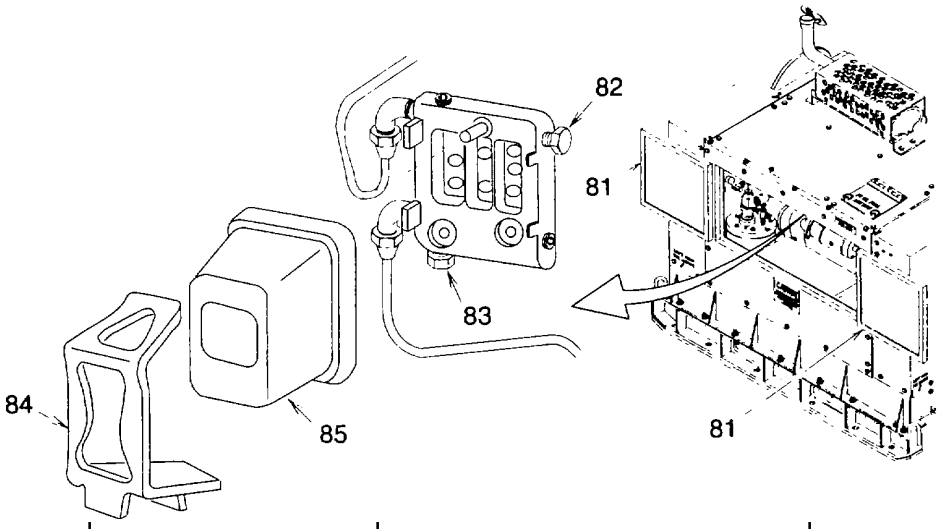
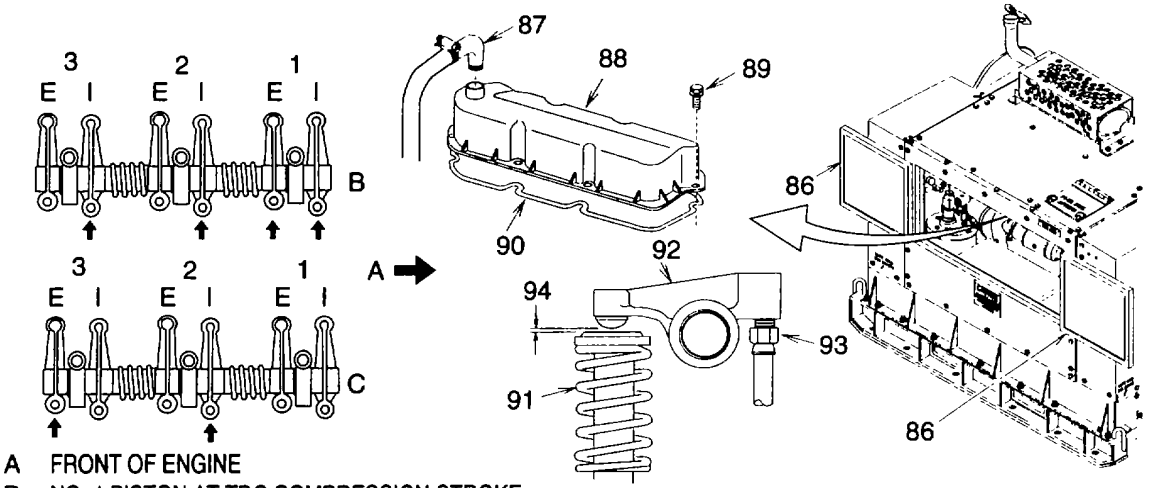


Table 4-1. Preventive Maintenance checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
17-Cont			d. Carefully remove clamp (84) and fuel filter (85). Discard fuel filter. Contact your local environmental officer for guidance on how to dispose of oil filter in accordance with local regulations. e. Install drain plug (83) and vent plug (82). f. Clean any fuel spills with a wiping rag (item 2, section II, appendix E). g. Install new fuel filter (85) (item 7, section IV, chapter 4) and clamp (84). h. Close access doors (81).	
18	1200 Service Hours	Engine, Valves	Service the valves by checking for proper valve to rocker arm clearance and adjusting if necessary. a. Open access doors (86). b. Carefully pull vent tube elbow (87) out of valve cover (88).	



A FRONT OF ENGINE
B NO. 1 PISTON AT TDC COMPRESSION STROKE
C NO. 3 PISTON AT TDC COMPRESSION STROKE

Table 4-1. Preventive Maintenance checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
18 - Cont			c. Remove six hex washer head bolts (89), valve cover (88), and o-ring (gasket) (90). Discard o-ring (gasket). d. Using engine rotation tool, rotate engine flywheel in running direction (clockwise viewed from water pump) until number one cylinder (front) reaches top dead center on the compression stroke. Valve springs (91) should not be compressed by rocker arm (92) when cylinder is in the proper position. e. Turn adjustment screw (93) to set the clearance gap (94) to the following: • Cylinders, number one and two exhaust valves, 0.018 in. (0.45 mm). • Cylinders, number one and three intake valves, 0.014 in. (0.35 mm). f. Using engine rotation tool, rotate engine flywheel in running direction (clockwise viewed from water pump) 360°. g. Turn adjustment screw (93) to set the clearance gap (94) to the following: • Cylinder number three exhaust valve 0.018 in. (0.45 mm). •· Cylinder number two intake valve 0.014 in. (0.35 mm). h. Install new o-ring (gasket) (90) (item 6, section IV, chapter 4), valve cover (88), and six hex washer head screws (89). Tighten screw to 96 in. lb (10.8 Nm) torque.	

Table 4-1. Preventive Maintenance checks and Services for 16MS125 - Continued

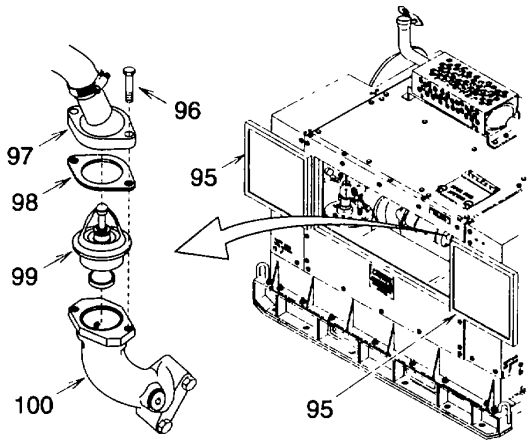
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
18 - Cont			i. Install vent tube elbow (87). j. Close access doors (86).	
19	1200 Service Hours	Engine, Engine Thermostat	Service the engine thermostat by replacing it as follows: a. Open access doors (95).	
			 **NOTE** **Coolant will be re-used.** b. Drain approximately four quarts of coolant from radiator into a clean container. See para 4-6, e. c. Remove two hex head screws (96). d. Lift cover (97) and remove gasket (98) and thermostat (99). Discard gasket and thermostat. e. Carefully clean any remaining gasket material from mating surfaces of cover (97) and housing (100) using a small putty knife.	

Table 4-1. Preventive Maintenance checks and Services for 16MS125 - Continued

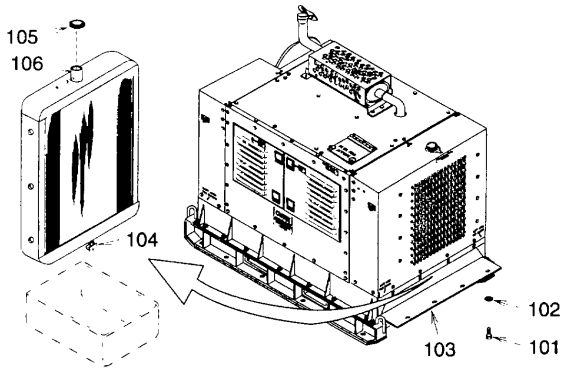
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
19-Cont			f. Install new thermostat (99) (item 5, section IV, chapter 4), new gasket (98) (item 3, section IV, chapter 4), cover (97), and two hex head screws (96). g. Pour coolant drained in step b. above back into radiator. h. Clean any coolant spills with a wiping rag (item 2, section II, appendix E). i. Close access doors (95).	
20	1200 Service Hours or 2 Years	Exterior Rear, Radiator	Service the radiator by draining and flushing per the following: a. Remove four hex head screws (101) and lock washers (102). Open airblock (103). Discard lock washers.  b. Place pan (section II, appendix D) under drain cock (104). c. Remove radiator fill cap (105).	

Table 4-1. Preventive Maintenance checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
20 - Cont			d. Open drain cock (104) and wait for all coolant to drain out. Contact your local environmental officer for guidance on how to properly dispose of coolant in accordance with local regulations. e. Place pan (section II, appendix D) under drain cock (104). f. Flush the cooling system by pouring clean water into the radiator fill collar (106) until clean water comes out the drain cock (104). Wait for all coolant to drain out. Contact your local environmental officer for guidance on how to properly dispose of coolant in accordance with local regulations. g. Close drain cock (104). **NOTE** **A drain cock is also provided on the curbside of the engine block. This drain cock is to be used only to ensure that engine has been totally drained of coolant should the unit be stored without proper antifreeze mix during freezing temperatures.** h. Install approximately 18 quarts of antifreeze (item 8, section II, appendix E) into radiator fill collar (106) or until antifreeze is visible at the top of the radiator. i. Install radiator fill cap (105). j. Remove pan if still under drain cock (104).	

Table 4-1. Preventive Maintenance checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
20-Cont			k. Close airblock (103) and install four screws (101) and new lock washers (102) (item 4, section IV, chapter 4).	
21	1200 Service Hours	Engine, Fuel Injection System	Service the fuel injection system. Contact General Support Maintenance for the following checks and services: a. Check the engine/injection pump timing. b. Check and adjust the speed advance. c. Adjust the opening pressure. d. Clean the injection nozzles.	
22	4000 Service Hours	Interior, Compressor Oil Separator	Service the compressor oil separator by replacing the separator element as follows: a. Open access doors (107). b. Tag (item 18, section II, appendix E) and disconnect hoses as necessary to remove oil separator cover (108). c. Match mark the oil separator cover (108) with the oil separator tank (109). Remove eight hex head screws (110), lock washers (111), and oil separator cover. Discard lock washers. d. Remove and discard separator element (112). e. Install new separator element (112) (item 9, section IV, chapter 4).	

Table 4-1. Preventive Maintenance checks and Services for 16MS125 - Continued

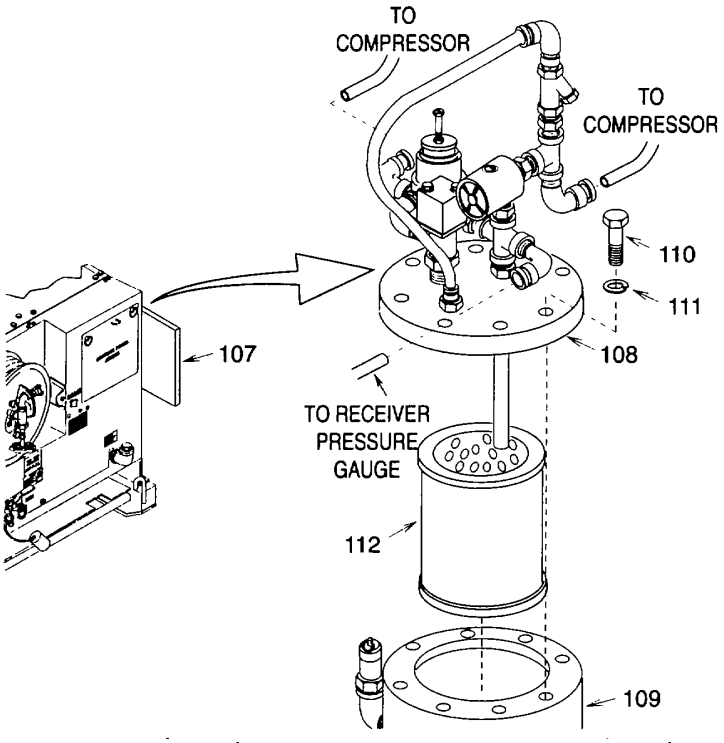
Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
22- Cont			**CAUTION** **Using standard commercial hex head screws in place of high tensile hex head screws to secure the oil separator cover can result in damage or failure of the equipment during operation. The original, or correct replacement, high tensile hex head screws must be used to secure the oil separator cover to meet ASME standards for pressure vessels.** f. Install oil separator cover (108) and align match marks. Install eight hex head screws (110) and new lock washers (111) (item 1, section IV, chapter 4).	

Table 4-1. Preventive Maintenance checks and Services for 16MS125 - Continued

Item No.	Interval	Location Item to Check/Service	Procedure	Not Fully Mission Capable If:
22 - Cont			g. Connect any loose hoses per tags. Remove tags. h. Check compressor oil level. i. Close access doors (107).	

SECTION IV MANDATORY REPLACEMENT PARTS

The following table includes all items that must be replaced during PMCS whether they have failed or not. The table reflects the interval at which these items must be replaced whether hardtime maintenance or on condition maintenance.

ITEM NO.	PART NUMBER	NSN	NOMENCLATURE	QTY
1	MS35338-48	5310-00-584-5272	Lock Washer	8
2	R17, 86810, 51459, PF-881, PH-977A	2940-01-080-3861	Compressor Oil Filter	1
3	T20215	5330-00-340-5374	Gasket	1
4	MS35338-44	5310-00-582-5965	Lock Washer	4
5	DD14941	6685-01-378-3468	Thermostat	1
6	R106796	5330-01-388-8523	O-Ring (Gasket)	1
7	AR50041	2910-00-100-3354	Fuel Filter	1
8	T19044	2940-00-007-4791	Engine Oil Filter	1
9	DVC-0168-3, 48772	4310-00-883-0512	Separator Element	1

SECTION V TROUBLESHOOTING

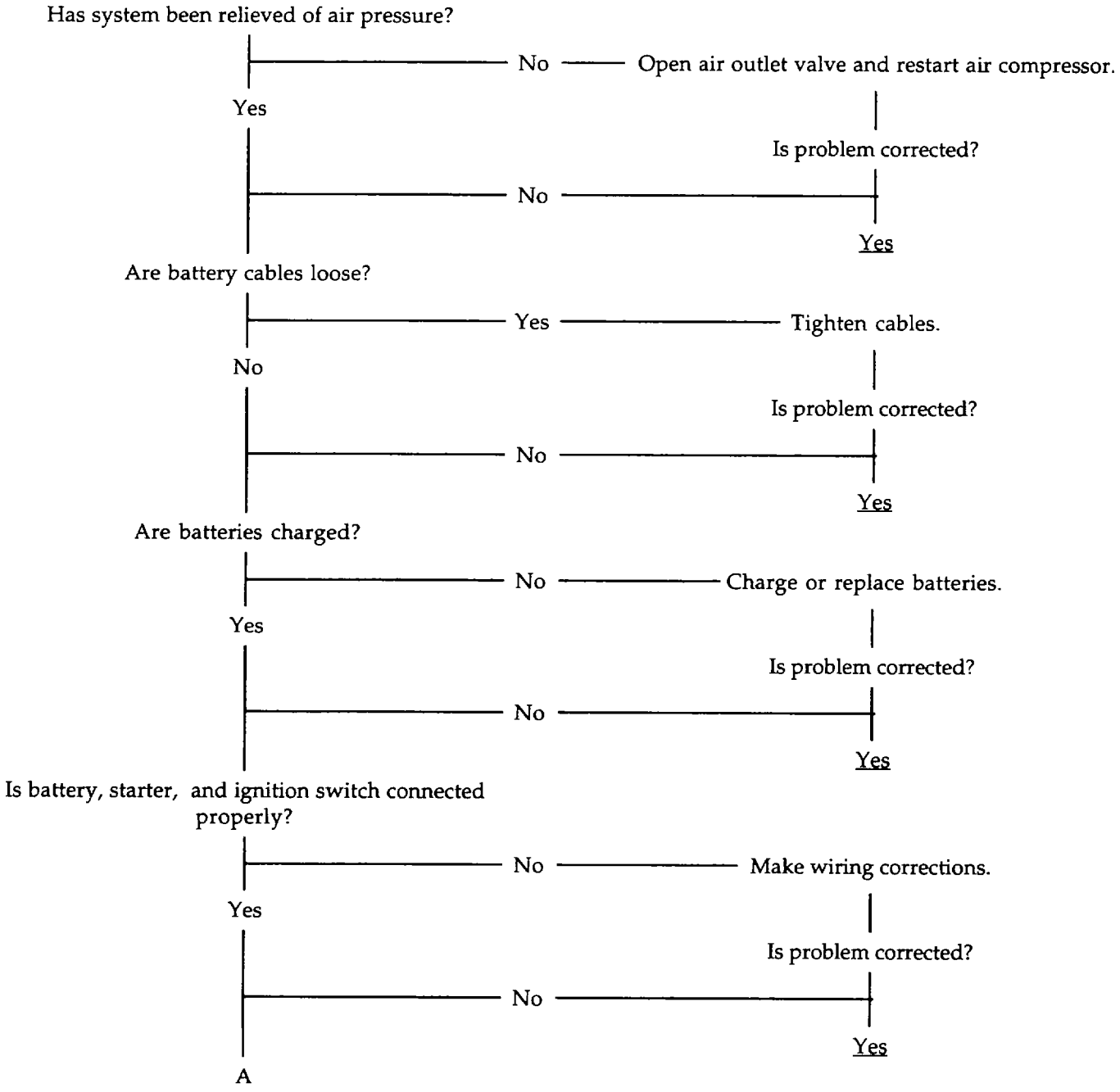
4-8. GENERAL.

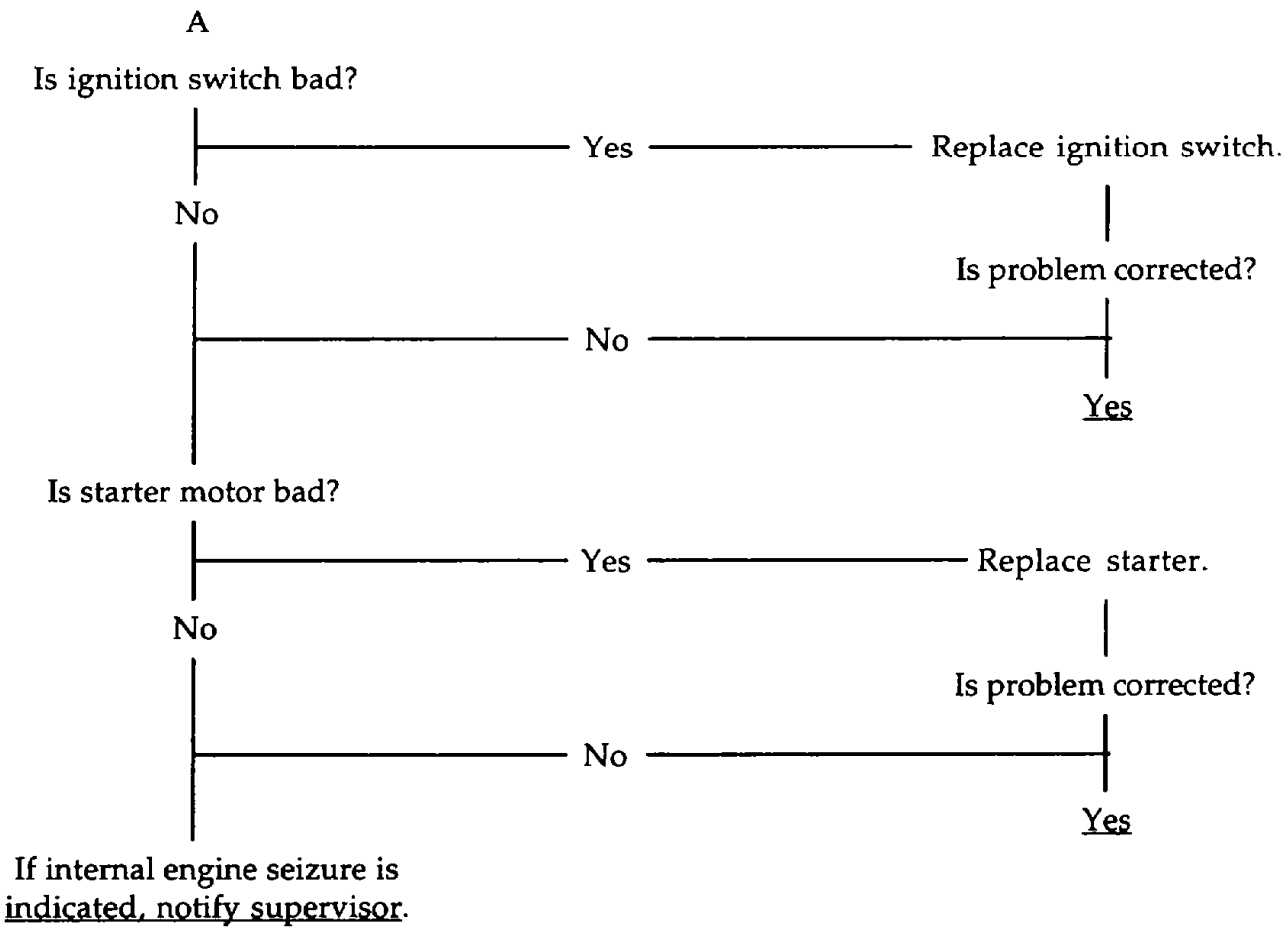
The branching logic tree diagrams list common malfunctions that you may find with your equipment. Follow the instructions given in the order they appear. The branching logic tree diagrams cannot list all the malfunctions that may occur, all the steps needed to find the fault, or all the corrective actions needed to correct the fault. If the equipment malfunction is not listed or corrective actions taken do not correct the fault, notify your supervisor.

MALFUNCTION INDEX

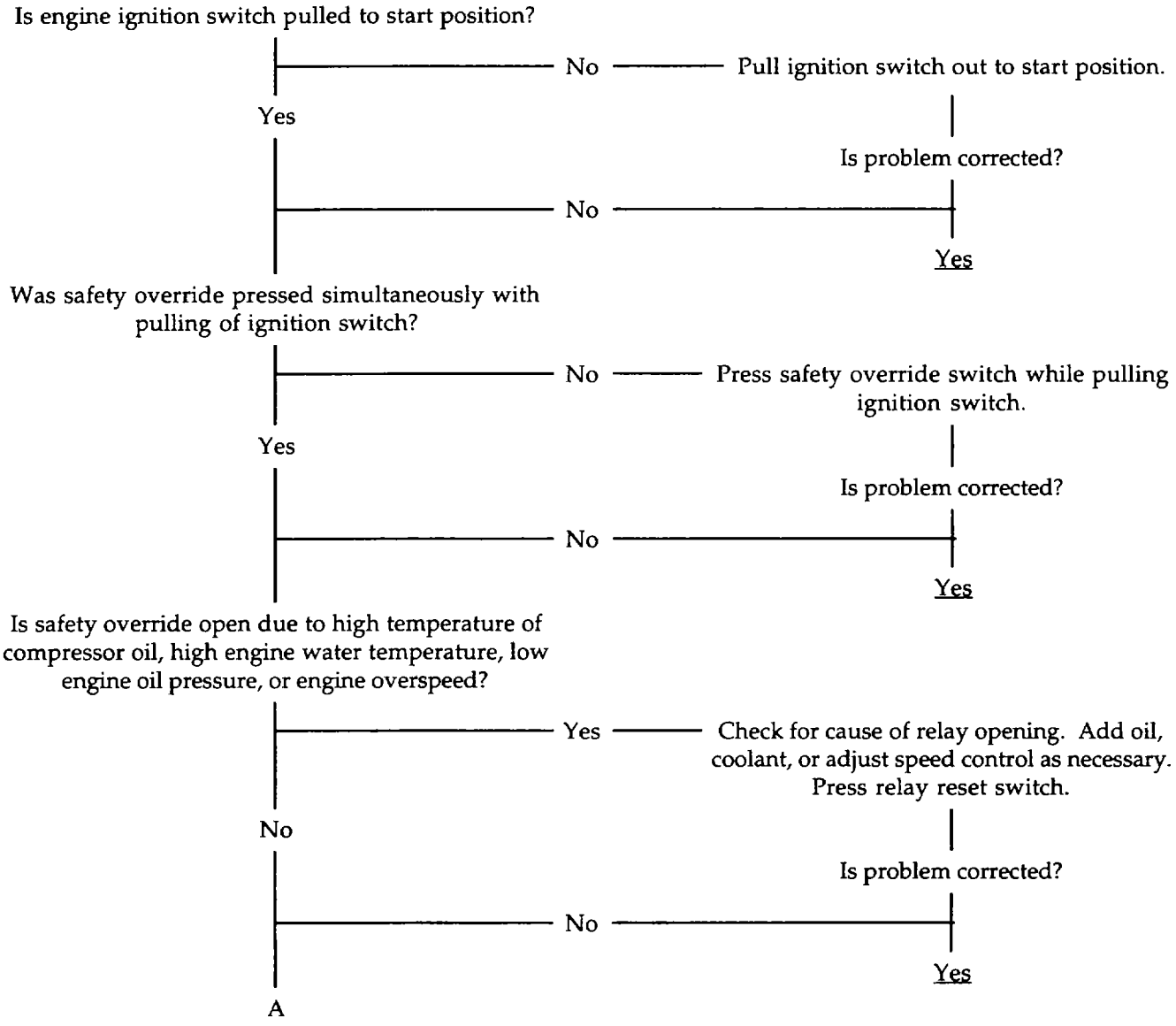
MALFUNCTION	TROUBLE SHOOTING PROCEDURE (PARA)
Engine Will Not Crank When Start Switch Is Pulled	4-9
Engine Cranks But Will Not Start	4-10
Engine Stops During Operation	4-11
Engine Does Not Develop Full Power	4-12
Loss Of Engine Oil Pressure	4-13
Engine Overheats	4-14
Battery Discharging/Alternator Not Charging	4-15
Engine Coolant Temperature Too Low	4-16
Engine Knocks	4-17
Engine Returns To Idle But Compressor Does Not Unload	4-18
Engine Using Too Much Fuel	4-19
Engine Using Too Much Oil	4-20
Compressor Overheats	4-21
Compressor Operation Is Noisy	4-22
Compressor Not Operating To Full Capacity Or Pressure	4-23
Compressor Fails To Load Or Unload	4-24
Compressor Unloads But Engine Does Not Idle	4-25
Excessive Compressor Oil Consumption	4-26
Condensate And/Or Emulsion In Oil Separator Tank	4-27
Engine Stalls At Idle	4-28
Excessive Oil In Air Discharge	4-29

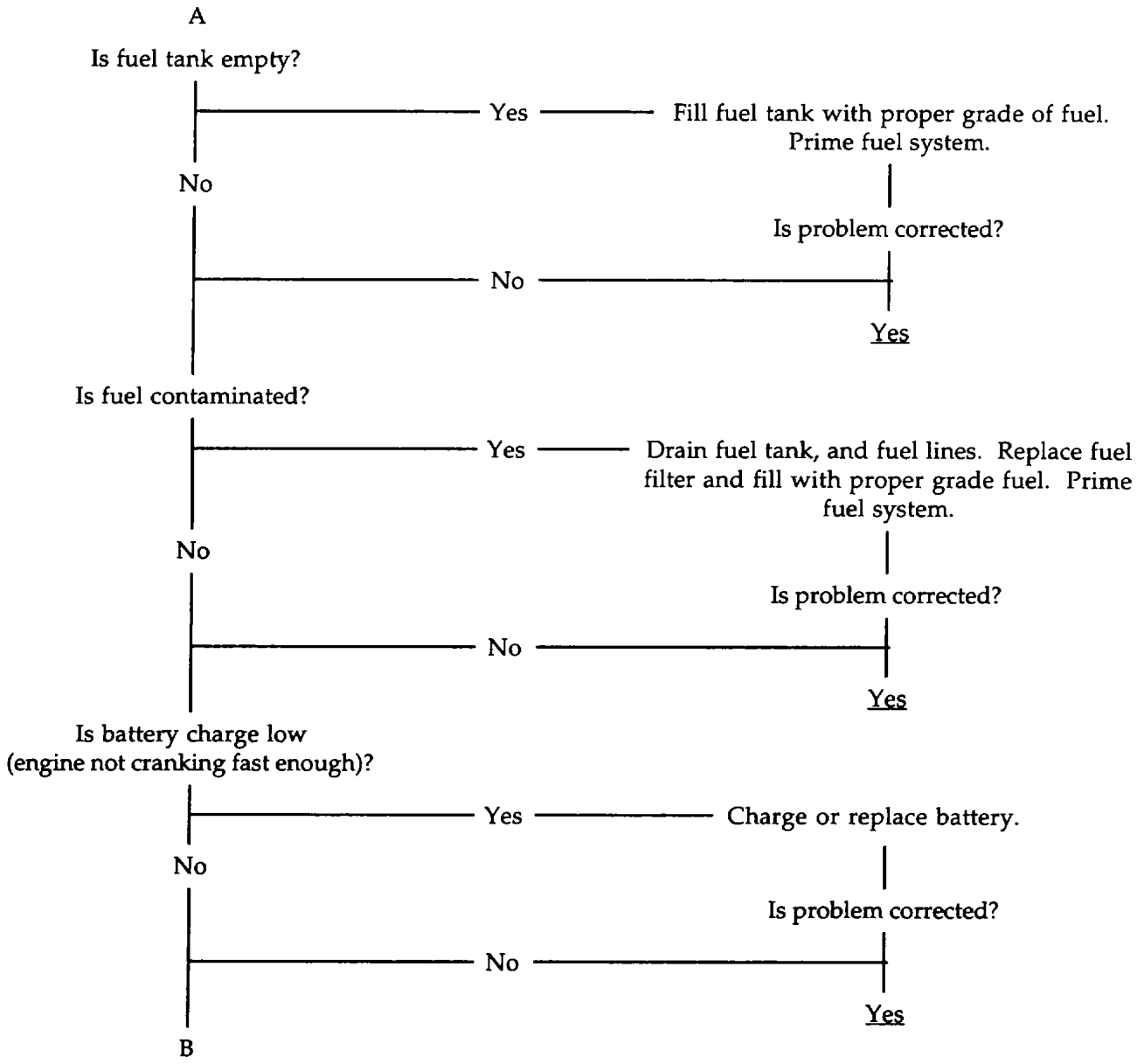
4-9. ENGINE WILL NOT CRANK WHEN START SWITCH IS PULLED.



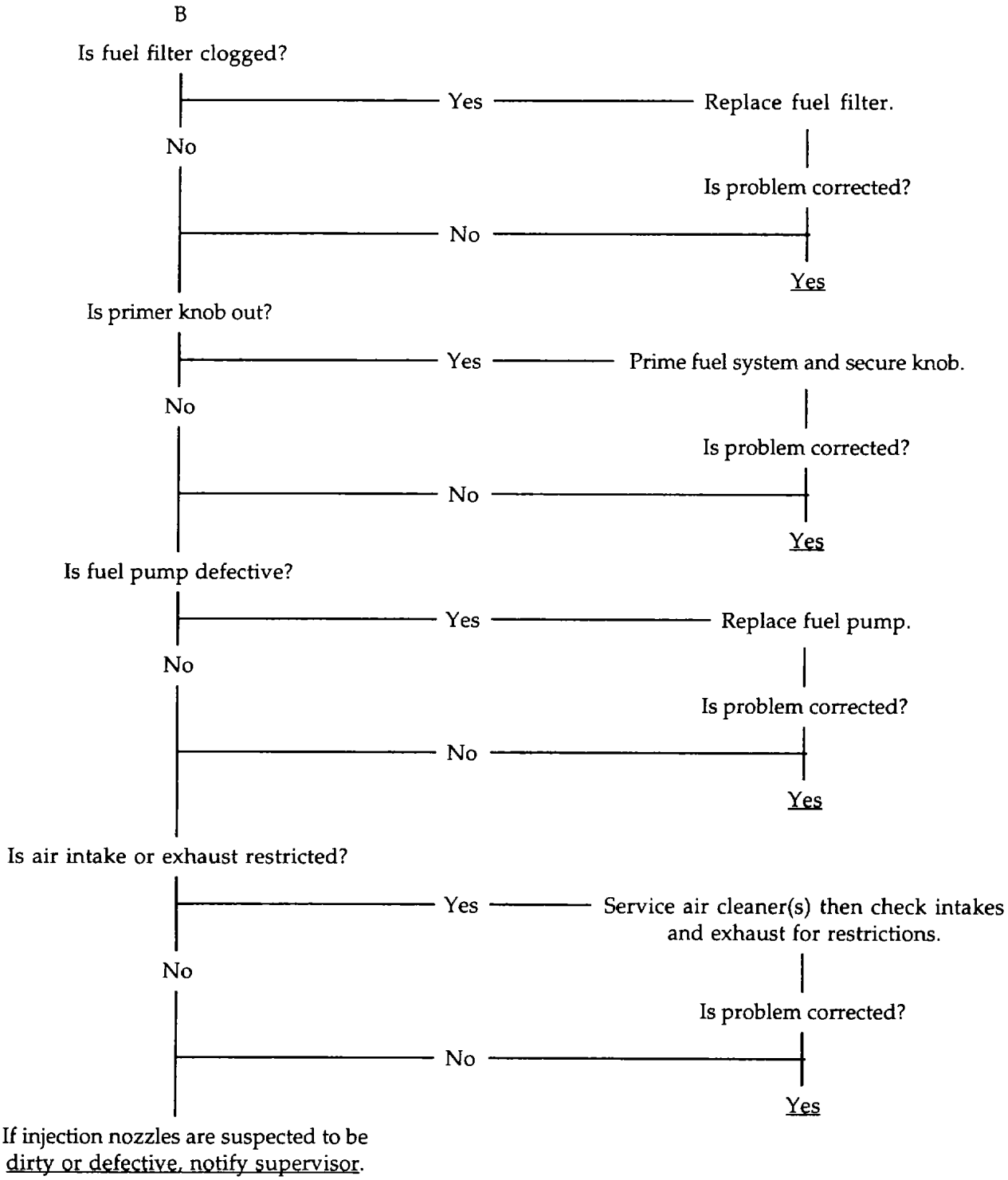

A
Is ignition switch bad?
Yes
Replace ignition switch.
No
Is problem corrected?
No
Yes
Is starter motor bad?
Yes
Replace starter.
No
Is problem corrected?
No
Yes
If internal engine seizure is indicated, notify supervisor.

4-10. ENGINE CRANKS BUT WILL NOT START.

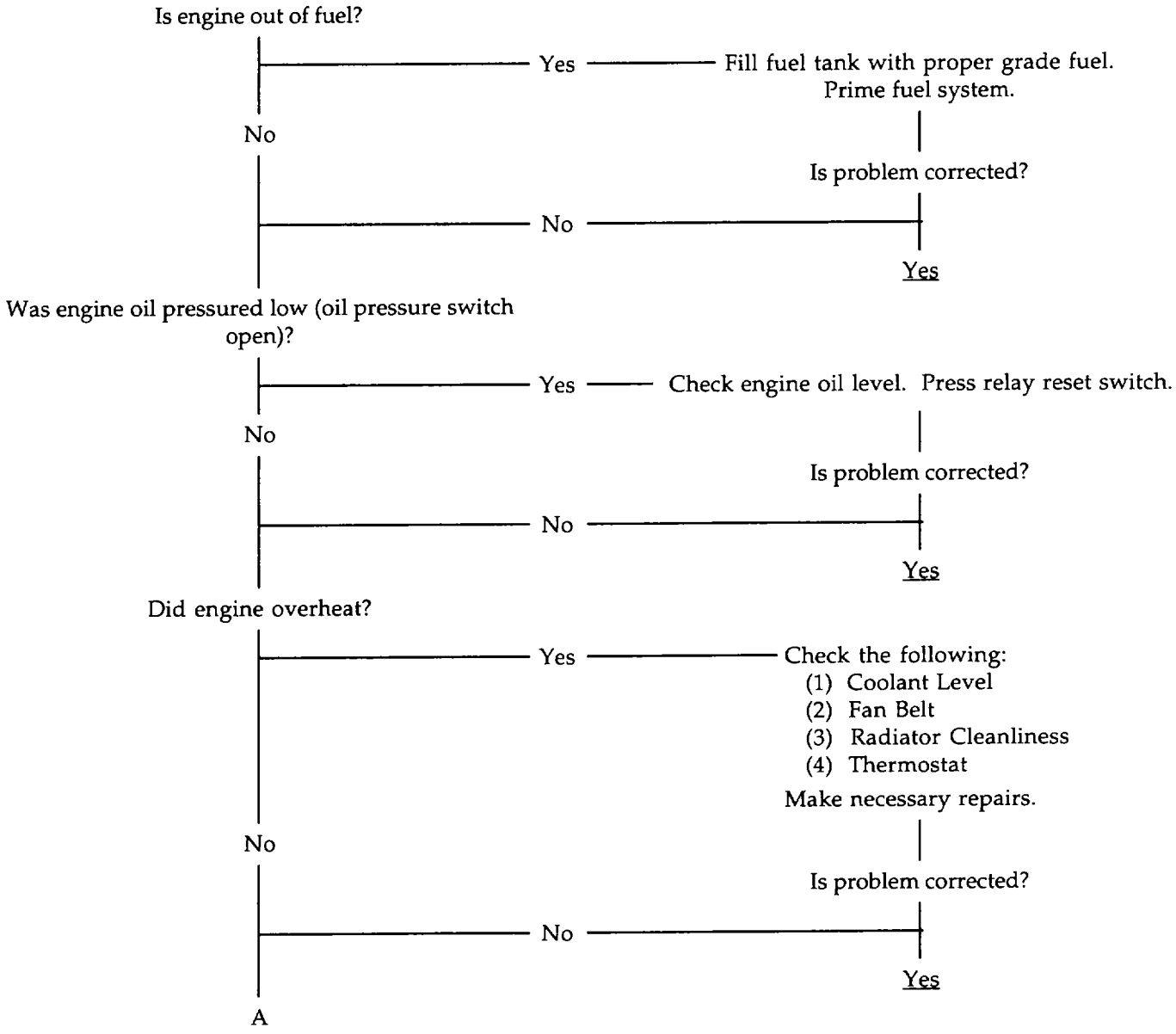



A
Is fuel tank empty?
Yes
Fill fuel tank with proper grade of fuel. Prime fuel system.
No
Is problem corrected?
No
Yes
Is fuel contaminated?
Yes
Drain fuel tank, and fuel lines. Replace fuel filter and fill with proper grade fuel. Prime fuel system.
No
Is problem corrected?
No
Yes
Is battery charge low (engine not cranking fast enough)?
Yes
Charge or replace battery.
No
Is problem corrected?
No
Yes
B

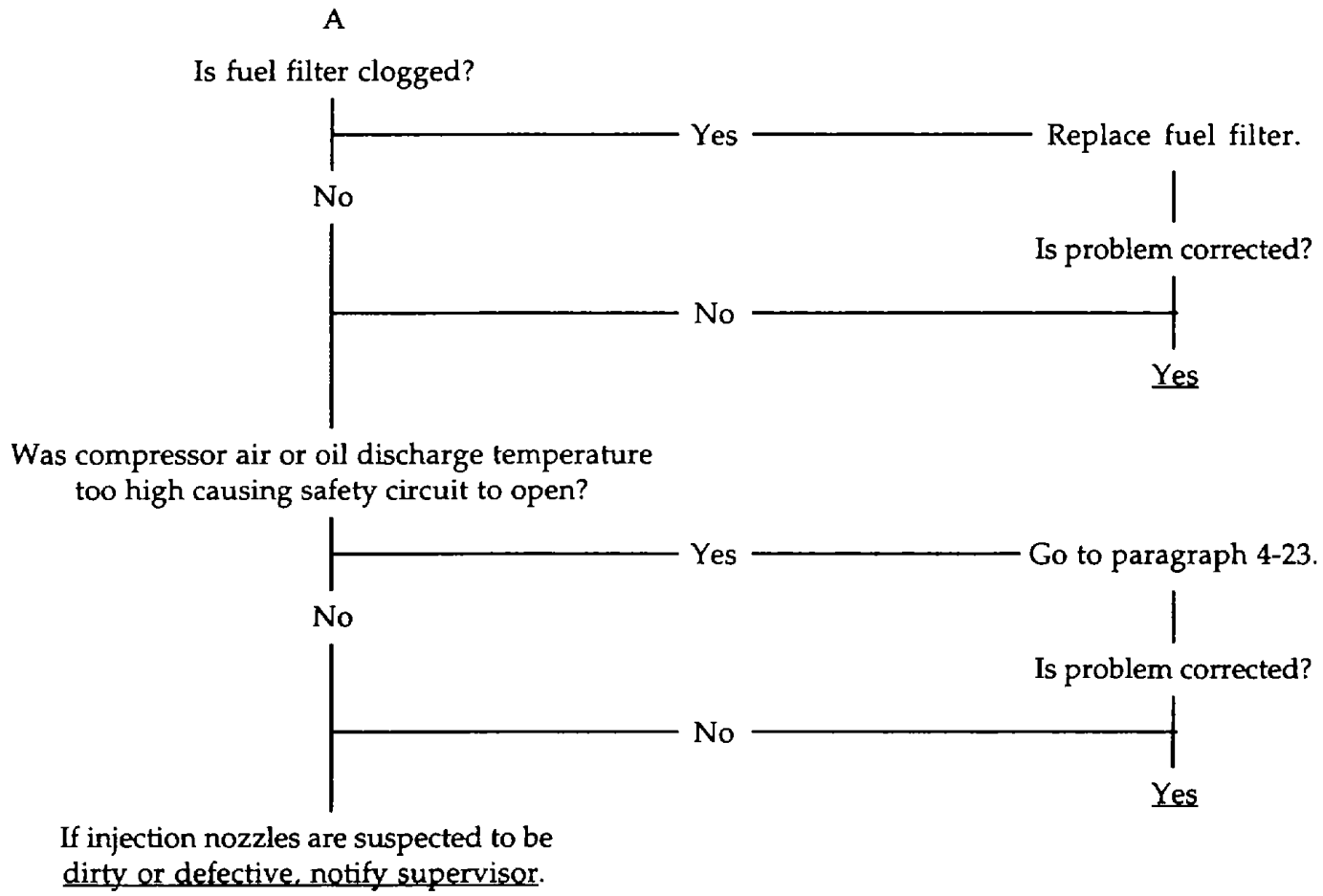
4-10. ENGINE CRANKS BUT WILL NOT START. - Continued



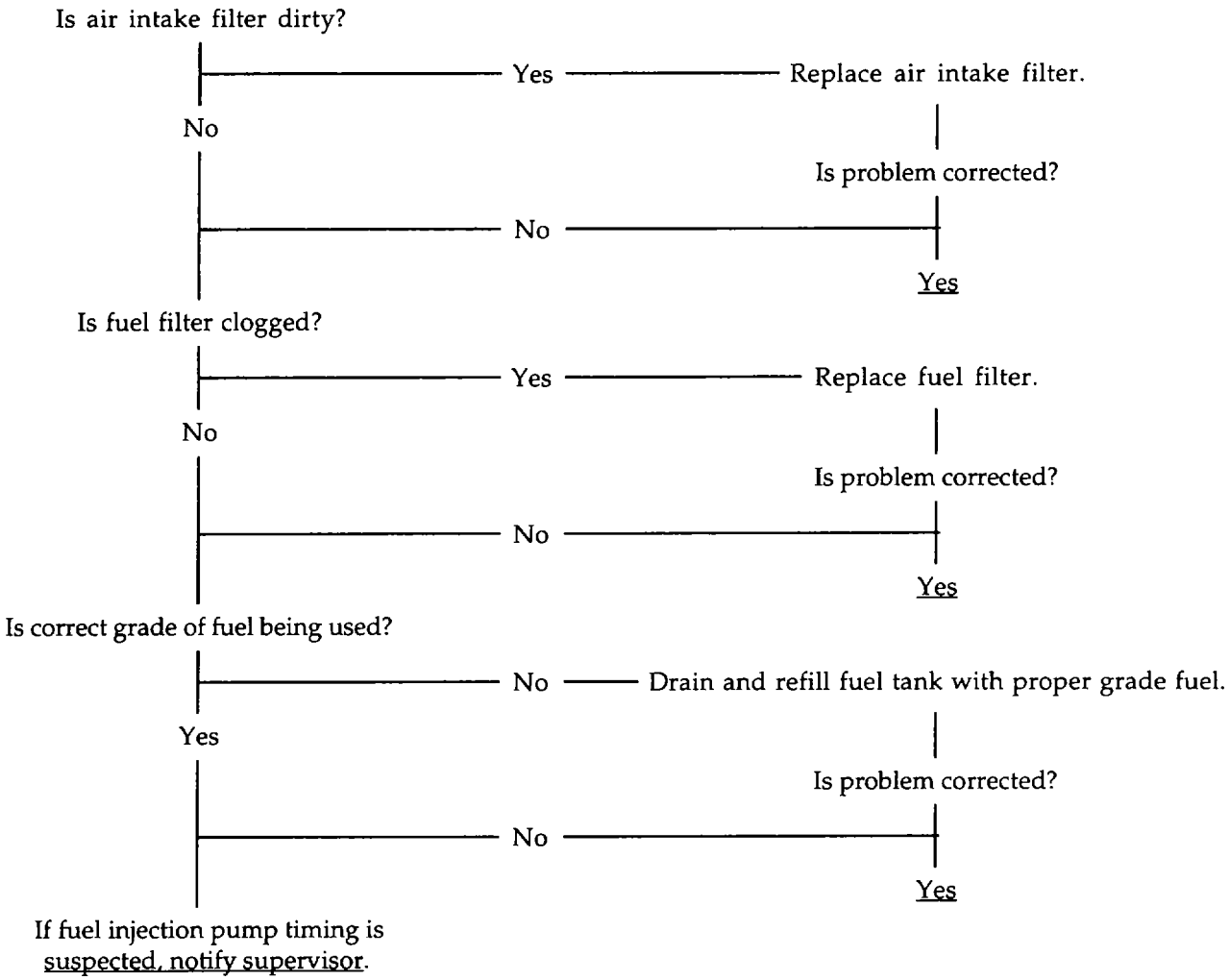
4-11. ENGINE STOPS DURING OPERATION.



4-11. ENGINE STOPS DURING OPERATION. - Continued



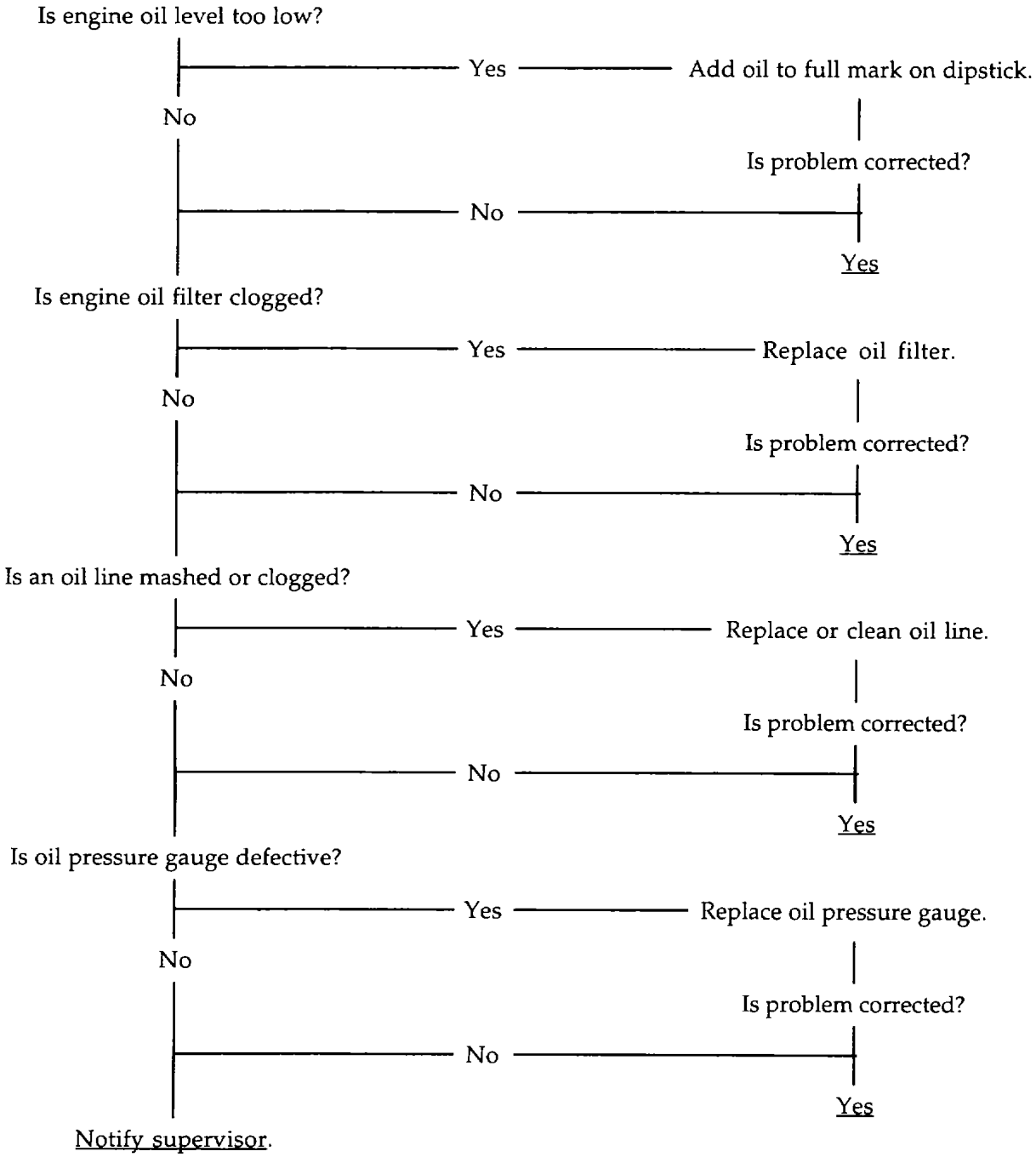
4-12. ENGINE DOES NOT DEVELOP FULL POWER.



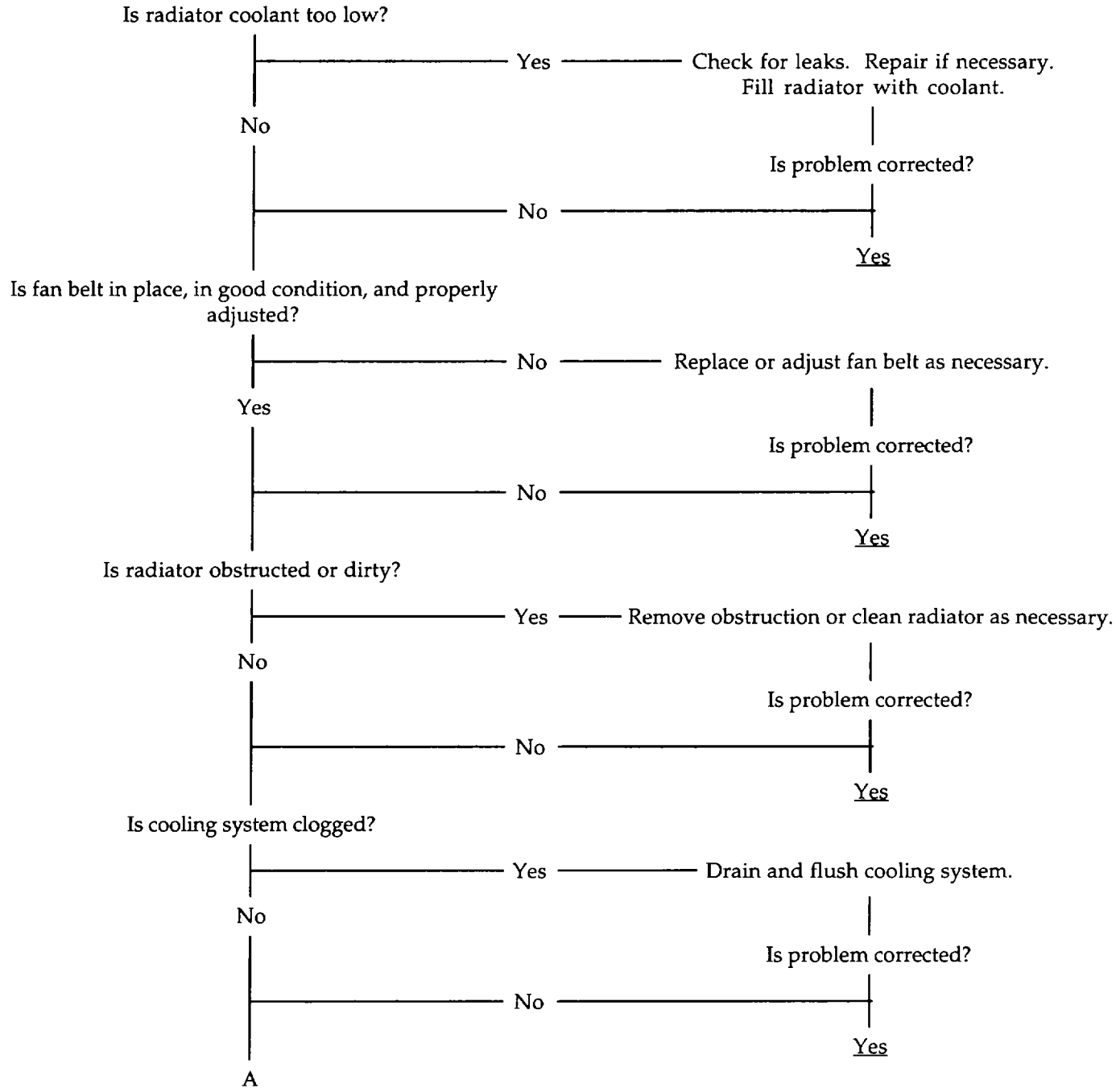
4-13. LOSS OF ENGINE OIL PRESSURE.

NOTE

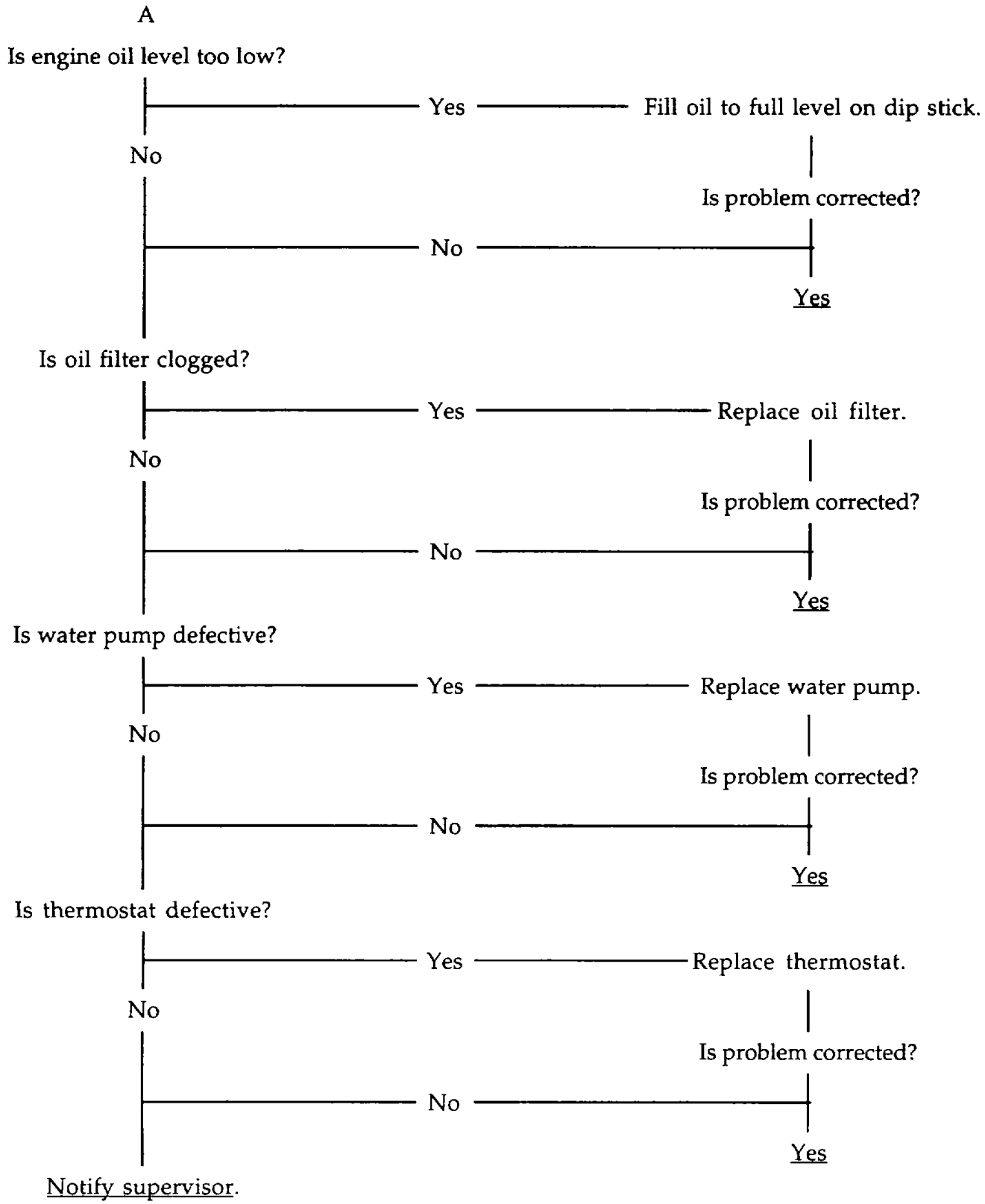
Normal engine oil pressure range is 60 to 100 psi (4.2 to 7.0 kg/cm^2)



4-14. ENGINE OVERHEATS.

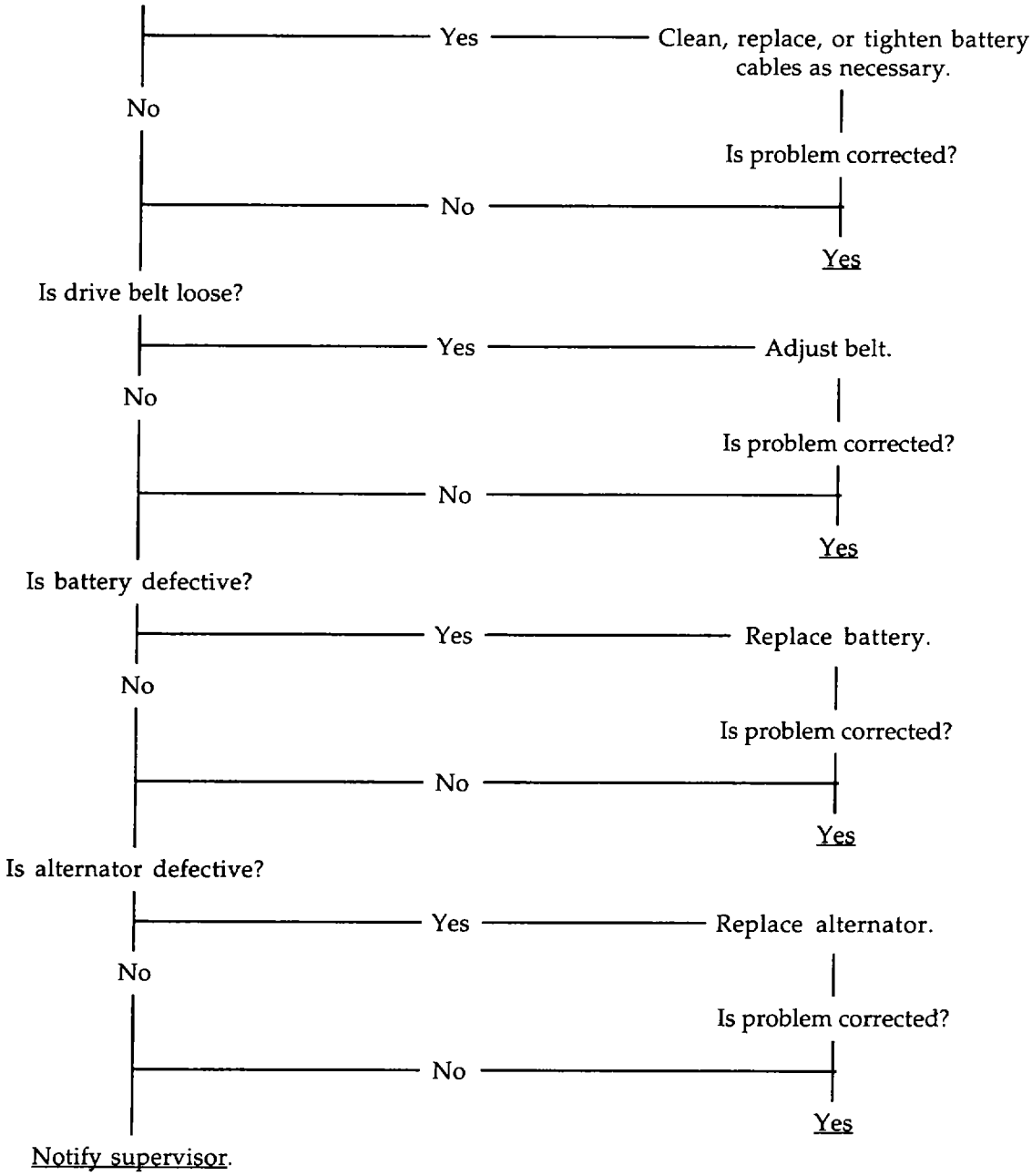


4-14. ENGINE OVERHEATS. - Continued

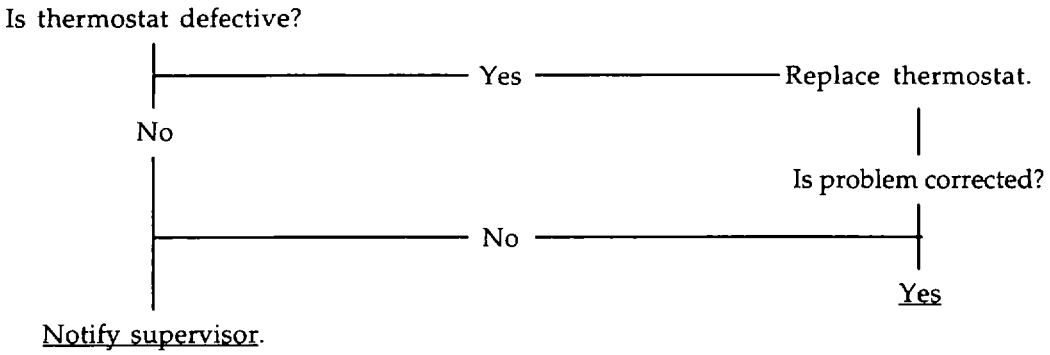


4-15. BATTERY DISCHARGING/ALTERNATOR NOT CHARGING.

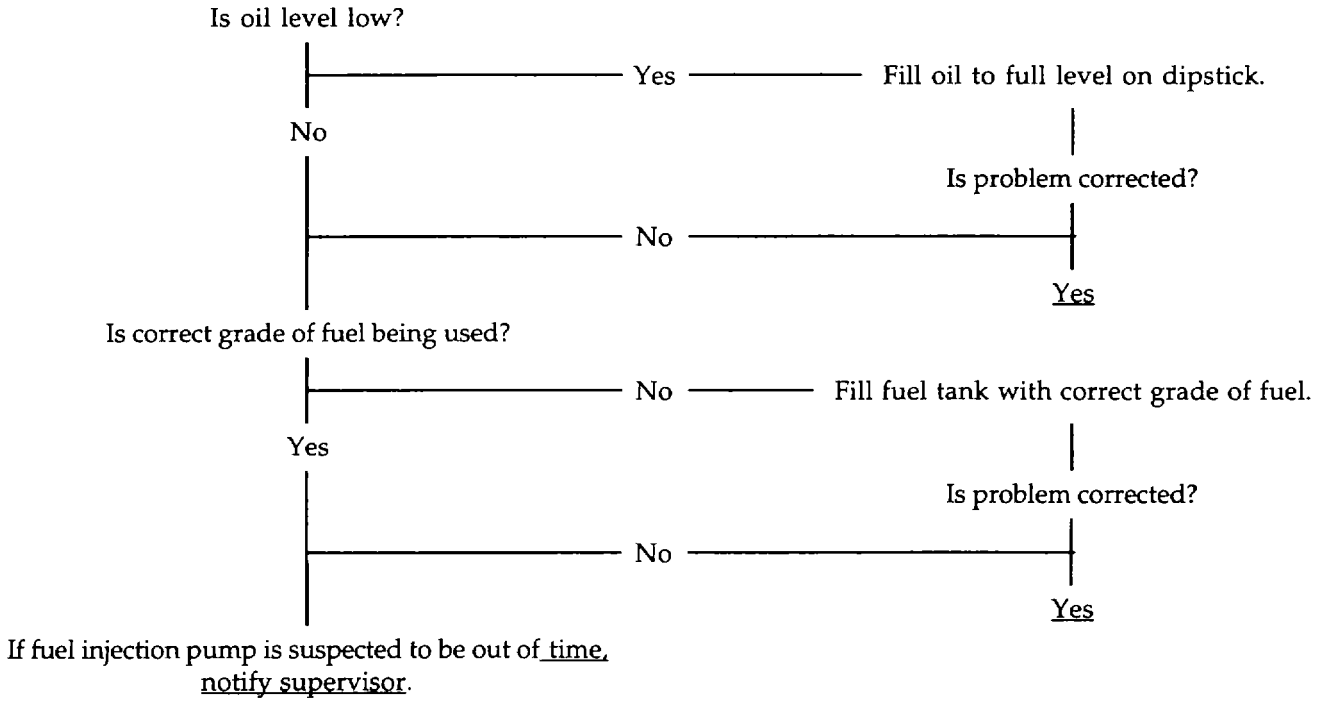
Are battery cables loose, dirty, or in bad condition?



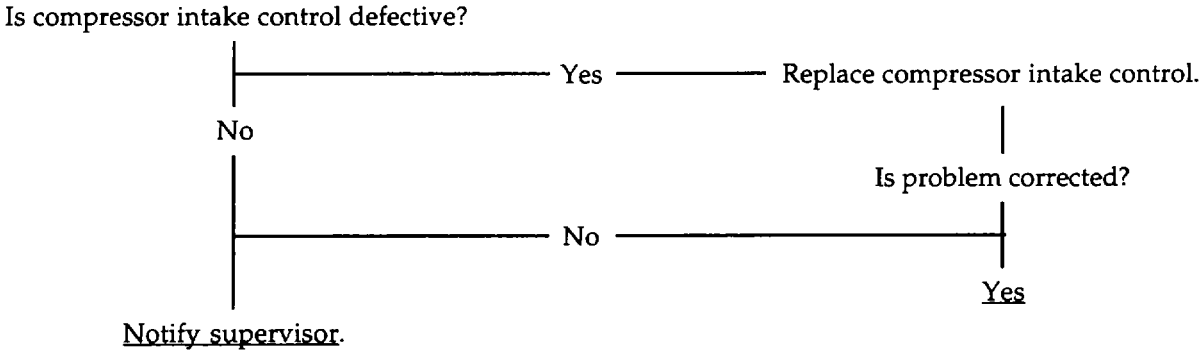
4-16. ENGINE COOLANT TEMPERATURE TOO LOW.



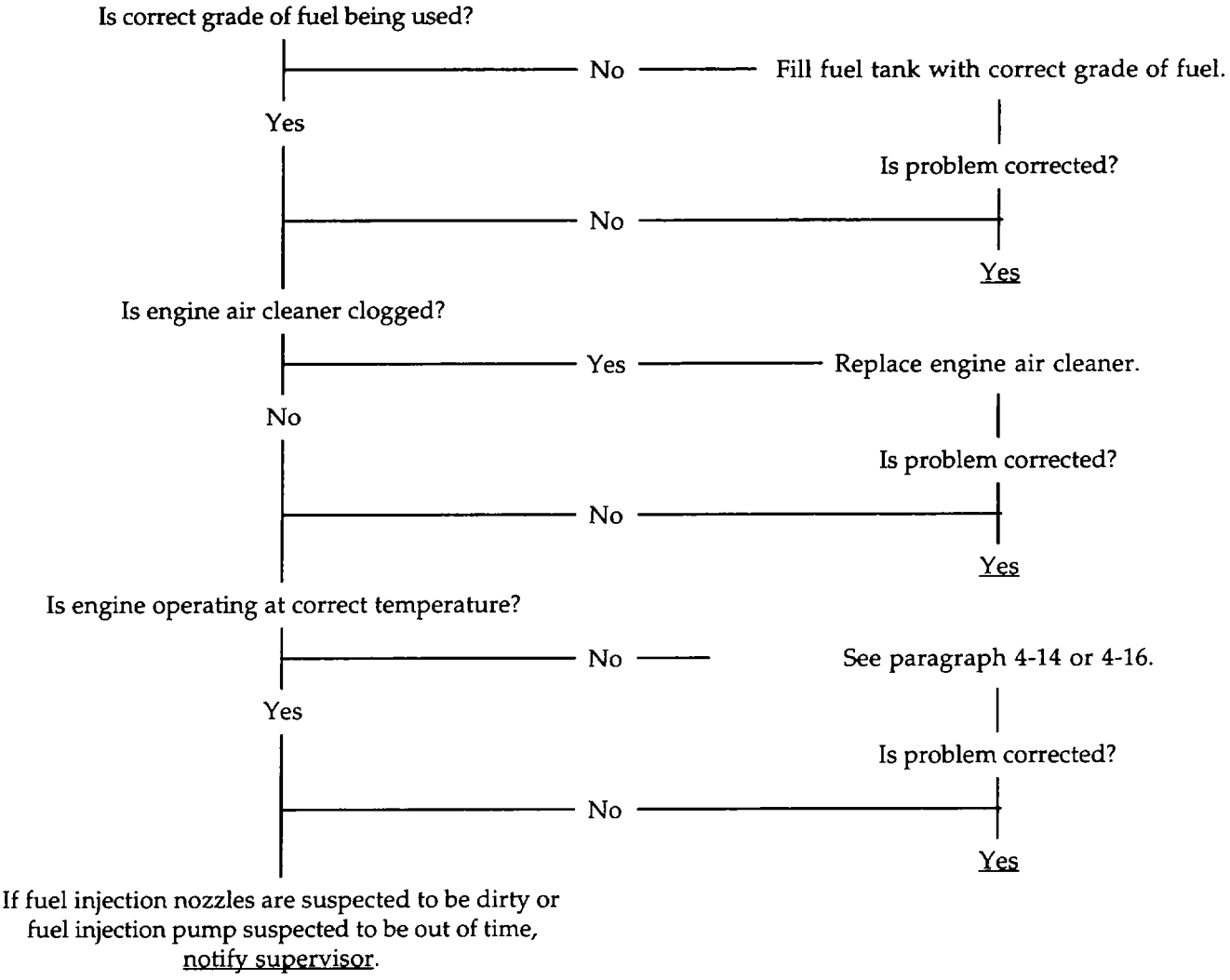
4-17. ENGINE KNOCKS.



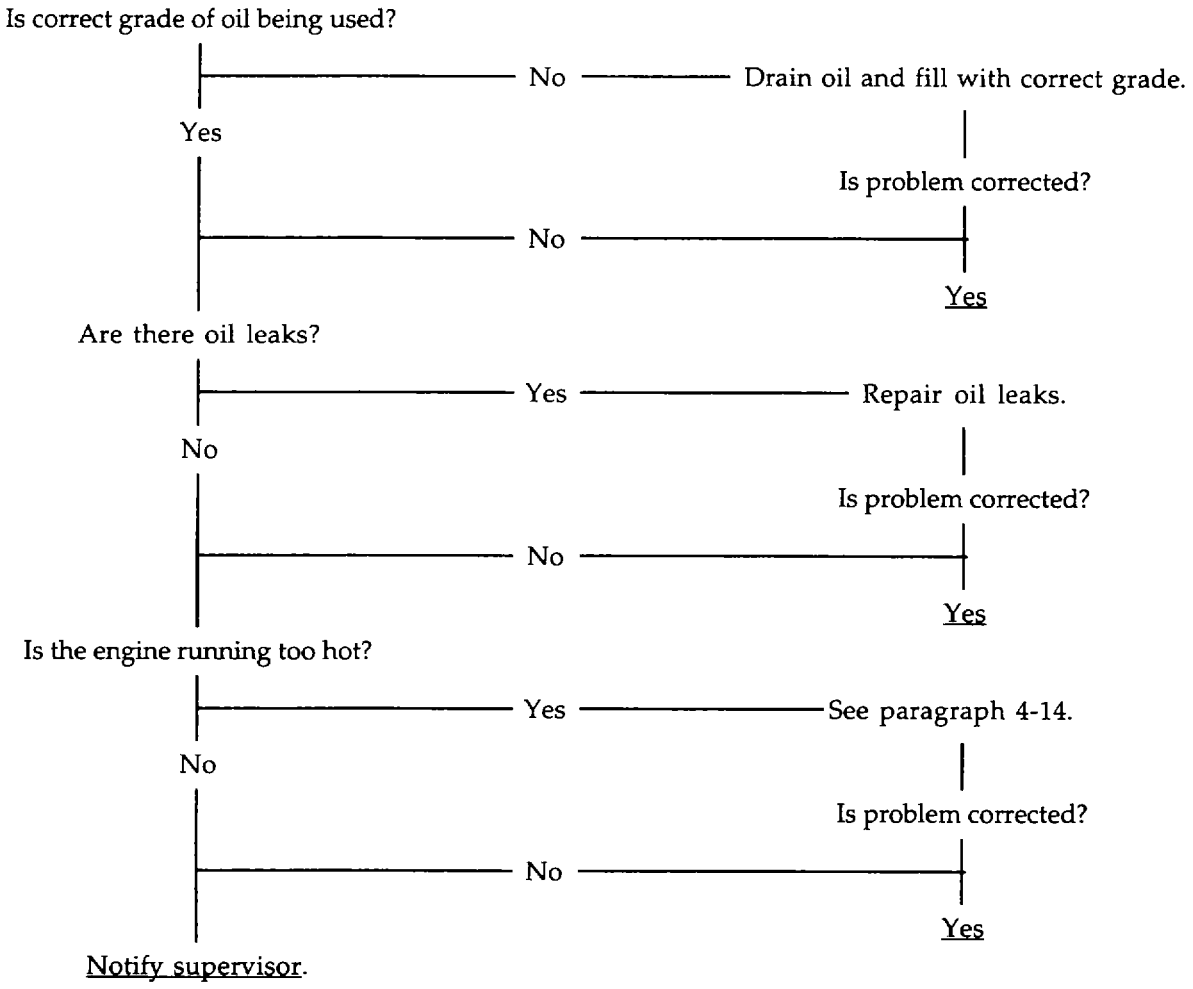
4-18. ENGINE RETURNS TO IDLE BUT COMPRESSOR DOES NOT UNLOAD.



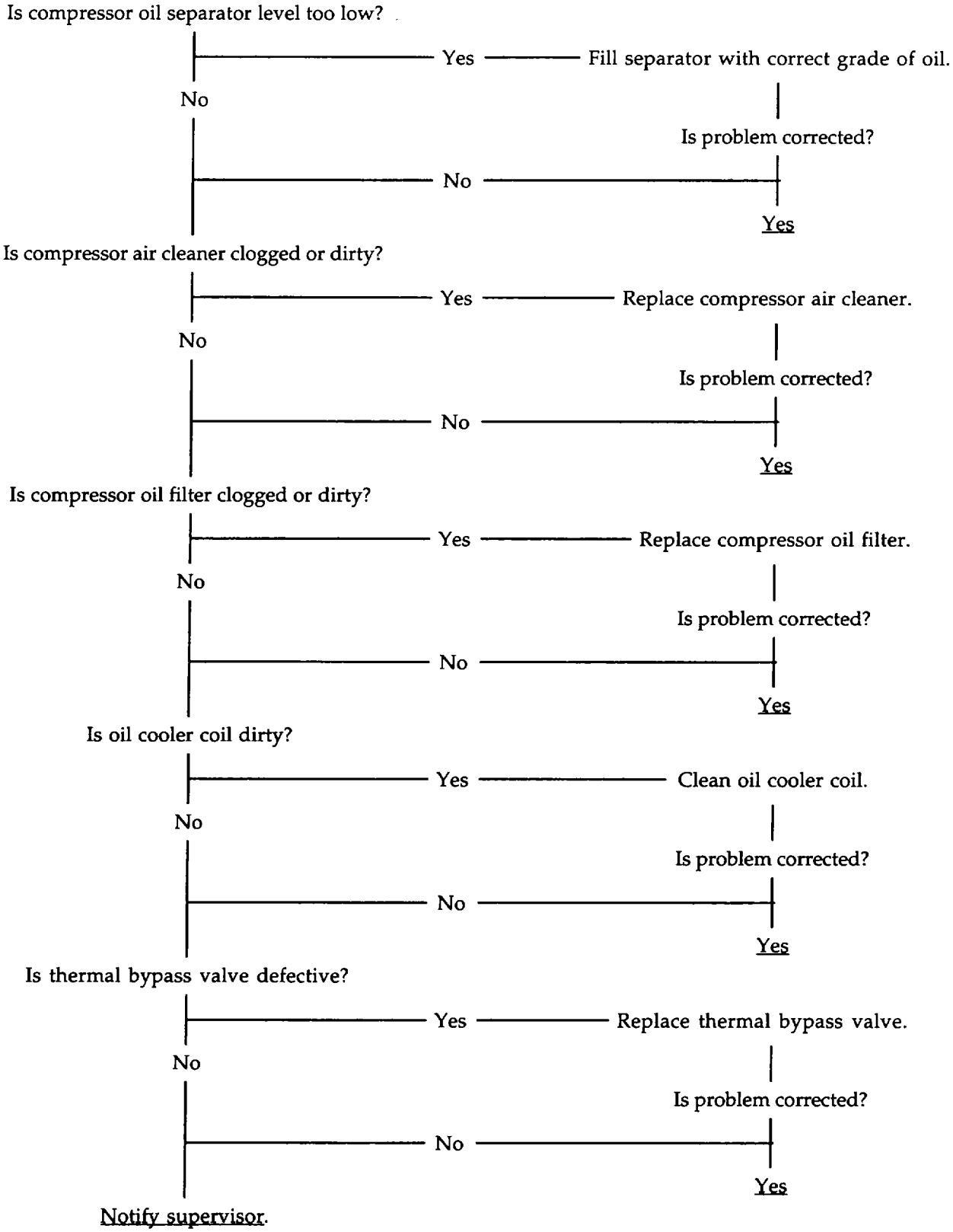
4-19. ENGINE USING TOO MUCH FUEL.



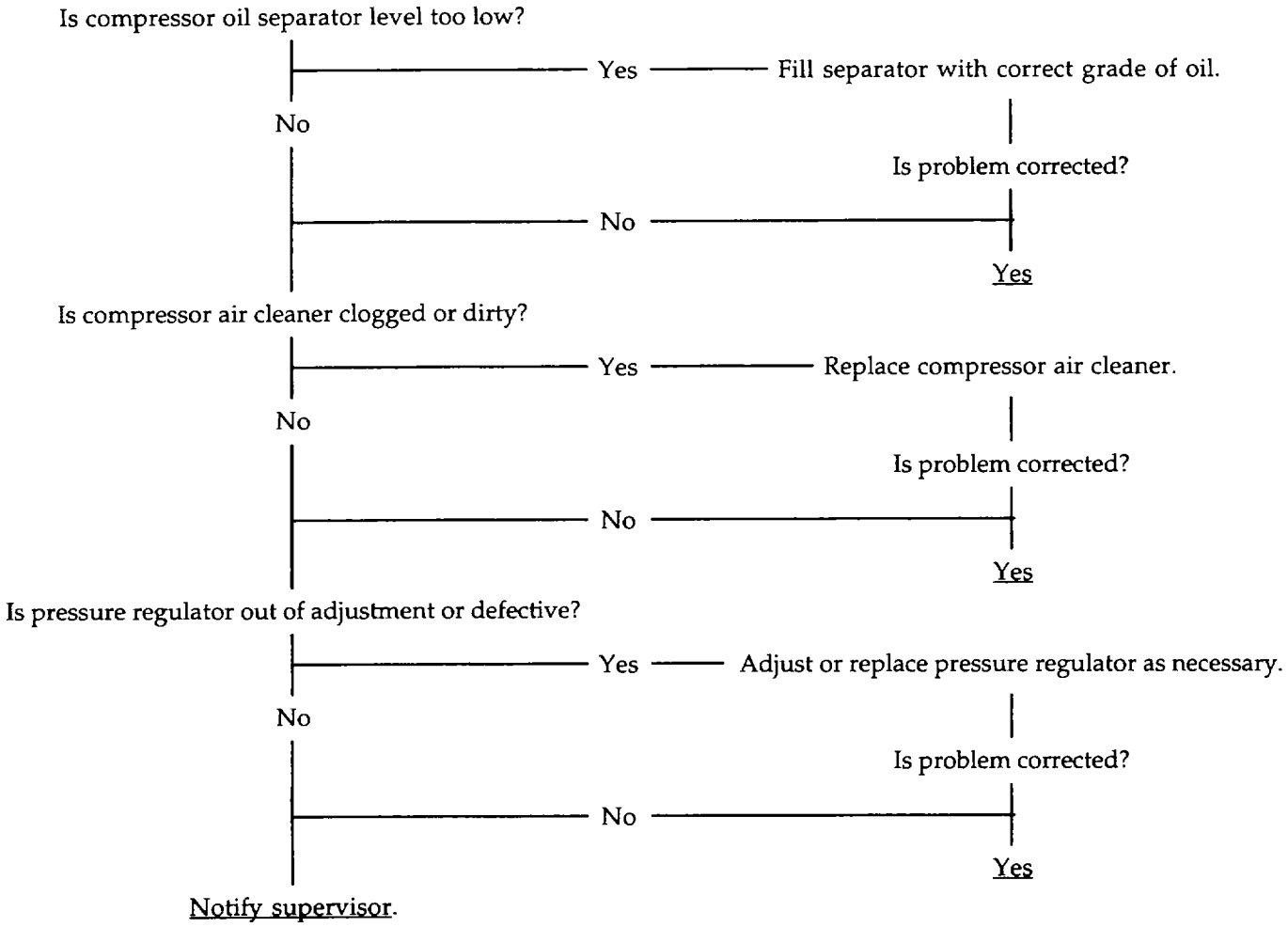
4-20. ENGINE USING TOO MUCH OIL.



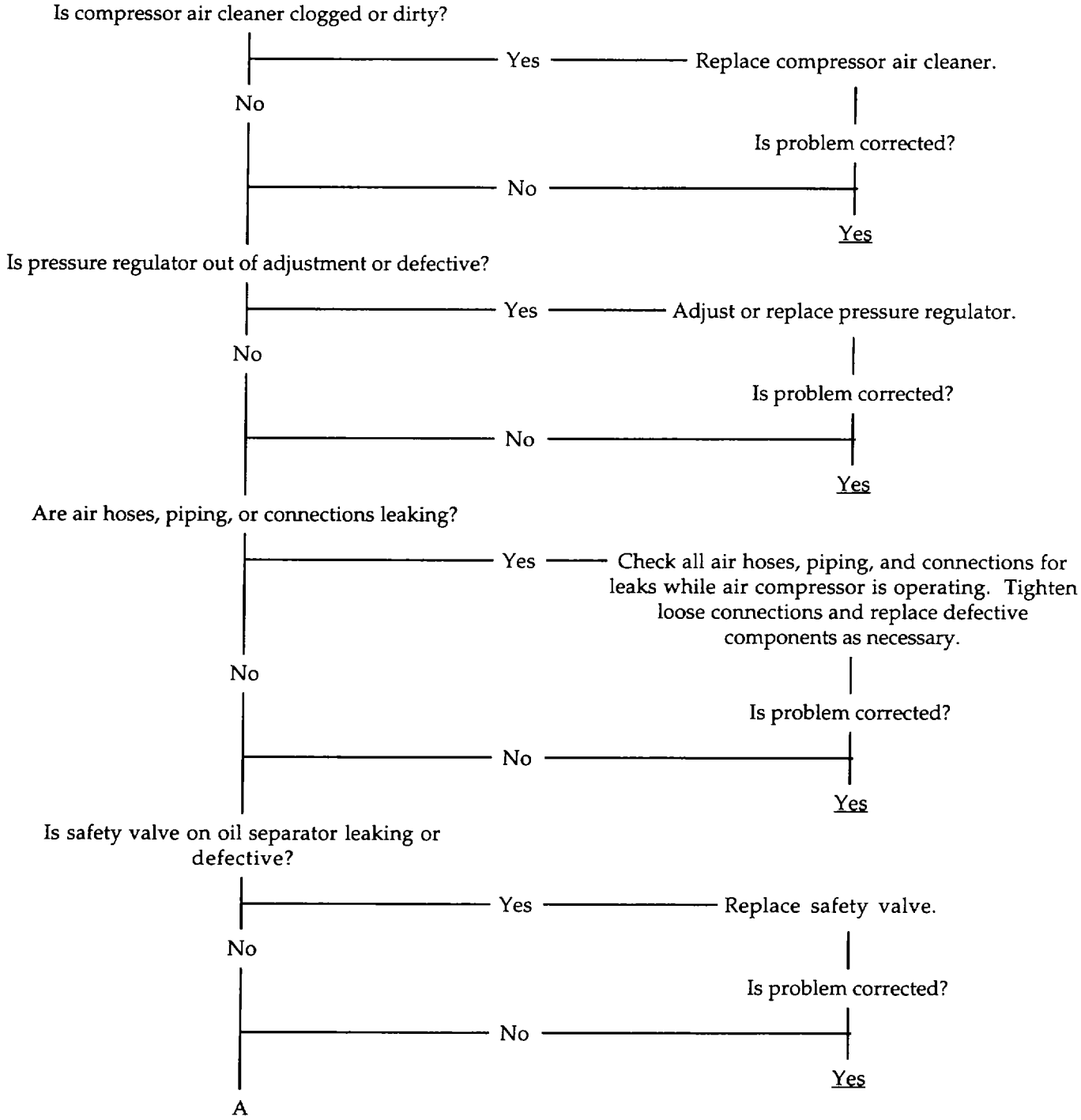
4-21. COMPRESSOR OVERHEATS.



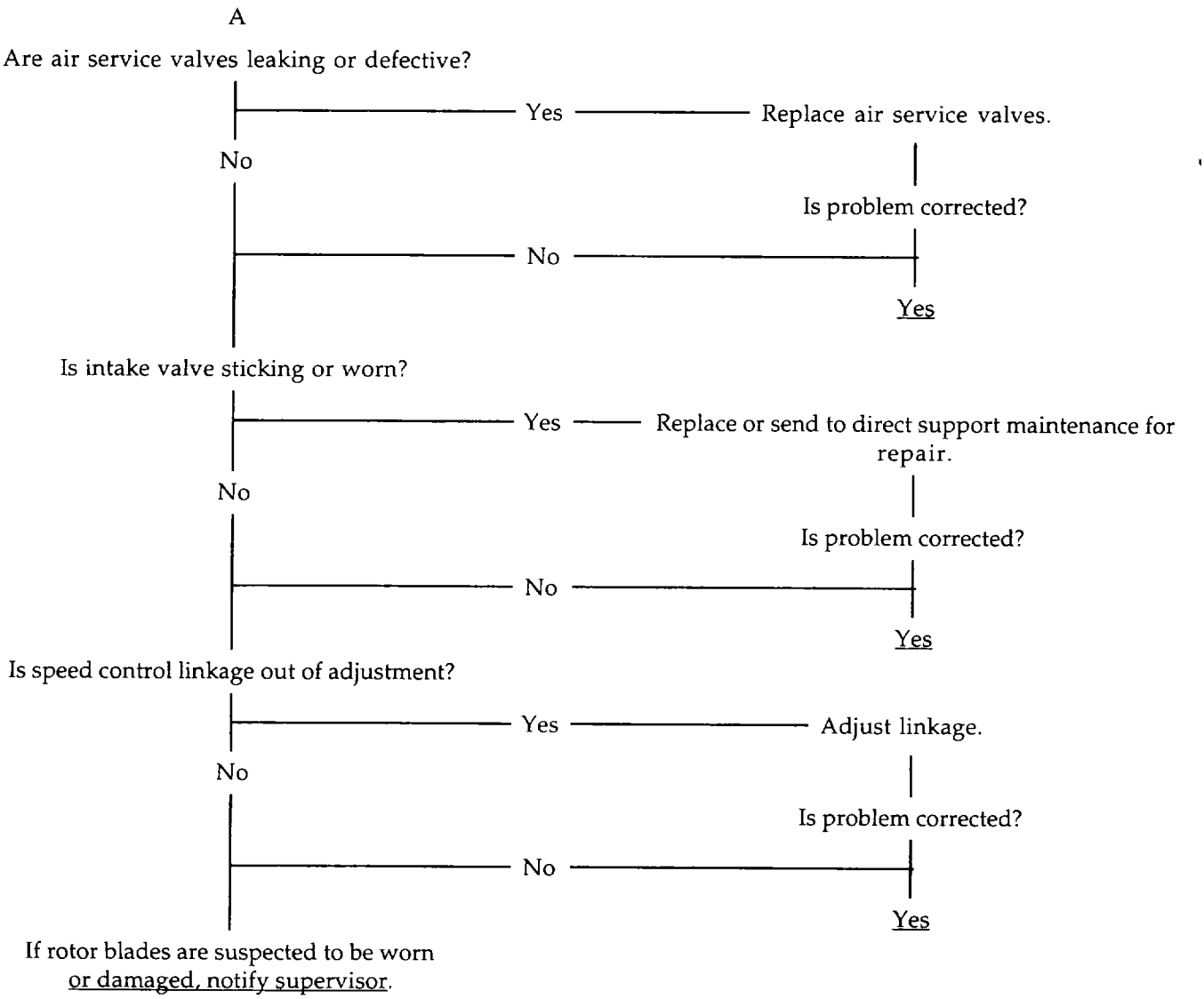
4-22. COMPRESSOR OPERATION IS NOISY.



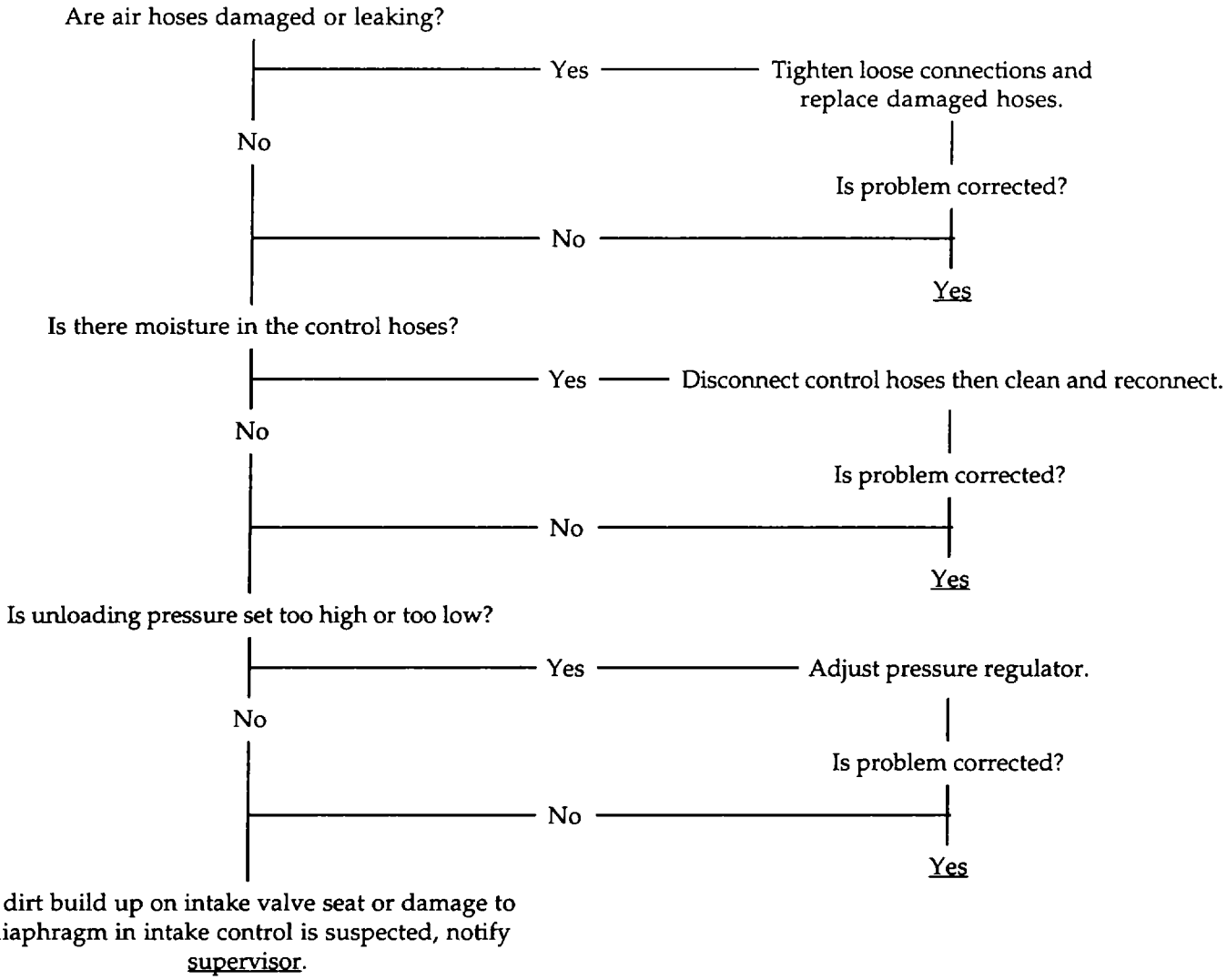
4-23. COMPRESSOR NOT OPERATING TO FULL CAPACITY OR PRESSURE.



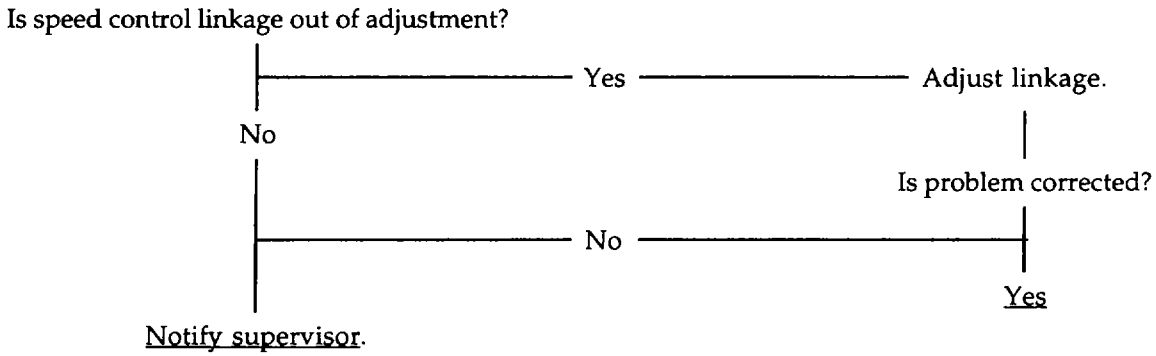
4-23. COMPRESSOR NOT OPERATING TO FULL CAPACITY OR PRESSURE. - Continued



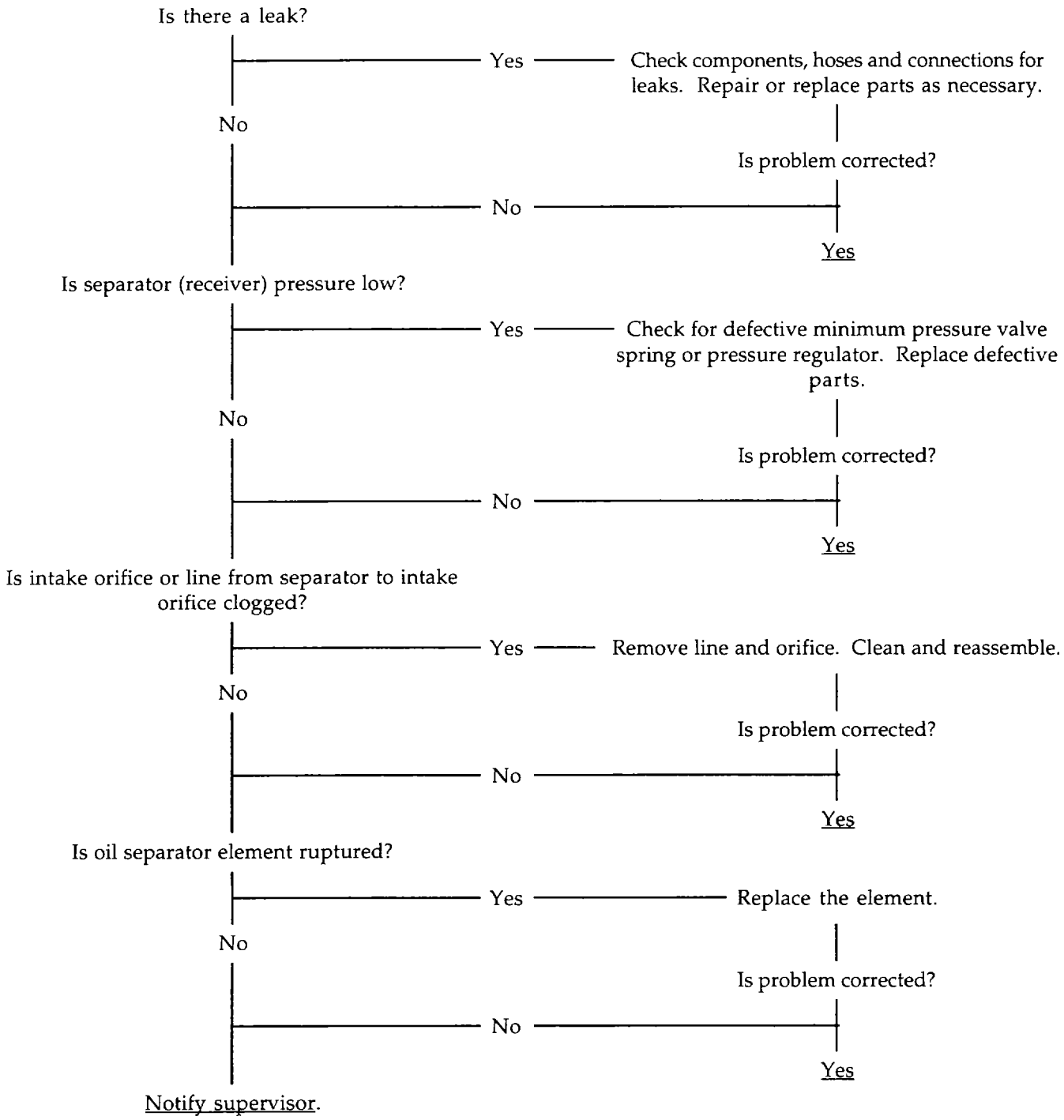
4-24. COMPRESSOR FAILS TO LOAD OR UNLOAD.



4-25. COMPRESSOR UNLOADS BUT ENGINE DOES NOT IDLE.



4-26. EXCESSIVE COMPRESSOR OIL CONSUMPTION.



4-27. CONDENSATE AND/OR EMULSION IN OIL SEPARATOR TANK.

Is temperature unusually low and humidity high?

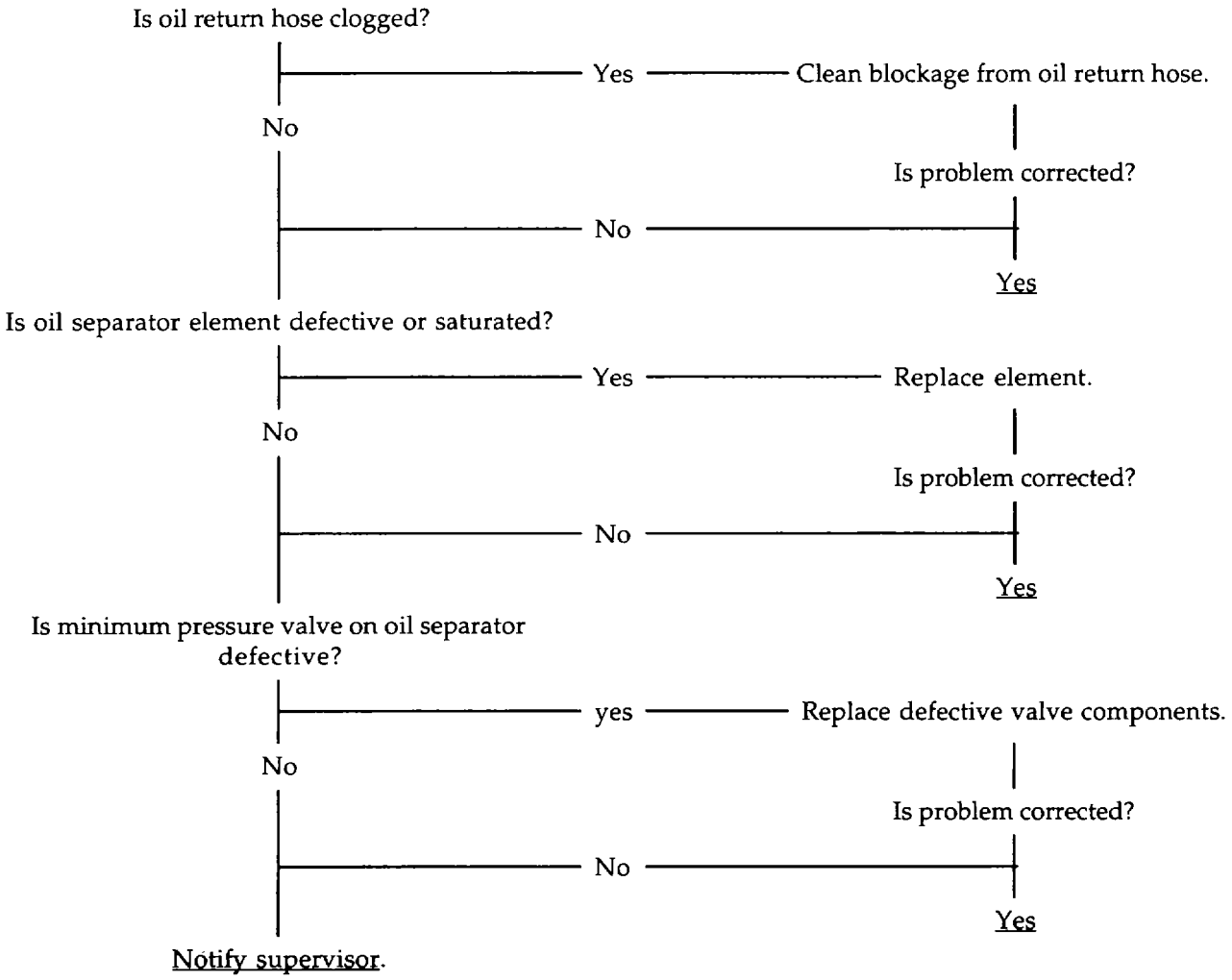
- Yes → Change compressor oil to proper grade for operating condition.
  - Is problem corrected?
    - No → Yes
- No → Is thermal bypass valve defective?
  - Yes → Replace thermal bypass valve.
    - Is problem corrected?
      - No → Yes
  - No → Notify supervisor.

4-28. ENGINE STALLS AT IDLE.

Is idle speed set too low?

- Yes → Adjust idle speed to between 1000 and 1300 rpm.
  - Is problem corrected?
    - No → Yes
- No → Is speed control linkage out of adjustment?
  - Yes → Adjust linkage.
    - Is problem corrected?
      - No → Yes
  - No → Notify supervisor.

4-29. EXCESSIVE OIL IN AIR DISCHARGE.



SECTION VI MAINTENANCE PROCEDURES

4-30. EXHAUST MUFFLER. PIPING AND RISER REPLACEMENT .

This task covers:
a. Removal **b. Installation**

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:

Curbside doors open.
Battery cables disconnected from batteries.
(See para 4-49.)

a. Removal.

(1) Remove four self locking nuts (1), pan head screws (2), flat washers (3), and muffler shroud (4). Discard self locking nuts.

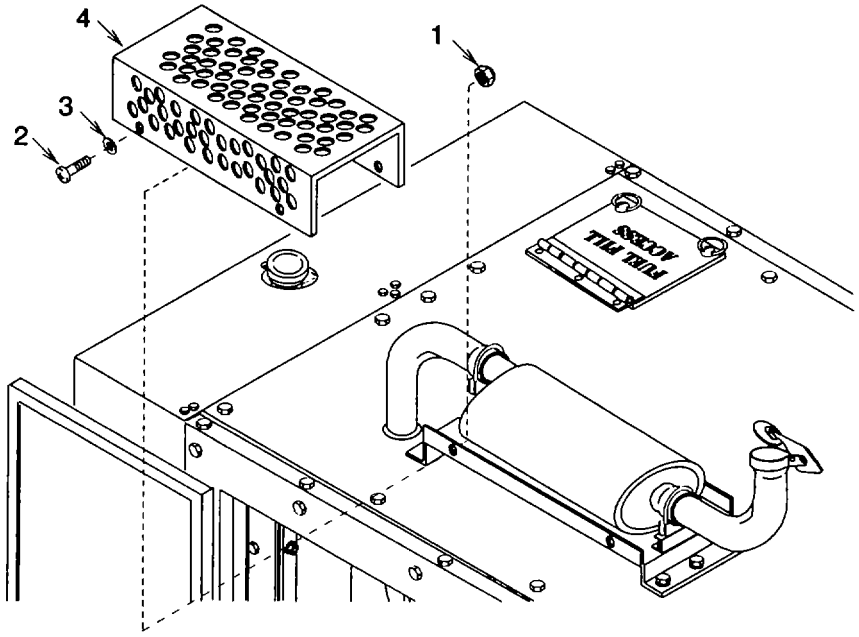


Figure 4-9. Muffler Shroud

(2) Remove four hex nuts (Figure 4-10, 1), two U bolts (2), and saddles (3).

4-30. EXHAUST MUFFLER AND PIPING REPLACEMENT . - Continued

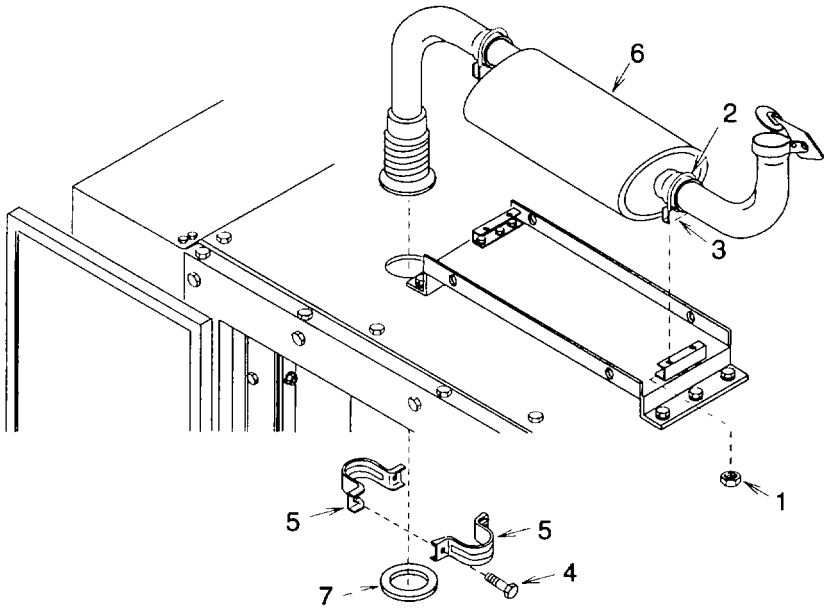


Figure 4-10. Muffler Assembly

(3) Remove two cap screws (4) and clamps (5).

(4) Remove muffler assembly (6) from air compressor. Remove and discard gasket (7).

(a) Remove elbow (Figure 4-11, 1) and exhaust pipe (2) from muffler (3).

(b) Remove rain cap (4) from elbow (1).

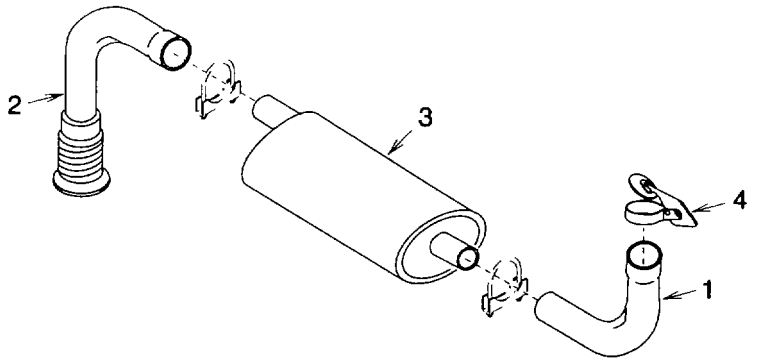


Figure 4-11. Exhaust Pipes and Muffler

(5) Remove six self locking nuts (Figure 4-12, 1), hex washer head bolts (2), flat washers (3), and riser (4). Discard self locking nuts.

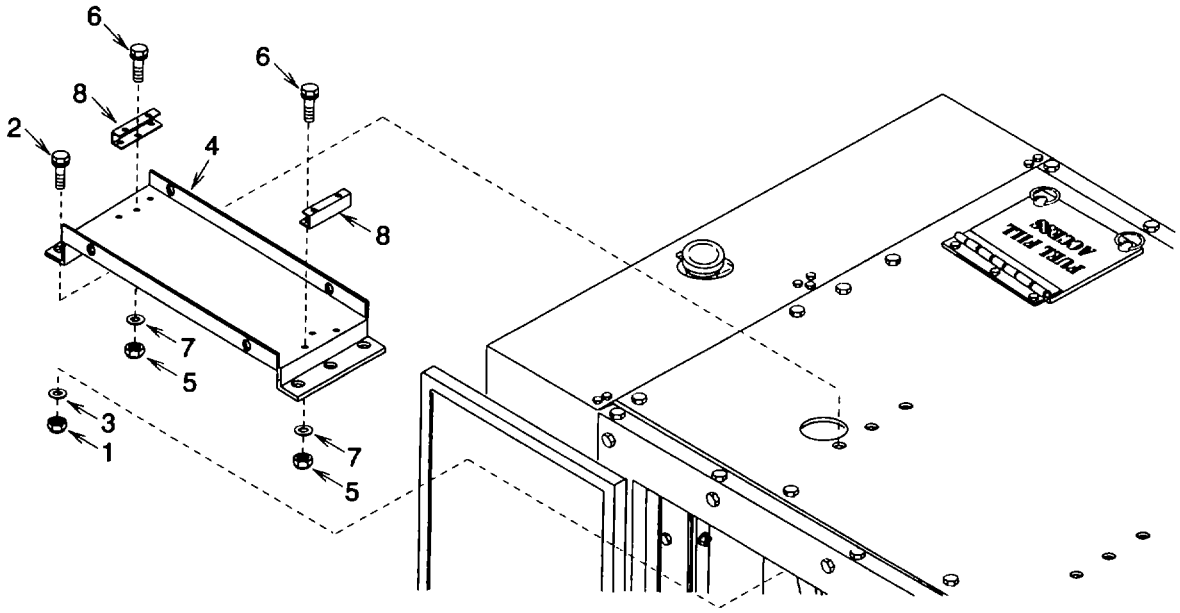


Figure 4-12. Riser Assembly

(6) Remove four self locking nuts (5), hex washer head bolts (6), flat washers (7), and channel mountings (8). Discard self locking nuts.

b. Installation.

(1) Install channel mountings (Figure 4-12, 8) onto riser (4) using four hex washer head bolts (6), flat washers (7) and new self locking nuts (5) (item 3, appendix H).

(2) Aline riser (4) onto cover and secure using six hex washer head bolts (2), flat washers (3), and new self locking nuts (1) (item 3, appendix H).

(3) Install exhaust pipes and muffler (Figure 4-11).

(a) Install rain cap (4) onto elbow (1).

(b) Install elbow assembly (1) and exhaust pipe (2) on muffler (3).

(4) Install muffler assembly (Figure 4-10, 6) through cabinet opening. Install new gasket (7) (item 2, appendix H). Secure muffler assembly with clamps (5), hex head screws (4) and tighten.

(5) Secure muffler assembly to riser by installing two U bolts (2), saddles (3), and four nuts (1).

(6) Install shroud (Figure 4-9, 4) and secure with four pan head screws (2), flat washers (3), and new self locking nuts (1) (item 1, appendix H).

(7) Connect battery cables to batteries. (See para 4-49.)

(8) Close curbside doors.

4-31. COVERS, PANELS AND DOORS REPLACEMENT.

This task covers:
a. Removal **b. Disassembly** **c. Assembly** **d. Installation**

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:

Battery cable disconnected from batteries.
(See para 4-49)
Exhaust muffler, piping and riser removed.
(See para 4-30.)

Personnel Required:

Two

a. Removal.

NOTE
Remove and disassemble only to the extent necessary to replace components.

(1) Top Panel.

(a) Remove twenty hex head screws (Figure 4-13, 1), flat washers (2), and top panel (3).

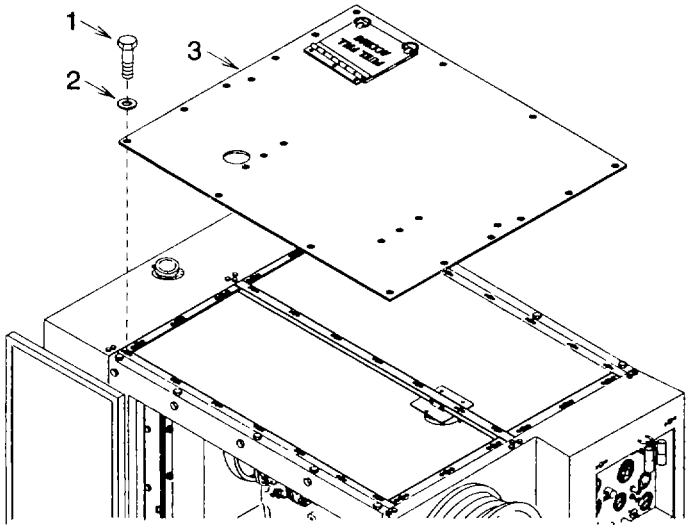


Figure 4-13. Top Panel

(b) Unplug single circuit connector (Figure 4-14, 1) and housing tab (2).

1 Remove four self locking nuts (3), pan head screws (4), flat washers (5) and mounting plate (6). Discard self locking nuts.

2 Remove grommet (7).

3 Drill out three rivets (8) from dome light (9).

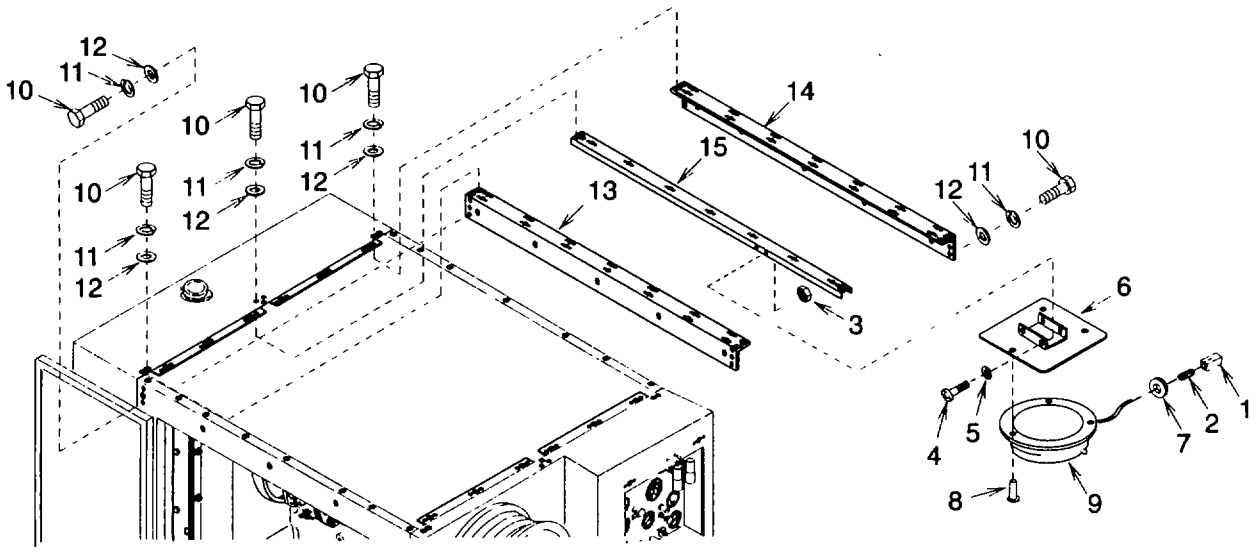


Figure 4-14. Cover Panel Angles and Dome Light

(c) Remove twenty six cap screws (10), lock washers (11), and flat washers (12) from two cover panel angles (13) and (14) and one cover panel channel (15). Discard lock washers.

(d) Remove three hex washer head screws (Figure 4-15, 1) and access door (2).

NOTE

Gaskets are glued to panels and must be replaced if removed.

(e) Remove gaskets (3) and (4).

(f) Disassemble bail handle stud (5) by removing retainer (6).

NOTE

Insulation has an adhesive backing and must be replaced if removed.

(g) Remove clips (7) as necessary to remove insulation (8), (9), and (10) from panel (11). Discard clips.

(h) Drill out rivets (12) and receptacle (13).

4-31. COVERS, PANELS AND DOORS REPLACEMENT. - Continued

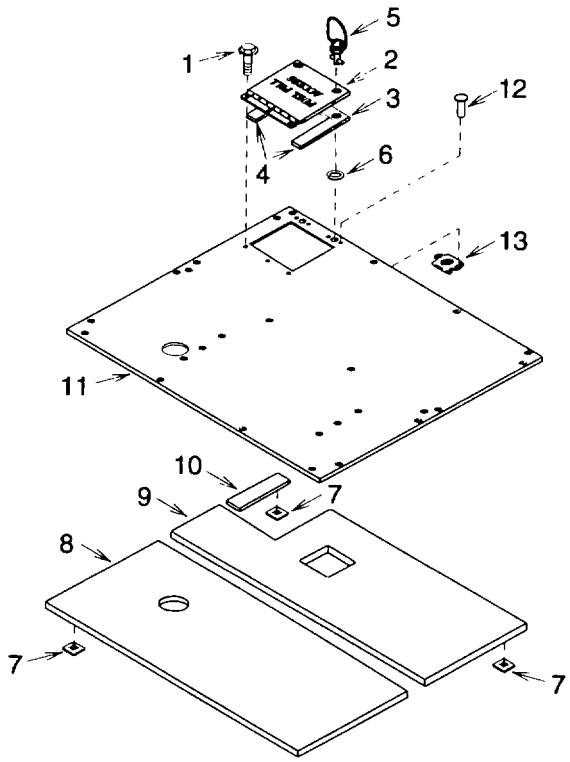


Figure 4-15. Access Door, Top Panel and Insulation

(2) Curbside Panel.

(a) Remove twenty two hex head screws (Figure 4-16, 1) and flat washers (2).

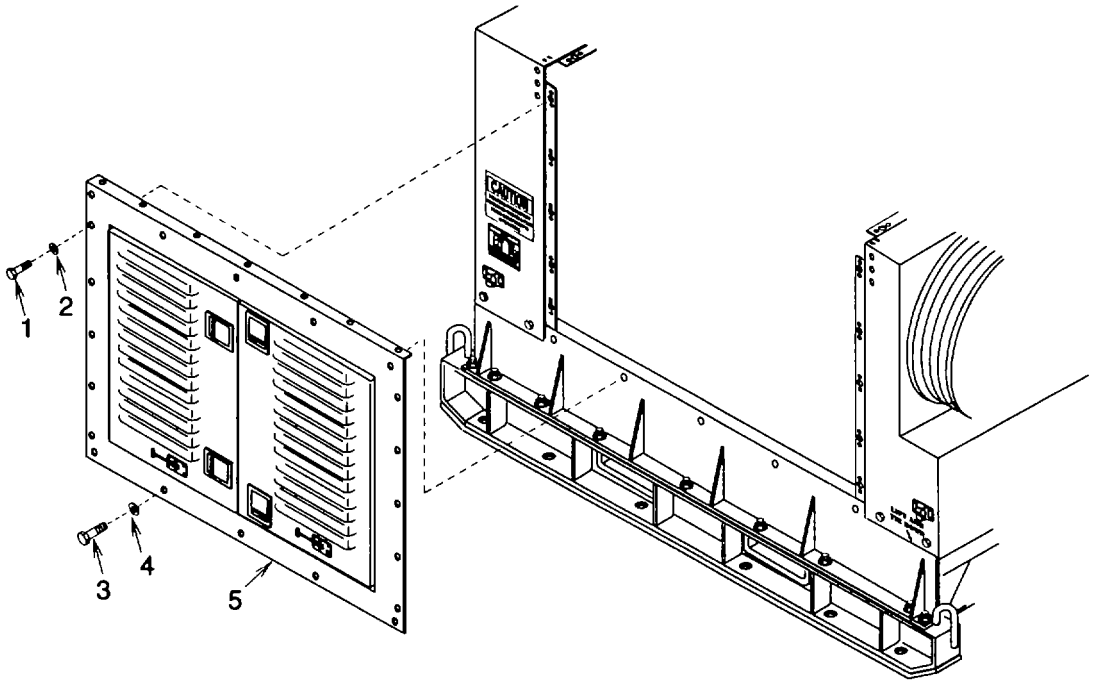


Figure 4-16. Curbside Doors and Panel

(b) Remove five hex head screws (3) and flat washers (4) and remove curbside panel assembly (5).

(3) Curbside Doors.

(a) Remove hex nuts, part of door latch (Figure 4-17,1) to remove latches.

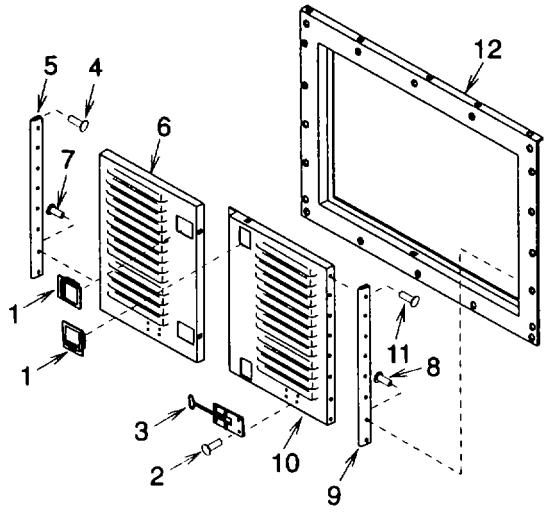


Figure 4-17. Curbside Doors and Panel Assembly

4-31. COVERS, PANELS AND DOORS REPLACEMENT. - Continued

(b) Drill out eight rivets (2) to remove door holder (3).

(c) Drill out seven rivets (4) from left door panel hinge (5) to remove door assembly (6).

(d) Drill out eight rivets (7) to remove hinge (5) from door (6).

(e) Drill out seven rivets (8) from right door panel hinge (9) to remove door assembly (10).

(f) Drill out eight rivets (11) to remove hinge (9) from door (10).

(4) Roadside Panel.

(a) Remove twenty two hex head screws (Figure 4-18, 1) and flat washers (2).

(b) Remove five hex head screws (3), flat washers (4) and roadside panel assembly (5).

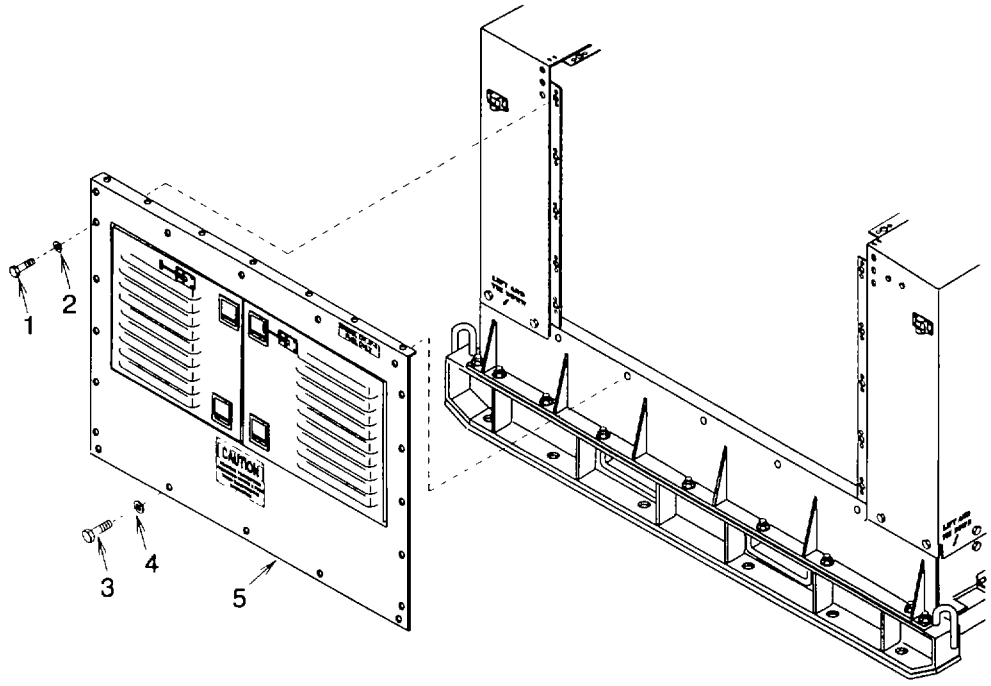


Figure 4-18. Road Side Doors and Panel Assembly

(5) Roadside Doors.

(a) Remove hex nut, part of each door latch (Figure 4-19, 1) to remove latches.

(b) Drill out four rivets (2) from each door holder (3).

(c) Drill out five rivets (4) from door hinge (5) and panel assembly (6). Remove left door (7).

(d) Drill out three rivets (8) from door hinge (5) and door (7).

(e) Drill out four rivets (2) from each door holder (3).

(f) Drill out five rivets (9) from door hinge (10) and panel assembly (6). Remove right door (11).

(g) Drill out three rivets (12) from door hinge (10) and door (11).

(h) Drill out four rivets (13) from caution plate (14).

(i) Peel off decal (15) to remove.

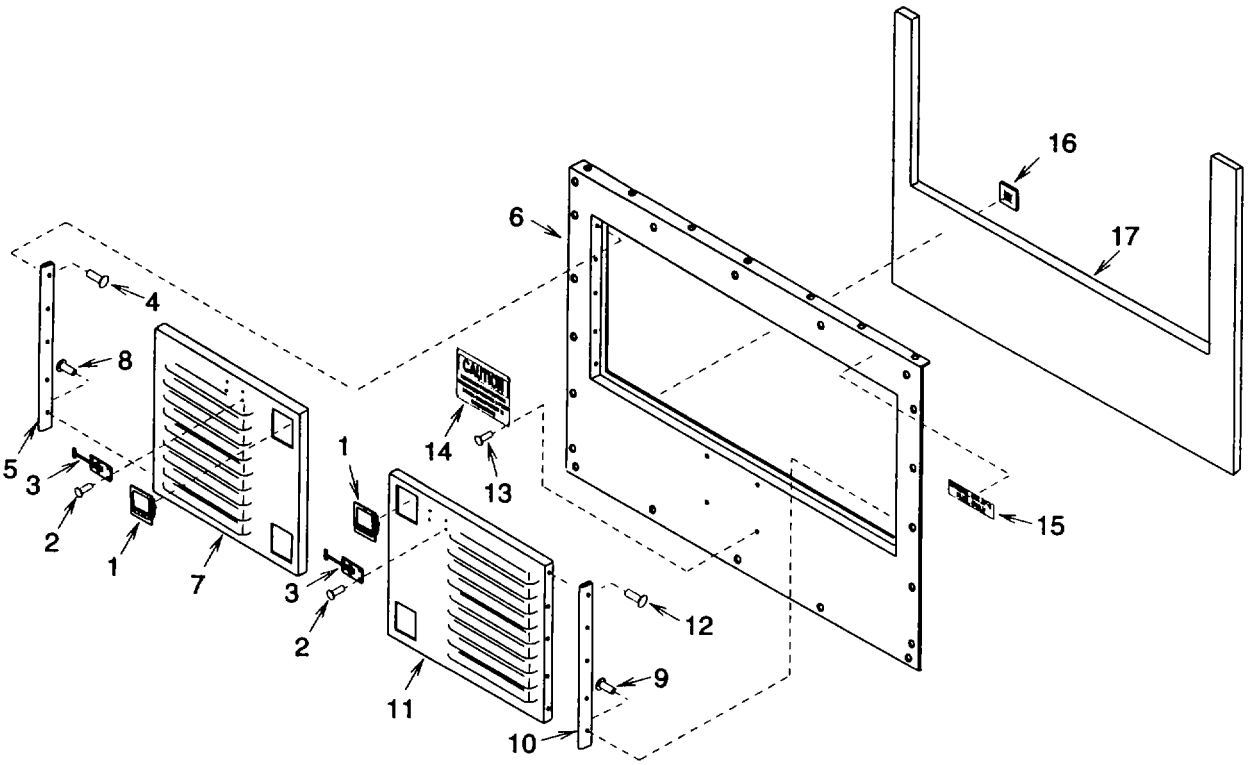


Figure 4-19. Road Side Doors and Panel

NOTE

Insulation has an adhesive backing and must be replaced if removed.

(j) Remove clips (16) and peel off insulation (17) and discard both.

(6) Rear Panel.

(a) Remove two pan head screws (Figure 4-20, 1), and lock washers (2). Discard lock washers.

4-31. COVERS, PANELS AND DOORS REPLACEMENT. - Continued

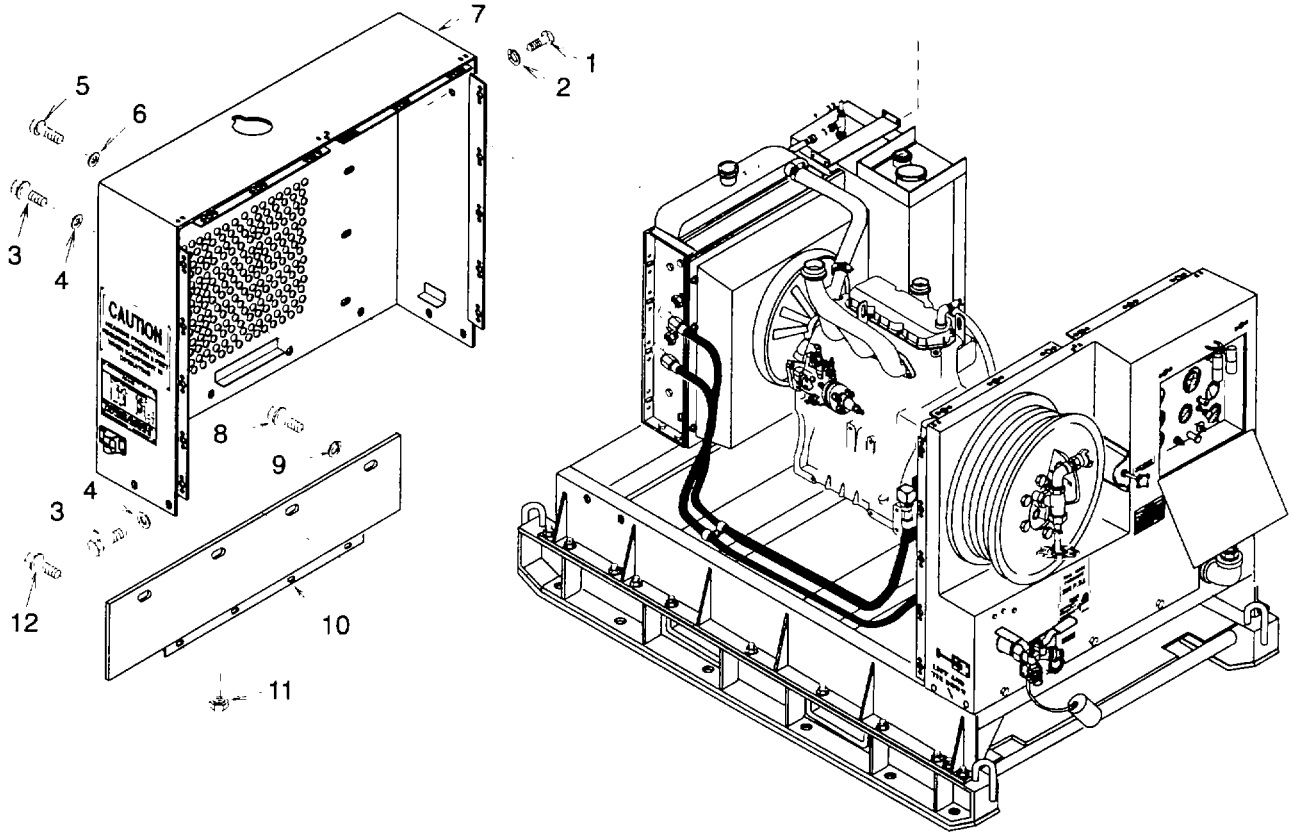


Figure 4-20. Rear Panel And Air Block Lower Hinged Panel

(b) Remove eight hex washer head bolts (3) and flat washers (4).

(c) Remove eight hex washer head bolts (5), flat washers (6) and rear panel (7).

(d) Remove four hex washer head bolts (8) and lock washers (9) from air block (10). Discard lock washers.

(e) Remove four self locking nuts (11), hex washer head bolts (12), and air block cover (10). Discard self locking nuts.

(f) Rear Panel Information Plates and Insulation.

1 Drill out four rivets (Figure 4-21, 1) to remove receptacle (2).

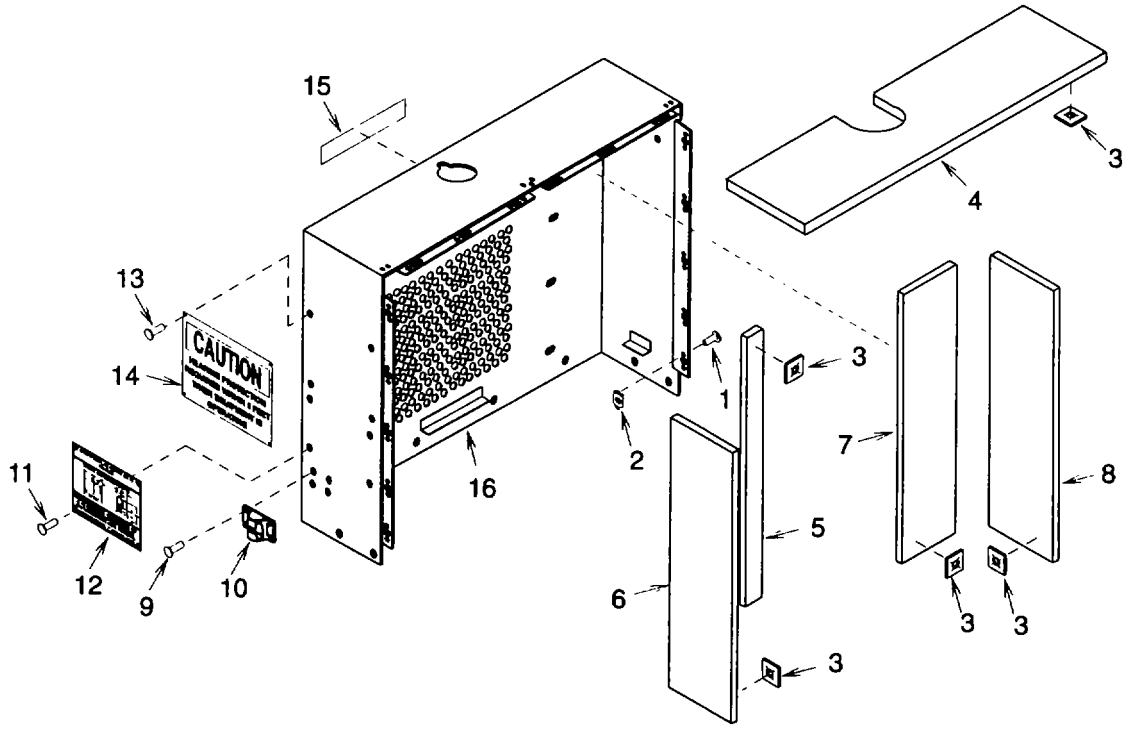


Figure 4-21. Rear Panel Hardware

NOTE

Insulation has an adhesive backing and must be replaced if removed.

2 Remove clips (3) as necessary to remove insulation (4), (5), (6), (7) and (8). Discard clips and insulation.

3 Drill out eight rivets (9) to remove two door holders (10).

4 Drill out four rivets (11) to remove shipping data plate (12).

5 Drill out four rivets (13) to remove caution plate (14).

6 Peel off warning decal (15) from rear panel (16).

(7) Front Panel Assembly.

NOTE

Two personnel are required to complete removal of component parts.

(a) Remove control panel gauges per paragraphs 4-33 through 4-46.

4-31. COVERS, PANELS AND DOORS REPLACEMENT. - Continued

(b) Disconnect hoses (Figure 4-22, 1) and (2) and remove elbow to hose reel (3).

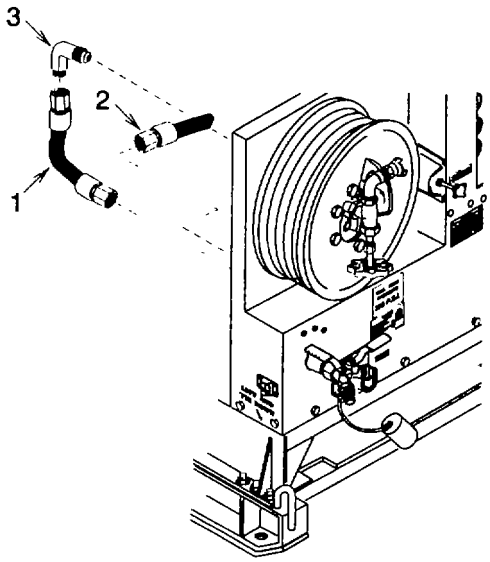


Figure 4-22 Hose Connections

(c) Remove knob (Figure 4-23, 1) and pull knob and braking block (2) off hose reel (3).

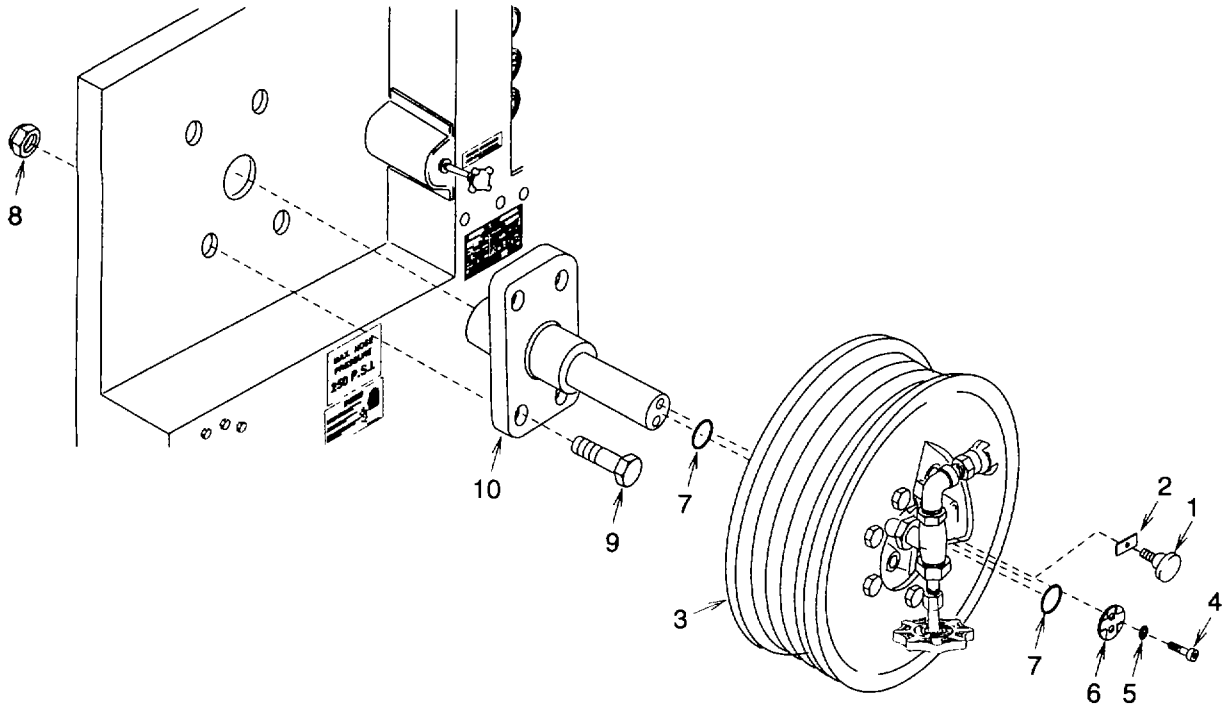


Figure 4-23. Hose Reel

(d) Remove two socket head screws (4), lock washers (5), hose reel body retainer (6) and preformed packing (7). Discard lock washers and preformed packing.

(e) Remove hose reel assembly (3) and preformed packing (7). Discard preformed packing.

(f) Remove four self locking nuts (8), hex head screws (9), and spindle (10). Discard self locking nuts.

(g) Loosen setscrew (Figure 4-24, 1) and remove knob (2) from rod (3).

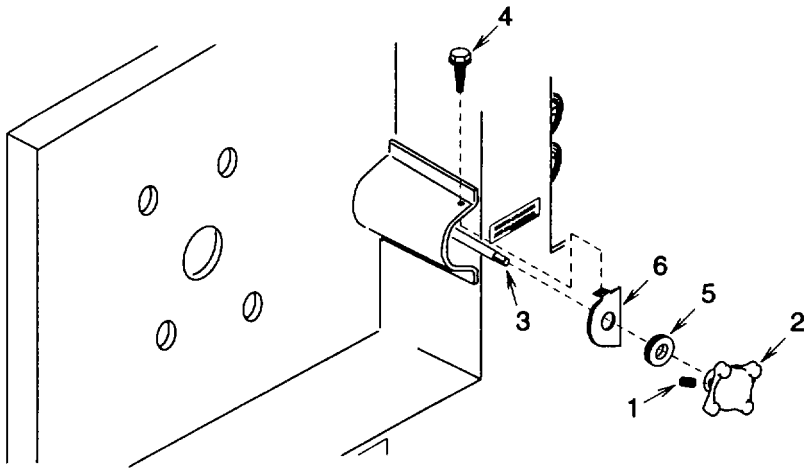


Figure 4-24. Inlet Housing Knob (Unloader)

(h) Remove two hex washer head bolts (4), guide plate assembly (6), and grommet (5).

(i) Tag wire leads (Figure 4-25, 1).

(j) Remove lock nut (2), wire leads (1), and hex washer head bolt (3).

(k) Loosen, but do not remove, screw (4). Remove push/pull cable (5).

(l) Remove hex head screw (6) and clamp (7).

(m) Remove nut (8) and pull push/pull cable assembly (9) through front of panel.

(n) Remove four lock nuts (10), hex washer head bolts (11), and cold starting aid (12). Discard lock nuts.

(o) Remove two cap screws (13) from cables (14) and (15) and pull cables from connector (16).

(p) Remove eight pan head screw (17) and flat washers (18).

NOTE

Two personnel are required to complete removal of component parts.

(q) Remove control panel (19) taking care not to damage rod (Figure 4-24, 3).

4-31. COVERS, PANELS AND DOORS REPLACEMENT. - Continued

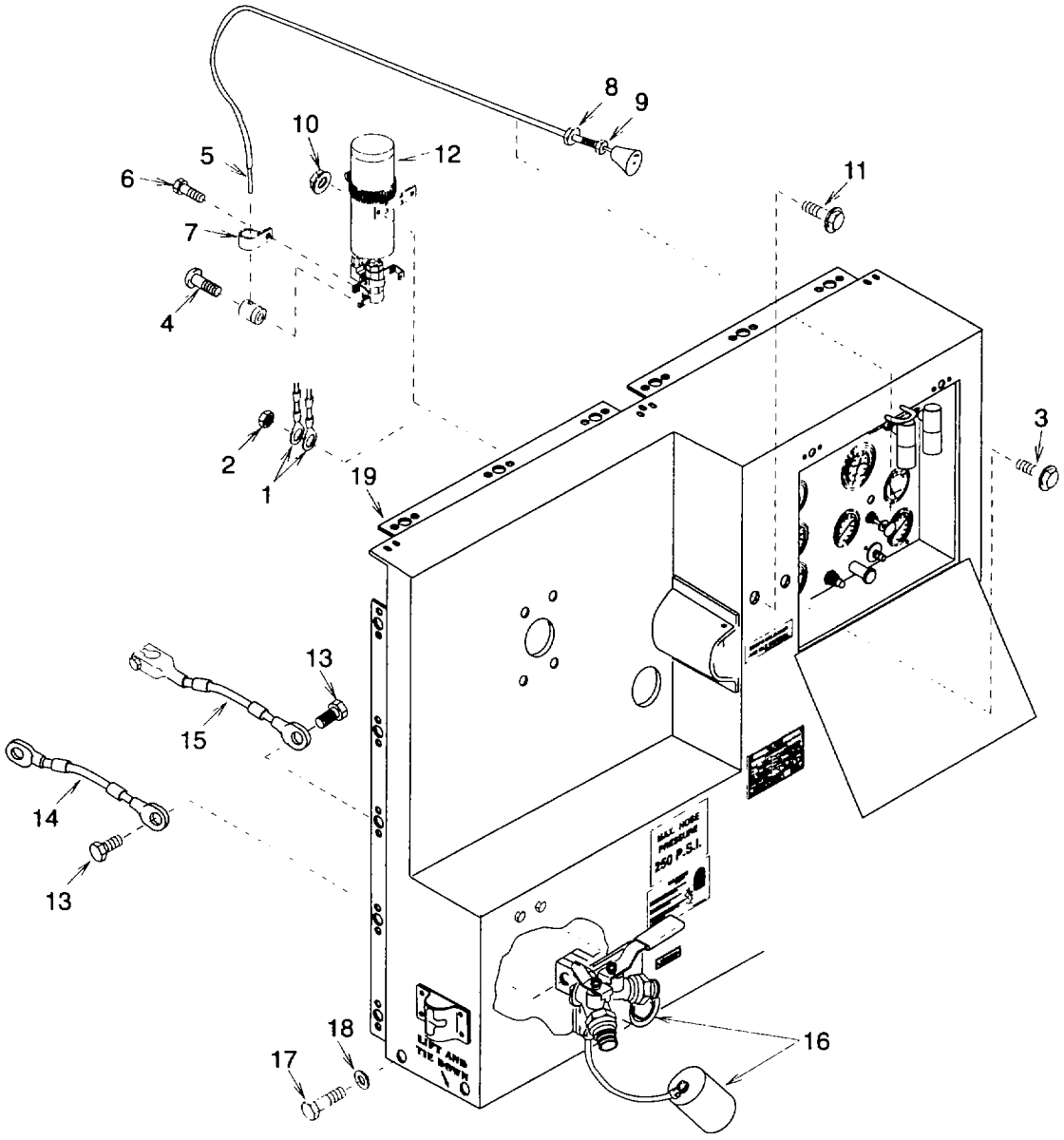


Figure 4-25. Front Panel Assembly

b. Disassembly.

(1) Remove double discharge valve (Figure 4-26, 1).

(2) Remove four lock nuts (2), hex washer head bolts (3), and service valve pipe (4). Discard lock nuts.

(3) Remove tee assembly (5).

(4) Remove four self locking nuts (6) and pan head screws (7) from connector (8). Discard self locking nuts.

(5) Remove two hex nuts (9), lock washers (10), pan head screws (11), flat washers (12), and bumpers (13). Discard lock washers.

(6) Drill out four rivets (14) from each door holder (15) located on side panels.

(7) Drill out four rivets (16) from door assembly (17).

NOTE

Insulation has an adhesive backing and must be replaced if removed.

(8) Peel off gaskets (18) and (19).

(9) Remove bail handle stud (20) from retainer (21).

(10) Drill out two rivets (22) from each anchor nut (23).

(11) Drill out two rivets (24) from each anchor nut (25), as required, for replacement.

4-31. COVERS, PANELS AND DOORS REPLACEMENT. - Continued

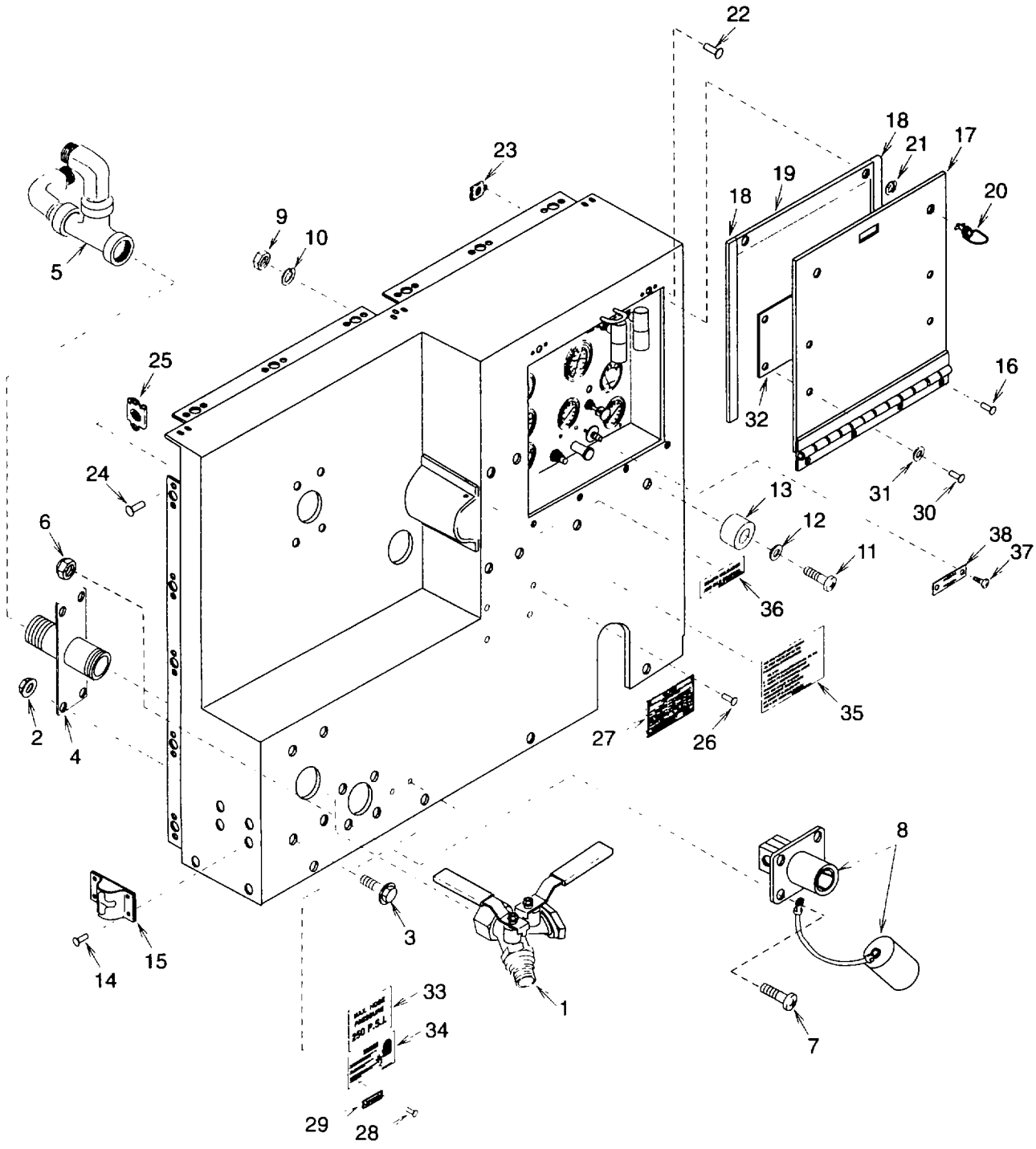


Figure 4-26. Front Panel Information Plates and Decals

NOTE

Insulation has an adhesive backing and must be replaced if removed.

(12) Remove clips (Figure 4-27, 1) as necessary to replace insulation panels (2) through (8) from front panel (9). Discard clips and peel insulation off.

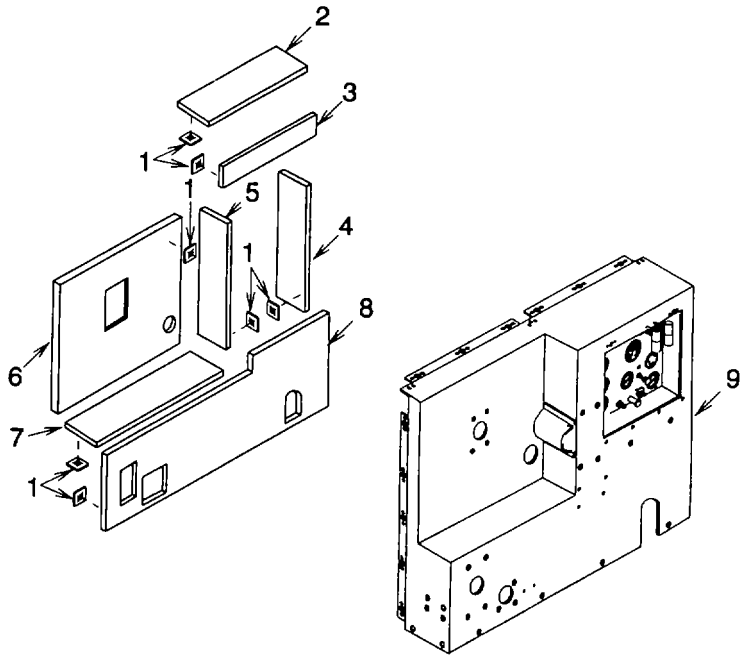


Figure 4-27. Front Panel Insulation

(13) Drill out four rivets (Figure 4-26, 26) to remove identification plate (27).

(14) Drill out four rivets (28) to remove slave receptacle plate (29)

(15) Drill out four rivets (30), to remove flat washers (31), and operating instruction plate (32).

(16) Peel off decals (33), (34), (35) and (36) to remove.

NOTE

The following procedure is typical for all instrument identification plates.

(17) Remove two screws (37) and instrument identification plate (38).

c. Assembly.

(1) Fabricate insulation panels (Figure 4-27, 2 through 8), as required, per the following:

(a) Cut insulation panel per appendix F.

NOTE

Paper backing on insulation panel must be removed when installed.

(b) Carefully peel paper backing away from around insulation panel edge.

(c) Cover exposed insulation panel edge with foil back tape (item 9, section II, appendix E) folded over edges. Be sure tape is under paper backing on insulation panel.

4-31. COVERS, PANELS AND DOORS REPLACEMENT. - Continued

WARNING

Metal pins pierce insulation panels when installed. Injury to hands can result if care is not taken when installing insulation panels.

(2) Remove paper backing from insulation panel and install with sticky side against sheet metal panel. Carefully locate pins and install new clips (1) (item 6, appendix H).

(3) Install anchor nuts (Figure 4-26, 25) as required and secure with two rivets (24) (item 64, appendix H).

(4) Install anchor nuts (23) as required and secure with two rivets (22) (item 64, appendix H).

(5) Install door assembly (17) and secure with four rivets (16) (item 9, appendix H).

WARNING

Adhesive (item 5, section II, appendix E) is toxic and flammable. Use in well ventilated areas only. Avoid breathing vapor and avoid repeated or prolonged contact with liquid. Do not use near open flame or excessive heat.

(6) Install bail handle stud (20) and retainer (21).

(7) Install gaskets (18) and (19) as required, per the following:

(a) Scrape off as much of the old gasket material from surface.

(b) Remove old adhesive and gasket residue by scraping.

(c) Cut gasket per appendix F.

(d) Apply adhesive (item 5, section II, appendix E), to mating surfaces of metal and gasket.

(e) Let surface air dry until adhesive is tacky but will not stick to fingers.

(f) Carefully attach gasket to the metal. Press into firm contact all over.

(8) Install door holder (15) and secure with four rivets (14) (item 42, appendix H).

(9) Install two bumpers (13) and secure with two pan head screws (11) and flat washers (12), new lock washers (10),(item 7, appendix H) and nuts (9).

(10) Install connector (8) and secure with four pan head screws (7) and self locking nuts (6) (item 1, appendix H).

(11) Install service valve pipe (Figure 4-26, 4) and secure with four hex head bolts (3) and new lock nuts (2) (item 3, appendix H).

(12) Wrap antiseize tape (item 1, section II, appendix E) around the service valve pipe threads (4) and install double discharge valve (1) and tee assembly (5).

NOTE

The following procedure is typical for all instrument identification plates. Figure 2-4 indicates location of individual plates.

(13) Install instrument identification plate (38) and secure with two screws (37).

(14) Install decals (33) through (36), as required, by peeling back protective backing and placing decals in position.

(15) Install operating instruction plate (32), four flat washers (31), and secure with rivets (30) (item 37, appendix H).

(16) Install slave receptacle plate (29) and secure with four rivets (28) (item 55, appendix H).

(17) Install identification plate (27) and secure with four rivets (26) (item 55, appendix H).

d. Installation.

(1) Front Panel Assembly.

NOTE

Two personnel are required to complete installation of component parts.

(a) Aline rod (Figure 4-24, 3) and install front panel (Figure 4-25, 19) being careful not to damage rod. Secure front panel with eight pan head screws (17) and flat washers (18).

(b) Install cables (14) and (15) onto connector (16) and secure using two cap screws (13).

(c) Install cold starting aid (12), four hex washer head bolts (11), and new lock nuts (10) (item 3, appendix H).

(d) Feed the push/pull cable assembly (9) through front of panel and install nut (8).

(e) Install clamp (7) and secure with hex head screw (6).

(f) Install push/pull cable (5) and tighten screw (4).

(g) Install wire leads (1) using tags and wiring diagram figure 4-3, hex washer head bolt (3), and new lock nut (2) (item 68, appendix H). Remove tags.

(h) Install grommet (Figure 4-24, 5) onto guide plate assembly (6)

(i) Install guide plate assembly (6) onto rod (3) and secure with two hex washer head bolts (4).

(j) Install knob (2) onto rod (3) and secure with setscrew (1).

(k) Install spindle (Figure 4-23, 10), four hex head screws (9), and new self locking nuts (8) (item 5, appendix H).

(l) Install new preformed packing (7) (item 8, appendix H) onto hose reel assembly (3) and carefully install hose reel assembly onto spindle (10). Secure hose reel assembly using hose reel body retainer (6), two new lock washers (item 4, appendix H), and socket head screws (4).

(m) Install braking block (2), and knob (1).

4-31. COVERS, PANELS AND DOORS REPLACEMENT. - Continued

(n) Connect elbow (Figure 4-22, 3) to hose reel.

(o) Wrap antiseize tape (item 1, section II, appendix E) around elbow male end connections and connect hoses (1) and (2).

(p) Install control panel gauges per paragraphs 4-33 through 4-46.

(2) Rear Panel Information Plates and Insulation.

(a) Peel backing off decal (Figure 4-21, 15) and position on rear panel (16).

(b) Install caution plate (14) and secure with four rivets (13) (item 55, appendix H).

(c) Install shipping data plate (12) and secure with four rivets (11) (item 55, appendix H).

(d) Install door holder (10) and secure with four rivets (9) (item 42, appendix H).

(e) Fabricate insulation panels (4), (5), (6), (7) and (8), as required, per the following:

1 Cut insulation panel per appendix F.

NOTE

Paper backing on insulation panel must be removed when installed.

2 Carefully peel paper backing away from around insulation panel edge.

3 Cover exposed insulation panel edge with foil back tape (item 9, section II, appendix E) folded over edges. Be sure tape is under paper backing on insulation panel.

WARNING

Metal pins pierce insulation panels when installed. Injury to hands can result if care is not taken when installing insulation panels.

(f) Remove paper backing from insulation panel and install with sticky side against sheet metal panel. Carefully locate pins and install new clips (3) (item 6, appendix H).

(g) Install receptacle (2) and secure with four rivets (1) (item 42, appendix H).

(3) Rear Panel.

(a) Install rear panel (Figure 4-20, 7) and secure with eight hex washer head bolts (3) and flat washers (4).

(b) Install eight hex washer head bolts (5) and flat washers (6).

(c) Install two pan head screws (1) and new lock washers (2) (item 10, appendix H).

(d) Install air block (10) and secure with four hex washer head bolts (12) and self locking nuts (11) (item 5, appendix H).

(e) Secure air block with four hex washer head bolts (8) and lock washers (9) (item 4, appendix H).

(4) Roadside Doors and Panel.

(a) Install door latches (Figure 4-19, 1) and secure with hex nuts on both doors.

(b) Install door holders (3) and secure with four rivets (2) (item 42, appendix H) on both doors.

(c) Install door hinge (5) and secure to left door (7) with three rivets (8) (item 63, appendix H).

(d) Install door hinge (10) and secure to right door (11) with five rivets (12) (item 63, appendix H).

(e) Fabricate insulation panel (17) per the following:

1 Cut insulation panel per appendix F.

NOTE

Paper backing on insulation panel must be removed when installed.

2 Carefully peel paper backing away from around insulation panel edge.

3 Cover exposed insulation panel edge with foil back tape (item 9, section II, appendix E) folded over edges. Be sure tape is under paper backing on insulation panel.

WARNING

Metal pins pierce insulation panels when installed. Injury to hands can result if care is not taken when installing insulation panels.

(f) Remove paper backing from insulation panel and install with sticky side against sheet metal panel. Carefully locate pins and install new clips (16) (item 6, appendix H).

(g) Install doors (7) and (11) onto panel (6) and secure with ten rivets (4) and (9) (item 63, appendix H).

(h) Install caution plate (14) with four rivets (13) (item 55, appendix H).

(i) Peel backing off decal (15) and position on road side panel (6).

(j) Install panel assembly (Figure 4-18, 5) and secure with twenty one hex head screws (1) and flat washers (2).

(k) Install five hex head screws (3), flat washers (4).

(5) Curbside Doors and Panel.

(a) Install door latches (Figure 4-17, 1) and secure with hex nuts on both doors.

(b) Install door holders (3) and secure each with eight rivets (2) (item 42, appendix H) onto doors.

(c) Install door hinge (5) and secure to left door (6) with seven rivets (4) (item 63, appendix H).

(d) Install door hinge (9) and secure to right door (10) with seven rivets (8) (item 63, appendix H).

(e) Install doors onto panel (12) and secure with eight rivets (7) and (11) (item 63, appendix H).

4-31. COVERS, PANELS AND DOORS REPLACEMENT. - Continued

(f) Install panel assembly (Figure 4-16, 5) and secure with twenty two hex head screws (1) and flat washers (2).

(g) Install five hex head screws (3), flat washers (4).

(6) Top Panel.

(a) Install bail handle stud (Figure 4-15, 5) and retainer (6) onto access door (2).

(b) Fabricate gaskets (3) and (4) per the following:

1 Scrape off as much of the old gasket material from surface as possible.

2 Remove old adhesive and gasket residue by scraping.

3 Cut gasket per appendix F.

WARNING

Adhesive (item 5, section II, appendix E) is toxic and flammable. Use in well ventilated areas only. Avoid breathing vapor and avoid repeated or prolonged contact with liquid. Do not use near open flame or excessive heat.

4 Apply adhesive (item 5, section II, appendix E), to mating surfaces of metal and gasket.

5 Let both surfaces air dry until adhesive is tacky but will not stick to fingers.

6 Carefully attach gasket to the metal. Press into firm contact all over.

(c) Install access door (2) and secure with three hex head screws (1).

(d) Install receptacle (13) secure with rivets (12) (item 64, appendix H).

(e) Fabricate insulation panel (8), (9), and (10) per the following:

1 Cut insulation panel per appendix F.

NOTE

Paper backing on insulation panel must be removed when installed.

2 Carefully peel paper backing away from around insulation panel edge.

3 Cover exposed insulation panel edge with foil back tape (item 9, section II, appendix E) folded over edges. Be sure tape is under paper backing on insulation panel.

WARNING

Metal pins pierce insulation panels when installed. Injury to hands can result if care is not taken when installing insulation panels.

(f) Remove paper backing from Insulation panel and install with sticky side against sheet metal panel. Carefully locate pins and install new clips (7) (item 6, appendix H).

(g) Install muffler per paragraph 4-30.

(h) Connect battery cables to batteries per paragraph 4-49.

(i) Install cover panel channel (Figure 4-14, 15), cover panel angles (13) and (14), and secure with twenty six flat washers (12), new lock washers (11) (item 4, appendix H), and cap screws (10).

(j) Install dome light (9) per the following.

1 Install mounting plate (6) onto cover panel channel (15) using four pan head screws (4), flat washers (5), and new self locking nuts (3) (item 1, appendix H).

2 Install dome light (9) onto mounting plate (6) using three rivets (8) (item 37, appendix H).

3 Install grommet (7), housing tab (2), and single circuit connector (1).

(k) Install top panel (Figure 4-13, 3) and secure using twenty flat washers (2) and hex head screws (1).

(7) Install muffler, piping and riser per paragraph 4-30.

(8) Install battery cables to batteries per paragraph 4-49.

4-32. INSTRUMENT CONTROL PANEL WIRING HARNESS TESTING. REPAIR AND REPLACEMENT .

This task covers:
a. Removal **b. Testing** **c. Disassembly** **d. Repair**
e. Assembly **f. Installation**

INITIAL SETUP

Tools:
General Mechanics Tool Kit
Item 1, Section III, Appendix B
Electrical Repair
Item 3, Section III, Appendix B

Equipment Conditions:
Battery cables disconnected from batteries.
(See para 4-49.)

a. Removal.

(1) Wiring Harness.

(a) Cut tie down electrical wraps (Figure 4-28, 1) and (2).

NOTE

Terminal hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(b) Tag (item 18, section II, appendix E) leads.

(c) Remove terminal attaching hardware on individual components to remove terminal lug connections.

(d) Reinstall terminal attaching hardware back on components to prevent loss.

(e) Carefully remove harness (3) from air compressor.

(2) Wire Leads.

(a) Tag (item 18, section II, appendix E) leads (4).

(b) Remove terminal attaching hardware on individual components to remove terminal lug connections.

NOTE

Terminal hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(c) Reinstall terminal attaching hardware back on components to prevent loss.

b. Testing.

(1) Cut tie down electrical wraps (Figure 4-28, 1) and (2).

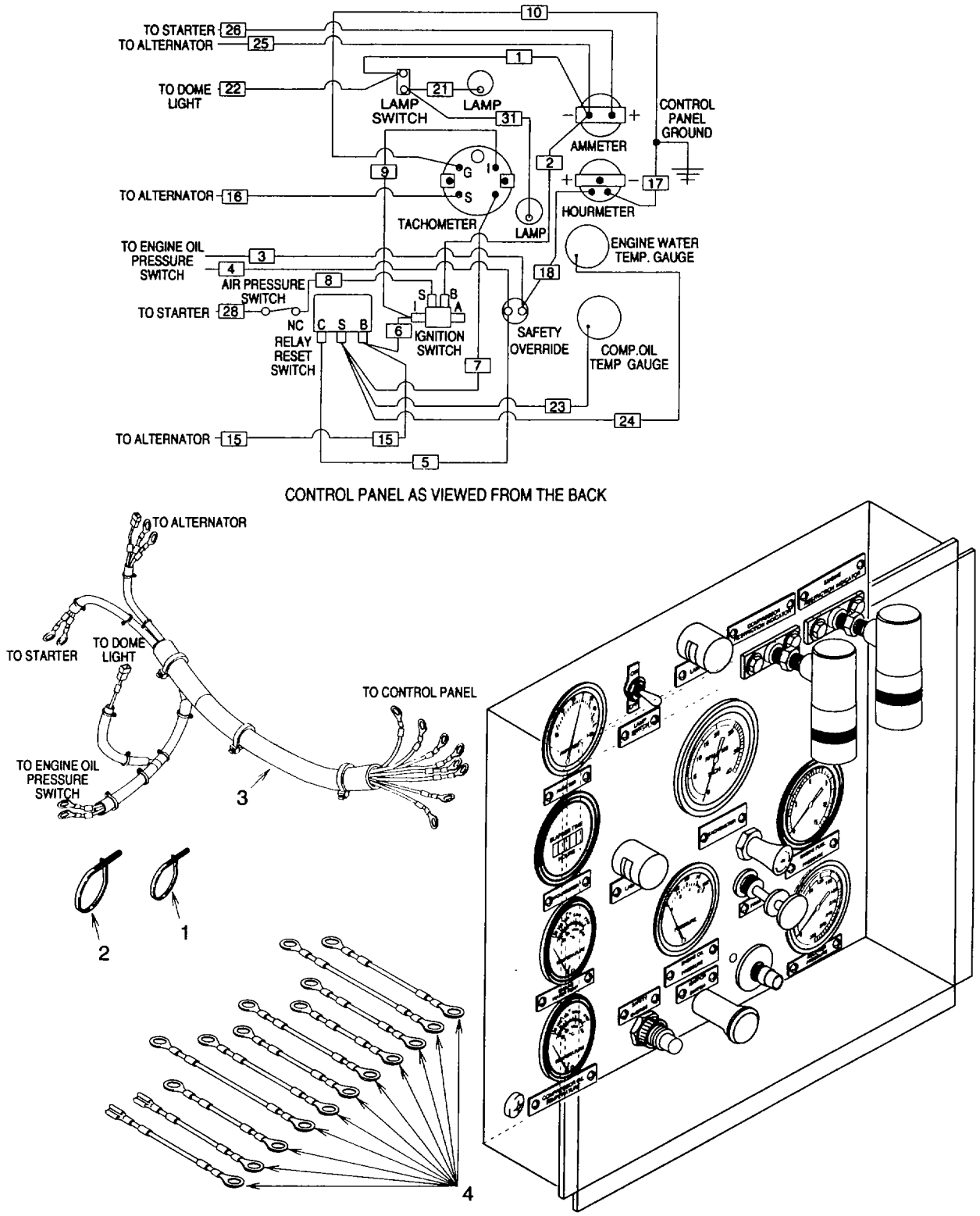


Figure 4-28. Wiring Harness and Leads

4-32. INSTRUMENT CONTROL PANEL WIRING HARNESS TESTING, REPAIR AND REPLACEMENT . - Continued

NOTE

Terminal hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(2) Tag (item 18, section II, appendix E) leads that are to be removed.

(3) Remove terminal attaching hardware on individual components to remove terminal lug connections.

(4) Reinstall terminal attaching hardware on components to prevent loss.

(5) Carefully remove harness (3) or leads (4) from air compressor.

(6) Using a multimeter set to measure resistance, check continuity between terminal ends of wire leads using wiring diagram provided in Figure 4-28.

(7) If no continuity is indicated, repair or replace as required.

c. Disassembly.

(1) Remove loom from wiring harness to remove individual wires for repair.

(2) Remove damaged heat-shrink material and terminal lug connections as necessary for replacement.

d. Repair.

(1) See appendix F for wire lengths and terminal information for individual wire replacement.

(2) Cut wire to size required.

(3) Strip 1/4 - 1/2 inch (0.6 - 1.3 cm) of insulation from the end of the wire.

(4) Install a terminal on the end the wire.

(5) Apply a one inch (2.5 cm) piece of heat-shrink tubing (if the terminals are of the uninsulated type).

(6) Insert wire end into the shank of the terminal.

(7) Crimp the shank and install heat-shrink tubing, if necessary.

e. Assembly.

(1) Reinstall loom onto wiring harness (3) after repairs have been completed.

(2) Use electrical tiedown strap to secure the loom to the wires which will minimize loose wires.

f. Installation.

NOTE

Terminal hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Remove hex nuts from component parts and connect terminal lug wires using wiring diagram (Figure 4-28) and tags on wires. Remove tags.

(2) Reinstall hex nuts on component parts.

(3) Use tiedown electrical straps (1) and (2) to secure wiring harness (3) to system hoses to minimize loose wires.

(4) Connect battery cables to batteries. See paragraph 4-49.

(5) Close roadside doors.

4-33. AMMETER TESTING AND REPLACEMENT .

This task covers:		
a. Removal	**b. Testing**	**c. Installation**

INITIAL SETUP

Tools:	Equipment Conditions:
General Mechanics Tool Kit Item 1, Section III, Appendix B	Control panel door open. Battery cables disconnected from batteries. (See para 4-49.)

a. Removal.

NOTE

Terminal hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Tag (item 18, section II, appendix E) wire leads (Figure 4-29, 3).

(2) Remove two hex nuts (1), four lock washers (2), and wire leads (3).

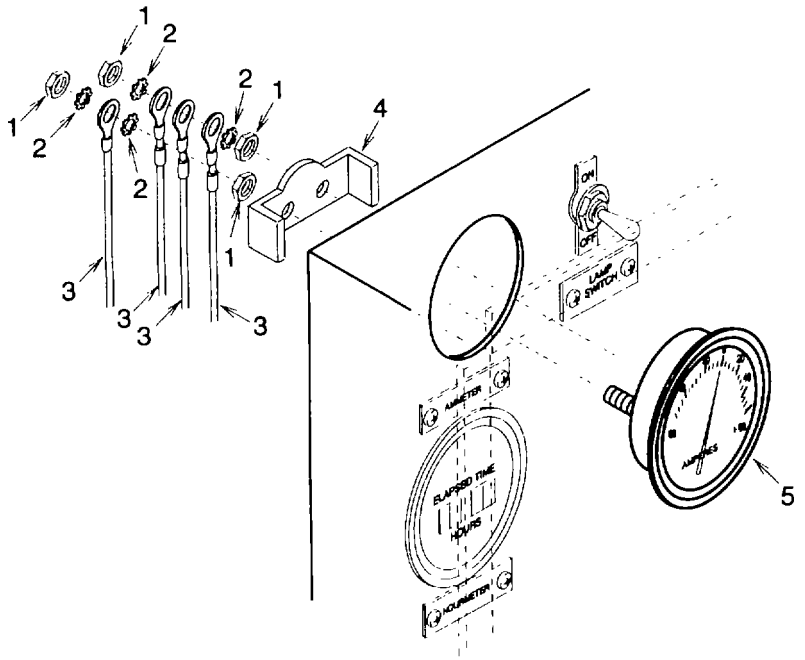


Figure 4-29. Ammeter

(3) Remove two hex nuts (1), bracket (4), and AMMETER (5).

b. Testing.

(1) Using a multimeter set to measure resistance, check continuity across terminals.

(2) If no reading is indicated, replace AMMETER.

c. Installation.

NOTE

Terminal hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Position AMMETER (5) on front panel and install bracket (4) and secure with two hex nuts (1).

(2) Use wiring diagram (Figure 4-3) and tags to reinstall wire leads (Figure 4-29, 3) and, two lock washers (2).

(3) Install two lock washers (2) and hex nuts (1).

(4) Remove tags from wire leads.

(5) Connect battery cables to batteries. See paragraph 4-49.

(6) Close control panel door.

4-34. HOURMETER TESTING AND REPLACEMENT.

This task covers:
a. Removal **b. Testing** **c. Installation**

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B
Electrical Repair
Item 3, Section III, Appendix B

Equipment Conditions:

Control panel door open.
Battery cables disconnected from batteries. (See para 4-49.)

a. Removal.

NOTE

Terminal hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Disconnect wire leads (Figure 4-30, 1) from HOURMETER (2) and tag (item 18, section II, appendix E).

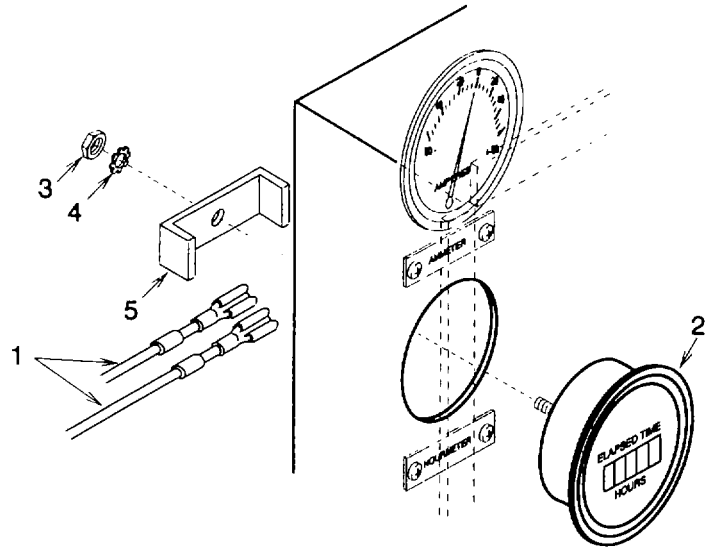


Figure 4-30. Hourmeter

(2) Remove one hex nut (3), lock washer (4), bracket (5), and HOURMETER (2).

b. Testing.

(1) Disconnect wire leads (1), and tag (item 18, section II, appendix E)for testing.

(2) Using a multimeter set to measure resistance, check resistance across HOURMETER terminals. Resistance indicated should be between 0.3 - 0.4 K OHM's.

(3) If no reading is indicated, HOURMETER is defective. Replace HOURMETER.

c. Installation.

(1) Install HOURMETER (Figure 4-32, 2) through front panel.

NOTE

Terminal hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(2) Install bracket (5), lock washer (4), and hex nut (3) to HOURMETER (2) and tighten.

(3) Refer to tags and wiring diagram Figure 4-3. Connect leads (1).

(4) Connect battery cables to batteries. See paragraph 4-49.

(5) Close control panel door.

4-35. ENGINE WATER TEMPERATURE GAUGE TESTING AND REPLACEMENT.

This task covers:
a. Removal **b. Testing** **c. Installation**

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B
Electrical Repair
Item 3, Section III, Appendix B

Equipment Conditions:

Roadside and control panel doors open.
Engine coolant drained. (See para 4-6, e.)

a. Removal.

NOTE

Terminal hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Disconnect temperature connector fitting (Figure 4-31, 1) to engine block.

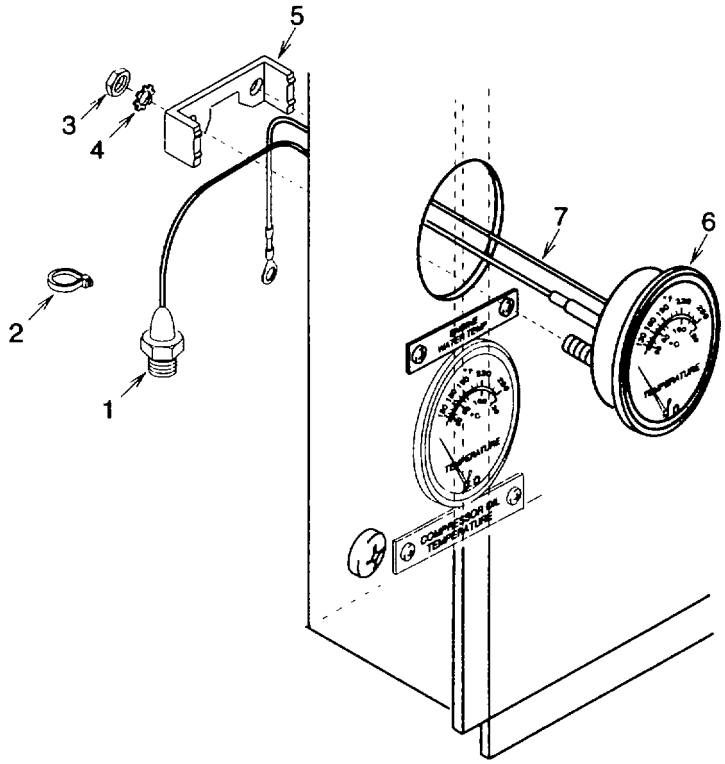


Figure 4-31. Engine Water Temperature Gauge

(2) Cut wire tie straps (2) off wire bundles to remove fitting.

(3) Cut wire tie straps (2), tag (item 18, section II, appendix E), and disconnect wire lead (7) to relay reset switch.

(4) Remove two hex nuts (3), lock washers (4), and bracket (5). Remove ENGINE WATER TEMPERATURE gauge (6).

b. Testing.

(1) Using multimeter set to measure resistance, check continuity between wire lead terminal and gauge case. No continuity should be indicated. Replace gauge if continuity was indicated.

(2) Heat temperature connector fitting (1) to 220° F (105° C) and check continuity between wire lead terminal and gauge case. Continuity should be indicated. Replace gauge if no continuity was indicated.

(3) Gauge should indicate within 5° F (2.4° C) of the temperature connector fitting (1). Replace the gauge if it does not.

c. Installation.

NOTE

Terminal hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Install ENGINE WATER TEMPERATURE gauge (Figure 4-31, 6) through front panel.

(2) Connect fitting (1) to engine block and tighten.

(3) Install bracket (5), two lock washers (4), and hex nuts (3) to ENGINE WATER TEMPERATURE gauge (6) and tighten.

(4) Using tags wiring diagram (Figure 4-3), connect wire lead (7) to relay reset switch.

(5) Secure wire leads with new tiedown straps (2) (item 11, appendix H).

(6) Close roadside and control panel doors.

(7) Fill engine coolant. (See para 4-6, e.)

4-36. COMPRESSOR OIL TEMPERATURE GAUGE TESTING AND REPLACEMENT.

This task covers:
a. Removal **b. Testing** **c. Installation**

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B
Shop Equipment Electrical
Item 3, Section III, Appendix B

Equipment Conditions:

Roadside and control panel doors are open.
Compressor oil drained. (See para 4-6, d (2).)

a. Removal.

NOTE

Mounting hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Disconnect COMPRESSOR OIL TEMPERATURE gauge fitting (Figure 4-32, 1).

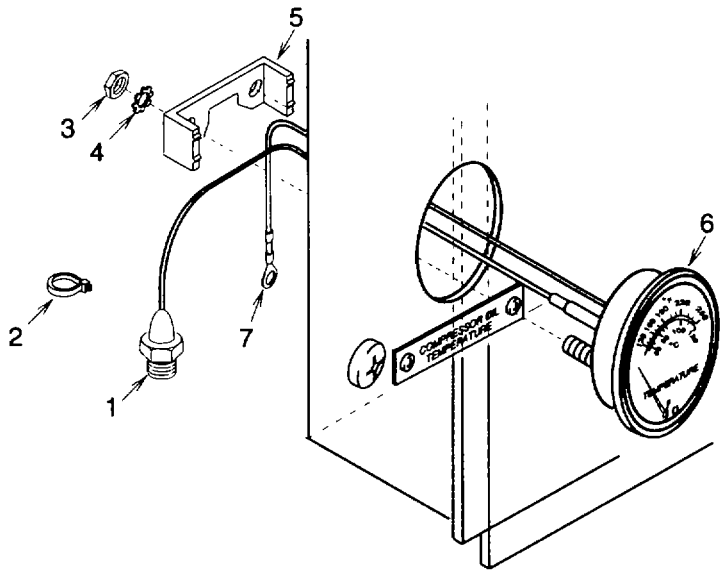


Figure 4-32. Compressor Oil Temperature Gauge

(2) Cut wire tie straps (2) and tag (item 18, section II, appendix E) disconnect wire lead (7) to relay reset switch.

(3) Remove two hex nuts (3), lock washers (4) and bracket (5).

(4) Remove COMPRESSOR OIL TEMPERATURE gauge (6).

b. Testing.

(1) Using multimeter set to measure resistance, check continuity between wire lead terminal and gauge case. No continuity should be indicated. Replace gauge if continuity was indicated.

(2) Heat compressor oil temperature gauge fitting (1) to 230° F (100° C) and check continuity between wire lead terminal and gauge case. Continuity should be indicated. Replace gauge if no continuity was indicated.

(3) Gauge should indicate within 5° F (2.4°C) of the compressor oil temperature gauge fitting (1). Replace the gauge if it does not.

c. Installation.

NOTE

Mounting hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Install COMPRESSOR OIL TEMPERATURE gauge (6) through the front panel.

(2) Connect fitting (1) to compressor.

(3) Connect wire lead (7) to relay reset switch.

(4) Secure wire lead with new tiedown straps (2) (item 11, appendix H).

(5) Install bracket (5), two lock washers (4), hex nuts (3), and tighten.

(6) Close roadside and control panel doors.

(7) Fill compressor with oil. (See para 4-6, d (2).)

4-37. LAMP SWITCH AND LAMP TESTING AND REPLACEMENT .

This task covers:
a. Testing **b. Removal** **c. Installation**

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B
Shop Equipment Electrical
Item 3, Section III, Appendix B

Equipment Conditions:

Control Panel door open.
Battery cables disconnected from batteries. (See para 4-49.)

a. Testing.

NOTE

Testing is limited to checking for continuity.

(1) See step b, (2) below and remove lamp. Check continuity across LAMP. Continuity should be indicated. Replace the LAMP if it tests defective.

(2) Using a multimeter set to measure resistance, check continuity across LAMP SWITCH. With the switch in the ON position, continuity should be indicated. With the switch in the OFF position, no continuity should be indicated. Replace the switch if it tests defective.

(3) Disconnect terminal lug connections (Figure 4-33, 2) and tag (item 18, section II, appendix E) for testing.

b. Removal.

NOTE

Terminal and mounting hardware are supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Lamp Switch.

(a) Tag (item 18, section II, appendix E) wire leads.

(b) Remove two pan head screws (1) that secure the terminal lugs (2) on the LAMP SWITCH (3).

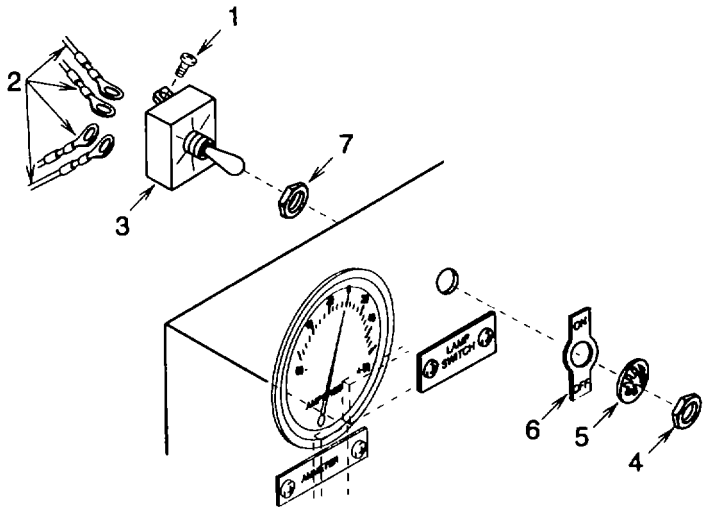


Figure 4-33. Lamp Switch

(c) Remove hex nut (4), lock washer (5), ON/OFF identification plate (6), LAMP SWITCH (3), and hex nut (7).

(2) Lamps.

(a) Loosen two pan head screws (Figure 4-34, 1) at base (8) of lamp cover and remove lamp cover (2).

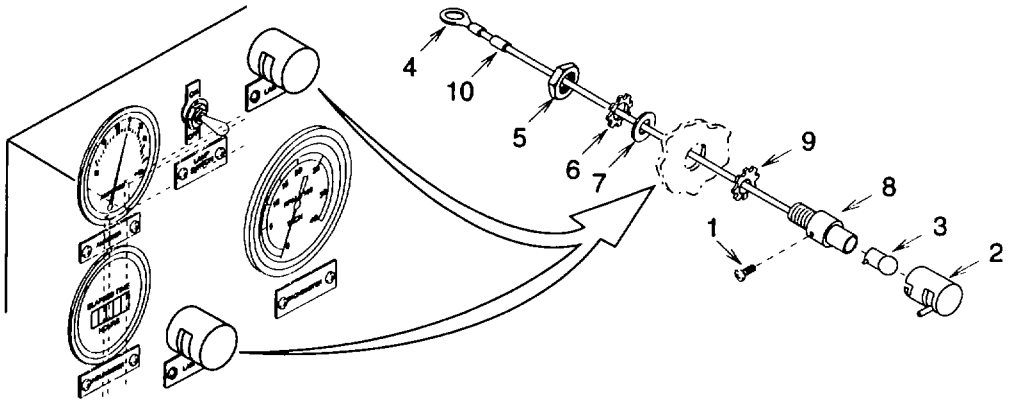


Figure 4-34. Lamps

(b) Push and turn lamp (3) and remove.

(c) Cut wire at terminal (4) and remove terminal.

4-37. LAMP SWITCH AND LAMP TESTING AND REPLACEMENT . - Continued

NOTE

Mounting hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(d) Remove nut (5), lock washer (6), and flat washer (7) and pull lamp base (8) and lock washer (9) from front of panel.

c. Installation.

(1) Lamps.

(a) Install lamp base (8) and lock washer (9) thru front of panel.

(b) Secure lamp base (8) with flat washer (7), lock washer (6) and nut (5).

(c) Mark wire using marker (10) and install new terminal (4).

(d) Refer to tags and wiring diagram (Figure 4-3). Connect leads (4).

(e) Install lamp (3), lamp cover (2) and tighten screw (1).

(2) Lamp Switch.

(a) Place nut (Figure 4-33, 7) on switch (3).

(b) Secure switch (3) and ON/OFF identification plate (6) to panel with lock washer (5) and nut (4).

(c) Refer to tags and wiring diagram (Figure 4-3). Connect leads (2).

(d) Connect battery cables to batteries. See paragraph 4-49.

(e) Close control panel door.

4-38. TACHOMETER TESTING AND REPLACEMENT.

This task covers:
a. Removal **b. Installation**

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B
Shop Equipment Electrical
Item 3, Section III, Appendix B

Equipment Conditions:

Control panel door open.
Battery cables disconnected from batteries.
(See para 4-49.)

a. Removal.

NOTE

Terminal and mounting hardware are supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Tag (item 18, section II, appendix E) wire leads (Figure 4-35, 1).

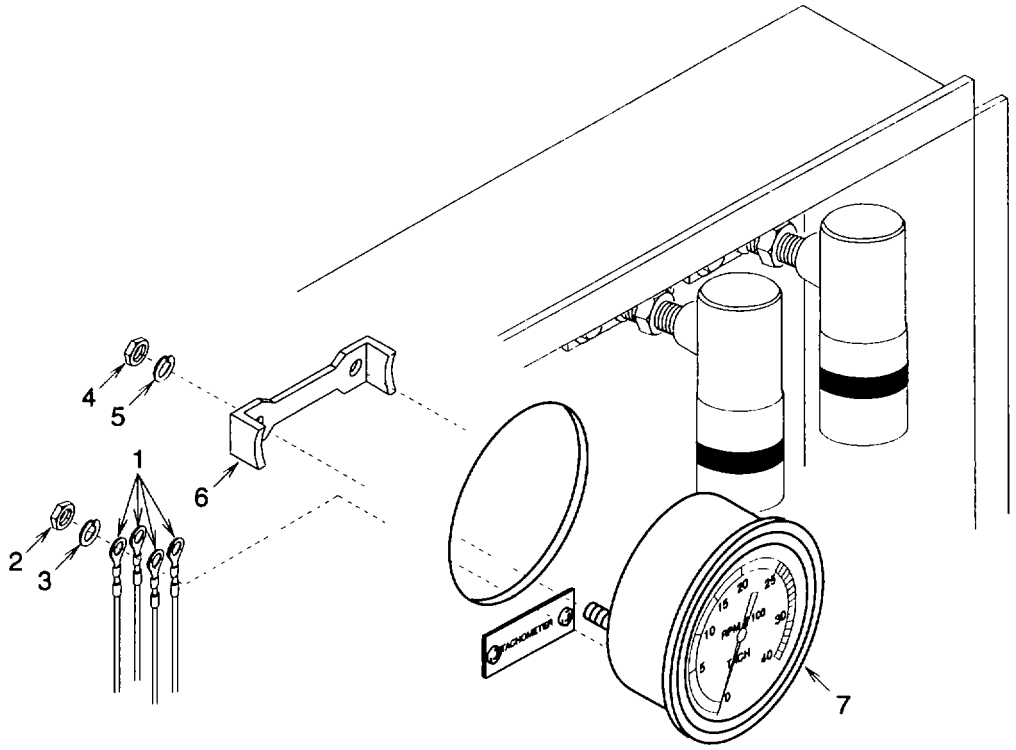


Figure 4-35. Tachometer

(2) Remove four each terminal mounting nuts (2) and lock washers (3) and disconnect wire leads (1).

4-38. TACHOMETER TESTING AND REPLACEMENT . - Continued

(3) Remove two each mounting nut (4) and lock washer (5) and remove mounting bracket (6) and tachometer (7).

b. Installation.

NOTE

Terminal and mounting hardware are supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Place tachometer (7) through control panel and secure with bracket (6) and two each nuts (4) and lock washers (5).

(2) See tags and wiring diagram (Figure 4-3) and secure wire leads (1) with four lock washers (3) and nuts (2).

(3) Connect battery cables to batteries. See paragraph 4-49.

(4) Close control panel door.

4-39. ENGINE OIL PRESSUREF GAUGE TESTING AND REPLACEMENT .

This task covers:
a. Removal **b. Installation**

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B
Shop Equipment Electrical
Item 3, Section III, Appendix B

Equipment Conditions:

Roadside and control panel doors open.

a. Removal.

NOTE

Mounting hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Disconnect hose (Figure 4-36, 1), male connector (2), bushing reducer (3), and pipe coupling (4).

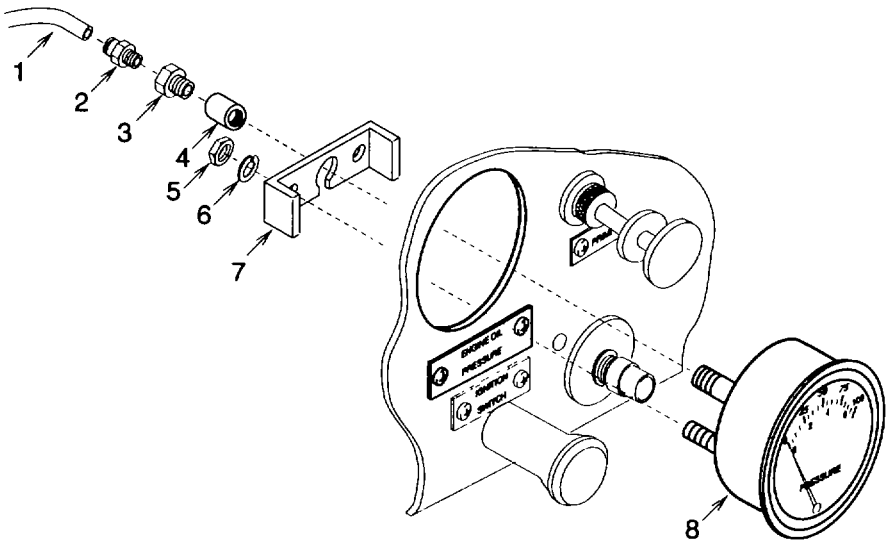


Figure 4-36. Engine Oil Pressure Gauge

(2) Remove two each hex nuts (5), lock washers (6), bracket (7), and remove ENGINE OIL PRESSURE gauge (8).

4-39. ENGINE OIL PRESSURE GAUGE TESTING AND REPLACEMENT . - Continued

b. Installation.

NOTE

Mounting hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Install ENGINE OIL PRESSURE gauge (Figure 4-36, 8) onto front of control panel.

(2) Install two each hex nuts (5), lock washers (6), bracket (7), and tighten.

(3) Wrap antiseize tape (item 1, section II, appendix E) onto threads of male connector (2), bushing reducer (3) and ENGINE OIL PRESSURE gauge (8).

(4) Install pipe coupling (4), bushing reducer (3), and male connector (2).

(5) Connect hose (1) to male connector (2).

(6) Check for leaks after unit is started.

(7) Close roadside and control panel doors.

4-40. SAFETY OVERRIDE SWITCH TESTING AND REPLACEMENT .

This task covers:
a. Testing **b. Removal** **c. Installation**

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B
Shop Equipment Electrical
Item 3, Section III, Appendix B

Equipment Conditions:

Control panel door open.
Battery cables disconnected from batteries.
(See para 4-49)

a. Removal.

NOTE

Terminal and mounting hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Tag (item 18, section II, appendix E) wire leads (Figure 4-37, 2).

(2) Remove pan head screws (1) to remove wire leads (2) from SAFETY OVERRIDE switch (3).

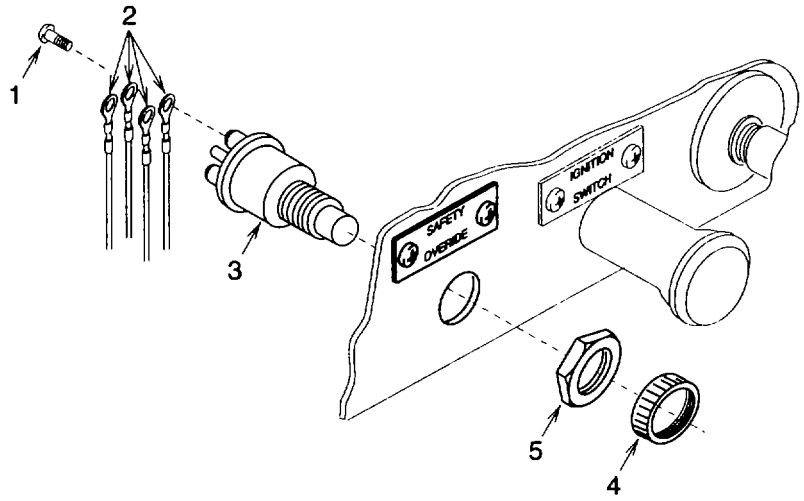


Figure 4-37. Safety Override Switch

(3) Remove knurl nut (4), hex nut (5), and SAFETY OVERRIDE switch (3).

4-40. SAFETY OVERRIDE SWITCH TESTING AND REPLACEMENT . - Continued

b. Testing.

NOTE

Testing is limited to continuity.

(1) Disconnect terminals and tag (item 18, section II, appendix E) for testing.

(2) Using a multimeter, check continuity across SAFETY OVERRIDE (3) terminals. If continuity is indicated, replace the switch.

(3) Press and hold SAFETY OVERRIDE (3) button. Using a multimeter, check continuity across SAFETY OVERRIDE terminals. If continuity is not indicated, replace the switch.

c. Installation.

(1) Install SAFETY OVERRIDE switch (3) through back of panel.

NOTE

Terminal and mounting hardware are supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(2) Screw hex nut (5) and knurl nut (4) onto SAFETY OVERRIDE switch (3) and tighten.

(3) Install wire leads (2) with screws (1) using wiring diagram (Figure 4-3) and tags. Remove tags.

(4) Connect battery cables to batteries. See paragraph 4-49.

(5) Close control panel door.

4-41. IGNITION SWITCH TESTING AND REPLACEMENT .

This task covers:
a. Removal **b. Testing** **c. Installation**

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:

Control panel door open.
Battery cables disconnected from batteries.
(See para 4-49.)

a. Removal.

NOTE

Terminal and mounting hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Remove terminal screws (Figure 4-38, 1).

(2) Tag (item 18, section II, appendix E) and disconnect wire leads (2).

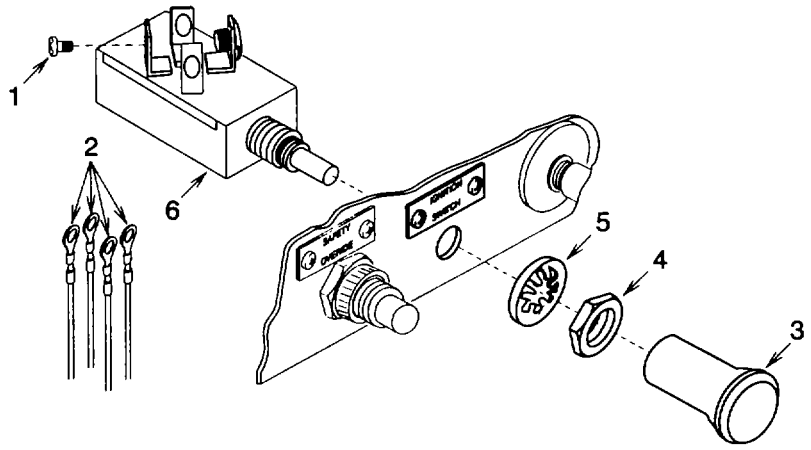


Figure 4-38. Ignition Switch

(2) Unscrew knob (3) and remove.

(3) Remove hex nut (4), lock washer (5), and IGNITION SWITCH (6).

4-41. IGNITION SWITCH TESTING AND REPLACEMENT . - Continued

Testing.

NOTE

Ignition switch terminal A is not used and will not be tested.

(1) Using a multimeter, check continuity as follows:

(a) With ignition switch (6) pushed in, check continuity between terminals B to I, B to S, and I to S. No continuity should be indicated.

(b) With ignition switch (6) pulled out to first position, check continuity between terminals B to I. Continuity should be indicated. Check continuity between terminals B to S and I to S. No continuity should be indicated.

(c) With ignition switch (6) pulled and held out to third position, check continuity between terminals B to I, B to S, and I to S. Continuity should be indicated.

(2) Replace Ignition switch (6) if it fails any of the above tests.

c. Installation.

NOTE

Terminal and mounting hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Install IGNITION SWITCH (6) through back of control panel and secure with lock washer (5) and hex nut (4).

(2) Screw knob (3) onto IGNITION SWITCH (6).

(3) Connect wire leads (2) using diagram (Figure 4-3) and tags and secure with terminal screws (1). Remove tags.

(4) Connect battery cables to batteries. See paragraph 4-49.

(5) Close control panel door.

4-42. RELAY RESET SWITCH TESTING AND REPLACEMENT.

This task covers:
a. Removal **b. Testing** **c. Installation**

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B
Shop Equipment Electrical
Item 3, Section III, Appendix B

Equipment Conditions:

Control panel door open.
Battery cables disconnected from batteries. (See para 4-49.)

a. Removal.

NOTE

Terminal and mounting hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Tag (item 18, section II, appendix E) wire leads (Figure 4-39, 2).

(2) Remove terminal screws (1).

(3) Disconnect wire leads (2) from RESET RELAY switch (3).

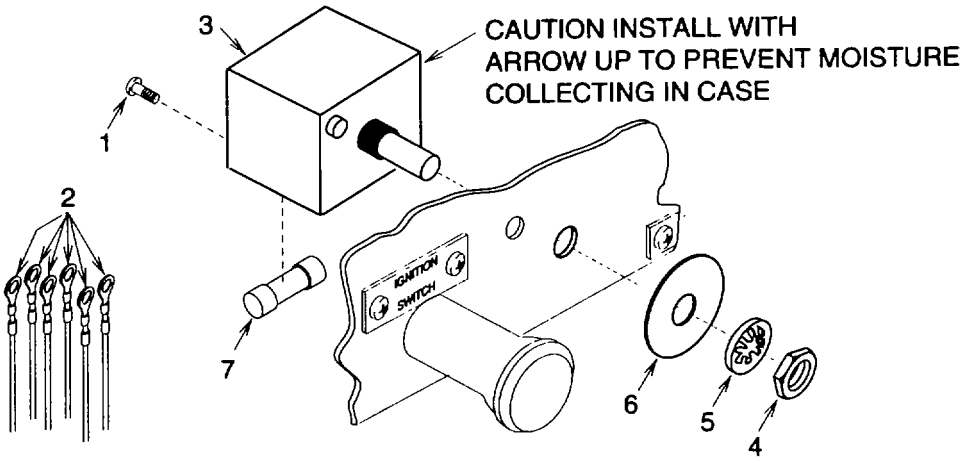


Figure 4-39. Relay Reset Switch

(4) Remove hex nut (4), lock washer (5), flat washer (6), and RESET RELAY switch (3).

(5) Remove fuse (7) from the bottom of the RESET RELAY switch (3) terminal ends.

4-42. RELAY RESET SWITCH TESTING AND REPLACEMENT . - Continued

b. Testing.

NOTE

Testing is limited to checking for continuity.

(1) Press and release relay reset switch (3).

(2) Using a multimeter, check continuity as follows:

(a) Check continuity between fuse terminal ends. Continuity should be indicated. Replace fuse (7) if defective before continuing test.

(b) Check continuity between relay reset switch (3) terminals B to C. Continuity should be indicated.

(c) Using multimeter set to measure resistance, check resistance between relay reset switch (3) terminals B to S and C to S. Resistance of between 16.2 to 19.8 ohms should be indicated.

(3) Replace relay reset switch (3) if it fails (b) or (c) tests above .

c. Installation.

NOTE

Terminal hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Carefully install RESET RELAY switch (3) with arrow pointing up to prevent moisture collecting in case.

(2) Secure RESET RELAY with flat washer (6), lock washer (5), and hex nut (3).

(3) Connect wire leads (2) using screws (1). See wiring diagram (Figure 4-3) and tags. Remove tags.

(4) Install fuse (7) to the bottom of the RESET RELAY switch (3).

(5) Connect battery cables to batteries. See paragraph 4-49.

(6) Close control panel door.

4-43. PRIMING PUMP CONTROL REPLACEMENT .

This task covers:

a. Removal **b. Disassembly**
c. Assembly **d. Installation**

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:

Roadside and control panel doors open.

WARNING

Splashes and spills can cause eye injury and skin irritation. Wear face shield and approved gloves. Immediately remove any articles of clothing or shoes that have become soaked with fuels. This should be done in an area free from ignition sources.

a. Removal.

(1) Remove clamps (Figure 4-40, 1) from hoses (2) and (3).

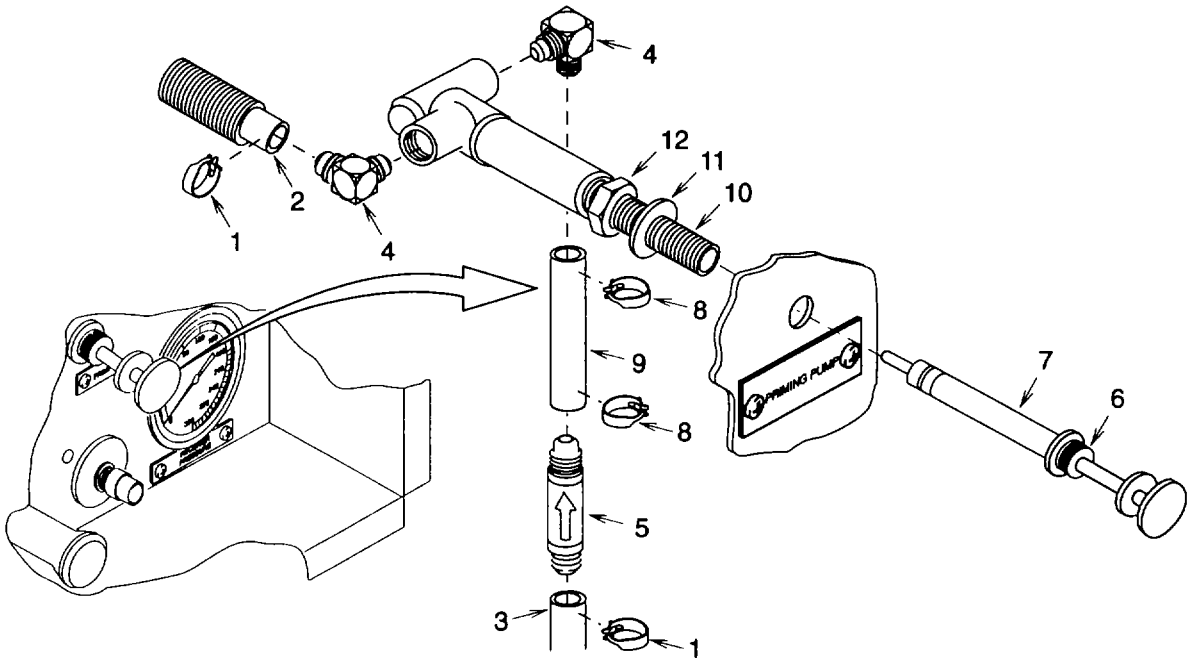


Figure 4-40. Priming Pump Control

(2) Pull hose (2) off of elbow adapter (4).

4-43. PRIMING PUMP CONTROL REPLACEMENT. - Continued

(3) Pull hose (3) off from fuel filter (5).

(4) Loosen knurl nut (6) on plunger (7) to remove PRIMING PUMP assembly.

b. Disassembly.

(1) Remove two clamps (8) from hose (9).

(2) Remove two elbows (4) and PRIMING PUMP control body (10).

(3) PRIMING PUMP is not repairable and must be replaced if damaged.

c. Assembly.

(1) Wrap antiseize tape (item 1, section II, appendix E) onto elbows (4).

(2) Install two elbows (4) onto PRIMING PUMP control body (10).

(3) Install fuel filter (5), hose (9), and clamps (8).

d. Installation.

NOTE

Terminal mounting hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Position PRIMING PUMP control body (10) onto unit with flat washer (11) and hex nut (12) and install the PRIMING PUMP plunger (7) into the control body.

(2) Tighten knurl nut (6) being careful not to damage locking pin on plunger.

(3) Connect hoses (2) and (3) onto PRIMING PUMP control assembly with clamps (1).

(4) Close roadside and control panel doors.

4-44. RESTRICTION INDICATORS TESTING AND REPLACEMENT .

This task covers:
a. Removal **b. Testing** **c. Installation**

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:

Roadside and control panel doors open.

a. Removal.

(1) Disconnect nylon hose (Figure 4-41, 1) and remove male adapter (2) from RESTRICTION INDICATOR (3) and female adapter (4). Tag (item 18, section II, appendix E) hose.

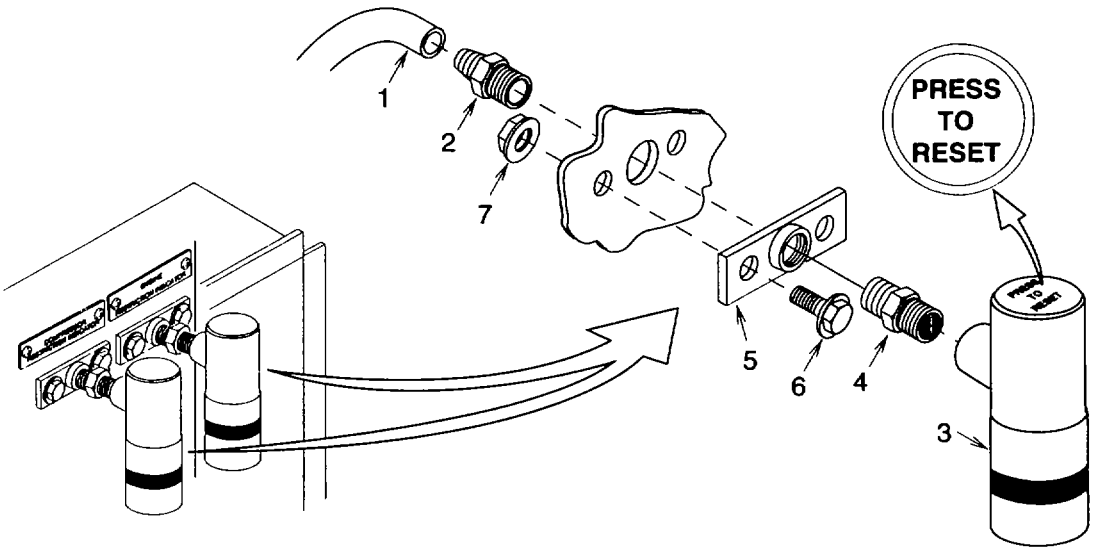


Figure 441. Restriction Indicators

(2) Remove RESTRICTION INDICATOR (3) and female adapter (4) from mounting plate (5).

(3) Remove female adapter (4) from RESTRICTION INDICATOR (3).

(4) Remove two bolts (6), hex nuts (7), and mounting plate (5).

b. Testing.

(1) Suck air from fitting end of RESTRICTION INDICATOR.

(2) If RESTRICTION INDICATOR changes to red, the component is serviceable.

(3) Press to reset RESTRICTION INDICATOR.

(4) RESTRICTION INDICATOR should be green in color.

4-44. RESTRICTION INDICATORS TESTING AND REPLACEMENT. - Continued

c. Installation.

(1) Wrap antiseize tape (item 1, section II, appendix E) onto female adapter threads (4).
(2) Install female adapter (4) into RESTRICTION INDICATOR (3).
(3) Install mounting plate (5), two bolts (6), and hex nuts (7).
(4) Install RESTRICTION INDICATOR (3).
(5) Wrap antiseize tape (item 1, section II, appendix E) onto male adapter threads (2).
(6) Install male adapter (2), into mounting plate (5).
(7) Install hose (1) and remove tags.
(8) Close roadside and control panel doors.

4-45. ENGINE FUEL PRESSURE GAUGE REPLACEMENT.

This task covers:
a. Removal **b. Installation**

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:

Roadside and control panel doors open.

WARNING

Splashes and spills can cause eye injury and skin irritation. Wear face shield and approved gloves. Immediately remove any articles of clothing or shoes that have become soaked with fuels. This should be done in an area free from ignition sources.

a. Removal.

(1) Pull hose (Figure 4-42, 1) off female adapter (2).

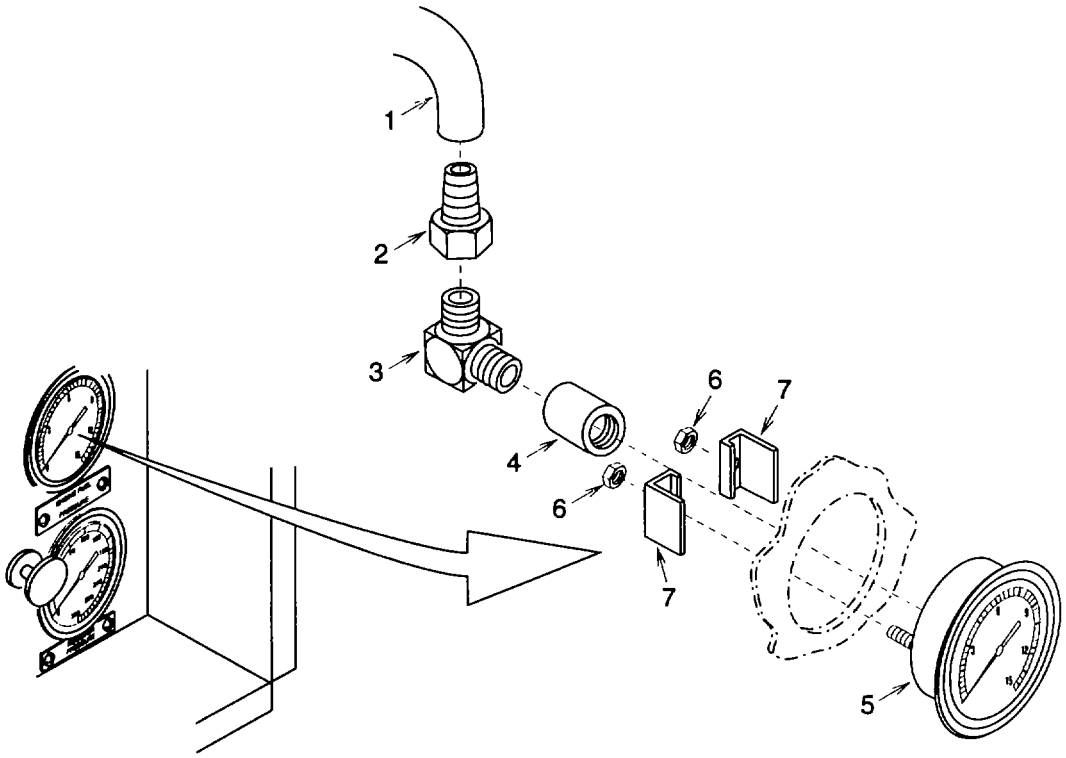


Figure 4-42. Engine Fuel Pressure Gauge

4-45. ENGINE FUEL PRESSURE GAUGE REPLACEMENT. - Continued

(2) Remove female adapter (2) and elbow tube (3).

(3) Unscrew snubber (4) from ENGINE FUEL PRESSURE gauge (5).

(4) Remove two hex nuts (6), brackets (7), and ENGINE FUEL PRESSURE gauge (5).

b. Installation.

(1) Install ENGINE FUEL PRESSURE gauge (5), brackets (7), and hex nuts (6).

(2) Wrap antiseize tape (item 1, section II, appendix E) onto ENGINE FUEL PRESSURE gauge (7) threads.

(3) Install snubber (4) on ENGINE FUEL PRESSURE gauge.

(4) Wrap antiseize tape (item 1, section II, appendix E) onto elbow (3) threads.

(5) Install elbow (3) and female adapter (2).

(6) Connect hose (1) to female adapter (2).

(7) Close roadside and control panel doors.

4-46. RECEIVER PRESSURE GAUGE REPLACEMENT.

This task covers:
a. Removal **b. Installation**

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:

Control panel door open.
Battery cables disconnected from batteries. (See para 4-49.)

a. Removal.

NOTE

Terminal mounting hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Remove terminal screws (Figure 4-43, 1) and tag (item 18, section II, appendix E) and disconnect and wire leads (2).

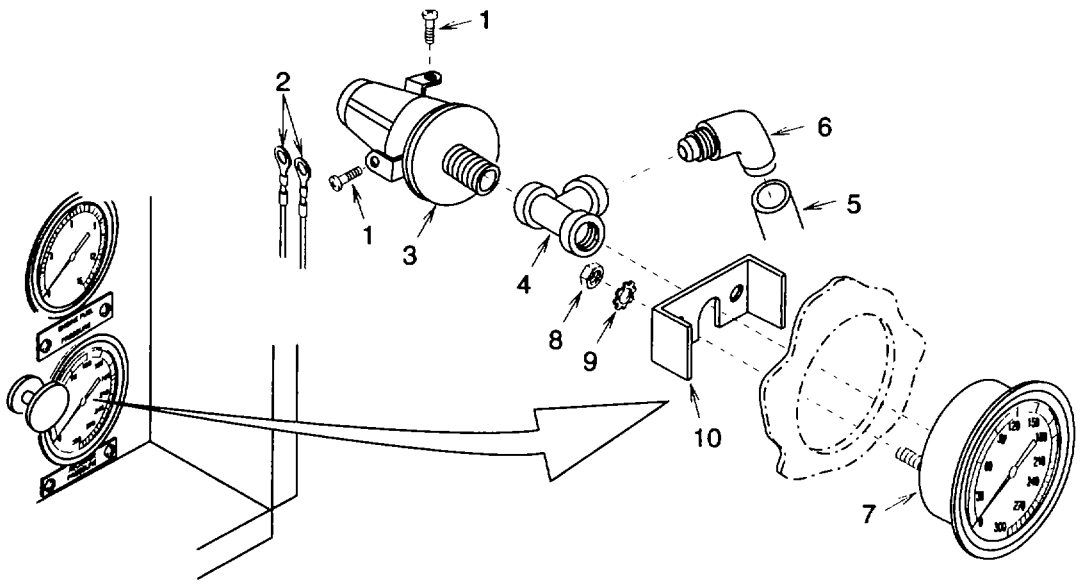


Figure 4-43. Receiver Pressure Gauge

(2) Remove pressure switch (3) from pipe tee (4).

(3) Disconnect hose (5) from elbow (6).

(4) Remove elbow (6) from pipe tee (4).

4-46. RECEIVER PRESSURE GAUGE REPLACEMENT. - Continued

(5) Remove pipe tee (4) from RECEIVER PRESSURE gauge (7).

(6) Remove two hex nuts (8), lock washers (9), and mounting bracket (10).

(7) Remove RECEIVER PRESSURE gauge (7) from unit.

b. Installation.

NOTE

Terminal mounting hardware is supplied with most components and cannot be purchased separately. Retain all hardware if original component is not being replaced. If component is being replaced, use new hardware supplied.

(1) Install RECEIVER PRESSURE gauge (7) into unit.

(2) Install mounting bracket (10) and secure with two lock washers (9) and hex nuts (8).

(3) Wrap antiseize tape (item 1, section II, appendix E) onto RECEIVER PRESSURE gauge (7) threads and install pipe tee (4).

(4) Wrap antiseize tape (item 1, section II, appendix E) around pressure switch (3) threads.

(5) Install pressure switch (3) onto pipe tee (4).

(6) Wrap antiseize tape (item 1, section II, appendix E) onto elbow (6) threads and install onto pipe tee (4).

(7) Install hose (5) onto elbow (6).

(8) Install wire leads (2) using screws (1). See wiring diagram (Figure 4-3) and tags. Remove tags.

(9) Connect battery cables to batteries. See paragraph 4-49.

(10) Close control panel door.

4-47. HOSE REEL REPLACEMENT.

This task covers: a. Removal	b. Installation

INITIAL SETUP

Tools:	Equipment Conditions:
General Mechanics Tool Kit Item 1, Section III, Appendix B	Curbside doors open.

a. Removal.

(1) Hose Reel.

(a) Unwind hose assembly from reel.

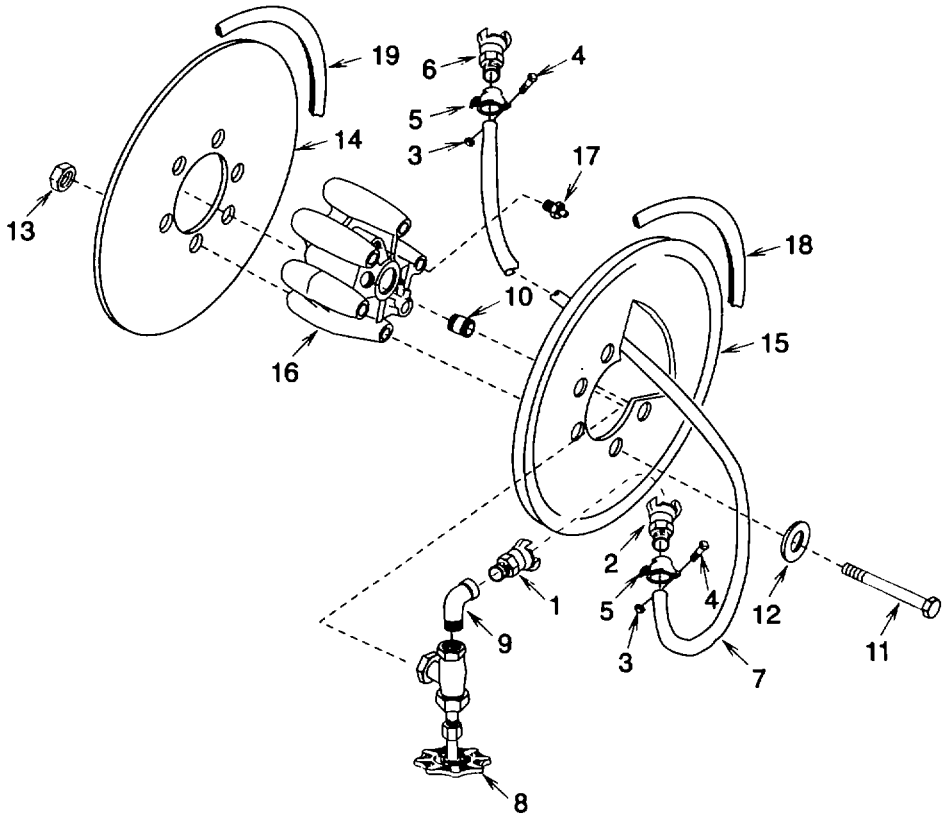


Figure 4-44. Hose Reel Assembly

(b) Disconnect coupling (Figure 4-44, 1) and (2) by twisting apart.

NOTE
Hose assembly need only be disassembled if replacement of component parts is required.

(2) Hose Assembly. Remove four hex nuts (3) and square head screws (4) from clamp assemblies (5) to remove couplings (2) and (6) from hose (7).

4-47. HOSE REEL REPLACEMENT. - Continued

(3) Reel Assembly.

(a) Remove valve (8), elbow (9), and pipe nipple (10). Disassemble if required.
(b) Remove six hex head bolts (11), flat washers (12), and self locking nuts (13). Discard self locking nuts.
(c) Remove hose reel ends (14) and (15) from hose reel body (16).
(d) Remove grease fitting (17) from hose reel body (16).
(e) Remove trim (18) and (19) from hose reel ends (14) and (15) if it is damaged and needs replacement.

b. Installation.

(1) Reel Assembly.

(a) Wrap antiseize tape (item 1, section II, appendix E) around the grease fitting threads (17) and install onto hose reel body (16).
(b) Assemble hose reel body (16) and two hose reel ends (14) and (15). Secure with six hex head bolts (11), flat washers (12), and new self locking nuts (13) (item 5, appendix H).
(c) Wrap antiseize tape (item 1, section II, appendix E) around the pipe nipple threads (10) and install into hose reel body (16).
(d) Wrap antiseize tape (item 1, section II, appendix E) around the threaded elbow end (9) and coupling (1).
(e) Assemble valve (12), elbow (9), and coupling (1) and install as an assembly.
(f) Fabricate trim in accordance with appendix F, Figure F2.
(g) Install trim (18) and (19) onto outside edge of hose ends (14) and (15) using adhesive (item 5, section II, appendix E).

(2) Hose Assembly.

(a) Fabricate new hose in accordance with appendix F, Figure Fl, part number 62400/hose.
(b) Install hose (7), air hose clamps (5), coupling (2), and secure hex screws.
(c) Install the opposite end of hose (7), air hose clamp (5), coupling (6), and secure with hex nuts (3) and square head screws (4).
(d) Mate couplings (1) and (2) by twisting until they interlock in place.
(e) Rewind hose onto reel. Be sure that hose does not kink.
(f) Close curbside doors.

4-48. MISCELLANEOUS WIRES AND CABLES TESTING AND REPLACEMENT.

This task covers: a. Removal b. Testing c. Repair d. Installation

INITIAL SETUP

Tools:
General Mechanics Tool Kit
Item 1, Section III, Appendix B
Shop Equipment Electrical
Item 3, Section III, Appendix B

Equipment Conditions:
Battery cables disconnected from batteries.
(See para 4-49.)

a. Removal.

(1) Remove hex headscrew (Figure 4-45, 1), and lock washer (2). Discard lock washer.
(2) Remove hex head screw (3), two flat washers (4), and self locking nut (5). Discard nut.
(3) Remove cable (6).
(4) Remove pan head screw (7), nut (8), and wire (9).

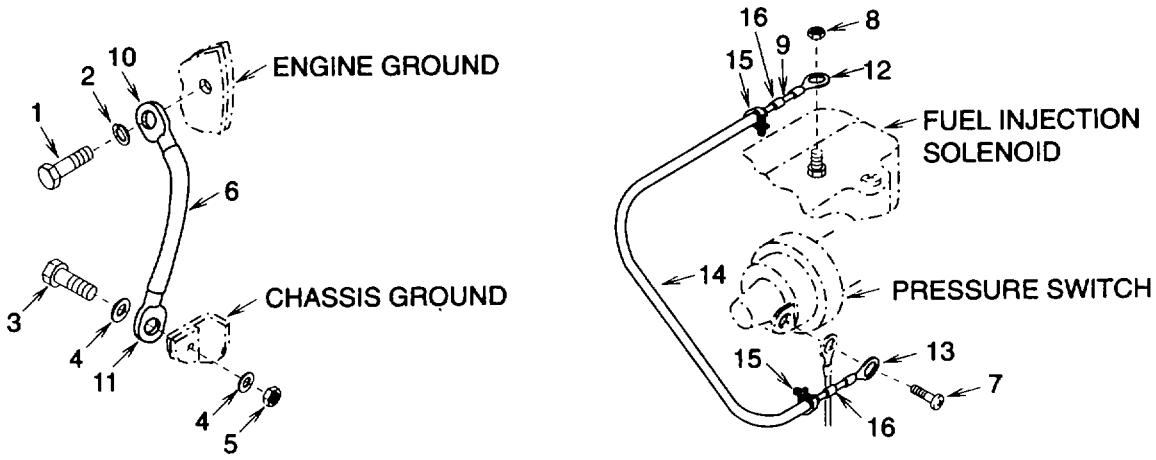


Figure 4-45. Miscellaneous Wires and Cables

b. Testing.

(1) Using a multimeter, check continuity between terminal lugs (10) and (11). Continuity should be indicated. If no continuity is indicated, replace cable.
(2) Using a multimeter, check continuity between terminal lugs (12) and (13). Continuity should be indicated. If no continuity is indicated, replace wire.

4-48. MISCELLANEOUS WIRES AND CABLES TESTING AND REPLACEMENT. - Continued

c. Repair.

(1) Cable.

(a) See appendix F (89886-1/1) for cable fabrication.
(b) Cut cable to size required.
(c) Strip 1/2 inch (1.3 cm) of insulation from the ends of the cable.
(d) Install terminals (10) and (11) on the ends of the cable.
(e) Crimp the terminal shanks.

(2) Wire.

(a) See appendix F (89892-1/6) for wire fabrication.
(b) Cut wire (9) to size required.
(c) Strip 3/8 inch (0.97 cm) of insulation from the end of the wire.
(d) Install loom (14). See appendix F (89892-1/4) for loom fabrication. Secure loom with two electrical tiedown straps (15).
(e) Install terminals (12) and (13) on the ends of wire.
(f) Crimp the terminal shanks.
(g) Install wire markers (16) on each end of wire. Wire number is 27.

d. Installation.

(1) Install cable (6), hex head screw (1), and new lock washer (2) (item 14, appendix H).
(2) Install hex head screw (3), two flat washers (4), and new self locking nut (5) (item 20, appendix H).
(3) Install wire (9) and secure with pan head screws (7) and nut (8).
(4) Connect battery cables to batteries. See paragraph 4-49.

4-49. BATTERIES TESTING AND REPLACEMENT.

This task covers: a. Removal b. Testing c. Installation

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:

Roadside doors open.

a. Removal.

(1) Unclip latches Figure 4-46,1) and remove box cover (2).
(2) Loosen three nuts (3) from L bolts (4) and remove hold down battery bracket (5).
(3) Remove battery shields (6) from battery cables (7).

WARNING

Battery can explode and cause injury to personnel if grounded negative (-) battery clamp is not removed first and replaced last.

(4) Using the diagram, disconnect the negative ground terminal and the negative slave receptacle terminal.
(5) Disconnect the positive terminals from the batteries.

WARNING

Battery can explode and cause injury to personnel and equipment if battery is dropped or punctured. Do not lift battery by terminals.

(6) Carefully lift each battery (8) out.
(7) Store batteries in a heated area.
(8) If battery cables (7) or battery box is to be replaced remove bolts (9), lock washers (10), and nut (11) and remove cables (7).

4-49 BATTERIES TESTING, AND REPLACEMENT. - Continued

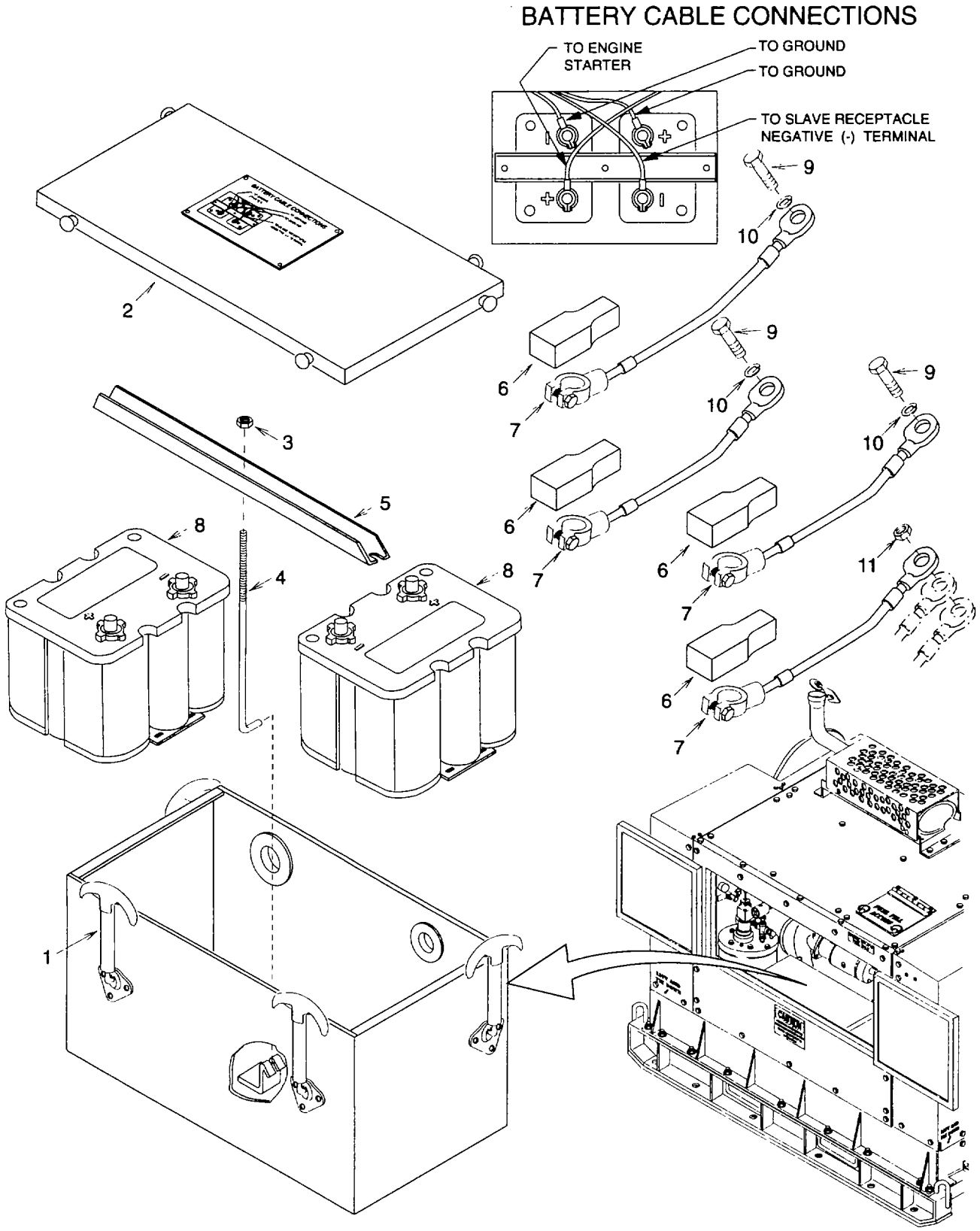


Figure 4-46. Batteries

(8) Disassemble battery box as follows:
(a) Drill out rivets (1) remove information plate (2) from battery cover (3).

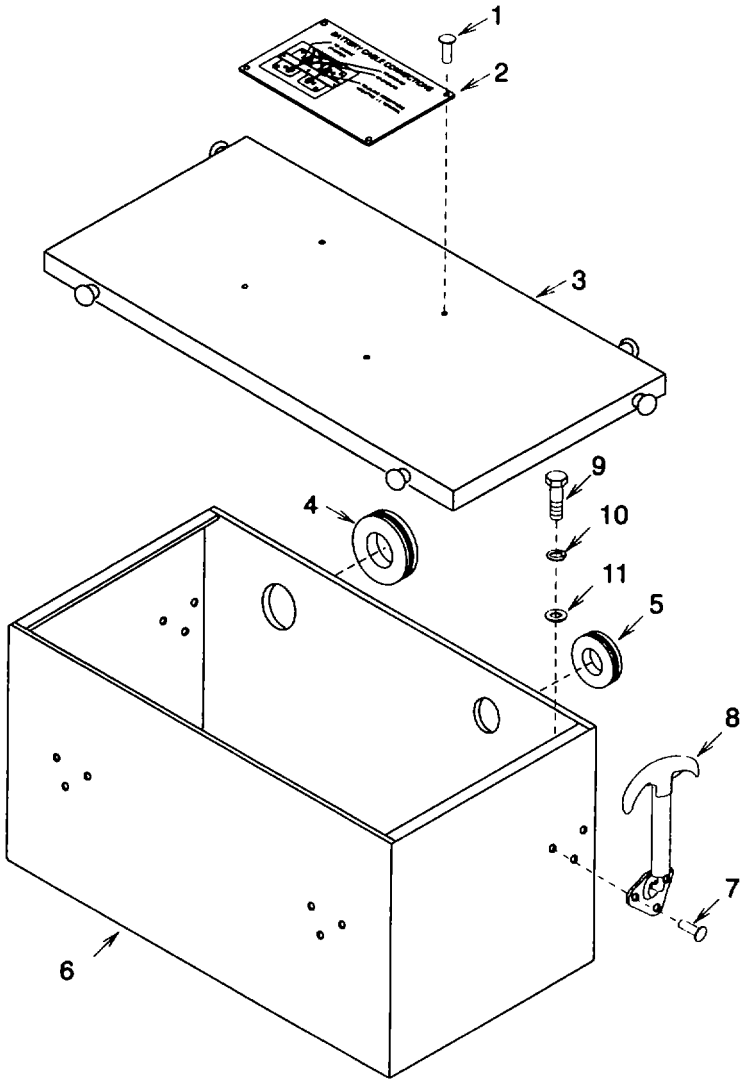


Figure 4-47. Battery Box

(b) Remove grommets (4) and (5) from battery box (6).
(c) Drill out rivets (7) from latches (8). Remove latches.
(d) Remove four hex head screws (9), lock washers (10), and flat washers (11).

b. Testing.

NOTE

Batteries supplied with unit are factory sealed lead acid type that require no water, won't corrode or leak and require no terminal cleaning.

(1) Using a voltmeter set to measure voltage, check voltage across terminals.

4-49. BATTERIES TESTING AND REPLACEMENT. - Continued

(2) If voltage is below 8 volts, recharge battery.
(3) Battery can be recharged in an hour. If battery does not hold charge, replace with a new battery.

c. Installation.

(1) Reassembly of battery box.

(a) Install information plate (Figure 4-47, 2) onto cover (3) with four rivets (1) (item 55, appendix H).
(b) Install four latches (8) with twelve rivets (7) (item 42, appendix H).
(c) Install grommets (4) and (5).
(d) Secure battery box (6) to air compressor with four hex head screws (9), lock washers (10) and flat washers (11).

(2) Carefully install batteries (Figure 4-46, 8) into battery box and secure with three battery hold down brackets (5), L bolts (4), and hex nuts (3).

(3) Connect positive battery cables first using the diagram and tighten.

(4) Connect negative slave receptacle and ground connection last and tighten.

(5) Snap on battery shields (6) on battery cable connections, and install battery cover (2).

(6) Secure cover (2) with latches (1).

(7) Close roadside doors.

4-50. RADIATOR HOSE AND OIL LINES REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:

Curbside doors open.
Battery cables disconnected from batteries. (See para 4-49.)
Engine coolant drained. (See para 4-6, e.)
Compressor oil drained. (See para 4-6, d (2).)

a. Removal.

(1) Loosen hose clamps (Figure 4-48, 1) and pull upper engine coolant hose (2) off.

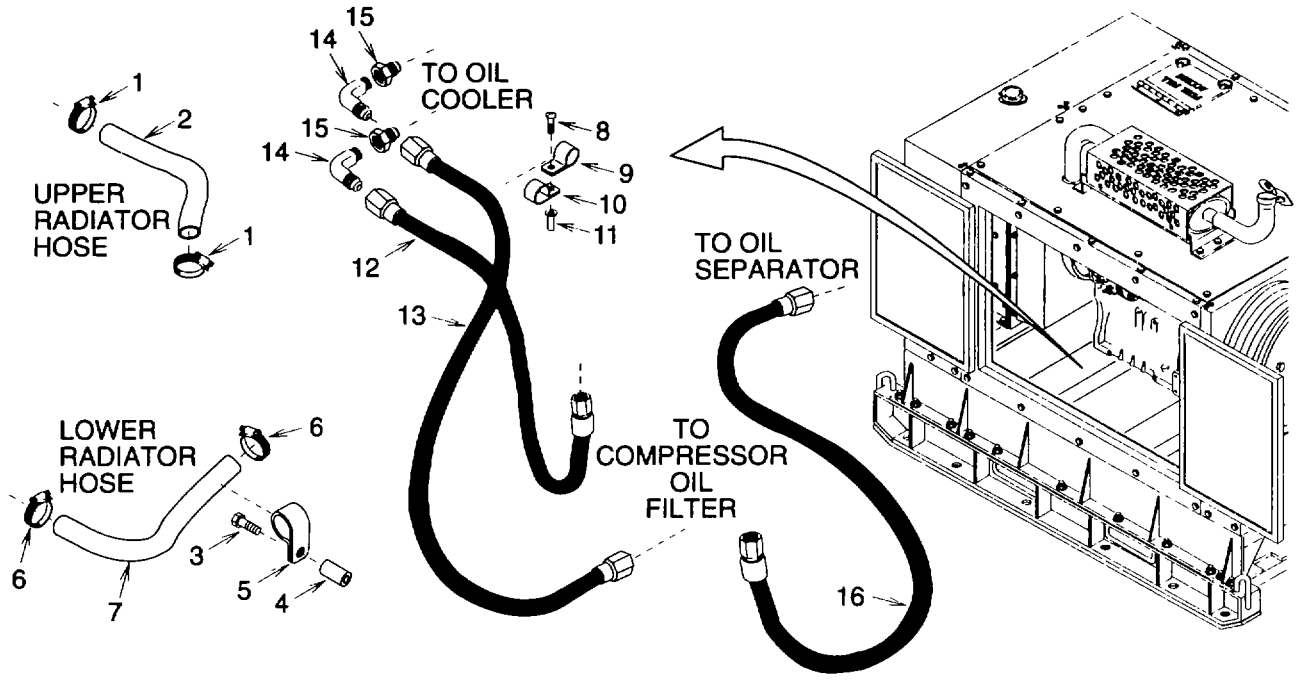


Figure 4-48. Radiator Hoses and Oil Lines

4-50. RADIATOR HOSE AND OIL LINES REPLACEMENT. - Continued

(2) Remove hex head screw (3), spacer (4), and hose clamp (5).

(3) Loosen hose clamps (6) and pull lower engine coolant hose (7).

NOTE
Do not remove (drill out) rivnut unless it is damaged.

(4) Remove pan head screw (8), clamps (9) and (10), and rivnut (11).

(5) Loosen hoses (12) and (13) and remove.

(6) Remove elbows (14) and adapters (15).

(7) Remove hose (16).

b. Installation.

(1) Install lower radiator hose (7) and hose clamps (6).
(2) Install clamp (5), spacer (4), and hex head screw (3).
(3) Install upper radiator hose (2) and hose clamps (1).
(4) Wrap antiseize tape (item 1, section II, appendix E) on threaded end of elbows (14) and adapter (15).
(5) Install elbows (14) and adapters (15).
(6) Connect hoses (12), (13), and (16).
(7) Install clamps (9) and (10) with pan head screw (8) and new rivnut (11) if removed.
(8) Refill engine coolant. See paragraph 4-6, e.
(9) Refill compressor oil. See paragraph 4-6, d (2).
(10) Connect battery cables to batteries. See paragraph 4-49.
(11) Close curbside door.

4-51. RADIATOR REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B

Personnel Required:

Two

Equipment Conditions:

Battery cables disconnected from batteries. (See para 4-49.)
Rear panels removed. (See para 4-31, a, (4).)
Radiator hoses removed. (See para 4-50.)
Fuel tank removed. (See para 4-56.)

a. Removal.

(1) Check that drain cock (Figure 4-49, 1) is open and that all coolant has been drained from radiator (2).

(2) Remove drain cock (1), coupling (3), and pipe nipple (4) from radiator (2).

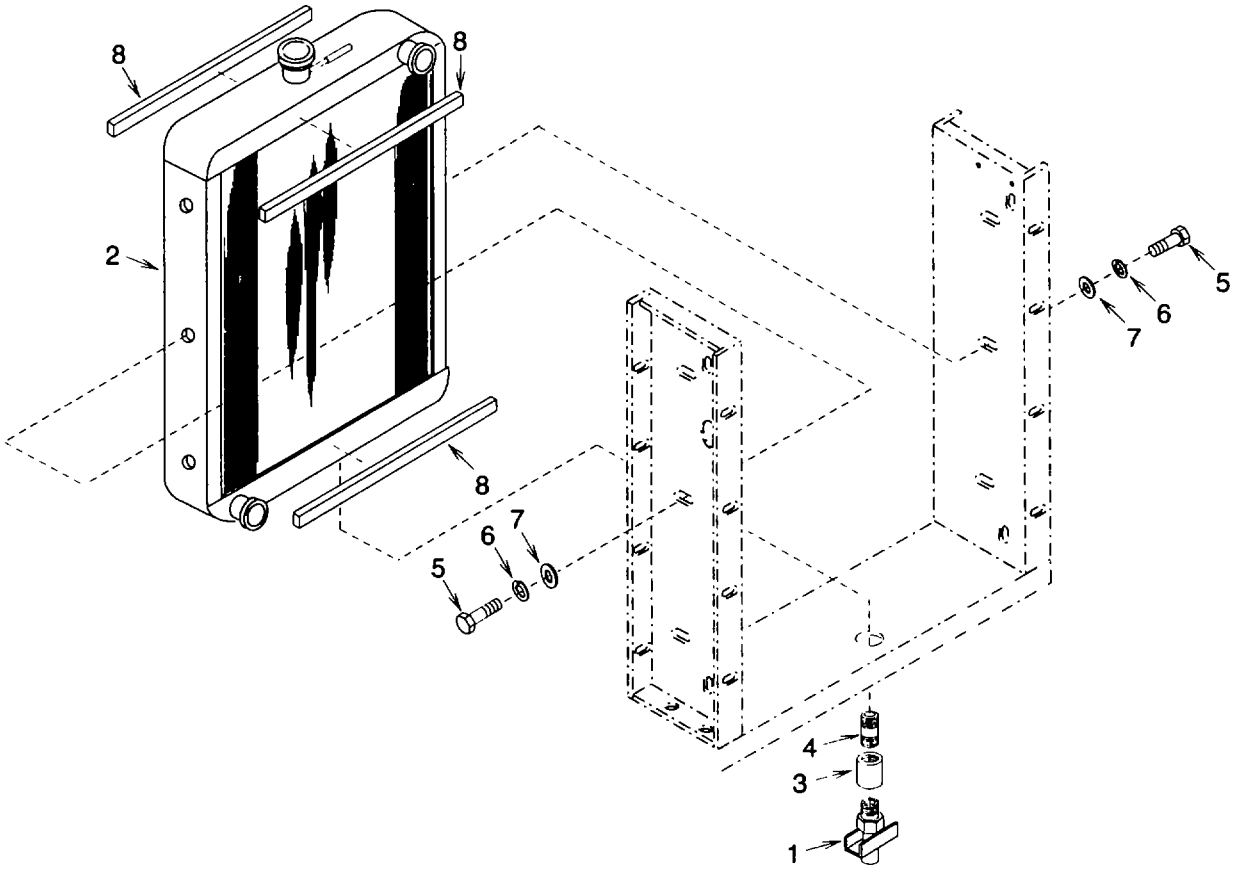


Figure 4-49. Radiator

4-51. RADIATOR REPLACEMENT. -Continued

(3) Remove six hex head screws (5), lock washers (6), and flat washers (7) from radiator (2). Discard lock washers.

(4) Carefully lift radiator (2) up and out of unit.

NOTES
Remove gaskets only if replacement is required.

(5) Remove gaskets (8) by scraping off.

b. Installation.

(1) Fabricate gaskets (8) per the following:

(a) Cut gasket per appendix F.
(b) Scrap off any gasket material left on radiator (2).
(c) Apply adhesive (item 11, section II, appendix E) to one side of gaskets and radiator.
(d) Air dry until tacky but will not stick to fingers.
(e) Press gaskets firmly into place.

(2) Carefully lift radiator (2) into place and aline with opening for drain cock and mounting holes.
(3) Use six hex head screws (5), new lock washers (6) (item 14, appendix H), flat washers (7), and tighten into radiator (2)
(4) Wrap antiseize tape (item 1, section II, appendix E) on threaded end of drain cock (1) and pipe nipple (4).
(5) Install pipe nipple (4), coupling (3), and drain cock (1) into radiator.
(6) Install fuel tank per paragraph 4-56.
(7) Install radiator hoses and oil cooler hoses per paragraph 4-50.
(8) Install rear panel per paragraph 4-31, d,(2).
(9) Refill engine coolant per paragraph 4-6, e and compressor oil per paragraph 4-6, d,(2).
(10) Connect battery cables to batteries per paragraph 4-49.

4-52. COMPRESSOR OIL COOLER REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B

Personnel Required:

Two

Equipment Conditions:

Radiator removed. (See para 4-51.)
Oil cooler hoses removed. (See para 4-50.)

a. Removal.

(1) Remove eight lock nuts (Figure 4-50, 1) and hex washer head bolts (2). Discard lock nuts.

(2) Lift shroud (3) off unit.

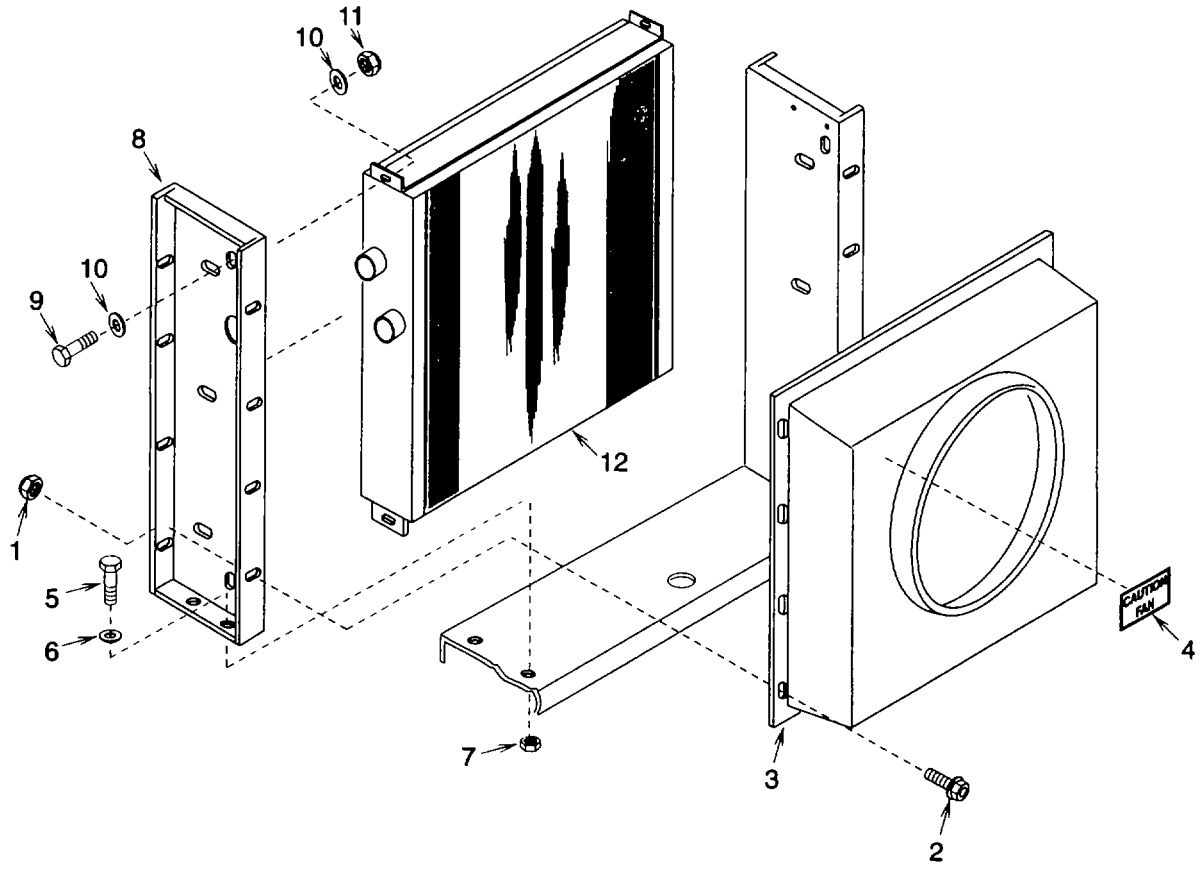


Figure 4-50. Oil Cooler

4-52. COMPRESSOR OIL COOLER REPLACEMENT. - Continued

(3) Replace caution plate (4) if damaged.
(4) Remove hex head screws (5), flat washers (6), and self locking nuts (7), from radiator support (8). Discard self locking nuts.
(5) Support oil cooler and remove four hex head screws (9), eight flat washers (10), four lock nuts (11) and radiator support (8). Discard lock nuts.
(6) Carefully lift oil cooler (12) from unit.

NOTE
Remaining radiator support may be removed at this time if it is damaged.

b. Installation.

(1) Position oil cooler (12) and radiator support (8).

(a) A line holes on radiator supports (8) and oil cooler (12).
(b) Install with four hex head screws (9), eight flat washers (10), and four lock nuts (11) (item 13, appendix H).

(2) Install radiator support (8) onto frame with four hex head screws (5), flat washers (6), and new self locking nuts (7) (item 13, appendix H).
(3) Position shroud (3) and install eight hex washer head bolts (2), and new lock nuts (1) (item 3, appendix H).
(4) Install oil cooler hoses per paragraph 4-50.
(5) Install radiator. See paragraph 4-51.

4-53. PNEUMATIC SERVICE VALVE HOSE REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:

Battery cables disconnected from batteries. (See para 4-49.)
Compressor oil drained. (See para 4-6, d, (2).)

a. Removal.

(1) Disconnect hose lines (Figure 4-51, 1) and (2) and remove.

(2) Remove hose elbows (3), (4), (5), and tee (6).

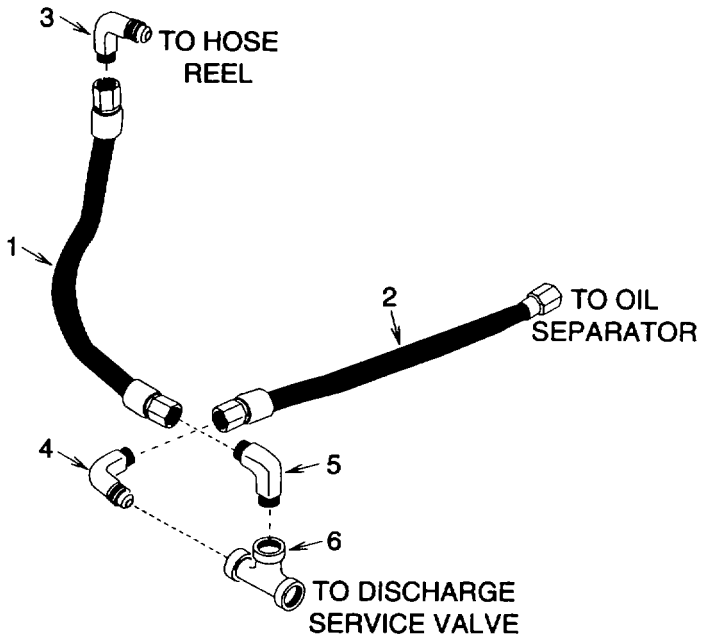


Figure 4-51. Pneumatic Service Valve Hoses

b. Installation.

(1) Wrap antiseize tape (item 1, section II, appendix E) on threaded end of elbows (3), (4), and (5).
(2) Install tee (6), and elbows (3), (4), and (5).
(3) Install hoses (1) and (2).
(4) Refill compressor oil per paragraph 4-6, d, (2).
(5) Connect battery cables to batteries per paragraph 4-49.

4-54. COMPRESSOR AIR CLEANER REPLACEMENT.

This task covers: a. Removal b. Installation -

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:

Roadside doors open.

a. Removal.

(1) Remove nut (Figure 4-52, 1) and flat washer (2).

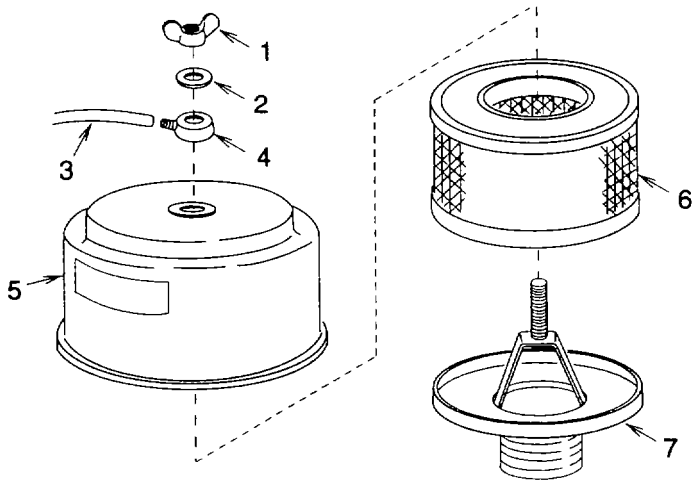


Figure 4-52. Compressor Air Cleaner

(2) Disconnect restriction indicator hose (3) and remove banjo fitting (4).
(3) Remove cover (5) and filter (6).
(4) Unscrew base (7).

b. Installation.

(1) Install base (7).
(2) Install filter (6) and cover (5).
(3) Install hose (3) from restriction indicator and banjo fitting.
(4) Secure using flat washer (2) and nut (1).
(5) Close roadside doors.

4-55. COMPRESSOR OIL FILTER REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools:	Equipment Conditions:
General Mechanics Tool Kit Item 1, Section III, Appendix B	Battery cables disconnected from batteries. (See para 4-49.) Oil lines removed. (See para 4-50.)

a. Removal.

(1) Remove filter (Figure 4-53, 1) and adapter (2).

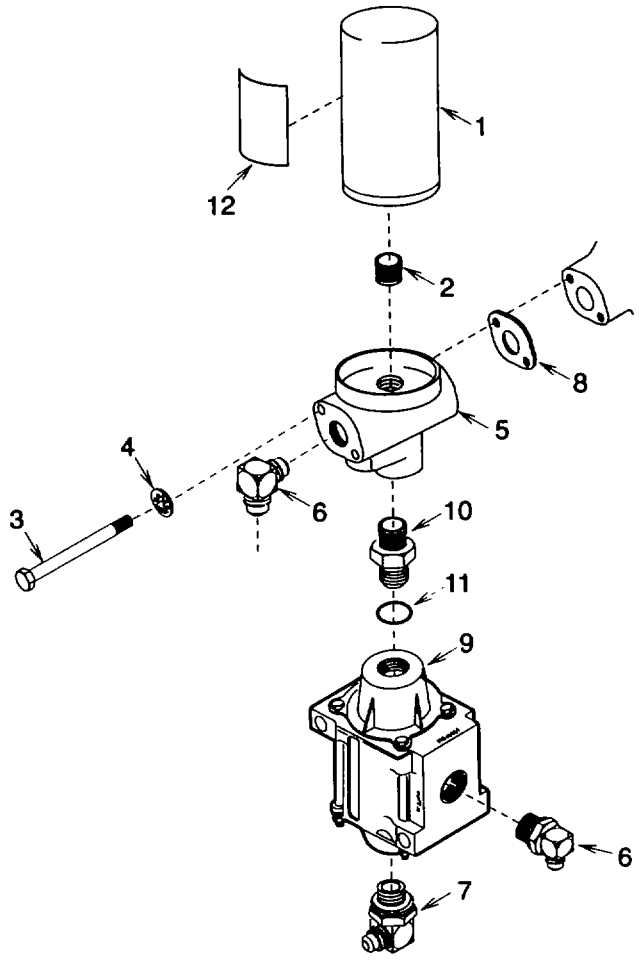


Figure 4-53. Compressor Oil Filter

4-55. COMPRESSOR OIL FILTER REPLACEMENT. - Continued

(2) Remove two hex head bolts (3), lock washers (4), bypass connector (5), elbows (6) and (7), and gasket (8). Discard gasket and lock washer.

(3) Remove thermal bypass (9), connector (10), and preformed packing (11). Discard preformed packing.

b. Installation.

(1) Wrap antiseize tape (item 1, section II, appendix E) on threaded ends of adapter (10), elbows (6), and (7).
(2) Assemble elbows (6) and (7), thermal bypass (9), new preformed packing (11) (item 21, appendix H), and adapter (10).
(3) install new gasket (8) (item 19, appendix H), bypass connector (5), elbow (6), and two hex head bolts (3) and lock washers (4) (item 16, appendix H).
(4) Install adapter (2) and filter (1).
(5) Check condition of decal (12) and install a new one if old decal is not readable, or if a new filter was installed without a decal.
(6) Connect oil lines per paragraph 4-50.
(7) Refill compressor with oil per paragraph 4-6, d, (2).
(8) Connect battery cables to batteries per paragraph 4-49.

4-56. COMPRESSOR AIR LINES REPAIR AND REPLACEMENT.

This task covers: a. Removal b. Repair c. Installation	
INITIAL SETUP	
Tools:	Equipment Conditions:
General Mechanics Tool Kit Item 1, Section III, Appendix B	Battery cables disconnected from batteries. (See para 4-49.)

a. Removal.

(1) Fittings used on nylon tubing are reusable. To remove tubing, push on shoulder fitting and pull tubing off. To install tubing, push fitting shoulder in and push tubing in. When you release pressure on the shoulder, the internal fittings expand and prevents tubing from coming off.

(2) Remove nylon tube (Figure 4-54, 1), connector (2), and elbow (3).

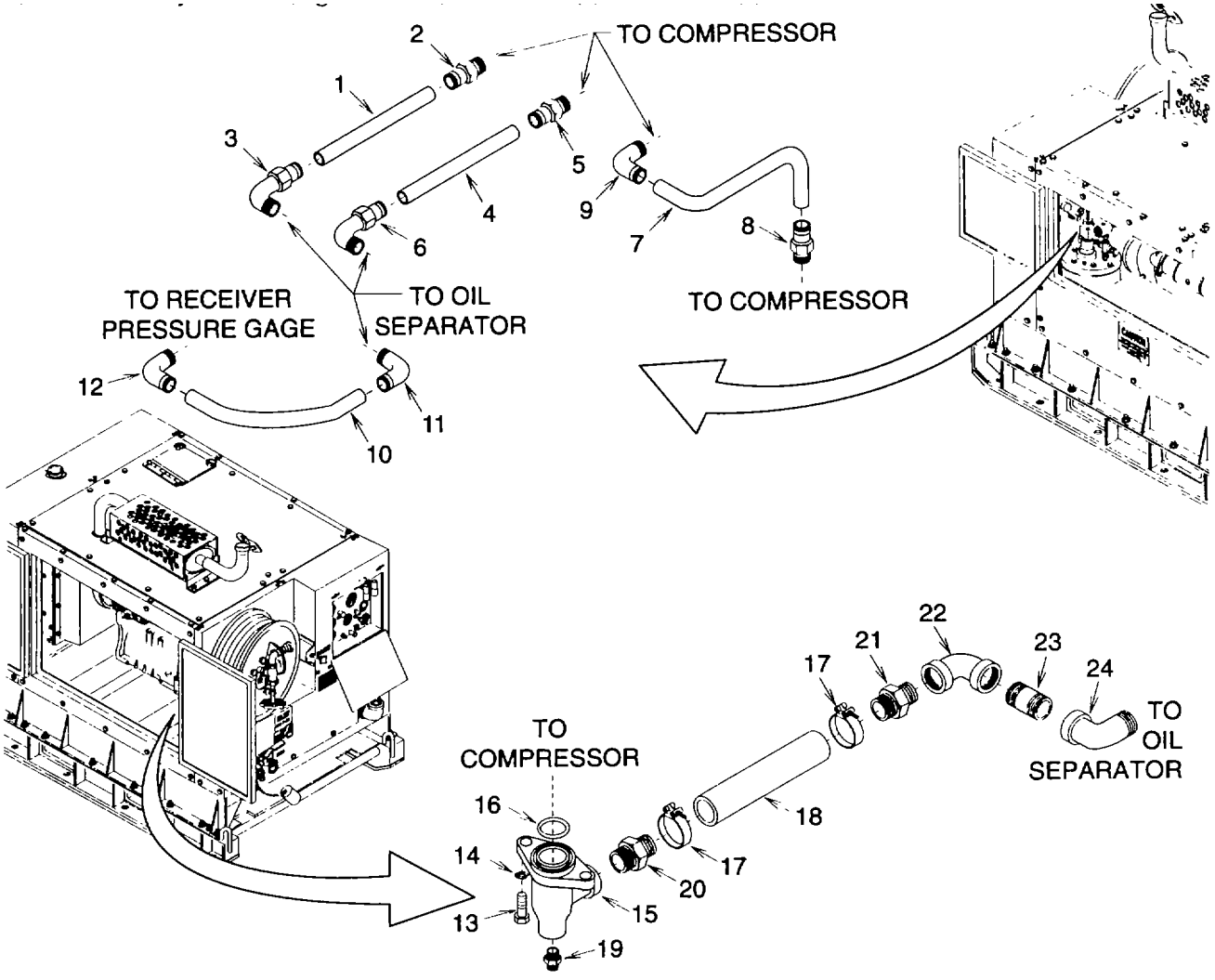


Figure 4-54. Air Lines

4-56. COMPRESSOR AIR LINES REPAIR AND REPLACEMENT. - Continued

(3) Remove nylon tube (4), connectors (5), and elbow (6).
(4) Remove nylon tube (7), connector (8), and elbow (9).
(5) Remove nylon tube (10), elbows (11), and (12).
(6) Remove hex head screw (13), lock washer (14), elbow (15), and performed packing (16).
(7) Remove two clamps (13) and hose (14).
(8) Remove connectors (19) and (20).
(9) Remove connector (21), elbow (22), nipple (23), and elbow (24).

NOTE
Repair of hose lines is limited to replacement of hose.

b. Repair. Cut tubing or hoses (1), (7), and (14) to length required using appendix F.
c. Installation.

(1) Install connectors (2), (5), and (8).
(2) Install elbows (3), (6), (9), (11), and (12).
(3) Install tubes (1), (4), (7), and (10) by pushing in on connectors or elbow fitting end, and inserting tube ends and releasing fitting end.
(4) Wrap antiseize tape (item 1, section II, appendix E) around threaded ends of connector (21), pipe nipple (23), elbow (24), and connectors (15) and (16).
(5) Install elbow (24), pipe nipple (23), elbow (22), and adapter (21).
(6) Install connectors (19) and (20) in discharge elbow (15).
(7) Install hose (18) with two clamps (17) on to adapters (20) and (21).
(8) Install new preformed packing (16) (item 65, appendix H) and discharge elbow (15) with two hex head screws (13) and new lock washers (14) (item 14, appendix H).
(9) Connect battery cables to batteries per paragraph 4-49.

4-57. COMPRESSOR OIL SEPARATOR REPLACEMENT.

This task covers: a. Removal b. Cleaning c. Installation	
INITIAL SETUP	
Tools:	Equipment Conditions:
General Mechanics Tool Kit Item 1, Section III, Appendix B	Battery cables disconnected from batteries. (See para 4-49.) Drain compressor oil. (See para 4-6, d, (2).)

a. Removal.

(1) Disconnect hoses (Figure 4-55, 1), (2), (3), and thermal bypass hose (4).

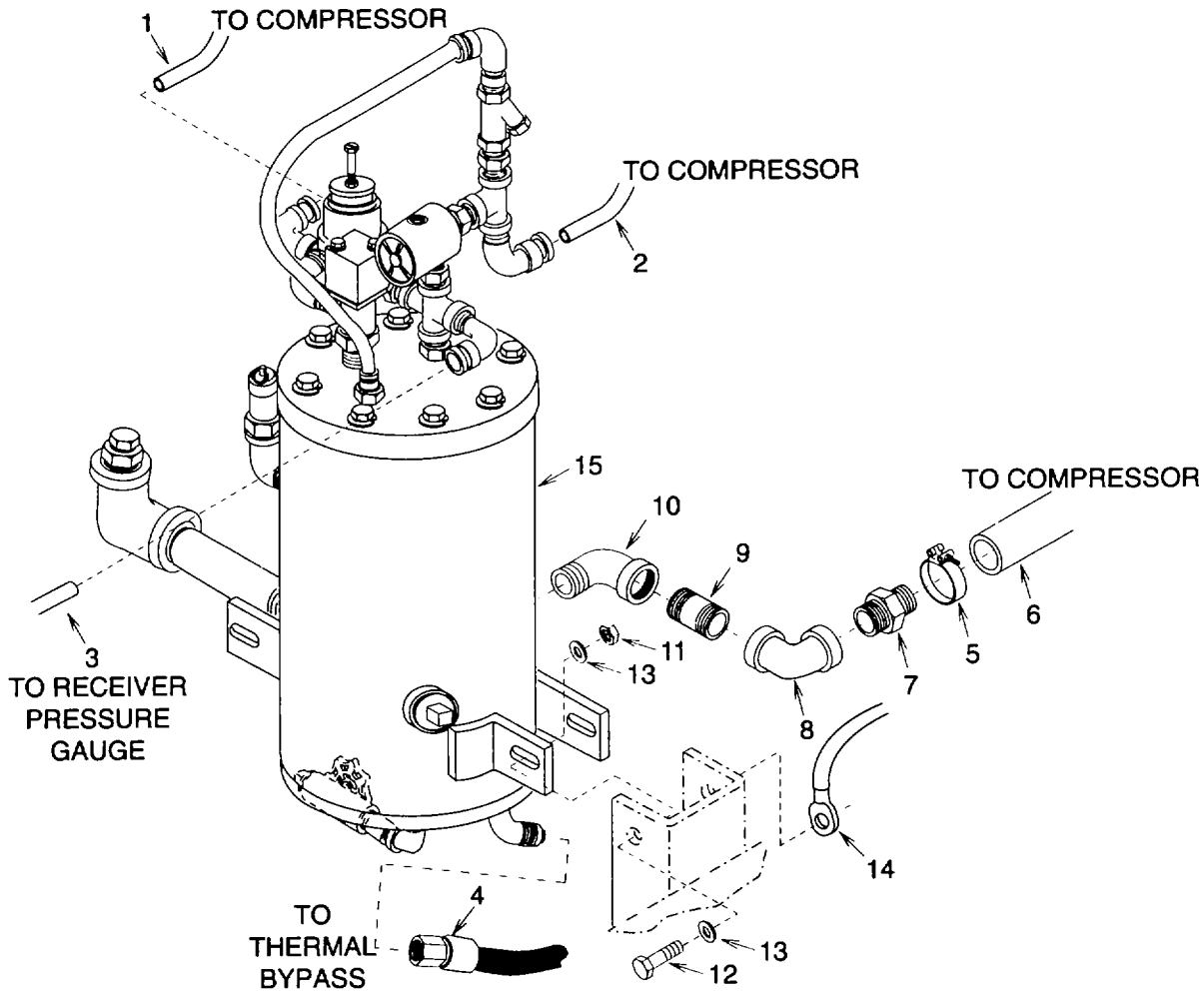


Figure 4-55. Compressor Oil Separator Tubing and Hose Connections

4-57. COMPRESSOR OIL SEPARATOR REPLACEMENT. - Continued

(2) Loosen clamp (5) and remove hose (6) from adapter (7).

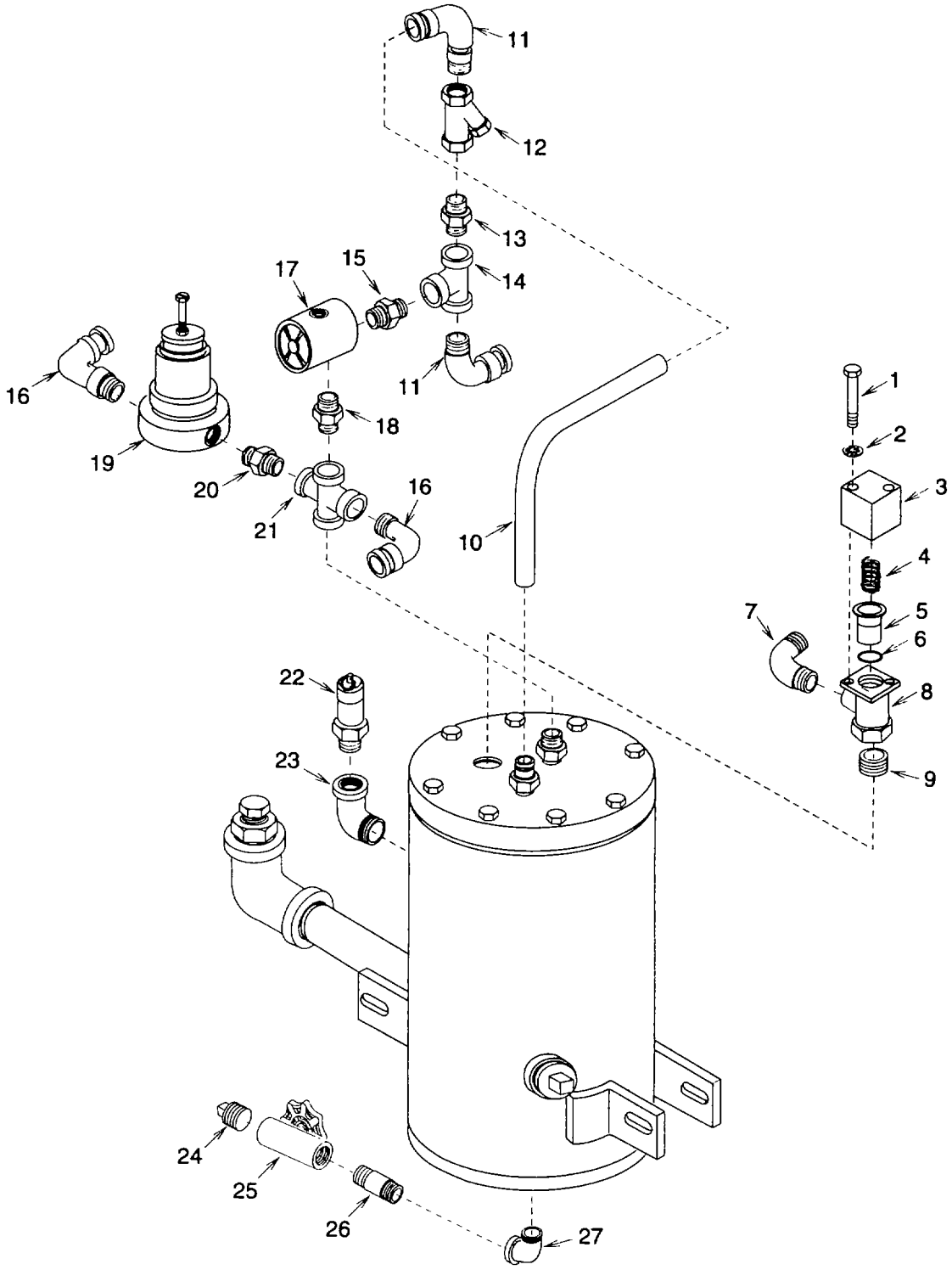


Figure 4-56. Compressor Oil Separator Service and Control Valves

(3) Remove adapter (7), elbow (8), nipple (9), and elbow (10).
(4) Remove four each hex lock nuts (11), capscrews (12) and eight flat washers (13).
(5) Remove ground cable (14) and compressor oil separator (15).
(6) Remove external components from compressor oil separator (15).

(a) Remove two hex head screws (Figure 4-56, 1), lock washers (2), and cover (3). Discard lock washers.
(b) Remove spring (4), piston (5), preformed packing (6), elbow (7), body (8), and nipple (9). Discard preformed packing.
(c) Remove hose (10), two elbows (11), line strainer (12), adapter (13), and tee (14).
(d) Remove adapter (15), two elbows (16), and valve (17).
(e) Remove adapter (18), regulator (19), adapter (20), and cross (21).
(f) Remove safety valve (22) and elbow (23).
(g) Remove plug (24), globe valve (25), nipple (26), and elbow (27).

(7) Remove compressor oil fill line and internal components. See Figure 4-57.

(a) Remove cap (1), preformed packing (2), adapter (3), elbow (4), and pipe (5). Discard preformed packing.
(b) Remove plug (6) and elbow (7).
(c) Remove adapters (8) and (9).
(d) Remove eight hex head bolts (10), lock washers (11), cover (12), and pipe (13). Discard lock washers.
(e) Remove separator element (14) from tank (15).

b. Cleaning.

CAUTION

Use of a clogged separator element can damage the compressor. There is no effective cleaning method for the separator element. A clean appearance does not indicate a clean, unobstructed condition.

(1) Remove all foreign material from bottom of tank (15). See Figure 4-57.
(2) Using a clean rag (item 2, section II, appendix E) and wipe all internal surfaces. Do not clean separator element (14). If separator is suspected to be clogged, replace it.

c. Installation.

(1) Reassemble tank.

(a) Install separator element (Figure 4-57, 14).
(b) Install pipe (13) on the bottom side of cover (12).

4-57. COMPRESSOR OIL SEPARATOR REPLACEMENT. - Continued

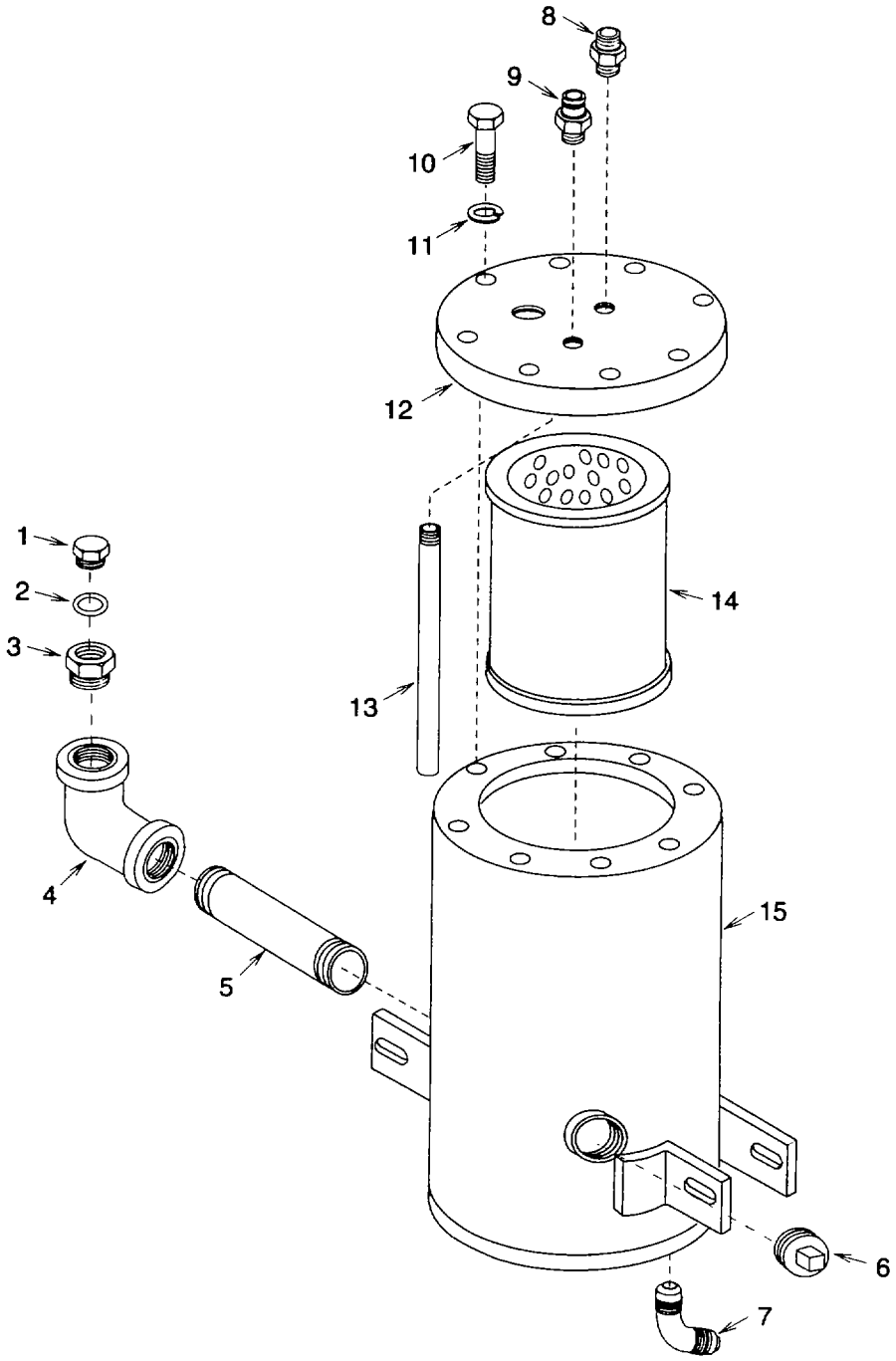


Figure 4-57. Compressor Oil Separator

WARNING

Use of standard commercial cap screws to assemble separator can result in cap screws breaking under pressure causing cover to come off. Personal injury could result.

(c) Install eight hex head bolts (10) and new lock washers (11) (item 39, appendix H). Do not substitute standard commercial cap screws for item (10). These are high tensile that meet ASME standards for pressure vessels.
(d) Wrap antiseize tape (item 1, section II, appendix E) around threads of adapters (8) and (9).
(e) Install adapters (8) and (9) in cover (12).
(f) Wrap antiseize tape (item 1, section II, appendix E) around threaded ends of elbow (7), plug (6), pipe (5), and adapter (3).
(g) Install elbow (7) and plug (6).
(h) Install pipe (5), elbow (4), adapter (3), new preformed packing (2) (item 17, appendix H), and cap (1).

(2) Install external components.

(a) Wrap antiseize tape (item 1, section II, appendix E) around threaded ends of elbow (Figure 4-56, 27) nipple (26), and plug (24).
(b) Install elbow (27), nipple (26), globe valve (25), and plug (24).
(c) Wrap antiseize tape (item 1, section II, appendix E) around threaded ends of elbow (23) and valve (22).
(d) Install elbow (23) and safety valve (22).
(e) Wrap antiseize tape (item 1, section II, appendix E) around threaded ends of two elbows (16), adapter (20), and adapter (18).
(f) Install elbows (16), cross (21), adapter (20), regulator (19), and adapter (18).
(g) Wrap antiseize tape (item 1, section II, appendix E) around threaded ends of adapter (15), two elbows (11), and adapter (13).
(h) Install valve (17), adapter (15), tee (14), elbows (11), adapter (13), and line strainer (12).
(i) Install hose (10).
(j) Wrap antiseize tape (item 1, section II, appendix E) around threaded ends of nipple (9) and elbow (7).
(k) Install nipple (9), cover (8) and elbow (7).
(1) Coat new preformed packing (6) (item 17, appendix H) with petrolatum (item 12, section II, appendix E).
(m) Install preformed packing (6), piston (5), spring (4), and cover (3).
(n) Install two new lock washers (2) (item 25, appendix H) and two hex head screws (1).

4-57. COMPRESSOR OIL SEPARATOR REPLACEMENT. - Continued

(3) Install oil separator into unit.

WARNING

Failure to reattach ground cable between separator and compressor could produce internal static electricity causing an explosion or internal separator fire. Personal injury can result.

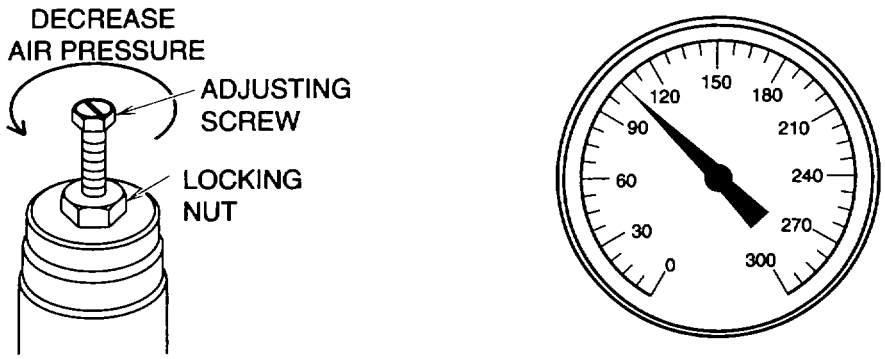
(a) Install compressor separator (Figure 4-55, 15) and attach ground cable (14), using four hex head screws (12), eight flat washers (13), and four new self locking nuts (11) (item 20, appendix H).
(b) Install thermal bypass hose (4).
(c) Wrap antiseize tape (item 1, section II, appendix E) around threaded ends of elbow (10), nipple (9), and adapter (7).
(d) Install elbow (10), nipple (9), elbow (8), and adapter (7).
(e) Install clamp (5) and hose (6).
(f) Install hoses (1), (2), and (3).
(g) Remove cap (Figure 4-57, 1) and install 20 quarts of lubricating oil (item 4, section II, appendix E) through adapter (3).
(h) Clean the adapter (3) with a wiping rag (item 2, section II, appendix E) and install oil filler cap (1).

(4) Connect the battery cables to batteries per paragraph 4-49.

(5) Air pressure regulator (Figure 4-56, 19) adjustment.

(a) Turn unit on and allow pressures and temperatures to stabilize.
(b) If the air pressure gauge indicates a reading other than 110-120 psi (7. 7-8. 4 kg/cm2) when compressor is running unloaded, and engine is running smoothly at a speed between 1000-1300 RPM, make adjustment of air pressure regulator as follows:

1 With air discharge valves closed, and engine running smoothly between 1000-1300 RPM, loosen adjusting screw locking nut and adjust air pressure regulator to obtain a reading of approximately 115 psi (8. 1 kg/cm2) on receiver pressure gauge.



A AIR PRESSURE REGULATOR **B RECEIVER PRESSURE GAGE**

Figure 4-58. Air Pressure Regulator Adjustment

2 If pressure rises above 115 psi (8. 1 kg/cm2), turn adjusting screw counterclockwise to decrease pressure.
3 Bleed off excess air by opening service valve. After excess air has been discharged, close service valve.
4 Readjust pressure regulator, as necessary to obtain 115 psi (8. 1 kg/cm2).
5 Cycle air compressor several times by opening and closing service valves. Observe receiver pressure gauge each time to ensure pressure setting remains stable.
6 Tighten adjusting screw locking nut.
7 Stop the unit.

(6) Close roadside doors.

4-58. COMPRESSOR REPLACEMENT.

This task covers: a. Removal b. Installation

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:

Battery cables disconnected from batteries. (See para 4-49.)

Compressor oil drained. (See para 4-6, d, (2).)
Top panel and channel removed. (See para 4-31, a, (1).)
Compressor air cleaner removed. (See para 4-54.)
Compressor oil filter removed. (See para 4-55.)

a. Removal.

(1) Remove inlet housing assembly (Figure 4-59, 1).

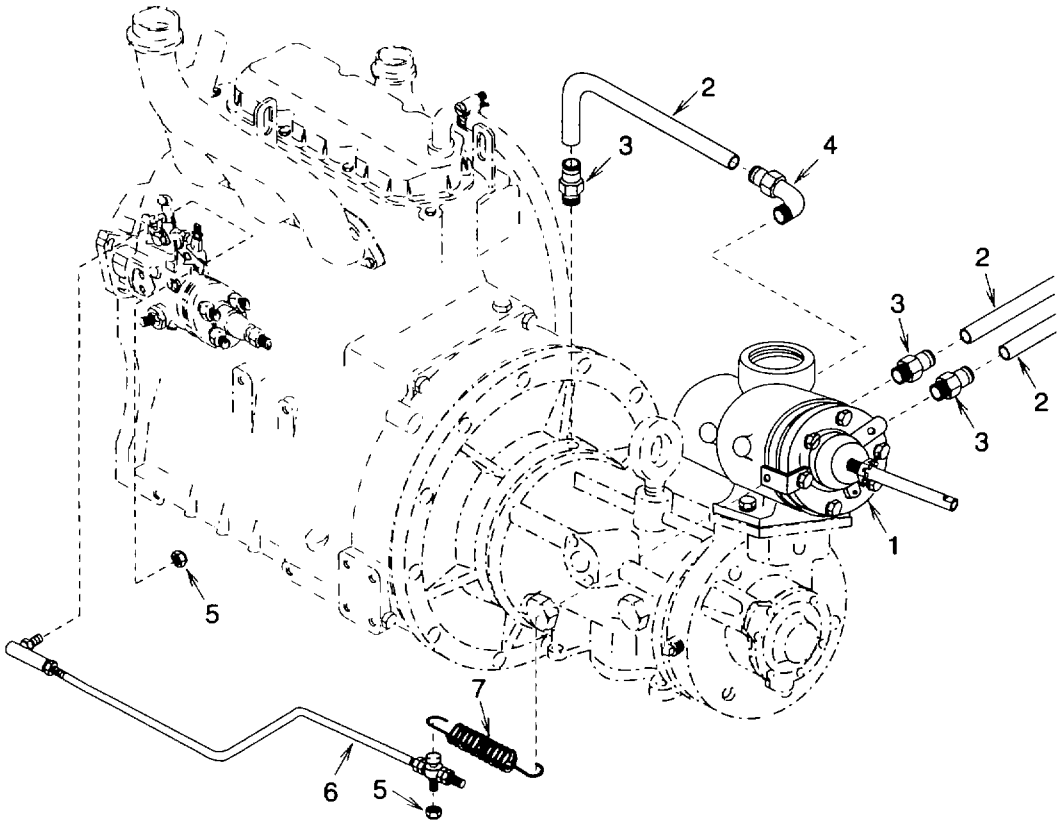


Figure 4-59. Air Compressor Linkage and Air Lines

(a) Remove air hose lines (2), adapters (3), and elbow (4).
(b) Remove two nuts (5), speed control rod (6), and spring (7).
(c) Loosen setscrew (Figure 4-60, 1) and remove knob (2).

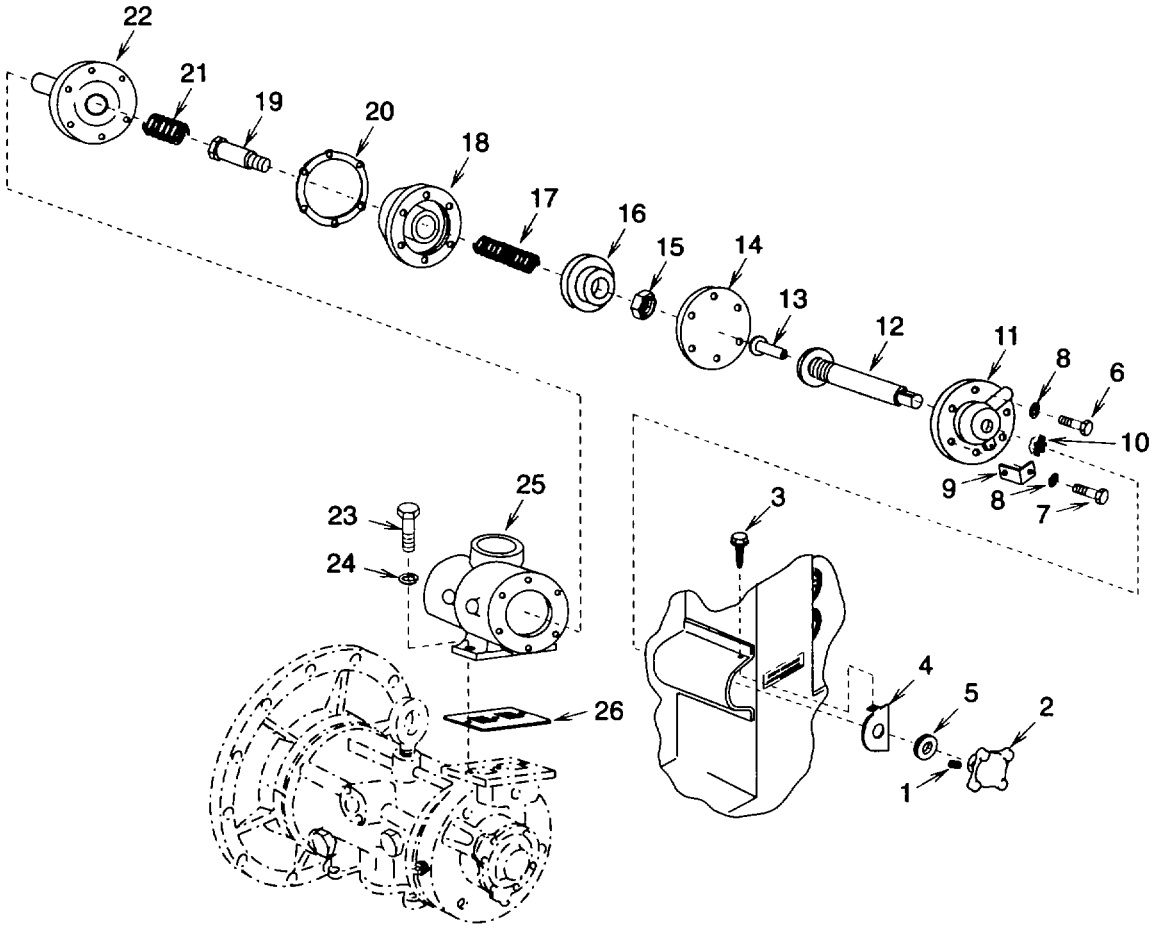


Figure 4-60. Air Compressor Inlet

(d) Remove two hex washer head bolts (3), guide plate (4), and one grommet (5).
(e) Remove five cap screws (6), one cap screw (7), six lock washers (8), and spring bracket (9). Discard lock washers.
(f) Remove slotted hex nut (10), cover (11), and rod (12) as an assembly.
(g) Remove unloader pin (13).
(h) Remove diaphragm (14).
(i) Remove lock nut (15), intake control piston (16), spring (17), air intake cylinder (18), and intake control stem (19) as an assembly.
(j) Remove gasket (20), spring (21) and intake control valve (22).
(k) Remove two hex head screws (23), lock washers (24), inlet housing (25), and gasket (26). Discard gasket and lock washers.

4-58. COMPRESSOR REPLACEMENT. - Continued

(2) Remove air compressor (Figure 4-61, 1).

(a) Remove two hex head screws (2), lock washers (3), discharge elbow (4), and preformed packing (5).Discard preformed packing and lock washers.

WARNING

Removing air compressor by hand can result in personal injury.

CAUTION

Removing the air compressor attaching hardware prior to supporting the air compressor weight, will allow the air compressor to drop and result in equipment damage.

(b) Attach lifting device to eye (6) provided on air compressor. Tension should be kept on lifting eye.
(c) Remove twelve hex head screws (7), and lock washers (8). Discard lock washers.

NOTE

Do not remove bushings and pins unless they are damaged.

(d) Carefully slide air compressor (1) forward and disengage the coupling (9) from the three bushings (10) and pins 11)

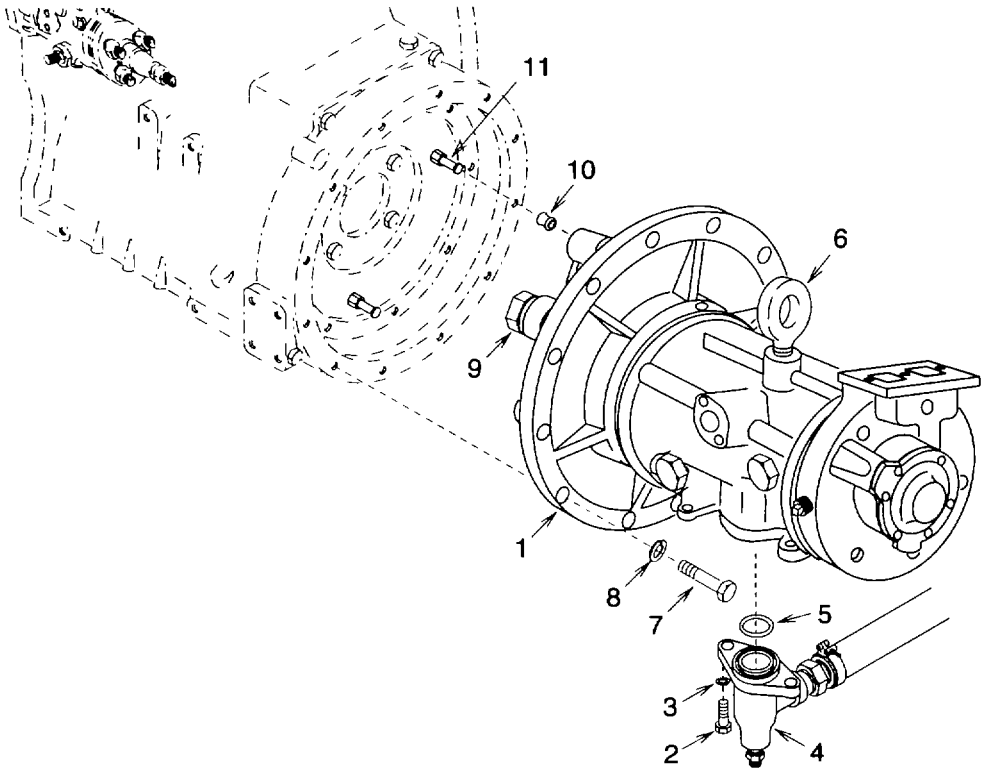


Figure 4-61. Air Compressor

b. Installation.

(1) Install the air compressor.

(a) Install three pins (11) and bushings (10) on engine. See Figure 4-61.

(b) Coat inside and outside of the bushings (10) with petrolatum (item 12, section II, appendix E).

WARNING

Installing the air compressor by hand can result in personal injury.

CAUTION

Support the air compressor weight, while attaching hardware thus preventing the air compressor from dropping which could result in equipment damage.

(c) Attach a lifting device to eye (6) and position air compressor coupling (9) to the pins (11) and bushings (10).

(d) Align mounting holes and install twelve hex head screws (7) and new lock washers (8) (item 14, appendix H).

(e) Install new preformed packing (5) (item 65, appendix H), body (4), two hex head screws (2), and new lock washers (3) (item 14, appendix H).

(2) Install air compressor inlet.

(a) Install new gasket (Figure 4-60, 26) (item 66, appendix H), and carefully align inlet housing (25).

(b) Install three new lock washers (24) (item 14, appendix H), and hex head screws (23).

(c) Assemble intake valve (22) and spring (21).

(d) Insert stem (19) through cylinder (18) and assemble spring (17), piston (16), and new lock nut (15) (item 27, appendix H) if not already assembled.

(e) Install new gasket (20) (item 28, appendix H) cylinder (18) and diaphragm (14) and unloader piston (8).

(f) Install assembled unloader rod (12), cover (11), and slotted hex nut (10) with spring bracket (9), six new lock washers (8) (item 15, appendix H) and one screw (7) and five cap screws (6).

(g) Install grommet (5), guide plate (4), and two hex head screws (3).

(h) Install knob (2) and tighten setscrew (1).

(i) Wrap antiseize tape (item 1, section II, appendix E) on threaded end of adapters (Figure 4-59, 3).

(j) Install adapters (3), elbow (4), and air lines (2).

(k) Install air compressor linkage (6), two hex head nuts (5), and spring (7).

(3) Install compressor oil filter per paragraph 4-55.
(4) Install compressor air cleaner per paragraph 4-54.

4-58. COMPRESSOR REPLACEMENT. -Continued

(5) Install top panel and channel per paragraph 4-31, d, (5).
(6) Refill compressor with oil per paragraph 4-6, d, (2).
(7) Connect battery cables to batteries per paragraph 4-49.
(8) Adjust speed control linkage per paragraph 4-64.
(9) Adjust air pressure regulator per paragraph 4-57, c, (5).

4-59. FUEL LINES REPAIR AND REPLACEMENT.

This task covers:
a. Removal b. Repair c. Installation

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:

Battery cables disconnected from batteries. (See para 4-49.)
Rear panel removed. (See para 4-31, a., (4).)

a. Removal.

(1) Drain fuel tank.

NOTE

Fuel spills can be minimized if the majority of fuel is pumped out of the tank before removing the drain plug.

(a) Open air block access cover and place a pan (section II, appendix D) under the fuel tank.

WARNING

The accumulation of liquid fuel is a fire hazard. Wipe and wash down such areas or surfaces promptly. Dispose of any wiping rags in approved containers. Apply no smoking rules within 50 ft of any fuel accumulation.

(b) Remove drain plug (Figure 4-62, 1).

WARNING

Hoses may still have residual fuel after draining. Injury to personnel can occur if care is not observed when removing fuel lines.

(2) Carefully remove clamps (2) and (3), and hose (4).
(3) Remove nut (5), ferrule (6), hose end (7), and elbow (8).
(4) Remove hose (9), hose end (10), nut (11), ferrule (12), elbow (13), and tee (14).
(5) Remove nut (15), ferrule (16), and hose end (17).
(6) Remove nut (18), hex bolt (19), clamp (20), and hose (21).
(7) Remove nut (22), ferrule (23), hose end (24), and connector (25).
(8) Remove nut (26), ferrule (27), and tubing (28).
(9) Remove elbow (29), bushing (30), and tee (31).

4-59. FUEL LINES REPAIR AND REPLACEMENT. - Continued

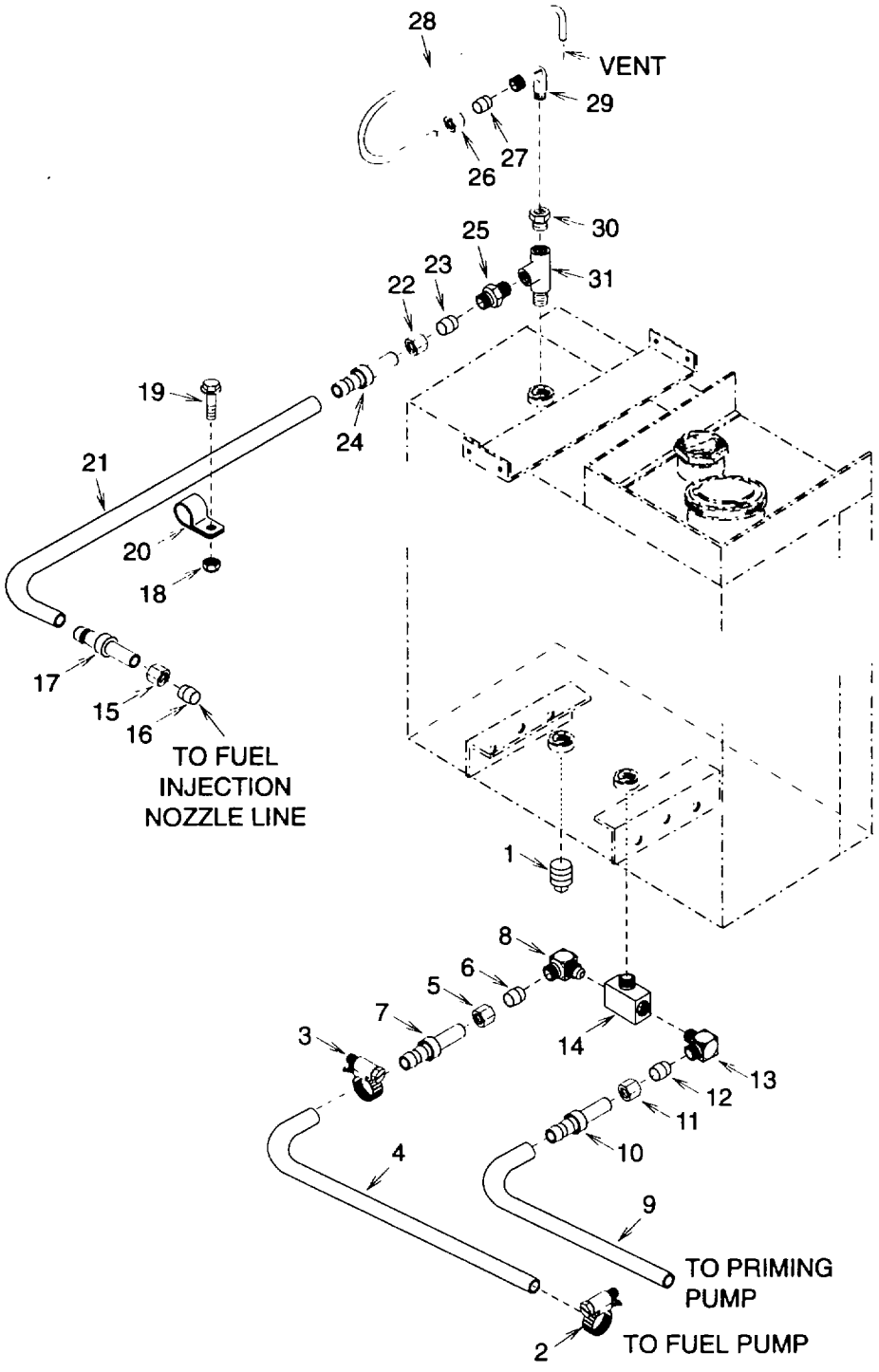


Figure 4-62. Fuel Lines from Fuel Tank

(10) Remove nut (Figure 4-63, 1), ferrule (2), hose end (3), hose (4), nut (5), ferrule (6), hose end (7), and elbow (8).

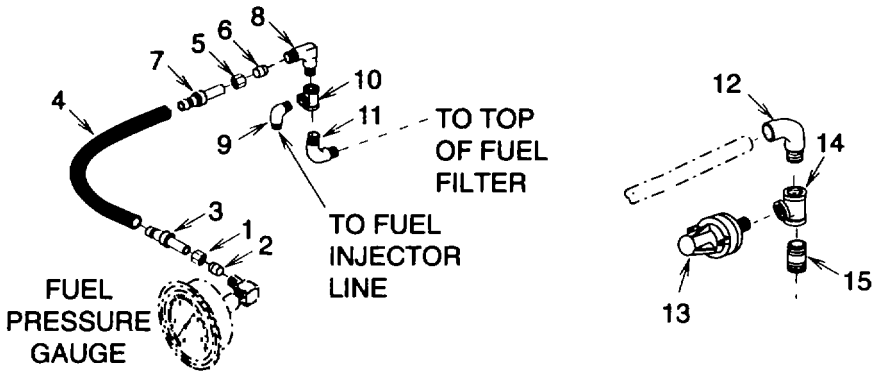


Figure 4-63. Fuel Lines from Fuel Pressure Gauge and Pressure Switch

(11) Disconnect fuel injector line from elbow (9).

(12) Remove elbow (9), tee (10), and elbow (11).

(13) Remove elbow (12), pressure switch (13), tee (14) and pipe nipple (15).

b. Repair.

(1) Manufacture hoses per appendix F and RPSTL.

(a) Cut material to the required length.

(b) Insure the ends are flat.

(2) Manufacture tubing per appendix F and RPSTL.

(a) Cut material to the required length.

(b) Insure the vent tube ends are flat and free of metal shavings.

c. Installation.

(1) Wrap antiseize tape (item 1, section II, appendix E) on threaded ends of elbows (Figure 4-63, 11), (12), (13), (15), (9), and (8).

(2) Install pipe nipple (15), tee (14), pressure switch (13) and elbow (12).

4-59. FUEL LINES REPAIR AND REPLACEMENT. - Continued

(3) Install elbow (11), tee (10), elbow (9), and elbow (8).
(4) Connect fuel injector line to elbow (9).
(5) Install ferrule (6), nut (5), and hose end (7).
(6) Install hose end (3), nut (1), ferrule (2) and hose (4).
(7) Wrap antiseize tape (item 1, section II, appendix E) on threaded end of plug (Figure 4-62, 1) and install.
(8) Wrap antiseize tape (item 1, section II, appendix E) on threaded end of tee (14), and elbow (13).
(9) Install tee (14), elbow (13), ferrule (12), nut (11), hose end (10), and hose (9).
(10) Wrap antiseize tape (item 1, section II, appendix E) on threaded end of elbow (8).
(11) Install elbow (8), ferrule (6), nut (5), hose end (7), clamp (3), hose (4), and clamp (2).
(12) Wrap antiseize tape (item 1, section II, appendix E) on threaded end of elbow (29), bushing (30), tee (31), and connector (25).
(13) Install tee (31), bushing (30), elbow (29), ferrule (27), nut (26), and vent tube (28).
(14) Install connector (25), ferrule (23), nut (22), and hose end (24).
(15) Install hose (21), hose end (17), nut (15), and ferrule (16).
(16) Install clamp (20), hex head bolt (19), and new lock nut (18) (item 3, appendix H).
(17) Install rear panels per paragraph 4-31, d, (2).
(18) Connect battery cables to batteries per paragraph 4-49.

4-60. FUEL TANK REPAIR AND REPLACEMENT.

This task covers:
a. Removal b. Repair c. Installation

INITIAL SETUP

Tools:
General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:
Battery cables disconnected from batteries. (See para 4-49.)
Rear panel removed. (See para 4-31, d, (2), k.)

WARNING

The accumulation of liquid fuel is a fire hazard. Wipe and wash down such areas or surfaces promptly. Dispose of any wiping rags in approved containers. Apply no smoking rules within 50 ft of any fuel accumulation.

a. Removal.

(1) Drain fuel tank.

NOTE

Fuel spills can be minimized if the majority of fuel is pumped out of the tank before removing the drain plug.

(a) Open air block access cover and place a pan (section II, appendix D) under the fuel tank. See paragraph 4-31., a., (6), (e).

(b) Remove drain plug (Figure 4-64, 1).

(c) Remove fuel lines. See paragraph 4-59.

(2) Remove two self locking nuts (2) and pan head screws (3).
(3) Remove six hex head bolts (4), nuts (5), lock washers (6), flat washers (7), and fuel tank (8). Discard lock washers.

4-60. FUEL TANK REPAIR AND REPLACEMENT. - Continued

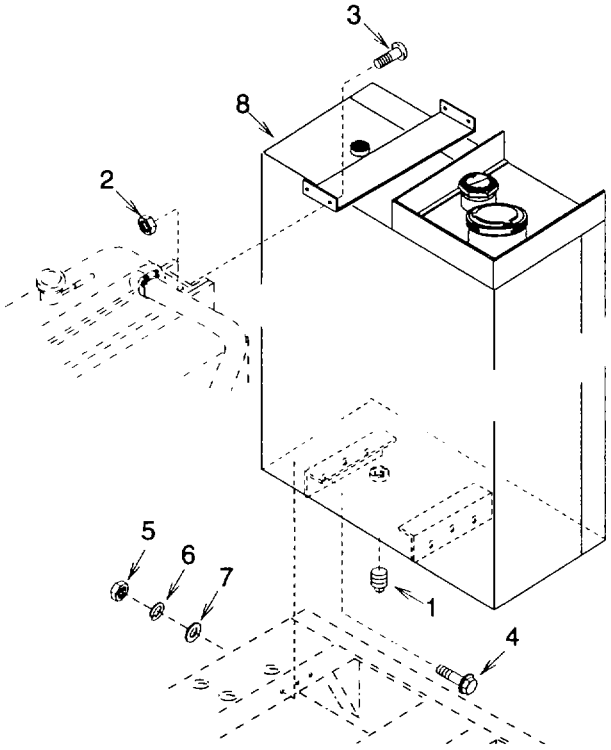


Figure 4-64. Fuel Tank

(4) Remove cap (Figure 4-65, 1).

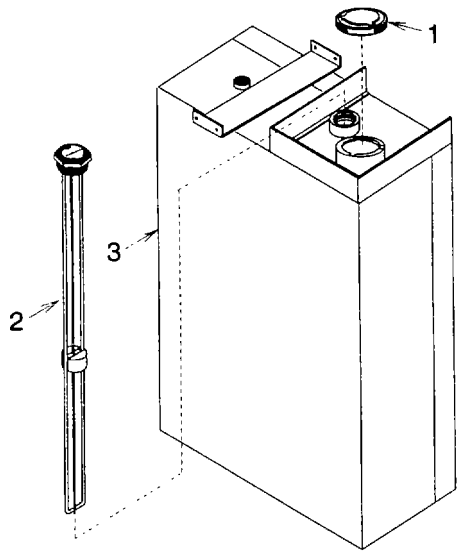


Figure 4-65. Fuel Tank Assembly

(5) Remove fuel gauge (2) from tank (3).

b. Repair. Repair is limited to replacement of component parts.

c. Installation.

(1) Wrap antiseize tape (item 1, section II, appendix E) on threaded ends of fuel gauge (Figure 4-65, 2).

(2) Install fuel gauge (2), and cap (1).

(3) Wrap antiseize tape (item 1, section I, appendix E) on threaded end of plug (Figure 4-64, 1) and install.

(4) Install fuel tank (8), six hex head bolts (4), flat washers (7), new lock washers (6) (item 4, appendix H), and nuts (5).

(5) Install two pan head screws and new lock nuts (2) (item 3, appendix H).

(6) Install rear panel per paragraph 4-31, d, (2).

(7) Add fuel as required to tank (8).

(8) Connect battery cables to batteries per paragraph 4-49.

4-61. ENGINE AIR CLEANER REPLACEMENT.

This task covers:
a. Removal b. Installation

INITIAL SETUP

Tools:
General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:
Roadside doors open.

a. Removal.

(1) Remove nut (Figure 4-66, 1), flat washer (2), disconnect restriction indicator hose (3), and remove banjo fitting (4).

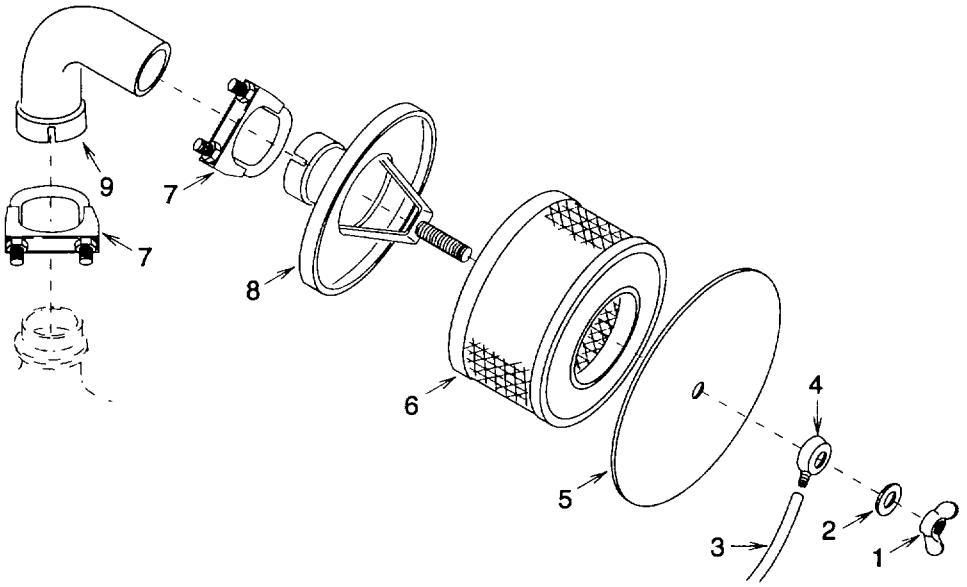


Figure 4-66. Engine Air Cleaner

(2) Remove lid (5) and filter (6).

(3) Remove two clamps (7), base (8), and elbow (9).

b. Installation.

(1) Install elbow (9), base (8), and two clamps (7).

(2) Install filter (6) and lid (5).

(3) Install banjo (4), flat washers (2), nut (1), and restriction indicator hose (3).

(4) Close roadside doors.

4-62. OIL FILTER REPLACEMENT.

This task covers:
a. Removal b. Installation

INITIAL SETUP

Tools:
Automotive Maintenance and Repair
Item 2, Section III, Appendix B

Equipment Conditions:
Roadside doors open.
Oil Drained. (See para 4-6, c., (1).)

a. Removal

(1) Remove oil filter (Figure 4-67, 1).

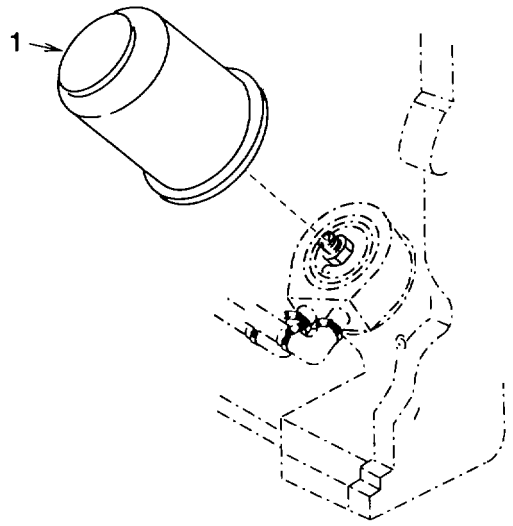


Figure 4-67. Oil Filter

(2) Dispose of oil filter properly.

b. Installation.

(1) Wipe off any spillage of oil on engine with a rag (item 2, section II, appendix E).

(2) Install new oil filter (1).

(3) Fill oil per paragraph 4-6, c., (2).

(4) Close roadside doors.

4-63. ENGINE OIL COOLER REPLACEMENT.

This task covers:
a. Removal b. Installation

INITIAL SETUP

Tools:
Automotive Maintenance and Repair
Item 2, Section III, Appendix B

Equipment Conditions:
Oil filter removed. (See para 4-62.)

a. Removal.

(1) Remove two clamps (Figure 4-68, 1) and disconnect hoses (2). Discard clamps.

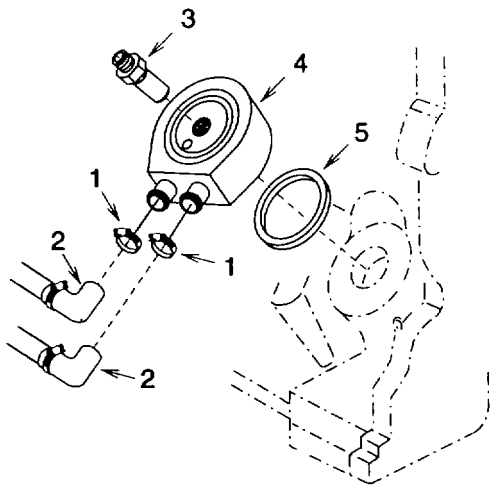


Figure 4-68. Oil Cooler

(2) Remove nipple (3), oil cooler (4), and washer (5). Discard washer.

b. Installation.

(1) Install new washer (5) (item 67, appendix H), oil cooler (4), and nipple (3).

(2) Torque nipple to 25 ft-lb (35 Nm).

(3) Slip new clamps (1) (item 44, appendix H) over hoses (2).

(4) Place hoses (2) on oil cooler (4) and tighten clamps (1).

(5) Install oil filter per paragraph 4-62.

4-64. SPEED CONTROL LINKAGE ADJUSTMENT AND REPLACEMENT.

This task covers:
a. Adjustment b. Removal c. Installation

INITIAL SETUP

Tools:
General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:
Open control panel and curbside doors.

a. Adjustment.

WARNING

Engines have fast moving parts that can injure hands, fingers, etc. Take special care while in operation. Engine parts, particularly the exhaust system, can be very hot and cause severe burn. Do not touch until engine is shut down and cooled off. Avoid spilling fuel or oil on hot engine parts which could result in a fire.

NOTE

Adjustments for both engine speed and air pressure must be preformed in sequence and always done together.

(1) Start engine per paragraph 2-4, b.

(2) Check idle speed. Tachometer reading should be between 1,000 and 1,300 RPM. Adjust speed linkage to correct for either low or high speed.

(3) Adjust speed control linkage as follows:

(a) Loosen four hex nuts (Figure 4-69, 1) and (2) on control rod (5).

(b) To increase speed, turn nut back to decrease threads and increase travel on rod. When speed is corrected, tighten nuts (1) and (2).

(c) To decrease speed, increase threads forward to decrease rod travel. When speed is corrected, tighten nuts (1) and (2).

4-64. SPEED CONTROL LINKAGE ADTUSTMENT AND REPLACEMENT. - Continued

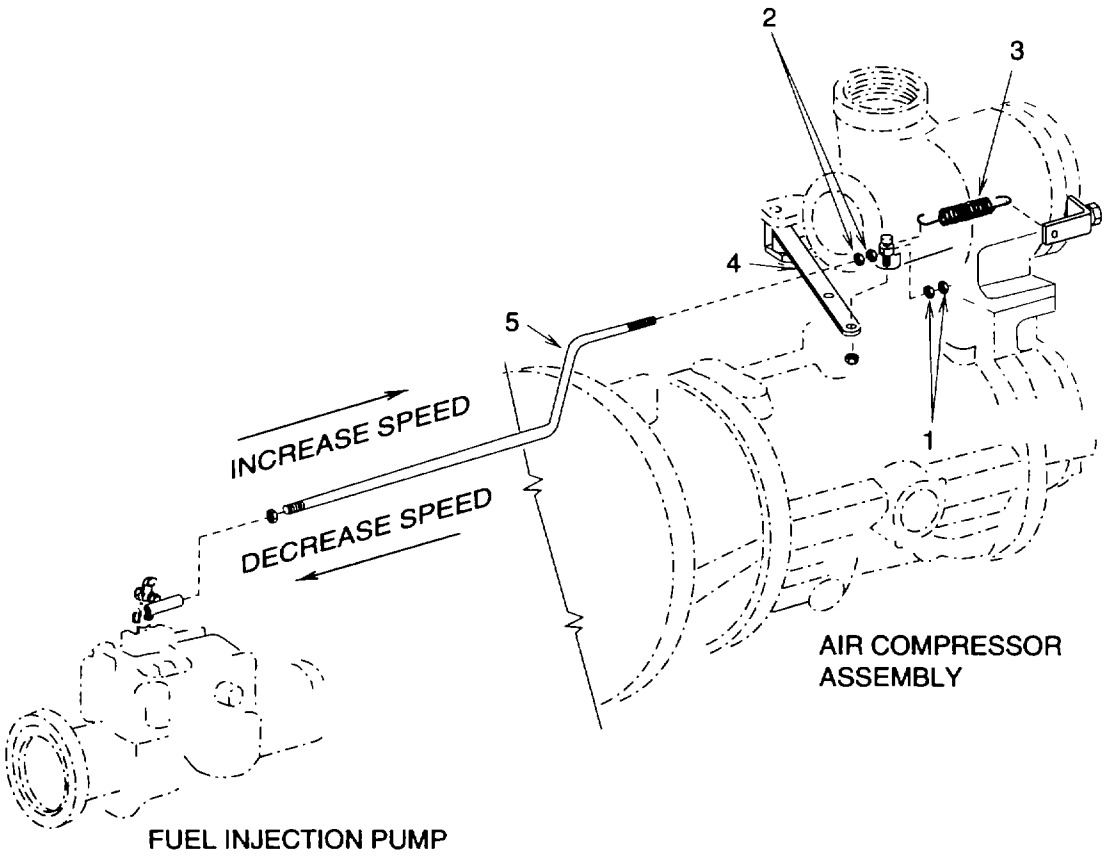


Figure 4-69. Speed Control Linkage Adjustment

(d) Shutdown engine per the following:

1 Turn COMPR UNLOADER AND IDLE CONTROL knob clockwise until it stops.
2 Close air outlet valves.

3. When engine speed reduces to steady idle speed, push IGNITION-START switch all the way in to stop engine.

b. Removal.

(1) Remove hex head screw (Figure 4-70, 1), lock washer (2), bracket (3), and spring (4). Discard lock washer.

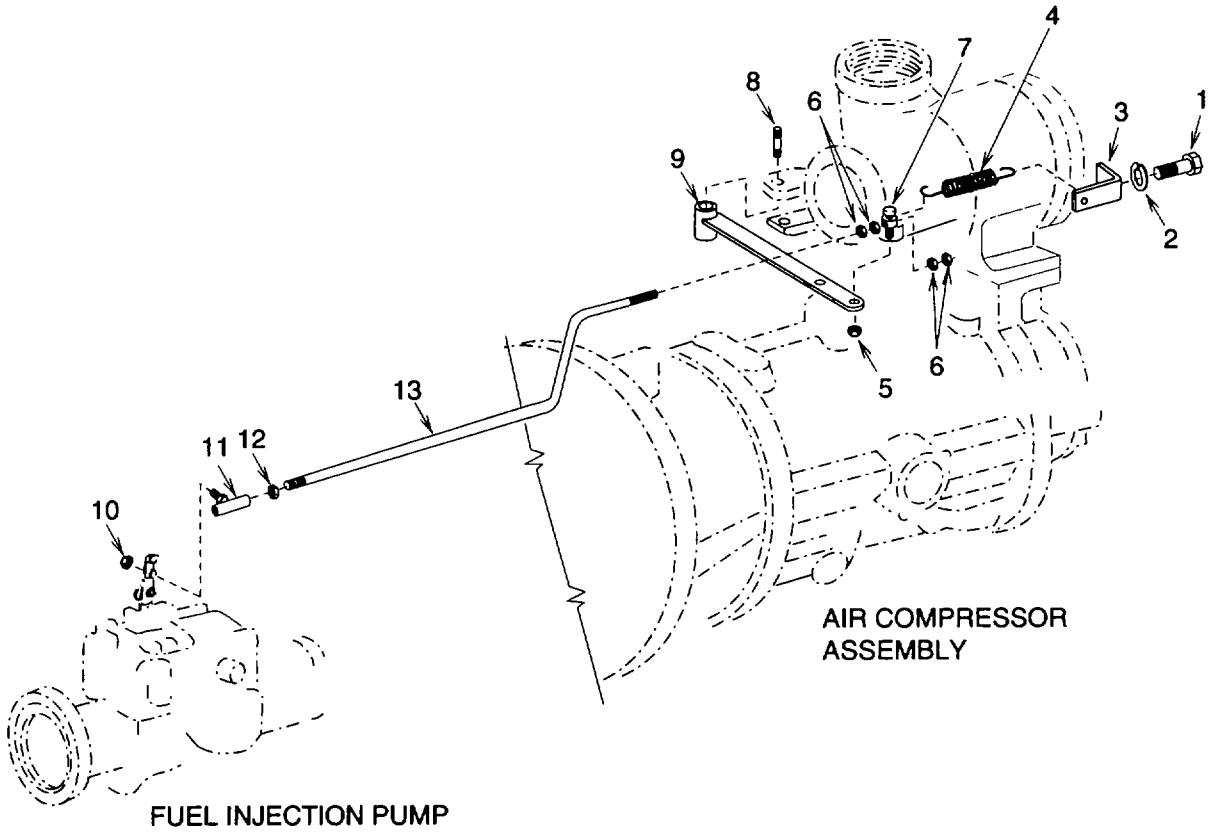


Figure 4-70. Speed Control Linkage

(2) Remove nuts (5), (6), and block stop (7).

(3) Remove pin (8) and arm (9).

(4) Remove nut (10), ball joint (11), nut (12), and rod (13).

c. Installation.

(1) Install rod (13), nut (12), ball joint (11), and nut (10).

(2) Install arm (9), pin (8), block stop (7), and nut (5).

(3) Install hex screw (1), new lock washer (2) (item 15, appendix H), bracket (3), and spring (4).

(4) Install four hex nuts (6) and tighten after adjustment to linkage per paragraph 4-41 a., have been performed.

(5) Close control panel and curbside doors.

4-65. ALTERNATOR AND BELT ADJUSTMENTAND REPLACEMENT.

This task covers:
a. Adjustment b. Removal c. Installation

INITIAL SETUP

Tools:
Automotive Maintenance and Repair
Item 2, Section III, Appendix B

Equipment Conditions:
Roadside doors open.

a. Adjustment.

(1) If belt is cold, start engine and run for five minutes, then shut engine off.

(2) Check belt tension using tension gauge (Figure 4-71, 1) or tension gauge (2) and straight edge (3).

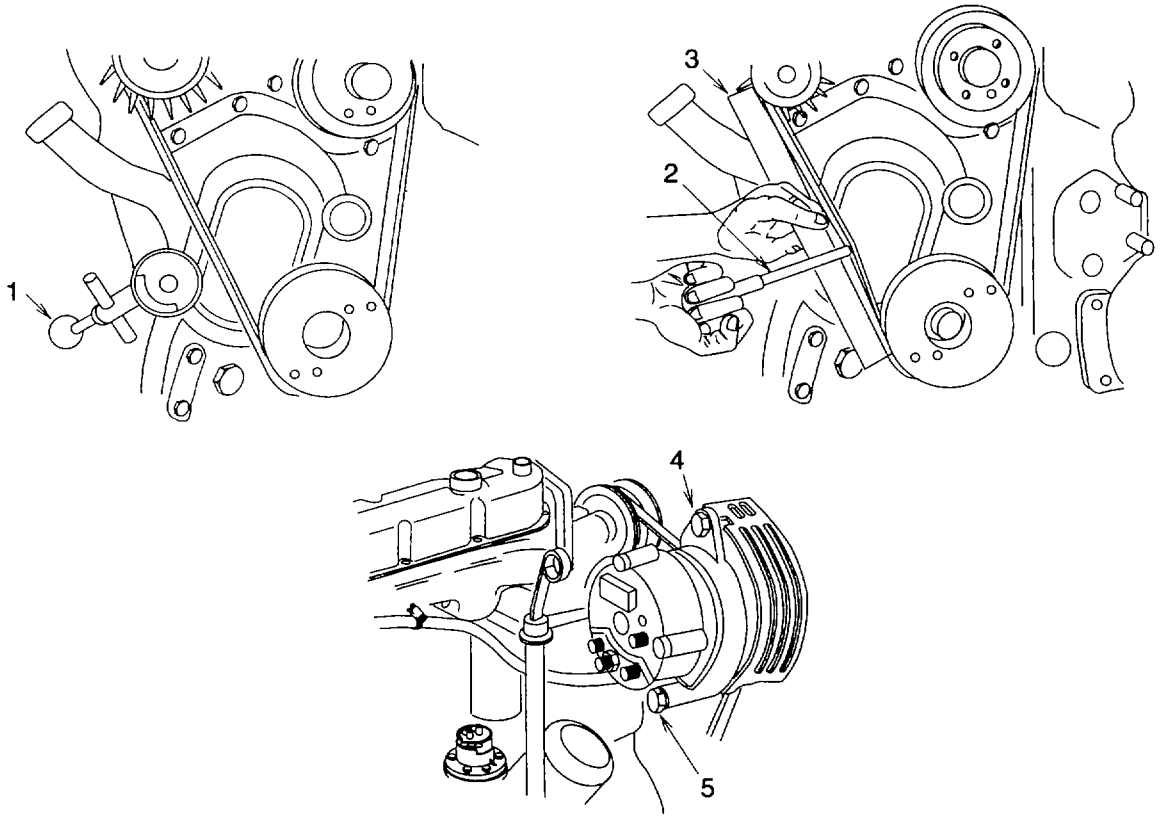


Figure 4-71. Belt Adjustment

(a) If using tension gauge (1) do the following:

1. Place gauge on the long part of the belt and take a reading.

NOTE
Belts are considered used after ten minutes of operation.

2. New belt reading for single belt should be 130-140 lb force (578-622N).

3. Used belt reading for single belt should be 85-94 lb force (378-423 N).

(b) If using tension gauge (2) and a straight edge do the following:

1 Place straight edge (3) between pulleys.

2 A 30 lb (130 N) force halfway between the pulleys should deflect the belt 0.50 in (13 mm).

CAUTION
Too little tension causes slippage or slip and grab, causing the belt to break. If the belt does not break, the slip will cause excessive cover wear, bum spots and overheating. Too much tension can cause belt heating and excessive stretch, as well as damage to drive components, such as sheaves and shafts. Excessive tightness will also place heavier loads on the bearings causing them to fail prematurely.

(3) If belt needs adjustment, loosen alternator bracket screw (4) and (5).

(4) Apply outward pressure to alternator front frame until belt tension is correct.

(5) Tighten screws (4) and (5). Remove tension gauge.

(6) Start engine and run for ten minutes. Shut engine off.

(7) Check tension again. If tension is not within specifications, wait ten minutes and adjust for used belt tension.

(8) Repeat steps (3) through (7).

b. Removal.

(1) Disconnect battery cables per paragraph 4-49.

(2) Disconnect connector (Figure 4-72, 1).

4-65. ALTERNATOR AND BELT ADJUSTMENT, TESTING AND REPLACEMENT. - Continued

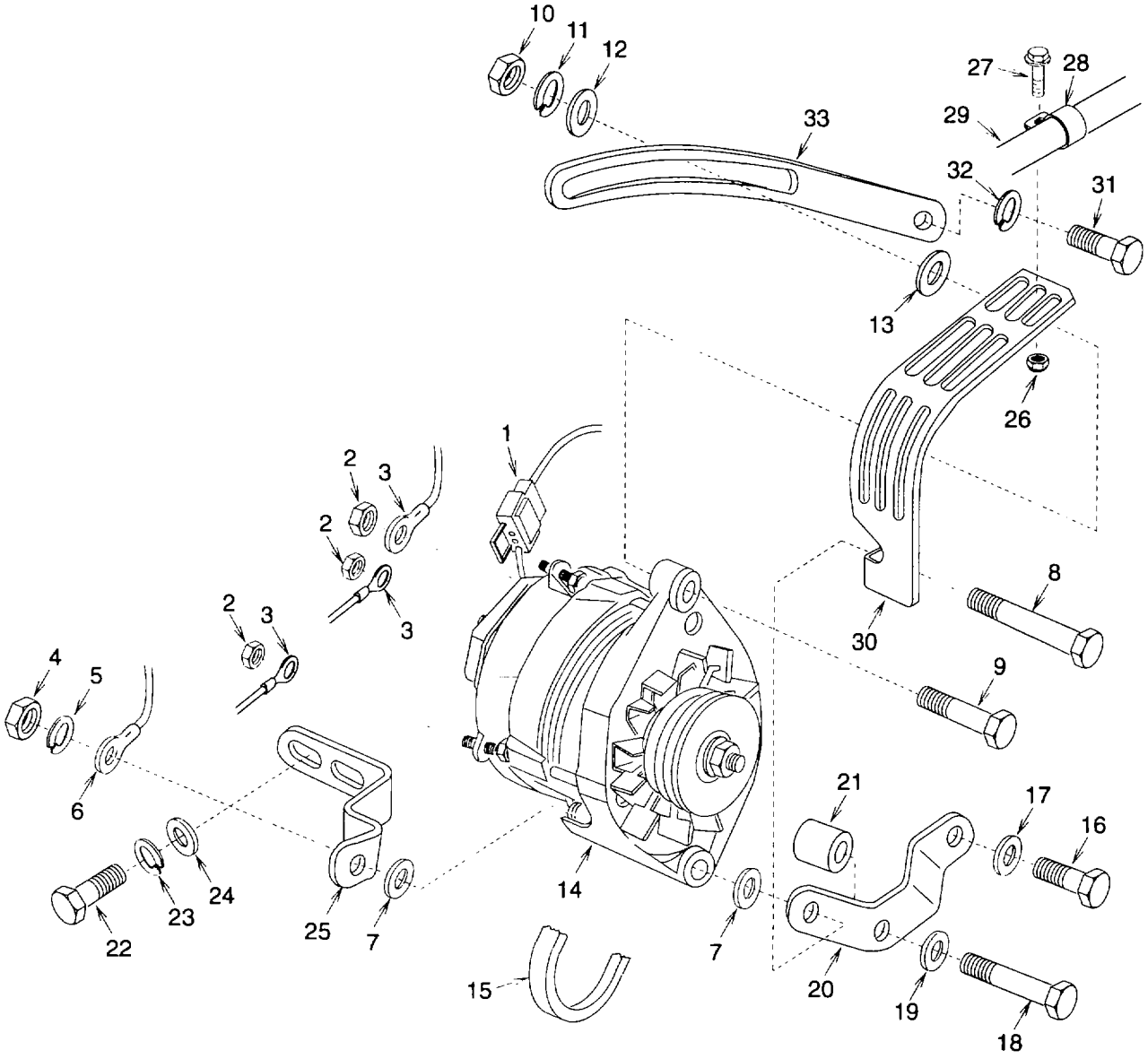


Figure 4-72. Alternator

(4) Remove three hex nuts (2). Tag (item 18, section II, appendix E) and disconnect wire leads (3).

(5) Remove nut (4), lock washer (5), lead (6), two flat washers (7), and hex head screw (8). Discard lock washer.

(6) Remove hex head screw (9), nut (10), lock washer (11), flat washers (12) and (13), alternator (14), and belt (15). Discard lock washer.

NOTE
Disassemble the following only if replacement is required.

(7) Remove hex head screw (16) and flat washer (17).

(8) Remove hex head screw (18), flat washer (19), bracket (20), and bushing (21).

(9) Remove two each hex head screws (22), lock washers (23), flat washers (24), and bracket (25). Discard lock washers.

(10) Remove lock nut (26), hex washer head bolt (27), and clamp (28) that secure fuel line (29) to shield (30). Discard lock nut.

(11) Remove hex head screw (31), lock washer (32), and strap (33). Discard lock washer.

c. Installation.

(1) Mount strap (33) on engine using hex head screw (31) and new lock washer (32) (item 68, appendix H).

(2) Attach fuel line (29) to shield (30) with hex washer head bolt (27), new lock nut (26) (item 3, appendix H), and clamp (28).

(3) Mount bracket (25) to engine using two hex head screws (22), new lock washers (23) (item 68, appendix H), and flat washers (24).

(4) Mount bracket (20) to engine using bushings (21), flat washers (17) and (19), and hex head screws (16) and (17).

(5) Move alternator (14) and belt (15) into place and insert screw (8) thru shield (30), bracket (20), flat washer (7), alternator (14), flat washer (7), and bracket (25).

(6) Place lead (6) on end of screw (17) and secure with new lock washer (5) (item 69, appendix H), and hex nut (4).

(7) Insert screw (9) through alternator (14), shield (30), washer (13), and strap (33). Secure with flat washer (12), new lock washer (11) (item 69, appendix H), and nut (10).

(8) Install lead wires (3) using tags and wiring diagram (Figure 4-3) and nuts (2). Remove tags.

(9) Install connector lead (1).

(10) Connect battery cables to batteries per paragraph 4-49.

(11) Adjust belts. (See step a. above.)

(12) Close roadside doors.

4-66. STARTER TESTING AND REPLACEMENT.

This task covers:
a. Removal b. Testing c. Installation

INITIAL SETUP

Tools:
General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:
Roadside doors open.
Battery cables disconnected from batteries. (See para 4-49.)
Dipstick removed. (See para 4-67.)

a. Removal.

NOTE

Mounting and terminal hardware is supplied with component and cannot be purchased separately. Retain all hardware if original component is to be installed. If component is being replaced, use new hardware supplied.

(1) Tag (item 18, section II, appendix E) wire leads (Figure 4-73, 3).

(2) Remove hex nut (1), lock washer (2), two battery cable wires (3), and lead wire (4).

(3) Push plastic cover (5) forward and remove nut (6), lock washer (7), and lead wire (8).

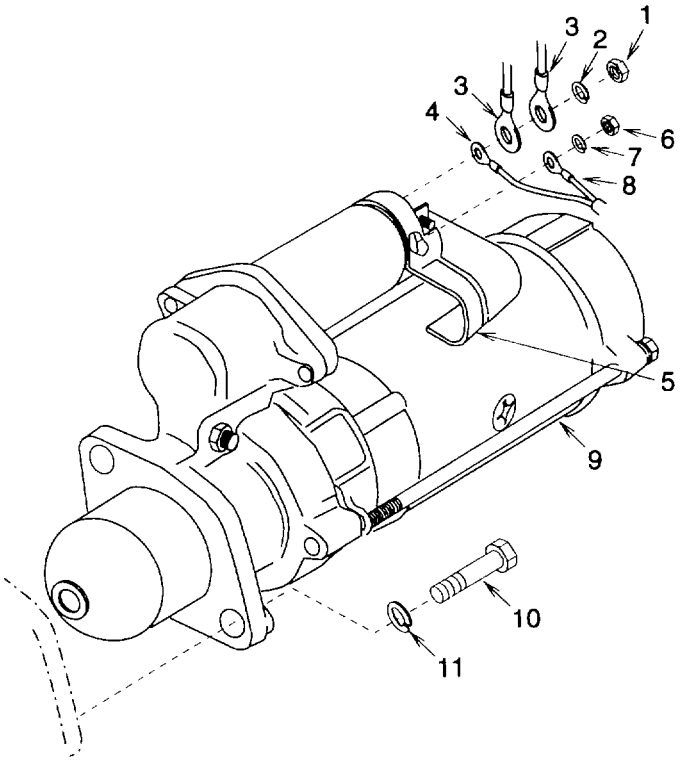


Figure 4-73. Starter

(4) Support starter (9) while removing two hex head screws (10), and lock washers (11). Discard lock washers.

(5) Carefully pull starter away from engine.

b. Testing.

(1) Test setup.

(a) Starter removed, battery, ammeter, momentary switch, voltmeter, RPM indicator, wire leads and carbon pile are required to perform test.

WARNING

High current surges can occur while connecting or disconnecting wire leads, causing personal injury to personnel. Insure switch is in the open position.

NOTE

Carbon pile load is used to adjust operating voltage for comparison with specifications.

(b) Setup equipment as shown in (Figure 4-74).

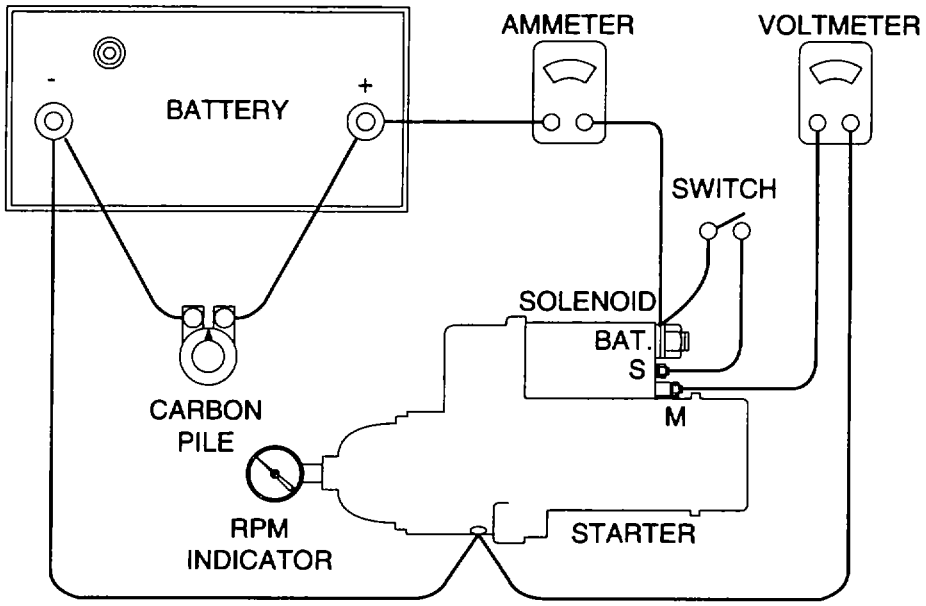


Figure 4-74. Starter No Load Test Hook Up

4-66. STARTER TESTING AND REPLACEMENT. - Continued

(c) Make all connections with switch open and carbon pile load turned off. Hook negative battery connection last to ground on the starter frame.

WARNING

Sparking or current flow can occur if the starter solenoid is frozen. Stop test or injury to personnel can occur.

(d) Watch for sparking or current flow in battery as you make all connections.

(e) If this occurs, stop test. Starter solenoid switch is frozen. Replace starter.

(2) Test starter.

WARNING

Keep fingers and tools away from opening in housing while testing. The starter drive pinion will shift strongly as it moves into the cranking position and spins and could cause personal injury.

CAUTION

Overheating and damage to the starter can occur if starter is operated under a no load test with the switch closed for longer than 30 second maximum cycles. Allow starter to cool for at least two minutes.

(a) Momentarily close switch and observe for the following:

1 High current flow and starter fails to operate (zero rpm), release switch immediately. Internal mechanical damage is indicated, replace the starter.

2 No current flow and starter fails to operate (zero rpm), release switch immediately. Open circuit is indicated, replace starter.

3 If there is current flow and starter operates, release switch and proceed with the next step.

(b) Close switch and observe voltmeter. Adjust carbon pile load to obtain 10 volt reading. Observe and record ammeter and RPM readings. Release switch.

1 Ammeter reading should be between 125 to 190 amps.

2 Rpm reading should be between 3,000 to 5,600 RPM.

3 Replace starter if readings are not within above ranges.

c. Installation.

(1) Position starter (Figure 4-73, 9), and install two hex head screws (10) and new lock washers (11) (item 43, appendix H).

(2) Install wire lead (4) and two battery cables (3), lock washer (2), and nut (1). Check wiring diagram (Figure 4-3) and tags before installing wires. Remove tags.

NOTE

Old mounting and terminal hardware must be reused if original component is being installed. If original component was replaced, use new hardware supplied.

(3) Push plastic cover (5) forward and install lead wire (8), lock washer (7), and nut (8).

(4) Return plastic cover (5) to its original position.

(5) Install dipstick per paragraph 4-67.

(6) Connect battery cables to batteries per paragraph 4-49.

4-67. OIL DIP STICK AND FILLER NECK REPLACEMENT.

This task covers:
a. Removal b. Installation

INITIAL SETUP

Tools:
Automotive Maintenance and Repair
Item 2, Section III, Appendix B

Equipment Conditions:
Roadside doors open.
Oil drained. (See 4-46, c, (1).)

a. Removal.

(1) Remove dip stick (Figure 4-75, 1), loosen nut (2), and unscrew nipple (3). Remove preformed packing (4) and discard.

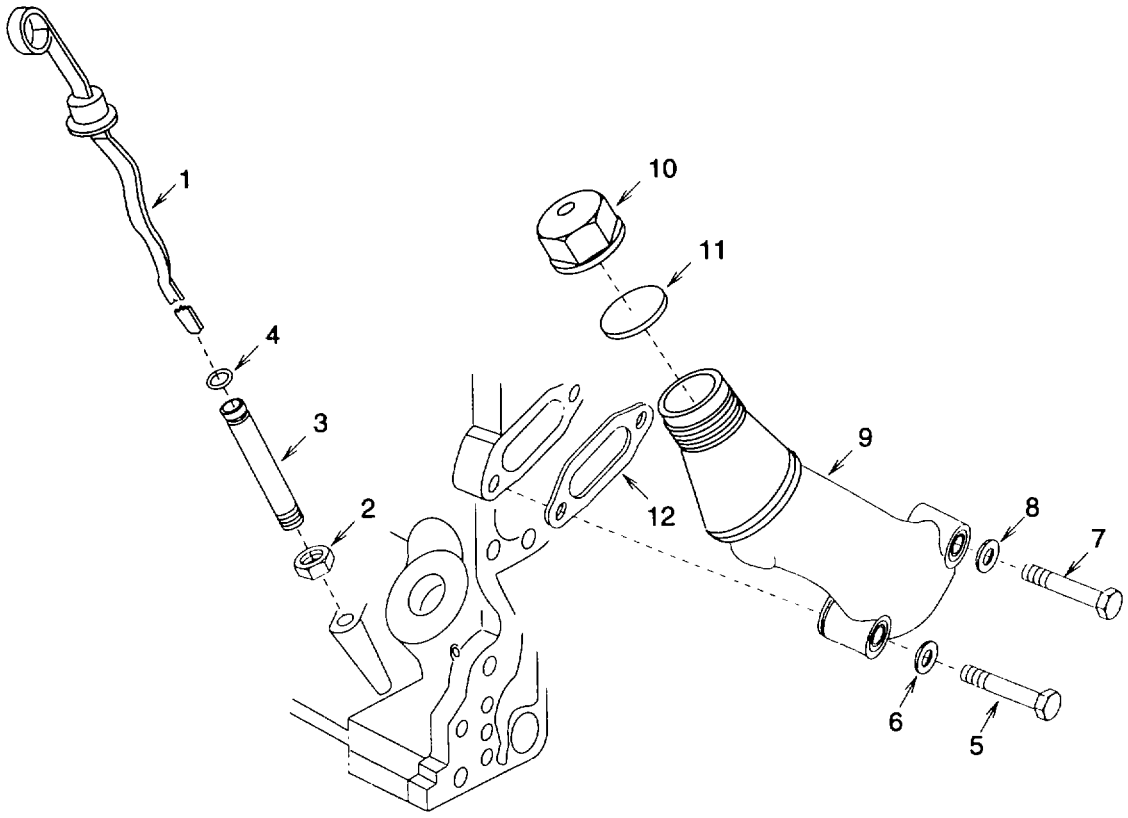


Figure 4-75. Dip Stick and Filler Neck

(2) Remove hex head screw (5), flat washer (6), hex head screw (7), flat washer (8), and filler neck (9).

(3) Remove plug (10) and gaskets (11) and (12). Discard gaskets.

b. Installation.

(1) Install new gasket (12) (item 71, appendix H), filler neck (9), flat washer (8), hex head screw (7), flat washer (6), and hex head screw (5).

(2) Install new gasket (11) (item 70, appendix H), and plug (10).

(3) Install nut (2) on nipple (3). Screw nipple into engine block.

(4) Adjust height of nipple (3) to 7.78 in. (189 mm) (Figure 4-76). Tighten nut (2) down to secure nipple.

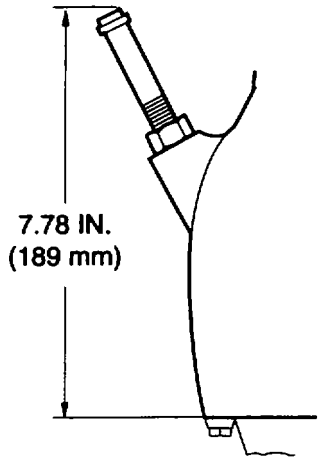


Figure 4-76. Dipstick Adjustment

NOTE
Alternate method must be performed with engine cold and new oil filter installed.

(5) Alternate method for adjusting the nipple is to drain and fill the crankcase with the required amount of new engine oil. Adjust nipple to have oil level read full on dip stick.

(6) Install dip stick (1) and new preformed packing (4) (item 18, appendix H).

(7) Refill engine oil per paragraph 4-6, step c, (2).

(8) Close roadside doors.

4-68. FUEL PUMP REPLACEMENT.

This task covers:
a. Removal b. Installation

INITIAL SETUP

Tools: Automotive Maintenance and Repair Item 2, Section III, Appendix B

Equipment Conditions: Roadside doors open. Fuel tank drained. (See para 4-60, a., (1).)

a. Removal.

(1) Remove clamp (Figure 4-77, 1) and fuel line (2).

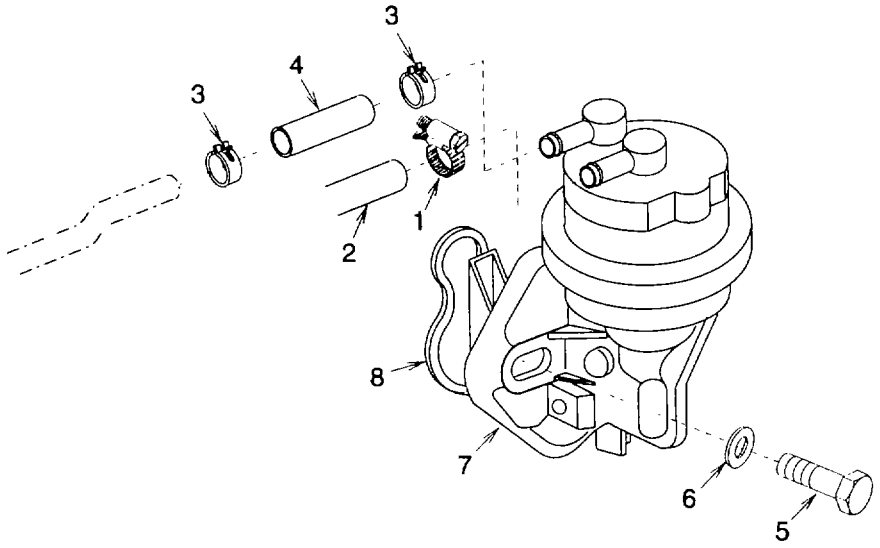


Figure 477. Fuel Pump

(2) Remove two clamps (3) and fuel line (4). Plug both connections on fuel line to prevent dirt from entering the engine.

(3) Remove two hex head screws (5), two flat washers (6), fuel pump (7), and gasket (8). Cover opening on engine to prevent dirt from entering and discard gasket.

b. Installation

(1) Install new gasket (8) (item 72, appendix H) and fuel pump (7). Secure with two hex head screws (5) and flat washers (6).

(2) Install fuel line (4) and two clamps (3).

(3) Install fuel line (2) and clamp (1).

(4) Fill fuel tank.

(5) Bleed fuel system per the following:

(a) Loosen vent plug (Figure 4-78, 1) on fuel filter.

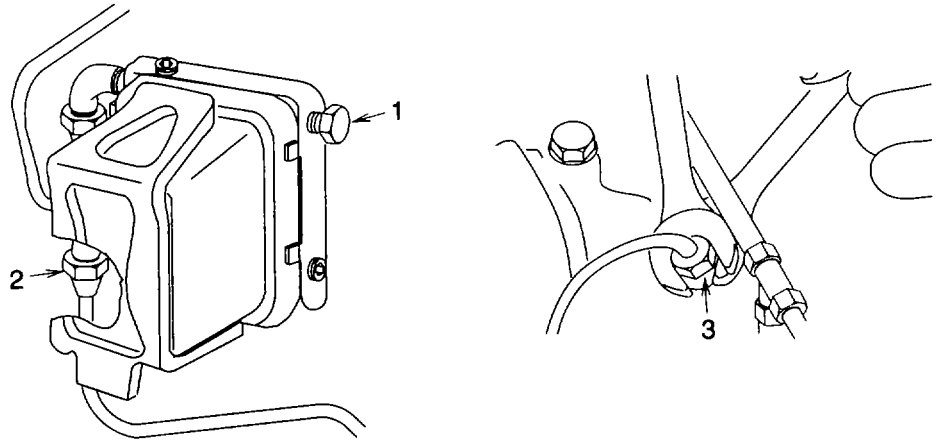


Figure 4-78. Fuel Bleed Procedure

WARNING

Diesel fuel escaping under pressure can have sufficient force to penetrate the skin causing serious personal injury. Infection or reaction can develop if medical treatment is not administrated immediately.

NOTE

Wiping rags can be used to soak up fuel that seeps from filter during bleeding procedure.

(b) Operate primer lever on fuel pump until fuel flow is free of air bubbles.

(c) Tighten vent plug (1).

(d) Start engine. If engine does not start proceed to next step.

(e) Place throttle lever in fast idle position.

(f) Use two open end wrenches, and loosen all three fuel lines (3) at injection nozzles.

(g) Turn over engine with starter motor until fuel flows free from bubbles at loosened connections.

(h) Torque connections to 18 ft lb (25 Nm).

(6) Close roadside and curbside doors.

4-69. ENGINE FUEL FILTER REPLACEMENT.

This task covers:
a. Removal b. Installation

INITIAL SETUP

Tools:
Automotive Maintenance and Repair
Item 2, Section III, Appendix B

Equipment Conditions:
Roadside doors open.

a. Removal.

(1) Remove vent plug (Figure 4-79, 1).

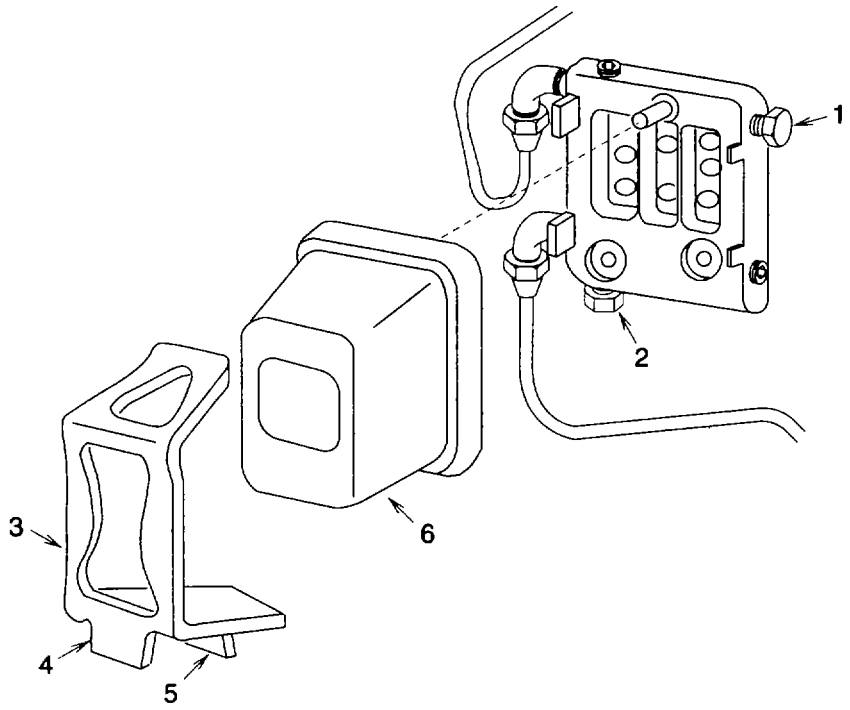


Figure 4-79. Fuel Filter

(2) Place a small container under the drain plug (2) to catch the draining fuel from fuel filter. Remove drain plug (2).

(3) Release the clamp (3) by pressing inward on the outside finger tab (4) and disengage top hook by pulling upward on the inside finger tab (5).

(4) Remove fuel filter body (6).

b. Installation.

(1) Install fuel filter body (6) with upper seal over pin.

(2) Hook bottom end of retaining clamp (5) first then hook the top end.

(3) Install drain plug (2) and vent plug (1).

(4) Bleed fuel system per paragraph 4-68, b, (5).

(5) Close roadside doors.

4-70. THERMOSTAT TESTING AND REPLACEMENT.

This task covers:
a. Removal b. Testing c. Installation

INITIAL SETUP

Tools:
Automotive Maintenance and Repair
Item 2, Section III, Appendix B

Equipment Conditions:
Curbside doors open.
Coolant drained. (See para 4-6, e.)

a. Removal.

(1) Loosen clamp (Figure 4-80, 1), and disconnect hose line (2).

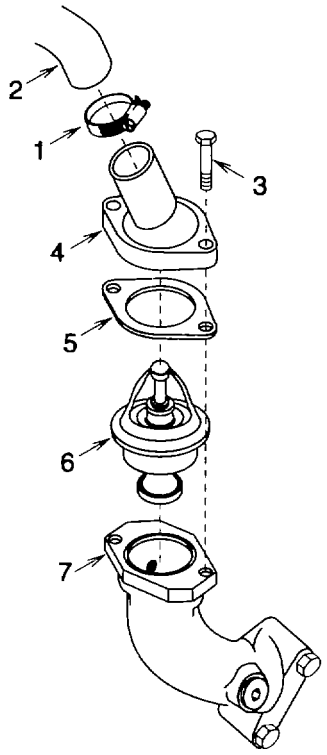


Figure 4-80. Thermostat

(2) Remove two hex head screw (3) and cover (4).

(3) Remove gasket (5), and thermostat (6). Discard gasket.

b. Testing.

(1) Test in hot water to 180° F (82° C) for the thermostat to open and close.

(2) If thermostat does not operate correctly, replace with a new one.

c. Installation.

(1) Install thermostat (6) into housing (7).

(2) Install new gasket (5) (item 73, appendix H), cover (4), and two hex head screws (3). Torque to 20 ft-lb (27 Nm).

(3) Slide clamp (2) over hose (1) and fit onto cover and tighten clamp.

(4) Refill coolant per paragraph 4-6, e.

(5) Close curbside doors.

4-71. EXHAUST MANIFOLD REPLACEMENT.

This task covers:
a. Removal **b. Installation**

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:

Curbside doors open.
Muffler tube disconnected. (See para 4-30.)

a. Removal.

(1) Remove four hex head screws (Figure 4-81, 1), and flat washers (2).

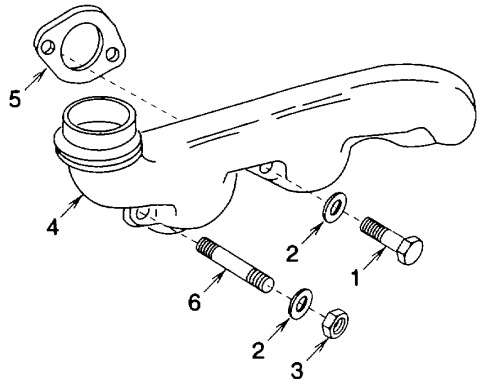


Figure 4-81. Exhaust Manifold

(2) Remove two hex nuts (3), and flat washers (2).

(3) Remove exhaust manifold (4) and three gaskets (5). Discard gaskets.

(4) Remove two studs (6).

b. Installation.

(1) Install two studs (6).

(2) Install three new gaskets (5) (item 74, appendix H) and position manifold (4).

(3) Install two flat washers (2) and hex nuts (3).

(4) Install four hex head screws (1) and flat washers (2).

(5) Reconnect muffler tube per paragraph 4-30.

(6) Close curbside doors.

4-72. ENGINE REPLACEMENT.

This task covers:
a. Removal **b. Installation**

INITIAL SETUP

Tools:
General Mechanics Tool Kit
Item 1, Section III, Appendix B

Personnel Required:
Two

Equipment Conditions:
Battery cables disconnected from batteries. (See para 4-49.)
Fuel, engine and compressor oil, coolant drained. (See para 4-6.)
Top, roadside, and curbside panels removed. (See para 4-31.)
Electrical leads and connecting tubing from engine tagged and disconnected.
Compressor removed. (See para 4-58.)
Engine air cleaner removed. (See para 4-61.)

a. Removal.

(1) Install hoist hooks on shackle (Figure 4-82, 1) and strap (2). Apply slight tension before removing hardware.

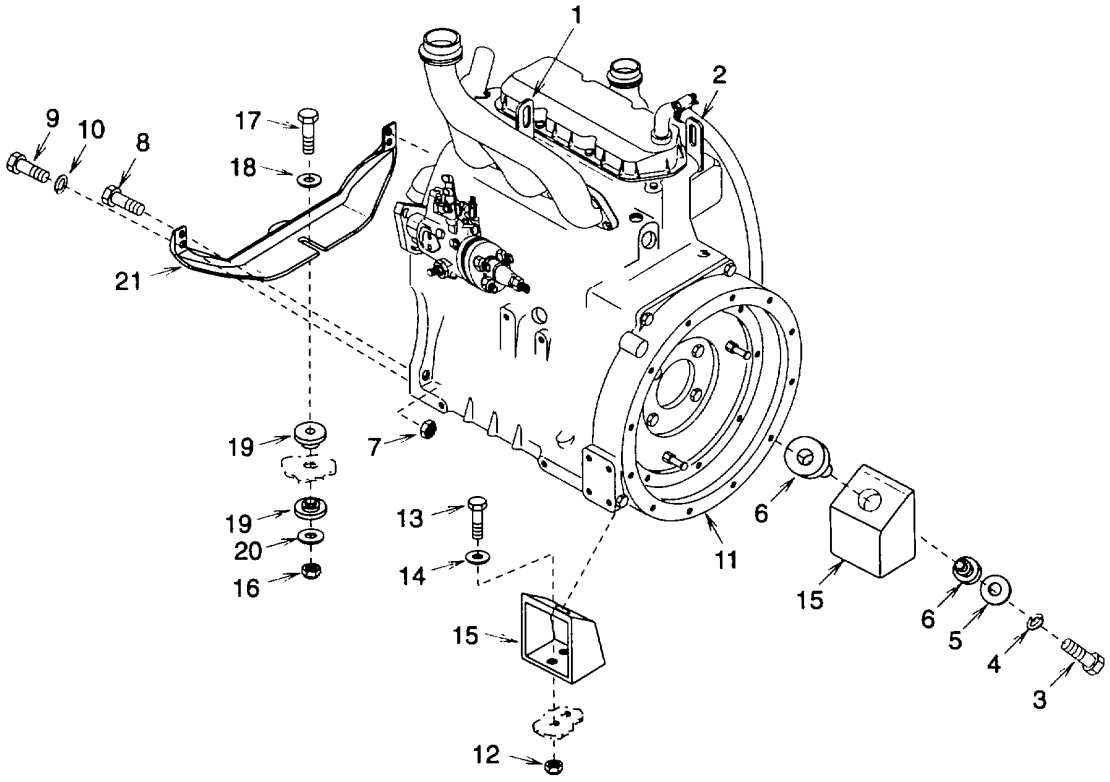


Figure 4-82. Diesel Engine

4-72. ENGINE REPLACEMENT.-Continued

(2) Remove two hex head screws (3), lock washers (4), spacers (5), and four vibration mounts (6). Discard lock washers.

(3) Remove two self locking nuts (7), and hex head screws (8). Discard lock nuts and lock washers.

(4) Remove two hex head screws (9) and lock washers (10). Discard lock washers.

(5) Carefully hoist engine (11) out of the cabinet and install on engine stand.

(6) Remove four self locking nuts (12), hex head screws (13), flat washers (14), and two rear mounts (15). Discard lock nuts.

(7) Remove self locking nut (16), hex head screws (17), flat washer (18), two vibrations mounts (19), spacer (20), and front mount (21). Discard lock nuts.

b. Installation.

(1) Install front mount (21), hex head screw (17), flat washer (18), two vibration mounts (19), spacer (20), and new self locking nut (16) (item 75, appendix H).

(2) Install two rear mounts (15), four hex head screws (13), flat washers (14), and new self locking nuts (12) (item 1, appendix H).

(3) Carefully hoist engine (11) and align holes on front mount (21). Install two hex head screws (9) and new lock washers (10) (item 76, appendix H).

(4) Install two hex head screws (8), new lock washers (9) (item 76, appendix H), and new self locking nuts (7) (item 75, appendix H).

(5) Install two hex head screws (3), new lock washers (4) (item 76, appendix H), spacers (5), and four vibration mounts (6).

(6) Remove hoist from engine.

(7) Install engine air cleaner per paragraph 4-61.

(8) Install compressor per paragraph 4-58.

(9) Install top, roadside, and curbside panels per paragraph 4-31.

(10) Install muffler per paragraph 4-30.

(11) Connect all wire leads and tubing using tags and wiring diagram using (Figure 4-3). Remove tags.

(12) Refill fuel, engine and compressor oil, and coolant per paragraph 4-6.

SECTION VII PREPARATION FOR STORAGE OR SHIPMENT

4-73. ADMINISTRATIVE STORAGE.

a. Placement of equipment in administrative storage should be for short periods of time when a shortage of maintenance effort exits. Items should be in mission readiness within 24 hours or within the time factors as determined by the directing authority. During the storage period, appropriate maintenance records will be kept.

b. Before placing the equipment in administrative storage, current preventive maintenance checks and services should be completed, shortcomings and deficiencies should be corrected, and all Modification Work Orders (MWO) should be applied.

c. Storage site selection. Inside storage is preferred for items selected for administrative storage. If inside storage is not available, trucks, vans, conex containers, and other containers may be used.

CHAPTER 5

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

SECTION I REPAIR PARTS, SPECIAL TOOLS, TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE), AND SUPPORT EQUIPMENT

5-1. COMMON TOOLS AND EQUIPMENT.

a. Repair Parts. Repair parts are listed and illustrated in the repair parts and special tools list TM 9-4310-397-24P covering unit, direct support, and general support maintenance for this equipment.

a. Authorized Common Tools And Equipment. Refer to the Modified Table of Organization and Equipment (MTOE), CTA 50-970, or CTA 8-100, as applicable to your unit.

b. Special Tools, TMDE, And Support Equipment. No special tools or test equipment are required for direct support maintenance of the air compressor unit. Tools and test equipment found in Shop Equipment Automotive Maintenance and Repair, Organizational Maintenance, Common NO. 1 & 2 Less Power are adequate to accomplish all maintenance functions required.

SECTION II MAINTENANCE INSTRUCTIONS

5-2. COMPRESSOR OIL COOLER AND RADIATOR REPAIR.

This task covers:
a. Repair

INITIAL SETUP

Tools:
General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:
Radiator removed. (See para 4-51.)
Oil cooler removed. (See para 4-52.)

Repair.

(1) Repair is limited to welding of cracks and broken weld seams.

(2) Install oil cooler per paragraph 4-52.

(3) Install radiator per paragraph 4-51.

5-3. AIR COMPRESSOR INLET HOUSING REPAIR.

This task covers:
a. Disassembly **b. Cleaning** **c. Inspection**
d. Assembly

INITIAL SETUP

Tools:
General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:
Compressor removed. (See para 4-58.)

a. Disassembly.
(1) Remove five cap screws (Figure 5-1, 1), one cap screw (2), six lock washers (3), and spring bracket (4). Discard lock washers.

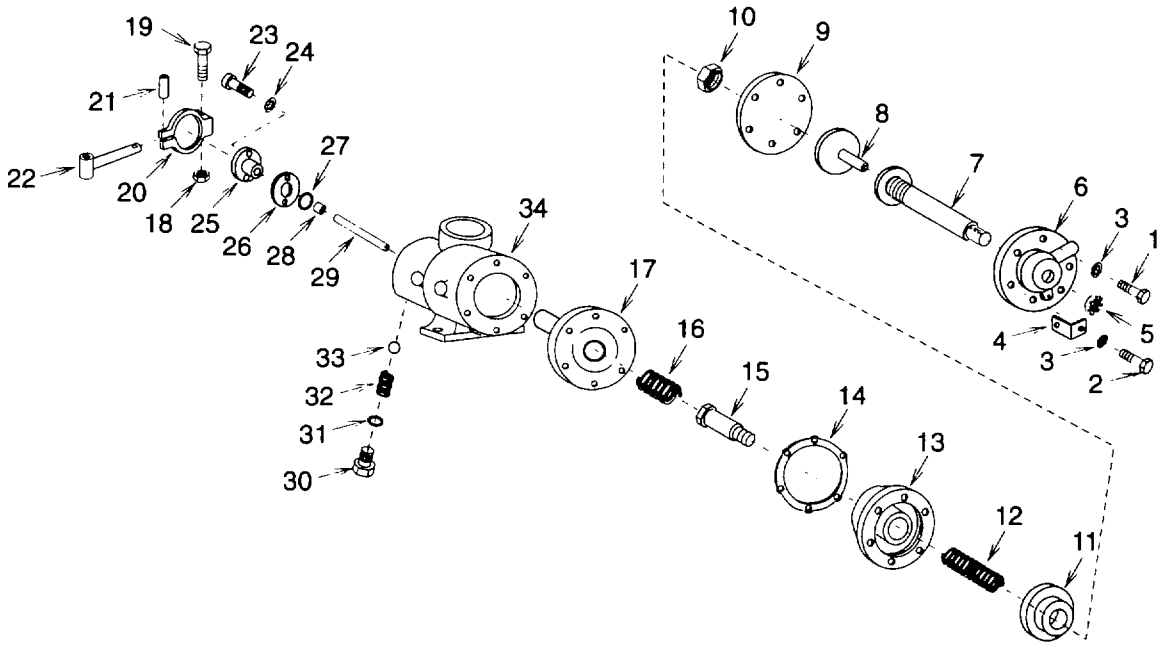


Figure 5-1. Air Compressor Inlet Housing

NOTE
The slotted hex nut has been installed using sealant.

(2) Remove slotted hex nut (5), cover (6), and rod (7) as an assembly.

(3) Remove unloader piston (8).

(4) Remove diaphragm (9), lock nut (10), intake control piston (11), spring (12) air intake cylinder (13), gasket (14), intake control stem (15), spring (16), and intake control valve (17). Discard gasket and lock nut.

(5) Remove lock nut (18), cap screw (19), and pivot clamp (20). Discard lock nut.

(6) Remove pin (21) and arm (22) if replacement is indicated.

(7) Remove two socket head screws (23), lock washers (24), speed control guide (25), and gasket (26). Discard lock washer and gasket.

(8) Remove performed packing (27), bushing (28), and push rod (29). Discard preformed packing.

(9) Remove plug (30), preformed packing (31), spring (32), and ball (33) from intake control body (34). Discard preformed packing.

b. Cleaning.

(1) Check parts for excessive buildup of dirt and debris. Clean if needed.

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in well ventilated area.

NOTE

Prior to reassembly, clean all metal parts. They must be free from oil, grease and corrosion resistant compounds on all interior and exterior surfaces.

(2) Wash all metal parts except valve assembly (17) and diaphragm (9) with dry cleaning solvent (item 11, appendix E).

(3) Dry thoroughly with clean, cloth (item 2, section II, appendix E).

(4) Clean valve assembly (17) and diaphragm (9) with a solution of mild detergent (item 6, section II, appendix E) and water. Then rinse with clean water and thoroughly dry.

(5) Make certain that all accumulated foreign matter is cleaned from air passages of intake control body (34).

NOTE

Do not allow parts to remain in cleaning solvent or detergent solution for extended periods of time or rust spots may form. If parts are not to be inspected immediately after cleaning, dip them in clean oil, MIL-L-2104, or equivalent.

c. Inspection.

(1) Inspect for visible wear, damage, distortion, cracks, breaks, and corrosion. Replace all gaskets, o-rings, and seals.

(2) Inspect threaded parts for stripped threads cross-threading, and for nicks and burrs.

d. Assemble.

(1) Assemble steel ball (Figure 5-1, 33), spring (32), new preformed packing (31), (item 23, appendix H) and relief plug (30) into intake control body (34).

5-3. AIR COMPRESSOR INLET HOUSING REPAIR .-Continued

(2) Assemble push rod (29) into body (34).

(3) Install new preformed packing (27), (item 23, appendix H) and bushing (28) into guide (25).

(4) Assemble new gasket (26) (item 24, appendix H), guide (25) and secure with two new lock washers (24) (item 25, appendix H) and cap screws (23).

(5) If removed, install pivot pin (21).

(6) Place pivot clamp (20) over guide (25); install screw (19) and new lock nut (18) (item 26, appendix H).

(7) Assemble intake valve (17) and spring (16).

(8) Insert stem (15) through cylinder (13) and assemble spring (12), piston (11), and new lock nut (10) (item 27, appendix H).

(9) Assemble new gasket (14) (item 28, appendix H) cylinder (13) and diaphragm (9).

(10) Applying sealing compound (item 3, section II, appendix E) to threads of unloader rod (7). Assemble unloader rod (7), unloader piston (8) and six new lock washers (3) (item 15, appendix H) and one screw (2) and five cap screws (1).

(11) Turn unloader rod (7) in until intake valve (17) seats. Then turn slotted nut (5) to seat against cover (6).

(12) Install compressor per paragraph 4-58.

5-4. AIR COMPRESSOR REPAIR.

This task covers:
a. Disassembly **b. Cleaning** **c. Inspection**
d. Assembly

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:

Compressor removed. (See para 4-58.)

Personnel Required:
Two

a. Disassembly.

(1) Remove cap screw (Figure 5-2, 1), lock washer (2), and gripspring retainer (3). Discard lock washer.

(2) Tap half coupling (4), with a soft mallet to release tension on grip spring.

(3) Remove half coupling (4), gripspring assemblies (5), and shaft key (6).

(4) Remove six cap screws (7) and packing with retainer (8). Discard packing with retainer.

(5) Tap engine adapter (9) with a soft mallet and remove it along with gasket (10). Discard gasket.

(6) To disassemble the rotor stator air end assembly, remove six cap screws (11), lock washers (12), bearing cover (13), and gasket (14). Discard lock washers and gasket.

(7) Remove cap screw (15), lock washer (16), and bearing retainer (17). Discard lock washer.

(8) Remove five cap screws (18), one cap screw (19) and six packing with retainer (20). Discard packing with retainer.

(9) Tap intake end cover (21) with a soft mallet and remove it.

(10) Remove outer race of bearing (22) from intake end cover (21). The inner race will remain on rotor shaft. It is not necessary to remove pipe plug (23) if it is not to be replaced.

(11) Remove preformed packing (24). Discard preformed packing.

(12) Remove six cap screws (25) and lock washers (26), oil seal cover (27), and gasket (28). It is not necessary to remove the pipe plug (29) unless it is to be replaced. Discard lock washers and gasket.

(13) Remove oil seal (30) from oil seal cover (27).

(14) Remove preformed packing (31), sealing sleeve (32), oil seal (33), and preformed packing (34). Discard preformed packing.

5-4. AIR COMPRESSOR REPAIR.-Continued

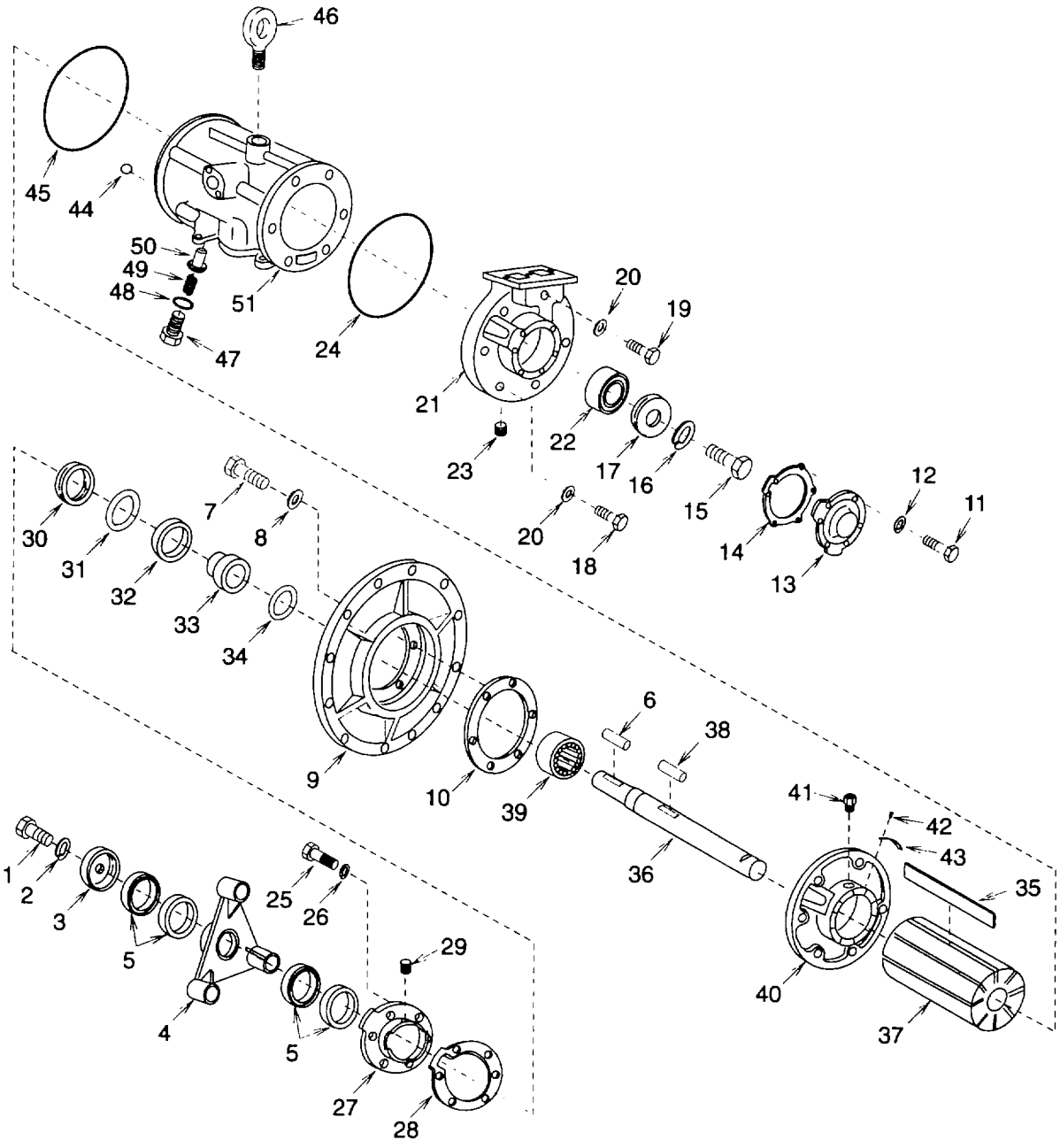


Figure 5-2. Air Compressor

NOTE

Make note of drain holes in the rotor blade slots. These holes will be on the leading edges in relation to rotation when rotor is reinstalled. Mark or tag as needed for assembly reference. Rotation is always toward the side of the stator where oil filter and bypass are mounted.

(15) Remove the eight blades (35).

CAUTION

Rotor/shaft assembly weighs approximately 60 lbs (27.2 kg). Remove it carefully.

(16) Carefully slide the rotor/shaft assembly (36 thru 43) out of the stator (51).

CAUTION

Excessive heat can cause softening of metal. If a bearing inner race must be heated for removal, discard it and replace the entire bearing.

(17) When it is necessary to disassemble the rotor, use a gear puller to remove the inner race of bearing (22), and nonintake end cover (40) from end of rotor shaft (36). If the inner race cannot be removed with a gear puller, heat the race evenly with a torch and pull race off shaft as quickly as possible to avoid over heating.

(18) Remove rotor (37), key (38), bearing (39), and shaft (36) as an assembly. Removal of male connector (41) drive screw (42) and data plate (43) is not necessary unless they are to be replaced.

(19) Steel ball (44), preformed packing (45) and eye bolt (46) can be removed if replacement is necessary. If removed, discard preformed packing.

(20) Remove two each drain valve plugs (47), preformed packings (48), springs (49), and drain valves (50) from stator (51). Discard preformed packings.

b. Cleaning.

(1) Check parts for excessive buildup of dirt and debris. Clean if needed.

WARNING

Dry cleaning solvent used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Use in well ventilated area.

NOTE

Prior to reassembly, clean all metal parts. They must be free from oil, grease and corrosion resistant compounds on all interior and exterior surfaces.

(2) Wash all metal parts with dry cleaning solvent (item 11, section II, appendix E).

(3) Dry thoroughly with clean, cloth (item 2, section II, appendix E).

5-4. AIR COMPRESSOR REPAIR.-Continued

(4) Make certain that all accumulated foreign matter is cleaned from air passages of intake end cover (21) and stator (51).

NOTE

Do not allow parts to remain in cleaning solvent for extended periods of time or rust spots may form. If parts are not to be inspected immediately after cleaning, dip them in clean oil, MIL-L-2104, or equivalent.

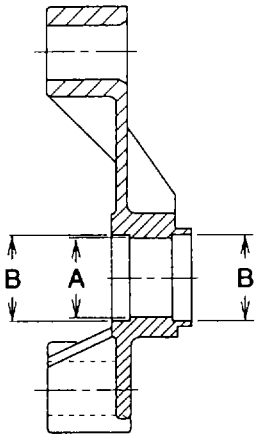
c. Inspection.

(1) Inspect for visible wear, damage, distortion, cracks, breaks, and corrosion. Replace all gaskets, preformed packings, and seals.

(2) Inspect threaded parts for stripped threads, cross-threading, and for nicks and burrs.

(3) Inspect following components and replace those that are out of tolerance.

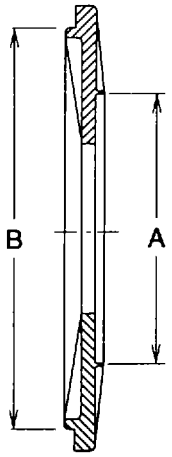
(a) Half Coupling.



DIM.	DESCRIPTION	MIN	MAX
A	SHAFT BORE DIAMETER	1.253 (31.83)	1.255 (31.88)
B	GRIPSPRING BORE DIAMETER	1.531 (38.88)	1.533 (38.94)

Figure 5-3. Half (Drive) Coupling

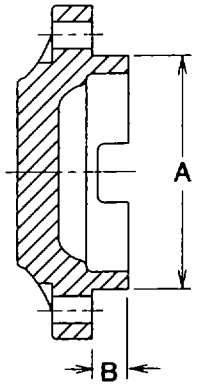
(b) Engine Adapter.



DIM.	DESCRIPTION	MIN	MAX
A	COMPRESSOR REGISTER DIAMETER	9.260 (235.20)	9.265 (235.33)
B	ENGINE FLYWHEEL HOUSING REGISTER DIAMETER	14.240 (361.70)	14.245 (361.82)
	B DIM. CONCENTRIC WITH A DIM. TO WITHIN	0.010 (0.254) TIR	

Figure 5-4. Engine Adapter

(c) Bearing Cover.

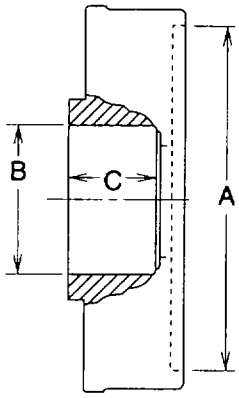


DIM.	DESCRIPTION	MIN	MAX
A	MOUNTING REGISTER DIAMETER	3.140 (79.76)	3.145 (79.88)
B	MOUNTING FLANGE TO FACE	0.490 (12.45)	0.495 (12.57)

Figure 5-5. Bearing Cover

5-4. AIR COMPRESSOR REPAIR.-Continued

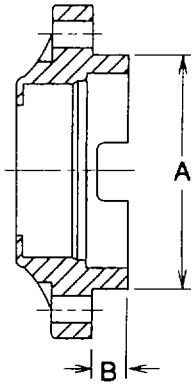
(d) Nonintake End Cover.



DIM.	DESCRIPTION	MIN	MAX
A	MOUNTING REGISTER DIAMETER	8.5005 (215.91)	8.5025 (215.96)
B	BEARING BORE DIAMETER	3.1496 (79.99)	3.1508 (80.03)
C	BEARING BORE DEPTH	1.870 (47.50)	1.875 (47.63)

Figure 5-6. Nonintake End Cover

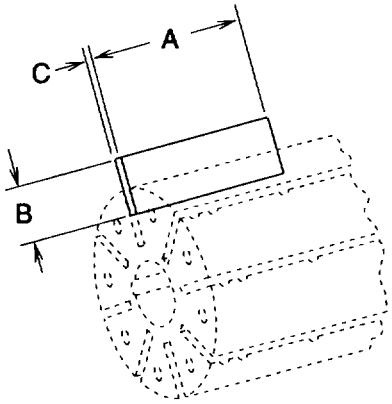
(e) Oil Seal Cover.



DIM.	DESCRIPTION	MIN	MAX
A	MOUNTING REGISTER DIAMETER	3.140 (79.76)	3.145 (79.88)
B	MOUNTING FLANGE TO FACE	0.510 (12.95)	0.515 (13.08)

Figure 5-7. Oil Seal Cover

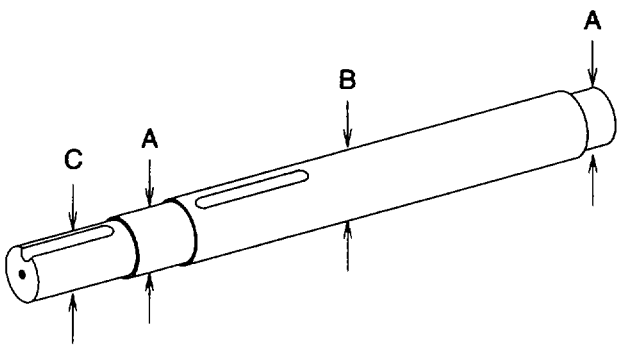
(f) Rotor Blades.



DIM.	DESCRIPTION	MIN	MAX
A	LENGTH	9.110 (231.39)	9.112 (231.45)
B	WIDTH	1.248 (31.70)	1.250 (31.75)
C	THICKNESS	0.1841 (4.68)	0.1871 (4.75)
ENDS SQUARE WITH LENGTH WITHIN		0.001 (0.025)	

Figure 5-8. Rotor Blades

(g) Rotor Shaft.

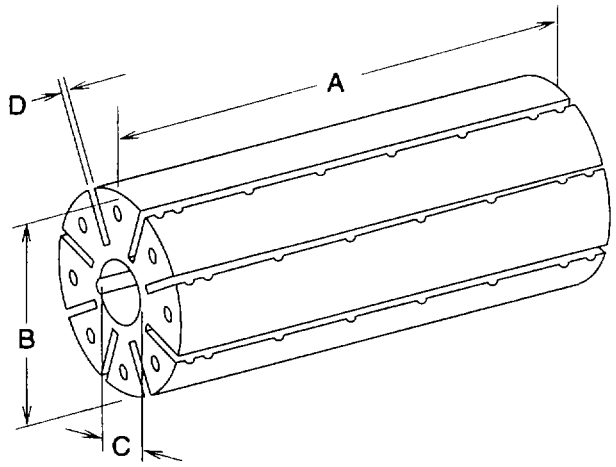


DIM.	DESCRIPTION	MIN	MAX
A	BEARING JOURNAL DIAMETER	1.3782 (35.006)	1.3786 (35.016)
B	ROTOR JOURNAL DIAMETER	1.608 (40.84)	1.609 (40.87)
C	DRIVE COUPLING JOURNAL DIAMETER	1.240 (31.73)	1.250 (31.75)
CONCENTRICITY (TOTAL INDICATOR READING)		WITHIN	0.001 (0.03)

Figure 5-9. Rotor Shaft

5-4. AIR COMPRESSOR REPAIR.-Continued

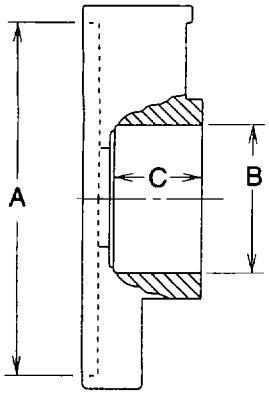
(h) Rotor.



DIM.	DESCRIPTION	MIN	MAX
A	ROTOR LENGTH	9.123 (231.72)	9.125 (231.78)
B	OUTSIDE DIAMETER	4.998 (126.95)	5.000 (127.00)
C	BORE DIAMETER	1.610 (40.89)	1.611 (40.92)
D	BLADE SLOT WIDTH	0.1865 (4.737)	0.1885 (4.788)

Figure 5-10. Rotor

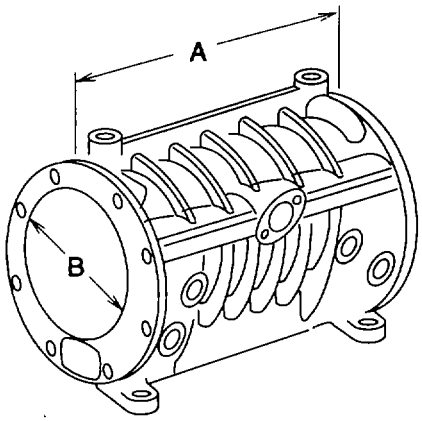
(i) Intake End Cover.



DIM.	DESCRIPTION	MIN	MAX
A	MOUNTING REGISTER DIAMETER	8.5005 (215.91)	8.5025 (215.96)
B	BEARING BORE DIAMETER	3.1496 (79.99)	3.1508 (80.03)
C	BEARING BORE DEPTH	1.870 (47.50)	1.875 (47.63)

Figure 5-11. Intake End Cover

(j) Stator.



DIM.	DESCRIPTION	MIN	MAX
A	STATOR LENGTH	9.129 (231.88)	9.131 (231.93)
B	STATOR BORE DIAMETER	5.784 (146.91)	5.787 (146.99)

Figure 5-12. Stator

d. Assembly.

(1) If removed, install eyebolt (Figure 5-2, 46) in top of stator (51).

(2) Assemble the two drain valves (50), springs (49), new preformed packing (48) (item 29, appendix H) and drain valve plugs (47) in stator (51).

(3) Place steel ball (44) in end of stator (51). Coat new preformed packing (45) (item 30, appendix H) with petrolatum (item 12, section II, appendix E) or equivalent, and place on end of stator (51).

(4) Preassemble rotor (37), shaft (36), and nonintake end cover (40) by pressing inner race of bearing (39) if removed, onto shaft (36) until it bottoms on shaft shoulder.

(5) Assemble nonintake end cover (40) onto shaft (36); install outer race of bearing (39).

CAUTION

Assemble rotor (37) onto shaft (36) with blade slot drain holes on rotation leading edge as noted at disassembly. Rotation is always toward the side of stator (51) where oil filter and bypass is mounted.

(6) Place key (38) in shaft keyway and slide rotor (37) onto shaft (36).

(7) Press inner race of bearing (22) onto end of rotor shaft (36) until it bottoms on shaft shoulder.

5-4. AIR COMPRESSOR REPAIR.-Continued

(8) Carefully assemble rotor (37), shaft (36), and nonintake cover (40) assembly into stator (51).

(9) Place facing washer of bearing (39) over end of shaft (36) against the outer race of bearing (39).

(10) Coat the eight blades (35) liberally with clean compressor oil (MIL-L-2104, item 10, section II, appendix E, or equivalent) and install blades in rotor (37) slots.

(11) If removed, install data plate (43), new drive screws (42) (item 31, appendix H) and male connector (41).

(12) Coat new preformed packing (31 and 34) (item 32, appendix H) and (item 33, appendix H) with petrolatum (item 12, section II, appendix E).

(13) Assemble new preformed packing (34), oil seal sleeve (33), sealing sleeve (32), new preformed packing (31), and press oil seal (30) into cover (27) with sealing lip of seal facing compressor.

(14) Install new gasket (28) (item 34, appendix H), cover (26), and secure with six lock washers (26) (item 15, appendix H), and cap screws (25). Torque cap screws to 111 ft-lb (14 Nm).

(15) Coat new preformed packing (24) (item 35, appendix H), with petrolatum (item 12, section II, appendix E) and place on end of stator (51).

(16) If removed, install pipe plug (23) in air intake end cover (21).

(17) Assemble air intake end cover (21) and secure to stator (51) with six new packing with retainer (20) (item 36, appendix H), one cap screw (19) and five cap screws (18). Torque cap screws to 45 ft-lb (61 Nm).

(18) Assemble outer race of bearing (22), retainer (17), new lock washer (16) (item 13, appendix H), and cap screw (15).

(19) Assemble new gasket (14) (item 34, appendix H), bearing cover (13), and six new lock washers (12) (item 14, appendix H), and cap screws (11). Torque cap screws to 11 ft-lb (14.9 Nm).

(20) Install new gasket (10) (item 38, appendix H), engine adapter (9), and secure to nonintake end cover (40) with six new packing with retainer (8) (item 36, appendix H) and cap screws (7). Torque cap screws (7) to 45 ft-lb (61 Nm).

(21) Install gripsprings (Figure 5-13, 5), shaft key (6), drive coupling (4) and secure with grip spring retainer (3), new lock washer (2) (item 39, appendix H) and screw (1). Torque screw (1) to 45 ft-lb (61 Nm).

(22) Install compressor per paragraph 4-58.

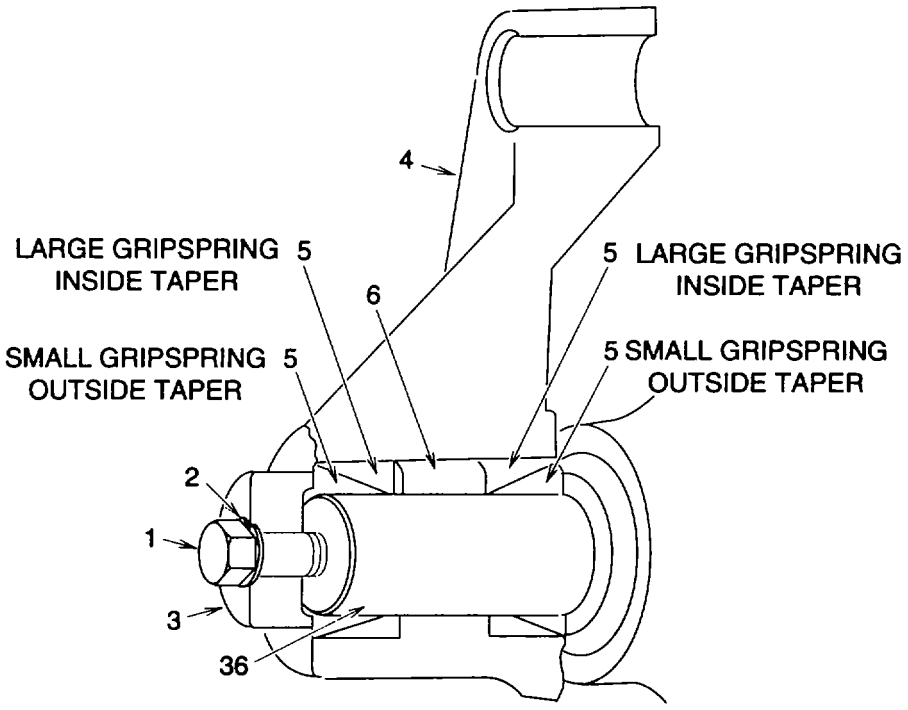


Figure 5-13. Gripspring Installation

5-5. WATER PUMP REPLACEMENT.

This task covers:
a. Removal **b. Installation**

INITIAL SETUP

Tools:

Automotive Maintenance and Repair
Item 2, Section III, Appendix B

Equipment Conditions:

Coolant Drained. (See para 4-6, e.)
Fan Belt Removed. (See para 4-65.)

a. Removal.
(1) Loosen four clamps (Figure 5-14, 1) and remove hoses (2) from water pump.

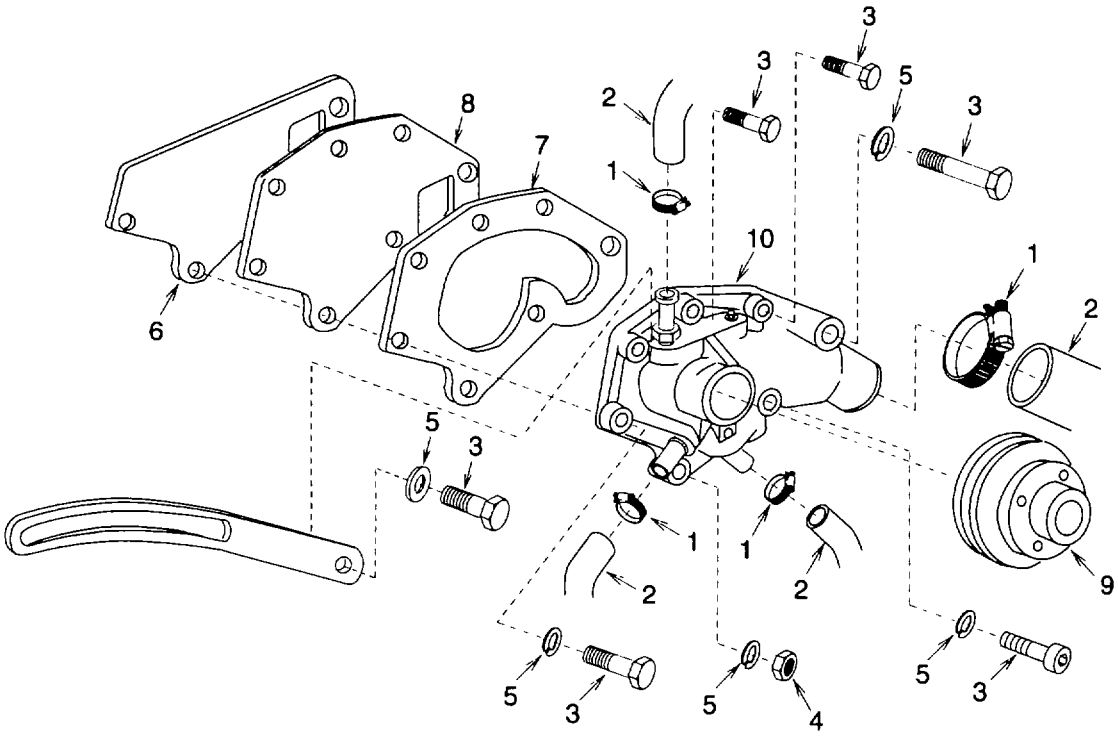


Figure 5-14. Water Pump

NOTE
Mark screws prior to removal so that correct screw type and length are placed in proper location at installation.

(2) Remove screws (3), hex nut (4), lock washers (5), and remove water pump (10). Discard lock washers.

(3) Remove gaskets (6), (7), and plate (8). Discard gaskets.

(4) Using a puller, remove water pump pulley (9).

b. Installation.

(1) Install new gaskets (Figure 5-15, 1) (item 40, appendix H) and (2) (item 41, appendix H), cover (3) and pump housing assembly (4).

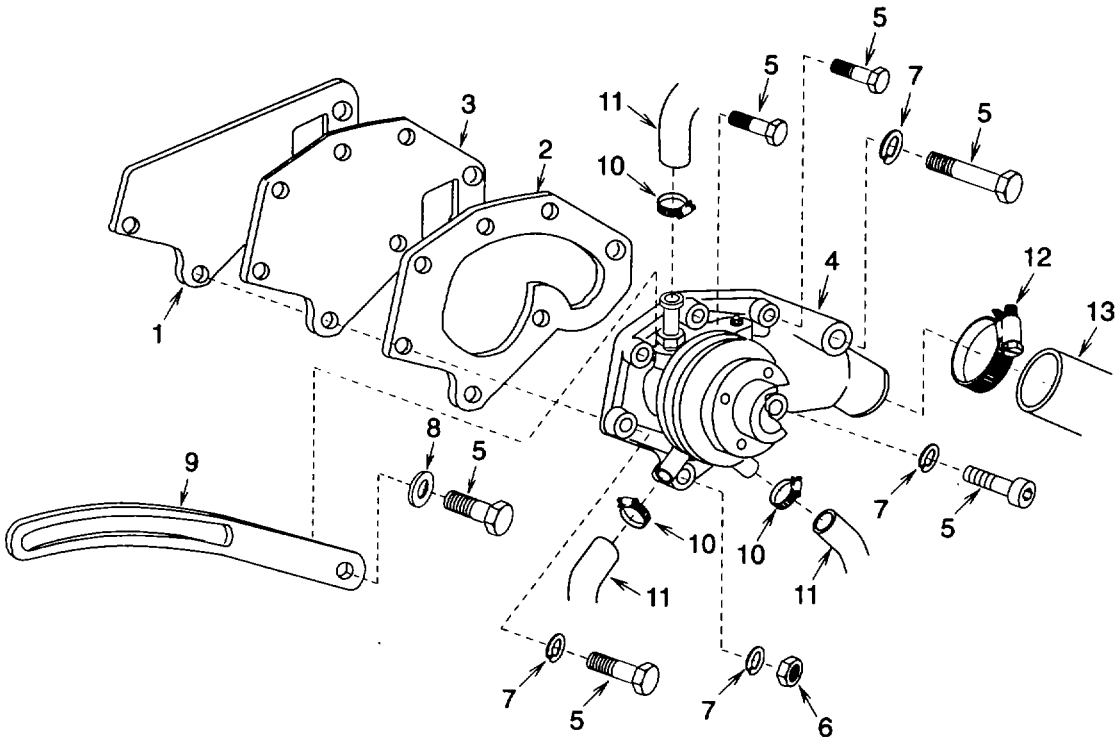


Figure 5-15. Water Pump Assembly

(2) Install pump housing assembly (4), screws (5), nut (6), new lock washers (7) (item 43, appendix H) and flat washer (8) in locations noted at disassembly. Be sure that alternator strap (9) is back in place. Torque cap screws (5) to 35 ft-lb (47 Nm).

(3) Install three new hose clamps (10) (item 44, appendix H) on ends of small hoses (11), and secure to pump.

(4) Install clamp (12) on large hose (13) and secure to pump.

(5) Fill cooling system with proper coolant. See paragraph 4-6, e.

(6) Air must be expelled from system when system is refilled. Loosen temperature sending unit fitting at rear of cylinder head or plug in thermostat housing to allow air to escape when filing system. Retighten fitting or plug when all the air has been expelled.

(7) Install and adjust fan belt per paragraph 4-65.

5-6. ROCKER ARM COVER REPLACEMENT.

This task covers:
a. Removal **b. Installation**

INITIAL SETUP

Tools:

General Mechanics Tool Kit
Item 1, Section III, Appendix B

Equipment Conditions:

Battery cables disconnected from batteries.
(See para 4-49.)

a. Removal.

(1) Loosen clamp (Figure 5-16, 1) and remove hose (2) from elbow (3).

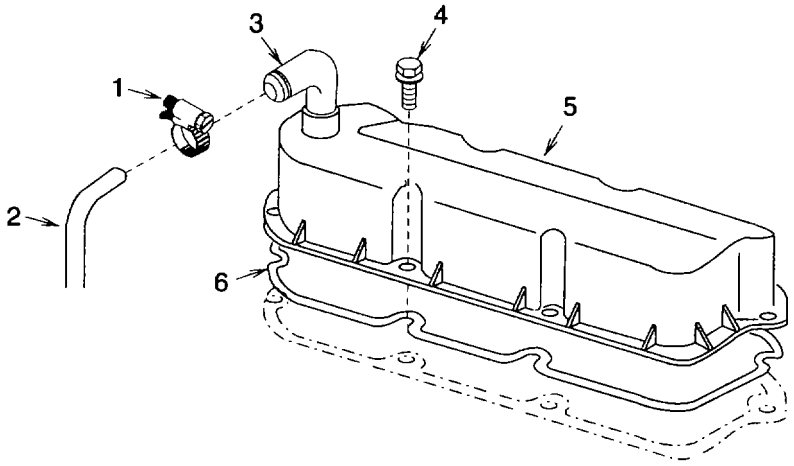


Figure 5-16. Rocker Arm Cover

(2) Remove six washer head screws (4) and remove valve cover (5) and gasket (6). Discard gasket.

(3) Remove all old gasket or preformed packing material from flange surfaces of valve cover and engine.

b. Installation.

(1) Install a new gasket or preformed packing (6) (item 45, appendix H).

NOTE

If engine has been rebuilt and will require break-in it is only necessary to hand tighten a few cover cap screws. The cover will have to be removed to readjust valves and retorque cylinder head cap screws after break-in.

(2) Place valve cover (5) carefully over gasket (6) and secure with six washer head screws, (4). Torque washer head screws, (4) to 96 in.-lb (10.8 Nm) after break-in.

(3) Place clamp (1) on hose (2) and secure hose and clamp to elbow (3).

(4) Connect battery cables per paragraph 4-49.

5-7. SKID AND RUNNER INSPECTION, REPAIR AND REPLACEMENT .

This task covers:
a. Inspection **b. Removal** **c. Repair**
d. Installation

INITIAL SETUP

Tools:
General Mechanics Tool Kit
Item 1, Section III, Appendix B

a. Inspection. Check skid and runners for any cracks or broken welds. Repair or replace as necessary.

NOTE
Lift air compressor only high enough to allow runner removal.

b. Removal.

(1) Using suitable material handling equipment, lift the air compressor from side using fork lift slots provided.

(2) Remove twelve nuts (1), lock washers (2), and flat washers (3). Discard lock washers.

(3) Remove runners (4).

(4) Remove four nuts (5), eight hex washer head bolts (6) and four lock washers (7). Discard lock washers.

(5) Remove air block (8).

(6) Set unit down and using two fork lift trucks, move them to ends of unit.

(7) Remove 18 lock nuts (9), flat washers (10), and cap screws (11). Discard lock nuts.

CAUTION
Inserting forklift forks too far into air compressor can damage components.

NOTE
Lift air compressor only high enough to allow skid removal.

(8) Lift air compressor up and away from skid (12).

c. Repair. Repair is limited to welding of cracked or broken welds and replacement of runners or skid.

d. Installation.

(1) Using suitable material handling equipment, place air compressor above skid (12) and aline mounting holes.

5-7. SKID AND RUNNER INSPECTION. REPAIR AND REPLACEMENT .-Continued

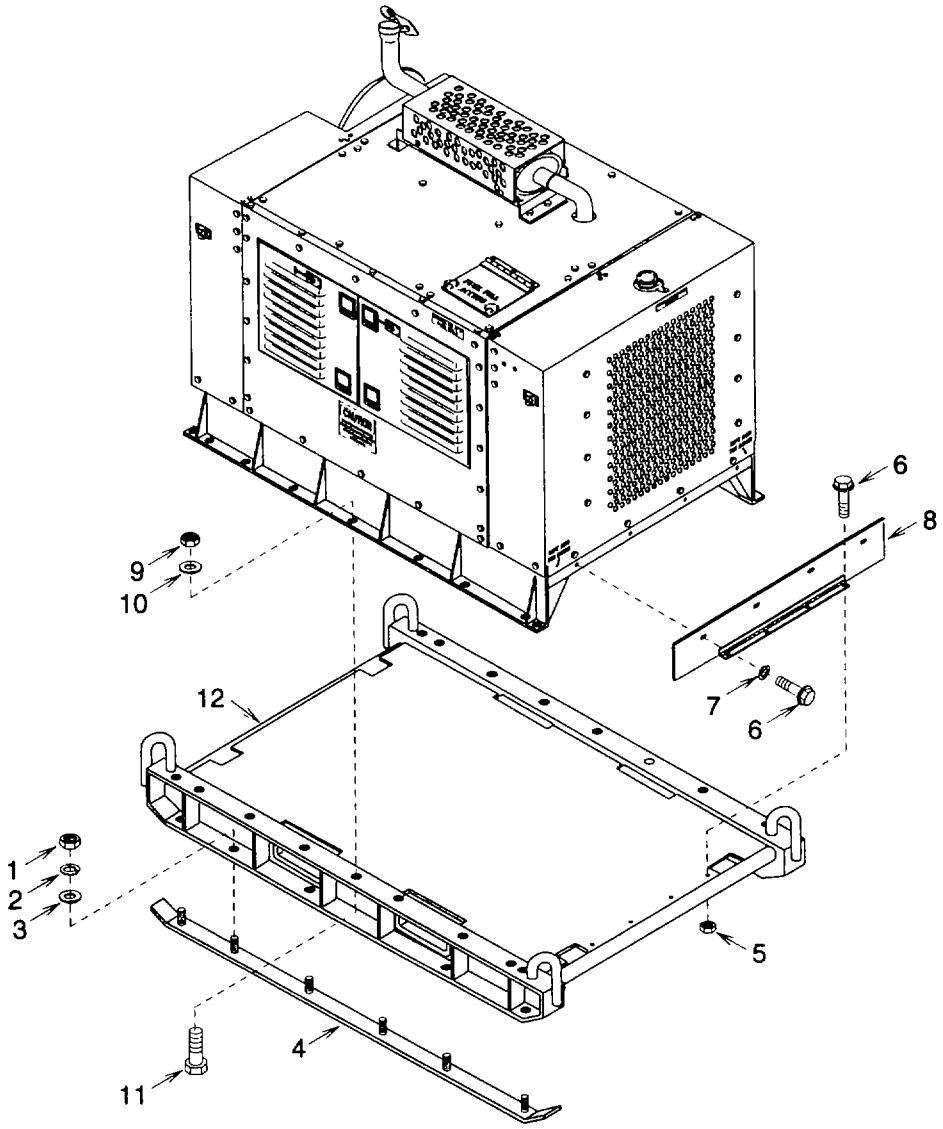


Figure 5-17. Runner and Skid

(2) Install 18 cap screws (11), flat washers (10), and new lock nuts (9) (item 20, appendix H).

NOTE
Lift air compressor only high enough to allow runner installation.

(3) Attach runners (4) to skid (12) with 12 each flat washers (3), new lock washers (2) (item 14, appendix H), and nuts (1).

(4) Move air compressor to desired location.

(5) Install air block (8) with four nuts (5) eight hex washer head bolts (6) and four lock washers (7) (item 4, appendix H).

CHAPTER 6

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

SECTION I REPAIR PARTS, SPECIAL TOOLS, TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE), AND SUPPORT EQUIPMENT

6-1. GENERAL.

a. Repair Parts. Repair parts are listed and illustrated in the repair parts and special tools list TM 9-4310-39724P covering general support maintenance for this equipment.

b. Authorized Common Tools and Equipment. Refer to the Modified Table of Organization and Equipment (MTOE), CTA 50-970, or CTA 8-100, as applicable to your unit.

c. Special Tools. TMDE, and Support Equipment. The following list of special tools or test equipment is required for the general support maintenance of the air compressor unit. Tools and test equipment found in Automotive Maintenance and Repair, SC4910-95-A31 are adequate to accomplish all other maintenance functions required.

Name	CAGEC	Part Number
Injection Nozzle Puller	(75160)	JDE-38
Nozzle Bore Cleaning Tool	(75160)	JDE-39
Nozzle Tester	(75160)	JT25510
Nozzle Tester	(75160)	D-01109AA
Injection Nozzle Service Tool Kit	(84760)	16494
Wrench 3/4 in. Special Crowsfoot	(75160)	JDF22
Injection Pump Removal Tool	(75160)	JDG670
Valve Seat Puller	(75160)	JDE41296
Spring Compression Tester	(75160)	D-01168AA
Valve Inspection Center	(75160)	D-05058ST
Flywheel Turning Tool	(75160)	JDE81-11 or JDE-83
Timing Pin	(75160)	JDE-814
Idler Gear Bushing Driver	(75160)	JD-252
Idler Gear Bushing Driver Handle	(75160)	JDG-537 or OTC815
Gear Timing Tool	(75160)	JD-254
Front Crankshaft Oil Seal Driver	(75160)	JD-250
Gear Driver	(75160)	JDH-7
Piston Liner Height Gauge	(75160)	JDG451
Cylinder Liner Puller	(75160)	A-D-01062AA or D-10173AA or B-KCD1001
Ring Groove Wear Gauge	(75160)	JDE-62
Flexible Cylinder Hone	(75160)	D-17004
Piston Pin Bushing Remover and Installer (small)	(75160)	JDE-88
Piston Pin Bushing Remover and Installer (large)	(75160)	JDE-286
O-ring Groove Cleaning Brush	(75160)	D-17015BR
Piston Ring Compressor	(75160)	JDE-84

SECTION II MAINTENANCE INSTRUCTIONS

6-2. GENERAL.
The only items restricted to general support maintenance level by the Maintenance Allocation Chart (MAC) are the repair or replacement of the following engine components. However, general support maintenance may be called upon, at times to perform any or all of the MAC items listed for Unit and Direct Support Maintenance for rehabilitation or overhaul of an air compressor.

6-3. FUEL INJECTION NOZ7ZLE REPAIR AND REPLACEMENT .

This task covers:
a. Removal **b. Cleaning** **c. Testing**
d. Adjusting **e. Installation**

INITIAL SETUP

Tools:
Automotive Maintenance and Repair
Item 2, Section III, Appendix B

Equipment Conditions:
Engine removed. (See para 4-72.)

a. Removal.

(1) Carefully remove all dirt from the cylinder head around fuel injection nozzles.

(2) Clean with compressed air in order to prevent dirt from entering the cylinder or valve seats.

(3) Plug the bore in the cylinder head after fuel injection nozzle has been removed.

(4) Cap fuel line openings as soon as they are removed.

CAUTION
Damage to nozzles can occur if not protected after removal. Improper fuel flow can result causing damage to engine.

(5) Fit protecting caps immediately over the nozzle tips and the line connections to avoid damage to the nozzles when handling them.

CAUTION
Bending the fuel pressure lines can affect their durability.

(6) Remove only leak-off lines to fuel tank and to fuel injection pump at T-pieces.

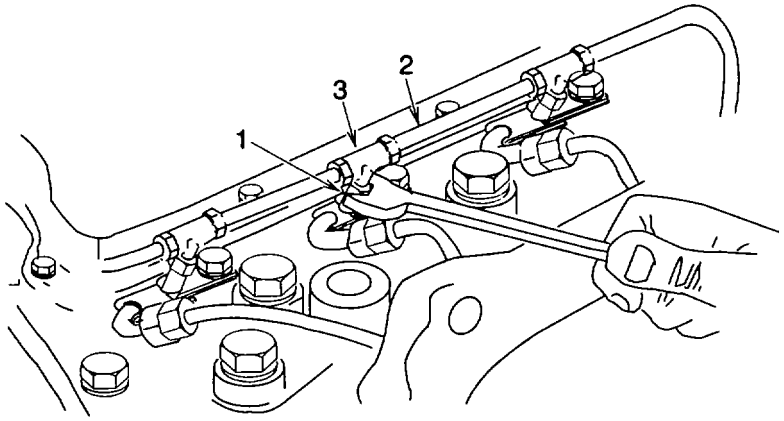


Figure 6-1. Injection Nozzle Leak Off Lines and Tee Fittings.

(7) When loosening the fuel pressure lines, hold male union of nozzle line to prevent bending lines. Remove nuts (Figure 6-1, 1) to remove leak-off lines (2), and tee fittings (3).

(8) Disconnect fuel injection line (Figure 6-2, 1) from nozzle.

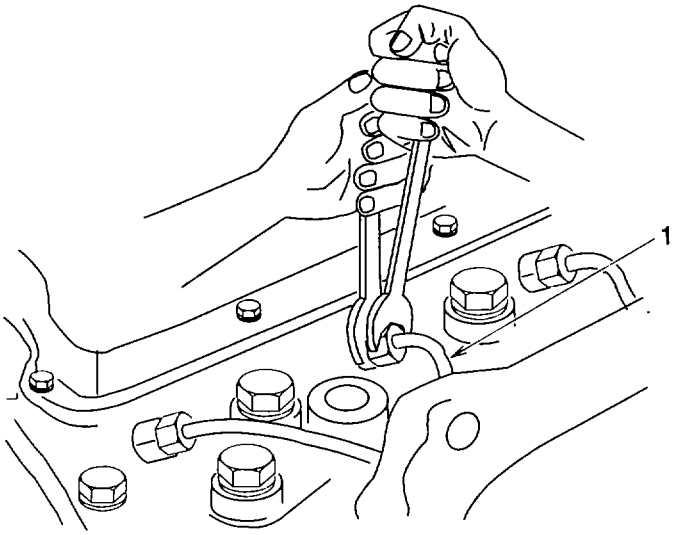


Figure 6-2. Injection Nozzle Lines

6-3. FUEL INJECTION NOZZLE REPAIR AND REPLACEMENT .-Continued

(9) Remove cap screw clamp (Figure 6-3, 1) washer (2) and spacer (3).

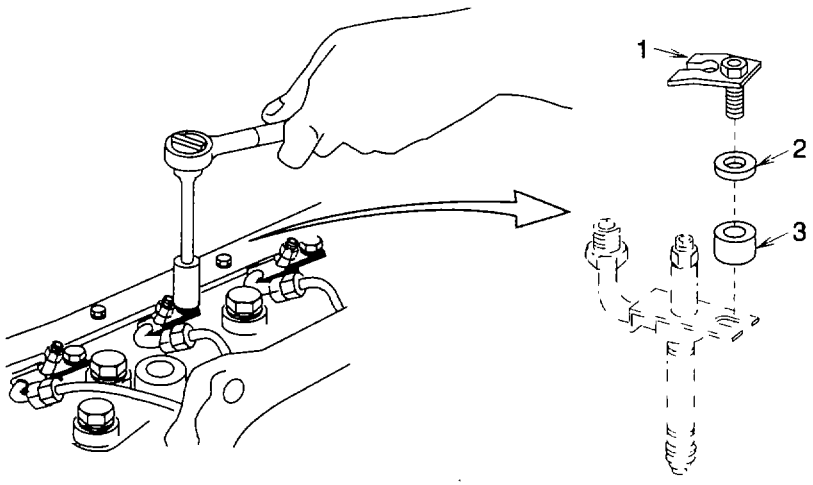


Figure 6-3. Nozzle Clamp

CAUTION

Using screwdrivers or similar tools to remove injection nozzle can damage the nozzle irreparably.

(10) Pull injection nozzle out of cylinder head with injection nozzle puller (Figure 6-4, 1) (item 5, section III, appendix B).

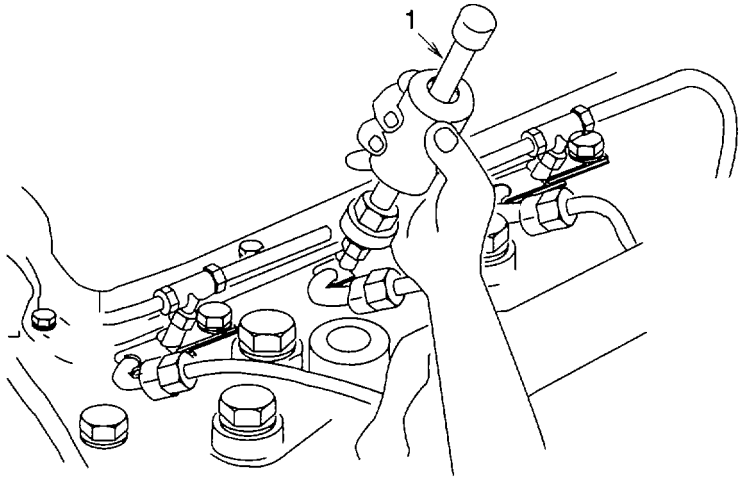


Figure 6-4. Injection Nozzle

(11) Using a needle-nose pliers, remove and discard the carbon stop seal (Figure 6-5, 1) and upper sealing washer (2).

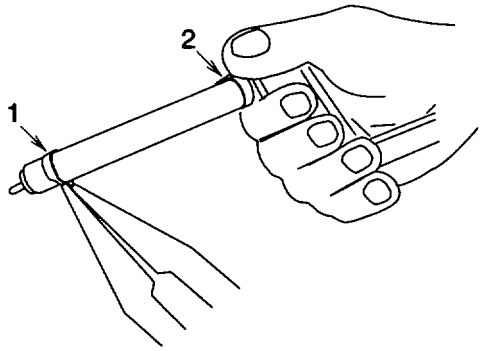


Figure 6-5. Injection Nozzle Seals

b. Cleaning.

CAUTION

Always turn the nozzle cleaning tool clockwise through the bore even when pulling back to prevent tool from becoming dull,

(1) Clean nozzle bore with nozzle bore cleaning tool (item 6, section III, appendix B). Blow debris from bore with compressed air, and plug the bore to prevent entry of foreign material.

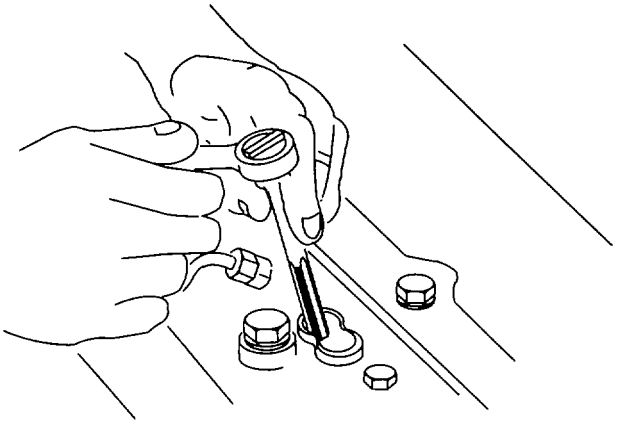


Figure 6-6. Nozzle Bore Cleaning

6-3. FUEL INJECTION NOZZLE REPAIR AND REPLACEMENT .-Continued

CAUTION

Using a motor-driven brush to clean up nozzle body can damage the Teflon coating on the nozzle body above the carbon stop seal groove. This coating will become discolored during normal service, but this is not harmful.

(2) Suspend nozzles (Figure 6-7), so carbon stop seal groove is just covered, in a commercial solvent such as cleaning solvent (item 17, section II, appendix E) heated to 200° F (93° C). Allow them to soak for 30 minutes.

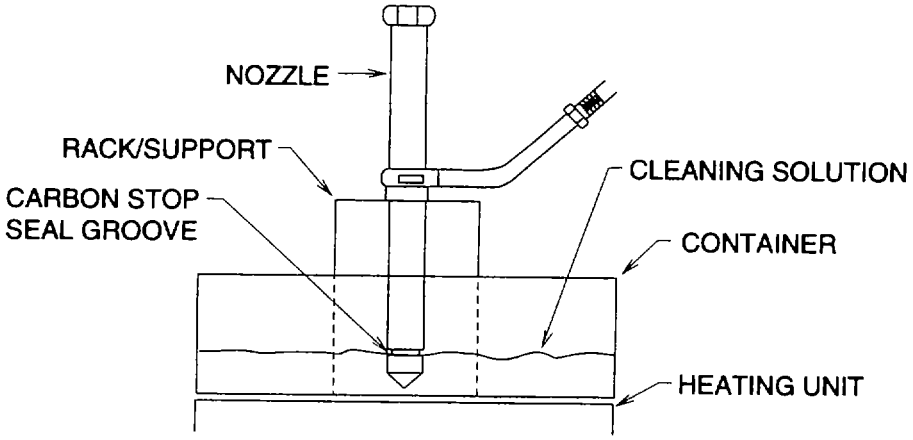


Figure 6-7. Nozzle Cleaning

(3) After soaking, clean tip with a brass wire brush.

c. Testing.

WARNING

Fuel from the spray orifices can penetrate clothing and skin causing serious personal injury. The nozzle tip should always be directed away from the operator. Enclosing the nozzle in a transparent cover is recommended.

(1) Use special tool (item 7, section III, appendix B) or (item 8, section III, appendix B) to test nozzles.

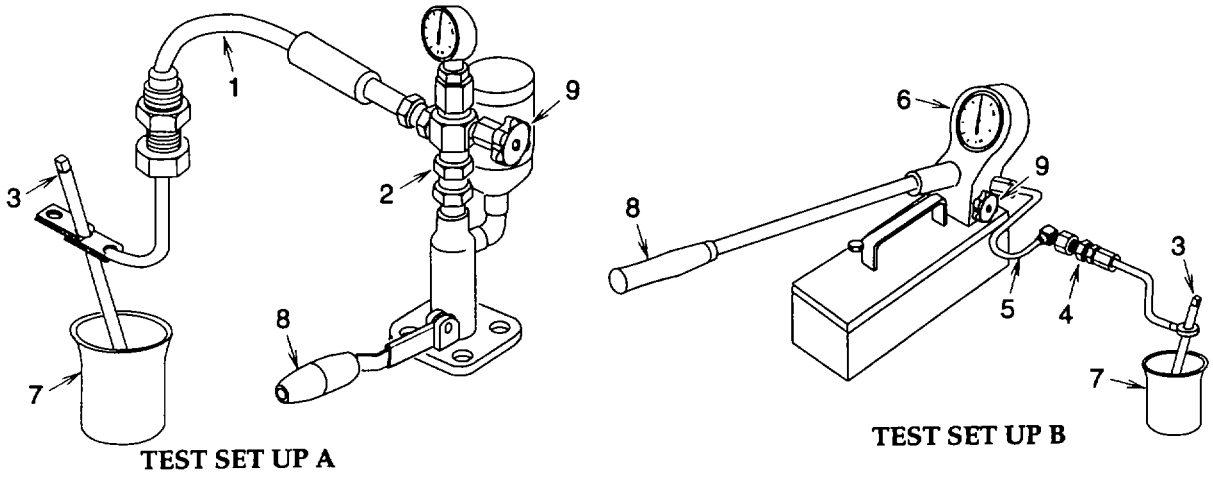


Figure 6-8. Nozzle Testing

(a) If nozzle tester (item 7, section III, appendix B) (Figure 6-8, 2) is used, see test setup A. Use the KJD10109 fuel line (1) and connect line to tester (2) and nozzle (3).

(b) If nozzle tester (item 8, section III, appendix B) (6) is used, see test setup B. Use Y-900-3, Y-900-5 adapters (4) and Y-900-2 Fuel Line (5) from D-01110AA Adapter Set to connect nozzles to D-01109AA Nozzle Tester (6).

WARNING

Before applying pressure to the nozzle tester, be sure that all connections are tight, and that the fittings are not damaged. Fluid escaping from a very small hole can be almost invisible. Use a piece of cardboard or wood, rather than hands, to search for suspected leaks.

(2) Position tip of nozzle below top of beaker (7) and back out 30° from vertical. This is necessary to contain all spray in beaker (7), as nozzle spray pattern is at an angle to the nozzle centerline. Leave connections slightly loose.

6-3. FUEL INJECTION NOZZLE REPAIR AND REPLACEMENT. - Continued

(3). Pump tester handle (8) five strokes to flush air from lines and fittings and to determine the pumping rate required for proper atomization. Tighten all connections securely.

WARNING

If injured by escaping fluid, see a doctor at once. Serious infection or reaction can develop if proper medical treatment is not administered immediately.

(4) Isolate test pump gauge by closing valve and flush nozzle by operating test pump rapidly.

(5) Opening pressure test.

NOTE

Actual opening pressure is less important than equal opening pressure of a l l nozzles. Permissible variation is 100 psi (700 kPa) (7 bar) difference between cylinders (nozzles).

(a) Actuate the nozzle tester rapidly several times to allow the valve to seat rapidly.

(b) Open gauge valve (9) and raise the pressure to a point where the gauge needle falls rapidly. This is the nozzle opening pressure. A new or reconditioned nozzle should be: 3150-3250 psi (21700-22400 kPa) (217-224-bar). A used nozzle should have a minimum opening pressure of 3000 psi (20700 kPa) (207 bar).

(c) If the nozzle opening pressure is not within specified range. Adjust nozzle BEFORE checking chatter and spray pattern.

(6) Chatter and spray pattern test.

(a) Check nozzle chatter.

NOTE

Until the chattering range is reached, fuel will emerge in non-atomized streams.

1 Operate nozzle tester at a pumping rate that will cause the nozzle to chatter. Nozzle should chatter softly, and spray pattern should be broad and finely atomized.

2 Using the pumping rate for proper atomization operate tester for ten strokes. (See step (3)). The nozzle must atomize on at least eight of the ten strokes without consecutive misses.

3 If the nozzle fails to meet this requirement, repeat procedure. Nozzles which do not meet the requirement after second test should be replaced.

(b) Check spray pattern.

1 Operate nozzle tester at a pumping rate that will cause the nozzle to chatter.

2 Observe spray pattern and check for plugged orifices, partially clogged, chipped, or corroded orifices will cause the spray to deviate from the correct angle.

3 Spray will be streaky, rather than finely atomized. Replace nozzle if found bad.

(7) Leakage Test.

(a) Check nozzle for fuel leakage past valve seat.

1 Position nozzle on nozzle tester with nozzle tip down.

2 Operate pump handle rapidly to firmly seat valve.

3 Raise pressure at nozzle to about 400-500 psi (2800-3500 kPa) (28-35 bar) under specified opening pressure.

4 Watch for an accumulation of fuel around the nozzle orifices. If fuel drips from nozzle within 5 seconds, nozzle is considered a "leaker", and must be replaced.

(b) Check nozzle for valve stem and guide bar.

1 Position nozzlewith tip slightly above the horizontal plane.

WARNING

Place a clear, protective shield around spray zone to avoid possible personal injury from spray.

2 Raise pressureto 1500 psi (10,300 kPa) (103 bar) on test gauge.

3 Look forleakage from the return end of nozzle. After one drop, leakage should be 3-10 drops in 30 seconds. Rate based on use of No. 2 diesel fuel or an equivalent viscosity of test oil at 65-75° F (18-24° C) ambient temperature.

(c) If nozzle leakage is not within specified range, nozzle must be replaced.

d. Adjusting.

WARNING

Fuel from the spray orifices can penetrate clothing and skin causing serious personal injury. The nozzle tip should always be directed away from the operator. Enclosing the nozzle in a transparent cover is recommended.

Before applying pressure to the nozzle tester, be sure that all connections are tight, and that the fittings are not damaged. Fluid escaping from a very small hole can be almost invisible. Use a piece of cardboard or wood, rather than hands, to search for suspected leaks.

If injured by escaping fluid, see a doctor at once. Serious infection or reaction can develop if proper medical treatment is not administered immediately.

(1) Connect nozzle to nozzle tester per paragraph 6-3, c, (1).

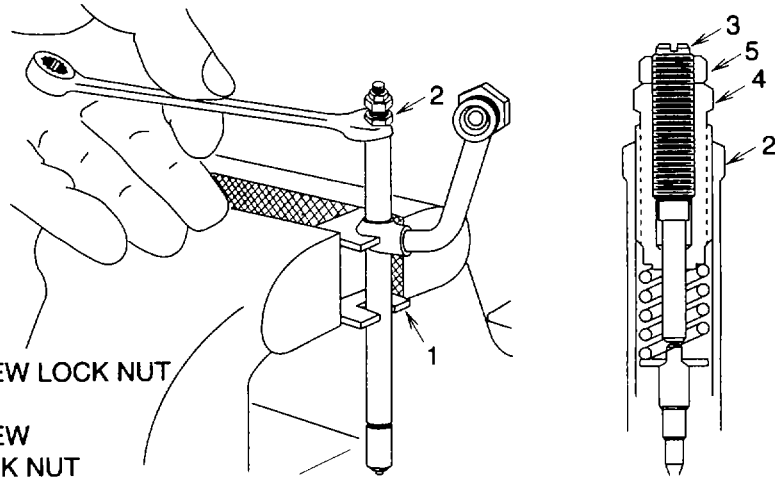
(2) Close pressure gauge valve (Figure 6-8, 9) and flush nozzle by operating pump rapidly.

(3) Raise pressure on pump until nozzle opens (gauge drops sharply). A new or reconditioned nozzle should open at 3150-3250 psi (21700-22400 kPa) (217-224 bar). A used nozzle should have a minimum opening pressure of 3000 psi (20700 kPa) (207 bar).

6-3. FUEL INJECTION NOZZLE REPAIR AND REPLACEMENT. - Continued

(4) If opening pressure is incorrect:

(a) Remove nozzle from tester and install in No. 17787 holding fixture from (item 9, section III, appendix B).



1. HOLDING FIXTURE
2. PRESSURE ADJUSTING SCREW LOCK NUT
3. LIFT ADJUSTING SCREW
4. PRESSURE ADJUSTING SCREW
5. LIFT ADJUSTING SCREW LOCK NUT

Figure 6-9. Nozzle Pressure Adjusting

(b) Loosen pressure adjusting screw lock nut (Figure 6-9, 2).

(c) Reconnect nozzle to tester with tip pointing downward.

(d) Back out lift adjusting screw (3) far enough (two or three turns) to prevent bottoming when pressure adjusting screw (4) is turned.

NOTE

It is desirable to set opening pressure to the high limit of specification. If required, repeat procedure to obtain proper result.

(e) Turn pressure adjusting screw (4) in (clockwise) to increase opening pressure, or out (counterclockwise) to decrease opening pressure.

(f) Remove nozzle from tester and secure in holding fixture (Figure 6-9, 1). While holding pressure adjusting screw (4), tighten pressure adjusting screw lock nut (2) 7 ft-lb (10 Nm) using the No. 18958 (English size) or No. 24374 (metric size) torque wrench adapter (Figure 6-10,1) from (item 9, section III, appendix B).

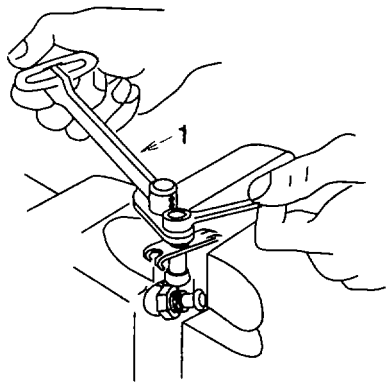


Figure 6-10. Nozzle Pressure Adjusting Lock Nut Torque

(5) Adjust valve lift per the following:

CAUTION
The valve is fragile and use of excessive force when manually bottoming i t out can bend it.

(a) Reconnect nozzle to tester. While pumping fuel through nozzle, hold pressure adjusting screw (Figure 6-11, 1)and slowly turn lift adjusting screw (2) in (clockwise) until valve ceases to open.

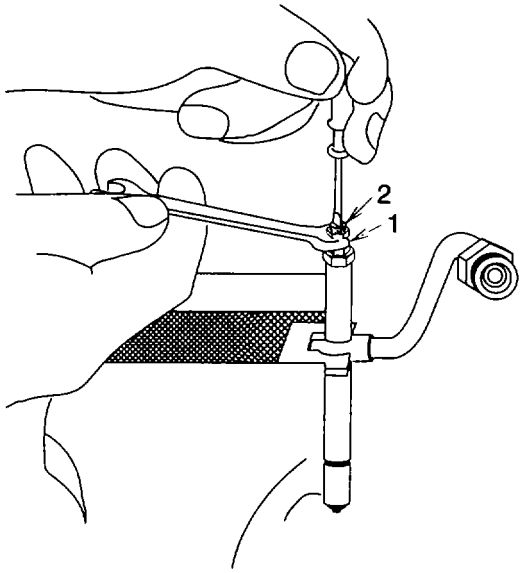


Figure 6-11. Nozzle Pressure Lift Adjusting Screw

6-3. FUEL INJECTION NOZZLE REPAIR AND REPLACEMENT. - Continued

(b) Check for valve bottoming by raising pressure to 200-500 psi (1380-3450 kPa) (14-34 bar) above nozzle opening pressure. Although some fuel may collect at nozzle tip, a rapid dribble should not occur.

(c) Remove nozzle from tester and install in holding fixture.

(d) Carefully turn lift adjusting screw out 1/2 turn counterclockwise. A tolerance of 1/8 turn is permissible.

(e) Hold pressure adjusting screw stationary while tightening lock nut. Use No. 18958 Torque Wrench Adapter from (item 9, section III, appendix B) on English-type lock nuts; No. 24374 from (item 9, section III, appendix B) on metric-type lock nuts.

(f) Torque pressure adjusting screw lock nut (2) to 3. 5 ft-lb (5 Nm).

(g) Recheck nozzle opening pressure.

(h) If nozzle chatter is incorrect after servicing, valve parts may be misaligned. To correct, screw pressure adjusting screw (Figure 6-9, 4) through its range of adjustment several times and reset valve lift. Recheck nozzle for chatter.

(i) Clean nozzle with No. 16488 Brass Wire Brush (item 9, section III, appendix B).

e. Installation.

NOTE

Upper seal washer, carbon stop seal and spacer are provided in sets of three each with injection nozzle repair kit.

(1) Slide a new upper seal washer (1) on to nozzle body from nozzle repair kit (item 46, appendix H).

(2) Each time an injection nozzle is removed from the cylinder head, replace carbon stop seal (2) with a new one.

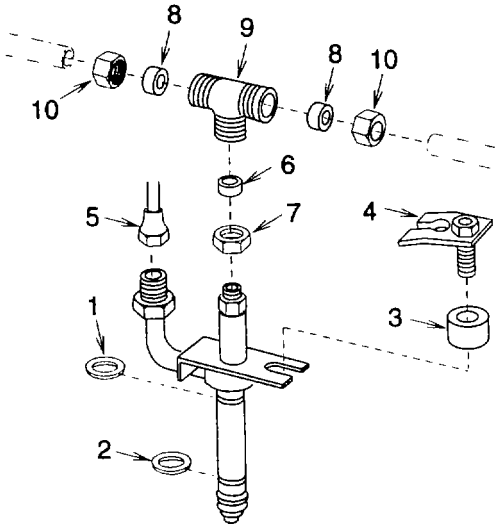


Figure 6-12. Injection Nozzle Installation

(3) Position a new carbon stop seal (2) on pilot tool and push on to nozzle body using No. 16189 Nozzle Protector Cap (found on all repair nozzles). Work seal into groove on nozzle body.

(4) If nozzle is not going to be installed at this time, install a No. 16189 nozzle protector cap over nozzle tip. Plug all other openings in nozzle to prevent contamination.

(5) Remove plug (if installed previously) from nozzle bore in cylinder head and blow out bore with compressed air.

(6) Before installing injection nozzles, make sure nozzles are clean and free from oil or grease. Do not grease or oil the nozzles.

(7) Make sure that the sealing surface of the cylinder head (on which the seal washer will be resting) is smooth and free of damage or dirt. Dirt and roughness could prevent proper sealing and cause distortion to nozzle when the attaching screw is tightened, making the valve stick.

(8) Install nozzle in cylinder head using a slight twisting motion as nozzle is seated.

NOTE
Figure 6-12 shows relationship of parts required for installation.

(9) Install spacer (3), clamp and cap screw (4). Do not tighten cap screw at this stage.

(10) Connect fuel pressure line (5) to nozzle. Leave connection slightly loose until air is bled from system.

(11) Tighten nozzle hold-down cap screws (4) 23 ft-lb (30 Nm).

(12) Install leak off line assemblies using new rubber packing (6) (item 47, appendix H) at nozzle packing nut (7) and new rubber packing (8) (item 48, appendix H) at tee (9) packing nuts (10). Do not overtighten packing nuts.

(13) Install engine per para 4-72.

6-4. FUEL INJECTION PUMP REPLACEMENT.

This task covers:
a. Removal **b. Installation**

INITIAL SETUP

Tools:

Automotive Maintenance and Repair
Item 2, Section III, Appendix B

Equipment Conditions:

Engine removed. (See para 4-72.)

a. Removal.

CAUTION
Fuel injection pump does get hot and can crack if cold water or steam cleaning is done while it is running or hot.

(1) Clean the fuel injection pump, lines, and area around pump with cleaning solvent (item 16, section II, appendix E) or a steam cleaner.

(2) Use (75160) JDE-81-1 or (75160) JDE-83 Flywheel Turning Tool (item 15, section III, appendix B) to rotate crankshaft to position No.1 piston at TDC on compression stroke.

NOTE
If the engine front plate is not to be replaced, proceed to Step 4.

(3) If the engine front plate is to be replaced, remove two timing hole screws (Figure 6-13, 1), cover plate (2), and gasket (3) from side of pump housing.

(a). Check timing marks (4). If there is a mark on cam ring (rear mark) and governor weight retainer (front mark) proceed with disassembly.

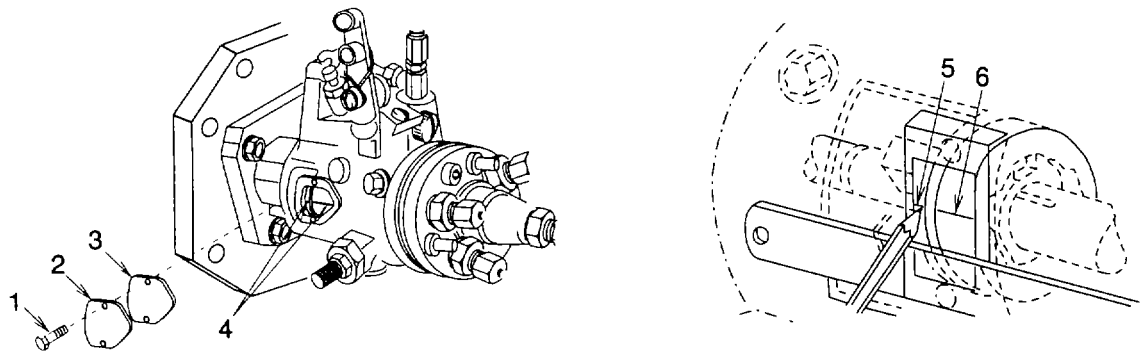


Figure 6-13. Timing Marks

(b). If there is no mark on the weight retainer, scribe a mark on weight retainer (5) directly in line with mark on cam ring (6).

(4) Disconnect shut-off wire lead and speed control rod.

(5) Disconnect fuel return line (Figure 6-14, 1).

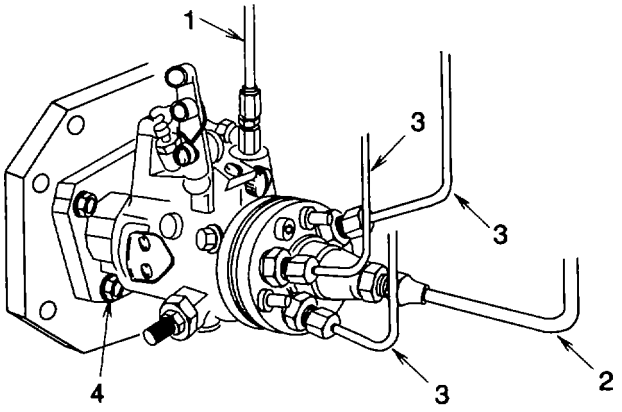


Figure 6-14. Injection Pump

(6) Disconnect fuel supply line (2).

(7) Disconnect fuel pressure lines (3), using special tool (item 10, section III, appendix B). Cap open lines.

(8) Remove two cap screws (Figure 6-15, 1), flat washers (2) and timing gear cover (3). Clean fuel and gasket from cover.

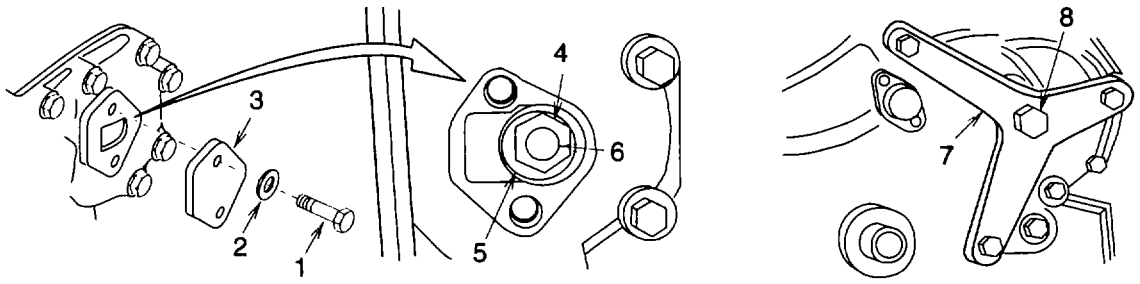


Figure 6-15. Timing Gear Cover

(9) Remove hex nut (4) and washer (5) securing pump drive gear to pump shaft (6). Be careful not to drop nut and washer inside engine.

(10) Remove three bolts on timing gear cover and attach special tool (7), (item 11, section III, appendix B) to timing gear cover.

(11) Loosen the three hex nuts (Figure 6-14, 4) several turns to permit shaft/gear separation. If nuts are removed prior to separation, pump will fall if not supported.

6-4. FUEL INJECTION PUMP TESTING. - Continued

NOTE

If pump shaft cannot be removed from tapered bore of drive gear, strike engine front plate several blows with a brass drift and hammer.

(12) Turn cap screw (Figure 6-15, 8) of special tool clockwise until pump shaft is loosened from tapered bore of drive gear.

(13) Remove nuts (Figure 6-14, 5) and withdraw pump from the three mounting studs. Be careful not to lose the Woodruff key in pump shaft.

(14) Remove special tool. Plug or cap all openings in pump and engine if new pump is not to be installed immediately.

b. Installation.

NOTE

If the injection pump drive gear was removed from engine, it must be timed when reinstalled.

Make sure that Woodruff key is in place in pump shaft and aligned with timing gear key way and that it is tight.

(1) Using a new gasket (Figure 6-16, 1) (item 49, appendix H) (if installed) and preformed packing (10), slide pump onto mounting studs.

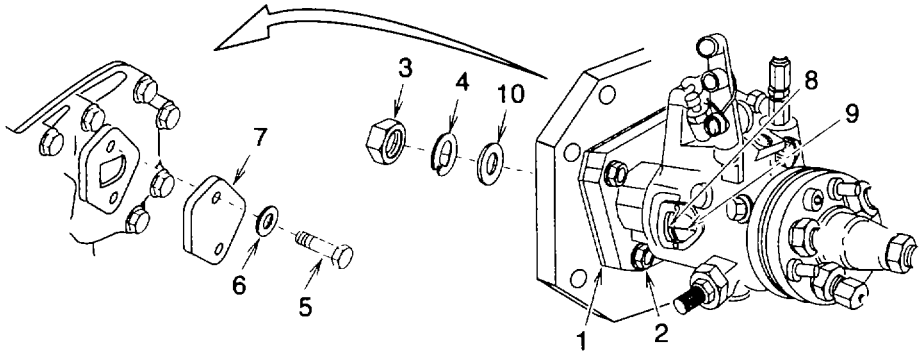


Figure 6-16. Injection Pump Installation

(2) Screw the three hex nuts (2) onto studs and tighten finger tight only at this stage.

(3) Install nut (3) and new lock washer (4) (item 50, appendix H), torque drive gear hex nut (3) to 44 ft-lb (60 Nm) torque. Install mounting hole cover (7) with two cap screws (5) and washers (6).

(4) Check that the three pump mounting nuts (2) are in place but loose. Pivot pump housing away from cylinder block as far as slots will allow. Then pivot it back far enough to align timing mark on weight retainer (8) with mark on cam ring (9).

(5) Torque the three hex nuts (2) securing the pump to the front plate to 18 ft-lb (25 Nm).

CAUTION

When tightening fuel pressure lines at fuel injection pump, be sure not to turn fuel injection pump fittings. Turning of these fittings may cause internal pump damage.

(6) Connect injection pump pressure lines (Figure 6-17, 1). Torque fuel pressure lines at pump to 18 ft-lb (25 Nm). Use special crowfoot wrench (item 10, section III, appendix B).

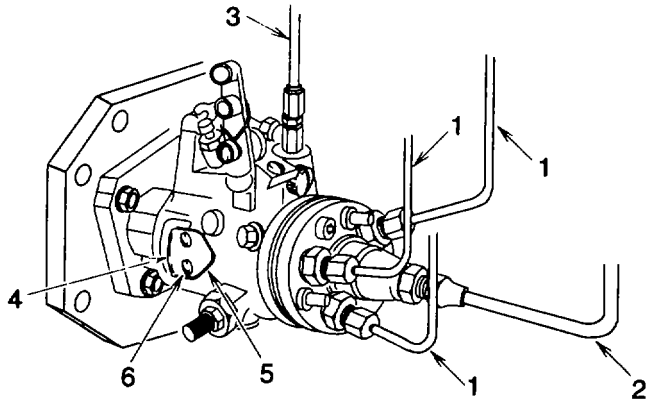


Figure 6-17. Injection Pump Line Connection

(7) Connect fuel supply line (2), return line (3), shut-off wire lead and speed control rod.

(8) Install timing hole cover plate (4) and gasket (5). Torque screws (6) 17 lb-in (2 Nm).

(9) Install engine per paragraph 4-72.

6-5. FLYWHEEL AND HOUSING INSPECTION. REPAIR, AND REPLACEMENT.

This task covers:
a. Inspection **b. Removal** **c. Repair** **d. Installation**

INITIAL SETUP

Tools:

Automotive Maintenance and Repair
Item 2, Section III, Appendix B

Equipment Conditions:

Engine removed. (See para 4-72.)
Oil pan removed. (See para 6-7.)

Personnel Required:

Two

a. Inspection. Check fly-wheel and housing for cracks or other damage. Replace if damaged.

b. Removal.

(1) Flywheel.

NOTE
Flywheel can be secured at TDC by inserting a 5/16 inch diameter (8 mm) bolt or rod into an existing hole in the flywheel housing.

(a) Remove two of the four cap screws (Figure 6-18, 1).

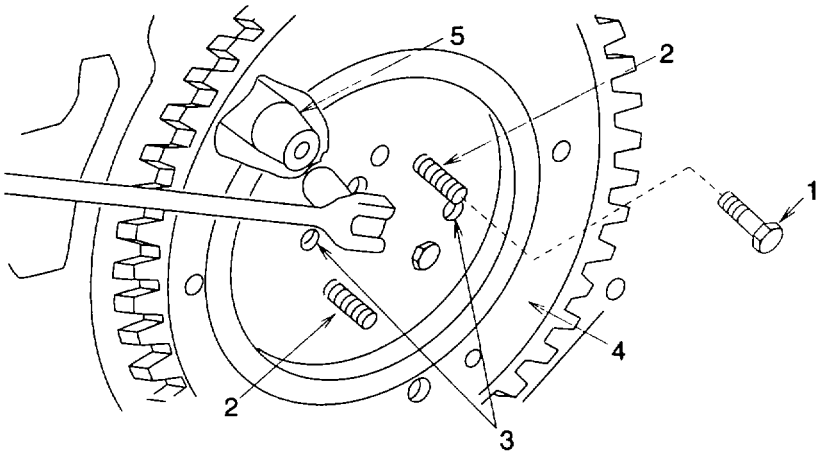


Figure 6-18. Flywheel

(b) Install guide studs (2) in their place if required.

CAUTION
Flywheel and flywheel housing are heavy. Use care when removing.

(c) Remove remaining two cap screws (1) and install them into the tapped holes (3), to push the flywheel (4) off crankshaft (5).

(2) Housing.

(a) Remove eight 3/8 inch cap screws (Figure 6-19, 1), and four 5/8 inch cap screws (2), from housing (3).

(b) Remove flywheel housing (3) and gasket (4). Discard gasket.

(c) Remove all old gasket (4) material from flange faces.

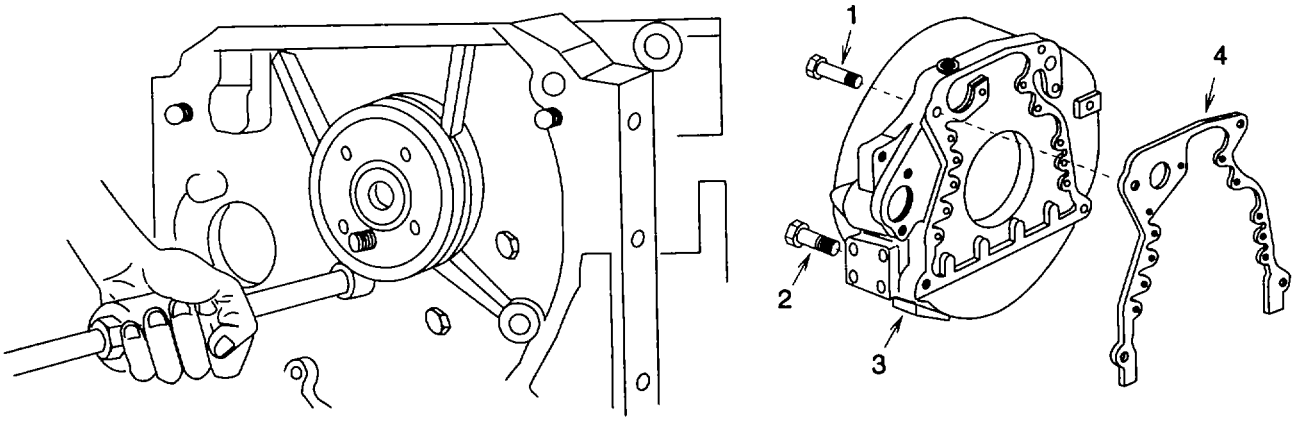


Figure 6-19. Flywheel Cover

c Repair. Repair is limited to replacement of damaged flywheel or housing.

d Installation.

(1) Install flywheel housing.

(a). Install new gasket (Figure 6-19, 4) (item 51, appendix H).

(b). Install flywheel housing (3) on cylinder block using eight 3/8 inch cap screws (1), and four 5/8 inch cap screws (2). The shorter screws are used at the top holes.

(c). Torque 3/8 inch screws (1) to 35 lb-in. (50 Nm) and 5/8 inch screws (2) to 167 lb-in (230 Nm).

6-5. FLYWHEEL AND HOUSING INSPECTION. REPAIR, AND REPLACEMENT. - Continued

(2) Install flywheel.

WARNING
Flywheel is heavy. Plan proper handling procedures to avoid injuries.

(a) Install two guide studs (Figure 6-18, 2) if required, in crankshaft cap screw threaded holes. Place flywheel (4) on studs and slide into position against crankshaft.

CAUTION
Always install new flywheel cap screws when flywheel has been removed.

(b) Start new cap screws (1) (item 52, appendix H) in crankshaft (5). Do not tighten until guide studs (2) if installed, are removed and all cap screws started.

(c) Torque screws (1) 120 ft-lb (160 Nm).

(d) Install oil pan per paragraph 6-7.

(e) Install engine in air compressor per paragraph 4-72.

6-6. ROCKER ARMS, CYLINDER HEAD, AND VALVES REPLACEMENT.

This task covers:
a. Removal b. Cleaning c. Inspection d. Installation

INITIAL SETUP

Tools:

Automotive Maintenance and Repair
Item 2, Section III, Appendix B

Personnel Required:

Two

Equipment Conditions:

Engine coolant drained. (See para 4-6, e.)
Exhaust manifold removed. (See para 4-71.)
Engine air cleaner removed. (See para 4-61.)
Thermostat housing removed. (See para 4-70.)
Fuel filter removed. (See para 4-69.)
Injection nozzles removed. (See para 6-3.)
Rocker arm cover removed. (See para 5-6.)

a. Removal.

(1) Remove two hex head bolts (Figure 6-20, 1) and remaining fuel filter housing assembly (2) with tubing in place.

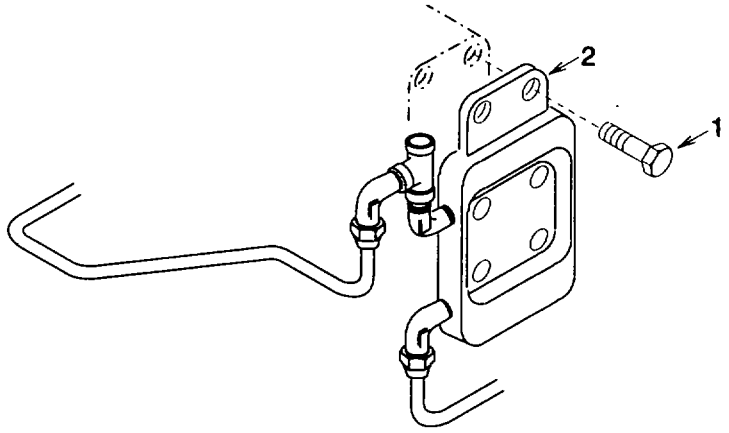


Figure 6-20. Fuel Filter Housing

(2) Remove rocker arm assembly.

(3) Remove wear caps from valve stems.

(4) Lift push rods from their bores.

(5) Remove fourteen cylinder head cap screws.

6-6. ROCKER ARMS, CYLINDER HEAD, AND VALVES REPLACEMENT. - Continued

CAUTION

Cylinder head is made of soft metal. Screwdrivers or pry bars used between cylinder block and cylinder head to loosen can damage cylinder head.

(6) Lift cylinder head from cylinder block. If cylinder head sticks, use a soft hammer to tap the cylinder head.

CAUTION

Do not rotate crankshaft with cylinder head removed unless all cylinder liners are secured with cap screws and large flat washers. Damage to cylinder head can occur.

(7) Remove cylinder head gasket. Inspect for possible oil, coolant, or combustion chamber leaks. Also look for defective or incorrect gasket being used.

(8) Remove cam followers (Figure 6-21, 1) from block.

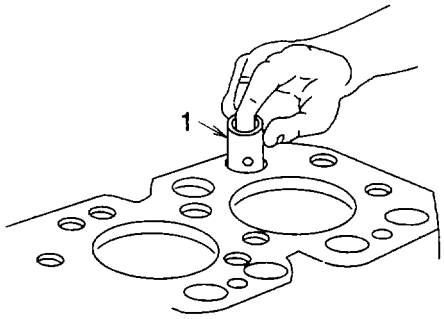


Figure 6-21. Cam Follower Removal

(9) Remove valves.

(a) Compress valve springs (Figure 6-22,1) far enough to remove keepers (2).

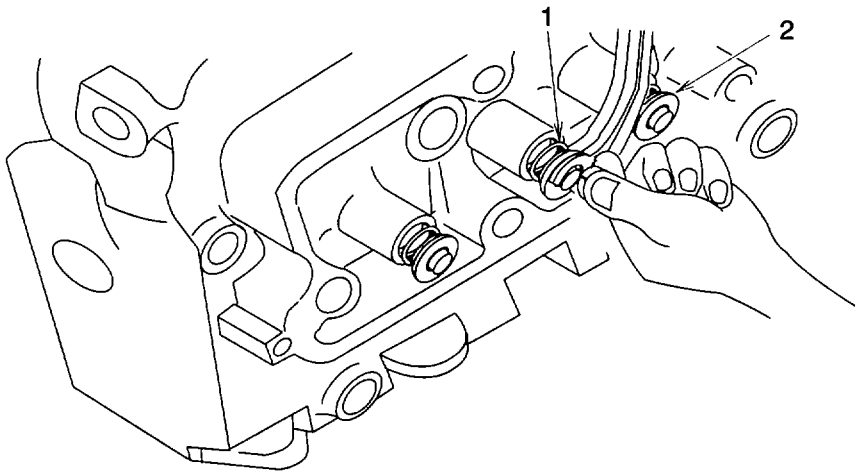


Figure 6-22. Keeper Removal

(b) Release spring tension and remove valve spring keeper (2) or rotator and valve spring (1).

(c) Remove valves, marking them for reassembly. Use a valve board or other suitable means of keeping valves in order.

(10). If valve seat inserts must be replaced, remove inserts with valve seat puller (item 12, section III, appendix B).

(11). Disassemble rocker arm shaft assembly.

(a) Remove plugs (Figure 6-23, 6) and bowed washers (5) from rocker arm shaft (4).

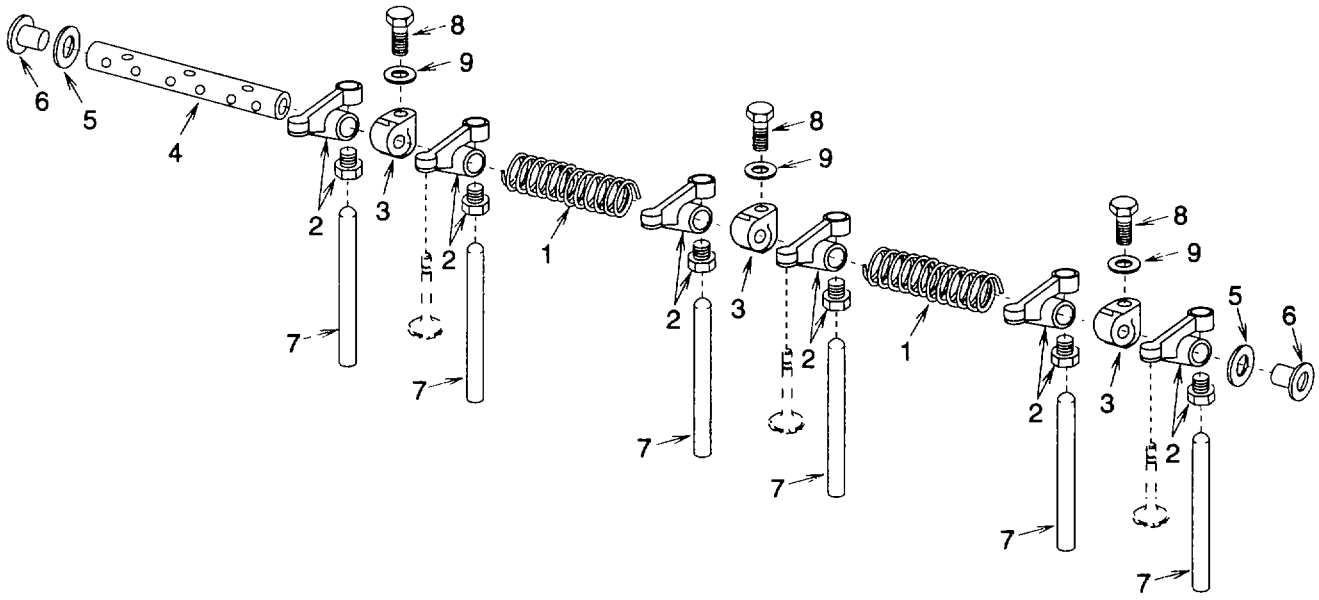


Figure 6-23. Rocker Arms, Shaft, and Push Rods

6-6. ROCKER ARMS, CYLINDER HEAD, AND VALVES REPLACEMENT. - Continued

(b) Slide springs (1), rocker arms (2), and rocker arm supports (3) off rocker arm shaft (4) identifying their parts for reassembly in the same relationship they were in before disassembly.

b. Cleaning.

(1) Scrape all old gasket material from head. Use a powered wire brush to clean sealing surfaces.

CAUTION

Always turn the tool clockwise through the bore, even when pulling back, otherwise tool will get dull.

(2) Using special tool (item 6, section III, appendix B), remove carbon deposits from bores for fuel injection nozzles.

NOTE

Heads with restricted or clogged passages can be cleaned by soaking them in a tank of hot caustic solution if available.

(3) If cylinder head is not put in a chemical hot tank for cleaning, clean with solvent (item 11, section II, appendix E) and a brush. Dry with compressed air and be sure to blow out all passages.

(4) Wash cam followers, rocker arm parts, push rods, and cap screws with clean solvent (item 11, section II, appendix E) and dry with compressed air.

(5) Clean valves.

(a). Hold each valve firmly against a soft wire wheel on a bench grinder.

CAUTION

Any carbon left on the stem will affect alignment in valve refacer if valves need to be refaced. Do not use wire wheel on plated portion of valve stem.

(b). Make sure all carbon is removed from valve head, face and unplated portion of stem.

(6) Clean valve guides and seats.

(a). Using a plastic brush, clean valve guides.

NOTE

A few drops of light oil will make cleaning of valve guides easier.

(b). Using an electrical hand drill with wire cleaning brush, remove all carbon deposits from valve seats.

c. Inspection.

(1) Check cylinder head for flatness using a precision straight edge and feeler gauge. Check lengthwise and crosswise in several places. A good secondary check is one that is on a diagonal. The out-of-flat measurement must not exceed 0.004 in. (0.102 mm) for any one measurement. If any measurement exceeds this specification, the cylinder head must be either reconditioned or replaced.

(2) Measure Cylinder Liner Height.

(a) Bolt-down liners as shown using cap screws and flat washers. Flat washers should be at least 1/8 in. (3.18 mm) thick. Torque cap screws to 50 ft-lb (68 Nm).

(b) Using a dial indicator, measure liner height.

NOTE

Variations in measurement readings may occur within one cylinder and/or between adjacent cylinders.

(c) Measure each liner in four places, approximately at 1, 5, 7 and 11 o'clock positions as viewed from the rear of the engine (flywheel end). Record all measurements.

Liner Height Specifications

Liner height above block	0.0004 - 0.004 in. (0.01 - 0.10 mm)
Maximum permissible difference between readings within one cylinder or between adjacent cylinders	0.001 in. (0.03 mm)

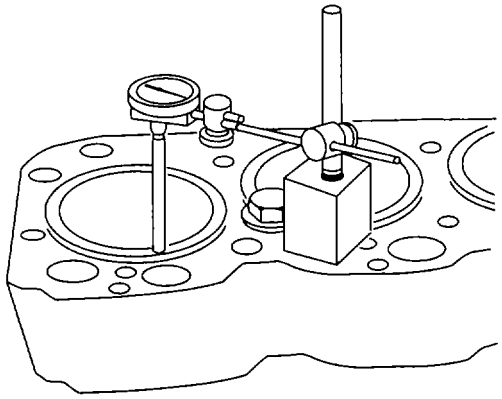


Figure 6-24. Liner Height

(d) Replace any liner that does not meet standout specification at any location.

(3) Check rocker arm shaft springs. Spring tension at a length of 1.81 in. (46 mm) and a force of 4-6 lbs (18-27 N) should be noted.

6-6. ROCKER ARMS, CYLINDER HEAD, AND VALVES REPLACEMENT. - Continued

NOTE

If the rocker arm has been damaged by a valve failure, replace it and push rod when replacing valve.

(4) Inspect rocker arm shaft for severe scratching, scoring, or excessive wear at points of rocker arm contact. Also check shaft for straightness. Rocker Arm Assembly Specifications are as follows.

Rocker Arm Shaft OD (Figure 6-25, 1) (New)	0.787 - 0.788 in. (19.99 - 20.02 mm)
Wear Tolerance	0.002 in. (0.05 mm)
Rocker Arm Shaft Support ID (2) (Max.).....	0.794 in. (20.17 mm)
Rocker Arm ID (3) (Max.)	0.790 - 0.792 in. (20.07 - 20.12 mm)
Wear Tolerance	0.002 in. (0.005 mm)

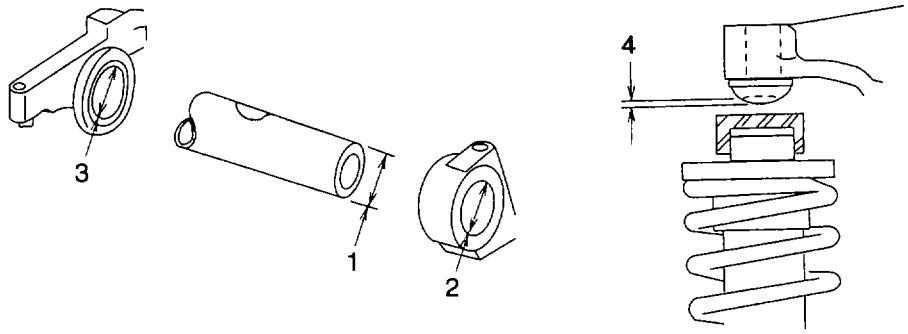


Figure 6-25. Rocker Arm Specifications

(5) Check rocker arm and adjusting screw (Figure 6-23, 2) for damage. Visually inspect rocker arm for hairline cracks. Replace if necessary.

NOTE

Be sure all oil holes in rocker arm shaft are clean and open.

(6) Check for cups or concave wear (Figure 6-25, 4) on ends of rocker arms where they contact wear caps. If wear exists, replace rocker arm.

(7) Inspect push rods for wear and damage.

(8) Check push rods (Figure 6-26, 1) for straightness by rolling on a flat surface.

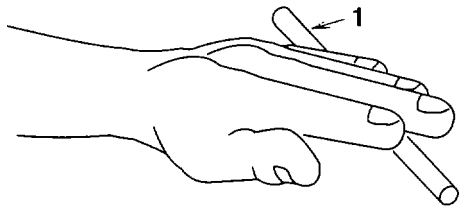


Figure 6-26. Inspect Push Rods

(9) Replace defective push rods.

(10) Inspect valve springs.

(a). Inspect valve springs for alignment, wear and damage.

(b). Put springs on a flat surface to see that they are square and parallel.

(c). Check valve spring tension using spring compression tester (item 13, section III, appendix B) and the specifications given for the valve spring.

NOTE
Free length of springs differ slightly, but compressed height must be the same.

Valve Spring Specifications

Compression	Height
54-62 lb force (240-276 N).	1.81 in. (46 mm)
133-153 lb force (591-680N)	1.36 in. (34.5 mm)

(11) Inspect and measure valves.

(a) Visually inspect valves to determine if they can be restored to a serviceable condition. Replace valves that are burned, cracked, eroded, or chipped.

6-6. ROCKER ARMS, CYLINDER HEAD, AND VALVES REPLACEMENT. - Continued

(b) Inspect grooves (Figure 6-27, 1) on valve stem for damage. Also inspect stems (2) for signs of scuffing, which may indicate insufficient valve guide-to-valve stem clearance. Replace if defects are evident.

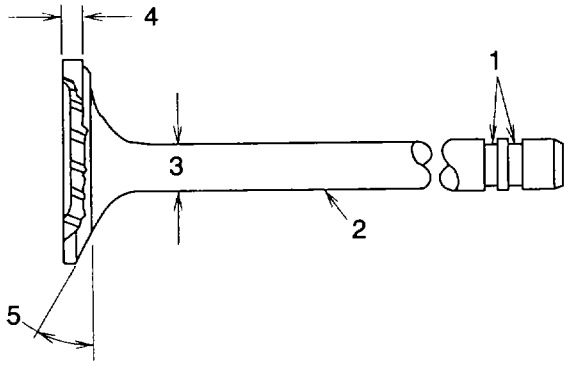


Figure 6-27. Valve Inspection

(c) Use Valve Inspection Center (item 14, section III, appendix B) to determine if valves are bent or have excessive runout. Maximum permissible runout of valve face is 0.002 in. (0.05 mm).

1 Measure valve stem OD (3) and margin (4).

2 Valve stem OD should be 0.3715 + 0.005 in. (9.445 + 0.015 mm).

3 Valves determined to be serviceable should be refaced to specified angle (5).

4 Engine intake valve and exhaust valve should both be 43.5.

(12) Using a telescopic gauge, check valve guides for wear per the following:

(a) ID of valve guide bore in a new cylinder head should be 0.374-0.375 in. (9.51-9.53 mm).

(b) New guide-to-valve stem clearance should be 0.002-0.004 in. (0.05-0.10 mm).

(c) Maximum permissible clearance should be 0.006 in. (0.015 mm).

(13) Inspect the valve seats for cracks, pits, and erosion.

d. Repair. Repair is limited to replacement of defective, damaged, or out-of-tolerance parts.

e. Installation.

(1) Install valves per the following:

(a) Apply Valve Stem Lubricant (item 14, section II, appendix E) to valve stems and guides.

NOTE
Valves must move freely and seat properly in head.

(b) Insert valves in head (must go in same location as when removed).

(c) Position valve springs. End of spring must be in machined counterbore of head.

(d) Install spring caps.

(e) Compress valve springs using valve spring compressor and install retainers.

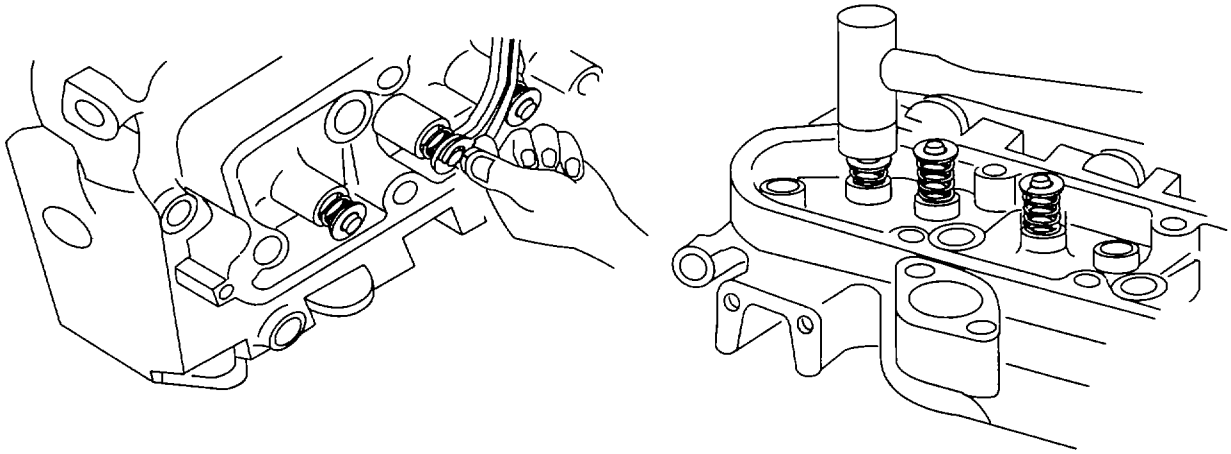


Figure 6-28. Valve Installation

(2) Install cylinder head.

(a) Clean tapped holes in cylinder block for cylinder head cap screws using a tap. Use compressed air to remove debris and any fluids which may be present in cap screw holes.

(b) Place new cylinder head gasket (item 53, appendix H) on cylinder block. Do not use sealant. Install dry.

(c) Dip threaded end and head end (including washers) of cap screw in engine oil. Remove excess oil from screw.

(d) Make sure that hardened flat washers are used if cap screws do not have washer heads under head of all cap screws.

(e) Install two guide studs in cylinder block (for piloting cylinder head) at locating holes (Figure 6-29, 11) and (12).

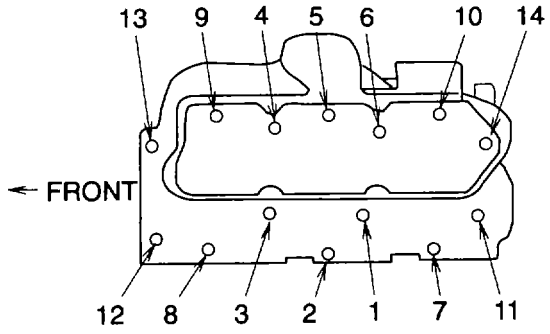


Figure 6-29. Cylinder Head

6-6. ROCKER ARMS, CYLINDER HEAD, AND VALVES REPLACEMENT. - Continued

CAUTION

Repositioning the cylinder head to align the head cap screws holes without the guide studs can damage the piston o-ring seal.

(f) Position cylinder head over guide studs and lower into place on cylinder block.

(g) Install cylinder head cap screws in all open holes. Remove guide studs and install cap screws in their place.

(h) Torque the 4.41 in. (112 mm) flange-head cap screws using the torque-turn method as follows:

1 Torque 63ft-lb (85 Nm) in sequence.

2 Torque 100ft-lb (135 Nm) in sequence.

3 Make a mark on cylinder head next to each cap screw. Make a mark on socket and then make a second mark 1/6 turn (60° ± 10°) counterclockwise from the first. Place socket on cap screw so that first mark on socket aligns with mark on cylinder head. Tighten (in sequence shown on Figure 6-30) all cap screws until second mark on socket aligns with mark on cylinder head.

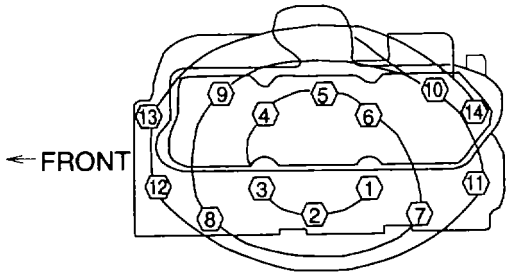


Figure 6-30. Cylinder Head Torque

(3) Assemble rocker arms on shaft.

(a) Lubricate OD of shaft, bores of rocker arms, and rocker arm supports with clean engine oil.

(b) Slide springs (Figure 6-23, 1) rocker arms (2), and rocker arm support (3) on shaft (4). Assemble in the same relationship they were in before disassembly.

(c) Install bowed washers (5) and plugs (6) on shaft (4).

(d) Install push rods (7).

(e) Install wear caps on valves, making certain caps rotate freely.

(f) Position rocker arm assembly on engine. Make sure that oil supply hole of rocker arm shaft is on the flywheel end and facing downward when rocker shaft is installed.

(g) Lubricate all rocker arms with engine oil and make sure they move freely.

(h) Install all cap screws (8) and washers (9). Tighten attaching cap screws (8) to 35 ft-lb (47 Nm) torque.

(i) Adjust valves per the following:

NOTE
The valve clearance can be adjusted with the engine cold or hot.

1 Using engine rotation tool (item 15, section III, appendix B), rotate engine flywheel in running direction (clockwise viewed from water pump) until No.1 piston (front) has reached top dead center (TDC) on compression stroke. Insert timing pin (item 16, section III, appendix B) into flywheel.

NOTE
When No.1 piston is at TDC on compression stroke, valve springs of No.1 cylinder are not under tension.

2 Adjust intake valve clearance to 0.014 in. (0.35 mm).

3 Adjust the exhaust valve to 0.018 in. (0.45 mm).

NOTE
Some engines may have rocker arms with socket head hollow set screw located above the adjusting screw. The set screw must be backed off two or three turns before making valve adjustment.

4 Torque set screw to 7 ft-lb (10 Nm) after adjustment is made. Make sure set screw does not restrict lube oil passages in rocker arm.

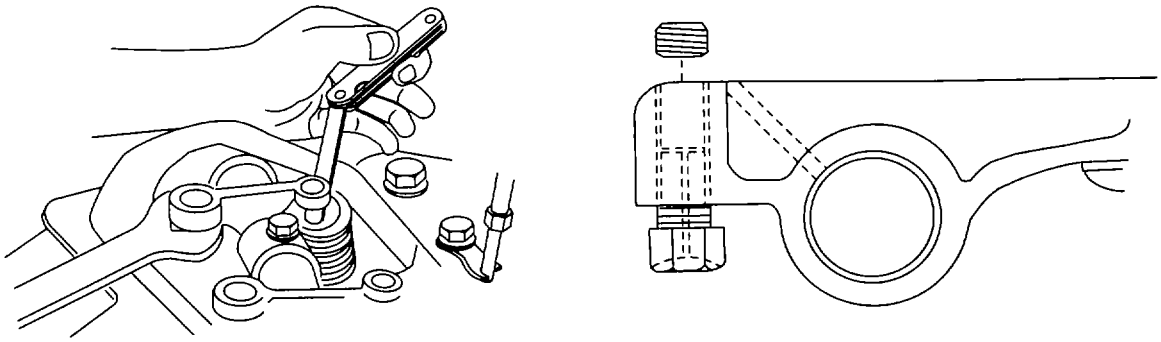


Figure 6-31. Valve Adjustment

6-6. ROCKER ARMS, CYLINDER HEAD, AND VALVES REPLACEMENT. - Continued

NOTE

Firing order is 1-2-3. Intake and exhaust valve locations are designated "I" and "E" in Figure 6-32.

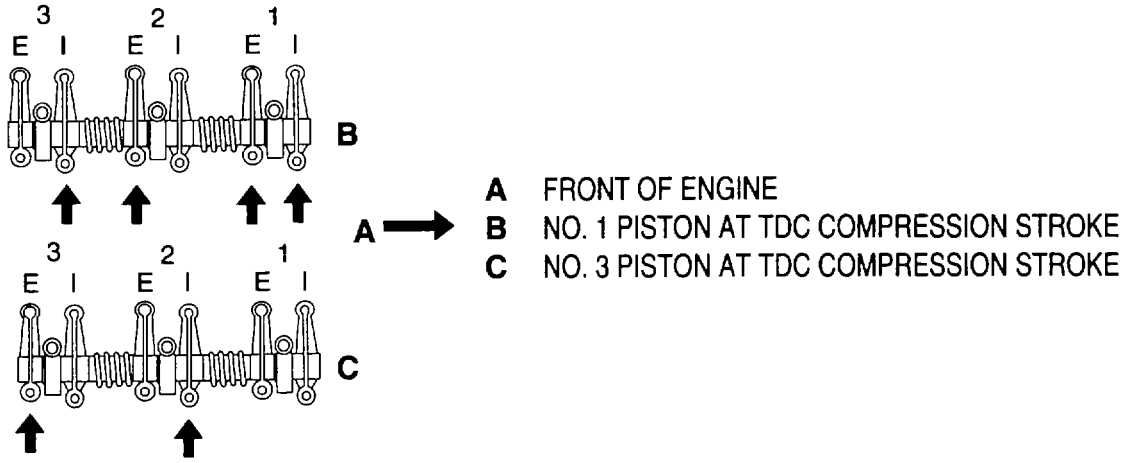


Figure 6-32. Firing Order

5 Adjust valve clearance on No.1 and 2 exhaust valves and No.1 and 3 intake valves.

6 Turn crankshaft 360° and reinsert timing pin.

7 Adjust valve clearance on No.3 exhaust valve and No.2 intake valves.

(4) Install rocker arm cover per paragraph 5-6.

(5) Install injection nozzles and injection lines per paragraph 6-3.

(6) Install exhaust manifold per paragraph 4-71.

(7) Install fuel filter per paragraph 4-69.

(8) Install thermostat housing per paragraph 4-70.

(9) Install engine air cleaner per paragraph 4-61.

(10) If engine oil was drained from crankcase, refill with new oil of correct grade and viscosity. Install a new oil filter per paragraph 4-62.

(11) Fill cooling system with clean coolant per paragraph 4-6, e.

(12) Change engine oil and oil filter after 100 hours of operation.

6-7. ENGINE OIL PAN INSPECTION AND REPLACEMENT.

This task covers:
a. Inspection b. Removal c. Installation

INITIAL SETUP

Tools:

Automotive Maintenance and Repair
Item 2, Section III, Appendix B

Equipment Conditions:

Engine removed. (See para 4-72.)

a Inspection. Check engine oil pan for any dents or holes. Replace if damaged.

b Removal.

CAUTION

The oil pan is attached with twenty four screws, of two different lengths. Note their positions as they are removed to prevent equipment damage.

(1) Remove 24 each cap screws (Figure 6-33, 1) lock washers (2) and straps (3) and pull oil pan (4) and gasket (5) away from engine. Discard gasket and lock washers.

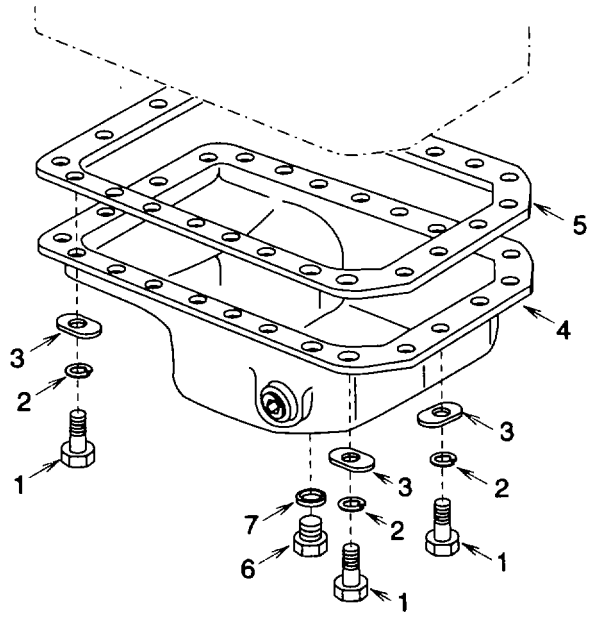


Figure 6-33. Engine Oil Pan

(2) Remove drain plug (6) and washer (7).

(3) Remove all old gasket material from oil pan and engine flange surfaces.

6-7. ENGINE OIL PAN INSPECTION AND REPLACEMENT. - Continued

c Installation.

(1) Place new gasket (5) (item 54, appendix H) on flange face.

(2) See cap screw length positions noted at disassembly and install oil pan (4) with twenty four cap screws (1) new lock washers (2) (item 43, appendix H) and straps (3). Torque cap screws to 35 ft-lb (50 Nm).

(3) Place aluminum washer (7) on plug (6) with raised center against plug.

(4) Install plug (6) and washer (7) in oil pan.

(5) Install engine per paragraph 4-72.

6-8. ENGINE OIL PUMP INSPECTION, REPAIR AND REPLACEMENT.

This task covers:
a. Removal b. Inspection c. Repair d. Installation

INITIAL SETUP

Tools:

Automotive Maintenance and Repair
Item 2, Section III, Appendix B

Equipment Conditions:

Engine removed. (See para 4-72.)
Oil pan removed. (See para 6-7.)

Personnel Required:
Two

a. Removal.

(1) Retain gear (Figure 6-34, 2) and remove nut (1) from gear (2) and pump shaft (3).

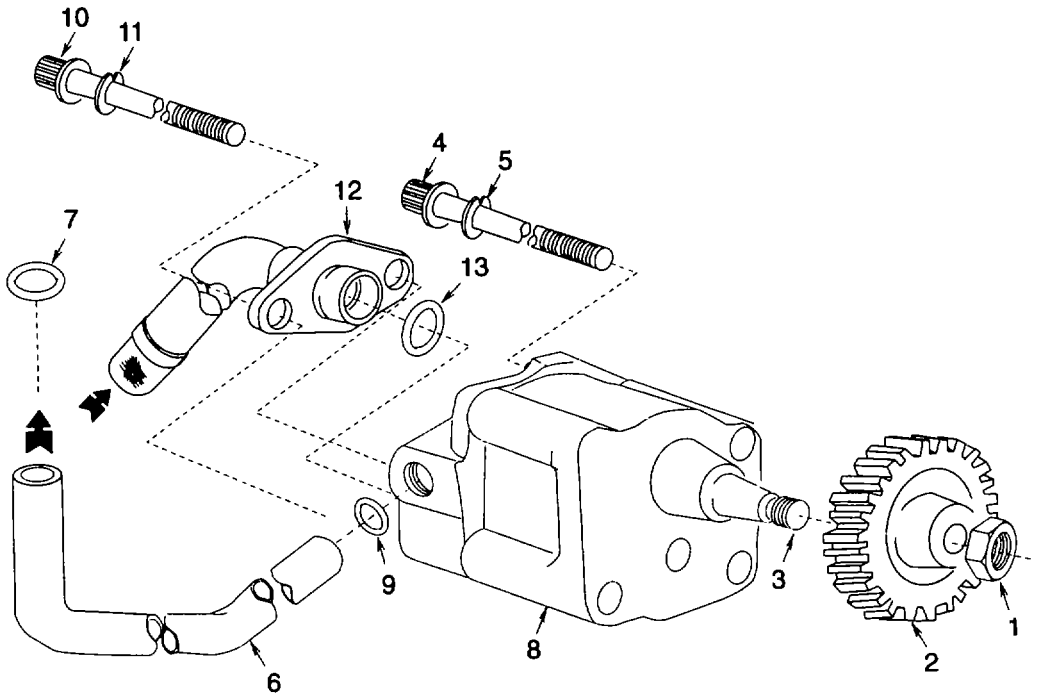


Figure 6-34. Oil Pump

(2) Remove three oil pump-to-front plate cap screws (4), lock washers (5) and intake tube (12). Discard lock washers.

(3) Remove gear (2).

6-8. ENGINE OIL PUMP INSPECTION, REPAIR AND REPLACEMENT.

(4) Remove outlet tube (6).

(5) Remove preformed packing (7) from outlet tube bore in block. Discard preformed packing.

(6) Remove housing and gear assembly (8) from front plate.

(7) Remove outlet tube (6) from cover.

(8) Remove o-ring (9) with preformed packing hook. Discard preformed packing.

(9) Remove cap screw (10) and lock washer (11) and pick up tube (12). Discard lock washer.

(10) Remove preformed packing (13) from pick-up tube. Discard preformed packing.

(11) Clean all oil pump parts in solvent (item 11, section II, appendix E). Use compressed air to dry parts.

b. Inspection.

(1) Inspect pick-up tube. Check flange-to-tube weld for cracks. If cracks or other defects are found, replace pick-up tube.

(2) Measure clearances for the following:

(a). Axial clearance between gear and pump cover.

1 Place a straight edge (Figure 6-35, 1) across the face of the pump.

2 Thickness of the gears is 1.62-1.622 in. (41.15-41.20 mm).

3 Axial clearance should be 0.002-0.007 in. (0.05-0.17 mm).

4 The maximum permissible axial clearance should be 0.0085 in. (0.22 mm).

5 Replace pump if clearances exceed tolerances.

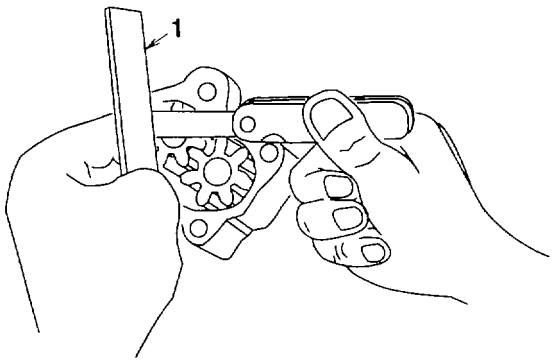


Figure 6-35. Oil Pump Axial Clearance

(b) Radial clearance between gear and pump housing are as follows:
1. Insert gauge (Figure 6-36, 1) between oil pump and gear.
2. A measurement of 0.004 - 0.006 in. (0.10 - 0.16 mm) is the norm.
3. The maximum permissible radial clearance is 0.008 in. (0.20 mm).
4. Replace pump if clearance exceeds tolerances.

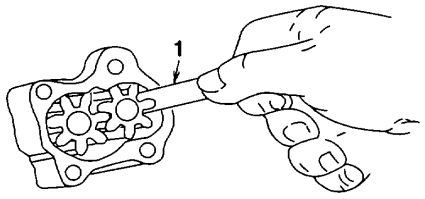


Figure 6-36. Oil Pump Radial Clearance

(c) Housing bore ID and pump shaft OD are as follows:
1. Measure the housing bore (Figure 6-37). The measurement taken should be 0.632 - 0.633 in. (16.05-16.08 mm).
2. The maximum permissible wear is 0.003 in. (0.08 mm).
3. Measure drive shaft OD. The measurement taken should be 0.630 - 0.631 in. (16.05-16.08 mm).
4. The maximum permissible wear is 0.001 in. (16.02 - 16.03 mm).

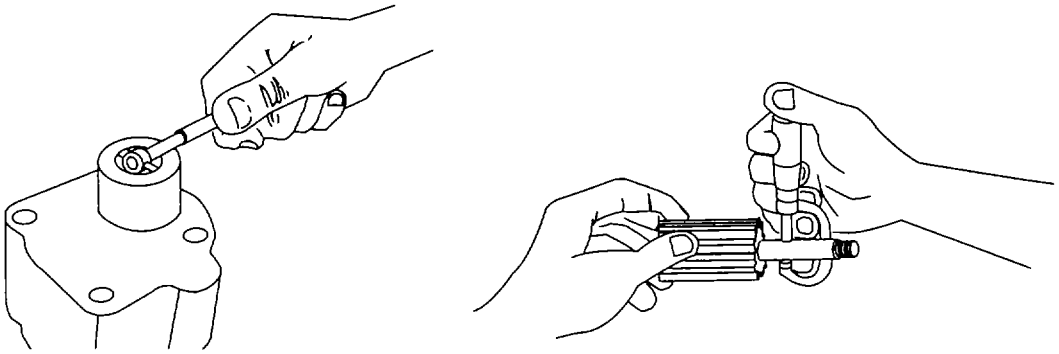


Figure 6-37. Oil Pump Housing Bore and Shaft OD

6-8. ENGINE OIL PUMP REPLACEMENT. - Continued

5. Measure the Idler shaft OD. The measurement taken should be 0.485 - 0.486 in. (12.32 - 12.34 mm).
6. The maximum permissible wear is 0.0005 in. (0.013 mm).
7. Replace pump if any of the above stated tolerances are exceeded.

c. Repair. Repair of pump is limited to replacement.

d. Installation.

(1) Install a new preformed packing (Figure 6-34, 7) (item 56, appendix H) in cylinder block (for outlet tube).

(2) Install a new preformed packing (13) (item 57, appendix H) on oil intake pickup tube (12).
(3) Install new preformed packing (9) (item 58, appendix H) in outlet tube bore in housing and gear assembly (8).
(4) Install pump on front plate with cover, pick-up tube (12), and outlet tube (6).
(5) Install the three cap screws (4) and new lock washers (5) (item 43, appendix H) and torque to 35 ft-lb (50 Nm).

(6) Turn oil pump shaft by hand to be sure it turns easily.
(7) Install oil pump gear (2) and nut (1). Torque nut to 40 ft-lb (54 Nm).

(8) Stake nut (1) to pump shaft (3).
(9) Install oil pan per paragraph 6-7.
(10) Install engine per paragraph 4-72.

6-9. CAMSHAFT, AND TIMING GEAR TRAIN INSPECTION. REPAIR AND REPLACEMENT.

This task covers:
a. INSERT FUNCTION b. INSERT FUNCTION c. INSERT FUNCTION

INITIAL SETUP

Tools:
Automotive Maintenance and Repair
Item 2, Section III, Appendix B

Personnel Required:
Two

Equipment Conditions:
Engine removed. (See para 4-72.)
Water pump removed. (See para 5-5.)
Alternator removed. (See para 6-5.)
Crankshaft pulley removed. (See para 6-10.)
Oil Pan removed. (See para 6-7.)
Engine oil cooler removed. (See para 4-68.)

a. Removal.

(1) Remove the oil pressure regulating valve assembly by unscrewing plug (Figure 6-38, 1) and withdrawing parts.

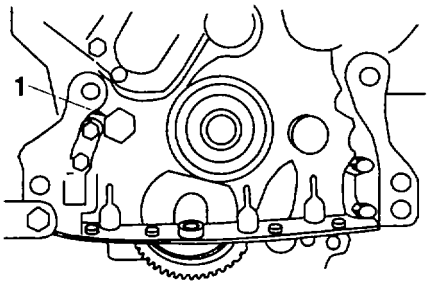


Figure 6-38. Oil Pressure Regulating Valve Plug

NOTE

There are two different size cap screws, note the location when removed and replace in original holes.

(2) Remove timing gear cover cap screws and washers. Remove cover.

(3) Remove key (Figure 6-39,1) and oil deflector (2) from crankshaft.

6-9. CAMSHAFT. AND TIMING GEAR TRAIN. - Continued

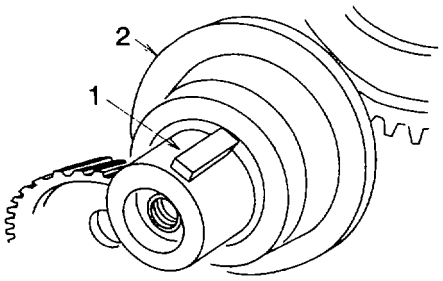


Figure 6-39. Oil Deflector

(4) Measure camshaft end play (Figure 6-40).

(a) New camshaft end play is 0.002 - 0.009 in. (0.05 - 0.23 mm). Maximum allowable end play is 0.015 in. (0.38 mm).

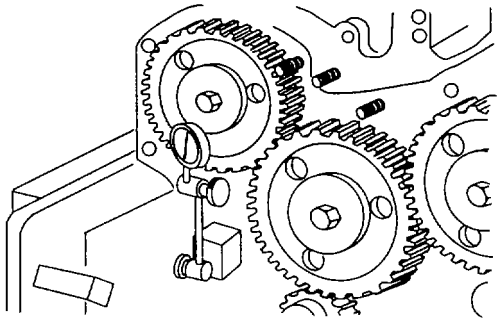


Figure 6-40. Camshaft End Play

(b) If end play is excessive, check thrust plate thickness using a new thrust plate and a feeler gauge after camshaft is removed. If camshaft end play is correct, measure timing gear backlash.

(5) Measure timing gear backlash.

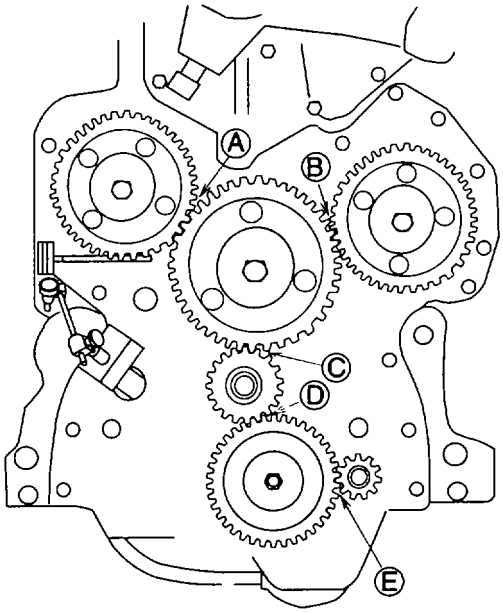


Figure 6-41. Gear Backlash

(a) Measure backlash between gears. Specifications of backlash of new parts is as follows:
1 Gear (Figure 6-41, A): 0.003 - 0.014 in. (0.07 - 0.35 mm).
2 Gear (B): 0.003 - 0.014 in. (0.07 - 0.35 mm).
3 Gear (C): 0.003 - 0.012 in. (0.07 - 0.30 mm).
4 Gear (D): 0.003 - 0.014 in. (0.07 - 0.35 mm).
5 Gear (E): 0.002 - 0.014 in. (0.05 - 0.36 mm).

(b) If backlash is not correct, install new gears.

(6) Measure idler gear end play with a dial indicator (Figure 6-42). Check end play of upper and lower idler gears.
(a) End play should read 0.001 - 0.007 in. (0.02 - 0.17 mm).
(b) Maximum wear tolerance is 0.015 in. (0.26 mm).

6-9. CAMSHAFT, AND TIMING GEAR TRAIN. - Continued

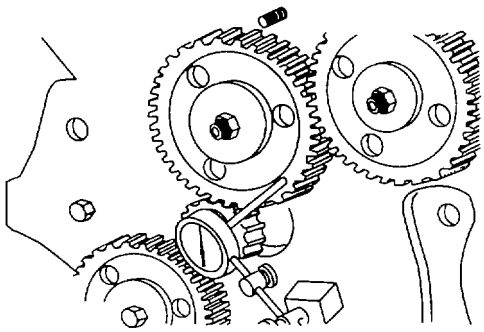


Figure 6-42. Idler Gear End Play

(7) Remove camshaft.

(a) Remove rocker arm assembly and pushrods. (See para 6-6.)

(b) Move cam followers off camshaft lobes using magnetic tape lifting tools (Figure 6-43, 1) if available.

NOTE

Cam followers can be moved off lobes by turning engine up-side down if lifting tools are not available.

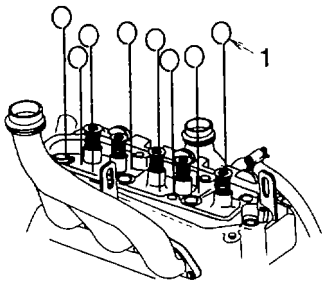


Figure 643. Lifting Tools

(8) Remove fuel transfer pump per paragraph 6-48.

(9) Turn crankshaft until cap screws (Figure 6-44, 1) can be removed.

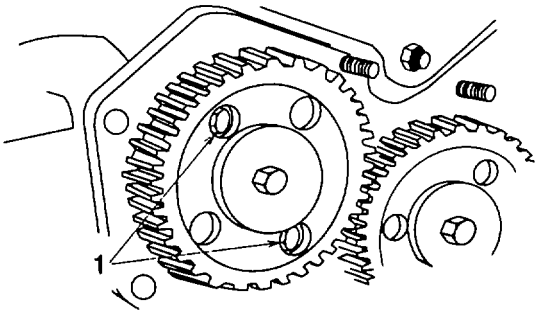


Figure 6-44. Cap Screw Location

(10) Turn engine front side up.

CAUTION

Do not allow camshaft lobes to drag an its honed bearing bore surfaces while removing camshaft from cylinder block.

(11) Remove cap screws (1). Pull camshaft (Figure 6-45, 1) straight up, out of cylinder block. Remove thrust plate (2).

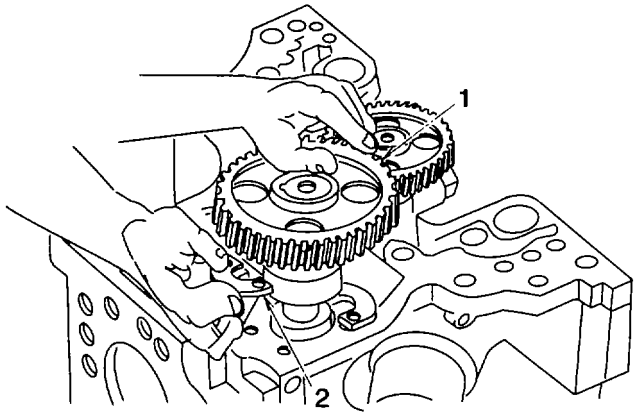


Figure 6-45. Pull Camshaft

6-9. CAMSHAFT, AND TIMING GEAR TRAIN. - Continued

(12) Clean and inspect camshaft and thrust plate.
(a) Clean camshaft and thrust plate in solvent (item 11, section II, appendix E). Dry with compressed air.

(b) Visually inspect camshaft lobes and journals for wear or damage. Replace as necessary. New cam followers can be used with old camshaft (if camshaft is serviceable). However, do not reuse old cam followers with a new camshaft.

NOTE

Very light score marks may be found, but are acceptable if valve lift is within specification. Pitting or galling dictates replacement.

(13) Measure camshaft thrust plate clearance. Check thrust plate clearance using a feeler gauge (Figure 6-46, 1). New part clearance is 0.003 - 0.009 in. (0.08 - 0.23 mm). Maximum allowable clearance is 0.015 in. (0.38 mm). Replace parts as necessary.

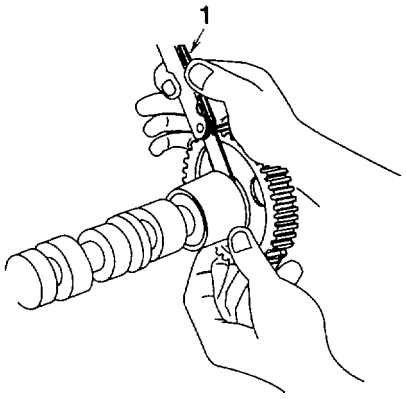


Figure 6-46. Thrust Plate Clearance

(14) Measure camshaft journals (Figure 6-47).

(a) New camshaft journal diameter is 2.200 - 2.201 in. (55.87 - 55.90 mm).

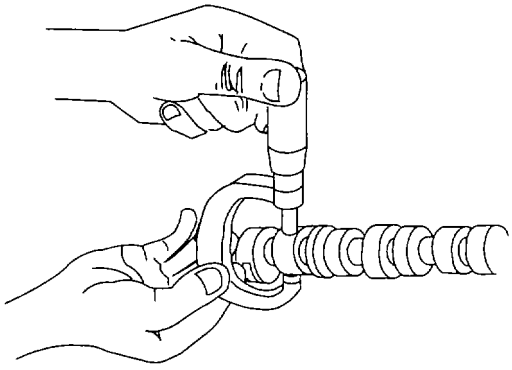


Figure 6-47. Camshaft Journal Diameter

(b) If a camshaft journal diameter is less than 2.199 in. (55.85 mm), install a new camshaft.
(c) Measure camshaft bearing bore diameter in cylinder block: 2.204 - 2.205 in. (55.98 - 56.01 mm). Maximum clearance 0.007 in. (0.18 mm).

(15) Measure camshaft lobe height (Figure 6-48).
(a) Measure each camshaft lobe at highest point and at narrowest point. Subtract narrowest dimension from highest dimension to find camshaft lobe height.

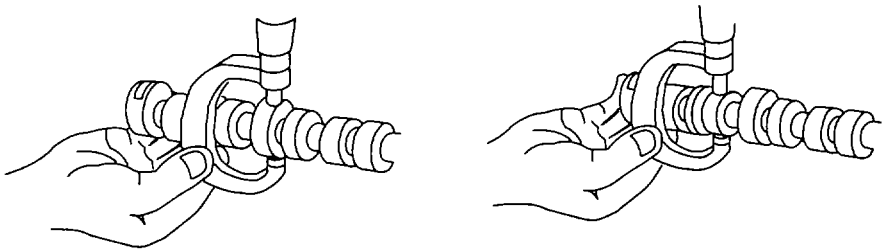


Figure 6-48. Camshaft Lobe Height

(b) New camshaft lobe height is 0.266 - 0.286 in. (6.76 - 7.26 mm).
(c) If height is not correct on any lobe, install a new camshaft.
(16) Remove and install camshaft gear (Figure 6-49).
(a) Press camshaft out of gear.

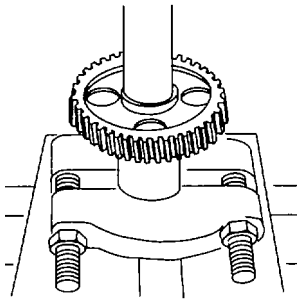


Figure 6-49. Camshaft Gear Removal

(b) Install gear with timing mark (Figure 6-50, 1) away from camshaft. Align slot in gear with Woodruff key. Press gear on shaft with a tubular driver. Press gear against shoulder on camshaft.

6-9. CAMSHAFT, AND TIMING GEAR TRAIN. - Continued

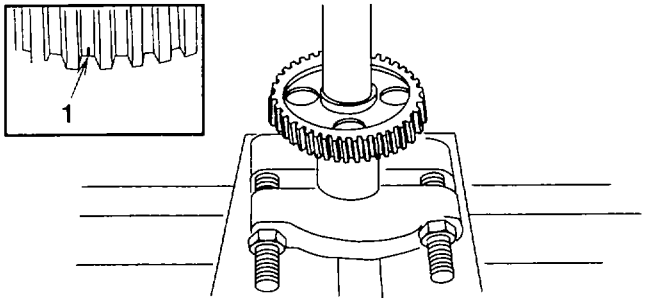


Figure 6-50. Camshaft Gear Installation

(17) Remove timing gears and cylinder block front plate.

(a) Remove camshaft and drive gear, injection pump, oil pump drive gear, oil pump drive gear, and idler gears.

(b) Remove five flat-head screws (Figure 6-51, 1) and lift off front plate.

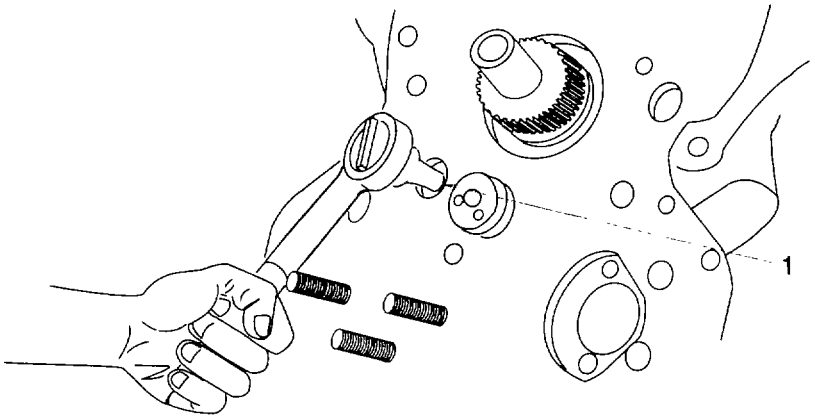


Figure 6-51. Front Plate

(c) Remove oil by-pass valve (Figure 6-52, 1) and spring (2).

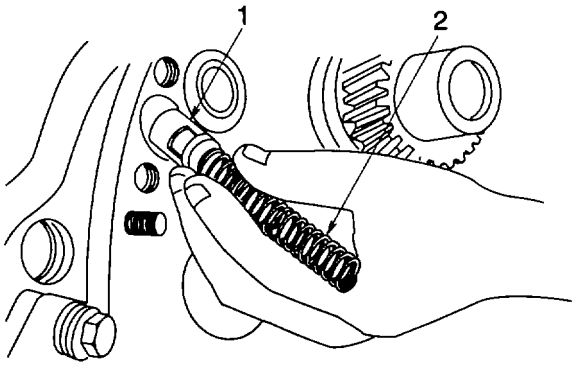


Figure 6-52. Oil By-pass Valve and Spring

(18) Measure idler gear bushing and shaft (Figure 6-53). Idler gear specifications are as follows:

(a) New parts dimensions:

1	Bushing ID	1.751 - 1753 in. (44.94 - 44.54 mm).
2	Shaft OD	1.750 - 1.751 in. (44.44 - 44.47 mm).
3	Oil Clearance	0.001 - 0.003 in. (0.03 - 0.08 mm).
4	Wear Limit for oil clearance	0.0006 in. (0.14 mm).

(b) If oil clearance is more that the specification, replace worn parts with new ones.

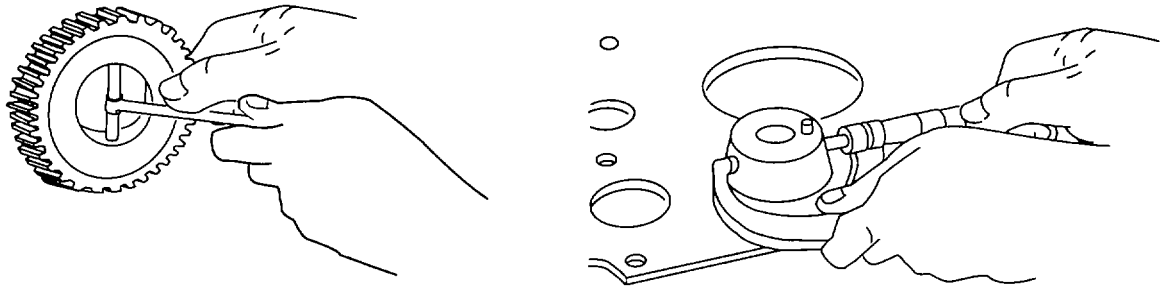


Figure 6-53. Idler Gear and Bushing

6-9. CAMSHAFT. AND TIMING GEAR TRAIN. - Continued

(19) Remove and install idler gear bushings.

(a) Press worn idler gear bushings out of gears (Figure 6-54).

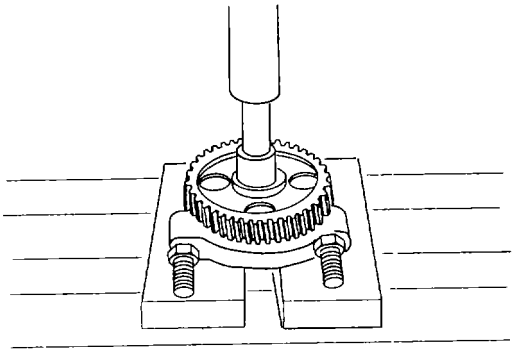


Figure 6-54. Idler Gear Bushing Removal

NOTE

Upper and lower idler gear bushings have the same ID, but are different. Bushing with spiral oil groove goes in lower idler gear. Bushing without groove goes in upper idler gear (pressure lubed). Do not intermix bushings.

(b) Install correct bushing into respective idler gear using driver (item 17, section III, appendix B) and handle (item 18, section III, appendix B) (Figure 6-55).

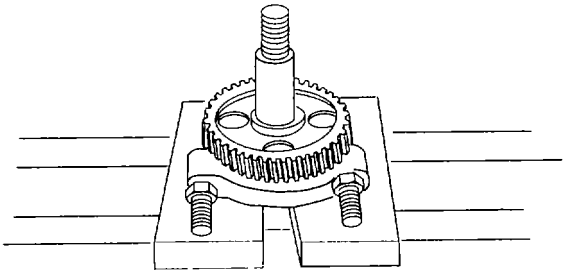


Figure 6-55. Idler Gear Bushing Installation

(20) Remove idler shafts. Remove upper and lower idler shaft by driving or pressing shaft out of front plate. Remove thrust washer.

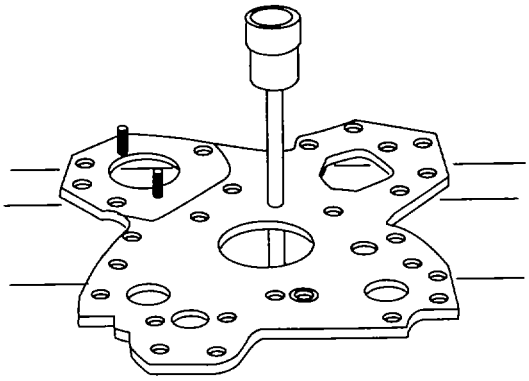


Figure 6-56. Idler Shaft Removal

(21) Clean and inspect front plate.

(a) Remove all old gasket material from front plate and engine block.

(b) Clean plate with solvent (item 11, section II, appendix E) and dry with compressed air. Wipe front face of engine block with a clean cloth. Be sure gasket surface on engine block is clean.

(c) Inspect front plate for wear or damage. Replace if necessary.

b. Repair. Repair is limited to replacement of defective, damaged, or out-of-tolerance parts.

c. Installation.

(1) Front plate installation.

(a) New replacement front plates do not have a timing mark for the fuel injection pump. A new timing mark must be established at reassembly. See paragraph 6-4.

(b) Install studs (Figure 6-57, 1) in front plate for injection pump. Install set screws (2) in threaded holes not used for the studs.

6-9. CAMSHAFT. AND TIMING GEAR TRAIN. - Continued

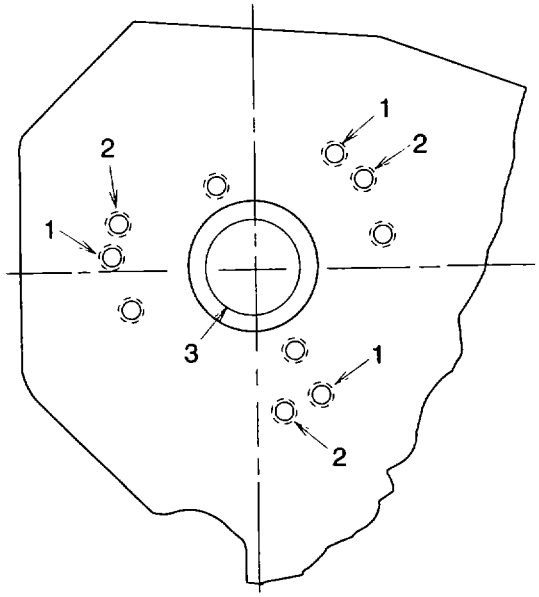


Figure 6-57. Front Plate Studs

(c) Replacement plate may have a bushing installed that may have to be removed. Compare bore to old front plate.

(d) Install upper and lower idler shafts by pressing shaft (Figure 6-58, 1) and thrust washer (2) in place in front plate.

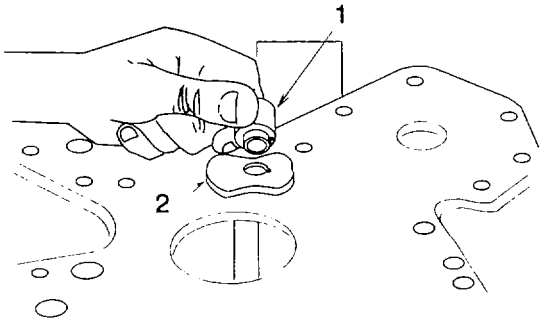


Figure 6-58. Front Plate

(e) Install oil by-pass valve (Figure 6-59, 1) and spring (2).

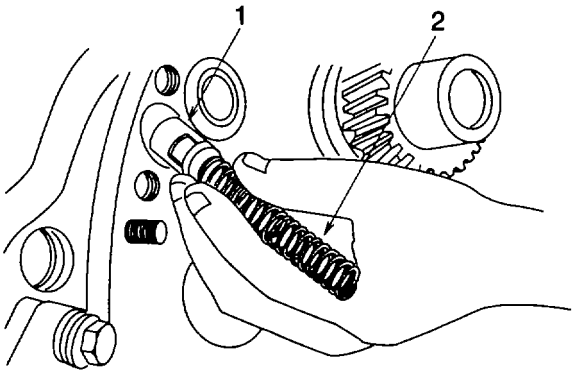


Figure 6-59. Oil By-pass Valve

(f) Apply a light coating of Permatex No. 3 (or equivalent) to cylinder block side of new gasket.

(g) Install new gasket (item 59, appendix H) and front plate. Place new external-tooth washers (item 77, appendix H) on screws and torque screws 25 ft-lb. (35 Nm).

(h) Cut off protruding edge of gasket only after timing gear cover has been tightened.

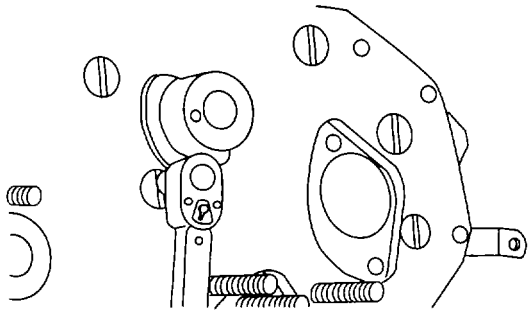


Figure 6-60. Front Plate Installation

(2) Install and time camshaft.

(a) Make sure engine is at TDC, (No. 1 piston on compression stroke) with timing pin engaged in flywheel.

(b) Install fuel injection pump hex nut (Figure 6-15, 4), washer (5), and pump drive gear..

(c) Torque injection pump-to-front plate hex nuts 18 ft-lb. (25 Nm). Torque injection pump drive gear hex nut (4) to 44 ft-lb (60 Nm).

(d) Put clean engine oil on camshaft bearing journals.

6-9. CAMSHAFT, AND TIMING GEAR TRAIN. - Continued

CAUTION
Do not allow camshaft lobes to drag on the honed bearing surfaces while installing cam-shaft. Machine surfaces may become scratched or scored.

(e) Install camshaft (Figure 6-61, 1) and thrust plate (2) in cylinder block.

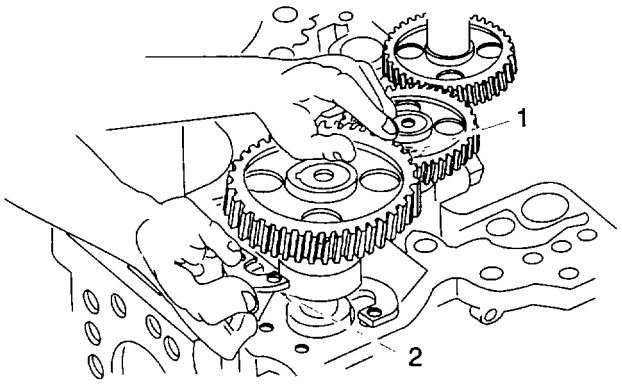


Figure 6-61. Install Camshaft

(f) Install cap screws and torque 35 ft-lb (50 Nm).

(g) Turn camshaft until timing mark (Figure 6-62, 1) is under Timing Tool (item 19, section III, appendix B).

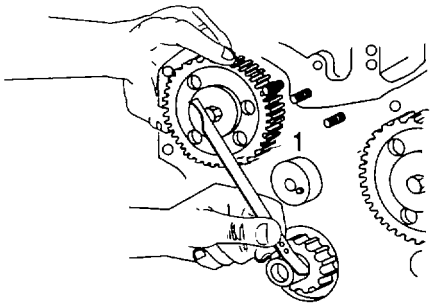


Figure 6-62. Timing Mark

(h) Check injection pump gear timing with Timing Tool (item 19, section III, appendix B). Timing mark (Figure 6-63, 1) with 3 (indicating 3 cylinder engine) beside it must be under timing tool.

NOTE
Use the timing mark corresponding to the number of cylinders.

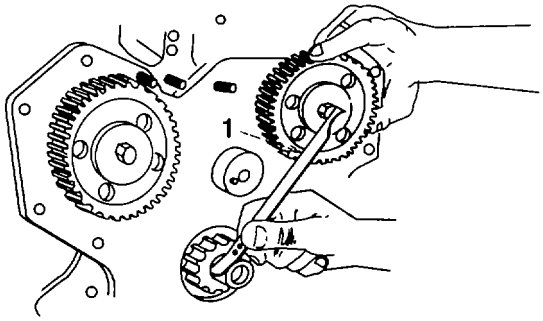


Figure 6-63. Injection Pump Timing

(i) Install upper idler gear (Figure 6-64, 1) on shaft without turning camshaft gear or injection pump gear.

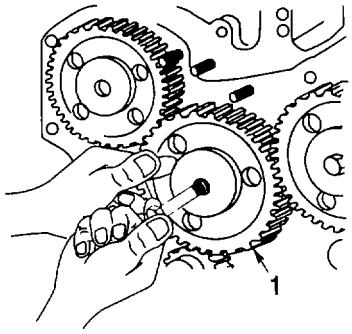


Figure 6-64. Install Upper Idler Gear

(j) Install washer and cap screw. Torque cap screw to 65 ft-lb (90 Nm).

(k) Install lower idler gear without turning balancer shaft using a cap screw, retaining washer, flat washer and nut. Apply thread lock sealant (item 13, section II, appendix E) and torque nut to 75 ft lb (100 Nm).

(1) Recheck gear timing to make sure it is still correct.

6-9. CAMSHAFT, AND TIMING GEAR TRAIN. - Continued

(3) Clean and inspect timing gear cover.

(a) Drive crankshaft front oil seal out of cover.

(b) Remove all old gasket material and sealant from gasket surface on cylinder block and timing gear cover. If necessary, remove oil filter neck and gasket and injection pump drive gear nut cover plate and gasket.

CAUTION

Do not allow ball bearings to spin when drying with compressed air.

(c) Clean cover in solvent and dry with compressed air.

(d) Inspect cover for cracks or damage. Make sure that seal bore is clean and not nicked.

(4) Install crankshaft front oil seal.

(a) Apply a light coating of non-hardening sealant (such as Permatex No. 3) to OD of a new seal. Apply a light coating of grease to seal lip.

(b) Support the oil seal bore area of the timing gear cover.

(c) With timing gear cover removed from block, use Driver (item 20, section III, appendix B) and Handle (item 18, section III, appendix B) (Figure 6-65, 1) and press oil seal to bottom of bore with spring-loaded lip facing inward.

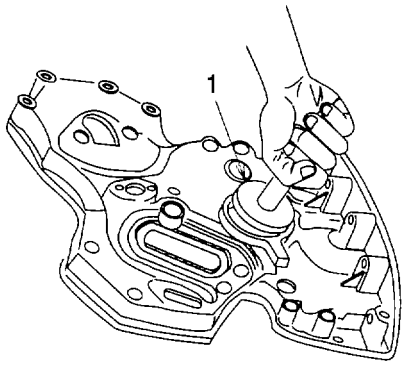


Figure 6-65. Oil Seal

(5) Install timing gear cover.

(a) Make sure gasket surfaces on cover and front plate are clean.

(b) Install oil deflector (Figure 6-66, 1) on crankshaft.

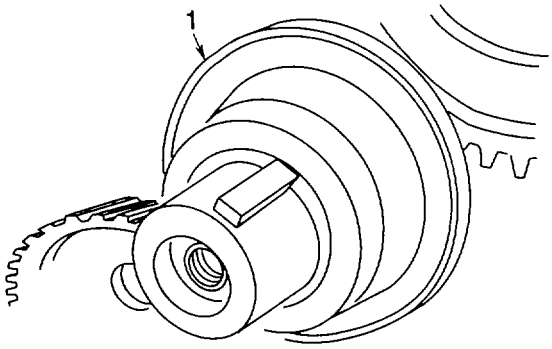


Figure 6-66. Install Oil Deflector

(c) Apply a light coating of non-hardening sealant to cylinder block side of a new gasket. Position gasket (item 60, appendix H) on front plate.

CAUTION
Do not invert crankshaft front oil seal lip.

(d) Install gear cover, alternator mounting bracket, gear cover cap screws, and washers. Torque to 35 ft-lb (50 Nm).

(6) If a new front plate-to-engine block gasket was installed, trim off protruding portion of both gaskets and apply sealant.

(7) Install the oil pressure regulating valve assembly and torque plug (Figure 6-37, 1) to 70 ft lbs (95 Nm).

(8) Install oil pan per paragraph 6-7.

(9) Install pulley on crankshaft per paragraph 6-10.

(10) Install fuel transfer pump per paragraph 4-68.

(11) Remove cam follower lifting tools (if used for camshaft removal).

(12) Install push rods and rocker arm assembly per paragraph 6-6.

(13) Install alternator, fan belt, and fan per paragraph 4-65.

(14) Install engine per paragraph 4-72.

(15) Fill engine crankcase with clean oil having correct viscosity and grade specifications per paragraph 4-6, c, (2).

(16) Adjust valve clearance per paragraph 6-6.

(17) Install rocker arm cover per paragraph 5-6.

6-10. CONNECTING ROD, PISTONS, RINGS, AND LINERS AND CYLINDER BLOCK INSPECTION, REPAIR AND REPLACEMENT.

This task covers:
a. REMOVAL b. INSPECTION c. REPAIR d. INSTALLATION

INITIAL SETUP

Tools:

Automotive Maintenance and Repair
Item 2, Section III, Appendix B

Equipment Conditions:

Cylinder head removed. (See para 6-6.)
Oil pump removed. (See para 6-8.)
Personnel Required:
Two

a. Removal.

NOTE
Do not rotate crankshaft with cylinder head removed unless liners are bolted down. Bolt liners down before removing pistons.

(1) Remove pistons and connecting rods.

(a) Use short cap screws (Figure 6-67, 1) and 1/8 in. (3.18 mm) thick washers (2) to bolt down cylinder liners (3). Fasten liners 3-cylinder in 4 locations. Torque cap screws to 50 ft-lb (68 Nm).

(b) Remove cam followers and keep in exact order.

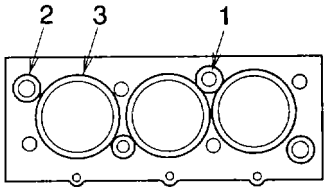


Figure 6-67. Cylinder Liners

CAUTION
Cap screws and washers must be tightened to the above specification to achieve an accurate reading when checking liner height above block, later in this paragraph.

(c) Remove carbon from liner bore with a scraper or reamer. Use compressed air to remove loose material from cylinders.

(d) Before removing pistons visually inspect condition of cylinder liners with pistons at bottom dead center "BDC". Liners will require replacement if:

1 The hone pattern is not visible all the way around the liner in over 75 percent of the ring travel area.

2 Liners are pitted or contain deep vertical scratches that can be detected by the fingernail.

3 No further inspection is required if any one of the above conditions are found.

(e) Connecting rod bearing clearance should be measured before removing piston/rod assembly. Be sure to check connecting rod cap screws for proper torque.

(f) Remove connecting rod cap. Place a piece of bearing clearance gauge (Plastigage) (item 21, 22, 23, section II, appendix E) (Figure 6-68, 1) in the center of the bearing. Install cap and torque cap screws 55 ft lbs (75 Nm).

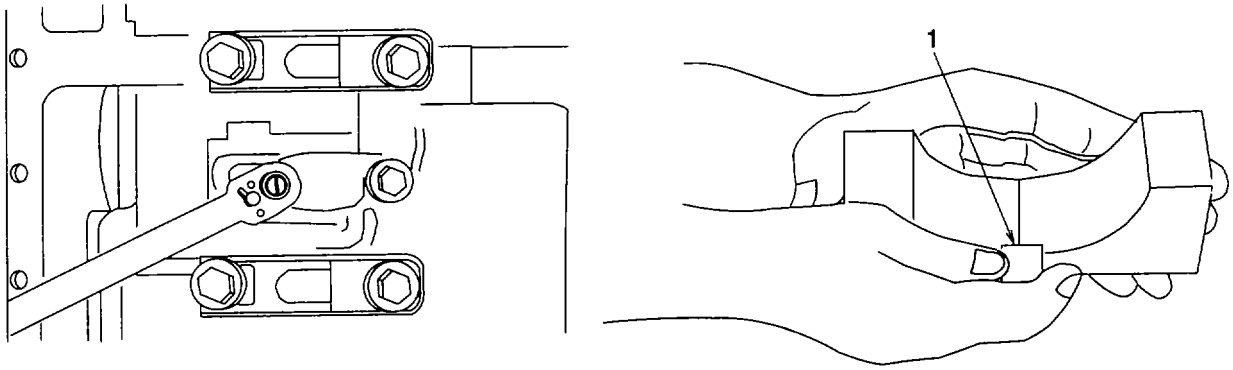


Figure 6-68. Connecting Rod Cap

(g) Remove cap and compare the width of bearing clearance gauge (Plastigage) with scale provided on the side of package to determine clearance. Maximum permissible clearance: 0.0062 in. (0.16 mm).

(h) Remove all rod caps with bearings.

1 If liners are to be reused, be extremely careful not to let connecting rod hit liner bore when removing piston/liner assembly.

2 Keep bearing inserts with their respective rods and caps. Mark rods, pistons, and caps to insure correct assembly in same location.

CAUTION

Once piston rings have cleared cylinder liner, hold on to piston to prevent piston from dropping.

(i) Gently tap piston through top of cylinder block from the bottom.

6-10. CONNECTING ROD, PISTONS, RINGS, AND LINERS AND CYLINDER BLOCK INSPECTION AND REPAIR. - Continued

(2) Measure cylinder height (Figure 6-69). Use a dial indicator and gauge (item 22, section III, appendix B).

NOTE

Variations in measurement readings may occur within one cylinder and/or between adjacent cylinders.

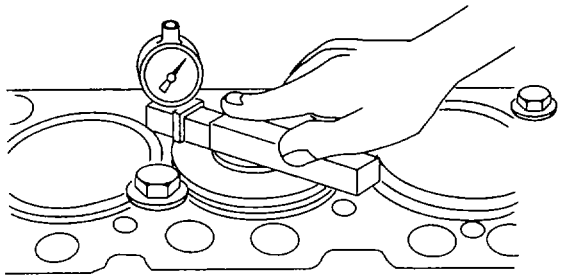


Figure 6-69. Measure Cylinder Height

(a) Measure each liner in four places, approximately at 1, 5, 7, and 11 o'clock positions as viewed from the rear of the engine (flywheel end). Record all measurements. Liner height Specifications are as follows:

1 Liner height above block 0.0004 - 0.004 in. (0.01-0.10 mm). NW

2 Maximum permissible difference between readings within one cylinder or between adjacent cylinders 0.002 in. (0.06 mm).

3 If liner height is less than minimum specified, one liner shim may be installed on bottom of liner flange. Two sizes of shims are available 0.002 in. (0.05 mm) and 0.004 in. (0.10 mm).

(b) Remove cap screws and washers securing liners to cylinder block.

NOTE

Each cylinder liner must be reinstalled in cylinder bore from which it was removed.

(c) Number cylinder liners and pistons. Stamp front of liner to assure correct assembly. Do not stamp liner flange; stamp on fire dam only.

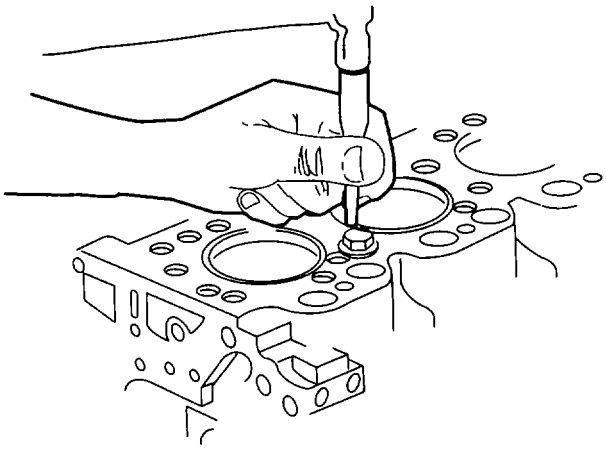


Figure 6-70. Number Cylinder Liners

(d) Pull liners out of cylinder block with puller (item 23, section III, appendix B).

1 If the KCD10001 Puller is used, secure puller with two cylinder head cap screws. If the D-01062AA or D-01073AA Puller is used, see following.

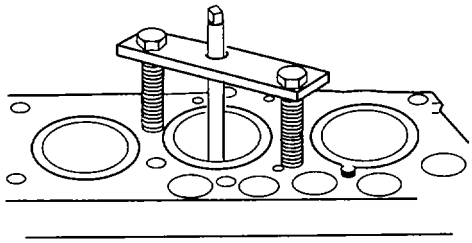


Figure 6-71. Pull Cylinder Liners

CAUTION

Do not over-tighten liner puller to remove liners. Doing so could easily break liners.

2 When using the D-01062AA (or D-01073AA) Cylinder Liner Puller (Figure 6-72, 1) to remove liners (2), be sure that jaw (3) of puller is correctly positioned before attempting to remove liner.

6-10. CONNECTING ROD, PISTONS, RINGS, AND LINERS AND CYLINDER BLOCK INSPECTION AND REPAIR. - Continued

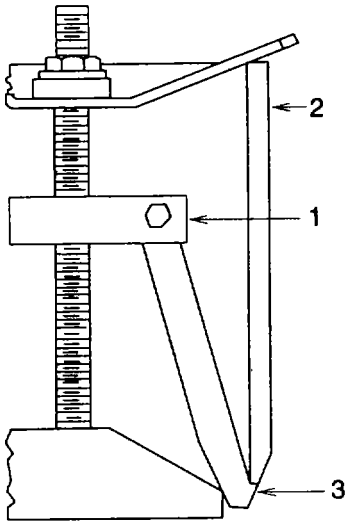


Figure 6-72. Cylinder Liner Puller

(e) Remove cylinder liner preformed packing (Figure 6-73, 1) from grooves in cylinder block (2). Also remove packing (3) from cylinder liner (4).

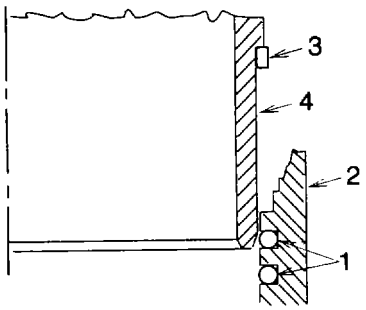


Figure 6-73. Cylinder Liner Performed Packing

(3) Remove the following to disassemble the cylinder block.

(a) Crankshaft pulley.

(b) Oil pressure regulating plug, valve, and spring.
(c) Timing gear cover, timing gears, and camshaft.

(d) Front plate and lubrication system oil bypass valve.
(e) Crankshaft and main bearings.
(f) Piston cooling orifices.

(g) Remove water gallery plugs.

(h) If necessary to "Hot Tank" the block, also remove screw-in type oil gallery plugs and the engine serial number plate.

(4) Disassemble piston and rod per the following:

(a) Remove piston pin snap rings and push piston pin out of piston.

(b) Separate piston and rod. Keep these parts in place with the respective cylinder liner.

(c) Discard piston rings and connecting rod bearings. Do not reuse.

b. Inspection.

(1) Pistons.

(a) Match piston with correct liner and check for scoring (arrows). Wear of this type could be caused by: engine overheating, or foreign material entering the cylinder through the oiling system. Check for any cracks or other obvious failures. If any defects are found, replace the piston and liner as required. If no defects are found, proceed to next step.

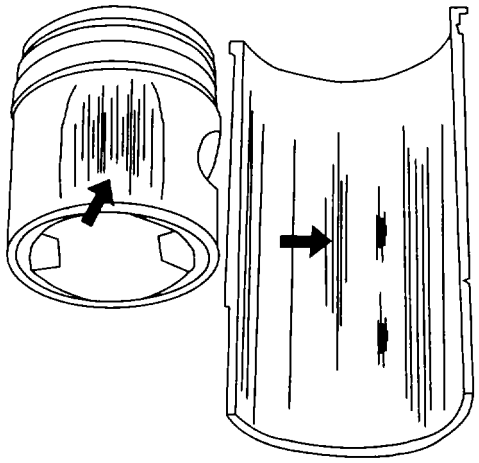


Figure 6-74. Inspect Pistons and Liners

(b) If piston ring face and ring land have excessive wear, replacement is necessary for both piston and liner. If no defects are found, proceed to next step.

(c) Remove piston rings using a Piston Ring Expander (Figure 6-75, 1). Discard rings.

6-10. CONNECTING ROD, PISTONS, RINGS, AND LINERS AND CYLINDER BLOCK INSPECTION AND REPAIR. - Continued

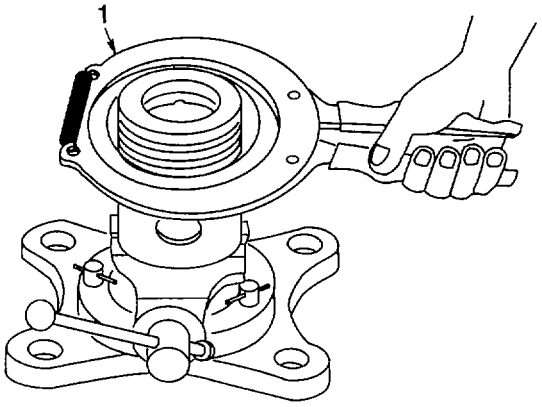


Figure 6-75. Remove Piston Rings

CAUTION

Always follow manufacturer's instructions, and safety steps exactly. When washing pistons, always use a stiff bristle brush, not a wire brush, to loosen carbon residue.

(d) Clean with hot water and liquid detergent, soak pistons in a 50 per cent solution of liquid household detergent and hot water for 30 to 60 minutes. Use a stiff bristle brush, but not a wire brush, to loosen , carbon residue. Dry with compressed air.

(e) Carefully use a stiff bristle brush to remove all debris and scale from the OD of the liners. Make certain there are no nicks or burrs in areas where packings will seat.

(f) Thoroughly clean liner ID with a 50 percent solution of hot water and liquid detergent.

(g) Rinse thoroughly and wipe dry with a clean, dry rag (item 2, section II, appendix E).

(h) Swab out liner as many times as necessary with clean lubricating oil (item 10, section II, appendix E).

(i) Continue to clean liner until a clean, white rag shows no discoloration.

CAUTION

Gasoline, or commercial solvents have a high flash point and can ignite and cause personal injury to personnel.

NOTE

Solvents will not remove all the abr asives from liner walls.

(j) Carefully inspect the clean pistons under magnification for signs of fatigue.

(k) Look for fine cracks in the piston head (Figure 6-76, 1).

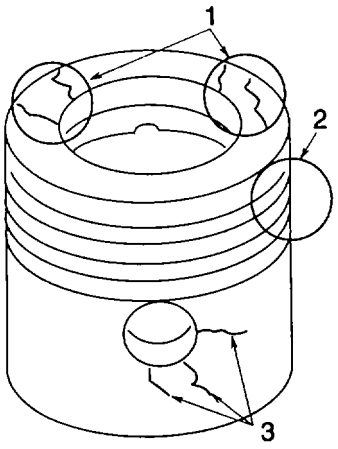


Figure 6-76. Inspect Pistons for Cracks

(1) Inspect for bent or broken ring lands (2).

(m) Inspect the inner and outer ends of the piston pin bore for cracks in the skirt (3).

(n) If the original machining marks are not visible, or the piston skirt is worn to the depth of the original machining marks, replace both piston and liner.

(o) If any defects are found, replace the piston and liner as a set. If no defects are found, proceed to next step.

(p) Use the Ring Groove Wear Gauge (3) (item 24, section III, appendix B) to check wear of keystone ring groove (top groove). Clearance (4) between shoulders of tool and ring land indicate that ring groove is good. If ring groove is worn, replace piston and liner as a set. If ring groove is good, proceed to next step.

1 Piston (Figure 6-77, 1) with good keystone ring groove.

2 Piston (2) with worn keystone ring groove.

3 JDE - 62 gauge (3).

4 Tool shoulder-to-ring land clearance (4).

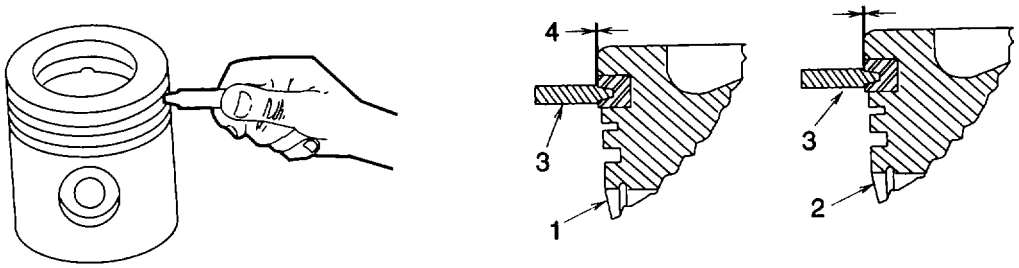


Figure 6-77. Check Keystone Ring Groove

6-10. CONNECTING ROD, PISTONS, RINGS, AND LINERS AND CYLINDER BLOCK INSPECTION AND REPAIR. - Continued

(q) Check second and third ring grooves using a new piston ring (Figure 6-78, 1) and a feeler gauge. Ring groove clearance must not exceed 0.008 in. (0.20 mm). Replace piston if clearance is exceeded.

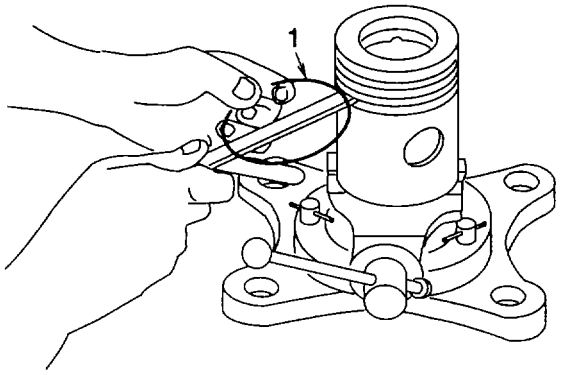


Figure 6-78. Check Second and Third Ring Grooves

NOTE
Piston pin must be in good condition and not worn beyond specification given below.

(r) Dip piston pin in clean engine oil.

(s) Install pin (Figure 6-79, 1) through piston.

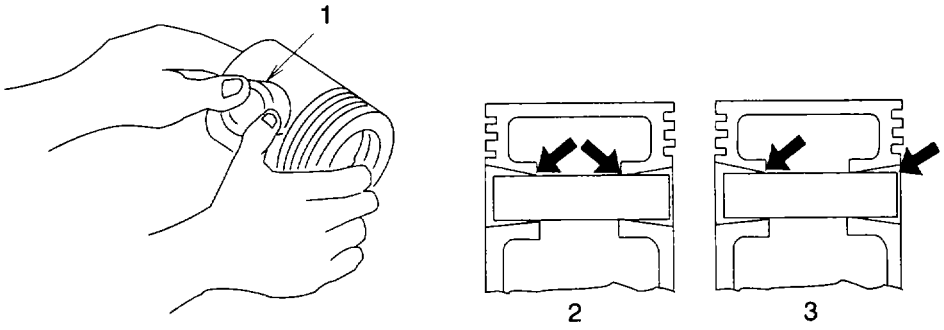


Figure 6-79. Install Pin

1 Pin (1) should pass through piston using only light thumb pressure.

2 Check taper in piston pin bore by inserting pin from both sides. If pin enters freely, but binds in the center, the bore could be tapered (2).

3 If bore is not tapered, insert pin to check for bore alignment. Pin should not "click" or need to be forced into bore on opposite side (3).

(t) Check piston pin and piston bore specifications. If either are not within specification replace pin and piston.

Pin/Bore Specifications

Piston Pin OD
Small pin ..... .1.374 - 1.375 in. (34.92 - 34.93 mm)
Large pin ..... 1.6247 - 1.6253 in. (41.27 - 41.28 mm)

Wear Tolerance. ..... 0.005 in. (0.13 mm)

Piston Bore (For Pin)
Small pin ..... 1.3753 - 1.3757 in. (34.93 - 34.94 mm)
Large Pin . ..... .1.6254 - 1.6258 in. (41.285 - 41.295 mm)

NOTE

Some piston bores are elliptical, the width being 0.0015 in. (0.038 mm) larger than the above specifications.

(2) Liners.

(a) Inspect exterior length of liner for pitting (Figure 6-80, 1). Check packing step for erosion (2). If pitting or erosion is observed, measure the depth of pits and erosion with a fine wire or needle. If pitting has occurred, check condition of coolant.

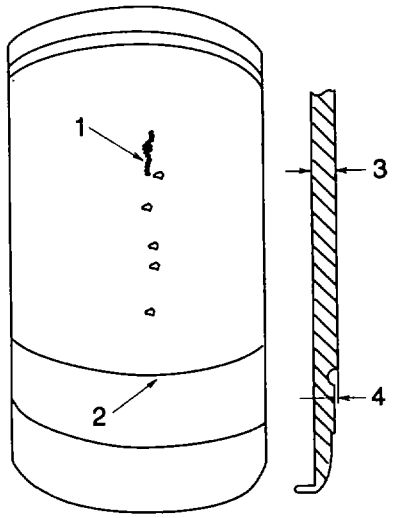


Figure 6-80. Inspect Liner for Pitting

(b) Replace liner if any of the following problems are noted:

1 Depth of any pit is one-half or more of liner thickness (3).

2 Depth of erosion is one-half or more of the packing step (4).

6-10. CONNECTING ROD, PISTONS, RINGS, AND LINERS AND CYLINDER BLOCK INSPECTION AND REPAIR. - Continued

NOTE

Liners are reusable if the depth of pits or erosion is less than the amount specified. When installing these liners, rotate 90° from original position. The liners should be deglazed and ring sets installed on pistons. If NO defects are found, proceed to next step.

(c) Carefully examine the cylinder liner for signs of fatigue, such as fine cracks in the flange area (Figure 6-81, 1) and cracks in the ring travel area (2).

(d) Inspect block for cracks or erosion in the preformed packing area. Replace block if any of these defects are found.

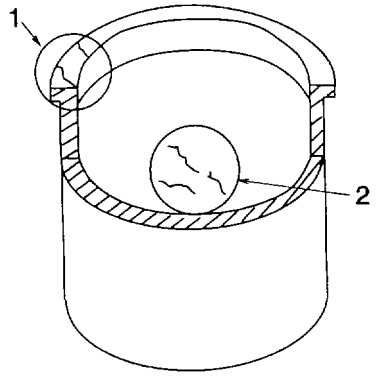


Figure 6-81. Inspect Liner for Cracks

(e) If any defects are found, replace the liner. If no defects are found, and pistons and liners have passed all previous checks, proceed to check both for proper specifications.

(f) Measure piston skirt (A, Figure 6-82) at right angles to piston pin bore at 0.74 in. (19 mm) from bottom of piston (B). Record measurement.

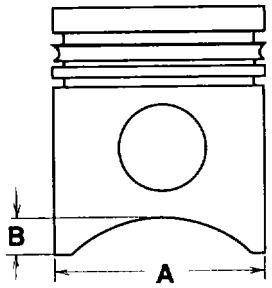


Figure 6-82. Measure Piston

(g) Measure cylinder liner as directed in step (h) and compare with piston measurement. Piston Skirt Diameter Specifications.

1 Dimension (B) bottom of skirt 0.74 in. (19 mm) from bottom of piston.

2 Dimension (A) 4.188 - 4.189 in. (106.38 - 106.40 mm).

(h) Measure piston to liner clearance.

1 Put piston in matched liner with piston "front" and liner "front" aligned. Move piston down until bottom edge of piston skirt is 1.00 in. (25.4 mm) (C, Figure 6-83) above bottom of liner. Use a feeler gauge to measure distance (d)between piston skirt and liner 90° to piston pin bore. Record the measured distance (D). Piston to liner clearance (measured at bottom of piston skirt) 0.003 - 0.005 in. (0.08-0.14 mm).

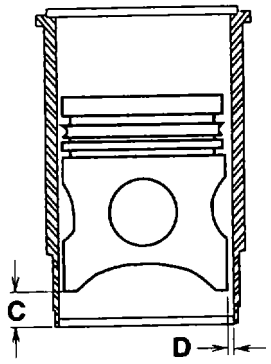


Figure 6-83. Piston Clearance

2 Turn piston 90° in liner. Use a feeler gauge to measure distance between piston skirt and liner 90° to piston pin bore. Record the measured distance. The difference between the two measurements steps (1) and (2) is the distance the liner is out of round at the bottom of the liner.

3 Pull piston out of liner. Put piston in liner upside down with piston "front" and liner "front" aligned. Move piston so bottom edge of piston skirt is 1.00 in. (25.4 mm) (E, Figure 6-84) below top of liner.

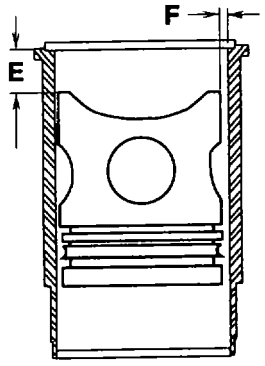


Figure 6-84. Piston Clearance

6-10. CONNECTING ROD, PISTONS, RINGS, AND LINERS AND CYLINDER BLOCK INSPECTION AND REPAIR. - Continued

4 Use a feeler gauge to measure distance (F) between piston skirt and liner at 90° to piston pin bore. Record the measured distance (F).

5 Turn piston 90° in liner. Use a feeler gauge to measure distance between piston skirt and liner 90° to piston pin bore. Record the measured distance. The difference between the two measurement steps (3) and (5) is the distance the liner is out of round at the top of the liner.

6 If liner is out of round more than 0.002 in. (0.05 mm) at top or bottom, install a new one.

7 Find difference between distance measured in Step (1) and distance measured in Step (3). This is the distance the liner is tapered.

8 If liner is tapered more than 0.002 in. (0.05 mm) install a new one.

(i) Deglaze cylinder liners.

1 Secure cylinder liner in a holding fixture.

2 Use Flex-Hone (item 25, section III, appendix B) to deglaze cylinder liner.

NOTE

Use honing lubricating oil (item 10, section II, appendix E) along with flex hone when deglazing liners.

(3) Inspect and measure connecting rod bearings.

NOTE

Never use new connecting rod cap screws when checking rod bearing ID. Use new cap screws only for final assembly of connecting rods.

(a) Rod bearing-to-journal oil clearance can be checked with bearing clearance gauge (items 21, 22, and 23, section II, appendix E) (Plastigage) if rod is connected to crankshaft. If rod is out of engine, measure ID of connecting rod bearings and compare with OD of crankshaft journal.

NOTE

Remember, the use of bearing clearance gauge (Plastigage) will determine bearing journal clearance, but will not indicate the condition of either surface.

(b) With crankshaft removed, measure connecting rod journal OD at several points.
(c) Install connecting rod cap on rod with bearings.
(d) Install rod cap screws and tighten to 55 ft-lb (75 Nm).
(e) Using an inside micrometer measure ID of bearing.
(f) Subtract OD of crankshaft journals from ID of rod bearings to obtain oil clearance.

(g) Compare measurements with the following specifications:

Connecting Rod Specifications

Crankshaft Journal OD .....2.748 - 2.749 in.(69.80 - 69.82 mm)

Assembled Rod Bearing ID.....2.750 - 2.72 in.(69.85 - 69.90 mm)

Oil Clearance (new parts).....0.0012 - 0.004 in.(0.03 - 0.10 mm)

Maximum Serviceable Clearance 0.0062 in .....(0.16 mm)

(h) Inspect connecting rod bearings for wear or damage. If bearings are worn or are out of specification, replace both connecting rod bearings.

(4) Inspect rod and cap.

(a) Inspect rod and cap for wear or damage, such as chips or cracks in the joint area.

(b) Inspect in and around cap screw holes in cap. If any defects are found, replace rod and cap.

(c) Carefully clamp rod in a soft-jawed vise (cap end upward).

(d) Install cap without bearing inserts.

(e) Torque cap screws to 55 ft-lb (75 Nm).

(f) Using an inside micrometer, measure rod bore at center of bore and record measurements as follows:

1 At right angle to rod/cap joint.

2 At 45 degrees left of measurement step 1.

3 At 45 degrees right of measurement step 1.

4 Rod Bore ID Specification 2.900 - 2.901 in. (73.66 - 73.96 mm)

(g) Compare the measurements. If difference between the greatest and least measurement is more than 0.0015 in. (0.038 mm), the rod and cap are out of round. Replace both connecting rod and cap.

(5) Inspect piston pins and bushings.

(a) Visually inspect piston pin for general overall condition. Pin must be replaced if it shows signs of fretting. Piston pin has a highly polished surface. Do not attempt to polish or refinish.

(b) Measure OD of pin. Replace if not within specifications:

Piston Pin Specifications

Small pin .....1.374 - 1.375 in.(34.92 - 34.93 mm)

Large pin .....1.624 - 1.625 in.(41.27 - 4.28 mm)

Wear Tolerance..... 0.005 in. (0.13 mm)

(c) Inspect piston pin bushing for damage or excessive wear. Lubrication hole must be open.

(d) Compare pin bushing ID with pin for specified clearance.

6-10. CONNECTING ROD, PISTONS, RINGS, AND LINERS AND CYLINDER BLOCK INSPECTION AND REPAIR. - Continued

(e) Insert pin from either side of rod bushing. If pin is free on one end, but tight on the other, the bore could be tapered (Figure 6-85, 1). If pin enters freely from both sides, but is tight in the center, bore is bell mouthed (2).

Piston Pin Bushing Specifications

ID of New Piston Pin Bushing (installed)

Small pin .....1.376 - 1.377 in.(34.95 - 34.97 mm)

Large pin .....1.626 - 1.627 in.(41.30 - 41.33 mm)

Wear Tolerance ..... 0.002 in.(0.05 mm)

Pin-to-Bushing Clearance .....0.008 - 0.002 in.(0.02 - 0.06 mm)

Maximum ..... 0.004 in.(0.10 mm)

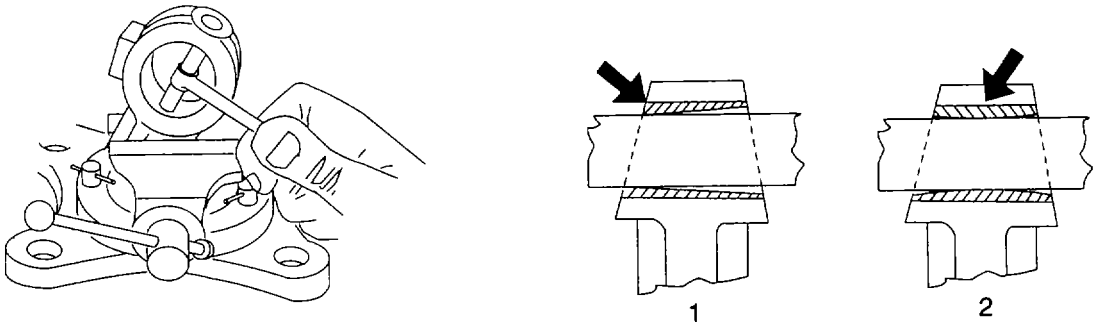


Figure 6-85. Piston Pin Bushing

(f) If piston pin bushing replacement is necessary:

1 Push bushing out of connecting rod using driver (item 27, section III, appendix B) for large pin or (item 26, section III, appendix B) for small pin.

2 Clean bore of rod with medium grit emery cloth.

3 Inspect for cracks or other defects. Make sure that lube oil hole in top of rod is open.

4 Measure bore diameter in two places, 90° apart. If bushing has spun in rod or if measured diameter is not within specification, replace rod.

Rod piston Pin Bushing Bore

Small pin .....1.4995 - 1.5005 in.(38.09 - 38.11 mm)

Large pin ..... 1.8120 - 1.8130 in.(46.025 - 46.051 mm)

5 Align lubrication oil hole in bushing with bore in connecting rod.

6 Press a new bushing into rod using (item 27, section III, appendix B) Driver (large pin) or (item 26, section III, appendix B) small pin.

7 If necessary, hone bushing to obtain a clearance with piton pin of 0.0008 - 0.002 in.(0.02 - 0.06 mm).

(6) Inspect and clean cylinder block.

CAUTION

All components (including piston cooling orifices), soft plugs and oil gallery plugs must be removed from the cylinder block for inspection and cleaning.

(a) Clean block thoroughly using cleaning solvent, pressure steam, or a hot tank.

CAUTION

If cylinder block is cleaned in a hot tank, be sure to remove any aluminum parts (remove all nameplates). Aluminum parts can be damaged or destroyed by hot tank solutions.

(b) Make sure all passages and crevices are cleared of sludge, and grease.

(c) All coolant passages must be cleared of any lime deposits and scale.

(d) Be sure liner support flange (Figure 6-86, 1) is free of any burrs. If burrs are present, use a small halfmoon file and lightly file (in a circular motion) burr off at approximately a 60° angle. Do not let file hit top of cylinder block while filing.

CAUTION

Do not file liner support flange excessively. Excess filing can damage liner support flange and allow an improper liner fitting. Thoroughly clean all filings from cylinder block (2).

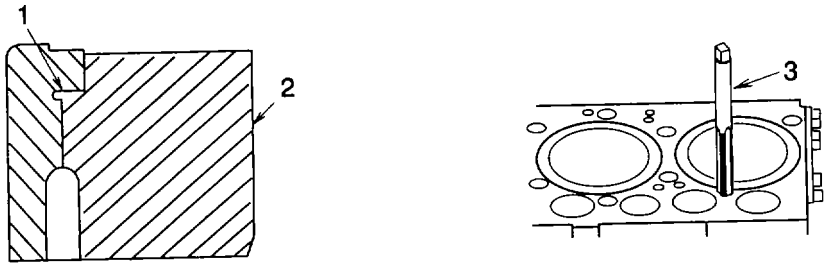


Figure 6-86. Liner Support Flange

6-10. CONNECTING ROD, PISTONS, RINGS, AND LINERS AND CYLINDER BLOCK INSPECTION AND REPAIR. - Continued

(e) Carefully inspect block for cracks or damage. Replace block if there is evidence of physical damage. Cylinder block liner counterbore depth is 0.2343 - 0.2357 in. (5.95 - 5.99 mm).

(f) When determined that the cylinder block is serviceable, clean out threads for cylinder head capscrews in top deck of cylinder block. Use a 1/2-13 UNC-2A tap (3) approximately 5.0 in. (127 mm) long. Use compressed air to remove any debris or fluid which may be present in the cap screw hole.

(g) Use Bore Cleaning Brush (Figure 6-87, 1) (item 28, section III, appendix B) to clean bore.

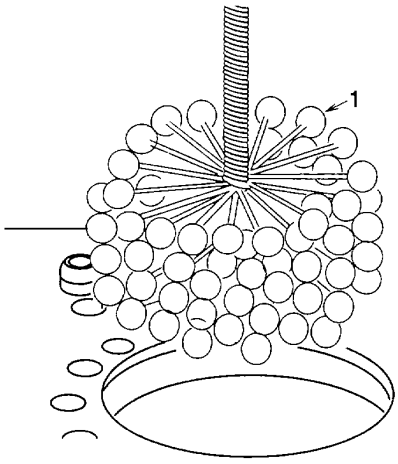


Figure 6-87. Clean Bore

(h) Thoroughly clean all debris from bore.

(7) Measure cylinder block.

(a) Measure main bearing bore diameter. Main bearing bore diameter must be 3.325 - 3.326 in. (84.46 - 84.48 mm). Also measure cylinder block main thrust bearing width. Width must be 1.3235 - 1.3275 in. (33.62 - 33.72 mm). If bearing caps are damaged, or bore is not within specification, replace cap and line bore to specifications.

NOTE

Replacement bearing caps are supplied with bearing bore unfinished.

(b) Measure cam follower bore diameter. New diameter is 1.248 - 1.250 in. (31.70 - 31.75 mm).

(c) If diameter is more than specified, install a new cylinder block. Service bushings are not available through service parts.

(d) New cam follower diameter is 1.245 - 1.246 in. (31.61 - 31.64 mm). Maximum cam follower clearance is 0.005 in. (0.13 mm).

(e) Measure camshaft bore diameter. New diameter is 2.204 - 2.205 in. (55.99 - 56.01 mm).

(f) If diameter is more than specified, install a new cylinder block.

(g) New camshaft journal clearance (journal diameter minus bearing diameter) is 0.003 - 0.005 in. (0.08 - 0.13 mm). Maximum clearance is 0.006 in. (0.15 mm).

(h) Measure cylinder block top deck flatness. New flatness is 0.003 in. (0.08 mm). If flatness is not as specified, resurface cylinder block.

CAUTION

When cylinder block is machined (top deck or crankshaft bearing bores), the dimension from centerline of crankshaft bearing bore to top deck will be changed. Make sure that this dimension will not be less than 11.889 in. (301.98 mm). Otherwise, piston may contact cylinder head. If cylinder block top deck is resurfaced, also measure depth of liner counter bores. Bore depth must be within 0.2343 - 0.2357 in. (5.95 - 5.99 mm).

(i) Inspect each cooling orifice to make sure it is not plugged or damaged. Cooling orifices deliver approximately 0.4 GPM (0.025 L/s) oil flow.

(j) Use a soft wire and compressed air to clean orifice. Replace, if condition is questionable.

CAUTION

A piston cooling orifice failure could cause damage to pistons, piston pins, rod pin bushings, and liners. If a piston cooling orifice is left out at reassembly, low or no oil pressure will result.

(k) Install orifices and torque to 84 lb-in. (10 Nm).

(8) Recheck cylinder liner height.

NOTE

If liner height was not checked when liners were removed (see Remove Cylinder Liners earlier in this paragraph), or a new liner is being installed in a new or used cylinder block, liner height must be checked.

(a) Be sure liner bore in cylinder block is clean.

(b) Install liners without preformed packing and packing.

NOTE

Liner should rotate smoothly by hand when installed. If not, remove liner and polish bottom liner pilot bore in cylinder block with emery cloth. Use a shop towel or other suitable means to collect debris when polishing bore.

(c) Measure liner height at four locations, each liner. Liner height specification is 0.0004 - 0.004 in. (0.01-0.10 mm). Maximum permissible difference between readings within one cylinder or between adjacent cylinders is 0.002 in. (0.06 mm).

(d) If liner height is above specification, check cylinder block for burrs on liner support flange or incorrect counterbore depth.

6-10. CONNECTING ROD, PISTONS, RINGS, AND LINERS AND CYLINDER BLOCK INSPECTION AND REPAIR. - Continued

(e) If liner height is below specification, install one liner shim on bottom of liner flange. Two sizes of shims are available.

c. Repair. Repair is limited to replacement of defective, damaged, or out-of-tolerance parts

d. Installation.

(1) Pour Soap Lubricant (item 15, section II, appendix E) into a suitable container.

NOTE

Block preformed packings are installed dry. Use soap only on square packing. Install new preformed packings, they are available as a kit (item 62, appendix H).

(2) Install the black preformed packing (Figure 6-88, 1) in the lower preformed packing groove in the cylinder block (2).

(3) Install the red (or white) preformed packing (3) in the upper preformed packing groove in the cylinder block (2).

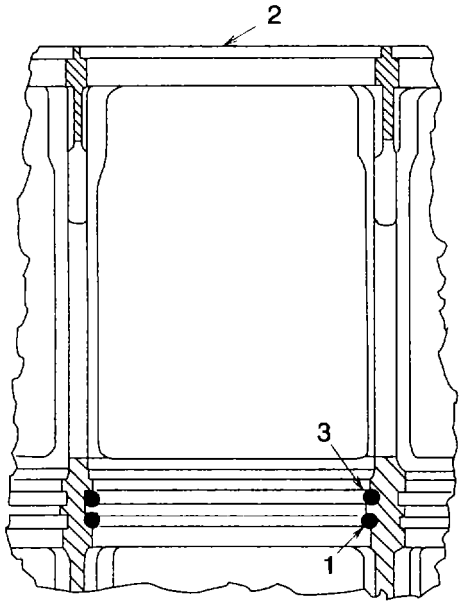


Figure 6-88. Install Preformed Packings

(4) Turn cylinder liner (Figure 6-89, 1) upside-down. Dip the square packing (2) in soap lubricant (item 15,section II, appendix E) and install over outside of liner.

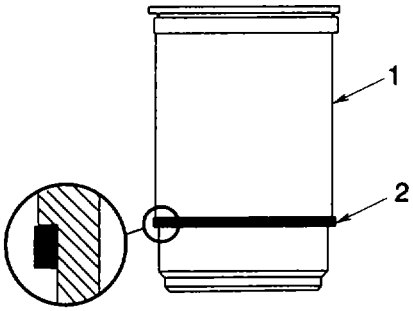


Figure 6-89. Install Packing

(5) Slide packing (2) down firmly against shoulder on the liner.

NOTE

Make sure the packing is not twisted.

(6) Coat the liner packings, sealing area of the cylinder liner and cylinder block preformed packing with lubricant soap.

CAUTION

Do not use oil or hand cleaner soap on cylinder liner packing or preformed packings. Petroleum products will cause the red (or white) preformed packing to swell, which may result in preformed packing damage during liner installation.

(7) Carefully place the cylinder liner, with packing installed, into the cylinder block bore. Do not scuff the packing across the upper bore.

(a) When liners are pitted or eroded on the OD and are under one-half the liner thickness, rotate liners 90° from their removed position. Rotate the pitted section of the liner either toward the front or rear of the engine.

(b) If liners are not pitted or eroded, rotation will not be necessary. Install liners with mark toward the front of the engine. A resistance will be felt when cylinder liner is aligned in pilot bore.

(8) Seat liners with wood block (Figure 6-90, 1) and hammer (2). If (75160) KCD10001 Puller (3) was used to remove liners, this tool may also be used to seat them. Cylinder liner will protrude over the top of the cylinder block more than normal due to uncompressed packings and preformed packings.

6-10. CONNECTING ROD, PISTONS, RINGS, AND LINERS AND CYLINDER BLOCK INSPECTION AND REPAIR. - Continued

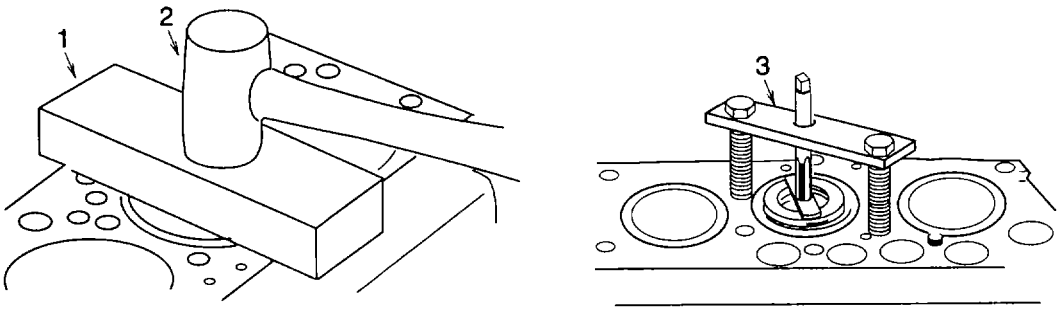


Figure 6-90. Seat Cylinder Liners

NOTE

If you suspect that a packing may have sheared or displaced during lowering into position, remove and examine the liner and packing assembly. If no damage is found, check the packings for proper position, resoap the packings and reinstall liner assembly.

(9) With liners installed, hold in place with large flat washers and cap screws. Turn cap screws snug but do not tighten.

(10) Clean cylinder liner bores with waterless hand cleaner after installation.

(11) Wipe dry with clean rag.

(12) Install pistons and connecting rods.

(a) If a new piston and liner assembly is to be installed. Do not remove piston from liner. Push piston out of liner bottom only far enough to install piston pin.

(b) New fitted rings are furnished with the correct end gap; therefore, fitting to the liner is not necessary.

(c) Lubricate piston pin and bushing with oil (item 10, section II, appendix E).

NOTE

Pistons must be installed on connecting rods from which they were removed.

(d) Assemble pistons and connecting rods, making sure the word "Front" or arrow on top of the piston and side of connecting rod are on same side. If "Front" or arrow is not visible, install piston on rod so that offset in combustion bowl of piston is opposite camshaft side of engine.

(e) Insert piston pin into piston pin bore. Install new piston pin retaining rings. Check to be sure retaining rings are seated in grooves of piston pin bore.

(f) When installing new rings from service parts, use a Piston Ring Expander. Install oil ring expander in bottom ring groove. Position end gap over either end of piston pin.

(g) Install oil control ring in bottom ring groove over ring expander. Install with end gap on opposite side of piston from ring expander gap.

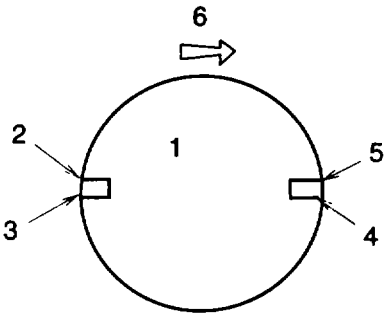
(h) Rectangular compression ring is marked to identify top side of ring. Install rectangular compression ring in center ring groove with mark toward top of piston.

(i) Position gap in rectangular compression ring on opposite side of piston from oil control ring gap.

(j) Keystone compression ring has a mark to identify top side of ring. Install keystone compression ring in top ring groove with mark toward top of piston.

(k) Position gap in Keystone compression ring on opposite side of piston from rectangular compression ring gap.

(l) Stagger ring gaps on pistons as shown. If crankshaft was removed, install crankshaft per paragraph 6-11.



1. PISTON HEAD
2. TOP COMPRESSION RING GAP
3. OIL CONTROL RING GAP
4. EXPANDER RING GAP
5. BOTTOM COMPRESSION RING GAP
6. FRONT OF ENGINE

Figure 6-91. Ring Gaps

(m) Coat pistons, liners and inside ring compressor (item 4, section III, appendix B) with oil (item 10, section II, appendix E).

(n) Carefully place ring compressor with piston and rod over liner.

CAUTION

Be sure crankshaft journals and liner walls are not damaged when installing piston and rod in liner.

NOTE

Be sure the word "front" on rod faces toward the front of the engine.

(o) With piston centered in installing tool and rings staggered correctly, push piston (Figure 6-92, 1) into liner.

6-10. CONNECTING ROD, PISTONS, RINGS, AND LINERS AND CYLINDER BLOCK INSPECTION AND REPAIR. - Continued

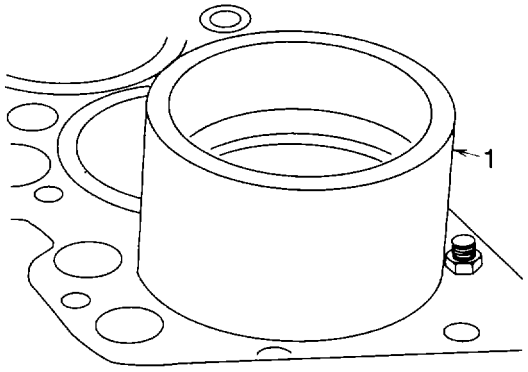


Figure 6-92. Install Piston

(p) Install bearing insert in connecting rod with tang (Figure 6-93, 1) in groove (2).

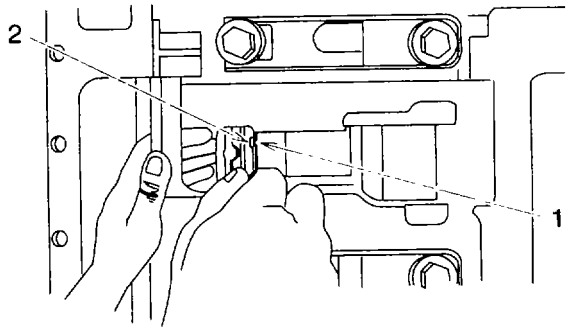


Figure 6-93. Install Bearing Insert in Connecting Rod

(q) Put clean engine oil on insert and crankshaft journal.

(r) Pull connecting rod to crankshaft.

(s) Install bearing insert in connecting rod cap with tang (Figure 6-94, 1) in groove (2).

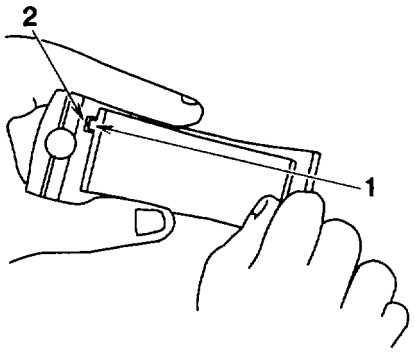


Figure 6-94. Install Bearing Insert in Connecting Rod Cap

(t) Put clean engine oil on insert.

(u) Install cap on connecting rod with tangs (Figure 6-95, 1) to same side.

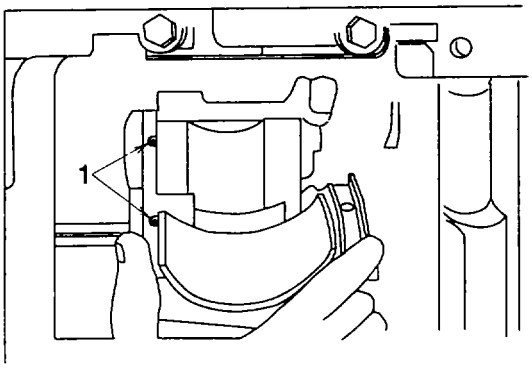


Figure 6-95. Install Cap

NOTE

Never use connecting rod cap screws more than once.

(v) Install new connecting rod cap screws (item 62, appendix H). Dip them in clean engine oil and torque them to 50-55 ft-lb (65-76 Nm).

6-10. CONNECTING ROD, PISTONS, RINGS, AND LINERS AND CYLINDER BLOCK INSPECTION AND REPAIR. - Continued

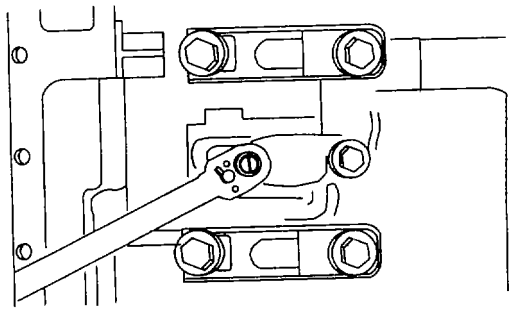


Figure 6-96. Install Connecting Rods

(13) Check engine for excessive tightness.

(a) Rotate crankshaft several revolutions to be sure engine rotates without excessive tightness.

(b) Check liners for deep scratches which would indicate an improperly installed or broken piston ring.

(c) Check for proper side clearance in all rods. Should have slight movement in each rod by moving side-to-side.

(14) Install oil pump outlet tube o-ring in cylinder block. Install oil pump and outlet tube per paragraph 6-8.

(15) Install oil pan per paragraph 6-7.

(16) Install cam followers per paragraph 6-8.

(17) Install cylinder head with new gasket per paragraph 6-6.

(18) Install engine per paragraph 4-72.

(19) Fill engine with clean oil and proper coolant per paragraph 4-6.

(20) Change engine oil and engine oil filter after 100 hours of operation.

6-11. CRANKSHAFT, PULLEY, IDLER GEARS, AND MAIN BEARINGS INSPECTION, REPAIR AND REPLACEMENT.

This task covers: **a. Removal** **b. Inspection** **c. Repair** **d. Installation**

INITIAL SETUP

Tools:

Automotive Maintenance and Repair
Item 2, Section III, Appendix B

Personnel Required:

Two

Equipment Conditions:

Oil pump removed. (See para 6-8.)
Rocker arm cover, rocker arm assembly, push rods, and cam followers removed. (See para 6-6.)
Fan belt removed. (See para 4-65.)
Fuel injection and transfer pumps removed. (See para 6-4.)
Timing gear cover, timing gear train (including camshaft), and front plate removed. (See para 6-9.)
Connecting rod caps removed. (See para 6-11.)
Staring motor removed. (See para 4-66.)
Flywheel and flywheel cover removed. (See para 6-5.)

a. Removal.

(1) Remove main bearings.

NOTE

When crankshaft is to be removed, leave front and rear main bearing caps installed until all of the connecting rod caps have been removed. Push pistons and rods away from crankshaft.

(a) Check main bearing caps for arrows (Figure 6-97, 1) (cast in main bearing cap) and numbers (2) stamped on cap and oil pan rail. Arrow points toward camshaft side of engine. If there are no numbers, stamp corresponding numbers on cap and oil pan rail. This will assure correct placing of main bearing caps during reassembly.

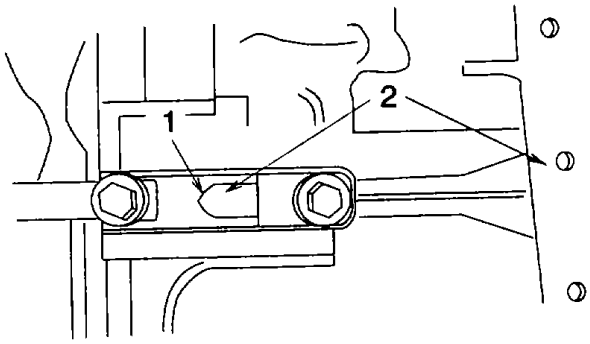


Figure 6-97. Main Bearing Caps

6-11. CRANKSHAFT, PULLEY, IDLER GEARS, AND MAIN BEARINGS INSPECTION, REPAIR AND REPLACEMENT. - Continued

(b) Remove main bearing caps.

NOTE

Visually inspect condition of bearing inserts as bearing caps are removed. Keep caps and inserts together and in correct order.

(c) Check main bearing clearance.

1 Place a strip of bearing clearance gauge (items 21, 22, and 23, section II, appendix E) (Figure 6-98, 1) in the center of the main bearing cap about three-fourths of the width of the bearing.

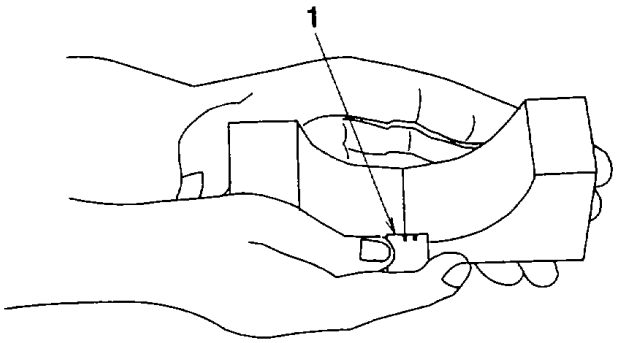


Figure 6-98. Main Bearing Clearance

2 Use oil on bearing clearance gauge to prevent smearing.

3 Install cap and torque to 85 ft-lb. (120 Nm).

NOTE

The use of bearing clearance gauge will determine wear, but will not determine condition of either bearing or journal.

4 Remove cap and compare width of bearing clearance gauge with scale provided to determine clearance. Maximum permissible clearance 0.006 in. (0.15 mm).

(2) Remove crankshaft.

WARNING

Do not attempt to remove crankshaft by hand. Use proper lifting equipment to avoid personal injury and damage to equipment.

(a) Attach a nylon sling (or other suitable lifting sling) to journals of crankshaft (Figure 6-99, 1).

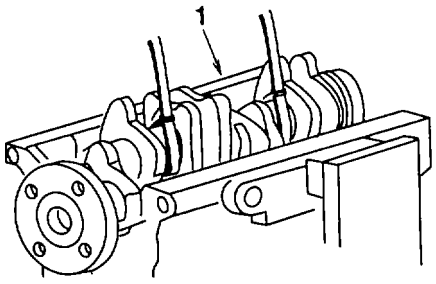


Figure 6-99. Remove Crankshaft

NOTE

An alternate method of attaching sling is to install a cap screw on both ends of crankshaft and attach sling to screws.

(b) Using proper lifting equipment, carefully raise crankshaft out of cylinder block.

(c) Place crankshaft on a clean flat surface and support journals with U-blocks.

(d) If main bearings are to be replaced, remove insert from cylinder block. Otherwise, leave in block until assembled ID has been measured.

(e) Remove Woodruff key from front end of crankshaft

(3) Remove crankshaft wear sleeve.

(a) Use the ball side of a ball peen hammer and tap (to deform) wear sleeve across its width in a straight line; or score the wear ring, (do not cut it) in several places with a blunt chisel (Figure 6-100, 1).

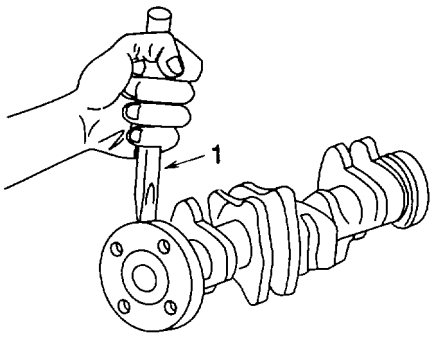


Figure 6-100. Remove Wear Sleeve

(b) Remove wear sleeve when it is loose.

6-11. CRANKSHAFT, PULLEY, IDLER GEARS, AND MAIN BEARINGS INSPECTION, REPAIR AND REPLACEMENT. - Continued

(4) Remove crankshaft gear.

(a) Inspect gear for wear or damage.

(b) If gear removal is required, pull gear with gear puller.

(c) Remove Woodruff key from crankshaft if crankshaft requires reconditioning.

b. Inspection.

(1) Inspect crankshaft.

(a) Clean crankshaft using solvent and compressed air.

(b) Inspect oil passages to make sure they are open. Use compressed air and a small piece of wire.

(c) Inspect crankshaft for any signs of load stress, cracks, scoring, or scratches on journals. An inspection must be made if the crankshaft damper was found to be damaged or defective. Figure 6-101 shows critical areas of load stress in a crankshaft.

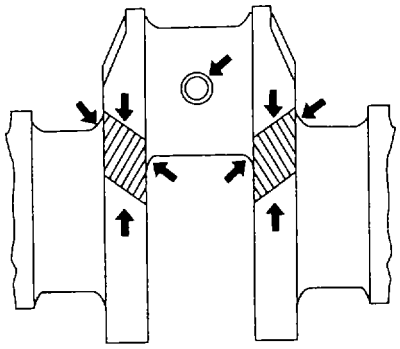


Figure 6-101. Inspect Crankshaft

(d) When inspecting crankshaft for cracks, a method (such as the Fluorescent Magnetic Particle Method if available) must be used that is capable of detecting minute cracks that are not visible to the eye. This method magnetizes the crank, employs magnetic particles which are fluorescent and glow under black light. Replace crankshaft if cracks are found. The crankshaft must be de-magnetized after the test.

(e) Check each journal for evidence of excessive overheating or discoloration. If either condition exists, replace crankshaft since heat treatment has probably been destroyed.

(2) Measure assembled ID of bearings and OD of crankshaft journals.

(a) With crankshaft out of cylinder block, install main bearing inserts and caps (be sure inserts are installed correctly).

(b) Torque main bearing cap screws to 85 ft-lb (120 Nm).

(c) Measure ID of all bearings with an inside micrometer. ID of assembled insert should be 3.12 - 3.127 in. (79.39 - 79.44 mm). See Figure 6-102.

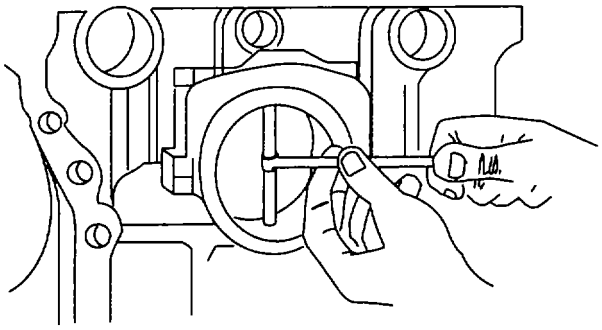


Figure 6-102. Measure Bearings

(d) Measure OD of all respective crankshaft journals at several points around journal. OD of Main Bearing Journal 3.123 - 3.124 in. (79.34 - 79.36 mm). See Figure 6-103.

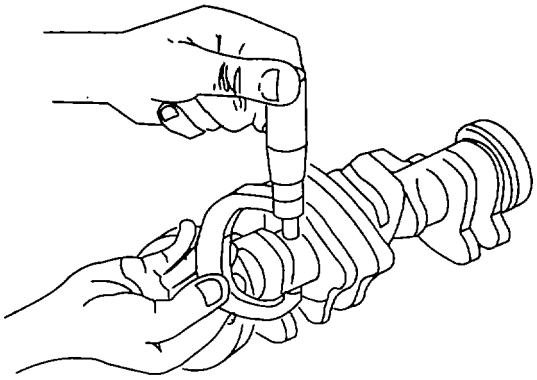


Figure 6-103. Measure Crankshaft Journals

(e) If engine has previously had a major overhaul and undersized bearing inserts were used, above listed ID and OD dimensions may not be the same as those recorded. However, oil clearance should be within specifications. Oil clearance is 0.0012 - 0.004 in. (0.030 - 0.10 mm). The maximum serviceable clearance is 0.006 in. (0.15 mm).

(f) Use crankshaft journal OD measurements to determine if journal is out-of-round or tapered. Crankshaft wear specifications are as follows:

1 Journal taper-per-inch of journal length 0.0001 in. (0.25 mm).

2 Journal out-of-roundness 0.003 in. (0.08 mm).

6-11. CRANKSHAFT, PULLEY, IDLER GEARS, AND MAIN BEARINGS INSPECTION, REPAIR AND REPLACEMENT. - Continued

(g) If journals are tapered, out-of-round, scored or damaged, the crankshaft should be ground. Proper undersize bearings should be installed.

(3) Measure main thrust journal width and thrust bearing width per the following (see Figure 6-104):

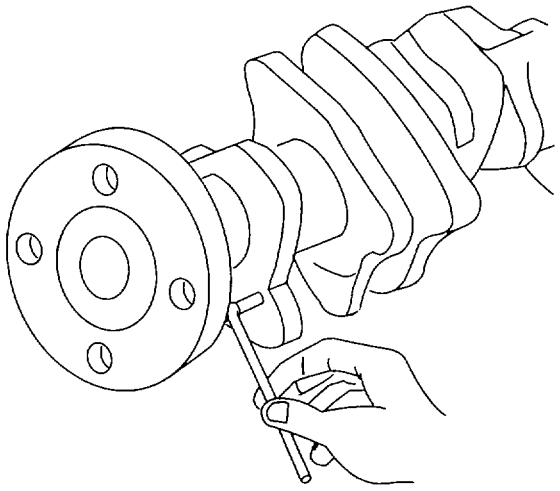


Figure 6-104. Measure Main Thrust Journal Width

(a) New main thrust journal width is 1.534 - 1.536 in. (38.90 - 39.00 mm).

(b) If width is not within specification, replace crankshaft.

(c) If width is correct, measure main thrust bearing width.

(d) New main thrust bearing width (standard size) is 1.528 - 1.530 in. (38.80 - 38.85 mm).

(e) New main thrust bearing clearance (thrust journal width minus thrust bearing width) is 0.004 - 0.008 in. (0.10 - 0.20 mm).

(f) Maximum allowable thrust bearing clearance is 0.015 in. (0.38 mm). Oversize thrust washer sets (Figure 6-105, 1) have thrust washers that are 0.007 in. (0.18 mm) oversize. Arrow (2) points toward front of engine.

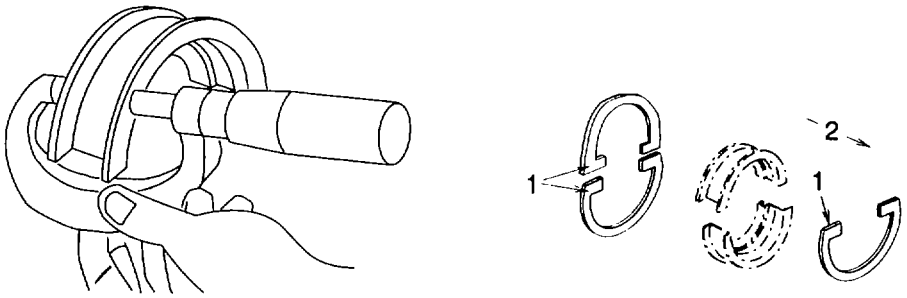


Figure 6-105. Main Thrust Bearing

c. Repair. Repair is limited to replacement of defective, damaged, or out-of-tolerance parts.

d. Installation.

(1) Install crankshaft gear.

WARNING

Oil fumes or oil can ignite above 380° F (193° C), use a thermometer and do not exceed 360° F (182° C). Do not allow a flame or heating element to be in direct contact with the oil. Heat the oil in a well-ventilated area. Plan a safe handling procedure to avoid burns.

(a) Heat new gear to 360° F (182° C).

(b) Install Woodruff key in crankshaft. Drive gear onto crankshaft using driver (item 21, section III, appendix B) (Figure 6-106, 1).

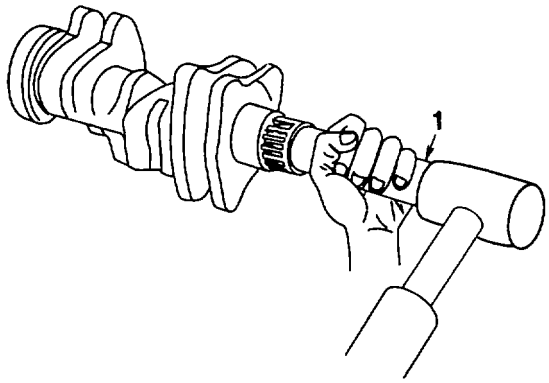


Figure 6-106. Crankshaft Gear Installation

(2) Inspect piston cooling orifices.

(a) Inspect each cooling orifice to make sure it is not plugged or damaged.

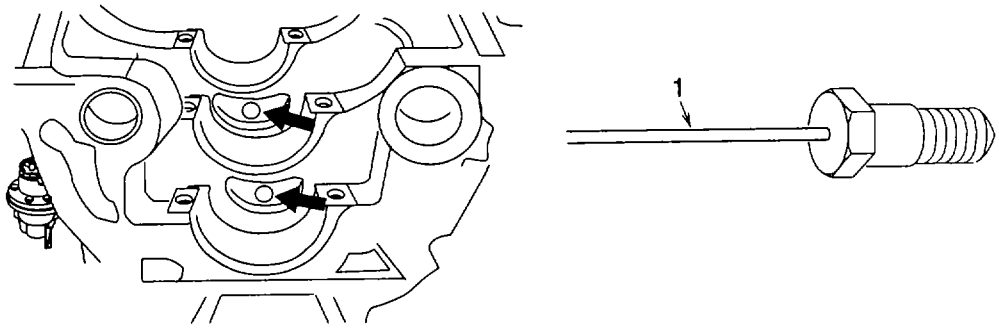


Figure 6-107. Inspect Piston Cooling Orifices

6-11. CRANKSHAFT, PULLEY, IDLER GEARS, AND MAIN BEARINGS INSPECTION, REPAIR AND REPLACEMENT. - Continued

(b) Use a soft wire (Figure 6-107, 1) and compressed air to clean orifice. Replace, if condition is questionable.

CAUTION

A piston cooling orifice failure could cause damage to pistons, piston pins, rod pin bushings, and liners. If a piston cooling orifice is left out, low or no oil pressure will result.

(c) Install all the orifices and torque to 84 lb-in (10 Nm).

(3) Install main bearings and crankshaft.

(a) Install main bearing inserts. Make sure that tang (Figure 6-108, 1) on the inserts is engaged with slot (2) in the cylinder block and main bearing caps. Also make sure that oil holes line up with oil passages in block.

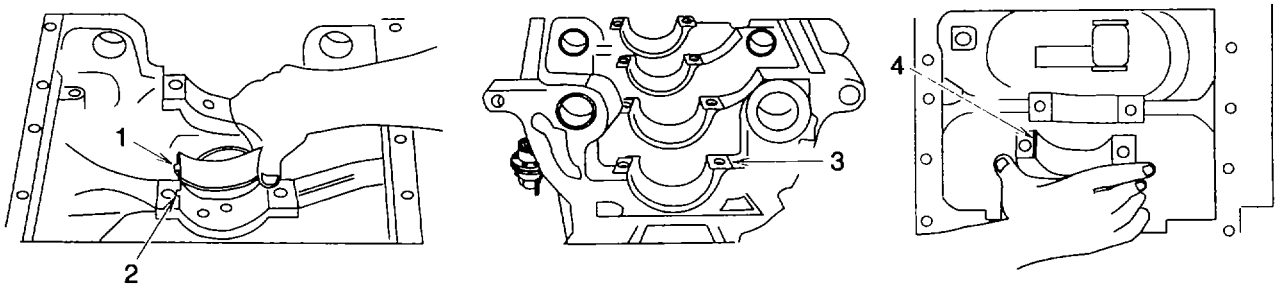


Figure 6-108. Install Main Bearings

NOTE

If new thrust bearing inserts or thrust bearing washers are installed, they must be installed as a set.

(b) Install main thrust bearing (3) in rear web of cylinder block.

(c) Apply a liberal coating of clean engine oil (item 10, section II, appendix E) to bearing surfaces and crankshaft journals.

(d) Using proper lifting equipment, lower crankshaft onto main bearings.

(e) Dip entire main bearing cap screws in clean engine oil and position them in the main bearing caps. Apply a liberal amount of oil to bearing inserts in caps.

(f) Install each bearing cap, bearings (4) and cap screws with washer with the recesses and tabs aligned in matching order. Make sure bearing tabs also match up before tightening cap screws.

CAUTION

Do not use pneumatic wrench to install main bearing cap screws.

NOTE

Make sure main bearing caps are installed on the bearing bosses from which they were removed. The numbers stamped on the caps should be on the same side as the numbers on the block. If there is an arrow on cap, arrow must point toward camshaft side of block.

(g) Before tightening cap screws on main bearing caps, align upper and lower thrust flanges on main thrust bearings. Using a soft-face hammer, tap crankshaft to the rear and then to the front to line up thrust bearing flanges.

(h) Torque all cap screws to 85 ft-lb (120 Nm).

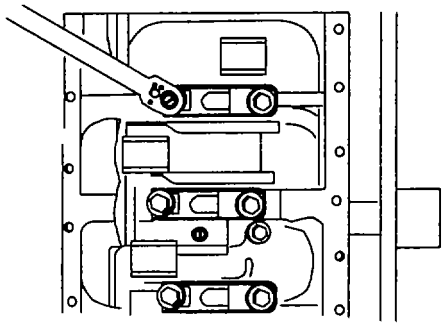


Figure 6-109. Install Main Bearings

(i) Turn crankshaft by hand. If it does not turn easily, disassemble parts and determine the cause.

CAUTION

Using pneumatic wrenches to install cap screws may cause damage to the threads. Never reuse connecting rod cap screws.

(j) Install connecting rod caps and bearings. Use new cap screws (item 61, appendix H) and torque to 50 -55 ft-lb (65 - 75 Nm)

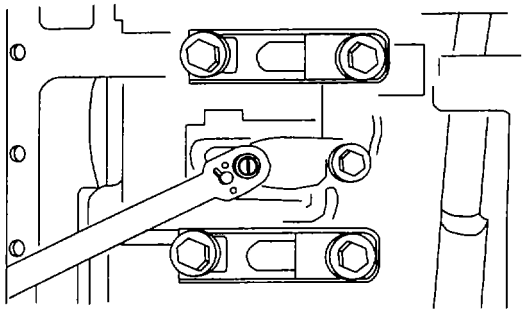


Figure 6-110. Install Connecting Rod Caps and Bearings

6-11. CRANKSHAFT, PULLEY, IDLER GEARS, AND MAIN BEARINGS INSPECTION, REPAIR AND REPLACEMENT. - Continued

(4) Install flywheel housing and flywheel per paragraph 6-5.

(5) Install crank shaft pulley with cap screw and flat washer. Torque cap screws to 110 ft lb (150 Nm).

(6) Install lube oil stem by-pass valve assembly per paragraph 6-9.

(7) Install front plate, timing gear train, camshaft, and balancer shafts (if equipped) per paragraph 6-9.

(8) Install oil pump assembly per paragraph 6-8.

(9) Install oil slinger 6-9.

(10) Install timing gear cover gasket, cover, oil pressure regulating valve assembly and front oil seal per paragraph 6-9.

(11) Install oil pan per paragraph 6-7.

(12) Install cam followers, push rods, rocker arm assembly per paragraph 6-6.

(13) Install fuel supply pump and injection pump per paragraph 4-68 and 6-4.

(14) Install starting motor per paragraph 4-66.

(15) Adjust valve clearance per paragraph 6-6.

(16) Install fan belt. Install engine in air compressor per paragraph 4-65.

(17) Fill engine with clean oil and proper coolant per paragraph 4-6.

(18) Change engine oil and engine oil filter after 100 hours of operation.

APPENDIX A

REFERENCES

A-1. SCOPE.

This appendix lists all forms, field manuals, and technical manuals referenced in this manual.

A-2. FORMS.

Recommended Changes to Publications ..... DA Form 2028
Recommended Changes to Equipment Technical Manuals ..... DA Form 2028-2
Report of Discrepancy ..... Standard Form 364
Product Quality Deficiency Report ..... Standard Form 368
Log Book ..... DA Form 2408-9
Equipment Inspection and Maintenance Worksheet ..... DA Form 2404

A-3. FIELD MANUALS.

NBC Contamination Avoidance ..... FM 3-3
NBC Protection ..... FM 3-4
NBC Decontamination ..... FM 3-5
First Aid of Soldiers ..... FM 21-11

A-4. TECHNICAL MANUALS.

Destruction of Army Material to Prevent Enemy Use ..... TM 750-244-3
Unit, Direct Support, and General Support Maintenance
Repair Parts and Special Tools List ..... TM 9-4310-397-24P

A-5. MISCELLANEOUS PUBLICATIONS.

Army Logistics Readiness and Sustainability ..... AR 700-138
Army Maintenance Management System (TAMMS) ..... DA Pam 738-750
Functional Users Manual for the
Army Maintenance Management System-Aviation (TAMMS-A) ..... DA Pam 738-751
Expendable Items
(Except Medical Class V, Repair Parts and Heraldic Items) ..... CTA 50-970
Army Medical Department Expendable/Durable Items ..... CTA 8-100

A-6. LUBRICATION ORDER.

Lubrication Order for Compressor, Air Rotary,
Diesel Engine Driven, Skid Mounted ..... LO 9-4310-397-12

APPENDIX B

MAINTENANCE ALLOCATION CHART

SECTION I INTRODUCTION

B-1. THE ARMY MAINTENANCE SYSTEM MAC.

a. This introduction (Section I) provides a general explanation of all maintenance and repair functions authorized at various maintenance levels under the standard Army Maintenance System concept.

b. The Maintenance Allocation Chart (MAC) is Section II designates overall authority and responsibility for the performance of maintenance functions on the air compressor. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance levels, which are shown on the MAC in column (4) as:

Unit - Includes two subcolumns, C (operator/crew) and O (unit) maintenance.
Direct Support - Includes an F subcolumn
General Support - Includes an H subcolumn
Depot - Includes a D subcolumn

c. Section III lists the tools and test equipment (both special tools and common tool sets required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

B-2. MAINTENANCE FORMS.

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel).

b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, 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, e.g., to clean (includes decontaminate when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases.

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.

e. Aline. To adjust specified variable elements of an item to bring about optimum or desired performance.

B-2. MAINTENANCE FORMS. - Continued

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and assigned maintenance level is shown as the 3d position code of the SMR code.

i. Repair. The application of maintenance services [1], including fault location/troubleshooting [2], removal/installation, and disassembly/assembly [3] procedures, and maintenance actions [4] to identify troubles and 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) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications (i.e., DMWR). 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 material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying Army equipment/components.

B-3. EXPLANATION OF COLUMNS IN THE MAC, SECTION II.

a. Column 1, Group Number. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2. Component/Assembly. Column 2 contains the names of the 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. (For detailed explanation of these functions, see paragraph B-2.)

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[1] Services - Inspect, test, service, adjust, align, calibrate, and/or replace.

[2] Fault location/troubleshooting The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or unit under test (UUT).

[3] Disassembly/assembly The step-by-step breakdown (taking apart) of a spare/functional group coded item to the level of its least component, that is assigned an SMR code for the level of maintenance under consideration (e.g., identified as maintenance significant).

[4] Actions - Welding, grinding, riveting, straightening, facing, machining, and/or resurfacing.

B-3. EXPLANATION OF COLUMNS IN THE MAC. SECTION II.

d. Column 4. Maintenance Level. Column 4 specifies each level of maintenance authorized to perform each function listed in column 3, by indicating work time required (expressed as man-hours in whole hours or decimals) in the appropriate subcolumn. This work-time figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number of complexity of the tasks within the listed maintenance function vary at different maintenance levels, appropriate work-time figures are to be shown for each level. The work-time figures represents the average time required to restore the an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance levels are as follows:

C .....Operator or Crew Maintenance
O .....Unit Maintenance
L .....Specialized Repair Activity (SRA) 5
F .....Direct Support Maintenance
H .....General Support Maintenance
D .....Depot Maintenance

e. Column 5, Tools and Equipment Reference Code. Column 5 specifies, by code, those common tool sets (not individual tools), common TMDE, and special tools, special TMDE, and special support equipment required to perform the designated function. Codes are keyed to tools and test equipment in Section III.

f. Column 6. Remarks. When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks contained in Section IV.

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[5] This maintenance level is not included in Section II, column (4) of the Maintenance Allocation Chart. Functions to this level of maintenance are identified by a work-time figure in the "H" column of Section II, column (4), and an associated reference code is used in the Remarks column (6). This code is keyed to Section IV, Remarks, and the SRA complete repair application is explained there.

B-4. EXPLANATION OF COLUMNS IN TOOL AND TEST EOUIPMENT REOUIREMENTS. SECTION III.

a. Column 1, Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, Section II, Column 5.

b. Column 2, Maintenance Level. The lowest level of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4. National Stock Number. The National stock number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer's part number or type number.

B-5. EXPLANATION OF COLUMNS IN REMARKS, SECTION IV.

a. Column 1. Remarks Code. The code recorded in column 6, Section II.

b. Column 2, Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

SECTION II. MAINTENANCE ALLOCATION CHART FOR COMPRESSOR, AIR, ROTARY, DIESEL ENGINE DRIVEN, SKID MOUNTED, 125 cfm, 100 psig

Maintenance Allocation Chart

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		DS	GS	Depot		
Group Number	Component/ Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment	Remarks
00	COMPRESSOR, AIR, ROTARY, DIESEL ENGINE DRIVEN, SKID MOUNTED, 125 cfm at 100 psig								
01	EXHAUST MUFFLER PIPING AND RISER								
0101	Muffler Shroud	Replace		0.3					
0102	Muffler Assembly	Inspect	0.1						
		Replace		0.3				1	
0103	Exhaust Pipe and Fittings	Inspect	0.1						
		Replace		0.8				1	
0104	Riser Assembly	Replace		0.3					
02	COVERS, PANELS, DOORS, AND INFORMATION PLATES								
0201	Covers	Inspect	0.1						
		Replace		0.3				1	
0202	Panels	Inspect	0.1						
		Replace		0.3				1	
0203	Doors	Inspect	0.1						
		Service		0.1					
		Replace		0.3				1	
03	INSTRUMENT CONTROL PANEL								
0301	Wiring Harness	Inspect	0.1						
		Test		0.5				1	
		Repair		0.5				1	
		Replace		1.0				1	

Maintenance Allocation Chart - Continued

(1)	(2)	(3)	(4) Maintenance Level					(5)	(6)
			Unit		DS	GS	Depot		
Group Number	Component/ Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment	Remarks
0302	Ammeter	Inspect	0.1						
		Test		0.3				1	
		Replace		0.3				1	
0303	Hourmeter	Inspect	0.1						
		Test		0.3				1	
		Replace		0.3				1	
0304	Engine Water Temperature Gauge	Inspect	0.1						
		Test		0.3				1	
		Replace		0.3				1	
0305	Compressor Oil Temperature Gauge	Inspect	0.1						
		Test		0.3				1	
		Replace		0.3				1	
0306	Lamp Switch	Inspect	0.1						
		Test		0.3				1	
		Replace		0.3				1	
0307	Lamps	Inspect	0.1						
		Test		0.3				1	
		Replace		0.3				1	
0308	Tachometer	Inspect	0.1						
		Replace		0.3				1	
0309	Engine Oil Pressure Gauge	Inspect	0.1						
		Replace		0.3				1	
0310	Safety Override Switch	Inspect	0.1						
		Test		0.3				1	
		Replace		0.3				1	
0311	Ignition Switch	Inspect	0.1						
		Test		0.3				1	
		Replace		0.3				1	
0312	Relay Reset Switch	Inspect	0.1						
		Test		0.3				1	
		Replace		0.3				1	

Maintenance Allocation Chart - Continued

(1)	(2)	(3)	(4) Maintenance Category					(5)	(6)
			Unit		DS	GS	Depot		
Group Number	Component/ Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment	Remarks
0313	Priming Pump Control	Inspect	0.1						
		Adjust	0.1					1	
		Replace		0.3				1	
0314	Restriction Indicators	Inspect	0.1						
		Test		0.3				1	
		Replace		0.3				1	
0315	Engine Fuel Pressure Gauge	Inspect	0.1						
		Replace		0.3				1	
0316	Receiver Pressure Gauge	Inspect	0.1						
		Replace		0.3				1	
04	HOSE REEL								
0401	Hose Reel	Inspect	0.1						
		Replace		0.3				1	
05	ELECTRICAL								
0501	Miscellaneous Wires and Cables	Inspect	0.1						
		Test		0.3				1	
		Replace		0.3				1	
0502	Batteries	Inspect	0.1						
		Service		0.1					
		Test		0.3				1	
		Replace		0.3				1	
06	RADIATOR AND OIL COOLER								
0601	Hoses and Oil Lines	Inspect	0.1						
		Replace		0.3				1	
0602	Radiator	Inspect	0.1						
		Service	0.1	1.0				1	
		Replace		0.7				1	
		Repair			2.0			1	A
0603	Oil Cooler	Inspect	0.1						
		Replace		0.7				1	
		Repair			2.0				A

Maintenance Allocation Chart - Continued

(1)	(2)	(3)	(4) Maintenance Category					(5)	(6)
			Unit		DS	GS	Depot		
Group Number	Component/ Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment	Remarks
07	PNEUMATIC								
0701	Pneumatic Service Valve	Inspect	0.1						
	Hoses	Repair		0.8				1	
		Replace		0.3				1	
0702	Compressor Air Cleaner	Inspect	0.1						
		Service		0.3					
		Replace		0.3				1	
0703	Compressor Oil Filter	Inspect	0.1						
		Service		0.1					
		Replace		0.1				1	
0704	Compressor Air Lines	Inspect	0.1						
		Repair		0.8				1	
		Replace		0.3				1	
0705	Service Valves	Inspect	0.1						
		Replace		0.3				1	
0706	Compressor Oil Separator	Inspect	0.1						
		Service		0.3					
		Repair		1.0				1	
		Replace		0.5				1	
		Adjust		0.3				1	
0707	Air Compressor Inlet Housing	Inspect	0.1						
		Service		0.8					
		Repair			3.5			1	
		Replace		1.5				1	
0708	Compressor	Inspect	0.1						
		Service		0.8					
		Repair			3.5			1	
		Replace		1.5				1	
08	FUEL								
0801	Fuel Lines	Inspect	0.1						
		Repair		0.8				1	
		Replace		0.3				1	

Maintenance Allocation Chart - Continued

(1)	(2)	(3)	(4) Maintenance Category					(5)	(6)
			Unit		DS	GS	Depot		
Group Number	Component/ Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment	Remarks
0802	Fuel Tank	Inspect	0.1						
		Service	0.1						
		Repair		0.8				1	
		Replace		0.7				1	
09	ENGINE								
0901	Engine Air Cleaner	Inspect	0.1						
		Service		0.3				1	
		Replace		0.3				1	
0902	Oil Filter	Inspect	0.1						
		Service		0.3					
		Replace		0.3					
0903	Oil Cooler	Inspect	0.1						
		Replace		0.3				1	
0904	Speed Control Linkage	Inspect	0.1						
		Adjust		0.3				1	
		Replace		0.3				1	
0905	Alternator and Belt	Inspect	0.1						
		Service		0.3				1	
		Adjust		0.3				1	
		Replace		0.5				1	
0906	Starter	Inspect	0.1						
		Test		1.0				1	
		Replace		0.5				1	
0907	Dip Stick and Filler Neck	Inspect	0.1						
		Replace		0.05				1	
0908	Fuel Injection Nozzle	Inspect		0.1					
		Test				1.0		2,5, 6, 7, 8, 9	
		Repair				1.5		2, 5, 6, 7, 8, 9	
		Replace				0.5		2, 5, 6, 7, 8,9	

Maintenance Allocation Chart - Continued

(1)	(2)	(3)	(4) Maintenance Category					(5)	(6)
			Unit		DS	GS	Depot		
Group Number	Component/ Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment	Remarks
0909	Fuel Injection Pump	Inspect		0.1					
		Test				1.0		2,10,11, 15	
		Repair				1.5		2,10,11, 15	
		Replace				0.5		2, 10, 11, 15	
0910	Fuel Pump	Inspect	0.1						
		Replace		0.5				1	
0911	Engine Fuel Filter	Inspect	0.1						
		Service		0.3				1	
		Replace		0.3				1	
0912	Thermostat	Test		0.8				1	
		Replace		0.3				1	
0913	Exhaust Manifold	Inspect	0.1						
		Replace		0.5				1	
0914	Water Pump	Inspect	0.1						
		Replace			0.8			2	
0915	Rocker Arm Cover	Inspect		0.1					
		Repair			0.8			1	
		Replace			0.3			1	
0916	Flywheel and Housing	Inspect				0.1		1	
		Repair				0.8		1	
		Replace				1.0		1	
0917	Rocker Arms, Cylinder Head, and Valves	Inspect				0.1		2, 12, 13, 14, 15, 16	
		Repair				2.0		2, 12, 13, 14, 15, 16	
		Replace				2.0		2, 12, 13, 14, 15, 16	
0918	Engine, Oil Pan	Inspect				0.1			
		Replace				2.0		2	
0919	Engine Oil Pump	Inspect				0.1			
		Repair				2.0		2	
		Replace				2.0		2	

Maintenance Allocation Chart - Continued

(1)	(2)	(3)	(4) Maintenance Category					(5)	(6)
			Unit		DS	GS	Depot		
Group Number	Component/ Assembly	Maintenance Function	C	O	F	H	D	Tools and Equipment	Remarks
0920	Camshaft and Timing Gear Train	Inspect				0.1		2, 16, 17, 18, 19, 20	
		Repair				4.0			
		Replace				4.0			
0921	Connecting Rod, Piston, Rings and Liner	Inspect				0.1			
		Replace				4.0		2, 22, 23, 24, 25, 26, 27, 28, 29	
0922	Crankshaft, Pulley, Idler Gears and Main Bearing	Inspect				0.1			
		Repair				4.0		2, 21	
		Replace				4.0		2, 21	
0923	Cylinder Block	Inspect				0.2			
		Repair				4.0		2	
		Replace				20.0		2	
1000	SKID								
1001	Skid and Runner	Inspect			0.1				
		Repair			4.0			1	B
		Replace			5.0			1	

SECTION III TOOL AND TEST EQUIPMENT REQUIREMENTS FOR AIR COMPRESSOR

Tool or Test Equipment Ref Code	Maintenance Level	Nomenclature	National/Stock Number (NSN)	Tool Number
1	O	General Mechanics Tool Kit	5810-00-699-5273	SC 5180-90-CL-N05
2	F	Automotive Maintenance and Repair	4910-00-754-0705	SC 4910-95-CL-A31
3	O	Electric Soldering Iron	3439-00-204-3858	FEDWS570 CORDASSE
4	H	Piston Ring Compression		JDE-84
5	H	Injection Nozzle Puller		JDE-38B
6	H	Nozzle Bore Cleaning Tool		JDE-39
7	H	Nozzle Tester		JT25510
8	H	Nozzle Tester		D-01109AA
9	H	Injection, Nozzle Service Tool Kit		16494
10	H	Wrench, 3/4 in. Special Crowsfoot		JDF22
11	H	Injection Pump Removal Tool		JDG275 or JDG535
12	H	Valve Seat Puller		JDE-41296
13	H	Spring Compression Tester		D-01168AA
14	H	Valve Inspection Center		D-05058ST
15	H	Flywheel Turning Tool		JDE-81-1 or JDE-83
16	H	Timing Pin		JDE-81-4
17	H	Idler Gear Bushing Driver		JD-252
18	H	Idler Gear Bushing Driver Handle		JDG-537 (OTC815)
19	H	Gear Timing Tool		JD-254
20	H	Front Crankshaft Oil Seal Driver		JD-250
21	H	Gear Driver		JDH-7
22	H	Piston Liner Height Gauge		A-JDG451

Tool and Test Equipment Requirements for Air Compressor - Continued

Tool or Test Equipment Ref Code	Maintenance Level	Nomenclature	National/Stock Number (NSN)	Tool Number
23	H	Cylinder Liner Puller		A-D-01062AA or D-10173AA or B-KCD10001
24	H	Ring Groove Wear Gauge		JDE-62
25	H	Flexible Cylinder Hone		D-17004BR
26	H	Piston Pin Bushing Remover and Installation (Small)		JDE-88
27	H	Piston Pin Bushing Remover and Installation (Large)		JDE-286
28	H	Cleaning Brush		D-17015BR

SECTION IV REMARKS FOR AIR COMPRESSOR

Reference Code	Remarks
A	Repair of Oil Cooler and Radiator is limited to welding of cracks and broken weld seams.
B	Repair of the skid is limited to welding of cracks and broken weld seams and replacement of damaged or missing parts.

APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LIST

SECTION I INTRODUCTION

C-1. SCOPE.

This appendix lists components of the end item and basic issue items for the air compressor to help you inventory the items for safe and efficient operation of the equipment.

a. General. The Components of End Item (COEI) and Basic Issue Items (BII) Lists are divided into the following sections:

(1) Section II Components of End Item. This section is not applicable to this equipment.

(2) Section III, Basic Issue Items. These essential items are required to place the air compressor in operation, operate it, and to do emergency repairs. Although shipped separately packaged, BII must be with the air compressor during operation and when it is transferred between property accounts. This list is your authority to request/requisition them for replacement based on authorization of the end item by the TOE/MTOE. Illustrations are furnished to help you find and identify the items.

b. Explanation of Columns.

(1) Column (1), Illus. Number, gives you the number of the item illustrated.

(2) Column (2), National Stock Number, identifies the stock number of the item to be used for requisitioning purposes.

(3) Column (3), Description and Usable on Code, identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The last line below the description is the Commercial and Government Entity Code (CAGEC) (in parentheses) and the part number.

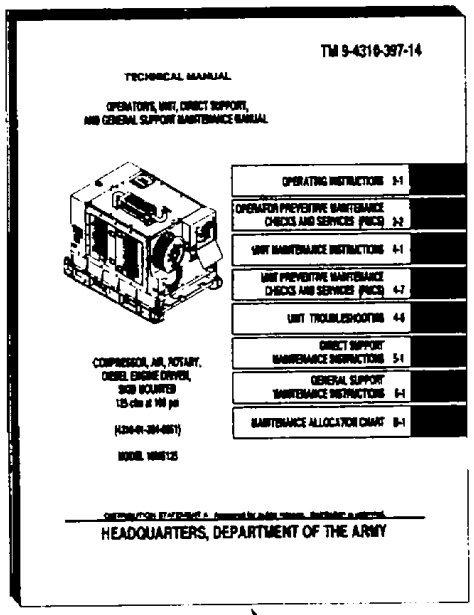
(4) Column (4), U/I (unit of issue), indicates how the item is issued for the National Stock Number shown in column two.

(5) Column (5), Qty Rqd, indicates the quantity required.

SECTION II COMPONENTS OF END ITEM

This section is not applicable to this equipment.

SECTION III BASIC ISSUE ITEMS



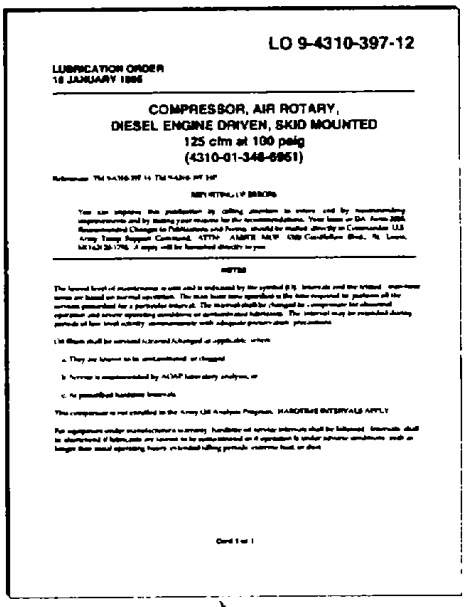


Figure C-1. Basic Issue Items

(1) Illus Number	(2) National Stock Number	(3) Description CAGEC and Part Number Usable On Code	(4) U/I	(5) Qty Rqr
1		DEPARTMENT OF THE ARMY TECHNICAL MANUAL; OPERATOR'S, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL TM 9-4310-397-14	EA	1
2		LUBRICATION ORDER; COMPRESSOR, AIR, ROTARY, DIESEL ENGINE DRIVEN, SKID MOUNTED LO 94310-397-12	EA	1

APPENDIX D

ADDITIONAL AUTHORIZATION LIST

SECTION I INTRODUCTION

D-1. SCOPE.

This appendix lists additional items you are authorized for the support of the air compressor.

D-2. GENERAL.

This list identifies items that do not have to accompany the air compressor and that do not have to be turned in with it. These items are authorized to you by CTA, MTOE, TDA, or JTA.

D-3. EXPLANATION OF LISTING .

National stock number, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. "Used On Code" codes are identified as follows: (Not applicable).

SECTION II ADDITIONAL AUTHORIZATION LIST

(1) National Stock Number	(2) Description CAGEC & Part Number Usable on Code	(4) U/M	(5) Qty rqr
4910-00-387-9592	Drain Pan	ea	1
	Pipe (extends the separator drain valve), 0.50 in (1.27 cm) diameter, threaded one end, 14 in (35 cm) length minimum.	ea	1
7520-00-559-9618	Cotton Duck Case	ea	1

APPENDIX E

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST (EDSML)

SECTION I INTRODUCTION

E-1. SCOPE.

This appendix lists expendable supplies and materials you will need to operate and maintain the 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 coater air filter, Item 1, Appendix E").

b. Column 2, Level This column identifies the lowest level of maintenance that requires the listed item.

C- Operator/Crew
O- Unit Maintenance
F- Direct Support Maintenance
H- General Support Maintenance

c. Column 3, National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column 4, Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Commercial And Government Entity Code (CAGEC) in parentheses, if applicable, followed by the part number.

e. Column 5, Unit of Issue (U/I). 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 CAGEC and Part Number	(5) U/I
1		8030-00-889-3535	Antisieze Tape (81349) MIL-T-27730-522	rl
2		7920-00-205-1711	Wiping Rag	bl
3		9150-00-189-6729	Lubricating Oil (81349) MIL-L-2104, OE/HDO 30	qt
4		9150-00-402-2372	Lubricating Oil (81349) MIL-L-46167, OE/HDO 10	qt
5		8040-00-221-3811	Industrial Adhesive (81348) MMM-A-1617, Type II	oz
6		7930-00-985-6911	Detergent (81349) MIL-D-16791	gl
7		6850-00-664-1403	Antifreeze (81348) O-A-548	gl
8		6850-00-174-1806	Antifreeze (81349) MIL-A-11755	dsu
9		5640-01-152-8458	Foil Back Tape (00941) FSK	rl
10		9150-00-189-6727	Lubricating Oil (81349) MIL-L-2104, OE/HDO 10	qt
11		6850-01-377-1809	Solvent, Dry Cleaning (81348) P-D-680, Type II	gl
12		9150-00-250-0926	Petrolatum (81348) VV-P-236	lb
13			Loctite Sealant (2A052) 271-2	oz
14			Valve Stem Lubricant (75160) AR44402	oz
15		9150-01-115-1649	Lubricant Soap (75160) AR 54749	qt
16			Thermo Solve Concentrate (24844) 7212 or (16004) 62853	gl
17			Cleaning Solvent (16004) D-05303ST	gl
18			Marker Tag	bx
19		9140-00-221-2233	Diesel Fuel (81348) VV-F-800	bbl
20		9130-01-305-5597	Turbine Fuel (81349) MIL-T-83133	bbl

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description CAGEC and Part Number	(5) U/I
21		5210-00-640-6176	Bearing Clearance Gage (77220) PB-1	ea
22		5210-00-640-6177	Bearing Clearance Gage (77220) PG-1	ea
23		5210-00-640-6178	Bearing Clearance Gage (77220) PR-1	ea

APPENDIX F

ILLUSTRATED LIST OF MANUFACTURED ITEMS
SECTION I INTRODUCTION

F-1. SCOPE.

a. This appendix includes complete instructions for making items authorized to be manufactured or fabricated at unit or direct support.

b. A part number index in alphanumeric order is provided for cross-referencing the part number of the item to be manufactured to the figure which covers fabrication criteria.

c. All bulk materials needed for manufacture of an item are listed by part number or specification number in a tabular list on the illustration.

d. All dimensions are given in inches with centimeters shown in parenthesis.

Manufactured Items Part Number Index

Part Number	Figure Number
44363K1	F-1
62400/HOSE	F-1
80286/HOSE	F-1
83668	F-1
83671	F-1
86425/1	F-2
86426/1	F-2
86488	F-1
88007	F-1
88465-3/4	F-3
89028	F-1
89221/5	F-4
89221/12	F-4
89767-1/4	F-4
89770	F-5
89865-1/3	F-4
89880K1	F-1
89881K1	F-1
89884-1/1	F-6
89884-1/2	F-6
89884-1/3	F-6
89884-1/4	F-6

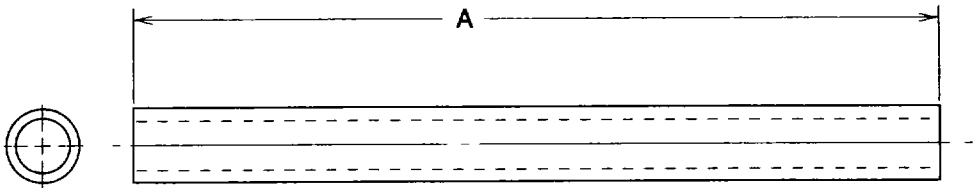
Manufactured Items Part Number Index - Continued

Part Number	Figure Number
89884-1/5	F-6
89884-1/7/3	F-7
89884-1/7/4	F-7
89884-1/7/15	F-7
89884-1/7/16	F-7
89884-1/7/22	F-7
89884-1/7/25	F-7
89884-1/7/26	F-7
89884-1/7/28	F-7
89885-1/1	F-7
89885-2/1	F-7
89885-3/1	F-7
89885-4/1	F-7
89885-5/1	F-7
89885-6/1	F-7
89885-7/1	F-7
89885-8/1	F-7
89885-9/1	F-7
89885-10/1	F-7
89885-11/1	F-7
89886-1/1	F-7
89887-1/1	F-7
89887-1/3	F-8
89888-1/1	F-7
89888-1/4	F-8
89889-1/1	F-7
89889-1/4	F-8
89890-1/1	F-7
89890-1/4	F-8
89891-1/1	F-7
89891-1/4	F-8
89892-1/4	F-6
89892-1/6	F-7
89903	F-1
89905	F-1
89906-1/1	F-1

Manufactured Items Part Number Index - Continued

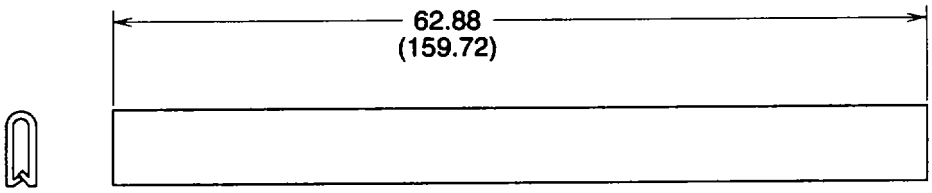
Part Number	Figure Number
89908	F-9
89909	F-10
89910	F-11
88911	F-12
89912	F-13
89913	F-14
89914	F-11
89915	F-11
89916	F-11
89917	F-11
89918	F-15
89919	F-11
89920	F-16
89921	F-11
89922	F-11
89923	F-11
89924	F-11
89995-1	F-1
89995-3	F-1
90101-1	F-17
90101-3	F-17

SECTION II MANUFACTURED ITEMS ILLUSTRATIONS



PART NUMBER	A DIM	FABRICATE FROM
44363K1	40.00 (88.90)	(01276) 2556-4 (OR EQUAL) LOW PRESSURE .25 (.64) ID HOSE
62400/HOSE	600.00 (1524.00)	(24161) ECONO FLEX 3204-0420 (OR EQUAL) 200 PSI MINIMUM WORKING PRESSURE .75 (1.91) ID AIR & WATER HOSE
80286/HOSE	41.00 (104.14)	(01276) 2556-4 (OR EQUAL) LOW PRESSURE .25 (.64) ID HOSE
83671	10.00 (25.4)	(45681) NN-5-040 (OR EQUAL) .3125 (.07938) OD NYLON TUBING
83668	14.00 (35.56)	(45681) NN-5-040 (OR EQUAL) .3125 (.07938) OD NYLON TUBING
86488	5.50 (13.97)	(01276) 2661-24 1.50 (3.81) ID HOSE
88007	6.00 (15.24)	(01276) 2556-4 (OR EQUAL) LOW PRESSURE .25 (.64) ID HOSE
89028	12.00 (3048)	(45681) NN-5-040 (OR EQUAL) .3125 (.07938) OD NYLON TUBING
89880K1	65.00 (165.10)	(00624) FC350-12AQP (OR EQUAL) MEDIUM PRESSURE .75 (1.91) ID HOSE
89881K1	21.00 (53.34)	(01276) FC350-12AQP (OR EQUAL) MEDIUM PRESSURE .75 (1.91) ID HOSE
89903	30.00 (76.20)	(45681) NN-5-040 (OR EQUAL) .3125 (.07938) OD NYLON TUBING
89905	30.00 (76.20)	(24161) 16C5D (OR EQUAL) MEDIUM PRESSURE .875 (2.54) ID HOSE
89906-1/1	28.00 (71.12)	(00624) 2556-4 (OR EQUAL) LOW PRESSURE .25 (.64) ID HOSE
89995-1	40.00 (101.60)	(81349) MIL-H-13444, Type I .125 (.318) ID RUBBER HOSE
89995-3	24.00 (60.96)	(81349) MIL-H-13444, Type I .125 (.318) ID RUBBER HOSE

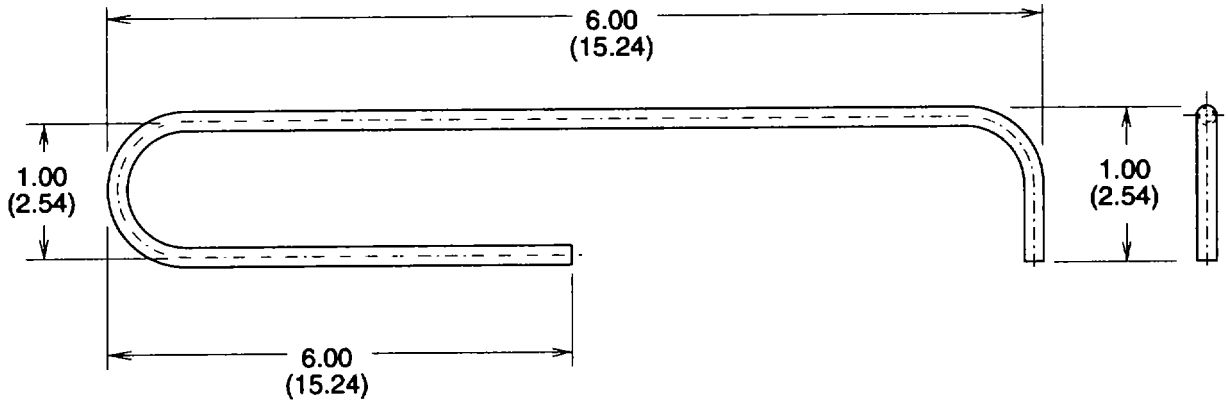
Figure F-1. Hose and Tubing



NOTE

1. FABRICATE FROM (82654) 75000316 ALUMINUM CORE VINYL TRIM

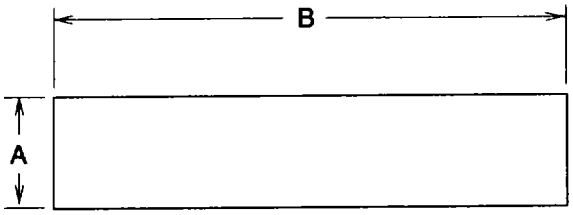
Figure F-2. Trim, Part Number 86425/1 &86426/1



NOTE

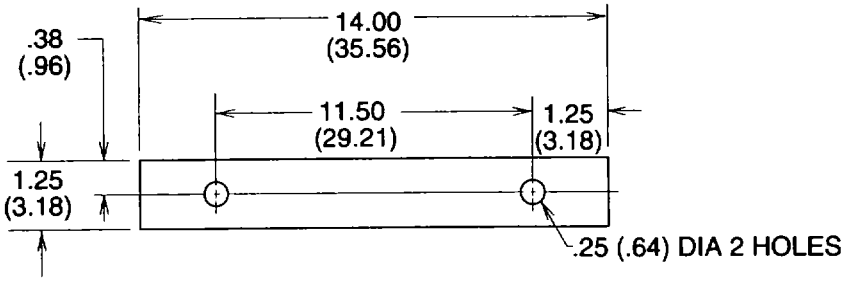
1. FABRICATE FROM ASTM A269, TYPE 304.125 (.318) OD X .028 (.071) WALL STAINLESS STEEL TUBING

Figure F-3. Tubing, Part Number 88465-3/4



PART NUMBER	A DIM	B DIM	FABRICATE FROM
89221/5	.50 (1.27)	26.00 (66.04)	(16004) 51278 WEATHER STRIPPING
89221/12	.50 (1.27)	26.00 (66.04)	(16004) 51279 WEATHER STRIPPING
89767-1/4	.75 (1.91)	13.75 (34.93)	ASTM D1056 2A2C2F2 RUBBER SHEET .063 (.160) TH
89865-1/3	1.00 (2.54)	8.25 (20.96)	ASTM D1056 2A2C2F2 RUBBER SHEET .125 (.318) TH

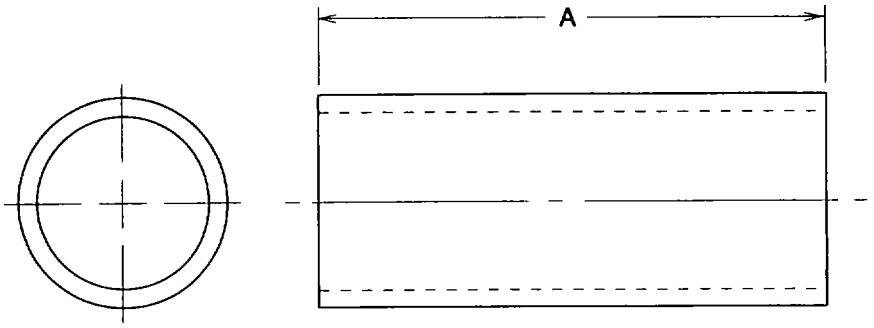
Figure F-4. Gasket



NOTE

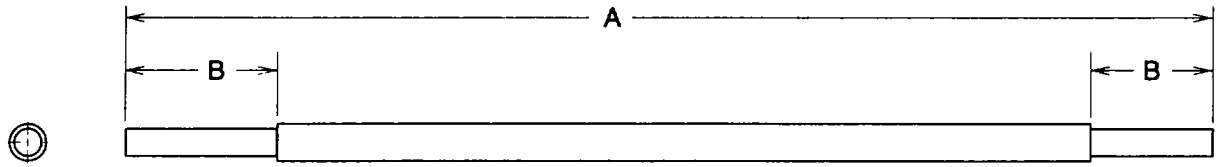
1. **FABRICATE FROM ASTM D1056 2A2C2F2 RUBBER SHEET .063 (.160) THICK**

Figure F-5. Gasket, Part Number 89770



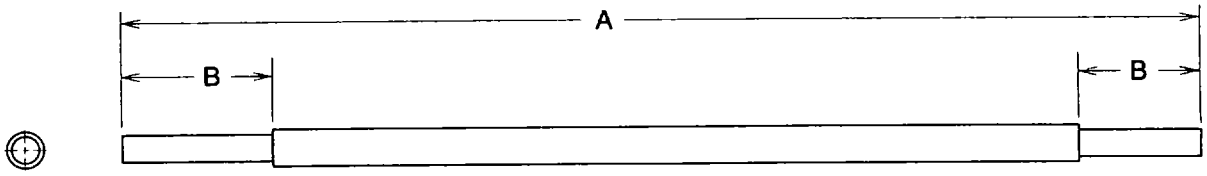
PART NUMBER	A DIM	FABRICATE FROM
89884-1/1	31.00 (78.74)	(5T246) PLF-58 NON METALLIC .625 (1.59) ID AUTO LOOM
89884-1/2	16.00 (40.64)	(77060) 1203 NON METALLIC .25 (.64) ID AUTO LOOM
89884-1/3	22.00 (55.88)	(77060) 1203 NON METALLIC .25 (.64) ID AUTO LOOM
89884-1/4	10.00 (25.40)	(77060) 1203 NON METALLIC .25 (.64) ID AUTO LOOM
89884-1/5	19.00 (48.26)	(77060) 1203 NON METALLIC .25 (.64) ID AUTO LOOM
89892-1/4	28.00 (71.12)	(77060) 1203 NON METALLIC .25 (.64) ID AUTO LOOM

Figure F-6. Loom



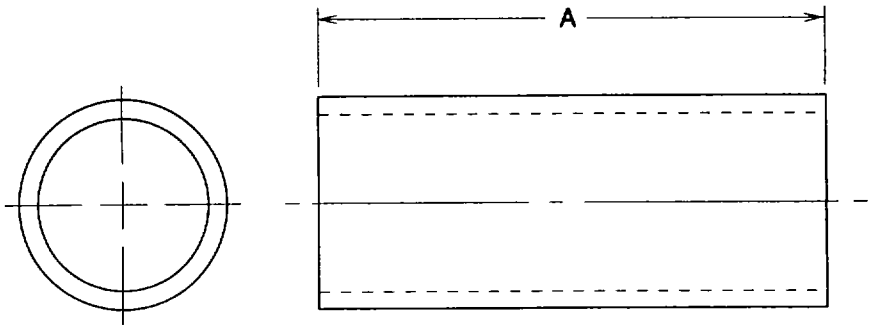
PART NUMBER	A DIM	B DIM	FABRICATE FROM
89884-1/7/3	51.00 (129.54)	.38 (.97)	(81349) M5086/2-14-3 WIRE, ELECTRIC, 14 GAGE
89884-1/7/4	51.00 (129.54)	.38 (.97)	(81349) M5086/2-14-7 WIRE, ELECTRIC, 14 GAGE
89884-1/7/15	62.00 (157.48)	.38 (.97)	(81349) M5086/2-14-2 WIRE, ELECTRIC, 14 GAGE
89884-1/7/16	62.00 (157.48)	.38 (.97)	(81349) M5086/2-14-4 WIRE, ELECTRIC, 14 GAGE
89884-1/7/22	65.00 (165.10)	.38 (.97)	(81349) M5086/2-14-6 WIRE, ELECTRIC, 14 GAGE
89884-1/7/25	64.00 (162.56)	.38 (.97)	(81349) M5086/2-10-9 WIRE, ELECTRIC, 10 GAGE
89884-1/7/26	52.50 (133.35)	.38 (.97)	(81349) M5086/2-10-9 WIRE, ELECTRIC, 10 GAGE
89884-1/7/28	52.50 (133.35)	.38 (.97)	(81349) M5086/2-10-9 WIRE, ELECTRIC, 10 GAGE
89885-1/1	10.00 (25.40)	.38 (.97)	(81349) M5086/2-14-2 WIRE, ELECTRIC, 14 GAGE
89885-2/1	14.00 (35.56)	.38 (.97)	(81349) M5086/2-10-9 WIRE, ELECTRIC, 10 GAGE
89885-3/1	6.00 (15.24)	.38 (.97)	(81349) M5086/2-14-6 WIRE, ELECTRIC, 14 GAGE
89885-4/1	4.00 (10.16)	.38 (.97)	(81349) M5086/2-14-3 WIRE, ELECTRIC, 14 GAGE
89885-5/1	10.00 (25.40)	.38 (.97)	(81349) M5086/2-14-2 WIRE, ELECTRIC, 14 GAGE
89885-6/1	6.00 (15.24)	.38 (.97)	(81349) M5086/2-10-9 WIRE, ELECTRIC, 14 GAGE
89885-7/1	10.00 (25.40)	.38 (.97)	(81349) M5086/2-14-4 WIRE, ELECTRIC, 14 GAGE
89885-8/1	12.00 (30.48)	.38 (.97)	(81349) M5086/2-14-5 WIRE, ELECTRIC, 14 GAGE
89885-9/1	6.00 (15.24)	.38 (.97)	(81349) M5086/2-14-5 WIRE, ELECTRIC, 14 GAGE
89885-10/1	8.00 (20.32)	.38 (.97)	(81349) M5086/2-14-5 WIRE, ELECTRIC, 14 GAGE
89885-11/1	10.00 (25.40)	.38 (.97)	(81349) M5086/2-14-6 WIRE, ELECTRIC, 14 GAGE
89886-1/1	16.00 (149.86)	.50 (1.27)	(81349) M5086/2-02-0 WIRE, ELECTRIC, 00 GAGE
89887-1/1	59.00 (149.86)	.50 (1.27)	(81349) M5086/2-02-0 WIRE, ELECTRIC, 00 GAGE
89888-1/1	59.00 (149.86)	.50 (1.27)	(81349) M5086/2-02-0 WIRE, ELECTRIC, 00 GAGE

Figure F-7. Electrical Wire



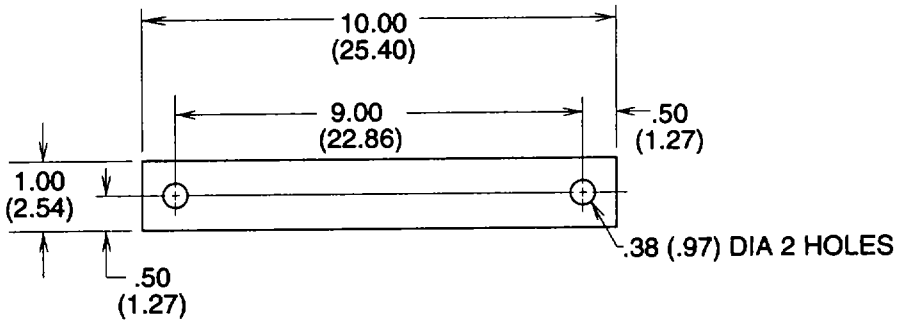
PART NUMBER	A DIM	B DIM	FABRICATE FROM
89889-1/1	30.00 (76.20)	.50 (1.27)	(81349) M5086/2-02-0 WIRE, ELECTRIC, 00 GAGE
89890-1/1	16.00 (40.64)	.50 (1.27)	(81349) M5086/2-02-0 WIRE, ELECTRIC, 00 GAGE
89891-1/1	24.00 (60.96)	.50 (1.27)	(81349) M5086/2-02-0 WIRE, ELECTRIC, 00 GAGE
89892-1/6	30.75 (78.11)	.38 (.97)	(81349) M5086/2-14-3 WIRE, ELECTRIC, 14 GAGE

Figure F-7. Electrical Wire (Continued)



PART NUMBER	A DIM	FABRICATE FROM
89887-1/3	1.50 (3.81)	(81349) M23053/5-108-2 HEAT SHRINKABLE TUBING
89888-1/4	1.50 (3.81)	(81349) M23053/5-108-9 HEAT SHRINKABLE TUBING
89889-1/4	1.50 (3.81)	(81349) M23053/5-108-2 HEAT SHRINKABLE TUBING
89890-1/4	1.50 (3.81)	(81349) M23053/5-108-9 HEAT SHRINKABLE TUBING
89891-1/4	1.50 (3.81)	(81349) M23053/5-108-2 HEAT SHRINKABLE TUBING

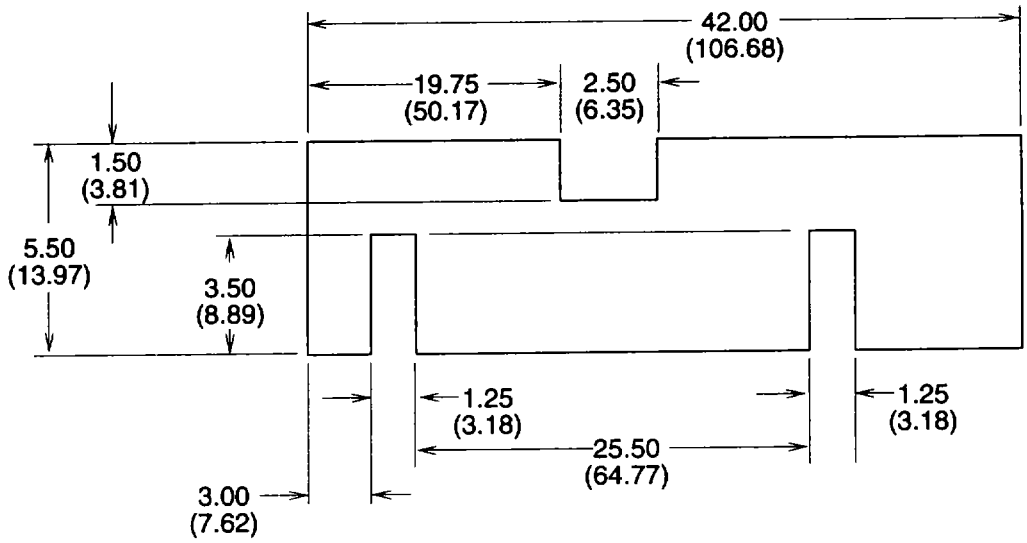
Figure F-8. Heat Shrink Tubing



NOTE

1. FABRICATE FROM ASTM D1056 A2C2F2 RUBBER SHEET .125 (.318) THICK

Figure F-9. Gasket, Part Number 89908



NOTE

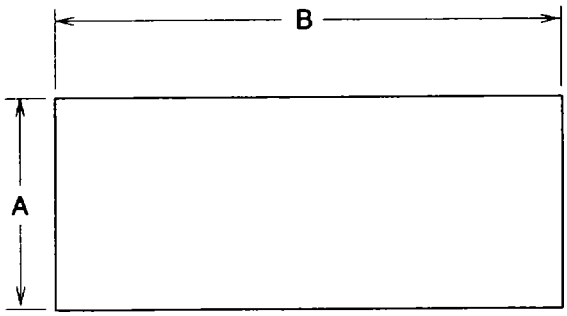
FABRICATE FROM ONE INCH THICK 4 LB DENSITY FIBERGLASS BONDED TO 1/16 INCH THICK ANTIPHON 13 RESONANCE BOARD WITH PRESSURE SENSITIVE ADHESIVE ON EXTERIOR. OPPOSITE SIDE TO BE BONDED TO 3.5 MIL THICK ALUMINUM.

MANUFACTURED BY: ANTIPHON INC.
290 NEW CHURCHMANS ROAD
NEW CASTLE, DELAWARE 19720

AVAILABLE FROM (16004) 51277

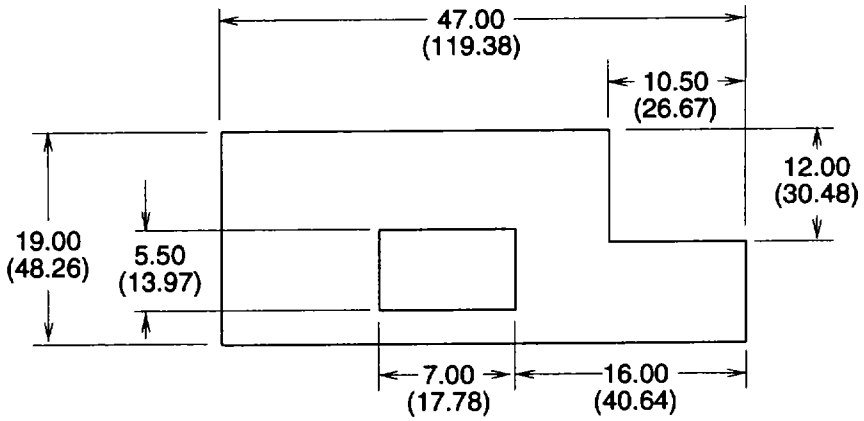
SHEET SIZE 40 X 48 INCHES (101.6 X 121.9)

Figure F-10. Insulation, Part Number 89909



PART NUMBER	A DIM	B DIM	FABRICATE FROM
89910	2.50 (6.35)	12.00 (30.48)	ONE INCH THICK 4 LB DENSITY FIBERGLASS BONDED TO 1/16 INCH THICK ANTIPHON 13 RESONANCE BOARD WITH PRESSURE SENSITIVE ADHESIVE ON EXTERIOR. OPPOSITE SIDE TO BE BONDED TO 3.5 MIL THICK ALUMINUM. MANUFACTURED BY: ANTIPHON INC. 290 NEW CHURCHMANS ROAD NEW CASTLE, DELAWARE 19720 AVAILABLE FROM (16004) 51277 SHEET SIZE 40 X 48 INCHES (101.6 X 121.9)
89914	6.00 (15.24)	20.50 (52.07)	
89915	3.50 (8.89)	20.50 (52.07)	
89916	6.00 (15.24)	34.00 (86.36)	
89917	5.00 (12.70)	22.00 (55.88)	
89919	3.50 (8.89)	23.50 (59.69)	
89921	11.00 (27.94)	34.00 (86.36)	
89922	10.00 (25.40)	34.00 (86.36)	
89923	3.00 (7.62)	34.00 (86.36)	
89924	11.00 (27.94)	34.00 (86.36)	

Figure F-11. Insulation



NOTE
FABRICATE FROM ONE INCH THICK 4 LB DENSITY FIBERGLASS BONDED TO 1/16 INCH THICK ANTIPHON 13 RESONANCE BOARD WITH PRESSURE SENSITIVE ADHESIVE ON EXTERIOR. OPPOSITE SIDE TO BE BONDED TO 3.5 MIL THICK ALUMINUM.

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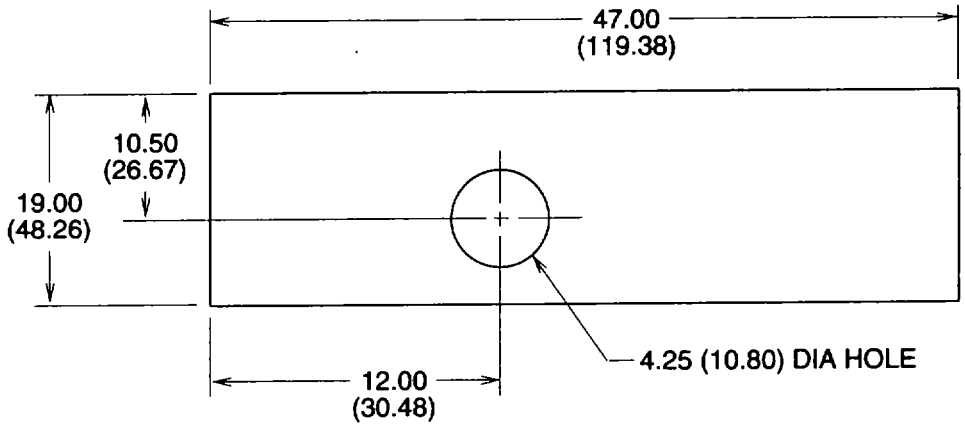
290 NEW CHURCHMANS ROAD
NEW CASTLE, DELAWARE 19720

AVAILABLE FROM (16004) 51277

SHEET SIZE 40 X 48 INCHES (101.6 X 121.9)

Figure F-12. Insulation, Part Number 89911



NOTE
FABRICATE FROM ONE INCH THICK 4 LB DENSITY FIBERGLASS BONDED TO 1/16 INCH THICK ANTIPHON 13 RESONANCE BOARD WITH PRESSURE SENSITIVE ADHESIVE ON EXTERIOR. OPPOSITE SIDE TO BE BONDED TO 3.5 MIL THICK ALUMINUM.

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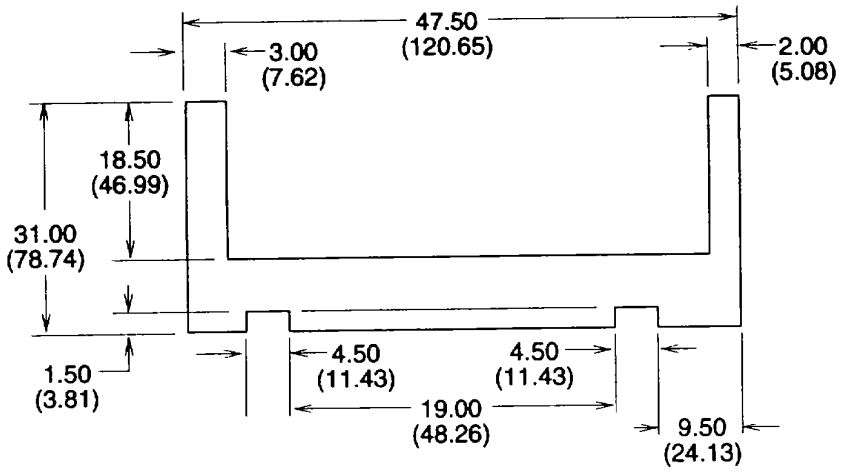
SHEET SIZE 40 X 48 INCHES (101.6 X 121.9)

Figure F-13. Insulation, Part Number 89912



NOTE
FABRICATE FROM ONE INCH THICK 4 LB DENSITY FIBERGLASS BONDED TO 1/16 INCH THICK ANTIPHON 13 RESONANCE BOARD WITH PRESSURE SENSITIVE ADHESIVE ON EXTERIOR. OPPOSITE SIDE TO BE BONDED TO 3.5 MIL THICK ALUMINUM.

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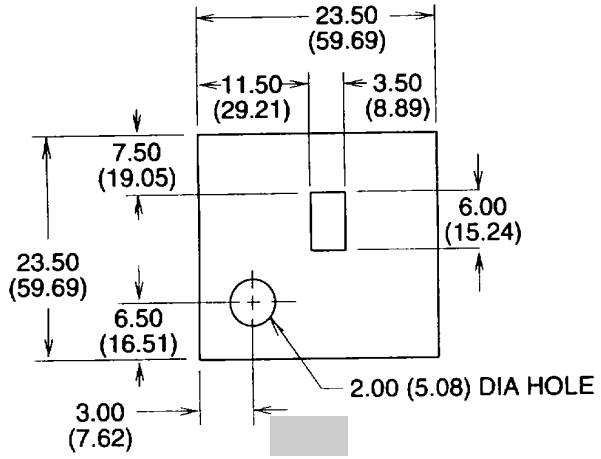
AVAILABLE FROM (16004) 51277

SHEET SIZE 40 X 48 INCHES (101.6 X 121.9)

Figure F-14. Insulation, Part Number 89913



NOTE
FABRICATE FROM ONE INCH THICK 4 LB DENSITY FIBERGLASS BONDED TO 1/16 INCH THICK ANTIPHON 13 RESONANCE BOARD WITH PRESSURE SENSITIVE ADHESIVE ON EXTERIOR. OPPOSITE SIDE TO BE BONDED TO 3.5 MIL THICK ALUMINUM.

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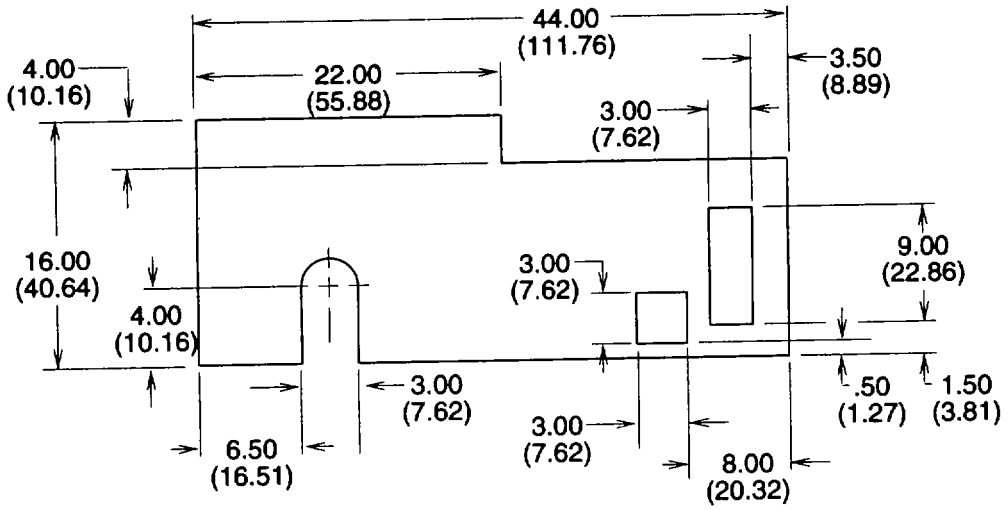
SHEET SIZE 40 X 48 INCHES (101.6 X 121.9)

Figure F-15. Insulation, Part Number 89918



NOTE
FABRICATE FROM ONE INCH THICK 4 LB DENSITY FIBERGLASS BONDED TO 1/16 INCH THICK ANTIPHON 13 RESONANCE BOARD WITH PRESSURE SENSITIVE ADHESIVE ON EXTERIOR. OPPOSITE SIDE TO BE BONDED TO 3.5 MIL THICK ALUMINUM.

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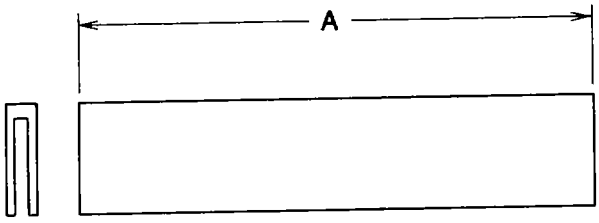
AVAILABLE FROM (16004) 51277

SHEET SIZE 40 X 48 INCHES (101.6 X 121.9)

Figure F-16. Insulation, Part Number 89920



PART NUMBER	A DIM	FABRICATE FROM
90101-1	9.94 (25.25)	(94833) 555K5009 NEOPRENE CHANNEL
90101-3	11.81 (30.00)	(94833) 555K5009 NEOPRENE CHANNEL

Figure F-17. Gasket

APPENDIX G

TORQUE LIMITS

GENERAL

All hardware items used on the air compressor that require specific torque values have been addressed throughout the maintenance procedures.

APPENDIX H

MANDATORY REPLACEMENT PARTS

Mandatory replacement parts consist of parts that are automatically replaced when the maintenance task is performed. Some examples are seals, gaskets, lock washers, etc.

ITEM NO.	PART NUMBER	NATIONAL STOCK NUMBER	NOMENCLATURE	QTY
1	53576-1	5310-01-184-5821	Nut, Self Locking	18
2	T20141	5330-01-117-5885	Gasket	1
3	21SFFU1420		Nut, Lock	29
4	MS35338-44	5310-00-582-5965	Washer, Lock	36
5	MS51922-1	5310-00-088-1251	Nut, Self Locking	8
6	009-479		Clip	80
7	MS35338-43	5310-00-045-3296	Washer, Lock	2
8	24936		Packing, Preformed	2
9	13214E3789-3		Rivet, Blind	4
10	MS35337-24	5310-00-186-7499	Washer, Lock	2
11	MS3367-2-9	5975-00-156-3253	Strap, Self Clinching	32
12	MS3367-4-9	5975-00-727-5153	Strap, Self Clinching	12
13	MS51922-17	5310-00-087-4652	Self, Locking Nut	8
14	MS35338-46	5310-00-637-9541	Washer, Lock Spring Helical	15
15	MS35338-45	5310-00-407-9566	Washer, Lock	28
16	1218-02	5310-00-187-0159	Washer, Lock	2
17	975-75		Packing, Preformed	1
18	R10093	9340-00-346-4407	Packing, Preformed	1
19	44051	5330-00-135-9807	Gasket	1
20	MS51922-33	5310-00-225-6993	Nut, Self Locking	16
21	7629x16	5330-00-584-1589	Packing Preformed	1
22	MS27183-42	5310-00-014-5850	Washer, Lock	4
23	PRP 568-012		Packing, Preformed	2
24	61761	5330-00-137-3455	Gasket	1
25	1214-10	5310-00-404-4637	Washer, Lock	2
26	MS59122-1		Nut, Self Locking	1
27	67911		Nut, Self Locking	1
28	43365	5330-00-357-2113	Gasket	1

MANDATORY REPLACEMENT PARTS - Continued

ITEM NO.	PART NUMBER	NATIONAL STOCK NUMBER	NOMENCLATURE	QTY
29	PRP568-119		Packing Preformed	2
30	PRP568-227		Packing Preformed	1
31	145369	5305-00-014-5369	Screw, Drive	2
32	PRP568-231		Packing, Preformed	1
33	24999	5330-00-422-2586	Packing, Preformed	1
34	43357		Gasket	2
35	PRP568-26		Packing, Preformed	1
36	110-1/2	5330-00-641-2291	Packing With Retainer	12
37	80610		Rivet, Blind	7
38	44413		Gasket	1
39	MS35338-48		Washer, Lock	9
40	T20243	5330-01-126-1042	Gasket	1
41	R97455	2930-01-352-9228	Gasket	1
42	13214E3789-10		Rivet, Blind	24
43	12H304	5310-01-118-2362	Washer, Lock	36
44	AR21837		Clamp, Hose	3
45	R106796	5330-01-388-8523	Gasket	1
46	RE13887		Preformed Packing Kit (Injection Nozzle Repair)	1
47	R79605	5365-01-188-4113	Bushing, Non-metallic	3
48	RE51936		Packing	6
49	R97354	5330-01-232-2155	Gasket	1
50	R63104	5310-01-413-5135	Washer, Lock	1
51	R97351	5330-01-333-4469	Gasket	1
52	19H3025		Screw, Cap	4
53	R97356	5330-01-414-7155	Gasket, Cylinder Head	1
54	T24534	5330-00-008-9220	Gasket	1
55	13214E3789-6		Rivet	16
56	R75892	5330-01-307-9411	Packing, Preformed	1
57	R74354	5330-01-236-1743	Packing, Preformed	1
58	R61871	5330-01-311-5972	Packing, Preformed	1
59	19H2284	5305-01-118-4271	Gasket	1
60	R97454	5330-01-335-6926	Gasket	1

MANDATORY REPLACEMENT PARTS - Continued

ITEM NO.	PART NUMBER	NATIONAL STOCK NUMBER	NOMENCLATURE	QTY
61	R80033	5306-01-236-0449	Screw, Cap	12
62	AR65507	5330-01-101-0440	Packing, Preformed Kit	3
63	13214E3789-13		Rivet, Blind	52
64	13220E5213-2	5320-00-135-1125	Rivet, Blind	4
65	PRP-568-225	5330-00-796-4586	Packing, preformed	1
66	44055	5330-00-477-1274	Gasket	1
67	R70956	5330-01-105-7264	Packing, Preformed	1
68	MS21044-N4	5310-00-877-5796	Nut, Lock	1
69	12H303	5310-01-118-2364	Washer, Lock	2
70	R87259	5330-01-360-7180	Retainer, Packing	1
71	T20328	5330-01-119-3977	Disk, Solid, Plain	1
72	T16318		Gasket	1
73	T20215	5330-00-340-5374	Gasket	1
74	R90658		Gasket	3
75	MS51922-49	5310-00-269-4040	Nut, Self Locking	3
76	MS35338-50		Washer, Lock	6
77	12H324	5310-01-118-7940	Washer, Lock	5

GLOSSARY

SECTION I ABBREVIATIONS

AAL ..... Additional Authorization List
ATTN ..... Attention
bbl ..... Barrel
BII ..... Basic Issue Items
Blvd ..... Barrel
BII ..... Basic Issue Items
Blvd. ..... Boulevard
BOI ..... Basis Of Issue
CAGEC ..... Commercial And Government Entity Code
CPC ..... Corrosion Prevention and Control
EIR ..... Equipment Improvement Recommendation
FIG ..... Figure
Illus ..... Illustration
MAC ..... Maintenance Allocation Chart
MIL-HDBK ..... Military Standardization Handbook
MO ..... Missouri
MTOE ..... Modified Table of Organization and Equipment
NATO ..... North Atlantic Treaty Organization
NBC ..... Nuclear, Biological, and Chemical
NIIN ..... National Item Identification Number
NSN ..... National Stock Number
PMCS ..... Preventive Maintenance Checks and Services
psig ..... Pounds per square inch gauge
QTY ..... Quantity
Ref ..... Reference
RPSTL ..... Repair Parts and Special Tools List
SMR ..... Source Maintenance and Recoverability
St ..... Saint
TAMS ..... The Army Maintenance Management Systems
TMDE ..... Test Measurement and Diagnostic Equipment
UOC ..... Usable On Code

SECTION II DEFINITION OF UNUSUAL TERMS

No unusual terms are used in this manual.

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10. **Publication Date**: 04-JUL-85
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P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

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 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 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

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

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