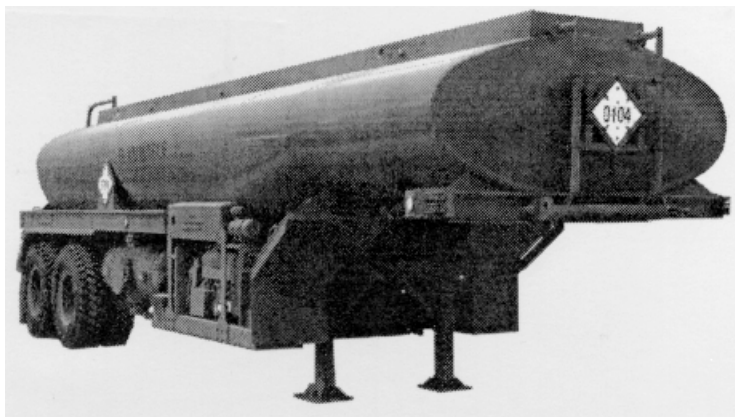


## TECHNICAL MANUAL

### UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL FOR SEMITRAILER, TANK, 5000-GALLON, FUEL DISPENSING, AUTOMOTIVE M969A2 (NSN 2330-01-377-9337)



HOW TO USE THIS MANUAL

v

INTRODUCTION

1-1

UNIT PREVENTIVE MAINTENANCE  
CHECKS AND SERVICES (PMCS)

2-4

UNIT TROUBLESHOOTING  
PROCEDURES

2-14

UNIT GENERAL MAINTENANCE  
INSTRUCTIONS

2-64

DIRECT SUPPORT  
TROUBLESHOOTING  
PROCEDURES

3-1

DIRECT SUPPORT GENERAL  
MAINTENANCE INSTRUCTIONS

3-25

GENERAL SUPPORT  
MAINTENANCE

4-1

APPENDIX A: REFERENCES

A-1

APPENDIX B: MAINTENANCE  
ALLOCATION CHART

B-1

APPENDIX C: EXPENDABLE AND  
DURABLE ITEMS LIST

C-1

APPENDIX D: ILLUSTRATED LIST OF  
MANUFACTURED ITEMS

D-1

APPENDIX E: TORQUE VALUES  
FOR THREADED FASTENERS

E-1

APPENDIX F: MANDATORY  
REPLACEMENT PARTS

F-1

APPENDIX G: LUBRICATION  
INSTRUCTIONS

G-1

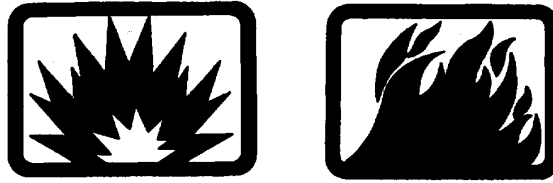
APPENDIX H: ELECTRICAL SYSTEM  
SCHEMATICS

H-1

INDEX  
INDEX-1

Approved for public release; distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY  
JUNE 1996

**WARNING****GROUNDING SEMITRAILER**

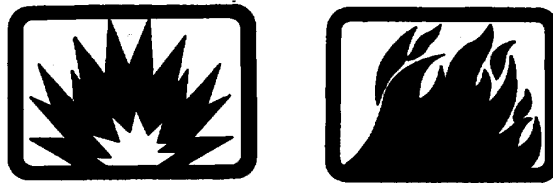
- Be sure that grounding connections are made properly and firmly before any fueling operations begin. This will ensure that grounding connections will not release, thus eliminating the possibility of sparks caused by static electricity which will ignite the fuel. This applies to top loading and bottom loading at a fixed loading facility. Bottom loading is the preferred method when facilities are available. Failure to follow this warning may cause a spark to ignite, resulting in serious injury or death to personnel.
- The grounding cable must be connected before any servicing operations. The first dip should be attached to the ground rod. The second clip should be attached to the aircraft grounding fitting, if one is provided, or to a convenient unpainted metal point on the aircraft. Grounding should not be made to a propeller, radio antenna, or highly stressed components of the landing gear where scratches could cause metal failure. Always disconnect the grounding clips in reverse order: first the aircraft, then the ground rod. The grounding cables shall be disconnected only after full servicing operations have been completed and all dispensing nozzles and hoses have been disconnected or removed from the filler opening and stowed on the refueling vehicle. Grounding cables attached to dispensing nozzles may be disconnected only after nozzles have been disconnected or removed from filler openings of the aircraft being serviced. Failure to follow this warning may cause a spark to ignite, resulting in serious injury or death to personnel.

**WARNING****BONDING AND GROUNDING AIRCRAFT OR VEHICLE TO SEMITRAILER**

- Bond the fuel nozzle to the aircraft or vehicle before opening the filler cap. Connect closed-circuit nozzles securely before beginning fuel flow. Electrical hazards may be introduced in several ways, such as:
  - Electrostatic sparks.
  - Operation of aircraft engines, auxiliary power units, and heaters.
  - Operation of automotive equipment, other than that performing the fuel servicing functions, within 50 feet (15.25 m) of the aircraft or vehicle during fuel-servicing operations.
  - Arcing of electrical circuits.
  - Open flames.
  - Energy from energized equipment.
  - Lightning.

**WARNING****BONDING AND GROUNDING AIRCRAFT OR VEHICLE TO SEMITRAILER (continued)**

- Due to the dangers of static electricity, grounding the semitrailer to the aircraft or vehicle while refueling is mandatory, regardless of amount of fuel to be dispensed. Failure to follow this warning may cause spark to ignite, resulting in serious injury or death to personnel.
- Before performing maintenance on the semitrailer, the semitrailer must be grounded to an approved (earth) ground and it must be safe to proceed. Failure to follow the warning may cause a spark to ignite, resulting in serious injury or death to personnel.

**WARNING****FUEL HANDLING**

- To avoid serious injury or death to personnel, DO NOT fill tanker while pump engine is running, while smoking, or when near open flame. Never overfill the tanker or spill fuel. If fuel is spilled, clean it up immediately.
- Post signs that read "NO SMOKING WITHIN 50 FEET" when performing any fueling operation. Failure to follow this warning can cause fuel to ignite, resulting in serious injury or death to personnel.
- Do not smoke while performing any fueling operation, or when located within 50 feet (15.25 m) of fueling and fuel storage areas.
- Do not let fuel or oil drain on hot engine. Fuel or oil can catch fire and cause injury or death to personnel.
- Keep fuel away from open flames and keep fire extinguisher within easy reach when working with fuel. Fuel is very flammable and can explode easily, resulting in serious injury or death to personnel.
- Spilled fuel is slippery and can cause you to slip and fall. To avoid injury, wipe up spilled fuel immediately with rags.
- Follow all fuel-handling procedures precisely, to prevent injury or death to personnel.
- All fueling/defueling operations must be performed outside. Failure to follow this warning may cause spark to ignite fuel vapors, resulting in serious injury or death to personnel.

**WARNING****FUEL HANDLING (continued)**

- Before and after all fuel-servicing operations, all valves must be in the closed position. Failure to follow this warning could cause excessive spillage or fire, resulting in serious injury or death to personnel.
- DO NOT permit automotive equipment, other than that performing the fuel-servicing functions, to be within 50 feet (15.25 m) of the aircraft or vehicle during fuel-servicing operations.
- When the semitrailer is emptied of fuel, a mixture of vapor and air remains that may be, and often is, within the flammable range. Refilling the semitrailer with a different type of fuel other than it originally contained can cause a potential explosive atmosphere within the semitrailer. Know what fuel was previously carried so that preventive measures may be taken to ensure that injurious or explosive fumes are not released. Failure to follow this warning may result in serious injury or death to personnel.
- DO NOT attempt aircraft fueling operations if combustion heaters (e.g., wing and tail surface heaters or integral cabin heaters) are being operated on the aircraft. Failure to follow this warning may cause a fire or explosion, resulting in serious injury or death to personnel.
- When filling tank by means of bottom loading, or self-loading, a test of the precheck system is mandatory. If this system is not functioning, stop all operations. Determine the problem and have it corrected by a qualified technician. Failure of automatic shutoff to function may cause uncontrolled fuel spillage, fire, and/or explosion, resulting in serious injury or death to personnel.
- When top loading through fill cover, there is no automatic shutdown. Man the loading hose to avoid fuel spillage. Use the capacity indicator gage and dipstick gage to determine amount of fuel loaded. Failure to follow this warning may cause uncontrolled fuel spillage, fire, and/or explosion, resulting in serious injury or death to personnel.
- DO NOT mix incompatible fuels in the tank. Dangerous fumes and explosion may result. Know what fuel was previously carried so that preventive measures may be taken to ensure that injurious or explosive fumes are not released. Failure to follow this warning may result in injury or death to personnel.
- In an emergency, pull emergency valve A control handle to CLOSED or pull emergency valve A shutoff valve on opposite side (curb side) of semitrailer. Failure to do so may result in injury to personnel.



**WARNING****FUEL HANDLING (continued)**

- The operator must be alert for leaking or malfunctioning equipment. Stop all servicing operations immediately at the first sign of leaks or malfunctions. Corrective action must be performed by qualified technicians before resuming any operations. Failure to follow this warning may cause fire or explosion, resulting in serious injury or death to personnel.
- Parking areas for fuel-servicing vehicles should be arranged to:
  - Facilitate the dispersal of vehicles in event of an emergency.
  - Provide a distance of at least 25 feet (7.63 m) of clear space between vehicles for accessibility for firecontrol purposes.
  - Prevent fuel from any vehicle from draining into an adjacent building.
  - Provide a distance of at least 50 feet (15.25 m) from any structure that houses the public and may have windows or doors in exposed walls.
- All vapor-freeing work by any method should be carried on outdoors, remote from vehicles and other known sources of ignition, and the tank unit must be stationed where flammable vapors will not blow or drift indoors. Failure to follow this warning may result in serious injury or death to personnel.
- **DO NOT** allow fuel-dispensing nozzle spray to contact skin. Diesel fuel under pressure can penetrate flesh and cause serious injury and infection.
- The following must be observed if the semitrailer is to be moved to the inside of a building:
  - The tank must be completely drained and purged.
  - The interior of the tank must be checked with explosive meter prior to moving into the building.
  - The combustible gas indicator set must be used to check the tank prior to starting work each day, and random checks must be performed during the day.
  - No open flames, welding, or use of heat-producing devices is permitted near the tank during maintenance unless the tank tests safe with the combustible gas indicator set.
  - No smoking is allowed within 50 feet (15.25 m) of semitrailer at any time.
- **DO NOT** climb into interior of the tank until it has been completely drained and purged and a combustible gas indicator set check indicates that it is safe. Adequate forced-air ventilation or a self-contained breathing apparatus must be used. Any person entering the tank must have an attached lifeline. An observer must be stationed at the manhole opening so that assistance may be summoned in the event of an emergency. Failure to follow this warning may result in serious injury or death to personnel.

**WARNING**

**GENERAL OPERATION**

**DO NOT** let go of static reel cable when rewinding until ball stop is firmly touching the reel. Failure to follow this warning may cause injury to personnel.

**WARNING**

The semitrailer must not be operated if fuel leaks from semitrailer tank or engine. Report any fuel leaks to your supervisor or Unit maintenance. Failure to do so may result in a fire hazard, which can cause severe injury or death to personnel.

**WARNING**

Ladder has narrow treads. To prevent injury, use care when climbing.

**WARNING**

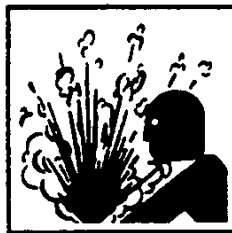
Spare tire and ladder are heavy. Make sure cable is not frayed or damaged. Do not raise spare tire and ladder past the vertical position or they will slam into carrier assembly. Failure to follow this warning may result in severe injury to personnel or damage to equipment.

**WARNING**

The following should be done when servicing a semitrailer when connected to the prime mover, regardless of the nature of the repair:

- The prime mover's engine should be shut down.
- The prime mover's parking brakes should be applied.
- The prime mover's ignition key should be removed and be in the hands of the operating technician or be locked in an area away from the vehicle.

**WARNING**



Handle charged fire extinguisher cylinders with care. To prevent serious injury to personnel, DO NOT Jar or expose to temperature above 140°F (60°C).

**WARNING**

Voltage of 115-220 volt can cause personal injury or death. Take extreme care when working with this much voltage.

**WARNING****GENERAL OPERATION (continued)**

Manhole fill cover does not lock open. Injury may occur if manhole fill cover accidentally closes on personnel.

**WARNING**

DO NOT crawl underneath, on top, or near the tires of the semitrailer unless the brakes are positively locked and all other personnel are aware of your presence.

**WARNING**

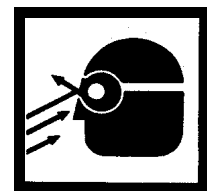
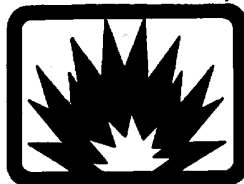
Operators must wear ear protection while on engine side of semitrailer when engine is running. Failure to follow this warning may result In Injury to personnel.

**WARNING**

**HOSE REEL** When the hose has been pulled from the hose reel, the hose reel is under spring tension. To avoid movement of the hose reel by accidental activation of the hose reel rewind switch, tighten the hose reel lock. Failure to follow this warning may result In personal Injury.

**WARNING**

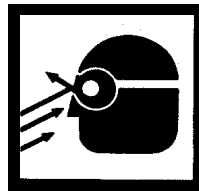
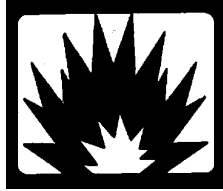
Use extreme caution when operating electric rewind on the hose reels. NEVER use the electric rewind on both hose reels at the same time. Electric rewind should be halted, then resumed carefully as the fuel-dispensing nozzle approaching the vehicle. As the hose becomes fully wound on the hose reel, the nozzle may slam against the vehicle with force sufficient to create injury to personnel and/or to equipment. Extreme care is to be used, ensuring that the hose is rewound slowly. Caution should be used at the hose reels to prevent accidental tripping of the rewind switches. If these are accidentally depressed by hand or by falling objects, serious injury to personnel and/or damage to equipment may occur.

**WARNING****SOLVENT, P-D 680 HAZARDS**

- Drycleaning solvent (P-D-80) is TOXIC and flammable. Wear protective goggles and gloves; Use only in a well-ventilated area : avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using drycleaning solvent. Failure to follow this warning may result in Injury or death to personnel.

**SOLVENT P-D 680 HAZARDS (continued)**

- If personnel become dizzy while using drycleaning solvent, Immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush them with water and get immediate medical attention.
- When P-D480 drycleaning solvent is used, notify the local medical authority (preventive medicine) and environmental coordinator concerning medical surveillance, respiratory protection, and disposal requirements.

**BATTERY HAZARDS**

- Lead-acid batteries can explode. Do not smoke, have open flames, or make sparks around a battery, especially if the caps are off. If a battery is gassing, it can explode and cause injury to personnel.
- Ventilate when charging or using battery in an enclosed space.
- Wear safety goggles and acid-proof gloves when battery cover must be removed or when adding electrolyte.
- Avoid contact between battery electrolyte and skin, eyes, or clothing. If electrolyte spills, take immediate action to stop burning effects:
  - External. Immediately flush with cold running water to remove all acid.
  - Eyes. Flush with cold water for at least 15 minutes. Seek immediate medical attention.
  - Internal. Drink large amounts of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Seek immediate medical attention.
  - Clothing or Vehicle. Wash at once with cold water. Neutralize with baking soda or household ammonia solution.
- Wear safety glasses or goggles when checking batteries. Always check electrolyte level with engine stopped. Do not smoke or use exposed flame when checking battery; explosive gases are present and severe injury to personnel can result.
- Remove or disconnect batteries prior to performing maintenance in immediate battery area or working on electrical system. Such disconnections prevent electrical shock to personnel or equipment.

**BATTERY HAZARDS (continued)**

- Battery acid (electrolyte) is extremely harmful. Always wear safety goggles and rubber gloves, and do not smoke when performing maintenance on batteries. Injury will result if acid contacts skin or eyes. Wear rubber apron to prevent damage to clothing.
- Remove all jewelry, such as ring, identification tags bracelets, and so on. If jewelry contacts battery terminal, a direct short may result in instant heating of tools, damage to equipment, and injury or death to personnel.

**WARNING**  
**NUCLEAR, BIOLOGICAL, OR CHEMICAL (NBC) EXPOSURE AND**  
**VEHICLE AIR FILTER HAZARDS**



- NBC-contaminated air filters must be handled and disposed of only by authorized and trained personnel. The unit commander or senior officer in charge of maintenance personnel must ensure that prescribed protective clothing (F 3-4) is used and that prescribed safety measures and decontamination procedures (FM 3-5) are followed. The local unit SOP is responsible for final disposal of contaminated air filters. Failure to comply with this warning may cause severe injury to personnel.
- The NBC protection filters use a type of carbon that contains Chromium VI. This is a known carcinogen if inhaled or swallowed. Damaged or unusable filter are classified as hazardous waste.
  - Do not throw away damaged or unusable filters as trash.
  - Turn in damaged or unusable filters to your Hazardous Waste Management Office or Defense Reutilization and Marketing Office.
- Filters are completely safe to handle and use if they are not damaged in such a way that carbon leaks from them. If carbon does leak use protection, such as a dust respirator to cover nose and mouth, and put carbon in a container, such as a self-sealing plastic bag; turn in to Hazardous Waste Management Office or Defense Reutilization and Marketing Office.
- Disposal of hazardous waste is restricted by law. Violation is subject to criminal penalties.
- Hearing protection is required within 50 feet of tanker during operation of the engine. Failure to follow this warning may result in injury to personnel.
- Sudden changes in temperature may cause M989A2 semitrailers to develop leaks at the fittings and connectors. Use caution and pay special attention to these areas. If something is broken or worn out, notify Unit maintenance. Corrective action must be performed before resuming any operations. Failure to follow this warning may result in injury to personnel.

TECHNICAL MANUAL  
UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT  
MAINTENANCE MANUAL  
FOR  
SEMITRAILER, TANK, 5000-GALLON,  
FUEL DISPENSING, AUTOMOTIVE  
M969A2 (NSN 2330-01-377-9337)

Approved for public release; distribution is unlimited.

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, 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, U.S. Army Tank-automotive and Armaments Command, ATTN: AMSTA-IM-OPIT, Warren, MI 48397-5000. A reply will be furnished to you.

You may also provide DA Form 2028-2 information to TACOM via datafax or e-mail:

- TACOM's fax number is DSN 786-6323 or (810) 574-6323
- TACOM's e-mail address is [tacom-tech-pubs@cc.army.mil](mailto:tacom-tech-pubs@cc.army.mil)

TABLE OF CONTENTS

	Page
HOW TO USE THIS MANUAL .....	v
<b>CHAPTER 1      INTRODUCTION</b>	
Section I.      General Information .....	1-1
Section II.     Equipment Description and Data .....	1-5
Section III.    Principles of Operation .....	1-11
<b>CHAPTER 2      UNIT MAINTENANCE</b>	
Section I.      Repair Parts; Special Tools; Test, Measurement, and Diagnostic Equipment (TMDE); and Support Equipment .....	2-1
Section II.     Service Upon Receipt .....	2-2

**TABLE OF CONTENTS (continued)**

	Page
Section III. Unit Preventive Maintenance Checks and Services (PMCS) .....	2-4
Section IV. Unit Troubleshooting Procedures .....	2-14
Section V. General Maintenance Instructions .....	2-64
Section VI. Electrical System/Circuit Maintenance.....	2-70
Section VII. Brake System Maintenance .....	2-120
Section VIII. Wheel, Hub, and Brakedrum Maintenance.....	2-150
Section IX. Frame, Towing Attachments, Drawbars, and Articulation Systems Maintenance.....	2-158
Section X. Body, Cab, Hood, and Hull Maintenance .....	2-165
Section XI. Body, Chassis, and Hull Accessory Items Maintenance.....	2-188
Section XII. Auxiliary Generator and Engine, and Controls Maintenance.....	2-193
Section XIII. Special Purpose Kits Maintenance .....	2-247
Section XIV. Electrical Equipment Maintenance .....	2-251
Section XV. Gages (Nonelectrical), Weighing and Measuring Devices Maintenance.....	2-255
Section XVI. Filters, Separators, and Purifiers Maintenance.....	2-256
Section XVII. Dispensing and Servicing Equipment Components Maintenance.....	2-263
Section XVIII. Chemical, Biological, and Radiological (CBR) Equipment Maintenance.....	2-298
Section XIX. Preparation for Storage or Shipment .....	2-299
 <b>CHAPTER 3</b>	 <b>DIRECT SUPPORT MAINTENANCE INSTRUCTIONS</b>
Section I. Direct Support Troubleshooting Procedures.....	3-1
Section II. General Maintenance Instructions .....	3-25
Section III. Rear Axle Maintenance.....	3-30
Section IV. Springs and Shock Absorbers Maintenance.....	3-35
Section V. Body, Cab, Hood, and Hull Maintenance.....	3-38
Section VI. Auxiliary Generator and Engine and Controls Maintenance.....	3-53
Section VII. Filters, Separators, and Purifiers Maintenance.....	3-96
Section VIII. Dispensing and Servicing Equipment Components.....	3-102
 <b>CHAPTER 4</b>	 <b>GENERAL SUPPORT MAINTENANCE .....</b>
	4-1
 <b>APPENDIX A</b>	 <b>REFERENCES .....</b>
	A-1
 <b>APPENDIX B</b>	 <b>MAINTENANCE ALLOCATION CHART</b>
Section I. Introduction .....	B-1
Section II. Maintenance Allocation Chart for Semitrailer, Tank: 5000-Gallon, M969A2 .....	B-4
Section III. Tool and Test Equipment Requirements .....	B-22
 <b>APPENDIX C</b>	 <b>EXPENDABLE AND DURABLE ITEMS LIST</b>
Section I. Introduction .....	C-1
Section II. Expendable and Durable Items List.....	C-2

TABLE OF CONTENTS (continued)

	Page
<b>APPENDIX D</b>	<b>ILLUSTRATED LIST OF MANUFACTURED ITEMS</b>
Section I	Introduction ..... D-1
Section II	Manufacturing Instructions..... D-3
<b>APPENDIX E</b>	<b>TORQUE VALUES FOR THREADED FASTENERS..... E-1</b>
<b>APPENDIX F</b>	<b>MANDATORY REPLACEMENT PARTS..... F-1</b>
<b>APPENDIX G</b>	<b>LUBRICATION INSTRUCTIONS ..... G-1</b>
<b>APPENDIX H</b>	<b>ELECTRICAL SYSTEM SCHEMATICS ..... H-1</b>
<b>INDEX</b>	..... Index-1



## HOW TO USE THIS MANUAL

---

### SCOPE.

---

This technical manual contains Unit, Direct Support, and General Support maintenance procedures for the following semitrailer:

- Semitrailer, Tank, 5000-Gallon, Fuel Dispensing, Automotive, M969A2

The information contained in this manual is presented in four chapters, eight appendixes, and a subject index. Chapter 1 contains general information; Chapter 2 contains Unit maintenance and troubleshooting procedures; Chapter 3 provides Direct Support maintenance and troubleshooting procedures; and Chapter 4 contains General Support maintenance engine-specific procedures.

Note that the titles of publications and forms referenced anywhere in the manual are listed in Appendix A.

---

### INDEXING.

---

Four indexing procedures are used to help you locate information quickly:

- Cover Index. Lists chapters and other important parts of the manual, with corresponding page numbers. Each chapter/part listed is boxed in, with a black outer edge that is in line with the first page of that chapter/part.
- Table of Contents. The table of contents starts on page i, following the warning summary.
- Section Indexes. Each section in a chapter starts with a numerical listing of all paragraphs in that section.
- Index. The alphabetically arranged subject index starts on page Index-1.

---

### MAINTENANCE TEXT AND ILLUSTRATIONS (CHAPTERS 2 THROUGH 4).

---

Each maintenance chapter is divided into sections covering the major components and systems at the appropriate maintenance level. Every section begins with a numerical listing of the paragraphs in that section.

Each paragraph contains the following information, as appropriate:

- The tools, test equipment, or special tools required to perform the procedures are listed under the heading "Tools/Test Equipment." Common and special tools are listed in Appendix B.
- Materials and parts that will be discarded during the procedure are listed under the heading "Materials/Parts." These lists do not contain items that maybe replaced if found defective during inspection. Also, these lists do not contain the item named in the paragraph title. Materials are listed in Appendix C, and mandatory replacement parts are listed in Appendix F.
- If more than one person is required to perform the procedure, the number is specified under the heading "Personnel Required."

---

**TEXT AND ILLUSTRATIONS.**

---

- Procedures that must be performed on the vehicle prior to beginning the maintenance procedure are listed under the heading "Equipment Conditions."
- Technical manuals, technical bulletins, field manuals, or other reference material that maybe required in order to perform the procedure is listed under the heading "References."

Maintenance procedures are to be performed in the sequence shown in the text and illustrations.

The parts in illustrations are numbered clockwise, beginning at the 11 o'clock position, and are cited in text with their appropriate numbers. Parts that are removed sequentially do not necessarily have sequential numbers. For example:

Remove screw (4), lockwasher (6), washer (7), and bracket (5) from transmission (8).

Before beginning a maintenance procedure, be sure to read the entire procedures paragraph. Also read the general information in Chapter 1 before beginning a procedure.

---

**WARNINGS, CAUTIONS, AND NOTES.**

---

Throughout this manual you will see WARNING, CAUTION, and NOTE headings. There are good reasons for every one of these notices.

**WARNING**

**A warning is used to alert the user to hazardous operating and maintenance procedures, practices, or conditions that could result in injury or death. Warnings must be strictly observed.**

**CAUTION**

**A caution is used to alert the user to hazardous operating and maintenance procedures, practices, or conditions that could result in damage to, or destruction of, equipment or mission effectiveness. Cautions must be strictly observed.**

**NOTE**

**A note highlights an essential operating or maintenance procedure, condition, or statement.**

Warnings and cautions appear immediately preceding the step to which they pertain. It is important to read and thoroughly understand the warnings and/or cautions before beginning maintenance.

Notes may precede or follow the steps to which they pertain, depending on what makes the most sense.

---

**PROBLEM SOLVING.**

---

The best way for you to fulfill your responsibility for maintaining the equipment covered in this manual is to make maximum use of your maintenance manual. The following three sample problems illustrate ways to use the manual efficiently.

---

**PROBLEM SOLVING (continued).**

---

1. How do I replace the hub and brakedrum assembly?
  - Look in the subject index for 'hub and brakedrum assembly and turn to the appropriate page.
2. An equipment condition for replacing the hub and brakedrum assembly (para 2-63) is, "Tire and wheel assembly removed (para 2-62)." How do I find out what page paragraph 2-62 begins on?
  - Look in the Table of Contents for Chapter 2. Find the appropriate section heading: "Section VIII. Wheel, Hub, and Brakedrum Maintenance." Then, in the section index (within Chapter 2), find the specific paragraph title and turn to that page.
3. The engine won't start. How do I find out what's wrong?
  - Turn to the Quick Guide to Troubleshooting (para 2-15). Find the name of the item that doesn't work (e.g., ENGINE).
  - Find the problem (e.g., ENGINE TURNS OVER BUT FAILS TO START) in the listing for ENGINE.
  - Turn to the paragraph in the Troubleshooting Chart (para 2-16) that is referenced in this case, paragraph 2-16e(2).
  - Follow the troubleshooting steps until you find out what is wrong.
  - Follow the Instructions given or turn to the paragraph referenced for repair of the damaged component.

---

**REPAIR PARTS AND SPECIAL TOOLS.**

---

For repair parts and special tools used on this vehicle, refer to TM 9-2330-398-24P.

## SAFETY SUMMARY

This safety summary contains general safety precautions and hazardous materials warnings that must be understood and applied during maintenance to protect personnel and Department of Defense property. Portions of this summary are repeated elsewhere for emphasis.

WARNING and CAUTION statements appear throughout this manual prior to procedures, practices, or conditions that may endanger personnel (WARNING) or cause equipment and property damage (CAUTION). A warning or caution will apply each time the related step is repeated. Before starting any task, review and understand the warnings and cautions included in the text for that task.

This manual contains procedures that may require using chemicals, solvent, paints, or other commercially available material that may pose a health or safety hazard. Refer to the "Materials/Parts" list at the beginning of a task to see which materials will be used during the task. Obtain material safety data sheets (Occupational Safety and Health Act [OSHA] Form 20 or equivalent) from the manufacturer or supplier of the material to be used. Become completely familiar with the information and manufacturer/supplier procedures, recommendations, warnings, and cautions for the safe use, handling, storage, and disposal of Users materials.

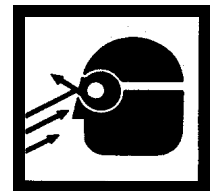
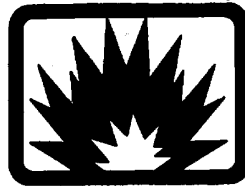
Following the "General Safety Precautions" list is a list of "Hazardous Materials Warnings." These warnings are designed to warn personnel of dangers associated with hazardous materials. For each hazardous material used, a material safety data sheet is required to be provided and available for review by personnel. Consult your local safety and health staff concerning questions on hazardous chemicals, personnel protective equipment requirements, and appropriate handling and emergency procedures.

## GENERAL SAFETY PRECAUTION

- Always use the same fastener part number (or equivalent) when replace ring fasteners. Do not risk using a fastener of less quality; do not mix metric and inch (customary) fasteners. Mismatched or incorrect fasteners can result in damage, malfunction, or injury.
- Fuel and oil are slippery and can cause falls. To avoid injury, wipe up spilled fuel or oil with rags.
- Make sure equipment will not move while repairing or inspecting it. For powered equipment, block or chock wheels or tracks and "red tag" the starter. Prevent a "quick fix" from becoming a quick injury.
- When adjustment or service requires a running engine, two persons are required, one at the controls and one at the service point. This helps prevent accidental movement of controls.
- When checking connections, do not let tools touch battery box. A direct short, arcing, tool heating to red hot, and battery explosion could result, causing injury or death to personnel. Sharp edges can cut hands. Use rags or a brush to lubricate.
- Do not use equipment for other than its intended use, unless authorized by the National Inventory Control Point/commodity command.

**GENERAL SAFETY PRECAUTIONS (continued)**

- Hearing protection is required for all personnel working and around this vehicle while engine is running.
- Remove rings, bracelets, wristwatches, and neck chains before working on any vehicle. Jewelry can catch on equipment and cause injury, or may short across an electrical circuit and cause severe burns or electrical shock.
- Never crawl under equipment when performing maintenance unless equipment is securely blocked. Equipment may fall and cause serious injury or death to personnel.
- Keep clear of equipment when equipment is being raised or lowered. Equipment may fall and caused serious injury or death to personnel.
- Do not work on any item supported only by lift jacks or hoist. Always use blocks or proper stands to support the item prior to any work. Equipment may fall and cause injury or death to personnel.
- Do not allow heavy components to swing while hanging from lifting device.
- Equipment may strike personnel and cause injury.
- Exercise extreme caution when working near a cable or chain under tension. A snapped cable or a swinging or shifting load may result in injury or death to personnel.
- When working on a running engine, provide shielding around exposed rotating parts. Tools, clothing, or hands can get caught and cause serious injury to personnel.

**HAZARDOUS MATERIALS WARNING**

- Adhesive causes immediate bonding on contact with eyes, skin, or clothing and also gives off harmful vapors. Wear protective goggles and use in a well-ventilated area. If adhesive gets in eyes, try to keep eyes open; flush them with water for 15 minutes and get immediate medical attention.
- Sealing compound (adhesive sealant MILS46163 [Loctite]) can damage your eyes. Wear safety goggles/glasses when using; avoid contact with eyes. If sealant contacts eyes, flush them with water and get immediate medical attention.

**HAZARDOUS MATERIALS WARNINGS (continued)**

- Chemical agent resistant coating (CARC) paint contains isocyanate (HDI) which is highly irritating to skin and respiratory system. High concentrations of HDI can produce symptoms of itching and reddening of skin, a burning reaction in throat and nose, and watering of the eyes. In extreme concentrations, HDI can cause cough, shortness of breath, pain during respiration, increased sputum production, and chest tightness. The following precautions must be taken whenever using CARC paint:
  - ALWAYS use air line respirators when using CARC paint unless air sampling shows exposure to be below standards. Use chemical cartridge respirator if air sampling is below standards.
  - DO NOT let skin or eyes come in contact with CARC paint. Always wear protective equipment (gloves, ventilation mask, safety goggles, etc.).
  - DO NOT use CARC paint without adequate ventilation.
  - NEVER weld or cut CARC-coated materials.
  - DO NOT grind or sand painted equipment without using high-frequency, air-purifying respirators.
  - BE AWARE of CARC paint exposure symptoms; symptoms can occur a few days after initial exposure. Seek medical help immediately if symptoms are detected.
- Drycleaning solvent (P-D-680) is TOXIC and flammable. Wear protective goggles and gloves; use only in a well-ventilated area; avoid contact with skin, eyes, and clothes; and do not breathe vapors. Keep away from heat or flame. Never smoke when using drycleaning solvent. Failure to follow this warning may result in injury or death to personnel.
- If personnel become dizzy while using drycleaning solvent immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush them with water and get immediate medical attention.
- When P-D40 drycleaning solvent is used, notify the local medical authority (preventive medicine) and environmental coordinator concerning medical surveillance, respiratory protection, and disposal requirements.

## CHAPTER 1 INTRODUCTION

### Section I. GENERAL INFORMATION

Paragraph Number	Paragraph Title	Page Number
1-1	Scope.....	1-1
1-2	Maintenance Forms, Records, and Reports .....	1-2
1-3	Destruction of Army Materiel To Prevent Enemy Use .....	1-3
1-4	Preparation for Storage or Shipment .....	1-3
1-5	Quality Assurance.....	1-3
1-6	Official Nomenclature, Names, and Designations .....	1-3
1-7	Reporting Equipment Improvement Recommendations (EIRs) .....	1-3
1-8	Warranty Information .....	1-4
1-9	Safety, Care, and Handling.....	1-4
1-10	Corrosion Prevention and Control (CPC) .....	1-4

#### 1-1. SCOPE.

- a. This manual contains Unit maintenance instructions for the Semitrailer, Tank, 5000-Gallon, Fuel Dispensing, Automotive, M969A2.
- b. Throughout the manual, the terms "right side" or "curb side" and "left side" or "road side" are used to describe views of the semitrailer as viewed from the rear.
- c. The maintenance of any fuel-hauling semitrailer can be hazardous due to the flammable and explosive nature of the load.
- d. Read and become familiar with all WARNINGS in the warning summary at the front of this manual. Throughout the manual, WARNINGS are placed as they pertain to specific maintenance procedures. Read these warnings and follow them exactly.
- e. The following is a summary of safety regulations that MUST be strictly observed when maintaining the M969A2 semitrailer. Personnel who fail to follow these regulations endanger the mission, equipment, and their lives and the lives of bystanders.
  1. Refer to FM 10-20, FM 10-68, FM 10-69, and FM 10-71 to become familiar with safe fuel-handling procedures.
  2. Personnel engaged in maintenance of the semitrailer must not wear clothing that generates static electricity. DO NOT wear nylon, silk, rayon, or other similar materials. Remove all contents from pockets. Wear rubber boots and gloves during fuel loading and unloading.
  3. Before loading or unloading fuel or purging tank on semitrailer, connect all bonding and grounding connections (refer to TM 9-2330-398-10).
  4. Never climb on semitrailer without first touching grounding stud to discharge static electricity from your body.

---

**1-1. SCOPE (continued).**

---

5. Under normal circumstances, perform all maintenance on the semitrailer outdoors, away from buildings, and with tank empty. The semitrailer tank should be checked to make sure it is free of vapors that could ignite during maintenance activities.
6. If circumstances require that maintenance be performed inside a building, the semitrailer tank must be thoroughly drained and purged and the exterior of the semitrailer steam-cleaned. After purging, the combustible gas indicator must read in the SAFE zone. Even if the semitrailer has tested SAFE with a combustible gas indicator set, the semitrailer **MUST** be retested prior to starting work each day and at regular intervals throughout the day. This test can be accomplished by authorized Unit or Direct Support maintenance personnel with a military occupational specialty (MOS) of 77F or the equivalent (see FM 10-20).
7. Hearing protection is required for personnel within 50 feet (15.25 m) of the semitrailer when the pump engine is running.
8. To reduce the risk of fire and explosion, **DO NOT** perform the following operations on the semitrailer unless the tank has been drained and purged and the exterior has been steam-cleaned:
  - Replace any component that communicated with the inside of the tank and therefore came in contact with fuel or vapors; the components include manhole, jet level sensor and tubing, emergency valve, vapor collection system components, vent caps, sump drain, piping assembly, and rear inlet.
  - Troubleshoot the electrical system with any test device other than the ohms scale of a multimeter.
  - Weld or solder.
  - Cut with acetylene torch or chisel and hammer.
  - Drill (except aluminum).
9. Follow these rules if working inside a purged tank:
  - Always provide adequate forced-air ventilation with air directed inside to the compartment where work is being performed.
  - **NEVER** work alone inside a tank; a second person must be stationed at the manhole opening. The person inside the tank must have on a safety line and harness for rescue operations in case of emergency.
  - If the person inside the tank encounters any difficulties, the person stationed at the manhole must summon assistance **IMMEDIATELY**. **DO NOT** attempt a rescue until assistance has arrived.

---

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

---

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by (as applicable) DA Pam 738-750, DA Pam 738-751, or AR 700-138.



---

**1-3. DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE.**

---

Refer to TM 750-244-6 for procedures on the destruction of military vehicles.

---

**1-4. PREPARATION FOR STORAGE OR SHIPMENT.**

---

Refer to Chapter 2, Section XIX, of this manual for procedures on preparation of the semitrailer for storage or shipment.

---

**1-5. QUALITY ASSURANCE.**

---

- a. No specific quality assurance manual pertains to the semitrailer.
- b. Defective material received through the supply system should be reported on an SF Form 368 (Product Quality Deficiency Report). Instructions for preparing the reports are provided in AR 702-7, Reporting of Product Quality Deficiencies Across Component Lines. Mail your completed form directly to:

Commander  
 U.S. Army Tank-automotive and Armaments Command  
 ATTN: AMSTA-IM-MMAA  
 Warren, MI 48397-5000

---

**1-6. OFFICIAL NOMENCLATURE, NAMES, AND DESIGNATIONS.**

---

- a. Nomenclature in this manual was chosen in accordance with the terms used for provisioning as they appear in the repair parts and special tools list (RPSTL) and maintenance allocation chart (MAC) for Unit maintenance on the M969A2.
- b. A few components are, however, referred to by names more common than those in the RPSTL. In many cases, the more common name is a shorter name for the same component.

**Nomenclature Cross-Reference****Manual Nomenclature**

lockwire  
 tube  
 wiring harness

**Official Nomenclature**

nonelectrical wire  
 metallic bent tube  
 branched wiring harness

---

**1-7. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR'S).**

---

If your semitrailer 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 Form 368 (Product Quality Deficiency Report). Mail it to the address specified in DA Pam 738-750.

---

**1-8. WARRANTY INFORMATION.**

---

The M969A2 semitrailers are not warranted.

---

**1-9. SAFETY, CARE, AND HANDLING.**

---

For information on general safety precautions and regulations, review the warning summary at the front of this manual and the safety summary that follows the table of contents. Observe all warnings and cautions that appear in the maintenance procedures.

---

**1-10. CORROSION PREVENTION AND CONTROL (CPC).**

---

- a. Corrosion prevention and control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problems with the semitrailers be reported so that the problems can be corrected and improvements can be made to prevent the problems in future semitrailers.
- b. While corrosion is typically associated with the rusting of metals, it can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem. If a corrosion problem is identified, it can be reported using an SF Form 368. The use of key words, such as "corrosion," "rust," "deterioration," or "cracking," will ensure that the information is identified as a CPC problem (see TB 43-0213). The form should be submitted to the address specified in DA Pam 738-750.

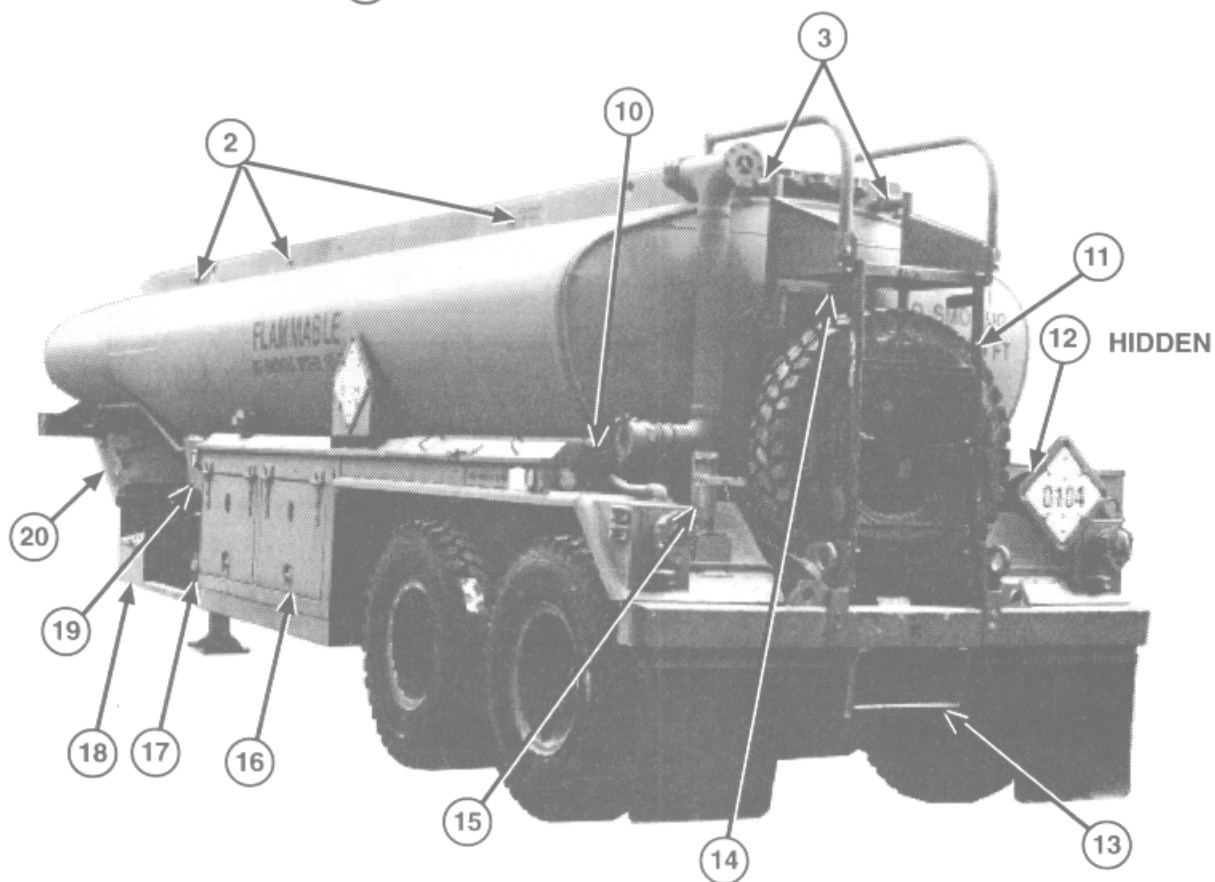
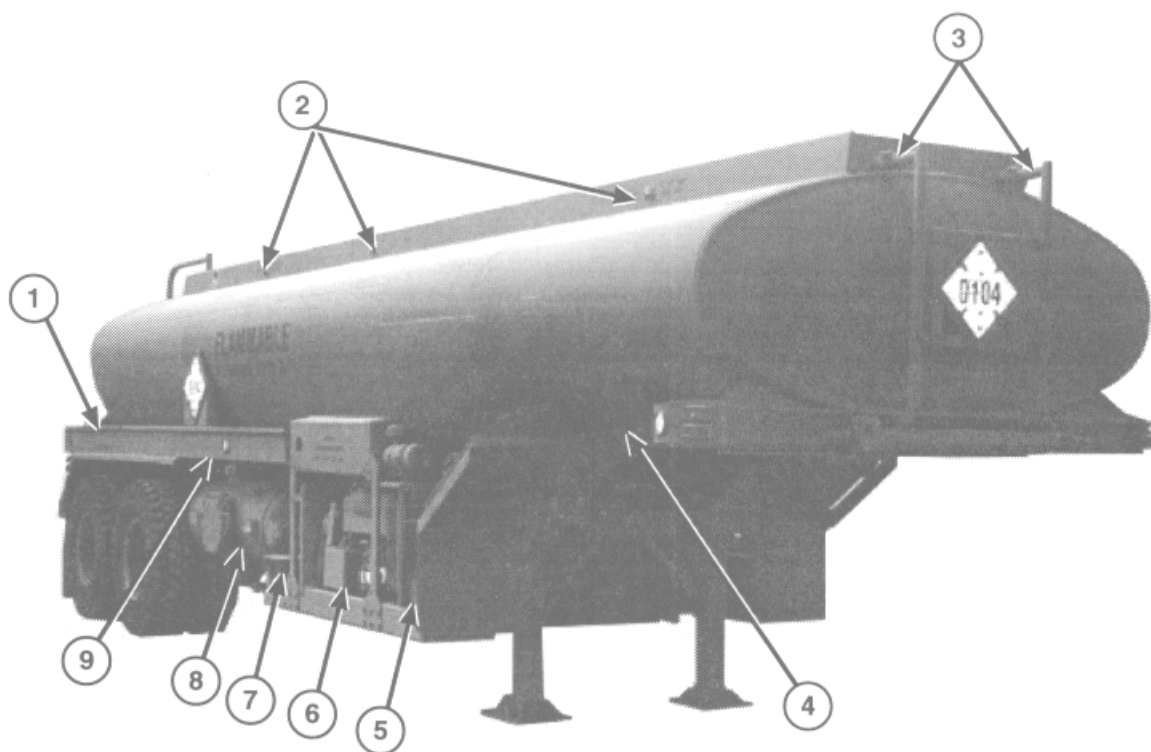
## Section II. EQUIPMENT DESCRIPTION AND DATA

Paragraph Number	Paragraph Title	Page Number
1-11	Equipment Characteristics, Capabilities, and Features .....	1-5
1-12	Location and Description of Major Components.....	1-6
1-13	Equipment Data .....	1-8

**1-11. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.**

- a. The entire M969A2 similar is constructed of welded stainless steel. Semitrailers have a stainless steel, single-compartment tank of 5000gallon capacity, plus 3 percent capacity for product expansion. The chassis is constructed of welded steel and is equipped with full floating tandem axles and manually operated landing gear.
- b. The semitrailer is designed to be towed by 4 truck tractor equipped with a fifth wheel. Authorized 5-ton truck tractors are the M818, M931, M931 A1, M931 A2, M932, M932A1, M932A2,and M1088. When driving on hard surface highways only, the 10-ton military-adapted commercial 6 x 4 truck tractors (the M915, M915A1, and M915A2) are also authorized.
- c. The M969A2 semitrailer can be loaded through the bottom or the top fill opening. The four-cylinder diesel engine and pump assembly provide self-load/unload capability.
- d. The semitrailer is equipped with pressure and vacuum vents, hose troughs, sealed manhole, calibrated gage, vapor recovery system, bulk fuel hoses, portable grounding rod, static reel, and spare tire. A ladder at the rear of the M969A2 semitrailer provides access to the top manhole and is also used as a spare tire lifting device.

1-12. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.



**1-12. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (continued).**

KEY	COMPONENT	DESCRIPTION
1	Hose Trough Cover	Protects hose.
2	Grounding Studs	Allow semitrailer to be grounded, discharging static electricity.
3	Drain Pipes	Allow water to drain from top of semitrailer.
4	Emergency Valve Shut-Off	Manually stops fuel flow in an emergency.
5	Engine Fuel Tank	Stores fuel for pump engine.
6	Pump and Engine Compartment	Houses pump and engine.
7	Batteries	Provide electricity for starting pump engine.
8	Filter/Separator	Separates water from fuel and filters fuel.
9	Hose Trough	Stores hose.
10	Portable Grounding Rod	Allows semitrailer to be grounded, discharging static electricity.
11	Ladder	Allows access to top manhole.
12	Portable M13 Decontaminating Apparatus	Used to spray decontaminating agent DS-2 on surfaces of semitrailer and equipment to reduce the level of toxic chemical agents.
13	Step	Allows access to ladder.
14	Spare Tire Carrier	Allows easy deployment and recovery of spare tire.
15	Fire Extinguisher	Removed from stowage bracket and available at operation point, in case of fire.
16	Hose Reel Cabinet	Houses hose reel and automotive dispensing hose.
17	Piping Assembly	Dispenses fuel.
18	Tool Box	Stores tools.
19	Engine Control Panel	Houses controls, meters, and gages for pump engine.
20	Landing Leg Ground Board	Positioned under landing leg shoe in mud, sand, or snow.

**1-13. EQUIPMENT DATA.****NOTE**

**At a slope of over 10 percent, slight leakage may occur. If a slope of over 10 percent is anticipated, reduce payload to 3800 gallons.**

## Bridge Classification:

Empty weight with prime mover.....	Class. 14
Empty weight without prime mover.....	Class. 6
Cross-country loaded with prime mover.....	Class. 25
Cross-country loaded without prime mover.....	Class. 18
Highway loaded with prime mover.....	Class. 30
Highway loaded without prime mover.....	Class. 22

## Fuel-Dispensing Hose (Automotive, Overwing):

Length.....	50 ft (15.25 m)
Quantity .....	2
Nominal size.....	1.25 in. (3.18 cm)

## Meter

Quantity .....	2
Type.....	full metering
Maximum capacity.....	100 gpm

Angle of departure .....	60°
--------------------------	-----

## Capacities of Tank (Vehicle Capacity):

Hard surface road and cross-country .....	5000 gal. (18,925 L)
20% maximum side slope without leakage .....	5000 gal. (18,925 L)
10% maximum longitudinal slope without leakage.....	5000 gal. (18,925 L)

## Center of Gravity:

Empty (vertical).....	54 in. (137.16 cm)
Empty (horizontal from kingpin).....	198 in. (502.92 cm)
Loaded (vertical).....	66.5 in. (168.91 cm)
Loaded (horizontal from kingpin).....	170 in. (431.80 cm)

## Dimensions Overall:

Height .....	104.5 in. (265.43 cm)
Length.....	366 in. (929.64 cm)
Width .....	96 in. (243.84 cm)
To outside of tires.....	97.75 in. (248.28 cm)

## Weights:

Empty .....	16,350 lb (7422.9 kg)
Tongue weight .....	6800 lb (3087.2 kg)
Rear axle .....	9650 lb (4381.1 kg)
Loaded.....	50,010 lb (22704.5 kg)

**1-13. EQUIPMENT DATA (continued).**

## Kingpin Location:

From nose of vehicle ..... 28 in. (71.12 cm)

To landing gear ..... 80 in. (203.2 cm)

## Portable Fire Extinguisher:

Type ..... Purple-K, dry chemical

Size ..... 10 lb (4.5 kg)

Number per vehicle ..... 2

## Tires:

Quantity (including spare) ..... 9

Type ..... radial

Size ..... 11.00 X 20

Tube equipped ..... yes

Tire pressure, cross-country and sand ..... 45 psi (310.3 kPa)

Tire pressure, hard surface roads ..... 65 psi (448.2 kPa)

Towing Facility ..... kingpin

## Prime Mover

5-ton ..... M818, M931, M931A1, M931A2, M932, M932A1, M932A2, and M1088

10-ton (hard surface highway only) ..... M915, M915A1, and M915A2

## Track:

Center to center of dual wheels ..... 72 in. (182.88 cm)

## Transfer Hose:

Type ..... flexible

Storage ..... trough

## Axles and Suspension:

Quantity ..... 2

Axle model number ..... A21T-7CT7R-DW10A

Capacity ..... 25,000 lb (11,350 kg) each

Suspension model number ..... 10476-0 1

Type ..... tandem overslung axle

## Springs:

Type ..... semielliptic multileaf

Shaft ..... semielliptic

## Brakes:

Quantity ..... 4 sets

Type ..... self-adjusting cam

Actuation ..... full air S-type cam

Operating pressure ..... 75-95 psi (517-655 kPa)

## Drain Valve:

Working pressure ..... 120 psi (827.4 kPa)

## Electrical System-Engine:

Type ..... 12 V dc

Alternator (Model A001-2300JB) ..... 65 amps, belt drive

Batteries ..... 2, 12 V dc each, connected in parallel

## Electrical System-Vehicle:

Voltage ..... 24 V dc

**1-13. EQUIPMENT DATA (continued).****Lamps:**

Clearance lights ..... 3 cp  
 Taillights (service) ..... 3 cp  
 Taillights (blackout) ..... 3 cp  
 Stoplights (service) ..... 32 cp

**Engine:**

Type ..... 4-cylinder, 4-cycle, diesel, air-cooled (Onan)  
 Model ..... DC-MS 4494  
 Horsepower ..... 27.5  
 Bore ..... 3.25 in. (8.25 cm)  
 Stroke ..... 3.625 in. (9.21 cm)

**Oil Capacity Crankcase:**

Without oil filter change ..... 6 qt (5.6 L)  
 With oil filter change ..... 6-1/2 qt (6.149 L)  
 Displacement ..... 120 cu in (774 cu cm)  
 Injection (firing) sequence ..... 1-2-4-3

**Throttle Control:**

Length ..... 100 in. (254 cm)  
 Model ..... flexible  
 Type ..... push-pull with locking handle

**Engine Air Cleaner**

Capacity (air-flow) ..... 115 cfm @ 12 in. H<sub>2</sub>O

**Filter/Separator, Fuel/Water**

Construction ..... aluminum  
 Rating ..... 300 gpm 0 150 psi (1034.25 kPa)  
 Differential pressure gage psi indicator ..... 0-25 psid (0-172.38 kPa)

**Bulk Fuel Servicing Hose (Two with Male and Female Connectors, One with Female Connector, Both Ends):**

Length ..... 14 ft (4.27 m)  
 Quantity ..... 3  
 Nominal size ..... 4 in. (10.1 cm)

Hose Reels ..... electric, full control and manual crank

**Landing Gear:**

Type ..... vertical support with footpads  
 Operation ..... hand crank, two-speeds

**Pump (4-Inch Model):**

Type ..... low pressure, centrifugal  
 Drive ..... flexible coupling

**Emergency Valve Control:**

Type ..... full release  
 Control ..... flexible cable

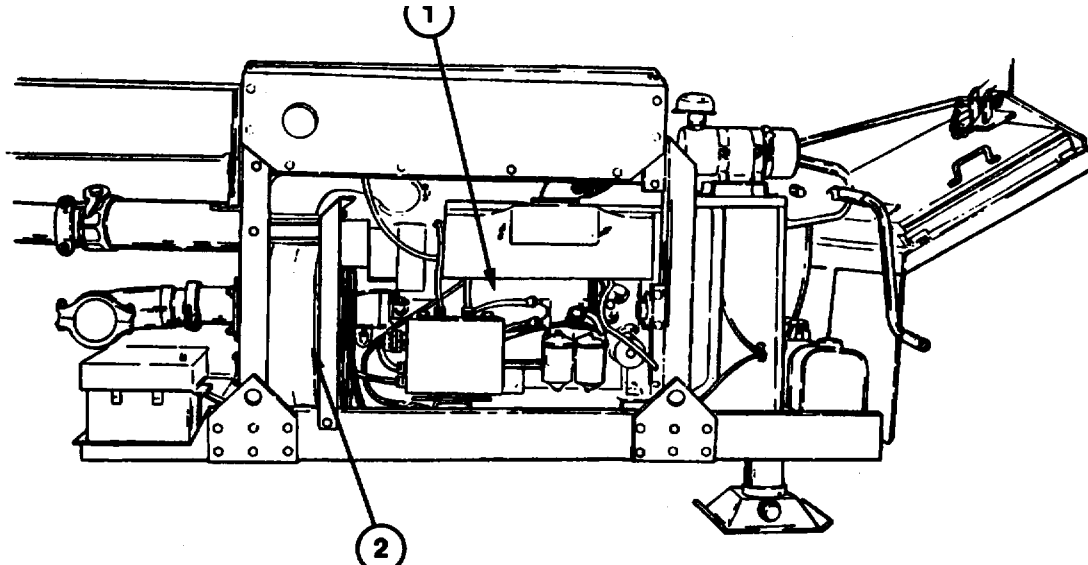


## Section III. PRINCIPLES OF OPERATION

## 1-14. EQUIPMENT OPERATION.

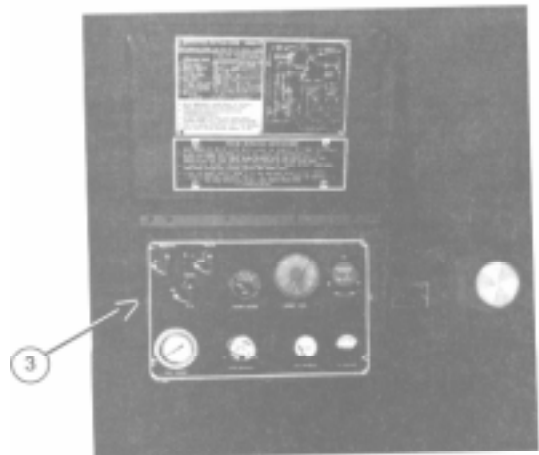
The purpose of the M969A2 5000-gallon tank semitrailer is to provide the means for automotive refueling or bulk fuel hauling and delivery. The semitrailer can be loaded through the top or bottom fill opening. Bottom loading is the preferred method.

## PUMP AND ENGINE ASSEMBLY



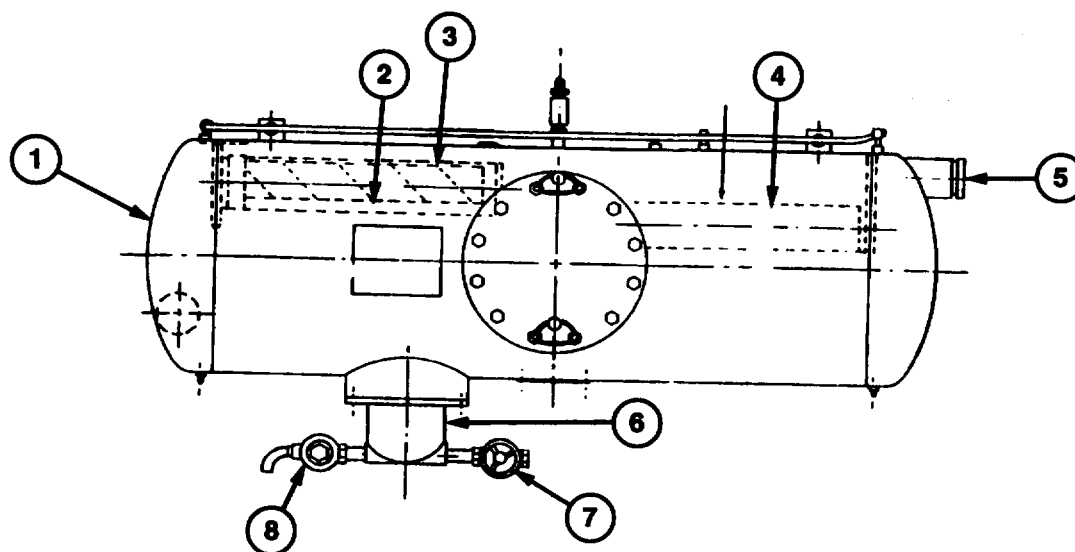
**ENGINE:** Provides power to the centrifugal pump (2) through a flexible coupling. The diesel engine (1) is a four-cylinder, four-cycle, valve-in-head, air-cooled engine with a maximum rating of 27.5 horsepower, located on the curb side of the semitrailer. The engine (1) is operated and monitored at the control panel (3) located on the road side of the semitrailer.

**PUMP:** The M969A2 semitrailer is equipped with a four-inch, self-priming, low-head, low-pressure centrifugal pump (2). The centrifugal pump (2) provides a flow rate for metered fuel (gasoline or diesel) delivery of up to 60 gpm through one or both fuel-dispensing nozzles.



## 1-14. EQUIPMENT OPERATION (continued).

## FILTER/SEPARATOR ASSEMBLY



**FILTER/SEPARATOR:** Provides filtering capabilities to remove contamination and condensation of fuel. The filter/separator consists of an aluminum tank (1) containing 15 filter elements (4) and five second-stage water separator assemblies (3) containing 15 monitor fuses (2). Fuel under pressure from the pump enters the filter tank inlet (5) and flows through the 15 filter elements (4), where solid particles are removed. The fuel then flows through the five second stage water separator assemblies (3), which further filter out smaller solid particles and coalesce water particles to be collected in the filter sump (6). Coalescence is a process by which many small droplets of free water in the fuel are collected to form larger water drops. These large water drops are then released into the filter sump (6).

**AUTOMATIC DRAIN VALVE:** As water accumulates in the filter sump (6), a float rises. When the float reaches a certain level, a valve will open in the automatic drain valve (8). This allows pump pressure to be applied to a diaphragm valve, opening the automatic drain valve (8). Water is then ejected out of the filter sump (6) through the automatic drain valve (8). As water is being ejected, fuel flow is continued.

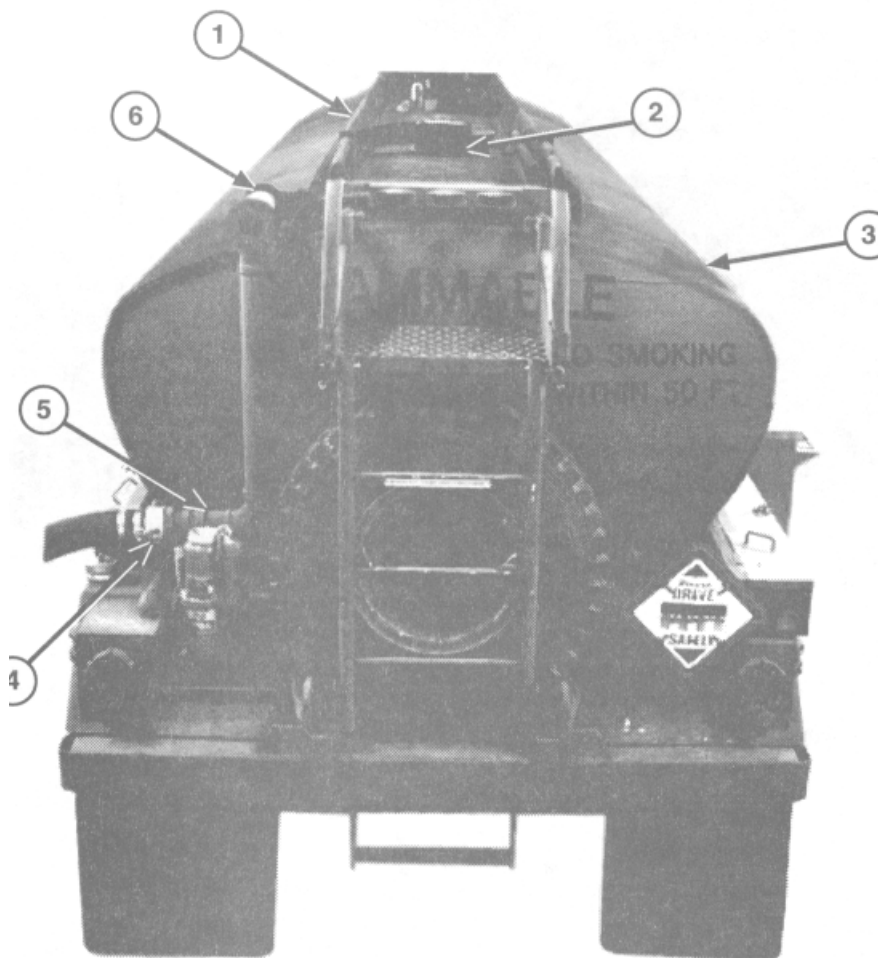
**MANUAL DRAIN VALVE:** Used primarily during cold-weather operations. Water accumulated in the filter sump (6) may freeze. It is important that the manual drain valve (7) on the filter sump (6) be opened after each operation, to drain the water accumulation. Be sure to close the manual drain valve (7) after draining.

**MONITOR FUSES:** Each of the five-second-stage water separator assemblies (3) is equipped with three monitor fuses (2). The fuses are fuel contaminant monitoring devices located downstream of the second stage. The fuses restrict the fuel flow when water and solid contaminants are present in the fuel stream.

---

1-14. EQUIPMENT OPERATION (continued).

---

**VAPOR RECOVERY SYSTEM**

**VAPOR RECOVERY SYSTEM:** The vapor recovery system allows a fuel depot to collect or recover the vapors and gases that are present during bottom-loading operations, and allows the semitrailer to collect or recover the vapors and gases present during unloading operations. This system consists of a sealed vapor-tight line (5) from the vapor recovery hood (2) on the emergency valve vent (6) (directly behind the manhole cover) to the rear of the tank (3). The rollover rail (1) on the road side of the semitrailer is used as part of the line (5). The adapter (4) on the end of the line (5) is compatible with the four-inch vapor recovery quick-disconnect connections at a majority of the fuel depots.

1-13/(1-14 blank)

## CHAPTER 2 UNIT MAINTENANCE

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

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

#### **2-1. GENERAL.**

This chapter describes the Unit maintenance tasks to be performed on the M969A2 semitrailer.

#### **2-2. COMMON TOOLS AND EQUIPMENT.**

Common tools and equipment are issued to Unit maintenance personnel for maintaining the semitrailer. Common tools and equipment should not be used for purposes other than those prescribed and should be properly stored when not in use. For authorized common tools and equipment, refer to the Modification Table of Organization and Equipment (MTOE), CTA 50-970, or CTA 8-100, as applicable to your unit.

#### **2-3. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.**

Special tools, TMDE, and support equipment are authorized for the M969A2 semitrailer. Refer to Appendix B of this manual and to TM 9-2330-398-24P.

#### **2-4. REPAIR PARTS.**

- a. Repair parts are listed and illustrated in TM 9-2330-398-24P, the repair parts and special tools list (RPSTL), which covers Unit, Direct Support, and General Support maintenance for the M969A2 semitrailer.
- b. Mandatory replacement parts, such as gaskets, preformed packings, seals, lockwashers, self-locking nuts, cotter pins, and spring pins, are listed in the Initial Setup section of each maintenance task paragraph and are referenced to Appendix F for detailed information. Bushings must be replaced only if removed.
- c. Springs must be replaced if broken, kinked, or cracked or if they do not conform to standards specified in the repair procedures.

## Section II. SERVICE UPON RECEIPT

Paragraph Number	Paragraph Title	Page Number
2-5	General.....	2-2
2-6	Inspection Instructions.....	2-2
2-7	Servicing Instructions .....	2-2

**2-5. GENERAL.**

When a new, used, or reconditioned semitrailer is first received, determine whether it has been properly prepared for service and is in condition to perform its mission. Whenever practical, the operator/crew will assist Unit maintenance personnel in the performance of these services. Follow the inspection instructions in paragraph 2-6 and the servicing instructions in paragraph 2-7.

**2-6. INSPECTION INSTRUCTIONS.**

- a. Refer to DD Form 1397 for procedures on unpacking the semitrailer.
- b. Remove all straps, plywood, tape, seals, and wrappings.

**WARNING**

**Drycleaning solvent P-D-680 is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes--, and DO NOT breathe vapors. DO NOT use near open flame or excessive heat.**

- c. Remove rust preventive compound from coated exterior parts of the semitrailer using drycleaning solvent (Item 12, Appendix C) and rags (Item 25, Appendix C).
- d. Inspect the semitrailer for damage incurred during shipment. Check also to see if the equipment has been modified.
- e. Check the equipment against the packing list to make sure the shipment is complete. Report any discrepancies in accordance with instructions in DA Pam 738-750.

**2-7. SERVICING INSTRUCTIONS.**

Perform the following overall servicing inspections prior to any Unit, Direct Support, or General Support maintenance:

- Perform all operator/crew preventive maintenance checks and services (PMCS) (refer to TM 9-2330-398-10) and all Unit PMCS procedures listed in Table 2-1.
- Lubricate all lubrication points as described in Appendix G, regardless of interval.

**2-7. SERVICING INSTRUCTIONS (continued).**

---

- Perform a break-in road test of 25 miles (40 km) at a maximum speed of 30 mph (48 kmh).
- Report any problems on DA Form 2404.

**CAUTION**

**Do not use abrasive powder, steel wool, or other material that will scratch the inside surface of the tank**

- Place a suitable container under all drain valves to remove all preservatives.
- Perform depreservation in accordance with DD Form 1397.
- Open manhole cover to let the tank 'air out.'

**WARNING**

**DO NOT climb into tank unless interior of tank has been drained and purged and an explosive meter check indicates that it is safe to do so. Adequate forced -air ventilation or self-contained breathing apparatus must be used. Any person entering tank must have an attached lifeline. An observer must be stationed at the manhole opening so assistance may be summoned in the event of an emergency. Failure to follow this warning may result in serious injury or death to personnel.**

- Climb into the tank through the manhole and inspect for cleanliness. Remove all sediment and debris using a lint-free cloth.
- Remove all bands and antitheft bolts and nuts from hose troughs and fire extinguishers.
- Remove all tape from exhaust and intake ports of the engine.
- Place suitable container under engine fuel tank and remove drain plug. When engine fuel tank is empty, replace drain plug and fill tank with the proper grade of fuel.
- Replace engine crankcase oil with OE15W-40. Check level of oil (refer to 9-2330-398-10). If low, add proper grade oil to bring level up to "Full" mark on the dipstick.
- Install upper handrails on ladder (para 2-83).
- Notify Direct Support maintenance to perform pneumatic leakage test (para 3-7).
- Remove filters from filter/separator (para 2-120). Replace gasket and access cover. Put about 200 gallons of the type of fuel to be hauled in the semitrailer tank. Start the engine and pump fuel through the piping. If fuel fails to flow, prime centrifugal pump (Appendix G). Discharge about 60 gallons of fuel into suitable container through each hose reel. Discharge remaining fuel through the four-inch hose(s) into suitable containers. Stop engine. Open all drain valves and drain residual fuel into containers. Dispose of fuel in accordance with local SOP. Remove cover and gasket from the filter/separator and install filters (para 2-120). Replace gasket and cover.

### Section III. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (P910)

Paragraph Number	Paragraph Title	Page Number
2-8	General.....	2-4
2-9	Service Intervals.....	2-4
2-10	Reporting Repairs .....	2-4
2-11	General PMCS Procedures.....	2-4
2-12	Specific PMCS Procedures .....	2-5
Table 2-1	Unit Preventive Maintenance Checks and Services (PMCS) for the M969A2 .....	2-6

#### 2-8. GENERAL

To ensure that the M969A2 semitrailers are ready for operation at all times, they must be inspected on a regular basis so defects may be found before they result in serious damage, equipment failure, or injury to personnel. Table 2-1 is a listing of systematic instructions on inspections, adjustments, and corrections to be performed by Unit maintenance.

#### 2-9. SERVICE INTERVALS.

- a. Perform the PMCS procedures listed in Table 2-1 at the following intervals:
  - Monthly - once every month.
  - Semiannual - once every six months.
  - Annual - once each year.
- b. PMCS items and intervals are to be scheduled on DD Form 314 in accordance with DA Pam 738-750.
- c. After operation in water, mud, or loose sand, the semitrailer should be cleaned as soon as possible. Lubricate without waiting for the next scheduled service.
- d. Lubrication instructions are included in Appendix G. For Operator/Crew lubrication instructions, refer to TM 9-2330-398-10.

#### 2-10. REPORTING REPAIRS.

Report all defects and corrective actions on DA Form 2404. If a serious problem is found, IMMEDIATELY report it to your supervisor.

#### 2-11. GENERAL PMCS PROCEDURES.

#### WARNING

**Drycleaning solvent P-D-680 is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breathe vapors. DO NOT use near open flame or excessive heat.**

---

**2-11. GENERAL PMCS PROCEDURES (continued).**


---

- a. Keep equipment clean. Dirt, oil, and debris may cover up a serious problem. Clean as you work and as needed. Use drycleaning solvent (Item 12, Appendix C) on all metal surfaces. Use solution of soap and water on rubber, plastic, and painted surfaces.
- b. While performing PMCS, inspect the following components:

**Bolts, Nuts, and Screws:** Make sure they are not loose, missing, bent, or broken. Tighten any that are loose.

**Welds:** Inspect for gaps where parts are welded together. Report bad welds to your supervisor.

**Electrical Wires or Connectors:** Inspect for cracked or broken insulation, bare wires, and loose or broken connectors. Make repairs or replace as required.

**Hoses, Lines, and Fittings:** Inspect for wear, damage, and leaks. Make sure clamps and fittings are tight. If leak originates from a loose fitting or connector, tighten it. If not authorized, report it to your supervisor.

---

**2-12. SPECIFIC PMCS PROCEDURES.**


---

- a. Unit PMCS procedures are listed in Table 2-1. Always perform PMCS procedures in the order listed. Once PMCS becomes a habit, anything that is not right can be spotted in a minute. If anything wrong is discovered through PMCS, perform the appropriate troubleshooting task (Section IV of this chapter). If any component or system is not serviceable, or if the service given does not correct the problem, notify your supervisor.
- b. Before performing PMCS, read all the checks required for the applicable interval and prepare the tools needed to make all the checks. Have several clean rags (Item 25, Appendix C) handy. Perform ALL inspections at the applicable intervals.
- c. Explanation of the columns in Table 2-1 are as follows:

**Item No:** The item number column of your PMCS table is to be used for reference. When completing DA Form 2404, include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must do checks and services for the intervals listed.

**Interval:** This column tells you when to do a certain check or service. Special intervals will also be specified (e.g., every 100 hours) when the component requires service more frequently than semiannually or annually.

**Item To Check/Service:** This column names the item to be checked or to be serviced.

**Procedure:** This column tells you how to do the required checks and services. Carefully follow these instructions. If you do not have the tools, or if the procedure tells you to, have Unit maintenance do the work.

**Not Fully Mission Capable If:** Information in this column tells you what faults will keep the equipment from being capable of performing its mission. If PMCS reveals any of the faults listed in this column, do not operate the equipment. Follow standard procedures for maintaining the equipment or reporting equipment failure.



Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) FOR THE M969A2

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
1	Monthly	Brakes	<p>a. Lubricate slack adjuster (Appendix G).</p> <p>b. Lubricate camshaft bearings (Appendix G).</p> <p><b>NOTE</b> Perform Operator/Crew PMCS prior to or along with Unit PMCS.</p>	
2	Monthly	Centrifugal	Fill centrifugal pump with oil (Appendix G).	
3	Semiannual	Electrical System	<p>Inspect intervehicular cable receptacle for damage or corrosion. Repair or replace damaged intervehicular cable receptacle (para 2-42).</p> <div> </div> <p><b>INTERVEHICULAR CABLE RECEPTACLE</b></p> <p><b>WARNING</b> Drycleaning solvent P-D-680 is toxic and flammable. Always wear protective goggles and glove, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breathe vapors. DO NOT use near open flame or excessive heat.</p>	

Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) FOR THE M969A2 (continued)

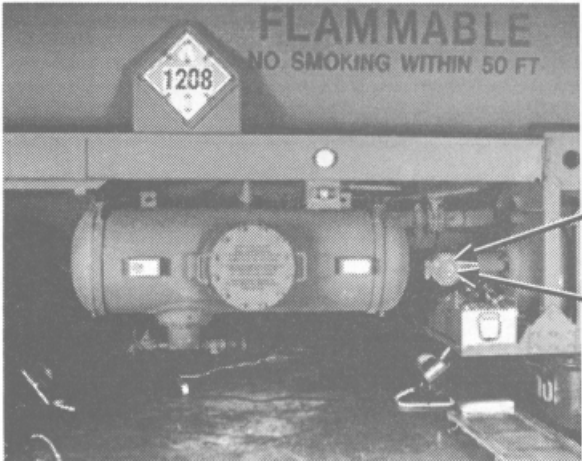
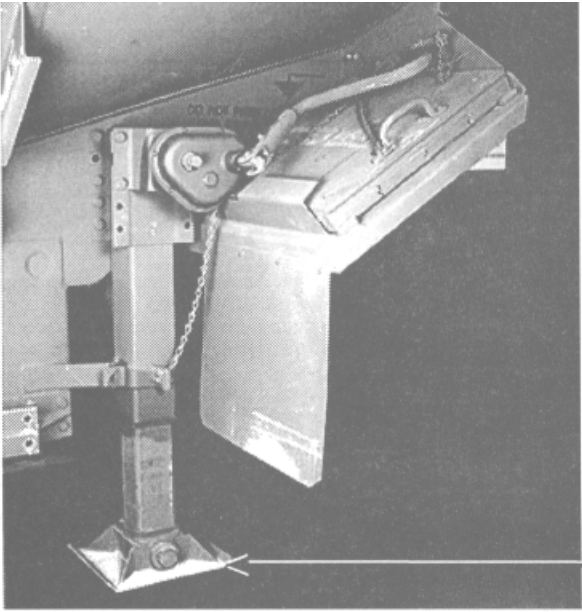
Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
4	Semiannual	Piping Strainer	<p>Place suitable container under split coupling piping strainer, then remove and inspect piping strainer. Clean piping strainer with drycleaning solvent. Replace piping strainer if heavily clogged or damaged (para 2-117).</p>  <p>SPLIT COUPLING</p> <p>PIPING STRAINER (HIDDEN)</p>	
5	Semiannual	Landing Gear	<p>Check condition and operation of landing gear. Inspect for damage or wear. Replace damaged parts (paras 2-67 through 2-69).</p>  <p>LANDING GEAR</p>	

Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) FOR THE M969A2 (continued)

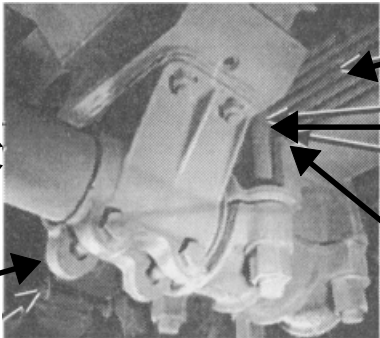
Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
6	Semiannual	Bogie Assembly	<p>a. Position semitrailer on hard level surface with front resting on landing gear. Jack and block frame. Remove tire and wheel assemblies (para 2-62).</p> <p><b>NOTE</b> Clean axle and suspension system with water and fiber brush to allow for careful inspection.</p> <p>b. Inspect general condition of trunnion tube, axles, and leaf springs. Look for cracks or damage. If cracked or damaged, notify Direct Support maintenance</p> <div>  <p>TRUNNION TUBE</p> <p>AXLE (HIDDEN)</p> <p>CLIP</p> <p>LEAF SPRING CAP (HIDDEN)</p> <p>U-BOLT</p> <p>LEAF SPRING</p> </div> <p>c. Check tightness of U-bolts and clips on leaf springs. Tighten loose U-bolts and clips. If damage or wear is evident, notify Direct Support maintenance.</p> <p>d. Check tightness of U-bolts and screws on leaf spring cap and seat. Tighten loose U-bolts and screws. If damage or wear is evident, notify Direct Support maintenance.</p>	

Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) FOR THE M969A2 (continued)

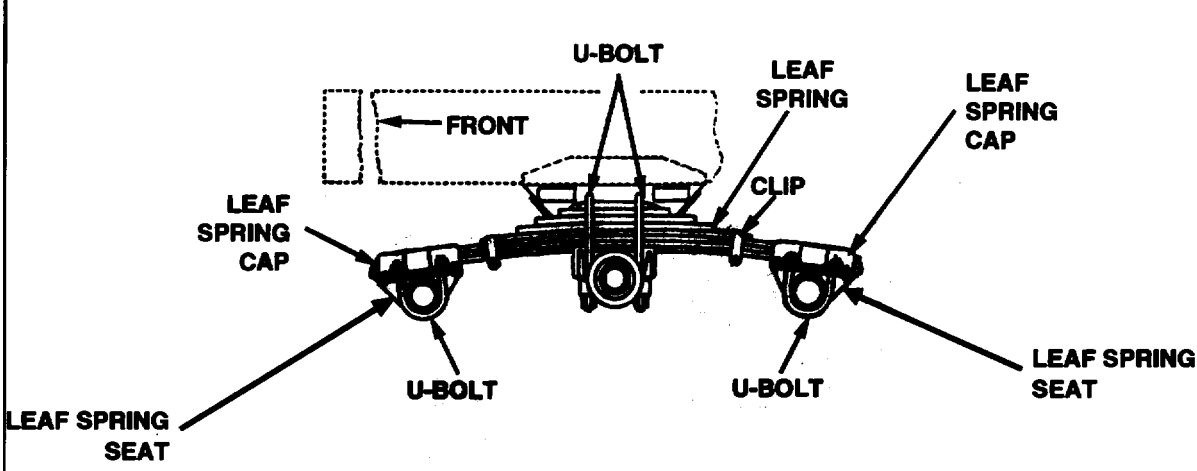
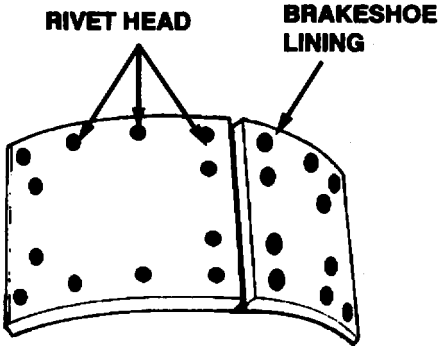
Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
6	Semiannual	Bogie Assembly (continued)		
7	Semiannual	Brakes	<p>e. Check tightness of bolts fastening bogie assembly to trailer frame. Tighten loose bolts. If damage or wear is evident, notify Direct Support maintenance.</p> <p>a. Check brakeshoe lining thickness. Replace if lining is within 0.063 inch (0.160 cm) of rivet heads (para 2-63).</p> 	

Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) FOR THE M969A2 (continued)

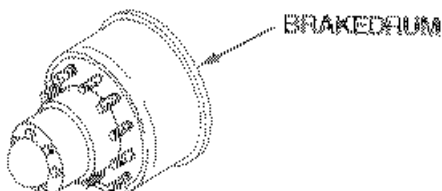
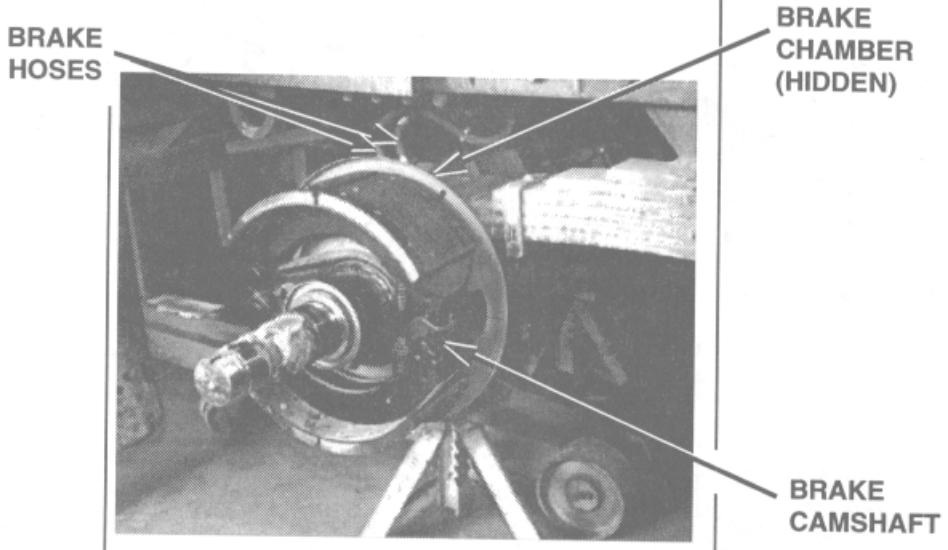
Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
7	Semiannual	Brakes (continued)	<p>b. Check brakedrums for overheating.</p>   <p>c. Look for cracked brakedrum. If cracked or damaged, replace (para 2-63).</p> <p>d. Look for damaged brake camshaft. If damaged, replace (para 2-63).</p> <p>e. Look for worn brake hoses or damaged brake chamber. If worn or damaged, replace (para 2-63).</p> <p>f. Lubricate brake shoe roller and brake anchor pin (Appendix G).</p>	
8	Semiannual	Batteries and Cable	Check electrolyte specific gravity. Charge batteries if necessary (refer to TM 9-6140-200-14).	
9	Annual	Towing Connections	Inspect condition of upper coupler (kingpin). Upper coupler (kingpin) plate should be replaced when any of the following conditions exist:	

Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) FOR THE M969A2 (continued)

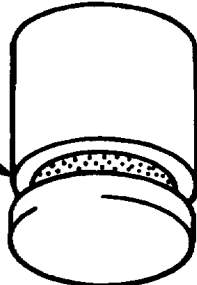
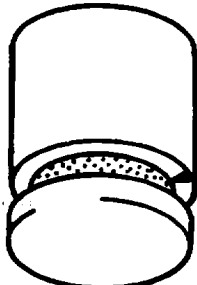
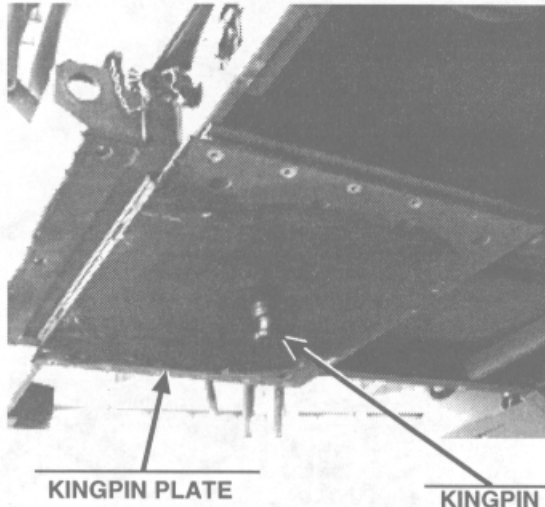
Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
9	Annual	Towing Connections (continued)	<p>a. Wear of 0.063 inch (0.160 cm) or more over 1/4 of the circumference of kingpin. This would be a condition of uneven wear on one or more sides of the kingpin wear surface.</p> <div> <p><b>EVEN WEAR OF 0.063 INCH (0.160 CM) ALL AROUND</b></p> </div>  <div> <p><b>UNEVEN WEAR OF 0.063 INCH (0.160 CM) OVER 1/4 OF CIRCUMFERENCE</b></p> </div>  <p>b. Even wear over kingpin surface causing the diameter to be reduced by 0.063 inch (0.160 cm) or more.</p>  <p>c. A crack of any size noted anywhere on pin or associated welds.</p> <p>d. A nick, chip, or gouge deeper than 0.125 inch (0.240 cm) noted anywhere on wear surface of kingpin.</p>	Any cracks

Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) FOR THE M969A2 (continued)

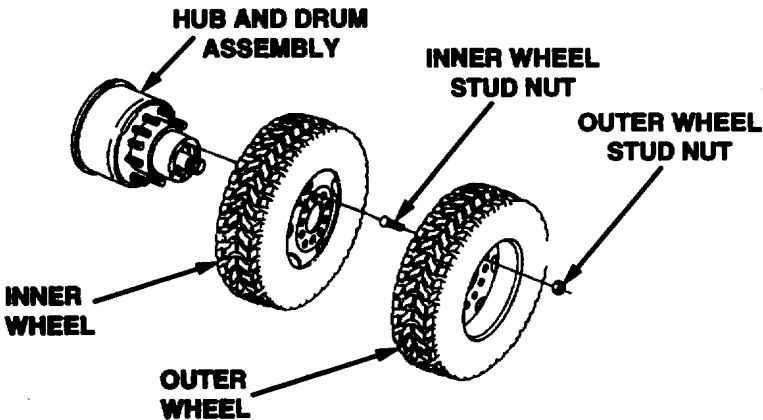
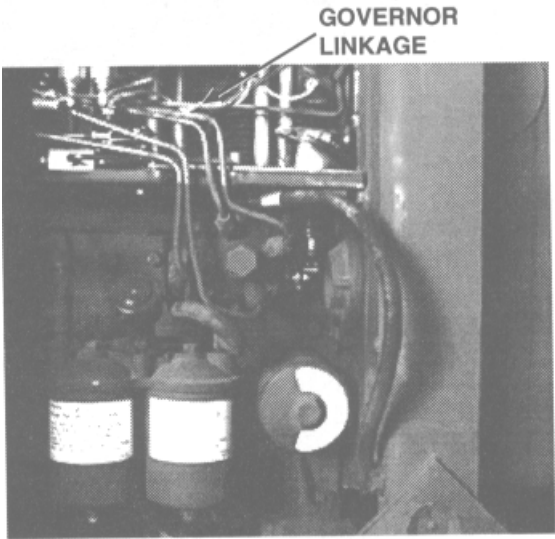
Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
10	Annual	Wheels and Hubs	<p>a. Check for cracked wheels or hubs and missing or loose wheel stud nuts. Repair or replace as required.</p> <p>b. Disassemble hub and drum assembly (para 2-63). Clean and repack wheel bearings (Appendix G).</p> 	Three or more wheel stud nuts missing or loose.
11	Every 100 Hours	Engine	<p>a. Check governor linkage for loose or missing hardware.</p> 	

Table 2-1. Unit Preventive Maintenance Checks and Services (PMCS) FOR THE M969A2 (continued)

Item No.	Interval	Item to Check/ Service	Procedure	Not Fully Mission Capable If:
11	Every 100	Engine (continued)	b. Change crankcase oil (Appendix G).	
	Hours Every 200		c. Replace oil filter element (para 2-105).	
	Hours Every 600		d. Change electric fuel pump filters (para 2-91).	
	hours Every 600		e. Change primary fuel filter (para 2-108).	
	Hours Every 3000 Hours		f. Change secondary fuel filter (para 2-109).	



## Section IV. UNIT TROUBLESHOOTING PROCEDURES

Paragraph Number	Paragraph Title	Page Number
2-13	General.....	2-14
2-14	Electrical Troubleshooting .....	2-14
2-15	Quick Guide to Troubleshooting.....	2-16
2-16	Troubleshooting Chart.....	2-18

**2-13. GENERAL.**

- a. This section provides information for identifying and correcting malfunctions that may develop when operating or maintaining the M969A2 semitrailer.
- b. The Quick Guide to Troubleshooting (para 2-15) lists common malfunctions of the semitrailer or its components and refers you to the proper subparagraph in the Troubleshooting Chart (para 2-16). You should perform tests/inspections and corrective actions in the order listed.
- c. If you are unsure of the location of an item mentioned in troubleshooting, refer to paragraph 1-12 or the maintenance task where the item is replaced.
- d. Before performing troubleshooting, read and follow all safety instructions found in the warning summary at the beginning of this manual.
- e. This section cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by the listed corrective actions, notify your supervisor.
- f. When troubleshooting a malfunction:
  - Locate the symptom or symptoms in the Quick Guide to Troubleshooting that best describe the malfunction.
  - Turn to the subparagraph in the Troubleshooting Chart where the troubleshooting procedures for the malfunction in question are described.
  - Perform each step in the order listed until the malfunction is corrected. DO NOT perform any maintenance task unless the troubleshooting procedure tells you to do so.

**2-14. ELECTRICAL TROUBLESHOOTING.**

- a. This paragraph provides instructions to give clear insight to general troubleshooting of wiring harnesses and components. Schematic diagrams can be found in Appendix H.
- b. When troubleshooting any electrical system or component, exercise extreme care in order to prevent electrical shock.

---

**2-14. ELECTRICAL TROUBLESHOOTING (continued).**

---

**WARNING**

**Throughout troubleshooting of the electrical system or electrical components, be certain MASTER switch is OFF between every step unless otherwise directed. To / prevent injury due to electrical shock, remove all jewelry and metal objects when working on the electrical system.**

- c. The multimeter is used throughout electrical troubleshooting. When using the multimeter, make sure it is used with a probe kit.
- d. When performing a shorts test, make sure all connectors and/or leads are disconnected from their components. Probe the pins (or sockets) with a multimeter. This is done by placing the red lead on pin (or socket) A (or 1) and then placing the black lead on the next pin (or socket) in alphabetical (or numerical) order. Probe every pin (or socket) on the connector or lead with the black lead of the multimeter.
- e. When probing has been completed, place the red lead on the second pin (or connector) and do the probing with the black lead in order again. Do this until every pin has been probed with the red lead of the multimeter. Then place the black lead of the multimeter on the connector and place the red lead on each pin (or socket) on the connector.
- f. If continuity is present between any two points, a short exists. Shorts must be repaired in order to continue any operation.
- g. If instructed in a procedure to skip a pin (or socket) during a shorts test, it is because the pin (or socket) is not used / or is shielded.
- h. When a repair or replacement of a lead or wiring harness has been done, do the shorts test again to make sure the problem has been corrected.
- i. When performing a continuity check, connect the meter probes to both terminals of the circuit you are testing. Read the meter. Interpret the results. If the needle swings over to near 0 on the top scale, the circuit has continuity. If the needle does not move, the circuit is open. If the needle jumps or flickers, there is a loose connection.
- j. Check light bulbs for cracks or discoloration. Check the continuity of a light bulb by placing one probe of the meter on the metal button base connection of the bulb and one probe on the metal side of the base. If the meter needle swings over to 0 on the top scale, the circuit has continuity. If the meter needle does not move, the circuit is open, indicating a defect.

**2-15. QUICK GUIDE TO TROUBLESHOOTING.**

<b>ITEM</b>	<b>SYMPTOM</b>	<b>PARAGRAPH</b>
LIGHTS	ALL SEMITRAILER LIGHTS ARE INOPERABLE.	para 2-16a(1)
	ONE OR MORE (BUT NOT ALL) TAILLIGHT LAMPS OR LIGHTS WILL NOT OPERATE.	para 2-16a(2)
	LIGHTS ARE DIM OR FLICKERING.	para 2-16a(3)
BRAKE SYSTEM	BRAKES WILL NOT RELEASE.	para 2-16b(1)
	NO BRAKES OR BRAKES ARE WEAK.	para 2-16b(2)
	BRAKE APPLICATION OR RELEASE IS SLOW.	para 2-16b(3)
	BRAKES GRAB.	para 2-16b(4)
	BRAKES DRAG (one or more brakedrums are running hot).	para 2-16b(5)
LANDING GEAR	HAND CRANK IS DIFFICULT TO TURN.	para 2-16c(1)
MANHOLE COVER	EXCESSIVE LEAKAGE EXISTS AROUND MANHOLE.	para 2-16d(1)
ENGINE	ENGINE STARTER WILL NOT RUN.	para 2-16e(1)
	ENGINE TURNS OVER BUT FAILS TO START.	para 2-16e(2)
	ENGINE IS HARD TO START OR HAS LOW ENGINE POWER.	para 2-16e(3)
	LOW OIL PRESSURE IS INDICATED ON GAGE (20 psi [138 kPa] minimum).	para 2-16e(4)
	HIGH OIL PRESSURE IS INDICATED ON GAGE (40 psi [276 kPa] maximum when engine is warm).	para 2-16e(5)
	ENGINE MISFIRES UNDER HEAVY LOAD.	para 2-16e(6)
	ENGINE SPEED IS ERRATIC OR WILL NOT MAINTAIN STEADY RPM.	para 2-16e(7)
	ENGINE SPEED IS TOO HIGH OR TOO LOW.	para 2-16e(8)
	ENGINE EXHAUST IS BLACK OR FUEL CONSUMPTION IS EXCESSIVE.	para 2-16e(9)
	PREHEAT INDICATOR LAMP WILL NOT LIGHT.	para 2-16e(10)

**2-15. QUICK GUIDE TO TROUBLESHOOTING (continued).**

<b>ITEM</b>	<b>SYMPTOM</b>	<b>PARAGRAPH</b>
CENTRIFUGAL PUMP	PUMP FAILS TO DELIVER FUEL.	para 2-16f(1)
BATTERY	BATTERY CHARGE IS LOW.	para 2-16g(1)
	BATTERY IS DISCHARGED.	para 2-16g(2)
FILTER/ SEPARATOR	FUEL DOES NOT FLOW DURING FUEL-SERVICING OPERATION.	para 2-16h(1)
PIPING CONTROL COMPONENTS	EMERGENCY VALVE A WILL NOT OPEN OR CLOSE OR LEAKS OCCUR.	para 2-16i(1)
	EMERGENCY VALVE A CONTROL HANDLE OPERATES IMPROPERLY.	para 2-16i(2)
	GATE VALVES OPERATE IMPROPERLY.	para 2-16i(3)
FUELING OPERATIONS	FUEL DOES NOT FLOW DURING ANY NONFILTERED FUELING OPERATION.	para 2-16j(1)
	FUEL DOES NOT FLOW DURING ANY FILTERED FUELING OPERATION.	para 2-16j(2)

## 2-16. TROUBLESHOOTING CHART.

## a. LIGHTS

(1) ALL SEMITRAILER LIGHTS ARE INOPERABLE

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Gasket (Item 45, Appendix F)
- Lockwasher (6) (Item 94, Appendix F)

**Equipment Conditions:**

- Parking brakes set on prime mover and semitrailer (refer to TM 9-2330-398-10).
- Intervehicular cable disconnected (refer to TM 9-2330-398-10).

**WARNING**

When troubleshooting an electrical malfunction or performing electrical maintenance, **ALWAYS** disconnect intervehicular electrical cable from semitrailer and disconnect negative battery cables at batteries. Failure to follow this warning may create a spark and explosion, resulting in serious injury or death to personnel.

A. Remove front electrical access cover from semitrailer.

1. Remove six screws and lockwashers, access cover, and gasket from front of semitrailer. Discard lockwashers and gasket.

2. Check for loose receptacle ground leads.

Are receptacle ground leads loose?

B. 1. Tighten loose receptacle ground leads.

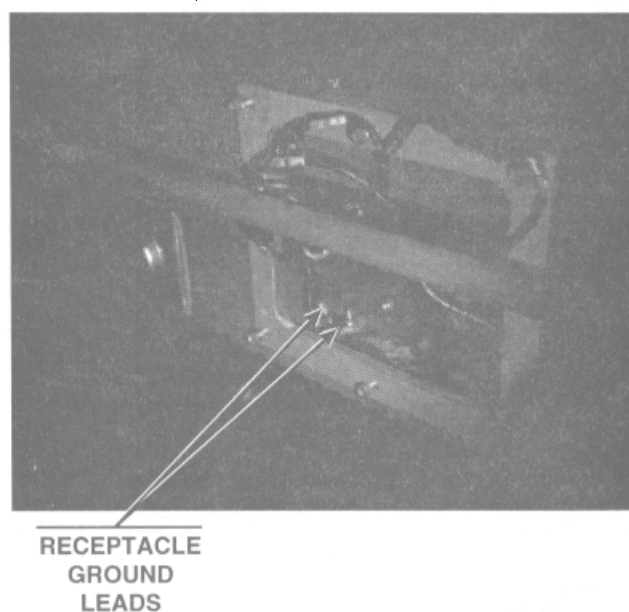
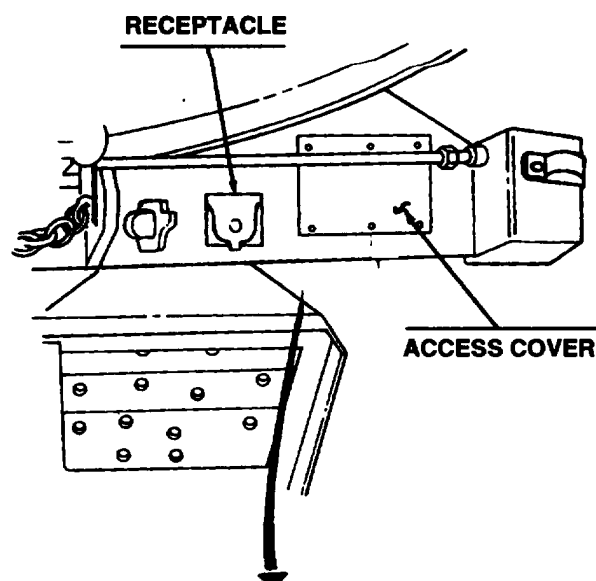
2. Connect intervehicular cable and test operation of semitrailer lights. Verify problem is solved.

3. Install access cover and new gasket with six screws and new lockwashers.

C. 1. Test operation of semitrailer lights.

2. Install access cover and new gasket with six screws and new lockwashers.

END OF TASK



**2-16. TROUBLESHOOTING CHART (continued).****a. LIGHTS (continued)***Initial Setup:*(2) ONE OR MORE (BUT NOT ALL) TAILLIGHT LAMPS  
OR LIGHTS WILL NOT OPERATE.**Tool/Test Equipment:**

- Common no. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Preformed packing (Item 135, Appendix F)

**Equipment Conditions:**

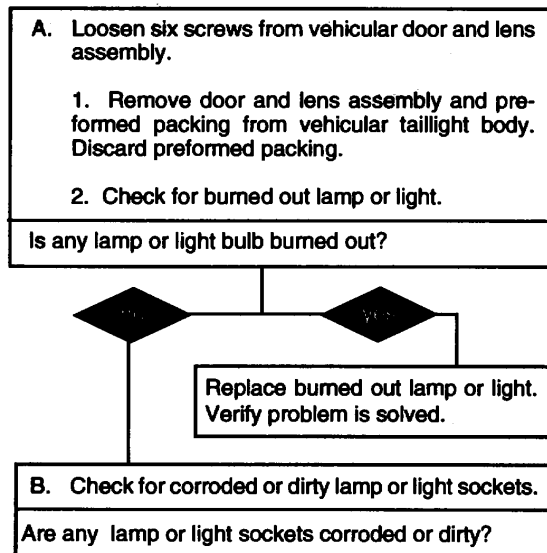
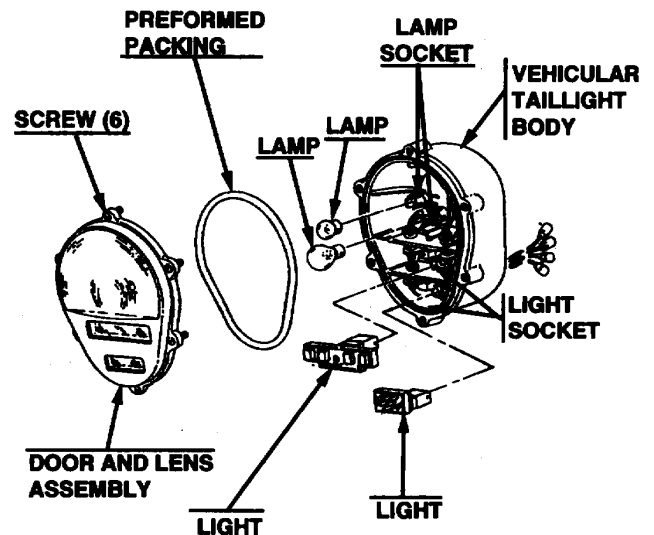
- Parking brakes set on prime mover and semitrailer (refer to TM 9-2330-39810).
- Intervehicular cable disconnected (refer to TM 9-2330-398-10).

**WARNING**

When troubleshooting an electrical malfunction or performing electrical maintenance, **ALWAYS** disconnect intervehicular electrical cable from semitrailer and disconnect negative battery cables at batteries. Failure to follow this warning may create a spark and explosion, resulting in serious injury or death to personnel.

**NOTE**

Refer to para 2-14 prior to performing any maintenance.



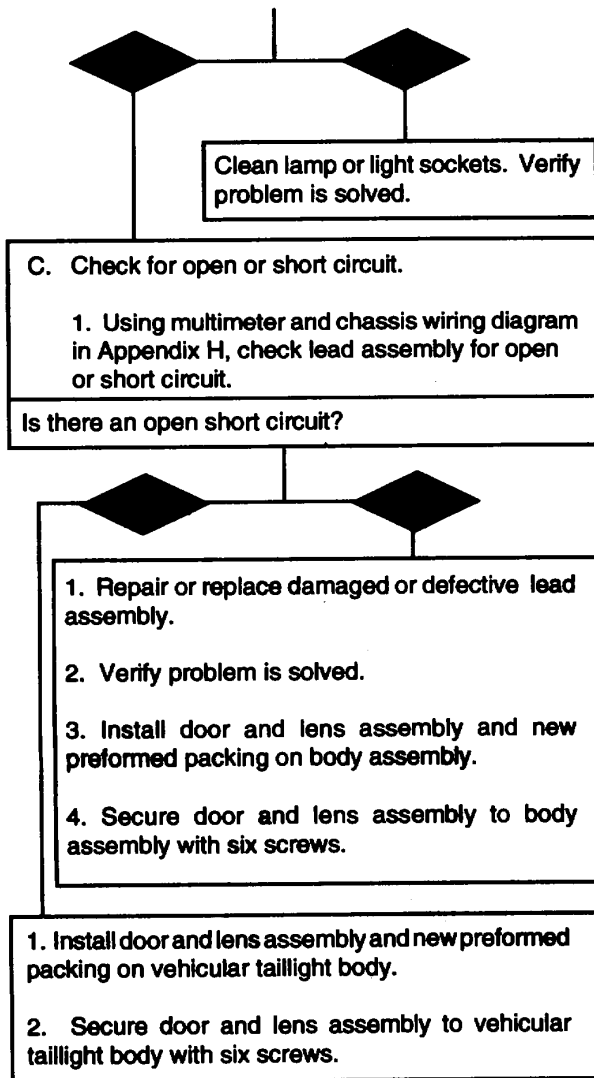
continued on next page

## 2-16. TROUBLESHOOTING CHART (continued).

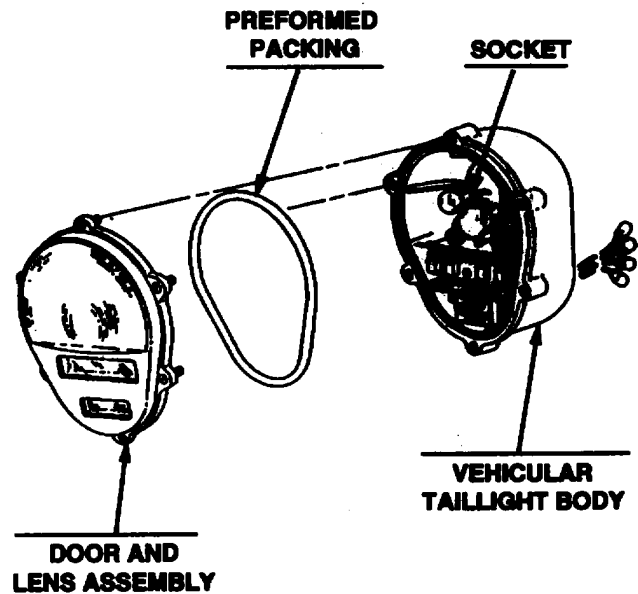
a. LIGHTS (continued)

(2) ONE OR MORE (BUT NOT ALL) TAILLIGHT LAMPS  
OR LIGHTS WILL NOT OPERATE (continued).

CONTINUED FROM STEP B



END OF TASK



**2-16. TROUBLESHOOTING CHART (continued).****a. LIGHTS (continued)****(3) LIGHTS ARE DIM OR FLICKERING.***Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Gasket (Item 45, Appendix F)
- Lockwasher (6) (Item 94, Appendix F)

**Equipment Conditions:**

- Parking brakes set on prime mover and semitrailer (refer to TM 9-2330-39&10).
- Intervehicular cable disconnected (refer to TM 9-2330-398-10).

**WARNING**

When troubleshooting an electrical malfunction or performing electrical maintenance, **ALWAYS** disconnect intervehicular electrical cable from semitrailer and disconnect negative battery cables at batteries. Failure to follow the warning may create a spark and explosion, resulting in serious injury or death to personnel.

**A. Remove front electrical access cover from semitrailer.**

1. Remove six screws and lockwashers, access cover, and gasket from front of semitrailer. Discard lockwashers and gasket.

2. Check for loose receptacle ground leads.

Are receptacle ground leads loose?

no

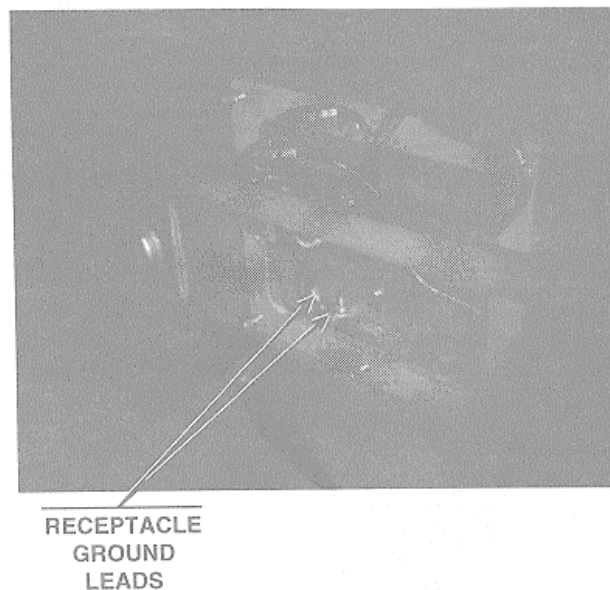
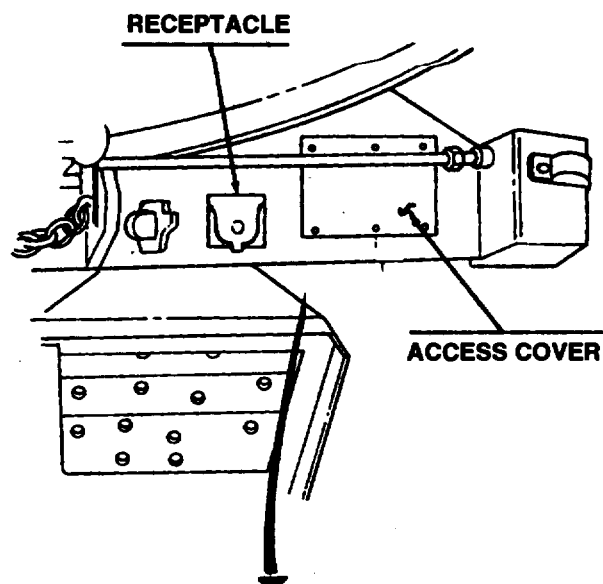
yes

Refer to troubleshooting, **ALL SEMITRAILER LIGHTS ARE INOPERABLE** (para 2-16a(1)). Verify problem is solved.

1. Connect intervehicular cable, and test operation of semitrailer lights.

2. Install access cover, gasket, and six new lockwashers and screws on semitrailer.

**END OF TASK**





## 2-16. TROUBLESHOOTING CHART (continued).

## b. BRAKE SYSTEM

## (1) BRAKES WILL NOT RELEASE.

*Initial Setup:*

## Tools/Test Equipment:

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

## Equipment Conditions:

- Semitrailer jacked up and all wheels lifted off the ground. Frame blocked securely.

- A. Check for leaking airbrake chamber with air available (para 2-51).

**CAUTION**

Do not leave airbrake chamber top plugs off any longer than necessary. Water, mud, and other contaminants can harm operation of brake actuator. Vent on airbrake chamber top plug must be at lowest location, pointing down.

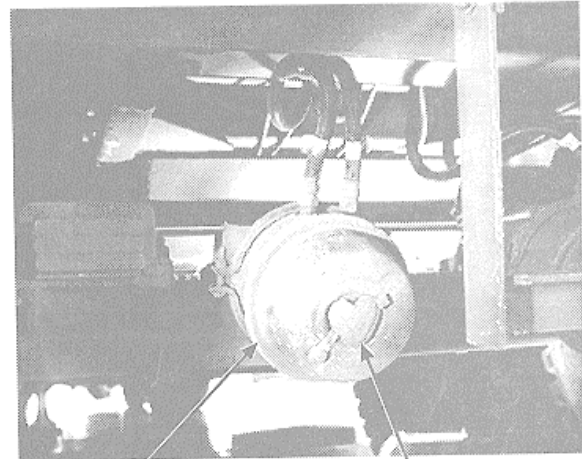
1. To manually release fail-safe brakes when no air is available, do the following:

- Remove nut and the release tool from mounting hole in airbrake chamber.
- Remove airbrake chamber top plug from airbrake chamber.
- Insert release tool into hole and turn 1/4 turn to seat release tool in pressure plate.
- Install nut on release tool and tighten until 2 1/2 to 2 3/4 inches of release tool are exposed.
- Repeat steps for remaining airbrake chambers.

Is any air brake chamber leaking?

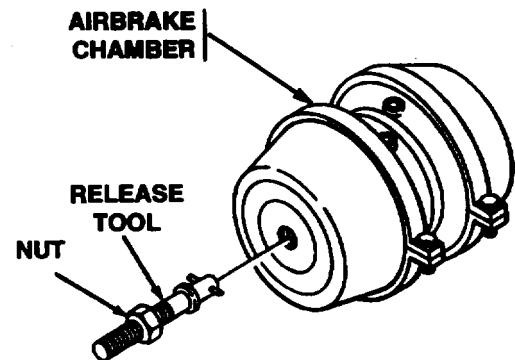
Replace airbrake chamber (para 2-51). Verify problem is solved.

continued on next page



AIRBRAKE  
CHAMBER

AIRBRAKE  
CHAMBER  
TOP PLUG

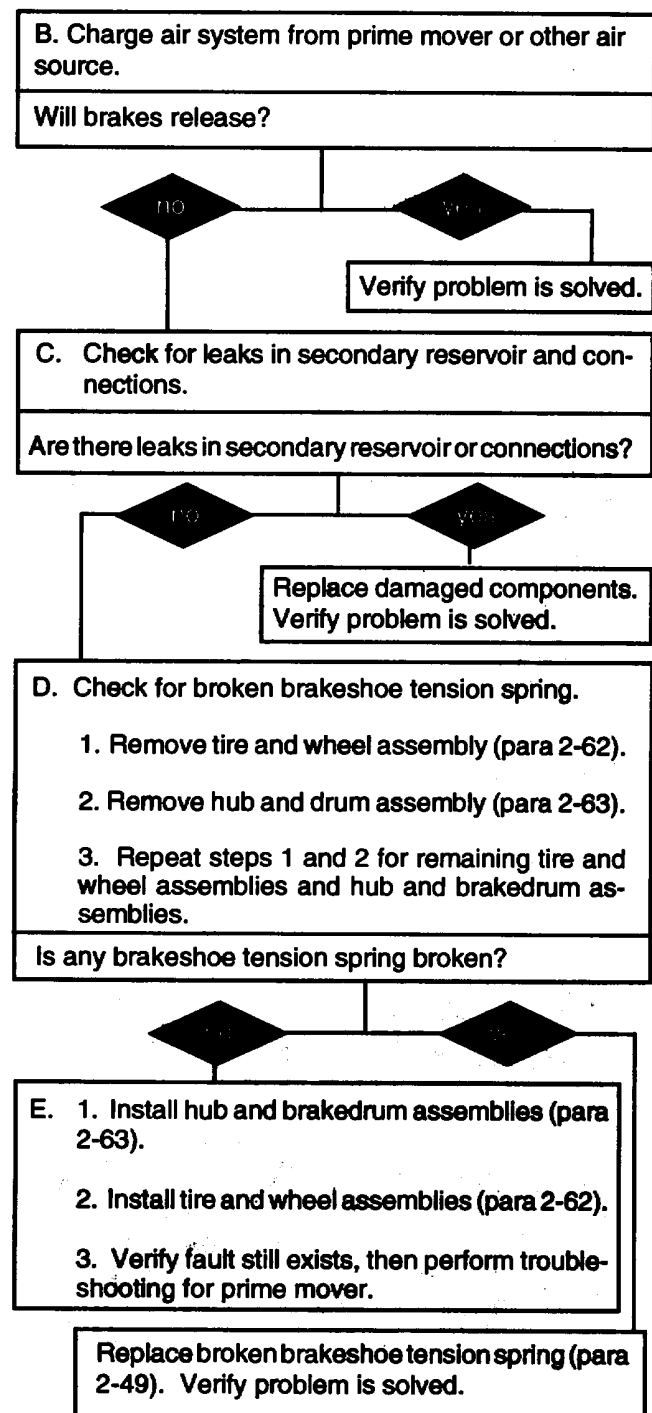


## 2-16. TROUBLESHOOTING CHART (continued).

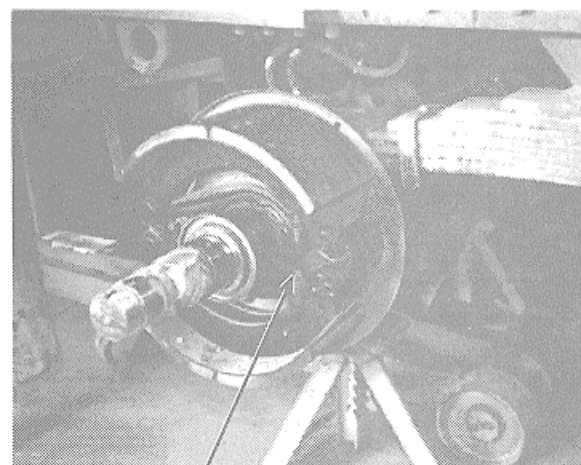
b. BRAKE SYSTEM (continued)

(1) BRAKES WILL NOT RELEASE (continued).

CONTINUED FROM STEP A



END OF TASK



BRAKESHOE  
TENSION  
SPRING

**2-16. TROUBLESHOOTING CHART (continued).****b. BRAKE SYSTEM (continued)****(2) NO BRAKES OR BRAKES ARE WEAK.***Initial Setup:***Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Soap (Item 28, Appendix C)

**Personnel Required: Two****Equipment Conditions:**

- Parking brakes set on prime mover (refer to technical manual for prime mover).

**A. Check airbrake chamber for leaks (para 2-51).**

Is airbrake chamber leaking?

1. Open drain cocks on front and rear air reservoirs and allow air to bleed.
2. Replace airbrake chamber (para 2-51). Verify problem is solved.

**B. 1. Remove tire and wheel assembly (para 2-62).**

2. Remove hub and brakedrum assembly (para 2-63).

3. Repeat steps 1 and 2 for remaining tire and wheel assemblies and hub and brakedrum assemblies.

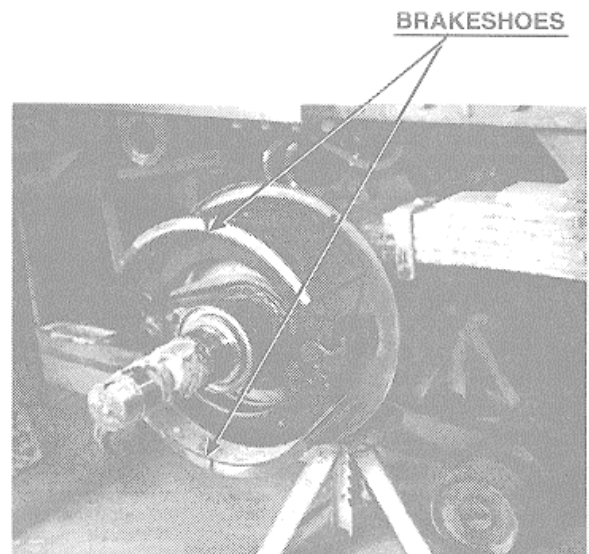
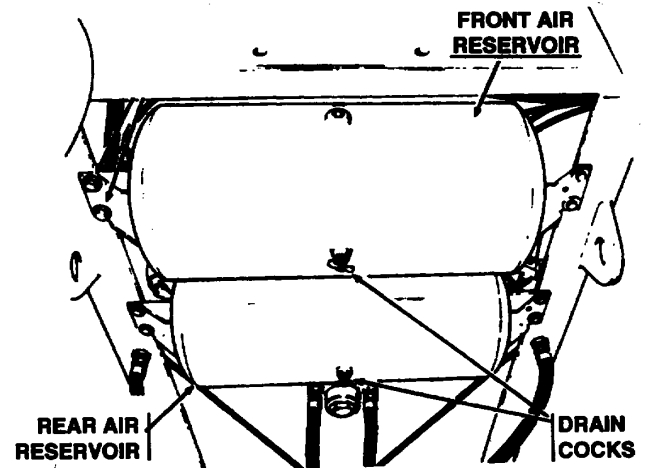
4. Inspect for grease on brakeshoes.

Is grease present on brakeshoes?

Replace brakeshoes (para 2-49). Verify problem is solved.

**C. Inspect for worn brakeshoes.**

Are brakeshoes worn within 0.063 inch of rivet heads?

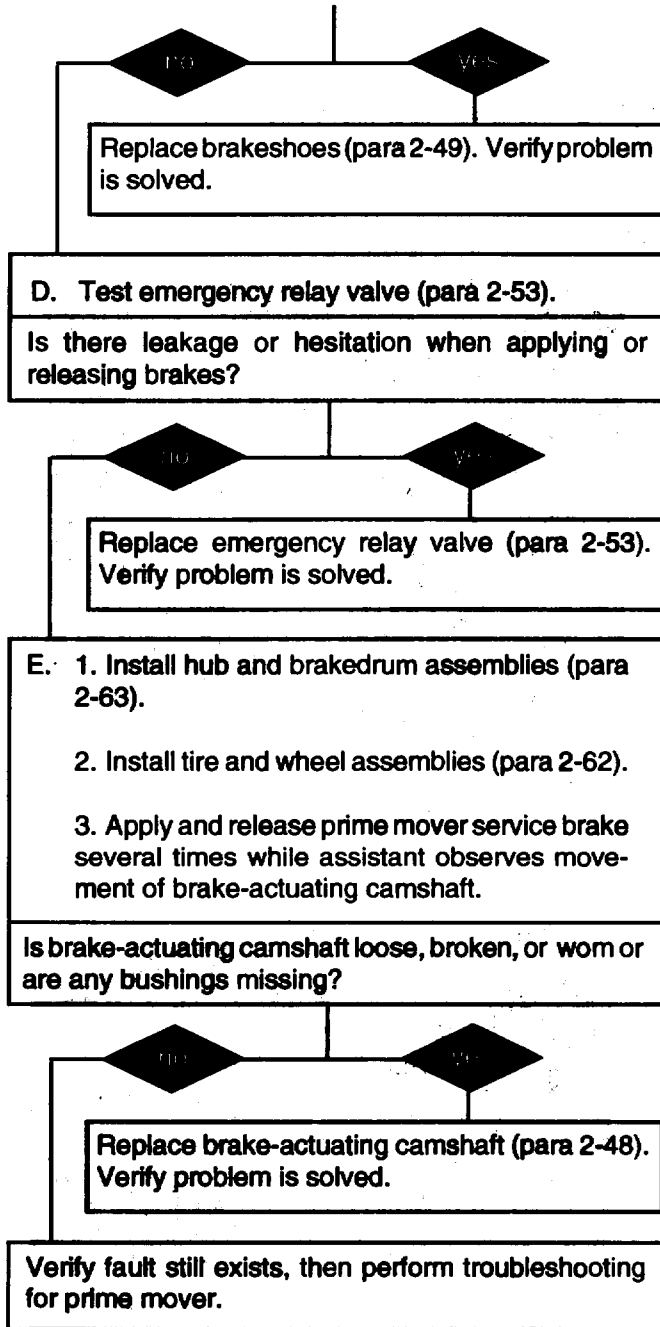
**continued on next page**

2-16. TROUBLESHOOTING CHART (continued).

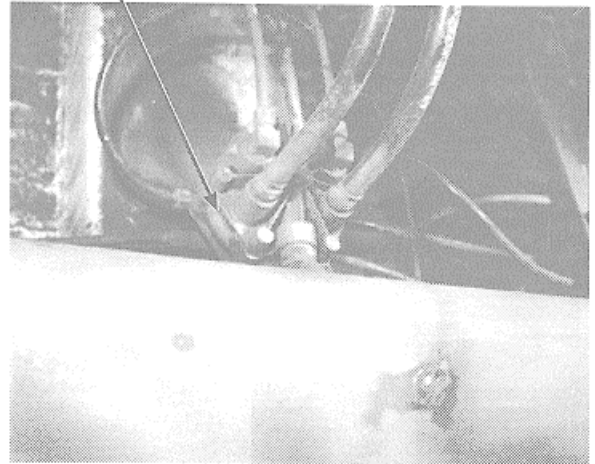
b. BRAKE SYSTEM (continued)

(2) NO BRAKES OR BRAKES ARE WEAK (continued).

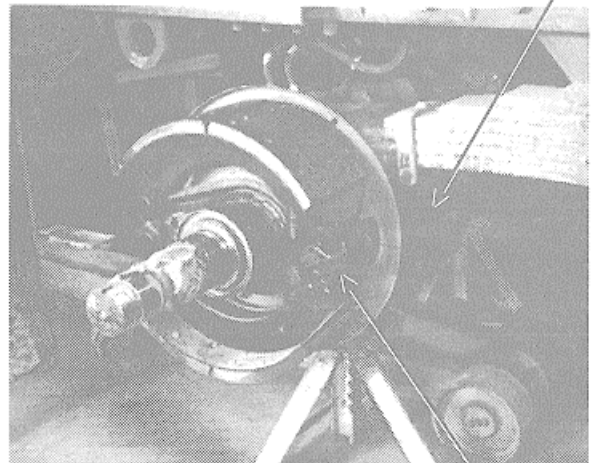
CONTINUED FROM STEP C



EMERGENCY RELAY VALVE



BUSHING



BRAKE-ACTUATING CAMSHAFT

END OF TASK

## 2-16. TROUBLESHOOTING CHART (continued).

## b. BRAKE SYSTEM (continued)

## (3) BRAKE APPLICATION OR RELEASE IS SLOW.

*Initial Setup:*

## Tools/Test Equipment:

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

## Equipment Conditions:

Parking brakes set on prime mover and semitrailer (refer to TM 92330-398-10).

**A. Check airbrake chamber for leaks (para 2-51).**

1. With prime mover connected, coat flanges and connections of airbrake chamber with soapy water.

2. Check for leakage indicated by bubbles. No leakage is permissible.

**CAUTION**

Do not overtighten clamp on airbrake chamber. Maximum torque should be between 20 and 25 ft-lb (137.9 and 172.4 kPa). Overtightening will distort flange and cause more leakage.

3. If leakage is found at flange, tighten clamp. If leakage is found at connection, tighten fittings.

Is airbrake chamber leaking?

Replace airbrake chamber (para 2-51). Verify problem is solved.

**B. 1. Remove tire and wheel assembly (para 2-62).**

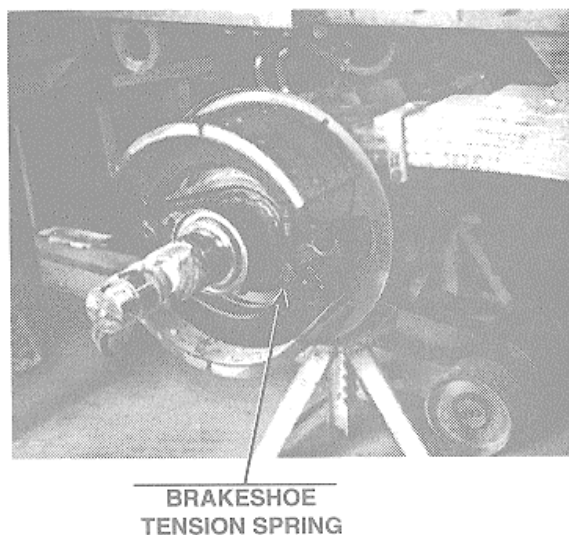
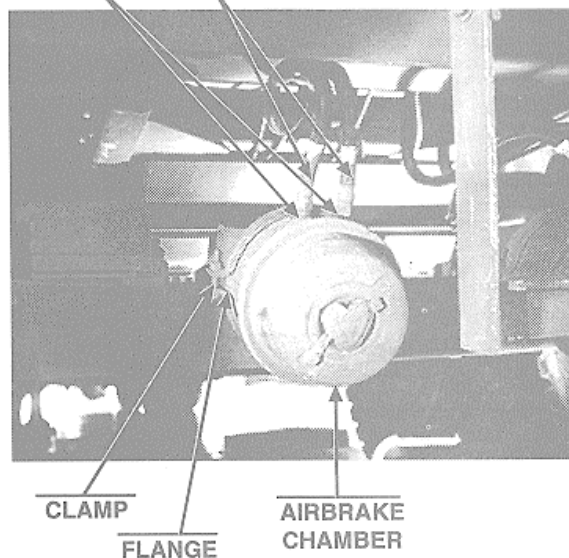
2. Remove hub and brakedrum assembly (para 2-63).

3. Check for broken brakeshoe tension spring.

Is brakeshoe tension spring broken?

continued on next page

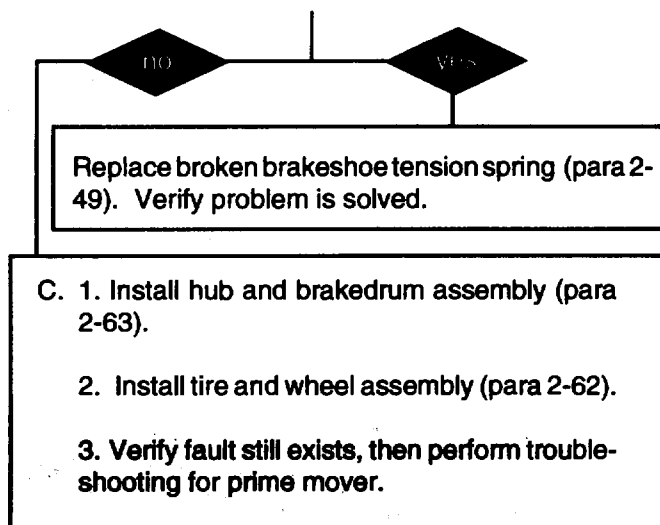
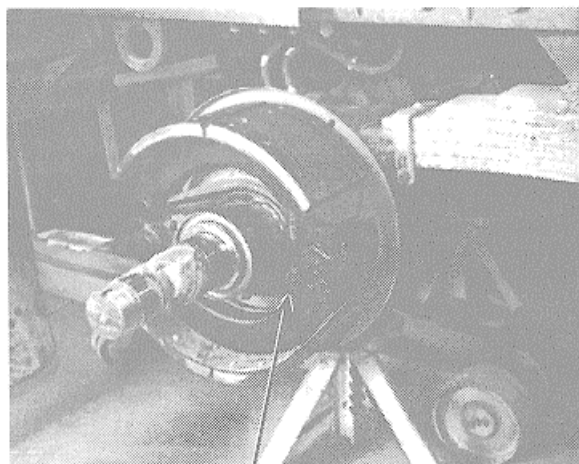
CONNECTIONS    FITTINGS



## 2-16. TROUBLESHOOTING CHART (continued).

## b. BRAKE SYSTEM (continued)

CONTINUED FROM STEP B

**END OF TASK**BRAKESHOE  
TENSION SPRING

## 2-16. TROUBLESHOOTING CHART (continued).

## b. BRAKE SYSTEM (continued).

## (4) BRAKES GRAB.

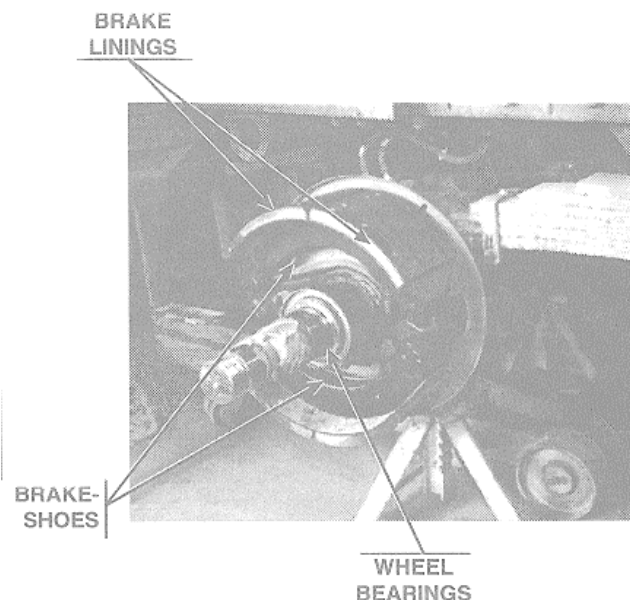
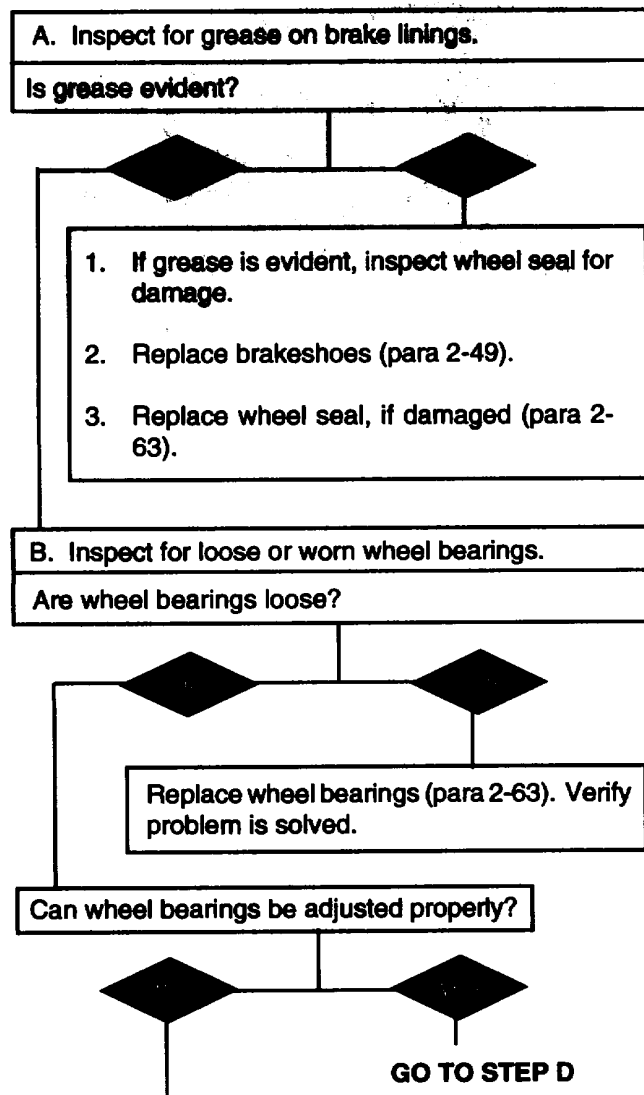
*Initial Setup:*

## Tools/Test Equipment:

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

## Equipment Conditions:

Parking brakes set on prime mover and semitrailer (refer to primer mover TM).



2-16. TROUBLESHOOTING CHART (continued).

b. BRAKE SYSTEM (continued)

(4) BRAKES GRAB (continued).

CONTINUED FROM STEP B

C. Replace bearing seal (para 2-63).

D. Inspect for worn or loose brakeshoes.

Are brake linings worn within 0.063 inch of rivet heads?

Replace brakeshoes if brake linings are worn within 0.063 inch of rivet heads (para 2-49).

Record lining wear between scheduled annual brake maintenance periods. Expected wear can be calculated. Brakeshoes with linings that will not last until the next scheduled maintenance interval should be replaced.

Are linings loose?

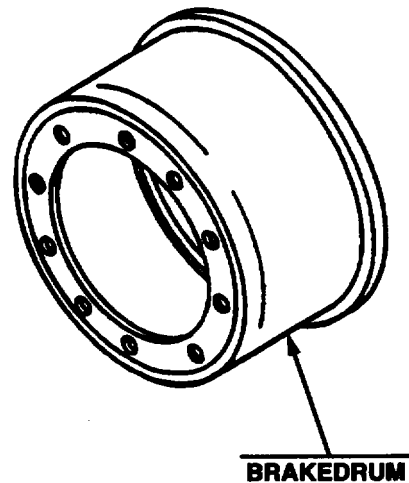
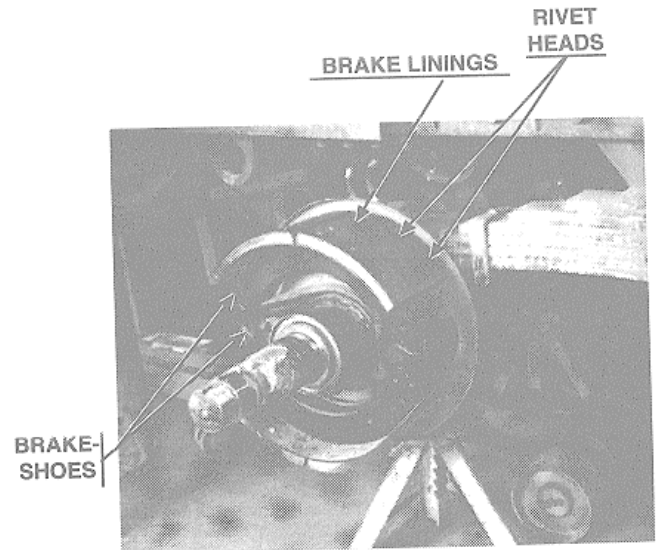
Replace brakeshoes (para 2-49). Verify problem is solved.

E. Disassemble hub and brakedrum assembly (para 2-63). Inspect parts for damage or wear.

Are damaged or worn parts found?

Replace damaged parts in hub and brakedrum assembly (para 2-63). Verify problem is solved.

continued on next page



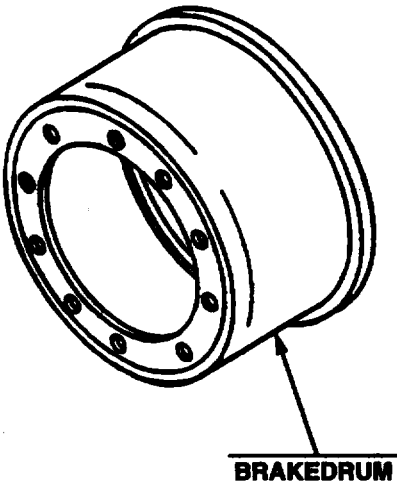
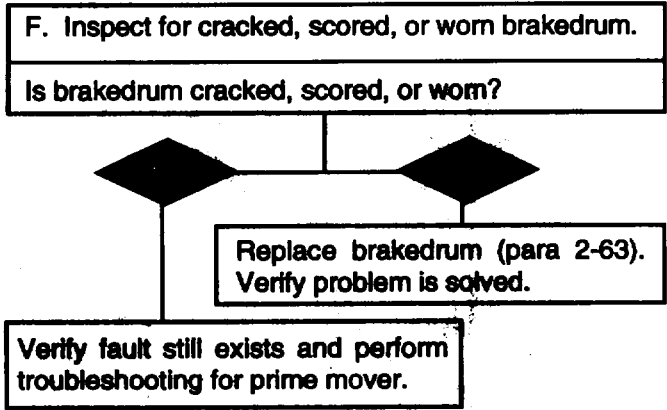


2-16. TROUBLESHOOTING CHART (continued).

b. BRAKE SYSTEM (continued)

CONTINUED FROM PREVIOUS PAGE

F. Inspect for cracked, scored, or worn brakedrum.



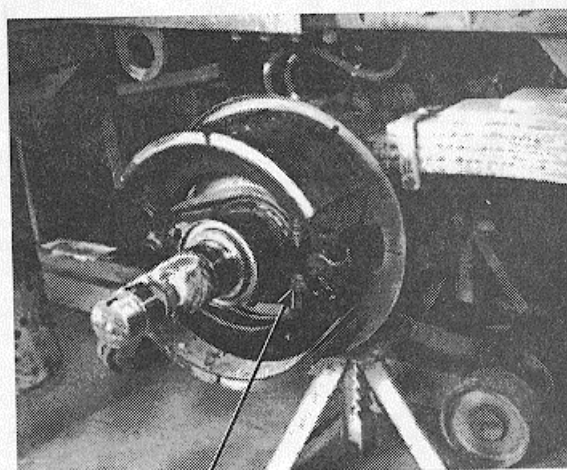
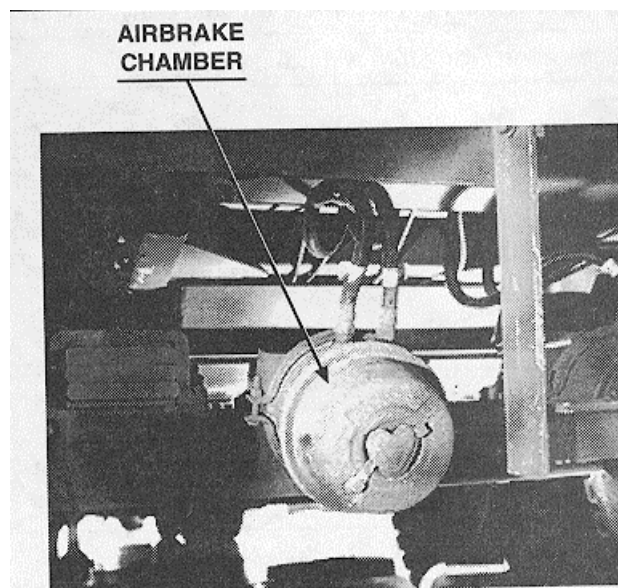
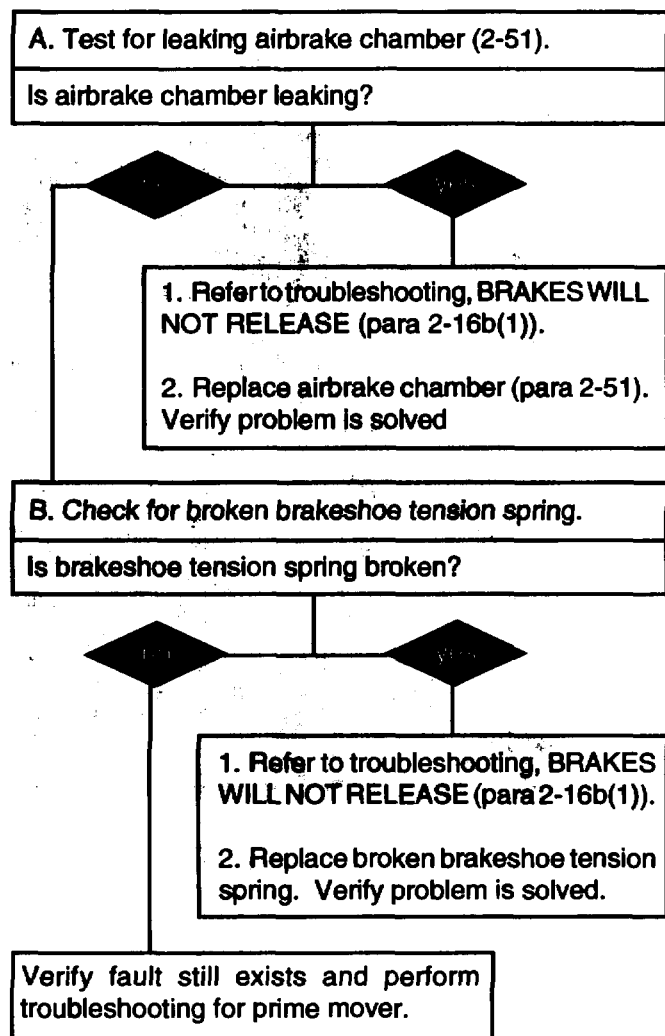
**END OF TASK**

**2-16. TROUBLESHOOTING CHART (continued).****b. BRAKE SYSTEM (continued)****(5) BRAKES DRAG (one or more brakedrums are running hot)***Initial Setup:***Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Parking brakes set on prime mover and semitrailer (refer to TM 9-2330-398-10).

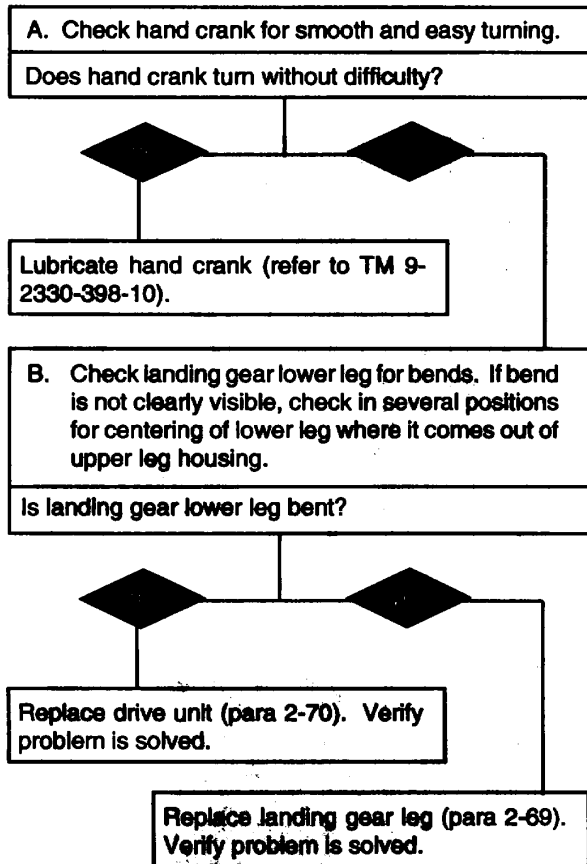


**2-16. TROUBLESHOOTING CHART (continued).**

**c. LANDING GEAR**

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

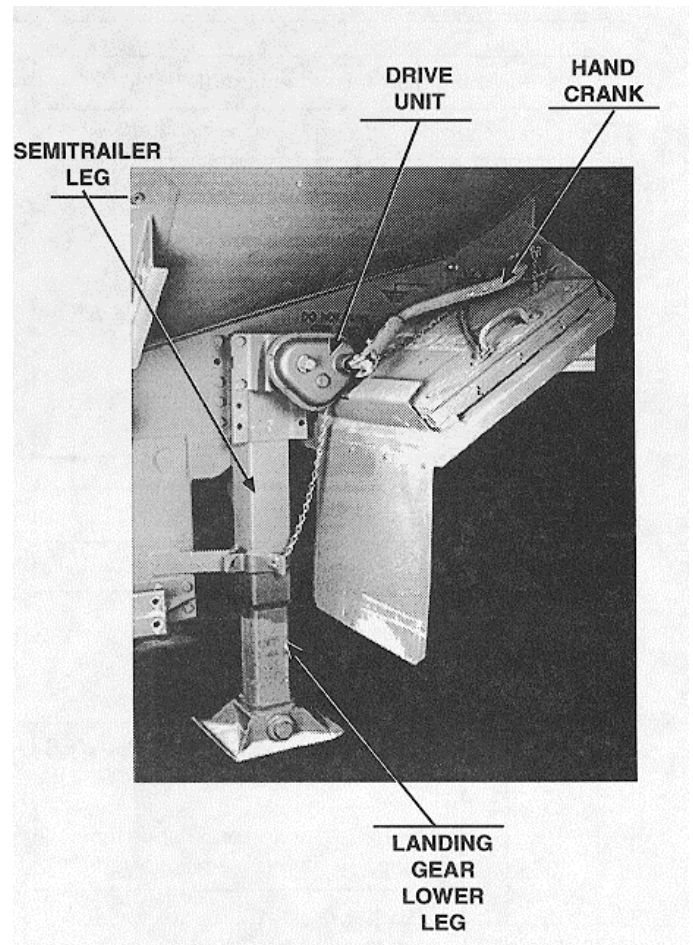


END OF TASK

**(1) HAND CRANK IS DIFFICULT TO TURN.**

**Equipment Conditions:**

- Parking brakes set on prime mover and semitrailer (refer to TM 9-2330-398-10).



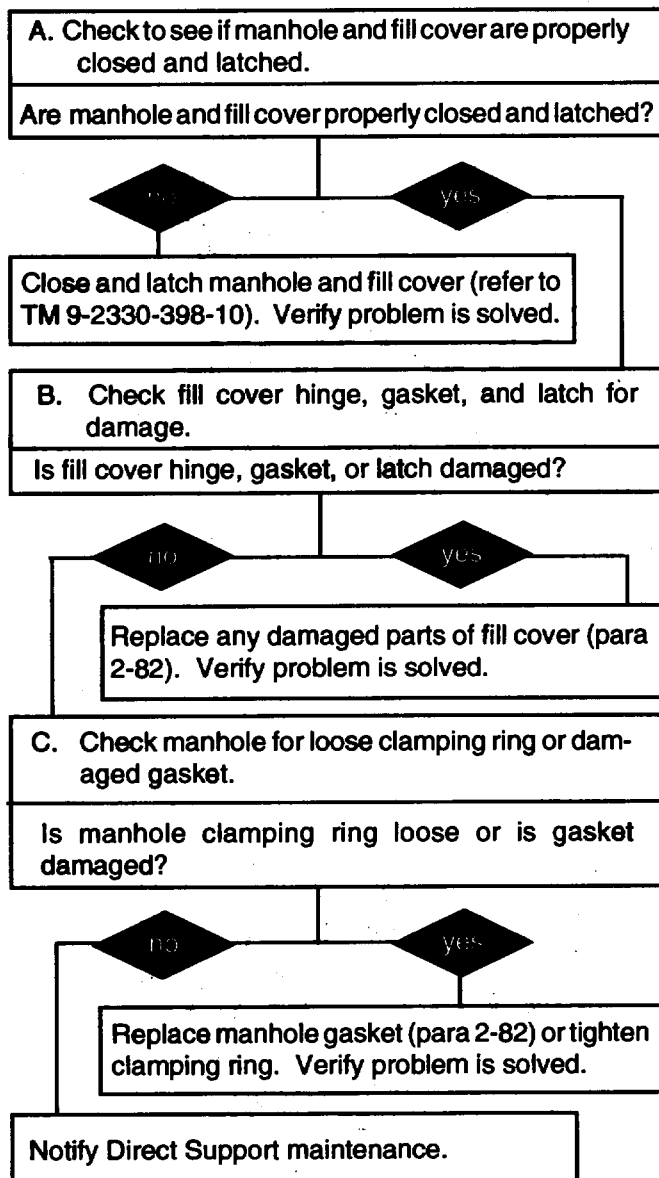
**2-16. TROUBLESHOOTING CHART (continued).****d. MANHOLE COVER***Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

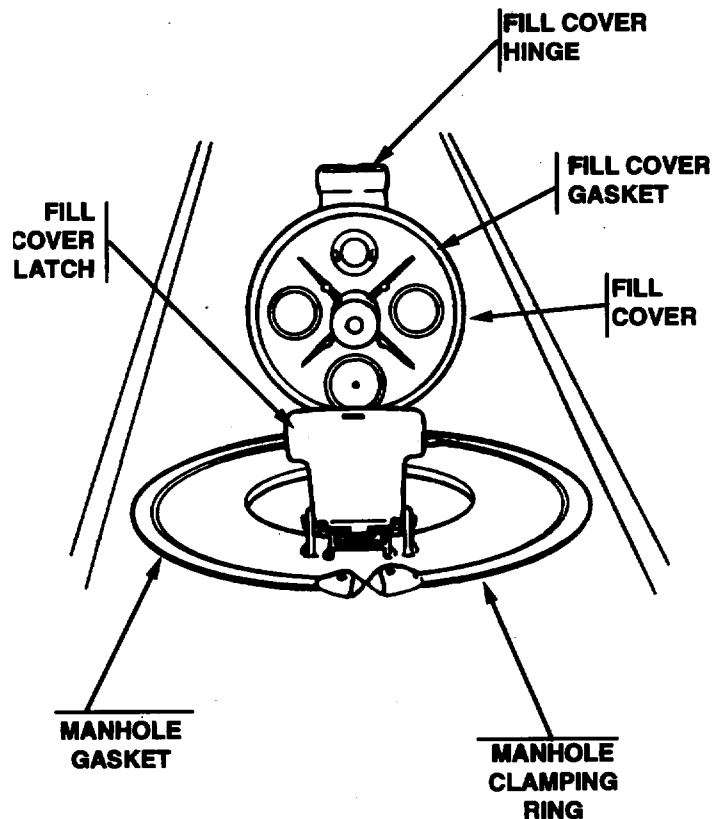
- (1) EXCESSIVE LEAKAGE EXISTS AROUND MANHOLE.

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Parking brakes set on semitrailer (refer to TM 9-2330-398-10).



END OF TASK



## 2-16. TROUBLESHOOTING CHART (continued).

e. ENGINE  
Initial Setup:

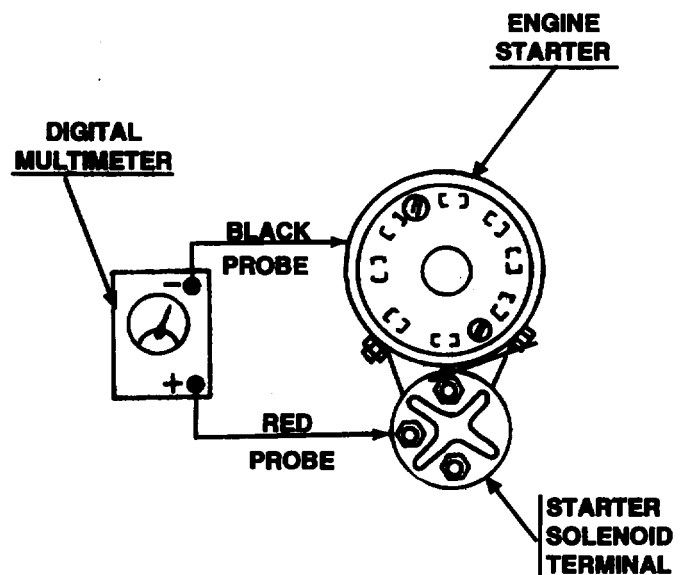
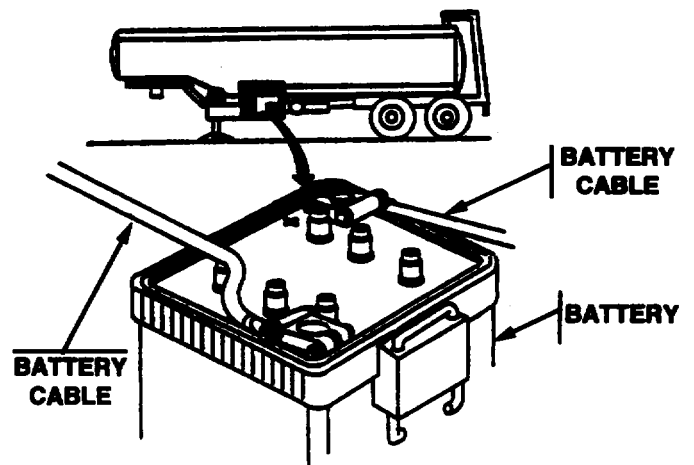
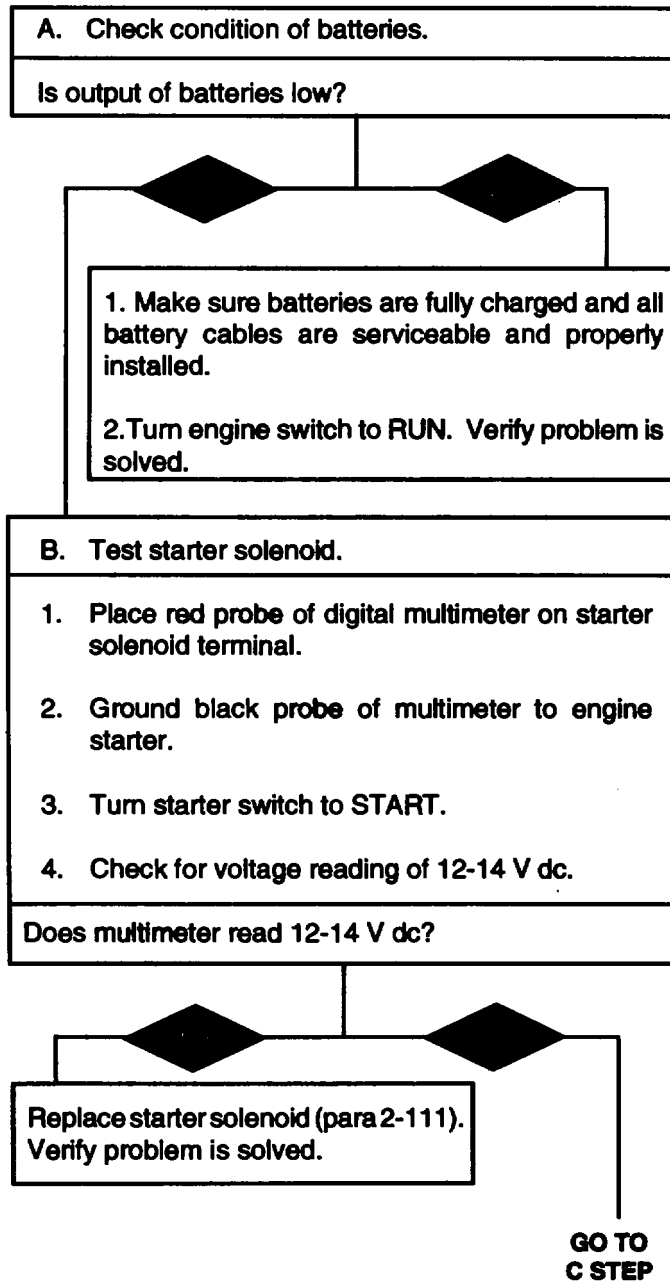
### Tool/Test Equipment:

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

(1) ENGINE STARTER WILL NOT RUN.

### Equipment Conditions:

- Semitrailer uncoupled (refer to TM 9-2330-398-10).



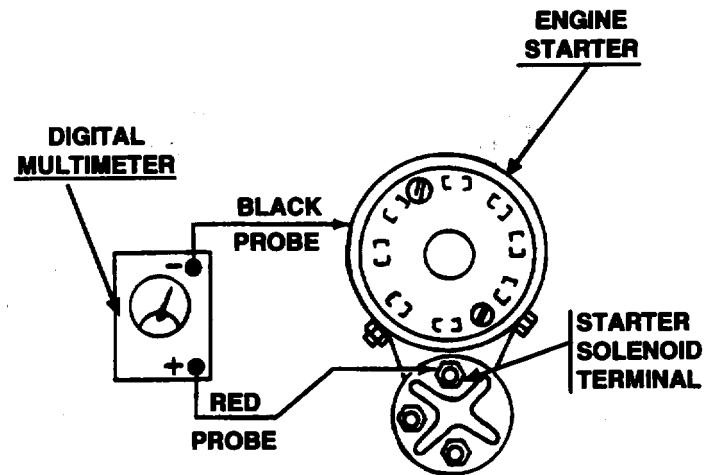
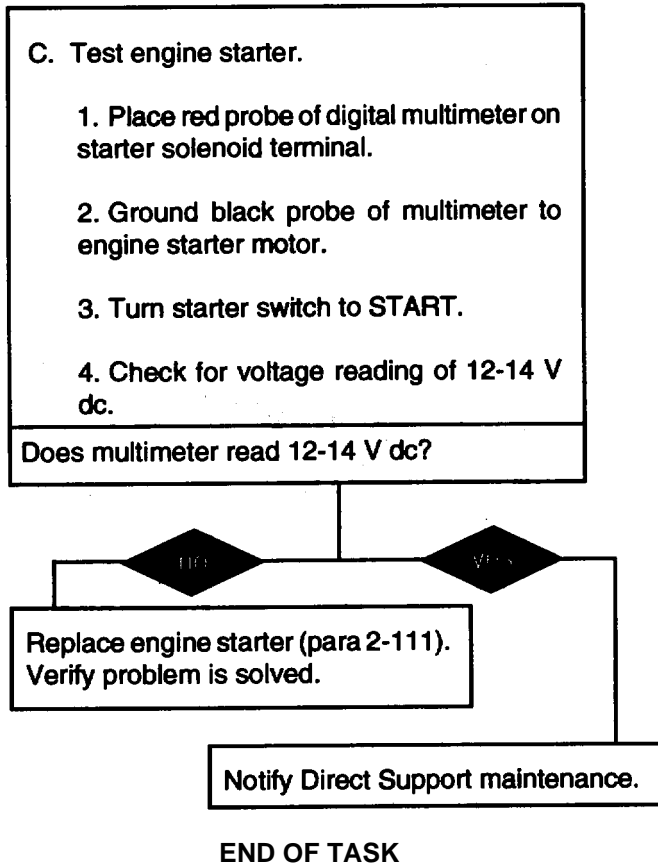
continued on next page

**2-16. TROUBLESHOOTING CHART (continued).**

e. ENGINE (continued)

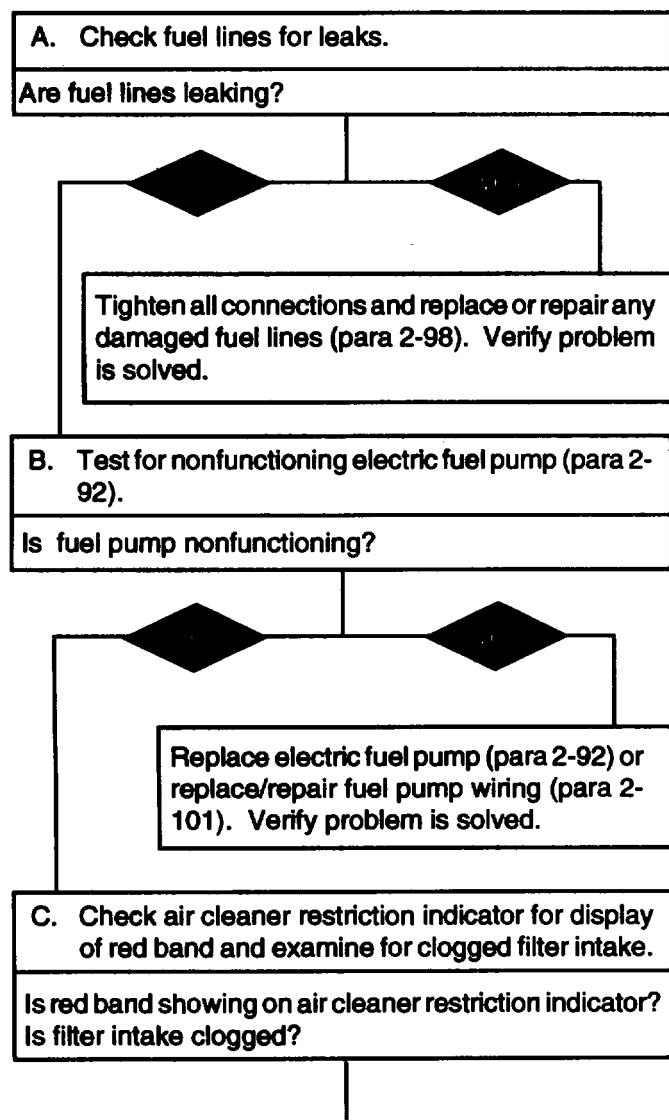
(1) ENGINE STARTER WILL NOT RUN  
(continued).

CONTINUED FROM STEP B



**2-16. TROUBLESHOOTING CHART (continued).****e. ENGINE (continued)***Initial Setup:***Tools/Test Equipment:**

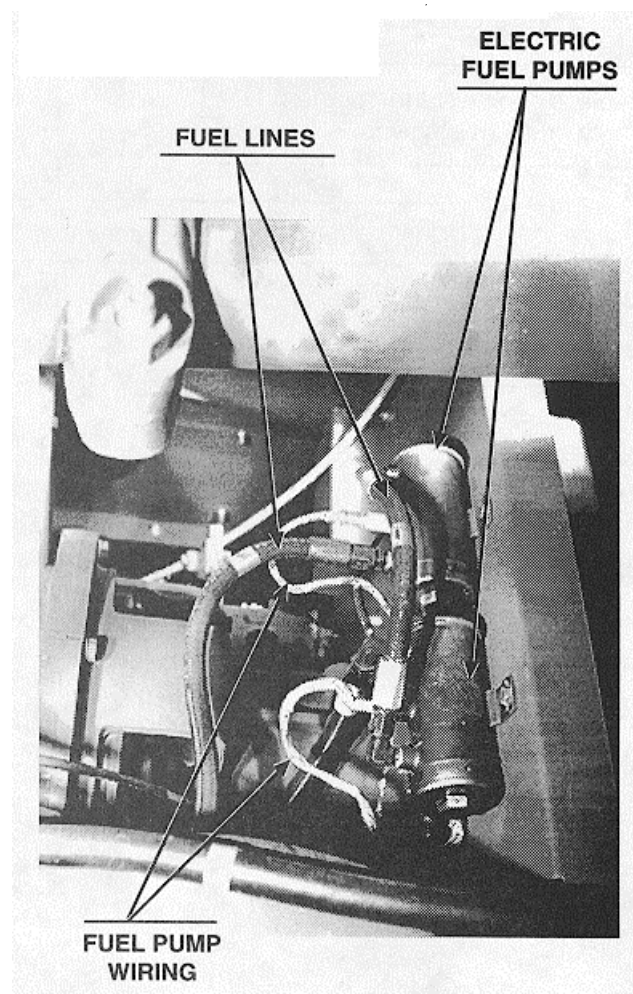
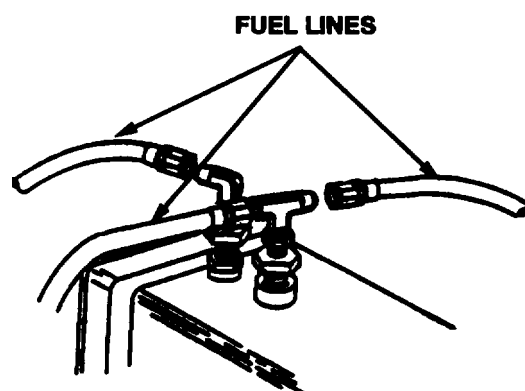
- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)



continued on next page

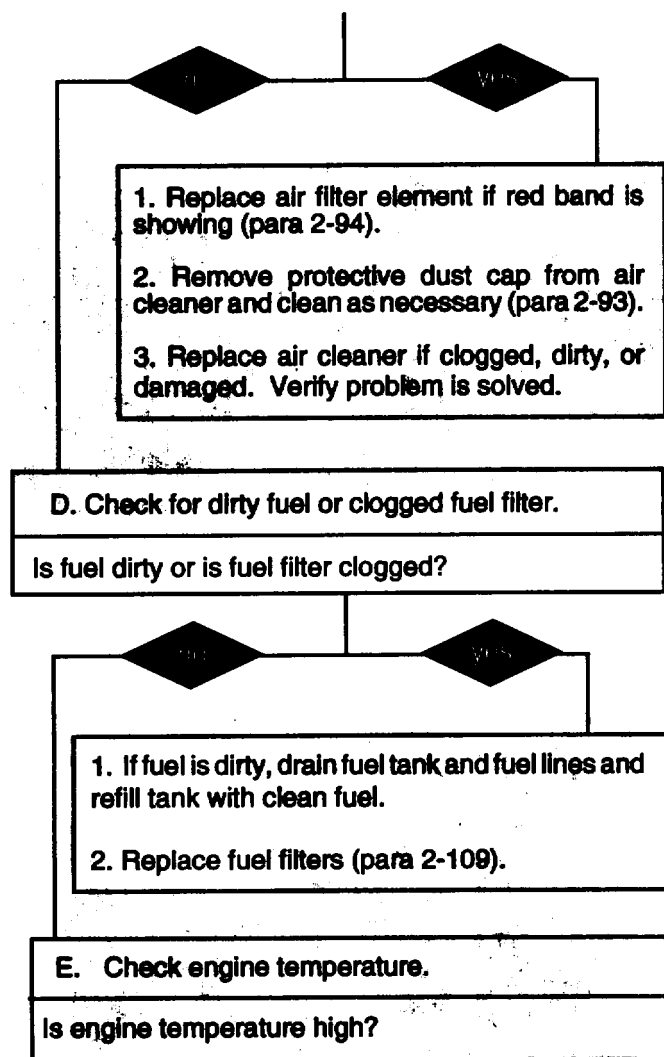
**(2) ENGINE TURNS OVER BUT FAILS TO START.****Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 92330-398-10).



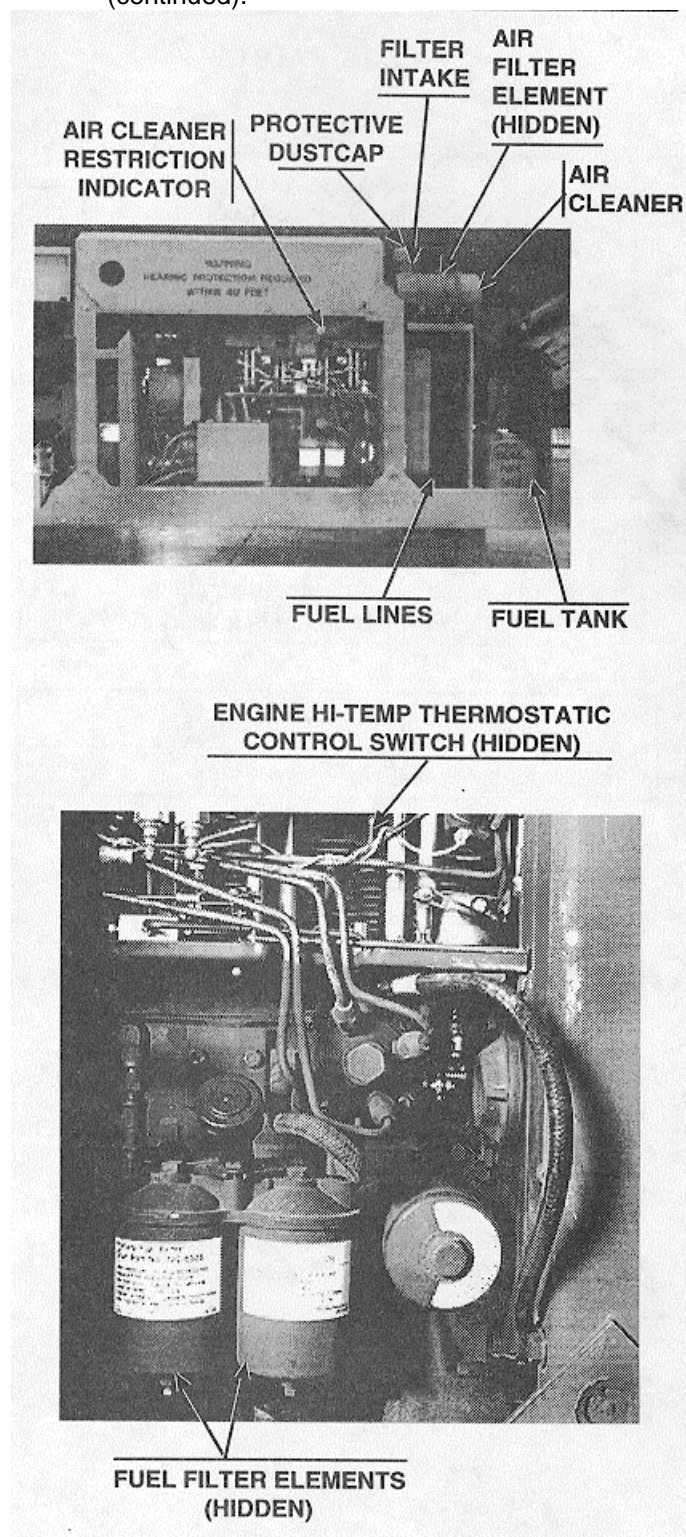
**2-16. TROUBLESHOOTING CHART (continued).**

e. ENGINE (continued)



continued on next page

(2) ENGINE TURNS OVER BUT FAILS TO START (continued).

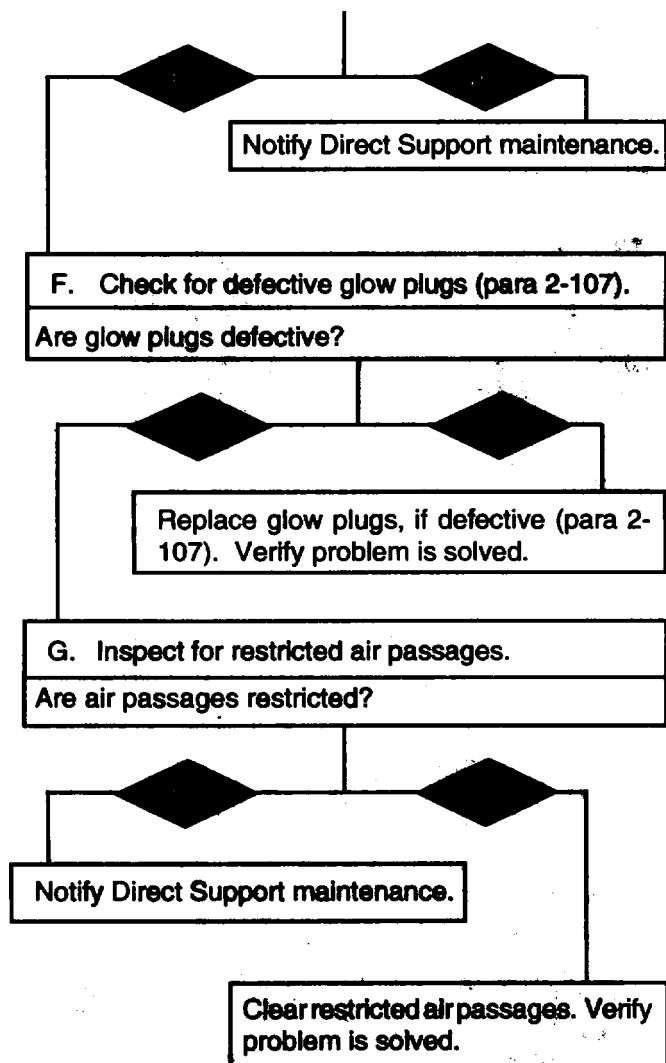




**2-16. TROUBLESHOOTING CHART (continued).**

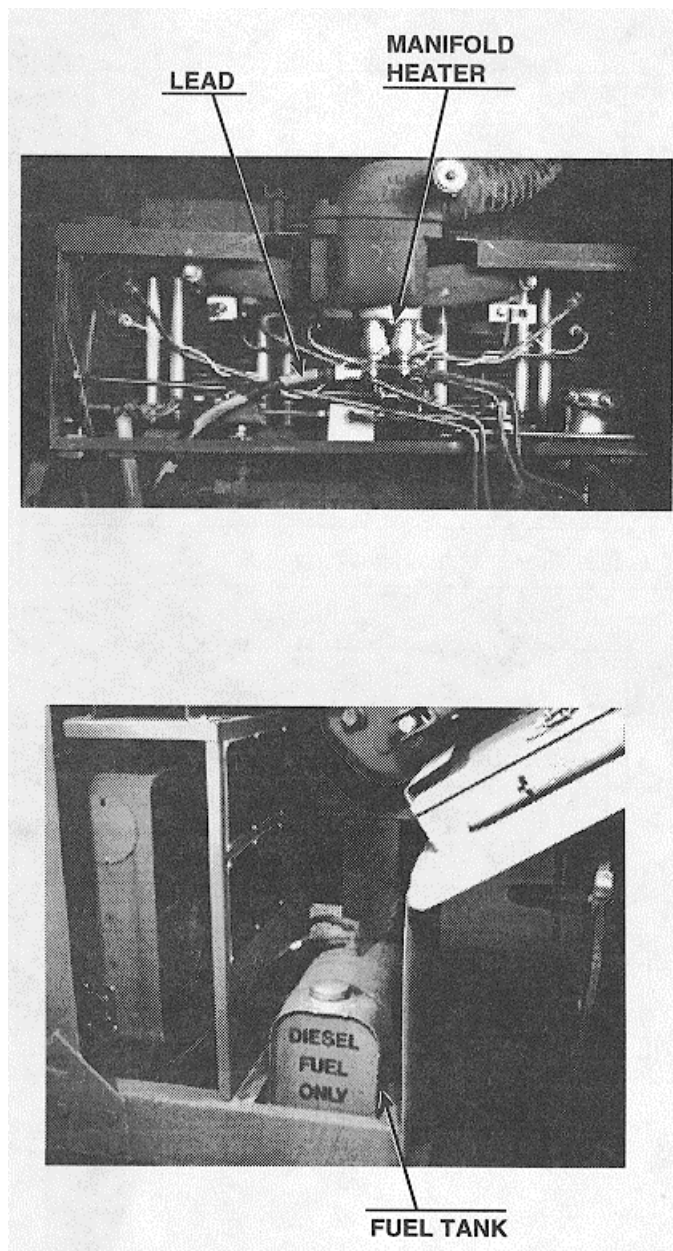
e. ENGINE (continued).

CONTINUED FROM STEP F



END OF TASK

(2) ENGINE TURNS OVER BUT FAILS TO START (continued).



**2-16. TROUBLESHOOTING CHART (continued).**

e. ENGINE (continued)

*Initial Setup:*

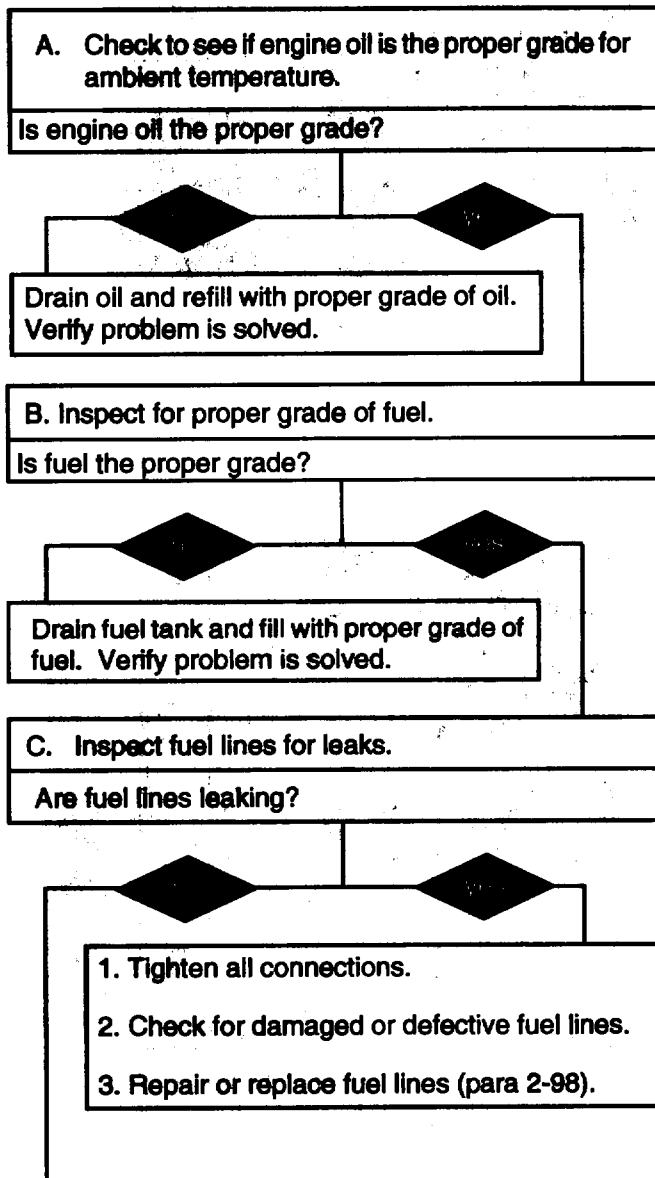
**Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

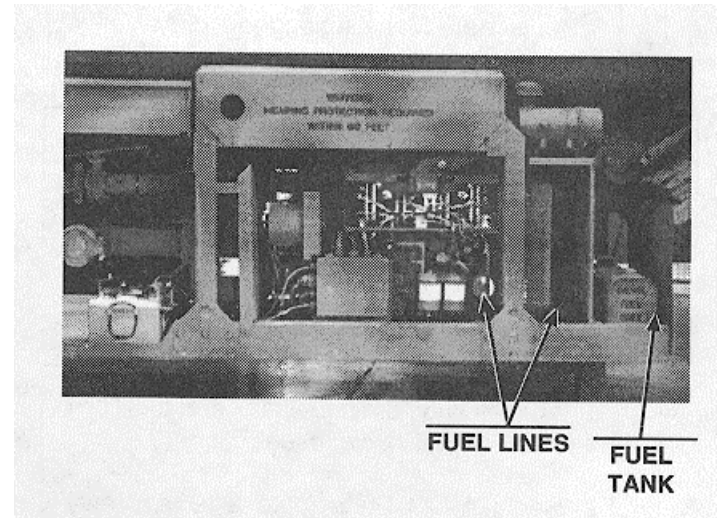
(3) ENGINE IS HARD TO START OR HAS LOW ENGINE POWER.

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

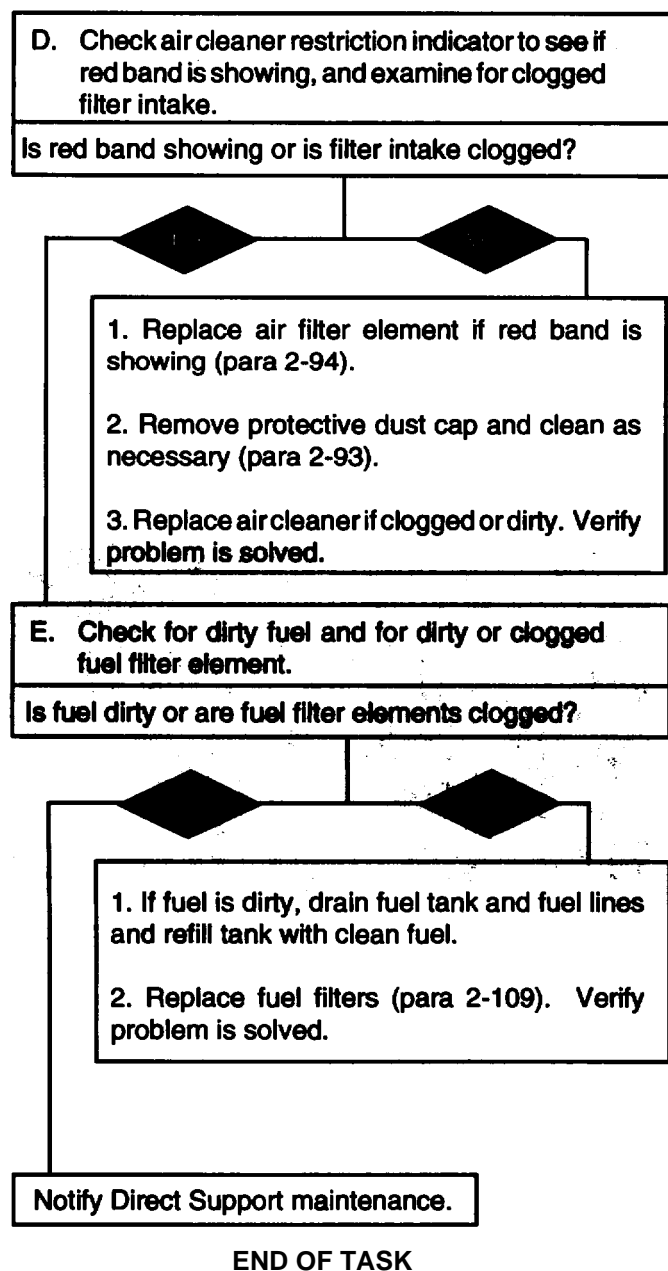


continued on next page

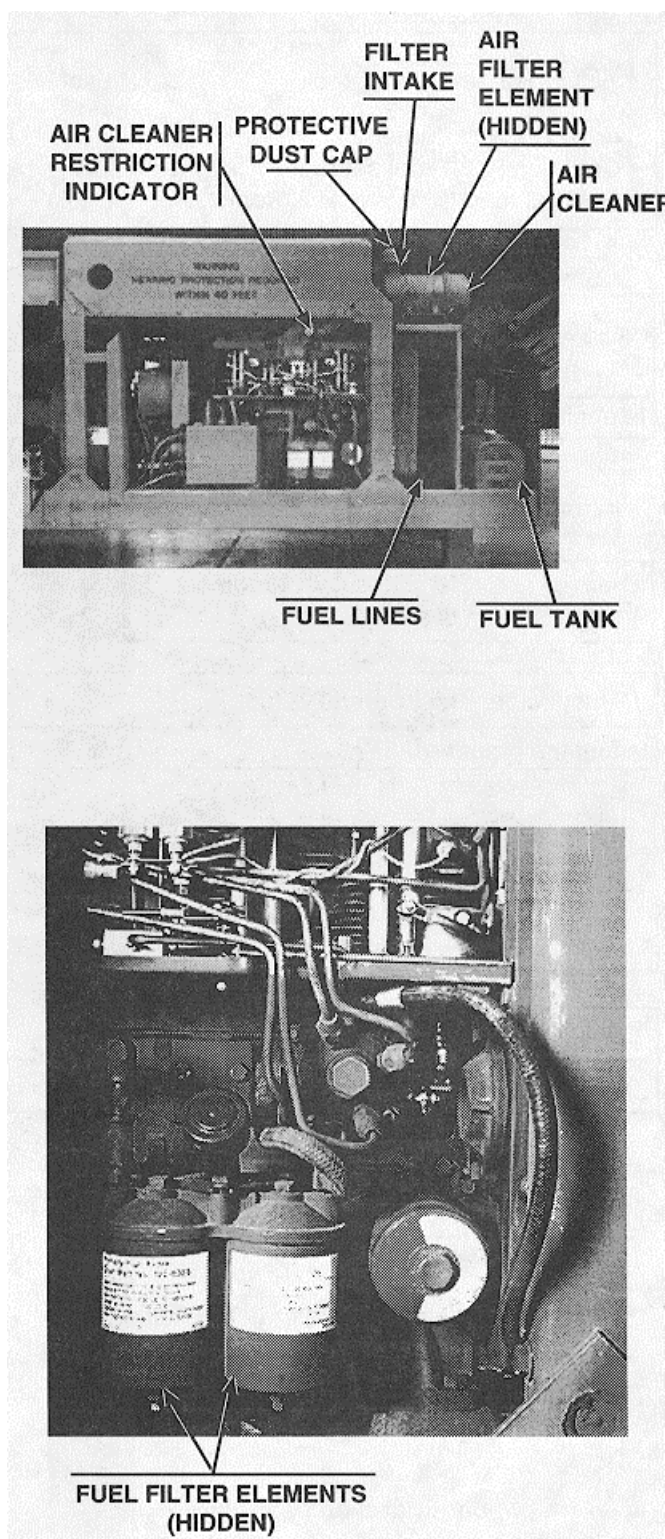


**2-16. TROUBLESHOOTING CHART (continued).**

e. ENGINE (continued)

**CONTINUED FROM STEP C**

3) ENGINE IS HARD TO START OR HAS LOW ENGINE POWER (continued).



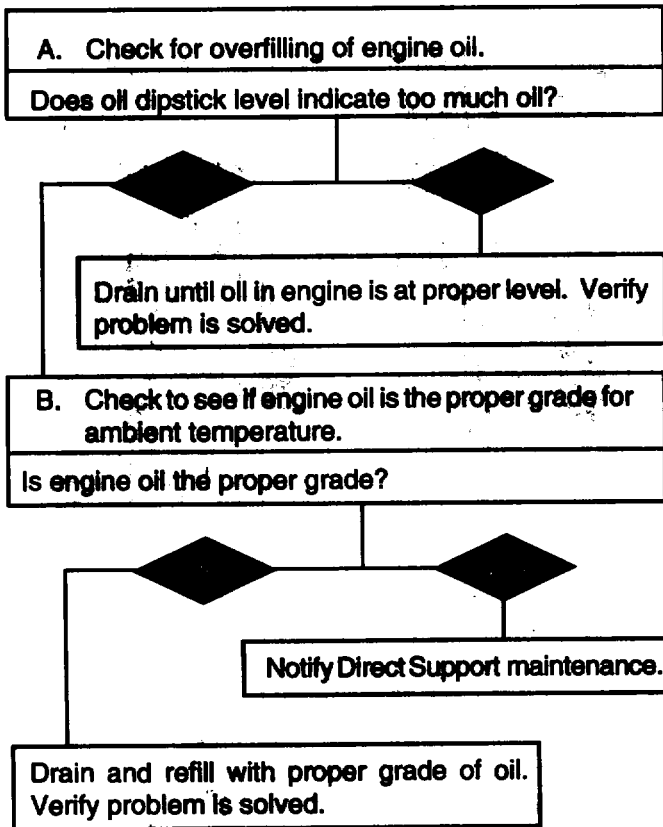
**2-16. TROUBLESHOOTING CHART (continued).****e. ENGINE (continued)***Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

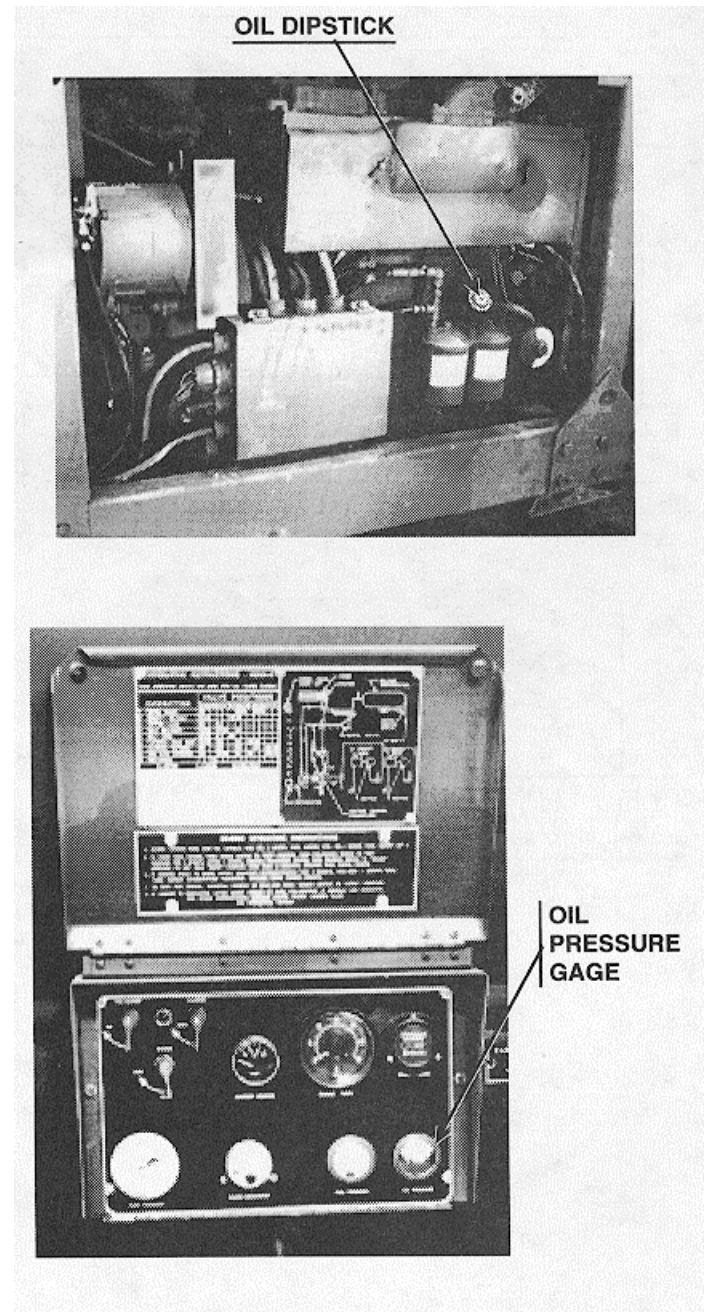
- (4) LOW OIL PRESSURE IS INDICATED ON GAGE (20 psi [138 kPa] minimum).

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).



END OF TASK



**2-16. TROUBLESHOOTING CHART (continued).**

e. ENGINE (continued)O

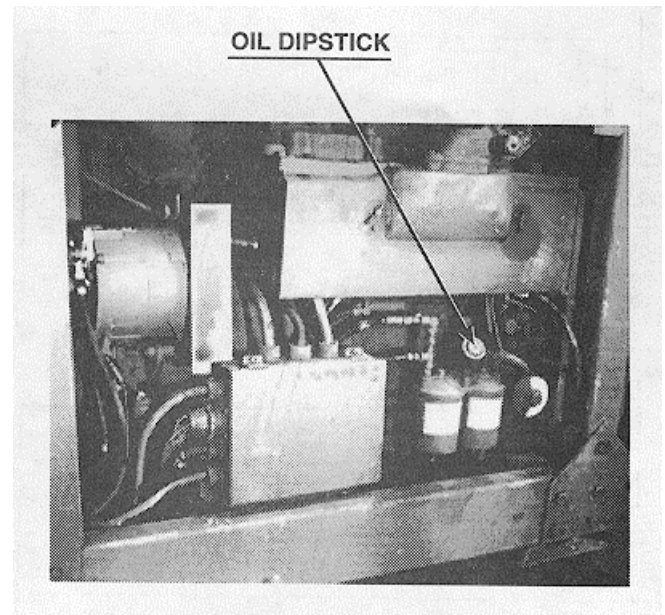
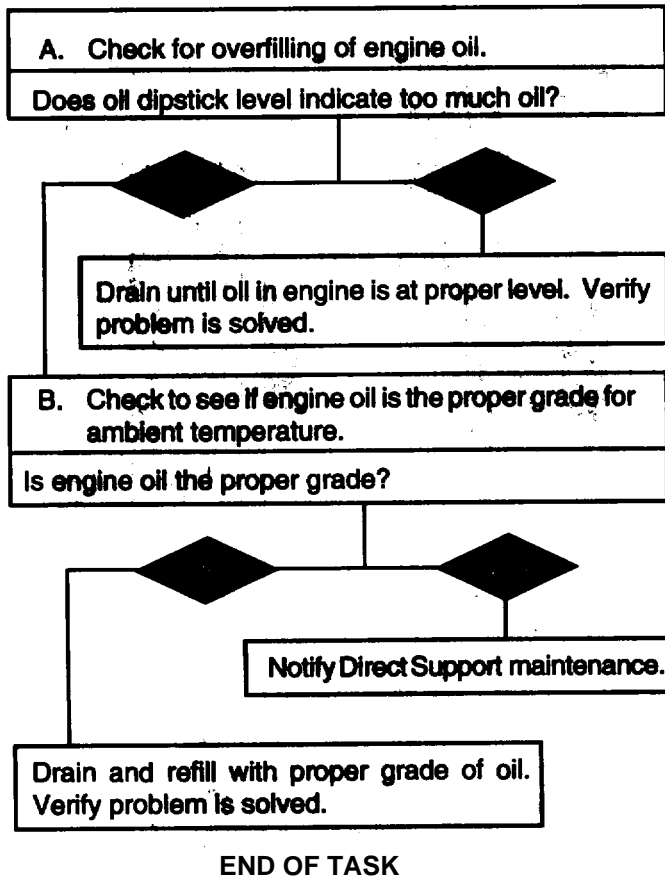
**Tools/Test Equipment:**

- Common No. 1 Tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

- (5) HIGH OIL PRESSURE IS INDICATED ON GAGE (40 psi [276 kPa] maximum when engine is warm).

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).



**2-16. TROUBLESHOOTING CHART (continued).**

e. ENGINE (continued)

(6) ENGINE MISFIRES UNDER HEAVY LOAD.

*Initial Setup:***Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

A. Check air cleaner restriction indicator for red band. Check for clogged filter intake.

Is air cleaner restriction indicator showing red band?

no

yes

1. Replace air filter element if red band is showing (para 2-94).
2. Remove protective dust cap and clean if necessary (para 2-93).
3. Replace air cleaner if clogged or dirty (para 2-93). Verify problem is solved.

B. Check for dirty fuel or clogged fuel filter element.

Is fuel dirty or is fuel filter clogged?

no

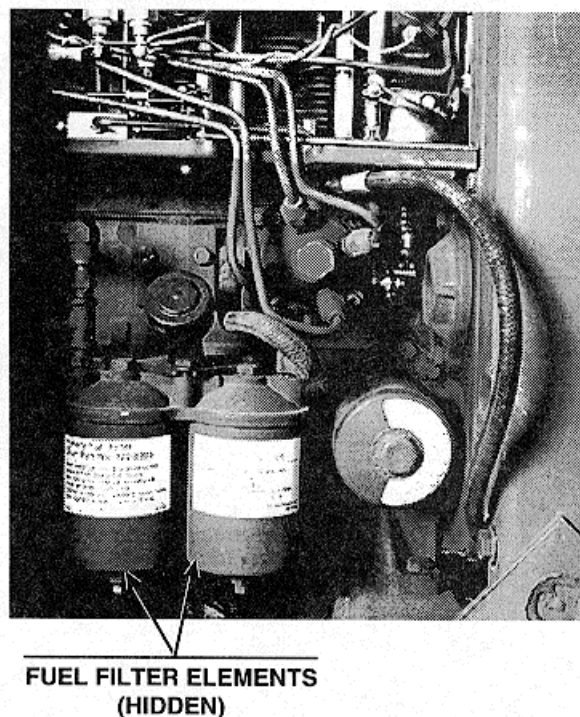
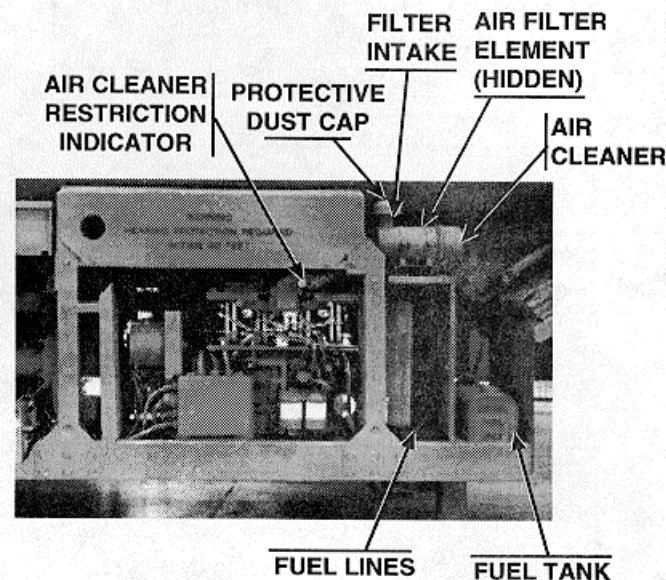
yes

1. If fuel is dirty, drain fuel tank and fuel lines and refill tank with clean fuel.
2. Replace fuel filters (para 2-109). Verify problem is solved.

C. Inspect for proper grade of fuel.

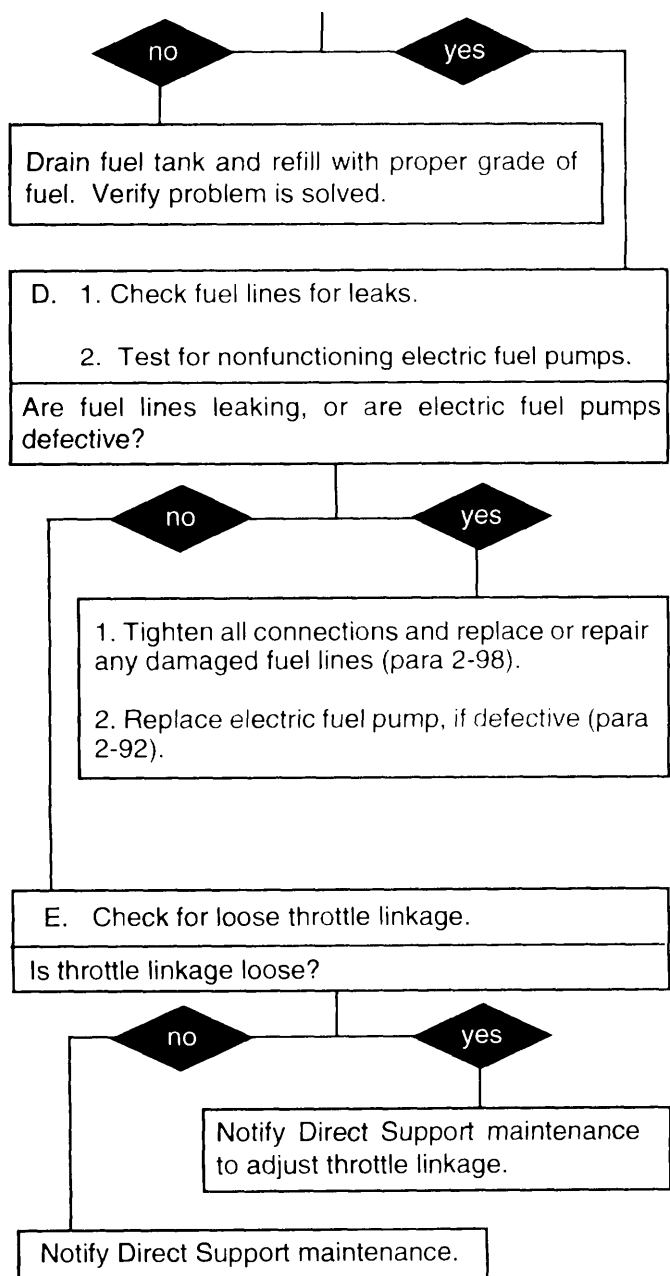
Is fuel the proper grade?

continued on next page

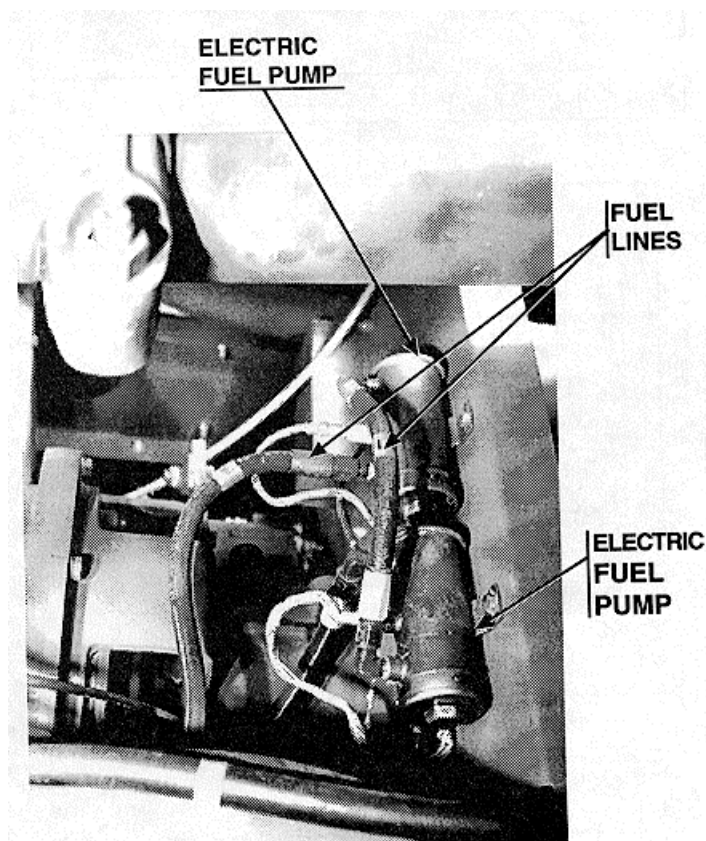


**2-16. TROUBLESHOOTING CHART (continued).**

e. ENGINE (continued)

**CONTINUED FROM C****END OF TASK**

(6) ENGINE MISFIRES UNDER HEAVY LOAD (continued).





**2-16 TROUBLESHOOTING CHART (continued).**

e. ENGINE (continued)

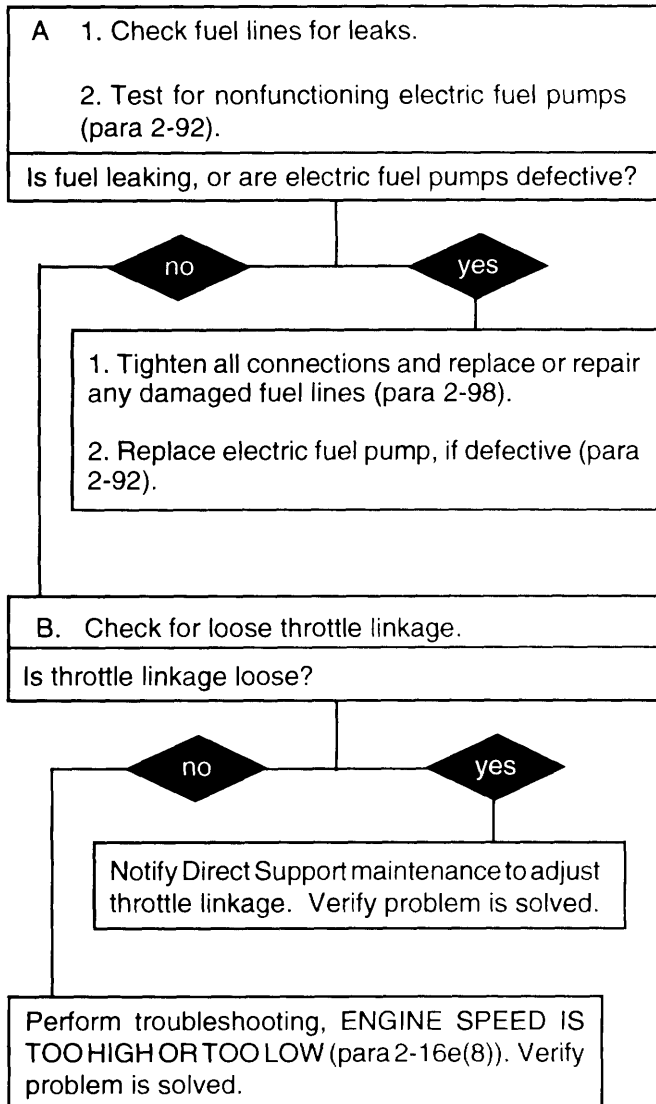
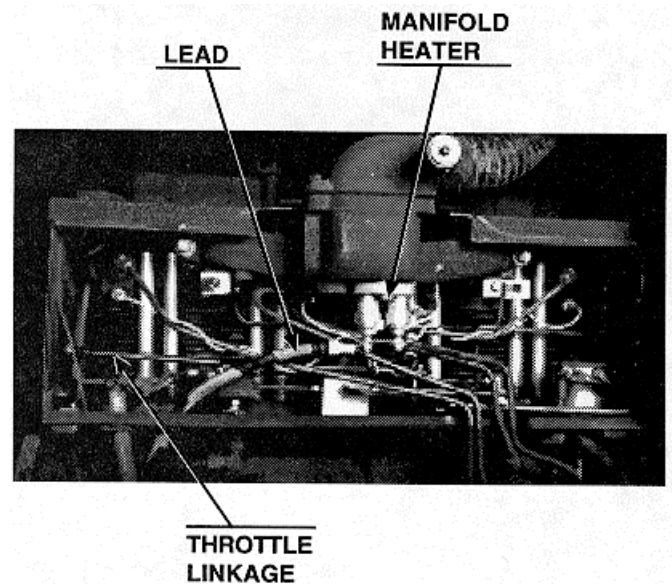
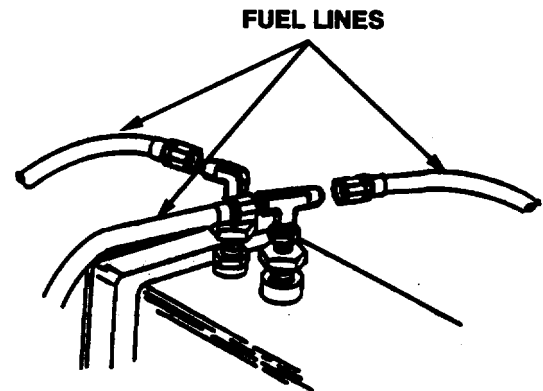
(7) ENGINE SPEED IS ERRATIC OR WILL NOT MAINTAIN STEADY RPM.

*Initial Setup:***Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

**END OF TASK**



## 2-16. TROUBLESHOOTING CHART (continued).

e. ENGINE (continued)

(8) ENGINE SPEED IS TOO HIGH OR TOO LOW.

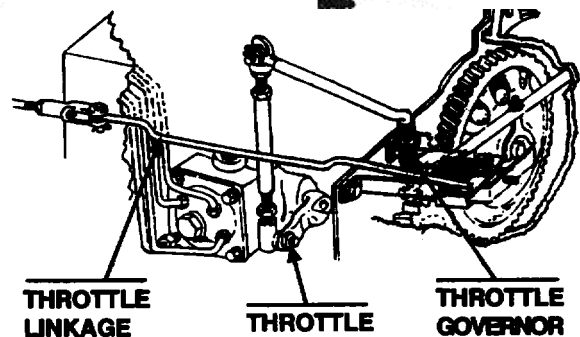
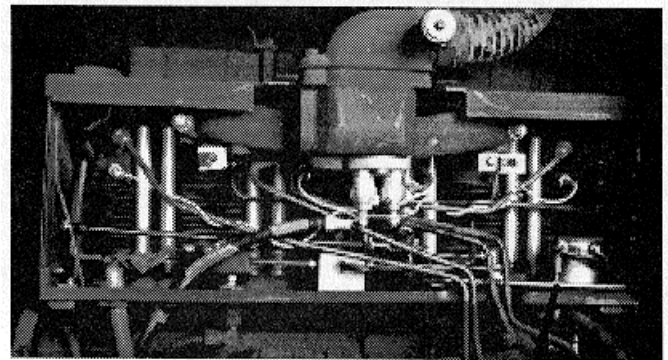
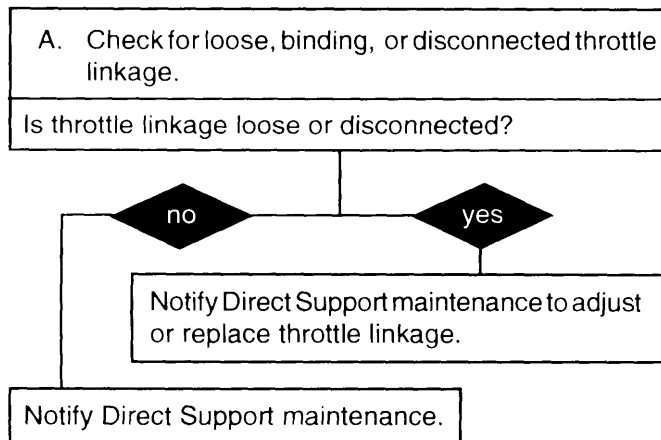
*Initial Setup:*

### Tools/Test Equipment:

- General mechanic's tool kit (Item 4, Appendix B)

### Equipment Conditions

- Semitrailer uncoupled (refer to TM 9-2330-398-10).



**2-16. TROUBLESHOOTING CHART (continued).**

e. ENGINE (continued)

(9) ENGINE EXHAUST IS BLACK OR FUEL CONSUMPTION IS EXCESSIVE.

*Initial Setup:***Tools/Test Equipment:**

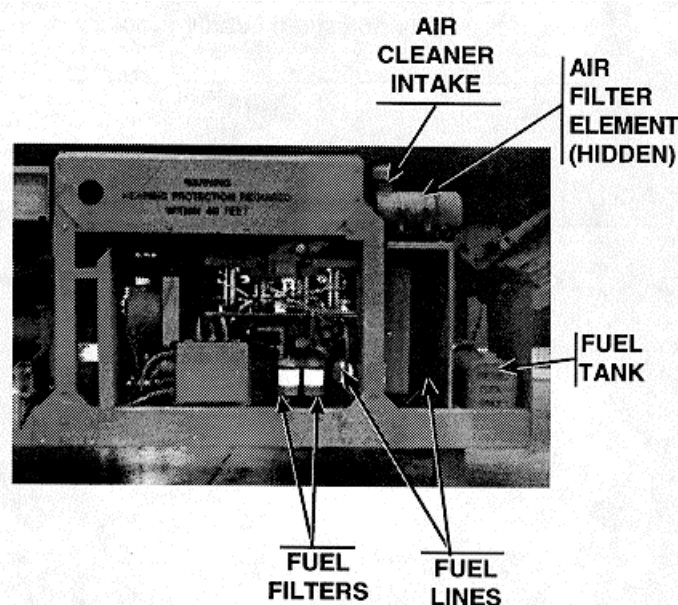
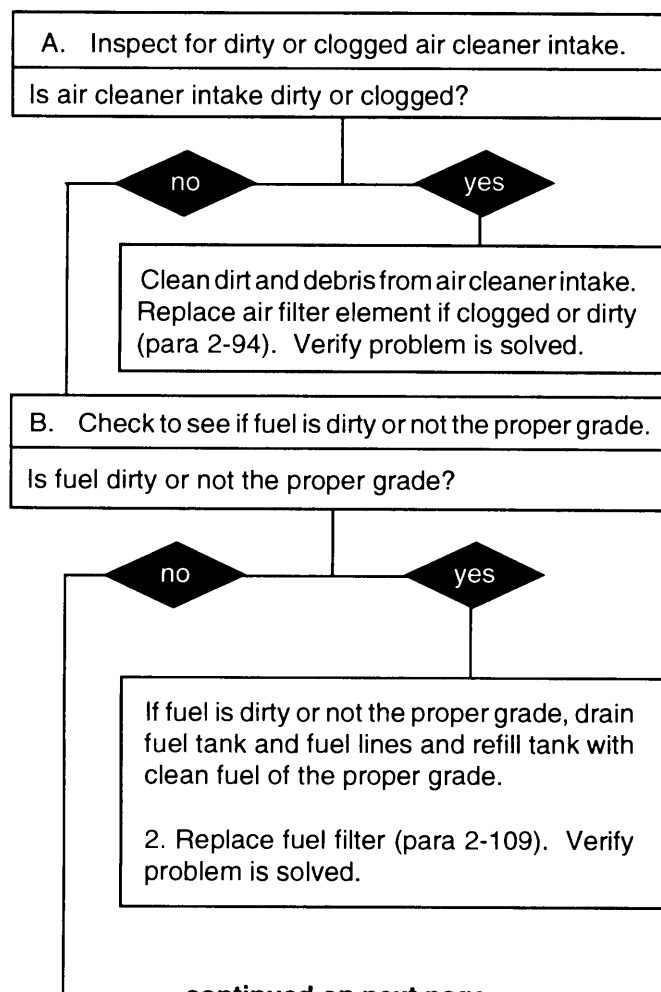
- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

**NOTE**

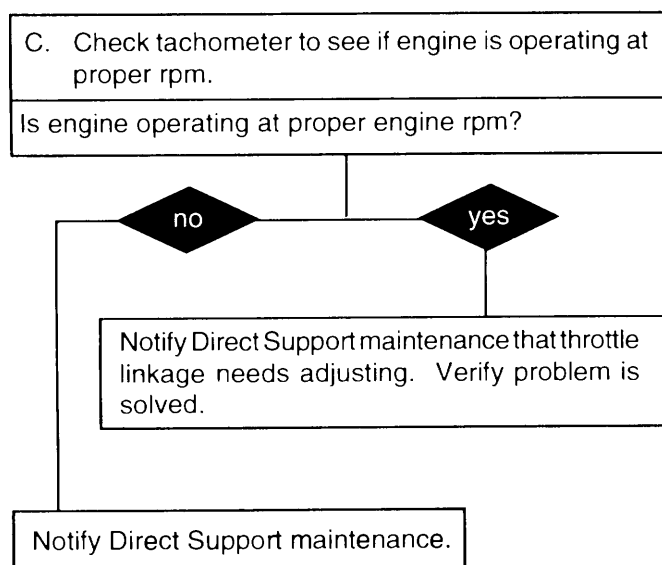
Brown or black color in exhaust indicates incomplete combustion. Exhaust gases will never be invisible but darker exhaust may indicate trouble, especially if there is no apparent change in engine condition.



## 2-16. TROUBLESHOOTING CHART (continued).

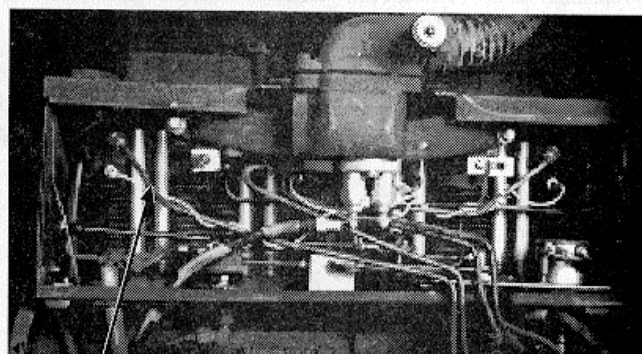
e. ENGINE (continued).

### CONTINUED FROM B



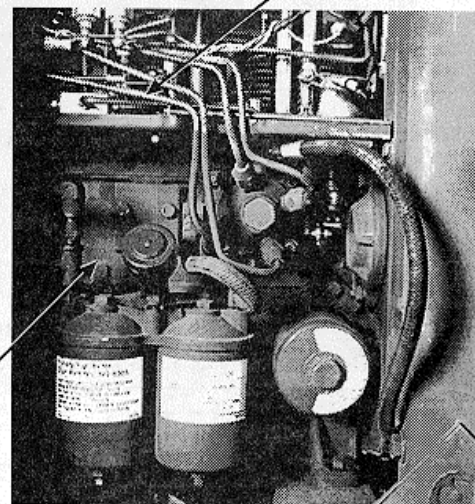
END OF TASK

(9) ENGINE EXHAUST IS BLACK OR FUEL CONSUMPTION IS EXCESSIVE (continued).

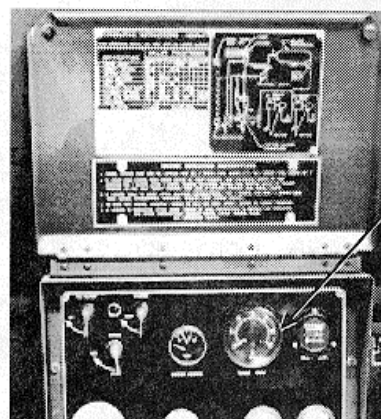


THROTTLE LINKAGE

THROTTLE LINKAGE



ENGINE



TACHOMETER

**2-16. TROUBLESHOOTING CHART (continued).**

e. ENGINE (continued)

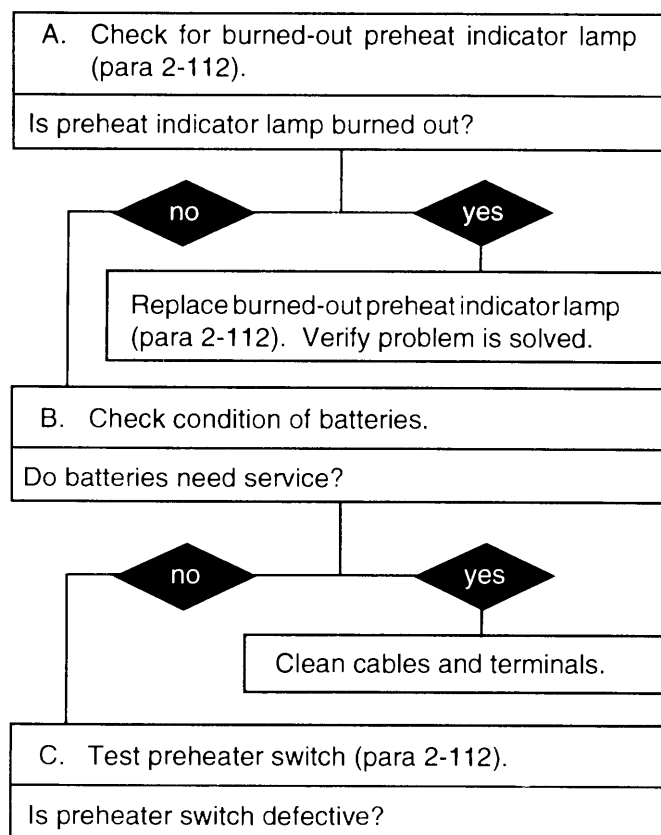
(10) PREHEAT INDICATOR LAMP WILL NOT LIGHT.

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**WARNING**

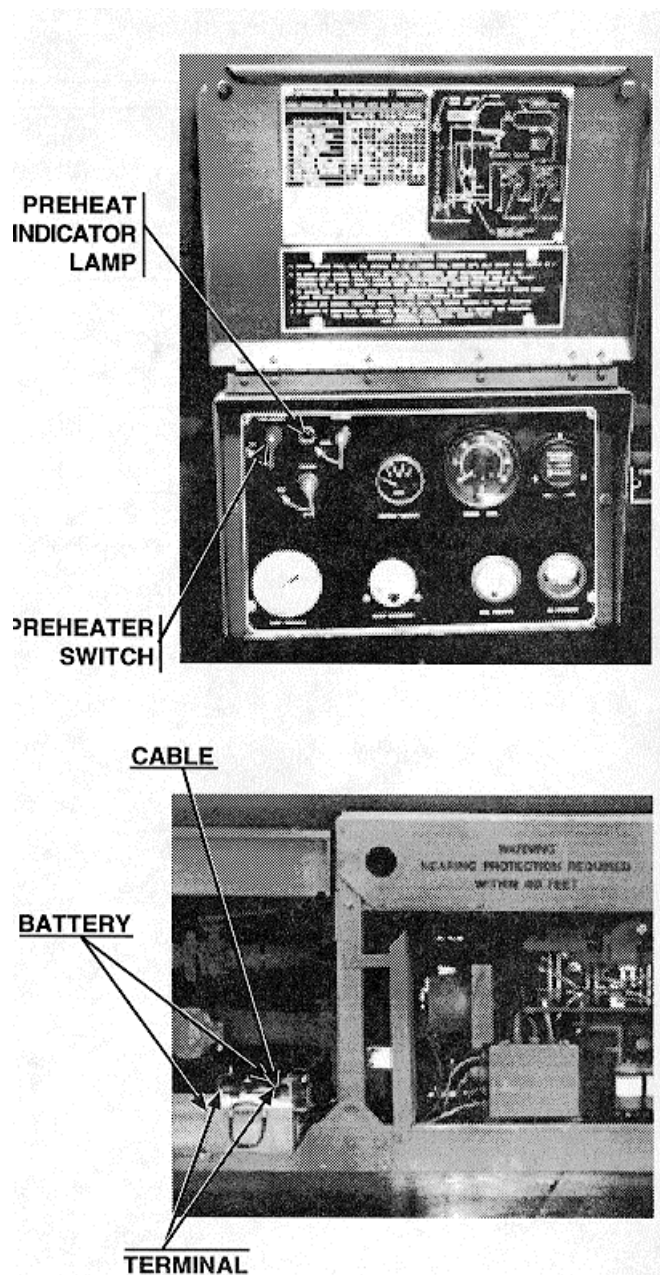
When troubleshooting an electrical malfunction or performing electrical maintenance, **ALWAYS** disconnect intervehicular electrical cable from semitrailer and disconnect negative batteries. Failure to follow this warning may create a spark and explosion, resulting in serious injury or death to personnel.



continued on next page

**Equipment Conditions**

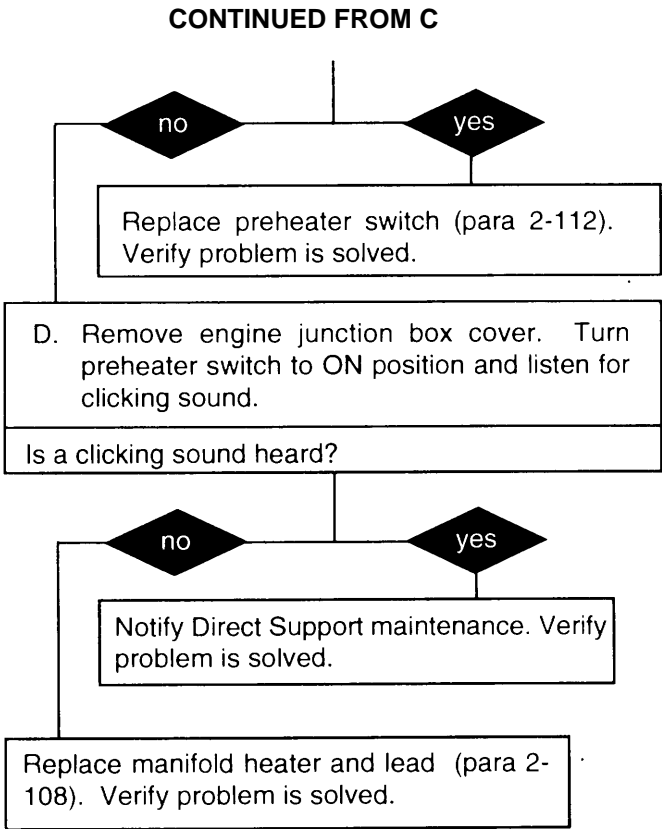
- Semitrailer uncoupled (refer to TM 9-2330-398-10).



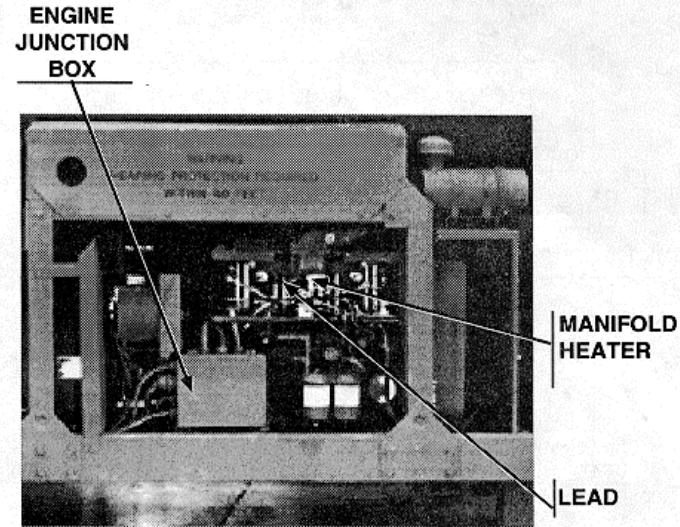
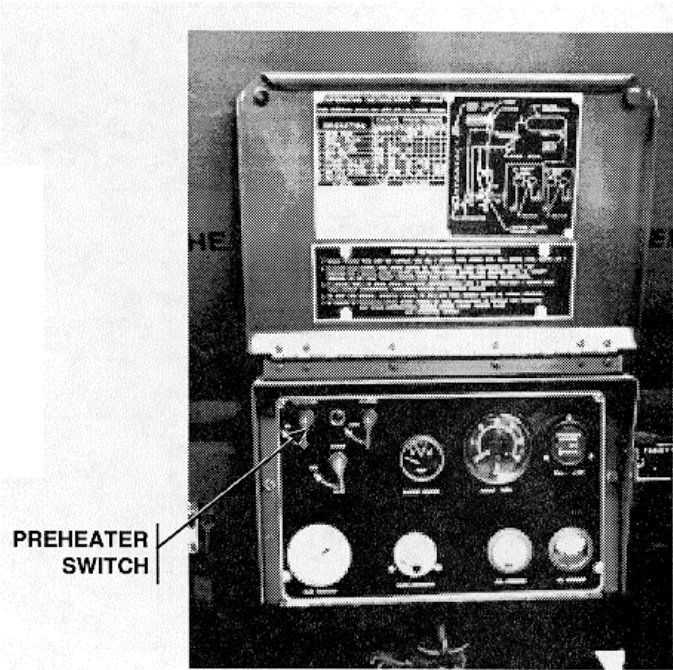
**2-16. TROUBLESHOOTING CHART (continued).**

e. ENGINE (continued)

(9) PREHEAT INDICATOR LAMP WILL NOT LIGHT (continued).



**END OF TASK**

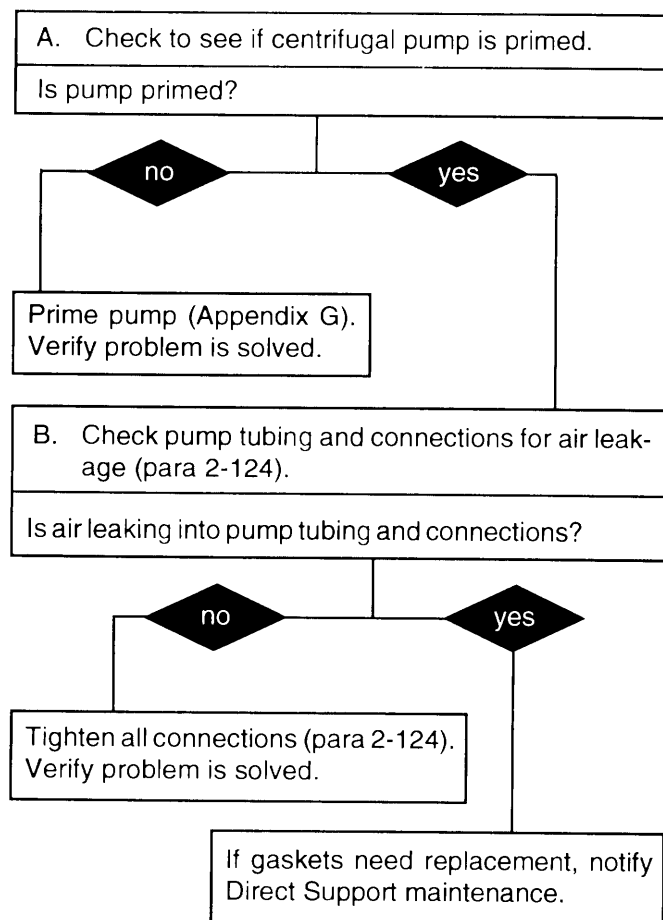
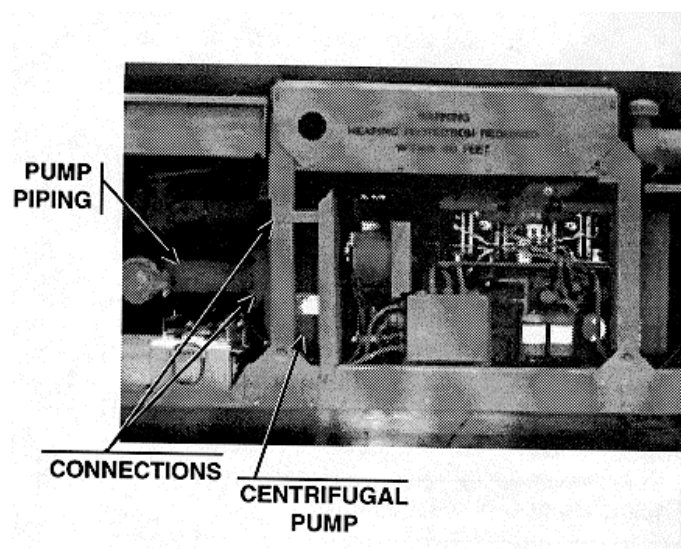


**2-16. TROUBLESHOOTING CHART (continued).****f. CENTRIFUGAL PUMP****(1) PUMP FAILS TO DELIVER FUEL***Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

**END OF TASK**

**2-16. TROUBLESHOOTING CHART (continued).**

## g. BATTERY

(1) BATTERY CHARGE IS LOW.

*Initial Setup:***Tools/Test Equipment:**

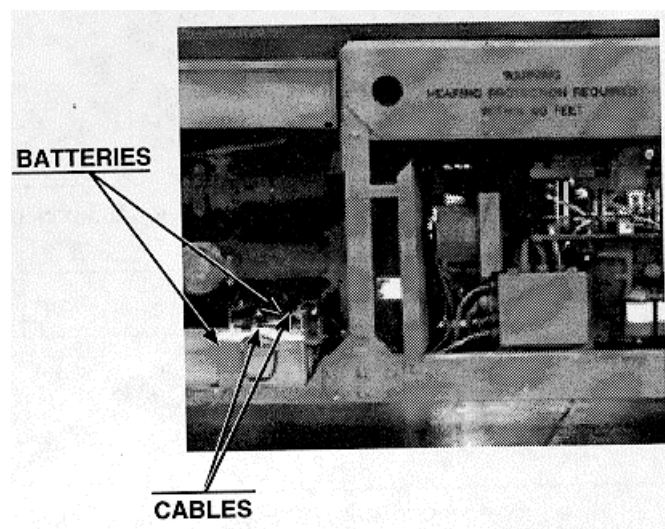
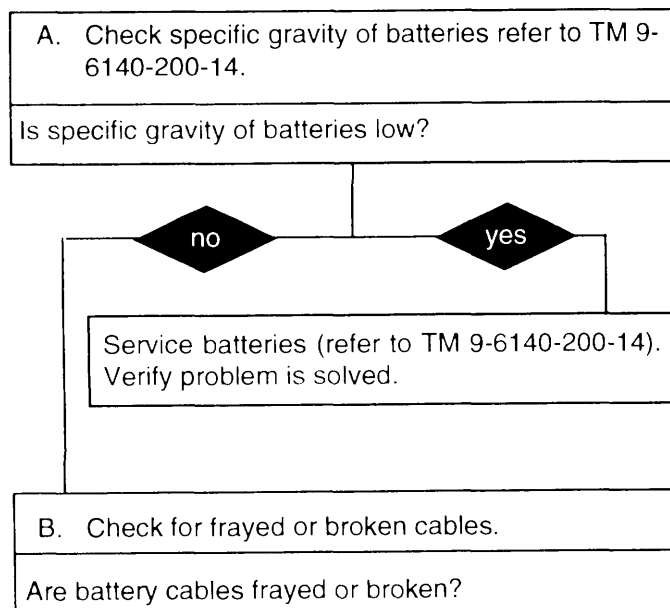
- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

**WARNING**

- Batteries produce explosive gases. Keep sparks, flame and smoking material away. Ventilate when charging or using in an enclosed space.
- Batteries contain sulfuric acid that causes severe burns. If acid contacts eyes, skin, or clothing, flush well with water. For contact with eyes, get immediate medical attention.

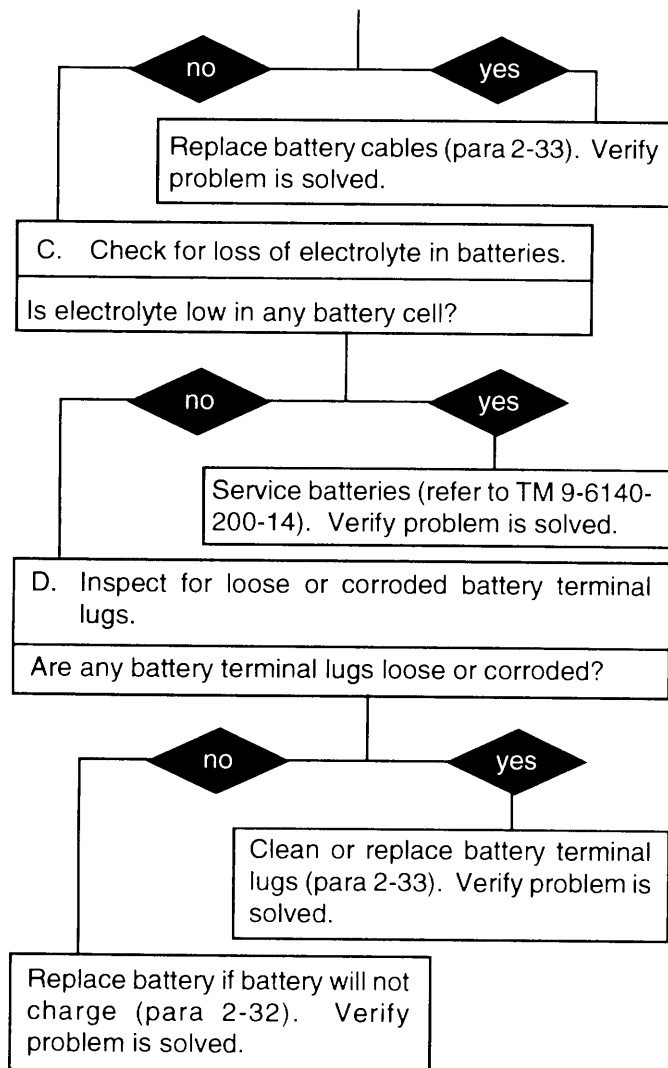
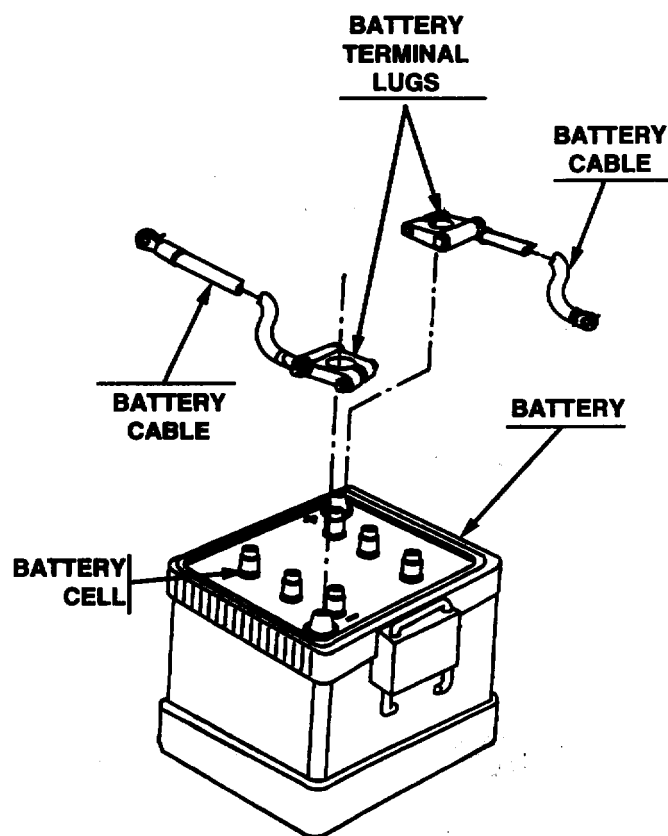


continued on next page

**2-16. TROUBLESHOOTING CHART (continued).**

g. BATTERY (continued)

(1) BATTERY CHARGE IS LOW (continued).

**CONTINUED FROM STEP B****END OF TASK**



**2-16. TROUBLESHOOTING CHART (continued).**

g. BATTERY (continued)

(2) BATTERY IS DISCHARGED.

*Initial Setup:***Tools/Test Equipment:**

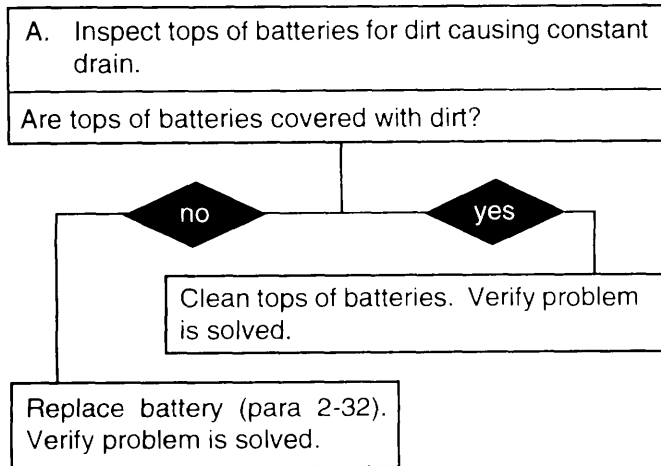
- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

**WARNING**

- Batteries produce explosive gases. Keep sparks, flame, and smoking material away. Ventilate when charging or using in an enclosed space.
- Batteries contain sulfuric acid that causes severe burns. If acid contacts eyes, skin, or clothing, flush well with water. For contact with eyes, get immediate medical attention.

**BATTERIES****END OF TASK**

**2-16. TROUBLESHOOTING CHART (continued).**

**h. FILTER/SEPARATOR**

(1) FUEL DOES NOT FLOW DURING FUEL-SERVICING OPERATION.

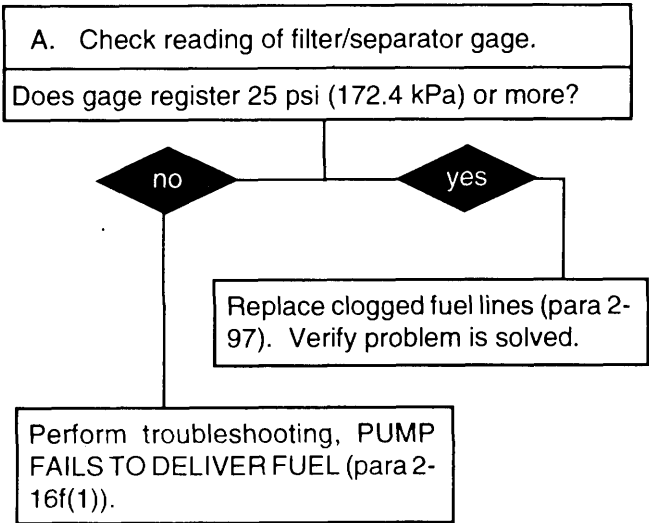
*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).



**END OF TASK**



**2-16. TROUBLESHOOTING CHART (continued).****i. PIPING CONTROL COMPONENTS**

(1) EMERGENCY VALVE A WILL NOT OPEN OR CLOSE OR LEAKS OCCUR.

*Initial Setup:***Tools/Test Equipment:**

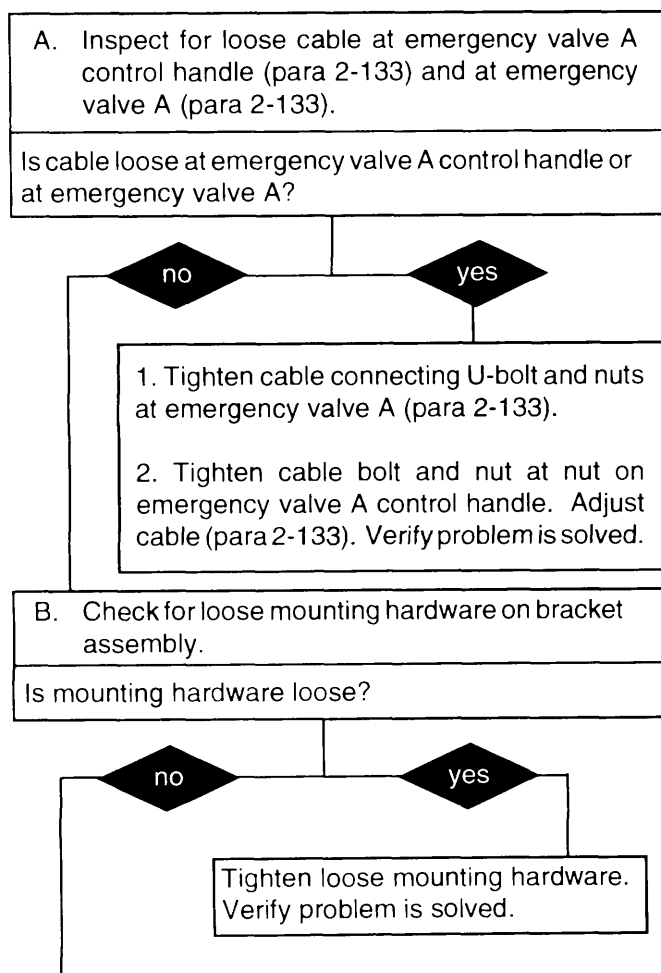
- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions**

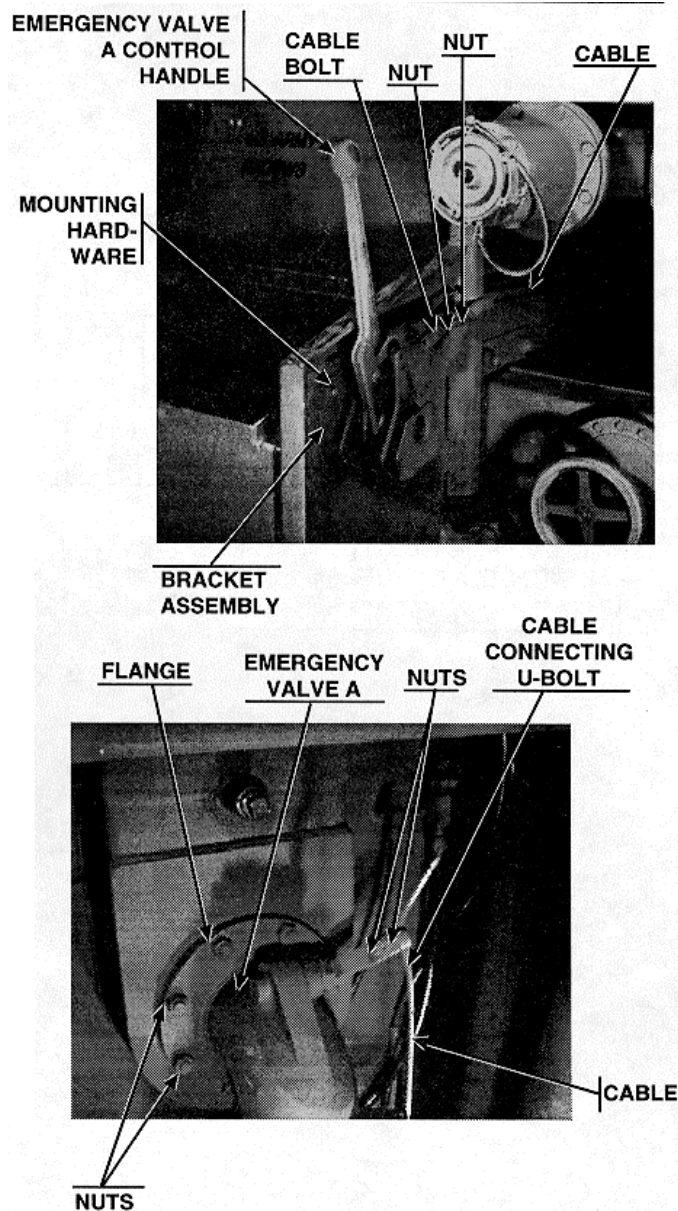
- Semitrailer uncoupled (refer to TM 9-2330-398-10).

**NOTE**

Emergency valve A control handle mechanically controls both the emergency valve on outlet sump and the vapor vent on top of semitrailer.



**GO TO STEP C**

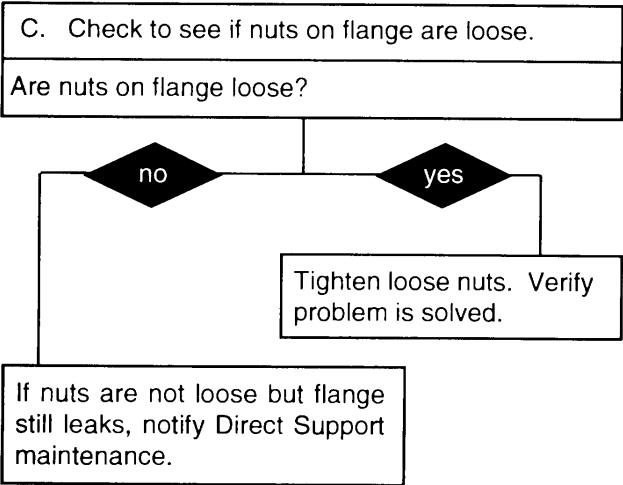


**2-16. TROUBLESHOOTING CHART (continued).**

i. PIPING CONTROL COMPONENTS (continued)

(1) EMERGENCY VALVE A WILL NOT OPEN OR CLOSE OR LEAKS OCCUR (continued).

**CONTINUED FROM STEP B**



**END OF TASK**

**2-16. TROUBLESHOOTING CHART (continued).**

## i. PIPING CONTROL COMPONENTS (continued)

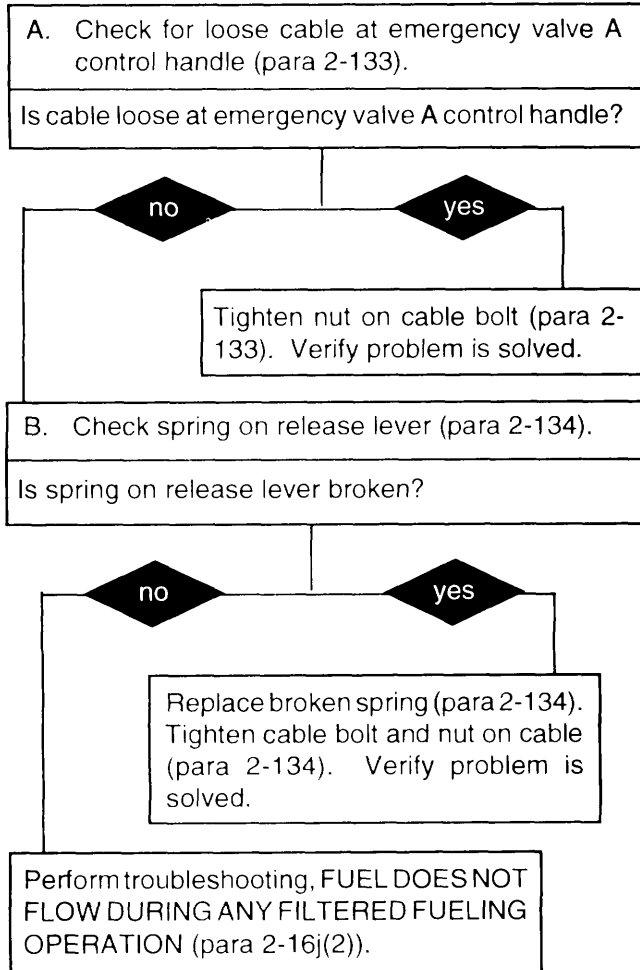
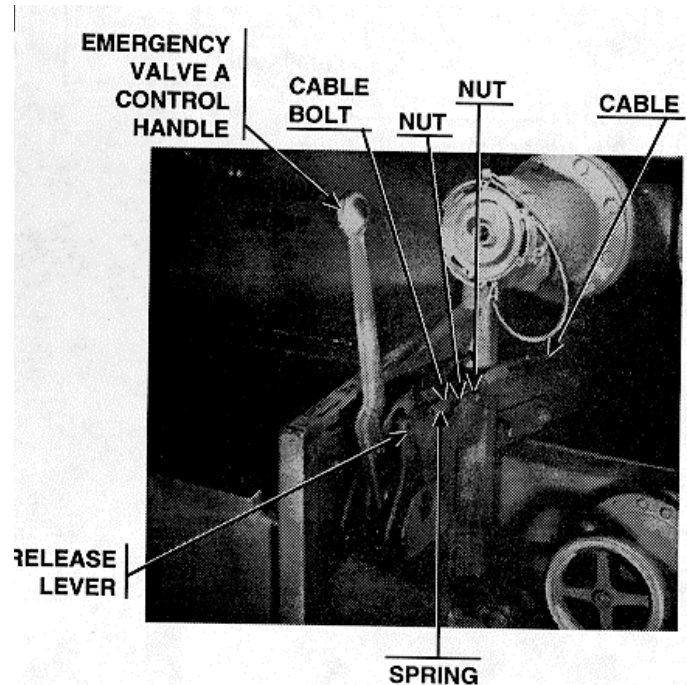
## (2) EMERGENCY VALVE A CONTROL HANDLE OPERATES IMPROPERLY.

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

**END OF TASK**

2-16. TROUBLESHOOTING CHART (continued).

i. PIPING CONTROL COMPONENTS (continued)

(3) GATE VALVES OPERATE IMPROPERLY.

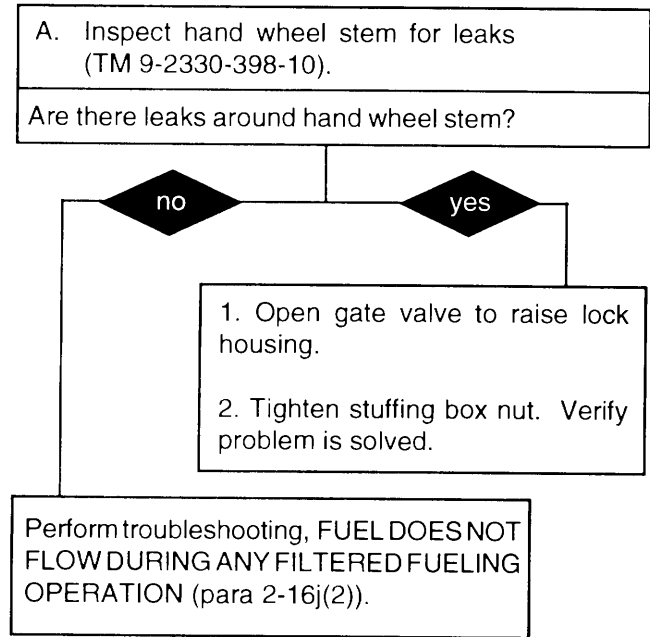
Initial Setup:

Tools/Test Equipment:

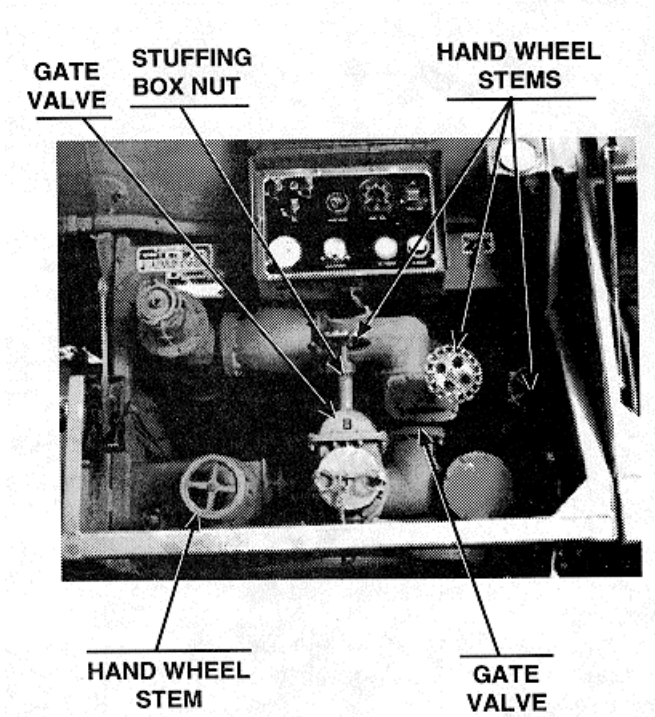
- General mechanic's tool kit (Item 4, Appendix B)

Equipment Conditions

- Semitrailer uncoupled (refer to TM 9-2330-398-10).



END OF TASK



**2-16. TROUBLESHOOTING CHART (continued).****j. FUELING OPERATIONS**

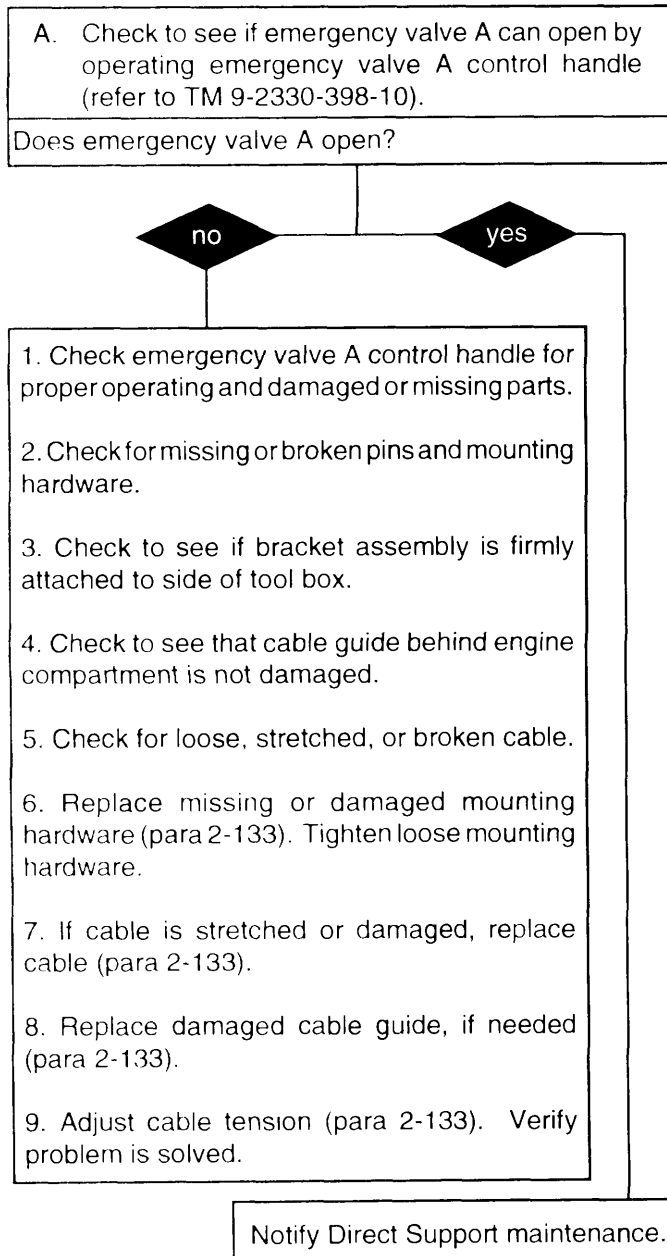
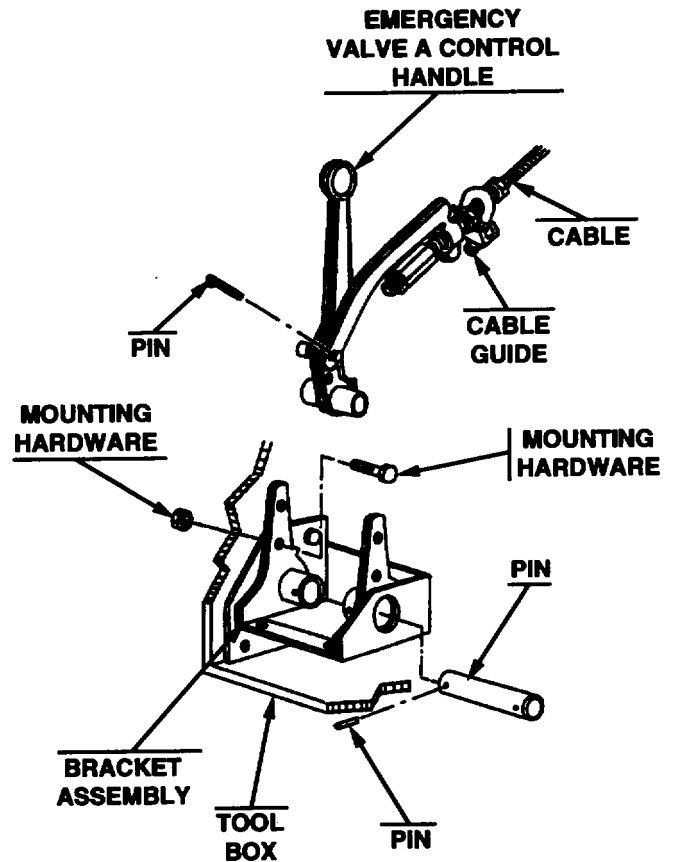
(1) FUEL DOES NOT FLOW DURING ANY NON-FILTERED FUELING OPERATION.

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

**END OF TASK**

**2-16. TROUBLESHOOTING CHART (continued).****j. FUELING OPERATIONS (continued)****(2) FUEL DOES NOT FLOW DURING ANY FILTERED FUELING OPERATION.***Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

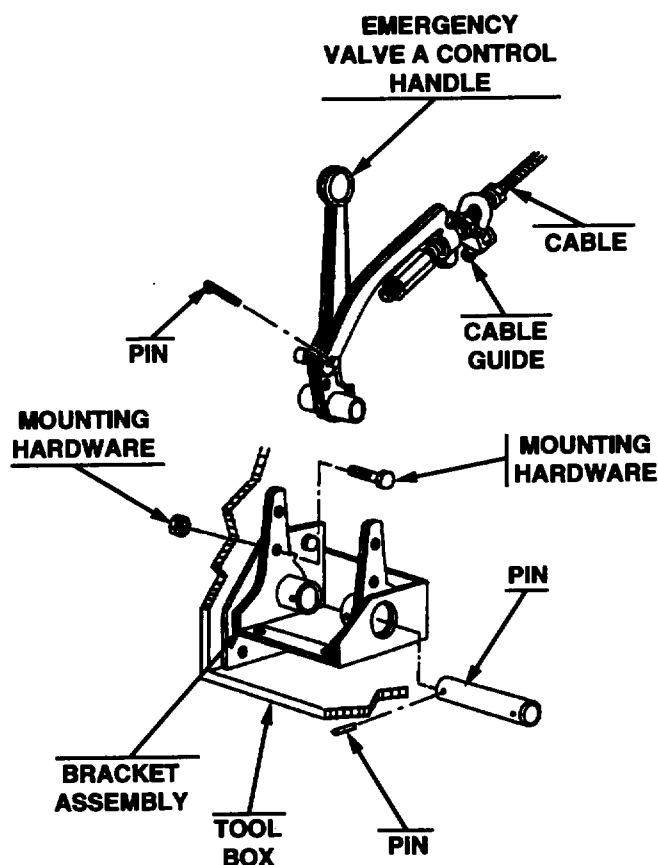
A. Check to see if emergency valve A can open by operating emergency valve A control handle (para 2-134).

Does emergency valve A open?

no

yes

1. Check emergency valve A control handle for proper operation and damaged or missing parts.
2. Check for missing or broken pins and mounting hardware.
3. Check to see if bracket assembly is firmly attached to side of tool box.
4. Check to see that cable guide behind engine compartment is not damaged.
5. Check for loose, stretched, or broken cable.
6. Replace missing or damaged hardware (para 2-134). Tighten loose mounting hardware.
7. If control cable is stretched or damaged, replace cable (para 2-133).
8. Replace damaged cable guide (para 2-133), if needed.
9. Adjust cable tension (para 2-133). Verify problem is solved.



continued on next page

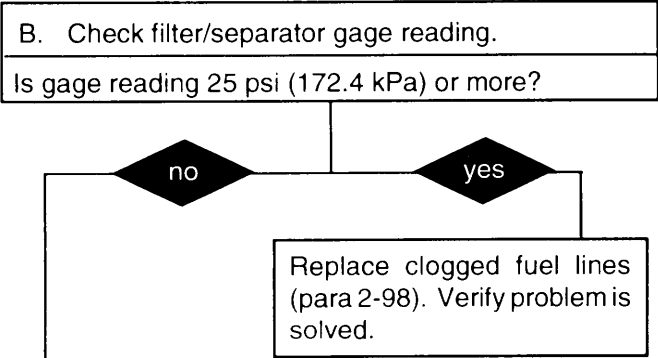


2-16. TROUBLESHOOTING CHART (continued).

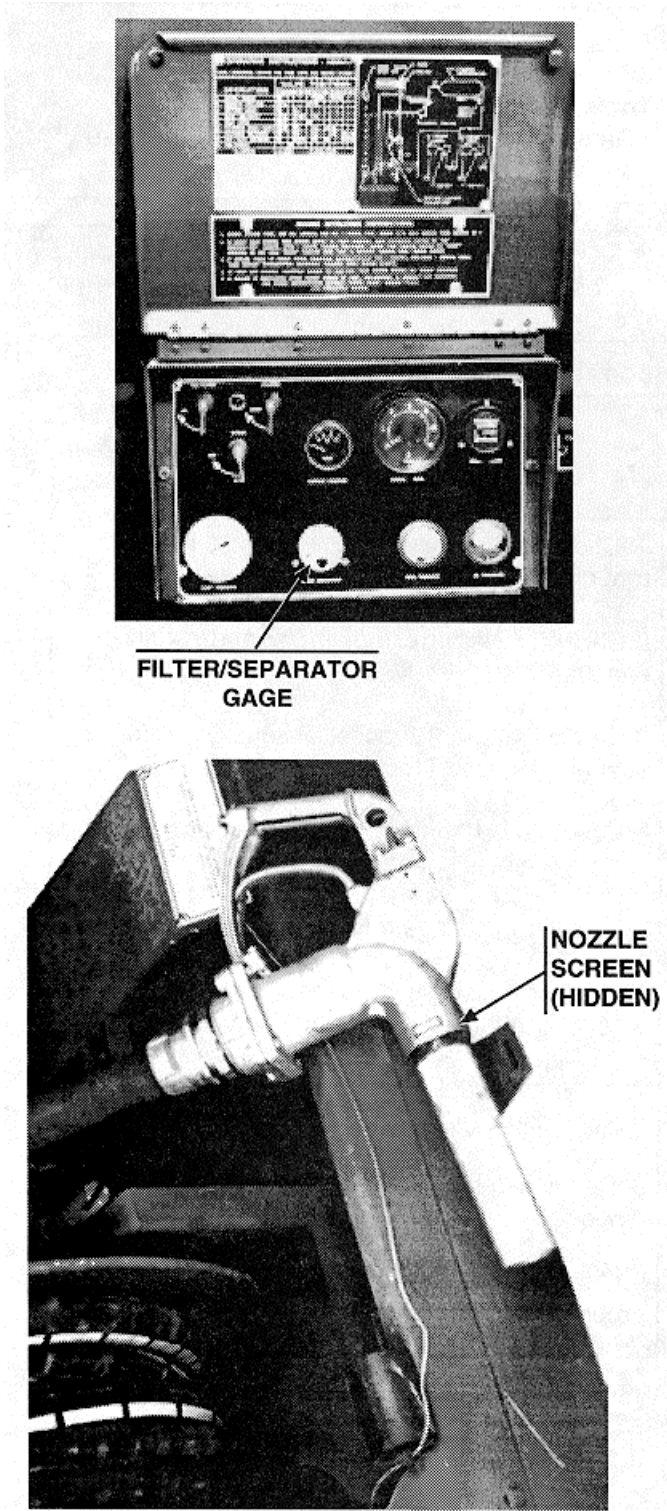
j. FUELING OPERATIONS (continued)

(2) FUEL DOES NOT FLOW DURING ANY  
FILTERED FUELING OPERATION (continued).

CONTINUED FROM A



CONTINUED ON NEXT PAGE

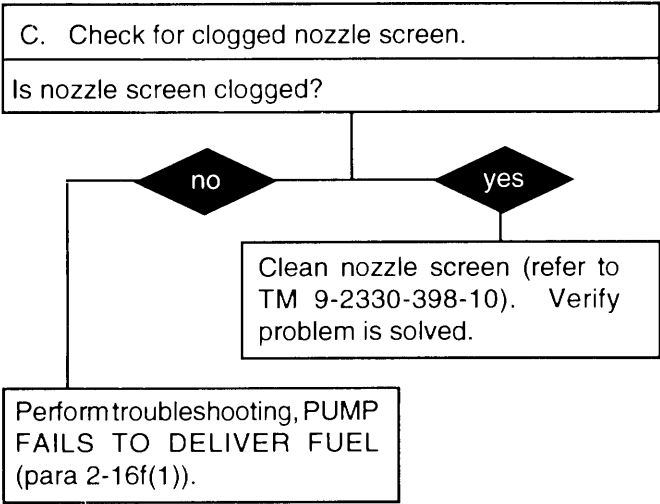


**2-16. TROUBLESHOOTING CHART (continued).**

j. FUELING OPERATIONS (continued)

(2) FUEL DOES NOT FLOW DURING ANY  
FILTERED FUELING OPERATION (continued).

**CONTINUED FROM B**



**END OF TASK**

## Section V. GENERAL MAINTENANCE INSTRUCTIONS

Paragraph Number	Paragraph Title	Page Number
2-17	General .....	2-64
2-18	Work Safety .....	2-65
2-19	Cleaning Instructions .....	2-65
2-20	Inspection Instructions .....	2-66
2-21	Repair Instructions .....	2-67
2-22	Tagging Hoses and Tubes.....	2-67
2-23	Painting and Stenciling .....	2-67
2-24	Lubrication Instructions .....	2-69
2-25	Torque Values .....	2-69
2-26	Decal Replacement .....	2-69

**2-17. GENERAL**

- a. These general maintenance instructions contain general shop practices and specific methods you must be familiar with to maintain your semitrailer. You should read and understand these practices and methods before performing any Unit maintenance tasks.
- b. Before beginning a task, find out how much repair, modification, or replacement is needed to fix the equipment as described in this manual. Sometimes the reason for equipment failure can be seen right away, and complete teardown is not necessary. Disassemble equipment only as far as necessary to repair or replace damaged or broken parts.
- c. The following "Initial Setup" information applies to all procedures:
  1. Resources are not listed unless they apply to the procedure.
  2. Personnel are listed only if more than one technician is required to complete the task. If "Personnel Required" is not listed, one technician can complete the task.
- d. All tags and forms attached to equipment must be checked to learn the reason for removal from service. Modification work orders and technical bulletins must also be checked for equipment changes and updates.
- e. In some cases, a part may be damaged by removal. If the part appears to be good and other parts behind it are not defective, leave it on and continue with the procedure. Here are a few simple rules:
  1. Do not remove dowel pins or studs unless loose, bent, broken, or otherwise damaged.
  2. Do not remove bearings or bushings unless damaged. If you need to remove them to access parts, pull bearings and bushings out carefully.
  3. Replace all gaskets, seals, lockwashers, cotter pins, and preformed packings.

---

**2-18. WORK SAFETY.**


---

- a. Observe all WARNINGS and CAUTIONS. Always use power tools carefully.
- b. Protect yourself against injury. Wear protective gear, such as safety goggles or lenses, safety shoes, rubber apron, or gloves.
- c. When lifting heavy parts, have someone help you. Make sure that lifting/jacking equipment is working properly, is suitable for the assigned task, and is secure against slipping.
- d. All maintenance should be performed with
  - trailer parking brake engaged;
  - tow vehicle in neutral with parking brake engaged, if attached; and
  - tow vehicle engine stopped, if attached.




---

**2-19. CLEANING INSTRUCTIONS.**


---

**WARNING**

**Improper cleaning methods and the use of unauthorized cleaning liquids or solvents can injure personnel and damage equipment. To prevent this, refer to TM 9-247 for further instructions.**

- a. **General.** Cleaning instructions will be the same for a majority of parts and components that make up the semitrailer. The following should apply to all cleaning, inspection, repair, and assembly operations:
  1. Clean all parts before inspection, after repair, and before assembly.
  2. Keep hands free of grease, which can collect dust, dirt, and grit.
  3. After cleaning, cover or wrap all parts to protect them from dust and dirt. Parts that are subject to rust should be lightly oiled.
- b. **Steam-Cleaning.**
  1. Before steam-cleaning exterior of semitrailer, protect all electrical equipment that could be damaged by steam or moisture.
  2. Place disassembled parts in a suitable container to steam-clean. Parts that are subject to rust should be dried and lightly oiled after cleaning.
- c. **Castings, Forgings, and Machined Metal Parts.**

**WARNING**

**Dry-cleaning solvent P-D-680 is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breathe vapors. DO NOT use near open flames or excessive heat.**

1. Clean inner and outer surfaces with dry-cleaning solvent (Item 12, Appendix C).

---

**2-19. CLEANING INSTRUCTIONS (continued).**


---

2. Remove grease and accumulated deposits with a stiff-bristled brush.

**WARNING**

**Compressed air used for cleaning or drying purpose, or for clearing restrictions, should never exceed 30 psi (207 kPa). Wear protective clothing (goggles/shield, gloves, etc.) and use caution to avoid injury to personnel.**

3. Clear out all threaded holes with compressed air to remove dirt and cleaning fluids.

**CAUTION**

**Do not wash oil seals, electrical cables, and flexible hoses with dry-cleaning solvent or mineral spirits. Serious damage or destruction of material would result.**

- d. **Oil Seals, Electrical Cables, and Flexible Hoses.** Wash electrical cables and flexible hoses with solution of water and soap (Item 28, Appendix C) and wipe dry.
- e. **Bearings.** Clean bearings in accordance with TM 9-214.

---

**2-20. INSPECTION INSTRUCTIONS.**


---

**NOTE**

**All damaged areas should be marked for repair or replacement.**

- a. All components and parts must be carefully checked to determine if they are serviceable for reuse, can be repaired, or must be scrapped.
- b. Inspect drilled and tapped (threaded) holes for the following:
  1. Wear, distortion, cracks, and any other damage in or around holes.
  2. Threaded areas for wear distortion (stretching) and evidence of cross-threading.
- c. Inspect metal lines, flexible lines (hoses), and metal fittings for the following:
  1. Metal lines-harp kinks, cracks, bad bends, and dents.
  2. Flexible lines-fraying, evidence of leakage, and loose metal fittings or connectors.
  3. Metal fittings and connectors-thread damage and worn or rounded hex heads.
- d. Inspect castings, forgings, and machined metal parts for the following:
  1. Machined surfaces - nicks, burrs, raised metal, wear, and other damage.
  2. Inner and outer surfaces - breaks and cracks.
- e. Inspect air lines, fittings, and connectors for leaks by coating fittings and connectors with solution of soap (Item 28, Appendix C) and water. No leakage is permissible.
- f. Inspect bearings in accordance with TM 9-214.

---

**2-21. REPAIR INSTRUCTIONS.**

---

- a. Any repair procedure peculiar to a specific part or component is covered in the section or paragraph relating to that item. After repair, clean all parts thoroughly to prevent dirt, metal chips, or other foreign material from entering any working parts.
- b. Repair castings, forgings, and machined parts using the following instructions:

**WARNING**

**Dry-cleaning solvent P-D-80 is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breathe vapors. DO NOT use near open flames or excessive heat.**

1. Refer to TM 9-237 for instructions on repairing minor cracked castings or forgings.
2. Repair minor damage to machined surfaces with a fine mill file or abrasive cloth dipped in dry-cleaning solvent (Item 12, Appendix C).
3. Replace any deeply nicked machined surface that could affect the assembled operation.
4. Repair minor damage to threaded screw holes with thread tap of same size, to prevent cutting oversize.

---

**2-22. TAGGING HOSES AND TUBES.**

---

- a. As soon as first hose or tube is disconnected, write number "1" on two tags. Secure one tag to the hose or tube and the other tag to the nipple or fitting. After disconnecting the second hose or tube, write number "2" on two tags. Secure one tag to the hose or tube and the other tag to the nipple or fitting. Do the same for all hoses and tubes.
- b. Note which numbers you used, in pencil, on the art in this manual. This will help you retag properly when you remove tags from some parts to perform cleaning and maintenance work.
- c. Remove all tags when finished.

---

**2-23. PAINTING AND STENCILING.**

---

- a. General instructions for painting and stenciling are in TB 43-0209 and TM 43-0139.
- b. Spot painting and stenciling will be performed under the control of Unit maintenance personnel.
- c. Painting of a complete semitrailer can be authorized and performed only by Direct Support maintenance or by higher support levels.



---

**2-24. LUBRICATION INSTRUCTIONS.**

---

To prevent corrosion, apply a light coat of lubricating oil to metal parts after they are cleaned but before they are assembled. Lubricate components and systems in accordance with the instructions in PMCS, Table 2-1, and Appendix G.

---

**2-25. TORQUE VALUES.**

---

Torque values given in the maintenance procedures apply to unlubricated threads. Follow the torque values given in the maintenance procedures; if no torque value is given, refer to Appendix E.

---

**2-26. DECAL REPLACEMENT.**

---

**WARNING**

**Dry-cleaning solvent P-D-680 is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothing, and DO NOT use near open flame or excessive heat.**

**NOTE**

**For proper installation of a decal, note its location before removing.**

- a. Use dry-cleaning solvent to loosen damaged decal, and remove decal from surface. Discard decal.
- b. Clean any decal residue from surface with dry-cleaning solvent. Wipe surface with clean rag.

**NOTE**

**Surface must be clean and dry before installing new decal.**

- c. Remove protective backing from new decal and position on surface.
- d. Using a dry rag (Item 25, Appendix C), press decal into position. Start in the center of decal and press outward to remove any air bubbles.



## Section VI. ELECTRICAL SYSTEM CIRCUIT MAINTENANCE

Paragraph Number	Paragraph Title	Page Number
2-27	General .....	2-70
2-28	Marker Light LED and Lens Replacement.....	2-71
2-29	Marker Light Replacement.....	2-72
2-30	Composite Stoplight, Taillight, and Blackout Light Repair .....	2-73
2-31	Control Panel Light Assembly Repair .....	2-76
2-32	Battery Replacement .....	2-78
2-33	Battery Cable Replacement.....	2-80
2-34	Front Blackout Marker Lights Wiring Harness Replacement.....	2-82
2-35	Main Trailer Wiring Harness Replacement.....	2-87
2-36	Lead Assembly 12275202 Replacement.....	2-94
2-37	Front Marker Lights Lead Assembly Replacement.....	2-96
2-38	Lead Assembly 12275204 Replacement.....	2-99
2-39	Lead Assembly 12275206 Replacement.....	2-101
2-40	Electrical Jumper from Intervehicular Cable to Road-Side Blackout Marker Light Lead Replacement.....	2-104
2-41	Lead Assembly 12275208 Replacement.....	2-106
2-42	Electrical Intervehicular Wiring Harness Lead Assembly Replacement .....	2-108
2-43	Wiring Harness 12356095 Replacement.....	2-112
2-44	Lead Assembly 12275205 Replacement .....	2-114
2-45	Wiring Harness Components Replacement .....	2-116
2-46	Wiring Harness and Lead Assembly Repair .....	2-118

**2-27. GENERAL.**

This section describes and illustrates removal and installation procedures for the marker light/LED and lens assemblies, marker light, composite stoplight, taillight and blackout light, control panel light assembly repair, battery and battery cable, and wiring harnesses and lead assemblies.

---

**2-28. MARKER LIGHT LED AND LENS REPLACEMENT.**

---

*This Task Covers:*

a. Removal

b. Installation

---

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

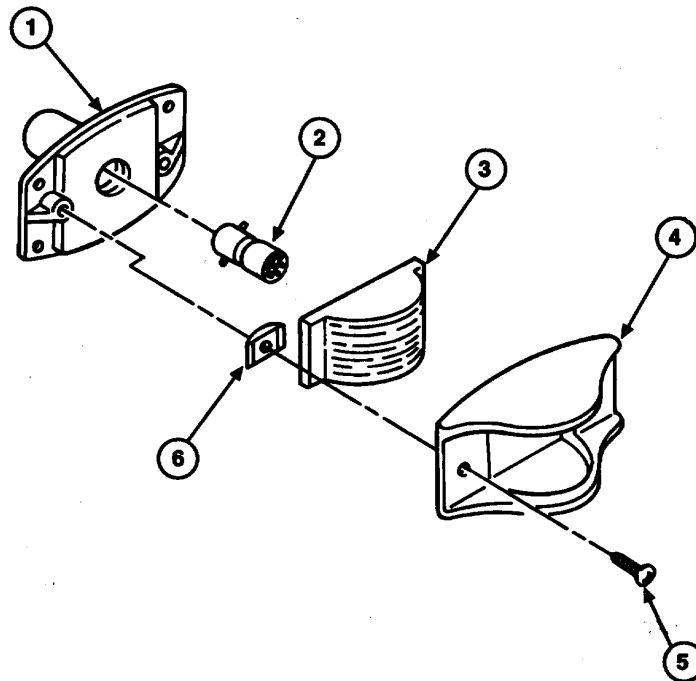
- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- 

**a. REMOVAL**

1. Remove two screws (5) and nuts (6), lens housing (4), and lens (3) from marker light body (1).
2. Remove marker light/light-emitting diode (LED) (2) from marker light body (1).

**b. INSTALLATION**

1. Install LED (2) in marker light body (1).
2. Install lens (3) and lens housing (4) on marker light body (1) with two screws (5) and nuts (6).



**FOLLOW-ON MAINTENANCE:**

- None

---

**2-29. MARKER LIGHT REPLACEMENT.**


---

*This Task Covers:*

a. Removal

b. Installation

---

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-3910).
- Negative battery cable disconnected (para 2-33).
- Marker light LED and lens removed (para 2-28).

**Materials/Parts:**

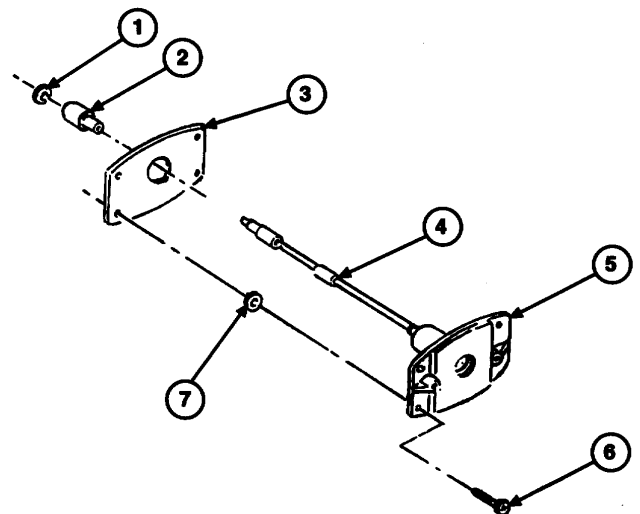
- Gasket (item 73, Appendix F)
- 

**a. REMOVAL**

1. Remove four screws (6) and washers (7) from marker light body (5).
2. Disconnect marker light lead (4) from semitrailer, and remove marker light body (5), lead (4), and gasket (3) from semitrailer. Discard gasket.
3. Remove washer (1) and shell (2) from lead (4).

**b. INSTALLATION**

1. Install shell (2) and washer (1) on lead (4).
2. Connect marker light lead (4) to semitrailer.
3. Install new gasket (3), lead (4), and marker light body (5) on semitrailer with four screws (6) and washers (7).



**FOLLOW-ON MAINTENANCE:**

- Install marker light LED and lens (para 2-28).
- Connect negative battery cable (para 2-33).

---

**2-30. COMPOSITE STOPLIGHT, TAILLIGHT, AND BLACKOUT LIGHT REPAIR.**


---

*This Task Covers:*

- |             |                 |
|-------------|-----------------|
| a. Removal  | b. Disassembly  |
| c. Assembly | d. Installation |
- 

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

- Lockwasher (2) (Item 89, Appendix F)
- Preformed packing (Item 135, Appendix F)

**Materials/Parts:**

- Gasket (Item 44, Appendix F)
- Gasket (Item 46, Appendix F)

**Equipment Conditions:**

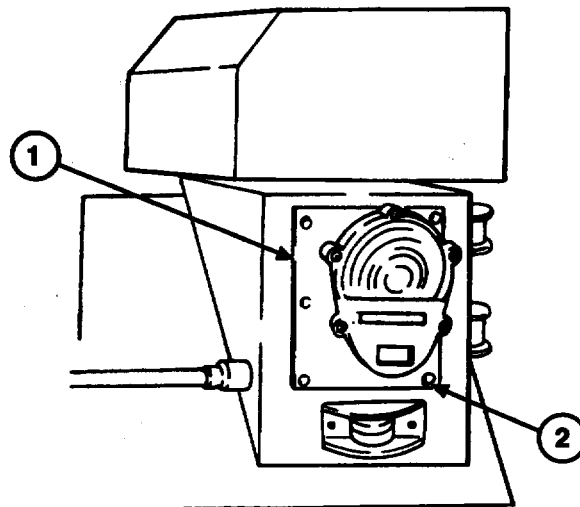
- Semitrailer uncoupled (refer to TM 9-2330-39810).
  - Negative battery cable disconnected (para 2-33).
- 

**NOTE**

**Removal of composite stoplight, taillight, and blackout light from semitrailer is not required for lamp/light replacement.**

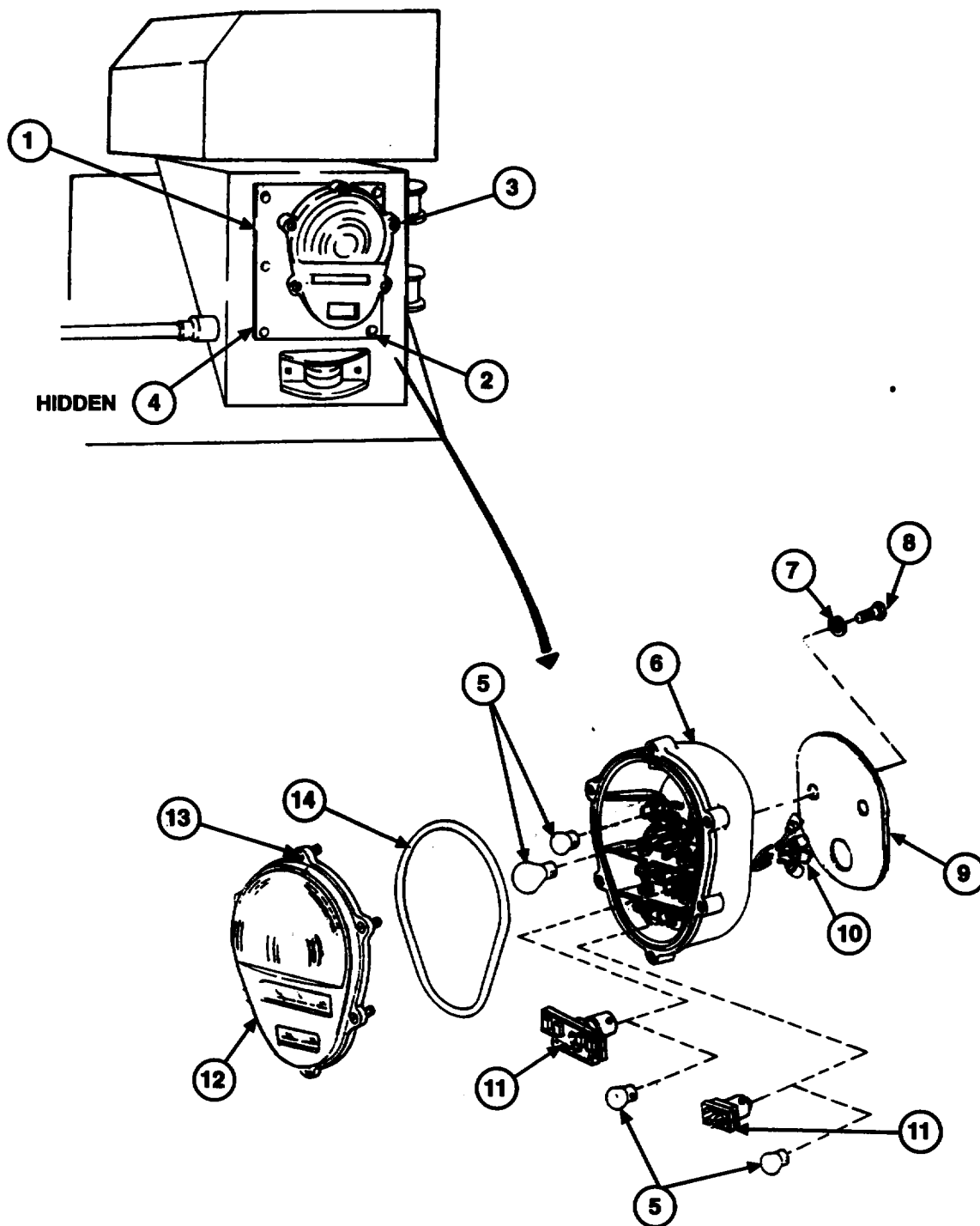
**a. REMOVAL**

1. Remove six screws (2) from cover plate (1), and pull cover plate (1) from semitrailer.



**2-30. COMPOSITE STOPLIGHT, TAILLIGHT, AND BLACKOUT LIGHT REPAIR (continued).**

2. Tag and disconnect composite light wires (10) from semitrailer harness, and remove composite stoplight, taillight, blackout light (3), cover plate (1), and gasket (4) from semitrailer. Discard gasket.



---

**2-30. COMPOSITE STOPLIGHT, TAILLIGHT, AND BLACKOUT LIGHT REPAIR (continued).**

---

**b. DISASSEMBLY**

1. Remove two screws (8) and lockwashers (7), cover plate (1), and gasket (9) from composite light housing (6). Discard gasket and lockwashers.
2. Loosen six captive screws (13). Remove lens door (12) and preformed packing (14) from housing (6). Discard preformed packing.
3. Remove two blackout lights (11) and/or incandescent lamps (5) from housing (6).

**c. ASSEMBLY**

1. Install two blackout lights (11) and/or incandescent lamps (5) in housing (6).
2. Install lens door (12) and new preformed packing (14) on housing (6) with six captive screws (13).
3. Install cover plate (1) and new gasket (9) on housing (6) with two screws (8) and new lockwashers (9).

**d. INSTALLATION**

1. Install new gasket (4) on cover plate (1), and connect composite light wires (10) to semitrailer harness.
2. Install composite light (3), cover plate (1), and gasket (4) on semitrailer with six screws (2).

**FOLLOW-ON MAINTENANCE:**

- Connect negative battery cable (para 2-33).

---

**2-31. CONTROL PANEL LIGHT ASSEMBLY REPAIR.**

---

*This Task Covers:*

- |             |                 |
|-------------|-----------------|
| a. Removal  | b. Disassembly  |
| c. Assembly | d. Installation |
- 

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Performed packing (Item 141, Appendix F)
- Self-locking nut (2) (Item 165, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
  - Negative battery cable disconnected (para 2-33).
  - Engine control panel opened (para 2-112).
  - Road-side hose trough access cover removed para 2-76).
- 

**NOTE**

**Removal of control panel light assembly from semitrailer is not required for lamp replacement.**

**a. REMOVAL**

1. Disconnect terminal (12) from control panel wiring harness connector B (16).
2. Remove terminal (12), washer (13), and shell (11) from electrical lead (14).
3. Remove conduit adapter (10) from control panel (15).
4. Remove two screws (5) and self-locking nuts (6) and control panel light assembly (4) from semitrailer. Discard self-locking nuts.

**b. DISASSEMBLY**

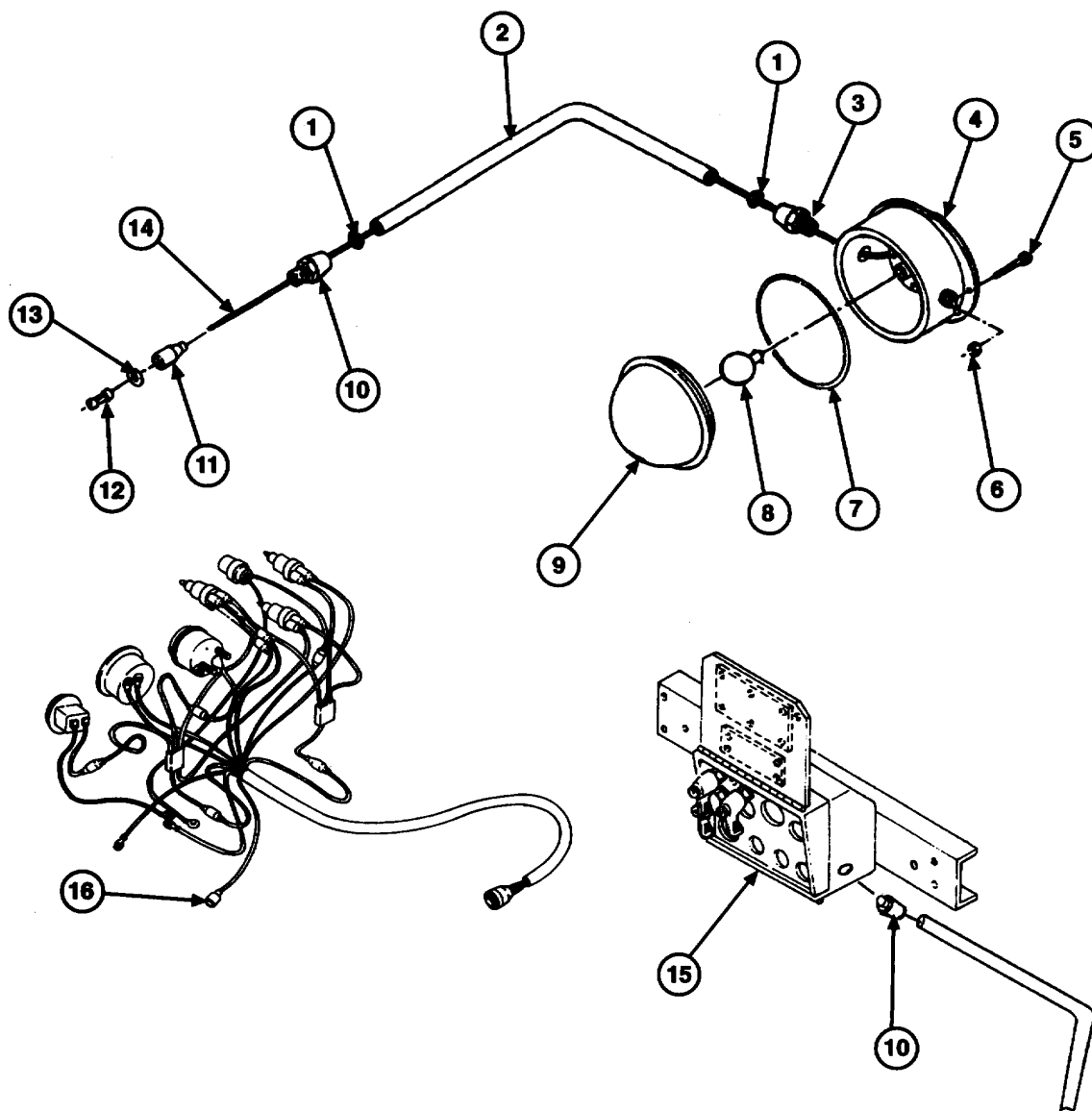
1. Remove lens (9) and preformed packing (7) from light assembly (4). Discard preformed packing.
2. Remove lamp (8) from light assembly (4).
3. Remove two conduit adapters (3 and 10) and compression sleeves (1) and conduit (2) from light assembly (4).

**c. ASSEMBLY**

1. Install conduit (2) and two compression sleeves (1) and conduit adapters (3 and 10) on light assembly (4).
2. Install lamp (8) in light assembly (4).
3. Install lens (9) and new preformed packing (7) on light assembly (4).

**2-31. CONTROL PANEL LIGHT ASSEMBLY REPAIR (continued).****d. INSTALLATION**

1. Install light assembly (4) on semitrailer with two screws (5) and new self-locking nuts (6).
2. Install conduit adapter (10) on control panel (15).
3. Install shell (11), washer (13), and terminal (12) on electrical lead (14).
4. Connect terminal (12) to control panel wiring harness connector B (16).

**FOLLOW-ON MAINTENANCE:**

- Install road-side hose trough access cover (para 2-76).
- Close engine control panel (para 2-112).
- Connect negative battery cable (para 2-33).



---

**2-42. BATTERY REPLACEMENT.**

---

*This Task Covers:*

a. Removal

b. Installation

---

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

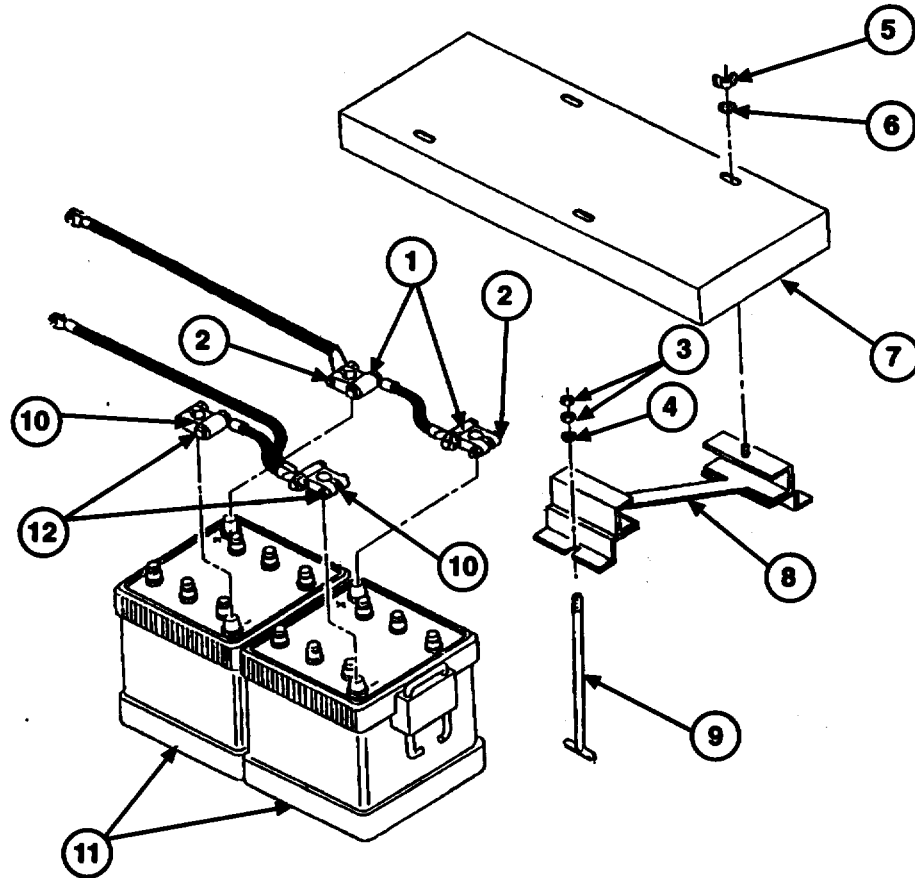
- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- 

**WARNING**

**Battery acid (electrolyte) is extremely harmful. Always wear safety goggles and rubber gloves, and do not smoke when performing maintenance on batteries. Injury will result if acid contacts skin or eyes. Wear rubber apron to prevent damage to clothing.**

**a. REMOVAL**

1. Remove two wing nuts (5) and washers (6) and cover (7) from two battery retainers (8).
2. Loosen two screws (10) on two negative battery terminals (12). Remove negative battery terminals (12) from two batteries (11).
3. Loosen two screws (2) on two positive battery terminals (1). Remove positive battery terminals (1) from two batteries (11).
4. Remove eight nuts (3), four washers (4), two battery retainers (8), and four hook bolts (9) from two batteries (11).
5. Remove two batteries (11) from semitrailer.

**2-32. BATTERY REPLACEMENT (continued).****b. INSTALLATION**

1. Install two batteries (11) on semitrailer.
2. Install four hook bolts (9), two battery retainers (8), four washers (4), and eight nuts (3) on two batteries (11).
3. Install two positive battery terminals (1) on two batteries (11). Tighten two screws (2) on positive battery terminals (1).
4. Install two negative battery terminals (12) on two batteries (11). Tighten two screws (10) on negative battery terminals (12).
5. Install cover (7) on two battery retainers (8) with two wing nuts (5) and washers (6).

**FOLLOW-ON MAINTENANCE:**

- None

---

**2-33. BATTERY CABLE REPLACEMENT.**


---

*This Task Covers:*

a. Removal

b. Installation

---

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

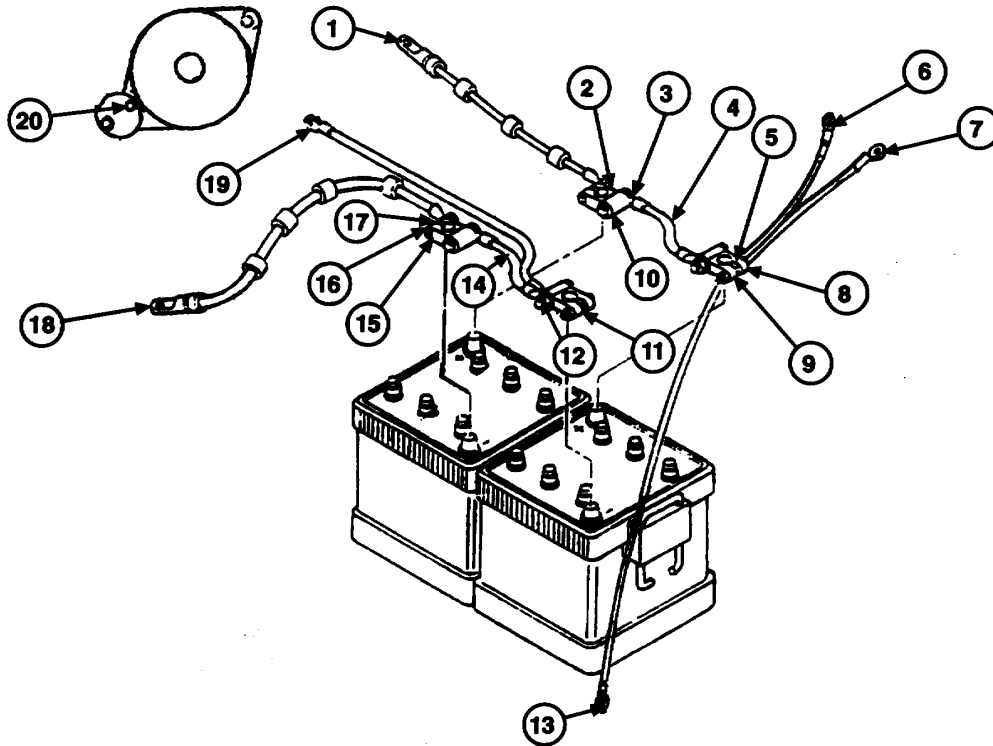
- Semitrailer uncoupled (refer to TM 9-2330-398-10).
  - Battery cover and negative and positive battery terminals removed (para 2-32).
- 

**WARNING**

**Battery acid (electrolyte) is extremely harmful. Always wear safety goggles and rubber gloves, and do not smoke when performing maintenance on batteries. Injury will result if acid contacts skin or eyes. Wear rubber apron to prevent damage to clothing.**

**a. REMOVAL**

1. Remove fastener (12) and two leads (14 and 19) from terminal (11).
2. Disconnect opposite end of lead (19) from semitrailer ground.
3. Remove fastener (15) and lead (14) from terminal (17).
4. Remove fastener (5) and lead (4) from terminal (9).
5. Remove fastener (3), lead (4), fastener (2), and lead (1) from terminal (10).
6. Disconnect opposite end of lead (1) from starter (20).
7. Remove fastener (16) and lead (18) from terminal (17).
8. Disconnect opposite end of lead (18) from engine ground.
9. Remove fastener (8), lead (6), wiring harness (7), and wiring harness (13) from terminal (9).
10. Disconnect opposite end of lead (6) from alternator.
11. Disconnect opposite end of wiring harness (7) from junction box solenoid.
12. Disconnect opposite end of wiring harness (13) from junction box circuit breaker.

**2-33. BATTERY CABLE REPLACEMENT (continued).****b. INSTALLATION**

1. Install lead (6), wiring harness (7), and wiring harness (13) on terminal (9) with fastener (8).
2. Connect opposite end of lead (6) to alternator.
3. Connect opposite end of wiring harness (7) to junction box solenoid.
4. Connect opposite end of wiring harness (13) to junction box circuit breaker.
5. Install lead (18) on terminal (17) with fastener (16), and connect opposite end of lead (18) to engine ground.
6. Connect lead (1) to starter (20), and install opposite end of lead (1) on terminal (10) with fastener (2).
7. Install lead (4) on terminal (10) with fastener (3).
8. Install lead (4) on terminal (9) with fastener (5).
9. Install lead (14) on terminal (17) with fastener (15).
10. Install two leads (14 and 19) on terminal (11) with fastener (12).
11. Connect opposite end of lead (19) to semitrailer ground.

**FOLLOW-ON MAINTENANCE:**

- Install negative and positive battery terminals and battery cover (para 2-32).

---

**2-34. FRONT BLACKOUT MARKER LIGHTS WIRING HARNESS REPLACEMENT.**


---

*This Task Covers:*

- |                 |               |
|-----------------|---------------|
| a. Removal      | b. Inspection |
| c. Installation |               |
- 

*Initial Setup:*

**Tools/Test Equipment**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Gasket (2) (Item 43, Appendix F)
- Gasket (Item 45, Appendix F)
- Lockwasher (6) (Item 94, Appendix F)

**Equipment Conditions:**

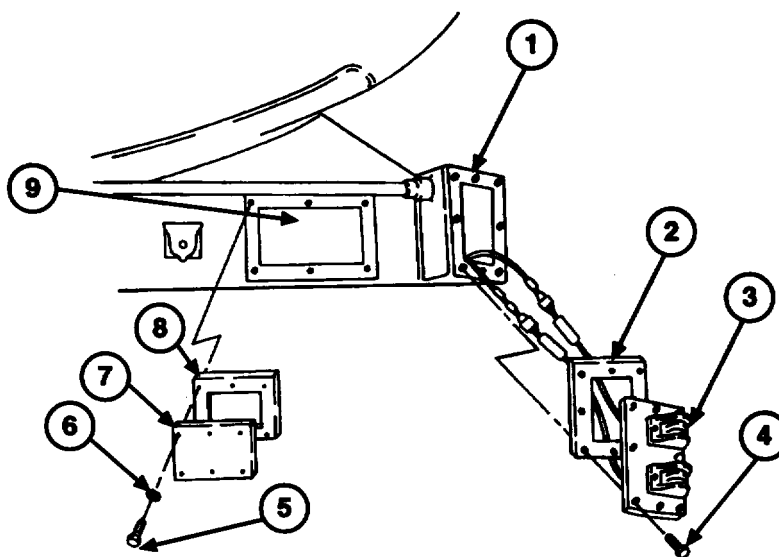
- Semitrailer uncoupled (refer to TM 9-2330-398-10). Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
  - Road-side composite light cover plate removed (para 2-30).
- 

**a. REMOVAL**

**NOTE**

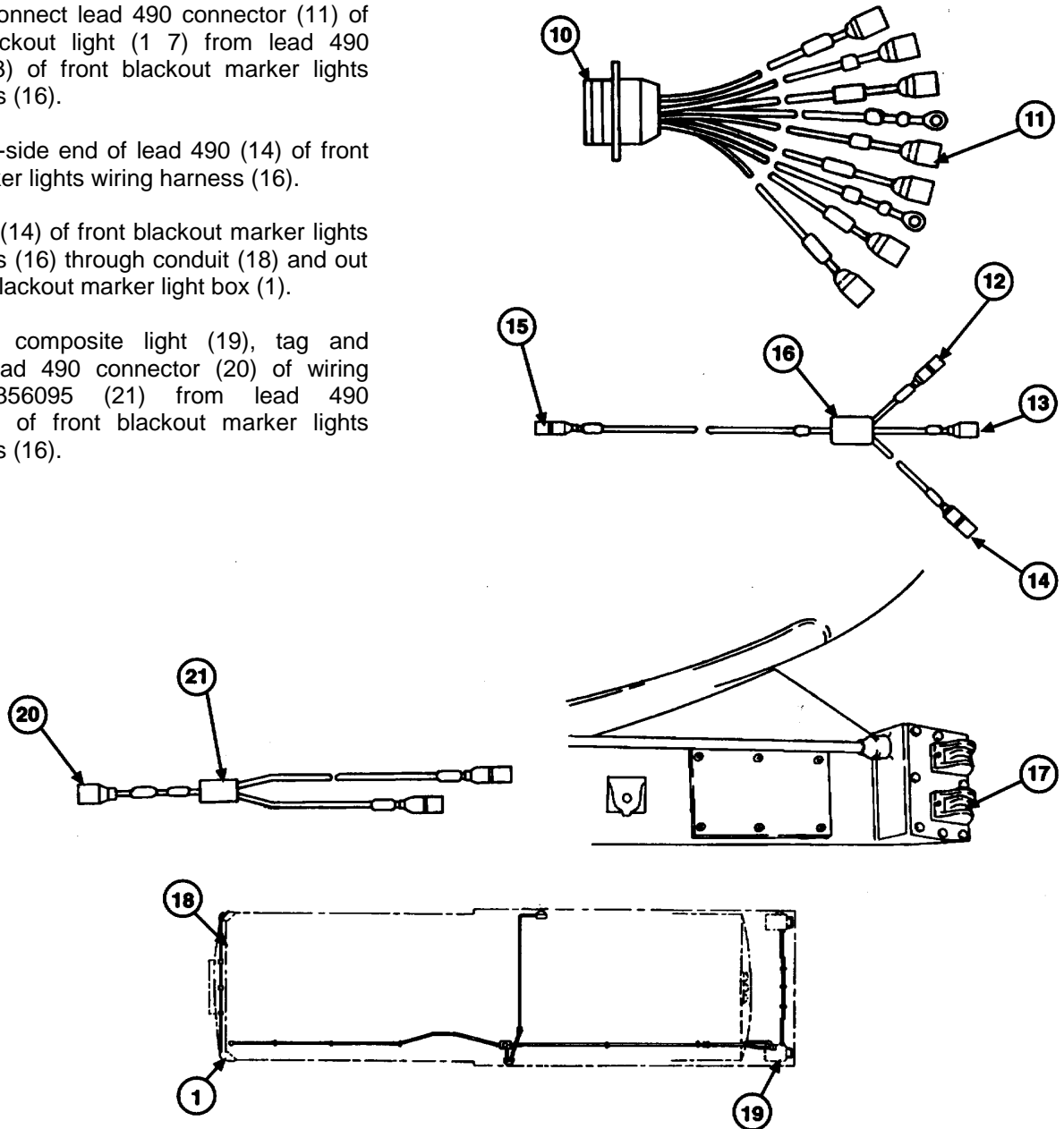
**Front blackout marker light boxes are located on curb side and road side of semitrailer. Removal of access cover is the same for both boxes; road-side light box is shown.**

1. Remove six screws (5) and lockwashers (6), access cover (7), and gasket (8) from semitrailer access hole (9). Discard gasket and lockwashers.
2. Remove 16 screws (4) and two cover plates (3) and gaskets (2) from curb-side and road-side blackout marker light boxes (1). Discard gaskets.



**2-34. FRONT BLACKOUT MARKER LIGHTS WIRING HARNESS REPLACEMENT (continued).**

3. Tag and disconnect lead 490 connector (11) of electrical intervehicular wiring harness lead assembly (10) from lead 490 connector (13) of front blackout marker lights wiring harness (16).
4. Tag and disconnect lead 490 connector (11 ) of road-side blackout light (17) from lead 490 connector (12) front blackout marker lights wiring harness (16).
5. Tag and disconnect lead 490 connector (11) of curb-side blackout light (17) from lead 490 connector (13) of front blackout marker lights wiring harness (16).
6. Remove curb-side end of lead 490 (14) of front blackout marker lights wiring harness (16).
7. Pull lead 490 (14) of front blackout marker lights wiring harness (16) through conduit (18) and out of road-side blackout marker light box (1).
8. At road-side composite light (19), tag and disconnect lead 490 connector (20) of wiring harness 12356095 (21) from lead 490 connector(15) of front blackout marker lights wiring harness (16).

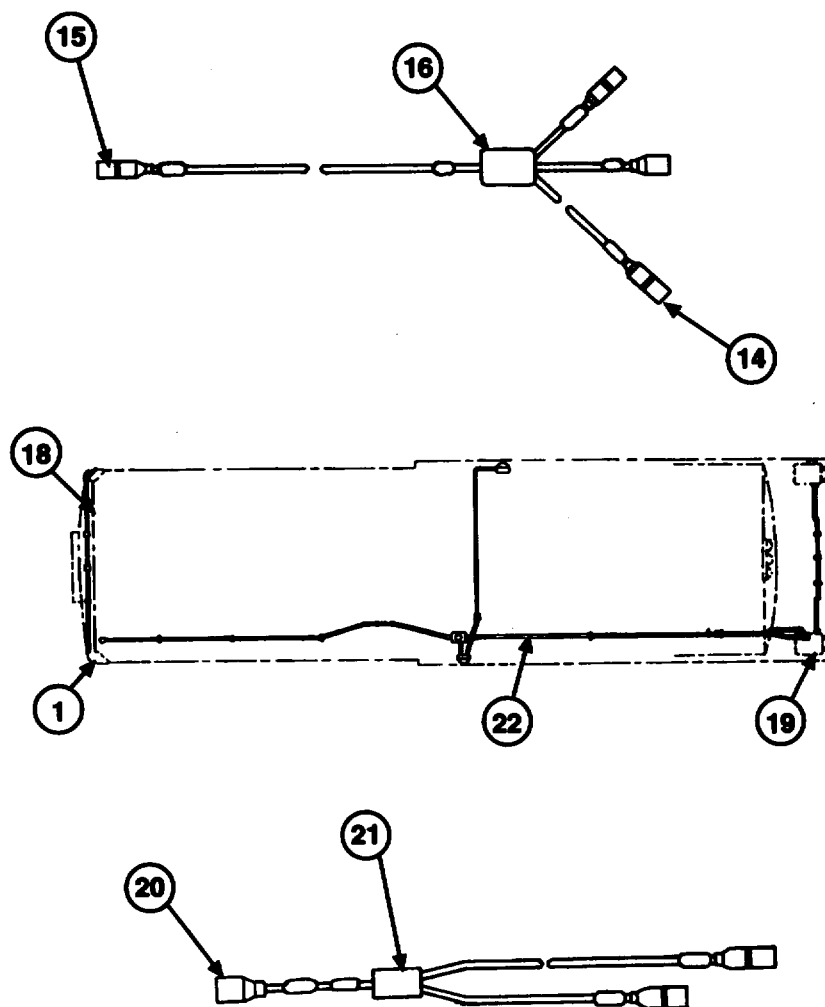


**2-34. FRONT BLACKOUT MARKER LIGHTS WIRING HARNESS REPLACEMENT (continued).**

9. Remove connector (15) from end of lead 490 (14) of front blackout marker lights wiring harness (16).
10. Pull lead 490 (14) of front blackout marker lights wiring harness (16) through conduit (22) and out of road-side blackout marker light box (1).
11. Remove front blackout marker lights wiring harness (16) from semitrailer.

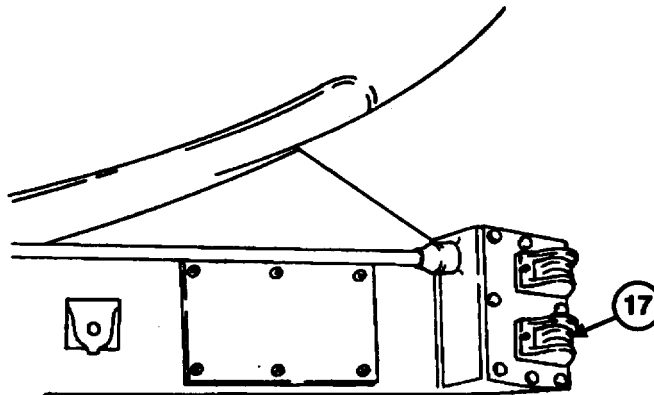
**b. INSPECTION**

Inspect wiring harness for loose/damaged terminals, frayed/exposed wiring, and worn/missing insulation. If these conditions exist, perform appropriate repair to harness (para 2-46).



**2-34. FRONT BLACKOUT MARKER LIGHTS WIRING HARNESS REPLACEMENT (continued).****c. INSTALLATION**

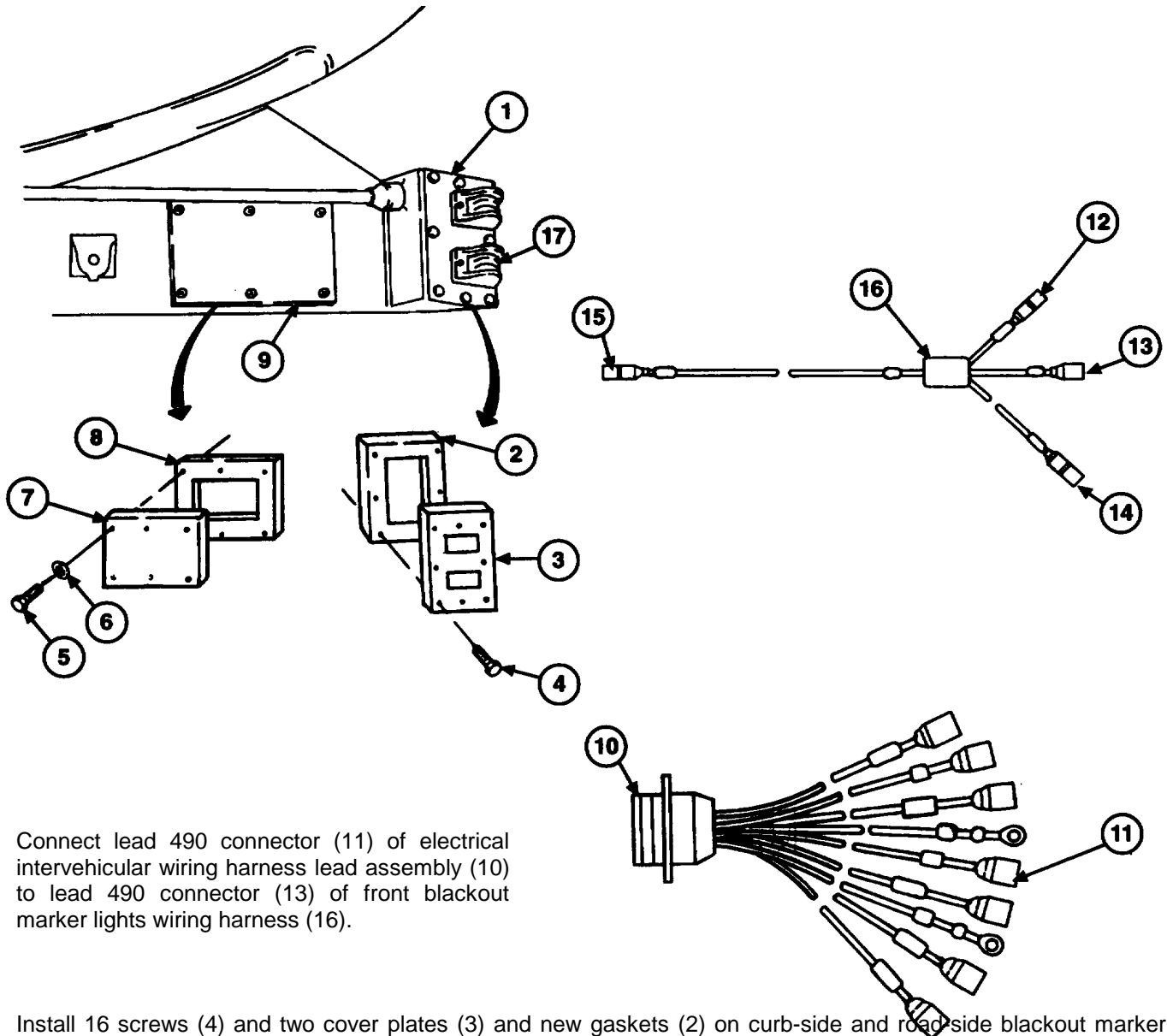
1. Pull lead 490 (14) of front blackout marker lights wiring harness (16) through conduit (22) and out of road-side composite light (19).
2. Install connector (15) on end of lead 490 (14) of front blackout marker lights wiring harness (16).
3. Connect lead 490 connector (20) of wiring harness 12356095 (21) to lead 490 connector (15) of front blackout marker lights wiring harness (16).
4. Tie string in conduit (18) to end of lead 490 (14) of front blackout marker lights wiring harness (16) at roadside blackout/marker light box (1).
5. Pull lead 490 (14) of front blackout marker lights wiring harness (16) through conduit (18) and out of curb-side blackout marker light box (1).
6. Install connector on end of lead 490 (14) of front blackout marker lights wiring harness (16).
7. Connect lead 490 connector of curb-side blackout light (17) to lead 490 connector(15) of front blackout marker lights wiring harness (16).





**2-34. FRONT BLACKOUT MARKER LIGHTS WIRING HARNESS REPLACEMENT (continued).**

8. Connect lead 490 connector (11) of road-side blackout light (17) to lead 490 connector (12) of front blackout marker lights wiring harness (16).



9. Connect lead 490 connector (11) of electrical intervehicular wiring harness lead assembly (10) to lead 490 connector (13) of front blackout marker lights wiring harness (16).
10. Install 16 screws (4) and two cover plates (3) and new gaskets (2) on curb-side and road-side blackout marker light boxes (1).
11. Install six screws (5) and new lockwashers (6), access cover (7), and new gasket (8) on semitrailer access hole (9).

**FOLLOW-ON MAINTENANCE:**

- Install roadside composite light cover plate (para 2-30).
- Disconnect ground (refer to TM 9-2330-398-10).

**2-35. MAIN TRAILER WIRING HARNESS REPLACEMENT.***This Task Covers:*

- |                 |               |
|-----------------|---------------|
| a. Removal      | b. Inspection |
| c. Installation |               |

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

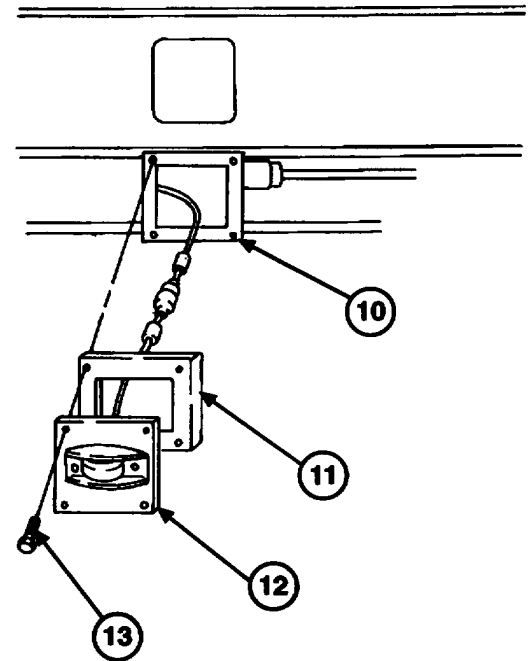
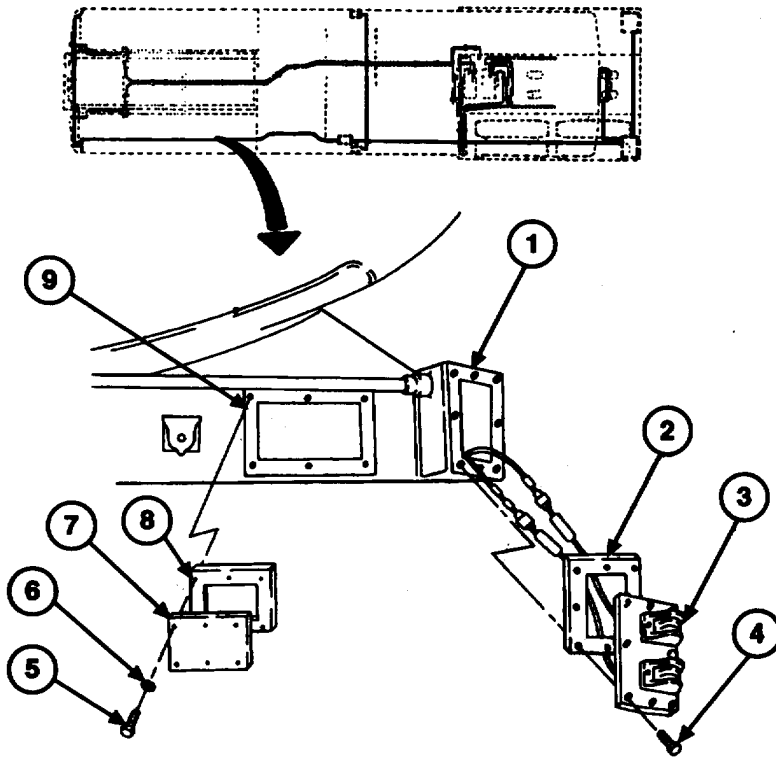
- Gasket (2) (Item 43, Appendix F)
- Gasket (Item 45, Appendix F)
- Lockwasher (6) (Item 94, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Road-side composite light cover plate removed (para 2-30).

**a. REMOVAL**

1. Remove six screws (5) and lockwashers (6), access cover (7), and gasket (8) from access hole (9). Discard gasket and lockwashers.
2. Remove eight screws (4), cover plate (3), and gasket (2) from road-side blackout marker light box (1). Discard gasket.

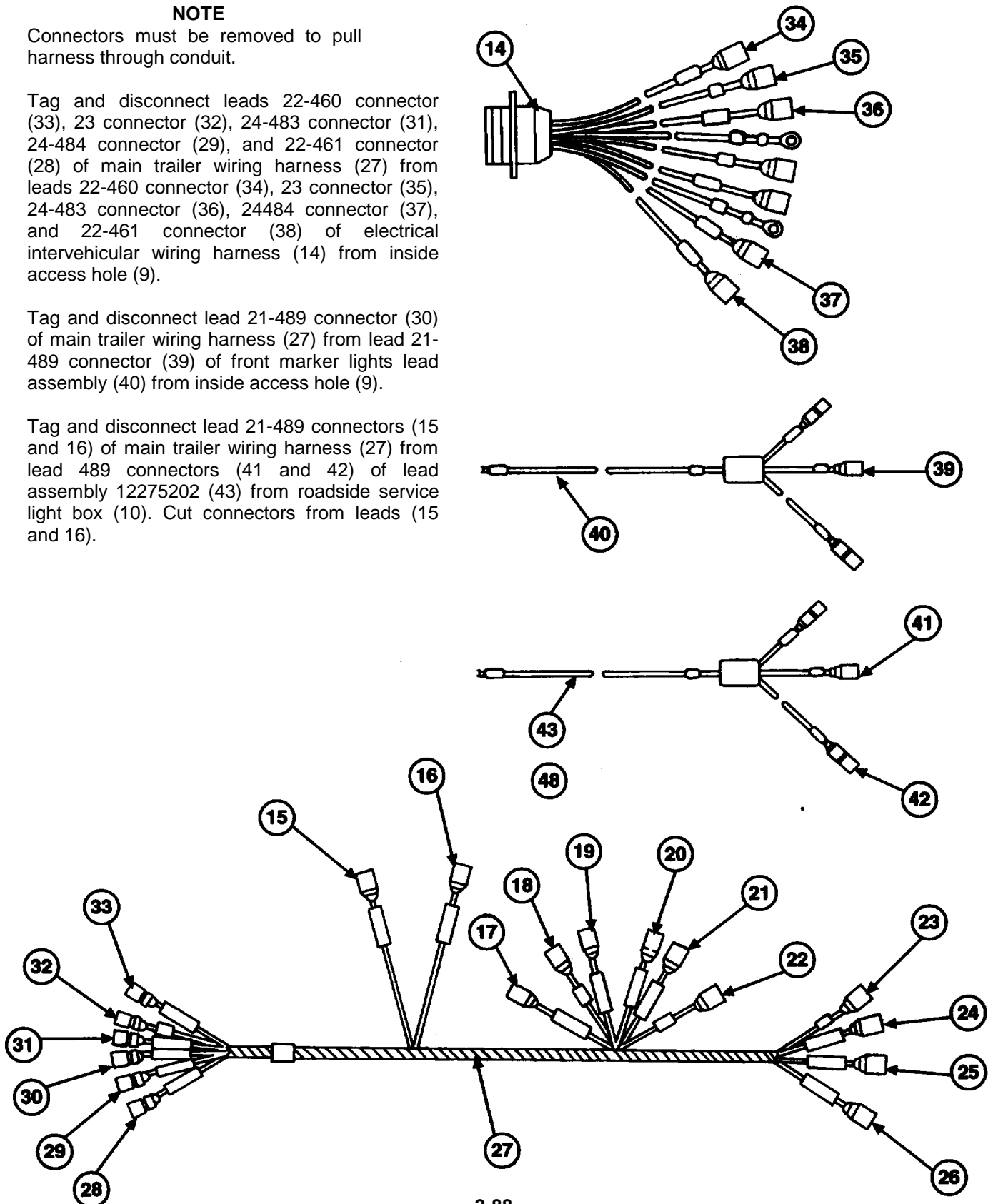


3. Remove four screws (13), cover plate (12), and gasket (11) from road-side service light box (10). Discard gasket.

**2-35. MAIN TRAILER WIRING HARNESS REPLACEMENT (continued)****NOTE**

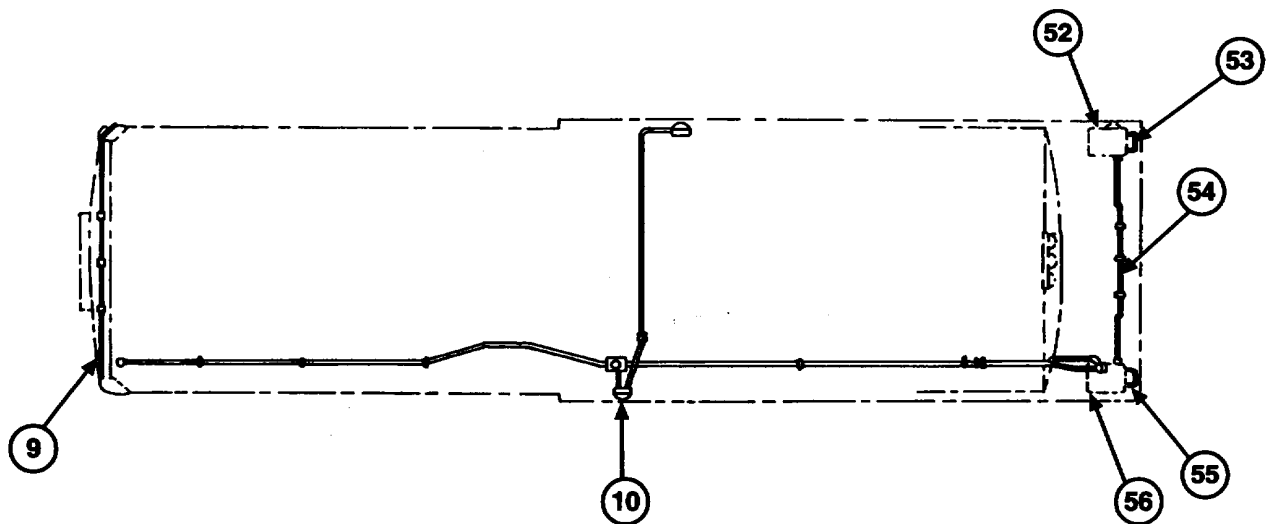
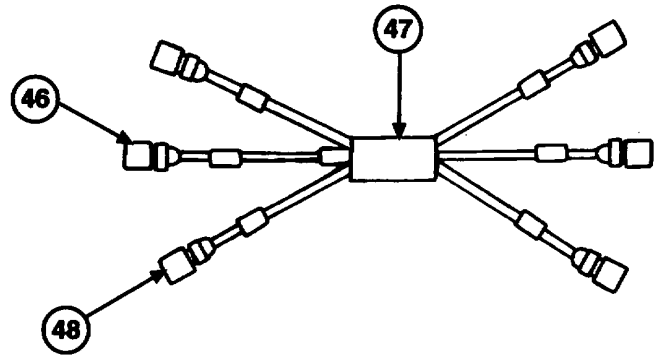
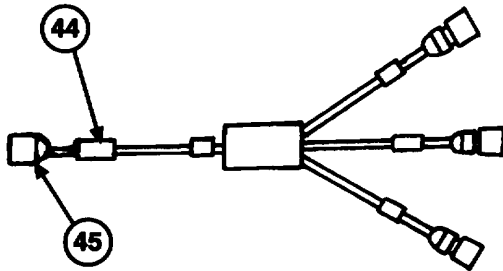
Connectors must be removed to pull harness through conduit.

4. Tag and disconnect leads 22-460 connector (33), 23 connector (32), 24-483 connector (31), 24-484 connector (29), and 22-461 connector (28) of main trailer wiring harness (27) from leads 22-460 connector (34), 23 connector (35), 24-483 connector (36), 24-484 connector (37), and 22-461 connector (38) of electrical intervehicular wiring harness (14) from inside access hole (9).
5. Tag and disconnect lead 21-489 connector (30) of main trailer wiring harness (27) from lead 21-489 connector (39) of front marker lights lead assembly (40) from inside access hole (9).
6. Tag and disconnect lead 21-489 connectors (15 and 16) of main trailer wiring harness (27) from lead 489 connectors (41 and 42) of lead assembly 12275202 (43) from roadside service light box (10). Cut connectors from leads (15 and 16).



**2-35. MAIN TRAILER WIRING HARNESS REPLACEMENT (continued).**

7. Tag and disconnect lead 23 connector (23), 24-483 connector (24), and 22460 connector (25) of main trailer wiring harness (27) from curb-side composite light (53). Cut connectors from leads (23, 24, and 25).
8. Tag and disconnect lead 21-489 connector (26) of main trailer wiring harness (27) from lead 489 connector (45) of lead assembly 12275204 (44) from rear curb-side composite light box (52). Cut connector from lead (26).
9. Tag and disconnect lead 24-484 connector (17) and lead 24-461 connector (21) from road-side composite light (55). Cut connectors from leads (17 and 21).
10. Tag and disconnect lead 21-489 connectors (19 and 20) of main trailer wiring harness (27) from lead connectors (48 and 46) of lead assembly 12275205 (47) from road-side composite light box (56). Cut connectors from leads (19 and 20).



**2-35. MAIN TRAILER WIRING HARNESS REPLACEMENT (continued).**

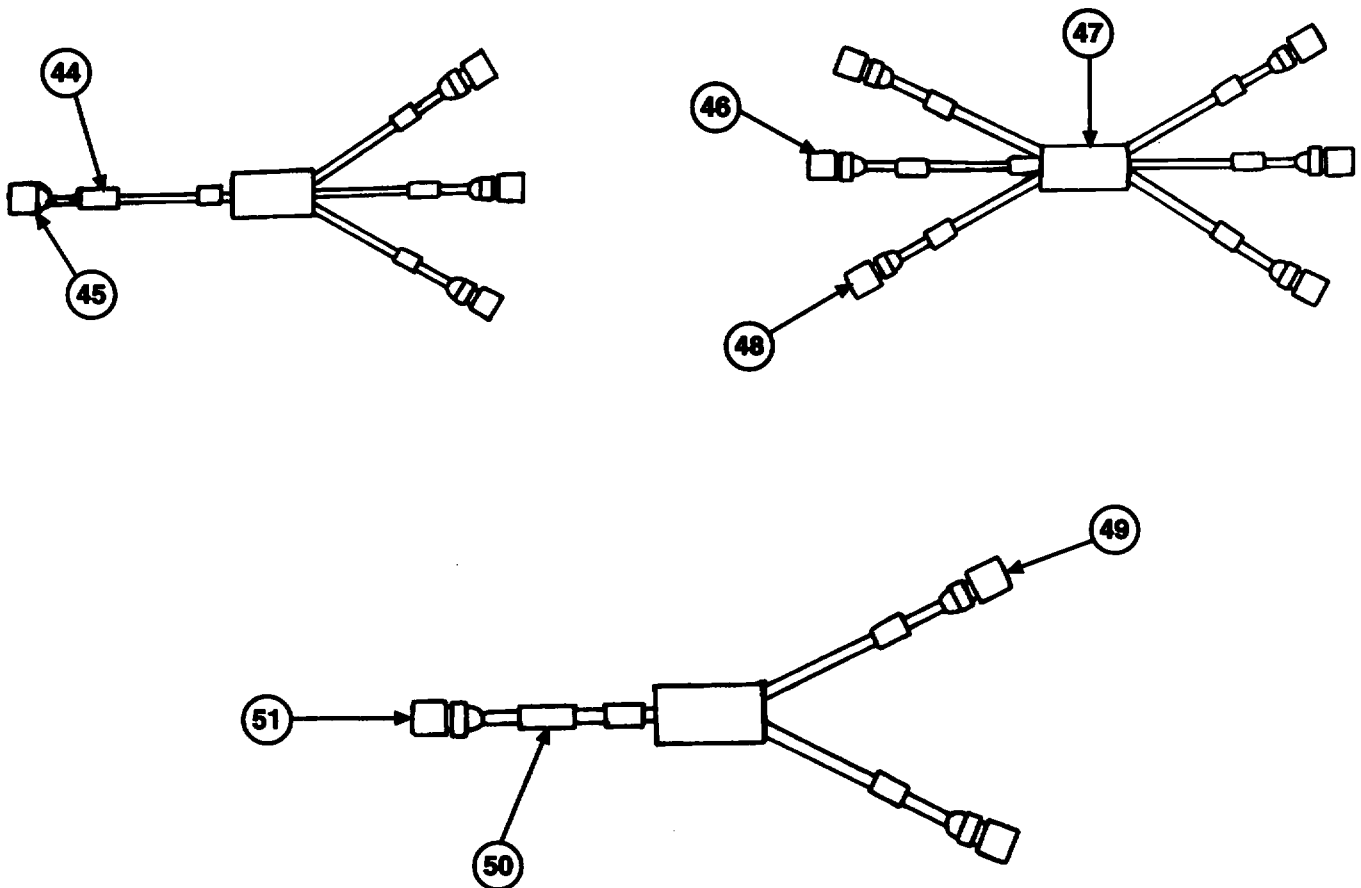
11. Tag and disconnect lead 23 connectors (18 and 22) of main trailer wiring harness (27) from lead connectors (49 and 51) of lead assembly 12275208 (50) from road-side composite light box (56). Cut connectors from leads (18 and 22).
12. Pull main trailer wiring harness (27) through conduit (54) and out through road-side composite light box (56).
13. Pull main trailer wiring harness (27) through conduit (57) and out through access hole (9).

**b. INSPECTION**

Inspect wiring harness for loose/damaged terminals, frayed/exposed wiring, and worn/missing insulation. If these conditions exist, perform appropriate repair to wiring harness (para 2-46).

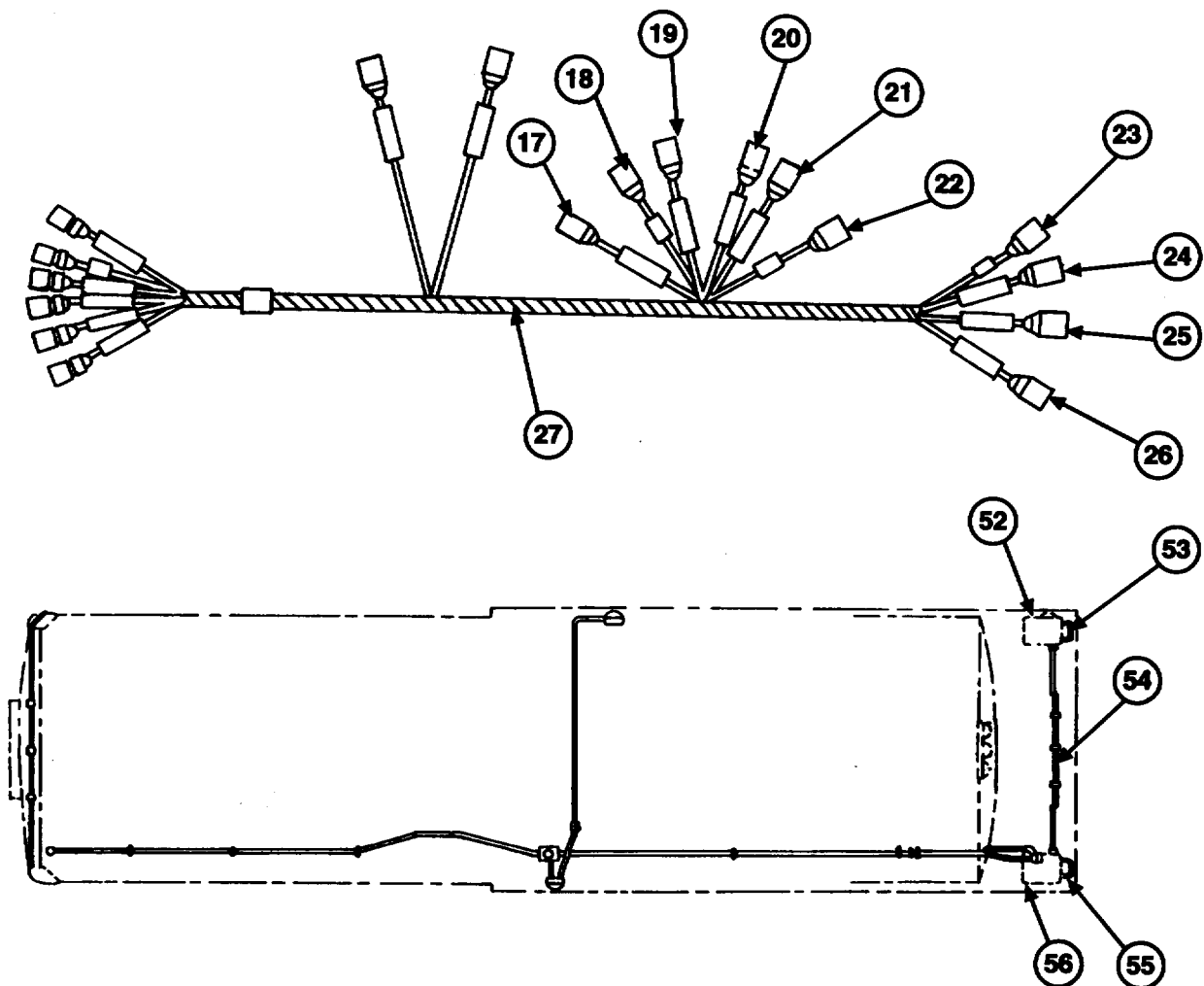
**c. INSTALLATION**

1. Pull wiring harness leads out of conduit (57) and into road-side and curb-side composite light boxes (56 and 52).



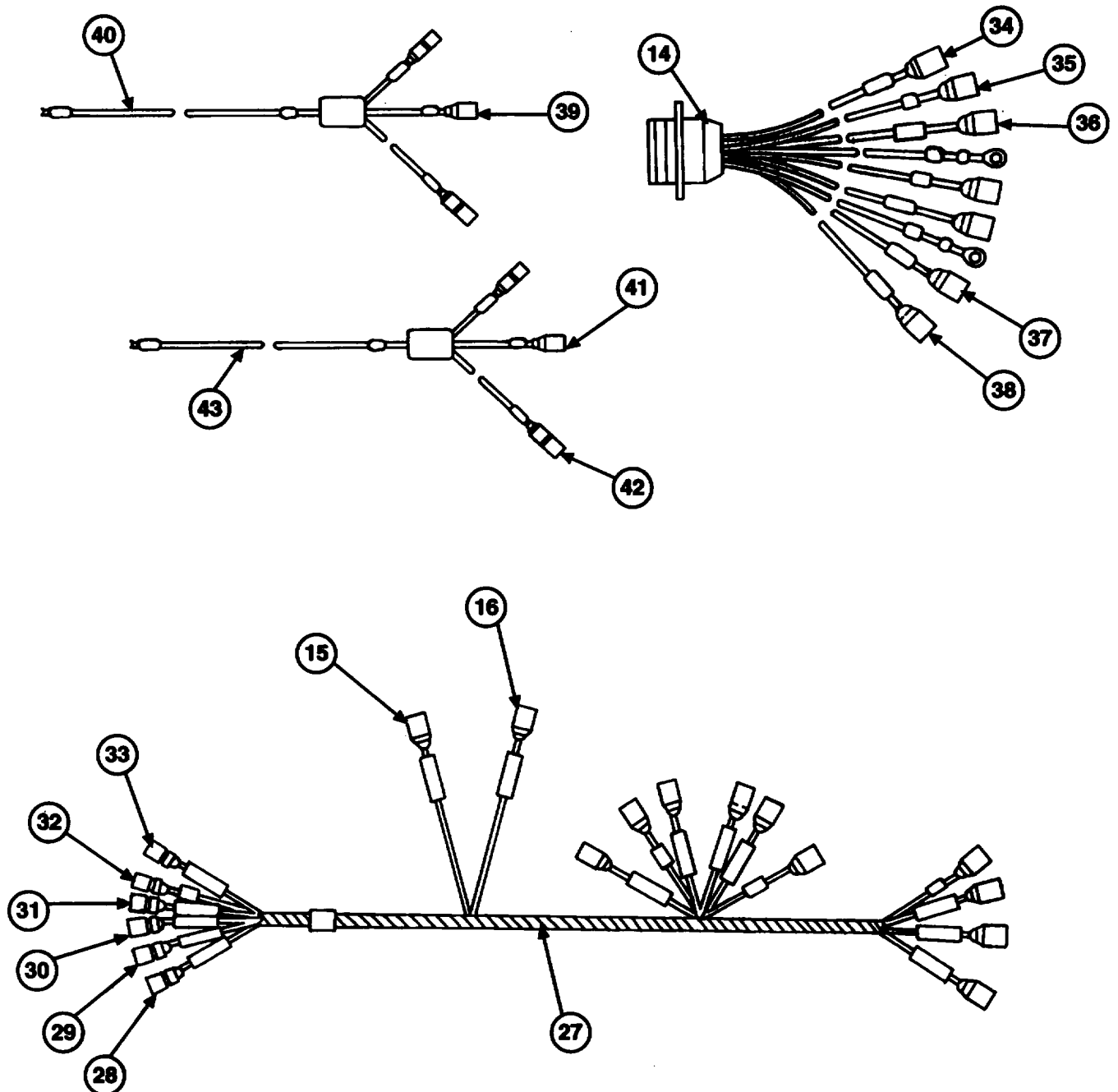
**2-35. MAIN TRAILER WIRING HARNESS REPLACEMENT (continued).**

2. Pull wiring harness (27) through conduit (54) and out through rear curb-side composite light box (52). Disconnect lacing wire from wiring harness (27).
3. Install new connectors on each wiring harness lead (para 2-46).
4. Connect lead 23 connectors (18 and 22) of main trailer wiring harness (27) to lead connectors (49 and 51) of lead assembly 12275208 (50) inside road-side composite light box (56).
5. Connect lead 21-489 connectors (19 and 20) of main trailer wiring harness (27) to lead connectors (48 and 46) of lead assembly 12275205 (47) inside road-side composite light box (56).
6. Connect lead 24-484 connector (17) and lead 24-461 connector (21) to road-side composite light (55).
7. Connect lead 21-489 connector (26) of main trailer wiring harness (27) to lead 489 connector (45) of lead assembly 12275204 (44) inside rear curb-side composite light box (52).
8. Connect lead 23 connector (23), lead 24-483 connector (24), and lead 22-460 connector (25) of main trailer wiring harness (27) to curb-side composite light (53).



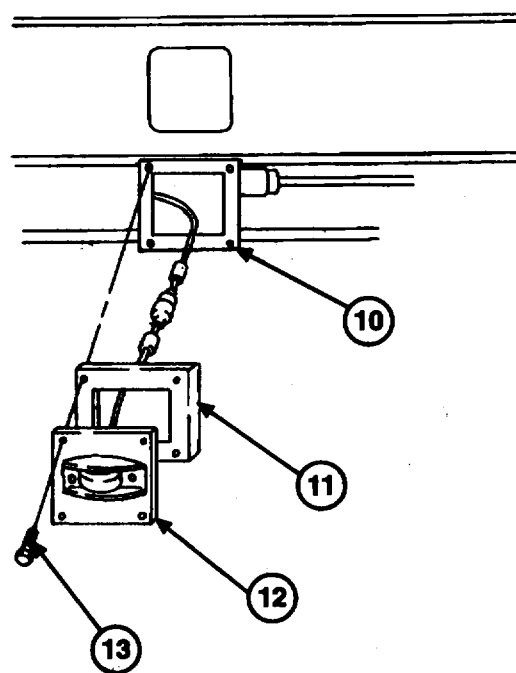
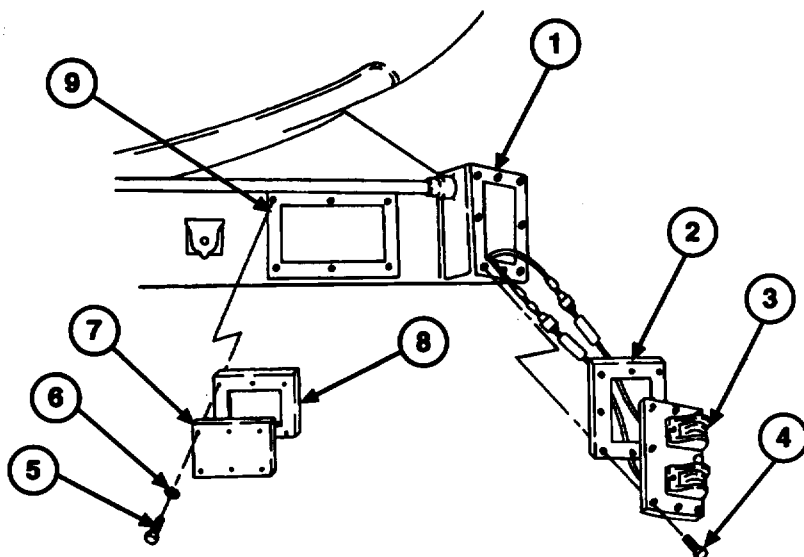
**2-35. MAIN TRAILER WIRING HARNESS REPLACEMENT (continued).**

9. Connect lead 21-489 connectors (15 and 16) of main trailer wiring harness (27) to lead 489 connectors (41 and 42) of lead assembly 12275202 (43) inside road-side service light box (11).
10. Connect lead 21-489 connector (30) of main trailer wiring harness (27) to lead 21-489 connector (39) of front marker lights lead assembly (40) inside front access hole (10).
11. Connect leads 22-460 connector (33), 23 connector (32), 24-483 connector (31), 24-484 connector (29), and 22-461 connector (28) of main trailer wiring harness (27) to leads 22-460 connector (34), 23 connector (35), 24-483 connector (36), 24-484 connector (37), and 22-461 connector (38) of electrical intervehicular wiring harness lead (14) inside access hole (9).



**2-35. MAIN TRAILER WIRING HARNESS REPLACEMENT (continued).**

12. Install new gasket (11), cover plate (12), and four screws (13) on road-side service light box (11).
13. Install new gasket (2), cover plate (3), and eight screws (4) on road-side blackout marker light box (1).
14. Install new gasket (8), access cover (7), and six new lockwashers (6) and screws (5) on access hole (10).

**FOLLOW-ON MAINTENANCE:**

- Install road-side composite light cover plate (para 2-30).
- Disconnect ground (refer to TM 9-2330-398-10).



**2-36. LEAD ASSEMBLY 12275202 REPLACEMENT.***This Task Covers:*

a. Removal

b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Gasket (2) (Item 42, Appendix F)

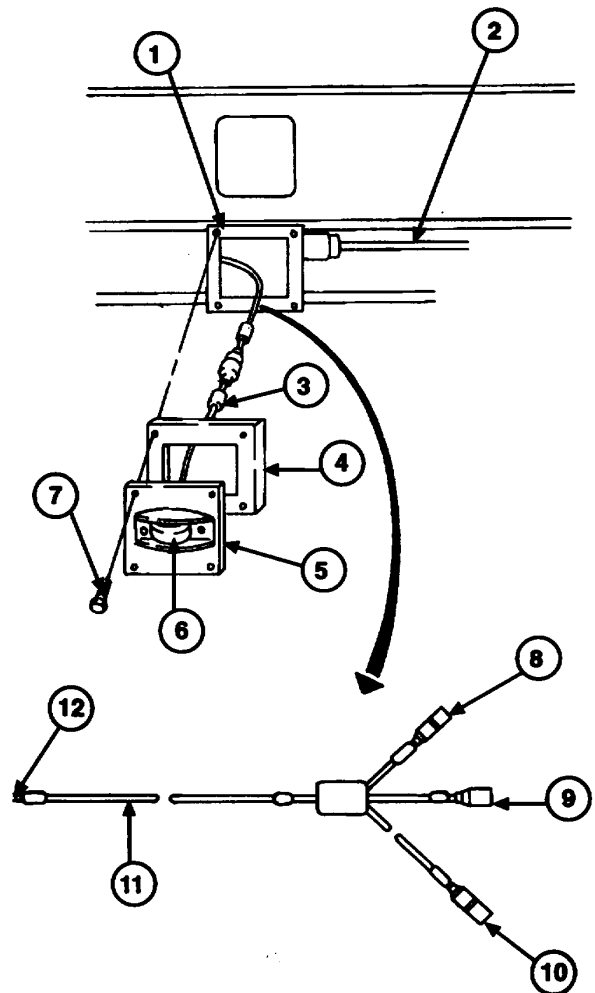
**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

**a. REMOVAL****NOTE**

- Service light boxes are located on curb side and road side of semitrailer; road-side service light box is shown.
- Removal of cover plate is the same for both service light boxes. Road-side service light is shown.

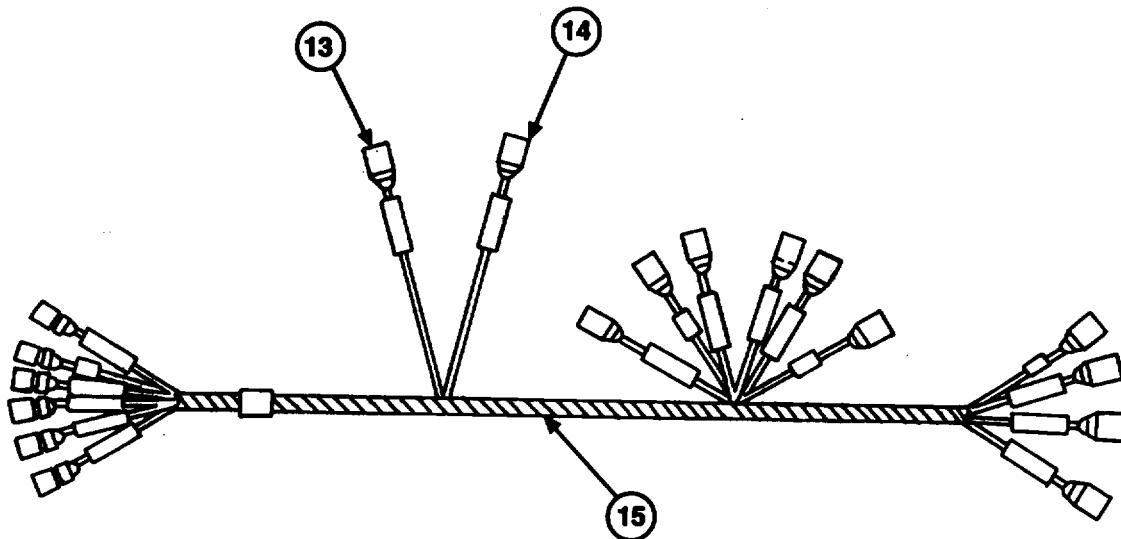
1. Remove eight screws (7) and two cover plates (5) and gaskets (4) from road-side and curb-side service light boxes (1). Discard gaskets.
2. At road-side service light box (1), tag and disconnect lead 21-489 connectors (13 and 14) of main trailer wiring harness (15) from lead 489 connectors (8 and 10) of lead assembly 12275202 (11).
3. Tag and disconnect lead 489 connector (9) of lead assembly 12275202 (11) from lead 489 connector (3) of road-side service light (6).
4. Tag and disconnect lead 489 connector (12) of lead assembly 12275202 (11) from lead 489 connector (3) of curb-side service light (6). Cut connector (12) from end of lead assembly (11).
5. Pull lead assembly 12275202 (11) through conduit (2) and out through road-side service light box (1).



**2-36. LEAD ASSEMBLY 12275202 REPLACEMENT (continued).****b. INSTALLATION****NOTE**

Repair wiring harness as required (para 2-46).

1. Pull lead assembly 12275202 through conduit (2) and out through curb-side light box (1).
2. Install new connector on lead assembly 12275202.
3. Connect lead 489 connector (12) of lead assembly 12275202 (11) to lead 489 connector (3) of curb-side service light (6).
4. Connect lead 489 connector (9) of lead assembly 12275202 (1 1) to lead 489 connector (3) of road-side service light (6).
5. At road-side service light box (1), connect lead 21-489 connectors (13 and 14) of main trailer wiring harness (15) to lead 489 connectors (8 and 10) of lead assembly 12275202 (11).
6. Install two new gaskets (4) and cover plates (5) and eight screws (7) to road-side and curb-side service light boxes (1).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

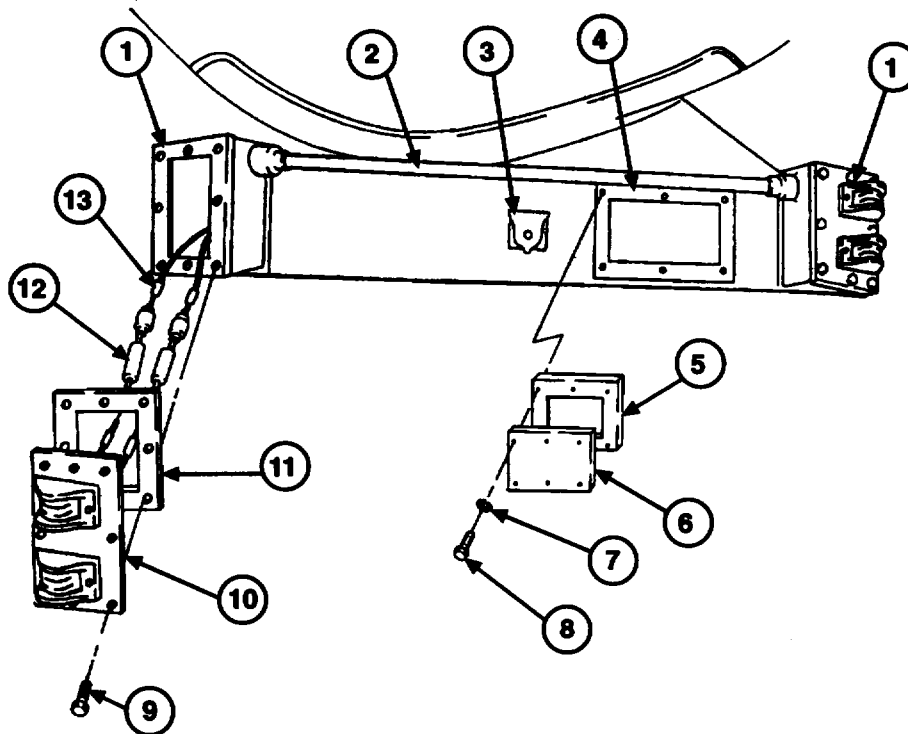
## b. Installation

## Equipment

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

- Gasket (2) (Item 43, Appendix F)
- Gasket (Item 45, Appendix F)
- Lockwasher (6) (Item 94, Appendix F)

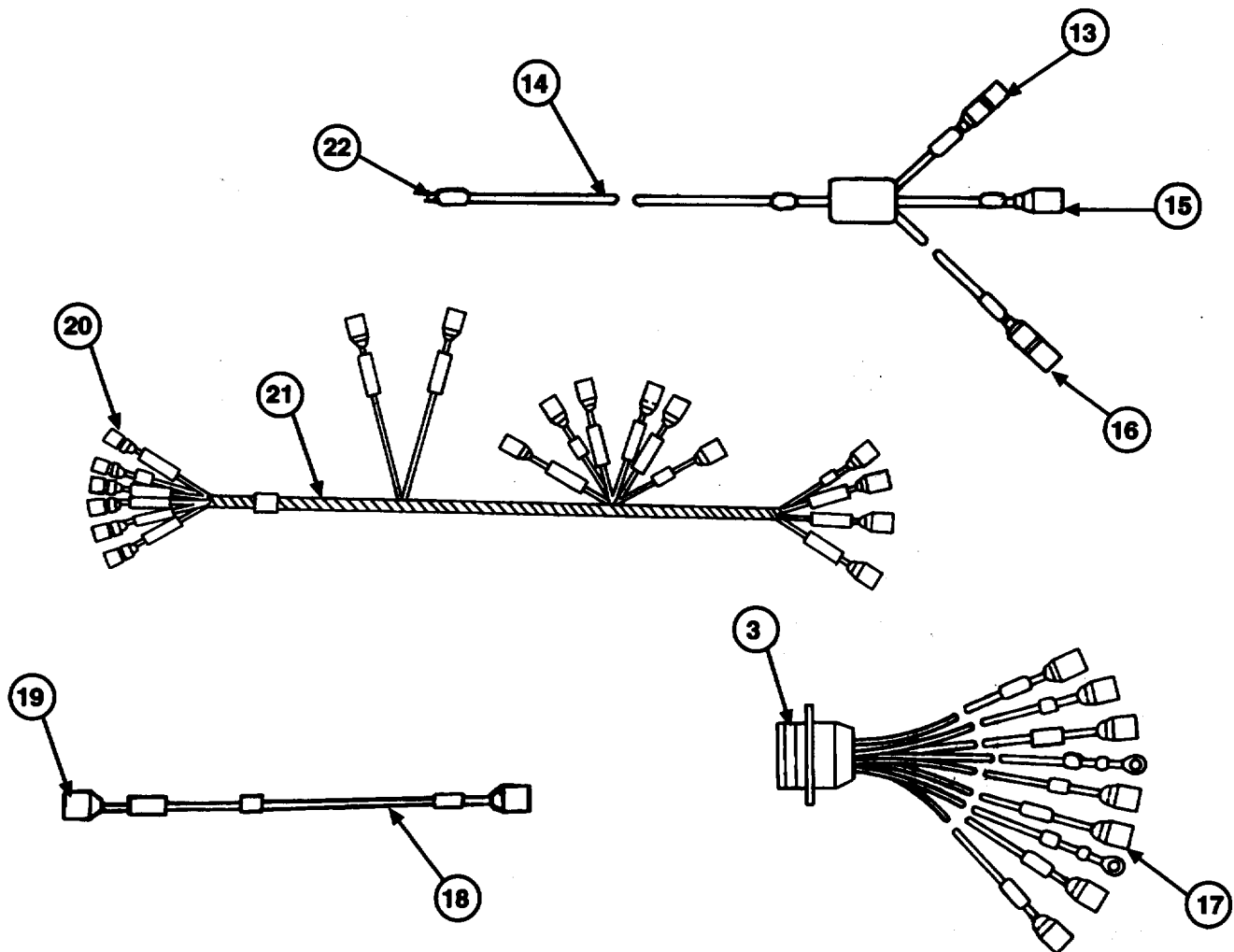
2. Remove 16 screws (9) and two cover plates (10) and gaskets (11 ) from curbside and road-side front blackout marker light boxes (1). Discard gaskets.



**2-37. FRONT MARKER LIGHTS LEAD ASSEMBLY REPLACEMENT (continued).****NOTE**

Connector must be removed to pull lead through conduit.

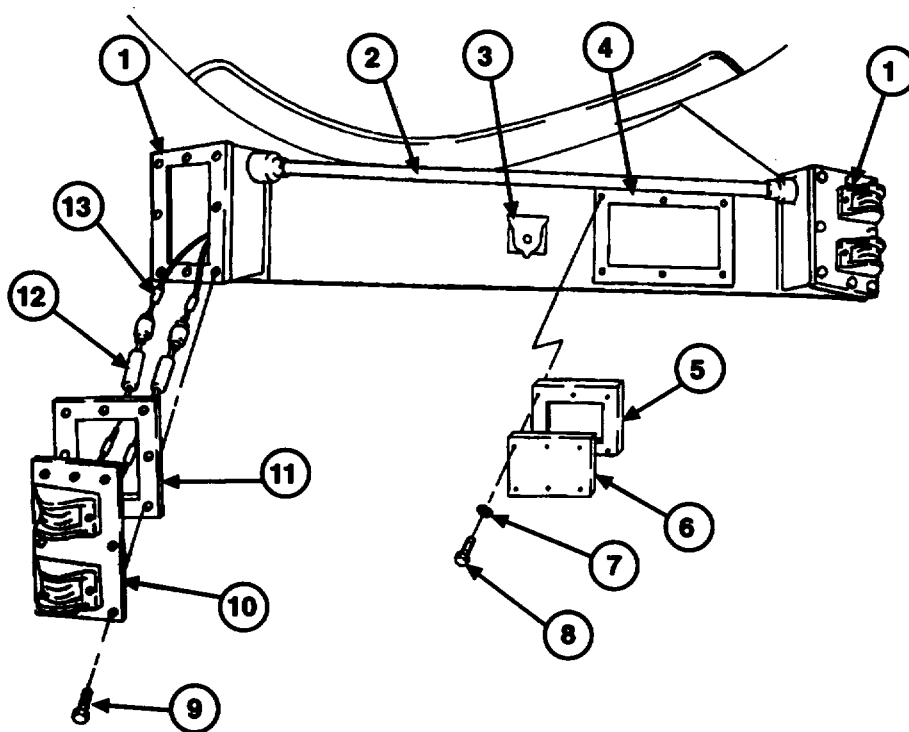
3. Tag and disconnect lead 489 (13) connector of front marker lights lead assembly (14) from service light lead 489 connector (12) at curb-side blackout marker light box (1). Cut connector from end of front marker lights lead assembly (14).
4. Tag and disconnect lead 21-489 connector (15) of front marker lights lead assembly (14) from lead 21-489 connector (20) of main trailer wiring harness (21) inside access hole (4).
5. Tag and disconnect lead 489 connector (16) of front marker lights lead assembly (14) from lead 489 connector (19) of electrical jumper from intervehicular cable to road-side blackout marker light lead (18) inside access hole (4).
6. Tag and disconnect lead 489 connector (22) of front marker lights lead assembly (14) from lead 21-489 connector (17) of electrical intervehicular wiring harness lead assembly (3). Pull lead 489 (13) of front marker lights lead assembly (14) through conduit (2), and remove front marker lights lead assembly (14) from roadside blackout marker light box (1).



**2-37. FRONT MARKER LIGHTS LEAD ASSEMBLY REPLACEMENT (continued).****b. INSTALLATION****NOTE**

Repair front marker lights lead assembly as required (para 2-46).

1. Pull lead 489 (13) through conduit (2) and out through curb-side light box (1). Disconnect lacing wire from lead 489 (13).
2. Install new connector on lead 489.
3. Connect lead 489 connector (22) of front marker lights lead assembly (14) to lead 21-489 connector (19) of electrical intervehicular wiring harness lead assembly (3).
4. Connect lead 489 connector (16) of front marker lights lead assembly (14) to lead 489 connector (20) of electrical jumper from intervehicular cable to road-side blackout marker lights lead (18) inside access hole (4).
5. Connect lead 21-489 connector (15) of front marker lights lead assembly (14) to lead 21-489 connector (21) of main trailer wiring harness (17) inside access hole (4).
6. Connect lead 489 connector (13) of front marker lights lead assembly (14) from service light lead 489 connector (12) at curb-side blackout marker light box (1).
7. Install two new gaskets (11) and cover plates (10) and 16 screws (9) on road-side and curb-side front blackout marker light boxes (1).
8. Install new gasket (5) and access cover plate (6) on access hole (4) with six new lockwashers (7) and screws (8).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

**2-38. LEAD ASSEMBLY 12275204 REPLACEMENT.***This Task Covers:*

- a. Removal
- b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

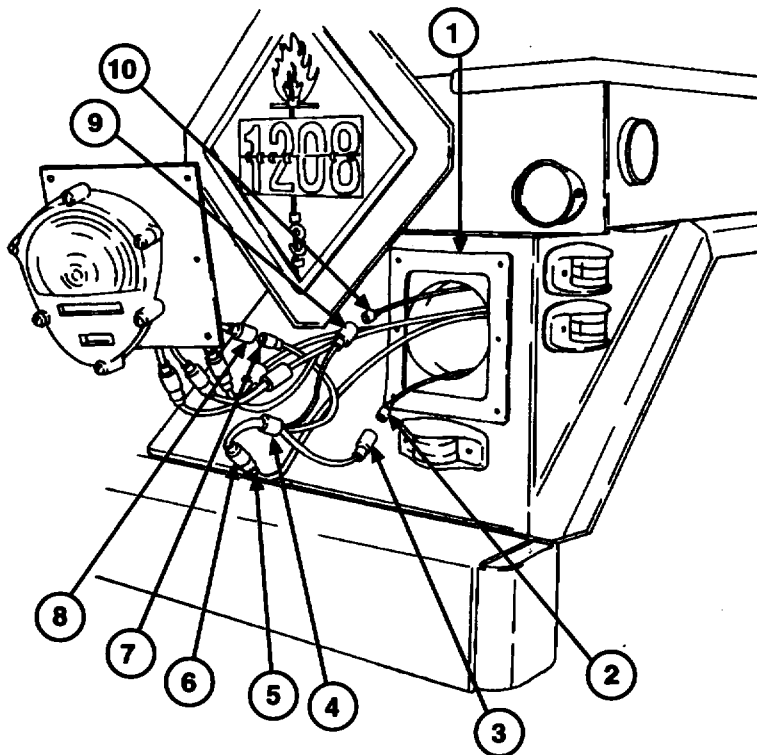
- Gasket (Item 46, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Curb-side composite light cover plate removed (para 2-30).

**a. REMOVAL**

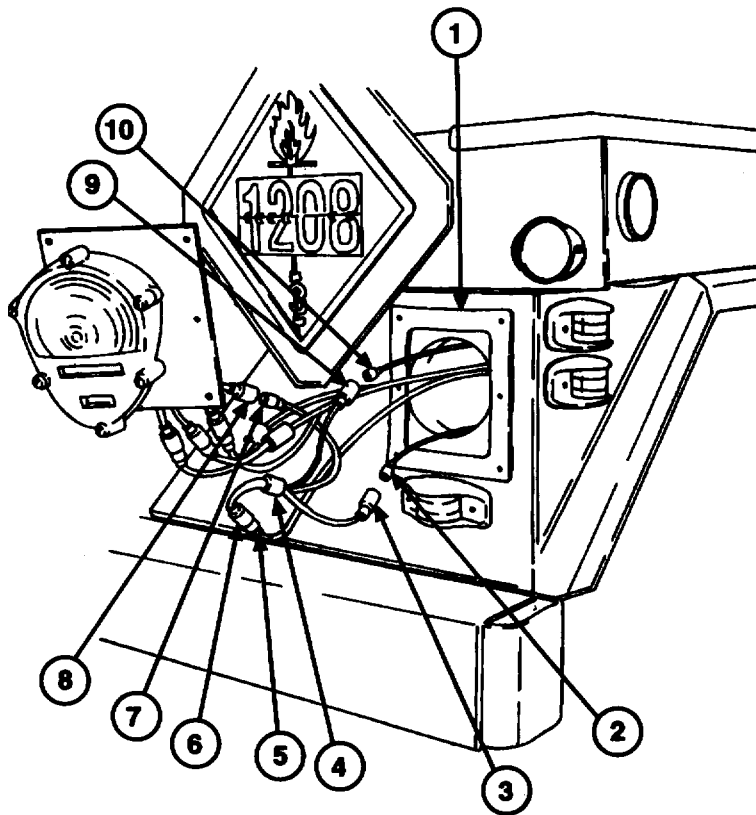
1. Tag and disconnect lead 489 connector (3) of lead assembly 12275204 (4) from service light lead 489 connector (2) at curb-side blackout marker light box (1).
2. Tag and disconnect lead 489 connector (9) of lead assembly 12275204 (4) from service light lead 489 connector (10) at curb-side blackout marker box (1).
3. Tag and disconnect lead 489 connector (7) of lead assembly 12275204 (4) from lead 21 connector (8) of curbside composite light.
4. Tag and disconnect lead 489 connector (5) of lead assembly 12275204 (4) from lead 21-489 connector (6) of main trailer wiring harness. Remove lead assembly 12275204 (4) from curb-side blackout marker box (1).



**2-38. LEAD ASSEMBLY 12275204 REPLACEMENT (continued).****b. INSTALLATION****NOTE**

Repair wiring harness as required (para 2-46).

1. Connect lead 489 connector (5) of lead assembly 12275204 (4) to lead 21-489 connector (6) of main trailer wiring harness at curb-side blackout marker box (1).
2. Connect lead 489 connector (7) of lead assembly 12275204 (4) to lead 21 connector (8) of curb-side composite light.
3. Connect lead 489 connector (9) of lead assembly 12275204 (4) to service light lead 489 connector (10) at curbside blackout marker box (1).
4. Connect lead 489 connector (3) of lead assembly 12275204 (4) to service light lead 489 connector (2) at curbside blackout marker light box (1).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).
- Install curb-side composite light cover plate (para 2-30).

a. Removal

Initial Setup:

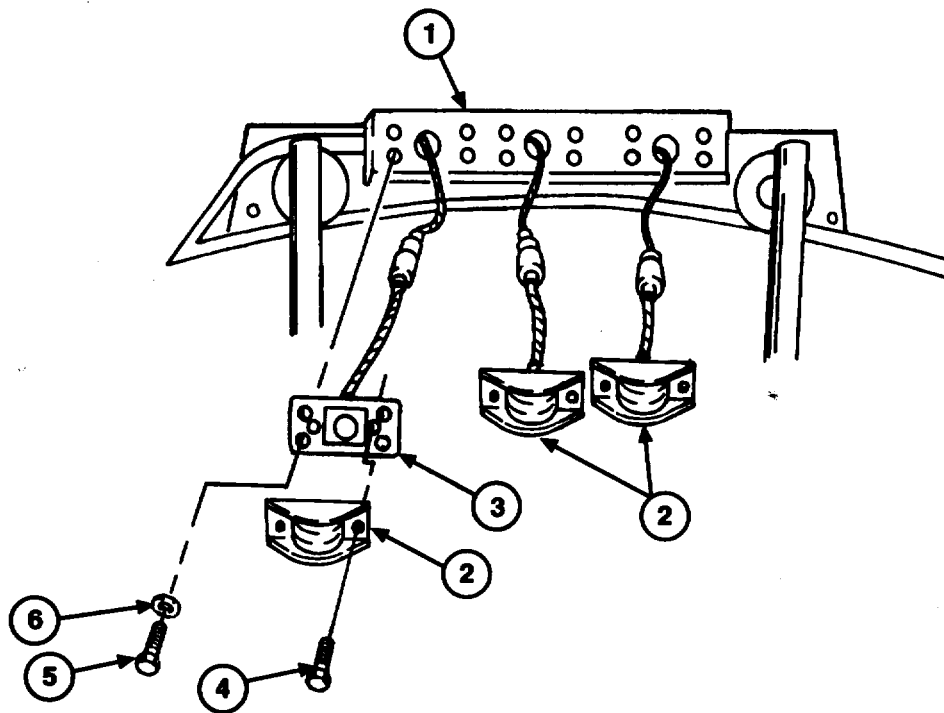
- General mechanic's tool kit (Item 4, Appendix B)

- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Road-side composite light cover plate removed (para 2-30).

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

## NOTE

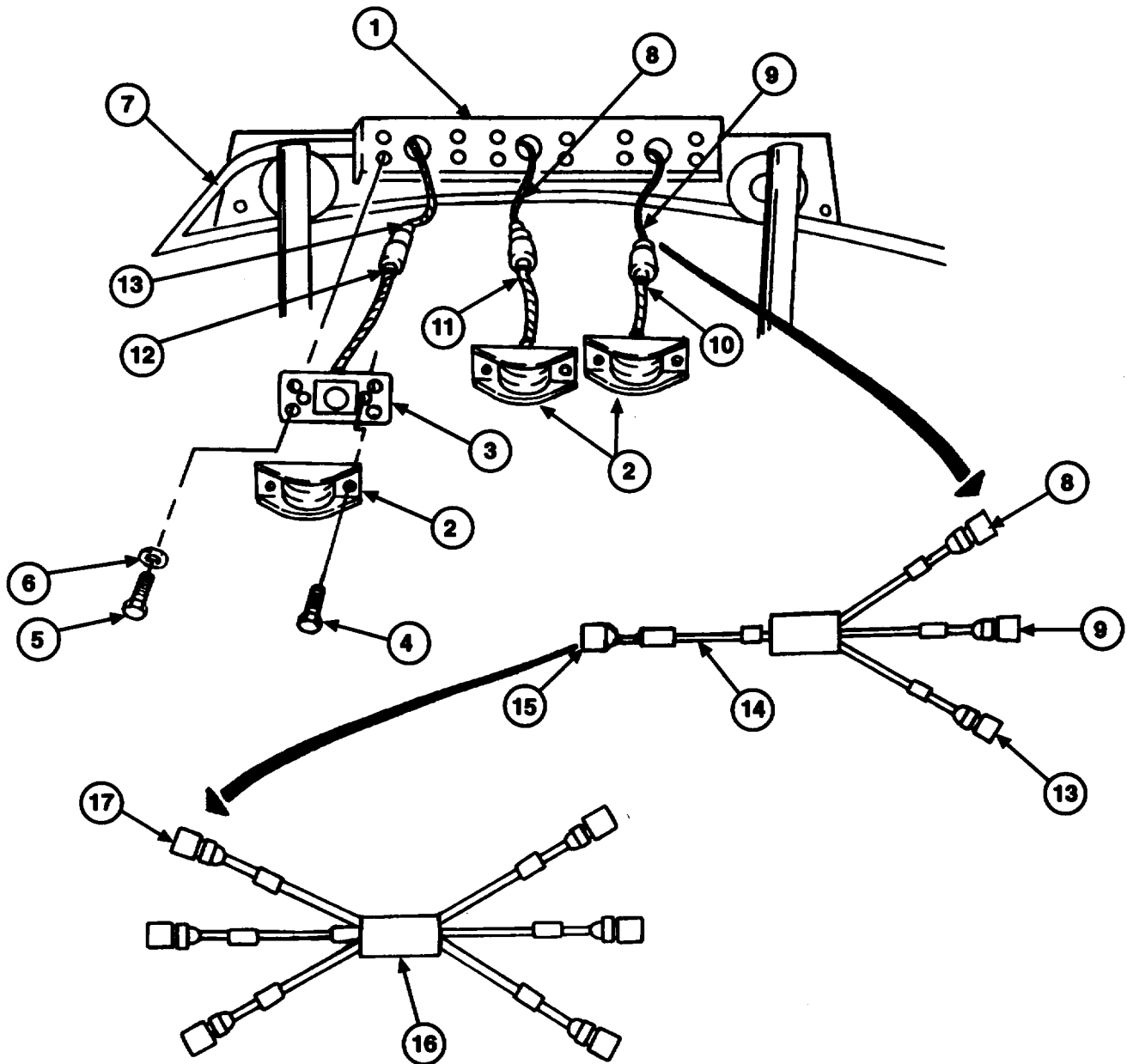
1. Remove six screws (4) and three lens housing covers (3) from three marker light bodies (2).
2. Remove 12 screws (5) and washers (6) and three marker light bodies (2) from marker light box (1).





**2-39. LEAD ASSEMBLY 12275206 REPLACEMENT (continued).**

3. Tag and disconnect three lead 489 connectors (8, 9, and 13) of lead assembly 12275206 (14) from three lead connectors (10, 11, and 12) of marker light bodies (3).
4. Tag and disconnect lead 489 (15) connector of lead assembly 12275206 (14) from lead connector (17) of lead assembly 12275208 (16) at road-side composite light box. Cut connector from end of lead 489 (15) of lead assembly 12275206 (14).
5. Pull lead assembly 12275206 (14) through conduit (7) and out through marker light box (1).



---

**2-39. LEAD ASSEMBLY 12275206 REPLACEMENT (continued).**

---

**b. INSTALLATION****NOTE**

- All marker lights are Installed the same way.
- Repair wiring harness as required (para 2-46).

1. Starting at marker light box (1), pull lead assembly 12275206 (14) through conduit (7) and through road-side composite light box.
2. Install new connector on lead 489 (15) of lead assembly 12275206 (14).
3. Connect lead 489 (15) connector of lead assembly 12275206 (14) to lead connector (17) of lead assembly 12275205 (16) at road-side composite light box.
4. Connect three lead 489 connectors (8, 9, and 10) of lead assembly 12275206 (14) to three lead connectors (10, 11, and 12) of marker light bodies (3).
5. Install 12 screws (5) and washers (6) and three marker light bodies (3) on marker light box (1).
6. Install six screws (4) and three lens housing covers (2) on marker light bodies (3).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).
- Install road-side composite light cover plate (para 2-30).

a. Removal

**Tools/Test Equipment:**

- Equipment Conditions:**

- ### Materials/Parts:

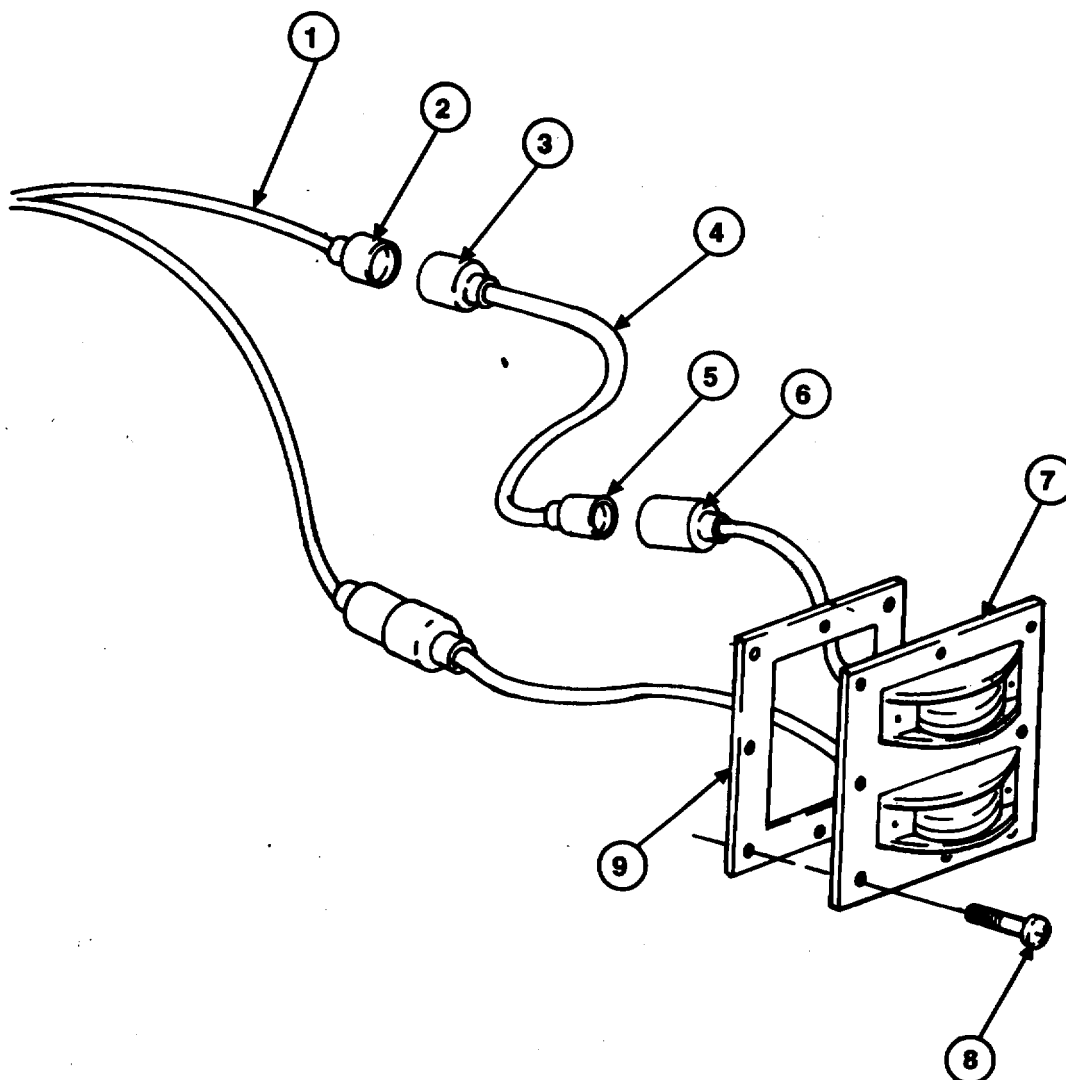
- Gasket (item 43, Appendix F)

1. Remove eight screws (8), road-side blackout marker light (7), and gasket (9) from road-side blackout marker light box. Discard gasket.
3. Tag and disconnect lead 489 connector (5) of electrical jumper from intervehicular cable to road-side blackout marker light lead (4) from lead connector (6) of blackout marker light (7) at roadside blackout marker light box.
4. Tag and disconnect lead 489 connector (3) of lead (4) from lead 489 connector (2) of front marker lights lead assembly (1) at road-side blackout marker light box.

## b. INSTALLATION

Repair wiring harness as required (para 2-46).

1. At road-side blackout marker light box, connect lead 489 connector (3) of lead (4) to lead 489 connector (2) of front marker lights lead assembly (1).
2. At road-side blackout marker light box, connect lead 489 connector (5) of lead (4) to lead connector (6) of blackout marker light (7).
3. Install eight screws (8), road-side blackout marker light (7), and new gasket (9) at road-side blackout marker light box.

**2-40. ELECTRICAL JUMPER FROM INTERVEHICULAR CABLE TO ROAD-SIDE BLACKOUT MARKER LIGHT  
LEAD REPLACEMENT (continued).****FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

---

**2.41. LEAD ASSEMBLY 12275208 REPLACEMENT.**

---

*This Task Covers:*

- |            |                 |
|------------|-----------------|
| a. Removal | b. Installation |
|------------|-----------------|

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Road-side composite light cover plate removed (para 2-30).

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- 

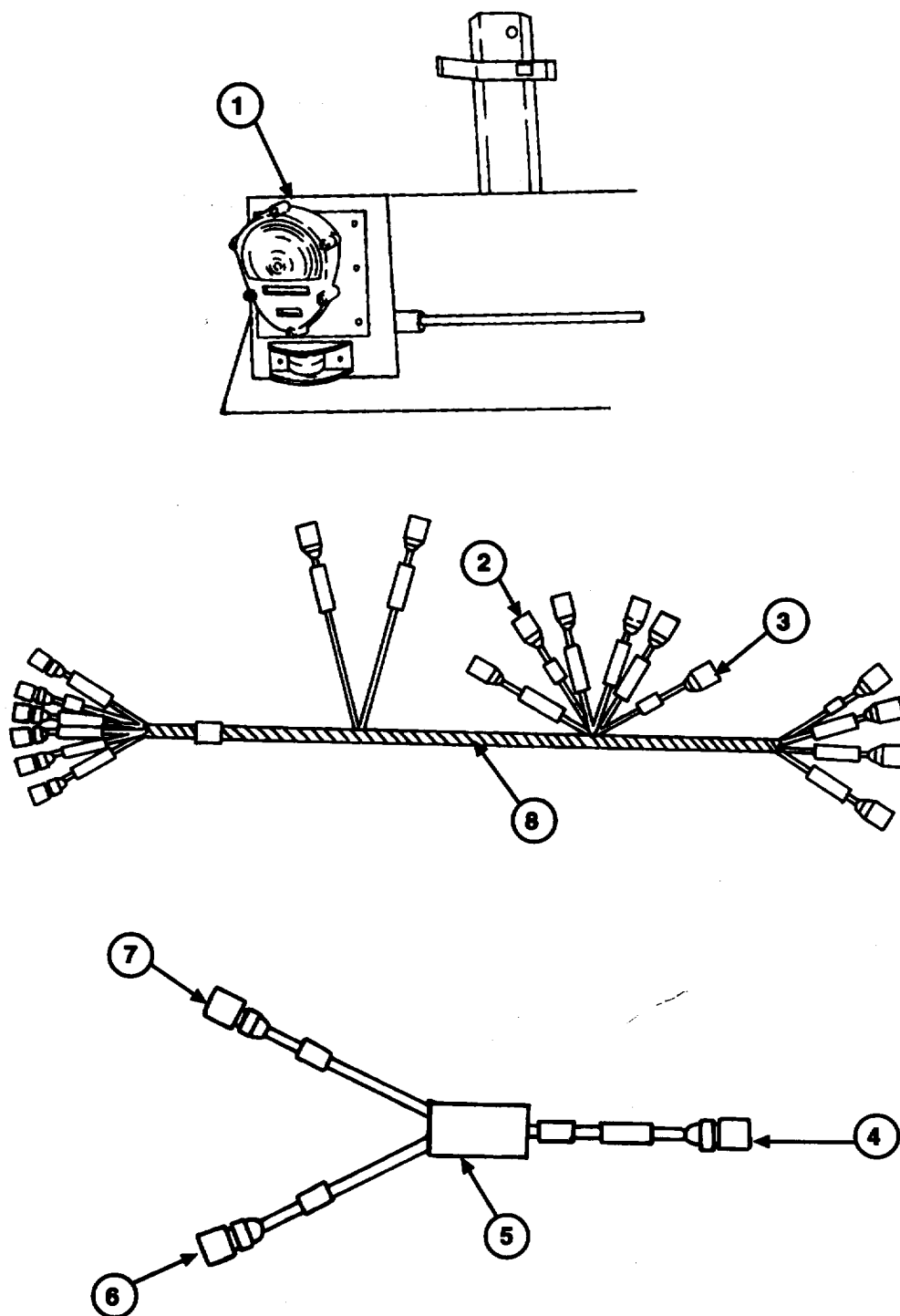
**a. REMOVAL**

1. Tag and disconnect lead 23 connector (4) of lead assembly 12275208 (5) from lead 23 connector (2) of main trailer wiring harness (8).
2. Tag and disconnect lead 23 connector (6) of lead assembly 12275208 (5) from lead 23 connector (3) of main trailer wiring harness (8).
3. Tag and disconnect lead 23 connector(7) of lead assembly 12275208 (5) from lead 23 connector of road-side composite light (1). Remove lead assembly (5) from semitrailer.

**b. INSTALLATION****NOTE**

Repair wiring harness as required (para 2-46).

1. Connect lead 23 connector (7) of lead assembly 12275208 (5) to lead 23 connector of road-side composite light (1).
2. Connect lead 23 connector (6) of lead assembly 12275208 (5) to lead 23 connector (3) of main trailer wiring harness (8).
3. Connect lead 23 connector (4) of lead assembly 12275208 (5) to lead 23 connector (2) of main trailer wiring harness (8).

**2-41. LEAD ASSEMBLY 12275208 REPLACEMENT (continued).****FOLLOW-ON MAINTENANCE:**

- Install road-side composite light cover plate (para 2-30).
- Disconnect ground (refer to TM 92330-398-10).

a. Removal

### b. Installation

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

### Materials/Parts:

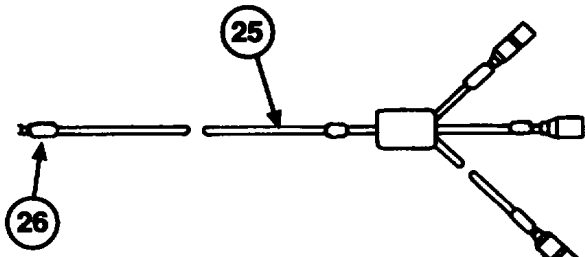
- Gasket (Item 46, Appendix F)
- Gasket (Item 75, Appendix F)
- Lockwasher (4) (Item 95, Appendix F)

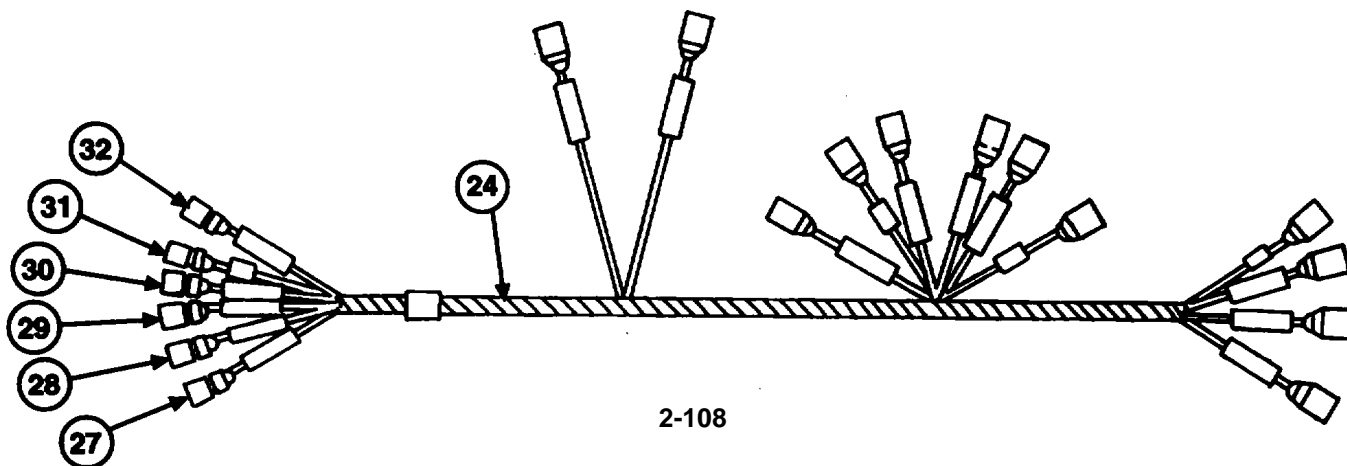
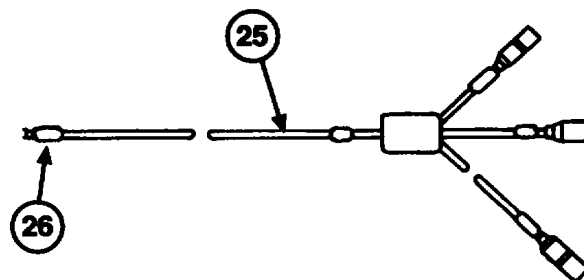
- Lockwasher (6) (Item 94, Appendix F)
- Self-locking nut (Item 166, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10)
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

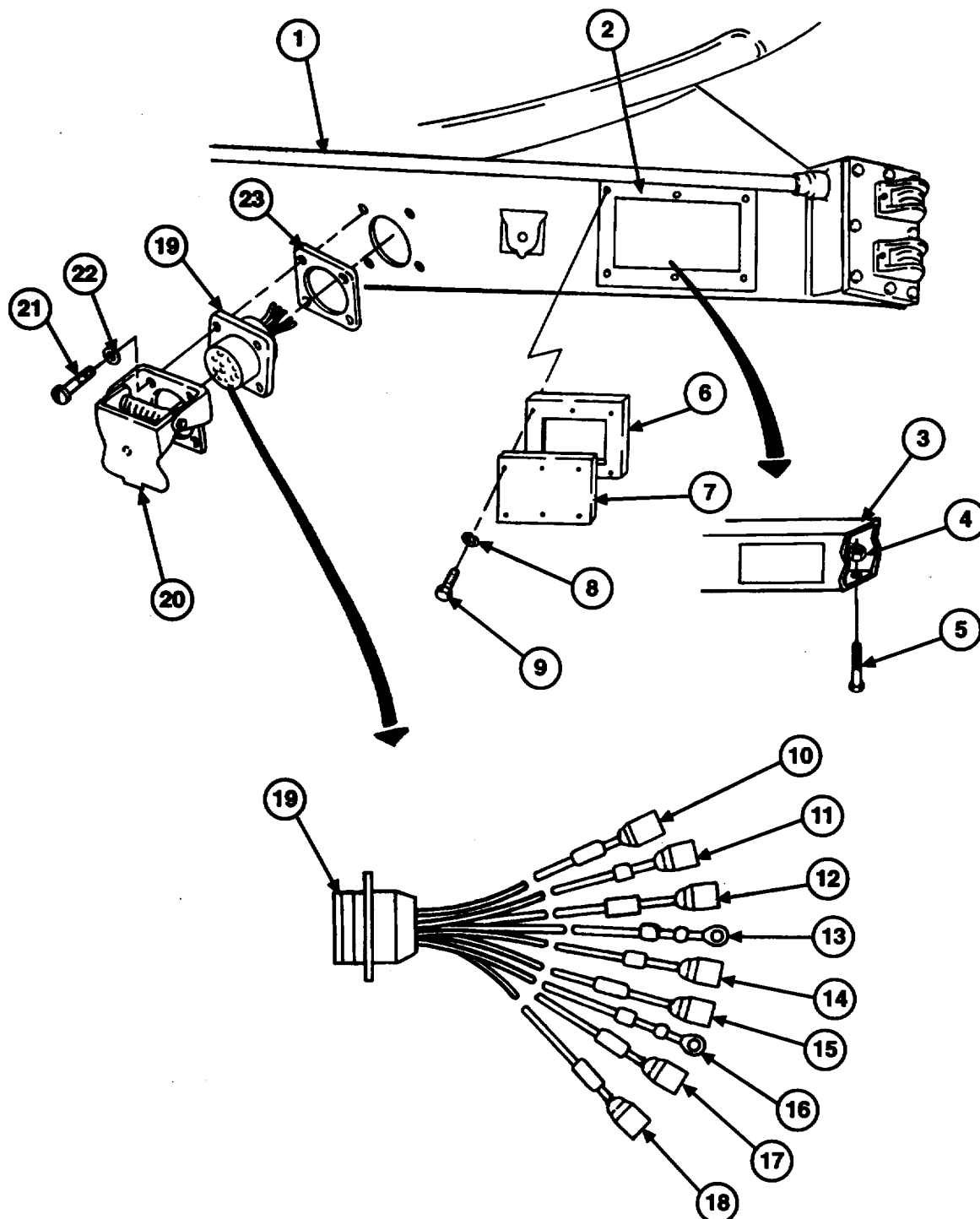
**a. REMOVAL**

1. Remove six screws (9) and lockwashers (8), access cover (7), and gasket (6) from access hole (2). Discard gasket and lockwashers.
  2. From inside access hole (2), tag and disconnect lead connectors (10, 11, 12, 14, 17, and 18) of electrical intervehicular wiring harness lead assembly (19) from lead connectors (27, 28, 29, 30, 31, and 32) of main trailer wiring harness (24).
  3. From inside access hole (2), remove screw (5) and self-locking nut (4) fastening two ground leads (13 and V J 16) of electrical intervehicular wiring harness lead assembly (19) to bulkhead (3). Discard self-locking nut.
  4. Tag and disconnect lead 489 connector (26) of front marker lights lead assembly (25) from lead 21 -489 connector (15) of electrical intervehicular wiring harness lead assembly (19).
  5. Remove four screws (21) and lockwashers (22), electrical cover (20), electrical intervehicular wiring harness lead assembly (19), and gasket (23) from semitrailer (1). Discard lockwashers and gasket.
- 
- The diagram shows a side view of a trailer bulkhead. A horizontal line represents the bulkhead. On the left, a circular connector labeled '26' is shown. To its right, a rectangular connector labeled '25' is shown. Several wires are connected to these connectors. The diagram is a simplified line drawing used for technical documentation.



**2-42. ELECTRICAL INTERVEHICULAR WIRING HARNESS LEAD ASSEMBLY REPLACEMENT (continued).****b. INSTALLATION****NOTE**

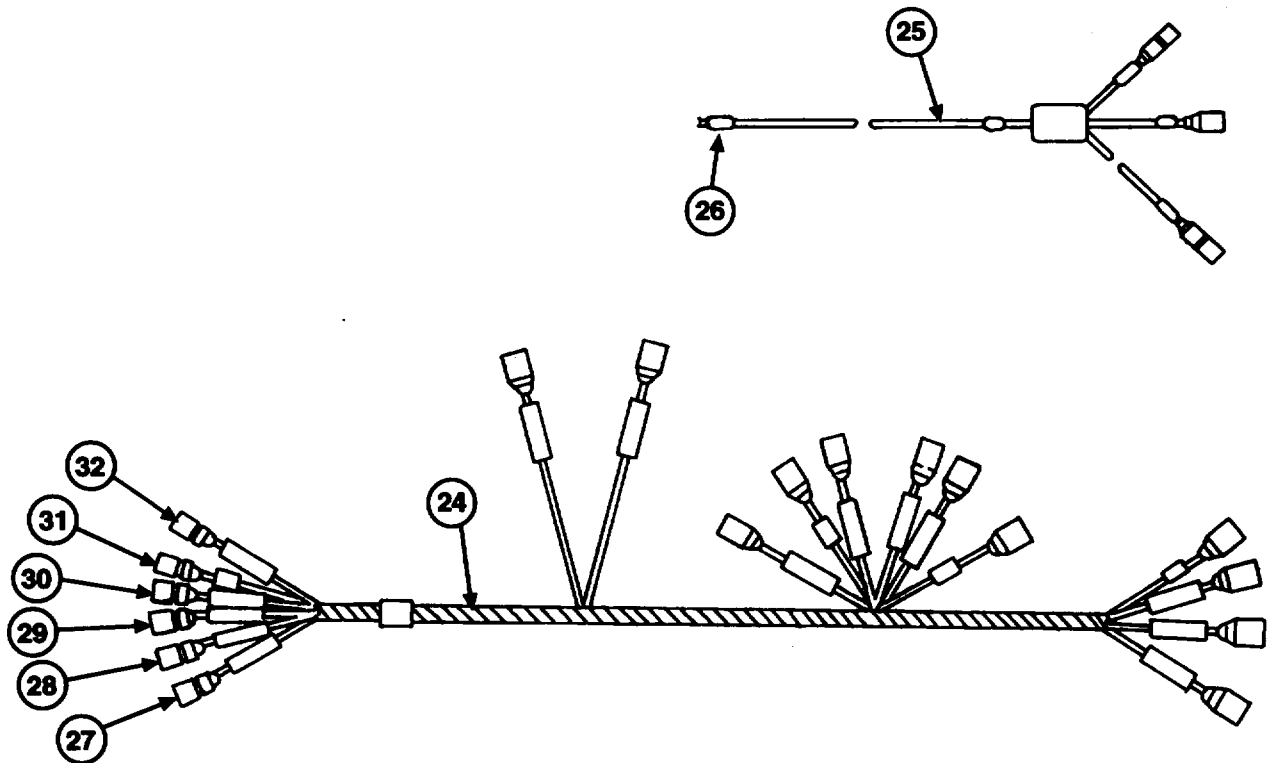
Repair wiring harness as required (para 2-46).



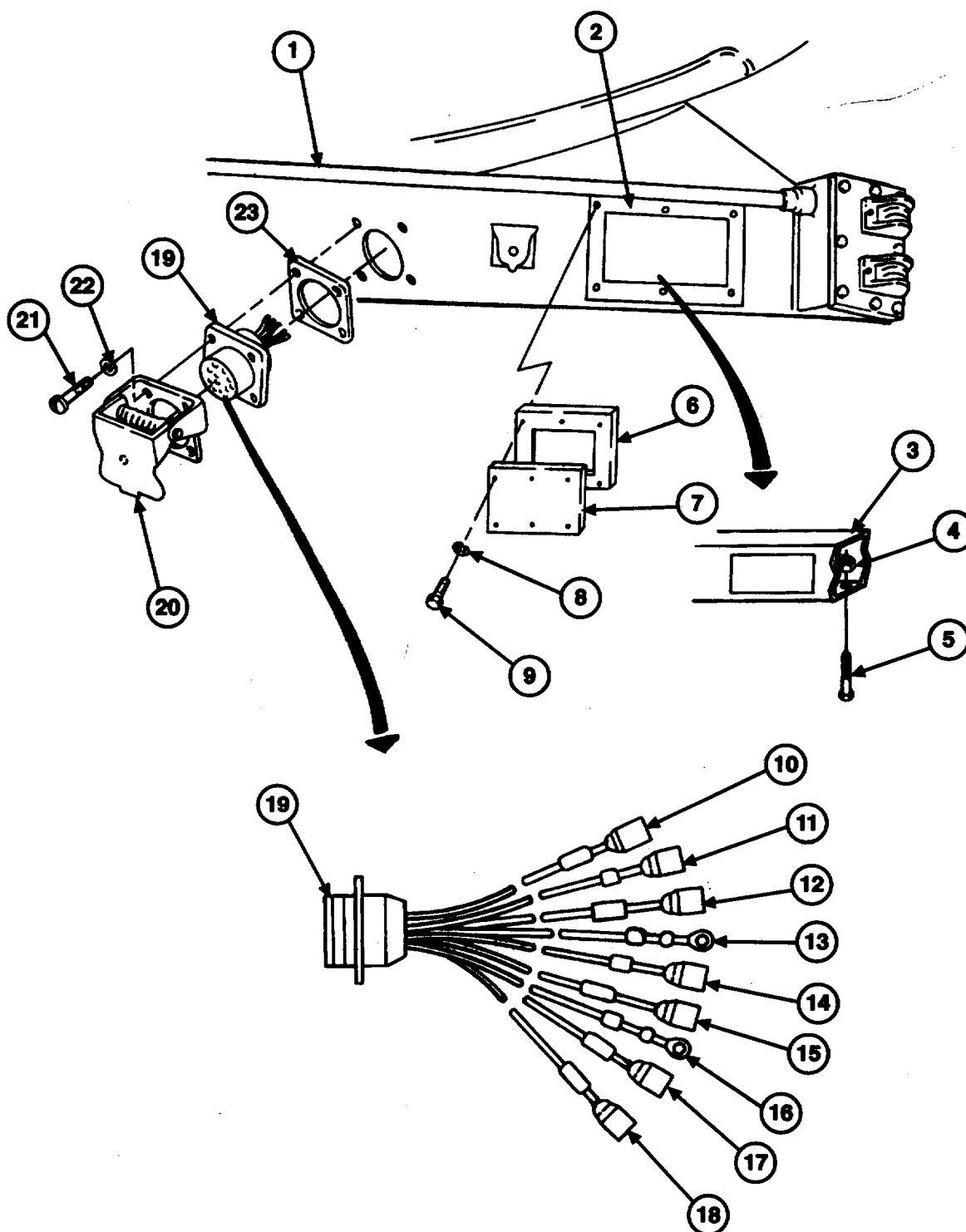


**2-42. ELECTRICAL INTERVEHICULAR WIRING HARNESS LEAD ASSEMBLY REPLACEMENT (continued).**

1. Install four screws (21) and new lockwashers (22), electrical cover (20), electrical intervehicular wiring harness lead assembly (19), and new gasket (23) on semitrailer (1).
2. Connect lead 489 connector (26) of front marker lights lead assembly (25) to lead 21-489 connector (15) of electrical intervehicular wiring harness lead assembly (19).
3. Inside access hole (2), install two ground leads (13 and 16) of electrical intervehicular wiring harness lead assembly (19), screw (5), and new self-locking nut (4) on bulkhead (3).
4. Inside access hole (2), connect lead connectors (10, 11, 12, 14, 17, and 18) of electrical intervehicular wiring harness lead assembly (19) to lead connectors (27, 28, 29, 30, 31, and 32) of main trailer wiring harness (24).
5. Install six screws (9) and new lockwashers (8), access cover plate (7), and new gasket (6) on access hole (2).



## 2.42. ELECTRICAL INTERVEHICULAR WIRING HARNESS LEAD ASSEMBLY REPLACEMENT (continued).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

---

**2-43. WIRING HARNESS 12356095 REPLACEMENT.**

---

*This Task Covers:*

- |            |                 |
|------------|-----------------|
| a. Removal | b. Installation |
|------------|-----------------|

---

*Initial Setup:*

**Tools/Test Equipment:**

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• General mechanic's tool kit (Item 4, Appendix B)</li> </ul> | <ul style="list-style-type: none"> <li>• Semitrailer bonded and grounded (refer to TM 9-2330-398-10).</li> <li>• Composite light cover plates removed (para 2-30).</li> </ul> |
|--|---|

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- 

**NOTE**

- Composite light boxes are located on curb side and road side of semitrailer. Removal of cover plate is common for both boxes.
- Connectors must be removed in order to pull wiring harness through conduit.

**a. REMOVAL**

1. From inside road-side and curb-side composite light boxes (2 and 4), tag and disconnect lead 490 connectors (8 and 9) of wiring harness 12356095 (10) from lead 490 connectors of blackout clearance lights (1 and 5). From inside curb-side light box (4), cut lead 490 connectors (8) from lead 490.
2. From inside road-side composite light box (2), tag and disconnect lead 490 connector (11) of wiring harness 12356095 (10) from lead 490 connector (7) of front blackout marker lights wiring harness (6).
3. Pull wiring harness 12356095 (10) through conduit (3) and out through road-side composite light box (2).

**b. INSTALLATION**

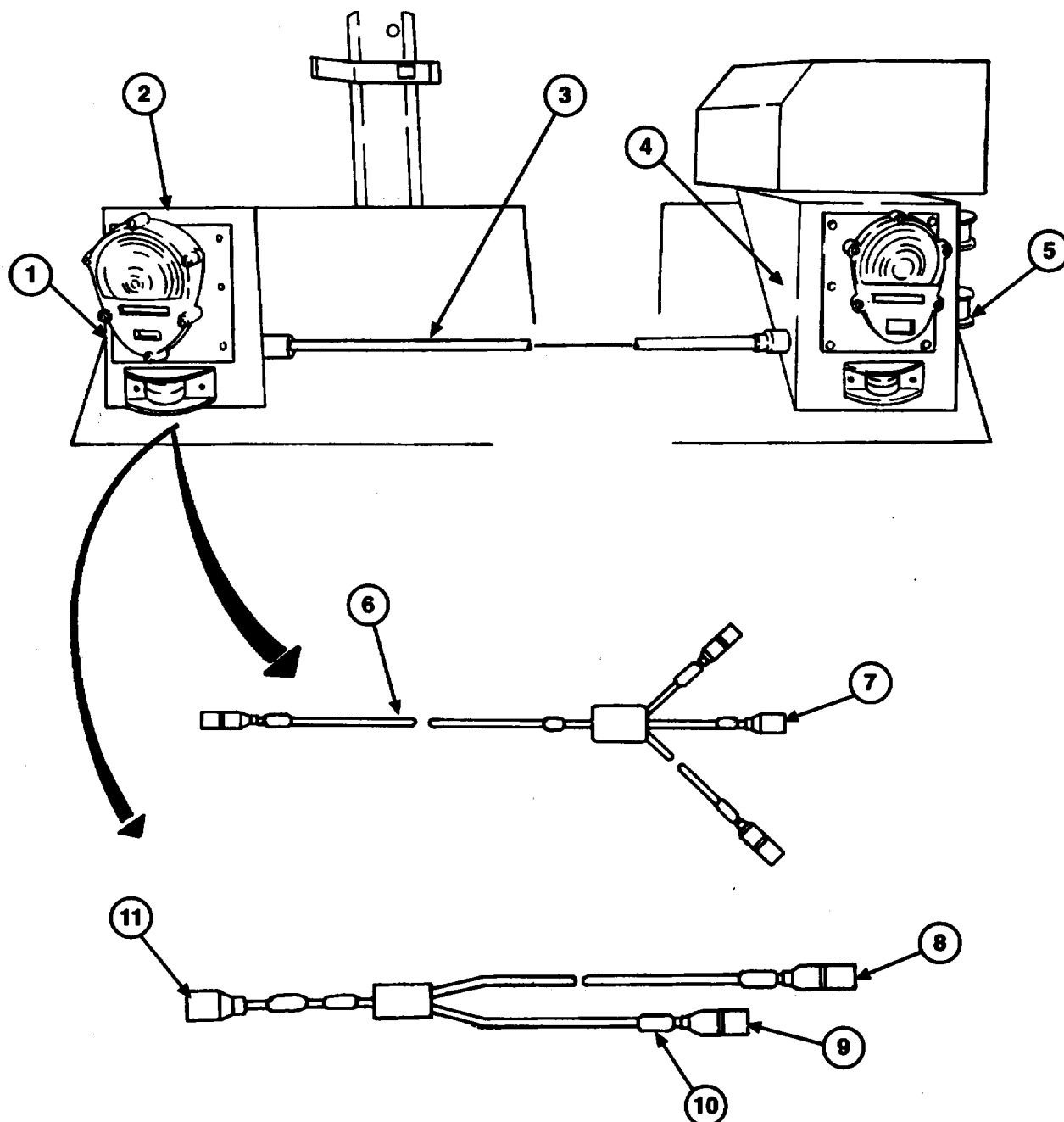
**NOTE**

Repair wiring harness as required (para 2-46).

1. Pull lead 490 (8) through conduit (3) and out through curb-side composite light box (4).
2. Install new connector on lead 490.
3. Inside road-side composite light box (2), connect lead 490 connector (11) of wiring harness 12356095 (10) to lead 490 connector (7) of front blackout marker lights wiring harness (6).

**2-43. WIRING HARNESS 12356095 REPLACEMENT (continued).**

4. Inside road-side and curb-side composite light boxes (2 and 4), connect two lead 490 connectors (8 and 9) of wiring harness 12356095 (10) to lead 490 connectors of two blackout clearance lights (1 and 5).

**FOLLOW-ON MAINTENANCE:**

- composite light cover plates (para 2-30).
- ground (refer to TM 9-2330-398-10).

---

**2-44. LEAD ASSEMBLY 12275205 REPLACEMENT.**

---

*This Task Covers:*

- |            |                 |
|------------|-----------------|
| a. Removal | b. Inspection   |
|            | c. Installation |
- 

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

- Road-side composite light cover plate removed (para 2-30).
- 

**a. REMOVAL**

1. Tag and disconnect lead 489 connector (7) of lead assembly 12275205 (4) from service light lead 489 connector at road-side composite light box (1).
2. Tag and disconnect lead 489 connector (6) of lead assembly 12275205 (4) from service light lead 489 connector at road-side composite light box (1).
3. Tag and disconnect lead 21 connector (5) of lead assembly 12275205 (4) from composite light lead 21 connector at road-side composite light box (1).
4. Tag and disconnect lead 21-489 connector (11) of lead assembly 12275205 (4) from lead 21-489 connector (10) of main trailer wiring harness (9).
5. Tag and disconnect lead 21-489 connector (12) of lead assembly 12275205 (4) from lead 21-489 connector (8) of main trailer wiring harness (9).
6. Tag and disconnect lead 489 connector (13) of lead assembly 12275205 (4) from lead 489 connector (2) of lead assembly 12275206 (3). Remove lead assembly 12275205 (4) from road-side composite light box (1).

**b. INSPECTION**

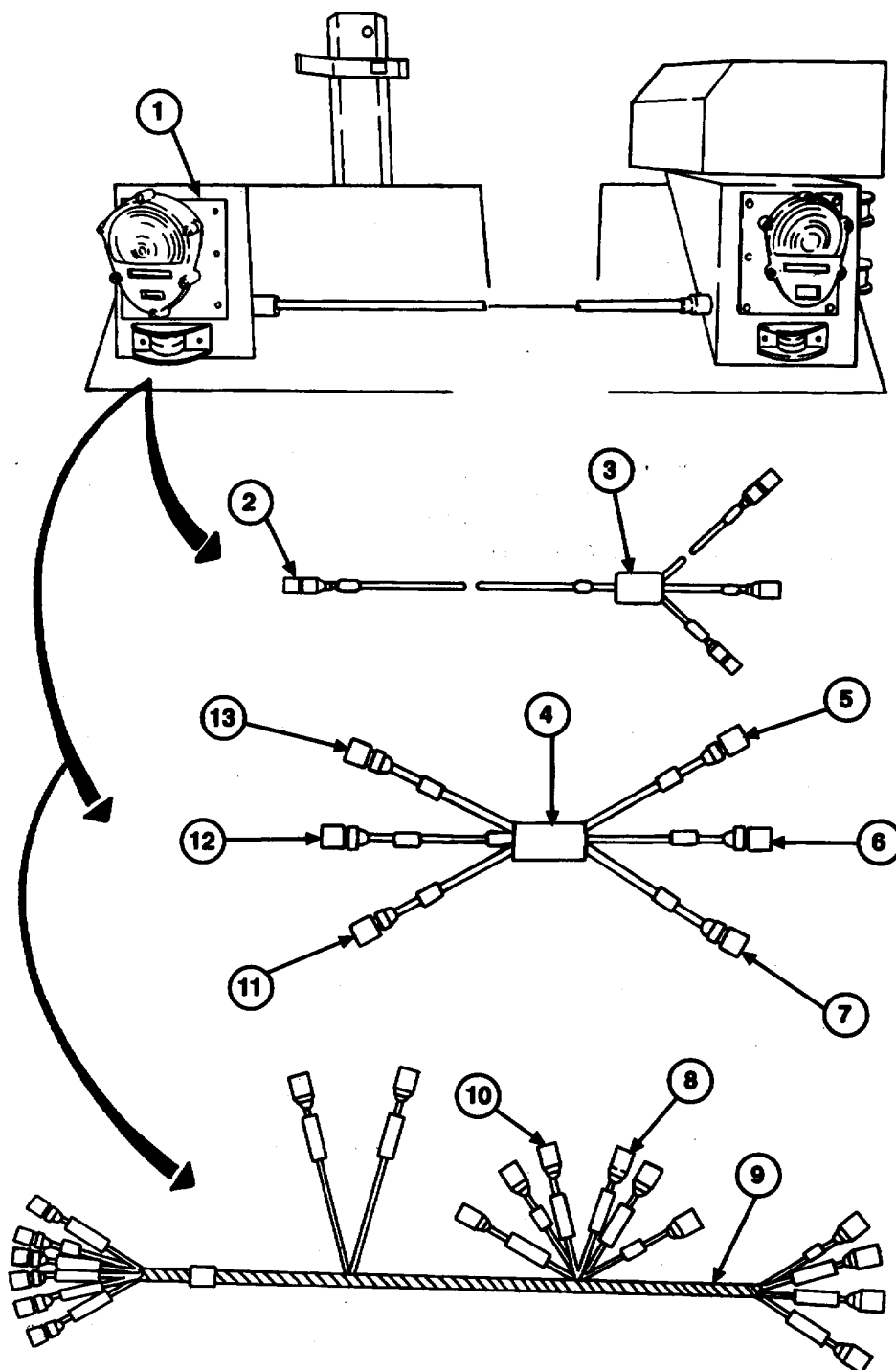
Inspect lead assembly for loose or damaged connectors, frayed or exposed wiring, and worn or missing insulation. If these conditions exist, perform appropriate repair to harness (para 2-46).

**c. INSTALLATION**

1. Connect lead 489 connector (13) of lead assembly 12275205 (4) to lead 489 connector (2) of lead assembly 12275206 (3).
2. Connect lead 21-489 connector (12) of lead assembly 12275205 (4) to lead 21-489 connector (8) of main trailer wiring harness (9).
3. Connect lead 21-489 connector (11) of lead assembly 12275205 (4) to lead 21-489 connector (10) of main trailer wiring harness (9).
4. Connect lead 21 connector (5) of lead assembly 12275205 (4) to composite light lead 21 connector at roadside composite light box (1).
5. Connect lead 489 connector (6) of lead assembly 12275205 (4) to service light lead 489 connector at roadside composite light box (1).

**2-44. LEAD ASSEMBLY 12275205 REPLACEMENT (continued).**

6. Connect lead 489 connector (7) of lead assembly 12275205 (4) to service light lead 489 connector at road-side composite light box (1).

**FOLLOW-ON MAINTENANCE:**

- road-side composite light cover plate (para 2-30).
- ground (refer to TM 9-2330-398-10).

---

**2-45. WIRING HARNESS COMPONENTS REPLACEMENT.**

---

*This Task Covers:*

a. Removal

b. Installation

---

*Initial Setup:***Tools and Lost Equipment**

• General mechanic's tool kit (Item 4, Appendix B)

• Semitrailer bonded and grounded (refer to TM 9-2330-39810).

**Equipment Conditions:**

Semitrailer uncoupled (refer to TM 9-2330-398-10).

---

**WARNING**

When troubleshooting an electrical malfunction or performing electrical maintenance, **ALWAYS** disconnect intervehicular electrical cable from semitrailer and disconnect semitrailer negative battery cables at batteries. Failure to follow this warning may create a spark and explosion, resulting in serious injury or death to personnel.

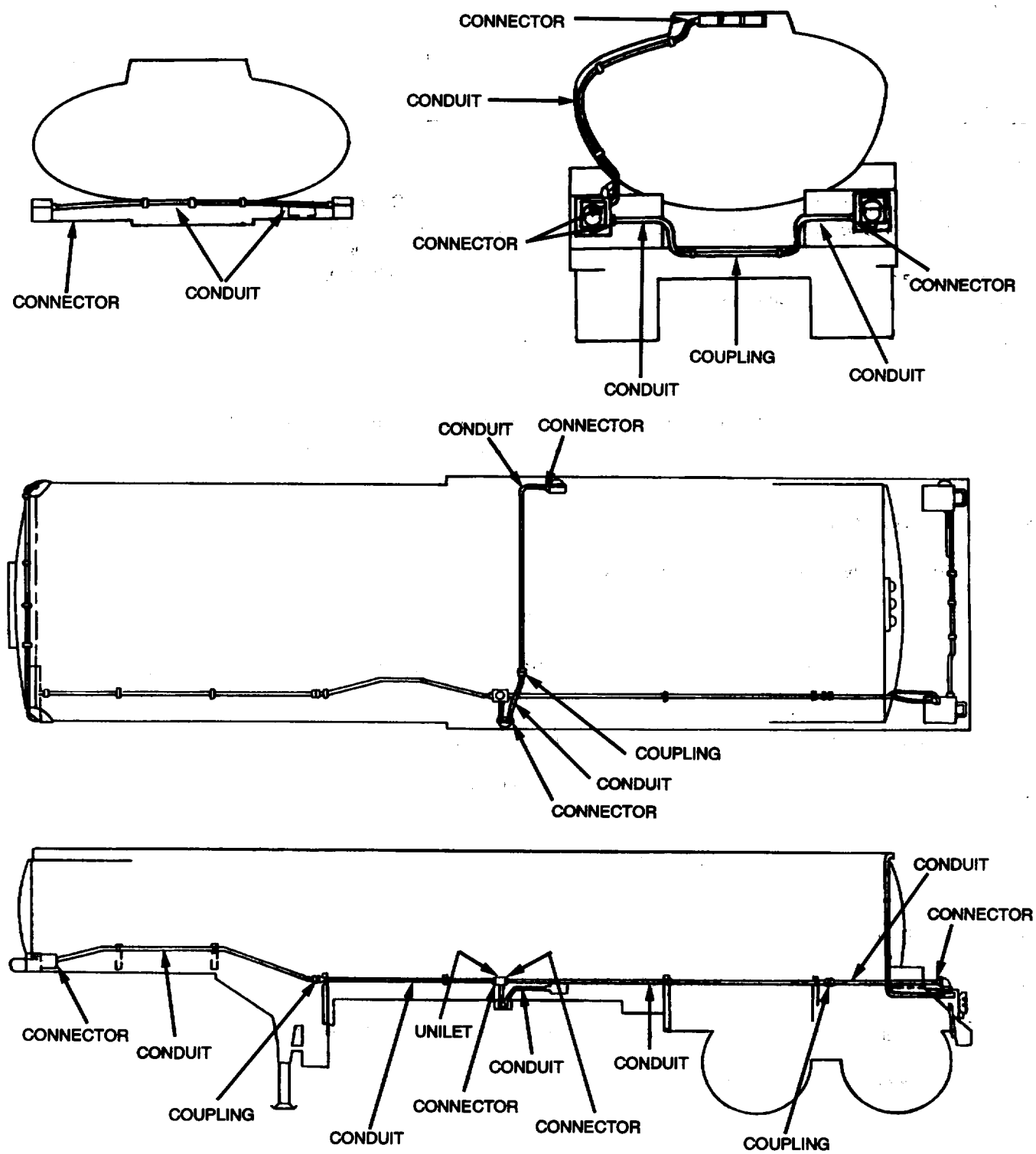
**a. REMOVAL****NOTE**

Use illustration as reference when removing conduit. Where conduit passes under clips, bend clips far enough back to remove conduit, but do not break off clips.

**b. INSTALLATION****NOTE**

Use illustration as reference when installing conduit. If enough clips break off to hamper installation of conduit, notify Direct Support maintenance to weld on new clips.

## 2-45. WIRING HARNESS COMPONENTS REPLACEMENT (continued).

**FOLLOW-ON MAINTENANCE:**

- ground (refer to TM 9-2330-398-10).



a. Disassembly

b. Assembly

### Tool Test Equipments:

- General mechanic's tool kit (Item 4, Appendix B)

### Equipment Conditions

- Semitrailer uncoupled (refer to TM 9-2330-39810).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

### Material/Parts:

- Tape, insulation, electrical (Item 31, Appendix C)

## NOTE

**This task applies to all wiring harnesses and lead assemblies. See illustration for location of wiring harnesses and lead assemblies.**

### a. DISASSEMBLY

1. Remove any loose or damaged connectors from wiring harness/lead assembly.

### NOTE

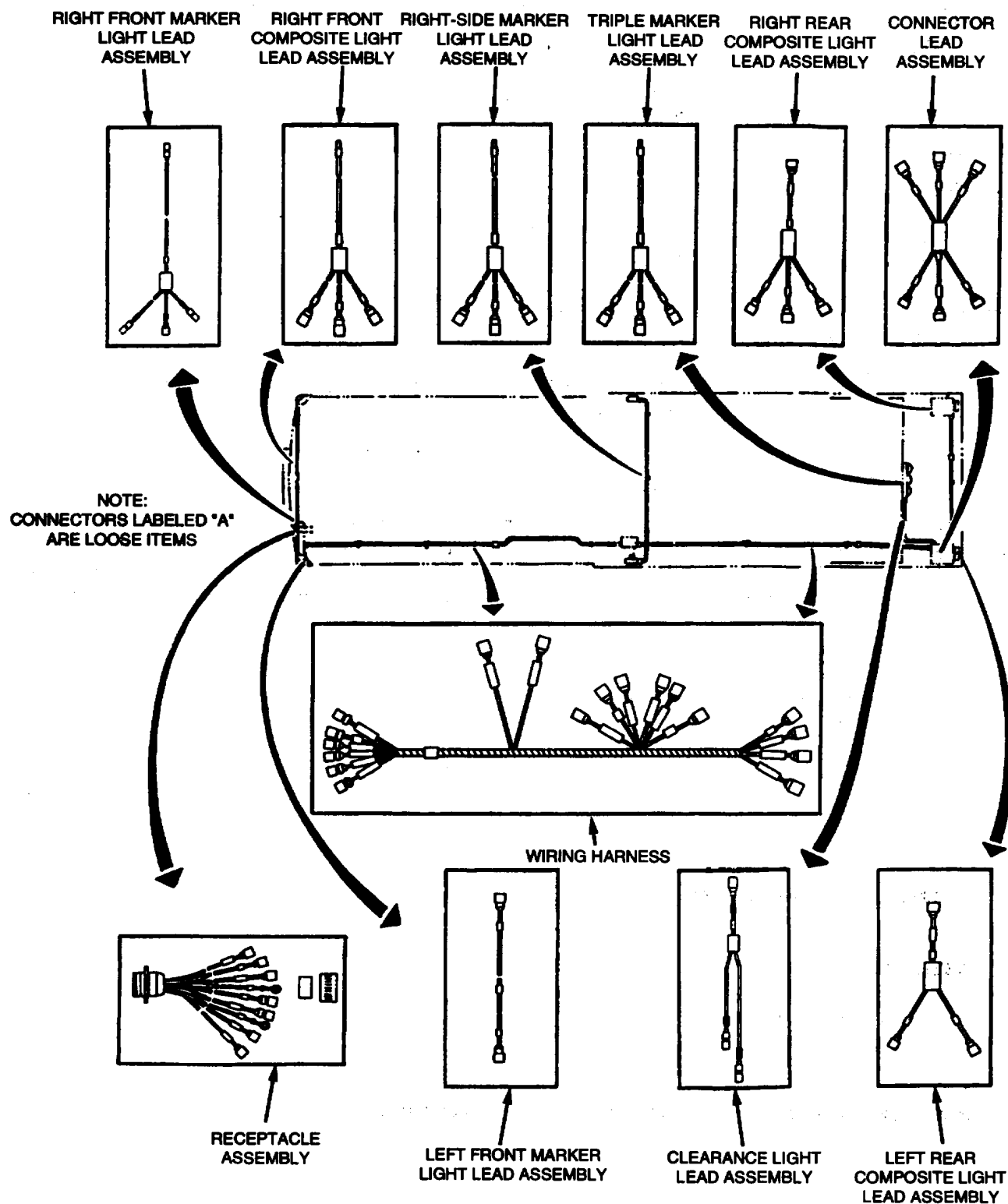
**Remove electrical insulation tape only from section of wiring harness/lead assembly to be disassembled.**

2. Remove electrical insulation tape from section of wiring harness/lead assembly.
3. Separate and isolate wiring harness/lead assembly branches.
4. Disassemble each wiring harnessed assembly branch and replace defective wires.

## b. ASSEMBLY

1. 4leassemble each wiring harness/lead assembly branch.
2. Regroup wiring harness/lead assembly branches and secure with electrical insulation tape.
3. Install new connectors on wiring harness/lead assembly as required.

2-46. WIRING HARNESS AND LEAD ASSEMBLY REPAIR (continued).



**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

## Section VII. BRAKE SYSTEM MAINTENANCE

Paragraph Number	Paragraph Title	Page Number
2-47	General.....	2-120
2-48	Brake-Actuating Camshaft Replacement .....	2-121
2-49	Brakeshoe Replacement .....	2-124
2-50	Slack Adjuster Replacement .....	2-128
2-51	Brake Air Chamber Replacement and Test .....	2-131
2-52	Service and Emergency Couplings, Air Lines, and Fittings Replacement .....	2-133
2-53	Emergency Relay Valve Replacement.....	2-135
2-54	Air Reservoir Replacement .....	2-136
2-55	Safety Relief Valve Replacement.....	2-138
2-56	Parking Brake Control Valve Replacement.....	2-140
2-57	Air Line Tubing and Fittings Replacement .....	2-142
2-58	Brake Air Hose Replacement.....	2-144
2-59	Full Function Valve and Direct Linear Valve Replacement .....	2-146
2-60	Release of Fail-Safe Chamber Brakes.....	2-148

**2-47. GENERAL.**

The M969A2 semitrailer brakes are air-operated, cam-type brakes. Two brake-actuating camshafts, slack adjusters, and brake airchambers are assembled on each axle. When the brake is actuated air is applied to the brake chambers and the diaphragm rod moves the slack adjusters, rotating the brake camshaft against the two rollers on the brakeshoes. This action forces the brakeshoes against the brakedrum, causing friction to slow or stop the vehicle.

**2-48. BRAKE-ACTUATING CAMSHAFT REPLACEMENT.***This Task Covers:*

- a. Removal
- b. Cleaning and Inspection
- c. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

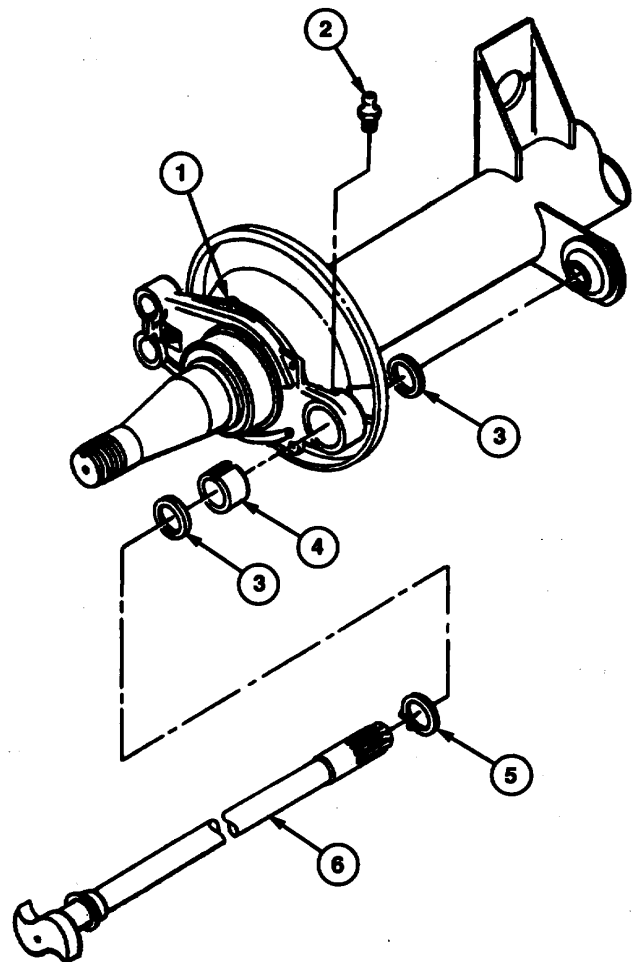
- Drycleaning solvent (Item 12, Appendix C)
- Rag (Item 25, Appendix C)
- Preformed packing (2) (Item 132, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Air reservoir drained (refer to TM 9-2330-398-10).
- Hub and brakedrum assembly (para 2-63).
- Brakeshoes removed (para 2-49).
- Slack adjuster removed (para 2-50).

**a. REMOVAL**

1. Expand retaining ring (5), slide camshaft (6) partway out of spider (1) and remove retaining ring (5) from camshaft (6).
2. Remove camshaft (6) from spider (1).
3. Remove two preformed packings (3) and spider bushing (4) from camshaft (6). Discard preformed packings.
4. Remove lubrication fitting (2) from spider (1).



---

**2-48. BRAKE-ACTUATING CAMSHAFT REPLACEMENT (continued).**

---

**b. CLEANING AND INSPECTION****WARNING**

Drycleaning solvent P-D-680 is toxic and is, toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breathe vapors. DO NOT use near open flames or excessive heat.

**NOTE**

If necessary, use a wire brush to remove caked-on dirt and corrosion from camshaft and inner and outer restraints.

1. Clean all metal parts with drycleaning solvent and rag. Dry all parts with compressed air.
2. Inspect camshaft for twists and bends. Replace if damaged.
3. Inspect spider bushing and camshaft bushing for cracks and excessive wear. Replace if damaged.

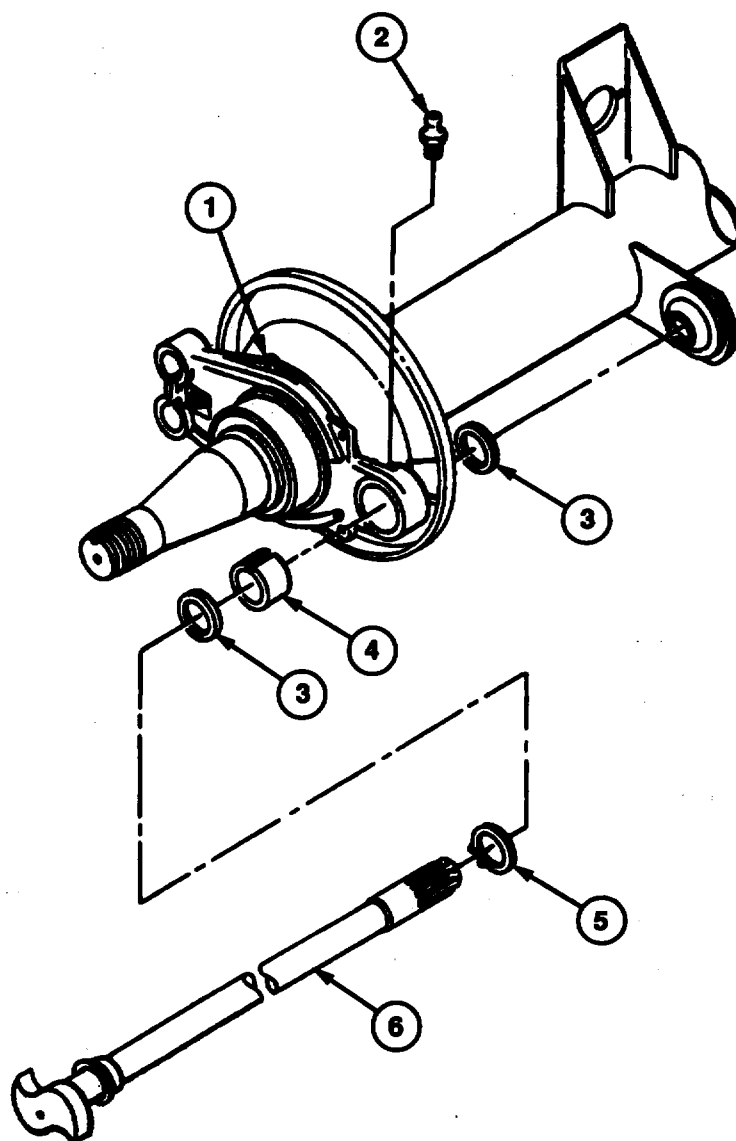
**c. INSTALLATION**

1. Install lubrication fitting (2) on spider (1).
2. Expand retaining ring (5) and slide retaining ring (5) over camshaft (6).
3. Install new preformed packing (3) on camshaft (6), and slide camshaft (6) partway into spider (1).
4. Install spider bushing (4) and new preformed packing (3) on camshaft (6).
5. Lock camshaft (6) in place with retaining ring (5).

---

**2-48. BRAKE-ACTUATING CAMSHAFT REPLACEMENT (continued).**

---

**FOLLOW-ON MAINTENANCE:**

- Install slack adjuster (para 2-50).
- Install brake shoes (para 2-49).
- Install hub and brake drum assembly (para 2-63).
- Adjust slack adjuster (para 2-50).
- Lubricate camshaft (Appendix G).
- Disconnect ground (refer to TM 9-2330-39110).

## 2-49. BRAKESHOE REPLACEMENT.

### *This Task Covers:*

- a. Removal
- c. Installation

- b. Cleaning and Inspection

### *Initial Setup:*

#### **Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

- Lockwasher (6) (Item 95, Appendix F)
- Retaining ring (4) (Item 145, Appendix F)
- Seal (Item 148, Appendix F)

#### **Material/Parts:**

- Drycleaning solvent (Item 12, Appendix C)
- Grease (Item 7, Appendix C)
- Rag (Item 25, Appendix C)
- Brakeshoe return spring (Item 2, Appendix F)
- Gasket (Item 22, Appendix F)

#### **Equipment Conditions:**

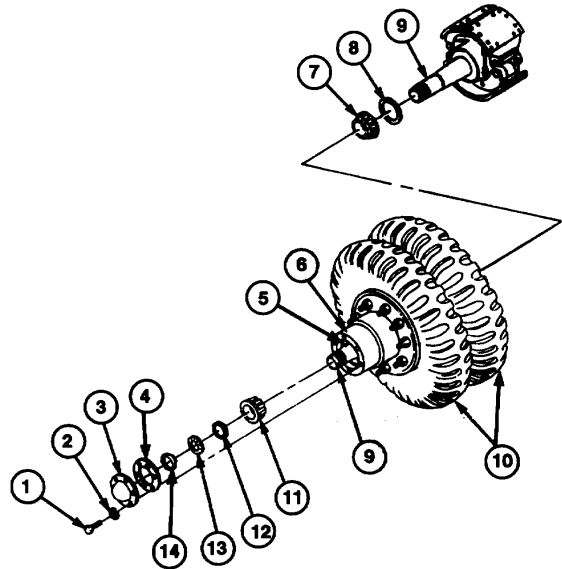
- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Fail-safe chamber brakes caged (para 2-60).
- Air reservoirs drained (refer to TM 9-2330-398-10).

### a. REMOVAL

#### **NOTE**

**If replacing brakeshoes only, perform this task as written. If other tire, wheel, hub, and brakedrum maintenance is required, refer to paragraphs 2-62 and 2-63.**

1. Raise axle until tires clear the ground. Remove six bolts (1) and lockwashers (2), hubcap (3), and gasket (4) from hub and drum assembly (6). Discard gasket and lockwashers.
2. Remove outer wheel bearing nut (14), lockring (13), and inner wheel bearing nut (12) from spindle (9).
3. Remove outer wheel bearing (11) from outer wheel bearing cup (5) and spindle (9).



**2-49. BRAKESHOE REPLACEMENT (continued).**

4. Place wheel lift jack under tires (10), and slide tires (10), wheels, and hub and drum assembly (6) off spindle (9).

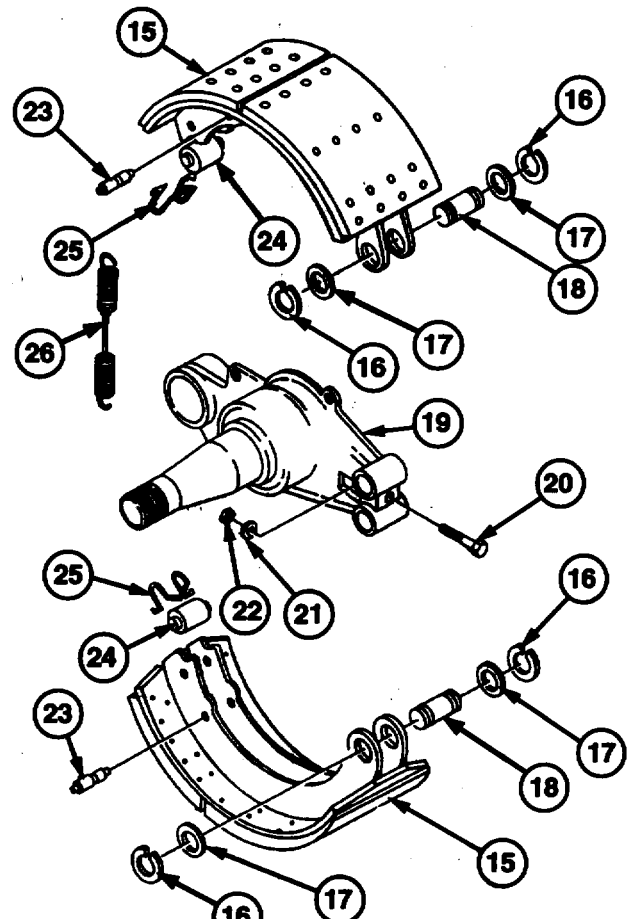
**NOTE**

For cleaning and inspection of bearing, wheels, hubs, and drums, refer to paragraph 2-63.

5. Remove inner wheel bearing (7) from hub and drum assembly (6) or spindle (9).
6. Using seal puller, remove seal (8) from spindle (9). Discard seal.
7. Loosen bolt (20) on spider (19).

**WARNING**

Use care when removing spring. Spring is under tension and can act as a projectile when released and cause severe eye injury.



8. Using brake spring pliers, remove brakeshoe return spring (26) from two spring pins (23). Discard spring.
9. Remove four retaining rings (16) and washers (17) from two anchor pins (18). Discard retaining rings.
10. Remove nut (22), washer (21), and bolt (20) from spider (19).
11. Remove roller retainer (25) and roller (24) from each of two brakeshoes (15).
12. Remove spring pin (23) from each of two brakeshoes (15).
13. Drive anchor pin (18) from rear of each of two brakeshoes (15), and remove brakeshoes (15) from spider (19).
- b. CLEANING AND INSPECTION

**WARNING**

Drycleaning solvent P-D-680 is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breathe vapors. DO NOT use near open flames or excessive heat.

1. Clean anchor pins, rollers, roller retainers, and spring pins with drycleaning solvent and rag.



**2-49. BRAKESHOE REPLACEMENT (continued).**

2. Inspect all parts for damage. Replace any damaged parts.
3. Inspect brake linings for damage and wear. Replace brakeshoe if lining is damaged or is worn within 0.063 inch (1.570 cm) of rivet heads (approximately 1/16 inch).

**NOTE**

- Brakeshoes with linings that will not last until the next scheduled maintenance interval should be tagged for repair.
- To calculate expected wear, record lining wear between scheduled annual brake maintenance periods.
- New brake lining has approximately 0.50 inch (12.70 mm) of stock above center rivets and approximately 0.25 inch (6.35 mm) of stock above end rivets.

4. If brake linings need replacement or if drums need refacing, notify Direct Support maintenance.

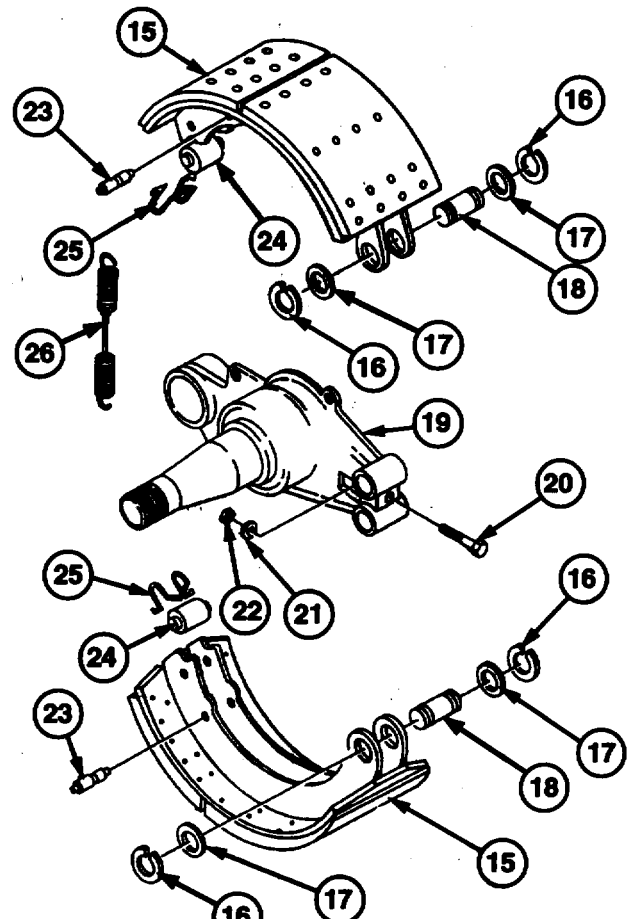
**c. INSTALLTION**

1. Install bolt (20), washer (21), and nut (22) on spider (19). Do not tighten bolt.
2. Install spring pin (23) on each of two brakeshoes (15).
3. Install roller (24) and roller retainer (25) on each brakeshoe (15).
4. Install each brakeshoe (15) on spider (19) with anchor pin (18) and two washers (17) and new retaining rings (16).

**WARNING**

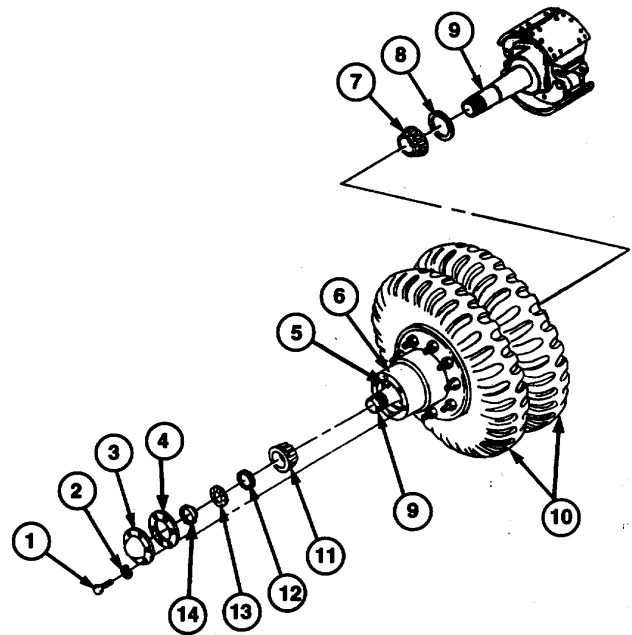
Use care when installing spring. Spring is under tension and can act as a projectile when released and cause sever eye injury.

5. Using brake spring pliers, install new spring (26) on two spring pins (23).



**2-49. BRAKESHOE REPLACEMENT (continued).**

6. Tighten nut (22) and bolt (20) between 100 and 120 lb-ft (135.6 and 162.7 N m).
7. Install inner wheel bearing (7) and new seal (8) in hub and drum assembly (6).
8. Place wheel lift jack under tires (10), and slide tires (10), wheels, and hub and drum assembly (6) onto spindle (9).
9. Install outer wheel bearing (11) on spindle (9).
10. Install inner wheel bearing nut (12) on spindle (9) and tighten to a minimum of 75 ft-lb (102 Nom) to ensure proper seating of wheel bearings (7 and 11). Loosen inner wheel bearing nut (12) so wheel will turn freely.
11. To properly position bearing for final adjustment, tighten inner wheel bearing nut (12) to 50 ft-lb (69 Nom) while rotating wheel.
12. Loosen inner wheel bearing nut (12) 1/3 turn.
13. Install locking (13) on spindle (9) so dowel on inner wheel bearing nut (12) aligns with hole in locking (13) and tang fits in keyway of spindle (9).

**WARNING**

**Failure to torque outer wheel bearing nut properly can cause wheel to come off during vehicle operation, which could result in injury or death to personnel or damage to equipment**

14. Install outer wheel bearing nut (14) on spindle (9). Tighten outer wheel bearing nut (14) between 250 and 400 ft-lb (339 and 542 N m).
15. Apply light coat of grease to new gasket (4) and position gasket (4) on hub and drum assembly (6).
16. Install hubcap (3) on hub and drum assembly (6) with six bolts (1) and new lockwashers (2). Tighten bolts between 16 and 20 ft-lb (22 and 27 N m).

**FOLLOW-ON MAINTENANCE:**

- Uncage fail-safe chamber brakes (para 2-60).
- Install wheel (if necessary) (para 2-62 or 2-63).
- Disconnect ground (refer to TM 9-2330-398-10).

## 2-50. SLACK ADJUSTER REPLACEMENT.

### *This Task Covers:*

- |                 |                            |
|-----------------|----------------------------|
| a. Removal      | b. Cleaning and Inspection |
| c. Installation | d. Adjustment              |

### *Initial Setup:*

### **Tools and Test Equipment:**

- Common no. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

### **Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 92330-398-10).
- Air reservoirs drained (refer to TM 9-2330-398-10).
- a Fail-safe chamber brakes caged (para 2-60).

### **Material/Parts:**

- Rag (Item 25, Appendix C)
- Cotter pin (Item 7, Appendix F)
- Cotter pin (Item 10, Appendix F)
- Retaining ring (Item 146, Appendix F)

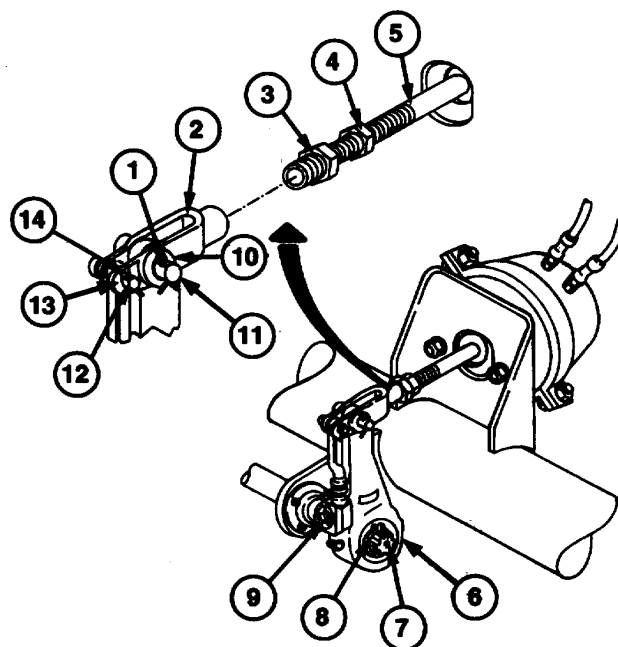
### **a. REMOVAL**

1. Loosen brake actuator push-rod jamnut (4). Loosen yoke adapter (3) until it is free of yoke (2).

### **NOTE**

**A lot more torque is required to rotate slack adjuster manual adjustment hex counterclockwise than is necessary to rotate it clockwise. Torque may be as high as 70 lb-ft (94.9 N m).**

2. Rotate slack adjuster manual adjustment hex (9) counterclockwise until slack adjuster (6) is clear of brake actuator push rod (5).
3. Remove retaining ring (8) from recess on end of camshaft (7). Discard retaining ring.
4. Using soft-faced hammer, tap on slack adjuster (6) lightly until it can be removed from camshaft (7).
5. Remove two cotter pins (1 and 14), yoke pin (11), link pin (12), two washers (10 and 13), and yoke (2) from slack adjuster (6). Discard cotter pins.



---

**2-50. SLACK ADJUSTER REPLACEMENT (continued).**

---

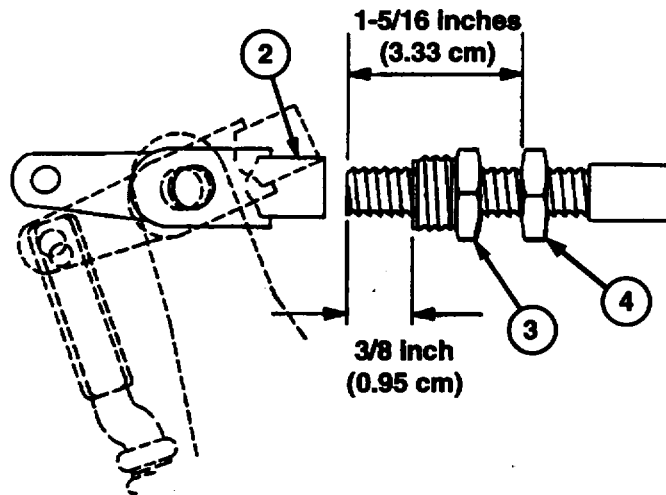
**b. CLEANING AND INSPECTION****NOTE**

**Do not use solvents or soaps and water for cleaning.**

1. Clean slack adjuster, splines of camshaft, and other metal parts using stiff fiber brush, and wipe clean.
2. Inspect slack adjuster for bent, broken, loose, or misaligned brake actuator push rods and cracked or damaged brake actuator brackets. Replace slack adjuster if damaged.

**c. INSTALLATION**

1. Install yoke (2), yoke pin (11), link pin (12), and two washers (10 and 13) and new cotter pins (1 and 14) on slack adjuster (6).
2. Install slack adjuster (6) and new retaining ring (8) on end of camshaft (7).
3. Install jamnut (4) approximately 1-5/16 inches ( 3.33 cm) from end of push rod (5).
4. Install yoke adapter (3) on push rod (5) approximately 3/8 inch (0.95 cm) from end of push rod (5).



5. Turn manual adjustment hex (9) clockwise until yoke adapter (3) extends into bore of yoke (2) approximately 1/8 inch (0.32 cm). Thread adapter into yoke and tighten to 10 lb-ft (13.56 Nom).
6. Tighten jamnut (4) between 400 and 600 in-ft (45 and 68 Nom).

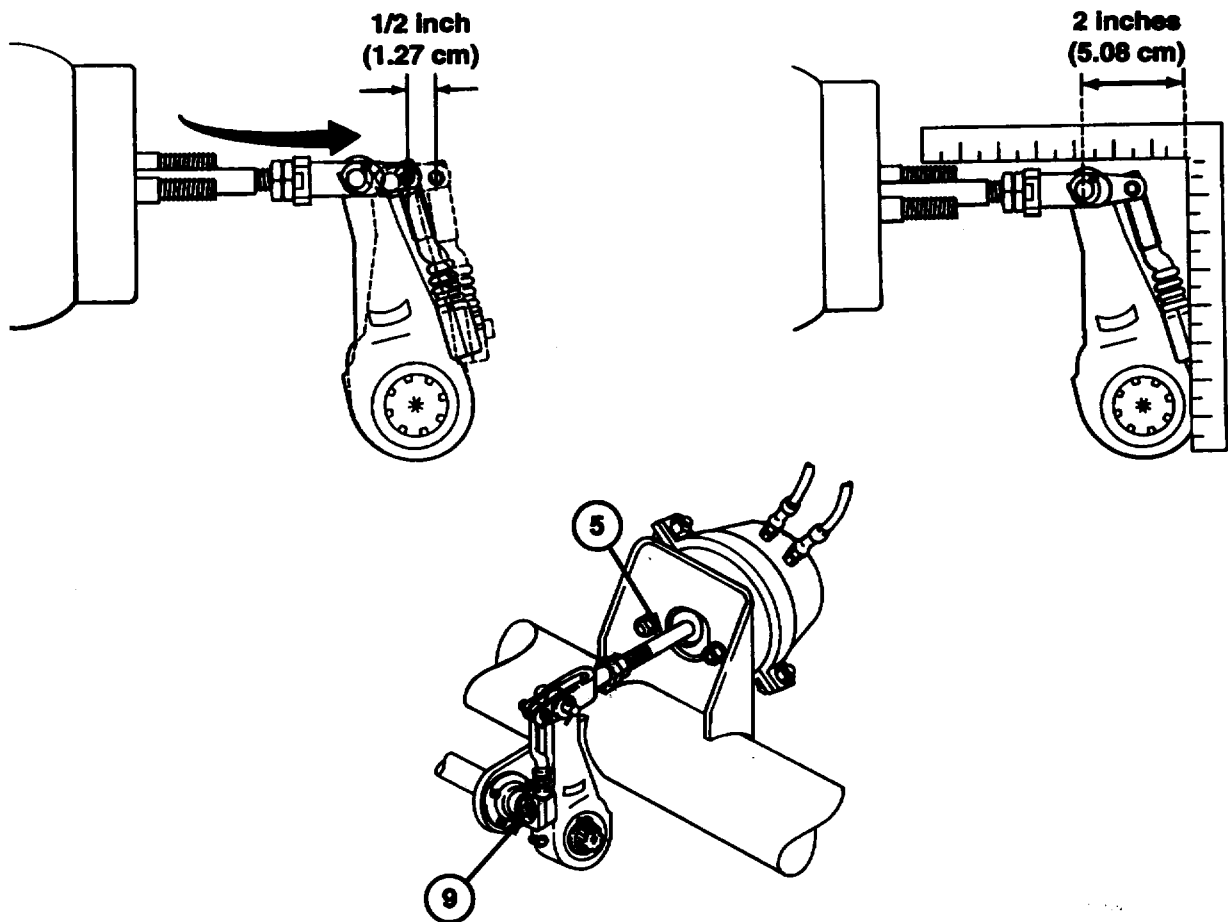
**2-60. SLACK ADJUSTER REPLACEMENT (continued).****d. ADJUSTMENT**

1. Raise rear axle until wheels clear the ground. Rotate manual adjustment hex (9) clockwise until brake linings are snug against brakedrum.

**NOTE**

**A lot more torque is required to rotate manual adjustment hex counterclockwise than is necessary to rotate it clockwise. Torque may be as high as 70 lb-ft (94.9 Nm).**

2. Turn manual adjustment hex (9) counterclockwise 1/4 turn. Pull push rod (5) to confirm that push rod (5) has approximately 0.50 inch (1.27 cm) of free travel.
3. Apply between 90 and 95 psi (621 and 655 kPa) air pressure from towing vehicle air gage. Make and hold a full brake application. Measure push-rod stroke. Two inches (5.08cm) is maximum stroke. If stroke exceeds the two-inch limit, inspect all brake system components for serviceability.

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 92330-398-10).
- Uncage fail-safe chamber brakes (para 2-60).

## 2-51. BRAKE AIR CHAMBER REPLACEMENT AND TEST.

### *This Task Covers:*

- |                 |               |
|-----------------|---------------|
| a. Removal      | b. Inspection |
| c. Installation | d. Test       |

### *Initial Setup:*

#### **Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

#### **Materials/Parts:**

- Lockwasher (2) (Item 107, Appendix F)

#### **Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Air reservoirs drained (refer to TM 9-2330-398-10).
- Fail-safe chamber brakes caged (para 2-60).

### **a. REMOVAL**

1. Disconnect two brake hoses (5) from brake air chamber (4).
2. Loosen brake actuator push-rod jamnut (3). Loosen yoke adapter (11) until it is free of yoke (1).

#### **NOTE**

**A lot more torque is required to rotate slack adjuster manual adjustment hex counterclockwise than is necessary to rotate it clockwise. Torque may be as high as 70 lb-ft (94.9 Nom).**

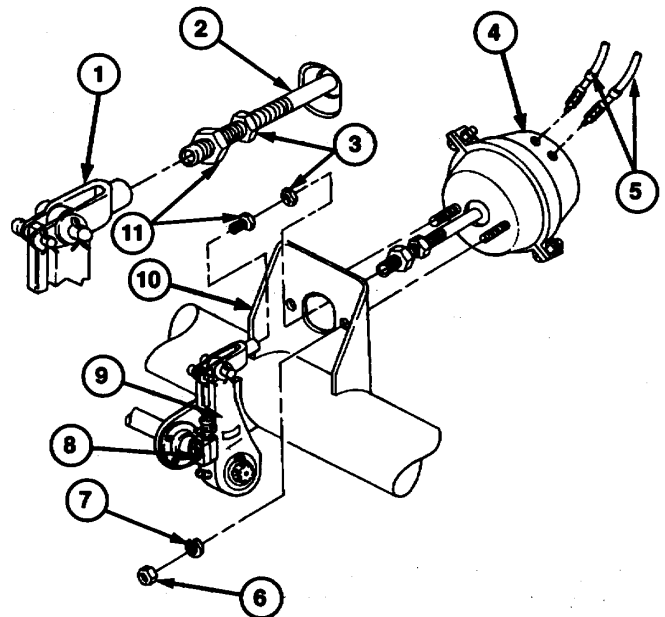
3. Rotate slack adjuster manual adjustment hex (8) counterclockwise until slack adjuster (9) is clear of brake actuator push rod (2)

4. Remove two nuts (6) and lockwashers (7) and brake air chamber (4) from bracket (10). Discard lockwashers.

- b. **INSPECTION** Inspect parts for damage. Replace damaged parts.

#### **c. INSTALLATION**

1. Install brake air chamber (4) on bracket (10) with two nuts (6) and new lockwashers (7).



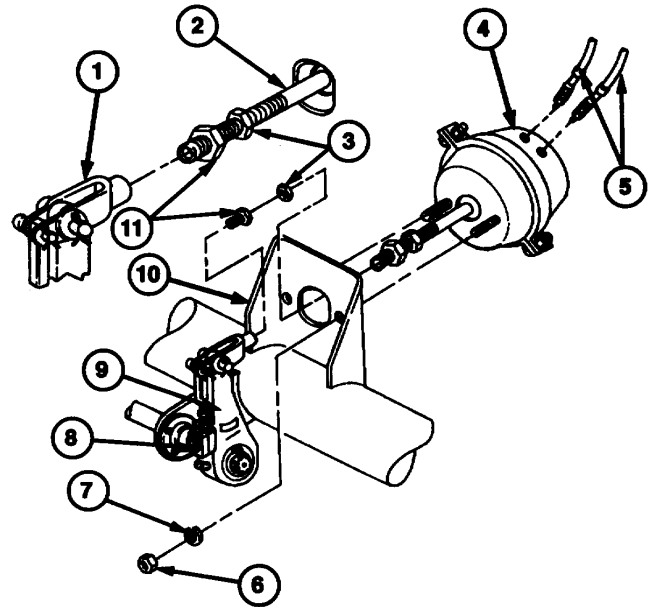
**2-51. BRAKE AIR CHAMBER REPLACEMENT AND TEST (continued).****NOTE**

Refer to para 2-50 for slack adjuster adjustment.

2. Install jamnut (3) approximately 1-5/16 inches (3.33 cm) from end of push rod (2).
3. Install yoke adapter (11) on push rod (2) approximately 3/8 inch (0.95 cm) from end of push rod (2).
4. Turn manual adjustment hex (8) clockwise until yoke adapter (11) extends into bore of yoke (1) approximately 1/8 inch (0.32 cm). Thread adapter into yoke and tighten to 10 lb-ft (13.3 N-m).
5. Tighten jamnut (3) between 400 and 600 in-lb (45 and 68 N-m).
6. Connect two brake hoses (5) to brake air chamber (4).

**d. TEST**

1. Apply and hold a full-pressure brake application.

**NOTE**

Initial brake application will force out a small amount of air. No air should be expelled from air chamber after initial application. If air continues to be expelled from air chamber, replace air chamber.

2. With prime mover connected and semitrailer brakes applied, coat flanges (12) and connections (14) on brake air chamber (4) with soapy water.
3. Inspect flanges (12) and connections (14) for leakage, indicated by bubbles.

**NOTE**

**DO NOT** overtighten clamp on brake chamber. Maximum torque should be between 20 and 25 lb-ft (27.12 and 33.9 Nm). Overtightening will distort flange and cause more leakage.

4. If leakage is found at flange (12), tighten clamp (13).
5. If leakage is found at connections (14), tighten fittings.

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330398-10).
- Uncage fail-safe chamber brakes (para 2-60).

**2-52. SERVICE AND EMERGENCY COUPUNGS, AIR LINES, AND FITTINGS REPLACEMENT.***This Task Covers:*

- |                             |                    |
|-----------------------------|--------------------|
| a. Packing Ring Replacement | b. Air Line Repair |
| c. Test                     |                    |

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 92330-398-10).

**Materials/Part:**

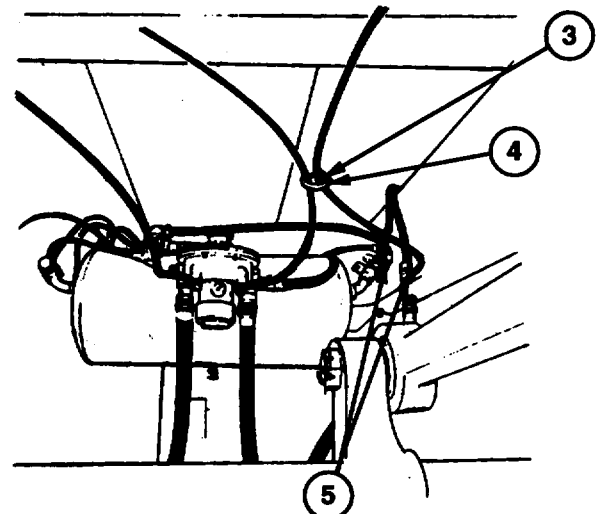
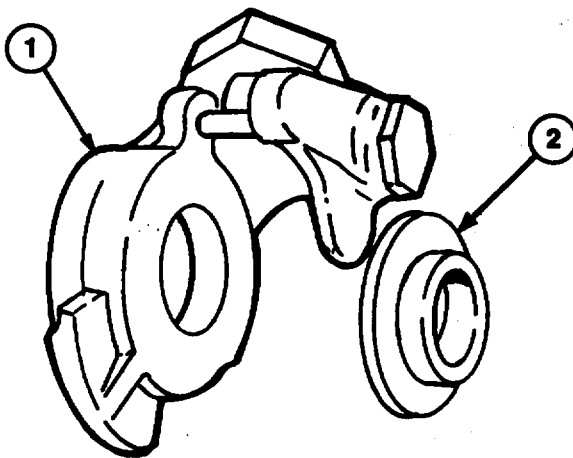
- Soap (Item 28, Appendix C)
- Packing ring (Item 127, Appendix F)

**a. PACKING RING REPLACEMENT**

1. Remove packing ring (2) from coupling (1). Discard packing ring.
2. Clean groove in coupling (1).

**NOTE**

Packing ring must lie flat, with no twists or bulges.



3. Partially collapse new packing ring (2) and put one side of packing ring flange into groove. Use blunt-ended tool to Push packing ring (2) into place in coupling (1).

**b. AIR-LINE REPAIR**

1. Tighten screw (3) holding any of 17 air-line clips (4).
2. Tighten fittings (5) if leaks are found. Replace lines or fittings if leaks cannot be stopped (para 2-57)



---

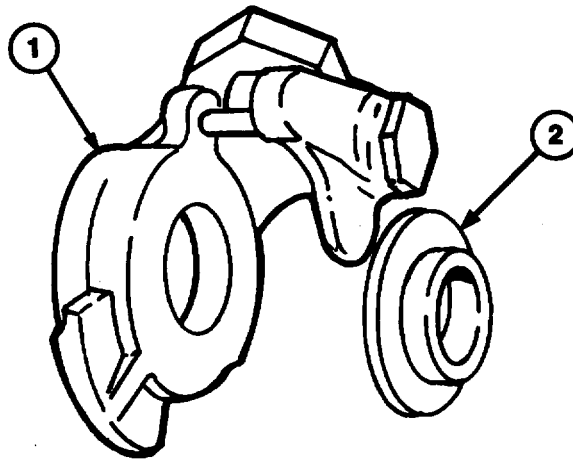
**2-52. SERVICE AND EMERGENCY COUPLINGS, AIR LINES, AND FITTINGS REPLACEMENT (continued).**

---

**c. TEST****NOTE**

**Coupling damage is usually caused by worn, damaged, or improperly installed packing ring.**

1. Install new packing ring (2) on coupling (1) to stop leaks.
2. Connect air brake hose couplings from prime mover to semitrailer. Apply brakes and coat hose couplings, connectors, and fittings of emergency and service lines with soap and water solution. Check for leaks.
3. Check air lines and fittings for restrictions caused by dents or kinks. Replace damaged air lines (para 2-57).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

## 2-53. EMERGENCY RELAY VALVE REPLACEMENT.

### *This Task Covers:*

- |            |                 |
|------------|-----------------|
| a. Removal | b. Installation |
| c. Test    |                 |

### *Initial Setup:*

#### **Tool and Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

#### **Materials/Parts:**

- Soap (Item 28, Appendix C)

#### **Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Air reservoirs drained (refer to TM 9-2330-398-10).

### a. REMOVAL

#### **NOTE**

**Before removal, tag all hoses and lines for identification at installation.**

1. Disconnect hoses and tube fittings (1 and 2) from relay valve (3) on reservoir (4).
2. Remove relay valve (3) from nipple on reservoir (4).

### b. INSTALLATION

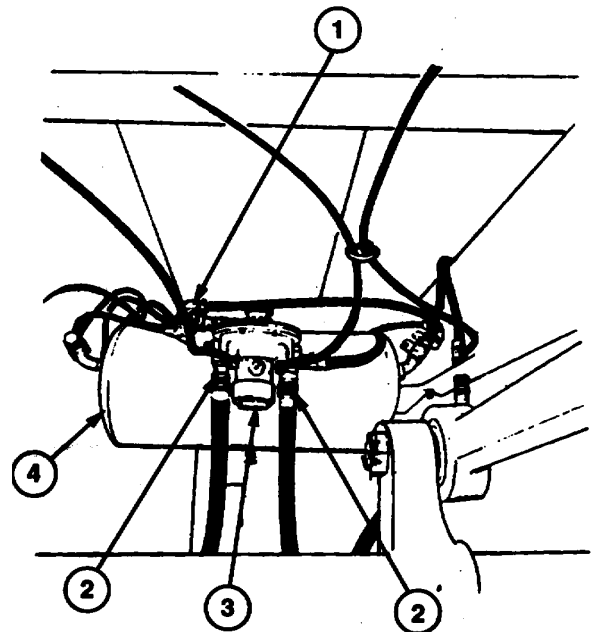
1. Install relay valve (3) on nipple of reservoir (4).
2. Connect hoses and tube fittings (1 and 2) to relay valve (3).

### c. TEST

1. Connect prime mover to semitrailer and fill air reservoirs.

#### **NOTE**

**When prime mover brake pedal or semitrailer handbrake lever is applied, air is delivered to emergency relay valve. The emergency relay valve releases air from primary brake reservoir to brake chambers to set the brakes.**



2. Engage service brake and apply soapy water to exhaust port on top of emergency relay valve. If there is leakage, replace relay valve.
3. Apply and release service brake pedal several times. Listen for immediate response from relay valve. If there is hesitation in brake application and release, replace relay valve.

#### **FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM-9-2330-398-10).

---

**2-54. AIR RESERVOIR REPLACEMENT.**

---

*This Task Covers:*

a. Removal

b. Installation

---

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Soap (Item 28, Appendix C)
- Self-locking nut (4) (Item 171, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 92330-398-10).
  - Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
  - Air reservoirs drained (refer to TM 9-2330-398-10).
- 

**NOTE**

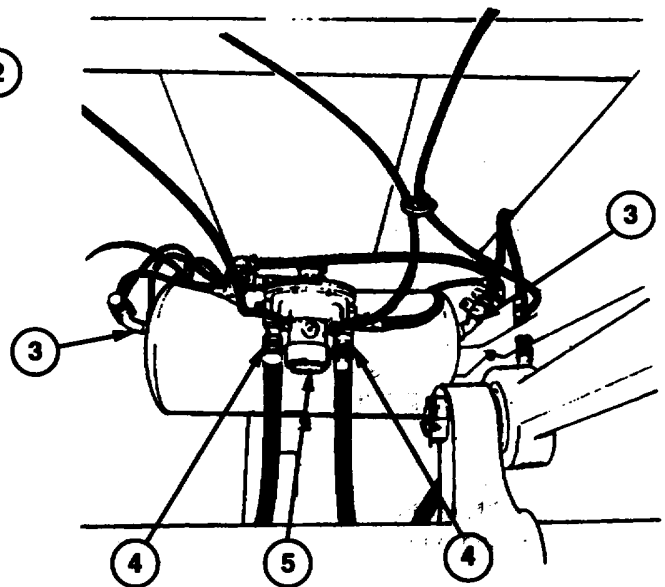
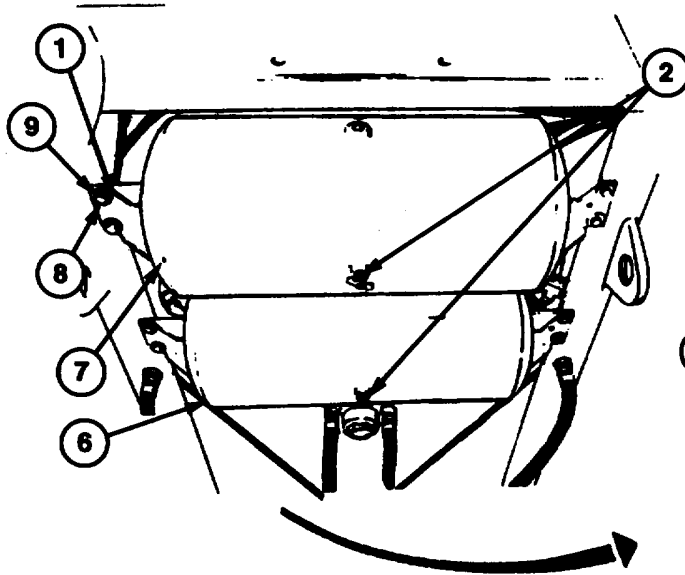
**Replacement of both air reservoirs is similar. Perform steps 2 and 4 of removal and installation procedure only if replacing primary reservoir.**

**a. REMOVAL**

1. Remove air drain valve (2) from primary (rear) air reservoir (6) and from secondary (forward) air reservoir (7).
2. Disconnect hoses and fittings (4) from emergency relay valve (5) on primary (rear) air reservoir (6).
3. Remove air fittings (3) from ends of air reservoir (6 or 7).
4. Remove relay valve (5) from primary (rear) air reservoir (6).
5. Remove four mounting bolts (8), washers (9), and self-locking nuts (1) from air reservoir (6 or 7), and remove air reservoir (6 or 7) from semitrailer. Discard self-locking nuts.

**2-54. AIR RESERVOIR REPLACEMENT (continued)****b. INSTALLATION**

1. Install air reservoir (6 or 7) on semitrailer with four mounting bolts (8), washers (9), and new self-locking nuts (1).
2. Install emergency relay valve (5) on primary (rear) air reservoir (6).
3. Install air fittings (3) on ends of air reservoir (6 or 7).
4. Install hoses and fittings (4) on emergency relay valve (5) on primary (rear) air reservoir (6).
5. Install air drain valve (2) on air reservoir (6 or 7).
6. Check air fittings (3), emergency relay valve (5), and air drain valves (2) for leaks. Tighten fittings if leaks are found.

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

## 2-55. SAFETY RELIEF VALVE REPLACEMENT.

### *This Task Covers:*

- a. Removal
- c. Test

- b. Installation

### *Initial Setup:*

#### **Tools/Test Equipment:**

- Common no. 2 tool set (Item 2, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

#### **Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-356-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-1 0).

#### **Materials/Parts:**

- Antiseize tape (Item 30, Appendix C)

### **a. REMOVAL**

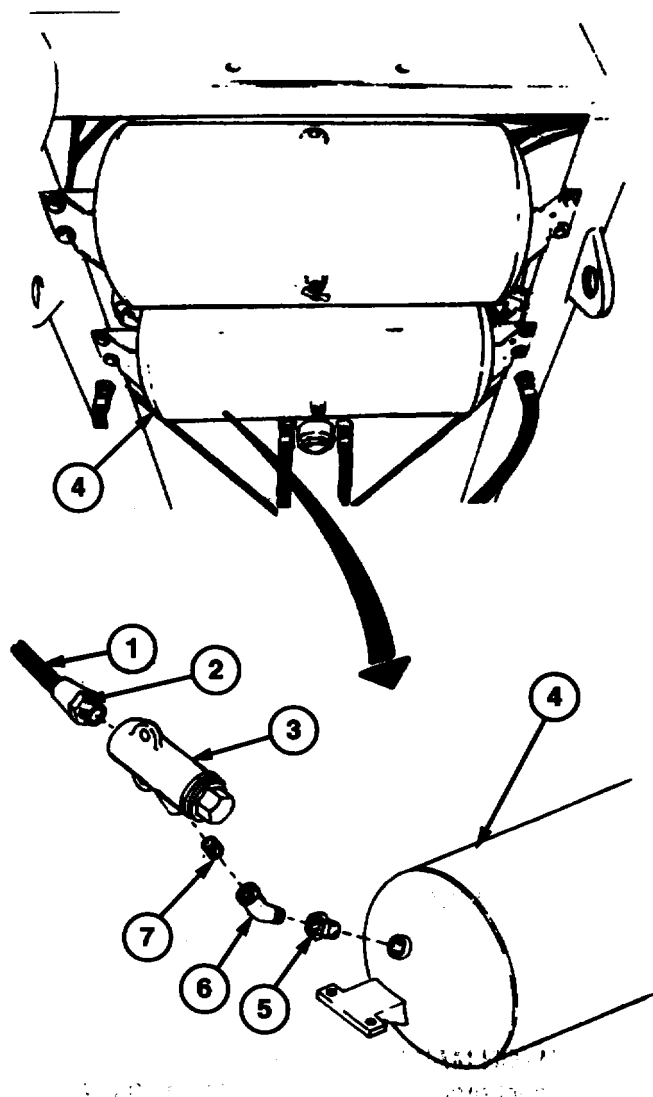
1. Remove air line (1) and adapter (2) from end of safety relief valve (3).
2. Remove valve (3) from nipple (7).
3. Remove nipple (7) from elbow (6).
4. Remove elbow (6) and bushing (5) from primary (rear) air reservoir (4).

### **b. INSTALLATION**

1. Install elbow (6) and bushing (5) on air reservoir (4).
2. Apply Teflon Antiseize tape to threads of nipple (7), and install nipple (7) in elbow (6). Install side port of valve (3) on nipple (7).
3. Install air line (1) and adapter (2) on valve (3).

### **c. TEST**

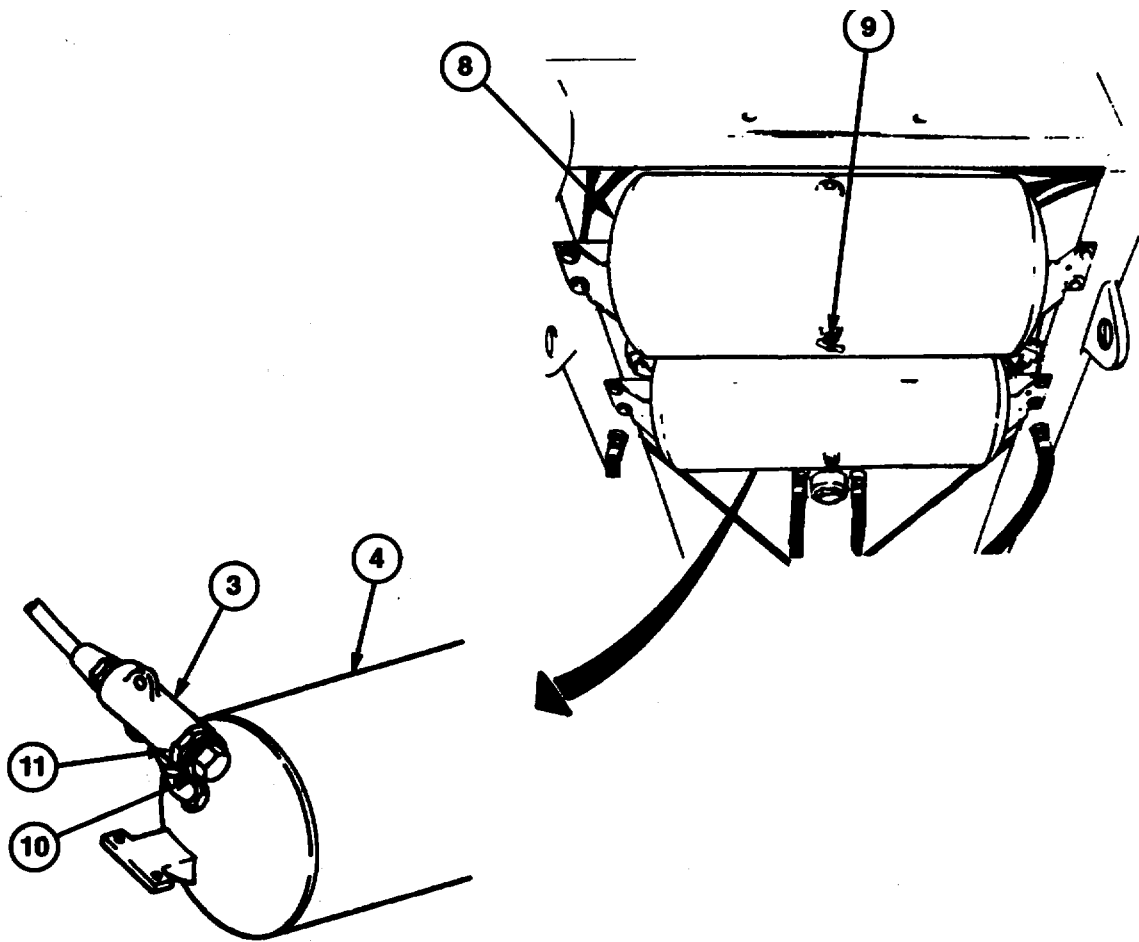
1. Attach end of air system test gage, without valve, to semitrailer emergency gladhand.



**2-55. SAFETY RELIEF VALVE REPLACEMENT (continued).****NOTE**

**Air supply can be either a prime mover or a stationary source.**

2. Attach air supply line to valve end of test gage.
3. Pressurize system and close valve on test gage when system is full.
4. Note gage reading and drain secondary (forward) air reservoir (8) by opening drain valve (9) on bottom of reservoir (8). When all air has been exhausted from secondary system, gage should read 75 psi (517 kPa). If pressure is not correct, do step 5.
5. Loosen locknut (11) at base of cap (10) on valve (3) and turn cap (10) clockwise to increase pressure setting, counterclockwise to decrease pressure setting.
6. Repeat step 5 until desired pressure is obtained, then tighten locknut (11).
7. Remove air system test gage from semitrailer emergency gladhand.

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

**2-56. PARKING BRAKE CONTROL VALVE REPLACEMENT.***This Task Covers:*

- a. Removal
- c. Test

## b. Installation

*Initial Setup:*

## Tools Test Equipment:

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Antiseize tape (Item 30, Appendix C)

## Equipment Conditions:

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-39810).
- Air reservoir drained (refer to TM 9-2330-398-10).

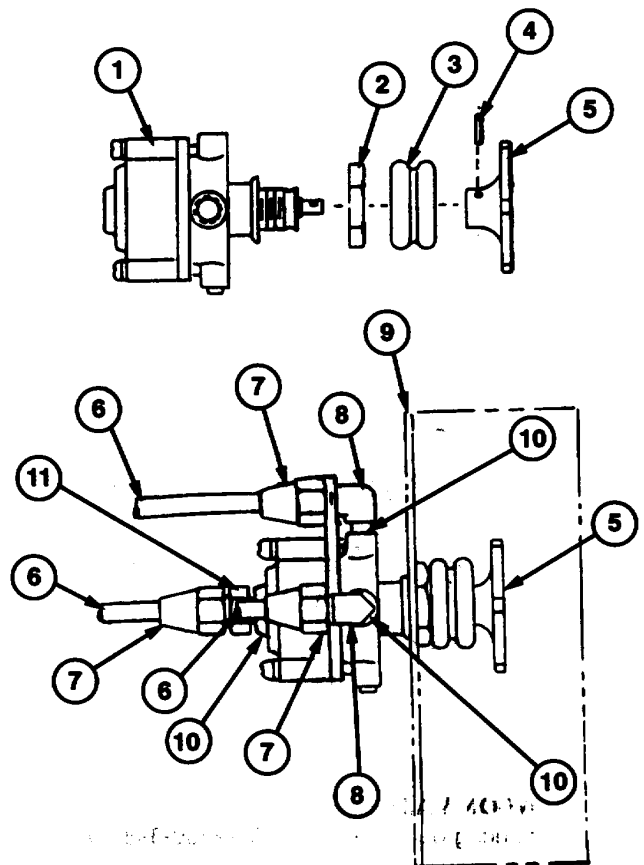
**a. REMOVAL****NOTE**

**Before removal, tag all hoses and lines for easy identification at installation.**

1. Disconnect three air lines (6) and fittings (7) from two elbows (8) and adapter (11) on parking brake control valve (1).
2. Remove roll pin (4), button (5), and boot (3) from control valve (1). V 3. Remove nut (2) on neck of control valve (1), and remove control valve (1) from mounting bracket (9).
4. Remove two elbows (8) and adapter (11) from three valve ports (10).

**b. INSTALLATION**

1. Install two elbows (8) and adapter (11) on three valve ports (10).
2. Apply Teflon Antiseize tape to male threads of control valve (1). With nut (2), install control valve (1) on neck of mounting bracket (9).
3. Install boot (3), button (5), and roll pin (4) on control valve (1).
4. Connect three air lines (6) and fittings (7) to two elbows (8) and adapter (11) on control valve (1).



---

**2-56. PARKING BRAKE CONTROL VALVE REPLACEMENT (continued).**

---

**c. TEST****NOTE**

- **No leakage is permitted. Replace control valve if it leaks or does not operate.**
- **Semitrailer must be coupled to prime mover or air source to perform test. Refer to TM 9-2330-398-10.**

1. Pull out button (5) and check to see that spring brakes apply properly. If spring brakes do not apply properly, Internal leakage is present.
2. Apply soapy water around valve stem and check for leakage. If soapy water bubbles around valve stem, external leakage is present.

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).



**2-57. AIR LINE TUBING AND FITTINGS REPLACEMENT.***This Task Covers:*

- a. Removal
- c. Test

- b. Installation

*Initial Setup:***Tools Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Material/Parts:**

- Antiseize tape (Item 30, Appendix C)
- Sealing compound (Item 27, Appendix C)

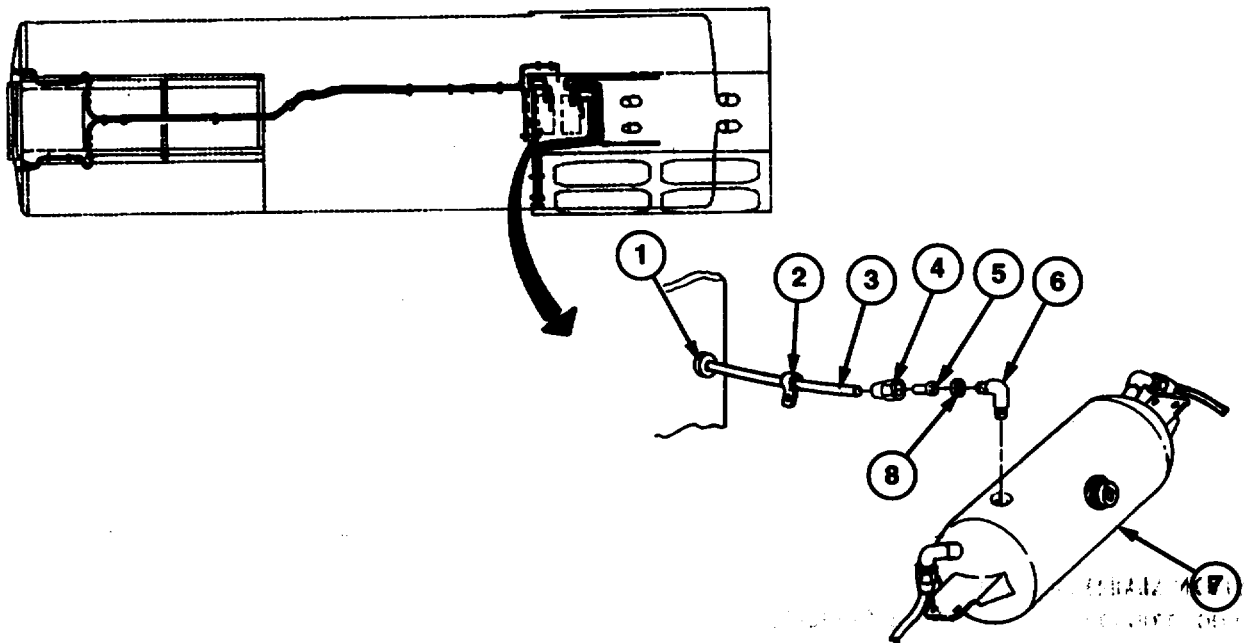
**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

**a. REMOVAL****NOTE**

**All air line tubing is replaced the same way. Only the number of clips varies.**

1. Disconnect air line tubing (3) from fitting (6) and remove insert (5), compression sleeve (8), and nut (4) from both ends of air line tubing (3).
2. Release clips (2) and pull air line tubing (3) through grommets (1).
3. Remove fitting (6) from air reservoir (7).



**2-57. AIR LINE TUBING AND FITTINGS REPLACEMENT (continued).****b. INSTALLATION**

1. Apply Teflon antiseize tape to fitting (6), and install fitting (6) on air reservoir (7).

**NOTE**

**Air line tubing is stocked in bulk lengths. Measure original air line tubing and cut new air line tubing to same length. Trim ends of air line tubing to get a smooth, square cut.**

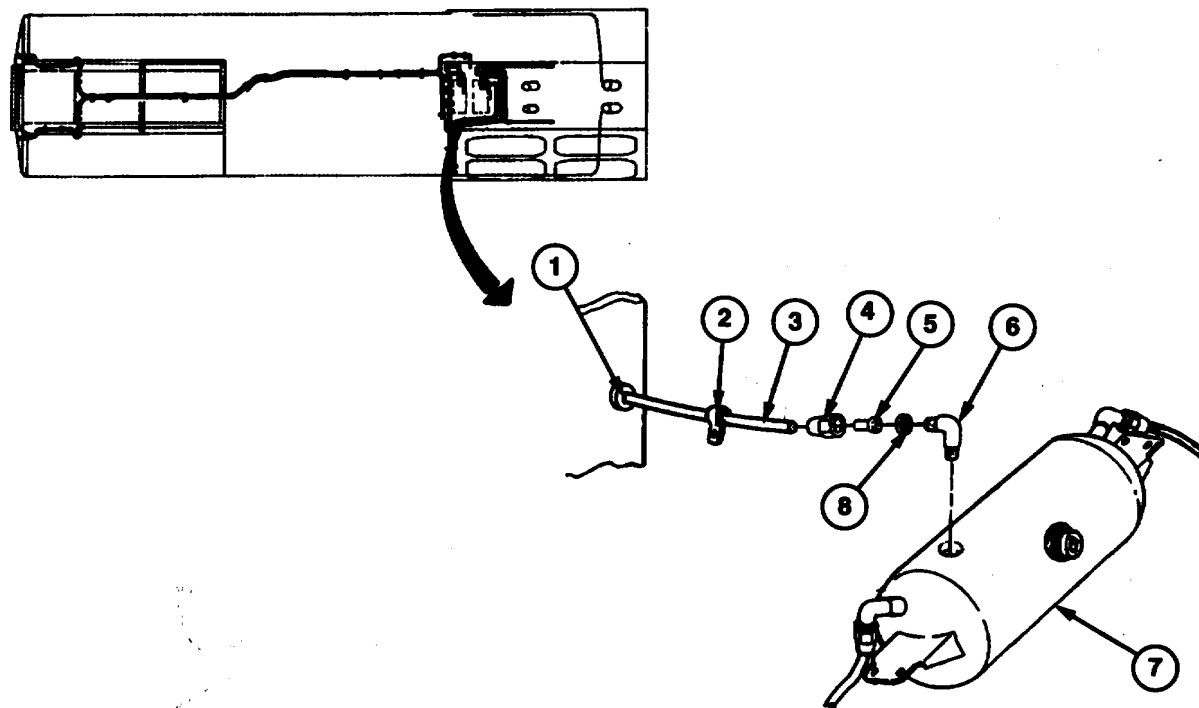
2. Install nut (4), compression sleeve (8), and insert (5) on both ends of air line tubing (3), and install air line tubing (3) on fitting (6).
3. Pull air line tubing (3) through grommets (1) and secure with clips (2).

**NOTE**

**Semitrailer must be coupled to prime mover or air source to perform test. Refer to TM 9-2330-398-10.**

**c. TEST**

Apply soapy water to ends of new air line tubing (3) and check for leaks. If leaks are detected, replace tubing.

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

---

**2-58. BRAKE AIR HOSE REPLACEMENT.**


---

*This Task Covers:*

- |            |                 |
|------------|-----------------|
| a. Removal | b. Installation |
| c. Test    |                 |
- 

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
  - Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
  - Air reservoirs drained (refer to TM 9-2330-398-10).
- 

**Materials/Parts:**

- Sealing compound (Item 27, Appendix C)
- 

**a. REMOVAL**

1. Disconnect two brake air hoses (2) from two elbows (1) and brake air chamber (4). Remove hose separator (3) from two brake air hoses (2).
2. Disconnect two brake air hoses (13 and 14) from brake air chamber (4), exhaust manifold (15), and pipe reducer (16). Remove hose separator (3) from two air hoses (13 and 14).
3. Remove two retaining straps (10) and tiedown straps (12) from two brake air hoses (11). Disconnect two air hoses (11) from two adapters (6) and elbows (1).
4. Remove four compression sleeves (7), inserts (8), and nuts (9) from two adapters (6) and elbows (1).
5. Remove two fittings (5) from two elbows (1).

**b. INSTALLATION**

1. Apply sealing compound to all male pipe threads.
2. Install two fittings (5) on two elbows (1).

**NOTE**

**Air line hoses are stocked in bulk lengths. Measure original air line hoses and cut new air line hoses to same length. Trim ends of air line hoses to get a smooth, square cut.**

2. Install four nuts (9), inserts (8), and compression sleeves (7) into two adapters (6) and elbows (1).
3. Connect two brake air hoses (11) to two adapters (6) and elbows (1). Install two retaining straps (10) and tiedown straps (12) on brake air hoses (11).
4. Connect two brake air hoses (13 and 14) to brake air chamber (4), exhaust manifold (15), and pipe reducer (16). Install hose separator (3) on brake air hoses (13 and 14).
5. Connect two brake air hoses (2) to elbows (1) and brake air chamber (4). Install hose separator (3) on air hoses (2).

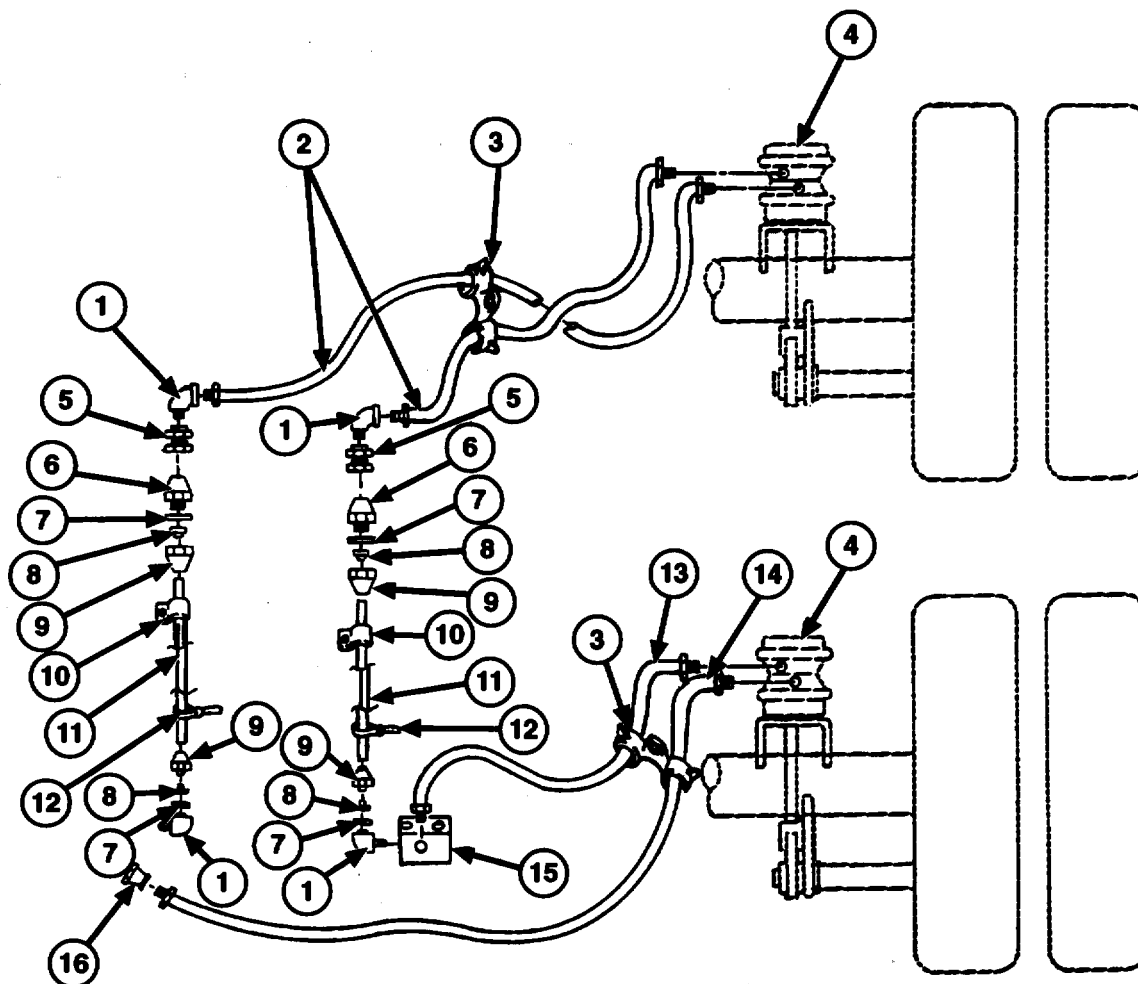
---

**2-58. BRAKE AIR HOSE REPLACEMENT (continued).**

---

**c. TEST**

Apply soapy water to ends of new tubing and check for leaks. If leaks are detected, replace tubing.

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

---

**2-59. FULL FUNCTION VALVE AND DIRECT LINEAR VALVE REPLACEMENT.**


---

*This Task Covers:*

- |  |  |
|--|--|
| a. Removal of Fuel Function Valve      | b. Removal of Direct Linear Valve      |
| c. Installation of Fuel Function Valve | d. Installation of Direct Linear Valve |
| e. Test                                |  |
- 

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

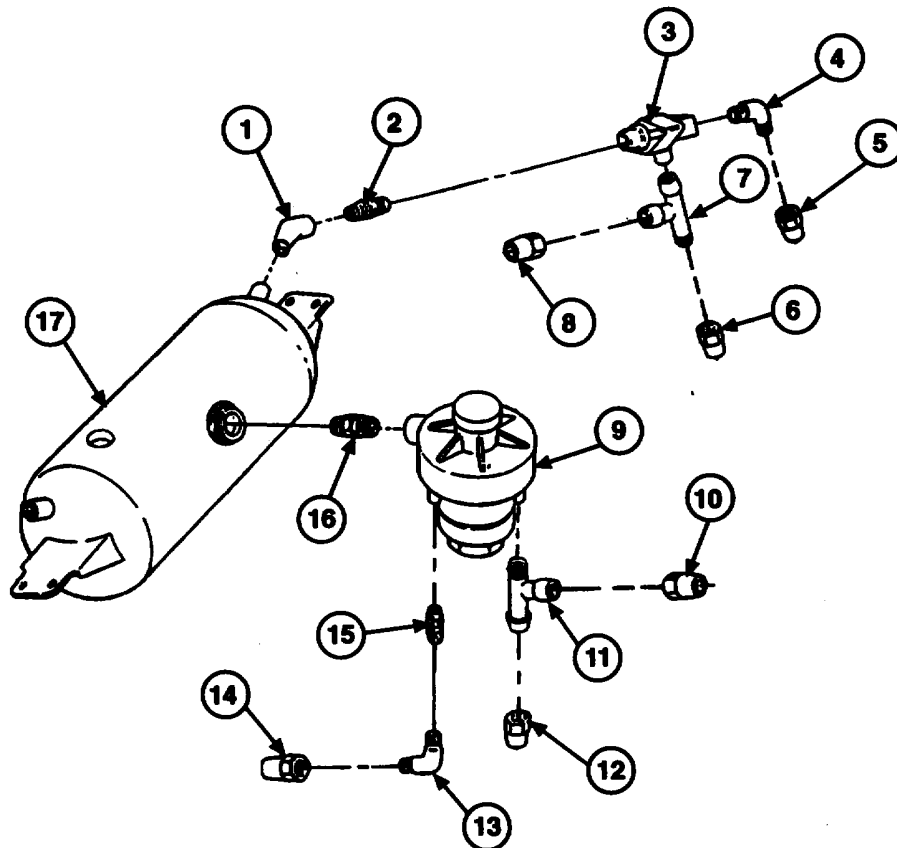
- Sealing compound (Item 27, Appendix C)
- Soap (Item 28, Appendix C)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
  - Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
  - Air reservoirs drained (refer to TM 9-2330-398-10).
- 

**a. REMOVAL OF FULL FUNCTION VALVE**

1. Disconnect two fittings (10 and 12) from tee fitting (11), and remove tee fitting (11) from full function valve (9).
2. Disconnect fitting (15) from elbow (13), and remove elbow (13) and hose separator (14) from valve (9).
3. Remove valve (9) from pipe nipple (16) on air reservoir (17).



---

**2-59. FULL FUNCTION VALVE AND DIRECT LINEAR VALVE REPLACEMENT (continued).**


---

**b. REMOVAL OF DIRECT LINEAR VALVE**

1. Disconnect fitting (5) from elbow (4), and remove elbow (4) from direct linear valve (3).
2. Disconnect two fittings (6 and 8) from tee fitting (7), and remove tee fitting (7) from valve (3).
3. Remove valve (3) from pipe nipple (2) and elbow (1) on air reservoir (17).

**c. INSTALLATION OF FULL FUNCTION VALVE****NOTE**

**Apply sealing compound to all male pipe threads.**

1. Install pipe nipple (16) and valve (9) on air reservoir (17).
2. Install hose separator (14) and elbow (13) on valve (9), and connect fitting (15) to elbow (13).
3. Install tee fitting (11) on valve (9), and connect two fittings (10 and 12) to tee fitting (11).

**d. INSTALLATION OF DIRECT LINEAR VALVE****NOTE**

**Apply sealing compound to all male pipe threads.**

1. Install elbow (1) and pipe nipple (2) on valve (3) on air reservoir (17).
2. Install tee fitting (7) on valve (3), and connect two fittings (6 and 8) to tee fitting (7).
3. Install elbow (4) on valve (3), and connect fitting (5) to elbow (4).

**e. TEST****NOTE**

- **No leaks are permitted.**
- **Semitrailer must be coupled to prime mover or air source to perform test. Refer to TM 9-2330-398-10.**

Apply brakes on prime mover, apply soap and water solution to all semitrailer air fittings, and check for leaks. If leaks are detected, tighten attaching hardware as required.

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

---

**2-60. RELEASE OF FAIL-SAFE CHAMBER BRAKES.**

---

*This Task Covers:*

- |                    |                            |
|--------------------|----------------------------|
| a. Reserve Release | b. Manual Release (Caging) |
|--------------------|----------------------------|
- 

*Initial Setup:*

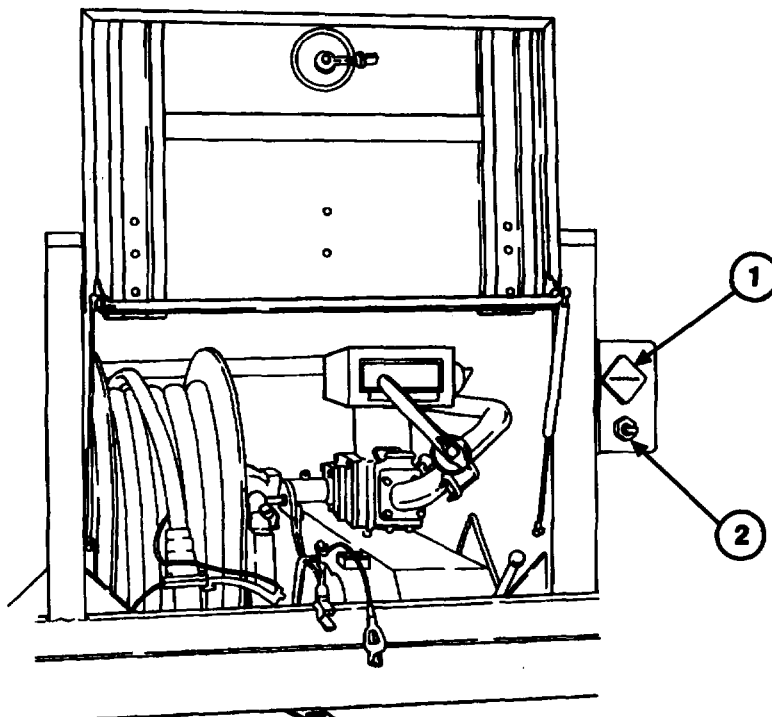
**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)
- 

**a. RESERVE RELEASE**

**NOTE**

- If semitrailer must be moved by an adequate vehicle other than a prime mover, begin at step 1. If semitrailer is to be moved by a prime mover, begin at step 2.
- Air in forward (secondary) air reservoir allows brakes to release twice.



1. Push brake release plunger (1) on road side of semitrailer to release fail-safe brakes.

**2-60. RELEASE OF FAIL-SAFE CHAMBER BRAKES (continued).****NOTE**

**When filling through filler valve, only forward (secondary) air reservoir is filled.**

2. When pressure falls under 55 psi (379 kPa), forward (secondary) air reservoir must be recharged either by connecting air lines to prime mover or by using a standard air hose and filling reservoir through filler valve (2).
3. Fill to air gage reading between 90 and 100 psi (621 and 690 kPa). A standard tire gage can be used to check pressure.

**b. MANUAL RELEASE (CAGING)****NOTE**

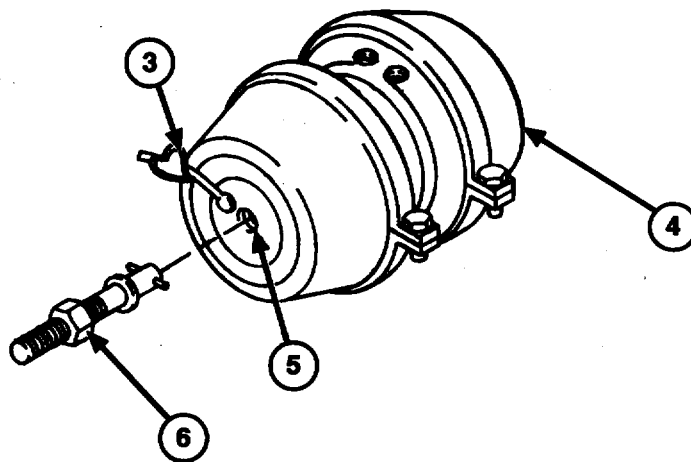
**Manually release (cage) fail-safe brakes when no air is available.**

1. Block wheels to prevent movement of semitrailer.
2. Unsnap breather cap (3) from each of four fail-safe units (4) and insert manual caging tool (6) into access hole (5).
3. Turn nut on manual caging tool (6) clockwise until brakeshoes are released on each brakedrum.

**CAUTION**

**Do not leave breather caps off any longer than necessary. Water, mud, and other contaminants can harm the operation of brake actuator. Vent on breather cap must be at the lowest location pointing down.**

4. As soon as air is available to refill the reservoirs, turn nut on manual caging tool (6) counterclockwise until each of four fail-safe units (4) are released. Snap breather caps in place on fail-safe units (4).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).



## SECTION VIII. WHEEL, HUB, AND BRAKEDRUM MAINTENANCE

Paragraph Number	Paragraph Title	Page Number
2-61	General .....	2-150
2-62	Tire and Wheel Assembly Replacement .....	2-150
2-63	Hub and Brakedrum Assembly Replacement.....	2-152
2-64	Wheel Studs Replacement .....	2-156
2-65	Tire and Tube Repair .....	2-157

**2-61. GENERAL**

This section describes and illustrates removal and installation procedures for the tire and wheel assembly, the hub and brakedrum assembly, and wheel studs. This section also includes repair procedures for tires and tubes.

**2-62. TIRE AND WHEEL ASSEMBLY REPLACEMENT.**

*This Task Covers:*

a. Removal

b. Installation

*Initial Setup:*

**Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

**Personnel Required:** Two

**a. REMOVAL**

1. Position jack under axle (7). Using jack, raise semitrailer until inner and outer tire and wheel assemblies (2 and 4) are off the ground. Support or block axle (7).

**NOTE**

**Curb-side wheel stud nuts are left-hand threaded, and road-side wheel stud nuts are right-hand threaded. Stud nuts may require excessive torque upon initial removal.**

2. Remove 10 outer stud nuts (5) and outer tire and wheel assembly (4) from hub and brakedrum assembly (1).

**NOTE**

**If inner tire and wheel assembly is being removed, perform step 3.**

3. Remove 10 inner stud nuts (3) and inner tire and wheel assembly (2) from hub and brakedrum assembly (1).

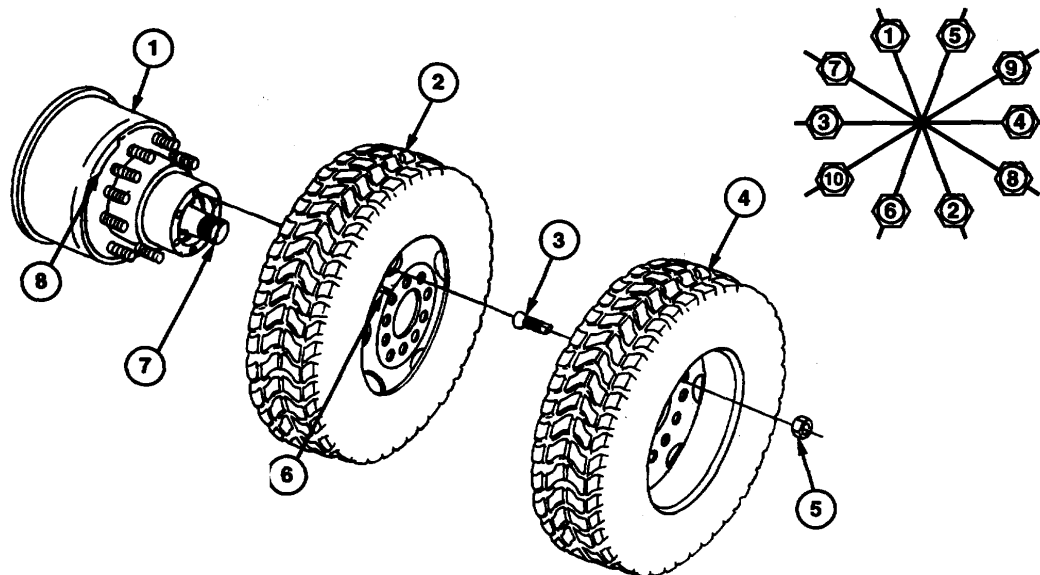
**2-62. TIRE AND WHEEL ASSEMBLY REPLACEMENT (continued).****b. INSTALLATION****NOTE**

If inner tire and wheel assembly was removed, perform steps 1 through 4. If not, go to step 5.

**CAUTION**

**Wheel and brakedrum have to be aligned properly during installation. If valve stem is not properly aligned (seated) in notch, valve stem will be damaged and tire will go flat.**

1. Install inner tire and wheel assembly (2) on hub and brakedrum assembly (1). Align inner tire and wheel assembly (2) so that valve stem (6) aligns with notch (8) on hub and brakedrum assembly (1) and secure with 10 inner stud nuts (3).
2. Using jack, lower tire and wheel assembly (2) to the ground.
3. Tighten 10 inner stud nuts (3) between 450 and 500 lb-ft (610 and 678 N•m) using the sequence shown below.
4. Using jack, raise axle (7) until tire and wheel assembly (2) is off the ground.
5. Install outer tire and wheel assembly (4) on hub and brakedrum assembly (1) and secure with 10 outer stud nuts (5).
6. Remove axle support.
7. Using jack, lower inner and outer tire and wheel assemblies (2 and 4) to the ground.
8. Tighten outer stud nuts (5) between 450 and 500 lb-ft (610 and 678 mm) using the sequence shown below.

**FOLLOW-ON MAINTENANCE:**

- None

---

**2-63. HUB AND BRAKEDRUM ASSEMBLY REPLACEMENT.**


---

*This Task Covers:*

- |                 |                            |
|-----------------|----------------------------|
| a. Removal      | b. Cleaning and Inspection |
| c. Installation |                            |
- 

*Initial Setup:*

**Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- Common No. 2 tool set (Item 2, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

- Gasket (Item 22, Appendix F)
- Lockwasher (6) (Item 96, Appendix F)

**Equipment Conditions:**

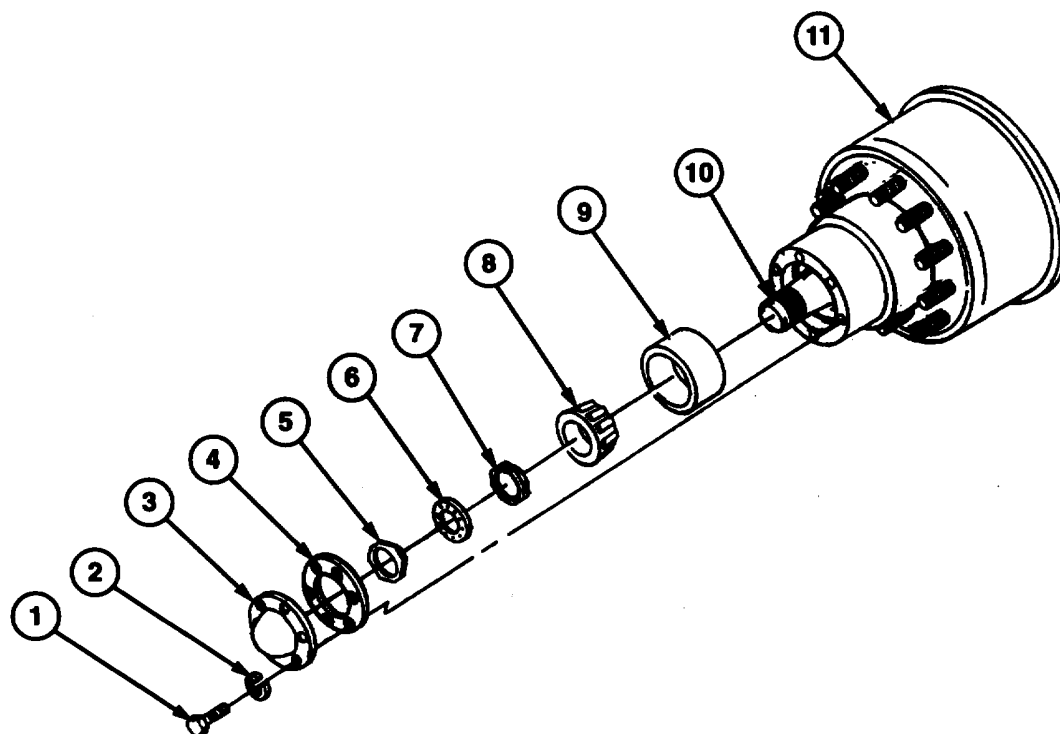
- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Fail-safe chamber brakes caged (para 2-60).
- Air reservoirs drained (refer to TM 9-2330-398-10).
- Tire and wheel assembly removed (para 2-62).

**Materials/Parts:**

- Dry-cleaning solvent (Item 12, Appendix C)
  - Grease (Item 18, Appendix C)
  - Rag (Item 25, Appendix C)
- 

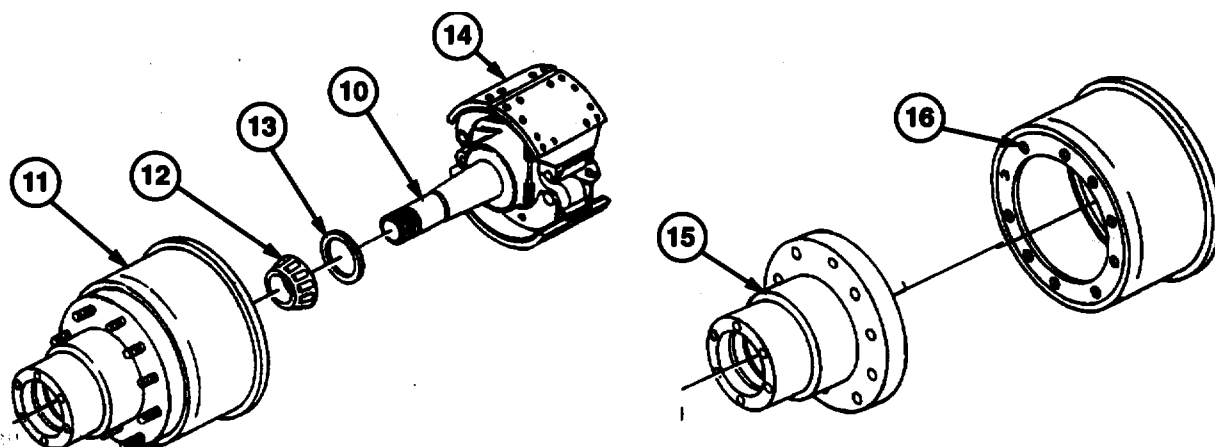
**a. REMOVAL**

1. Remove six bolts (1) and lockwashers (2), hubcap (3), and gasket (4) from hub and brakedrum assembly (11). Discard lockwashers and gasket.
2. Remove outer wheel bearing nut (5), lockring (6), and inner wheel bearing nut (7) from spindle (10).
3. Remove outer wheel bearing (8) from outer wheel bearing cup (9) and spindle (10).



**2-63. HUB AND BRAKEDRUM ASSEMBLY REPLACEMENT (continued).**

4. Slide hub and brakedrum assembly (11) off spindle (10). If hub and drum assembly (11) binds on brakeshoes (14) when partially installed, loosen manual adjustment hex on slack adjuster (para 2-50d).
5. Remove inner wheel bearing (12) from hub and brakedrum assembly (11) or spindle (10).
6. Using seal puller, remove seal (13) from spindle (10). Discard seal, if required.
7. Remove 10 wheel studs, nuts, and lockwashers (para 2-74). Separate hub (15) from brakedrum (16).

**b. CLEANING AND INSPECTION****WARNING**

- Dry-cleaning solvent P-D-680 is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breathe vapors. DO NOT use near open flame or excessive heat.
- Compressed air used for drying or cleaning purposes must not exceed 30 psi (207 kPa). Wear protective clothing (goggles and gloves, etc.) and use caution, to avoid injury to personnel.

**CAUTION**

- DO NOT clean parts with gasoline, in a hot solution tank, or with water and alkaline solutions.
  - DO NOT use compressed air to spin bearings.
1. Thoroughly clean all parts with dry-cleaning solvent and stiff fiber brush. Make sure parts are completely dry. Use low-pressure compressed air to dry parts.
  2. Inspect hubcap (3) for damage to flange that would allow water to leak into wheel bearings. Replace if damaged.
  3. Check for damage to threads of studs, screws, and nuts. Replace if damaged.
  4. Inspect brakedrum (16) for pitting or scoring. If brakedrum (16) is damaged, notify Direct Support maintenance.
  5. Inspect hub (15) for rust, pitting, or cracks. Replace if damaged.

**2-63. HUB AND BRAKEDRUM ASSEMBLY REPLACEMENT (continued).****NOTE**

**Wheel bearings and bearing cups are matched sets. If wheel bearings need replacing, bearing cups must also be replaced.**

6. Inspect inner and outer wheel bearings (12 and 8) for cracks or breaks in bearing cage, etching or pitting on roller surfaces, and any evidence of wear. Replace if worn or damaged.
7. Pack inner and outer wheel bearings (8 and 12) from large end of cone with grease, making sure all cavities between rollers and cage are filled. Cover bearings with clean, lint-free rag until time to install.
8. Inspect inner and outer bearing cup (17 and 9) in hub (15) for pits, grooves, or flaking. If damaged, use puller to remove. Drive new bearing cups (9 and 17) into hub (15) with suitable driver.

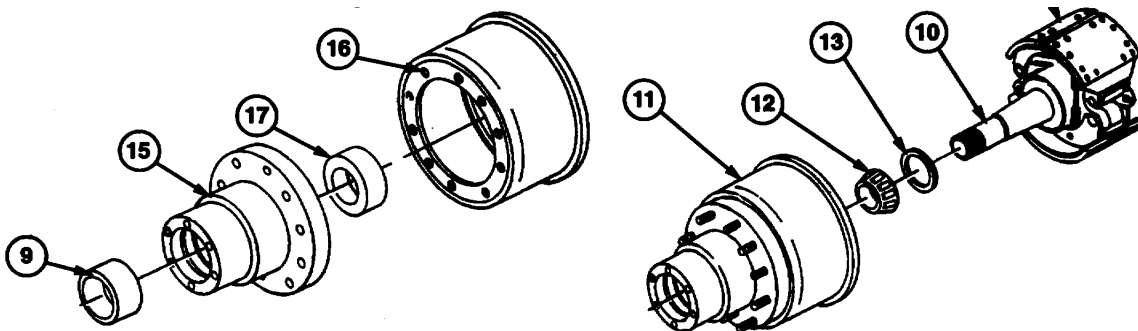
**c. INSTALLATION**

1. Install hub (15) on brakedrum (16). Install 10 wheel studs, nuts, and lockwashers (para 2-62).
2. Install inner wheel bearing (12) and seal (13) in hub and brakedrum assembly (11).
3. Install hub and brakedrum assembly (11) on spindle (10). If hub and brakedrum assembly (11) binds on brakeshoes (14) when partially installed, adjust brakeshoes (14) to reduce spread (para 2-50d). Push hub and brakedrum assembly (11) fully onto spindle (10).
4. Install outer wheel bearing (8) on spindle (10) and in outer wheel bearing cup (9).
5. Install inner wheel bearing nut (7) on spindle (10) and tighten to minimum of 75 ft-lb. (102 N•m), to ensure proper seating of wheel bearings (8 and 12) and wheel bearing cups (9 and 16) in hub and brakedrum assembly (11).
6. Loosen inner wheel bearing nut (7) so wheel will turn freely.
7. Tighten inner wheel bearing nut (7) to 50 ft-lb while rotating wheel, in order to properly position bearings for final adjustment.

**WARNING**

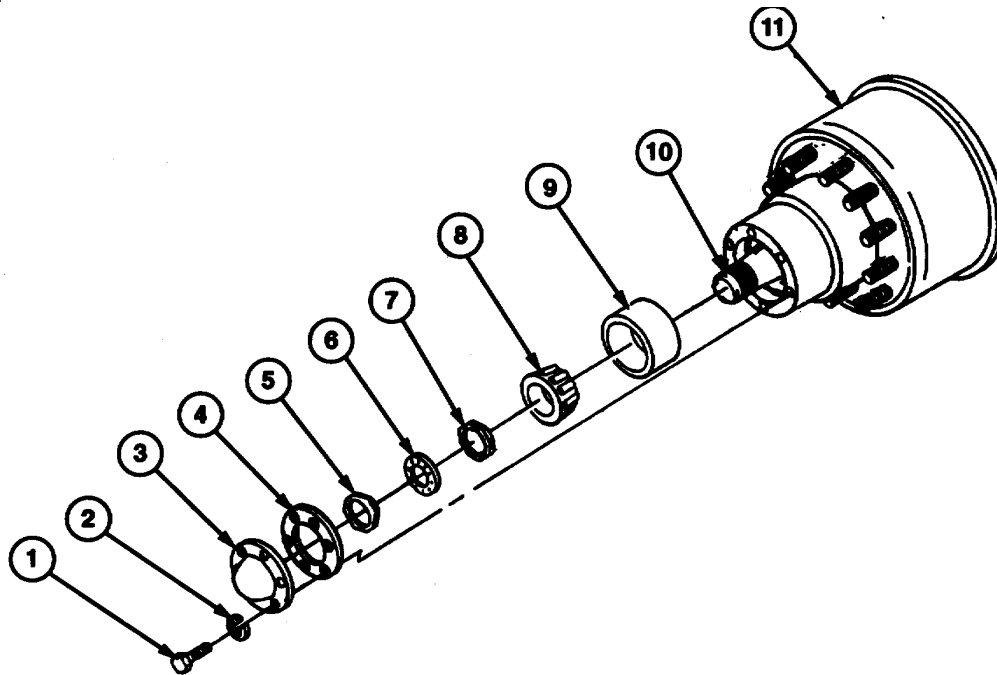
**Failure to back off inner wheel bearing nut could cause overheating of or damage to bearing and axle spindle. This could cause wheel to lock up or come off during vehicle operation, resulting in death to personnel or property damage.**

8. Loosen inner wheel bearing nut (7) 1/3 turn.



**2-63. HUB AND BRAKEDRUM ASSEMBLY REPLACEMENT (continued).**

9. Install lockring (6) so dowel on inner wheel bearing nut (7) aligns with hole in lockring (6) and tang fits in keyway of spindle (10).

**WARNING**

Failure to torque outer wheel bearing nut properly could cause wheel to come off during vehicle operation, which could result in death to personnel or property damage.

**NOTE**

If an external tang or setscrew-type lockwasher is used, it is important to remember to bend tabs over outer wheel bearing nut, or to install the setscrew in lockwasher, after outer wheel bearing nut has been properly torqued.

10. Install outer wheel bearing nut (5). Tighten outer wheel bearing nut (5) between 250 and 400 ft-lb (339 and 542 N•m).
11. Apply light coat of grease on new gasket (4), and position gasket (4) on hub and brakedrum assembly (11).
12. Install hubcap (3) on hub and brakedrum assembly (11) with six bolts (1) and new lockwashers (2). Tighten bolts between 16 and 20 ft-lb (22 and 27 N•m).

**FOLLOW-ON MAINTENANCE:**

- Install tire and wheel assembly (para 2-62).
- Adjust brakes (para 2-50d).
- Uncage fail-safe chamber brakes (pare 2-60).

---

**2-64. WHEEL STUDS REPLACEMENT.**


---

*This Task Covers:*

a. Removal

b. Installation

---

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B).

- Wheel stud (right-hand wheel) (as required) (Item 194, Appendix F).

**Materials/Parts:**

- Lockwasher (as required) (Item 110, Appendix F).
- Wheel stud (left-hand wheel) (as required) (Item 193, Appendix F).

**Equipment Conditions:**

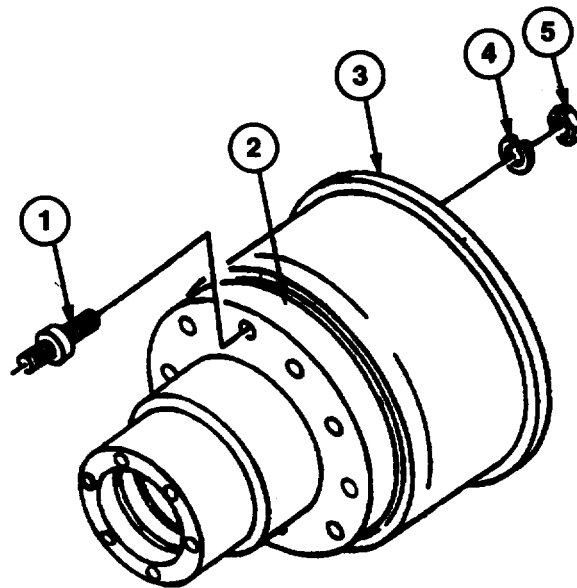
- Semitrailer uncoupled (refer to TM 9-2330-398-10).
  - Tire and wheel assembly removed (para 2-62).
  - Hub and brake drum assembly removed (para 2-63).
- 

**a. REMOVAL**

Remove nut (5) and lockwasher (4) from each of 10 wheel studs (1), and remove wheel stud (1) from hub (2) and brakedrum (3). Discard lockwashers and wheel stud(s).

**b. INSTALLATION**

Install each of 10 wheel studs (1) (short side from shoulder facing out) into hub (2) and brakedrum (3) with new lockwasher (4) and nut (5).



**FOLLOW-ON MAINTENANCE:**

- Install tire and wheel assembly (para 2-62).
- Install hub and brakedrum assembly (para 2-63).

---

**2-65. TIRE AND TUBE REPAIR.**

---

*This Task Covers:*

- |            |               |
|------------|---------------|
| a. Service | b. Inspection |
| c. Repair  |               |
- 

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
  - Tire and wheel assembly removed (para 2-62).
- 

**a. SERVICE**

Using air pressure gage, check tires for correct pressure. For hard surface roads, inflate radial tires to 65 psi (448-17 kPa); for cross-country and sand, inflate tires to 45 psi (310.8 kPa).

**b. INSPECTION**

1. Remove any objects, such as nails or glass, from tires.
2. Check for apparent loss of air, unusual wear, or missing valve caps. Replace as necessary.

**c. REPAIR****CAUTION**

- **Radial tubes must be used with radial tires. Failure to do so will result in damage to equipment.**
- **DO NOT use bias tires on the semitrailer. Failure to follow this caution will result in damage to equipment.**

Refer to TM 9-2610-200-14 for instructions on dismounting tire, repairing tire, and mounting tire and tube on rim.

**FOLLOW-ON MAINTENANCE:**

- Install tire and wheel assembly (para 2-62).



## SECTION IX. FRAME, TOWING ATTACHMENTS, DRAWBARS, AND ARTICULATION SYSTEMS MAINTENANCE

Paragraph Number	Paragraph Title	Page Number
2-66	General .....	2-158
2-67	Kingpin Coupler Replacement .....	2-158
2-68	Landing Gear Ground Board Replacement .....	2-160
2-69	Landing Gear Leg Replacement.....	2-161
2-70	Landing Gear Handcrank and Drive Unit Replacement.....	2-163

### 2-66. GENERAL

This section describes and illustrates removal and installation procedures for the kingpin coupler, landing gear ground board, landing gear leg, and landing gear handcrank and drive unit.

### 2-67. KINGPIN COUPLER REPLACEMENT.

*This Task Covers:*

a. Removal

b. Installation

*Initial Setup:*

#### Tools/Test Equipment:

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)
- Lifting device (Item 6, Appendix B)

#### Equipment Conditions:

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

#### Materials/Parts

- Corrosion preventive (Item 10, Appendix C)
- Grease (Item 18, Appendix C)
- Self-locking nut (12) (Item 174, Appendix F)

#### Personnel Required:

- Two

### NOTE

**Have an assistant help maneuver kingpin coupler.**

#### a. REMOVAL

1. Support kingpin coupler (1) with lifting device.
2. Remove 12 self-locking nuts (2), washers (3), and screws (4) from kingpin coupler (1). Discard self-locking nuts.
3. Remove kingpin coupler (1) from semitrailer.

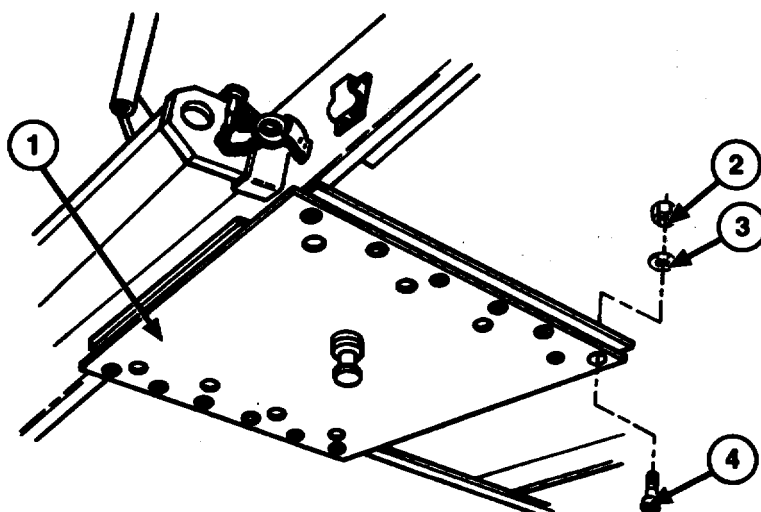
---

**2-67. KINGPIN COUPLER REPLACEMENT (continued).**

---

**b. INSTALLATION**

1. Using lifting device, position kingpin coupler (1) under semitrailer.
2. Install kingpin coupler (1) on semitrailer with 12 screws (4), washers (3), and new self-locking nuts (2).
3. Torque self-locking nuts (2) between 130 and 140 lb-ft (176 and 190 N•m).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

## 2-68. LANDING GEAR GROUND BOARD REPLACEMENT.

*This Task Covers:*

a. Removal

b. Installation

*Initial Setup:*

### Tools/Test Equipment:

- General mechanic's tool kit (Item 4, Appendix B)

### Equipment conditions:

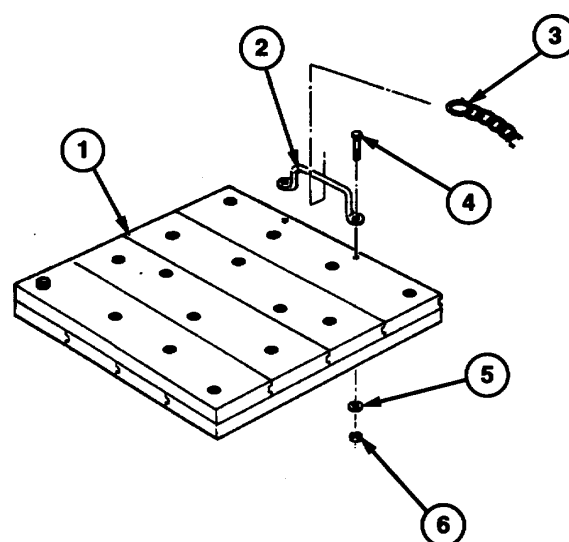
- Semitrailer uncoupled (refer to TM 9-2330-398-10).

### Materials/Parts:

- Self-locking nut (Item 172, Appendix F)

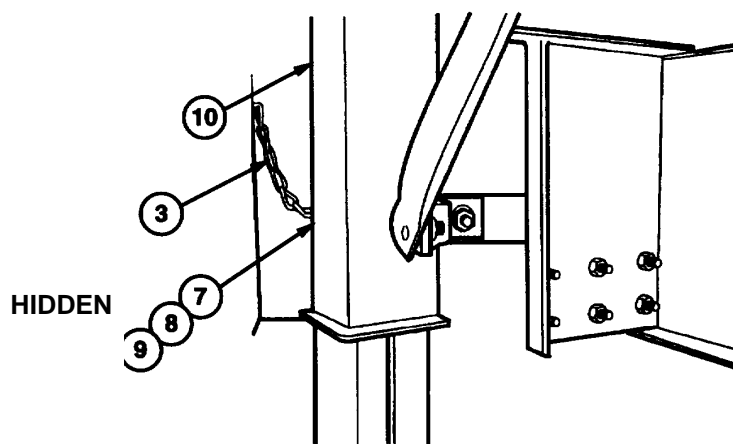
### a. REMOVAL

1. Remove two screws (4), washers (5), and nuts (6) from landing gear ground board (1).
2. Remove handle (2) and chain (3) from board (1).
3. Remove screw (7), self-locking nut (8), two washers (9), and chain (3) from landing gear leg (10). Discard self-locking nut.



### b. INSTALLATION

1. Install chain (3) on landing gear leg (10) with screw (7), two washers (9), and new self-locking nut (8).
2. Install chain (3) and handle (2) on board (1) with two screws (4), washers (5), and nuts (6).



### FOLLOW-ON MAINTENANCE:

- None

---

**2-69. LANDING GEAR LEG REPLACEMENT.**


---

*This Task Covers:*

a. Removal

b. Installation

---

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

- Self-locking nut (9) (Item 176, Appendix F)

- Spring pin (Item 186, Appendix F)

**Materials/Parts:**

- Self-locking nut (2) (Item 171, Appendix F)
- Self-locking nut (2) (Item 172, Appendix F)

**Equipment conditions:**

- Landing gear handcrank and drive unit removed (para 2-70).
- 

**a. REMOVAL**

**WARNING**

When prime mover is a five-ton tractor (e.g., M931A1, M931A2, M932A1, or M932A2) equipped with super single wheels and tires, use support shoes (part number 11625084, CAGEC 19207) on landing legs. This is to compensate for the increased height of the fifth wheel and the turning radius. Damage to equipment or injury to personnel may occur if this warning is not heeded.

**NOTE**

- If installing "tall" shoes on landing gear legs to configure M969A2 for M931A1/A2 and M932A1/A2 with super single tires and wheels, do steps 4 and 5 only.

- Landing gear leg installation is the same for both legs.

1. Remove screw (4), self-locking nut (5), and two washers (6) from landing gear leg (7). Discard self-locking nut.
2. Remove screw (1), self-locking nut (2), and two washers (3) from landing gear leg (7). Discard self-locking nut.
3. Remove screw (19), self-locking nut (23), and two washers (20 and 22) from sliding stay (21) and landing gear leg (7). Discard self-locking nut.
4. Remove spring pin (24) from shaft (25). Discard spring pin.
5. Remove shaft (25), landing gear shoe (27), and two washers (26) from landing gear leg (7).
6. Remove screw (11), washer (15), and self-locking nut (16) from shaft coupling (8) and landing gear leg (7). Discard self-locking nut.
7. Support landing gear leg (7) and remove eight screws (14) and self-locking nuts (12) and 16 washers (13) from landing gear leg (7). Remove landing gear leg (7) from semitrailer. Discard self-locking nuts.
8. Remove screw (10), washer (18), and self-locking nut (17) from shaft coupling (8) and shaft (9). Remove shaft coupling (8) from shaft (9). Discard self-locking nut.

**2-69. LANDING GEAR LEG REPLACEMENT (continued).****b. INSTALLATION****NOTE**

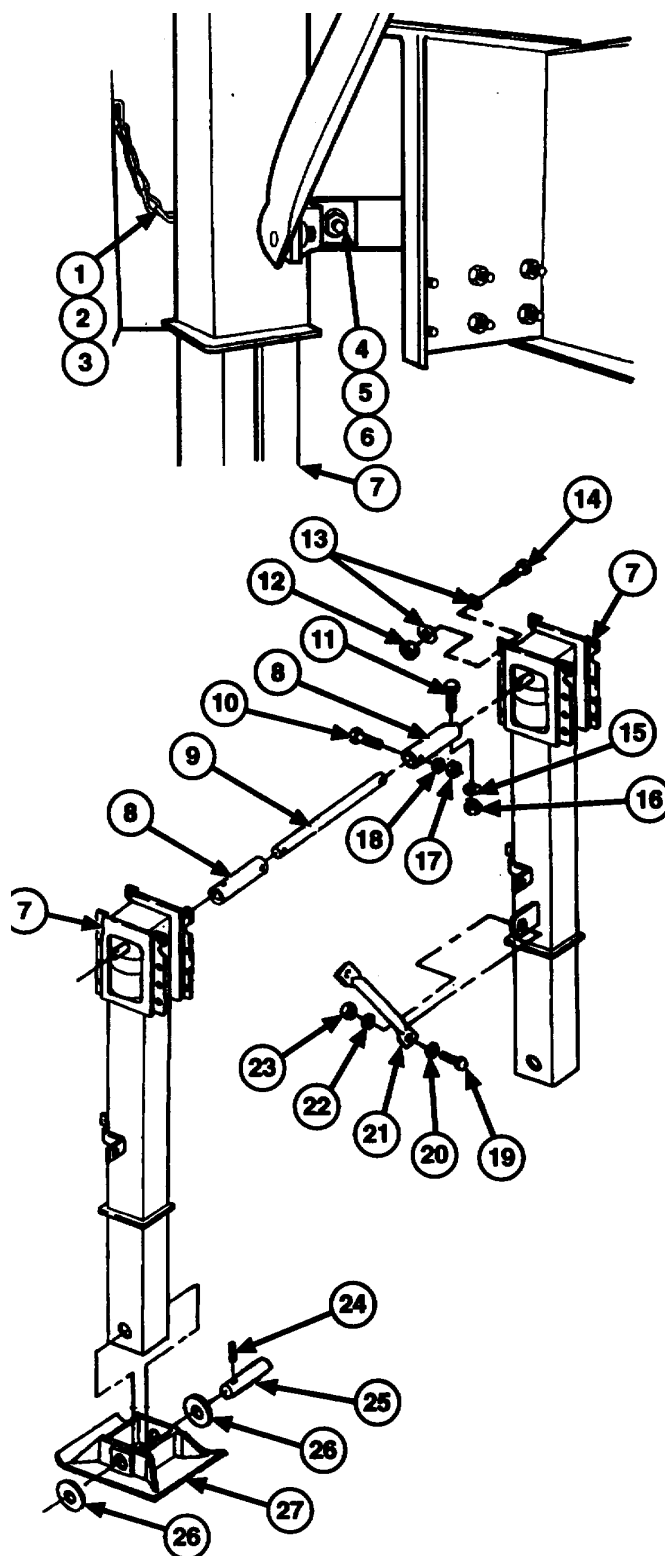
•If installing "tall" shoes on landing gear legs to configure M969A2 for M931A1/A2 and M932A1/A2 with super single tires and wheels, do step 4 only.

•Landing gear leg installation is the same for both legs.

1. Install shaft coupling (8) on shaft (9) with screw (10), washer (18), and new self-locking nut (17).
2. Install landing gear leg (7) on semitrailer with eight screws (14) and new self-locking nuts (12) and 16 washers (13).
3. Install shaft coupling (8) on landing gear leg (7) with screw (11), washer (15), and new self-locking nut (16).
4. Install shaft (25), landing gear shoe (27), and two washers (26) on landing gear leg (7). Install new spring pin (24) in shaft (25).
5. Install sliding stay (21) on landing gear leg (7) with screw (19), new self-locking nut (23), and two washers (22 and 20).
6. Install screw (1), new self-locking nut (2), and two washers (3) on landing gear leg (7).
7. Install screw (4), new self-locking nut (5), and two washers (6) on landing gear leg (7).

**FOLLOW-ON MAINTENANCE:**

- Install landing gear handcrank and drive unit (para 2-70).



**2-70. LANDING GEAR HANDCRANK AND DRIVE UNIT REPLACEMENT.***This Task Covers:*

a. Removal

b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B )

**Materials/Parts:**

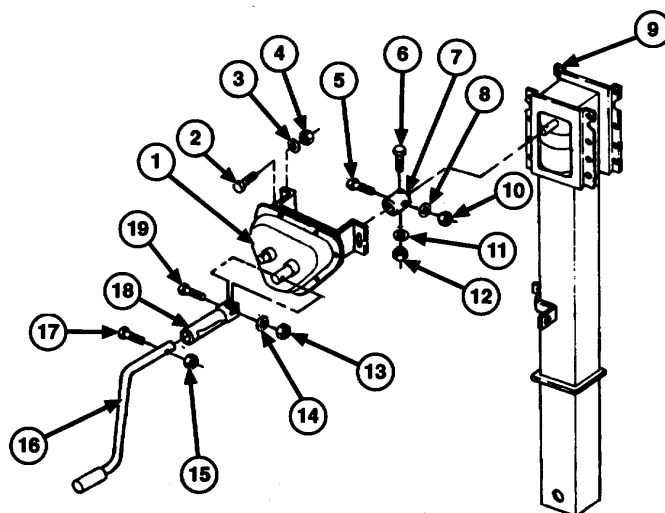
- Self-locking nut (4) (Item 172, Appendix F)
- Self-locking nut (4) (Item 176, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Wheels blocked to prevent semitrailer movement (refer to TM 9-2330-398-10).
- Front end of semitrailer raised and blocked securely (refer to TM 9-2330-398-10).

**a. REMOVAL****NOTE****Drive unit is attached to curb-side landing gear leg only.**

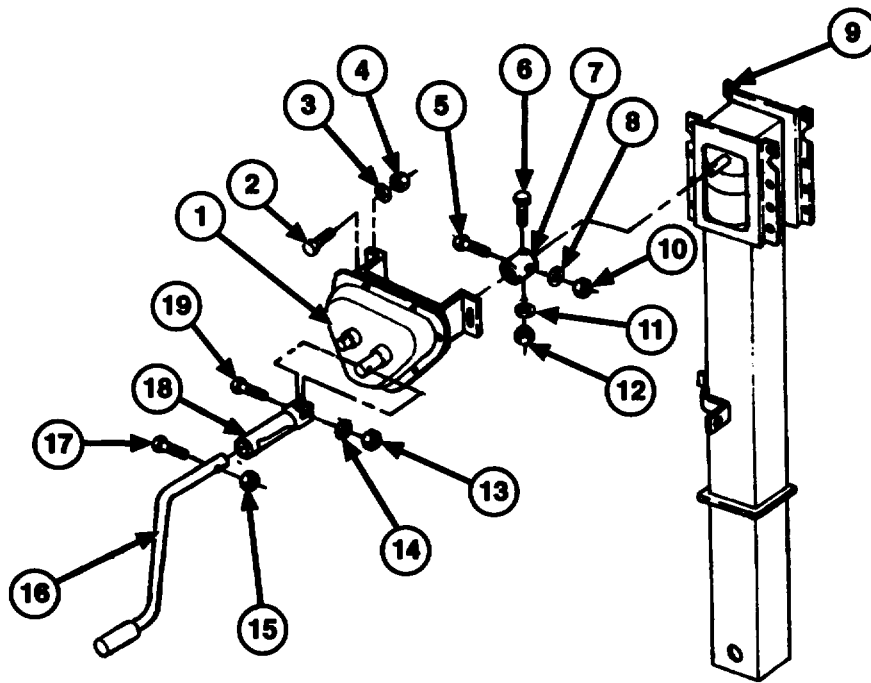
1. Remove screw (6), washer (11), and self-locking nut (12) from coupling (7). Discard self-locking nut.
2. Support drive unit (1) and remove four screws (2), washers (3), and self-locking nuts (4) from drive unit (1). Discard self-locking nuts.
3. Remove drive unit (1) from landing gear leg (9).
4. Remove screw (5), washer (8), and self-locking put (10) from coupling (7). Remove coupling (7) from drive unit (1). Discard self-locking nut.
5. Remove screw (17) and self-locking nut (15) from landing gear handcrank (16). Remove handcrank (16) from handle (18). Discard self-locking nut.
6. Remove screw (19), washer (14), and self-locking nut (13) from handle (18). Remove handle (18) from drive unit (1). Discard self-locking nut.



**2-70. LANDING GEAR HANDCRANK AND DRIVE UNIT REPLACEMENT (continued).****b. INSTALLATION****NOTE**

**Drive unit is to be installed on curb-side landing gear leg.**

1. Install handle (18) on drive unit (1) with screw (19), washer (14), and new self-locking nut (13).
2. Install handcrank (16) on handle (18) with screw (17) and new self-locking nut (15).
3. Install coupling (7) on drive unit (1) with screw (5), washer (8), and new self-locking nut (10).
4. Install drive unit (1) on landing gear leg (9) with four screws (2), washers (3), and new self-locking nuts (4).
5. Install coupling (7) on landing gear leg (9) with screw (6), washer (11), and new self-locking nut (12).

**FOLLOW-ON MAINTENANCE:**

- Lower front end of semitrailer (refer to TM 9-2330-398-10).
- Disconnect ground (refer to TM 9-2330-398-10).

**Section X. BODY, CAB, HOOD, AND HULL MAINTENANCE**

<b>Paragraph Number</b>	<b>Paragraph Title</b>	<b>Page Number</b>
2-71	General .....	2-165
2-72	Spare Tire Lifting Device Replacement .....	2-166
2-73	Mudflap Assembly Replacement .....	2-167
2-74	Fill Gage Storage Tube Cap Replacement.....	2-168
2-75	Grounding Rod Storage Tube Retaining Pin Replacement.....	2-169
2-76	Hose Trough Access Cover Replacement .....	2-170
2-77	Static Reel and Electrical Clip Replacement .....	2-172
2-78	Hose Reel Cabinet Door Lock-Release Lever Replacement .....	2-173
2-79	Hose Reel Cabinet Door Cylinder Assembly Replacement.....	2-174
2-80	Hose Reel Cabinet Door Bumper Replacement.....	2-175
2-81	Tool Box Assembly Repair .....	2-176
2-82	Manhole Cover Assembly Repair .....	2-178
2-83	Spare Tire Lifting Device and Drain Pipe Replacement .....	2-170
2-84	Grounding Stud Replacement .....	2-174
2-85	Engine Splash Guard Replacement .....	2-175
2-86	Vent Cap Replacement.....	2-176

**2-71. GENERAL**

This section describes and illustrates removal and installation procedures for the spare tire lifting device, mudflap assembly, fill gage storage tube cap, grounding rod storage tube retaining pin, hose trough access cover, static reel and electrical clip, hose reel cabinet door lock-release lever, hose reel cabinet door cylinder assembly, hose reel cabinet door bumper, spare tire lifting device ladder and drain, grounding stud, engine splash guard, and vent cap. This section also includes repair procedures for the tool box assembly and manhole cover assembly.



**2-72. SPARE TIRE LIFTING DEVICE REPLACEMENT.***This Task Covers:*

a. Removal

b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Lockwasher (7) (Item 95, Appendix F)

**Equipment Conditions:**

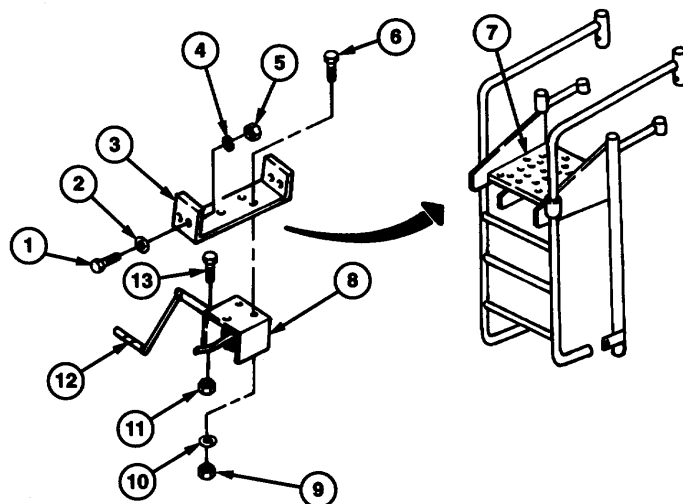
- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Spare tire removed (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

**a. REMOVAL**

1. Remove screw (13) and nut (11) and handle (12) from spare tire lifting device (8).
2. Remove four screws (1), washers (2), lockwashers (4), and nuts (5) and mounting plate (3) from top grating (7) of rear ladder. Discard lockwashers.
3. Remove three screws (6), lockwashers (10), and nuts (9), and spare tire lifting device (8) from mounting plate (3). Discard lockwashers.

**b. INSTALLATION**

1. Install spare tire lifting device (8) on mounting plate (3) with three screws (6), nuts (9), and new lockwashers (10).
2. Install mounting plate (3) on top grating (7) of rear ladder with four screws (1), washers (2), new lockwashers (4), and nuts (5).
3. Install handle (12) on spare tire lifting device (8) with screw (13) and nut (11).

**FOLLOW-ON MAINTENANCE:**

- Replace spare tire (refer to TM 9-2330-398-10).
- Disconnect ground (refer to TM 9-2330-398-10).

**2-73. MUDFLAP ASSEMBLY REPLACEMENT.***This Task Covers:*

a. Removal

b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Lockwasher (4) (Item 95, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Spare tire removed (refer to TM 9-2330-398-10)
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

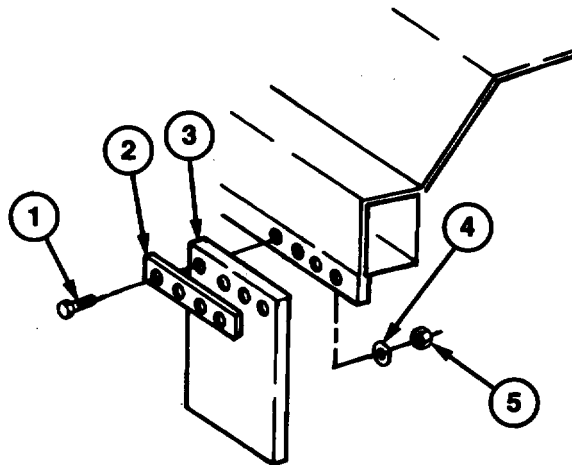
**a. REMOVAL**

Remove four bolts (1), lockwashers (4), and nuts (5), bracket (2), and mudflap (3) from rear bumper. Discard lockwashers.

**b. INSTALLATION****NOTE**

**Mudflaps are stocked in one size only.**

Install bracket (2) on top side of mudflap (3), and install mudflap (3) on rear bumper with four bolts (1), new lockwashers (4), and nuts (5).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

**2-74. FILL GAGE STORAGE TUBE CAP REPLACEMENT.***This Task Covers:*

a. Removal

b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

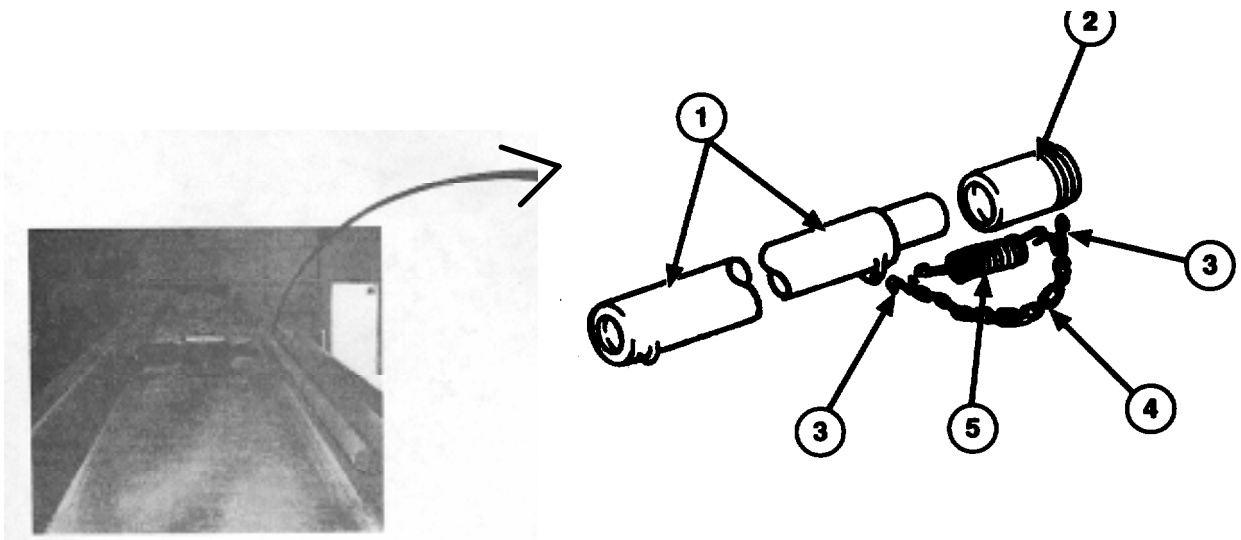
- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

**a. REMOVAL****WARNING****Ladder has narrow tread. Use care when climbing.**

1. Remove cap (2) from fill gage storage tube (1).
2. Remove two S-hooks (3), spring (5), and chain (4) from fill gage storage tube (1) and cap (2).

**b. INSTALLATION**

1. Install chain (4) and spring (5) on fill gage storage tube (1) and cap (2) with two S-hooks (3).
2. Install cap (2) in place on fill gage storage tube (1).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

**2-75. GROUNDING ROD STORAGE TUBE RETAINING PIN REPLACEMENT.***This Task Covers:*

a. Removal

b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

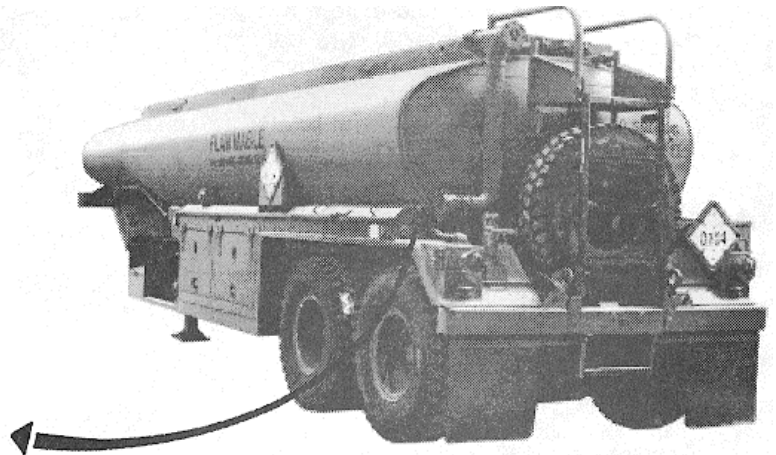
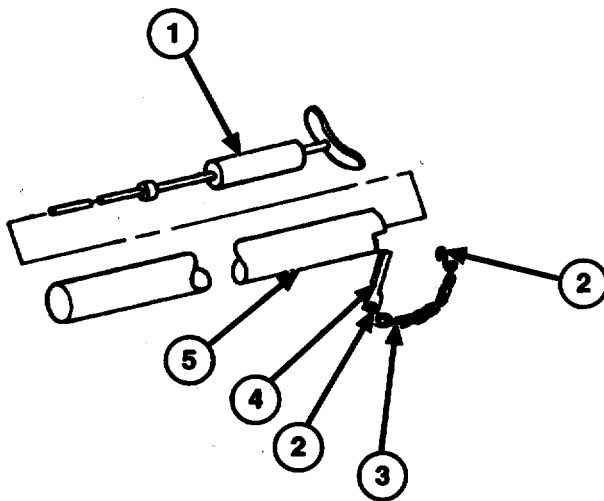
- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

**a. REMOVAL**

1. Remove S-hook (2) and chain (3) from portable grounding rod (1).
2. Remove retaining pin (4) from grounding rod storage tube (5).
3. Remove S-hook (2) from chain (3) and retaining pin (4).

**b. INSTALLATION**

1. Install retaining pin (4) on chain (3) with S-hook (2).
2. Install retaining pin (4) on grounding rod storage tube (5).
3. Install chain (3) on portable grounding rod (1) with S-hook (2).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

**2-76. HOSE TROUGH ACCESS COVER REPLACEMENT.***This Task Covers:*

a. Removal

b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Self-locking nut (4) (Item 166, Appendix F)
- Self-locking nut (4) (Item 169, Appendix F)

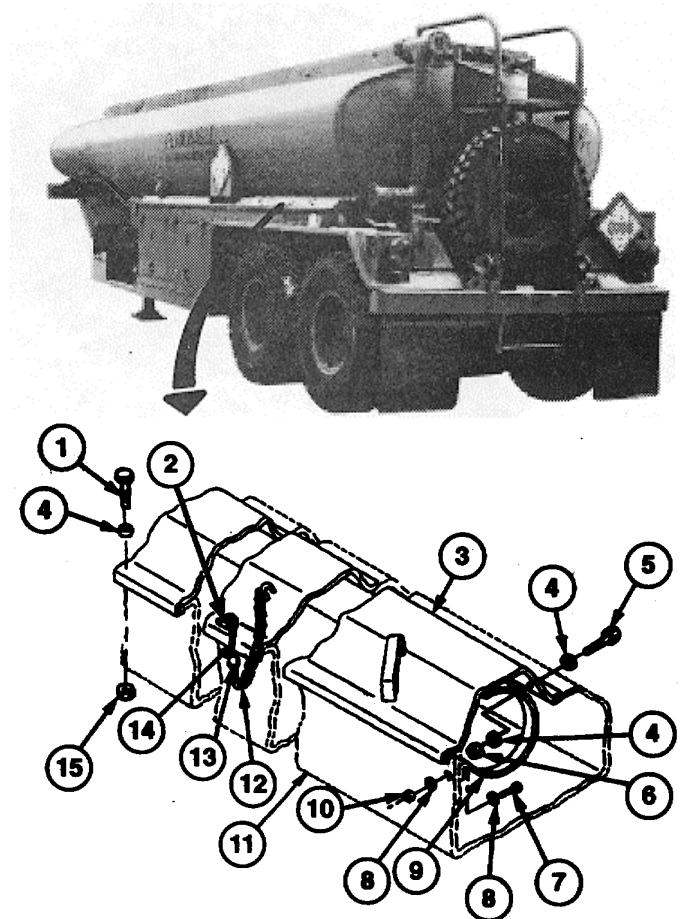
**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

**a. REMOVAL****NOTE**

Removal of road-side or curb-side hose trough access cover is the same. Road-side access cover is shown.

1. Unhook snaphook (14) from hose trough ring (2).
2. Remove four screws (1), washers (4), and self-locking nuts (15) from hose trough access cover (3) and hose trough (11). Discard self-locking nuts.
3. Open access cover (3) and remove two screws (7), four washers (8), two self-locking nuts (10) and webbings or wire rope assemblies (9) from hose trough (11). Discard self-locking nuts.
4. Remove access cover (3) from hose trough (11).
5. Remove two self-locking nuts (6) and webbings or wire rope assemblies (9), four washers (4), and two screws (5) from access cover (3). Discard self-locking nuts.
6. Remove snaphook (14) and S-hook (13) from chain (12).



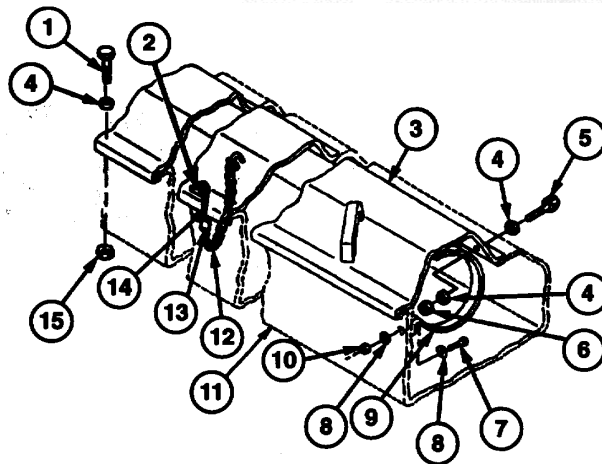
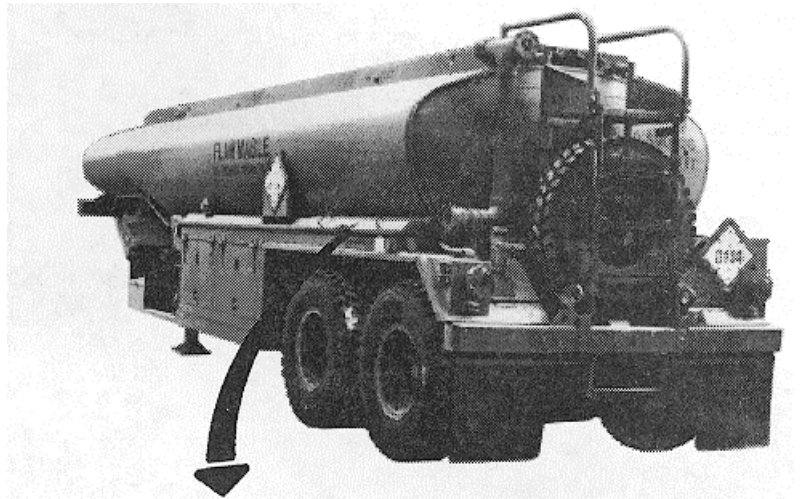
## 2-76. HOSE TROUGH ACCESS COVER REPLACEMENT (continued).

### b. INSTALLATION

#### NOTE

Installation of road-side or curb-side hose trough access cover is the same. Road-side access cover is shown.

1. Install snaphook (14) on chain (12) with S-hook (13).
2. Install two webbings or wire rope assemblies (9) on hose trough access cover (3) with two screws (5), four washers (4), and two new self-locking nuts (6).
3. Install access cover (3) on hose trough (11) in open position.
4. Install two webbings or wire rope assemblies (9) on hose trough (11) with two screws (7), four washers (8), and two new self-locking nuts (10).
5. Close access cover (3) and secure with four screws (1), washers (16), and new self-locking nuts (15).
6. Attach snaphook (14) on hose trough ring (2).



#### FOLLOW-ON MAINTENANCE:

- Disconnect ground (refer to TM 9-2330-398-10).

## 2-77. STATIC REEL AND ELECTRICAL CUP REPLACEMENT.

*This Task Covers:*

a. Removal

b. Installation

*Initial Setup:*

### Tools/Test Equipment:

- General mechanic's tool kit (Item 4, Appendix B)

### Materials/Parts:

- Lockwasher (4) (Item 99, Appendix F)
- Self-locking nut (2) (Item 172, Appendix F)

### Equipment Conditions:

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

### a. REMOVAL

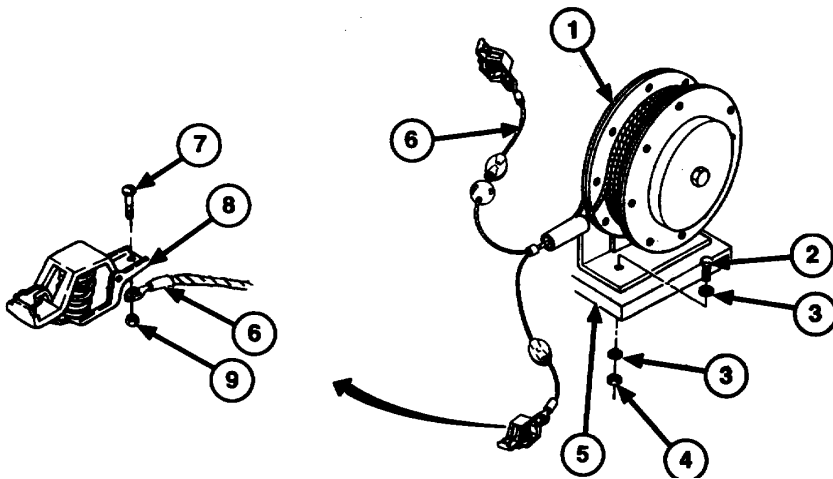
#### NOTE

**Removal of static reels and electrical clips from piping cabinet and hose reel cabinet is the same. One is shown here.**

1. Remove two screws (2), four washers (3), two self-locking nuts (4), and static reel (1) from cabinet (5). Discard lockwashers and self-locking nuts.
2. Remove screw (7), nut (9), and clip (8) from cable (6).

### b. INSTALLATION

1. Install static reel (1) on cabinet (5) with two screws (2), four new lockwashers (3), and two new self-locking nuts (4).
2. Install electrical dip (8) on cable (6) with screw (7) and nut (9).



### FOLLOW-ON MAINTENANCE:

- Disconnect ground (refer to TM 9-2330-398-10).

## 2-78. HOSE REEL CABINET DOOR LOCK-RELEASE LEVER REPLACEMENT.

This task covers:

- a. Removal
- b. Installation

Initial Setup:

### Tools/Test Equipment::

- General mechanic's tool kit (Item 4, Appendix B)

### Material/Parts:

- Self-locking nut (4) (Item 166, Appendix F)

### Equipment Conditions:

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

### a. REMOVAL

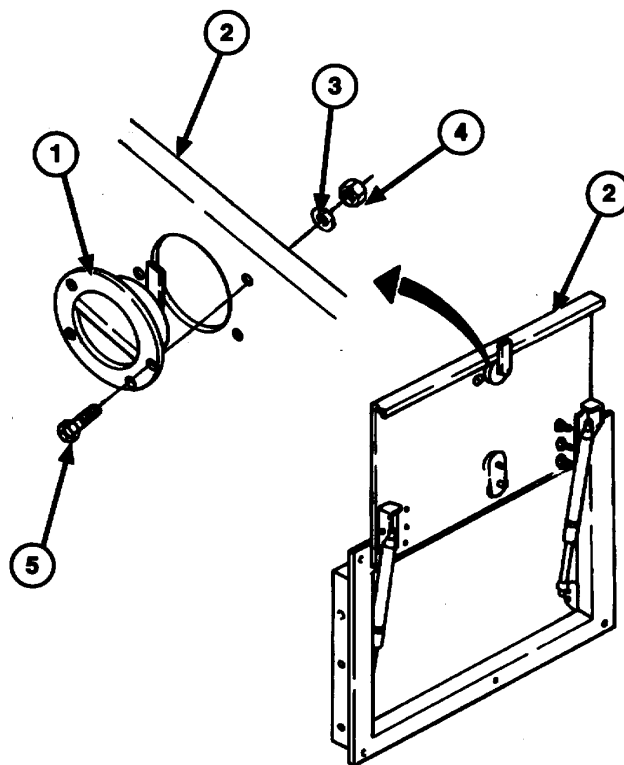
#### NOTE

Both hose reel cabinet door lock-release levers are replaced the same way.

1. Open hose reel cabinet door (refer to TM 9-2330-398-10).
2. Remove four screws (5), washers (3), and self-locking nuts (4) from lock release lever (1) and hose reel cabinet door (2). Discard self-locking nuts.
3. Remove lock-release lever (1) from hose reel cabinet door (2).

### b. INSTALLATION

1. Position lock-release lever (1) in place on hose reel cabinet door (2) and install four screws (5), washers (3), and new self-locking nuts (4).
2. Close hose reel cabinet door (refer to TM 9-2330-398-10).



### FOLLOW-ON MAINTENANCE:

- Disconnect ground (refer to TM 9-2330-398-10).



## 2-79. HOSE REEL CABINET DOOR CYLINDER ASSEMBLY REPLACEMENT.

This task covers:

- a. Removal
- b. Installation

Initial Setup:

### Tools/Test Equipment:

- General mechanic's tool kit (Item 4, Appendix B)

### Materials/Parts:

- Self-locking nut (2) (Item 177, Appendix F)

### Equipment Conditions:

- Semitrailer uncoupled (refer to TM 9-2330-39-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-39&10).

### a. REMOVAL

#### **WARNING**

Support hose reel cabinet door before removing cylinder assembly. Cabinet door can close suddenly, causing injury to personnel or damage to equipment

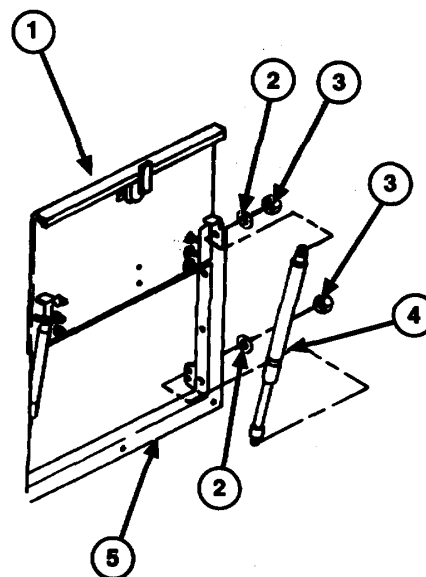
#### **NOTE**

All four hose reel cabinet door cylinder assemblies are replaced the same way.

- Open hose reel cabinet door (refer to TM 9-2330-398-10).
- Remove two self-locking nuts (3) and washers (2) and hose reel cabinet door cylinder assembly (4) from hose reel cabinet (5) and cabinet door (1). Discard self-locking nuts.

### b. INSTALLATION

- Position cylinder assembly (4) in place in hose reel cabinet (5) and on cabinet door (1).
- Secure cylinder assembly (4) with two new self-locking nuts (3) and washers (2).
- Close hose reel cabinet door (refer to TM 9-2330-39810).



### FOLLOW-ON MAINTENANCE:

- Disconnect ground (refer to TM 9-2330-398-10).

**2-80. HOSE REEL CABINET DOOR BUMPER REPLACEMENT.***This task covers:*

- a. Removal                      b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Self-locking nut (2) (Item 166, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-39-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-39&10).

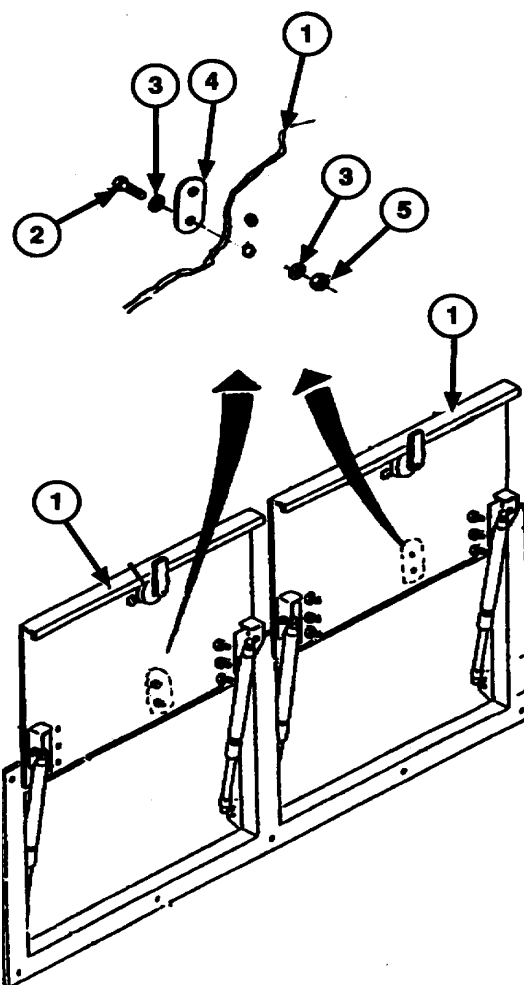
**a. REMOVAL****NOTE**

Both hose reel cabinet door bumpers are replaced the same way. One is shown.

1. Open hose reel cabinet door (refer to TM 9-2330-398-10).
2. Remove two self-locking nuts (5), four washers (3), bumper (4), and two screws (2) from hose reel cabinet door (1). Discard self-locking nuts.

**b. INSTALLATION**

1. Install bumper (4) on hose reel cabinet door (1) and secure with two screws (2), four washers (3), and two new self-locking nuts (5).
2. Close hose reel cabinet door (refer to TM 9-2330-398-10).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

---

**2-81. TOOL BOX ASSEMBLY REPAIR.**

---

*This task covers:*

- |                            |                |
|----------------------------|----------------|
| a. Removal                 | b. Disassembly |
| c. Cleaning and Inspection | d. Assembly    |
| e. Installation            |                |

---

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Emergency valve A handle control cable disconnected (para 2-133).
- Tool box emptied (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

**Materials/Parts:**

- Self-locking nut (Item 166, Appendix F)
- Self-locking nut (2) (Item 168, Appendix F)
- Self-locking nut (9) (Item 172, Appendix F)
- Self-locking nut (Item 176, Appendix F)

---

**a. REMOVAL****CAUTION**

**To avoid damage to equipment and injury to personnel, place support under tool box before removing mounting screws.**

1. Remove two screws (6 and 8) and self-locking nuts (4 and 9) from tool box (5). Discard self-locking nuts.
2. Remove two screws (13 and 15), washer (14), and two self-locking nuts (11 and 12) from tool box (5) and emergency valve A control handle bracket (10). Discard self-locking nuts.

**NOTE**

**Tool box may be tack welded in position. Do not reweld when installing tool box.**

3. Remove four mounting screws (22) and self-locking nuts (21) and tool box (5) from semitrailer. Discard self-locking nuts.

**b. INSTALLATION**

1. Remove two screws (2) and self-locking nuts (7), and angle brackets (3) and cover (1) from tool box (5). Discard self-locking nuts.
2. Remove screw (24) and self-locking nut (23) and catch (25) from cover (1). Discard self-locking nut.
3. Remove screw (16) and rubber catch (17) from bracket (19).
4. Remove two screws (18) and self-locking nuts (20) and bracket (19) from tool box (5). Discard self-locking nuts.

**c. CLEANING AND INSPECTION**

1. Inspect parts for cracks, bends, or damage. Replace defective parts. .

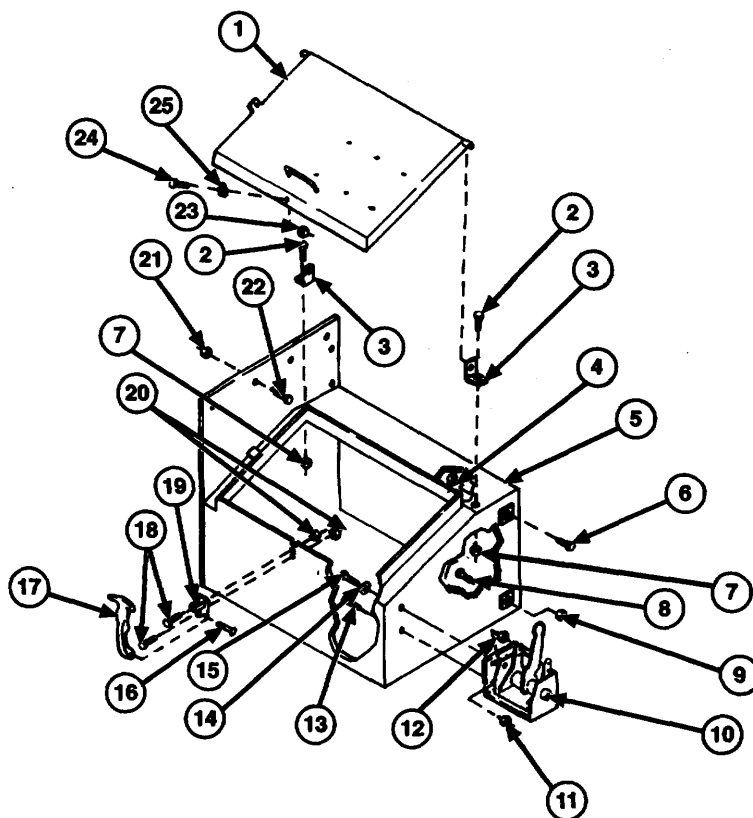
## 2-81. TOOL BOX ASSEMBLY REPAIR (continued).

### d. ASSEMBLY

1. Install bracket (19) on tool box (5) with two screws (18) and new self-locking nuts (20).
2. Install rubber catch (17) on bracket (19) with screw (16).
3. Install catch (25) on cover (1) with screw (24) and new self-locking nut (23).
4. Install cover (1) on tool box (5) with two screws (2), new self-locking nuts (7), and angle brackets (3).

### e. INSTALLATION

1. Install tool box (5) on semitrailer with four mounting screws (22) and new self-locking nuts (21).
2. Install two screws (6 and 8) and new self-locking nuts (4 and 9) on tool box (5).
3. Install two screws (13 and 15), one washer (14), and two new self-locking nuts (11 and 12) on emergency valve A control handle bracket (10) and tool box (5).



### FOLLOW-ON MAINTENANCE:

- Connect emergency valve A handle control cable (para 2-133).
- Place tools in tool box (refer to TM 9-2330-398-10).
- Disconnect ground (refer to TM 9-2330-398-10).

**2-82. MANHOLE COVER ASSEMBLY REPAIR.**

*This task covers:*

- |                            |                |
|----------------------------|----------------|
| a. Removal                 | b. Disassembly |
| c. Cleaning and Inspection | d. Assembly    |
| e. Installation            |                |

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Tool box emptied (refer to TM 9-2330-398-10).

**Materials/Parts:**

- Gasket (Item 66, Appendix F)
- Preformed packing (Item 133, Appendix F)

**WARNING**

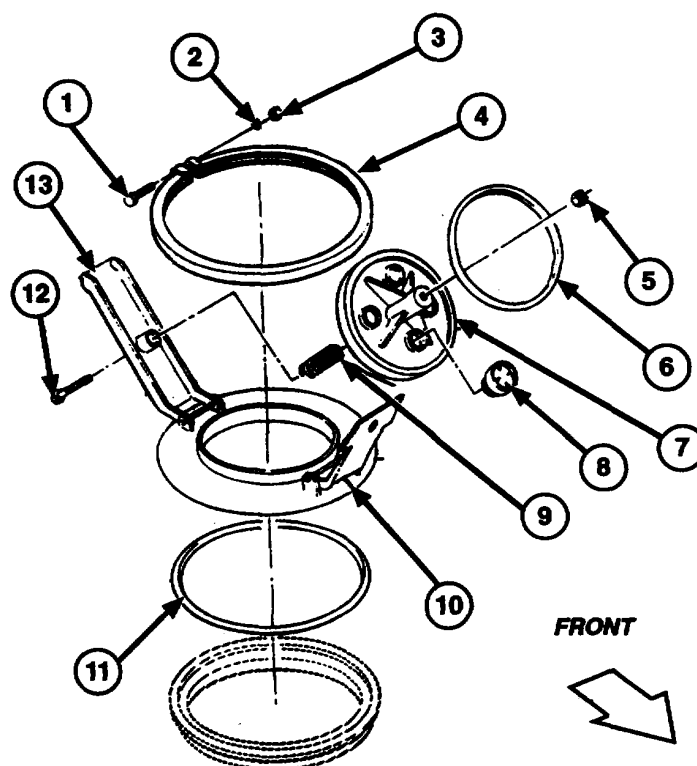
- **To avoid personal injury, always relieve pressure in tank shell and stand downwind when manhole cover assembly.**
- **Manhole fill cover assembly does not lock open. Injury can occur if manhole cover accidentally closes on personnel.**

**a. REMOVAL**

1. Remove bolt (1), washer (2), and nut (3) holding access locking ring (4) to semitrailer.
2. Remove locking ring (4), manhole cover assembly (10), and manhole cover gasket (12) from semitrailer. Discard gasket.

**b. INSTALLATION**

1. Remove nut (5), filler cap (7), adjusting bolt (12), and spring (9) from secondary latch (13).
2. Remove relief valve (8) and preformed packing (6) from filler cap (7). If relief valve (8) is gummed up with product, or if there are signs of obvious damage, replace relief valve. Discard preformed packing.



---

**2-82. MANHOLE COVER ASSEMBLY REPAIR (continued).**

---

**c. ASSEMBLY**

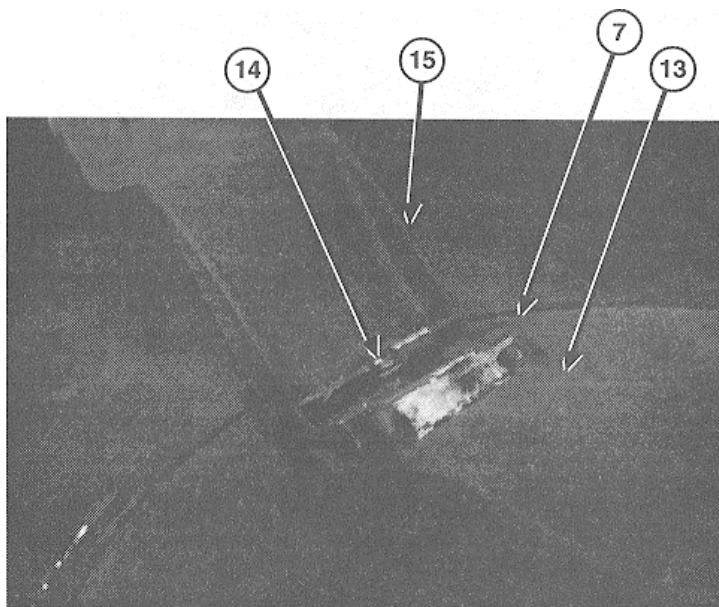
1. Install new preformed packing (6) and relief valve (8) on filler cap (7).
2. Install filler cap (7) on secondary latch (13) using adjusting bolt (12), spring (9), and nut (5).
3. Perform adjustments steps 1 through 5.

**d. INSTALLATION**

1. Position new manhole cover gasket (10) on semitrailer. Install manhole cover assembly (10) on semitrailer with locking ring (4).
2. Secure locking ring (4) with bolt (1), washer (2), and nut (3).

**e. ADJUSTMENT**

1. Remove padlock, release safety latch (13), and open filler cap (7).
2. Loosen nut (5) on underside of filler cap (7) and close filler cap (7).
3. Loosen or tighten adjusting bolt (12) until safety latch (14) just clears secondary latch (13) on end of strong-back (15).

**FRONT**

4. Open filler cap (7) and tighten nut (5).
5. Close filler cap (7) and recheck clearances of secondary latch (13) and strongback (15).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

---

**2-43. SPARE TIRE UFTING DEVICE AND DRAIN PIPE REPLACEMENT.**


---

*This task covers:*

- a. Removal                      b. Installation
- 

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

- Self-locking nut (4) (Item 173, Appendix F)
- Self-locking nut (2) (Item 174, Appendix F)

**Materials/Parts:**

- Lockwasher (4) (Item 95, Appendix F)
- Lockwasher (6) (Item 97, Appendix F)
- Pipe clamp coupling (2) (Item 129, Appendix F)
- Self-locking nut (8) (Item 169, Appendix F)
- Self-locking nut (4) (Item 171, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
  - Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
  - Spare tire removed (refer to TM 9-2330-398-10).
  - Front hazardous materials placard removed (para 2-90).
- 

**a. REMOVAL**

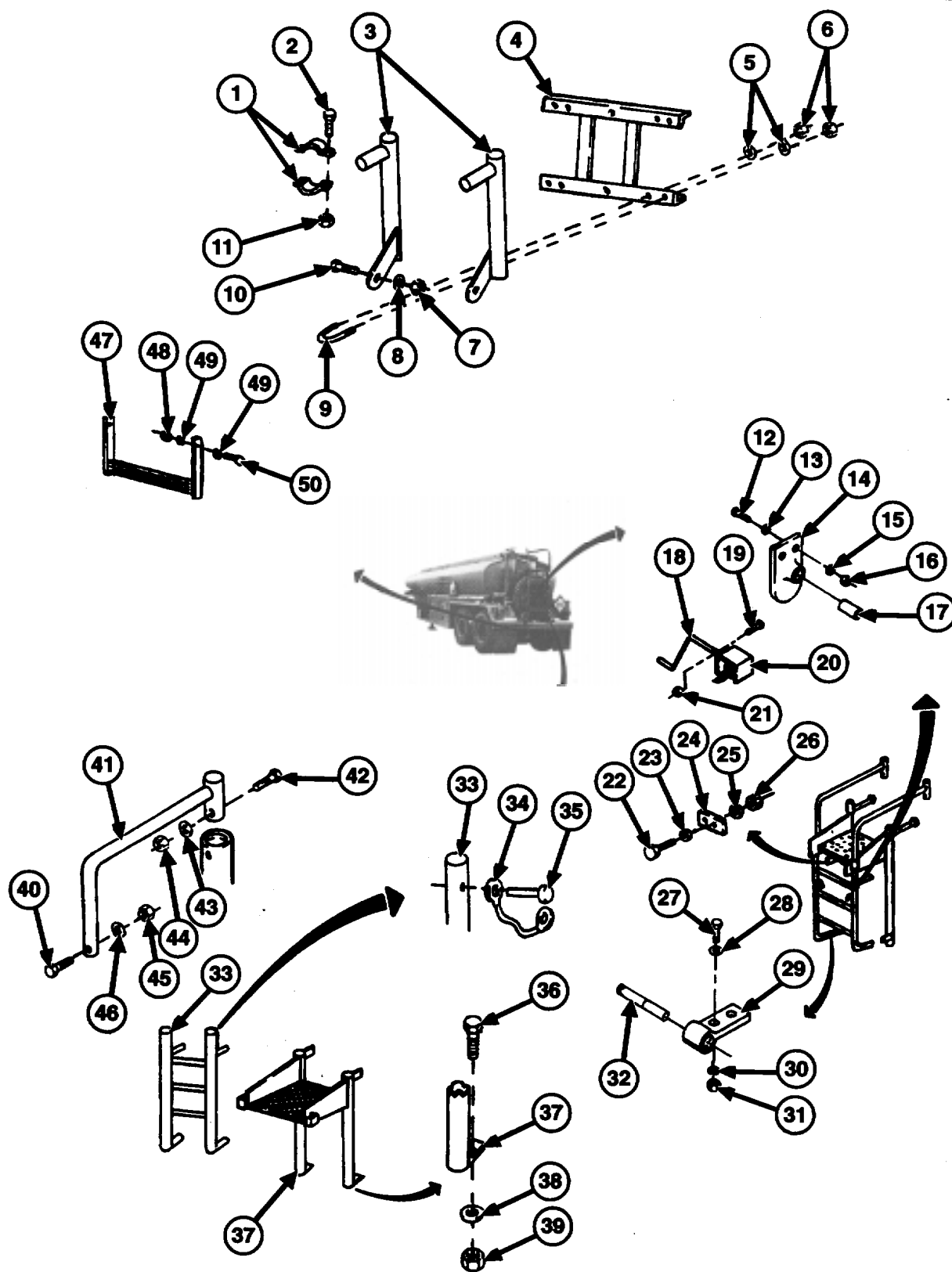
1. Remove eight self-locking nuts (6) and washers (5), four U-bolts (9), and bracket (4) from two front drain pipes (3). Discard self-locking nuts.
2. Remove two self-locking nuts (7), washers (8), and screws (10) from bottom of two front drain pipes (3). Discard self-locking nuts.
3. Remove four nuts (11) and screws (2), two pipe clamp couplings (1), and two front drain pipes (3) from semitrailer. Discard pipe clamp couplings.
4. Remove two self-locking nuts (45), washers (46), and screws (40) from two handrails (41). Discard self-locking nuts.
5. Remove two self-locking nuts (44), washers (43), screws (42), and two handrails (41) from semitrailer. Discard self-locking nuts.

**NOTE**

**Self-locking nut is provisioned with handle extension.**

6. Remove self-locking nut (21) and screw (19) from winch adapter (20) and handle extension (18).
7. Remove handle extension (18) and bushing (17) from support (14).
8. Remove two nuts (16), lockwashers (15), washers (13), and screws (12) from support (14). Discard lockwashers.
9. Remove four nuts (31), lockwashers (30), screws (27), and washers (28), and two hinges (29) from semitrailer. Discard lockwashers.
10. Remove two hinges (29) from two hinge pivots (32).

## 2-83. SPARE TIRE UFTING DEVICE AND DRAIN PIPE REPLACEMENT (continued).





---

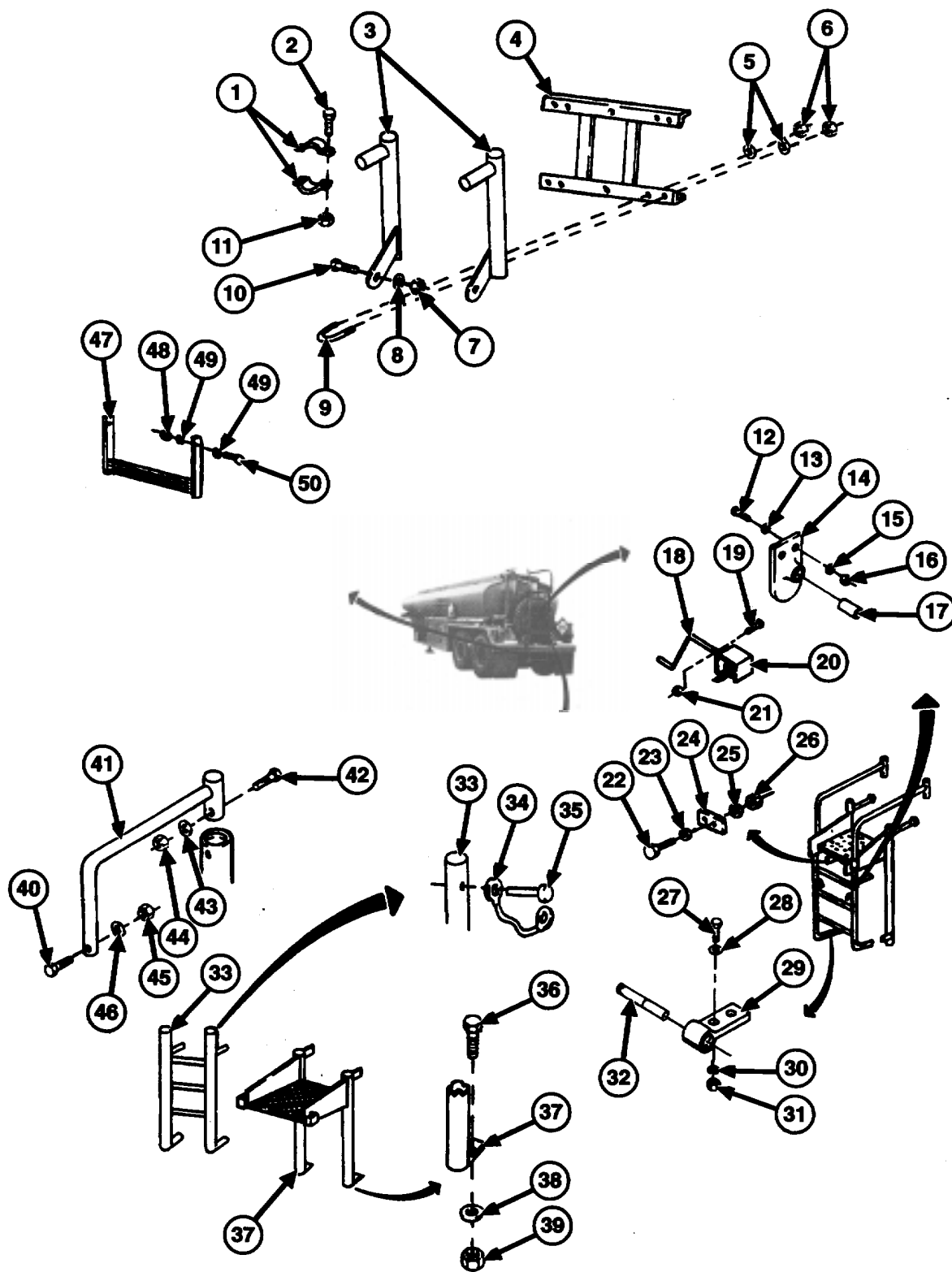
**2-83. SPARE TIRE UFTING DEVICE AND DRAIN PIPE REPLACEMENT (continued).**

11. Remove two hinge pivots (32) from spare tire lifting device ladder (33).
12. Remove two quick-release pins (35) and wire ropes (34), and ladder (33) from semitrailer.
13. Remove four nuts (26), lockwashers (25), screws (22), washers (23), and two rubber stops (24) from two back drain pipes (37). Discard lockwashers.
14. Remove two self-locking nuts (39), washers (38), screws (36), and two back drain pipes (37) from semitrailer. Discard self-locking nuts.
15. Remove two self-locking nuts (48), four washers (49), and two screws (50) and step (47) from semitrailer. Discard self-locking nuts.

**b. INSTALLATION**

1. Install step (47) on semitrailer with two screws (50), four washers (49), and two new self-locking nuts (48).
2. Install two back drain pipes (37) on semitrailer with two screws (36), washers (38), and new self-locking nuts (39).
3. Install two rubber stops (24) on two back drain pipes(3S) with four screw (22), washers (23), new lockwashers (25), and nuts (26).
4. Install spare tire lifting device ladder (33) on semitrailer with two quick-release pins (36) and two wire ropes (35).
5. Install two hinge pivots (32) on ladder (33).
6. Install two hinges (29) on two hinge pivots (32).
7. Install two hinges (29) on semitrailer with four screws (27), washers (28), new lockwashers (30), and nuts (31).
8. Install support (14) on semitrailer with two screws (12), washers (13), new lockwashers (15), and nuts (16).
9. Align handle extension (18) and bushing (17) in support (14).
10. Install handle extension (18) on winch adapter (20) with screw (19) and self-locking nut (21).
11. Install two upper handrails (41) on semitrailer with two screws (42), washers (43), and new self-locking nuts (44).
12. Install two screws (40), washers (46), and new self-locking nuts (45) on two upper handrails (41).
13. Install two front drain pipes (3) on semitrailer with two new pipe clamp couplings (1), and four screws (2), and nuts (11).
14. Install two screws (10) washers (8), and new self-locking nuts (7) on bottom of two front drain pipes (3).
15. Install bracket (4) on two front drain pipes (3) with four U-bolts (9), eight washers (5), and eight new self-locking nuts (6).

## 2-83. SPARE TIRE LIFTING DEVICE AND DRAIN PIPE REPLACEMENT (continued).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).
- Install front hazardous materials placard (para 2-90).

**2-84. GROUNDING STUD REPLACEMENT.***This task covers:*

- a. Removal                      b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

**Material/Parts:**

- Lockwasher (Item 100, Appendix F)

**WARNING**

Ladder has narrow tread. Use care when climbing.

**NOTE**

Replacement of lower grounding stud is similar to replacement of upper grounding stud, except that lower grounding stud has four lockwashers. Upper grounding stud is shown here.

**a. REMOVAL**

Remove nut (3), lockwasher (2), and grounding stud (1) from frame (4).

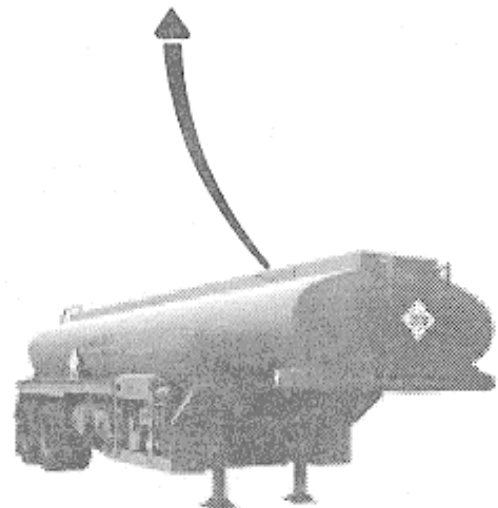
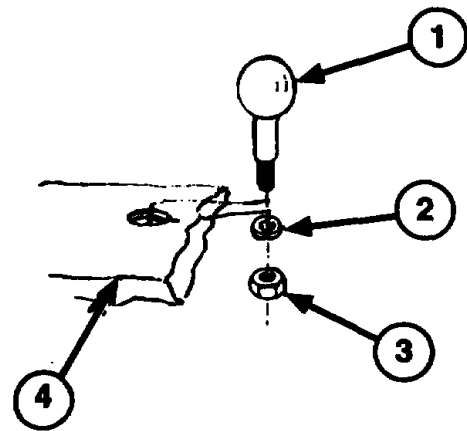
**b. INSTALLATION****NOTE**

Make sure grounding studs are installed on clean, unpainted metal surface. If mounting surface is painted, scrape off paint to bare metal.

1. Install new grounding stud (1) with new lockwasher (2) and nut (3) on frame (4)
2. Make sure International Grounding Symbol and "DO NOT PAINT GND STUD" stencils are present and legible.

**FOLLOW-ON MAINTENANCE:**

- None



---

**2-85. ENGINE SPLASH GUARD REPLACEMENT.**

---

*This task covers:*

- a. Removal
- b. Installation

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

**Material/Parts:**

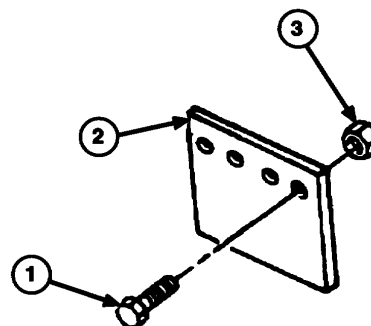
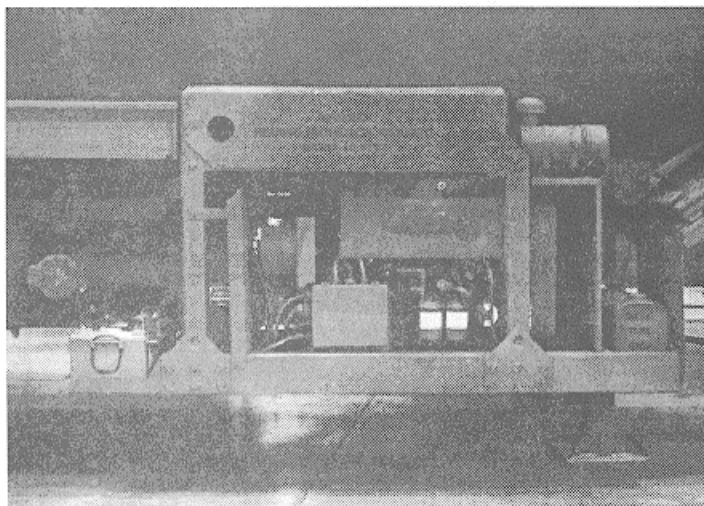
- Self-locking nut (4) (Item 167, Appendix F)

**a. REMOVAL**

Remove four screws (1) and self-locking nuts (3) and splash plate (2) from frame. Discard self-locking nuts.

**b. INSTALLATION**

Install splash plate (2) on frame with four screws (1) and new self-locking nuts (3).



**FOLLOW-ON MAINTENANCE:**

- None

---

**2-86. VENT CAP REPLACEMENT.**

---

*This task covers:*

- a. Removal                      b. Installation
- 

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

**Material/Parts:**

- Tape, antiseize (Item 30, Appendix C)
  - Gasket (Item 38, Appendix F)
- 

**WARNING**

Ladder has narrow tread. Use care when climbing.

**NOTE**

Both vent caps are replaced the same way. One is shown here.

**a. REMOVAL****NOTE**

If replacing gasket only, perform steps 1 and 3.

1. Remove vent cap (2) from pipe nipple (5).
2. Remove S-hook (3) and chain (1) from vent cap (2).
3. Remove gasket (4) from vent cap (2). Discard gasket.

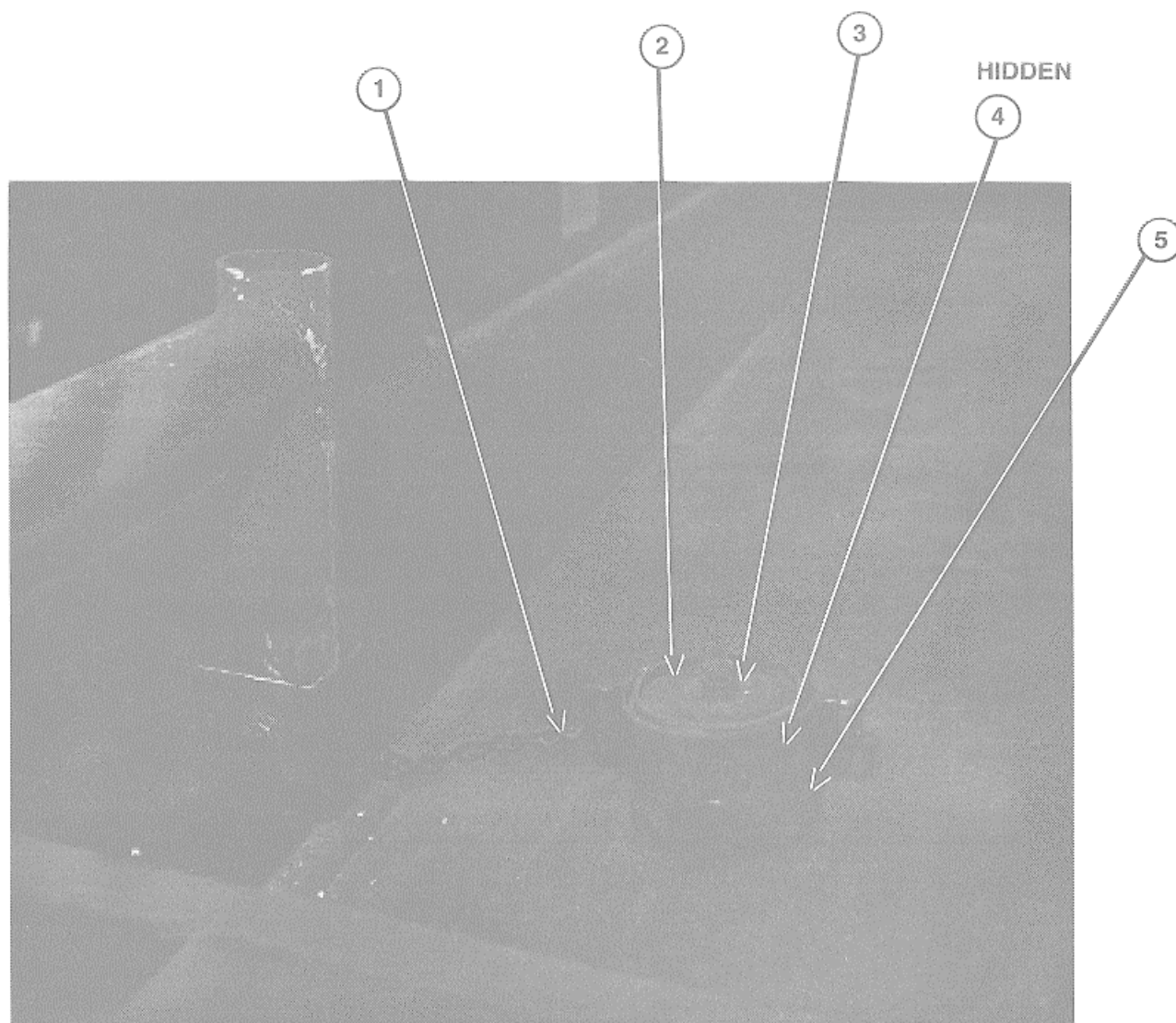
---

**2-86. VENT CAP REPLACEMENT (continued).**

---

**b. INSTALLATION**

1. Install new gasket (4) inside vent cap (2).
2. Install S-hook (3) and chain (1) on vent cap (2).
3. Apply antiseize tape to threads of pipe nipple (5), and install vent cap (2) on pipe nipple (5).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

## Section XI. BODY, CHASSIS, AND HULL ACCESSORY ITEMS MAINTENANCE

Paragraph Number	Title	Page Number
2-87	General .....	2-188
2-88	Reflector Replacement .....	2-188
2-89	Identification and Instruction Plate Replacement .....	2-190
2-90	Hazardous Materials Placard and Bracket Replacement .....	2-191

**2-87. GENERAL**

This section describes and illustrates removal and installation procedures for the reflectors, identification and instruction plates, and hazardous placard and bracket.

**2-88. REFLECTOR REPLACEMENT.**

*This task covers:*

- a. Removal                      b. Installation

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

- Self-locking nut (Item 169, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

**Material/Parts:**

- Drycleaning solvent (Item 12, Appendix C)
- Rag (Item 25, Appendix C)

**a. REMOVAL****WARNING**

**Drycleaning solvent P-D680 is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breathe vapors. DO NOT use near open flame or excessive heat.**

**NOTE**

**For proper installation of reflector, note its location before removing. If reflector is attached with adhesive, go to step 1; if it is attached with screws, go to step 3.**

1. Use drycleaning solvent to loosen damaged reflector (4), then remove reflector (4) from semitrailer.
2. Clean any adhesive residue from semitrailer with drycleaning solvent. Wipe surface with clean rag.
3. Remove two screws (1), washers (2), and self-locking nuts (3) and reflector (4) from semitrailer.

---

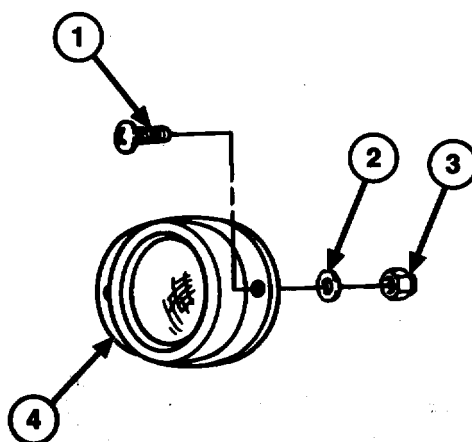
**2-88. REFLECTOR REPLACEMENT (continued).**

---

**b. INSTALLATION****NOTE**

Surface must be clean and dry before installing reflector. If reflector is attached with adhesive, go to step 1; if reflector is attached with screws, go to step 3.

1. Remove protective backing from new reflector (4) and position on semitrailer.
2. Using dry rag, press reflector (4) into position. Start in center of reflector (4) and press outward, to remove any air bubbles.
3. Secure reflector (4) on semitrailer with two screws (1), washers (2), and self-locking nuts (3).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).



**2-89. IDENTIFICATION AND INSTRUCTION PLATE REPLACEMENT.***This task covers:*

- a. Removal
- b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to

**Material/Parts:**

- Self-locking nut (Item 166, Appendix F)

**NOTE**

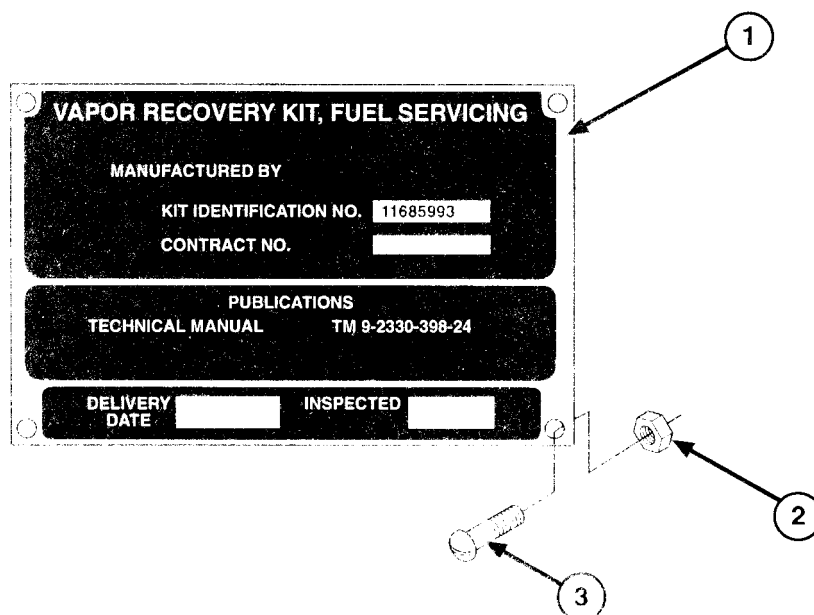
- If instruction plates have been mounted with rivets, drill out rivets and replace with proper machine screws.
- Number of screws securing instruction plates will vary.

**a. REMOVAL**

Remove four screws (3) and self-locking nuts (2) and instruction plate (1) from semitrailer. Discard self-locking nuts.

**b. INSTALLATION**

Install instruction plate (1) on semitrailer with four screws (3) and new self-locking nuts (2).

**FOLLOW-ON MAINTENANCE:**

- None.

**2-90. HAZARDOUS MATERIALS PLACARD AND BRACKET REPLACEMENT.**

*This task covers:*

- a. Removal                      b. Installation

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to

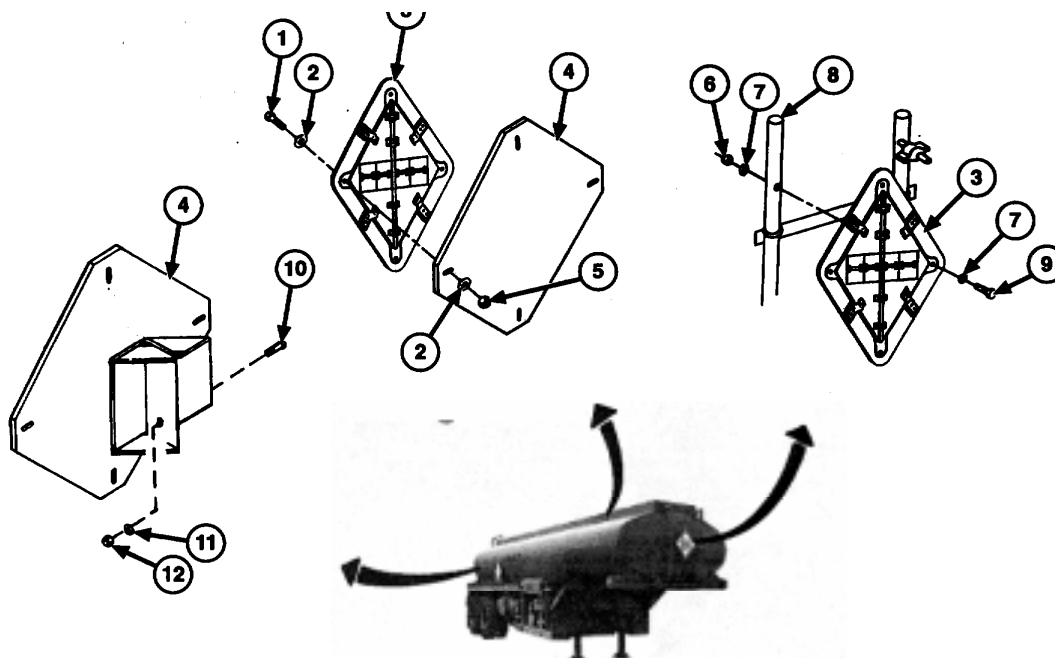
**Material/Parts:**

- Self-locking nut (16) (Item 166, Appendix F)
- Self-locking nut (16) (Item 171, Appendix F)

**a. REMOVAL****NOTE**

**All hazardous materials placards are removed and installed from brackets the same way. One placard is shown here. Brackets are different on rear, curb-side, and roadside of semitrailer.**

1. Remove four screws (1), eight washers (2), four self-locking nuts (5), and hazardous materials placard (3) from bracket (4). Discard self-locking nuts.
2. Remove four self-locking nuts (6), eight washers (7), four screws (9), and placard (3) from support (8) on front of semitrailer. Discard self-locking nuts.
3. Remove four screws (10), washers (11), and self-locking nuts (12) and bracket (4) from rear of semitrailer. Discard self-locking nuts.

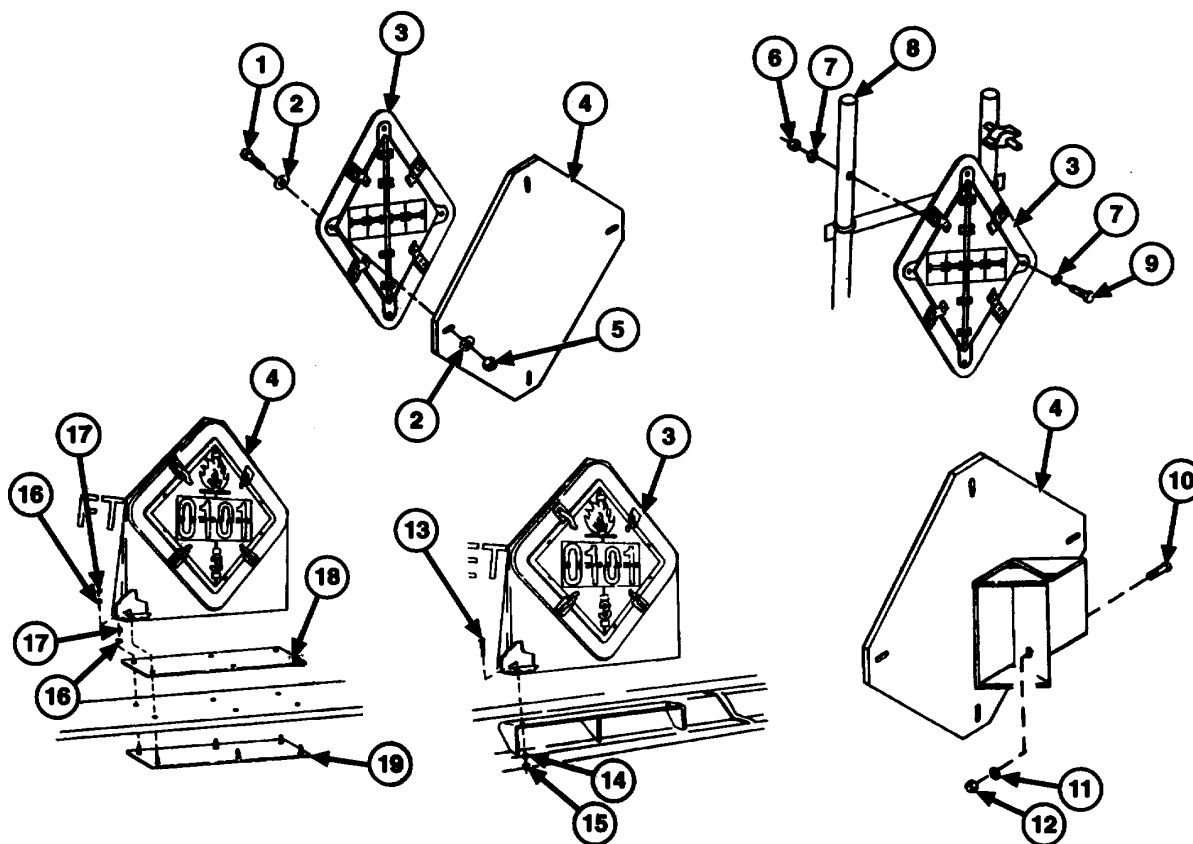


**2-90. HAZARDOUS MATERIALS PLACARD AND BRACKET REPLACEMENT (continued).**

4. Remove six screws (13), washers (14), and self-locking nuts (15) and bracket (4) from curb side of semitrailer.
5. Remove six self-locking nuts (17) and washers (16), support (19), plate (18), and bracket (4) from road side of semitrailer. Discard self-locking nuts.

**b. INSTALLATION**

1. Install bracket (4), plate (18), and support (19) on road side of semitrailer with six new self-locking nuts (16) and washers (17).
2. Install bracket (4) on curb-side of semitrailer with six screws (13), washers (14), and new self-locking nuts (15).
3. Install bracket (4) on rear of semitrailer with four screws (10), washers (11), and new self-locking nuts (12).
4. Install hazardous materials placard (3) on support (8) with four screws (9), eight washers (7), and four new self-locking nuts (6).
5. Install hazardous materials placard (3) on bracket (4) with four screws (1), eight washers (2), and four new self-locking nuts (5).



## Section XII. AUXILIARY GENERATOR AND ENGINE, AND CONTROLS MAINTENANCE

Paragraph Number	Title	Page Number
2-91	General .....	2-193
2-92	Engine Fuel Pump Assembly Repair .....	2-194
2-93	Engine Intake Air Cleaner Replacement .....	2-196
2-94	Engine Air Filter Element Replacement .....	2-197
2-95	Air Cleaner Restriction Indicator Replacement .....	2-199
2-96	Air Duct Hose and Pipe Coupling Replacement .....	2-200
2-97	Engine Fuel Tank Replacement .....	2-201
2-98	Engine Fuel Lines and Fittings Replacement .....	2-204
2-99	Muffler and Exhaust Pipe Replacement .....	2-206
2-100	Alternator, Mounting Bracket, and V-Belt Adjustment and Replacement .....	2-209
2-101	Engine Electrical Wiring Repair .....	2-213
2-102	Electrical Lead Assembly (12267081) Replacement .....	2-214
2-103	Engine Electrical Box Repair .....	2-216
2-104	Branch Wiring Harness Replacement .....	2-220
2-105	Engine Electrical Conduit Replacement .....	2-221
2-106	Engine Oil Filter Replacement .....	2-222
2-107	Glow Plugs Replacement .....	2-224
2-108	Intake Manifold Replacement .....	2-226
2-109	Fuel Filters (Primary and Secondary) Replacement .....	2-228
2-110	Fuel Filter Head and Hose Assembly Replacement .....	2-230
2-111	Engine Starter and Solenoid Replacement .....	2-232
2-112	Engine Control Panel Repair .....	2-236

### 2-91. GENERAL.

This section describes and illustrates removal and installation procedures for the engine fuel pump assembly, engine intake air cleaner, engine air filter, air cleaner indicator, air duct hose and pipe coupling, engine fuel tank, engine fuel lines and fittings, muffler and exhaust pipe, alternator and mounting bracket, engine electrical wiring, electrical lead, engine electrical box, branch wiring harness, engine oil filter, glow plugs, intake manifold, fuel filters, fuel filter head and hose, engine starter, and control panel gages. Repair procedures for the engine fuel pump assembly, engine electrical wiring, engine electrical box, and engine control panel gages are also addressed.

## 2-92. ENGINE FUEL PUMP ASSEMBLY REPAIR.

*This task covers:*

- |             |                 |
|-------------|-----------------|
| a. Removal  | b. Disassembly  |
| c. Assembly | d. Installation |

*Initial Setup:*

### Tools/Test Equipment:

- General mechanic's tool kit (Item 4, Appendix B)

### Material/Parts:

- Gasket (Item 70, Appendix F)

- Lockwasher (4) (Item 87, Appendix F)
- Self-locking nut (Item 169, Appendix F)

### Equipment Conditions:

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

### NOTE

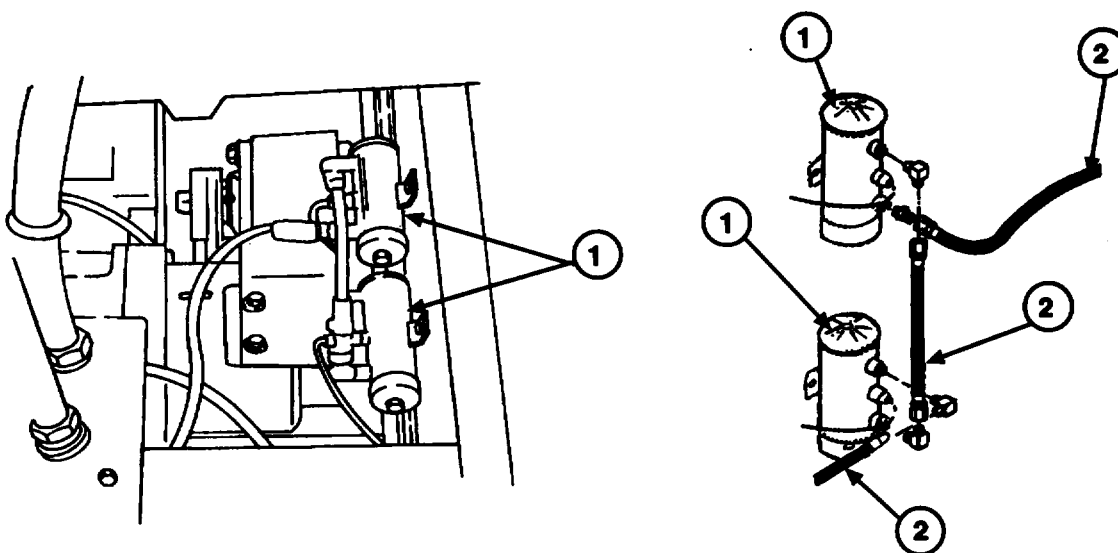
There are two electric fuel pumps. Use this paragraph to repair either one.

#### a. REMOVAL

### NOTE

The two fuel pumps are located on the left rear side of the engine and are mounted to the rear firewall.

1. Position suitable container in place under fuel pump (1) to collect any spilled fuel.
2. Tag and disconnect two fuel lines (2) from fuel pump (1). Plug fuel lines (2) to prevent fuel contamination.



**2-92. ENGINE FUEL PUMP ASSEMBLY REPAIR (continued).**

3. Tag and disconnect electrical lead (6) from fuel pump (1).
4. Remove two screws (5) and self-locking nuts (3), four lockwashers (4), and fuel pump (1) from rear firewall. Discard self-locking nuts and lockwashers.

**b. DISASSEMBLY**

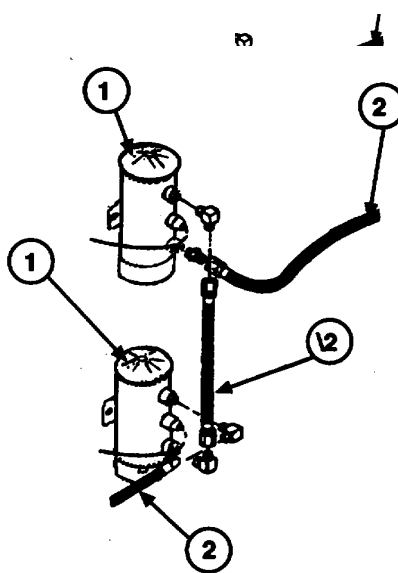
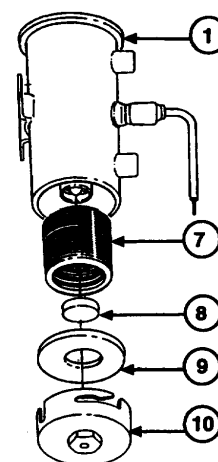
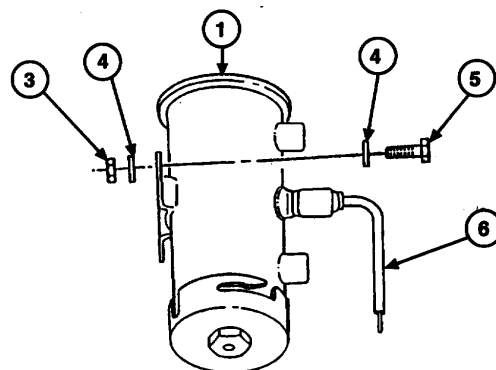
1. Remove bottom cover (10) from fuel pump (1).
2. Remove gasket (9), magnet (8), and filter (7) from fuel pump (1). Discard gasket.

**c. ASSEMBLY**

1. Install filter (7), magnet (8), and new gasket (9) in fuel pump (1).
2. Install bottom cover (10) on fuel pump (1).

**d. INSTALLATION**

1. Install fuel pump (1) in place on rear firewall of semitrailer and secure with two screws (5), four new lockwashers (4), and two new self-locking nuts (3).
2. Connect electrical lead (6) to fuel pump (1).
3. Connect two fuel lines (2) to fuel pump (1).

**FOLLOW-ON MAINTENANCE:**

- None.

## 2-93. ENGINE INTAKE AIR CLEANER REPLACEMENT.

This task covers:

- a. Removal
- b. Installation

Initial Setup:

### Tools/Test Equipment:

- General mechanic's tool kit (Item 4, Appendix B)

### Equipment Conditions:

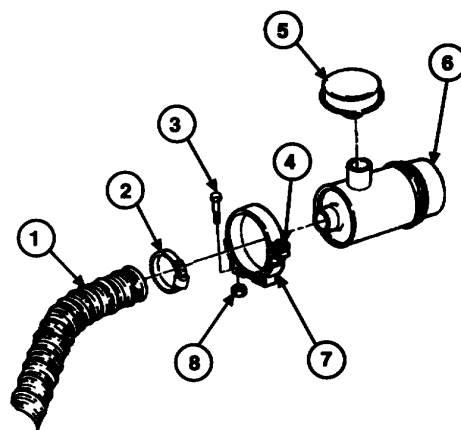
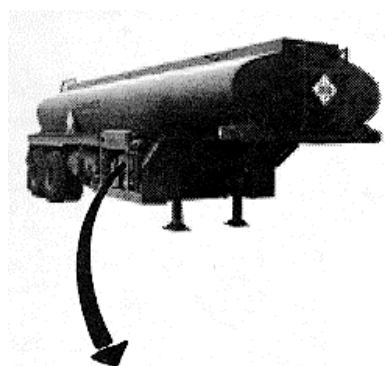
- Semitrailer uncoupled (refer to TM 9-2330-398-10).

### Material/Parts:

- Self-locking nut (4) (Item 170, Appendix E)

#### a. REMOVAL

1. Remove dust cap (5) from engine intake aircleaner (6).
2. Remove hose clamp (2) and air intake hose (1) from air cleaner (6).
3. Remove four screws (3) and self-locking nuts (8) from two loop clamps (7). Discard self-locking nuts.
4. Remove air cleaner (6) and two loop clamps (7) from semitrailer.
5. Loosen two screws (4) and remove loop clamps (7) from air cleaner (6).



#### b. INSTALLATION

1. Install two loop clamps (7) on air cleaner (6), but do not tighten two screws (4).
2. Install air cleaner (6) and two loop clamps (7) on semitrailer and secure with four screws (3) and new self-locking nuts (8).
3. Install dust cap (5) on air cleaner (6).
4. Rotate air cleaner (6) in two loop clamps (7) until dust cap (5) is pointing straight up. Tighten two screws (4) on loop clamps (7).
5. Install air intake hose (1) on air cleaner (6) and secure with hose clamp (2).

### FOLLOW-ON MAINTENANCE:

- None.

**2-94. ENGINE AIR FILTER ELEMENT REPLACEMENT.***This task covers:*

- a. Removal                      b. Cleaning and Inspection                      c. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

**Material/Parts:**

- Rag (Item 25, Appendix C)

**a. REMOVAL**

1. Loosen air cleaner housing clamp (3) and remove dust cap (5) from air cleaner (1).

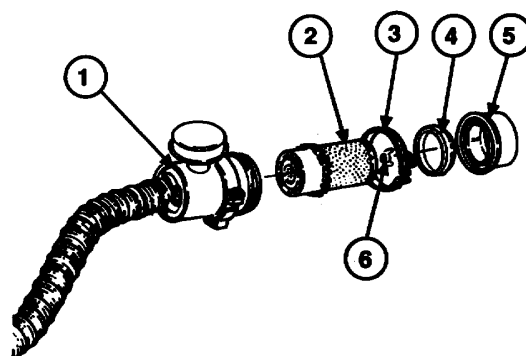
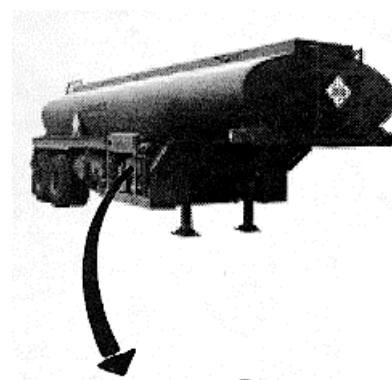
**WARNING**

If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Failure to follow this warning may result in severe injury or death to personnel.

2. Remove baffle (4) from dust cap (5).
3. Empty dust and debris collected in dust cap (5).
4. Remove wingnut (6) and engine air filter element (2) from air cleaner (1).

**b. CLEANING AND INSPECTION**

1. Check filter element for holes, rips, or tears. If damaged, replace filter element. If dirty or clogged, perform step 2.

**WARNING**

Compressed air used for cleaning purposes should not exceed 30 psi (206.8 kPa). Use only with effective chip-guarding and personal protective equipment (e.g., goggles/shield, gloves). Failure to do this can result in Injury to personnel.

2. Clean filter element with low-pressure compressed air directed inside the filter element.
3. Wipe inside of air cleaner with clean, damp rag.



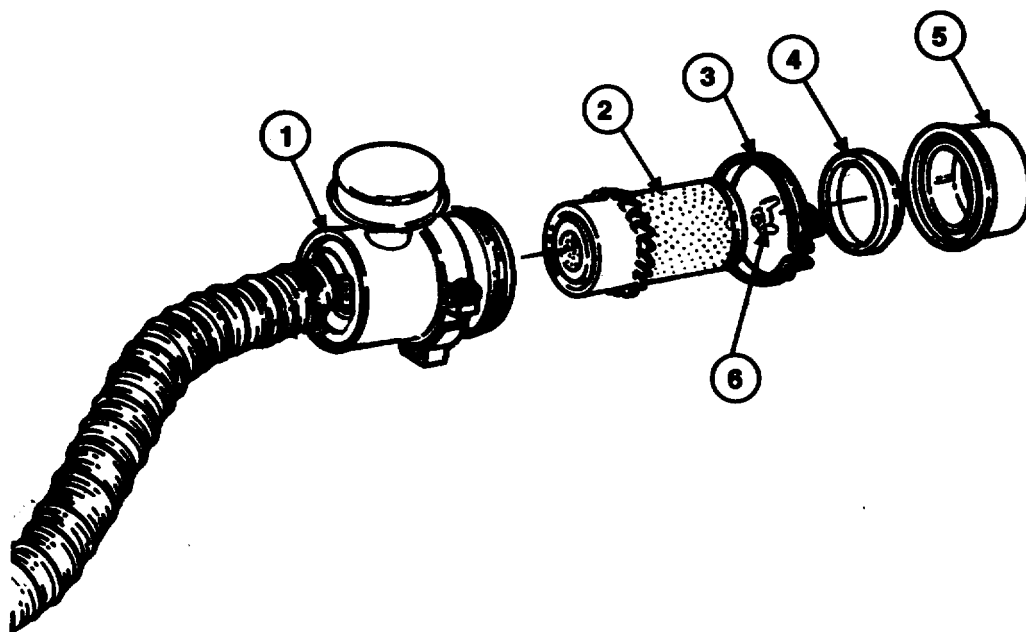
---

**2-94. ENGINE AIR FILTER ELEMENT REPLACEMENT (continued).**

---

**c. INSTALLATION**

1. Install baffle (4) in dust cap (5).
2. Install filter element (2) in air cleaner (1) and secure with wingnut (6).
3. Install dust cap (5) on air cleaner (1) and secure with air cleaner housing clamp (3).

**FOLLOW-ON MAINTENANCE:**

- None.

**2-95. AIR CLEANER RESTRICTION INDICATOR REPLACEMENT.***This Task Covers:*

- a. Removal
- b. Installation

*Initial Setup:***Tools Test Equipment:**

General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

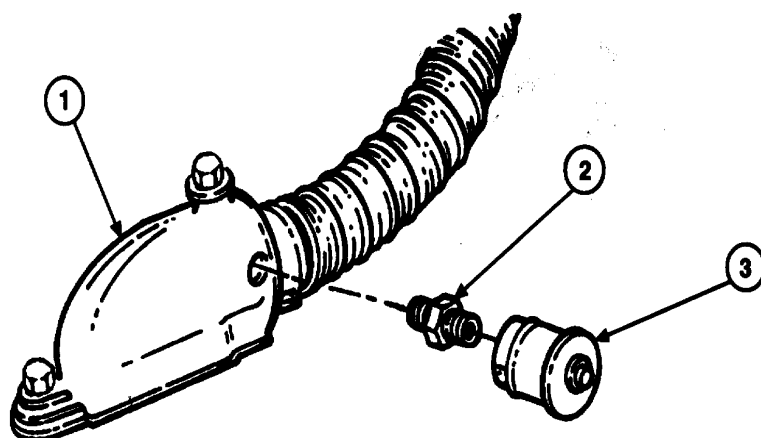
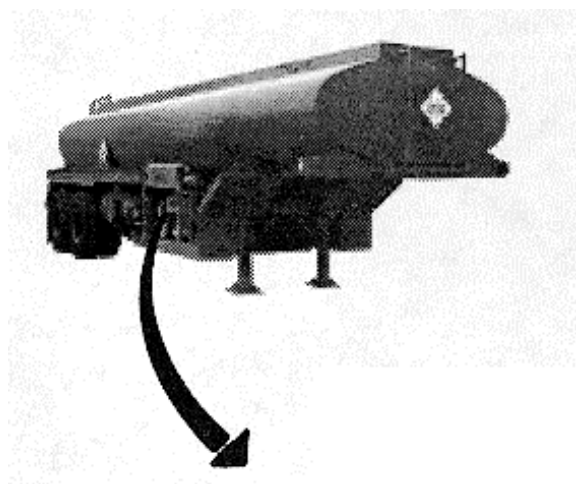
Semitrailer uncoupled (refer to TM 9-2330-398-10).

**a. REMOVAL**

1. Remove air cleaner restriction indicator (3) from fluid flow indicator restrictor (2).
2. Remove fluid flow indicator restrictor (2) from pipe coupling (1).

**b. INSTALLATION**

1. Install fluid flow indicator restrictor (2) in pipe coupling (1).
2. Install air cleaner restriction indicator (3) on fluid flow indicator restrictor (2).

**FOLLOW-ON MAINTENANCE:**

\* None

**2-96. AIR DUCT HOSE AND PIPE COUPLING REPLACEMENT.***This Task Covers:*

a. Removal

b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

- Lockwasher (Item 112, Appendix F)

**Equipment Conditions:****Materials/Parts:**

- Gasket (Item 55, Appendix F)

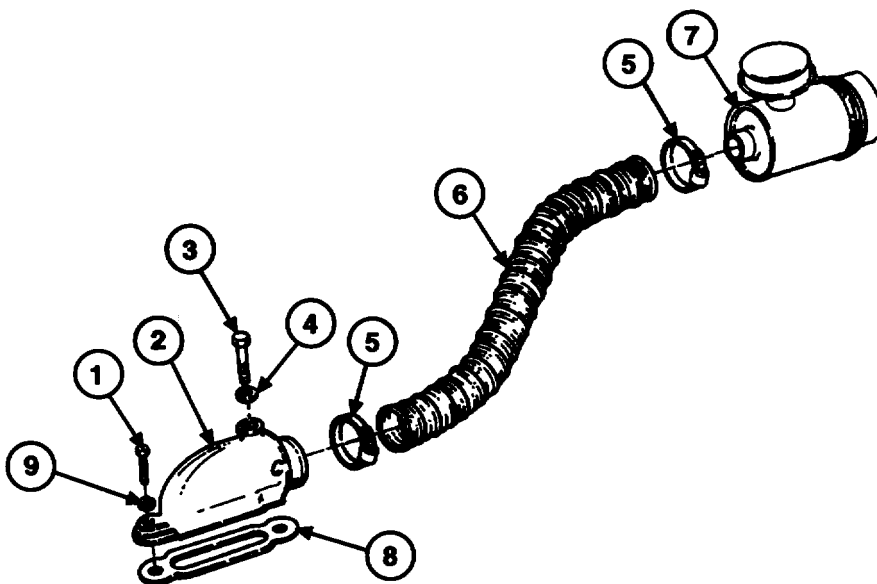
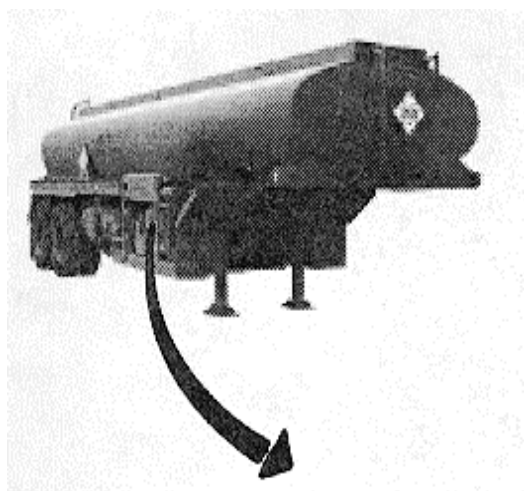
- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Air cleaner restriction indicator removed (para 2-95).

**a. REMOVAL**

1. Loosen two hose clamps (5) and remove air duct hose (6) from pipe coupling (2) and air cleaner (7).
2. Remove screw (1) and lockwasher (9) from pipe coupling (2). Discard lockwasher.
3. Remove screw (3), washer (4), pipe coupling (2), and gasket (8). Discard gasket.

**b. INSTALLATION**

1. Position pipe coupling (2) and new gasket (8) in place and secure with two screws (1 and 3), washer (4), and new lockwasher (9).
2. Install air duct hose (6) on air cleaner (7) and pipe coupling (2) and secure with two hose clamps (5).

**FOLLOW-ON MAINTENANCE:**

- Install air cleaner restriction indicator (para 2-95)

**2-97. ENGINE FUEL TANK REPLACEMENT.***This Task Covers:*

- a. Removal
- b. Installation
- c. Fuel System Bleeding

*Initial Setup:***Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

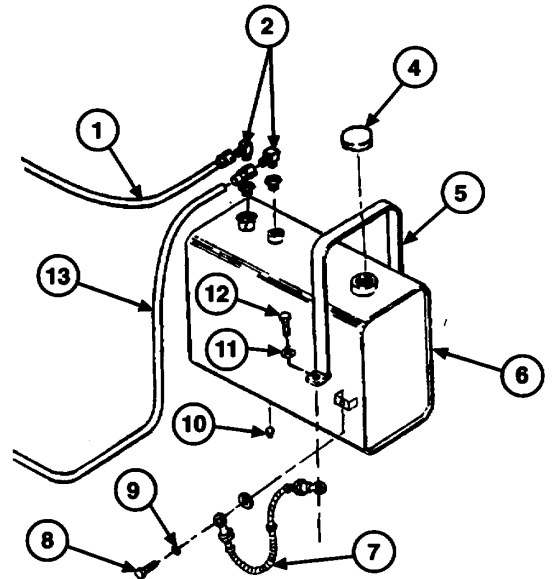
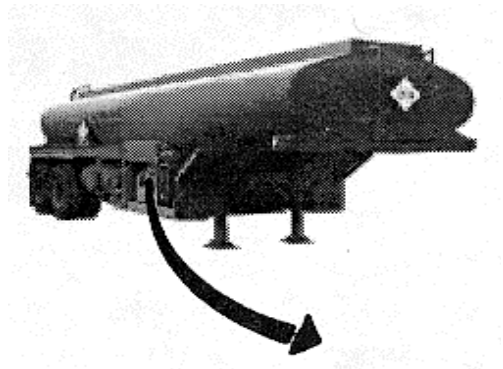
- Rag (Item 25, Appendix C)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

**a. REMOVAL**

1. Position suitable container in place under engine fuel tank (6) and remove drain plug (10). Drain fuel into container.
2. Tag and disconnect two fuel return lines (1 and 13) from top of fuel tank (6). Plug fuel lines (1 and 13) to prevent contamination of fuel.
3. Remove two elbows (2) and bushings (3) from fuel tank (6).
4. Remove screw (8), washer (9), and ground cable (7) from fuel tank (6).
5. Remove four screws (12) and washers (11), two mounting straps (5), and ground cable (7) from fuel tank (6) and semitrailer.
6. Remove fuel tank cap (4) from fuel tank (6).
7. Remove fuel tank (6) from semitrailer.



**2-97. ENGINE FUEL TANK REPLACEMENT (continued).****b. INSTALLATION**

1. Install drain plug (10) and fuel tank cap (4) in fuel tank (6).
2. Position fuel tank (6) in place on semitrailer and secure with four screws (12) and washers (11), two mounting straps (5), and ground cable (7).
3. Install screw (8), washer (9), and ground cable (7) on fuel tank (6).
4. Install two elbows (2) and bushings (3) on fuel tank (6).
5. Connect two fuel lines (1 and 13) to top of fuel tank (6).

**NOTE**

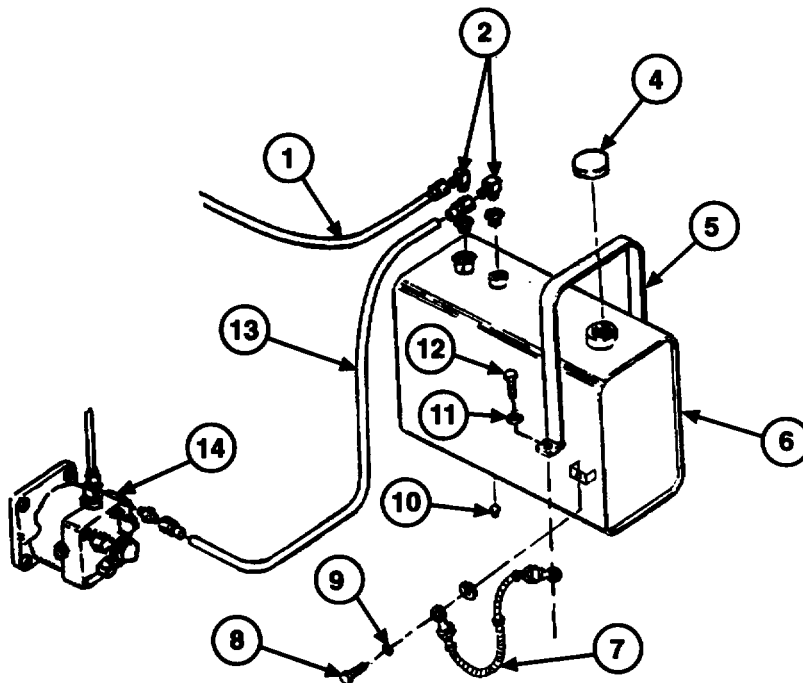
• During operations below 32°F (0°C), use No. 1 diesel fuel.

• During operations above 32°F (0°C), use No. 2 diesel fuel.

6. Remove fuel tank cap (4) and fill fuel tank (6) with fresh fuel, then install fuel tank cap (4).

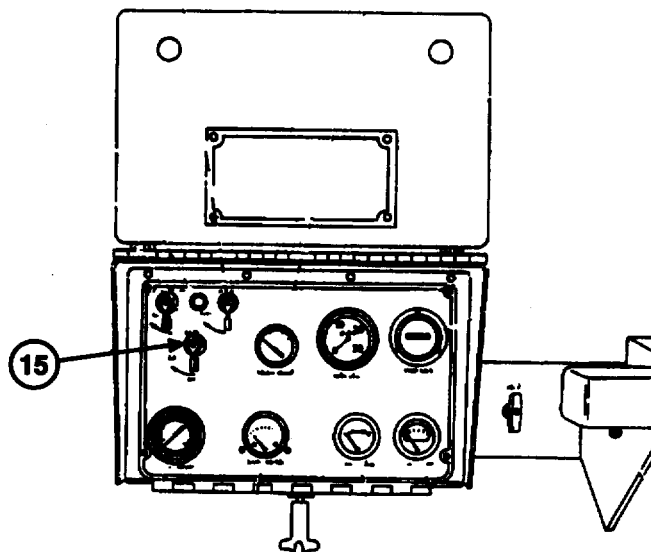
**c. FUEL SYSTEM BLEEDING**

1. Position suitable container in place under fuel injection pump (14).
2. Disconnect fuel return line (13) from fuel injection pump (14).



**24-7. ENGINE FUEL TANK REPLACEMENT (continued).**

3. Turn engine switch (15) to RUN position to energize electrical system and both fuel injection pumps (14).
4. Run both fuel Injection pumps (14) until there are no air bubbles in the fuel flowing from fuel injection pumps (14).
5. Turn engine switch (15) to OFF.
6. Connect fuel return line (13) to fuel injection pump (14).

**FOLLOW-ON MAINTENANCE:**

None

**2-98. ENGINE FUEL LINES AND FITTINGS REPLACEMENT.***This Task Covers:*

- a. Removal
- b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

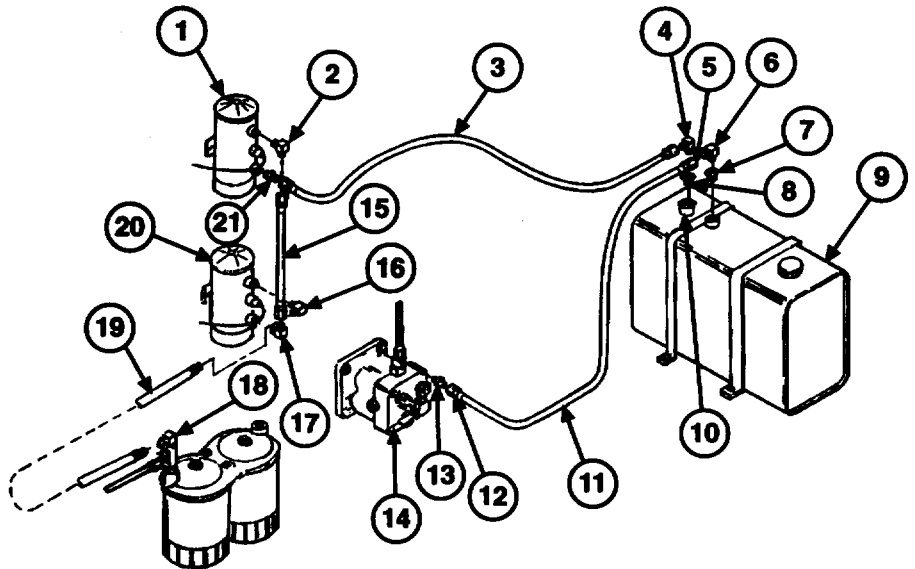
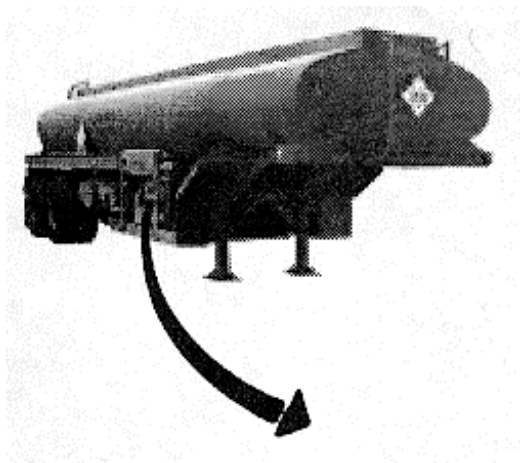
**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

**a. REMOVAL****NOTE**

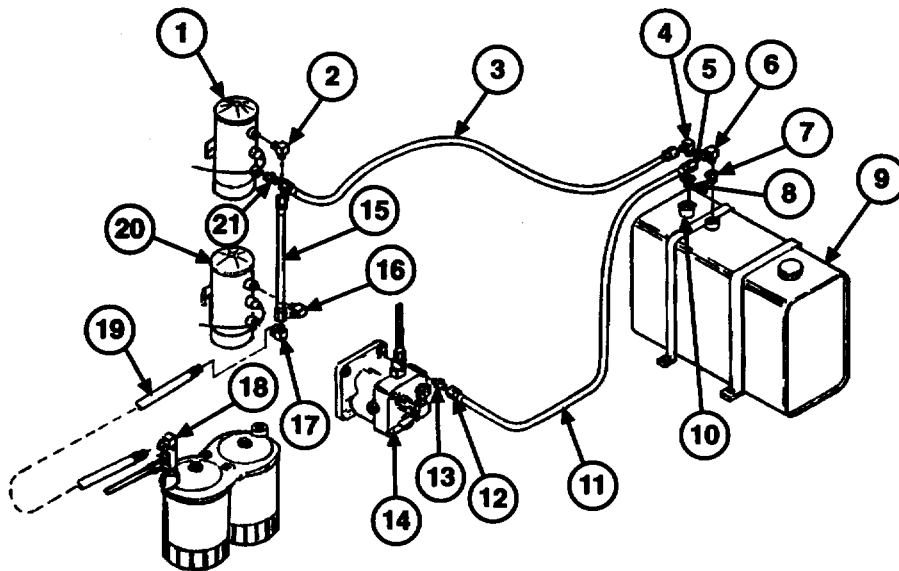
**Cap or plug all fuel lines, fittings, or fuel system component ports immediately after disconnecting, to prevent contamination.**

1. Tag and disconnect hose assembly (3) from adapter (21) and elbow (4). Remove elbow (4) and two pipe bushings (8 and 10) from fuel tank (9), and remove adapter (21) from upper fuel pump assembly (1).
2. Tag and disconnect hose assembly (15) from two elbows (2 and 17). Remove elbows (2 and 17) from upper and lower fuel pump assemblies (1 and 20).
3. Tag and disconnect hose assembly (19) from two elbows (16 and 18). Remove elbow (16) from lower fuel pump assembly (20).
4. Tag hose (11) and disconnect adapter (12) from tube nipple (13). Remove tube nipple (13) from fuel injection pump (14).
5. Disconnect adapter (5) from elbow (6) on other end of hose (11).
6. Remove elbow (6) and pipe bushing (7) from fuel tank (9).



**2-48. ENGINE FUEL LINES AND FITTINGS REPLACEMENT (continued).****b. INSTALLATION**

1. Install pipe bushing (7) and elbow (6) in fuel tank (9).
2. Connect one end of hose (11) and adapter (5) to elbow (6).
3. Install tube nipple (13) in fuel injection pump (14). Connect adapter (12) on other end of hose (11) to tube nipple (13).
4. Install elbow (16) in lower fuel pump assembly (20). Connect hose assembly (19) to two elbows (16 and 18).
5. Install two elbows (2 and 17) in upper and lower fuel pump assemblies (1 and 20). Connect hose assembly (15) to elbows (2 and 17).
6. Install adapter (21) in upper fuel pump assembly (1). Connect one end of hose assembly (3) to adapter (21).
7. Install two pipe bushings (10 and 8) in fuel tank (9). Install elbow (4) in pipe bushing (8). Connect other end of hose assembly (3) to elbow (4).

**FOLLOW-ON MAINTENANCE:**

\* None



**24-99. MUFFLER AND EXHAUST PIPE REPLACEMENT.***This Task Covers:*

a. Removal

b. Installation

*Initial Setup:***Tools Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Gasket (Item 32, Appendix F)
- Lockwasher (4) (Item 95, Appendix F)

- Lockwasher (4) (Item 97, Appendix F)

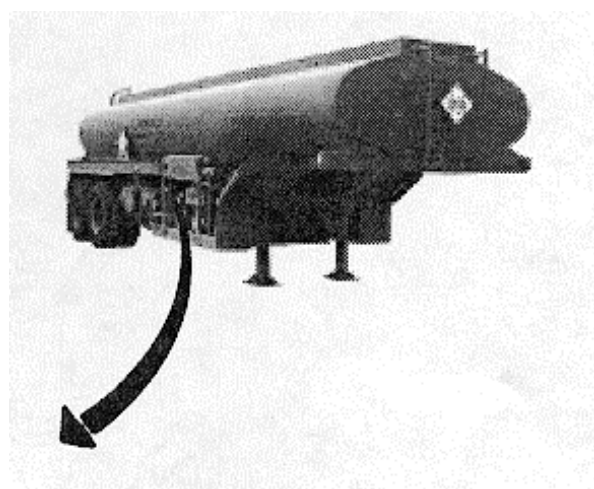
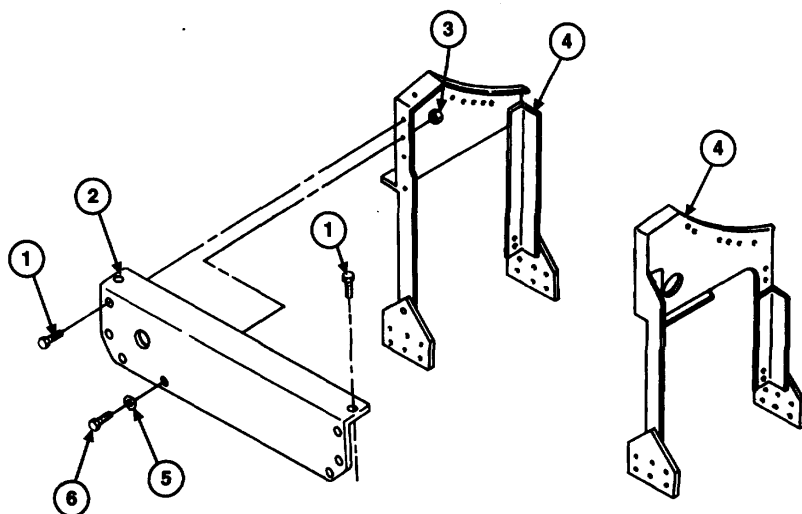
- Self-locking nut (4) (Item 169, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

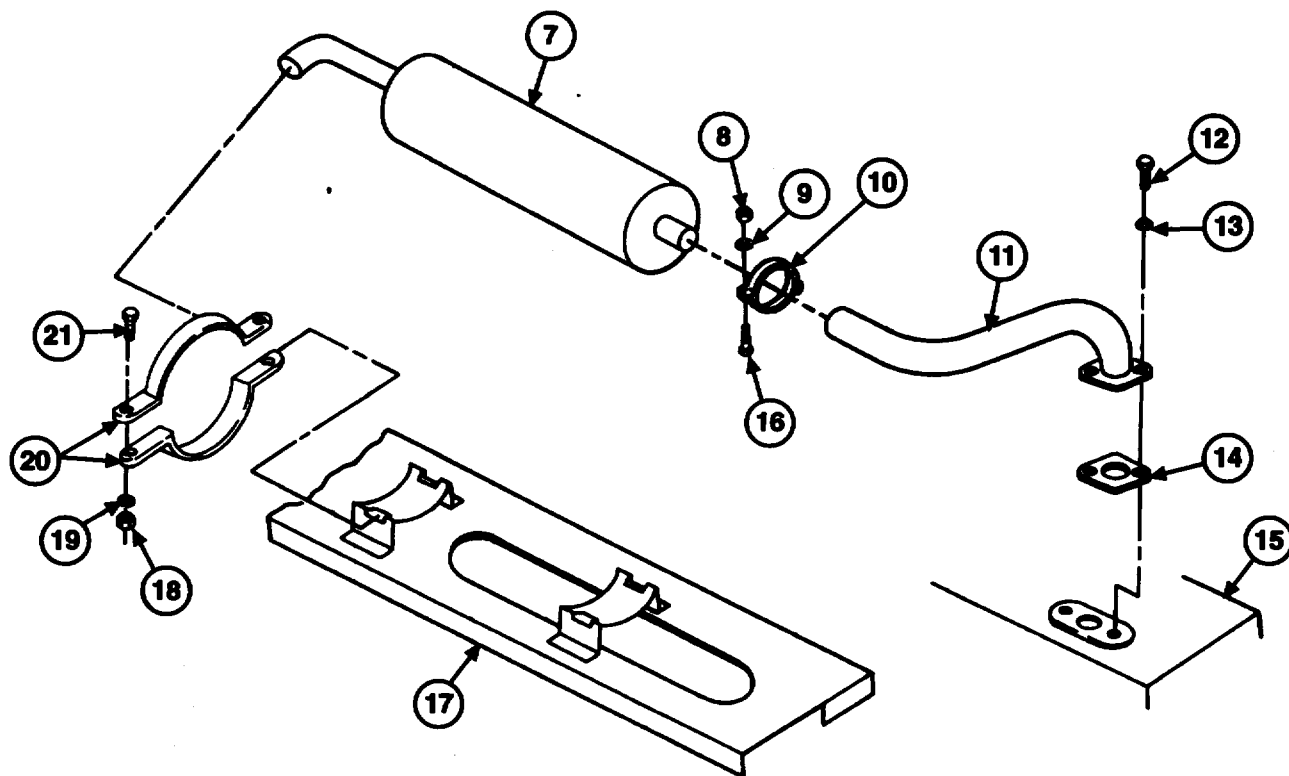
**a. REMOVAL**

1. Remove four screws (6), eight washers (5), and four self-locking nuts (3) from muffler shroud (2). Discard self-locking nuts.
2. Remove six screws (1) and muffler shroud (2) from frame (4).



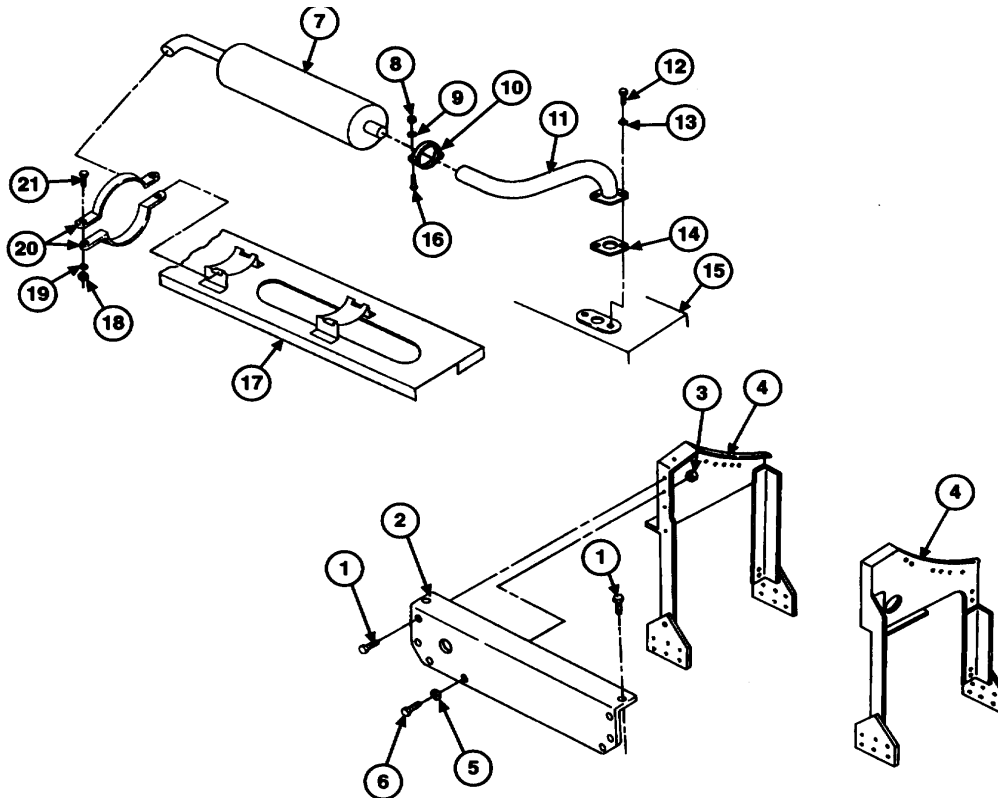
**2-99. MUFFLER AND EXHAUST PIPE REPLACEMENT (continued).**

3. Remove two screws (16), lockwashers (9), and nuts (8) and loop clamp (10) from muffler (7) and exhaust pipe (11). Discard lockwashers.
4. Remove four screws (21), lockwashers (19), nuts (18), and muffler clamps (20) from muffler (7) and mounting plate (17). Discard lockwashers.
5. Remove muffler (7) from exhaust pipe (11) and mounting plate (17).
6. Remove two screws (12) and lockwashers (13), exhaust pipe (11), and gasket (14) from manifold (15). Discard gasket and lockwashers.



**2-99. MUFFLER AND EXHAUST PIPE REPLACEMENT (continued).****b. INSTALLATION**

1. Install exhaust pipe (1) and new gasket (14) on manifold (15) with two screws (12) and new lockwashers (13).
2. Install muffler (7) on exhaust pipe (11) and mounting plate (17) with four mufflerclamps (20), screws (21), nuts (18), and new lockwashers (19).
3. Install loop clamp (10) on muffler (7) and exhaust pipe (11) with two screws (16) nuts (8), and new lockwashers (9).
4. Position muffler shroud (2) frame (4), and secure with four screws (6) and eight washers (5) and four new selflocking nuts (3).
5. Install six screws (1), on muffler shroud (2).

**FOLLOW-ON MAINTENANCE:**

\* None

---

**2-100. ALTERNATOR, MOUNTING BRACKET, AND V-BELT ADJUSTMENT AND REPLACEMENT.**

---

*This Task Covers:*

- |               |                 |
|---------------|-----------------|
| a. Removal    | b. Installation |
| c. Adjustment |                 |

---

*Initial Setup:***Tool/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Negative and positive battery cables disconnected (para 2-33).

**Material/Parts:**

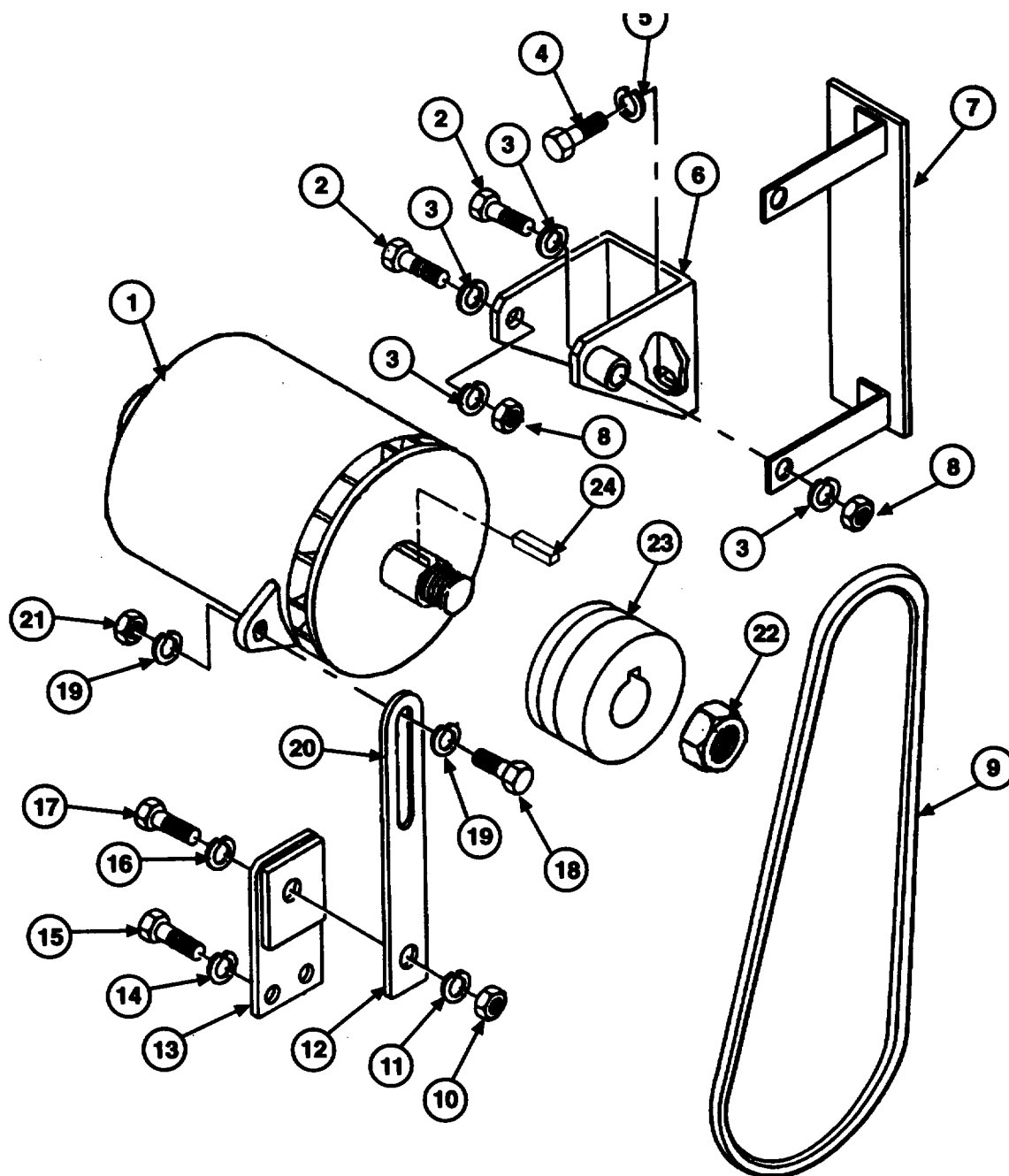
- Lockwasher (2) (Item 94, Appendix F)
  - Self-locking nut (2) (Item 173, Appendix F)
- 

**a. REMOVAL****WARNING**

- When performing electrical maintenance, always disconnect intervehicular electrical cable from semitrailer and disconnect negative and positive battery cables from batteries. Failure to follow this warning may create a spark and explosion, resulting in serious Injury or death to personnel.
- Alternator weighs approximately 25 pounds. Use care when replacing alternator, to avoid Injury to personnel or damage to equipment.

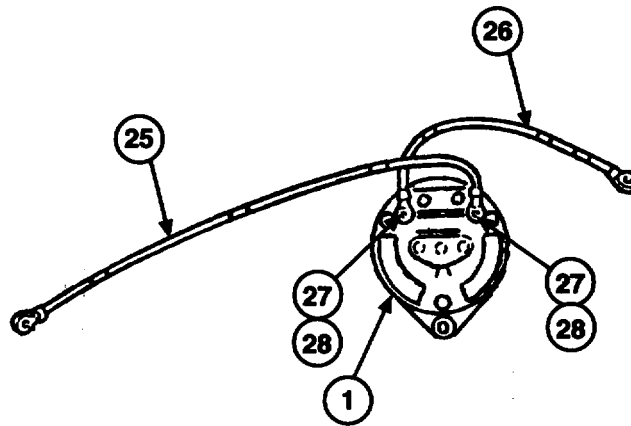
**2-100. ALTERNATOR, MOUNTING BRACKET, AND V-BELT ADJUSTMENT AND REPLACEMENT (continued).**

1. Remove screw (18), two washers (19), and self-locking nut (21) from alternator (1), adjusting arm (12), and guard (7). Discard self-locking nut.
2. Remove screw (17), two washers (11 and 16), self-locking nut (10), and adjusting arm (12) from mounting bracket (13). Discard self-locking nut.
3. Remove two screws (15) and washers (14) and mounting bracket (13) from engine.
4. Loosen two screws (2) and pull down alternator (1) to release tension on alternator V-belt (9). Remove V-belt from pulley (23).



**2-100. ALTERNATOR, MOUNTING BRACKET, AND V-BELT ADJUSTMENT AND REPLACEMENT (continued).**

6. Remove two nuts (27) and lockwashers (28) and positive and negative cables (25 and 26) from rear of alternator (1). Discard lockwashers.



7. Remove two screws (2) and self-locking nuts (8), four washers (3), alternator (1), and guard (7) from mounting bracket (6). Discard self-locking nuts.
8. Remove three screws (4) and washers (5) and mounting bracket (6) from engine.
9. Remove shouldered nut (22), pulley (23), and woodruff key (24) from alternator (1).

**b. INSTALLATION**

1. Install woodruff key (24) and pulley (23) on alternator (1) and secure with shouldered nut (22).
2. Install mounting bracket (6) on engine with three screws (4) and washers (5).
3. Install alternator (1) and guard (7) on mounting bracket (6) with two screws (2), four washers (7), and two new self-locking nuts (8). Do not tighten screws yet.
4. Install bracket (3) on engine with two screws (15) and washers (14).
5. Install adjusting arm (12) on bracket (13) with screw (17), two washers (16 and 11), and new self-locking nut (10).
6. Install alternator V-belt (9) on pulley (23).
7. Attach alternator (1) and guard (7) to adjusting arm (12) with screw (18), two washers (19), and new selflocking nut (21). Raise alternator (1) to put tension on V-belt (9); then hand tighten screw (18).

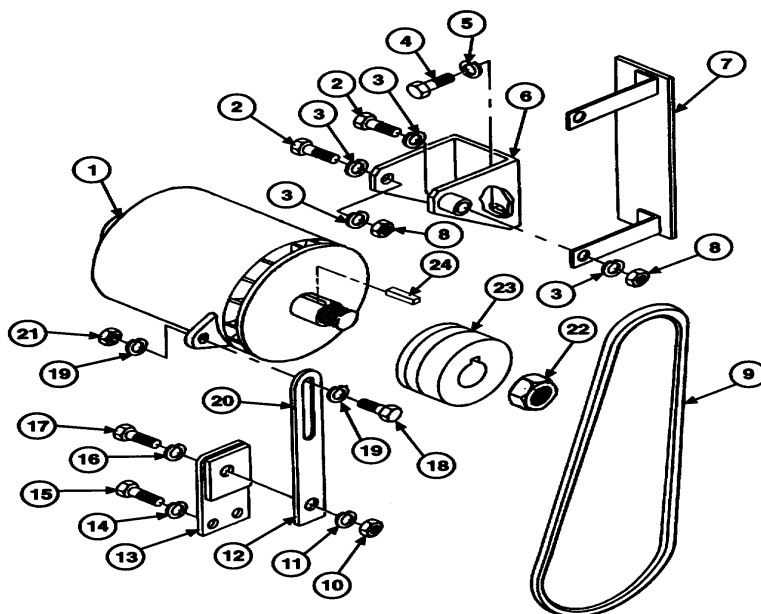
**2-100. ALTERNATOR, MOUNTING BRACKET, AND V-BELT ADJUSTMENT AND REPLACEMENT (continued).****c. ADJUSTMENT**

1. Loosen three screws (2 and 18) holding alternator (1) in place.

**NOTE**

**Proper V-belt tension is 1/8 inch (0.318 cm) to 1/4 inch (0.635 cm) deflection of belt midway between pulleys.**

2. Raise alternator (1) to obtain proper tension on V- belt (9).
3. Tighten three screws (18 and 2) to secure alternator (1) in place.

**FOLLOW-ON MAINTENANCE:**

- Connect positive and negative battery cables (para 2-33).

**2-101. ENGINE ELECTRICAL WIRING REPAIR.***This Task Covers:*

- a. Removal and Installation
- b. Repair

*Initial Setup:***Tools Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

- Negative battery cable disconnected (para 2-33).

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

**WARNING**

When troubleshooting an electrical malfunction or performing electrical maintenance, **ALWAYS** disconnect intervehicular electrical cable from semitrailer and disconnect negative battery cables at battery. Failure to follow this warning may create a spark and explosion, resulting in serious injury or death to personnel.

**a. REMOVAL AND INSTALLATION:**

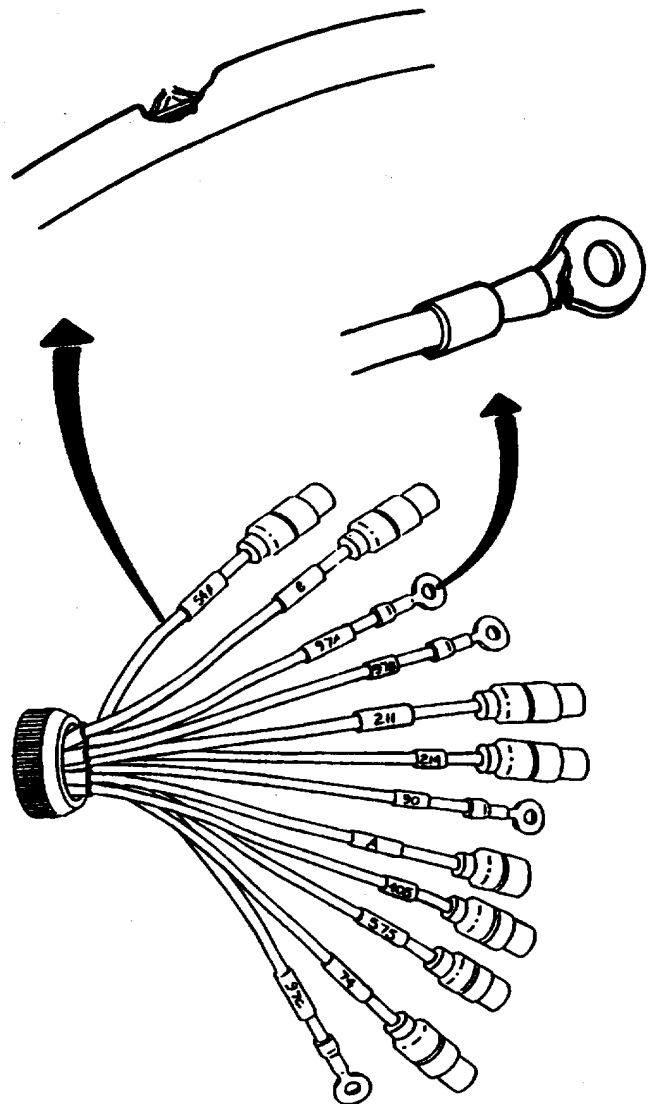
Refer to illustration for location, removal, and installation of electrical wiring.

**b. REPAIR**

1. Check ends of wire harness and leads for frayed insulation and broken wires. Tape or replace frayed wires.
2. Inspect wires for bent, broken, or missing terminals. Replace missing or damaged terminals.

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).
- Connect negative battery cable (para 2-33).





**2-102. ELECTRICAL LEAD ASSEMBLY (12267081) REPLACEMENT.***This Task Covers:*

- a. Removal
- b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

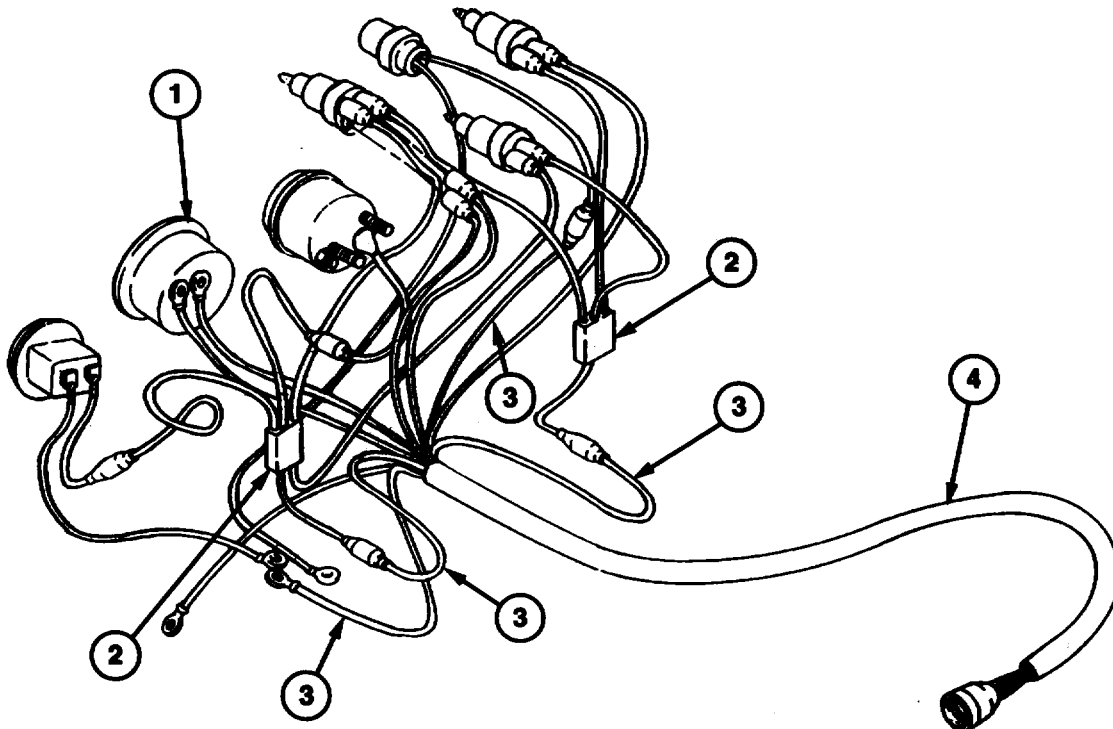
- Semitrailer uncoupled (refer to TM 9-2330-398-10).

- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Negative battery cable disconnected (para 2-33).
- Engine control panel removed (para 2-112).

**a. REMOVAL****WARNING**

**When troubleshooting an electrical malfunction or performing electrical maintenance, ALWAYS disconnect Intervehicular electrical cable from and Disconnect negative battery cables at batteries. Failure to follow this warning may create a spark and explosion, resulting in serious injury or death to personnel.**

1. Tag and disconnect all electrical leads (3), jumper assemblies (2) and electrical components (1) from electrical lead assembly 12267081 (4).



**2-102. ELECTRICAL LEAD ASSEMBLY (12207081) REPLACEMENT (continued).**

2. Disconnect control panel electrical lead assembly conduit (6) from back of control panel (5).

**NOTE**

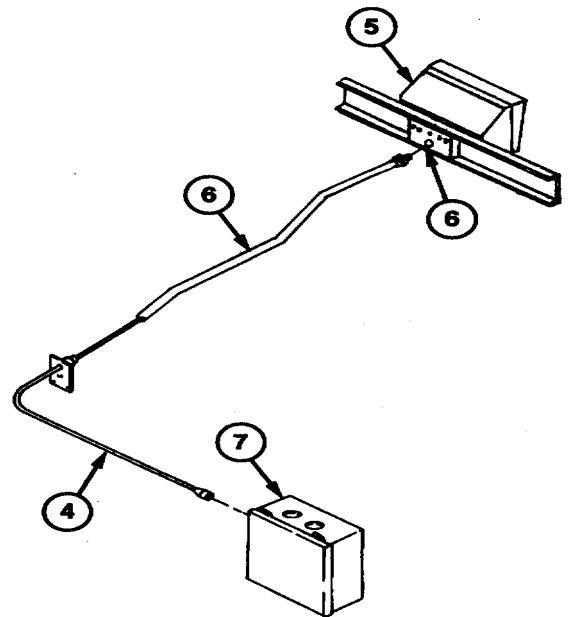
**Connectors must be removed in order to pull electrical lead assembly through conduit.**

3. Cut connectors from electrical lead assembly (4) and pull through conduit (6).
4. Disconnect electrical lead assembly (4) from electrical box (7) and remove lead assembly (4).

**b. INSTALLATION****NOTE**

• **Repair electrical lead assembly as required (para 2-101).**  
 • **Use lacing wire, electrical wire, string, or other suitable material to help pull lead assembly through conduit.**

1. Pull lead assembly (4) through conduit (6).
2. Install new connectors on each electrical lead assembly lead (para 2-101).
3. Install conduit (6) on back of control panel (5).
4. Connect electrical leads (3), jumper assemblies (2), and electrical components (1) to lead assembly (4).
5. Close panel and cover (para 2-32e).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 92330-398-10).
- Connect negative battery cable (para 2-33).
- Install engine control panel (para 2-112).

---

**2-103. ENGINE ELECTRICAL BOX REPAIR.**

---

*This Task Covers:*

a. Removal

b. Installation

---

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

- Self-locking nut (Item 169, Appendix F)

**Materials/Parts:**

- Electrical locknut (6) (Item 13, Appendix F)
- Gasket (Item 71, Appendix F)
- Lockwasher (8) (Item 94, Appendix F)
- Preformed packing (6) (Item 133, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
  - Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
  - Negative battery cable disconnected (para 2-33).
- 

**a. REMOVAL****WARNING**

**When troubleshooting an electrical malfunction or performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and disconnect negative battery cables at batteries. Failure to follow this warning may create a spark and explosion, resulting in serious injury or death to personnel.**

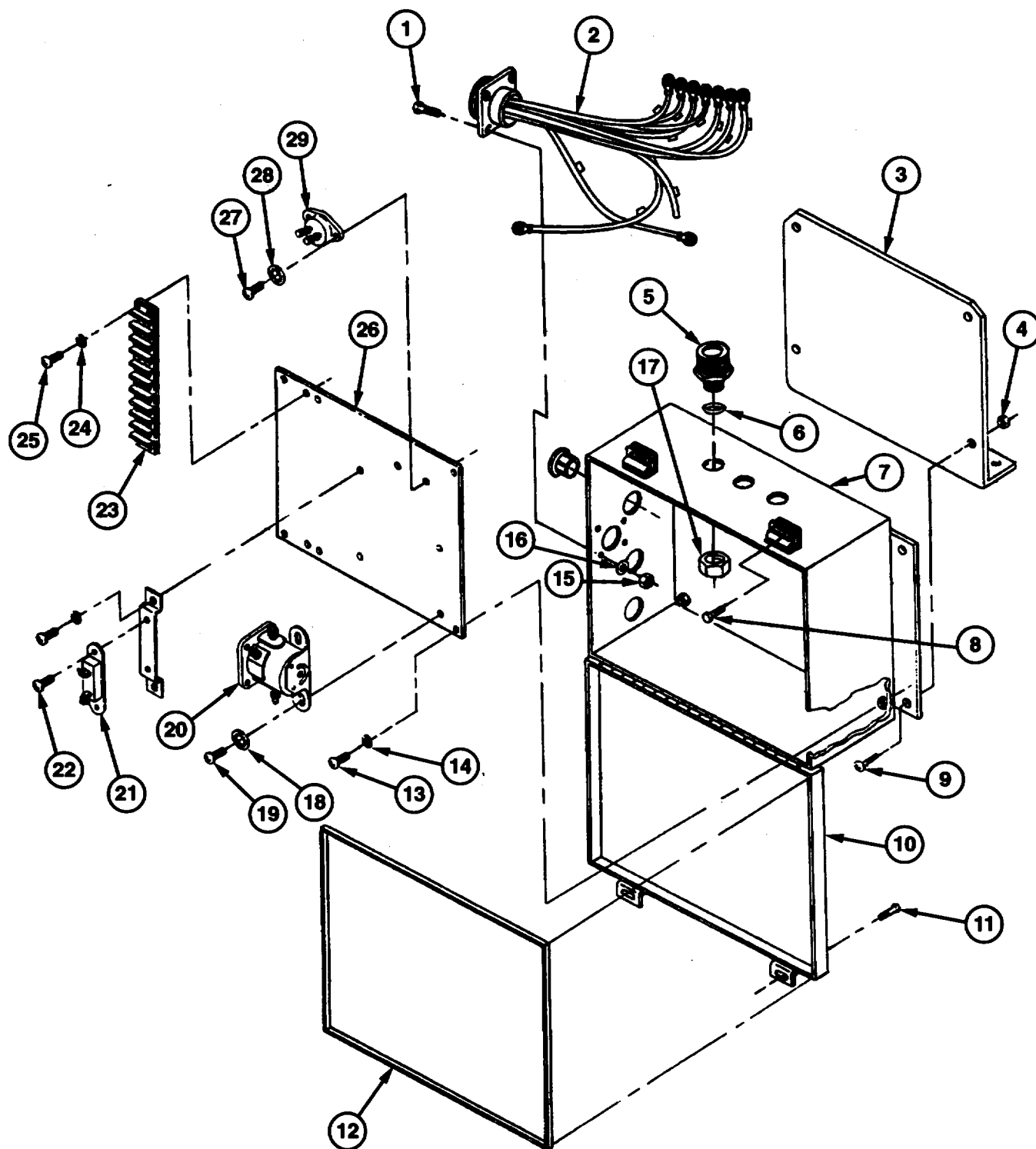
1. Loosen two clip screws (8) and open electrical box cover (10). Remove gasket (12) from electrical box cover (10). Discard gasket.

**NOTE**

**To ensure proper installation when installing electrical box, tag all leads in electrical box necessary for removal of cables.**

2. Disconnect all leads in engine electrical box (7) and remove completely.
3. Remove four capscrews (1), lockwashers (16), and nuts (15). Remove wiring harness (2) from electrical box (7). Discard lockwashers.
4. Remove five electrical connectors (5), electrical locknuts (17), and preformed packings (6) from electrical box (7). Discard locknuts and preformed packings.
5. Remove four screws (13) and lockwashers (14) from mounting plate (26). Remove mounting plate (26) from electrical box (7). Discard lockwashers.
6. Remove two capscrews (9) and nuts (4) from electrical box (7). Remove electrical box (7) from angle mounting plate (3).
7. Remove two screws (27) and lockwashers (28) and circuit breaker (29) from mounting plate (26). Discard lockwashers.
8. Remove two screws (22) and circuit breaker (21) from mounting plate (26).

## 2-103. ENGINE ELECTRICAL BOX REPAIR (continued).



---

**2-103. ENGINE ELECTRICAL BOX REPAIR (continued).**

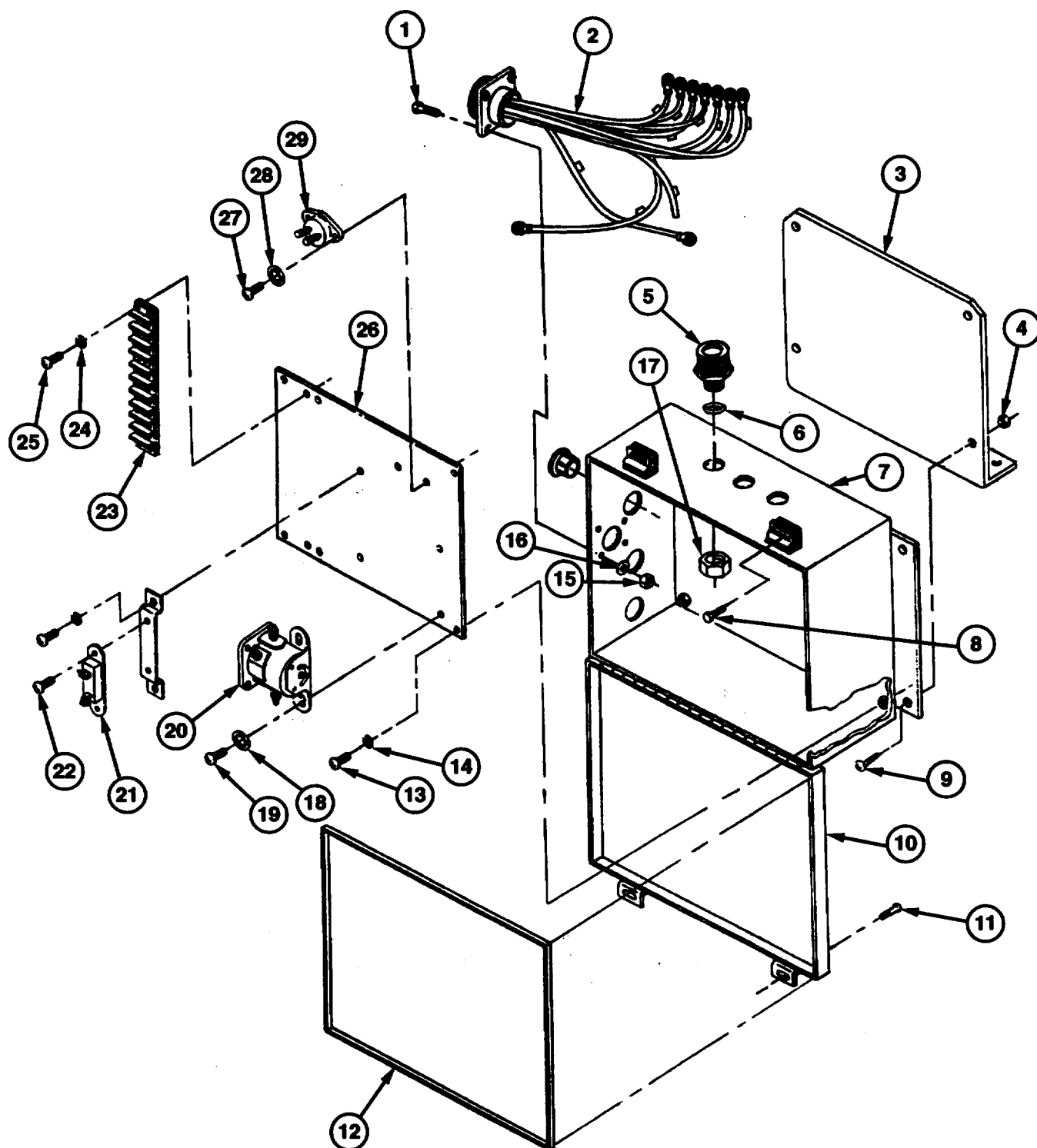
---

9. Remove two screws (19) and lockwashers (18) and solenoid (20) from mounting plate (26).
10. Remove four screws (25) and lockwashers (24) and terminal board (23) from electrical box (7). Discard lockwasher.

**b. INSTALLATION**

1. Install terminal board (23), four new lockwashers (24), and screws (25) on mounting plate (26).
2. Install solenoid (20) and two new lockwashers (18) and screws (19) on mounting plate (26).
3. Install circuit breaker (21) and two screws (22) on mounting plate(26).
4. Install circuit breaker (29) and two new lockwashers (28) and screws (27) on mounting plate (26).
5. Install electrical box (7) and two capscrews (9) and nuts (4) on angle mounting plate (3).
6. Install mounting plate (26) and two lockwashers (18) and screws (19) on electrical box (7).
7. Install five new preformed packing (6), electrical connectors (5), and new locknuts (17) on electrical box (7).
8. Install wiring harness (2) and four capscrews (1), new lockwashers (16), and nuts (15) on electrical box (7).
9. Connect all electrical leads in electrical box (7).
10. Install new gasket (12) on electrical box cover (10), close cover (10), and tighten two clip screws (8).

## 2-103. ENGINE ELECTRICAL BOX REPAIR (continued).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).
- Connect negative battery cable (para 2-33).

**2-104. BRANCH WIRING HARNESS (1226(082) REPLACEMENT.***This Task Covers:*

- a. Removal
- b. Installation

*Initial Setup:***Tools/ Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Material/Parts:**

- Gasket (Item 21, Appendix F)
- Lockwasher (4) (Item 93, Appendix F)

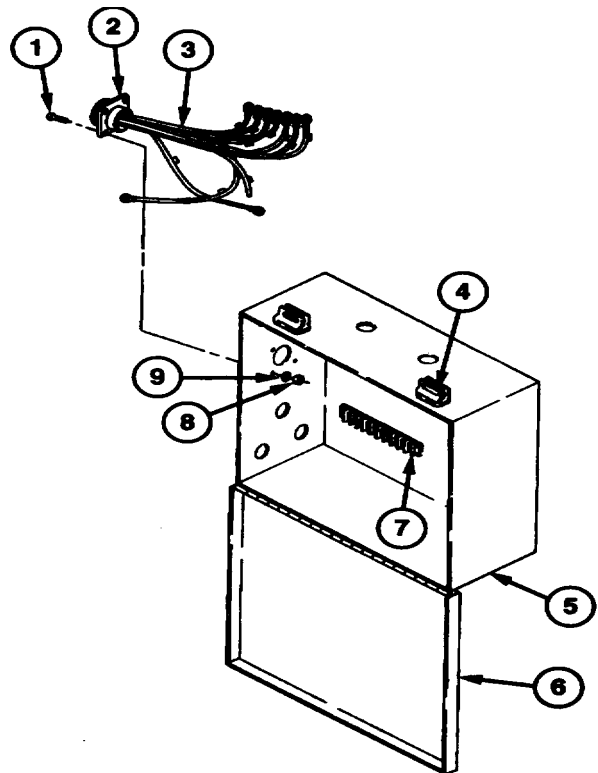
**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-&10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Negative battery cable disconnected (para 2-33).

**a. REMOVAL****WARNING**

**When troubleshooting an kit;; malfunction or performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and disconnect negative battery cables at vertical. Failure to follow to follow this warning may create a spark and explosion, resulting in serious Injury or death to personnel.**

1. Loosen two clip screws (4) and open electrical box cover (6).
2. Remove wiring harness leads (3) from terminal board (7).
3. Remove four nuts (8), lockwashers (9), and screws (1) and branch wiring harness (2) from electrical box (5). Discard lockwashers.

**b. INSTALLATION**

1. Install wiring harness (2) and four screws (1), new lockwashers (9), and nuts (8) on electrical box (5).
2. Install wiring harness leads (3) on terminal board (7).
3. Close electrical box cover (6) and tighten two clip screws (4).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).
- Connect negative battery cable (para 2-33).

**2-105. ENGINE ELECTRICAL CONDUIT REPLACEMENT.***This Task Covers:*

- a. Removal b. Installation

*Initial Setup:***Tools/ Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Self-locking nut (2) (Item 169, Appendix F) a
- Electrical lead assembly (12267081) removed (para 2-102).

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Negative battery cable disconnected (para 2-33).

**a. REMOVAL****WARNING:**

**When troubleshooting an electrical malfunction or performing electrical maintenance, ALWAYS disconnect Intervehicular electrical cable from semitrailer and disconnect negative battery cables at batteries. Failure to follow this warning may create a spark and explosion, resulting in serious injury or death to personnel.**

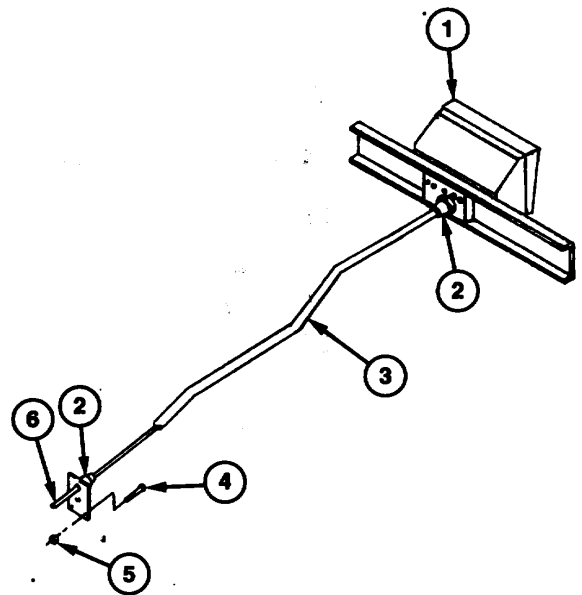
1. Loosen two conduit connectors (2) from engine control panel (1) and conduit mounting plate (6).
2. Remove two capscrews (4) and self-locking nuts (5) from mounting plate (6).
3. Remove mounting plate (6) and engine electrical conduit (3) from engine control panel (1).
4. Remove two conduit connectors (2) from conduit (3).

**b. INSTALLATION**

1. Install two conduit connectors (2) on conduit (3).
2. Install conduit (3) on control panel (1) and mounting plate (6).
3. Install two capscrews (4) and new self-locking nuts (5) on mounting plate (6).
4. Tighten two conduit connectors (2).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).
- Connect negative battery cable (para 2-33).
- Install electrical lead assembly (12267081) (para 2-102)





---

**2-106. ENGINE OIL FILTER REPLACEMENT.**

---

*This Task Covers:*

- a. Removal
- b. Installation

---

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)
- Common No. 1 tool set (Item 1, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398&10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

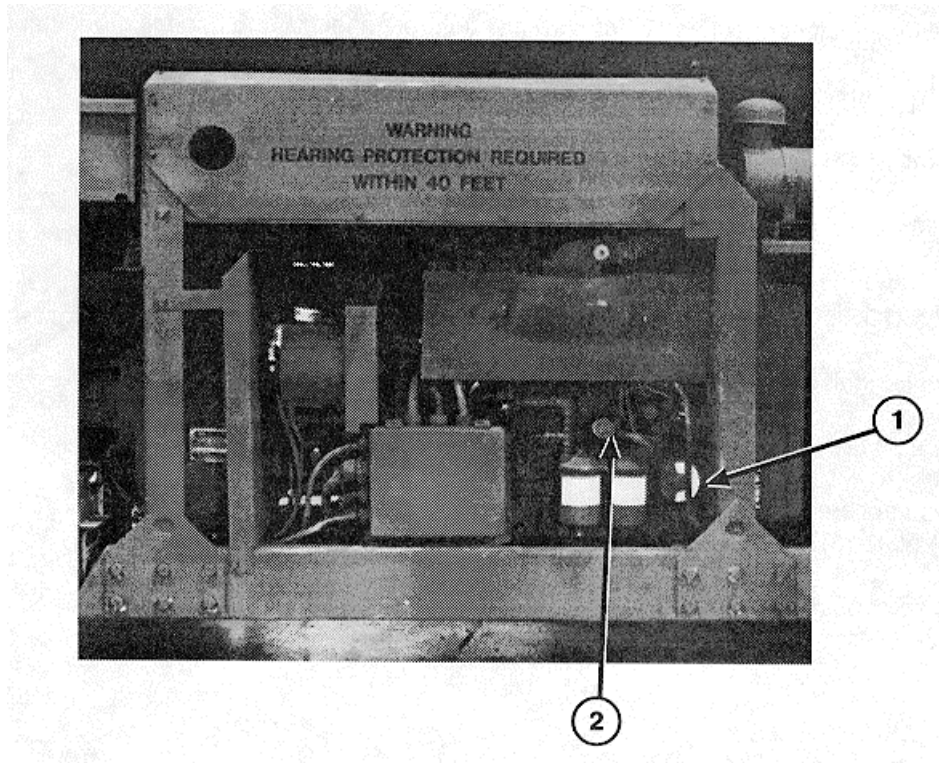
**Materials Parts:**

- Rag (Item 25, Appendix C)
- Oil filter (Item 121, Appendix F)

---

**a. REMOVAL**

1. Place suitable container under engine oil filter (1). Remove filter (1) from mounting shaft of engine, and drain oil into container. Discard filter.
2. Clean filter (1) mounting area on engine.



---

**2-106. ENGINE OIL FILTER REPLACEMENT (continued).**

---

**b. INSTALLATION**

1. Coat gasket on new filter (1) with clean oil. Install filter (1) on mounting shaft of engine.
2. Hand-tighten filter until gasket touches mounting shaft. Tighten an additional half-turn. DO NOT overtighten.
3. Refer to lubrication chart (Appendix G) for correct type of oil.
4. Remove oil fill cap (2) from engine. Inspect gasket in oil fill cap (2) and replace if damaged.
5. Add pint of oil to crankcase. Install oil fill cap (2) on engine and check oil level.

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 92330-398-10).

---

**2-107. GLOW PLUGS REPLACEMENT.**

---

*This Task Covers:*

- |                 |               |
|-----------------|---------------|
| a. Removal      | b. Inspection |
| c. Installation |               |

---

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

- Negative battery cable disconnected (para 2-33).

- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- 

**WARNING**

**When performing electrical maintenance, ALWAYS disconnect negative battery cables at batteries. Failure to follow this warning may create a spark and explosion, resulting in serious injury or death to personnel.**

**a. REMOVAL****NOTE**

- For ease of installation ,tag electrical leads at removal.
- Nuts are provisioned with glow plugs.

1. Remove two nuts (5) and five electrical leads (3, 4, 6, 7, and 8) from two glow plugs (1).
2. Remove strap (2) from two glow plugs (1).
3. Unscrew two glow plugs (1) from air intake manifold (9).

**b. INSPECTION**

Check to see if electrical leads to glow plugs are clean and secure.

**CAUTION**

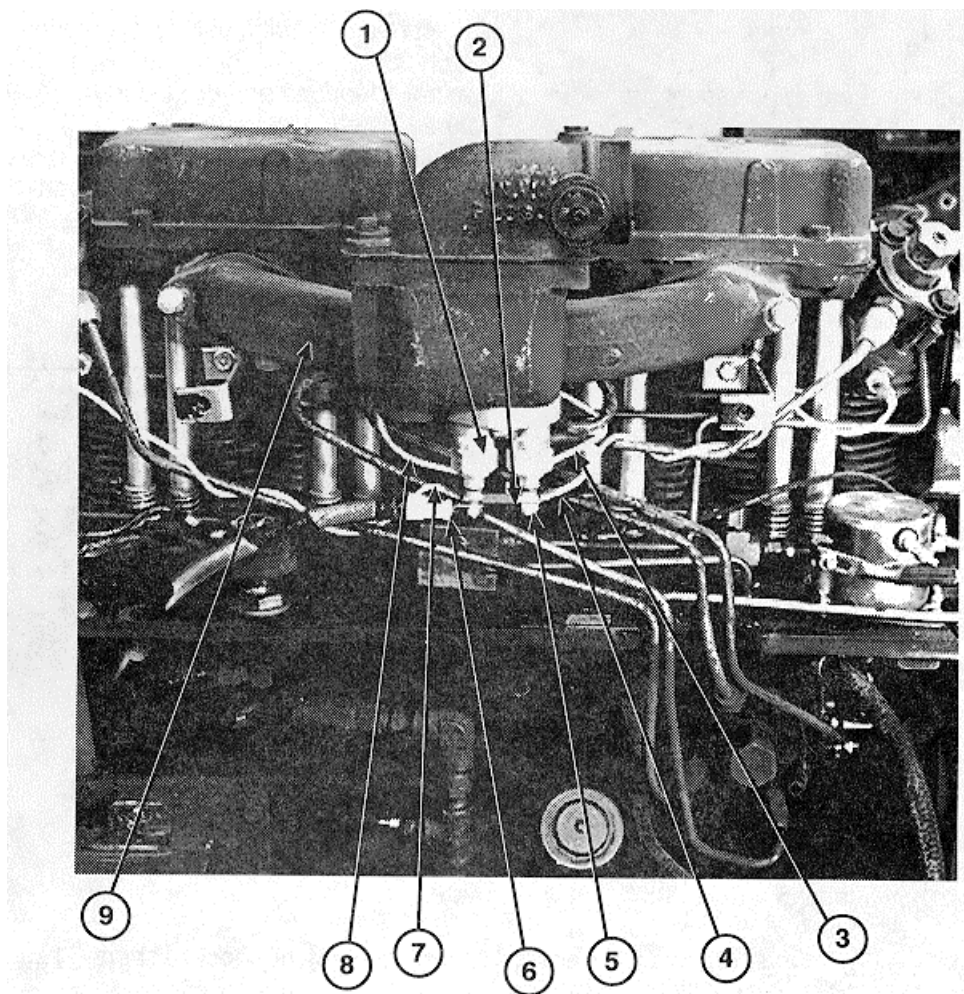
**With preheater switch in PREHEAT position, 12 V dc are applied to glow plugs. Do not handle glow plugs with preheater switch In PREHEAT position.**

**c. INSTALLATION**

1. Screw two glow plugs (1) into air intake manifold (9). Tighten glow plugs between 10 and 15 lb-ft (13 and 20 N-m).

**2-107. GLOW PLUGS REPLACEMENT (continued).**

2. Install strap (2) on two glow plugs (1).
3. Install five electrical leads (3, 4, 6, 7, and 8) and two new nuts (5) on two glow plugs (1).

**FOLLOW-ON MAINTENANCE:**

- Connect negative battery cable to battery (para 2-33).
- Disconnect ground (refer to TM 9-2330-398-10).

---

**2-108. INTAKE MANIFOLD REPLACEMENT.**

---

*This Task Covers:*

a. Removal

b. Installation

---

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)
- Common No. 1 tool set (Item 1, Appendix B)

**Materials/Parts:**

- Gasket (Item 56, Appendix F)
- Gasket (2) (Item 61, Appendix F)
- Insulator sleeve (2) (Item 80, Appendix F)
- Lockwasher (2) (Item 95, Appendix F)
- Nut (4) (Item 120, Appendix F)

**Equipment Conditions:**

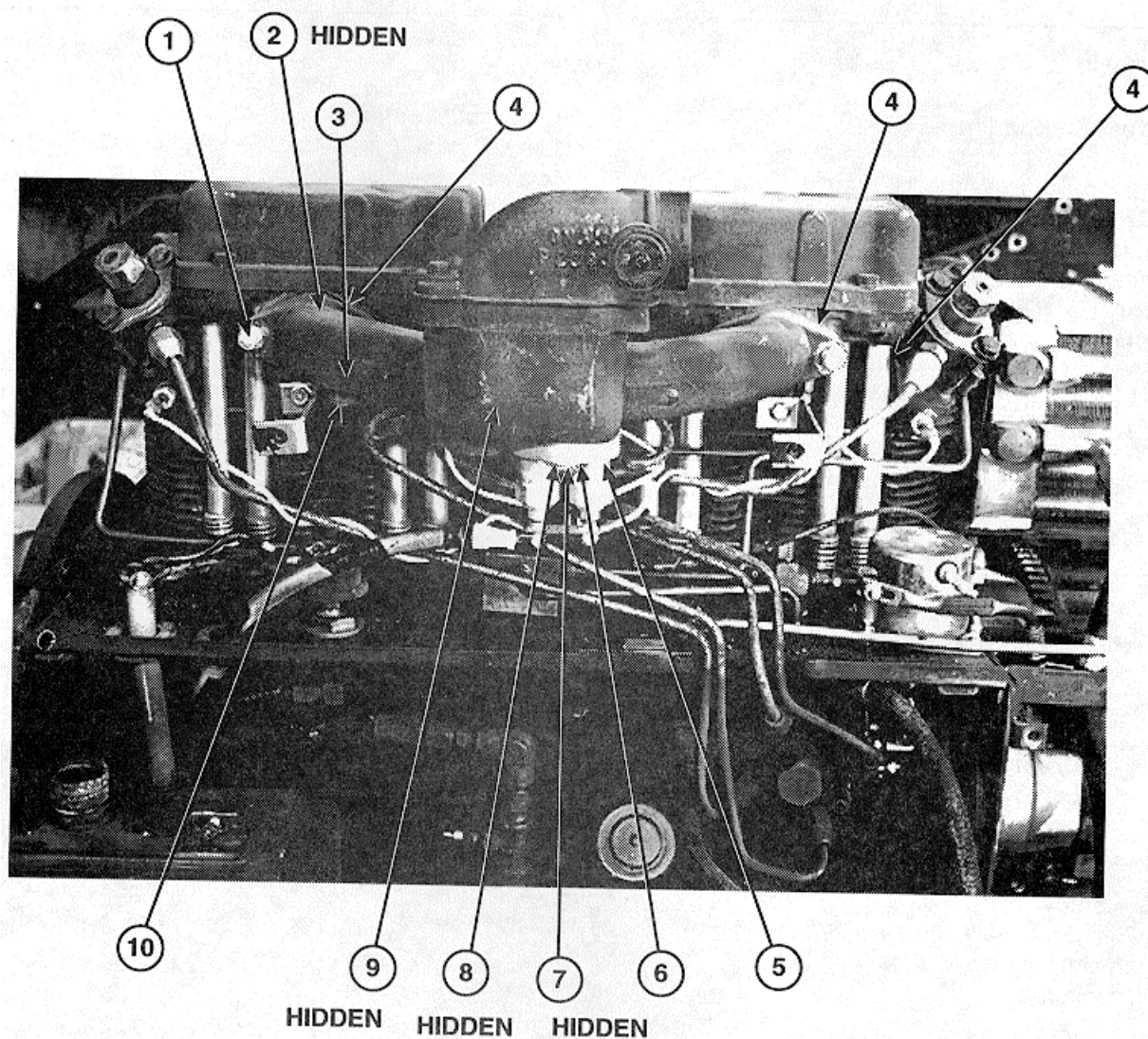
- Air duct hose and pipe coupling removed (para 2-96).
  - Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
  - Negative battery cable disconnected (para 2-33).
  - Muffler and exhaust pipe removed (para 2-99).
  - Glow plugs removed (para 2-107).
- 

**a. REMOVAL**

1. Remove four nuts (1), intake manifold (3), and two gaskets (2) from two cylinder heads (4). Discard gaskets and nuts.
2. Remove two screws (6), lockwashers (7), and insulator sleeves (8), adapter (5), and gasket (9) from intake manifold (3). Discard lockwashers, insulator sleeves, and gasket.
3. Remove plug (10) from intake manifold (3), if necessary.
4. Remove any gasket material stuck to intake manifold (3), two cylinder heads (4), or adapter (5).

**b. INSTALLATION**

1. Install plug (10) in intake manifold (3), if plug was removed.
2. Install new gasket (9), adapter (5), and two new insulator sleeves (8), new lockwashers (7) and screws (6) on intake manifold (3).
3. Install two new gaskets (2), intake manifold (3), and four new nuts (1) on two cylinder heads (4). Tighten nuts between 13 and 15 lb-ft (17 and 20 Nom).

**2-108. INTAKE MANIFOLD REPLACEMENT (continued).****FOLLOW-ON MAINTENANCE:**

- Install glow plugs (para 2-107).
- Install air duct hose and pipe coupling (para 2-96).
- Install muffler and exhaust pipe (para 2-99).
- Connect negative battery cable (para 2-33).
- Disconnect ground (refer to TM 9-2330-398-10).

---

**2-109. FUEL FILTERS (PRIMARY AND SECONDARY) REPLACEMENT.**

---

*This Task Covers:*

a. Removal

b. Installation

---

*Initial Setup:*

**Tools/Test Equipment:**

- Common No. 1 tool set, (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

**Material/Parts:**

- Rag (Item 25, Appendix C)
  - Primary fuel filter (Item 144, Appendix F)
  - Secondary fuel filter (Item 160, Appendix F)
- 

**a. REMOVAL****NOTE**

**Primary and secondary fuel filters and their mounting hardware differ from each other and must be reinstalled in their original location.**

1. Place suitable container under secondary and primary fuel filters (6 and 8) to collect any spilled fuel.

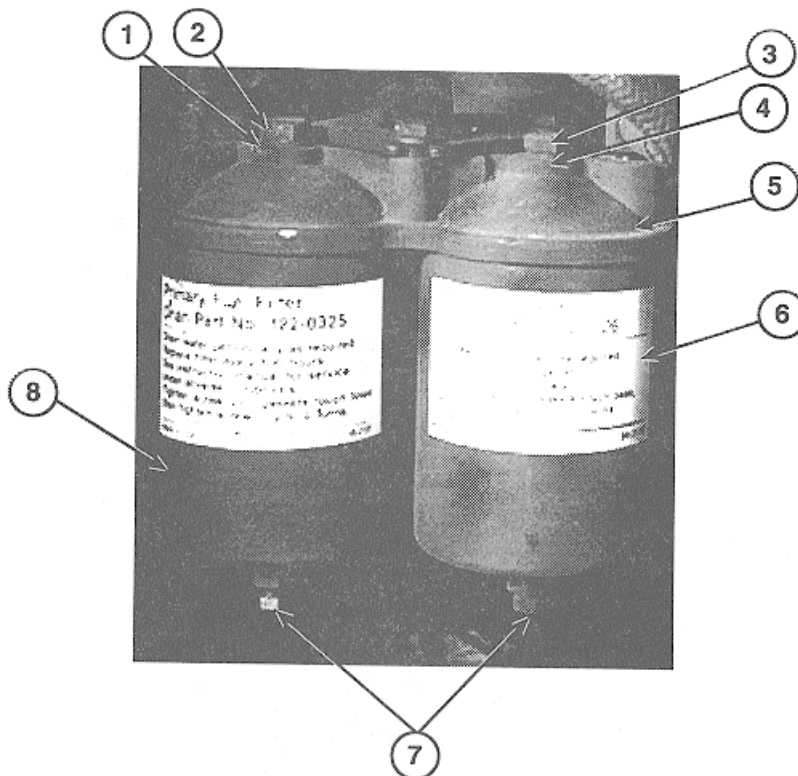
**CAUTION**

**Drain plug on fuel filter can take only a limited amount of torque. Use two wrenches in combination for loosening and tightening drain plug.**

2. Remove drain plug (7) from primary fuel filter (8) or secondary fuel filter (6) and drain fuel into container.
3. Remove screw (2) and washer (1) from primary fuel filter (8), or remove screw (3) and washer (4) from secondary fuel filter (6).
4. Remove primary fuel filter (8) or secondary fuel filter (6) from filter head (5). Discard filter.

**2-109. FUEL FILTERS (PRIMARY AND SECONDARY) REPLACEMENT (continued).****b. INSTALLATION**

1. Install new primary fuel filter (8) or new secondary fuel filter (6) on filter head (5).
2. Install screw (2) and washer (1) on primary fuel filter (8), or install screw (3) and washer (4) on secondary fuel filter (6).
3. Tighten screw (2 or 3) until gasket on fuel filter touches filter head (5). Tighten screw an additional 1 1/2 to 2 turns.
4. Install drain plug (7) on primary fuel filter (8) or secondary fuel filter (6).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).



---

**2-110. FUEL FILTER HEAD AND HOSE ASSEMBLY REPLACEMENT.**


---

This Task Covers:

- a. Removal                                      b. Installation
- 

Initial Setup:

**Tool/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

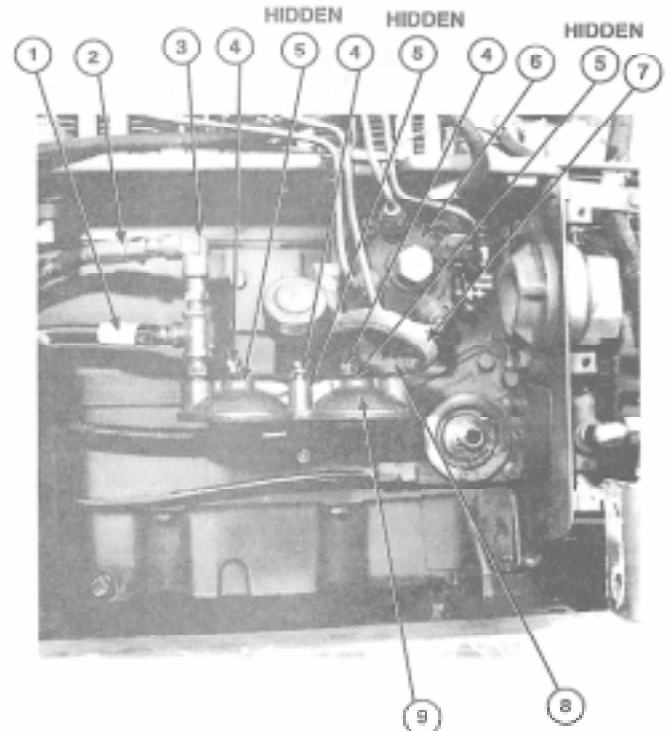
- Lockwasher (3) (Item 96, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
  - Primary and secondary fuel filters removed (para 2-109).
  - Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
  - Negative battery cable disconnected (para 2-33).
- 

**a. REMOVAL**

1. Remove hose assembly (7) from injection pump (6).
2. Remove hose assembly (7) from pipe elbow (8) on fuel filter head (9).
3. Remove pipe elbow (8) from fuel filter head (9).
4. Remove hose assembly (1) from pipe elbow assembly (3).
5. Remove hose assembly (2) from pipe elbow assembly (3).



**2-110. FUEL FILTER HEAD AND HOSE ASSEMBLY REPLACEMENT (continued).**

6. Remove pipe elbow assembly (3) from fuel filter head (9).
7. Remove three bolts (4) and lockwashers (5) from fuel filter head (9). Discard lockwashers.

**NOTE**

Perform steps 8 and 9 only if removing hose assemblies.

8. Remove one end of hose assembly (1) from fuel pump (11), if necessary.
9. Remove other end of hose assembly (2) from fuel pump (10), if necessary.

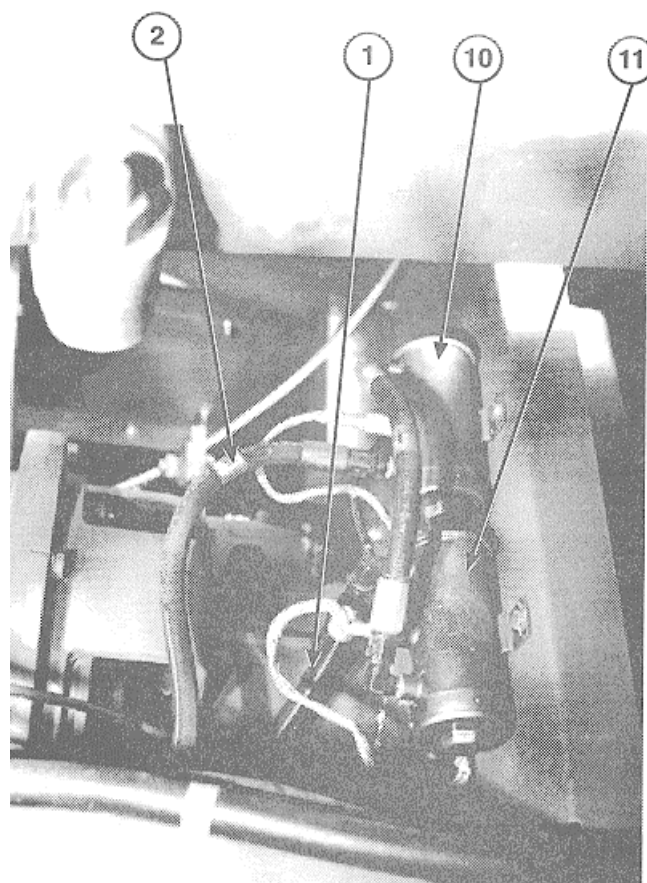
**b. INSTALLATION****NOTE**

Perform steps 1 and 2 only if installing hose assemblies.

1. Install hose assembly (2) on fuel pump (10), if hose assembly (2) was removed.
2. Install hose assembly (1) on fuel pump (11), if hose assembly (1) was removed.
3. Install pipe elbow assembly (3) on fuel filter head (9).
4. Install hose assembly (2) on pipe elbow assembly (3).
5. Install hose assembly (1) on pipe elbow assembly (3).
6. Install pipe elbow (8) on fuel filter head (9).
7. Install hose assembly (7) on injection pump (6).
8. Install hose assembly (7) on pipe elbow (8).
9. Install three bolts (4) and new lockwashers (5) on fuel filter head (9).

**FOLLOW-ON MAINTENANCE:**

- Install primary and secondary fuel filters (para 2-109).
- Connect negative battery cable (para 2-33).
- Disconnect ground (refer to TM 9-2330-398-10).



---

**2-111. ENGINE STARTER AND SOLENOID REPLACEMENT.**

---

*This Task Covers:*

- |                            |                |
|----------------------------|----------------|
| a. Removal                 | b. Disassembly |
| c. Cleaning and Inspection | d. Assembly    |
| e. Installation            |                |

---

*Initial Setup:***Tool Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Drycleaning solvent (Item 12, Appendix C)
- Rag (Item 25, Appendix C)
- Lockwasher (2) (Item 114, Appendix F)
- Lockwasher (5) (Item 118, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled from prime mover (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Negative battery cable disconnected (para 2-33).

---

**a. REMOVAL****WARNING**

**When performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and disconnect negative battery cables at batteries. Failure to follow this warning may create a spark and explosion, resulting in serious injury or death to personnel.**

**NOTE**

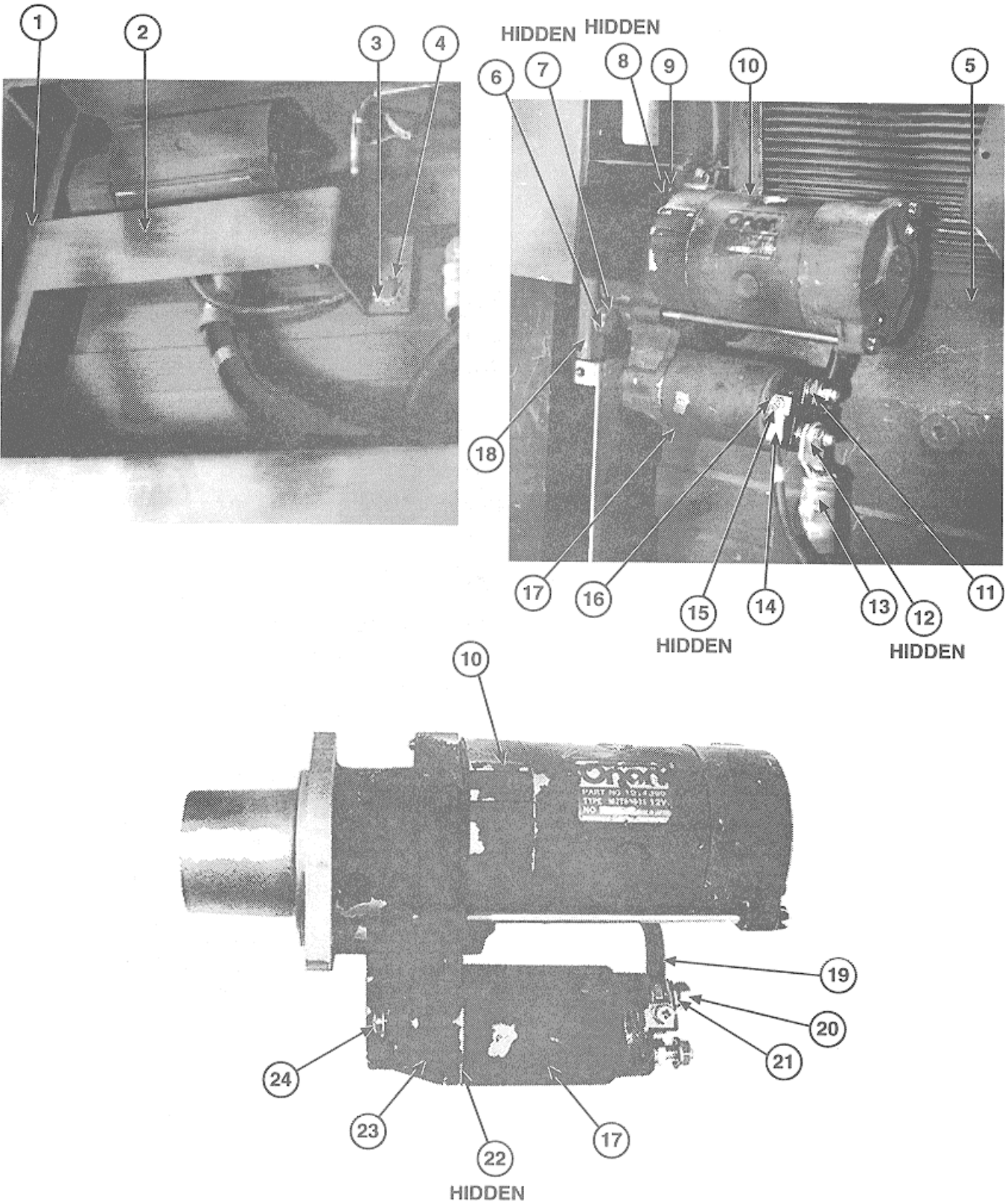
**The engine starter removal procedure is done from underneath the vehicle, on left side of engine.**

1. Remove two screws (1 and 3), lockwasher (4), and shroud (2) from engine (5). Discard lockwasher.
2. Remove nut (16), lockwasher (15), and lead (14) from pole of solenoid (17).
3. Remove nut (11), lockwasher (12), and lead (13) from pole on rear side of solenoid (17). Discard lockwasher.
4. Remove two screws (6 and 9) and lockwashers (7 and 8), baffle (18), and engine starter (10) from engine (5). Discard lockwashers.

**b. DISASSEMBLY**

1. Remove nut (20), lockwasher (21) and lead (19) from solenoid (17). Discard lockwasher.
2. Remove two screws (24), washer (22), and solenoid (17) from front housing (23) of engine starter (10).

2-111. ENGINE STARTER AND SOLENOID REPLACEMENT (continued).



---

**2-111. ENGINE STARTER AND SOLENOID REPLACEMENT (continued).**

---

**c. CLEANING AND INSPECTION****WARNING**

- Compressed air used for cleaning or drycleaning purposes should not exceed 30 psi (207 kPa). Use compressed air only with effective chip-guard and personal protective equipment (e.g., goggles/shield, gloves) and exercise caution. Failure to heed this warning can result in severe injury to personnel.
- Drycleaning solvent P-D-680 is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Do not use near open flame or excessive heat.

1. Clean dust off parts with compressed air or soft brush.

**CAUTION**

- Do not saturate armature or field coils with drycleaning solvent, as wire insulation may be damaged.
  - Do not dip drive assembly in drycleaning solvent, as it is packed in grease and cannot be replaced.
2. Remove grease and oil from all metal parts with drycleaning solvent and rags.
  3. Inspect solenoid switch for cracks, dents, or other damage. Make sure electrical terminals are clean and free of corrosion. After installation, make sure plunger and yoke move freely.

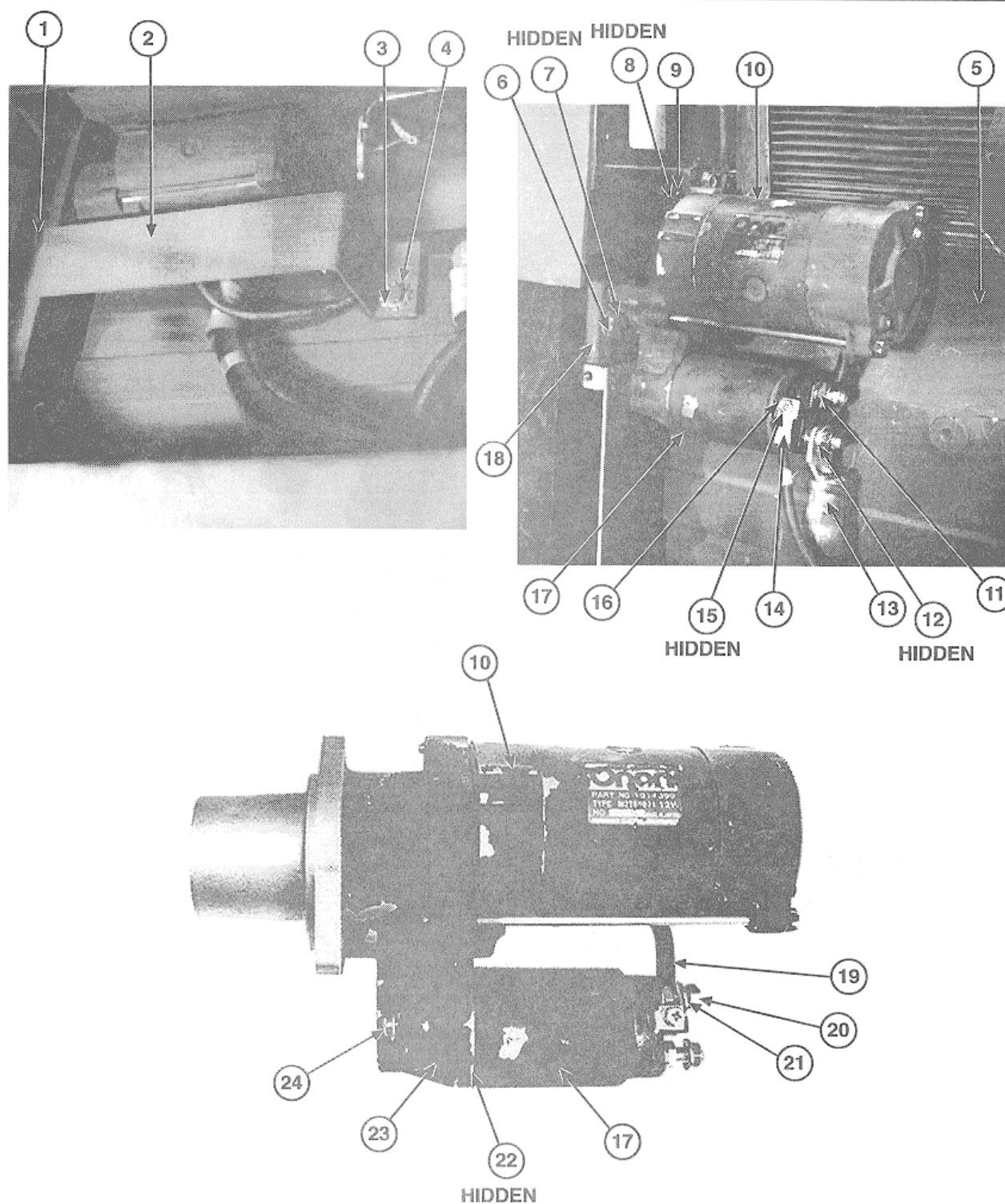
**d. ASSEMBLY**

1. Install washer (22) solenoid (17), and two screws (24) on front housing (23) of engine starter (10).
2. Install lead (19) on solenoid (17) with nut (20) and new lockwasher (21).

**e. INSTALLATION**

1. Install engine starter (10) and baffle (18) on engine (5) with two screws (6 and 9) and new lockwashers (7 and 8).
2. Install lead (13), new lock-washer (1) and nut (11) on pole on rear side of solenoid (17).
3. Install lead (24), new lock-washer (25), and nut (26) on pole of solenoid (17).
4. Install shroud (2) and two new lockwashers (4) on engine (5) with two screws (1 and 3).

## 2-111. ENGINE STARTER AND SOLENOID REPLACEMENT (continued).

**FOLLOW-ON MAINTENANCE:**

- Connect negative battery cable (para 2-33).
- Disconnect ground (refer to TM 92330-398-10).

**2-112. ENGINE CONTROL PANEL REPAIR.**

This Task Covers:

- |                 |                |
|-----------------|----------------|
| a. Removal      | b. Disassembly |
| c. Inspection   | d. Assembly    |
| e. Installation |                |

*Initial Setup:*

**Tool Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

- Self-locking nut (2) (Item 169, Appendix F)
- Self-locking nut (4) (Item 172, Appendix F)

**Materials/Parts:**

- Lockwasher (Item 93, Appendix F)
- Self-locking nut (22) (Item 166, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Negative battery cable disconnected (para 2-33).

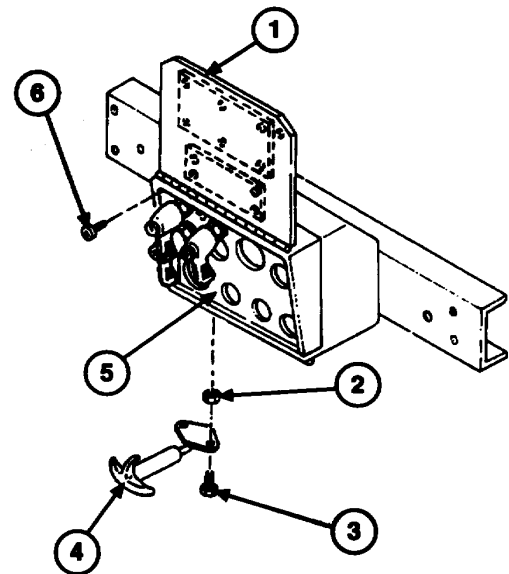
**a. REMOVAL****WARNING**

**When performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and disconnect semitrailer negative battery cables at batteries. Failure to follow this warning may create a spark and explosion, resulting in serious injury or death to personnel.**

**NOTE**

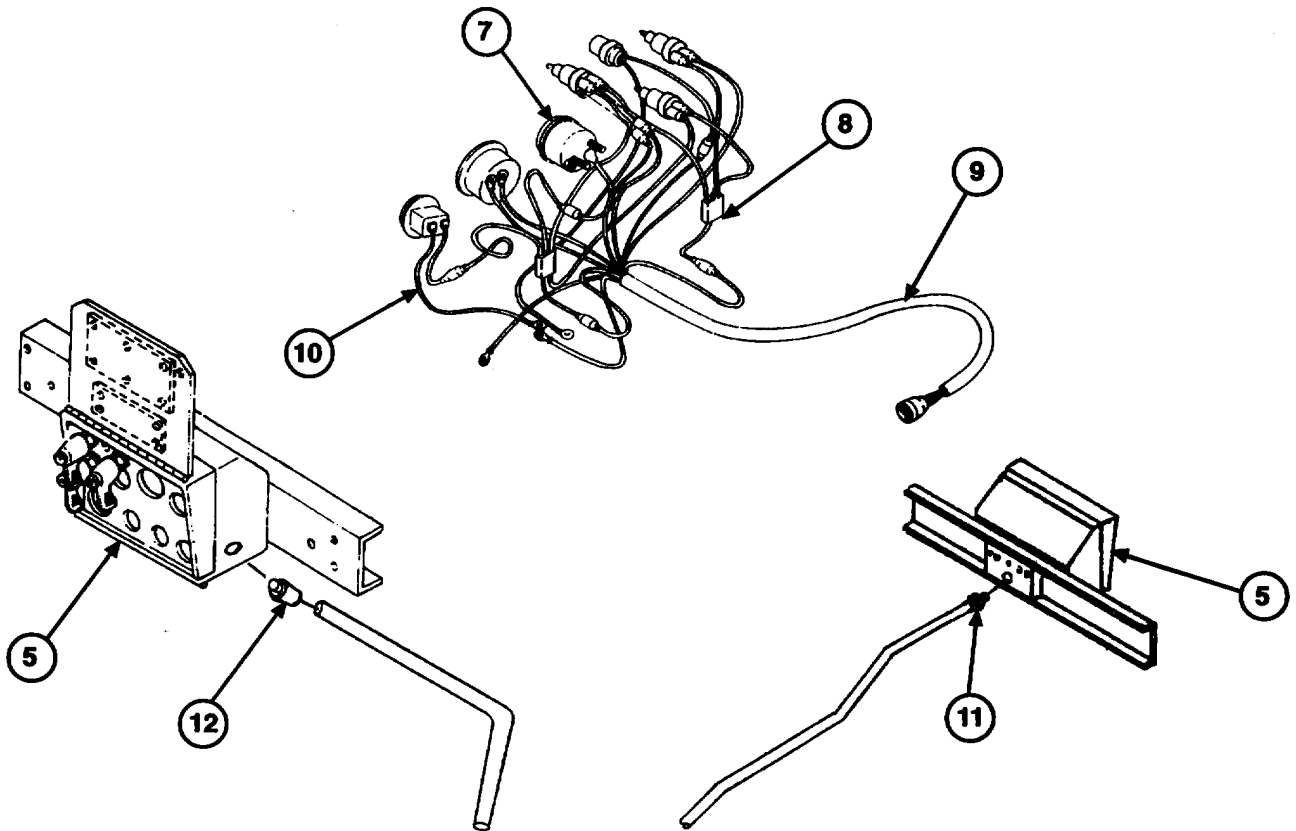
**Removal of engine control panel is not required for replacement of switches, gages, meters, and indicator light.**

1. Release fastener (4) and open control panel cover (1).
2. Remove six screws(6) from engine control panel (5), and swing control panel (5) down.
3. Remove two screws (3) and self-locking nuts (2) and fastener (4) from control panel (5). Discard self-locking nuts.



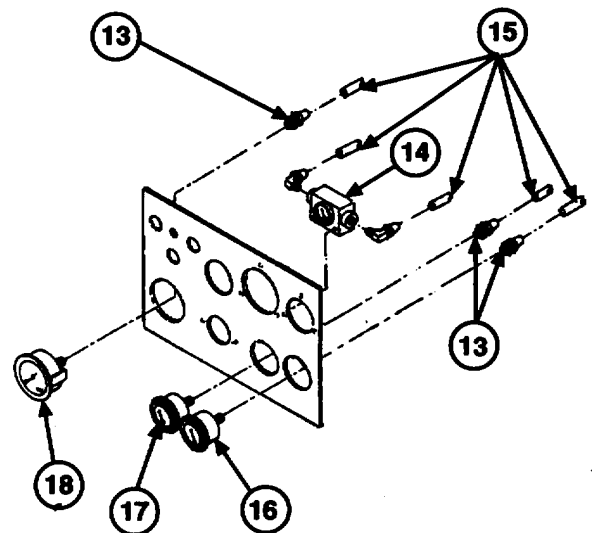
**2-112. ENGINE CONTROL PANEL REPAIR (continued).**

4. Tag and disconnect all electrical leads (10), jumper assemblies (8), and electrical components (7) from control panel wiring harness (9).
5. Remove control panel harness conduit adapter (11) from back of control panel (5).
6. Remove control panel light conduit adapter (12) from side of control panel (5).

**NOTE**

**Place suitable container under fuel/oil lines to catch fuel/oil.**

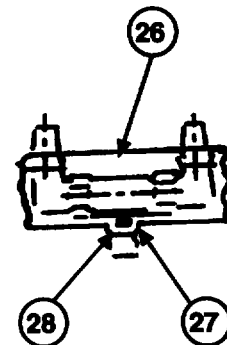
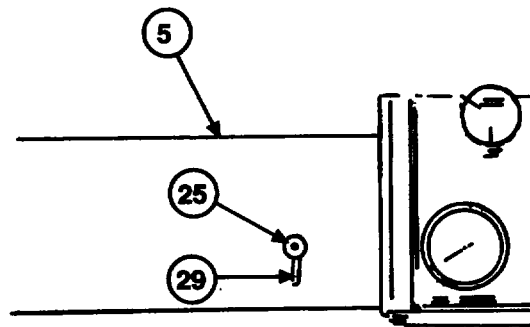
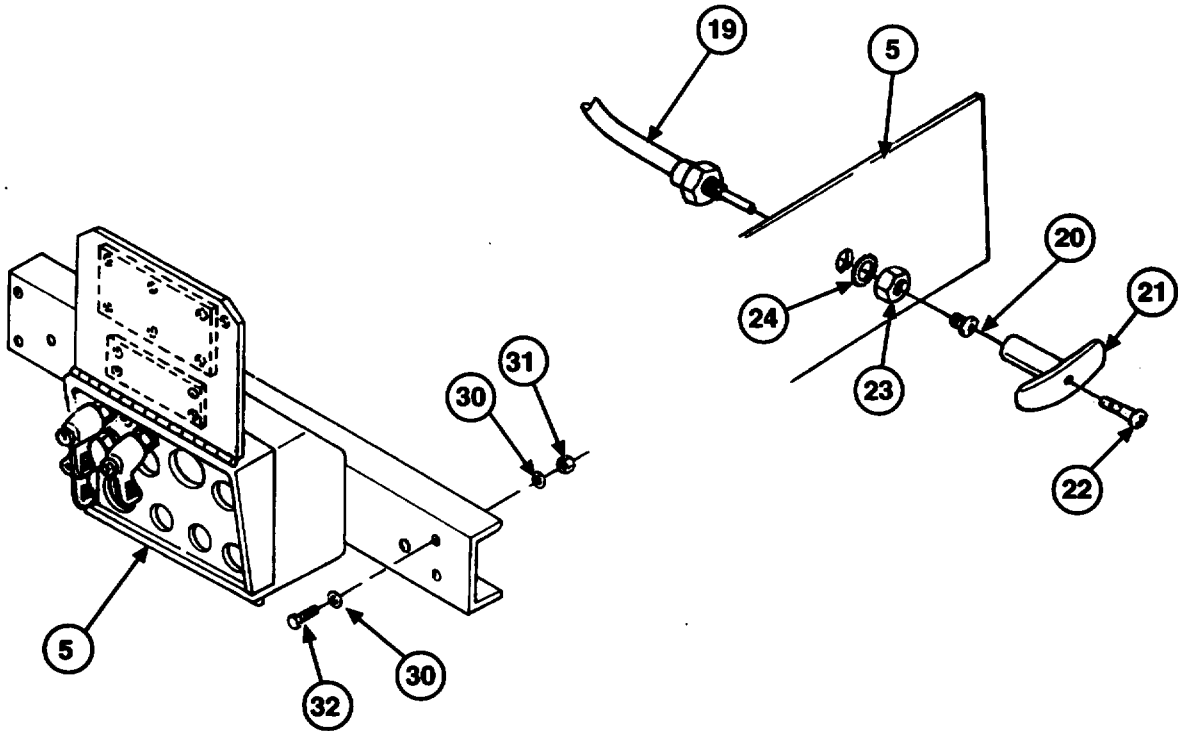
7. Disconnect fuel/oil lines (15) from adapters (13) on pump pressure gage (18), filter/separator gage (14), fuel pressure gage (17), and oil pressure gage (16).





**2-112. ENGINE CONTROL PANEL REPAIR (continued).**

8. Remove screw (22) and handle (21) from throttle cable (19).
9. Remove packing nut (20), jamnut (23), and washer (24) from throttle cable (19). Pull throttle cable (19) through channel of control panel (5).
10. Remove screw (25), lever (29), nut (28), washer (27), and valve (26) from channel of control panel (5).
11. Remove four screws (32), eight washers (30), four self-locking nuts (31), and control panel (5) from semitrailer. Discard self-locking nuts.



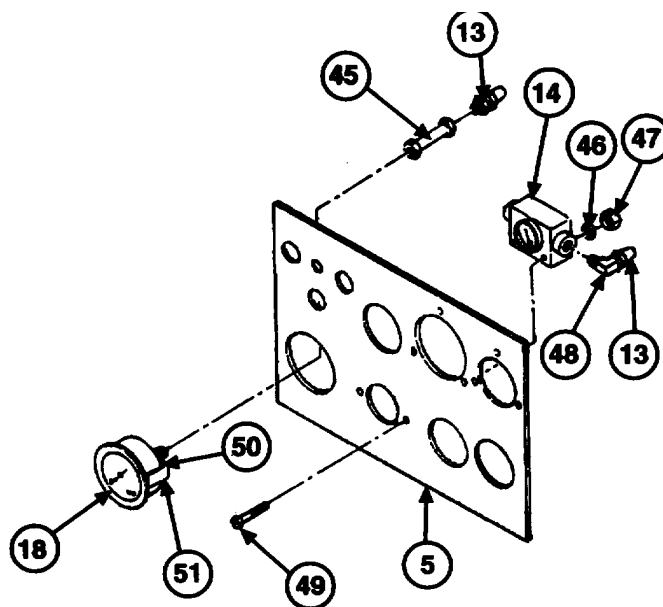
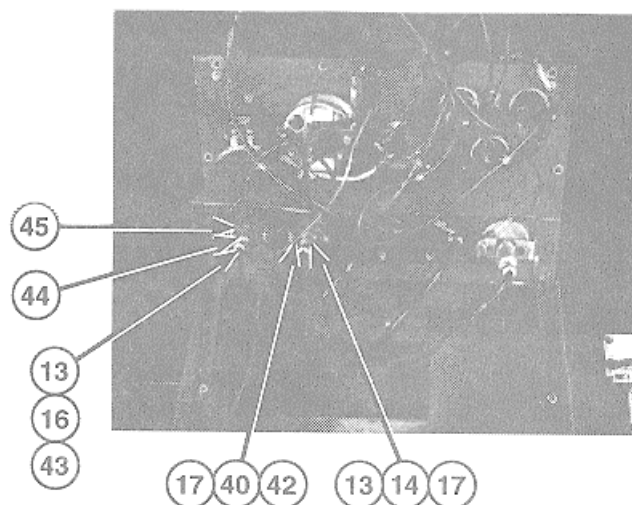
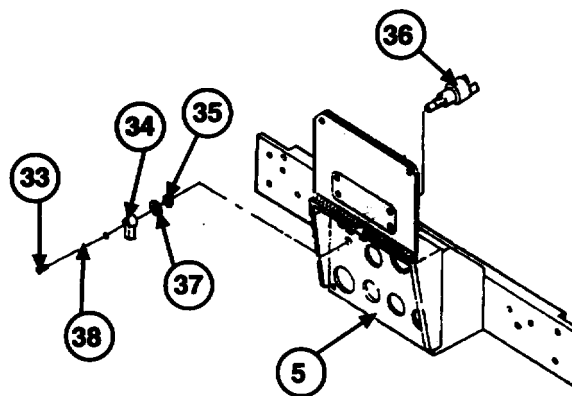
## 2-112. ENGINE CONTROL PANEL REPAIR (continued).

## b. DISASSEMBLY

## NOTE

Disassembly is the same for all three switches.

1. Engine Switches (Preheater, Starter, and Engine).
  - (a) Remove screw (33), washer (38), and lever (34) from switch (36).
  - (b) Remove nut (37), lockwasher (35), and switch (36) from control panel (5). Discard lockwasher.
2. Oil Pressure Gage
  - (a) Remove adapter (13) and coupling (42) from oil pressure gage (16).
  - (b) Remove two nuts (43), bracket (44), and oil pressure gage (16) from control panel (5).
3. Fuel Pressure Gage
  - (a) Remove adapter (13) and coupling (40) from fuel pressure gage (17).
  - (b) Remove two nuts (41), bracket (39), and fuel pressure gage (17) from control panel (5).
4. Filter/Separator Gage
  - (a) Remove two screws (49), washers (46), and nuts (47) and filter/separator gage (14) from control panel (5).
  - (b) Remove two adapters (13) and elbows (48) from filter/separator gage (14).
5. Pump Pressure Gage
  - (a) Remove adapter (13) and snubber (45) from pump pressure gage (18).
  - (b) Remove two nuts (50) and brackets (51) and pump pressure gage (18) from control panel (5).



**2-112. ENGINE CONTROL PANEL REPAIR (continued).****6. Hour Meter**

Remove three screws (60) and nuts (57) and hour meter (59) from control panel (5).

**7. Tachometer**

Remove two nuts (62), bracket (63), and tachometer (64) from control panel (5).

**8. Voltmeter**

Remove two nuts (67), bracket (66), and voltmeter (65) from control panel (5).

**9. Preheat Indicator Light**

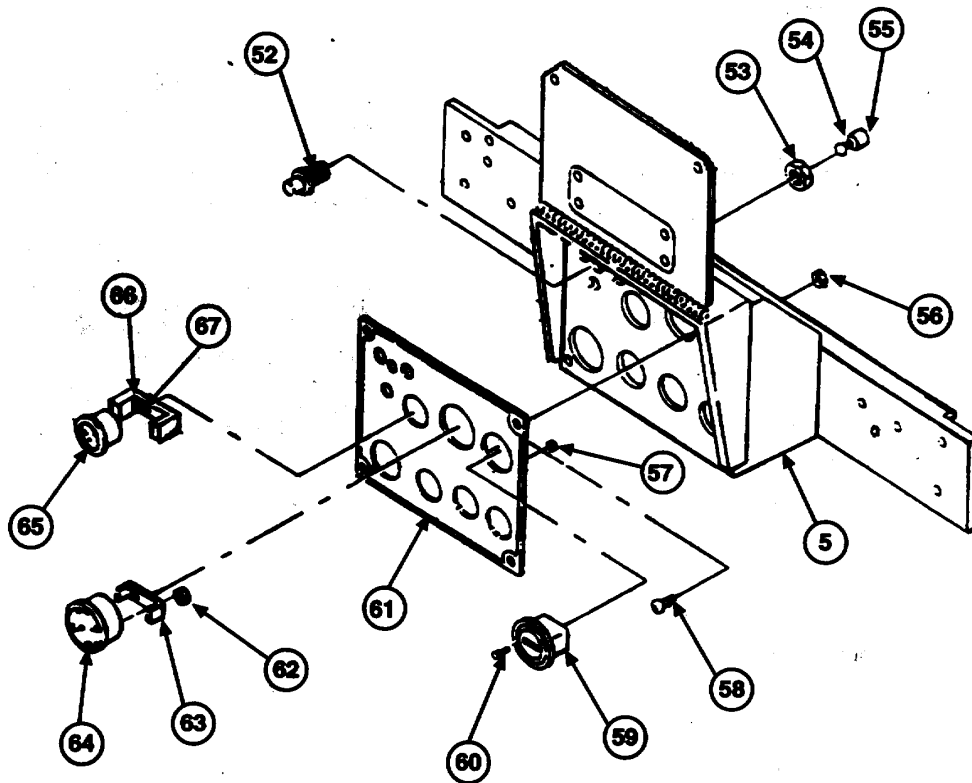
(a) Separate indicator light socket (55) from light body (52) by pulling on socket (55).

(b) Remove Indicator light.(54) from socket (55).

(c) Remove nut (53) and light body (52) from control panel (5).

**10. Control Panel Plate**

Remove four screws (58) and self-locking nuts (56) and control panel plate (61) from control panel (5). Discard self-locking nuts.

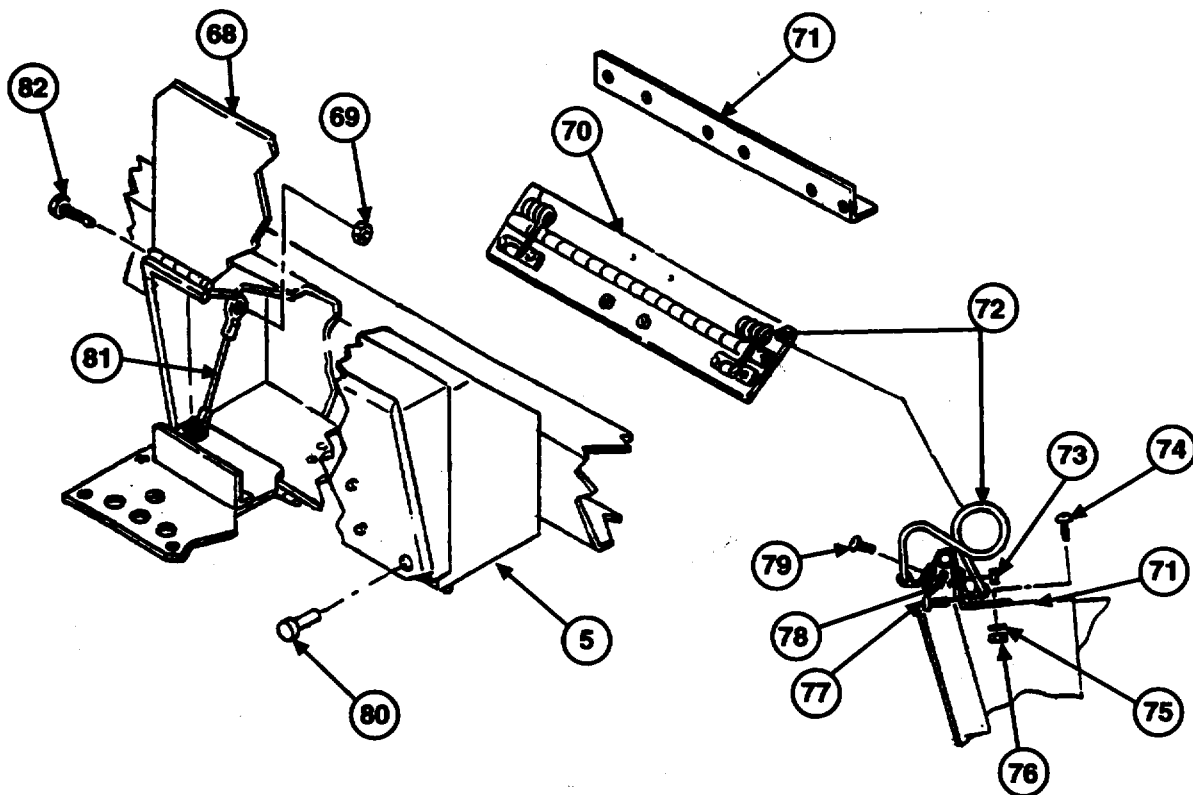


**2-112. ENGINE CONTROL PANEL REPAIR (continued).****11. Control Panel Access Cover**

- (a) Remove two bumpers (80) from access cover (68).
- (b) Remove two screws (82) and self-locking nuts (69) and wire rope (81) from control panel (5). Discard self-locking nuts.
- (c) Remove six screws (79) and self-locking nuts (78) and access cover (68) from hinge (70). Discard self-locking nuts.
- (d) Remove six screws (77) and self-locking nuts (73), two springs (72), and hinge (70) from bracket (71).

Discard self-locking nuts.

- (e) Remove four screws (74), washers (75), and self-locking nuts (76) and bracket (71) from control panel (5). Discard self-locking nuts.

**c. INSPECTION**

Visually check instruments for broken glass, damaged terminals, corrosion, and damage to cases and capillary tubes. Check wiring for broken or damaged insulation and for broken wires. Check couplings and lines to pump, filter/separator, fuel, and oil gages for damage.

**2-112. ENGINE CONTROL PANEL REPAIR (continued).****d. ASSEMBLY****1. Control Panel Access Cover**

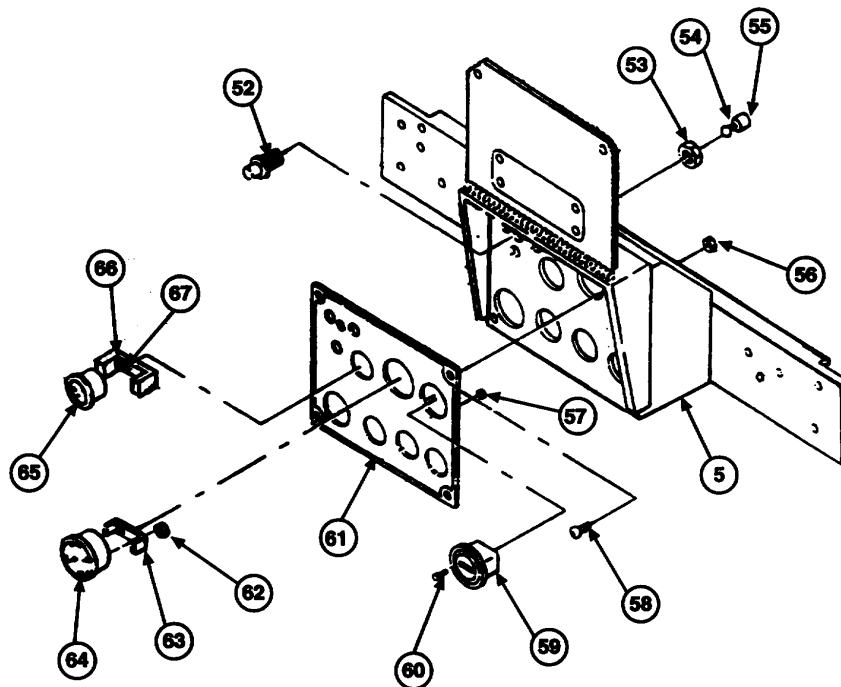
- (a) Install bracket (71) on control panel (5) with four screws (74), washers (75), and new self-locking nuts (76).
- (b) Install hinge (70) and two springs (72) on bracket (71) with six screws (77) and new self-locking nuts (73).
- (c) Install access cover (68) on hinge (70) with six screws (79) and new self-locking nuts (78).
- (d) Install wire rope (81) on control panel (5) with two screws (82) and new self-locking nuts (69).
- (e) Install two bumpers (80) on access cover (68).

**2. Control Panel Plate**

Install control panel plate (61) on control panel (5) with four screws (58) and new self-locking nuts (56).

**3. Preheat Indicator Light**

- (a) install light body (52) and nut (53) on control panel (5).
- (b) install indicator light (54) in socket (55).
- (c) install socket (55) into light body (52).



**2-112. ENGINE CONTROL PANEL REPAIR (continued).****4. Voltmeter**

Install voltmeter (65) on control panel (5) with bracket (66) and two nuts (67).

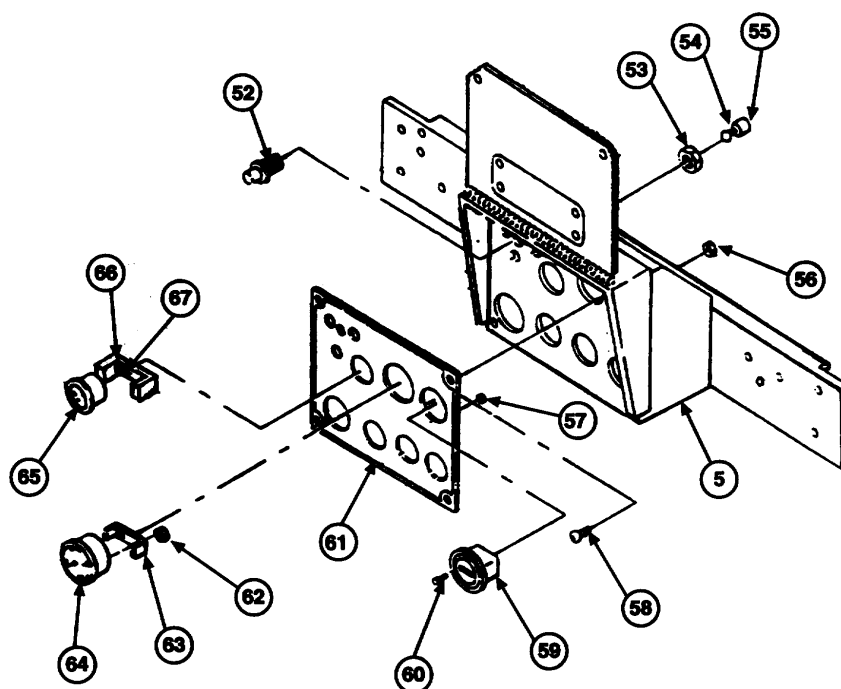
**5. Tachometer**

(a) Install tachometer (64) on control panel (5) with bracket (63) and two nuts (62).

(b) Fabricate two electrical lead assemblies 12275404 and 12275540 (Appendix D).

**6. Hour Meter**

Install hour meter (59) on control panel (5) with three screws (60) and nuts (57).

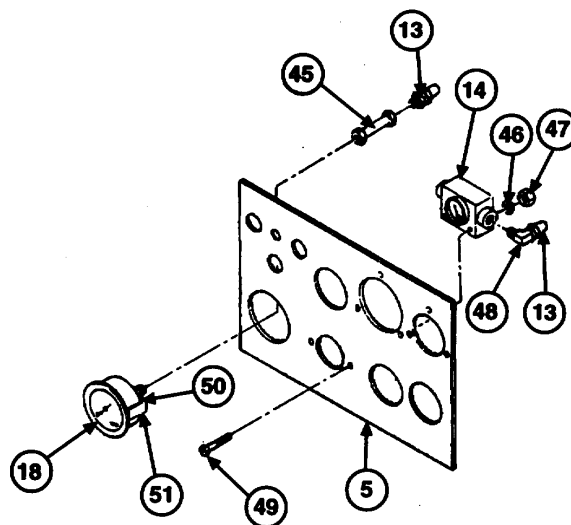


**2-112. ENGINE CONTROL PANEL REPAIR (continued).****7. Pump Pressure Gage**

- (a) Install pump pressure gage (18) on control panel (5) with two brackets (51) and nuts (50).
- (b) Install snubber (45) and adapter (13) on pump pressure gage (18).

**8. Filter/Separator Gage**

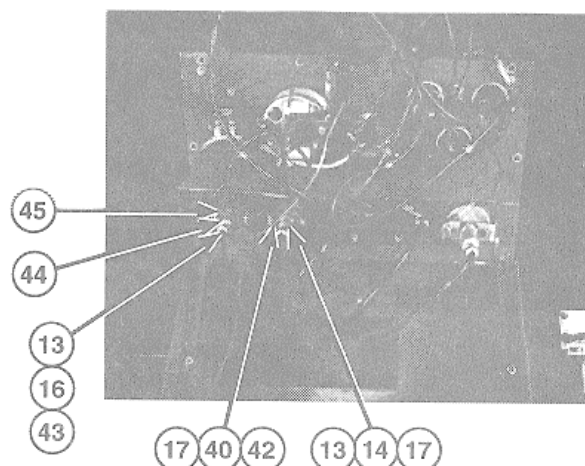
- (a) Install two elbows (48) and adapters (13) on filter/separator gage (14).
- (b) Install filter/separator gage (14) on control panel (5) with two screws (49), washers (46), and nuts (47).

**9. Fuel Pressure Gage**

- (a) Install fuel pressure gage (17) on control panel (5) with bracket (39) and two nuts (41).
- (b) Install coupling (40) and adapter (13) on fuel pressure gage (17).

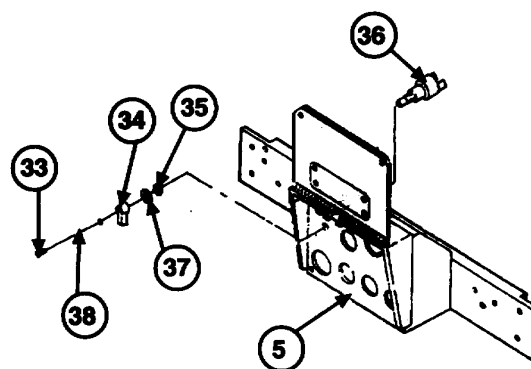
**10. Oil Pressure Gage**

- (a) Install oil pressure gage (16) on control panel (5) with bracket (44) and two nuts (43).
- (b) Install coupling (42) and adapter (13) on oil pressure gage (16).

**11. Engine Switches (Preheater, Starter, and Engine)****NOTE**

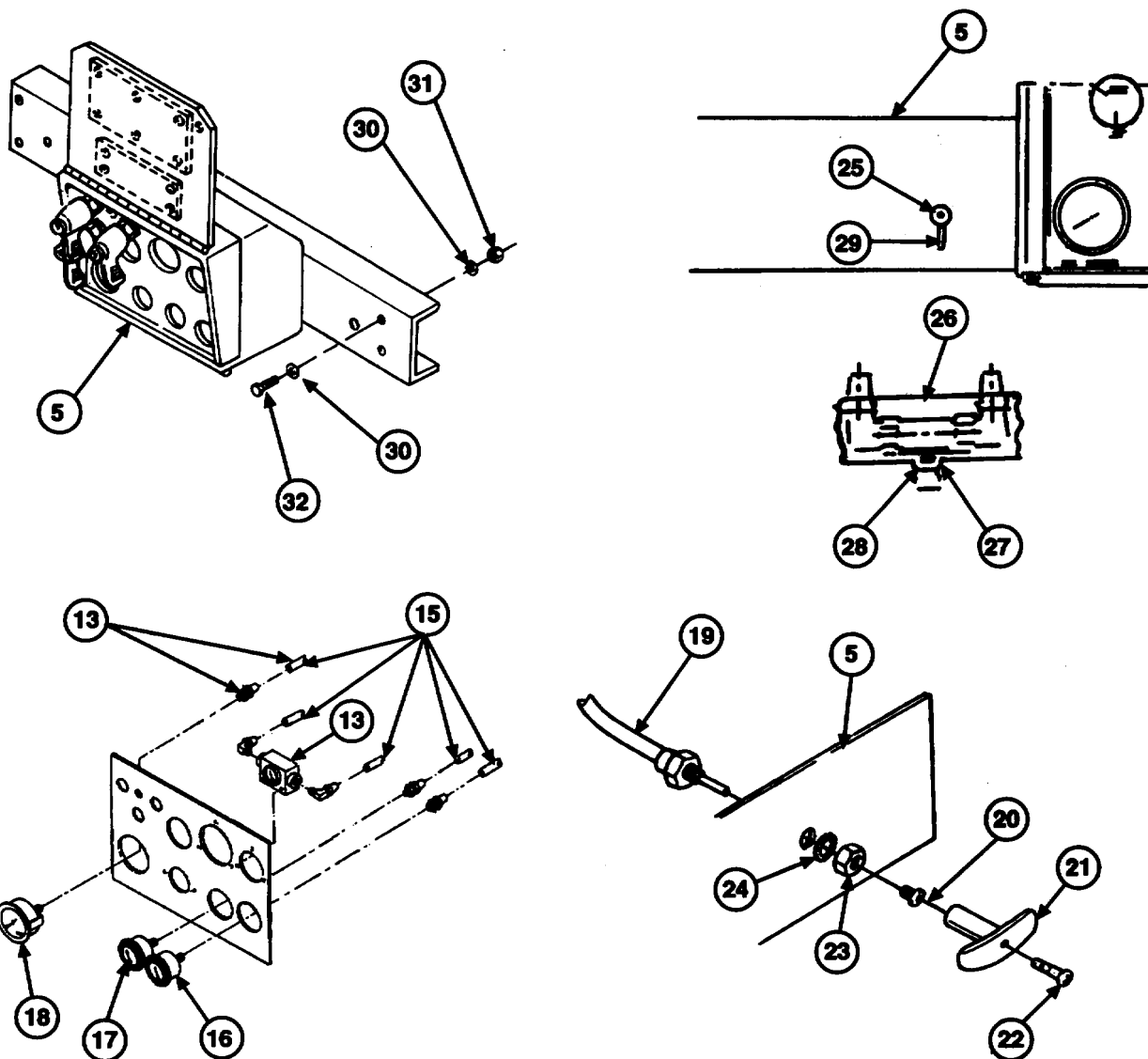
**Assembly is the same for all three switches.**

- (a) Install switch (36) on control panel (5) with nut (37) and new lockwasher (35).
- (b) Install lever (34) on switch (36) with screw (33) and washer (38).



**2-112. ENGINE CONTROL PANEL REPAIR (continued).****e. INSTALLATION**

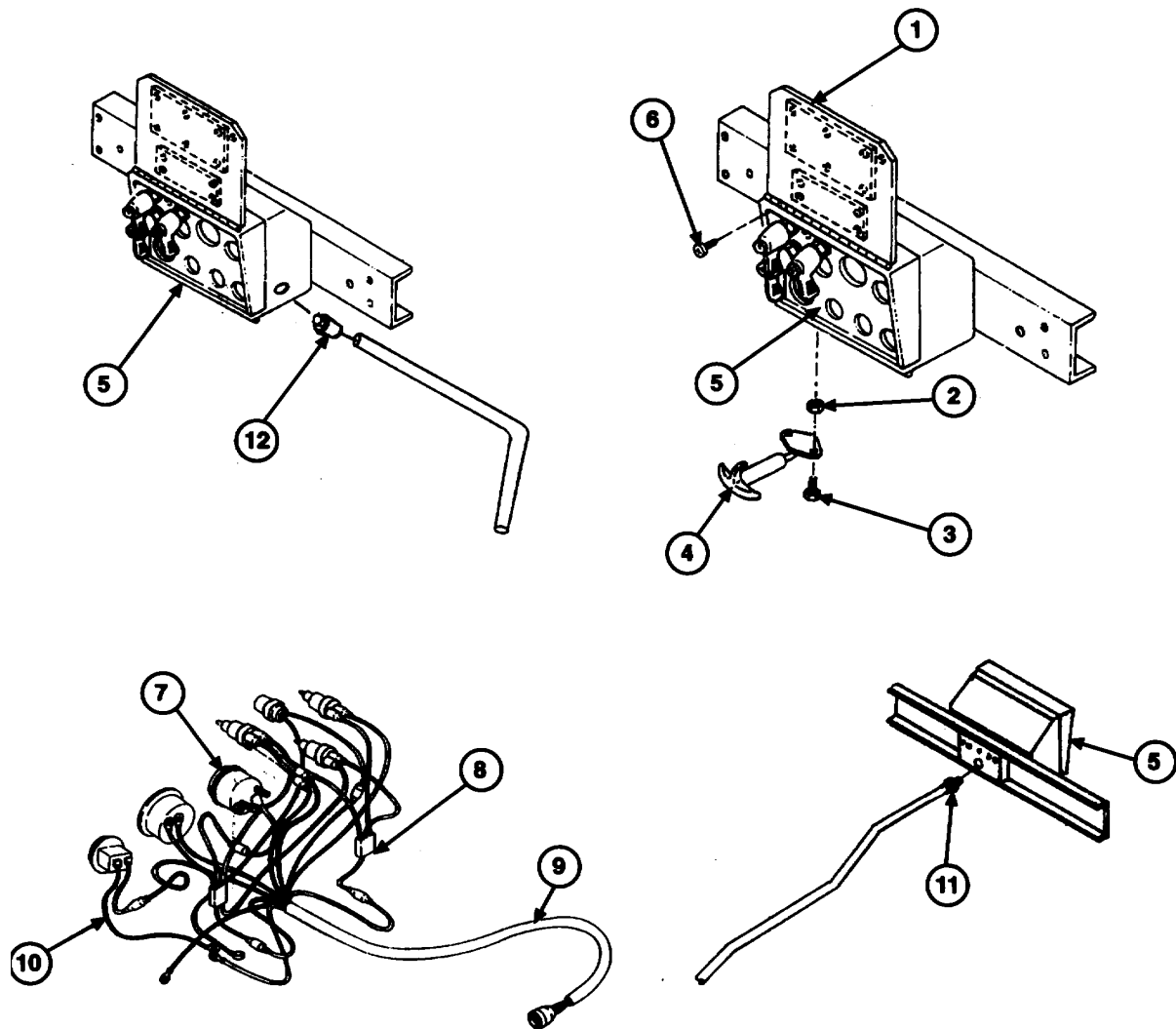
1. Install engine control panel (5) on semitrailer with four screws (32), eight washers (30), and four new self-locking nuts (31).
2. Install valve (26) on channel of control panel (5) with washer (27), nut (28), lever (29), and screw (25).
3. Install throttle cable (19) on channel of control panel (5) with washer (24) and jamnut (23).
4. Install handle (21) on throttle cable (19) with packing nut (20) and screw (22).
5. Connect fuel/oil lines (15) to adapters (13) on oil pressure gage (16), fuel pressure gage (17), filter/separator gage (14), and pump pressure gage (18).





**2-112. ENGINE CONTROL PANEL REPAIR (continued).**

6. Install control panel light conduit adapter (12) on side of control panel (5).
7. Install control panel harness conduit adapter (11) on back of control panel (5).
8. Connect electrical leads (10), jumper assemblies (8), and electrical components (7) to control panel wiring harness (9).
9. Install fastener (4) on control panel (5) with two screws (3) and new self-locking nuts (2).
10. Close control panel (5) and Install six screws (6).
11. Close control panel cover (1) and secure with fastener (4).

**FOLLOW-ON TASK:**

- Connect negative battery cable (para 2-33).

## Section XIII. SPECIAL PURPOSE KITS MAINTENANCE

**2-113. VAPOR RECOVERY SYSTEM REPLACEMENT.**

This Task Covers:

- |                                 |                                      |
|---------------------------------|--------------------------------------|
| a. Removal of Hood and Hose     | b. Installation of Hood and Hose     |
| c. Removal of Piping            | d. Installation of Piping            |
| e. Removal of Ground Receptacle | f. Installation of Ground Receptacle |

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)
- Common No. 1 tool set (Item 1, Appendix B)
- Self-locking nut (2) (Item 177, Appendix F)

**Materials/Parts:**

- Petrolatum (Item 24, Appendix C)
- Gasket (Item 20, Appendix F)
- Gasket (Item 39, Appendix F)
- Gasket (2) (Item 49, Appendix F)

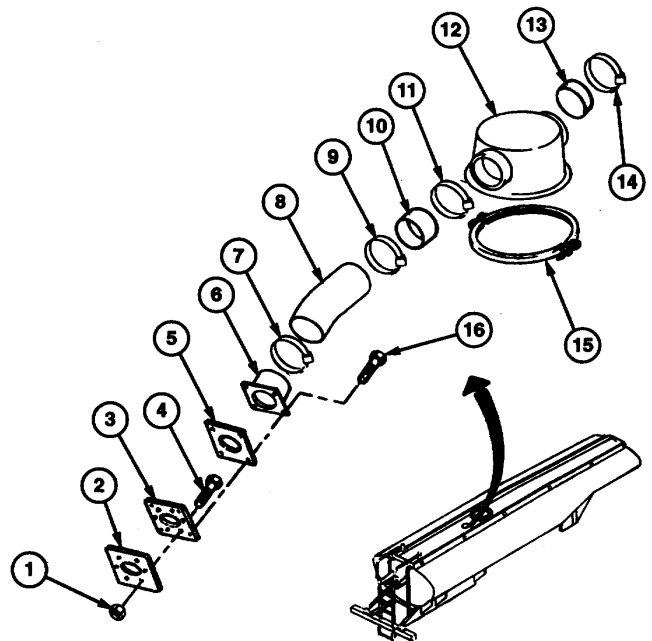
- Gasket (2) (Item 50, Appendix F)
- Seal (Item 153, Appendix F)
- Self-locking nut (8), (Item 171, Appendix F)
- Self-locking nut (12) (Item 172, Appendix F)
- Self-locking nut (10) (Item 173, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

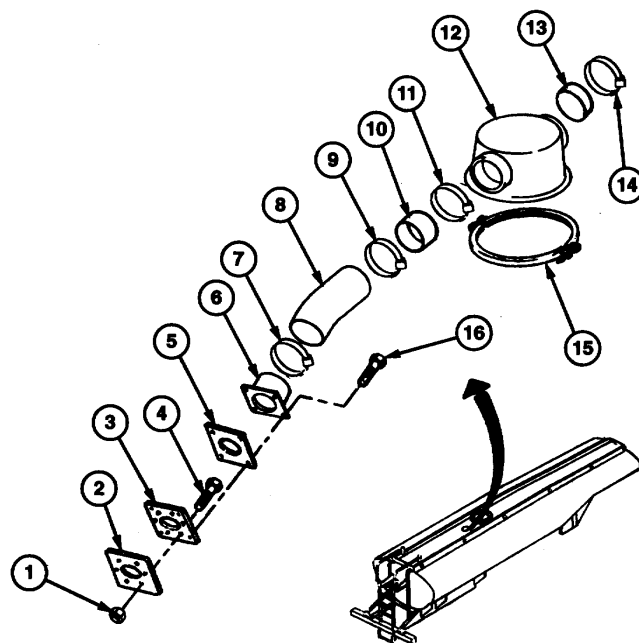
**a. REMOVAL OF HOOD AND HOSE**

1. Loosen clamp (15) on hood (12).
2. Loosen hose clamp (7). Slide off clamp (15), hose (8), and hood (12), as a unit, from semitrailer.
3. Loosen two hose clamps (9 and 11), and remove hose (8) and pipe (10) from hood (12).
4. Loosen clamp (14), and remove plug (13) from hood (12).
5. Remove four screws (16), adapter (6), and gasket (5) from semitrailer. Discard gasket.
6. Remove six screws (4) and self-locking nuts (1), adapter (2), and gasket (3) from I semitrailer. Discard self-locking nuts and gasket.



**2-113. VAPOR RECOVERY SYSTEM REPLACEMENT (continued).****b. INSTALLATION OF HOOD AND HOSE**

1. Install six screws (4) and new selflocking nuts (1), adapter (2), and new gasket (3) on semitrailer.
2. Install four screws (16), adapter (6), and new gasket (5) on semitrailer.
3. Install plug (13) and clamp (14) on hood (12), and tighten clamp (14).
4. Install pipe (10), hose (8), and two hose clamps (9 and 11) on hood (12), and tighten hose clamps (9 and 11).
5. Install clamp (15), hood (12), and hose (8), as a unit, on semitrailer. Tighten hose clamp (7).
6. Tighten clamp (15) on hood (12).

**c. REMOVAL OF PIPING**

1. Remove coupling (38), screen (37), and gasket (36) from coupling (35). Discard gasket.
2. Remove two bolts (41), coupling (40), and seal (39) from elbow (18). Discard seal.

**NOTE**

**Provide support for pipe assembly so it will not fall.**

3. Remove four self-locking nuts (33) and washers (31), two U-bolts (30), and pipe assembly (24) from bracket (29). Discard self-locking nuts.
4. Remove coupling (35) from pipe assembly (24).
5. Remove eight screws (27) and self-locking nuts (28), vent (26), and gasket (25) from semitrailer. Discard gasket and self-locking nuts.
6. Remove four screws (17), elbow (18), and gasket (19) from adapter (20). Discard gasket.
7. Remove six screws (23) and self-locking nuts (22), adapter (20), and gasket (21) from semitrailer. Discard self-locking nuts and gasket.
8. Remove four screws (32) and self-locking nuts (34), eight washers (31), and bracket (29) from semitrailer. Discard self-locking nuts.

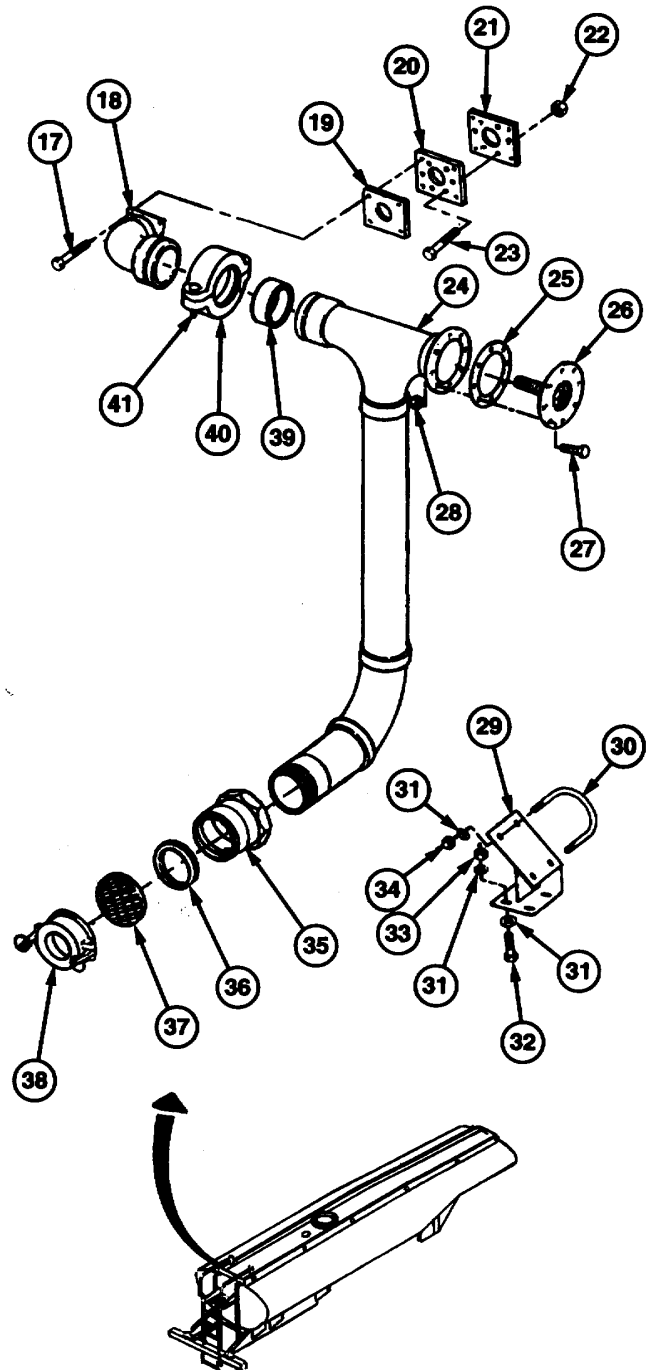
**2-113. VAPOR RECOVERY SYSTEM REPLACEMENT (continued).****d. INSTALLATION OF PIPING**

1. Install four screws (32) and new self-locking nuts (34), eight washers (31), and bracket (29) on semitrailer.
2. Install six screws (23) and new self-locking nuts (22), adapter (20), and new gasket (21) on semitrailer.
3. Install four screws (17), elbow (18), and new gasket (19) on adapter (20).
4. Install eight screws (27) and new self-locking nuts (28), vent (26), and new gasket (25) on semitrailer.
5. Install coupling (35) on pipe assembly (24).
6. Install pipe assembly (24), two U-bolts (30), and four new self-locking nuts (34) and washers (31) on bracket (29).

**NOTE**

**Lubricate seal with petrolatum.**

7. Install new seal (39) on elbow (18). Make sure gasket lip does not overhang end of elbow.
8. Align pipe assembly (24) and elbow (18). Slide seal (39) into position, centered between the grooves on each end of pipe assembly and elbow.
9. Install coupling (40) on elbow (18) with two bolts (41).
10. Install new gasket (36), screen (37), and coupling (38) on coupling (35).
11. Torque two bolts (41) between 104 and 116 lb-ft (141 and 157 N•m).

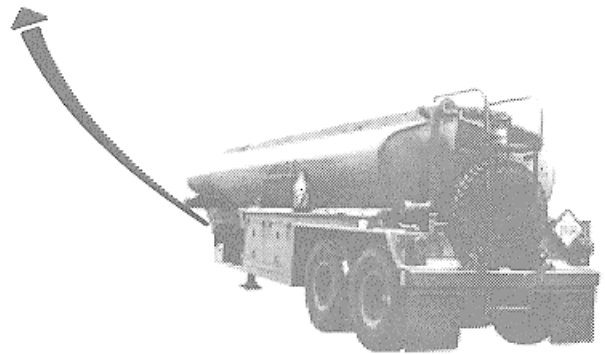
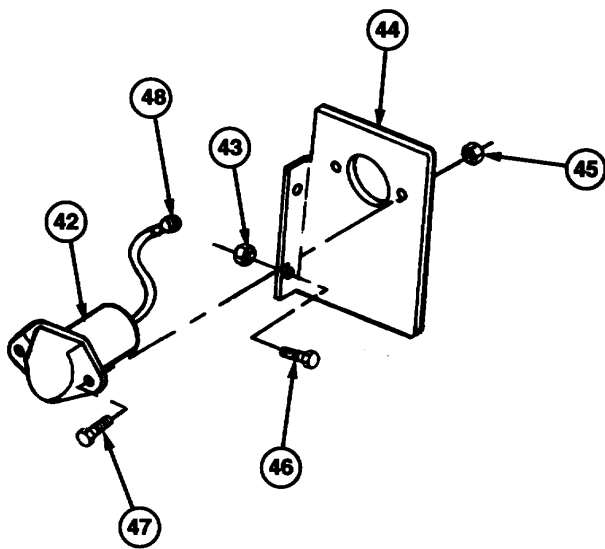


**2-113. VAPOR RECOVERY SYSTEM REPLACEMENT (continued).****e. REMOVAL OF GROUND RECEPTACLE**

1. Remove screw (46), self-locking nut (43), and ground lead (48) of ground receptacle (42) from bracket (44). Discard self-locking nut.
2. Remove two screws (47) and self-locking nuts (45) and receptacle (42) from bracket (44). Discard self-locking nuts.
3. Remove screw (46), self-locking nut (43), and bracket (44) from semitrailer. Discard self-locking nut.

**f. INSTALLATION OF GROUND RECEPTACLE**

1. Install bracket (44) on semitrailer with screw (46) and new self-locking nut (43).
2. Install receptacle (42) on bracket (44) with two screws (47) and new self-locking nuts (45).
3. Install ground lead of ground receptacle (42) on bracket (44) with screw (46) and new self-locking nut (43).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

## Section XIV. ELECTRICAL EQUIPMENT MAINTENANCE

Paragraph Number	Paragraph Title	Page Number
2-114	General .....	2-251
2-115	Hose Reel Cabinet Electrical Leads and Cable Assemblies Repair .....	2-251
2-116	Hose Reel Conduit Assembly Replacement .....	2-253

**2-114. GENERAL.**

This section describes and illustrates removal and installation procedures for the hose reel cabinet electrical lead and cable assemblies and the hose reel conduit assembly. Repair procedures for the hose reel cabinet electrical leads and cable assemblies are also addressed.

**2-115. HOSE REEL CABINET ELECTRICAL LEADS AND CABLE ASSEMBLIES REPAIR.**

*This Task Cover:*

- a. Removal and Installation      b. Repair

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Tape, insulation, electrical (Item 31, Appendix C)

**Equipment:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Negative battery cable disconnected (para 2-33).

**WARNING**

**When troubleshooting an electrical malfunction or performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cabs at batteries. Failure to follow this warning may create a spark and explosion, resulting in serious injury or death to personnel.**

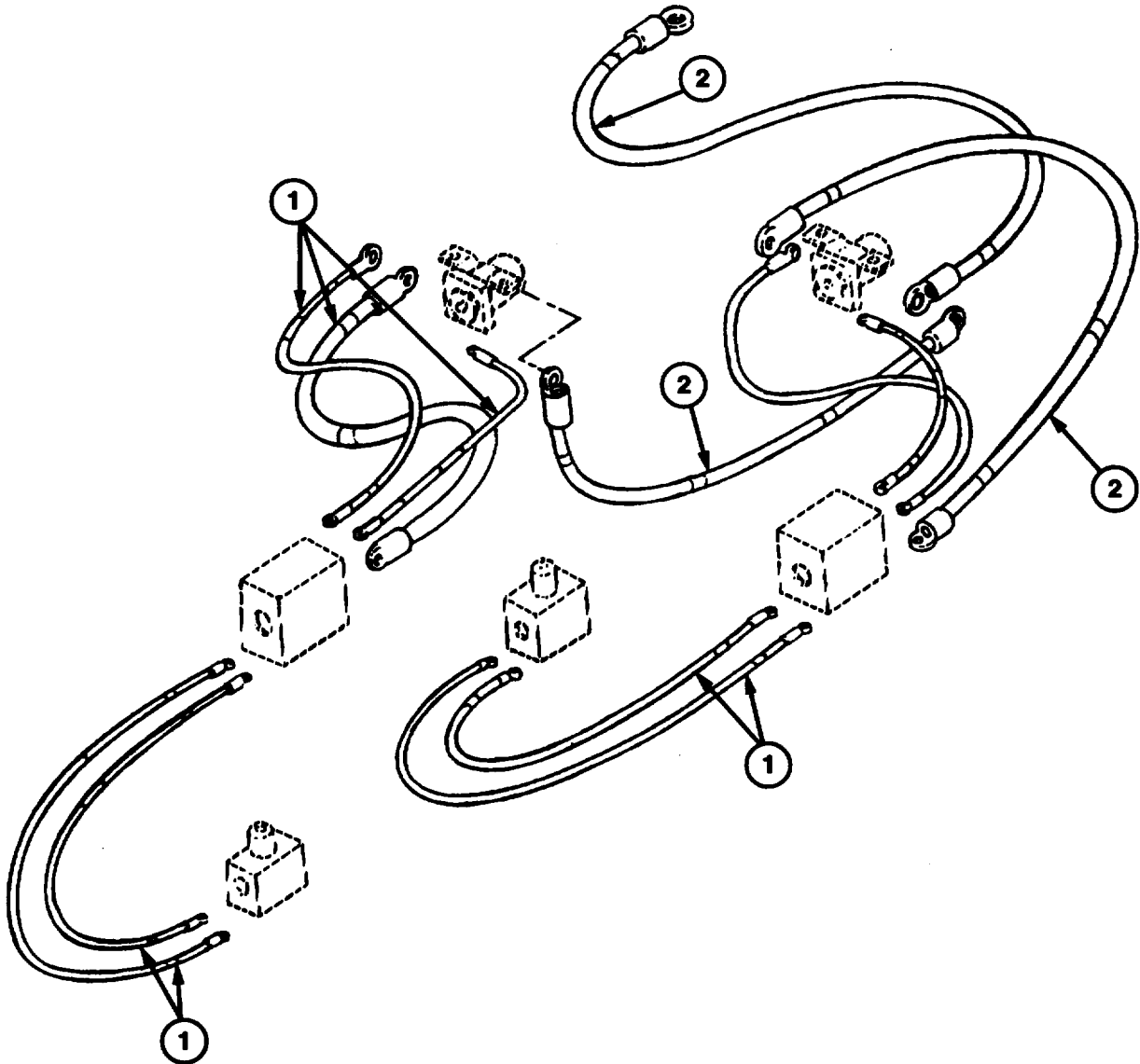
**a. REMOVAL AND INSTALLATION**

Use the illustration to locate, remove, and install cabinet electrical leads (1) and cable assemblies (2) wiring.

**2-115. HOSE REEL CABINET ELECTRICAL LEADS AND CABLE ASSEMBLIES REPAIR.****b. REPAIR****NOTE**

**Repair of cabinet electrical leads and cable assemblies can be performed without removing them from conduit.**

1. Check ends of cabinet electrical leads (1) and cable assemblies (2) for frayed insulation and broken wires. Tape or replace frayed wires.
2. Inspect wires for bent, broken, or missing terminals. Replace missing or damaged terminals.

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).
- Connect negative battery cable (para 2-33).

---

**2-116. HOSE REEL CONDUIT ASSEMBLY REPLACEMENT.**

---

*This Task Cover:*

- a. Removal                      b. Installation
- 

*Initial Setup:***Tool/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
  - Negative battery cable disconnected (para 2-33).
  - Cable assembly removed from hose reel conduit (para 2-115).
- 

**WARNING**

**When troubleshooting an electrical malfunction or performing electrical maintenance, ALWAYS disconnect intervehicular electrical cable from semitrailer and negative battery cables at batteries. Failure to follow this warning may create a spark and explosion, resulting in serious injury or death to personnel.**

**a. REMOVAL**

1. Loosen two conduit connectors (6) on two bushings (7) on two hose reel rewind switches (8).
2. Remove two conduits (2) from two conduit elbows (4).
3. Remove two conduit connectors (6) and bushings (7) from two hose reel rewind switches (8).
4. Remove two conduit elbows (4) from two junction boxes (3 and 5).
5. Remove two conduits (2) from four conduit elbows (4).
6. Remove conduit (2) from two conduit bushings (1).
7. Remove four conduit elbows (4) from two junction boxes (3 and 5) and semitrailer.

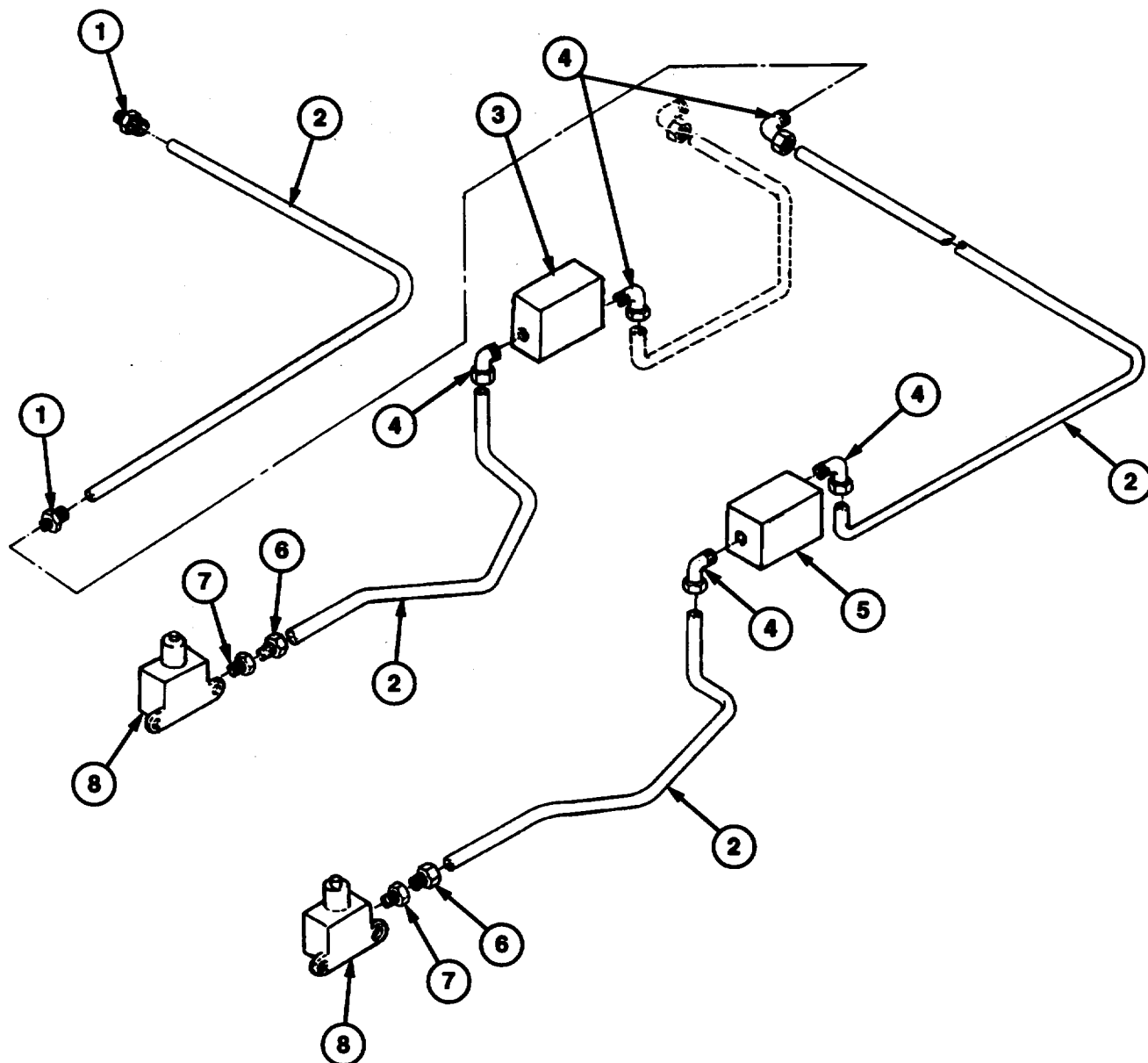
**b. INSTALLATION**

1. Install four conduit elbows (4) on semitrailer and two junction boxes (3 and 5).
2. Install conduit (2) on two conduit bushings (1).
3. Install two conduits (2) on four conduit elbows (4).
4. Install two conduit elbows (4) in two junction boxes (3 and 5).
5. Install two bushings (7) and conduit connectors (6) on two hose reel rewind switches (8).



**2-116. HOSE REEL CONDUIT ASSEMBLY REPLACEMENT (continued).**

6. Install two conduits (2) on two conduit elbows (4) and conduit connectors (6).
7. Tighten two conduit connectors (6) on two bushings (7).

**FOLLOW-ON MAINTENANCE:**

- Connect negative battery cable (para 2-33).
- Install cable assembly in hose reel conduit (para 2-115).
- Disconnect ground (refer to TM 9-2330-398-10).

## Section XV. GAGES (NONELECTRICAL), WEIGHING AND MEASURING DEVICES MAINTENANCE

**2-117. IN-TANK LIQUID LEVEL GAGE ASSEMBLY REPLACEMENT.***This Task Covers:*

- a. Removal      b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Cotter pin (Item 9, Appendix F)

**Equipment Conditions:**

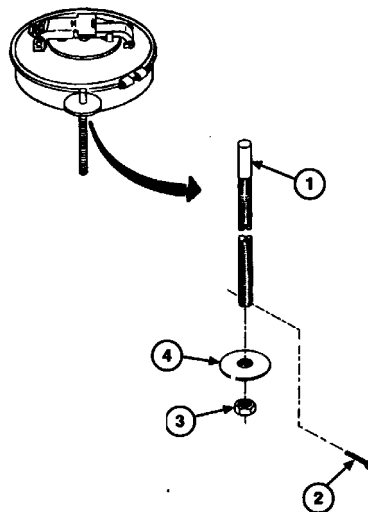
- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Manhole cover opened (refer to TM 9-2330-398-10).

**a. REMOVAL**

Remove cotter pin (2), nut (3), and in-tank liquid level gage (4) from rod (1). Discard cotter pin.

**b. INSTALLATION**

Install in-tank liquid level gage (4), nut (3), and new cotter pin (2) on rod (1).

**FOLLOW-ON MAINTENANCE:**

- Close manhole cover (refer to TM 9-2330-398-10).
- Disconnect ground (refer to TM 9-2330-398-10).

## Section XVI. FILTERS, SEPARATORS, AND PURIFIERS MAINTENANCE

Paragraph Number	Paragraph Title	Page Number
2-118	General .....	2-256
2-119	Fluid Regulating (Relief) Valve Replacement.....	2-256
2-120	Filter Separator Filter Elements Replacement (M & E Industries Model) .....	2-258

**2-118. GENERAL**

This section describes and illustrates removal and installation procedures for the fluid regulating (relief) valve and the filter separator filter elements.

**2-119. FLUID REGULATING (REUEF) VALVE REPLACEMENT.**

*This Task Covers:*

- a. Removal                      b. Installation

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Cap and plug set (Item 3, Appendix C)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer grounded and bonded (refer to TM 9-2330-398-10).
- Negative battery cable disconnected (para 2-33).

**a. REMOVAL****WARNING**

Read and observe all safety portions limited in the Warning Summary before performing any maintenance on filter separator. Make sure semitrailer is grounded to an approved (earth) ground and it is safe to proceed. Failure to follow this warning may cause a spark to ignite, resulting in serious injury or death to personnel.

---

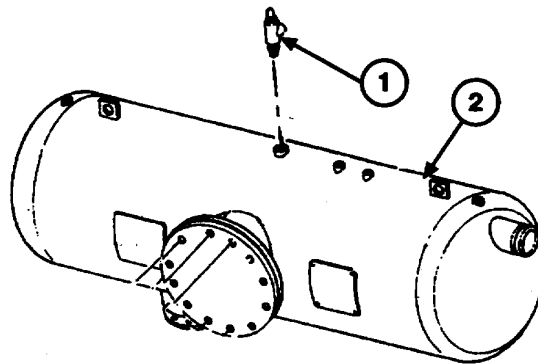
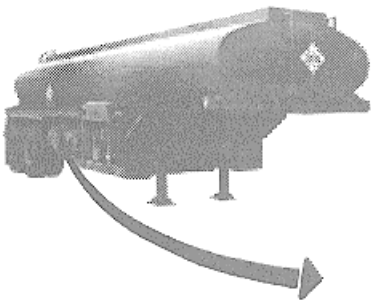
**2-119. FLUID REGULATING (REUEF) VALVE REPLACEMENT (continued).**

---

1. Remove flow regulating valve (1) from top of filter separator (2).
2. Plug opening in top of filter separator with plug from cap and plug set.

**b. INSTALLATION**

1. Remove plug from opening in top of filter separator (2).
2. Install flow regulating valve (1) in top of filter separator (2).

**FOLLOW-ON MAINTENANCE:**

- Connect negative battery cable (para 2-33).
- Disconnect ground (refer to TM 9-2330-398-10).

---

**2-120. FILTER SEPARATOR FILTER ELEMENTS REPLACEMENT (M & E INDUSTRIES MODEL).**

---

*This Task Covers:*

- |             |                 |
|-------------|-----------------|
| a. Removal  | b. Disassembly  |
| c. Assembly | d. Installation |

---

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Drycleaning solvent (Item 12, Appendix C)
- Petrolatum (Item 24, Appendix C)
- Rag (Item 25, Appendix C)
- Antipilferage seal (2) (Item 1, Appendix F)
- Gasket (Item 25, Appendix C)
- Gasket (5) (Item 26, Appendix F)
- Gasket (10) (Item 27, Appendix F)
- Lockwasher (12) (Item 105, Appendix F)

- Lockwasher (8) (Item 106, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- All fuel dispensing valves closed (refer to TM 9-2330-398-10).
- Semitrailer drained (refer to TM 9-2330-398-10).
- Negative battery disconnected (para 2-33).

---

**a. REMOVAL**

**WARNING**

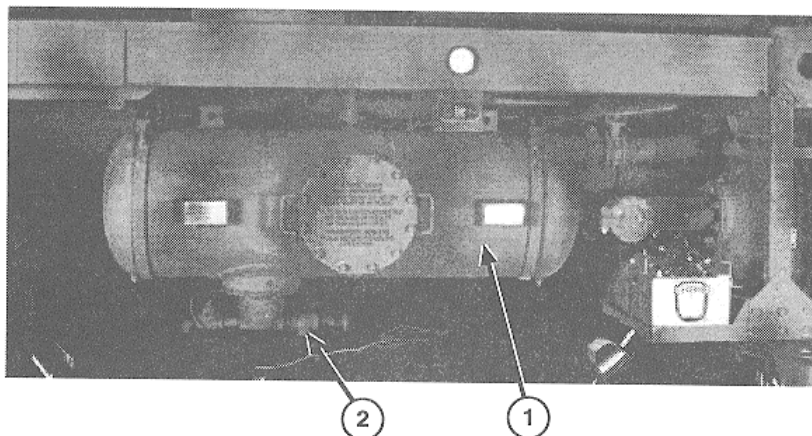
**Read and observe all safety precautions listed in the Warning Summary before performing any maintenance on filter separator. Make sure semitrailer is grounded to an approved (earth) ground and it is safe to proceed. Failure to follow this warning may cause a spark to ignite, resulting in serious injury or death to personnel.**

**NOTE**

- Semitrailer is equipped with five filter assemblies in the rear of the filter separator and 15 filter elements in the front. Removal of all five filter assemblies and 15 filter elements is the same. One of each is shown.
- Make sure all valves are closed.

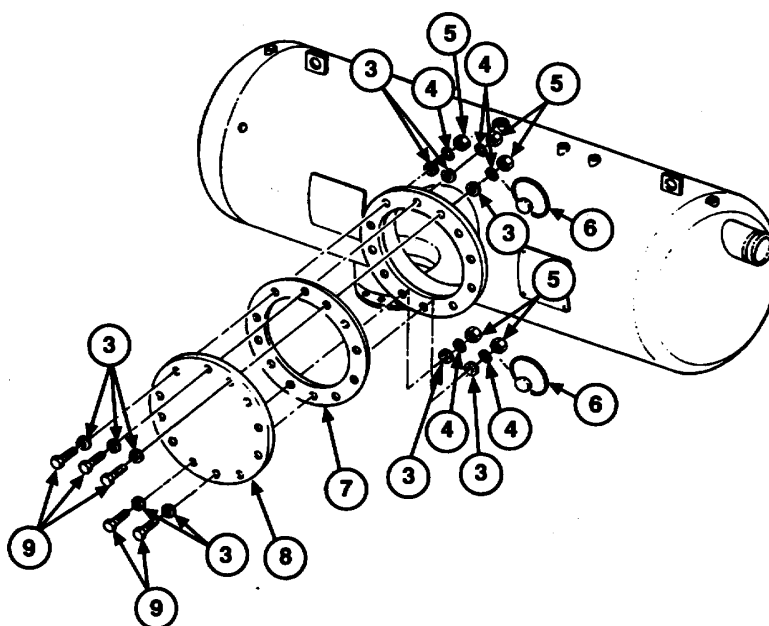
**2-120. FILTER SEPARATOR FILTER ELEMENTS REPLACEMENT (M & E INDUSTRIES MODEL) (continued).**

1. Position suitable container in place under filter separator (1). Open manual drain valve N (2) to remove any fluid from filter separator (1). Close manual drain valve N (2) when filter separator (1) is drained.

**Note**

**Note location of antipilferage seals for ease of installation.**

2. Cut two antipilferage seals (6) from screws (9) at top and bottom of access cover (8). Discard seals.
3. Remove 12 nuts (5) and screws (9) and 24 washers (3) and 12 lockwashers (4) from access cover (8) and mounting flange of filter separator (1). Discard lockwashers.
4. Remove access cover (8) and gasket (7) from filter separator (1). Discard gasket.

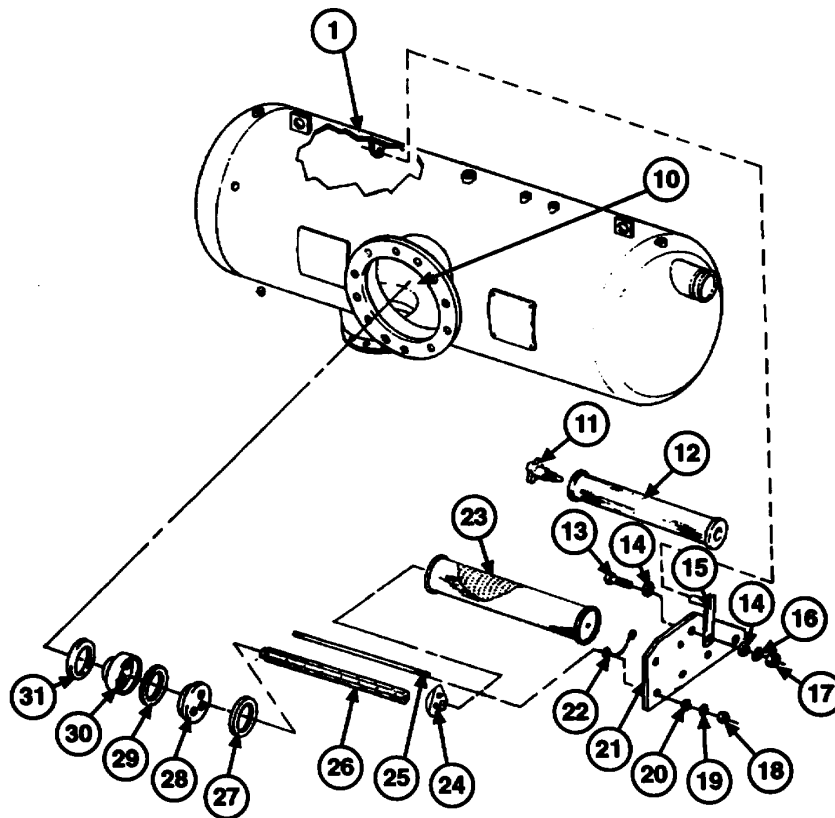


**2-120. FILTER SEPARATOR FILTER ELEMENTS REPLACEMENT (M & E INDUSTRIES MODEL) (continued).**

5. Remove seven nuts (18), lockwashers (19), and washers (20), and retaining plate (21) from five filter assemblies (23). Discard lockwashers.
6. Starting with lower filter assembly (23) nearest to service opening (10), remove spring tension clip (22) and pull filter assembly (23) to the right until it drops down and can be removed from filter separator (1) through service opening (10).
7. Repeat step 6 to remove remaining four filter assemblies (23).
8. Remove retainer nut (11) from filter element (12), and slide filter element (12) off guide pipe and out of filter separator (1).
9. Repeat step 8 to remove remaining 14 filter elements (12).

**b. DISASSEMBLY**

1. Remove filter adapter assembly (30), three filter elements (26), and fuse monitor bracket (24) from filter assembly (23).
2. Remove three gaskets (27, 29, and 31) and monitor mounting plate (28) from filter adapter assembly (30). Discard gaskets.



---

**2-120. FILTER SEPARATOR FILTER ELEMENTS REPLACEMENT (M & E INDUSTRIES MODEL) (continued).**

---

3. Remove seven stay rods (25) and spring tension dip (22) from filter separator (1), if necessary.
4. Remove nut (17), lockwasher (16), two washers (14), screw (13), and guide bar (15) from retaining plate (20), if necessary. Discard lockwasher.

**c. ASSEMBLY**

1. Install three new gaskets (27, 29, and 31) and monitor mounting plate (28) in filter adapter assembly (30).
2. Install three filter elements (26) in filter adapter assembly (30).
3. Install fuse monitor bracket (24) on top of three filter elements (26).
4. Install filter assembly (23) over three filter elements (26) and push into filter adapter assembly (30).
5. If removed, install seven stay rods (25) and spring tension clips (22) in filter separator (1).
6. If removed, install guide bar (15) on retaining plate (21) with screw (13), two washers (14), new lockwasher (16), and nut (17).

**d. INSTALLATION**

1. Coat end of filter element (12) with petrolatum. Install filter element (12) in filter separator (1) and slide into place on guide pipe.
2. Install retainer nut (11) and hand-tighten. Do not overtighten.
3. Repeat steps 1 and 2 install for remaining 14 filter elements (12).
4. Install filter assembly (23) in filter separator(l) with filter adapter assembly (30) end down. Turn filter assembly (23) so filter adapter assembly (30) end is toward rear of filter separator (1).
5. Starting at upper guide rod farthest from service opening (10), install filter assembly (23) in filter separator (1).
6. Repeat steps 4 and 5 to install remaining four filter assemblies (23).

**NOTE**

**Hand-tighten wingnuts. DO NOT use wrench.**

7. Install retaining plate (21) on five filter assemblies (23) and secure with seven washers (20), new lockwashers (19), and nuts (18).
8. Install access cover (8) and new gasket (7) on mounting flange of filter separator (1).



---

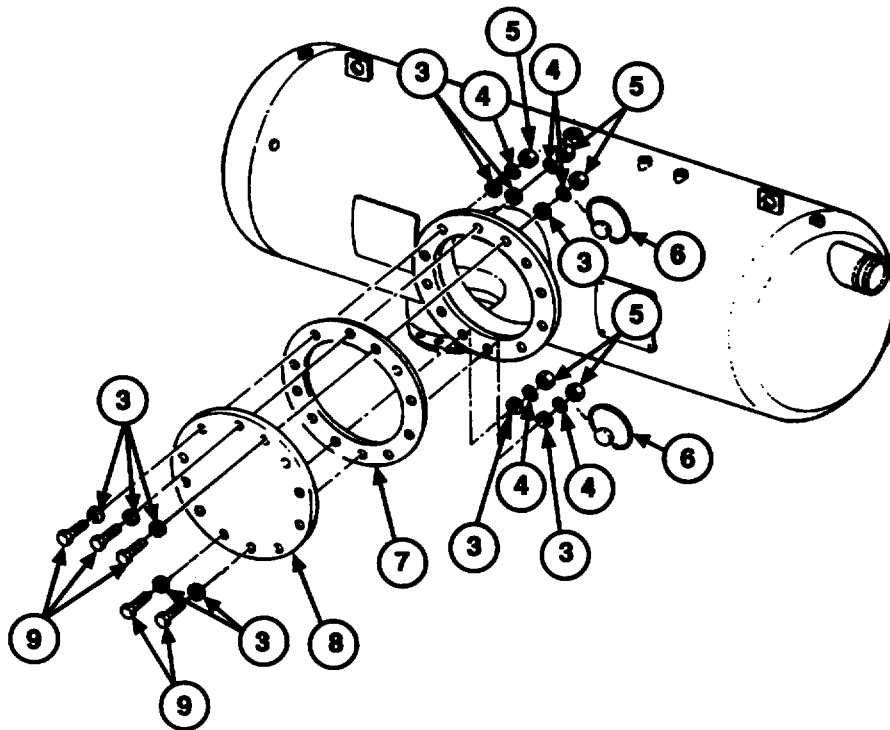
**2-120. FILTER SEPARATOR FILTER ELEMENTS REPLACEMENT (M & E INDUSTRIES MODEL) (continued).**

---

**NOTE**

Install two screws with holes in their shafts at the top and bottom of access cover so antipilferage seals can be installed.

9. Install 12 screws (9), 24 washers (3), 12 new lockwashers (4), and 12 nuts (5) on access cover (8) and mounting flange of filter separator (1).
10. Install antipilferage seal (6) through bottom pair of screws (9) and one through top pair of screws (9). Trim excess wire.

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).
- Connect negative battery cable (para 2-33). L.

## Section XVII. DISPENSING AND SERVICING EQUIPMENT COMPONENTS MAINTENANCE

Paragraph Number	Paragraph Title	Page Number
2-121	General .....	2-263
2-122	Volumetric Meter Assembly Replacement.....	2-264
2-123	Flow Control Valve and Flange Assembly Replacement.....	2-266
2-124	Pump Tubing Assembly Replacement.....	2-271
2-125	Manifold Valve Assembly Repair .....	2-274
2-126	Piping Control Assembly Replacement.....	2-278
2-127	Cabinet Piping Assembly Replacement.....	2-279
2-128	Precheck Control Tubing Assembly Replacement .....	2-282
2-129	F, B, and C Valve Assemblies Replacement .....	2-285
2-130	F, B, and C Valve Assemblies Handwheel Replacement .....	2-286
2-131	K Valve Replacement .....	2-287
2-132	Check Valve Assembly Replacement.....	2-289
2-133	Control Cables Replacement.....	2-290
2-134	Emergency Valve A Control Handle Repair.....	2-294
2-135	G, R, P, and M Valve Assemblies Replacement .....	2-296
2-136	Fire Extinguisher Bracket Replacement .....	2-297

### 2-121. GENERAL.

This section describes and illustrates removal and installation procedures for the volumetric meter assembly, flow control valve and flange assembly; pump tubing assembly; manifold valve assembly; piping control assembly; cabinet piping assembly; precheck control tubing assembly; F, B, and C valve assemblies; F, B, and C valve assembly handreels; control cables; emergency valve A control handle; check valve assembly; G, R, P, and M valve assemblies; and fire extinguisher bracket.

**2-122. VOLUMETRIC METER ASSEMBLY REPLACEMENT.***This Task Covers:*

- a. Removal
- b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)
- Common No. 1 tool set (Item 1, Appendix B)

- Lockwasher (3) (item 97, Appendix F)
- Seal (2) (Item 150, Appendix F)

**Equipment Conditions:**

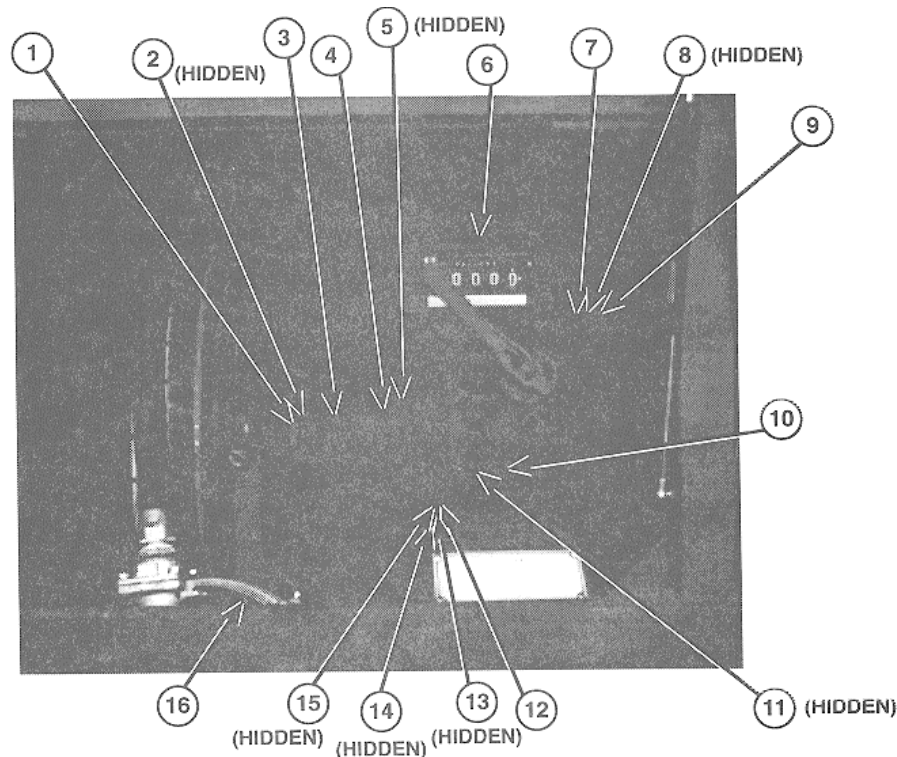
- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Negative battery cable disconnected (para 2-33).

**Materials/Parts:**

- Petrolatum (item 24, Appendix C)
- Gasket (2) (Item 54, Appendix F)

**Personnel Required:** Two**a. REMOVAL****NOTE****The two volumetric meter assemblies are replaced the same way.**

1. Position containers under outlet nipple (3) and elbow flange (9). Remove two split couplings (1 and 7) and seals (2 and 8) from flange (9). Discard seals.



---

**2-122. VOLUMETRIC METER ASSEMBLY REPLACEMENT (continued).**

---

**WARNING**

**Meter assembly is very heavy. To prevent injury to personnel, two persons are required when removing meter assembly.**

2. Remove three screws (15), lockwashers (14), washers (13), and spacers (12) and volumetric meter assembly (6) from hose reel cabinet (16). Discard lockwashers.
3. Remove four nuts (4), gasket (5), and outlet nipple (3) from meter assembly (6). Discard gasket.
4. Remove four nuts (10), gasket (11), and flange (9) from meter assembly (6). Discard gasket.

**b. INSTALLATION**

1. Install elbow flange (9), new gasket (11), and four nuts (10) on volumetric meter assembly (6). Tighten nuts between 50 and 70 lb-ft (67 and 95 Nom).
2. Install outlet nipple (3), new gasket (5), and four nuts (4) on meter assembly (6). Tighten nuts between 50 and 70 lb-ft (6 and 95 Nom).

**WARNING**

**Meter assembly is very heavy. To prevent injury to personnel, two persons are required when installing meter assembly.**

3. Install meter assembly (6) in hose reel cabinet (16) with three spacers (12), washers (13), new lockwashers (14), and screws (15).
4. Lubricate new seals (2 and 8) with petrolatum, and install two split couplings (1 and 7) and new seals (2 and 8) on flange (9) and outlet nipple (3). Tighten split couplings between 57 and 63 lb-ft (77 and 89 N-m).

**FOLLOW-ON MAINTENANCE:**

- Connect negative battery cable (refer to para 2-33).

**2-123. FLOW CONTROL VALVE AND FLANGE ASSEMBLY REPLACEMENT.***This Task Covers:*

- a. Removal
- b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Petrolatum (Item 24, Appendix C)
- Gasket (2) (Item 39, Appendix F)
- Seal (2) (Item 153, Appendix F)
- Self-locking nut (20) (Item 172, Appendix F)

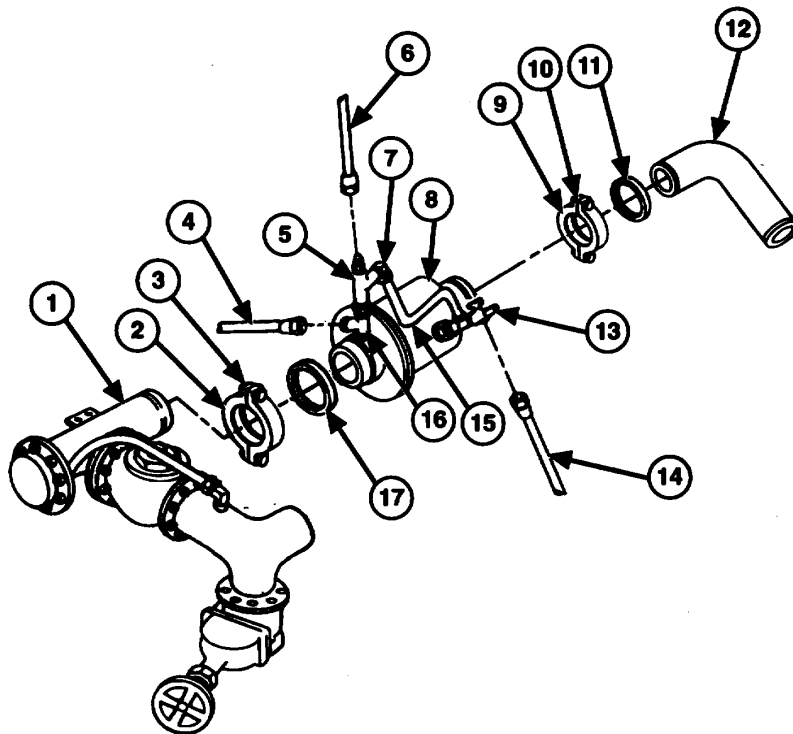
**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 92330-39810).
- Negative battery cable disconnected (para 2-33).
- Fuel tank drained and purged (refer to TM 9-2330-398-10).

**a. REMOVAL****CAUTION**

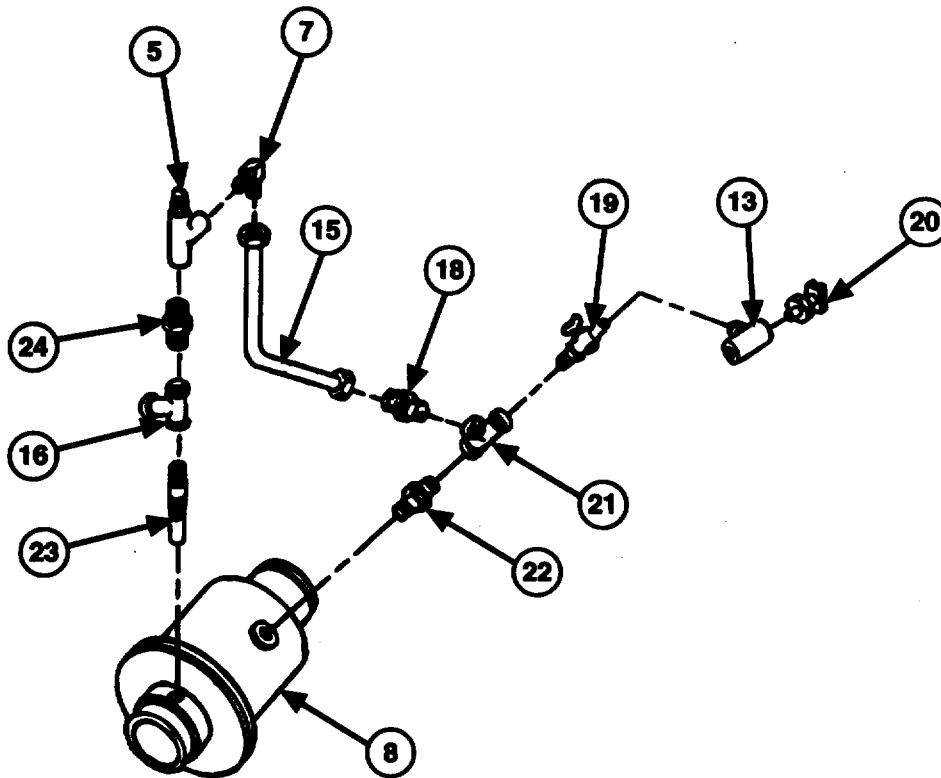
Hose and tube ends should be covered after disconnection to prevent contaminants from entering fuel system. Failure to do so may result in damage to equipment.

1. Disconnect line (6) from tee (5), and disconnect line (4) from tee (16).



**2-123. FLOW CONTROL VALVE AND FLANGE ASSEMBLY REPLACEMENT (continued).**

2. Disconnect line (15) from elbow (7), and disconnect line (14) from tee (13).
3. Remove two nuts (3) and coupling (2) and seal (17) from flange assembly (1) and flow control valve (8). Discard seal.
4. Remove two nuts (10) and coupling (9), seal (11), and flow control valve (8) from piping (12). Discard seal.
5. Disconnect line (15) from adapter (18).
6. Remove elbow (7), tee (5), adapter (24), tee (16), and check valve (23) from flow control valve (8).
7. Remove adapter (18) from tee (21).
8. Remove drain cock (20), tee (13), valve (19), tee (21) and adapter (22) from flow control valve (8).
9. Remove elbow (7 from tee (5).



**2-123. FLOW CONTROL VALVE AND FLANGE ASSEMBLY REPLACEMENT (continued).**

10. Remove cap (43) from coupling (42).
11. Remove eight screws (27), washers (26), and self-locking nuts (25), and coupling (42) and gasket (41) from flange assembly (1). Discard self-locking nuts and gasket.
12. Remove eight screws (34), washers (36), and self-locking nuts (37) from precheck valve (38) and flange assembly (1).
13. Remove two screws (29), four washers (28 and 39), and two self-locking nuts (40) and flange assembly (1) and gasket (35) from bracket (31) and precheck valve (38). Discard self-locking nuts and gasket.
14. Remove two screws (30), washers (32), and self-locking nuts (33) and bracket (31) from semitrailer. Discard self-locking nuts.

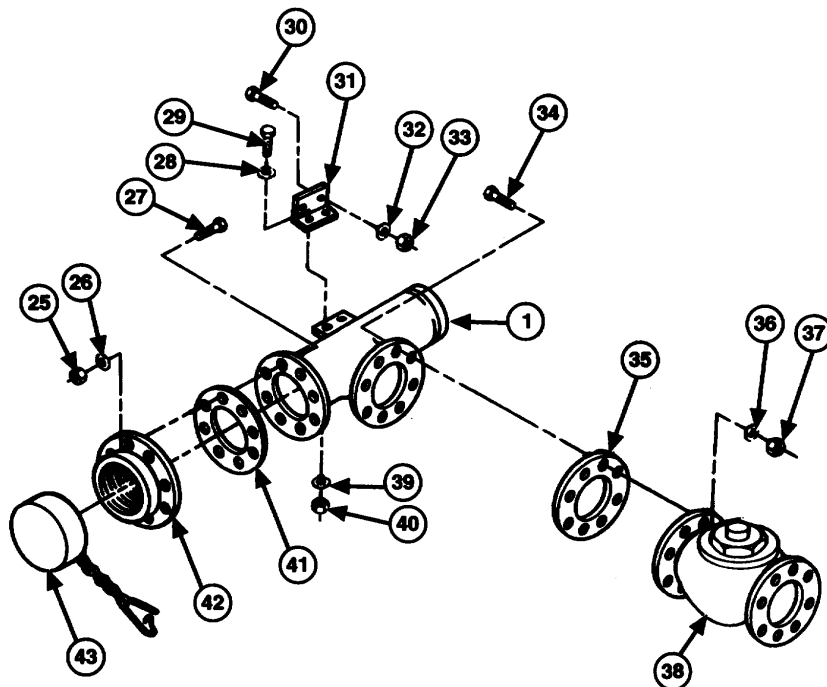
**b. INSTALLATION**

1. Install bracket (31) on semitrailer with two screws (30), washers (32), and new self-locking nuts (33).
2. Install flange assembly (1) and new gasket (35) on precheck valve (38) with eight screws (29), washers (28 and 39), and new self-locking nuts (40).

**NOTE**

**Do not tighten screws until after all connections are made.**

3. Install flange assembly (1) and precheck valve (38) on bracket (31) with two screws (30), four washers (28 and 39), and two new self-locking nuts (40).



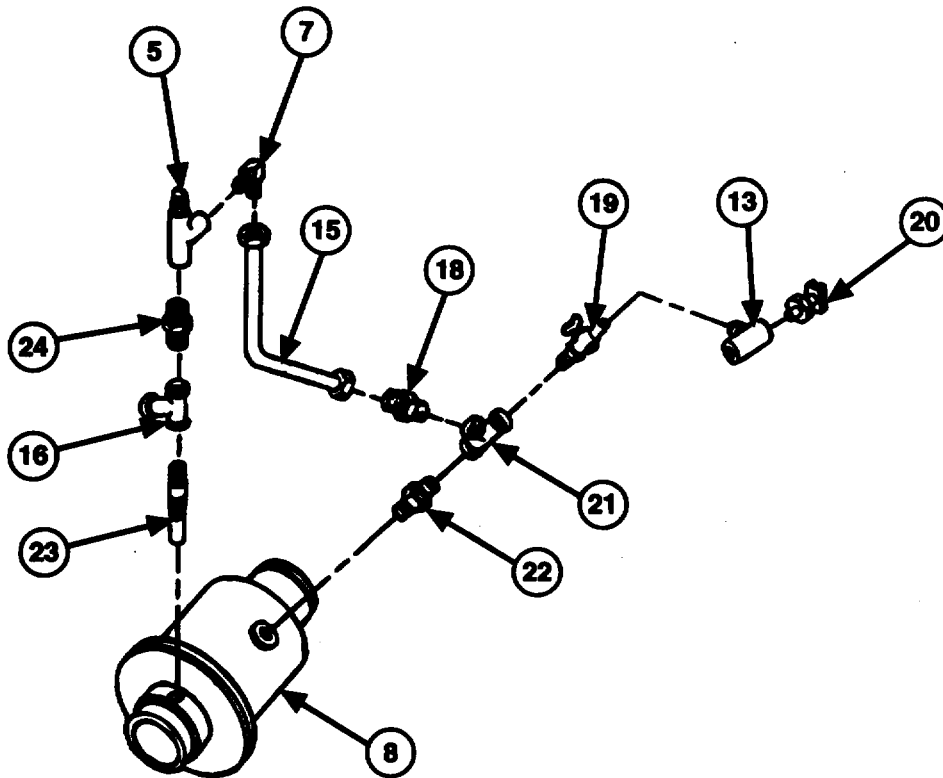
**2-123. FLOW CONTROL VALVE AND FLANGE ASSEMBLY REPLACEMENT (continued).**

4. Install coupling (42) and new gasket (41) on flange assembly (1) with eight screws (27), washers (26), and new self-locking nuts (25).
5. Install cap (43) on coupling (42).

**NOTE**

**To make connecting hoses easier, do not completely tighten fittings until after flow control valve has been installed.**

6. Install elbow (7) in tee (5).
7. Install adapter (22), tee (21), valve (19), tee (13), and drain cock (20) on flow control valve (8).
8. Install adapter (18) on tee (21).
9. Install check valve (23), tee (16), adapter (24), tee (5) and elbow (7) in flow control valve (8).
10. Connect line (15) to adapter (18).

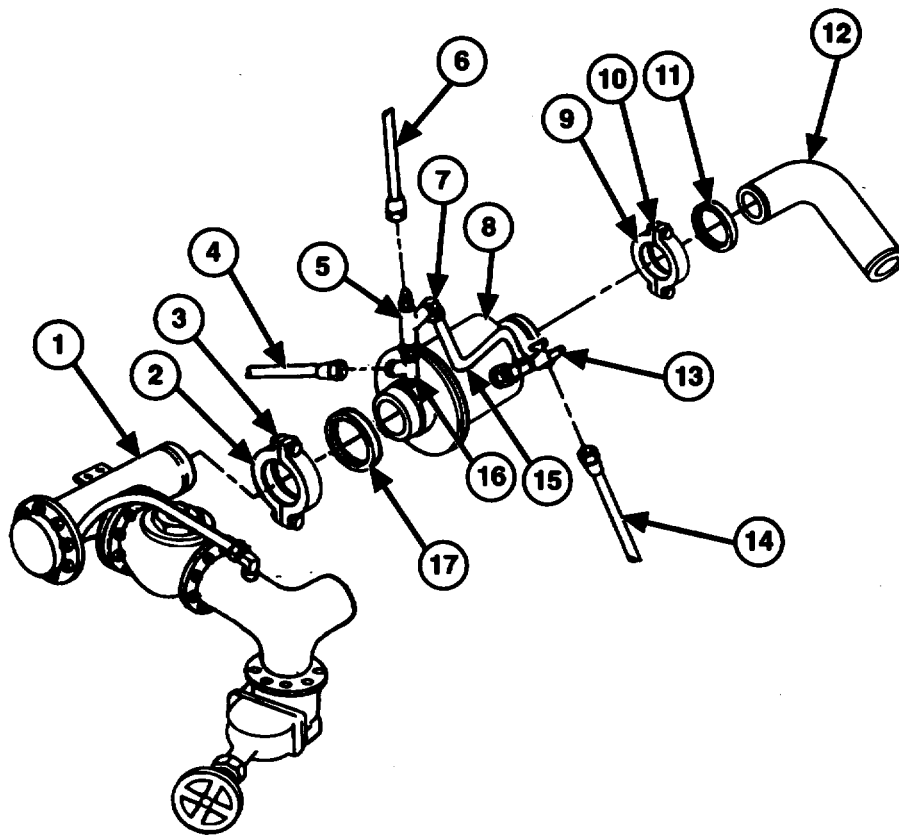




**2-123. FLOW CONTROL VALVE AND FLANGE ASSEMBLY REPLACEMENT (continued).****NOTE**

**Lubricate seal with petrolatum prior to installation.**

11. Install flow control valve (8) and new seal (17) and coupling (2) on flange assembly (1) with two nuts (3).
12. Install new seal (11) and coupling (9) on piping (12) and flow control valve (8) with two nuts (10).
13. Connect line (14) to tee (13), and connect line (15) to elbow (7).
14. Connect line (4) to tee (16) and connect line (6) to tee (5).

**FOLLOW-ON MAINTENANCE:**

- Connect negative battery cable (para 2-33).

**2-124. PUMP TUBING ASSEMBLY REPLACEMENT.**

*This Task Covers:*

- a. Removal
- b. Installation

*Initial Setup:*

**Tools/Test Equipment**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment/Conditions**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Tank drained and purged (refer to TM 9-2330-398-10).

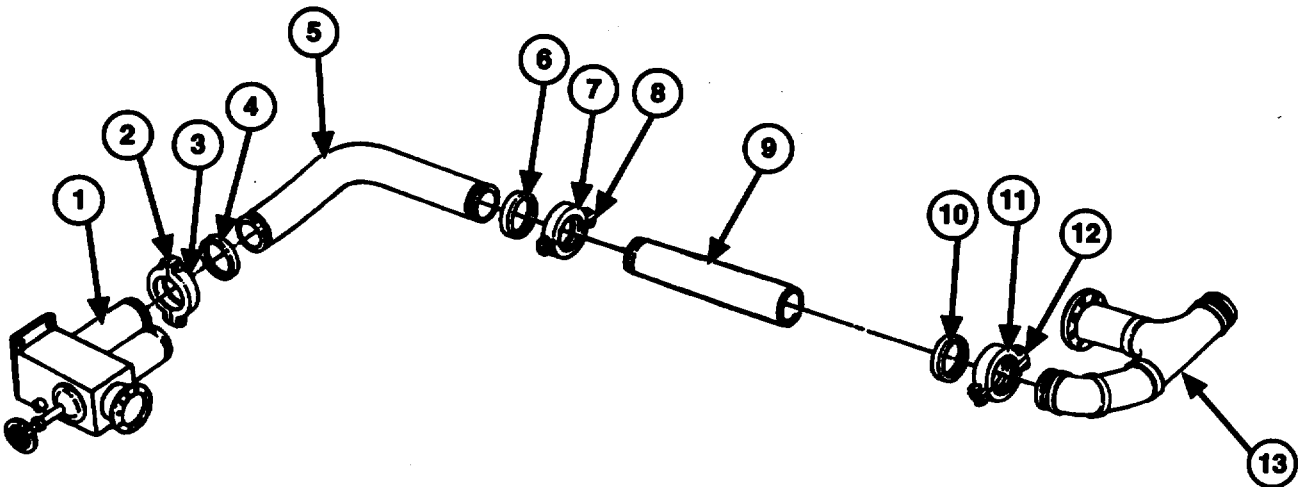
**Materials/Parts::**

- Gasket (2) (Item 41, Appendix F)
- Seal (Item 151, Appendix F)
- Seal (6) (Item 153, Appendix F)
- Self-locking nut (16), (Item 174, Appendix F)

- Batteries removed (para 2-32).
- Muffler and exhaust pipe removed (para 2-99).

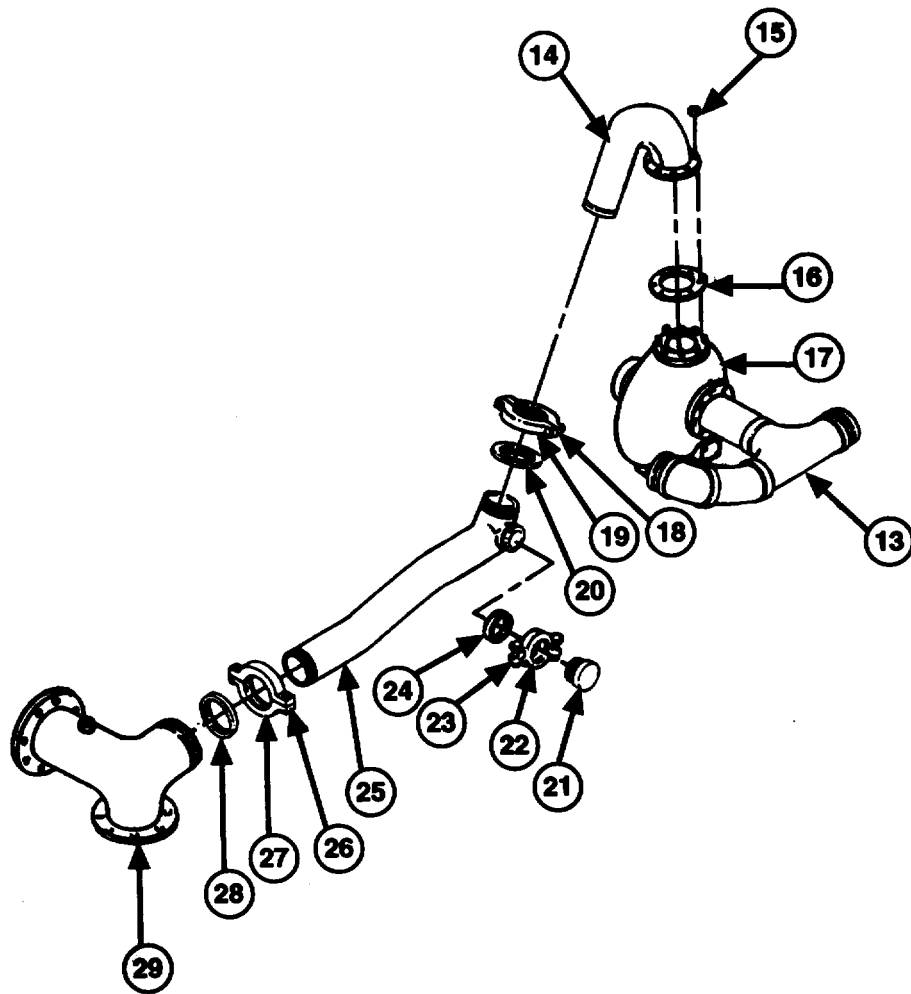
**a. REMOVAL**

1. Remove two screws (2), coupling (3), seal (4), and tubing (5) from manifold valve assembly (1). Discard seal.
2. Remove two screws (8), coupling (7), seal (6), and tubing (5) from tubing (9). Discard seal.
3. Remove two screws (12), coupling (11), seal (10), and tubing (9) from manifold tube (13). Discard seal.



**2-124. PUMP TUBING ASSEMBLY REPLACEMENT (continued)**

4. Remove two screws (18), coupling (19), seal (20), and tubing elbow (14) from tubing (25). Discard seal.
5. Remove eight self-locking nuts (15), gasket (16), and tubing elbow (14) from pump assembly (17). Discard self-locking nuts and gasket.
6. Remove two screws (23), coupling (22), dust plug (21), and seal (24) from tubing (25). Discard seal.
7. Remove two screws (26), coupling (27), seal (28), and tubing (25), from piping elbow (29). Discard seal.

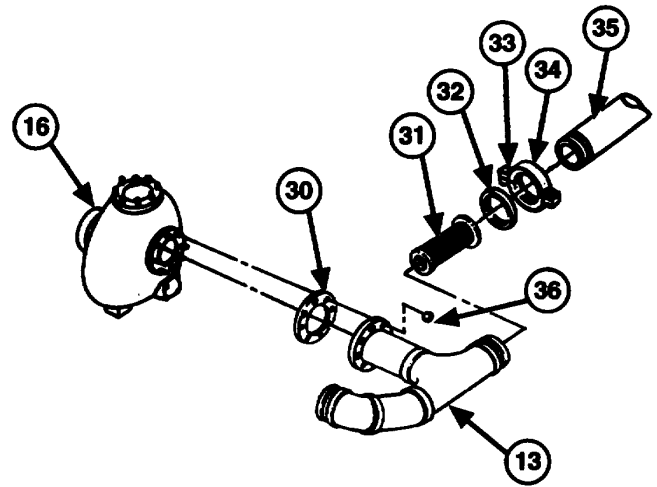


8. Remove two screws (33), coupling (34), seal (32), and tubing (35) from manifold tube (13). Discard seal.
9. Remove filter elements (31) from manifold tube (13). Discard filter element.
10. Remove eight self-locking nuts (36), manifold tube (13), and gasket (30) from pump assembly (16). Discard self-locking nuts and gasket.

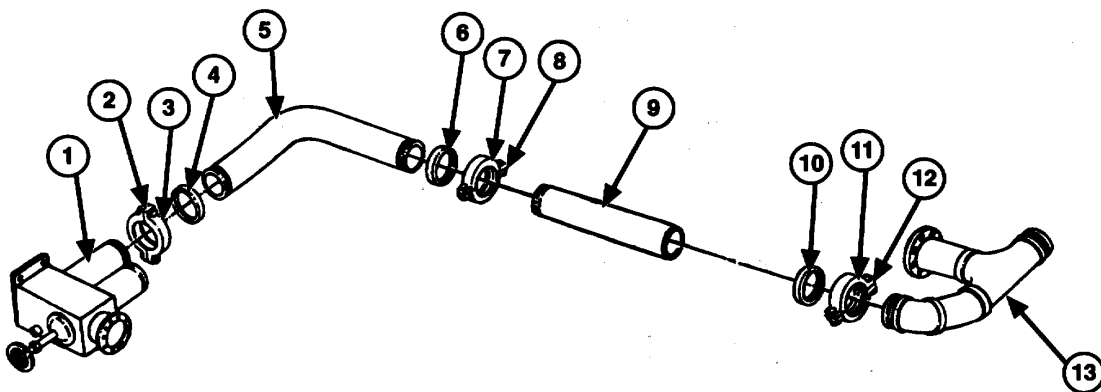
## 2-124. PUMP TUBING ASSEMBLY REPLACEMENT (continued)

### b. INSTALLATION

1. Install new gasket (30) and manifold tube (13) on pump assembly (16) with eight new self-locking nuts (36).
2. Install new filter element (31) in manifold tube (13).
3. Install tubing (35) and new seal (32) in manifold tube (13) with coupling (34) and two screws (33).



4. Install tubing (25) and new seal (28) on piping elbow (29) with coupling (27) and two screws (26).
5. Install new seal (24), dust plug (21), and coupling (22) on tubing (25) with two screws (23).
6. Install tubing elbow (14) and new gasket (16) on pump assembly (17) with eight new self-locking nuts (15).
7. Install tubing (25) and new seal (20) on tubing elbow (14) with coupling (19) and two screws (18).
8. Install tubing (9) and new seal (10) on manifold tube (13) with coupling (11) and two screws (12).
9. Install tubing (5) on tubing (9) with new seal (6), coupling (7), and two screws (8).
10. Install tubing (5) and new seal (4) on manifold valve assembly (1) with coupling (3) and two screws (2).



### FOLLOW-ON MAINTENANCE:

- Install batteries (para 2-32).
- Install muffler and exhaust pipe (para 2-99).

**2-125. MANIFOLD VALVE ASSEMBLY REPAIR.***This Task Covers:*

- |                            |                |
|----------------------------|----------------|
| a. Removal                 | b. Disassembly |
| c. Cleaning and Inspection | d. Assembly    |
| e. Installation            |                |

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

- Packing (Item 124, Appendix F)
- Seal (2), (Item 153, Appendix F)
- Self-locking nut (18) (Item 172, Appendix F)

**Materials/Parts:**

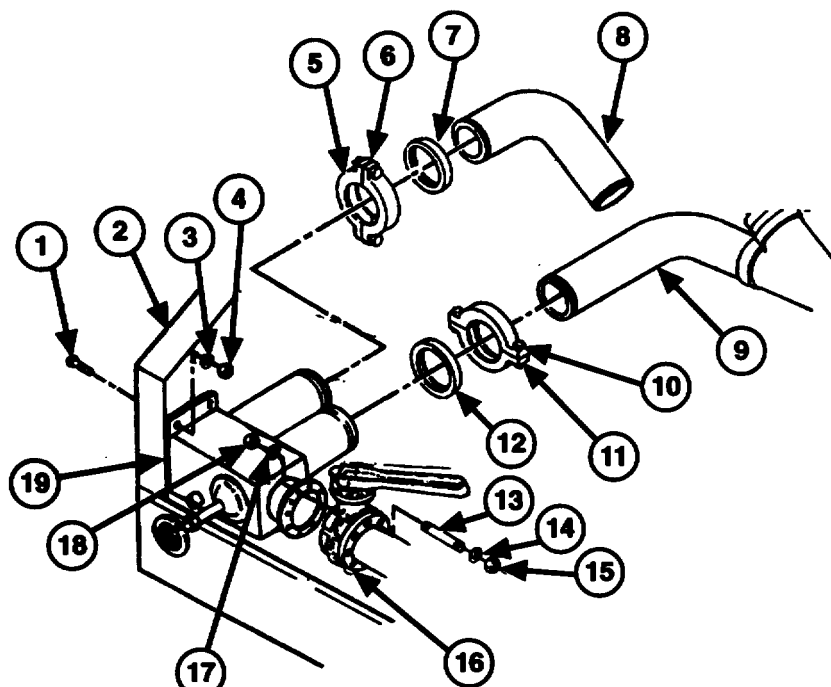
- Drycleaning solvent (Item 12, Appendix C)
- Rag (Item 25, Appendix C)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

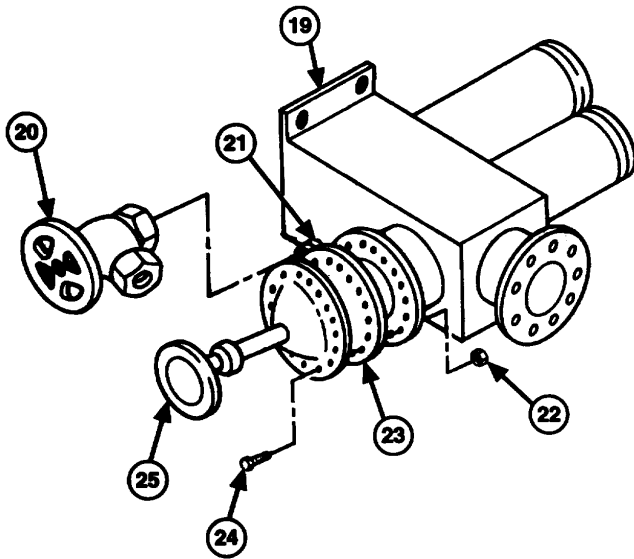
**a. REMOVAL**

1. Remove two screws (5), coupling (6) seal (7), and tubing (8) from manifold valve assembly (19). Discard seal.
2. Remove two screws (10), coupling (11), seal (12), and tubing (9) from manifold valve assembly (19). Discard seal.
3. Remove eight self-locking nuts (18), washers (17), studs (13), washers (14), and self-locking nuts (15) from manifold valve assembly (19) and valve G (16). Discard self-locking nuts.
4. Remove two screws (1), washers (3), and self-locking nuts (4) and manifold valve assembly (19) from piping control cabinet (2). Discard self-locking nuts.

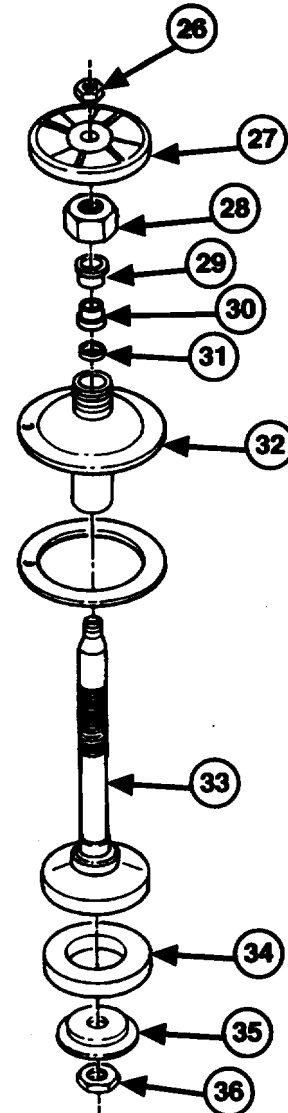


**2-125. MANIFOLD VALVE ASSEMBLY REPAIR (continued).****b. DISASSEMBLY**

1. Remove 16 screws (24) and nuts (12), valve (25), and gasket (23) from manifold valve assembly (19). Discard gasket.
2. Remove globe valve (20) from nipple (21) in manifold valve assembly (19).



3. Remove nut (26), handwheel (27), stuffing box nut (28), top gland (29), packing (30), and bottom gland (31) from top head and bonnet (32). Discard packing.
4. Remove disc holder and stem assembly (33), disc (34), disc retainer plate (35), and disc plate nut (36) from top head and bonnet (32).



## 2-125. MANIFOLD VALVE ASSEMBLY REPAIR (continued).

## c. CLEANING AND INSPECTION

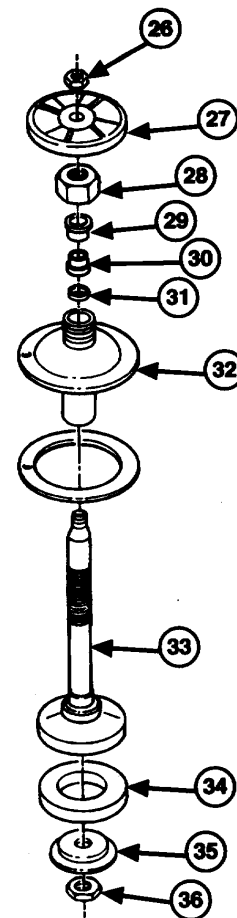
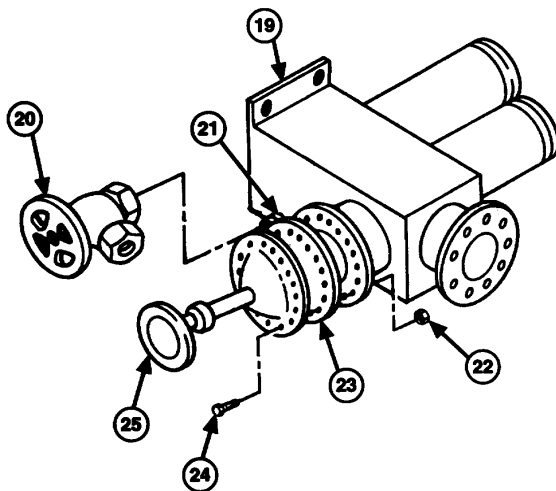
**WARNING**

Drycleaning solvent P-D-680 is toxic and flammable. Always wear protective goggles and gloves, and use in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Do not use near open flame or excessive heat.

1. Clean all parts with drycleaning solvent and wipe dry with rags.
2. Inspect metal parts for cracks, scoring, or pitting. If any parts are damaged, replace them.
3. If top head and bonnet or disc holder and stem assembly are damaged, replace valve.
4. If valve mating surfaces are damaged, replace manifold valve assembly.

## d. ASSEMBLY

1. Install disc and stem assembly (33), disc (34), disc retaining plate (35) and disc plate nut (36) on top head and bonnet (32).
2. Install bottom gland (31), new packing (30), top gland (29), stuffing nut (28), handwheel (27), and nut (26) on top head and bonnet (32).
3. Install globe valve (20) on nipple (21) in manifold valve assembly (19).
4. Install valve (25) and new gasket (23) on manifold valve assembly (19) with 16 screws (24) and nuts (22).



---

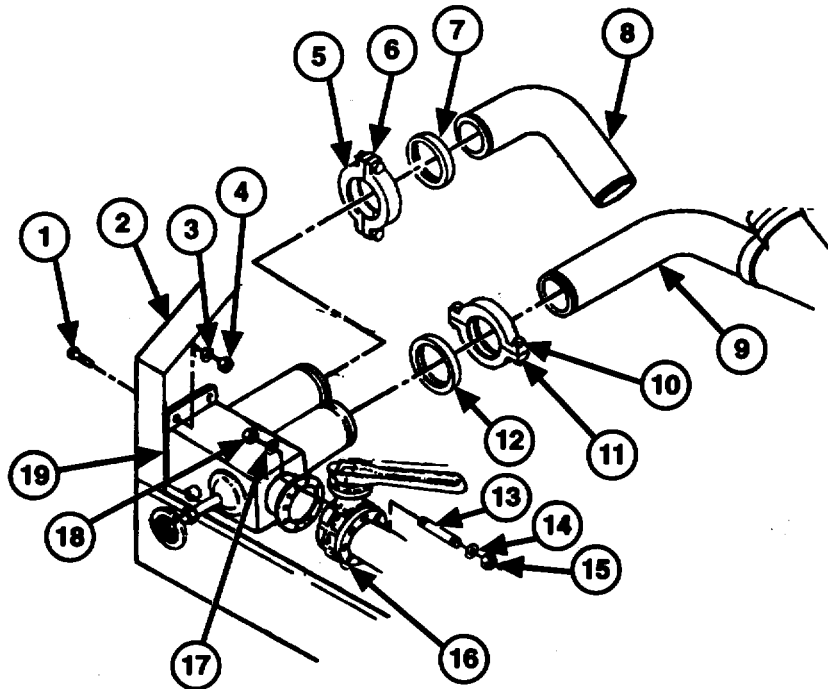
**2-125. MANIFOLD VALVE ASSEMBLY REPAIR (continued).**

---

**e. INSTALLATION****NOTE**

**Do not tighten nuts until all connections are made.**

1. Install manifold valve assembly (19) in piping control cabinet (2) with two screws (1), washers (3), and new self-locking nuts (4).
2. Secure manifold valve assembly (19) to valve G (16) with eight new self-locking nuts (15), washers (14), studs (13), new self-locking nuts (18), and washers (17).
3. Install tubing (9) and new seal (12) on manifold valve assembly (19) with coupling (11) and two screws (10).
4. Install tubing (8) and new seal (7) on manifold valve assembly (19) with coupling (5) and two screws (6).

**FOLLOW-ON MAINTENANCE:**

- None.



**2-126. PIPING CONTROL ASSEMBLY REPLACEMENT.***This Task Covers:*

- a. Removal                      b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Gasket (Item 20, Appendix F)
- Self-locking nut (13) (Item 172, Appendix F)

**Equipment Conditions:**

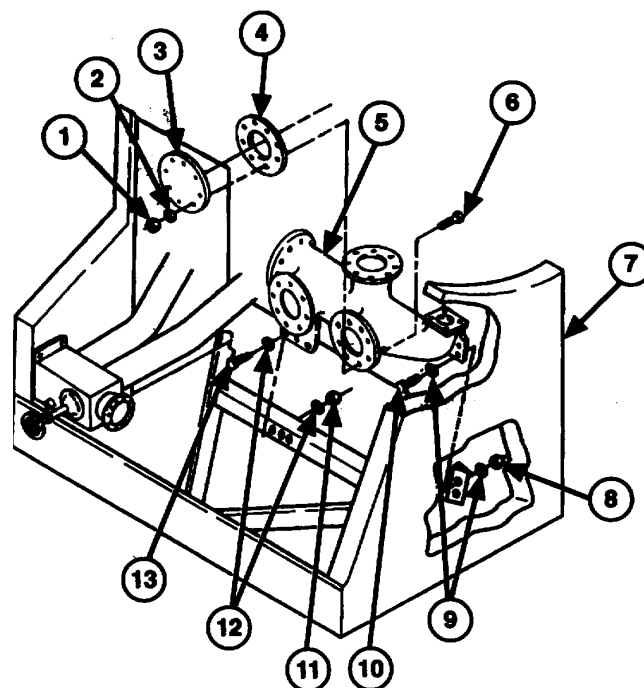
- B valve assembly removed (para 2-130).
- F valve assembly removed (para 2-130).
- K valve assembly removed (para 2-131).
- G valve assembly removed (para 2-135).
- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Fuel tank drained and purged (refer to TM 9-2330-398-10).

**a. REMOVAL**

1. Remove eight screws (6), washers (2), and self-locking nuts (1), access cover (3), and gasket (4) from discharge manifold (5). Discard self-locking nuts and gasket.
2. Remove three screws (13), six washers (12), and three self-locking nuts (11) from discharge manifold (5). Discard self-locking nuts.
3. Remove two screws (10), four washers (9), and two self-locking nuts (8) and discharge manifold (5) from piping control cabinet (7). Discard self-locking nuts.

**b. INSTALLATION**

1. Secure discharge manifold (4) in piping control cabinet (6) with two screws (9), four washers (8), and two new self-locking screws (7).
2. Install three screws (12), six washers (11), and three new self-locking nuts (10) on discharge manifold (6).
3. Install access cover (2) and new gasket (3) on discharge manifold (4) with eight screws (5), and new self-locking nuts (1).

**FOLLOW-ON MAINTENANCE:**

- Install G valve assembly (para 2-135).
- Install B valve assembly (para 2-130).
- Install F valve assembly (para 2-130).
- Install K valve assembly (para 2-131).

**2-127. CABINET PIPING ASSEMBLY REPLACEMENT.***This Task Covers:*

- a. Removal                      b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

- Self-locking nut (12) (Item 172, Appendix F)

**Materials/Parts:**

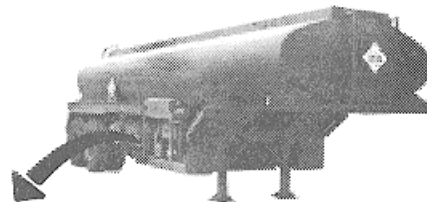
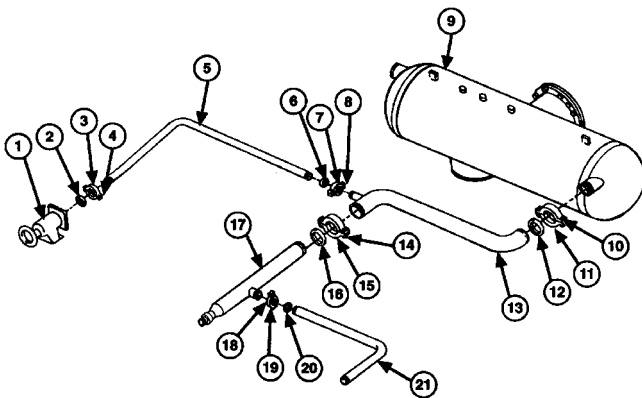
- Seal (5) (Item 150, Appendix F)
- Seal (Item 151, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Tank drained and purged (refer to TM 9-2330-398-10).

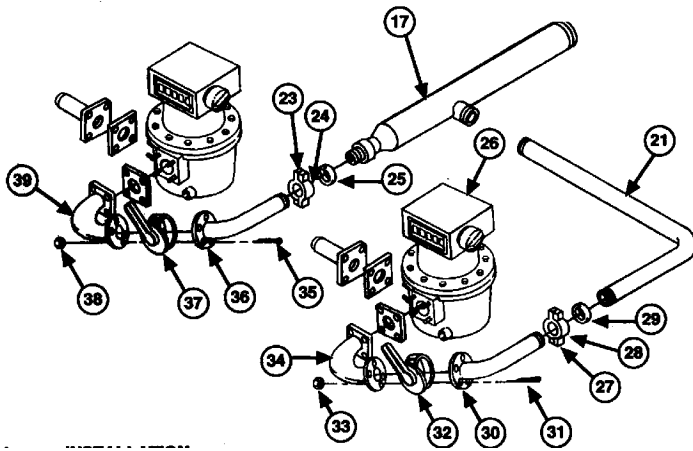
**a. REMOVAL**

1. Remove two screws (10), coupling (11), seal (12), and pipe (13) from filter separator (9). Discard seal.
2. Remove two screws (8), coupling (7), seal (6), and pipe (5) from pipe (13). Discard seal.
3. Remove two screws (14), coupling (15), seal (16), and pipe (13) from piping (17). Discard seal.
4. Remove two screws (19), coupling (18), seal (20), and pipe (21) from piping (17). Discard seal.
5. Remove two screws (4), coupling (3), seal (2), and pipe (5) from valve K (1). Discard seal.



**2-127. CABINET PIPING ASSEMBLY REPLACEMENT.**

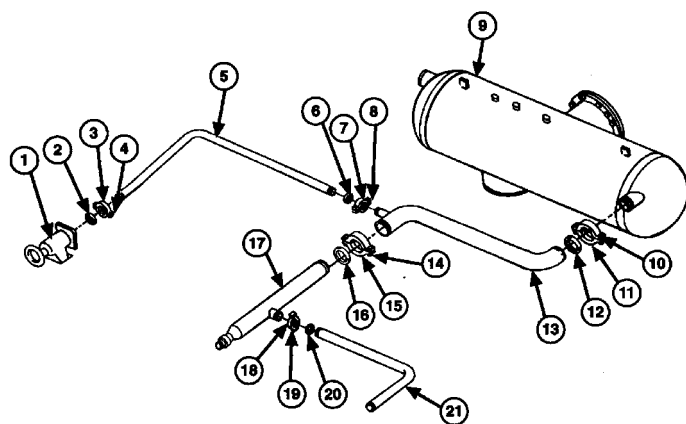
6. Remove two screws (23), coupling (24), seal (25), and piping (17) from cabinet piping assembly (36). Discard seal.
7. Remove two screws (27), coupling (28), seal (29), and pipe (21) from cabinet piping (30). Discard seal.
8. Remove six screws ((31) and self-locking nuts (33), valve R (32), and cabinet piping (30) from piping (34) on volumetric meter (26). Discard self-locking nuts.
9. Remove six screws (35) and self-locking nuts (38), valve P (37), and cabinet piping assembly (36) from piping (39) on volumetric meter (22). Discard self-locking nuts.

**b. INSTALLATION**

1. Install valve P (37) and cabinet piping assembly (36) on piping (39) on volumetric meter (22) with six screws (35) and new self-locking nuts (38).
2. Install valve R (32) and cabinet piping (30) on piping (34) on volumetric meter (26) with six screws (31) and new self-locking nuts (33).
3. Install cabinet piping (31), new seal (29), and coupling (28) on pipe (21) with two screws (27).
4. Install cabinet piping assembly (36), new seal (25), and coupling (24) on piping (17) with two screws (23).

**2-127. CABINET PIPING ASSEMBLY REPLACEMENT.**

5. Install pipe (5), new seal (2), and coupling (3) on valve K (1) with two screws (4).
6. Install pipe (21), new seal (20), and coupling (18) on piping (17) with two screws (19).
7. Install pipe (13), new seal (16), and coupling (15) on piping (17) with two screws (14).
8. Install pipe (5), new seal (6), and coupling (7) on pipe (13) with two screws (8).
9. Install pipe (13), new seal (12), and coupling (11) on filter separator (9) with two screws (10).

**FOLLOW-ON MAINTENANCE:**

- None

**2-128. PRECHECK CONTROL TUBING ASSEMBLY REPLACEMENT.***This Task Covers:*

- a. Removal                      b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Tape, antiseize (Item 30, Appendix C)

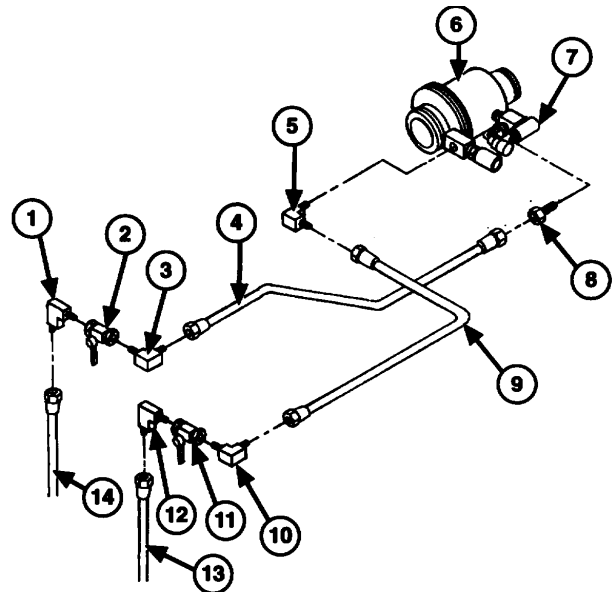
**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Precheck control tubing drained (refer to TM 9-2330-398-10).

**a. REMOVAL****NOTE**

**If any precheck control tubing assembly is damaged or is not long enough to reach properly, it should be replaced.**

1. Disconnect precheck control tubing assembly (4) from adapter (8) on tee (7) on flow control valve (6), and remove adapter (8) from tee (7).
2. Disconnect tubing assembly (4) from elbow (3) on E valve (2), and remove tubing assembly (4) from semitrailer.
3. Disconnect tubing assembly (9) from elbow (5) on flow control valve (6), and remove elbow (5) from flow control valve (6).
4. Disconnect tubing assembly (9) from elbow (10) on D valve (11), and remove tubing assembly (9) from semitrailer.
5. Disconnect tubing assembly (14) from elbow (1) on E valve (2).
6. Disconnect tubing assembly (13) from elbow (12) on D valve (11).
7. Remove two elbows (1 and 3) from E valve (2).
8. Remove two elbows (10 and 12) from D valve (11).

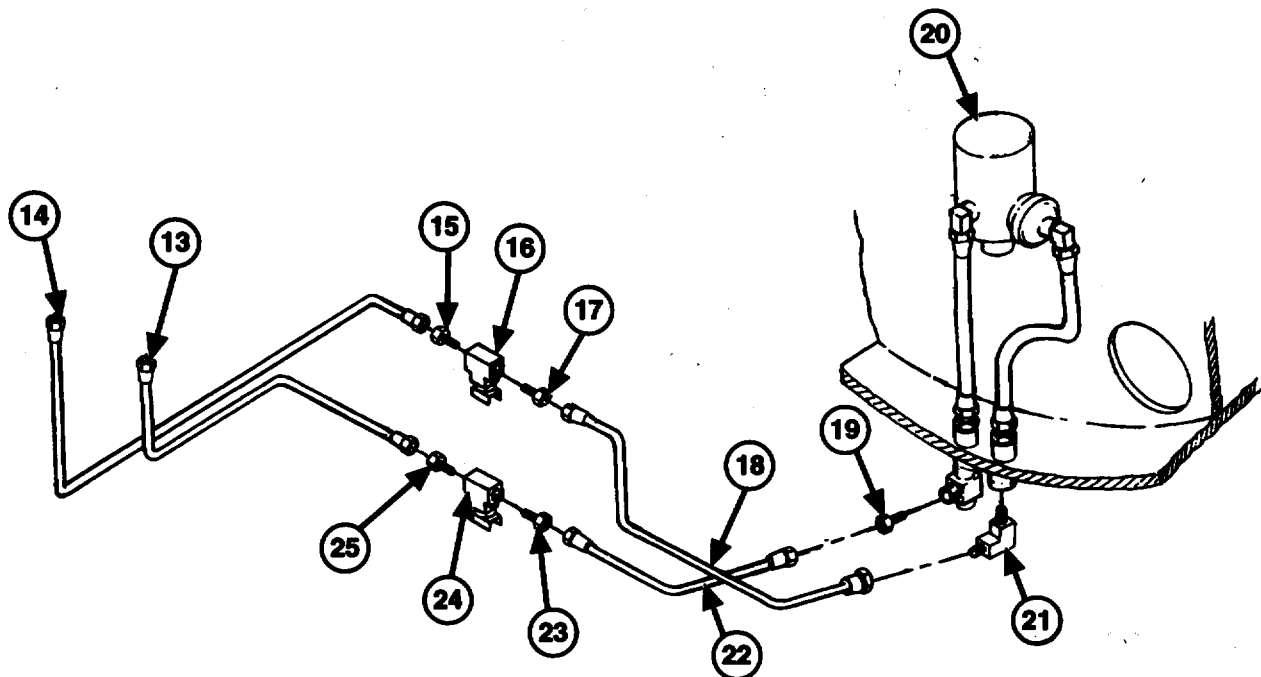


**2-128. PRECHECK CONTROL TUBING ASSEMBLY REPLACEMENT (continued).**

9. Disconnect tubing assembly (14) from adapter (15) on manifold (16), and remove tubing assembly (14) from semitrailer.
10. Disconnect tubing assembly (18) from elbow (21) on float valve (20), and remove tubing assembly (18) from semitrailer. Remove elbow (21) from float valve (20).
11. Remove two adapters (15 and 17) and manifold (16) from tubing assembly (18), 12. Disconnect tubing assembly (13) from adapter (25) on manifold (24).
13. Disconnect tubing assembly (22) from adapter (19) on float valve (20), and remove tubing assembly (20) from semitrailer. Remove adapter (19) from float valve (20).
14. Remove two adapters (23 and 25) and manifold (24) from tubing assembly (22).

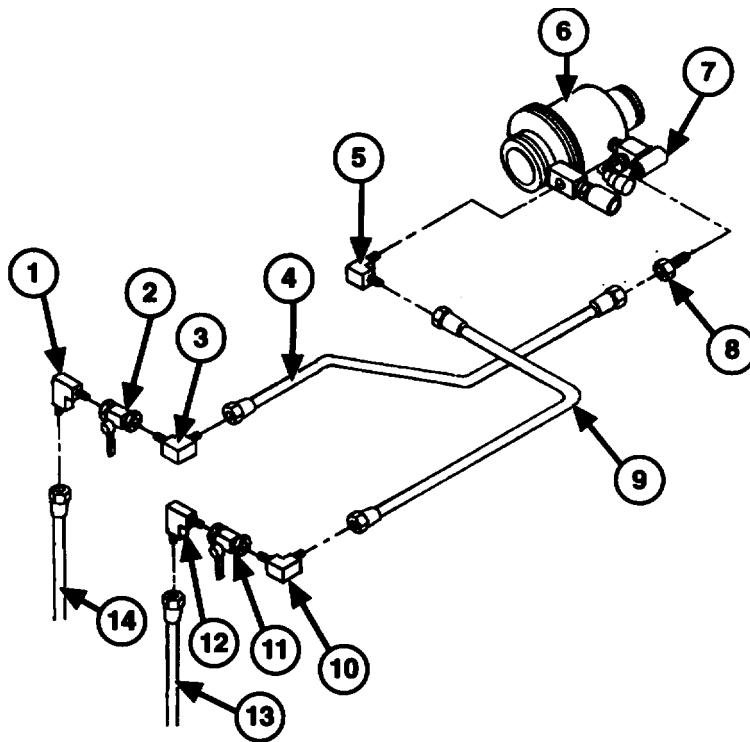
**b. INSTALLATION**

1. Install two adapters (23 and 25) and manifold (24) on tubing assembly (22).
2. Install adapter (19) on float valve (20), and connect tubing assembly (22) to adapter (19).
3. Connect tubing assembly (13) to adapter (25) on manifold (24).
4. Install two adapters (15 and 17) and manifold (16) on tubing assembly (18).
5. Install elbow (21) on float valve (20), and connect tubing assembly (18) to elbow (21).
6. Connect tubing assembly (14) to adapter (15) on manifold (16).



**2-128. PRECHECK CONTROL TUBING ASSEMBLY REPLACEMENT (continued)**

7. Install two elbows (10 and 12) on D valve (11).
8. Install two elbows (1 and 3) on E valve (2).
9. Connect tubing assembly (13) to elbow (12) on D valve (11).
10. Connect tubing assembly (14) to elbow (1) on E valve (2).
11. Connect tubing assembly (9) to elbow (10) on D valve (11).
12. Install elbow (5) on flow control valve (6), and connect tubing assembly (9) to elbow (5).
13. Connect tubing assembly (4) to elbow (3) on E valve (2).
14. Install adapter (8) in tee (7), and connect tubing assembly (4) to tee (7).

**FOLLOW-ON MAINTENANCE:**

- None

**2-129. F, B, AND C VALVE ASSEMBLIES REPLACEMENT.***This Task Covers:*

- a. Removal                      b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Gasket (2), (Item 39, Appendix F)

- Self-locking nut (16) (Item 176, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

**NOTE**

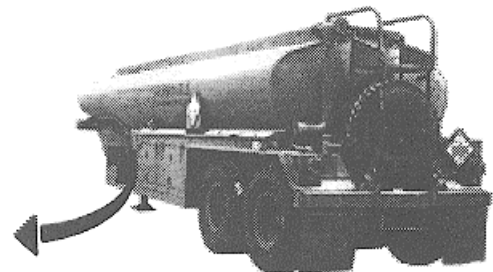
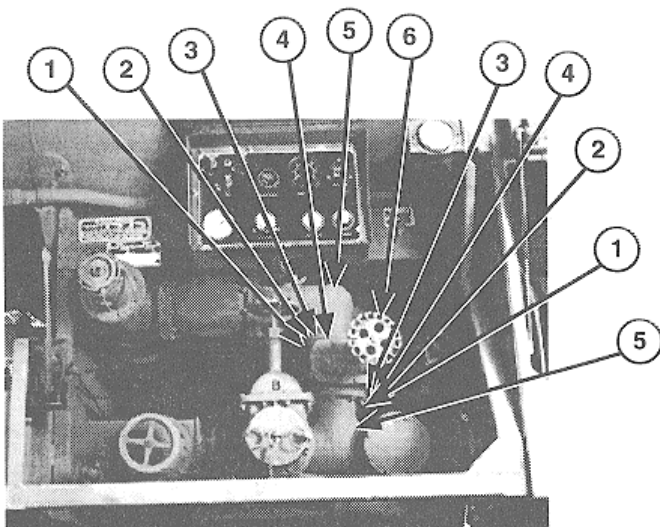
Use this task to replace F, B, or C valve assembly. F valve assembly is shown.

**a. REMOVAL**

Remove 16 screws (3), self-locking nuts (1), and washers (2), two gaskets (4), and F valve (6) from piping (5). Discard self-locking nuts and gaskets.

**b. INSTALLATION**

Install F valve (6) and two new gaskets (4), on piping (5) with 16 screws (3), new self-locking nuts (1), and washers (2).

**FOLLOW-ON MAINTENANCE:**

- None



---

**2-130. F, B, AND C VALVE ASSEMBLIES HANDWHEEL REPLACEMENT**

---

*This Task Covers:*

- a. Removal
- b. Installation

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

---

**NOTE**

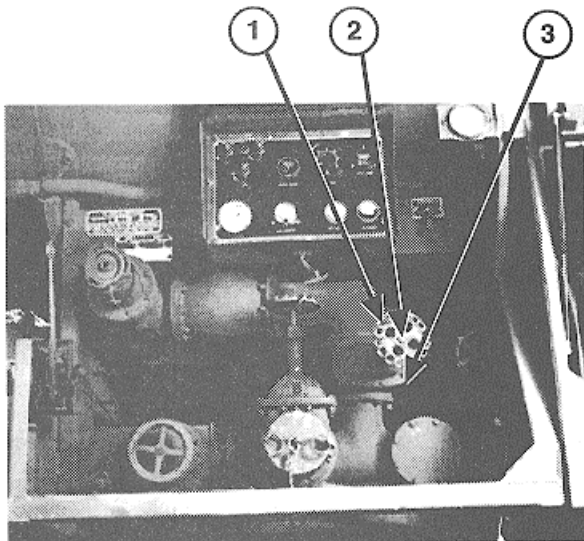
Use this task to replace handwheel on F, B, or C valve assembly . F valve assembly is shown.

**a. REMOVAL**

1. Loosen nut (2) and turn handwheel (1) counterclockwise.
2. Remove nut (2) and handwheel (1) from F valve assembly (3).

**b. INSTALLATION**

Install nut (2) and handwheel (1) on F valve assembly (3). Tighten nut (2) and turn handwheel (1) clockwise.

**FOLLOW-ON MAINTENANCE:**

- None

**2-131. K VALVE REPLACEMENT.***This Task Covers:*

- a. Removal                      b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

- Seal (Item 150, Appendix F)
- Self-locking nut (8) (Item 172, Appendix F)

**Material/Parts:**

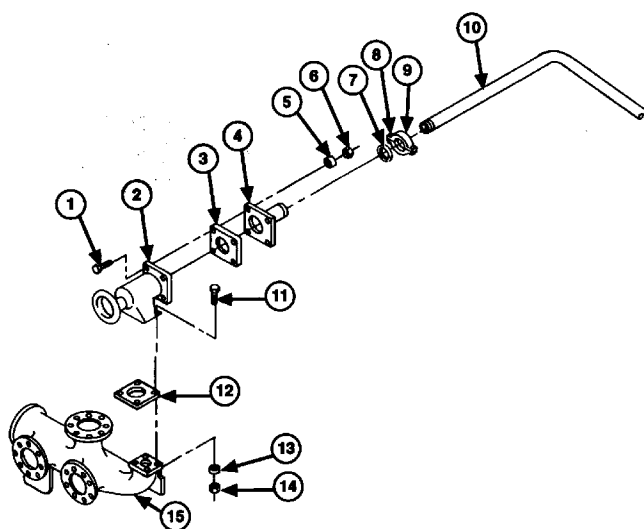
- Cap and plug set (Item 3, Appendix C)
- Gasket (2) (Item 39, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Tank drained and purged (refer to TM 9-2330-398-10).

**a. REMOVAL**

1. Remove two screws (8), coupling (9), seal (7), and pipe (10) from adapter (4). Discard seal.
2. Remove four screws (11), washers (13), and self-locking nuts (14), gasket (12), and K valve (2) from piping control manifold (15). Discard self-locking nuts and gasket.
3. Remove four screws (1), washers (5), and self-locking nuts (6), gasket (3), and adapter (4) from K valve (2). Discard self-locking nuts and gasket.



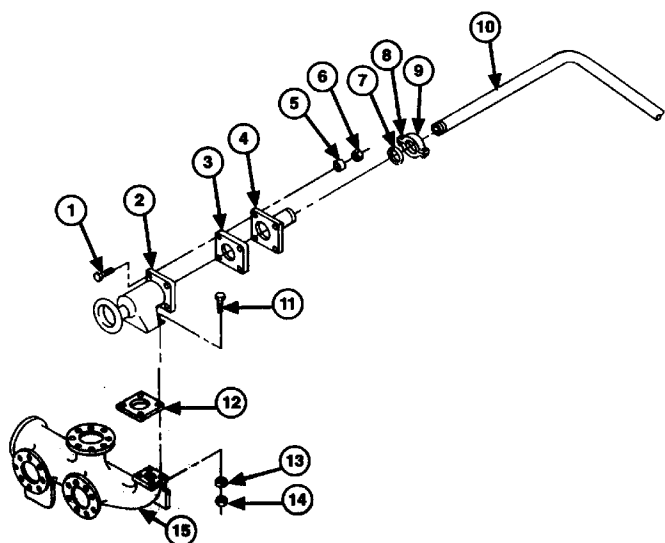
---

**2-131. K VALVE REPLACEMENT (continued).**

---

**b. INSTALLATION**

1. Install adapter (4) and new gasket (3) on K valve (2) with four screws (1), washers (5) and new self-locking nuts (6).
2. Install K valve (2) and new gasket (12) on piping control manifold (15) with four screws (11), washers (13), and new self-locking nuts (14).
3. Install pipe (10), new seal (7), and coupling (9) on adapter (4) with two screws (8).

**FOLLOW-ON MAINTENANCE:**

- None

**2-132. CHECK VALVE ASSEMBLY REPLACEMENT.***This Task Covers:*

a. Removal

b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

- Self-locking nut (16) (Item 172, Appendix F)

**Material/Parts:**

- Gasket (Item 39, Appendix F)

**Equipment Conditions:**

Semitrailer uncoupled (refer to TM 9-2330-398-10).

**a. REMOVAL**

1. Remove eight screws (2), washers (3), self-locking nuts (4) and gasket (5) from check valve assembly (6) and control valve assembly (1). Discard gasket and self-locking nuts.
2. Remove eight screws (2), washers (3), and self-locking nuts (4), and check valve assembly (6) and gasket (5) from piping (7). Discard gasket and self-locking nuts.

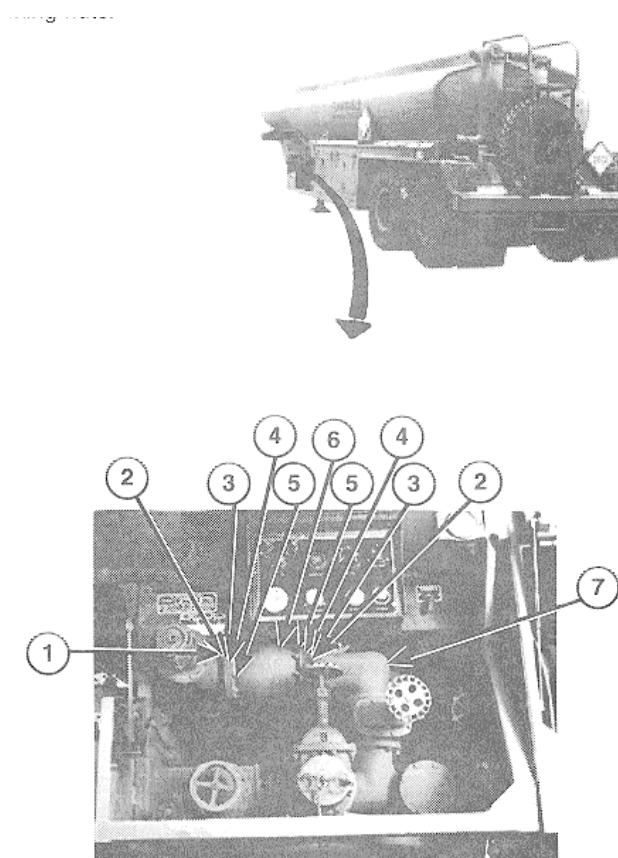
**b. INSTALLATION****NOTE**

To properly align check valve assembly to control valve assembly, make sure control valve assembly has been removed from mounting bracket (para 2-123). Secure check valve assembly to control valve assembly, then install control valve assembly on mounting bracket (para 2-123).

1. Install check valve assembly (6) and new gasket (5) on piping (7) with eight screws (2), washers (3) and new self-locking nuts (4).
2. Install check valve assembly (6) and new gasket (5) on control valve assembly (1) with eight screws (2), washers (3) and new self-locking nuts (4).

**FOLLOW-ON MAINTENANCE:**

- \*None



**2-133. CONTROL CABLES REPLACEMENT.***This Task Covers:*

- |               |                 |
|---------------|-----------------|
| a. Removal    | b. Installation |
| c. Adjustment |                 |

*Initial Setup:***Tool Test Equipment: Equipment Conditions:**

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• General mechanic's tool kit (Item 4, Appendix B)</li> </ul> | <ul style="list-style-type: none"> <li>• Semitrailer uncoupled (refer to TM 9-2330-398-10).</li> <li>• Semitrailer bonded and grounded (refer to TM 9-2330-398-10).</li> </ul> |
|--|--|

**Material/Parts:**

- Cotter pin (item 8, Appendix F)

**Personnel Required:**

- Two

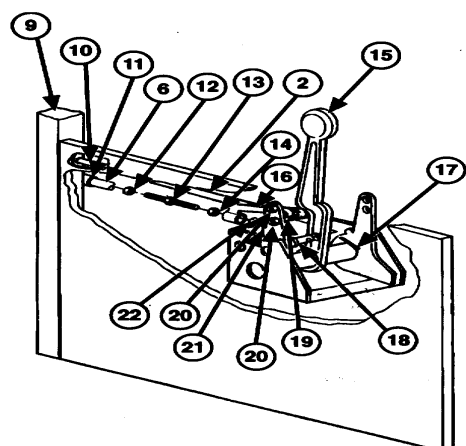
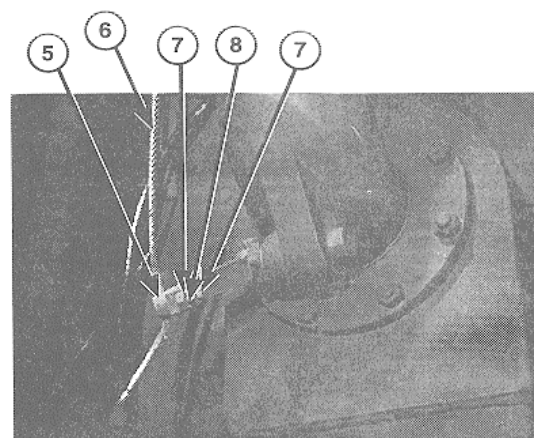
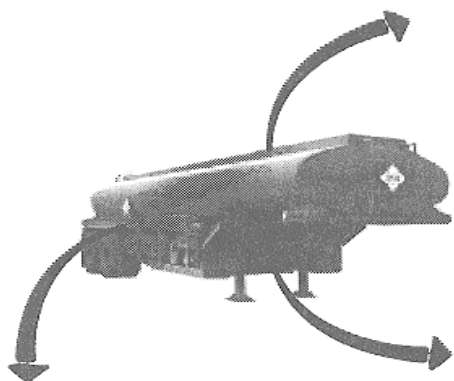
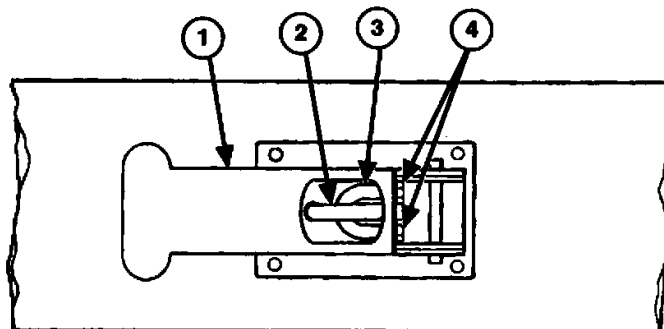
**a. REMOVAL**

1. Loosen two nuts (7) and U-bolt (8) on lever of emergency valve A (5).
2. Pull control cable (6) free of lever of emergency valve A (5).
3. Remove cotter pin (17) and straight pin (18) and connecting link (16) from emergency valve A control handle (15). Discard cotter pin.
4. Pull control cable (6) free of bracket (11), and remove control cable (6) from Semitrailer.
5. Remove three nuts (12, 14, and 22), connecting link (16), and stud (13) from control cable (6).
6. Loosen two nuts (4) on U-bolt (3) on shut-off lever handle (1).
7. Pull control cable (2) free of post (9).
8. Loosen two nuts (20) on U-bolt (19) on trip bracket (21) and remove control cable (2) from trip bracket (20).

**b. INSTALLATION**

1. Install control cable (2) on trip bracket (21) with U-bolt (19) and two nuts (20).
2. Route control cable (2) through post (9) to shut-off lever handle (1).
3. Install control cable (2) on shut-off lever handle (1) with U-bolt (3) and two nuts (4).
4. Install control cable (6) through bracket (11).
5. Install stud (13), connecting link (16), and three nuts (12, 14, and 22) on control cable (6).
6. Install connecting link (16) on emergency valve A control handle (15) with straight pin (17) and new cotter pin (18).

2-133. CONTROL CABLES REPLACEMENT (continued).



---

**2-133. CONTROL CABLES REPLACEMENT (continued).**

---

7. Route control cable (6) to lever of emergency valve A (5).
8. Install control cable (6) on lever of emergency valve A (5) with U-bolt (7) and two nuts (8).

**c. ADJUSTMENT**

1. Make sure emergency valve A (5) is closed, and that emergency valve A control handle (10) is up.
2. Loosen two nuts (7) and U-bolt (8) on lever of emergency valve A (5).
3. Remove all slack from control cable (6), and tighten two nuts (7) and U-bolt (8).

**NOTE**

**Have an assistant observe the operation of emergency valve A.**

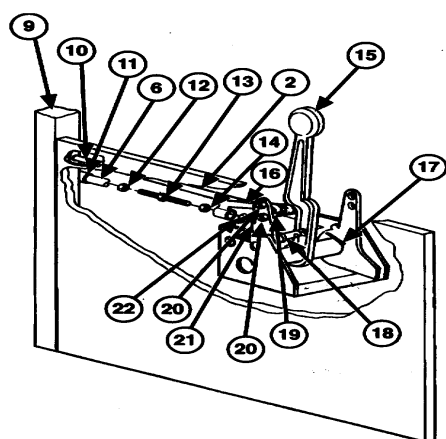
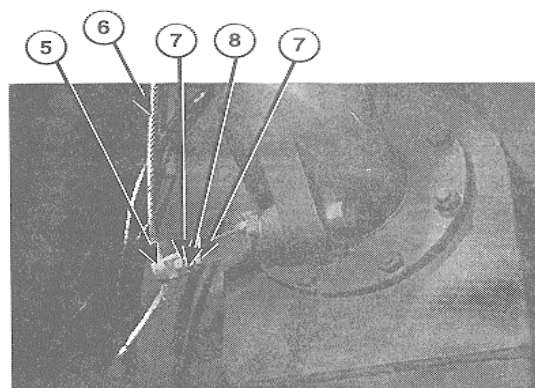
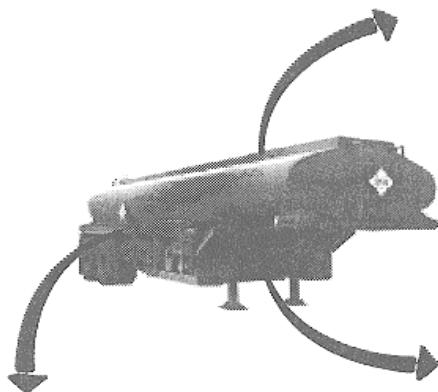
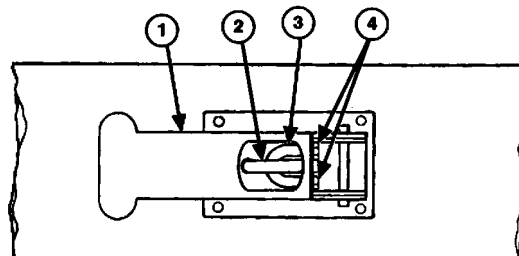
4. Pull control handle (15) and check that emergency valve A (5) opens. Push control handle (15) to upright position and check that emergency valve A (5) closes.
5. Pull shut-off lever handle (1) to open position.
6. Loosen U-bolt (3) and two nuts (4) on shut-off lever handle (1), and remove all slack from control cable (2). Tighten two: nuts (4) and U-bolt (2).

**NOTE**

- **It may be necessary to repeat steps 1 through 6 until control handle and shut-off lever operate properly.**
- **Have an assistant observe operation of shut-off lever.**

7. Pull control handle (17), and check that shut-off lever handle (1) moves to closed position, and that emergency valve A (5) opens.
8. Pull shut-off lever handle (1) and check that emergency valve A closes (5) and control handle (15) moves to upright position.

## 2-133. CONTROL CABLES REPLACEMENT (continued).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).



---

**2-134. EMERGENCY VALVE A CONTROL HANDLE REPAIR.**

---

*This Task Covers:*

- |                            |                |
|----------------------------|----------------|
| a. Removal                 | b. Disassembly |
| c. Cleaning and Inspection | d. Assembly    |
| e. Installation            |                |

---

*Initial Setup:***Tools/ Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

- Cotter pin (Item 8, Appendix F)

**Material/ Parts:**

- Dry-cleaning solvent (Item 12, Appendix C)
- Rag (Item 25, Appendix C)

**Equipment Conditions::**

- Emergency valve A control cables disconnected (para 2-133).
- 

**a. REMOVAL**

Remove two screws (1) and nuts (11) and emergency valve A control handle mounting bracket (9) from toolbox (2).

**b. DISASSEMBLY**

1. Remove pin (10), shaft (8), control handle (3), and trip bracket (7) from mounting bracket (9). V

**NOTE**

**Nuts and plate are provisioned with U-bolt.**

2. Remove two nuts (4), plate (5), and U-bolt (6) from trip bracket (7).

**c. CLEANING AND INSPECTION****WARNING**

**Dry-cleaning solvent P-D-680 is toxic and flammable.. always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and , clothes, and DO NOT breathe vapors. DO NOT us near open flame or excessive heat**

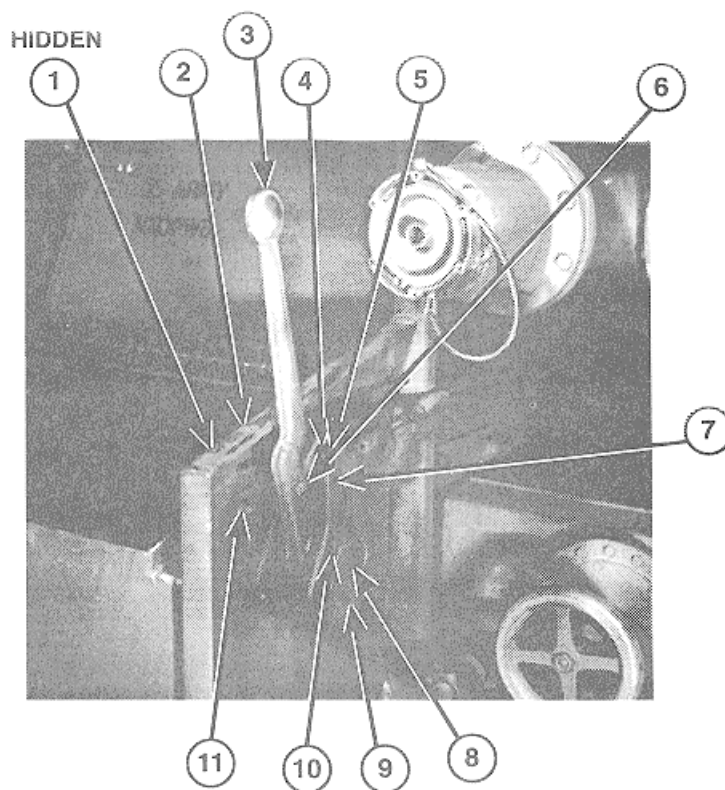
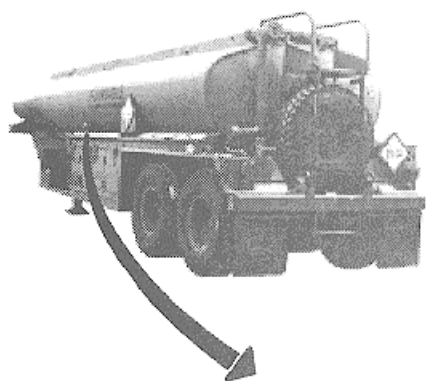
1. Clean all parts with dry-cleaning solvent and wipe dry with rags.
2. Inspect pin (10) and shaft (8) for bends, pits, or cracks. Replace damaged components.
3. Inspect control handle (3), trip bracket (7), and mounting bracket (9) for cracked welds, bends, or other unserviceable condition. Replace unserviceable components.

**2-134. EMERGENCY VALVE A CONTROL HANDLE REPAIR (continued).****d. ASSEMBLY**

1. Install control handle (3) and trip bracket (7) in emergency valve A control handle mounting bracket (9) with shaft (8) and straight pin (10).
2. Install plate (6) and U-bolt (5) on trip bracket (7) with two nuts (4).

**e. INSTALLATION**

Install emergency valve A control handle mounting bracket (9) on toolbox (2) with two screws (1) and nuts (11).

**FOLLOW-ON MAINTENANCE:**

- Connect emergency valve A control cables (2-133).
- Adjust control cables (2-133).
- Disconnect ground (refer to TM 9-2330-398-10).

**2-135. G, R, P, and M VALVE ASSEMBLIES REPLACEMENT.***This Task Covers:*

a. Removal b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Tank drained and purged (refer to TM 9-2330-398-10).

**Material/Parts:**

- Self-locking nut (16) (Item 171, Appendix F)

**NOTE**

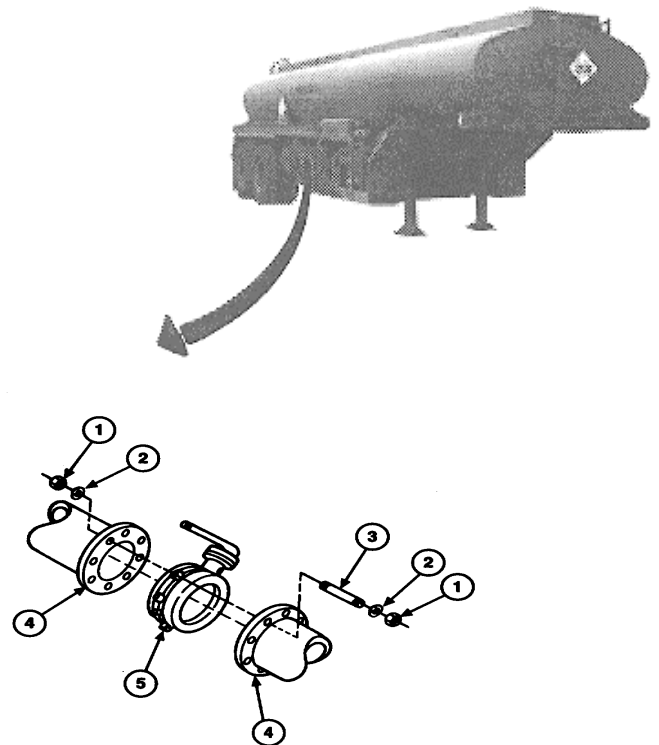
- Removal and installation of G and M valve assemblies are the same. One valve assembly is shown.
- R and P valve assemblies are secured with screws and self-locking nuts.

**a. REMOVAL**

1. Remove 16 self-locking nuts (1) and eight studs (3) from valve (5) and two flanges (4). Discard self-locking nuts.
2. Remove valve (5) from two flanges (4).

**b. INSTALLATION**

Install valve (5) on two flanges (4) with eight studs (3) and 16 washers (2) and new self-locking nuts (1).,

**FOLLOW-ON MAINTENANCE:**

- None

**2-136. FIRE EXTINGUISHER BRACKET REPLACEMENT.***This Task Covers:*

a. Removal b. Installation

*Initial Setup:***Tool/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Fire extinguisher and protective cover removed (refer to TM 9-2330-398-10).

**Materials/Parts:**

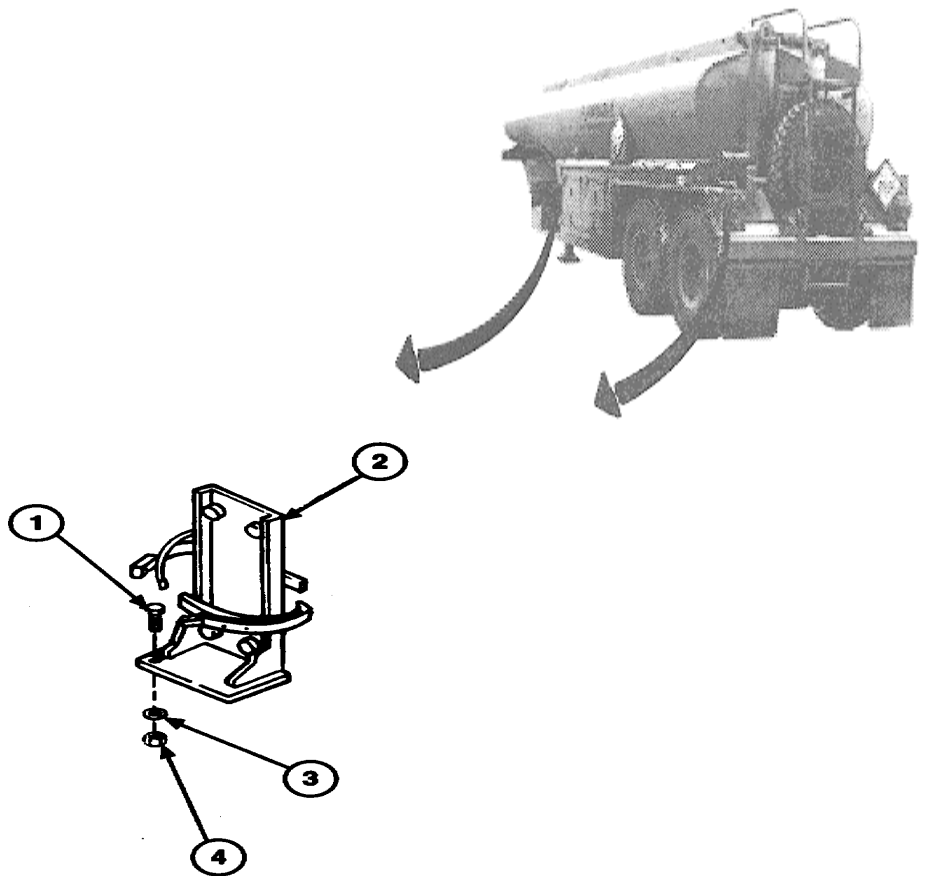
- Self-locking nut (5) (Item 162, Appendix F)

**a. REMOVAL**

Remove five self-locking nuts (4) washers (3), and screws (1) and fire extinguisher bracket (2) from Semitrailer. Discard self-locking nuts.

**b. INSTALLATION**

Install fire extinguisher bracket (2) on Semitrailer with five screws (1), washers (3), and new self-locking nuts (4).

**FOLLOW-ON MAINTENANCE:**

- Install fire extinguisher and protective cover (refer to TM 9-2330-398-10).

**Section XVIII. CHEMICAL, BIOLOGICAL, AND  
RADIOLOGICAL (CBR) EQUIPMENT MAINTENANCE**

**2-137. DECONTAMINATION APPARATUS BRACKET REPLACEMENT.**

*This Task Covers:*

- a. Removal b. Installation

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

**Materials/Parts:**

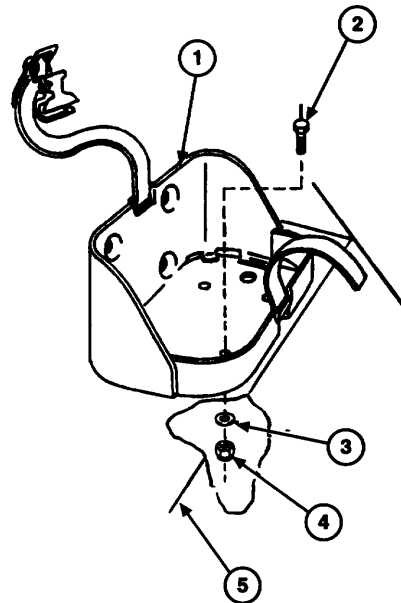
- Self-locking nut (4) (Item 171, Appendix F)

**a. REMOVAL**

1. Remove four screws (2), washers (3), and self-locking nuts (4) from bracket assembly (1). Discard self-locking nuts.
2. Remove bracket assembly (1) from rear fender deck (5) of Semitrailer.

**b. INSTALLATION**

1. Position bracket assembly (1) in place on rear fender deck (5) of Semitrailer.
2. Install four screws (2), washers (3), and new self-locking nuts (4) and bracket assembly (1) on rear fender deck (5).



**FOLLOW-ON MAINTENANCE:**

- None

**Section XIX. PREPARATION FOR STORAGE OR SHIPMENT**

<b>Paragraph Number</b>	<b>Paragraph Title</b>	<b>Page Number</b>
2-138	General .....	2-299
2-139	Definition of Administrative Storage .....	2-209
2-140	Preparation for Administrative Storage.....	2-300
2-141	Care of Equipment in Administrative Storage.....	2-301
2-142	Removal from Administrative Storage .....	2-302
2-143	Preparation of Equipment for Shipment .....	2-302

**2-138. GENERAL**

- a. This section contains requirements and procedures for the administrative storage of equipment that is issued to and in use by Army activities worldwide.
- b. The requirements specified herein are necessary to maintain equipment in administrative storage in such a way as to achieve maximum readiness condition.
- c. Equipment that is placed in administrative storage should be capable of being readied to perform its mission within a 24-hour period, or as otherwise prescribed by the approving authority. Before equipment is placed in administrative storage, current PMCS procedures should be completed and deficiencies corrected.
- d. Report equipment in administrative storage in Materiel Readiness and Unit Readiness reports as prescribed for all reportable equipment (refer to AR 200-1).
- e. Perform inspections, maintenance services, and lubrication in accordance with this manual and TM 9-2330398-10.
- f. Records and reports to be maintained for equipment in administrative storage are those prescribed by DA Pam 738-750 for equipment use.
9. A 10 percent variance is acceptable on time, running hours, or mileage used to determine maintenance actions.

**2-139. DEFINITION OF ADMINISTRATIVE STORAGE.**

- a. Equipment placement in administrative storage can be for short periods when
  - units lack operating funds, personnel, other resources, or normal usage of its organic materiel; or
  - materiel exceeding the owning unit's capability for operation and maintenance must be retained by that unit for contingency or other reasons
- b. Installation or unit commanders may authorize the administrative storage of their materiel through guidance furnished in AR 750-1.

---

**2-140. PREPARATION FOR ADMINISTRATIVE STORAGE.**

---

**Security**

Instructions in this paragraph do not modify security procedures and requirements for classified or pilferable items (refer to AR 190-13 and AR 190-51).

**Storage Site**

- a. Select the best available site for administrative storage. Separate stored equipment from equipment in use. Conspicuously mark the area 'Administrative Storage.'
- b. Covered storage space is preferred.
- c. When insufficient covered space is available for all semitrailers to be stored, select an open site. Open sites should be improved hardstand, if available. Unimproved sites should be firm, well drained, and free of excessive vegetation.

**Storage Plan**

- a. Store equipment to provide maximum protection from the elements and to provide access for inspection, maintenance, and exercising. Anticipate removal or deployment problems and take suitable precautions.
- b. Take into account environmental conditions, such as extreme heat or cold, high humidity, soft ground, mud, heavy snows, earthquakes, blowing sand, dust, or loose debris, or any combinations of these, and take adequate precautions.
- c. Establish a fire plan and provide adequate fire-fighting equipment and personnel. J

**Inspections and Maintenance Services**

- a. Inspect and approve equipment prior to storage. Do not place equipment that is not mission capable in storage.
- b. Prior to storage, perform the next scheduled Unit PMCS procedures.

**Basic Issue Items**

- a. Process basic issue items (BII) simultaneously with the semitrailer to which they are assigned.
- b. If possible, store BII with the semitrailers.
- c. If stored apart from the semitrailer, label BII with tags designating the vehicle, its registration or serial number, and location, and store in protective closures. In addition, place a tag or list indicating the location of the removed items in a conspicuous place in the semitrailer.

**Corrections of Shortcomings and Deficiencies**

- a. Before equipment is placed in administrative storage, current maintenance services, shortcomings, and deficiencies should be corrected, and all modification work orders should be applied. If all shortcomings and deficiencies will not be corrected prior to storage, a deferment must be obtained from the approving authority.
- b. A vehicle to be prepared for administrative storage must be given a limited technical inspection and be processed as prescribed on DD Form 1397. The result of the inspection and classification will be entered on DA Form 2404.

---

**2-140. PREPARATION FOR ADMINISTRATIVE STORAGE (continued).**

---

**Lubrication**

Lubricate equipment in accordance with the applicable lubrication instructions in TM 9-2330-398-10 and in PMCS (Table 2-1) and Appendix G of this manual.

**General Cleaning, Painting, and Preservation****CAUTION**

**Do not direct high-pressure water or steam against air cleaners, air duct outlets, exhaust outlets, unsealed electrical systems, automatic fire-extinguishing system (AFES) equipment, or any exterior component. Moisture will cause electrical malfunctions. Condensation in ducts can cause corrosion.**

- a. Clean dirt, grease, and other contaminants from the equipment in accordance with this manual.
- b. Remove rust and damaged paint by scraping, wire brushing, sanding, or buffing. Sand to a smooth finish and spot-paint as necessary (refer to TB 43-0209).
- c. After cleaning and drying, immediately coat all unpainted metal surfaces with oil or grease, as appropriate (Appendix G).

**NOTE**

- **Air circulation under draped covers reduces deterioration from moisture and heat.**
  - **A piece of cloth or other material placed between desiccant bags and metal surfaces helps to prevent corrosion.**
- d. Sunlight, heat, humidity, and dirt tend to accelerate deterioration. Install all covers (including vehicle protection closures) authorized for the equipment. Close and secure all openings except those required for venting and draining. Seal openings to prevent the entry of rain, snow, or dust. Insert desiccant when complete seal is required. Place equipment and provide blocking or framing to allow for ventilation and water drainage. Support cover away from semitrailer surfaces that may rust, rot, or mildew.

---

**2-141. CARE OF EQUIPMENT IN ADMINISTRATIVE STORAGE.**

---

**Maintenance services**

After equipment has been placed in administrative storage, suspend all regularly scheduled PMCS and inspect, service, and exercise as required.

**Inspection**

Inspection will usually be visual and must consist of at least a walk-around examination of all equipment to observe any deficiencies that may have occurred. Inspect equipment in open storage weekly, and inspect equipment in covered storage monthly. Immediately after any severe storm or environmental change, inspect all equipment. The following are examples of things to look for during visual inspection:

- a. Low or flat tires.



---

**2-141. CARE OF EQUIPMENT IN ADMINISTRATIVE STORAGE (continued).**

---

- b. Coolant, fuel, or oil leaks.
- c. Condition of preservatives, seals, and wraps. Seals may develop leaks during storage, during exercise, or shortly thereafter. If leaking continues, refer to the repair procedure in this manual.
- d. Corrosion or other deterioration.
- e. Damaged or missing parts.
- f. Water in compartments
- g. Any other readily recognizable shortcomings or deficiencies.

**Exercise Schedule**

To assure the utilization of all assigned materiel, rotate items in accordance with any rotational plan that will keep equipment in operational condition and reduce maintenance effort.

---

**2-142. REMOVAL FROM ADMINISTRATIVE STORAGE.**

---

**Activation**

Remove preservative materials. Perform the next scheduled maintenance service and prepare equipment for service in accordance with instructions on DD Form 1397 and instructions in TM 9-2330-398-10 and this manual.

**Servicing**

Resume the maintenance service schedule in effect at the commencement of storage, or service the equipment before the scheduled dates in order to produce a staggered maintenance workload.

---

**2-143. PREPARATION OF EQUIPMENT FOR SHIPMENT.**

---

- a. Refer to FM 55-21, TM 55-601, and TM 743-200-1 for additional instructions on processing, storage, and shipment of materiel.
- b. Trailers that have been removed from storage for shipment do not have to be reprocessed if they will reach their destination within the administrative storage period. Reprocess only if inspection reveals any corrosion or if anticipated in-transit weather conditions make it necessary.
- c. When a trailer is received and has already been processed for domestic shipment, as indicated on DD Form 1397, the trailer does not have to be reprocessed for storage unless corrosion and deterioration are found during the inspection upon receipt. List, on SF Form 364, all discrepancies found because of poor preservation, packaging, packing, marking, handling, loading, storage, or excessive preservation. Repairs that cannot be handled by the receiving unit must have tags attached listing the needed repairs. A report of these conditions will be submitted by the unit commander for action by an ordnance maintenance unit.

---

**2-143. PREPARATION OF EQUIPMENT FOR SHIPMENT (continued).**

---

**Army Shipping Documents**

Prepare all Army shipping documents in accordance with AR 55-355.

**Loading****CAUTION**

**Height and width of vehicle, when prepared for rail transportation, must not exceed limitations prescribed for particular railway lines. Remove handrails from ladder drain assembly and securely stow in catwalk on top of semitrailer. Whenever possible, local transportation officers must be consulted about limitations of particular railroad lines to be used for movement in order to avoid delays, dangerous conditions, or damage to equipment.**

- a. When vehicle is shipped by rail, every precaution must be taken to see that it is properly loaded and blocked and securely fastened to flatcar floor.
- b. Inspect flatcar prior to loading. Make sure flatcar is in suitable condition to carry loads safely.
- c. Prepare flat car for loading by removing debris, previous blocking, nails, and other obstructions. Inspect flatcar for loose or broken floor planks. If found unsatisfactory, reject flatcar for use.
- d. If suitable hoisting equipment, permanent loading ramps, and handling equipment are not available for loading or unloading materiel, improvised runways, ramps, and spanning platforms can be constructed.
- e. Loading must be governed by the capacity and length of flatcars available at the time of shipment, as well as requirements of bills of lading and shipping instructions.
- f. Position vehicle as far from brake wheel end of flatcar as space permits. Provide minimum clearance of four inches below and six inches above, behind, and to each side of flatcar brake wheel.

**Blocking****NOTE**

**All blocking instructions specified here are minimum requirements and are in accordance with the Association of American Railroads Pamphlet, Section No. 6 (Rules Governing the Loading of Department of Defense Materiel on Open-Top Cars). Additional blocking may be added at the discretion of the officer in charge.**

- a. Construct four chock blocks: two to fit the angle between the front wheels and flatcar deck, and two to fit the angle between the rear wheels and flatcar deck at the rear of the vehicle. Using lumber 1 5/8 inches thick, make chock blocks 12 inches wide and a minimum of 18 inches high. Nail the pieces together with twenty penny nails. Place one chock block against the front of each set of front wheels and against the rear of each set of rear wheels. Toenail chock blocks to car floor with forty penny nails.
- b. Place one end cleat (2 x 4 x 12 in., eight required) against end of each chock block and secure to flatcar deck with thirty penny nails. Place upper cleat on top of lower cleat and secure to lower cleat with thirty penny nails.
- c. Locate one cleat (2 x 3 x 10 in., eight required) against inside and outside of each chock block. Secure each to flatcar deck with twenty penny nails.

---

**2-143. PREPARATION OF EQUIPMENT FOR SHIPMENT (continued)**

---

d. Thread both ends of hold-down rod (1 1/4 in. diameter, as long as required). Insert one end of hold-down rod through lifting eye on front of vehicle. Bend rod and insert other end through stake pocket on opposite side of flatcar. Repeat operation with second rod and lifting eye on front of vehicle, and with two rods on rear of vehicle.

**Transportation**

When transporting the semitrailers by any means other than railroad flatcar, transport in accordance with MTMC TEA PAM 55-19 of the Military Traffic Management Command (MTMC) Transportation Engineering Agency (TEA).

## CHAPTER 3 DIRECT SUPPORT MAINTENANCE' INSTRUCTIONS

### Section I. DIRECT SUPPORT TROUBLESHOOTING PROCEDURES

Paragraph Number	Paragraph Title	Page Number
3-1	General.....	3-1
3-2	Quick Guide to Troubleshooting .....	3-2
3-3	Troubleshooting Chart .....	3-3

#### **3-1. GENERAL.**

- a. This section provides information for identifying and correcting malfunctions that may develop while operating or maintaining the M969A2 semitrailer.
- b. The Quick Guide to Troubleshooting (para 3-2) lists common symptoms you may find during operation or maintenance of your semitrailer or its components, and refers you to the Troubleshooting Chart (para 3-3) for the appropriate troubleshooting procedures. You should perform the tests inspections and corrective actions in the order listed.
- c. Before performing troubleshooting, read and follow all safety instructions found in the warning summary at the beginning of the manual.
- d. This section cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by the corrective actions listed, notify your supervisor.
- e. When troubleshooting a malfunction:
  1. Question the operator to obtain any information that might help determine the cause of the problem. Before continuing, make sure all applicable Operator/Crew and Unit troubleshooting procedures were performed.
  2. Locate the item(s) and symptom(s) in the Quick Guide to Troubleshooting that best describe the malfunction.
  3. Turn to the Troubleshooting Chart where the troubleshooting procedures for the malfunction in question are described.
  4. Perform each step in the order listed until the malfunction is corrected. DO NOT perform any maintenance task unless the troubleshooting procedure tells you to do so.

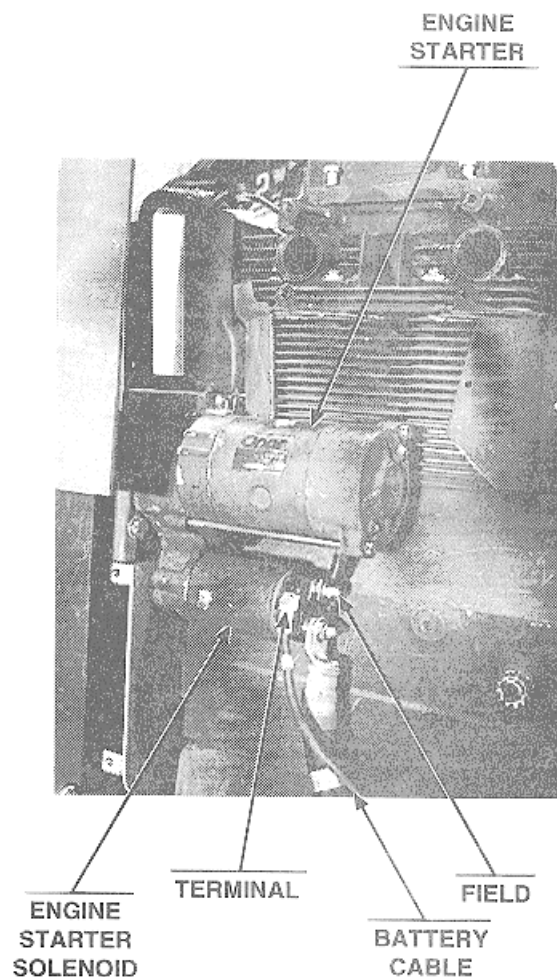
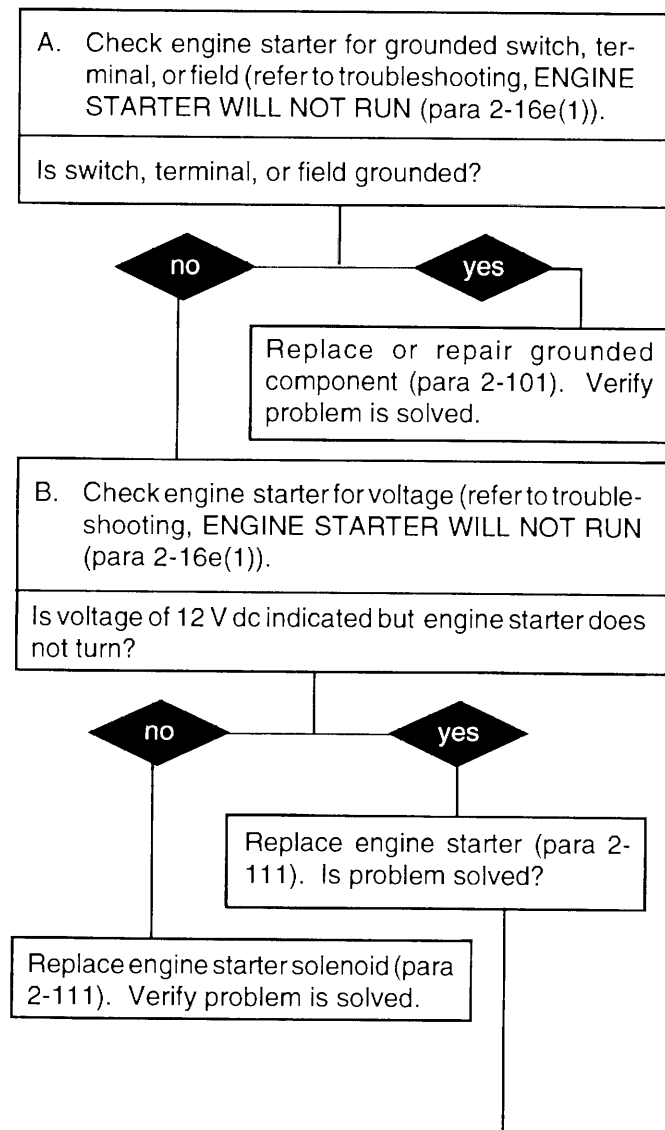
**3-2. QUICK GUIDE TO TROUBLESHOOTING.**

<b><u>ITEM</u></b>	<b><u>SYMPTOM</u></b>	<b><u>PARAGRAPH</u></b>
<b>ALTERNATOR AND CHARGING CIRCUIT</b>	ENGINE STARTER DOES NOT TURN - HIGH CURRENT DRAW - OR TURNS SLOWLY.	para 3-3a(1)
	STARTER WILL NOT ENGAGE FLYWHEEL.	para 3-3a(2)
	ENGINE WILL NOT START WHEN CRANKED.	para 3-3a(3)
	ENGINE MISFIRES.	para 3-3a(4)
	ENGINE POWER IS LOW.	para 3-3a(5)
	OIL PRESSURE IS LOW.	para 3-3a(6)
	OIL PRESSURE IS HIGH.	para 3-3a(7)
	EXHAUST IS BLUE AND OIL CONSUMPTION IS EXCESSIVE.	para 3-3a(8)
	EXHAUST IS BLACK AND SMOKY, AND FUEL CONSUMPTION IS EXCESSIVE.	para 3-3a(9)
	TAPPING OR CLICKING SOUND IS COMING FROM CYLINDER HEAD.	para 3-3a(10)
	METALLIC KNOCKING, CLICKING, OR POUNDING IS COMING FROM CRANK-CASE OR CYLINDER HEAD.	para 3-3a(1 1)
	ENGINE COMPRESSION IS LOW.	para 3-3a(12)
	VALVES ARE STICKING.	para 3-3a(13)
	BATTERIES ARE UNDERCHARGED	para 3-3b(1)
	BATTERIES ARE OVERCHARGED (indicated by high water usage).	para 3-3b(2)
	ALTERNATOR OUTPUT IS LOW.	para 3-3b(3)
	ALTERNATOR IS NOISY.	para 3-3b(4)

**3-3. TROUBLESHOOTING CHART.****a. ENGINE****(1) ENGINE STARTER DOES NOT TURN - HIGH CURRENT DRAW - OR TURNS SLOWLY.***Initial Setup:***Tools/Test Equipment:**

\* Common No. 1 tool set (Item 1, Appendix B)

- General mechanic's tool kit (Item 4, Appendix B)

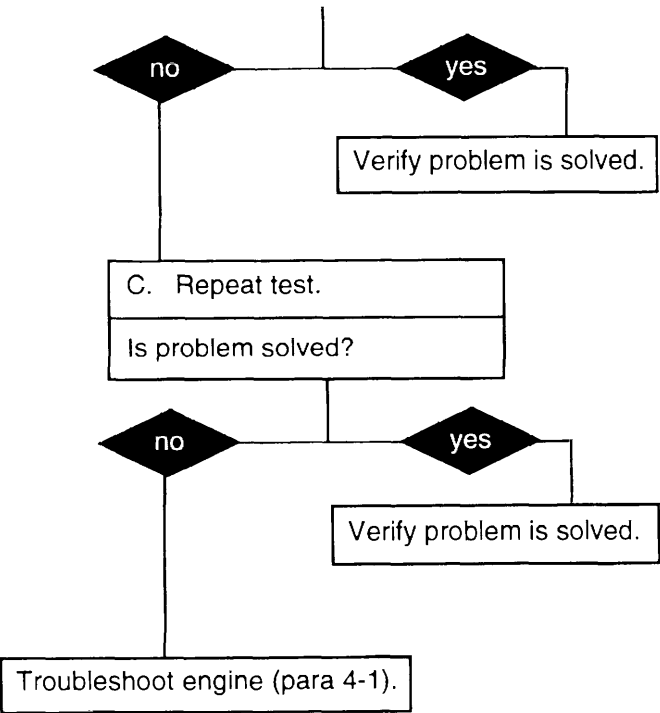
**continued on next page**

3-3. TROUBLESHOOTING CHART (continued)

a. ENGINE (continued)

(1) ENGINE STARTER DOES NOT TURN- HIGH  
CURRENT DRAW - OR TURNS SLOWLY

CONTINUED FROM STEP B



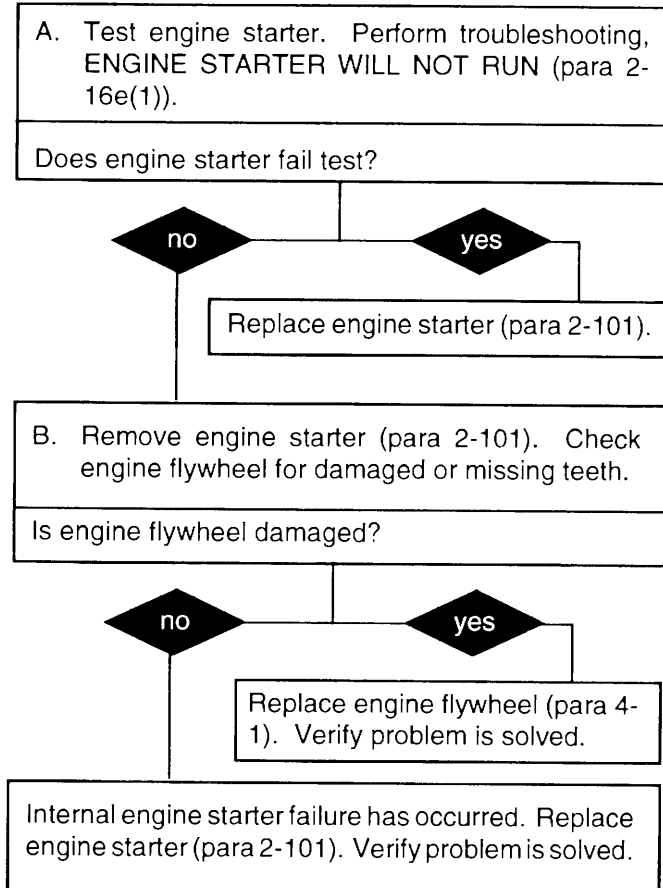
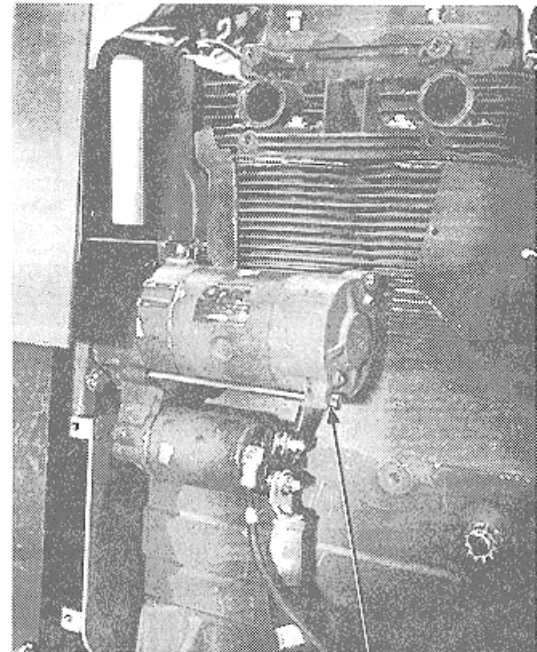
END OF TASK

**3-3. TROUBLESHOOTING CHART (continued).****a. ENGINE (continued)***Initial Setup:***Tools/Test Equipment:**

- \* Common No. 1 tool set (Item 4, Appendix B)
- \* General mechanic's tool kit (Item 1, Appendix B)

**Equipment Conditions:**

- Semitrailer parking brakes set (refer to TM 9-2330-398-10).

**END OF TASK****ENGINE STARTER****ENGINE FLYWHEEL**

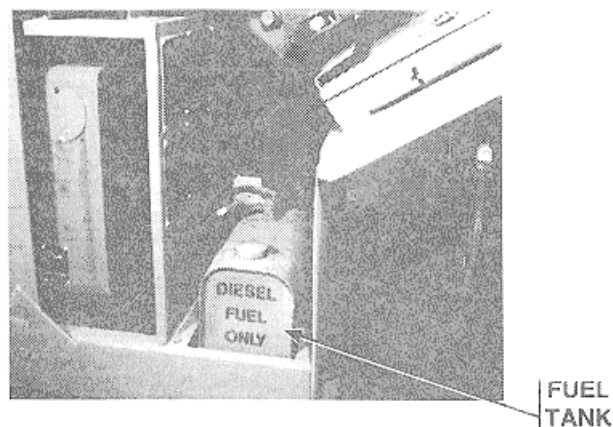
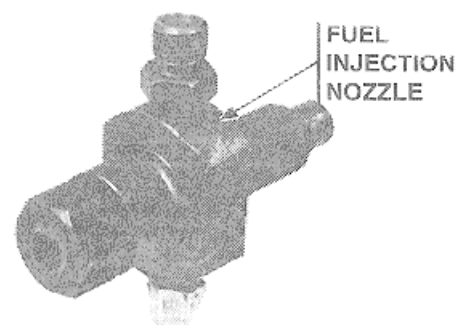
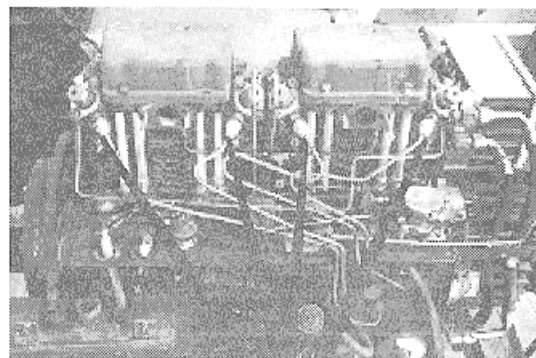
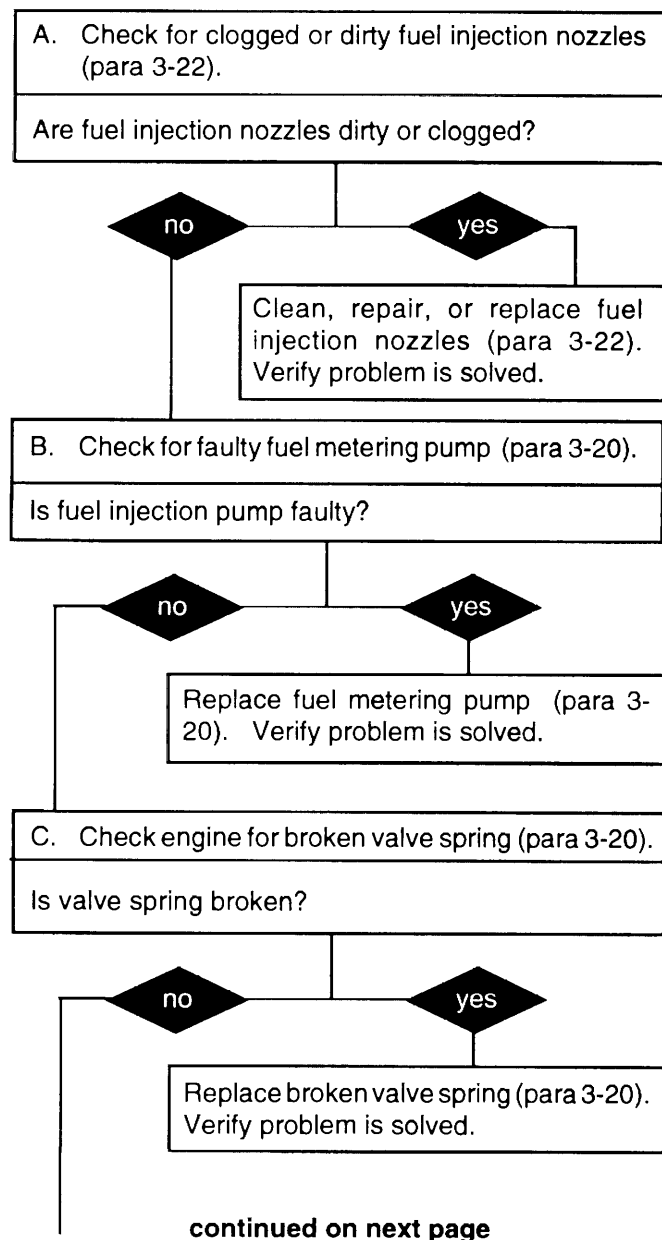


**3-3. TROUBLESHOOTING CHART (continued).****a. ENGINE (continued)****(3) ENGINE WILL NOT START WHEN CRANKED***Initial Setup:***Tools/ Test Equipment:**

- Common No. 1 tool set (Item 4, Appendix B)
- General mechanic's tool kit (Item 1, Appendix B)

**Equipment Conditions:**

- Fuel injection removed (para 3-22)



**3-3. TROUBLESHOOTING CHART (continued).**

a ENGINE (continued)

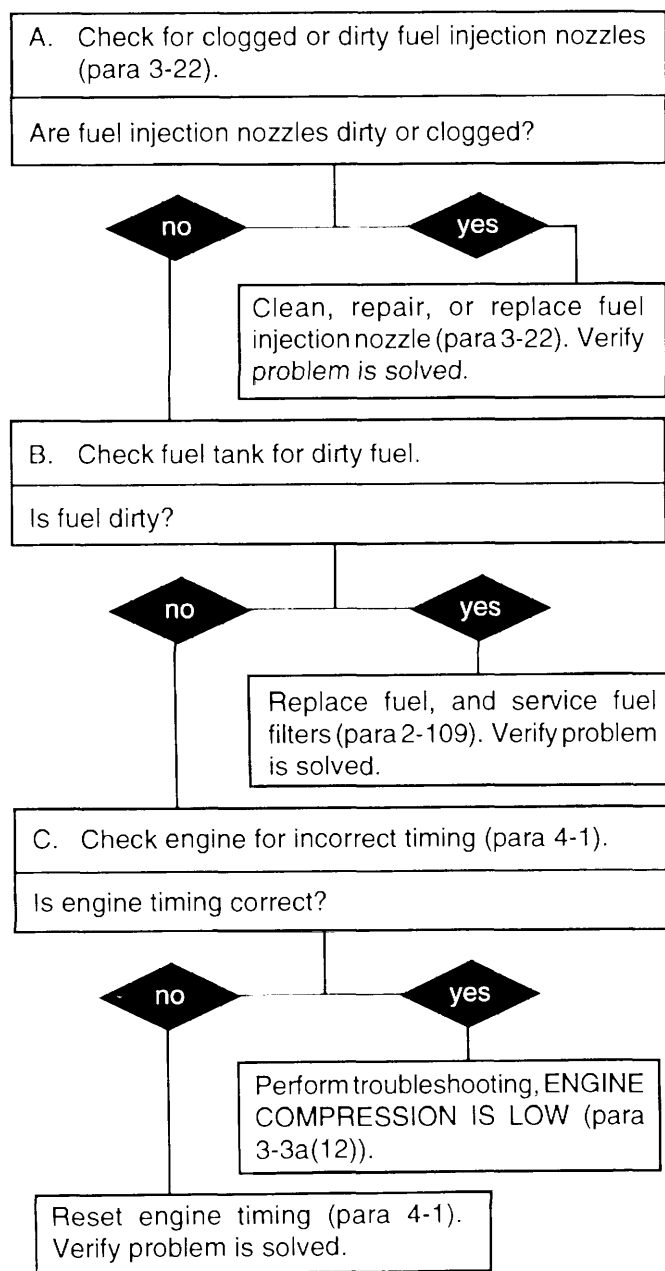
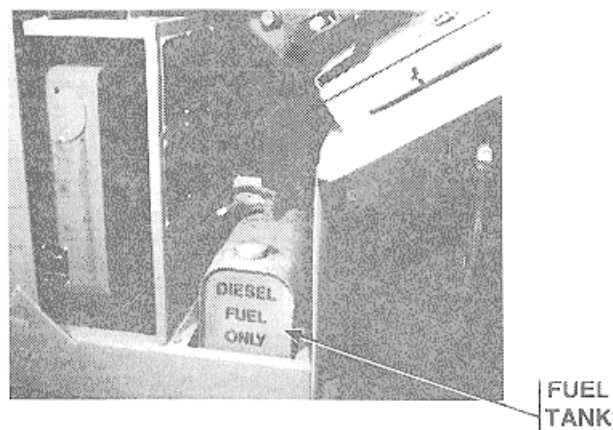
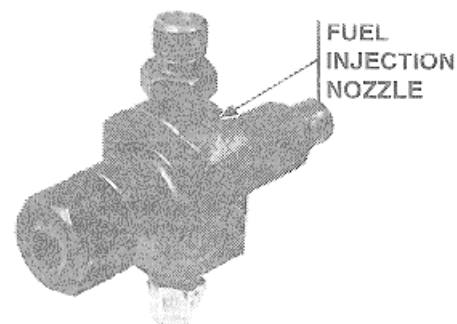
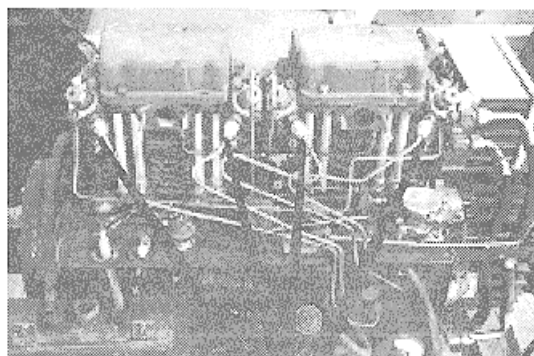
(4) ENGINE MISFIRES

*Initial Setup:***Tools/ test Equipment**

- \* Common No. 1 tool set (Item 1, Appendix B)
- \* General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions**

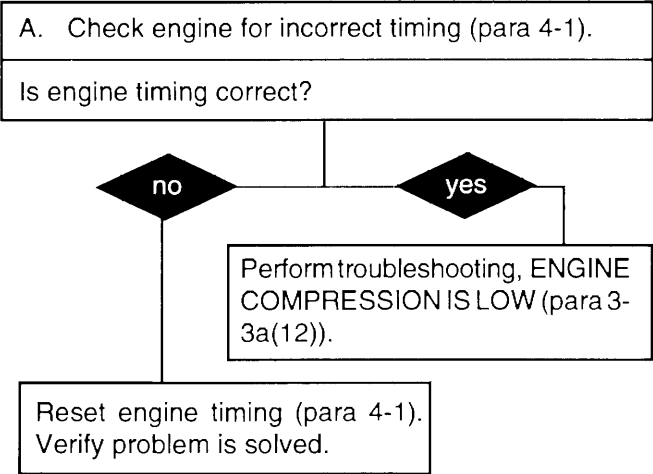
- Fuel injection nozzles removed (para 3-22)

**END OF TASK**

3-3. TROUBLESHOOTING CHART (continued).

a. ENGINE (continued)

(4) ENGINE MISFIRES (continued).



END OF TASK

3-3. TROUBLESHOOTING CHART,(continued).

a. ENGINE (continued)

(5) ENGINE POWER IS LOW.

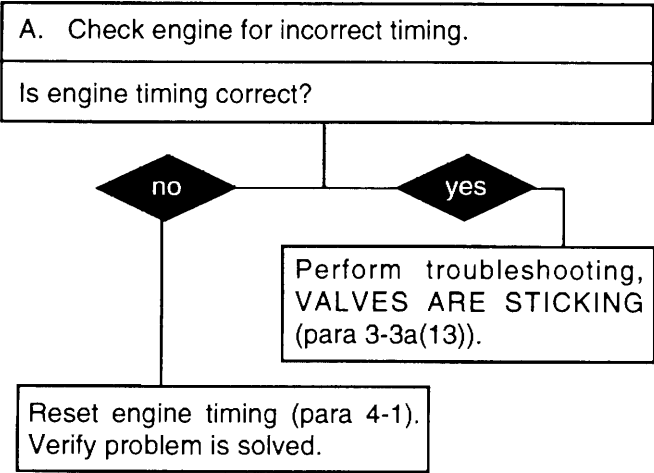
Initial Setup:

Tools/Test Equipment:

- \* Common No. 1 tool set (Item 1, Appendix B) .
- \* General mechanic's tool kit (Item 4, Appendix B)

Equipment Conditions:

- Semitrailer uncoupled (refer to TM 9-2330-398-10



END OF TASK

**3-3. TROUBLESHOOTING CHART (continued).**

a. ENGINE (continued)

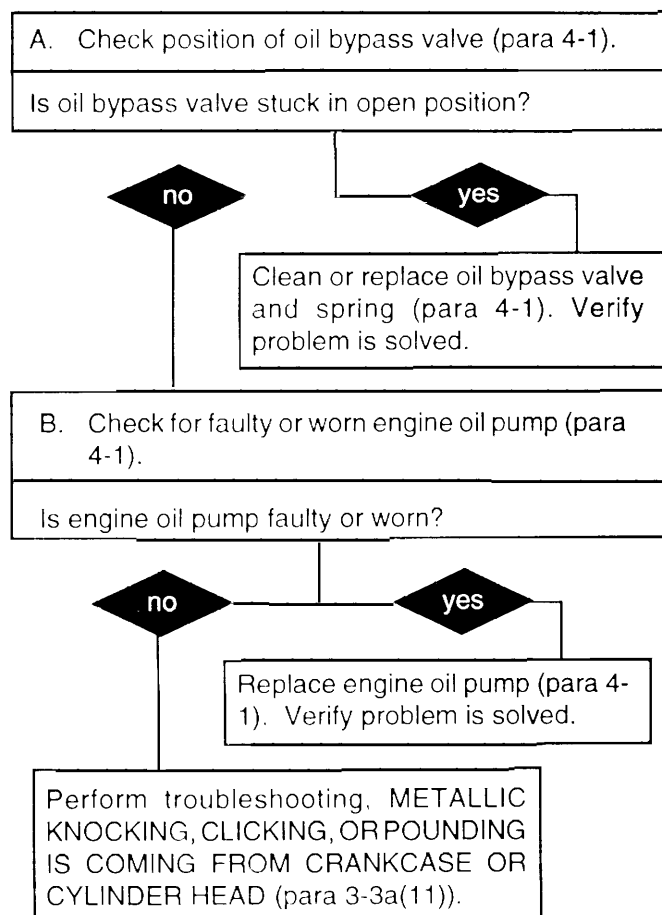
(6) OIL PRESSURE IS LOW

*Initial Setup:***Tools Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions**

- Semitrailer uncoupled (refer to TM 9-2330-398-10)

**END OF TASK**

3-3. TROUBLESHOOTING CHART (continued).

a. ENGINE (continued)

(7) OIL PRESSURE IS HIGH

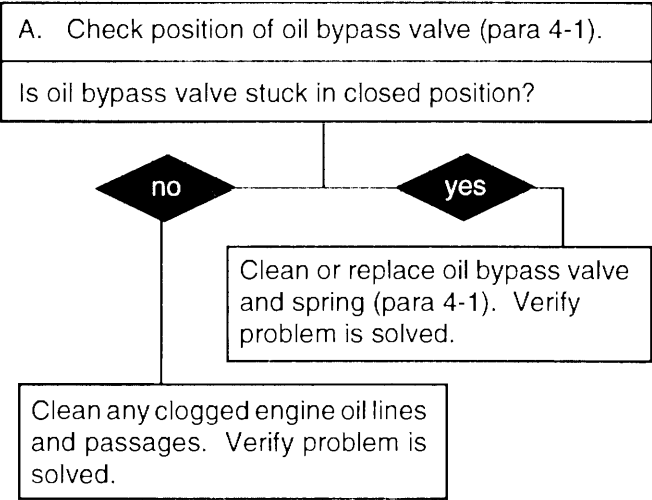
Initial Setup:

Tools/Test Equipment:

- \* Common No. 1 tool set (Item 1, Appendix B)
- \* General mechanic's tool kit (Item 4, Appendix B)

Equipment Conditions

- Semitrailer uncoupled (refer to TM 9-2330-398-10)



END OF TASK

### 3-3. TROUBLESHOOTING CHART (continued).

a. ENGINE (continued)

(8) EXHAUST IS BLUE AND OIL CONSUMPTION IS EXCESSIVE

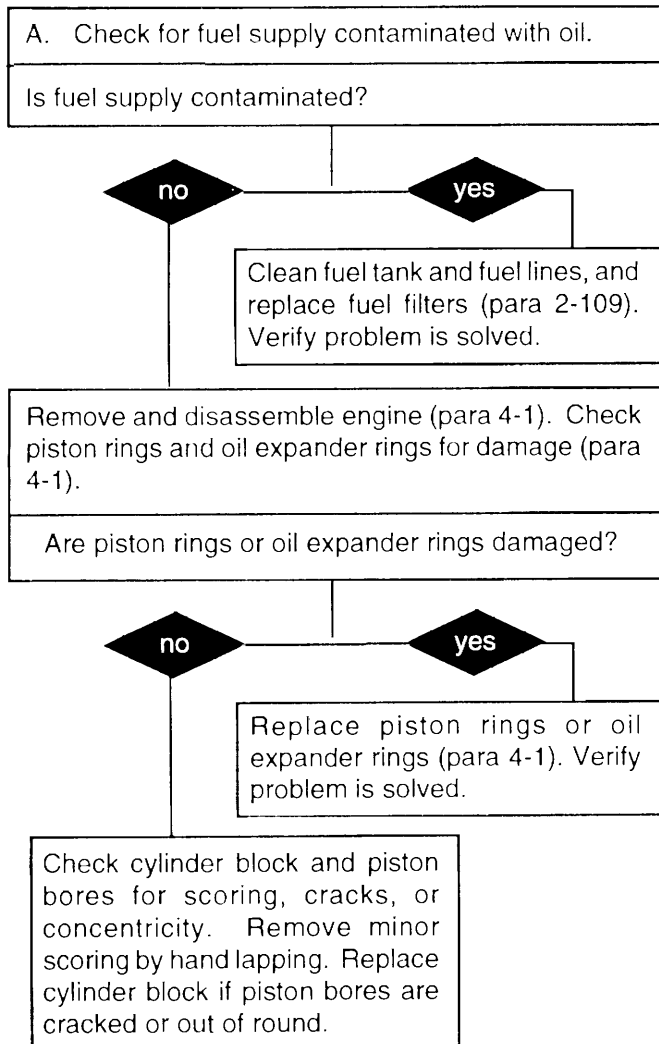
*Initial Setup:*

#### Tools/Test Equipment:

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

#### Equipment Conditions:

- Semitrailer bonded and grounded (refer to TM 9-2330-398-10)



**END OF TASK**

3-3. TROUBLESHOOTING CHART (continued).

a. ENGINE (continued)

(9) EXHAUST IS BLACK AND SMOKY, AND FUEL CONSUMPTION IS EXCESSIVE

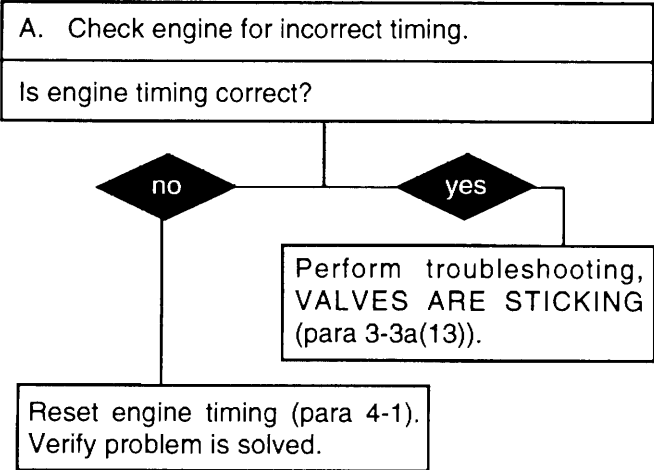
Initial Setup

**Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions**

- Semitrailer uncoupled (refer to TM 9-2330-398-10)



END OF TASK



3-3. TROUBLESHOOTING CHART (continued)

a. ENGINE (continued) (10) TAPPING OR CLICKING SOUND IS COMING FROM

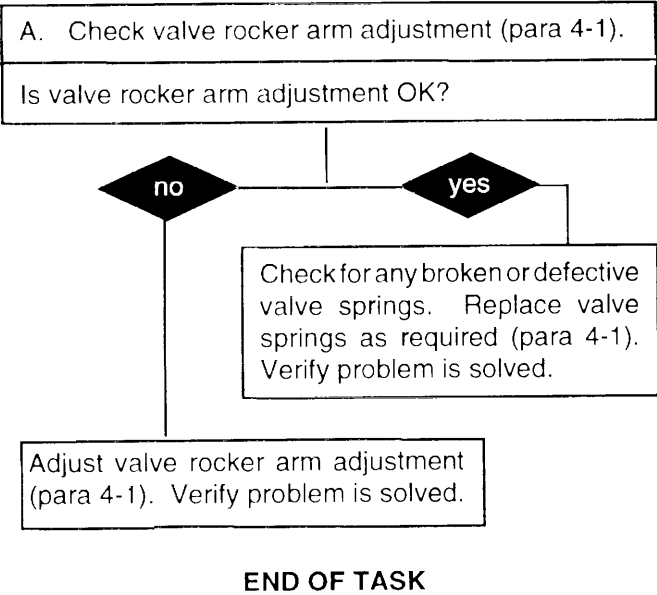
Initial Setup:

Tools/Test Equipment:

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

Equipment Conditions:

- Rocker arm covers removed (para 4-1).



**3-3. TROUBLESHOOTING CHART (continued).**

a. ENGINE (continued) (12) ENGINE COMPRESSION IS LOW (continued).

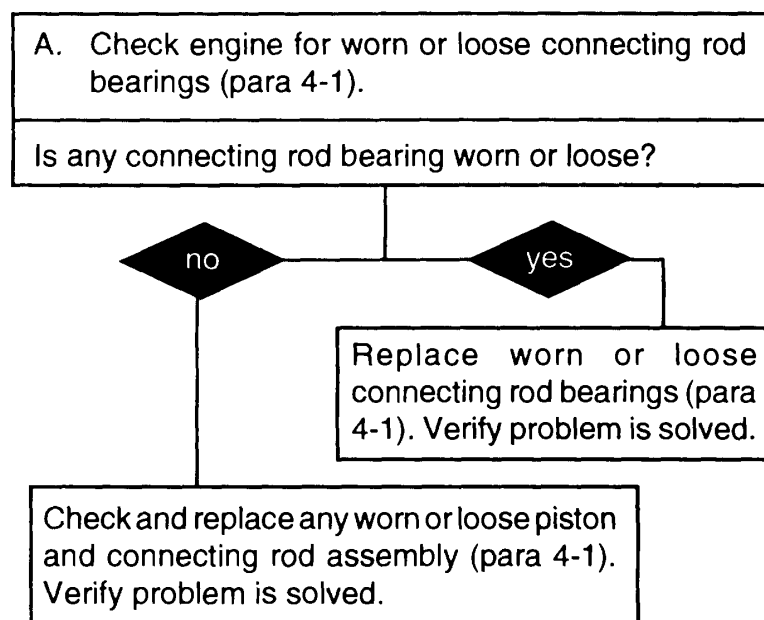
*Initial Setup:*

**Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Pistons removed (para 4-1).



**END OF TASK**

**3-3. TROUBLESHOOTING CHART (continued).**

. a. ENGINE (continued)

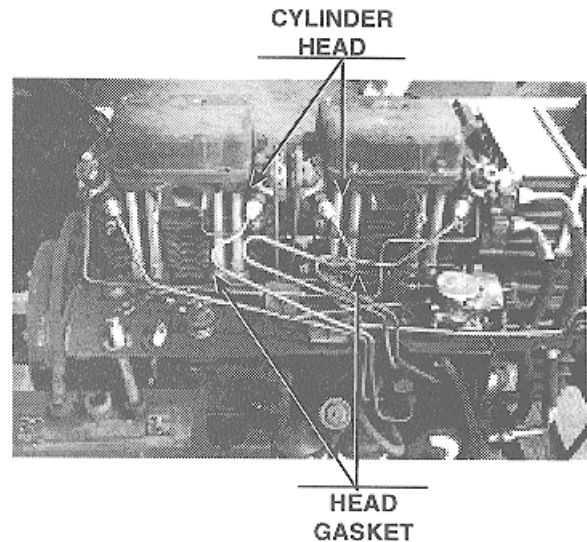
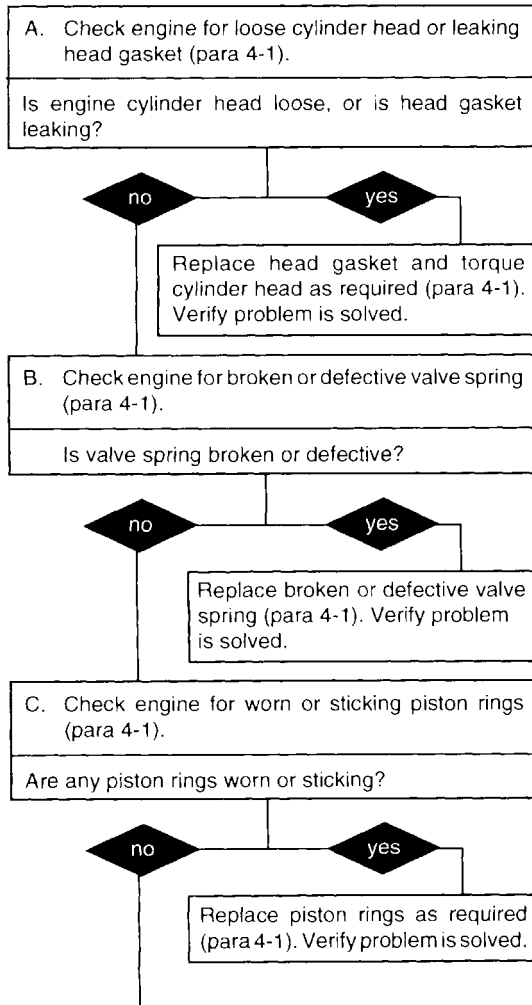
(12) ENGINE COMPRESSION IS LOW

*Initial Setup:***Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

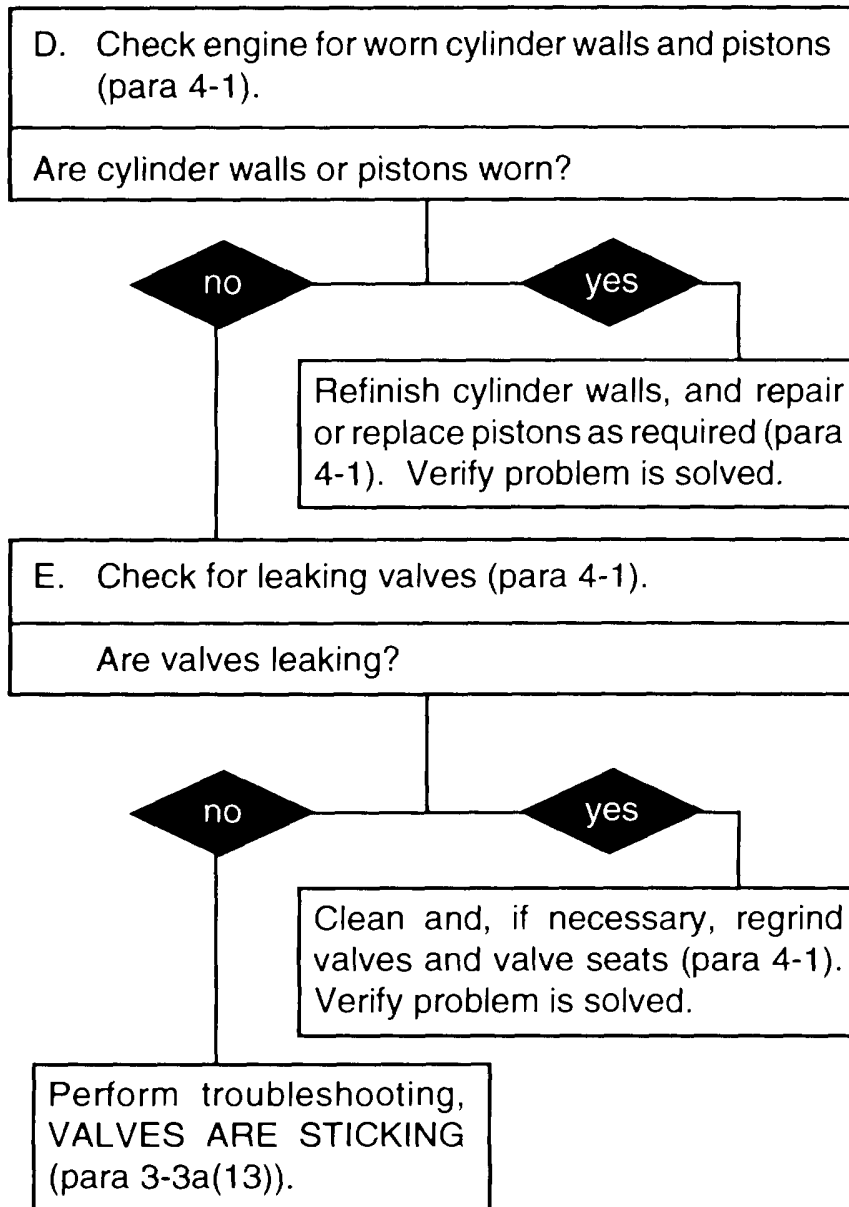
- Semitrailer uncoupled (refer to TM 9-2330-398-10).



**3-3. TROUBLESHOOTING CHART (continued).**

a. ENGINE (continued)

(12) ENGINE COMPRESSION IS LOW (continued).

**CONTINUED FROM STEP C****END OF TASK**

**3-3. TROUBLESHOOTING CHART (continued).**

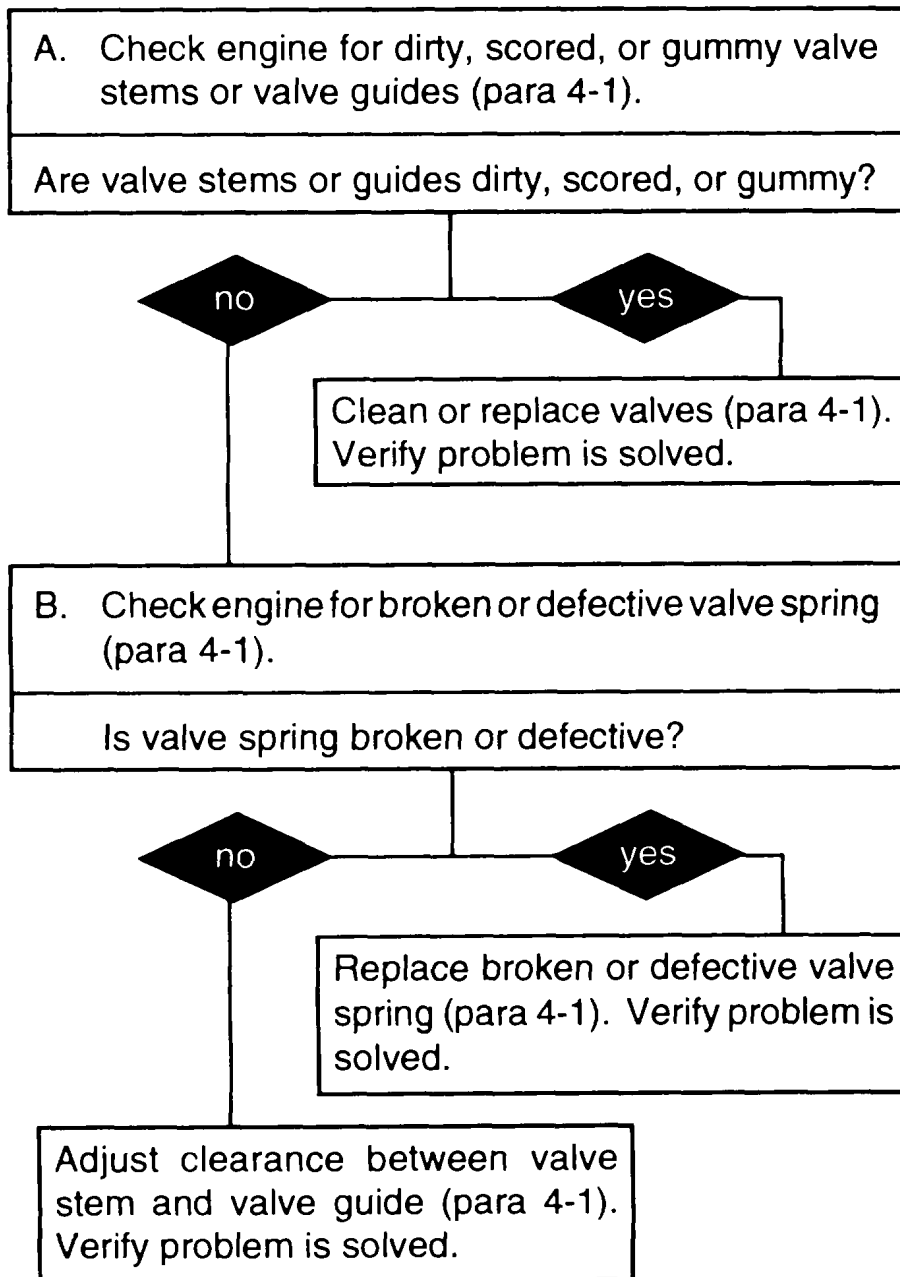
a. ENGINE (continued) (13) VALVES ARE STICKING.

*Initial Setup:***Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Engine disassembled (para 4-1).

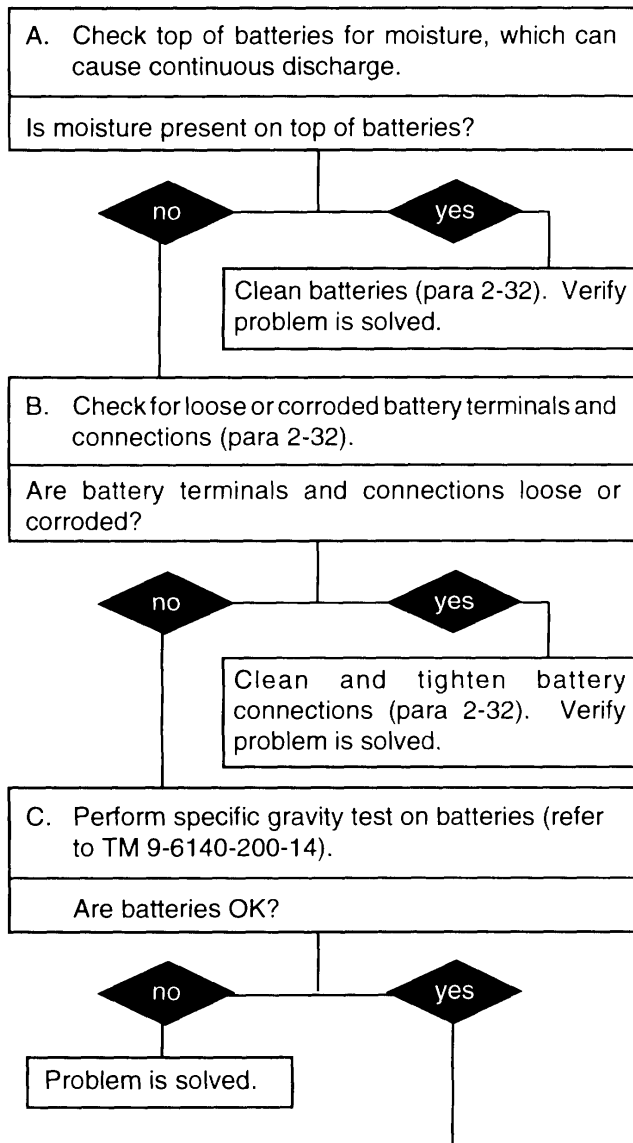
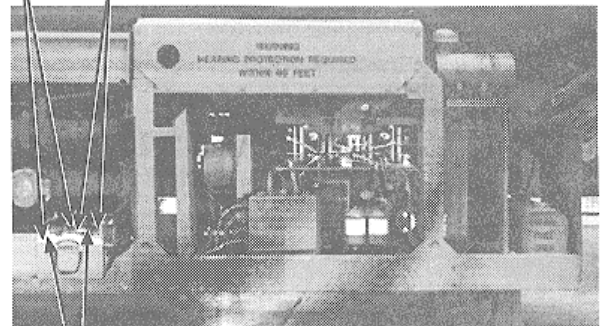
**END OF TASK**

**3-3. TROUBLESHOOTING CHART (continued).****b. ALTERNATOR AND CHARGING CIRCUIT.****(1) BATTERIES ARE UNDERCHARGED.***Initial Setup:***Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

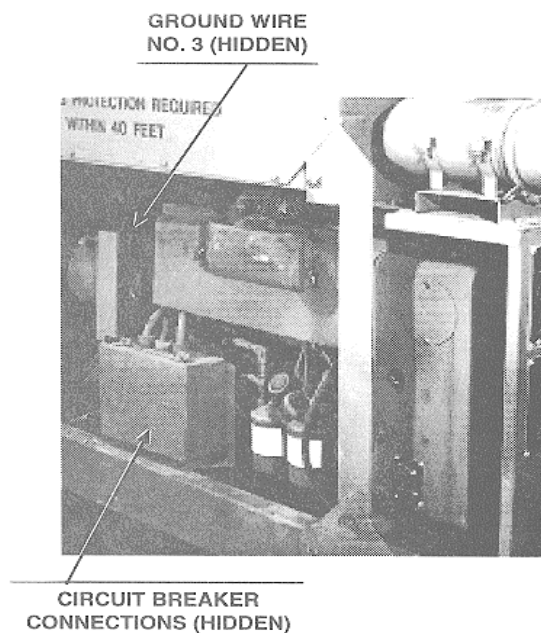
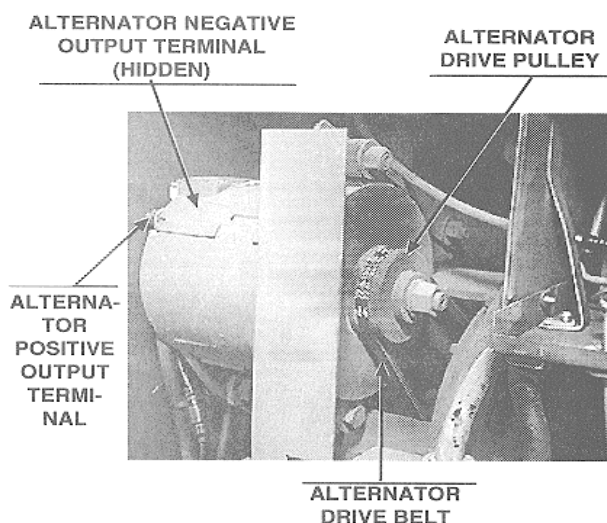
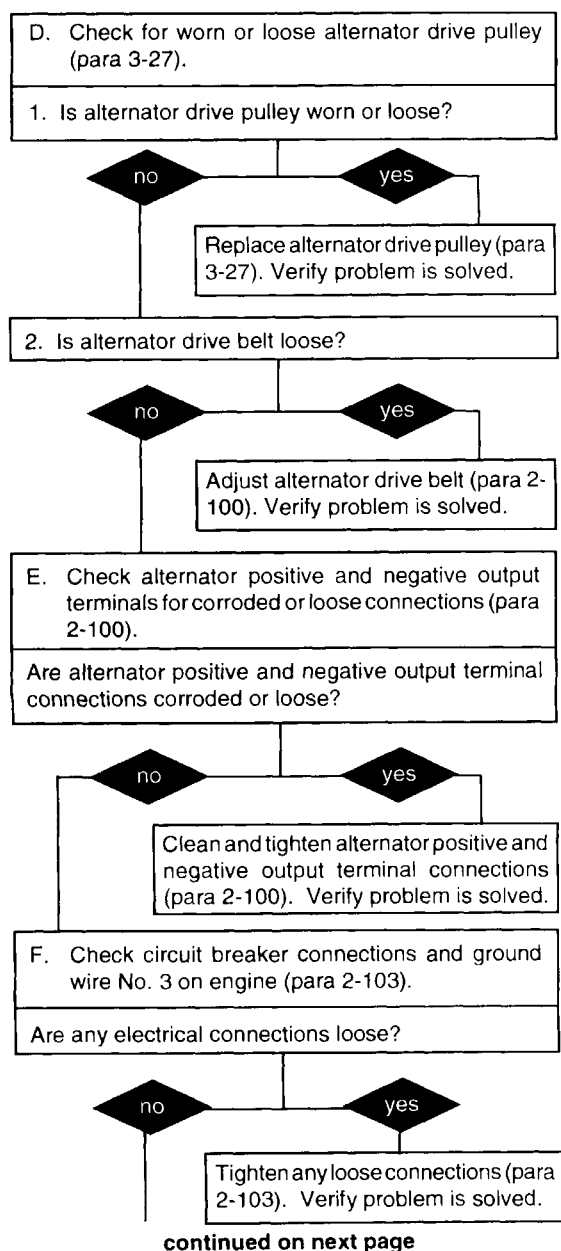
- Semitrailer uncoupled (refer to TM 9-2330-398-10)..

**BATTERIES CONNECTIONS****BATTERY TERMINALS****continued on next page**

## 3-3. TROUBLESHOOTING CHART (continued).

b. ALTERNATOR AND CHARGING CIRCUIT.(continued).. (1) BATTERIES ARE UNDERCHARGED. (continued)

## CONTINUED FROM STEP C



3-3 TROUBLESHOOTING CHART (continued).

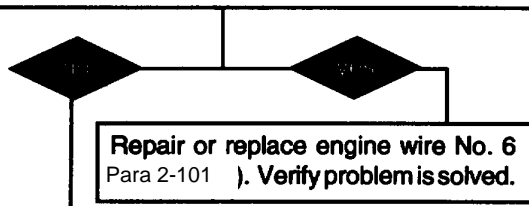
b. ALTERNATOR AND CHARGING CIRCUIT (continued)

(1) BATTERIES ARE UNDERCHARGED (continued).

CONTINUED FROM STEP F

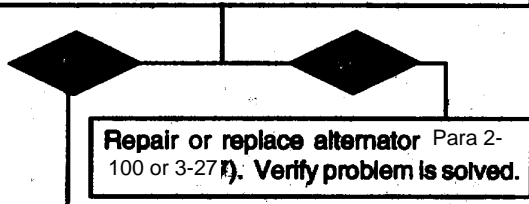
G. Check engine wire No. 6 (from circuit breaker to starter solenoid and from circuit breaker to engine junction box) for damage.

Is engine wire No. 6 damaged?



H. Check alternator for low output.

Is alternator output low?

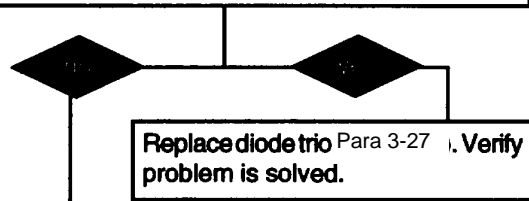


I. **NOTE**

Small current draw (90 milliamps) through field circuit when engine is not running is normal. This is the bleed circuit built into the voltage regulator.

With engine not running, check to see if rectifier has a field current draw of 2 to 4 amps.

Does rectifier have a field current draw of 2 to 4 amps?

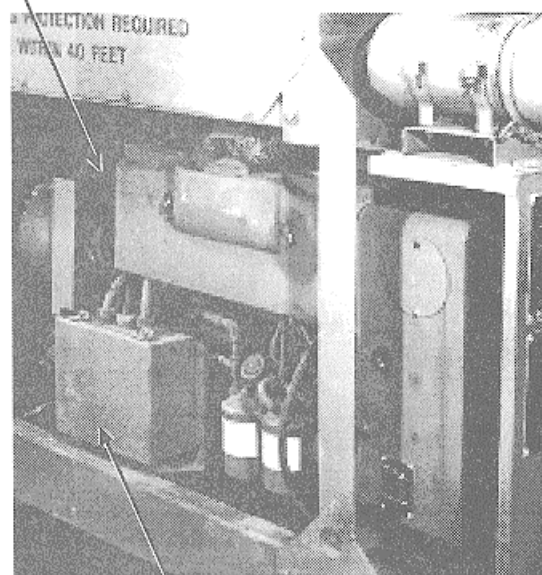


Replace voltage regulator (Para 3-27). Verify problem is solved.

END OF TASK

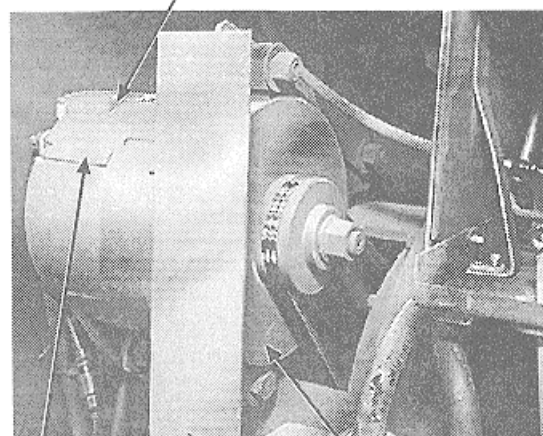
END OF TASK

ENGINE WIRE NO. 6 (HIDDEN)



ENGINE JUNCTION BOX

DIODE TRIO



VOLTAGE REGULATOR

ALTERNATOR



**3-3. TROUBLESHOOTING CHART (continued).**

b. ALTERNATOR AND CHARGING CIRCUIT. (continued)

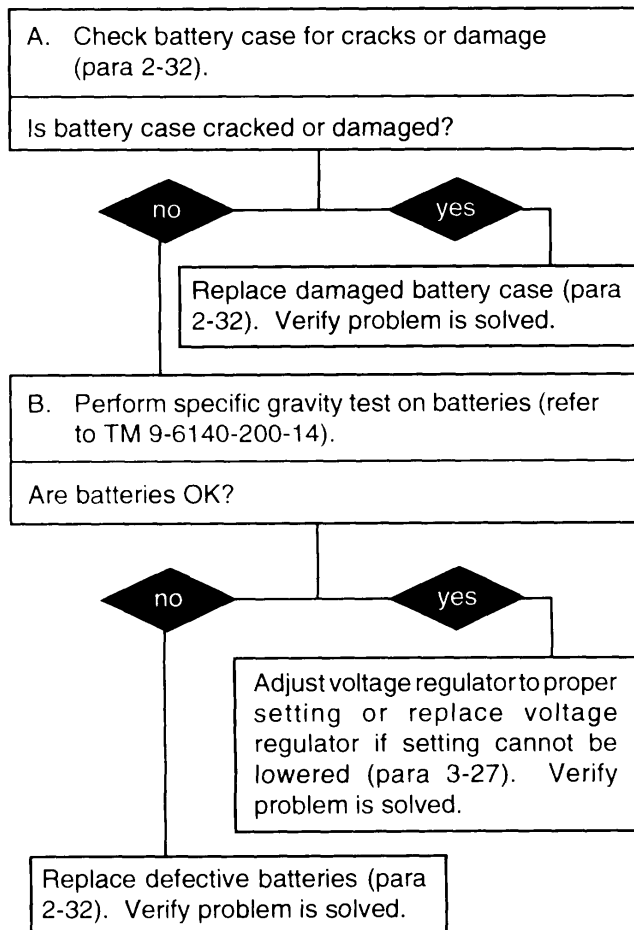
(2) BATTERIES ARE UNDERCHARGED. (continued).

*Initial Setup:***Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10)..

**END OF TASK**BATTERIES CONNECTIONSBATTERY TERMINALS

**3-3. TROUBLESHOOTING CHART (continued).**

b. ALTERNATOR AND CHARGING CIRCUIT.(continued).

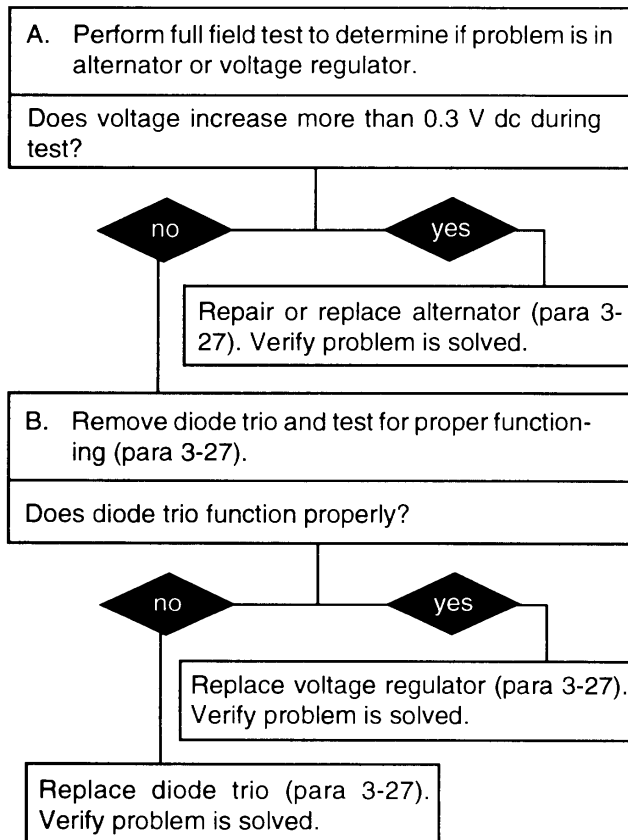
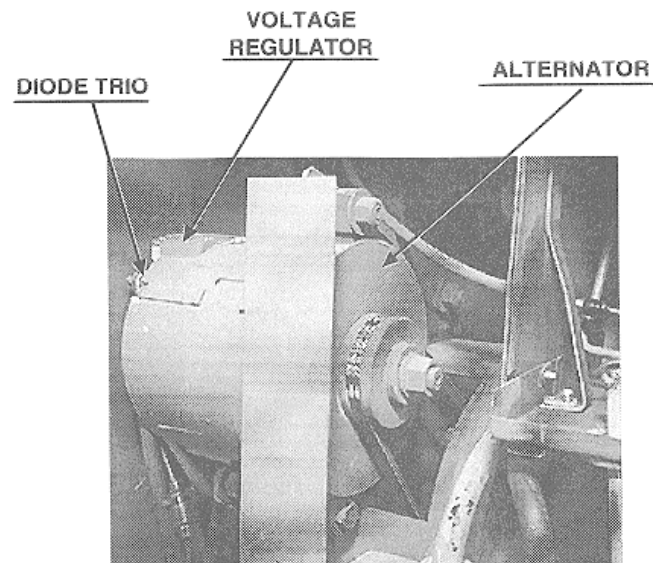
(3) ALTERNATOR OUTPUT IS LOW.

*Initial Setup:***Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

**END OF TASK**

**3-3. TROUBLESHOOTING CHART (continued).**

b. ALTERNATOR AND CHARGING CIRCUIT.(continued).

(4) ALTERNATOR OUTPUT IS LOW.

*Initial Setup:***Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit(Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

A. Check for loose alternator pulley (para 2-100).

Is alternator pulley loose?

no

yes

Tighten alternator pulley  
(para 2-100). Verify problem is solved.

B. Check alternator for any loose or missing mounting bolts (para 2-100).

Are any mounting bolts loose or missing?

no

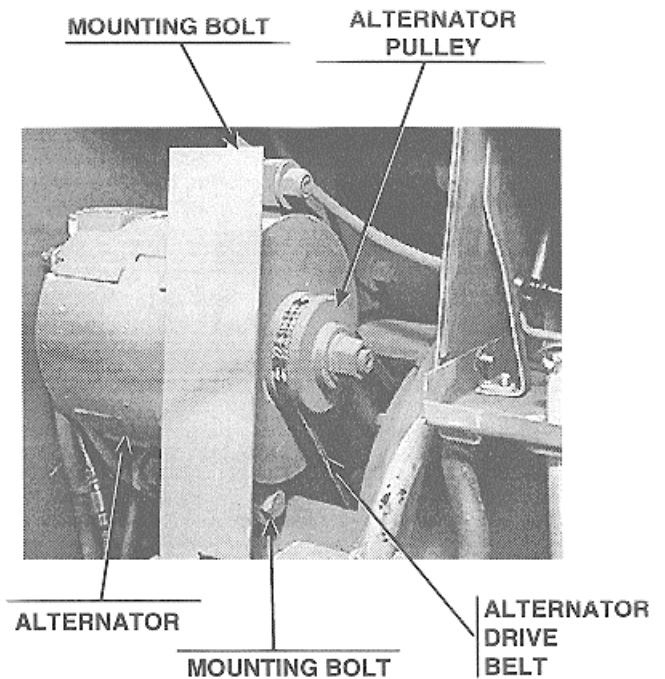
yes

Tighten or replace any loose or  
missing mounting bolts (para 2-100).  
Verify problem is solved.C. 1. Remove alternator drive belt (para 2-100).  
2. Rotate alternator drive pulley by hand and  
check for worn or sticking bearings.

Are bearings worn or sticking?

no

yes

Repair alternator (para 3-27). Verify  
problem is solved.Replace alternator (para 2-100).  
Verify problem is solved.**END OF TASK**

## Section II. GENERAL MAINTENANCE INSTRUCTIONS

Paragraph Number	Paragraph Title	Page Number
3-4	General .....	3-25
3-5	General Maintenance Procedures .....	3-25
3-6	Specific Procedures .....	3-27
3-7	Pneumatic Leakage Test .....	3-29
3-4.	GENERAL.	

**3-4. GENERAL.**

- a. This section contains general maintenance instructions that are the responsibility of Direct Support maintenance personnel; these instructions pertain to several components or assemblies. Specific information on welding, surface protection, repair of damaged threads, removal of burrs and other imperfections, and cleaning materials and methods are also addressed. Procedures for performing a pneumatic leakage test are also included.
- b. Make sure that all safety precautions listed in the Warning Summary are followed while performing maintenance. Pay close attention to all WARNINGS and CAUTIONS.

**3-5. GENERAL MAINTENANCE PROCEDURES.****a. WORK AREA**

1. Make sure the work area is clean before you begin repair procedures.
2. Make sure that materials needed for the maintenance task are at hand. These may include cleaning solvents, lubricants, buckets or other containers for cleaning or for keeping components separated, clean wiping cloths, and the proper tools.

**b. CLEANING OF COMPONENTS, ASSEMBLIES, OR PARTS****CAUTION**

**To prevent damage to machine-surfaced parts, make sure to clean exterior of component or assembly before disassembly.**

1. Clean exterior of component or assembly before disassembly to keep foreign matter from bearings, gears, and other machine-surfaced parts that are subject to scoring and other such damage.

**WARNING**

**Compressed air used for drying or cleaning purpose must not exceed 30 psi (207 kPa). Wear protective clothing (goggles and gloves) and use caution, to avoid injury to personnel.**

2. If compressed air is used to clean parts, make sure it is free of dirt and other contaminants.
3. Protect disassembled parts from dust, blowing sand, and moisture, which can cause rapid wear and deterioration of bearings, gears, and other machine parts.

### 3-5. GENERAL MAINTENANCE PROCEDURES (continued).

#### c. GENERAL INSTRUCTIONS

1. During disassembly, remove only as many parts or components as required for indicated repair. Complete disassembly of a component is not always required to make repairs. Good judgment should be used to keep disassembly operations to a minimum.
2. During disassembly, tag critical parts to ensure proper reassembly. Mark mating parts by scribe marks or indelible ink to be certain of correct positioning at assembly.
3. Unserviceable or unrepairable assemblies will be broken down into items of issue, and serviceable parts will be returned to stock. Parts or assemblies that cannot be repaired, selective fitted, or reclaimed to standards contained in this manual will be salvaged and replaced with new parts.
4. If a required new part is not available, reconditioning of the old part is necessary. Such parts should be inspected carefully after reconditioning to determine their suitability and probable service life. Replacement parts should be requisitioned immediately.
5. Replace seals and gaskets of all components that were disassembled.
6. Replace springs if broken, distorted, or cracked or if they do not conform to specific tensile standards.
7. Replace screws or nuts having damaged threads or rounded comers. Replace lockwashers, self-locking nuts, and self-locking screws.
8. Replace keys if damaged.
9. During assembly, subassemblies should be assembled first. The subassemblies can then be combined into major components and installed to make a complete major assembly.

#### d. CARE OF BEARINGS

##### WARNING

- Drycleaning solvent P-D-680 is toxic and flammable. Always wear protective goggles and glove, and use only in a well-ventiated area. Avoid contact with skin, eyes, and clothes, and DO NOT breath vapors. DO NOT use near open flames or excessive heat
- Compressed air used for drying or cleaning purposes must not exceed 30 pal (207 kPa). Wear protective clothing (goggles and gloves) and use caution, to avoid Injury to personnel.

##### NOTE

Refer to TM 9-214 for more information on the Inspection, care, and maintenance of bearings.

1. Clean ball and roller bearings by placing in a wire basket and immersing in a container of fresh drycleaning solvent (Item 12, Appendix C). Agitate bearings in solvent to remove all traces of old lubricant.

---

**3-5. GENERAL MAINTENANCE PROCEDURES (continued).**


---

2. After cleaning bearings, dry them with clean compressed air. Take care to prevent spinning the bearings when using compressed air jet.
3. Dip cleaned bearings in clean engine oil and immediately wrap them in a lint-free cloth (Item 25, Appendix C) to protect them from dust and other foreign matter.

---

**3-6. SPECIFIC PROCEDURES.**


---

**a. WELDING**

1. Refer to TM 9-237 for welding instructions and materials. All welds must reflect good workmanship and approved welding procedures. Welds must be secure and free from cracks, excessive spatter, and obvious defects.
2. Read and observe all safety precautions in the Warning Summary before performing any welding operation.

**b. SURFACE PROTECTION**

1. Clean and repaint all surfaces on which paint has deteriorated or become damaged.
2. Do not paint grounding studs or electrical harnesses or leads.
3. Paint exterior of vehicle in olive drab in accordance with TT-E-529 or TT-E-485.

**c. REPAIR OF DAMAGED THREADS**

1. When determined feasible by inspection, damaged threads should be repaired by retapping, using a thread die or a thread restorer file.
2. Tapped holes for screw thread inserts that have mutilated threads may be repaired by either of the following methods:
  - a. Drilling and tapping hole oversize, then installing larger screw.
  - b. Filling tapped hole by welding, then redrilling and tapping hole to original size.

**d. REMOVAL OF BURRS, SCRATCHES, AND RAISED METAL****WARNING**

**Drycleaning solvent P-D480 is toxic and flammable. Always wear protective goggle and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breathe vapors. DO NOT use near open flames or excessive heat.**

1. Use fine mill file, soft stone, or crocus cloth (Item 5, Appendix C) dipped in drycleaning solvent (Item 12, Appendix C) to remove burrs, scratches, or raised metal.

**3-6. SPECIFIC PROCEDURES (continued).**

2. When filing aluminum, clean file often with steel file brush to avoid loading file with aluminum particles, which will gouge work surface.

**e. CLEANING MATERIALS AND METHODS**

1. Refer to TM 9-247 for cleaning materials to be used.

**WARNING**

**Drycleaning solvent P-D-680 is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breathe vapors. DO NOT use near open flames or excessive heat**

2. Cleaning is normally done by the dip-tank and/or vapor-degreaser methods, or by cleaning with cloths soaked in drycleaning solvent (Item 12, Appendix C).

**f. CLEANING OF MATERIEL RECEIVED FROM STORAGE**

1. Materiel received from storage by Direct Support maintenance units will be cleaned by the dip-tank, vapor-degreaser, or steam method, whichever is applicable or available.

**WARNING**

**Drycleaning solvent P-D-R80 is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breathe vapors. DO NOT use near open flames or excessive heat.**

- (a) Dip-Tank Method. Disassemble as required and place parts in a perforated metal basket. Submerge and agitate basket in a tank containing drycleaning solvent (item 12, Appendix C). Repeat using a second tank with clean solvent. Extent of treatment in each tank will depend on ease with which parts are cleaned.
  - (b) Vapor-Degreaser Method. Tanks containing a heated solution of perchloroethylene (Type II) or other degreaser are used for degreasing items that are very greasy or oily and are not readily cleaned by the dip-tank method. Place parts in a perforated metal basket and submerge below the vapor in the tank. Keep basket in this position until all grease, oil, or dirt melts and runs off the parts. If necessary, material may be washed with degreasing spray unit.
  - (c) Steam Method. Place parts in a perforated metal basket and steam-treat until clean. This method is less efficient than vapor-degreaser method, and parts may require additional cleaning to remove final traces of grease, oil, or dirt, particularly from recesses.
2. If some time is to elapse before the start of repair or overhaul operation, apply a coat of corrosion preventive (Item 11, Appendix C) oil to all finished metal surfaces to prevent rusting.

---

**3-6. SPECIFIC PROCEDURES (continued).**

---

**g. CLEANING AFTER SHOP INSPECTION****WARNING**

**Compressed air used for drying or cleaning purposes must not exceed 30 psi (207 kPa). Wear protective clothing (goggles and gloves) and use caution to avoid injury to personnel.**

After in-process shop inspection, dip parts in a tank containing corrosion preventive (Item 11, Appendix C). Remove parts (with rubber gloves), and dry thoroughly with compressed air or by wiping with clean, lint-free cloths (Item 25, Appendix C). Apply preservatives as soon as possible after cleaning.

**h. LUBRICATION**

Refer to PMCS and Appendix G for lubrication instructions.

---

**3-7. PNEUMATIC LEAKAGE TEST.**

---

A pneumatic leakage test is to be performed at least annually. For procedures, contact:

Commander  
U.S. Tank-automotive and Armaments Command  
ATTN: AMSTA-IM-MTT  
Warren, MI 48397-5000



## Section III. REAR AXLE MAINTENANCE

Paragraph Number	Paragraph Title	Page Number
3-8	General.....	3-30
3-9	Axle Replacement .....	3-30
3-10	Bogie Assembly Replacement.....	3-32

**3-8. GENERAL.**

This section describes and illustrates removal and installation procedures for the rear axle and bogie assemblies.

**3-9. AXLE REPLACEMENT.**

*This Task Covers:*

a. Removal

b. Installation

Initial Setup:

**Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)
- Lifting device (Item 6, Appendix B)

- Air reservoirs drained (refer to TM 9-2330-398-10).
- Tire and wheel assemblies removed (para 2-62).
- Hub and brakedrum assemblies removed (para 2-63).
- Brake air chambers removed (para 2-51).
- Semitrailer bonded and grounded (refer to

**Equipment Conditions:** TM 9-2330-398-10).

- Semitrailer parked on hard level surface (refer to TM 9-2330-398-10).
- Semitrailer uncoupled (refer to TM 9-2330-398-10).

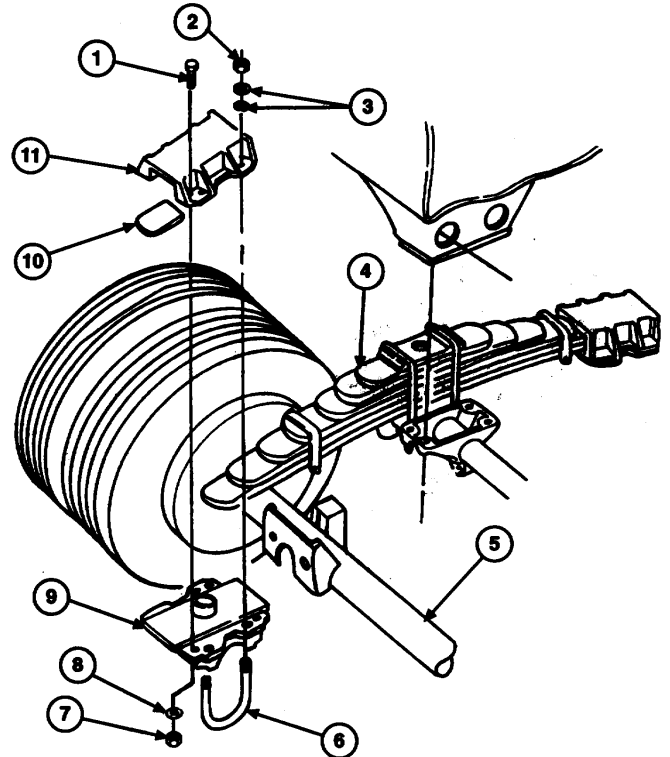
**Personnel Required:** Two

**a. REMOVAL**

1. Using lifting device, raise rear of semitrailer until weight of both suspension springs (4) has been removed from axle (5). Support or crib semitrailer frame securely.
2. Position and raise two jacks to support axle (5). Remove supports or cribbing from under axle (5).
3. Remove four nuts (7), washers (8), and screws (1) from spring end cap (11) and spring seat (9) on axle (5).
4. Remove four nuts (2), eight washers (3), and two U-bolts (6) from spring seat (9) and spring end cap (11) on axle (5).
5. Remove spring seats (9) and two cushioning pads (10) from axle (5).
6. Repeat steps 3 through 5 for other side of axle (5).
7. Using jacks, slowly lower and remove axle (5) from under semitrailer.

**3-9. AXLE REPLACEMENT (continued).****b. INSTALLATION**

1. Using jacks, position axle (5) in place under semitrailer. Raise jacks and rotate axle (5) into position on ends of both suspension springs (4).
2. At each end of axle (5), loosely install spring seats (9) two cushioning pads (10), and spring end cap (11) with two U-bolts (6), eight washers (3), and four nuts (2).
3. At each end of axle (5), loosely install spring end cap (11) on spring seat (9) on axle (5) with four screws (1), washers (8), and nuts (7).
4. Torque eight nuts (2 and 7) evenly between 200 and 320 lb-ft (271 and 434 N-m).
5. Position supports or cribbing under axle (5). Lower and remove jacks.
6. Using lifting device, raise rear of semitrailer and remove supports or cribbing. Lower semitrailer to ground.

**FOLLOW ON MAINTENANCE:**

- Install brake air chambers para 2,
- Install hub and brakedrum assemblies (para 2-63).
- Install re and wheel assemblies (para 2-62).
- Disconnect ground (refer to TM 9-2330-398-10).

**3-10. BOGIE ASSEMBLY REPLACEMENT.***This Task Covers:*

a. Removal

Initial Setup:

**Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)
- \* Lifting device (Item 6, Appendix B)

**Materials/Parts:**

- Self-locking nut (8) (Item 176, Appendix F)

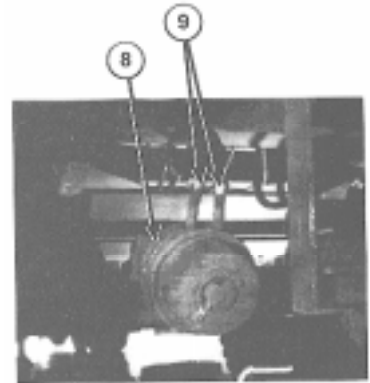
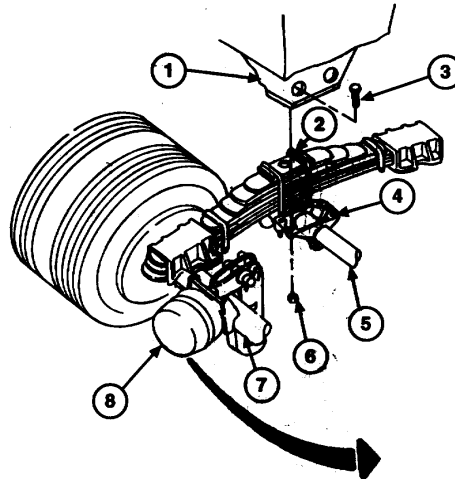
b. Installation

**Equipment Conditions:**

- Semitrailer parked on hard level surface (refer to TM 9-2330-398-10).
- Semitrailer uncoupled from prime mover (refer to TM 9-2330-398-10).
- Air reservoirs drained (refer to TM 9-2330-398-10).
- Fail-safe chamber brakes caged (para 2-60).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

**a REMOVAL**

1. Using lifting device, raise rear of semitrailer until weight of semitrailer has been removed from two suspension springs (2) and axle (7). Support or crib semitrailer securely.
2. Tag and disconnect eight hoses (9) from four brake air chambers (8) on two axles (7).

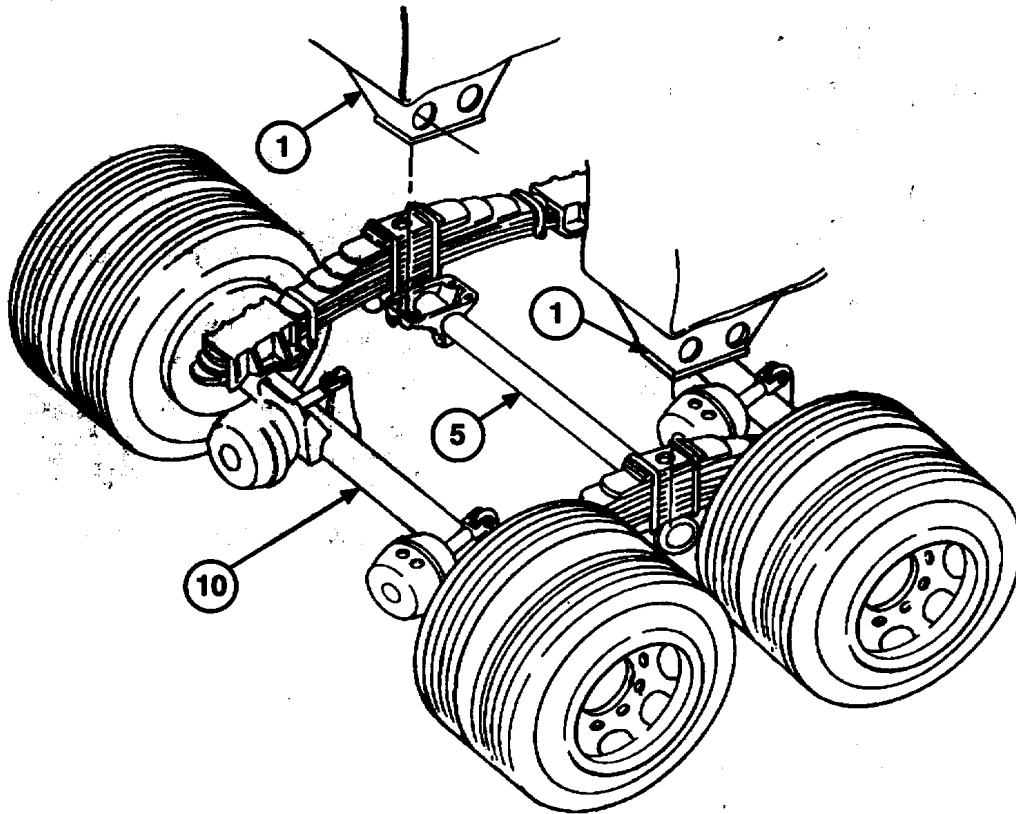


**3-10. BOGIE ASSEMBLY REPLACEMENT (continued).**

3. Position two jacks under trunnion tube (5) close to inside of each trunnion hanger (4). Raise jacks to support weight of trunnion tube (5).
4. Remove eight self-locking nuts (6) and screws (3) from trunnion hangers (4) and two trunnion cross tube mounting brackets (1). Discard self-locking nuts.
5. Lower and remove jacks from under trunnion tube (5).
6. Using lifting device, raise semitrailer until it clears bogie assembly (10).
7. Manually release brake air chambers (para 2-60).
8. Roll bogie assembly (10) out from under rear of semitrailer.
9. Lower semitrailer onto supports or cribbing.

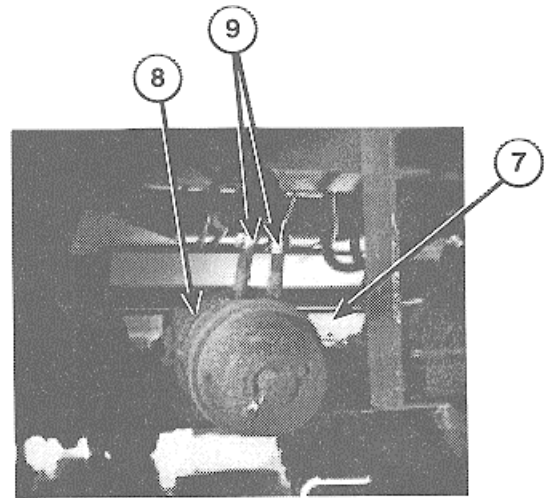
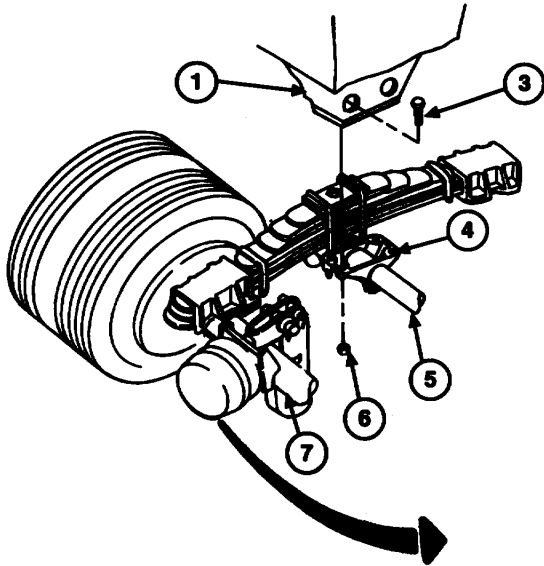
**b. INSTALLATION**

1. Using lifting device, raise rear of semitrailer high enough to allow bogie assembly (10) to roll under rear of semitrailer. Remove supports or cribbing.
2. Roll bogie assembly (10) into position under mounting brackets (1) and trunnion hangers (4) on each end of trunnion tube (5).
3. Manually set brake air chambers (para 2-60).



**3-10. BOGIE ASSEMBLY REPLACEMENT (continued)**

4. Position two jacks at each end of trunnion tube (5) as close as possible to inside of each trunnion hanger (4).
5. Using lifting device, raise semitrailer to within one inch (2.54 cm) of trunnion hangers (4).
6. Using lifting device, lower semitrailer off supports or cribbing. Remove supports or cribbing.
7. Align holes in mounting brackets (1) with holes in trunnion hangers (4).
8. Loosely install eight screws (3) and new self-locking nuts (6) in mounting brackets (1) and trunnion hangers (4).
9. Raise jacks until mounting brackets (1) are seated against trunnion hangers (4).
10. Torque eight self-locking nuts (6) to 90 lb-ft (122 Nom). Lower and remove jacks.
11. Connect eight hoses (9) to four brake air chambers (8) on two axles (7) as tagged.

**FOLLOW-ON MAINTENANCE:**

- Uncage fail-safe chamber brakes (para 2-60).
- Disconnect ground (refer to TM 9-2330-398-10).

## Section IV. SPRINGS AND SHOCK ABSORBERS MAINTENANCE

**3-11. LEAF SPRING ASSEMBLY REPLACEMENT.***This Task Covers:*

a. Removal

b. Installation

*Initial Setup:***Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- \* General mechanic's tool kit (Item 4, Appendix B)
- \* Lifting device (Item 6, Appendix B)

**Materials/Parts:**

- Grease (Item 17, Appendix C)
- Self-locking nut (Item 179, Appendix B)
- Self-locking nut (Item 181, Appendix B)

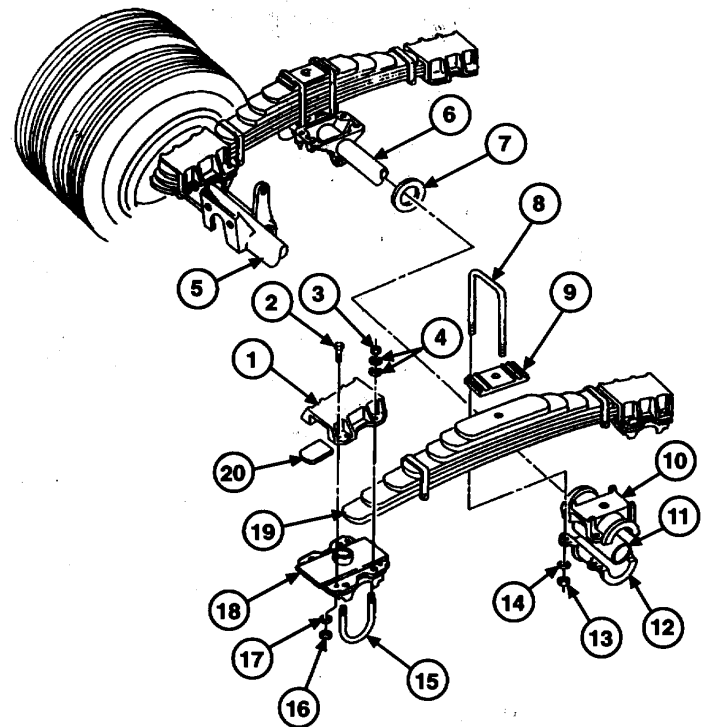
**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded refer to TM 9-2330-398-10).
  - Air released from air reservoirs (refer to TM 9-2330-398-10).
- Bogie assembly removed (para 3-10).

**a. REMOVAL****NOTE**

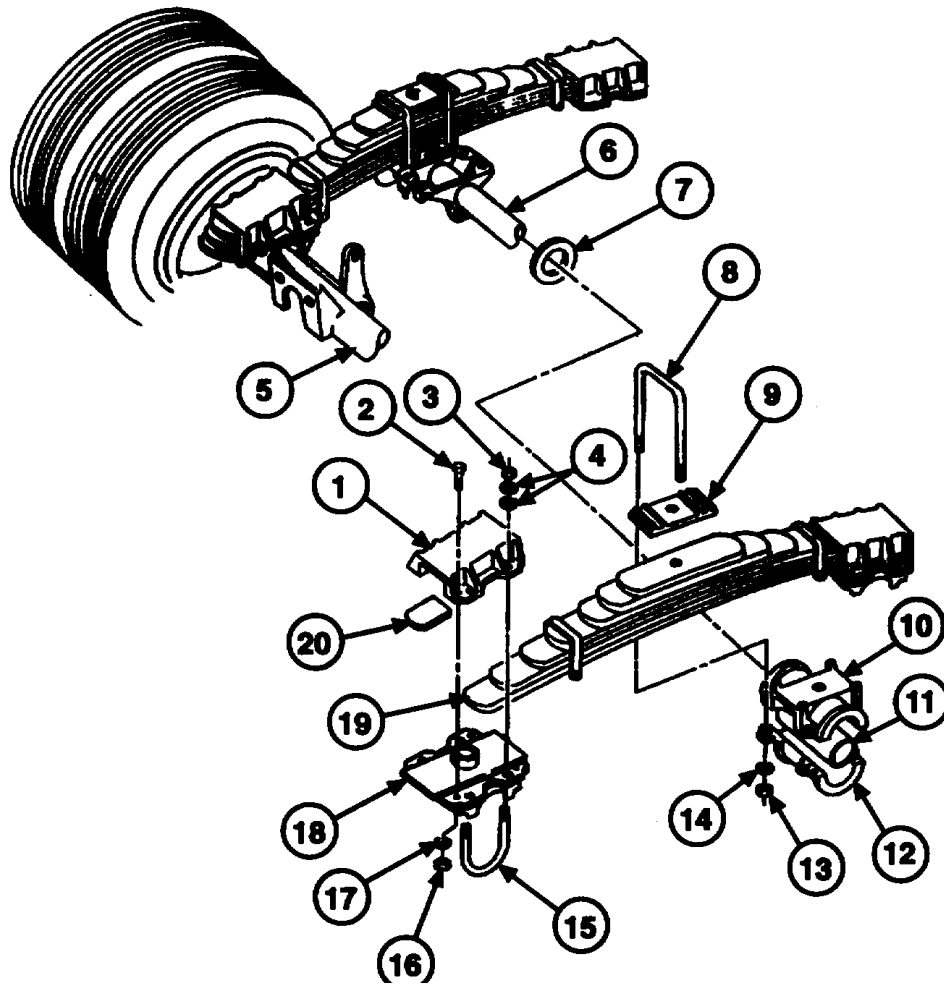
Semitrailer has two leaf spring assemblies. This procedure covers only one leaf spring assembly.

1. Position and raise lifting device to support weight of leaf spring assembly (19). Block or chock wheel assemblies
2. Remove four nuts (1 3) and washers (14) from two U-bolts (8).



**3-11. LEAF SPRING ASSEMBLY REPLACEMENT (continued).**

3. Remove two U-bolts (8), wear plate (9), and lower trunnion hub (12) from leaf spring assembly (19) and trunnion tube (6).
4. Remove four nuts (16), washers (17), and screws (2) from spring end cap (1) and spring seat (18) on axle (21).
5. Remove four self-locking nuts (3), eight washers (4), two U-bolts (15), spring end cap (1), end cap cushioning pad (20) and spring seat (18) on axle (5). Discard self-locking nuts.
6. Repeat steps 4 and 5 for remaining spring end cap (18).
7. Using lifting device, remove leaf spring assembly (19) from upper trunnion hub (10).
8. Remove upper trunnion hub (10), rubber bushing (11), and trunnion washer (7) from trunnion tube (6).



---

**3-11. LEAF SPRING ASSEMBLY REPLACEMENT (continued).**

---

**NOTE**

To replace opposite side leaf spring assembly, repeat steps 2 through 8.

**b. INSTALLATION**

1. Install trunnion washer (7), rubber bushing (11), and upper trunnion hub (10) on trunnion tube (6).
2. Using lifting device, position leaf spring assembly (19) on upper trunnion hub (10) so that center bolt of leaf spring assembly (19) is in recess of upper trunnion hub (10) and ends of leaf spring assembly (19) are in place on spring seats (18).
3. Install four screws (2), washers (17), and nuts (16), end cap cushioning pad (20), spring end cap (1) and spring seat (18) on axle (5).
4. Install two U-bolts (15), eight washers (4), and four new self-locking nuts (3) on spring end cap (1) and axle (5).
5. Position wear plate (9) in place on leaf assembly spring (19). Nut on center bolt of leaf spring assembly (19) fits into hole in wear plate (9).
6. Install two U-bolts (8) over wear plate (9) and through holes in upper and lower trunnion hubs (10 and 12).
7. Install four washers (14) and nuts (13) on two U-bolts (8), and tighten evenly between 200 and 320 lb-ft (271 .1/4> ,/and 434 N-m).
8. Repeat steps 1 through 7 for opposite side.

**FOLLOW-ON MAINTENANCE:**

- Install bogie assembly (para 3-10).
- Disconnect grounded (refer to TM 9-2330-398-10).



## Section V. BODY, CAB, HOOD, AND HULL MAINTENANCE

Paragraph Number	Paragraph Title	Page Number
3-12	General.....	3-38
3-13	11/4-Inch Hose Reel Assembly Replacement.....	3-38
3-14	Hose Reel Cabinet Replacement.....	3-42
3-15	Hose Reel Cabinet Access Door Repair.....	3-46
3-16	Engine and Pump Cabinet Frame Replacement.....	3-48

**3-12. GENERAL.**

This section describes and illustrates removal and installation procedures for the 11/4-inch hose reel assembly, the hose reel cabinet, and the engine and pump cabinet frame. This section also describes and illustrates repair procedures for the hose reel cabinet access door.

**3-13. 11/4-INCH HOSE REEL ASSEMBLY REPLACEMENT.**

*This Task Covers:*

a. Removal

b. Installation

Initial Setup:

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)
- TM 9-2330-398-10).

**Material/Parts:**

- Lockwasher (2) (Item 91, Appendix F)
- Lockwasher (4) (Item 96, Appendix F)
- Seal (Item 149, Appendix F)
- Self-locking nut (4) (Item 172, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to
- Hose reel cabinet removed (para 3-14).

**Personnel Required:** Two

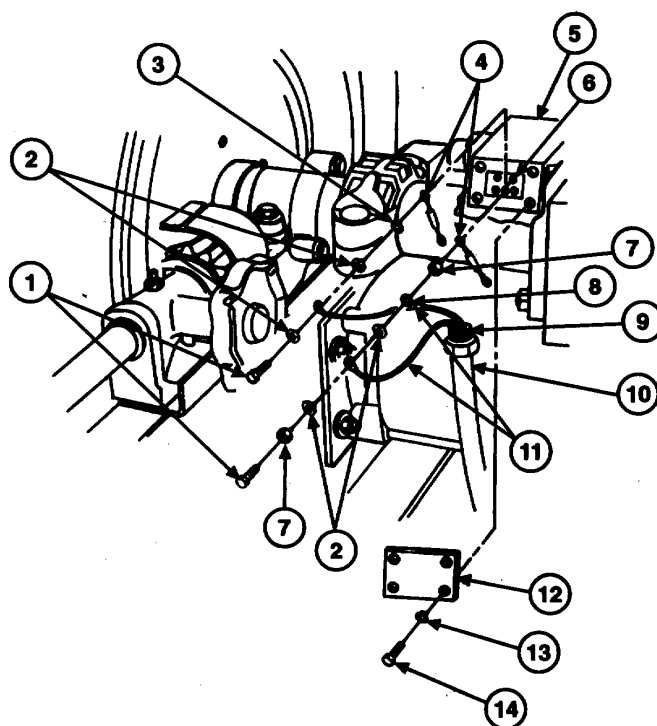
**a. REMOVAL**

1. Remove four screws (14), lockwashers (13), and cover (12) from motor junction box (5). Discard lockwashers.
2. Remove one screw (1), two washers (2), and one lockwasher (3), and electrical lead (11) from terminal board (6). Discard lockwashers.
3. Remove one screw (1), two nuts (7), two washers (2), one lockwasher (8), and electrical lead (11) from terminal board (6).
4. Remove bushing (9), and conduit (10) with two leads (11), from motor junction box (5).
5. Remove capacitors (4).

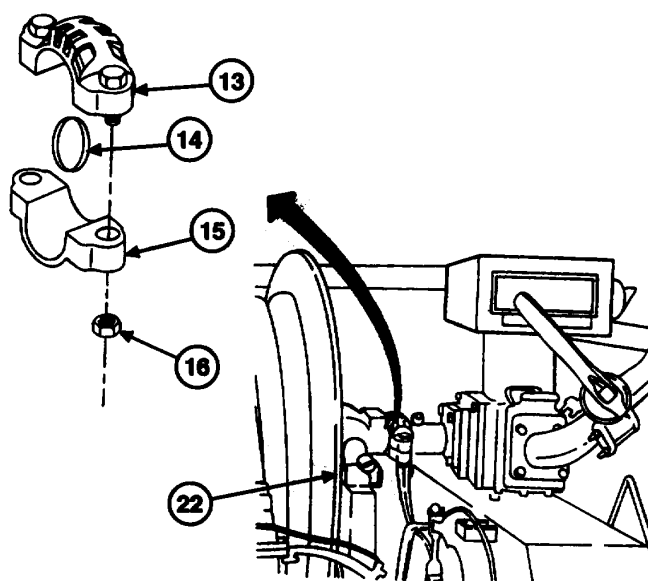
---

**3-13. 1 1/4-INCH HOSE REEL ASSEMBLY REPLACEMENT (continued).**


---



6. Remove nuts (16), uppersplit coupling half (13), seal (14), and lower split coupling half (15) from 1 1/4-inch hose reel (22). Discard seal.

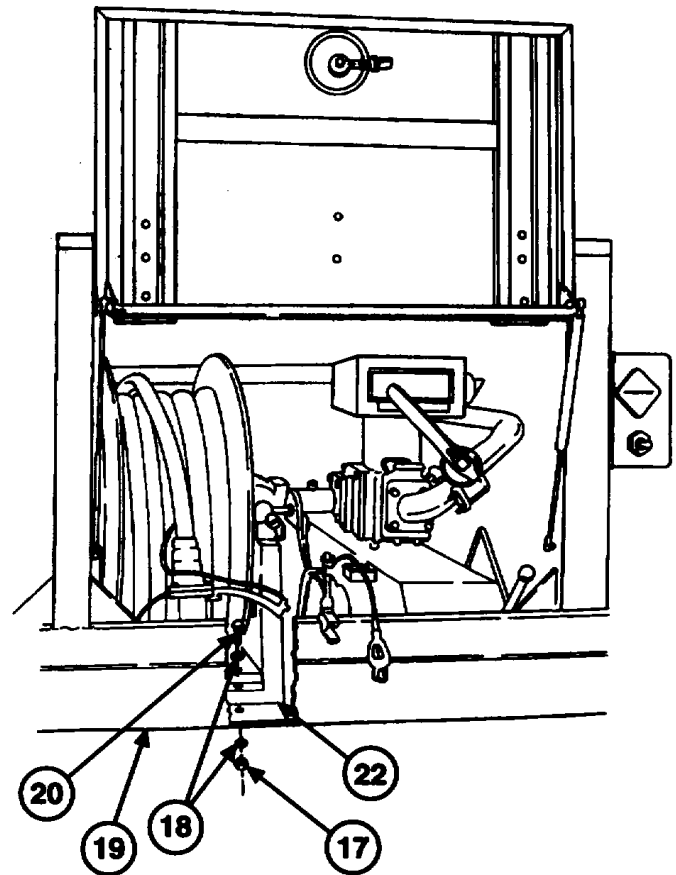


**3-13. 1 $\frac{1}{4}$ -INCH HOSE REEL ASSEMBLY REPLACEMENT (continued)**

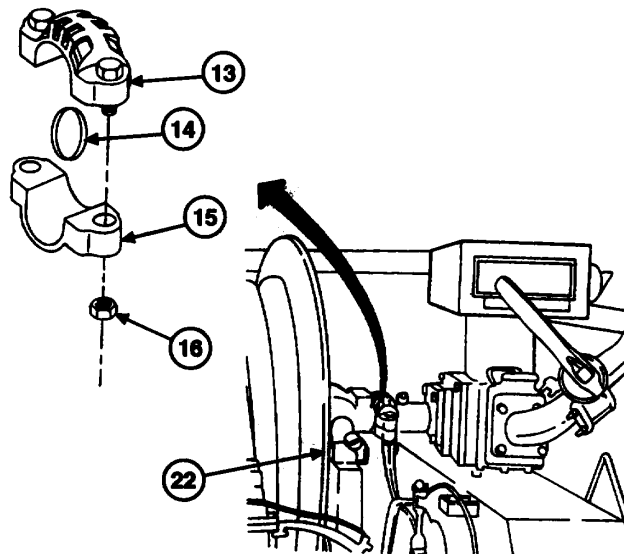
7. Remove four mounting screws (20), eight washers (18), and four self-locking nuts (17) from hose reel (22). Discard self-locking nuts.
8. With the aid of an assistant, lift hose reel (22) from cabinet (19).

**b. INSTALLATION**

1. With the aid of an assistant, lift and position hose reel (22) in cabinet (19).
2. Install four mounting screws (20), eight washers (18), and four new self-locking nuts (17) on hose reel. Tighten self-locking nuts between 25 and 35 lb-ft (34 and 47 Nom).

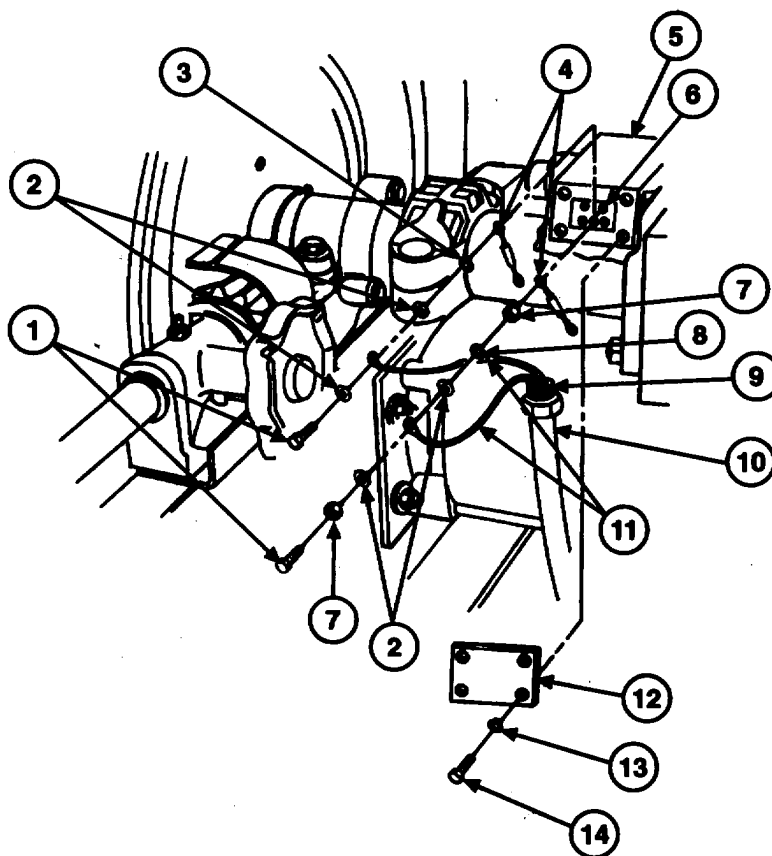


3. Install new seal (14), lower split coupling half (15), upper split coupling half (13), and two nuts (16) on hose reel (22). Tighten nuts (16) between 57 and 63 lb-ft (77 and 85 Nom).



**3-13. 1 $\frac{1}{4}$  INCH HOSE REEL ASSEMBLY REPLACEMENT (continued).**

4. Thread two leads (11) into motor junction box (5).
5. Connect bushing (9) and conduit (10) to motor junction box (5).
6. - Install lead (11) on terminal board (6) with screw (1), two washers (2), and new lockwasher (3).
7. Install lead (11) on terminal board (6) with one screw (1), two washers (2), one lockwasher (8), and two nuts (7).
8. Install cover (12) on motor junction box (5) with four screws (14) and new lockwashers (13).

**FOLLOW-ON MAINTENANCE:**

- Install hose reel cabinet (para 3-14).
- Disconnect ground (refer to TM 9-2330-398-10).

**3-14. HOSE REEL CABINET REPLACEMENT.***This Task Covers:*

a. Removal

b. Installation

*Initial Setup:***Tools/Test Equipment**

- General mechanic's tool kit (Item 4, Appendix B)
- Forklift (Item 5, Appendix B)

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Volumetric meter assemblies removed (para 2-122).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

**Material/Part:**

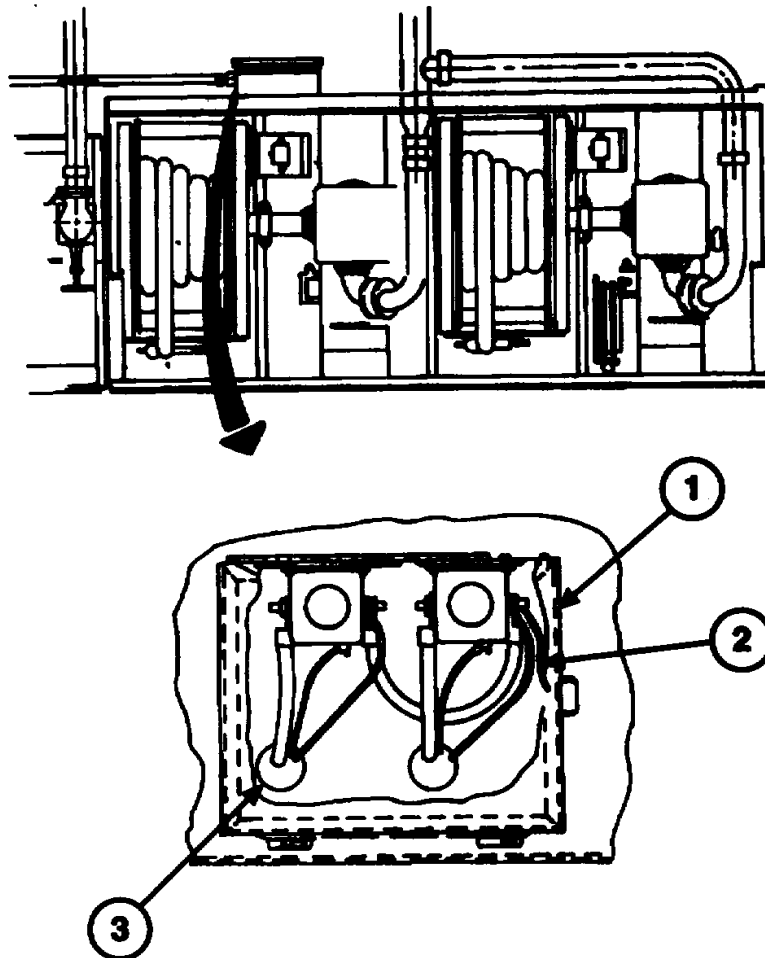
- Self-locking nut (16) (Item 169, Appendix F)
- Self-locking nut (11) (Item 176, Appendix F)

**Personnel Required:** Two**Equipment Conditions:**

- Negative battery cable disconnected (para 2-33).

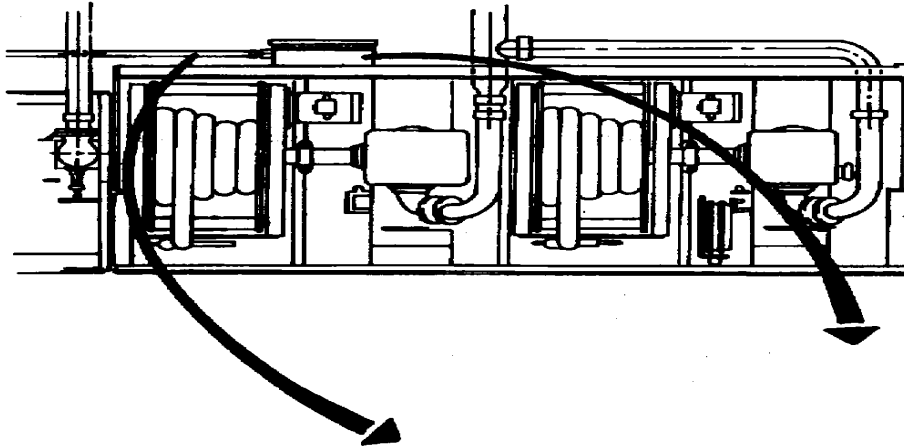
**a. REMOVAL**

1. Disconnect lead 14 (2) from electrical junction box (1) on rear of hose reel cabinet (3).



**3-14. HOSE REEL CABINET REPLACEMENT (continued).**

2. Disconnect conduit (4) from electrical junction box (1).

**WARNING**

Door and frame assembly is very heavy. To prevent injury to personnel, two persons are required when removing door and frame assembly from vehicle.

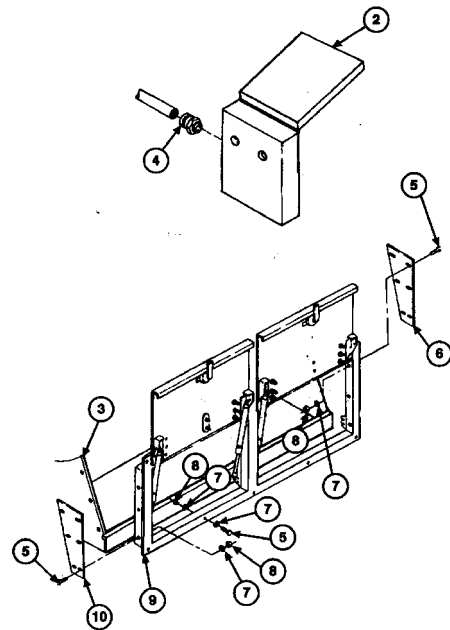
3. Remove 16 screws (5), 26 washers (7), and 16 self-locking nuts (8) from door and frame assembly (9). Remove door and frame assembly (9) and two plates (6 and 10) from hose reel cabinet (3). Discard self-locking nuts.

**CAUTION**

Before removing cabinet, make sure that all disconnections have been made.

**NOTE**

To relieve pressure on mounting screws and nuts, position forklift and lift cabinet slightly..



**3-14. HOSE REEL CABINET REPLACEMENT (continued).**

4. Remove 11 screws (11) and self-locking nuts (12) from hose reel cabinet (3), and remove cabinet (3) from semitrailer. Discard self-locking nuts.

**b. INSTALLATION****NOTE**

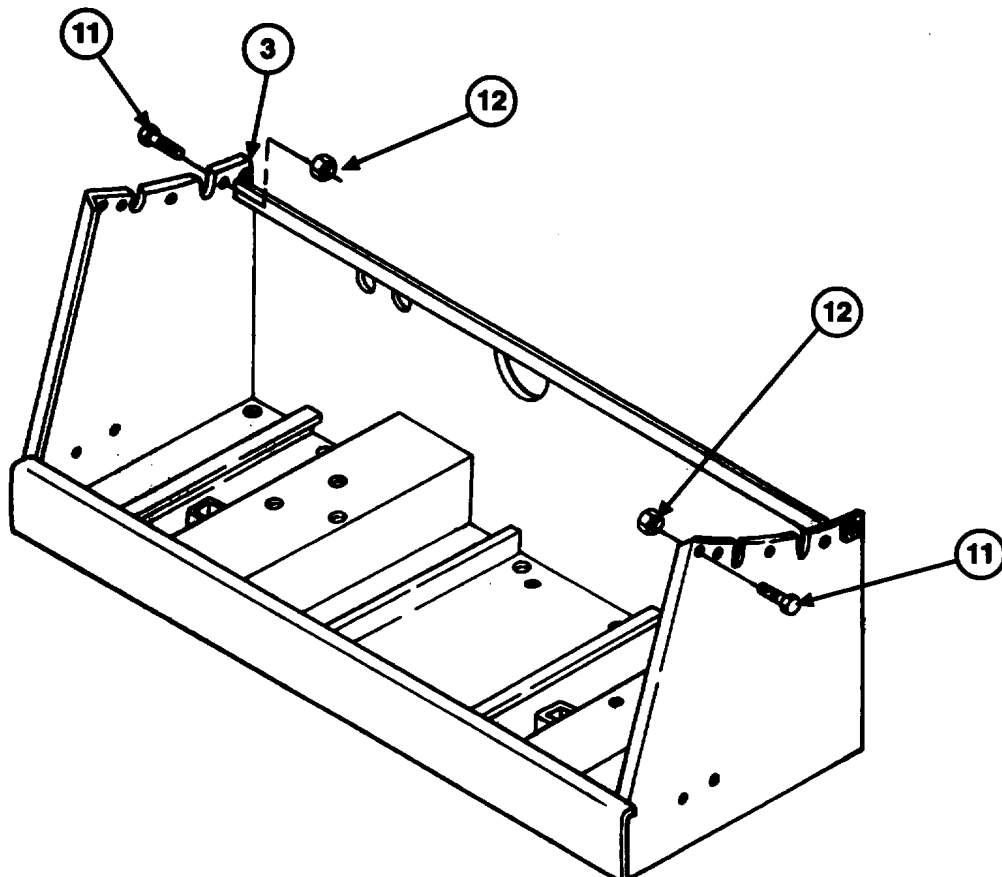
Use forklift to position hose reel cabinet under semitrailer.

1. Install hose reel cabinet (3) on semitrailer, and install 11 screws (11) and new self-locking nuts (12) in hose reel cabinet (3)

**WARNING**

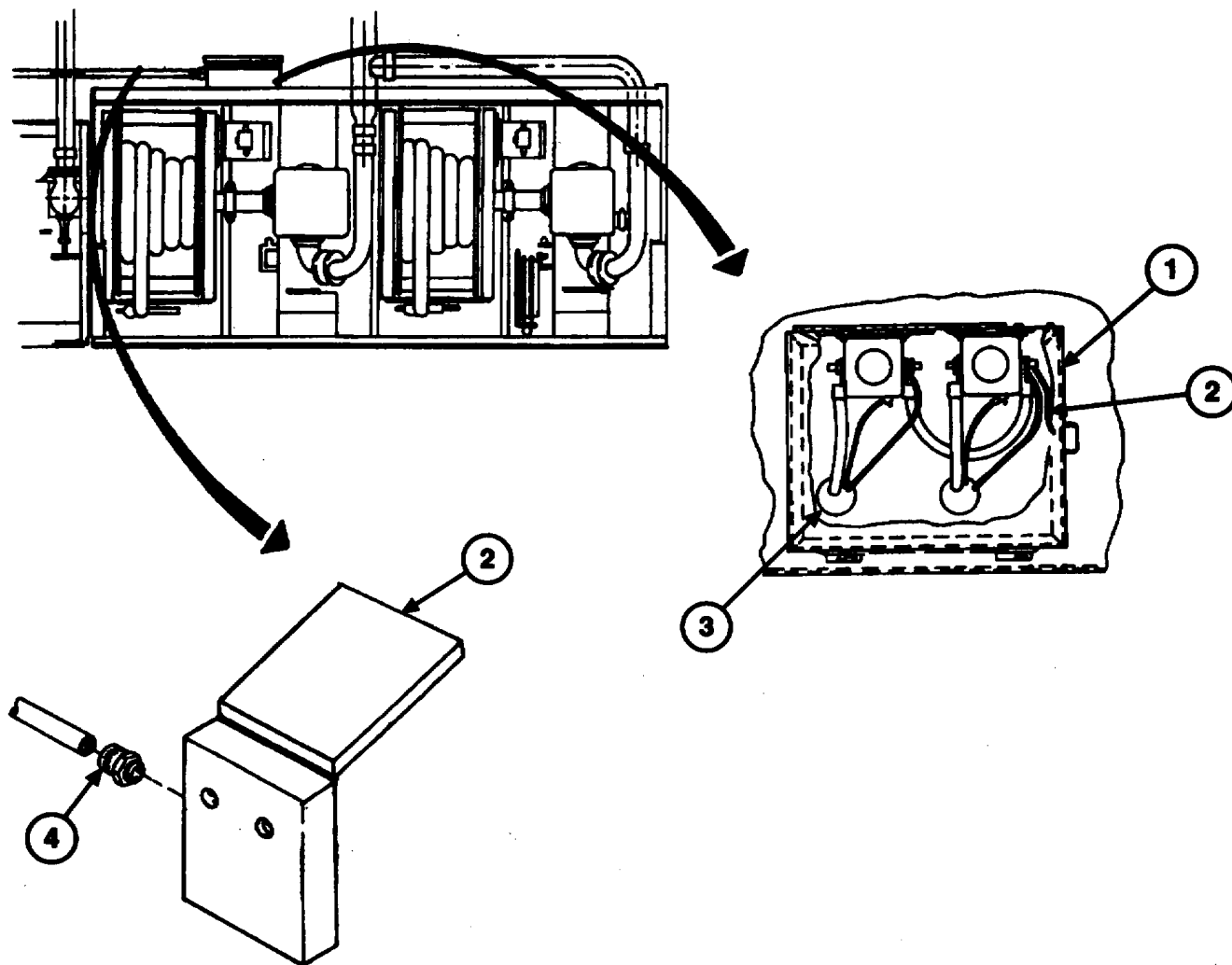
**Door and frame assembly is very heavy. To prevent injury to personnel, two persons are required when installing door and frame assembly.**

2. Install door and frame assembly (9) and two plates (6 and 10) on hose reel cabinet (3) with 16 screws (5), 26 washers (7), and 16 new self-locking nuts (8).



**3-14. HOSE REEL CABINET REPLACEMENT (continued).**

3. Connect conduit (4) to electrical junction box (1) on rear of hose reel cabinet (3).
4. Connect lead 14 (2) to electrical junction box (1) on rear of hose reel cabinet (3).

**FOLLOW-ON MAINTENANCE:**

- Connect negative battery cable (para 2-33).
- Replace meter assemblies (para 2-122).
- Disconnect ground (refer to TM 9-2330-398-10).



**3-15. HOSE REEL CABINET ACCESS DOOR REPAIR.***This Task Covers:*

- a. Disassembly
- b. Inspection
- c. Assembly

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

- Self-locking nut (8) (Item 177, Appendix F)

**Materials/Parts:**

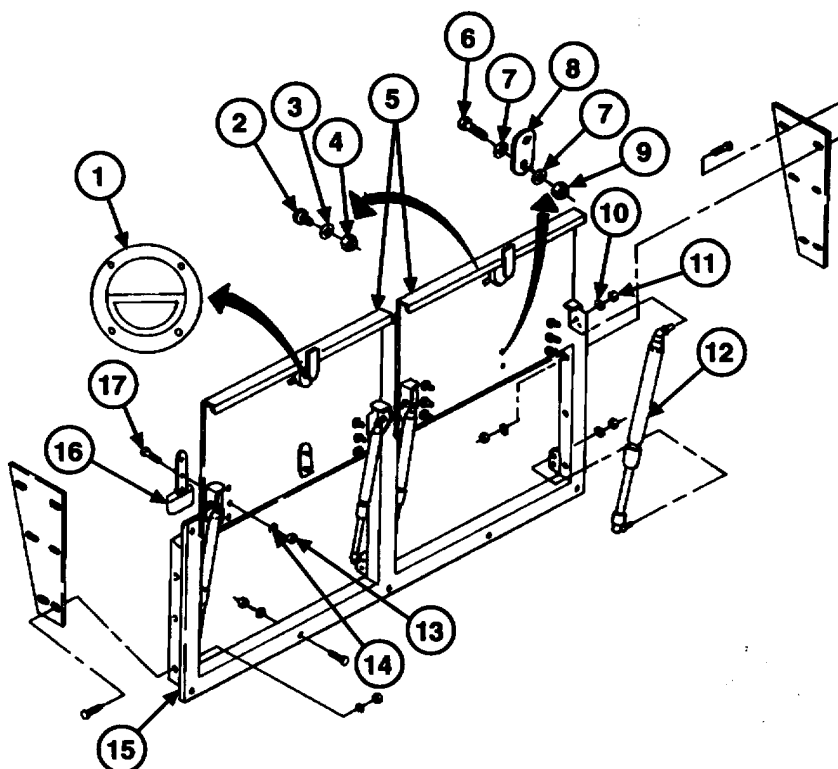
- Self-locking nut (12) (Item 166, Appendix F)
- Self-locking nut (12) (Item 169, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10)
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

**a. DISASSEMBLY**

1. Remove eight screws (2), washers (3), and self-locking nuts (4) and two lever lock-releases (1) from two hose reel cabinet access doors (5). Discard self-locking nuts.
2. Remove four self-locking nuts (9), eight washers (7), four screws (6), and two bumpers (8) from two doors (5). Discard self-locking nuts.
3. Remove eight self-locking nuts (11) and washers (10) and four cylinders (12) from two doors (5) and frame (15). Discard self-locking nuts.



---

**3-15. HOSE REEL CABINET ACCESS DOOR REPAIR (continued).**

---

4. Remove 12 self-locking nuts (13), washers (14), and screws (17) from four hinges (16). Remove two doors (5) from frame (15). Discard self-locking nuts.

**NOTE**

**Hinges are welded to frame. Remove hinges only if damaged.**

5. Break welds on four hinges (16) with steel chisel and remove from frame (15). Grind surfaces smooth.

**b. INSPECTION**

Inspect door, door hinges, springs, cylinders and frame for cracks, dents, excess wear and broken welds. Replace worn or damaged parts as required.

**c. ASSEMBLY****NOTE**

**Perform step 1 only if hinges were removed.**

1. Tack-weld four new hinges (16) to frame (15) in same locations as original welds.
2. Install two hose reel cabinet access doors (5) on four hinges (16) with 12 new self-locking nuts (13), washers (14), and screws (17).
3. Install four cylinders (12) on two doors (5) and frame (15) with eight new self-locking nuts (11) and washers (10).
4. Install two bumpers (8) on two doors (5) with four screws (6), eight washers (7), and four new self-locking nuts (9).
5. Install two lever lock-releases (1) on two doors (5) with eight screws (2), washers (3), and new self-locking nuts (4).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

### 3-16. ENGINE AND PUMP CABINET FRAME REPLACEMENT.

*This Task Covers:*

a. Removal

b. Installation

*Initial Setup:*

**Tool/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)
- Forklift (Item 5, Appendix B)

**Materials/Parts:**

- Gasket (2) (Item 41, Appendix F)
- Seal (2) (Item 153, Appendix F)
- Self-locking nut (4) (Item 166, Appendix F)
- Self-locking nut (12) (Item 169, Appendix F)
- Self-locking nut (8) (Item 177, Appendix F)

- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Engine throttle cable disconnected (para 3-23).
- Batteries removed (para 2-32).
- Curb-side hose trough access cover removed (para 2-76).
- Tank drained and purged (refer to TM 9-2330-398-10).
- Muffler shroud removed (para 2-99).
- Muffler and exhaust pipe removed (para 2-99).

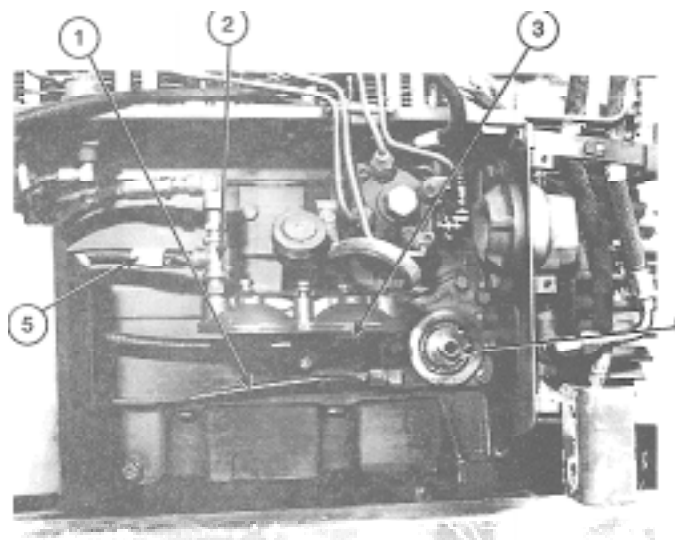
**Personnel Required:** Two

**Equipment Conditions:**

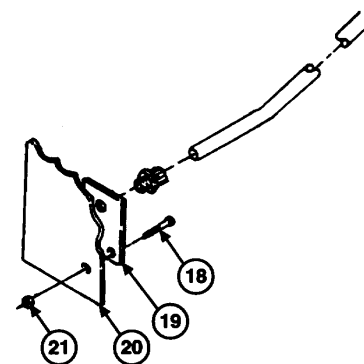
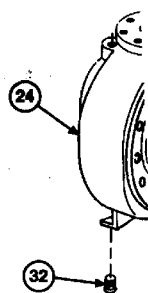
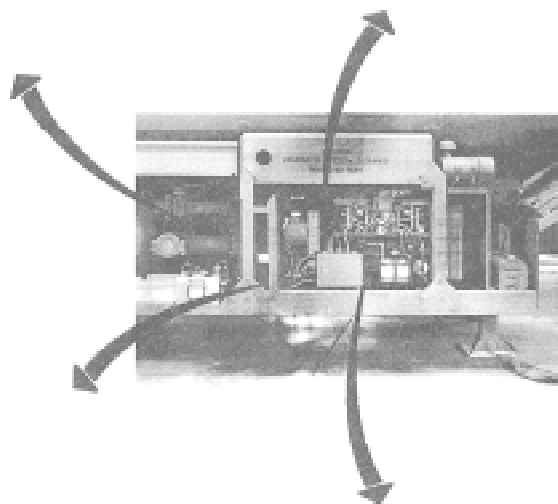
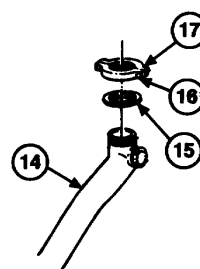
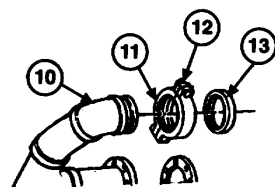
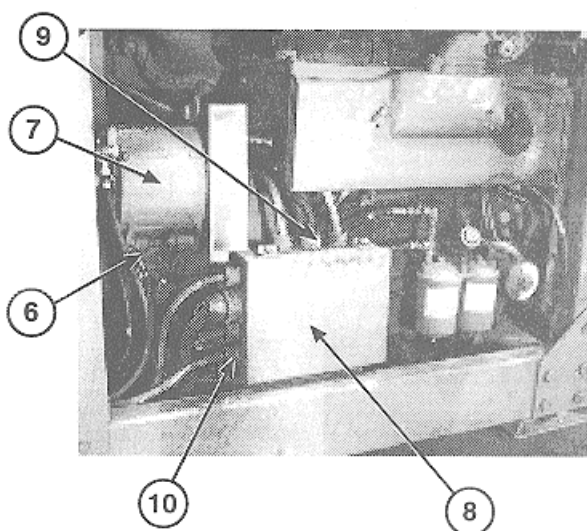
- Semitrailer uncoupled (refer to TM 9-2330-398-10).

#### a. REMOVAL

1. Tag and remove 1/4-inch oil pressure tube (1) from oil adapter (4). Tag and remove 1/4-inch fuel pressure tube (5) from tee (2) on primary fuel filter (3).
2. Disconnect two electrical leads (9 and 10) from engine electrical box (8).
3. Disconnect electrical lead (6) from alternator (7).
4. Remove two screws (18) and self-locking nuts (21) securing conduit mounting plate (19) to engine and pump cabinet frame (20). Discard self-locking nuts.
5. Place suitable container under inlet and outlet lines (10 and 14). Remove four screws (12 and 17), split couplings (11 and 16), and seals (13 and 15) from pump. Discard gaskets.
6. Place suitable container under drain plug (32) on bottom of centrifugal pump (24). Remove drain plug (32) and drain fuel from centrifugal pump (24).



3-16. ENGINE AND PUMP CABINET FRAME REPLACEMENT (continued).

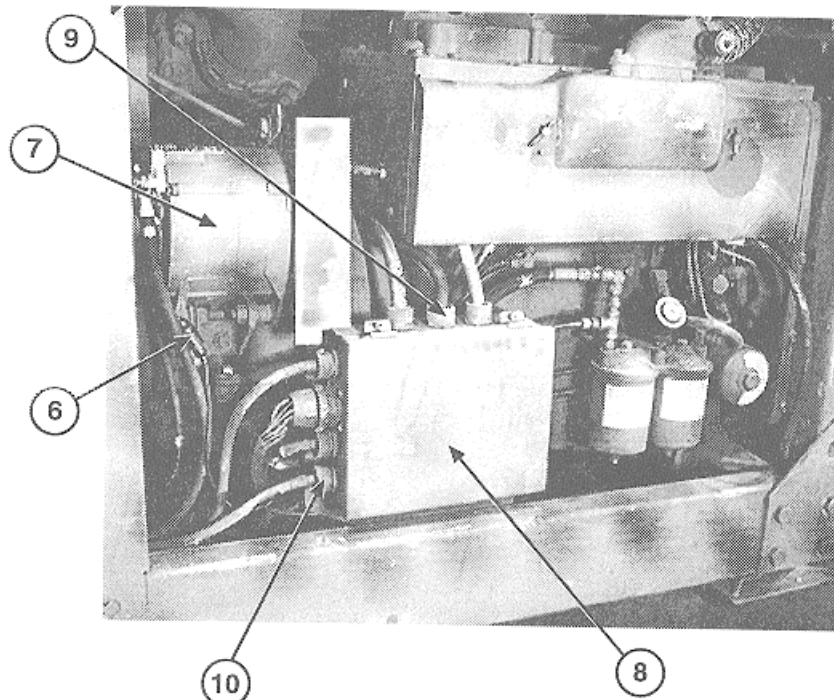


**3-16. ENGINE AND PUMP CABINET FRAME REPLACEMENT (continued).**

7. Remove 16 nuts (23), two gaskets (22), inlet line (10), and outlet line (14) from centrifugal pump (24). Discard gaskets.
8. Remove four screws (29) and self-locking nuts (31) and cross brace (30) from frame (26). Discard self-locking nuts.
9. Remove six screws (28) self-locking nuts (25) and support bracket (27) from frame (26). Discard self-locking nuts.
10. Position forklift under frame (26). Remove 12 self-locking nuts (34) and screws (35), and engine and pump assembly (33) in frame (26) from semitrailer. Discard self-locking nuts.

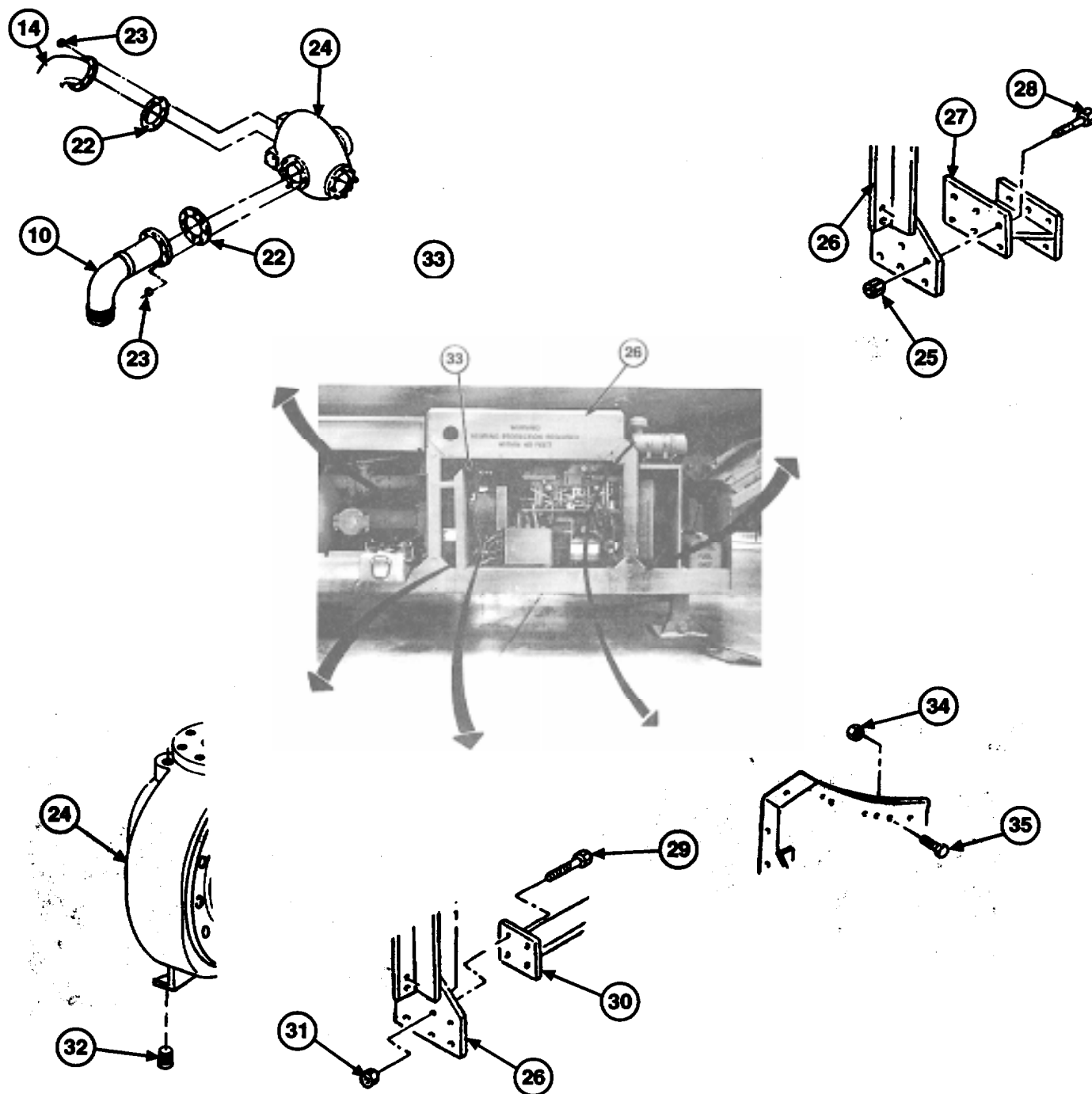
**b. INSTALLATION**

1. Position frame (26), with engine and pump assembly (33) under semitrailer. Install 12 screws (35) and new self-locking nuts (34) on frame (26).
2. Install support bracket (27) and six screws (28) and new self-locking nuts (25) on frame (26).
3. Install cross brace (30) and four screws (29) and new self-locking nuts (31) on frame (26).
4. Install two new gaskets (22), inlet line (10), and outlet line (14) on centrifugal pump (24) with 16 nuts (23).



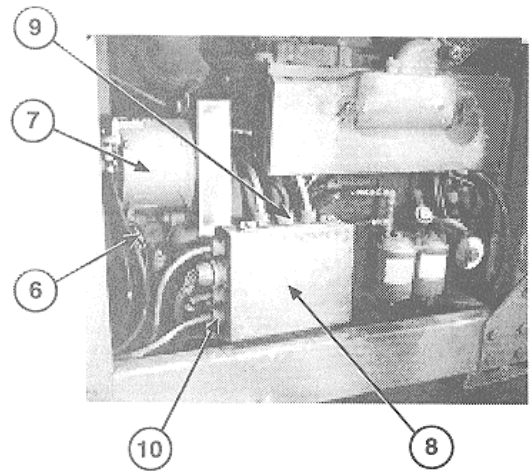
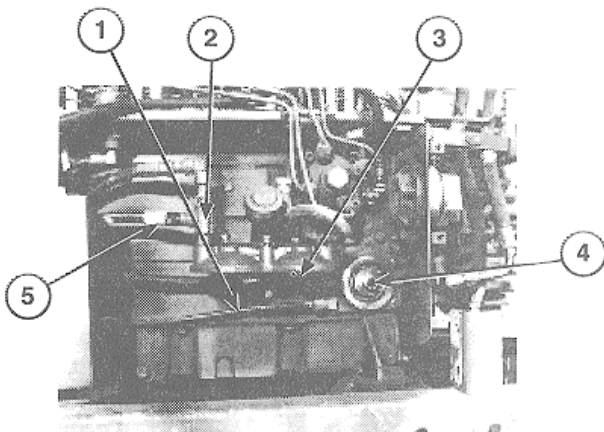
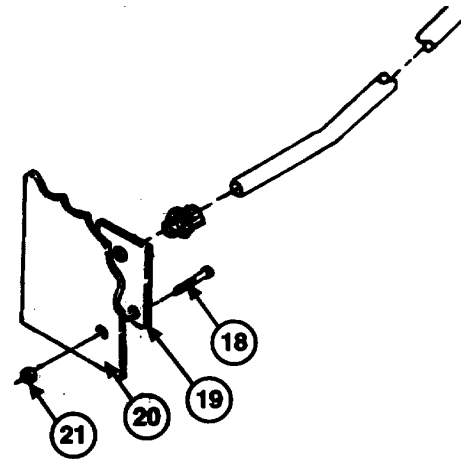
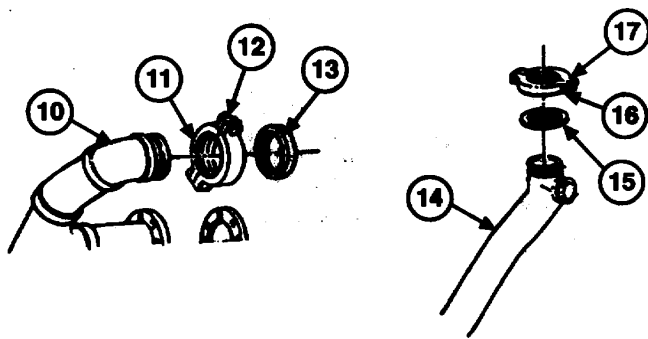
**3-16. ENGINE AND PUMP CABINET FRAME REPLACEMENT (continued).**

5. Install drain plug (32) on bottom of centrifugal pump (24).



**3-16. ENGINE AND PUMP CABINET FRAME REPLACEMENT (continued).**

6. Install two new seals (13 and 15) and split couplings (11 and 17) on inlet and outlet lines (10 and 14) with four nuts (12 and 16).
7. Install conduit mounting plate (19) and two screws (18) and new self-locking nuts (21) on engine and cabinet frame (20).
8. Install electrical lead (6) on alternator (7).
9. Install two electrical leads (9 and 10) on engine electrical box (8).
10. Install 1/4-inch oil pressure tube (1) on oil adapter (4) and tee (2) on primary fuel filter (3).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).
- Connect engine throttle cable (para 3-23).
- Install batteries (para 2-32).
- Install curb-side hose trough access cover (para 2-76).
- Install muffler shroud (para 2-99).
- Install muffler and exhaust pipe (para 2-99).

## Section VI. AUXILIARY GENERATOR AND ENGINE AND CONTROLS MAINTENANCE

Paragraph Number	Title	Page Number
3-17	General .....	3-53
3-18	Engine Oil Filter Head Replacement .....	3-54
3-19	Engine Oil Cooler, Lines, and Fittings Replacement .....	3-56
3-20	Fuel Metering Pump Replacement .....	3-58
3-21	Fuel Injection Lines and Fittings Replacement .....	3-62
3-22	Fuel Injection Nozzle Repair .....	3-64
3-23	Engine Throttle and Choke Linkage Replacement .....	3-69
3-24	Governor Linkage Assembly Repair .....	3-74
3-25	Engine Exhaust Manifold Replacement .....	3-77
3-26	Engine Shrouding Replacement .....	3-78
3-27	Alternator Repair .....	3-84
3-28	Engine High-Temp Thermostatic Control Switch Replacement .....	3-92
3-29	Engine Fuel Stop Solenoid Repair .....	3-94

**3-17. GENERAL**

This section describes and illustrates removal and installation procedures for the engine oil filter head, engine oil cooler, lines, and fittings, fuel metering pump, fuel injection lines and fittings, engine throttle and choke linkage, engine exhaust manifold, engine shrouding, and engine high-temp thermostatic control switch. This section also describes and illustrates repair procedures for the fuel injection nozzle, governor linkage, and alternator.



---

**3-18. ENGINE OIL FILTER HEAD REPLACEMENT.**


---

*This Task Covers:*

a. Removal

b. Installation

---

*Initial Setup:*

**Tool/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Gasket (Item 48, Appendix F)
- Lockwasher (3) (Item 113, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

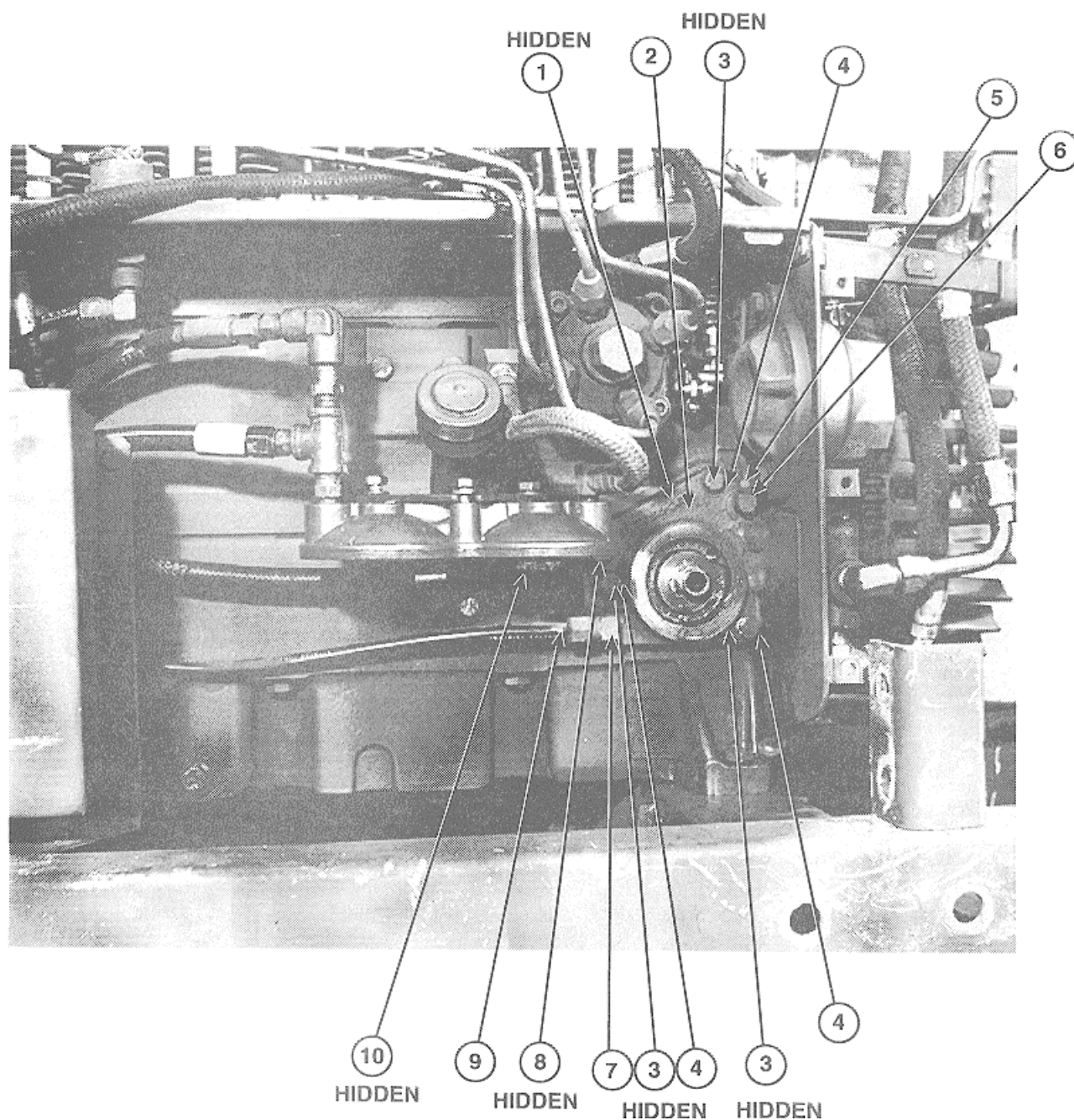
- Fuel filters (primary and secondary) removed (para 2-109).
  - Engine oil filter removed (para 2-106).
  - Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
  - Negative battery cable disconnected (para 2-33).
  - Blower housing removed (para 3-26).
  - Oil cooler lines removed from oil filter adapter (para 3-19).
- 

**a. REMOVAL**

1. Remove oil line (5) from elbow (6), and remove elbow (6) from engine oil filter head (2).
2. Remove oil line (10) from elbow (8), and remove elbow (8) from engine oil filter head (2).
3. Remove oil line (9) from elbow (7), and remove elbow (7) from engine oil filter head (2).
4. Remove three screws (4) and lockwashers (3), engine oil filter head (2), and gasket (1) from engine. Discard lockwashers and gasket.

**b. INSTALLATION**

1. Install new gasket (1) and engine oil filter head (2) on engine with three screws (4) and new lockwashers (3).
2. Install elbow (7) on engine oil filter head (2), and install oil line (9) on elbow (7).
3. Install elbow (8) on engine oil filter head (2), and install oil line (10) on elbow (8).
4. Install elbow (6) on engine oil filter head (2), and install oil line (5) on elbow (6).

**3-18. ENGINE OIL FILTER HEAD REPLACEMENT (continued).****FOLLOW-ON MAINTENANCE:**

- Install oil cooler lines on oil filter adapter (para 3-19).
- Install blower housing (para 3-26).
- Install engine oil filter (para 2-106).
- Connect negative battery cable (para 2-33).
- Disconnect ground (refer to TM 9-2330-398-10).
- Install fuel filters (primary and secondary) (para 2-109).

---

**3-19. ENGINE OIL COOLER, LINES, AND FITTINGS REPLACEMENT.**


---

*This Task Covers:*

a. Removal

b. Installation

*Initial Setup:*

**Tool/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)
- Common No. 1 tool set (Item 1, Appendix B)

**Materials/Parts:**

- Lockwasher (6) (Item 116, Appendix F)
- Self-locking screw (2) (Item 184, Appendix F)
- Self-locking screw (Item 183, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 92330-398-10).
- 

- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Negative battery cable disconnected (par 2-33).
- Engine and pump cabinet frame removed (par 3-16).
- Engine fuel lines removed (para 2-8).
- Blower housing removed (para 3-26).
- Muffler shroud removed (para 2-99).
- Top air housing cover removed (para 3-26).

**a. REMOVAL**

1. Remove self-locking screw (1) and two retaining clips (2) from two oil cooler lines (3 and 4). Discard self-locking screw.

**NOTE**

**Oil cooler lines may be filled with oil. Use care to prevent oil from spilling.**

2. Remove two oil cooler lines (3 and 4) from oil filter adapter (11). Drain oil from oil cooler lines (3 and 4) into suitable container.
3. Remove two oil cooler lines (3 and 4) from engine oil cooler (5).
4. Remove two self-locking screws (10) and oil cooler mounting plate (7) from engine. Discard self-locking screws.

**CAUTION**

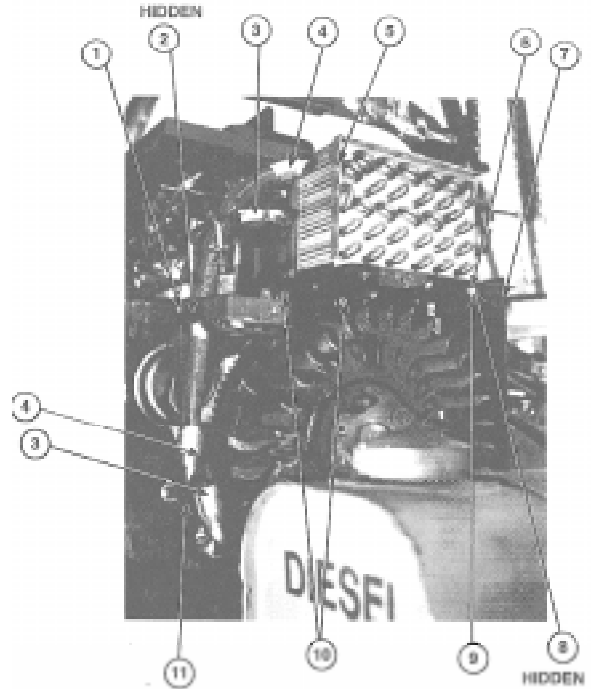
**Take care not to bend or damage aluminum cooling line when removing engine oil cooler.**

5. Remove six screws (6), lockwashers (8), and nuts (9) and engine oil cooler (5) from mounting plate (7). Discard lockwashers.

**3-19. ENGINE OIL COOLER, LINES, AND FITTINGS REPLACEMENT (continued).****b. INSTALLATION****CAUTION**

**Take care not to bend or damage aluminum cooling fins when installing engine oil cooler.**

1. Install engine oil cooler (5) on mounting plate (7) with six screws (6), new lockwashers (8), and nuts (9).
2. Install two new self-locking screws (10) and mounting plate (7) on engine.
3. Install two oil cooler lines (3 and 4) on engine oil cooler (5).
4. Install two oil cooler lines (3 and 4) on oil filter adapter (11).
5. Install two retaining clips (2) on two oil cooler lines (3 and 4) with new self-locking screw (1).

**FOLLOW-ON MAINTENANCE:**

- Fill engine with oil (Appendix G).
- Install blower housing (para 3-26).
- Disconnect ground (refer to TM 9-2330-398-10).
- Connect negative battery cable (para 2-33).
- Install engine and pump cabinet frame (para 3-16).
- Install engine fuel lines (para 2-98).
- Install muffler shroud (para 2-99).
- Tighten top air housing cover (para 3-26).
- Install engine door panel (para 2-99).

**3-20. FUEL METERING PUMP REPLACEMENT.***This Task Covers:*

a. Removal

b. Installation

*Initial Setup:***Tools/Test Equipment**

- General mechanic's tool kit (Item 4, Appendix B)

**Material/Parts:**

- Cap and plug set (Item 3, Appendix C)
- Fuel oil, diesel (Item 15, Appendix C)
- Drycleaning solvent (Item 12, Appendix C)
- Petrolatum (Item 24, Appendix C)
- Rag (Item 25, Appendix C)
- Lockwasher (4) (Item 113, Appendix F)

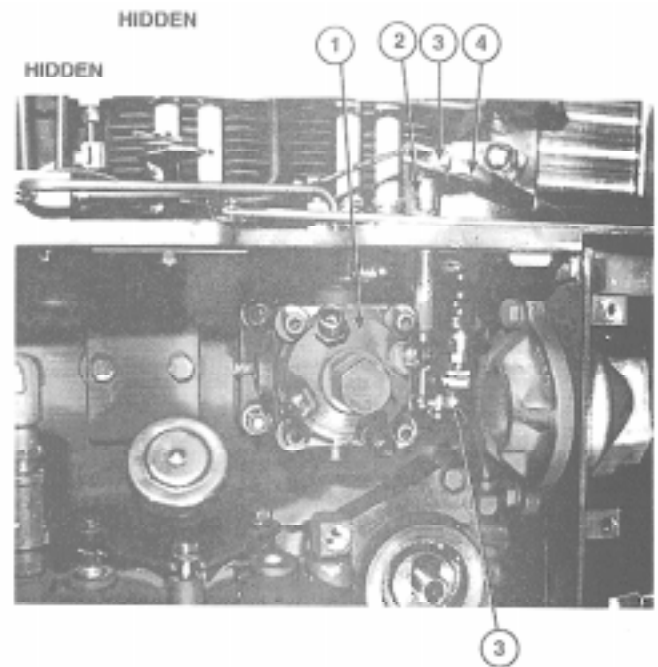
- Preformed packing (Item 140, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Negative battery cable disconnected (para 2-33).
- Top air housing cover removed (para 3-26).
- Fuel injection lines removed (para 3-21).

**a. REMOVAL****CAUTION****All fuel connection must be plugged or capped to prevent contamination and equipment damage.**

1. Remove two nuts (3) and governor linkage (2) from fuel metering pump (1), and governor control arm (4).



---

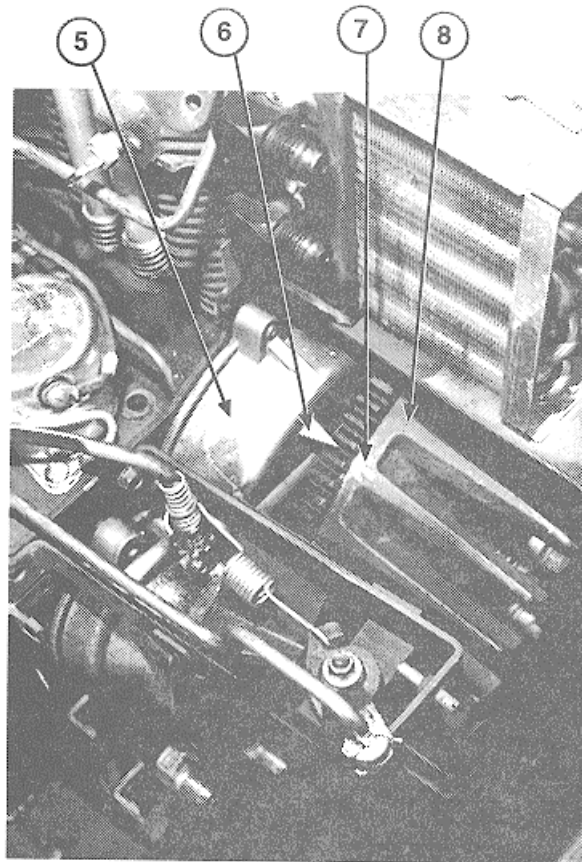
**3-20. FUEL METERING PUMP REPLACEMENT (continued).**

---

**NOTE**

Position of No. 1 piston can be checked by removing timing hole screw on left side of pump mounting flange and inserting a 1/8-inch diameter brass wire in timing index hole. If piston is on compression stroke, wire will enter index hole in gear face. If approximate depth of wire is 1 1/8 inches, piston is on compression stroke. If depth is 7/8 inch or less, rotate flywheel one complete revolution and insert wire again.

2. Position No. 1 piston on compression stroke by placing port closing (PC) mark (7) on flywheel (8) in line with timing mark (6) on gearcase cover (5).

**NOTE**

- Be careful to retain shims between crankcase and fuel metering pump.
- The correct thickness of shims is stamped on crankcase above fuel metering pump.

3. Remove four nuts (11), lockwashers (10), and washers (9), preformed packing (12), and fuel metering pump (1) from crankcase (13). Discard lockwashers and preformed packing.

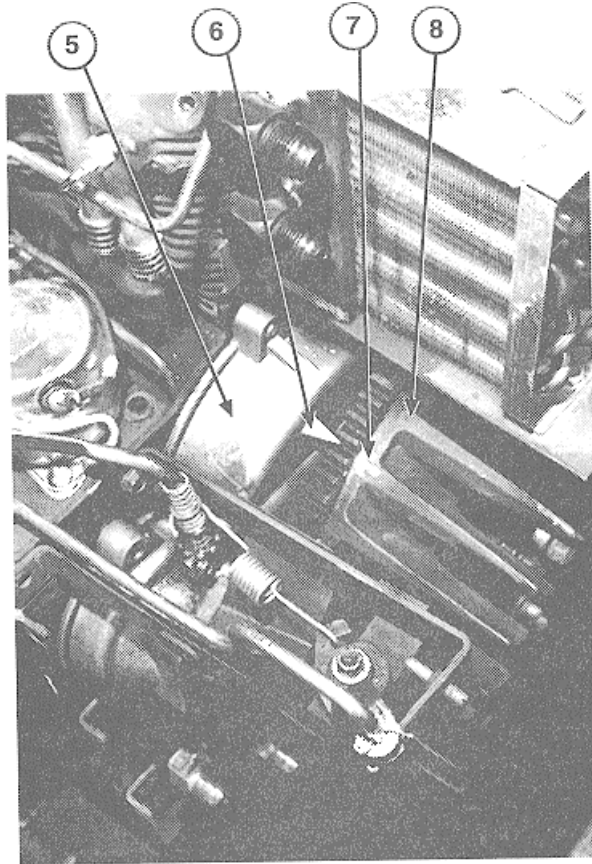
---

**3-20. FUEL METERING PUMP REPLACEMENT (continued).**

---

**b. INSTALLATION**

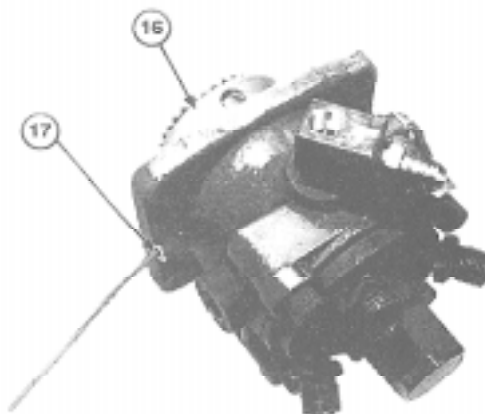
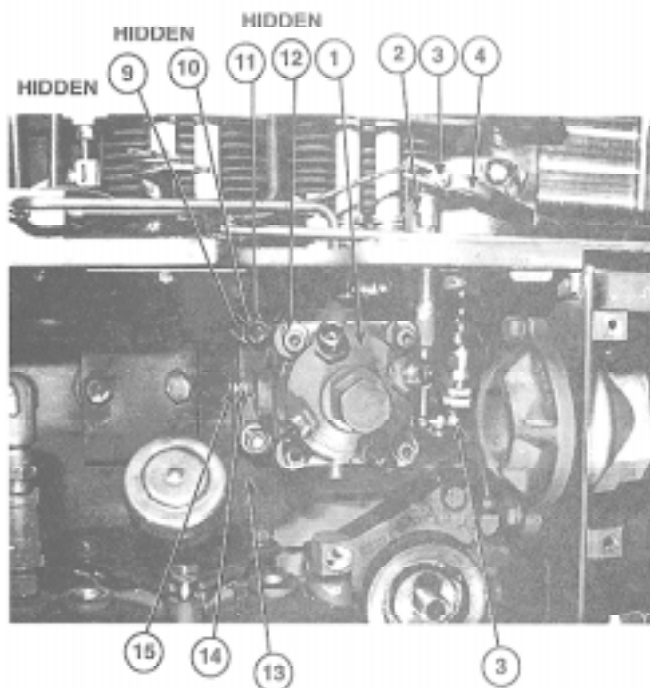
1. Position No. 1 piston on compression stroke by placing port closing (PC) mark (7) on flywheel (8) in line with timing mark (6) on gearcase cover (5).



2. Remove timing hole screw (15) and copper gasket (14) from fuel metering pump (1). Insert a 1/8-inch diameter brass rod or wire into hole (17).
3. Rotate pump face gear (16) until rod or wire slips into place, locking face gear (16) in position.
4. Mount new preformed packing (12) and fuel metering pump (1) on crankcase (13), ensuring that shims are in place, and secure into position with four nuts (11), washers (9), and new lockwashers (10).

**3-20. FUEL METERING PUMP-REPLACEMENT (continued).**

5. Remove brass rod or wire from hole (17). Install timing hole screw (14) and copper gasket (13) on fuel metering pump (1).
6. Install governor linkage (2) and two nuts (3) on fuel metering pump (1) and governor control arm (4).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).
- Connect negative battery cable (para 2-33).
- Install top air housing (para 3-26).
- Start and run engine (refer to TM 9-2330-398-10).
- Adjust governor linkage assembly (para 3-24).
- Install fuel injection lines (para 3-21).



---

### 3-21. FUEL INJECTION LINES AND FITTINGS REPLACEMENT.

---

*This Task Covers:*

a. Removal

b. Installation

---

*Initial Setup:*

**Tool/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

- Negative battery cable disconnected (para 2-33).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Top air housing cover removed (para 3-26).

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- 

#### a. REMOVAL

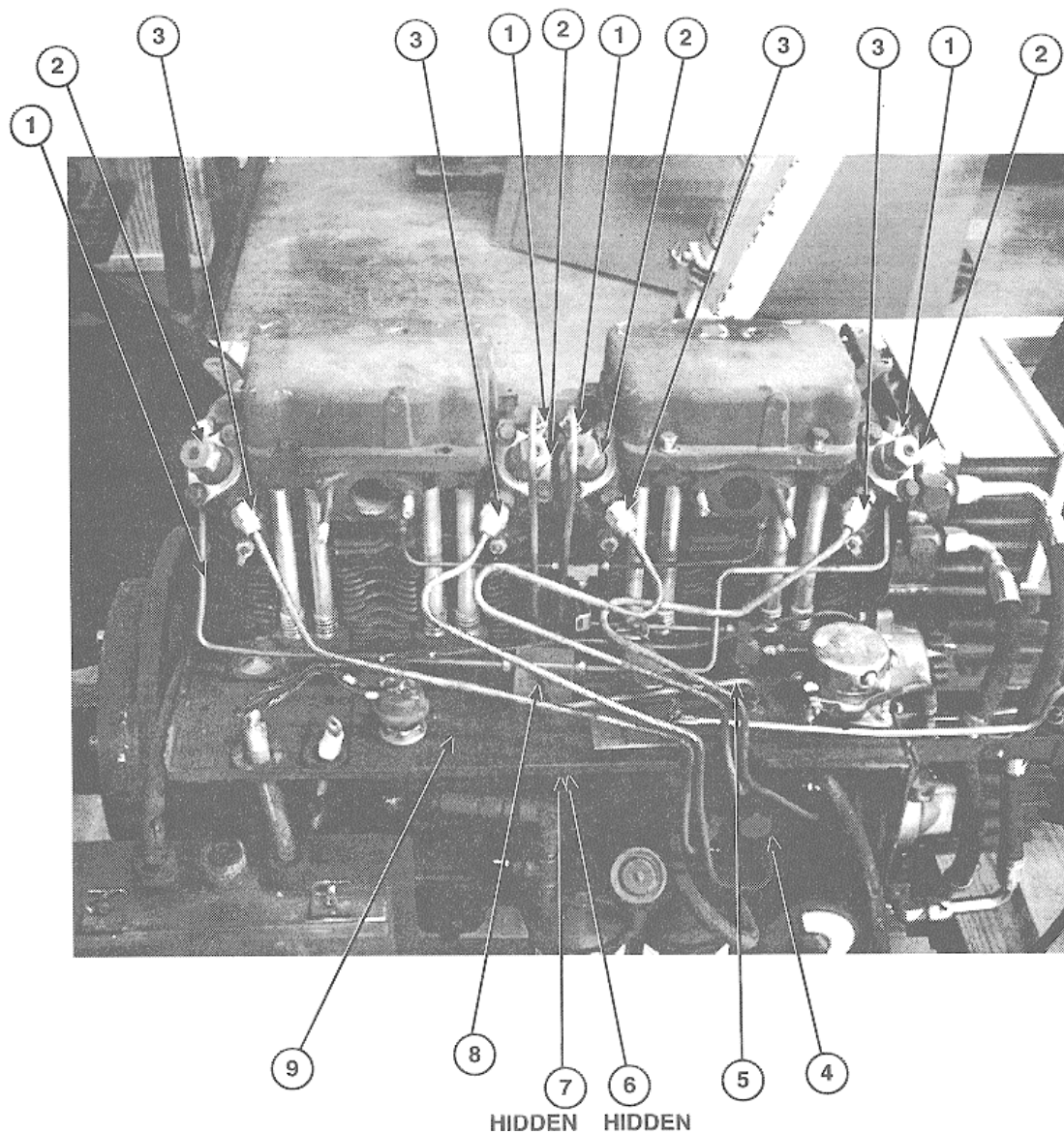
#### **WARNING**

**To avoid injury to personnel, wait until engine assembly lb cool before attempting to perform this procedure.**

1. Remove four injector nozzle return lines (1) from fuel return manifold (8) and four fuel injectors (2).
2. Remove fuel injection line (5) from fuel return manifold (8) and fuel metering pump (4).
3. Remove screw (6), four washers (7), and fuel return manifold (8) from engine assembly (9).
4. Remove fuel injection line (3) from each of four fuel injectors (2) on engine assembly (9).
5. Remove four fuel injection lines (3) from fuel metering pump (4).

#### b. INSTALLATION

1. Install four fuel injection lines (3) on fuel metering pump (4).
2. Install injection line (3) on each of four fuel injectors (2).
3. Install fuel return manifold (8) on engine assembly (9) with screw (6) and four washers (7).
4. Install fuel injection line (5) on fuel return manifold (8) and fuel injection metering pump (4).
5. Install four injector nozzle return lines (1) on fuel injection metering return manifold (8) and four fuel injectors (2).

**3-21. FUEL INJECTION LINES AND FITTINGS REPLACEMENT (continued).****FOLLOW-ON MAINTENANCE:**

- Install top air housing cover (para 3.26).
- Connect negative battery cable (para 2-33).
- Disconnect ground (refer to TM 9-2330-398-10).

### 3-22. FUEL INJECTION NOZZLE REPAIR.

#### *This Task Covers:*

- |                            |                |
|----------------------------|----------------|
| a. Removal                 | b. Disassembly |
| c. Cleaning and Inspection | d. Assembly    |
| e. Installation            |                |

#### *Initial Setup:*

#### **Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)
- Common No. 1 tool set (Item 1, Appendix B)

#### **Materials/Parts:**

- Cap and plug set (Item 3, Appendix C)
- Fuel oil, diesel (Item 15, Appendix F)
- Lubricating oil (Item 20, Appendix C)
- Rag (Item 25, Appendix C)
- Gasket (Item 33, Appendix F)
- Gasket (4) (Item 57, Appendix F)
- Gasket (item 58, Appendix F)

#### **Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-3910).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Negative battery cable disconnected (para 2-33).
- Top air housing cover removed (pla-26).
- Fuel injection Lines removed (paS21).
- Intake manifold removed (if removing fuel Injector from behind Intake manifold) (pare 2-108).

#### **a. REMOVAL**

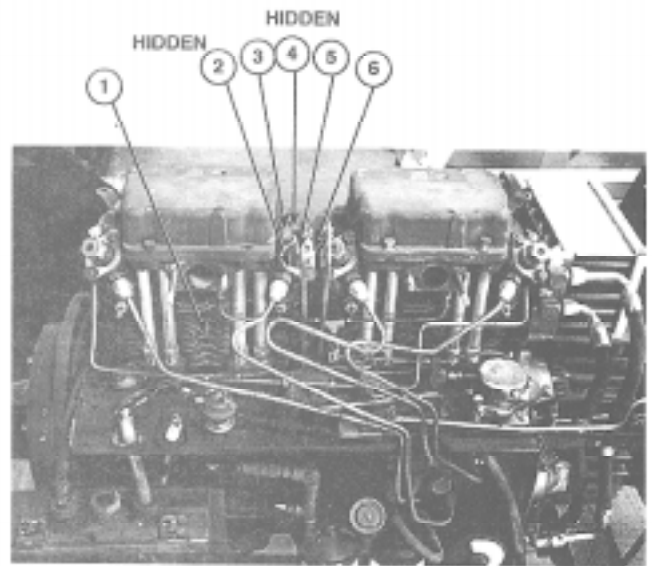
#### **CAUTION**

To prevent contamination, all fuel Injector openings and fuel injection nozzles must be capped when any of the four fuel injectors is removed from engine.

#### **NOTE**

Removal of four fuel injectors is the same.  
One is shown.

1. Remove two screws (3) and washers (4) and retaining flange (5) from cylinder head (1).
2. Remove fuel injector (6) from cylinder head (1).
3. Remove gasket (2) from cylinder head (1).  
Discard gasket.



**3-22. FUEL INJECTION NOZZLE REPAIR (continued),****b. DISASSEMBLY**

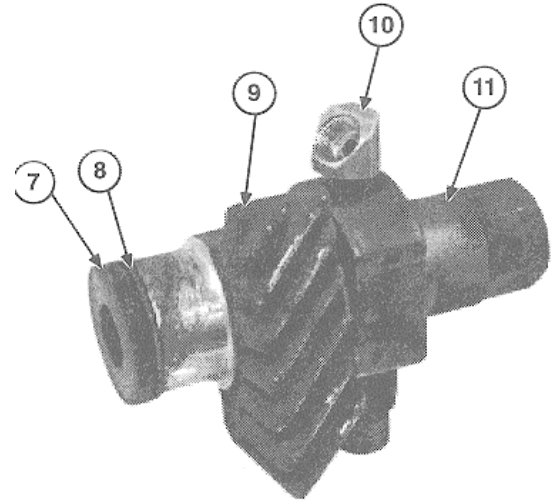
1. Remove spacer plate (7), gasket (8), and adapter (9), and pipe elbow (10) from fuel injector (6). Discard gaskets.

**CAUTION**

Never clamp fuel injector in a vise that has hardened jaws. Damage to fuel injector could result

**NOTE**

When disassembling fuel injectors, take care to label each component of each fuel injector being disassembled. Never interchange components of fuel injectors.

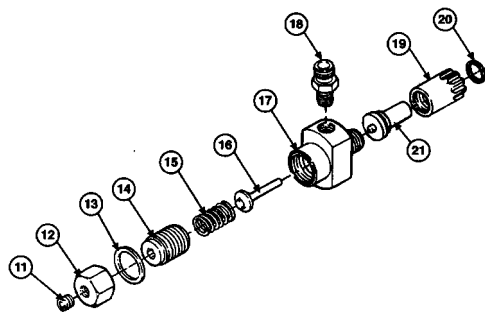


2. Secure fuel injector (6) in vise with vise jaw caps and remove injector nozzle cap (19) and nozzle assembly (21).
3. Remove gasket (20) from nozzle cap (19). Install nozzle cap (19) loosely on nozzle holder (17) to protect lapped surface of nozzle holder (17). Discard gaskets.
4. Remove plug (20) from protective cap (12).
5. Remove protective cap (12) and copper gasket (13) from adjusting screw (14).

**WARNING**

Adjusting screw is under pressure. To avoid injury to personnel, take care when removing adjusting screw from nozzle holder.

6. Remove adjusting screw (14) from nozzle holder (17).
7. Remove spring (15) and spindle (16) from nozzle holder (17).
8. Remove adapter (18) from hole holder (17).



---

**3-22. FUEL INJECTION NO771 F REPAIR (continued).**

---

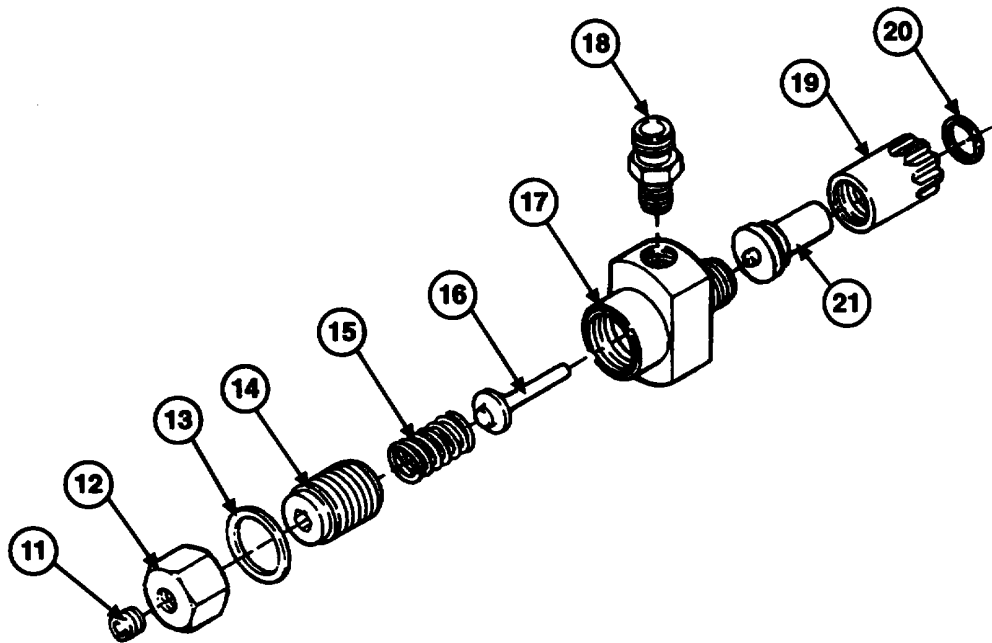
**c. CLEANING AND INSPECTION****CAUTION**

- **Never use hard or sharp tools, emery paper, grinding powder, or abrasives of any kind to clean fuel injectors. Damage to fuel injectors could result.**
- **Do not attempt to scrape carbon from nozzle surfaces. Severe damage to spray hole could result**

**NOTE**

**Clean fuel injector parts in clean room on clean bench to prevent contamination of fuel injector.**

1. Clean outer surfaces of nozzle cap (19) with brass brush.
2. Clean spindle (16) and nozzle holder (17) with soft, oil-soaked cloth.
3. Clean carbon deposits from nozzle assembly (21).
4. Clean small holes in tip of nozzle assembly (21).
5. Inspect nozzle assembly (21) for nicks or scoring. Replace nozzle assembly if damaged.



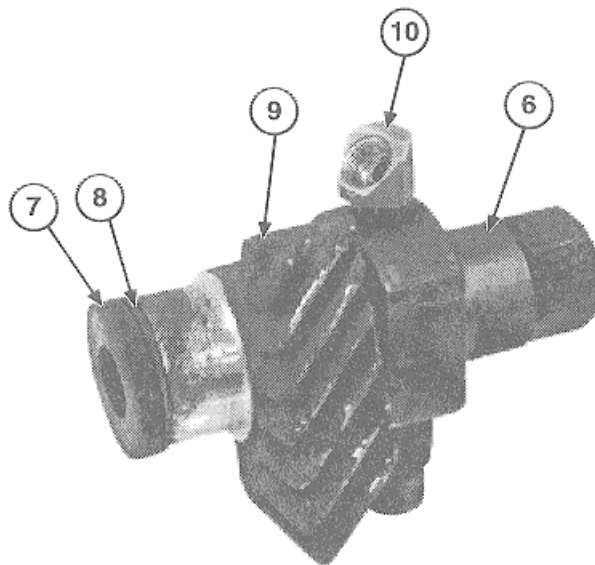
**3-22. FUEL INJECTION NOZZLE REPAIR (continued).****d. ASSEMBLY**

1. Secure nozzle holder (17) in vise, with vise jaw caps and install adapter (18) in nozzle holder (17).
2. Install spindle (16) on nozzle holder (17).
3. Install spring (15) on spindle (16) in nozzle holder (17) and secure with copper gasket (13) and adjusting screw (14).
4. Install plug (11) on protective cap (12).
5. Loosely install protective cap (12) on adjusting screw (14).
6. Rinse nozzle assembly (21) in clean diesel fuel.
7. Remove all pressure from spring (15) by loosening adjusting screw (14).
8. Remove nozzle cap (18) from nozzle holder (17), and install new gasket (20) in nozzle cap (18).
9. Install nozzle assembly (21) on nozzle cap (18).
10. Loosely install nozzle cap (18) on nozzle holder (17).

**CAUTION**

**To prevent damage to components, do not contact valve in nozzle when tightening nozzle cap nut. To prevent damage to nozzle assembly, make sure it is centered in nozzle cap before nozzle cap is tightened.**

11. Tighten nozzle cap (21) between 50 and 55 lb-ft (68 and 75 Nom).
12. Install pipe elbow (10), adapter (9), new gasket (8), and spacer plate (7) on fuel injector (11).



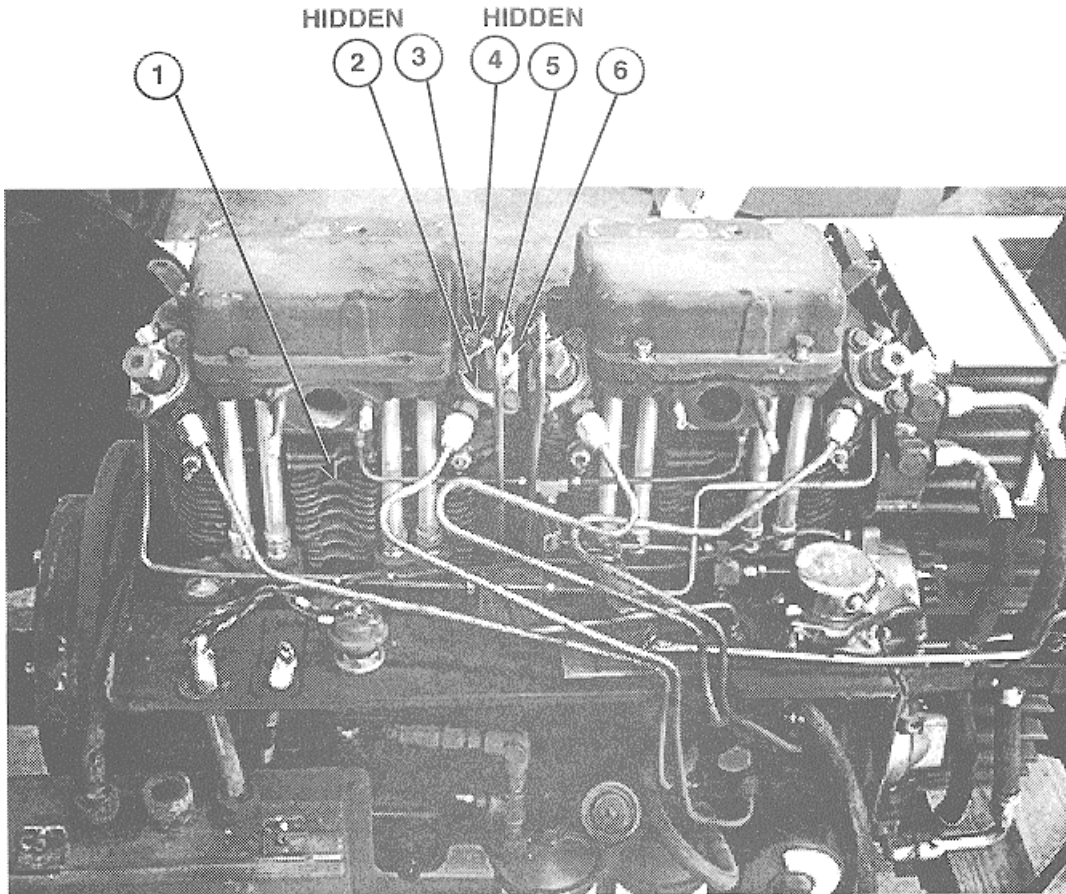
---

**3-22. FUEL INJECTION NOZZLE REPAIR (continued).**

---

**e. INSTALLATION**

1. Install new gasket (2) and fuel injector (6) on cylinder head (1).
2. Install retaining flange (5) on cylinder head (1) with two screws (3) and washers (4).

**FOLLOW-ON MAINTENANCE:**

- Install Intake manifold (if it was removed) (para 2-108).
- Install fuel injection lines (para 3-21).
- Connect negative battery cable (para 2-33).
- Install top air housing cover (para 3-26). A/
- Disconnect ground (refer to TM 9-2330-398-10).

---

**3-23. ENGINE THROTTLE AND CHOKE LINKAGE REPLACEMENT.**

---

*This Task Covers:*

- |                              |                 |
|------------------------------|-----------------|
| a. Removal                   | b. Installation |
| c. Throttle Cable Adjustment |                 |
- 

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

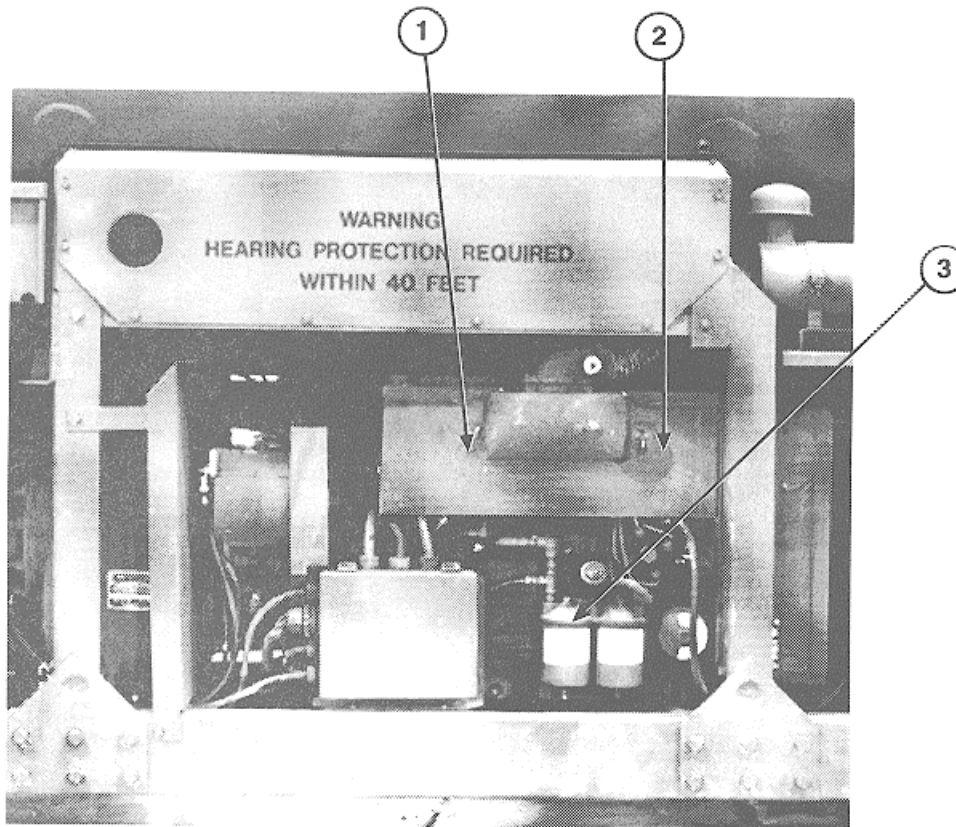
- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

**Material/Parts:**

- Cotter pin (Item 10, Appendix F)
  - Cotter pin (Item 11, Appendix F)
- 

**a. REMOVAL**

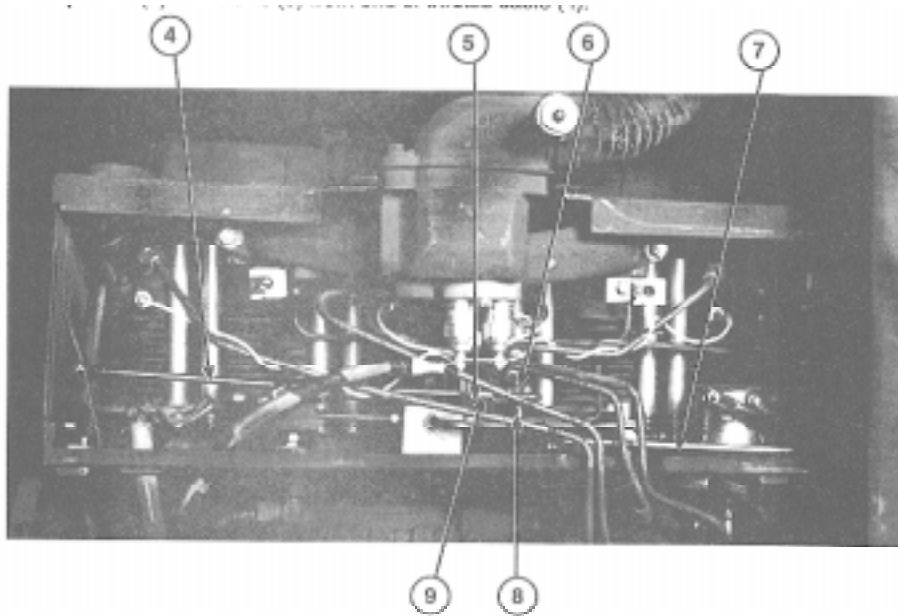
1. Loosen two retaining screws (1), and remove engine door panel (2) from engine (3).



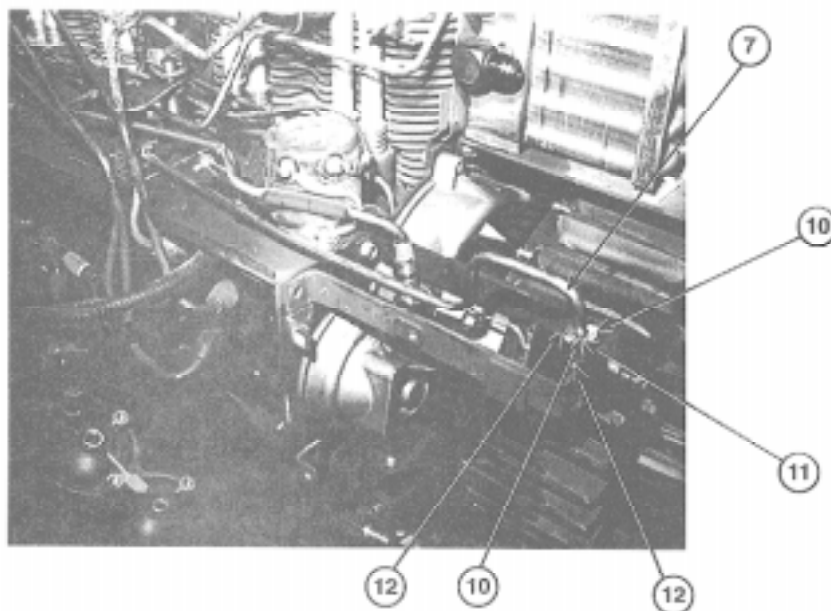


**3-23. ENGINE THROTTLE AND CHOKE LINKAGE REPLACEMENT (.continued).**

2. Remove cotter pin (8) and clevis pin (6) from end of throttle cable clevis (9), Disconnect clevis (9) from throttle linkage (7). Discard cotter pin.
3. Remove jamnut (5) and clevis (9) from end of throttle cable (4).

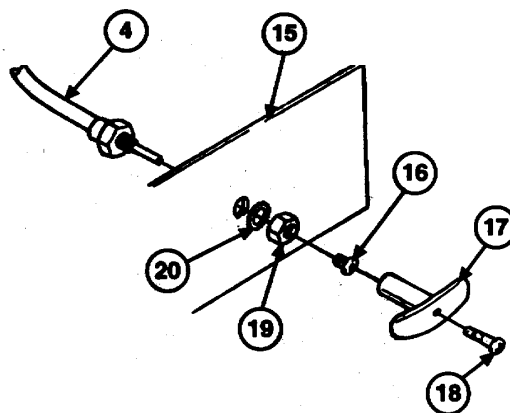
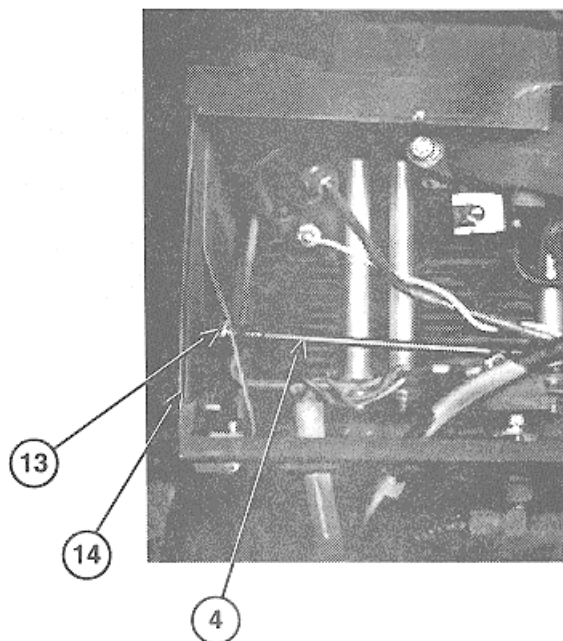
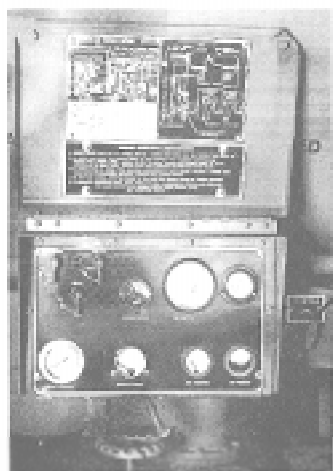


4. Remove two cotter pins (11) and washers (10) from end of throttle linkage (7). Remove throttle linkage (7) from lever (12). Discard cotter pins.



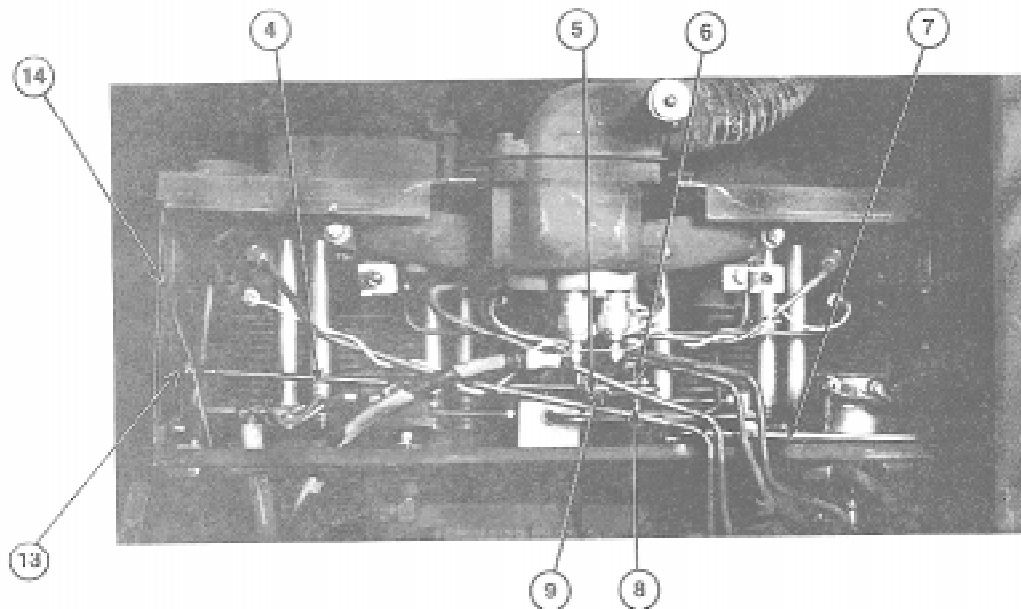
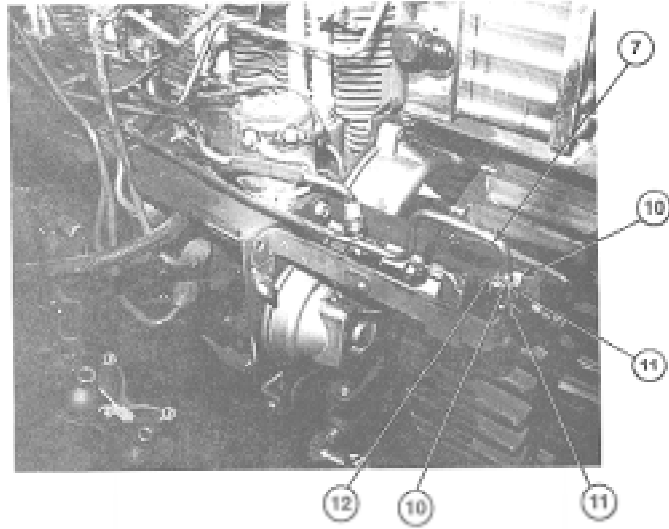
**3-23. ENGINE THROTTLE AND CHOKE LINKAGE REPLACEMENT (continued).**

5. Remove inside jamnut (13) from throttle cable (4), and pull throttle cable (4) through engine shrouding (14).
6. Remove screw (18) and handle (17) from throttle cable (4).
7. Remove packing nut (16), jamnut (19), and washer (20) from throttle cable (4).
8. Pull throttle cable (4) through channel of control panel (15), and remove cable (4) from semitrailer.



**3-23. ENGINE THROTTLE AND CHOKE LINKAGE REPLACEMENT (continued).****b. INSTALLATION**

1. Install throttle cable (4) through channel of control panel (15). Install washer (20), jamnut (19), packing nut (16), handle (17), and screw (1.8) on throttle cable (4).
2. Pull throttle cable (4) through engine shrouding (14). Install Inside jamnut (13) on throttle cable (4), but do not tighten.
3. Install two washers (10) and new cotter pins (11) on throttle linkage (7). Install throttle linkage (7) on lever (12).
4. Install jamnut (5) and clevis (9) on end of throttle cable (4).
5. Connect throttle cable (4) to throttle linkage (7) with clevis (6) and new cotter pin (8).



**3-23. ENGINE THROTTLE AND CHOKE LINKAGE REPLACEMENT (continued).****NOTE**

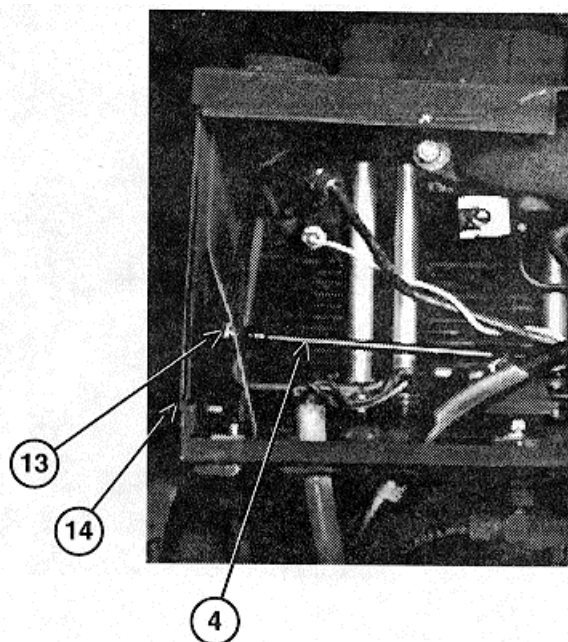
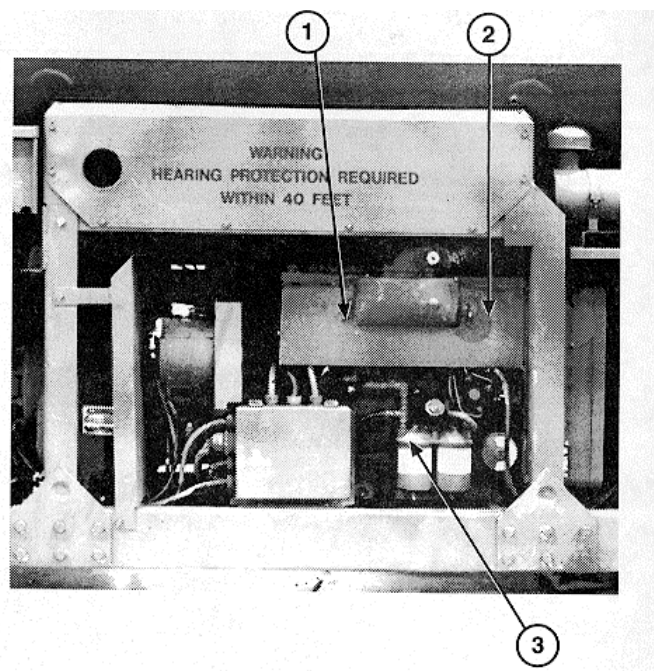
Do not perform step 6 if throttle cable needs to be adjusted.

6. Install engine door panel (2) on engine (3) with two retaining screws (1).

**c. THROTTLE CABLE ADJUSTMENT****NOTE**

- Perform step 1 only if removal and installation steps have not been performed.
- Engine should be adjusted to low idle speed (900 rpm).

1. Loosen two retaining screws (1), and remove engine door panel (2) from engine (3).
2. Start engine (refer to TM 9-2330-398-10).
3. To increase engine speed, loosen jamnut (21) on outside of engine shrouding (14) and tighten inside jamnut (13).
4. To decrease engine speed, loose pin side jamnut (13) and tighten outside jamnut (21).
5. Stop engine (refer to TM 9-2330-38-10).
6. Install engine door panel (2) on engine (3) with two retaining screws (1).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10)

**3-24. GOVERNOR LINKAGE ASSEMBLY REPAIR.**

*This Task Covers:*

- |                 |                |
|-----------------|----------------|
| a. Removal      | b. Disassembly |
| c. Inspection   | d. Assembly    |
| e. Installation |                |

*Initial Setup:*

**Tools/Test Equipment**

- General mechanic's tool kit (Item 4, Appendix B)

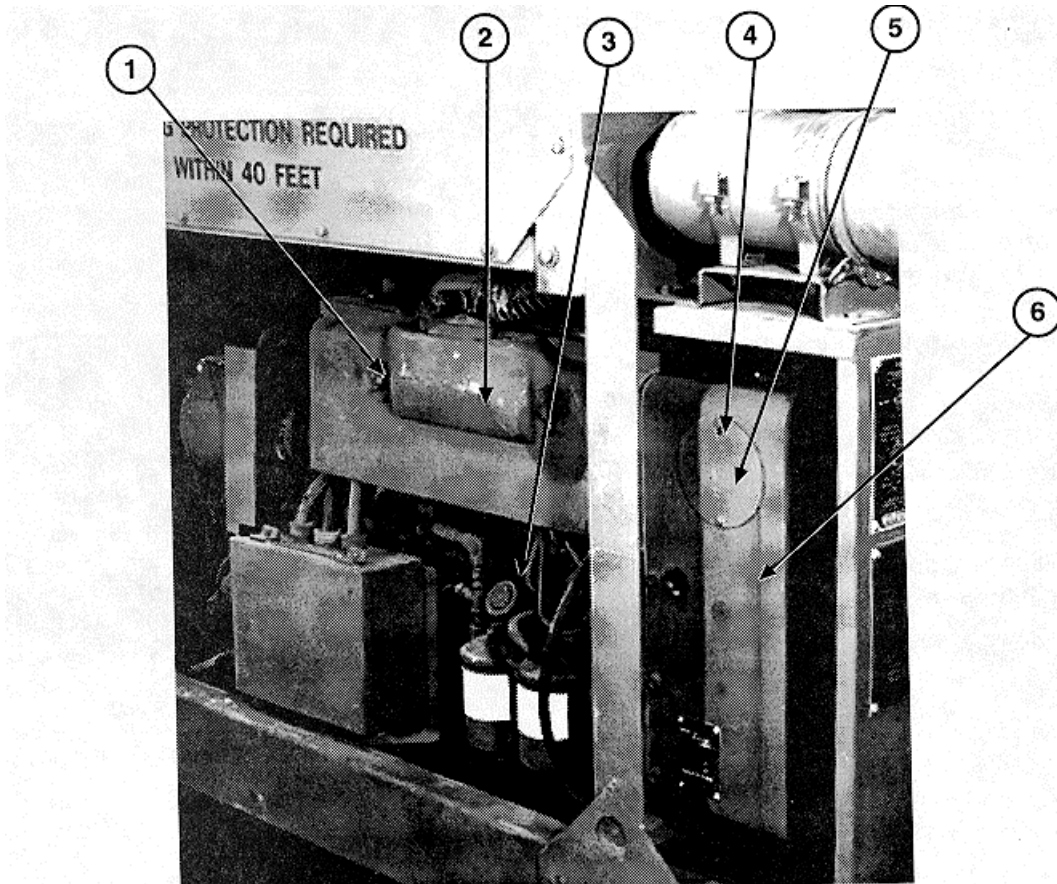
- Semi-trailer bonded and grounded (refer to TM 9-2330-398-10).

**Equipment Conditions:**

- Semi-trailer uncoupled (refer to TM 9-2330-398-10).

**a. REMOVAL**

1. Loosen two retaining screws (1), and remove engine door panel (2) from engine (3).
2. Remove screw (4) and access cover (5) from engine blower housing (6).



**3-24. GOVERNOR LINKAGE ASSEMBLY REPAIR (continued).**

3. Remove two nuts (10) and governor linkage assembly (7) from fuel metering pump (12) and governor arm (11).

**b. DISSASSEMBLY**

Remove two ball joints (9) and nuts (8) from governor linkage assembly (7).

**c. INSPECTION**

1. Inspect governor linkage components for damaged threads, bent linkage rod, defective spring, and excessive wear. Replace damaged components as required.
2. Inspect ball joints for tightness. Replace ball joints if they are worn and come apart easily.

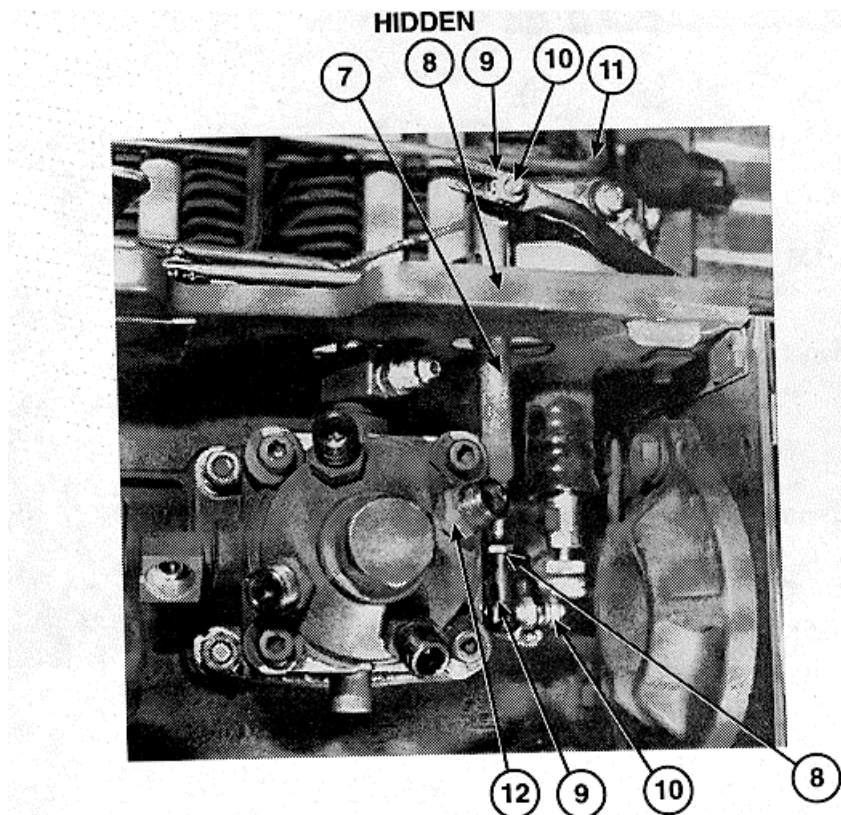
**d. ASSEMBLY****NOTE**

If new ball joints are used on linkage, position them to obtain the same length or 1/32 inch more than the old linkage (one turn equals 1/32 inch). If old linkage length is not available, position new ball joints about midway on each end of linkage, then lengthen 1/8 inch.

Install two ball joints (9) and two nuts (8) on governor linkage assembly (7).

**e. INSTALLATION**

1. Install governor linkage assembly (7) on fuel metering pump (12) and governor arm (11) with two nuts (10).



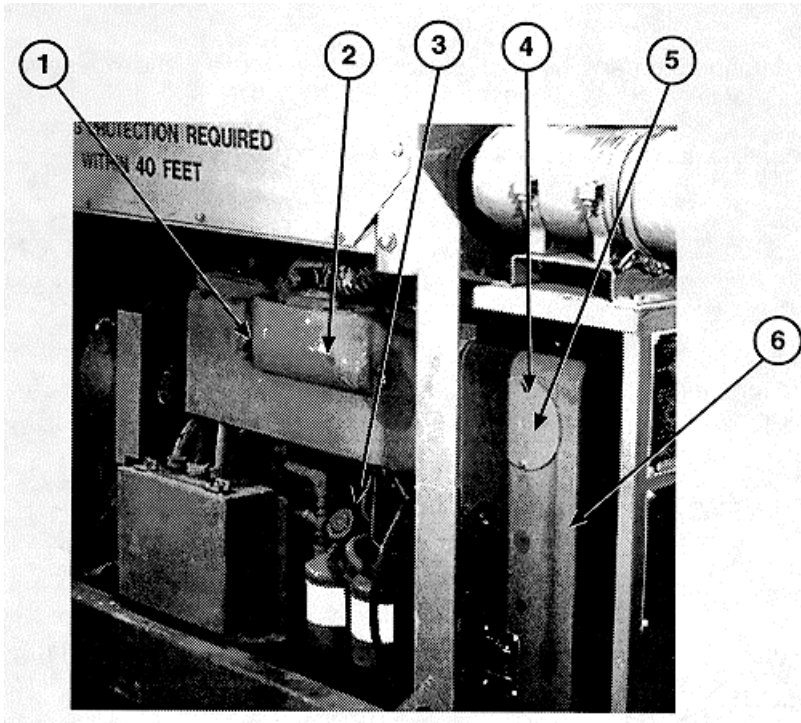
**3-24. GOVERNOR LINKAGE ASSEMBLY REPAIR (continued).**

2. Start engine (refer to TM 9-2330-398-10) and run at 1200 rpm.

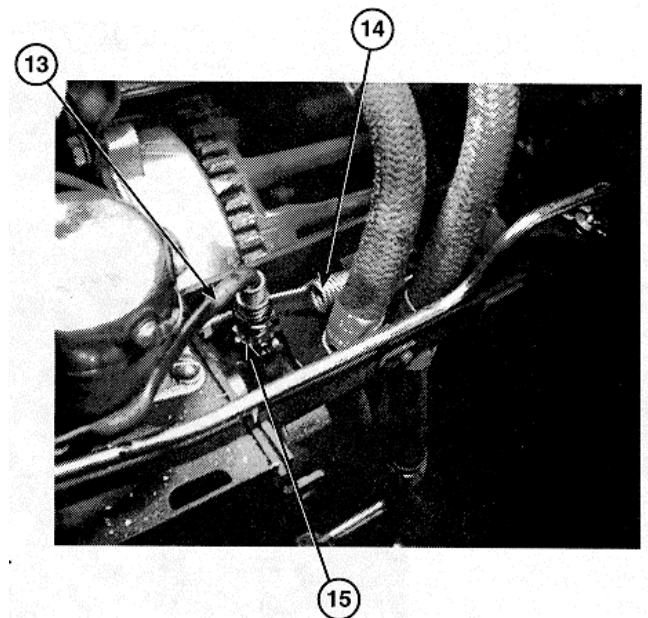
**NOTE**

Step 3 is for coarse adjustment of governor linkage; step 4 is for fine adjustment.

3. Relocate spring (14) in notches in governor arm (13) to eliminate rough idling or loping of engine.



4. Turn ratchet hub (15) clockwise to decrease rpm, counterclockwise to increase rpm to eliminate rough idling.
5. Stop engine (refer to TM 9-2330- 3 10).
6. Replace engine door panel (2) on engine assembly (3), and tighten two retainer screws (1).
7. Install access cover (5) and screw (4) on engine blower housing (6).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

**3-25. ENGINE EXHAUST MANIFOLD REPLACEMENT.***This Task Covers:*

- |            |                 |
|------------|-----------------|
| a. Removal | b. Installation |
|------------|-----------------|

*Initial Setup:***Tool/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)
- Exhaust pipe removed (para 2-99).

**Equipment Conditions:**

- Engine and pump cabinet frame removed (para 3-16).
- Air shutter assembly removed (para 3-26).

**Materials/Parts:**

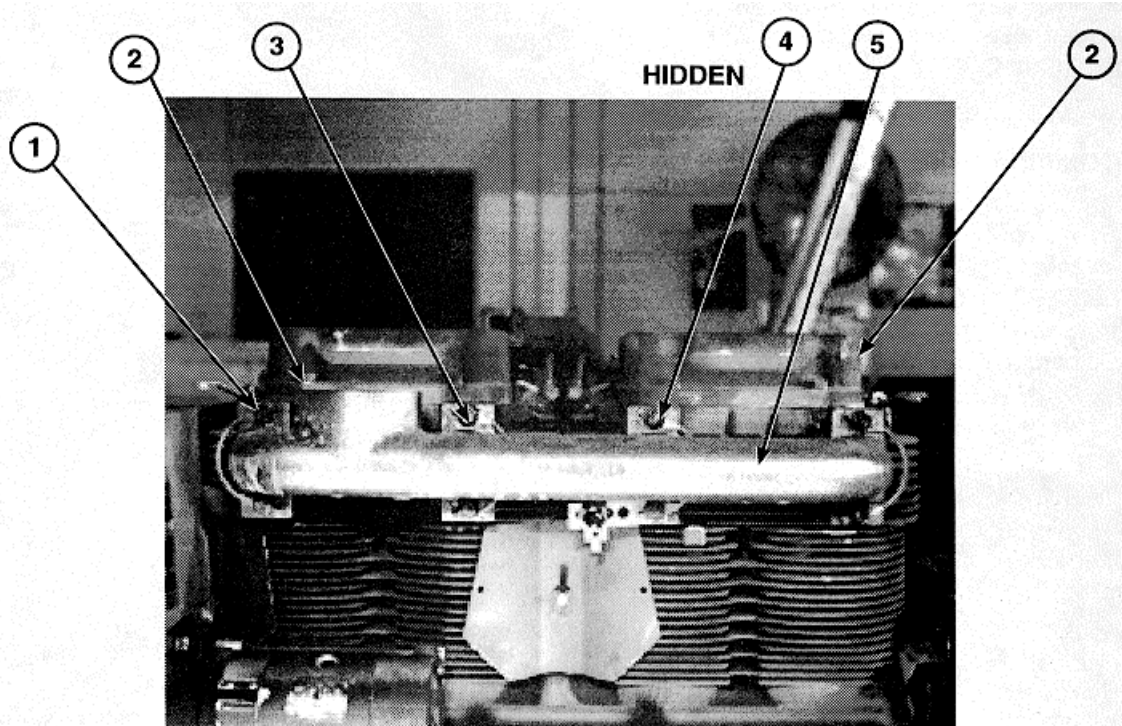
- Gasket (4) (Item 63, Appendix F)
- Washer (4) (Item 192, Appendix F)

**a. REMOVAL**

Bend out four locking tabs on each of four washers (1) and remove eight bolts (3), exhaust manifold (5), and four gaskets (4) from two cylinder heads (2). Discard gaskets and washers.

**b. INSTALLATION**

Install four new gaskets (4) and exhaust manifold (5) on two cylinder heads (2) with four new locking tabs (1) and eight bolts (3). Tighten bolts between 13 and 15 lb.-ft (17 and 20 N•m). Bend locking tabs (1) over bolts (3).

**FOLLOW-ON MAINTENANCE:**

- Install exhaust pipe (para 2-99).
- Install air shutter assembly (para 3-26).
- Install engine and pump cabinet frame (3-16).



### 3-26. ENGINE SHROUDING REPLACEMENT.

#### *This Task Covers:*

- |  |                                       |
|--|---------------------------------------|
| a. Top Air Housing Cover Removal       | b. Blower Housing Removal             |
| c. Air Shutter Assembly Removal        | d. Rear Cylinder Housing Removal      |
| e. Bottom Cylinder Pan Removal         | f. Front Cylinder Housing Removal     |
| g. Airflow Baffle Removal              | h. Air flow Baffle Installation       |
| i. Front Cylinder Housing Installation | j. Bottom Cylinder Pan Installation   |
| k. Rear Cylinder Housing Installation  | l. Air Shutter Assembly Installation  |
| m. Blower Housing Installation         | n. Top Air Housing Cover Installation |

#### *Initial Setup:*

#### **Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

#### **Materials/Parts:**

- Lockwasher (Item 95, Appendix F)
- Lockwasher (Item 96, Appendix F)
- Lockwasher (2) (Item 116, Appendix F)
- Self-locking nut (5) (Item 172, Appendix F)
- Self-locking nut (4) (Item 177, Appendix F)

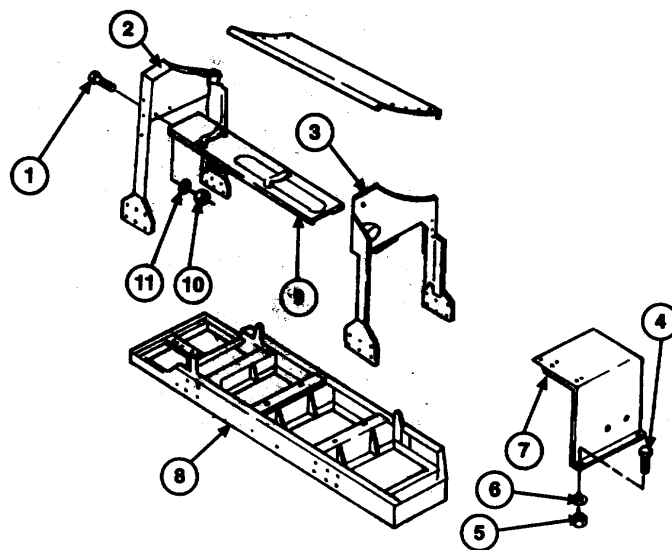
#### **Equipment Conditions:**

- Semi-trailer uncoupled (refer to TM 9-2330-398-10).
- Muffler and exhaust pipe removed (para 2-99).
- Air cleaner hose disconnected at intake manifold (para 2-96).

- Fuel lines removed from fuel tank (if removing blower housing) (para 2-97).
- Engine high-temp thermostatic control switch removed (if removing air shutter) (para 3-28).
- Throttle cable at engine removed (if removing rear cylinder housing) (para 3-23).
- Governor linkage assembly removed (if removing bottom cylinder pan) (para 3-24).
- Engine fuel lines disconnected (if removing bottom cylinder pan) (para 2-98).
- Engine throttle and choke linkage removed (para 3-23).

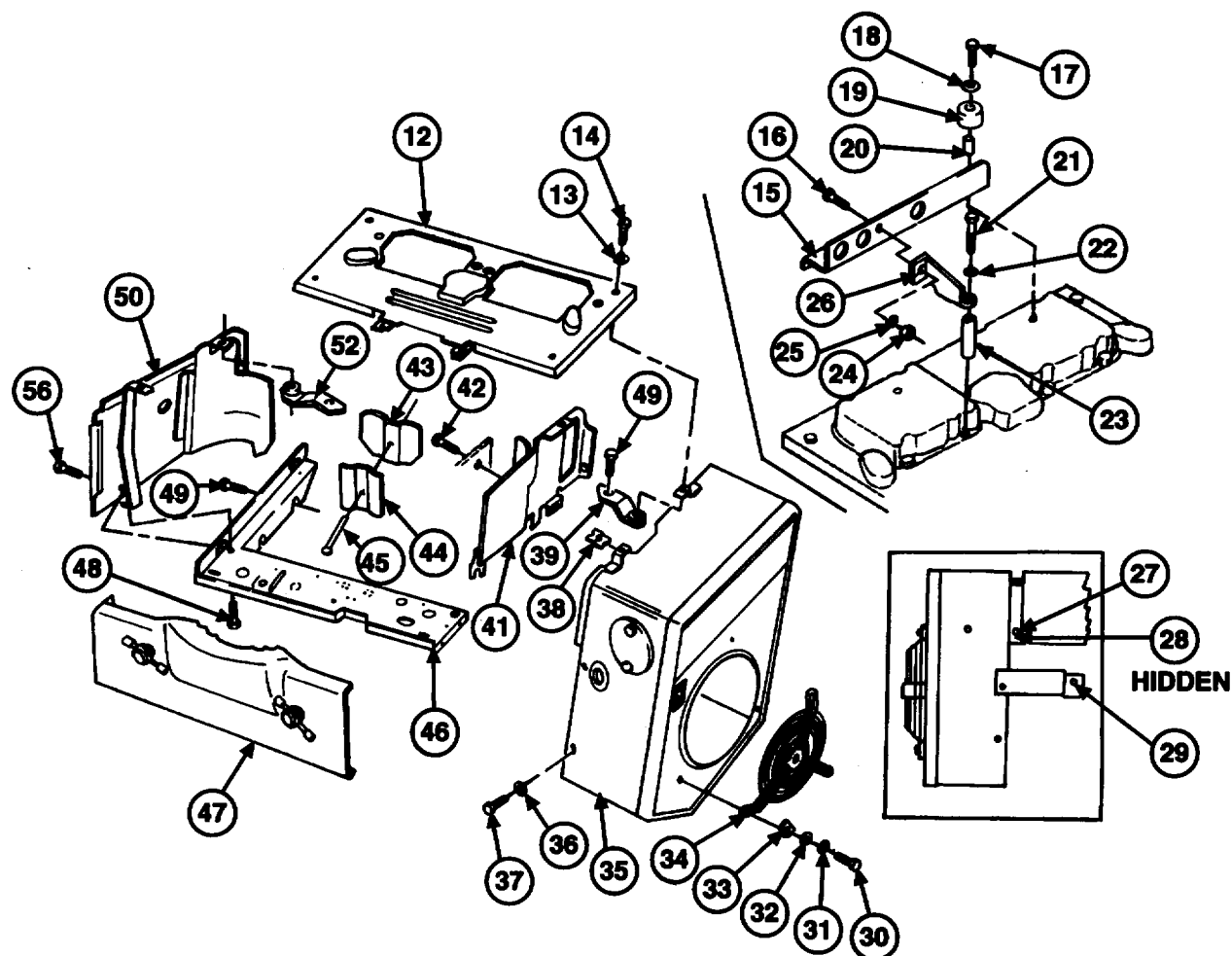
#### **a. TOP AIR HOUSING COVER REMOVAL**

1. Remove five screws (1), washers (11), and self-locking nuts (10) and muffler tray (9) from two supports (2 and 3). Discard self-locking nuts.



**3-26. ENGINE SHROUDING REPLACEMENT.**

2. Remove screw (21), lockwasher (22), and spacer (23) from top air housing cover (12). Discard lockwasher.
3. Remove two screws (17), washers (18), vibration cushions (19), and spacers (20) and lifting bracket (15), with brace (26) attached, from engine.
4. Remove four screws (14) and washers (13), two spring nuts (38), and top air housing cover (12) from engine.

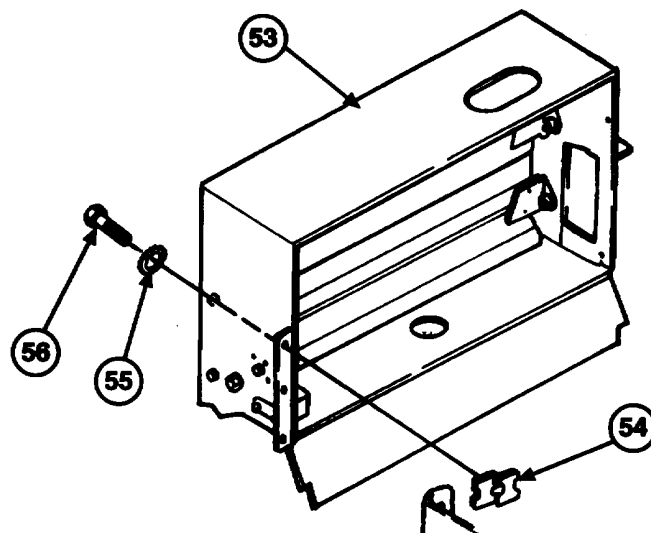
**b. BLOWER HOUSING REMOVAL****NOTE**

To remove blower housing only, top air housing cover need not be removed, just loosened.

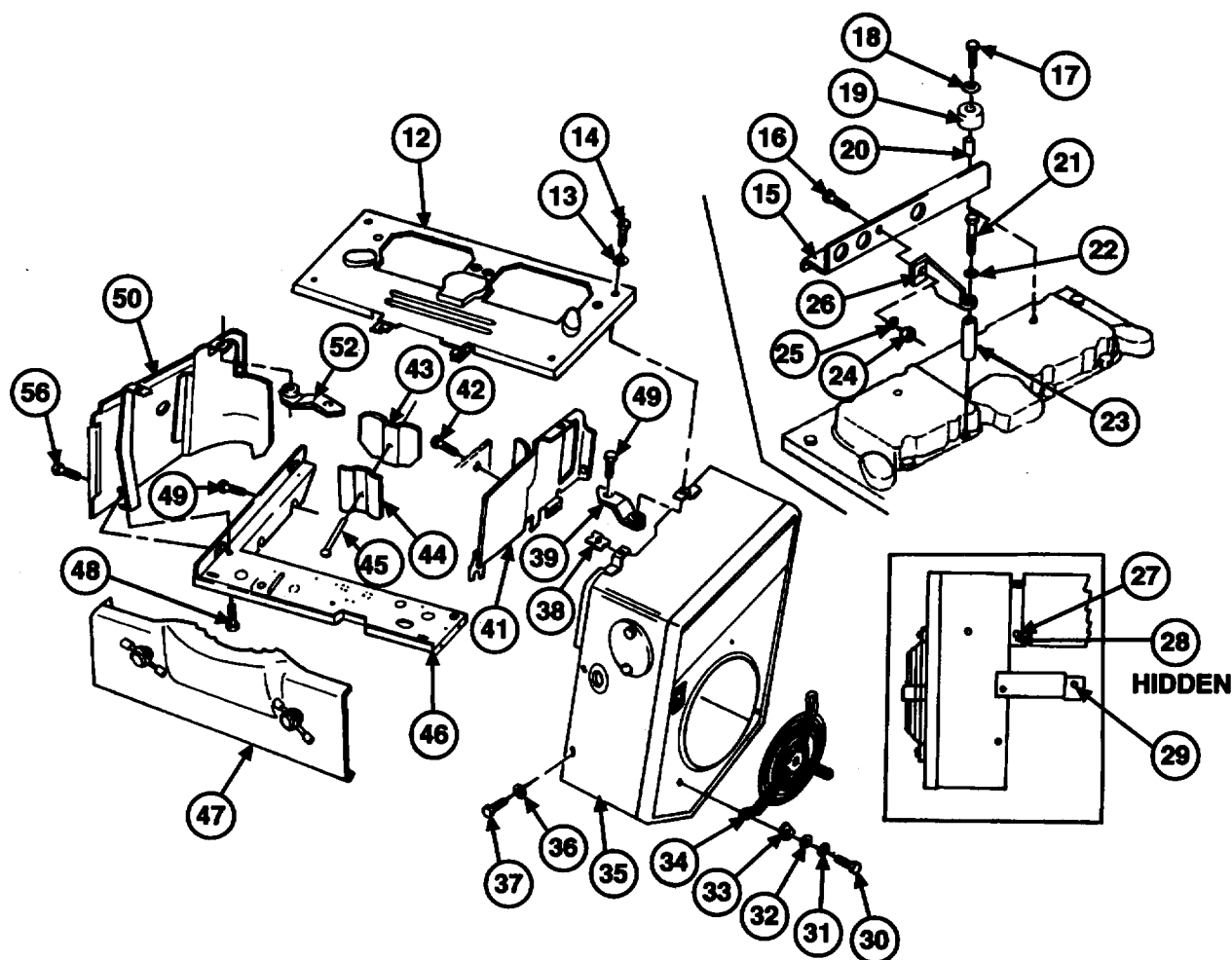
1. Remove four screws (4), washers (6), and self-locking nuts (5) and engine fan shroud (7) from frame (8) and support (3). Discard self-locking nuts.
2. Loosen screw (29), but do not remove.
3. Remove screw (30), lockwasher (31), washer (32), and grille retainer (33) and blower housing grille (34) from blower housing (35). Discard lockwashers.
4. Remove six screws (37) lockwashers (36), two screws (27) and washers (28), screw (29), and blower housing (35) from engine (1). Discard lockwashers.

**3-26. ENGINE SHROUDING REPLACEMENT (continued).****c. AIR SHUTTER ASSEMBLY REMOVAL**

1. Remove blower housing (sub-para 3-26b).
2. Remove three screws (56), lockwashers (55), and spring nuts (54) and air shutter assembly (53) from engine. Discard lockwashers.

**d. REAR CYLINDER HOUSING REMOVAL**

1. Remove air shutter assembly (sub-para 3-26c).
2. Remove three screws (48), engine door panel (47), and rear cylinder housing (51) from engine.



---

**3-26. ENGINE SHROUDING REPLACEMENT (continued).**

---

**e. BOTTOM CYLINDER PAN REMOVAL**

1. Remove top air housing cover (sub-para 3-26a), blower housing (sub-para 3-26b), air shutter assembly (sub-para 3-26c), and rear cylinder housing (sub-para 3-26d).
2. Remove four screws (49) and bottom cylinder pan (46) from engine (1).

**f. FRONT CYLINDER HOUSING REMOVAL**

1. Remove air shutter assembly (sub-para 3-26c).
2. Remove three screws (42), engine door panel (47), and front cylinder housing (41) from engine (1).

**g. AIRFLOW BAFFLE REMOVAL**

1. Remove air shutter assembly (sub-para 3-26c).
2. Remove screw (45) and two airflow baffles (43 and 44) from cylinder heads.

**h. AIRFLOW BAFFLE INSTALLATION**

1. Install two airflow baffles (43 and 44) and screw (45) on cylinder heads.
2. Install air shutter assembly (sub-para 3-261).

**i. FRONT CYLINDER HOUSING INSTALLATION**

1. Install front cylinder housing (41) engine door panel (47), on engine with three screws (42).
2. Install air shutter assembly (sub-para 3-261).

**j. BOTTOM CYLINDER PAN INSTALLATION**

1. Install bottom cylinder pan (46) on engine with four screws (49).
2. Install rear cylinder housing (sub-para 3-26k), air shutter assembly (sub-para 3-261), blower housing (sub-para 3-26m), and top air housing cover (sub-para 3-26n).

**k. REAR CYLINDER HOUSING INSTALLATION**

1. Install rear cylinder housing (51) and engine door panel (47) on engine (1) with three screws (48).
2. Install air shutter assembly (sub-para 3-261).

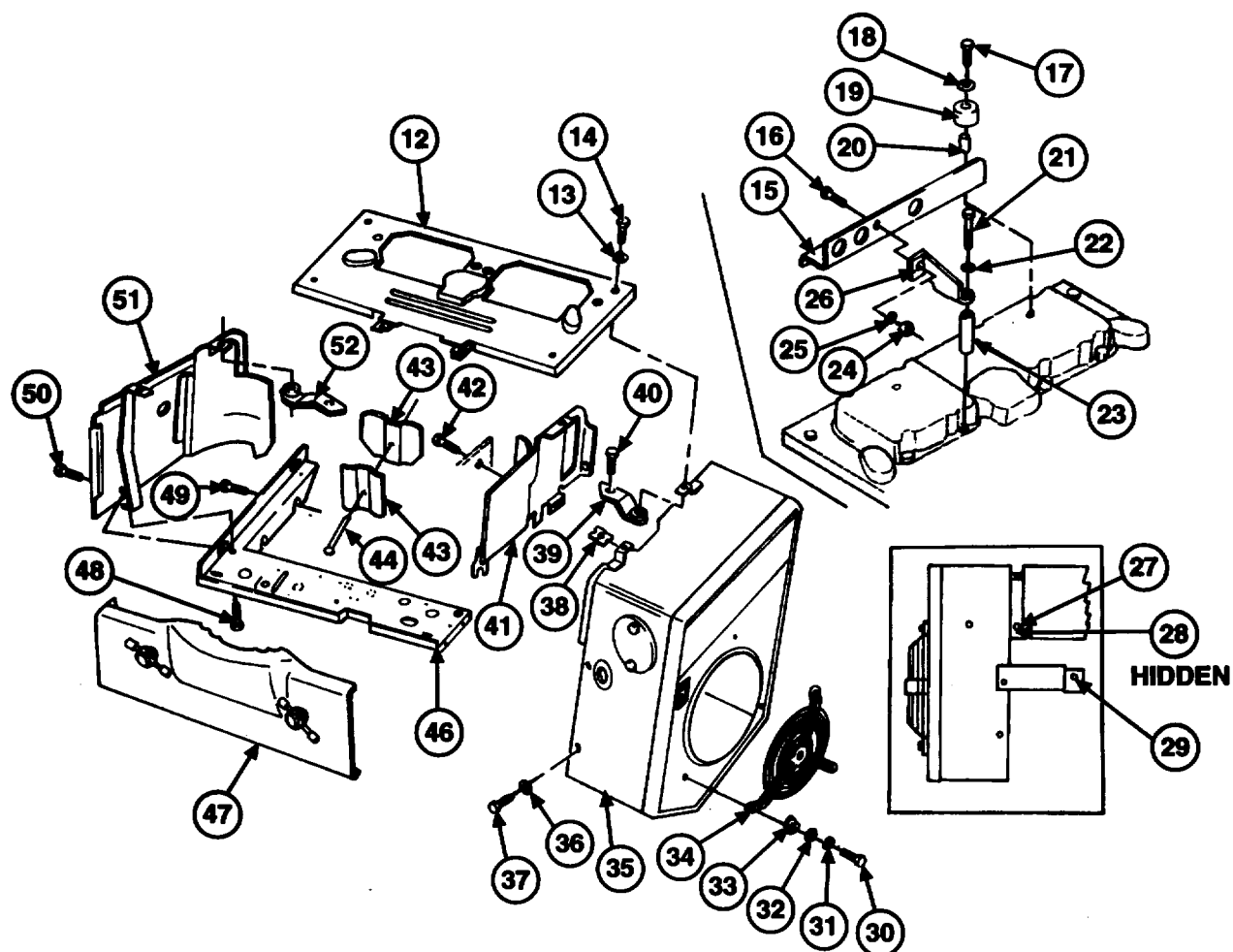
**3-26. ENGINE SHROUDING REPLACEMENT (continued).****I. AIR SHUTTER ASSEMBLY INSTALLATION**

1. Install air shutter assembly (53) on engine with three screws (56), new lockwashers (55), and spring nuts (54).
2. Install blower housing (sub-para 3-26m).\_\_

**NOTE**

If blower housing is installed, perform step 3. If blower housing is not installed, do not perform step 3.

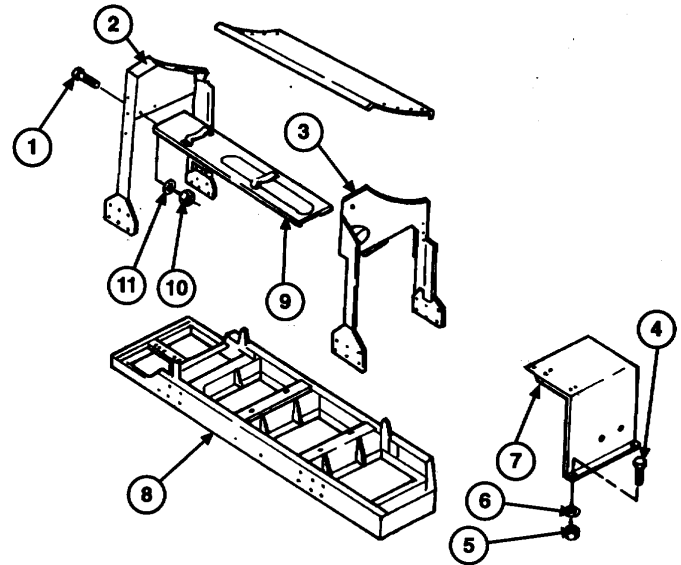
3. Install two screws (14) and washers (13) on top air housing (12).



**3-26. ENGINE SHROUDING REPLACEMENT (continued).****m. BLOWER HOUSING INSTALLATION****NOTE**

Make sure starter shroud is attached to blower housing.

1. Install blower housing (35) on engine with six screws (37) and new lockwashers (36), two screws (27) and washers (28), and screw (29).
2. Install blower housing grille (33) on blower housing (35) with grille retainer (33), washer (32), new lockwasher (31), and screw (30).
3. Tighten screw (29).
4. Install engine fan shroud (7) on frame (8) and support (3) with four screws (4), washers (6), and new self-locking nuts (5).

**n. TOP AIR HOUSING COVER INSTALLATION**

1. Install top air housing cover (12) on engine with four screws (14) and washers (13) and two spring nuts (38).
2. Install lifting bracket (15) and lifting bracket brace (26) on engine with two screws (17), washers (18), vibration cushions (19), and spacers (20).
3. Install spacer (23) on top air housing cover (12) with new lockwasher (22) and screw (21).
4. Install muffler tray (9) on two supports (3 and 2) with five screws (1), washers (11), and new self-locking nuts (10).

**FOLLOW-ON MAINTENANCE:**

- Install muffler and exhaust pipe (para 2-99).
- Connect air cleaner hose at intake manifold (para 2-96).
- Install fuel lines on fuel tank (if Installing blower housing) (para 2-97).
- Install throttle cable at engine (if installing rear cylinder housing) (para 3-23).
- Install governor linkage assembly (if Installing bottom cylinder pan) (para 3-24).
- Connect engine fuel lines (if installing bottom cylinder pan) (para 2-98).
- Install engine high-temp thermostatic control switch (para 3-28).
- Install engine throttle and choke linkage (para 3-23).

### 3-27. ALTERNATOR REPAIR.

*This Task Covers:*

- |                |                            |
|----------------|----------------------------|
| a. Disassembly | b. Cleaning and inspection |
| c. Assembly    | d. Adjustment              |

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (item 4, Appendix B)
- Common No. 1 tool set (Item 1, Appendix B)

**Materials/Parts:**

- Grease (Item 17, Appendix C)

- Gasket (Item 26, Appendix F)
- Gasket (Item 27, Appendix F)

**Equipment Conditions:**

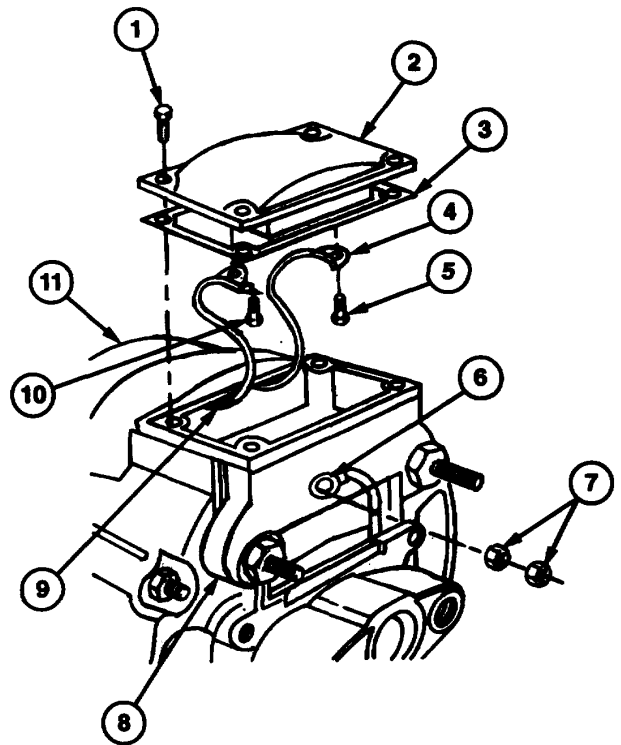
- Alternator removed (para 2-100).

#### a. DISASSEMBLY

**NOTE**

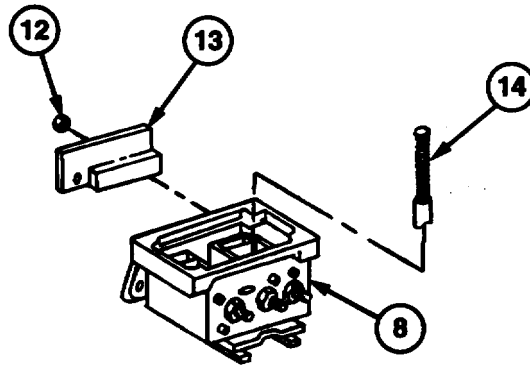
- Steps 1 through 6 cover removal of the voltage regulator.
- Tag electrical leads prior to disassembly to aid in assembly.

1. Place alternator (11) in vise with brass vise jaw caps.
2. Remove four screws (1), and lift regulator (2) and gasket (3) from alternator (11).
3. Remove screw (5) and red lead (4) from right (positive) terminal of regulator (2).
4. Remove screw (8) and black lead (9) from left (negative) terminal of regulator (2).
5. Remove two nuts (7) and diode electrical lead (6) from regulator housing (8).
6. Remove and discard gasket (3) from alternator (11).



**3-27. ALTERNATOR REPAIR (continued).**

7. Remove brush and spring assembly (14) from regulator housing (8).
8. Remove three nuts (12) and diode trio (13) from regulator housing (8).

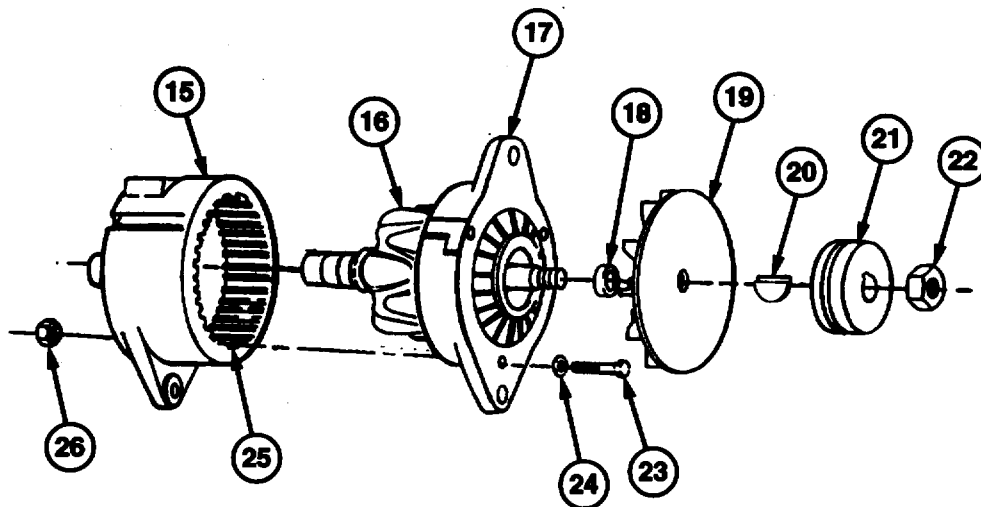


9. Remove nut (22), groove pulley (21), and fan holder assembly (19) from shaft of rotor (16).
10. Remove Woodruff key (20) and spacer (18) from shaft of rotor (16).

**NOTE**

Make sure stator remains in slip ring end housing.

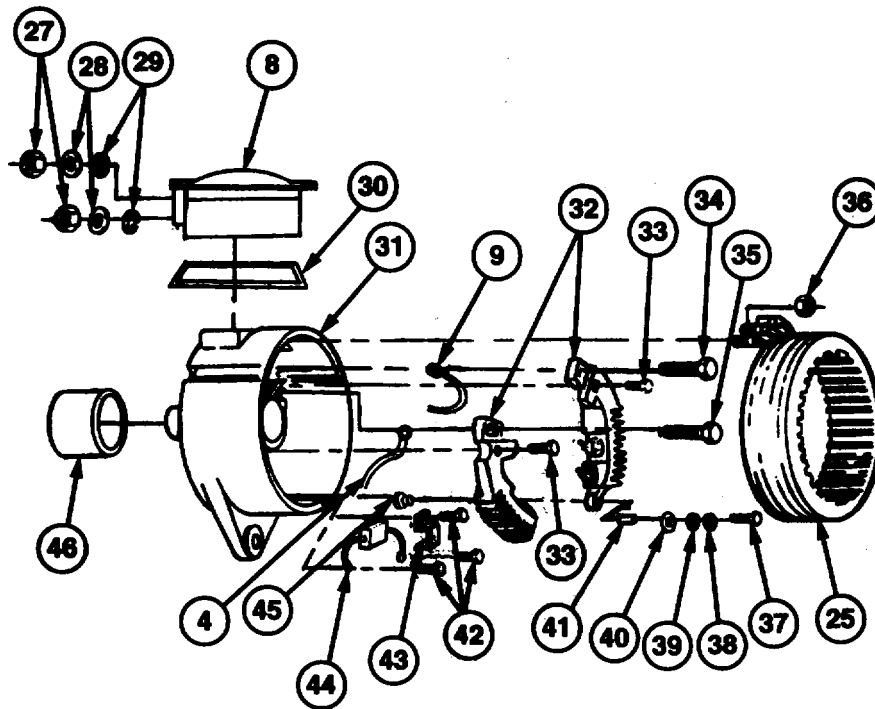
11. Remove three screws (23), nuts (26), and washers (24), drive end housing (17), and rotor (16) from stator (25) and slip ring end housing (15).





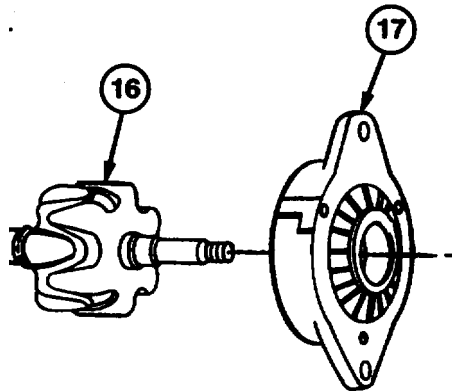
**3-27. ALTERNATOR REPAIR (continued).**

12. Remove three nuts (36) and three electrical leads of stator (25) and six electrical leads of rectifier assemblies (32) from slip ring housing (15).
13. Remove two nuts (27), washers (28), and nuts (29) from negative and positive output terminal bolts (34 and 35).
14. Remove negative and positive output terminal bolts (34 and 35), regulator housing (8), and gasket (30) from slip ring end housing (15). Discard gasket.
15. Remove three screws (42), clamp (43), and capacitor (44) from two rectifier assemblies (32).
16. Remove two screws (33), and red lead (4) and black lead (9) from two rectifier assemblies (32).
17. Remove two screws (37), washers (38), guard washers (39), insulating washers (40), and two rectifier assemblies (32) from slip ring end housing (15).
18. Remove insulating bushing (41) from each of two rectifier assemblies (32).
19. Remove four terminal stud insulating bushings (45) from slip ring end housing (15).
20. Remove flanged dust cap (46) from slip ring end housing (15).



**3-27. ALTERNATOR REPAIR (continued).**

21. Using puller set, remove rotor (16) from drive end housing (17)

**b. CLEANING AND INSPECTION.****WARNING**

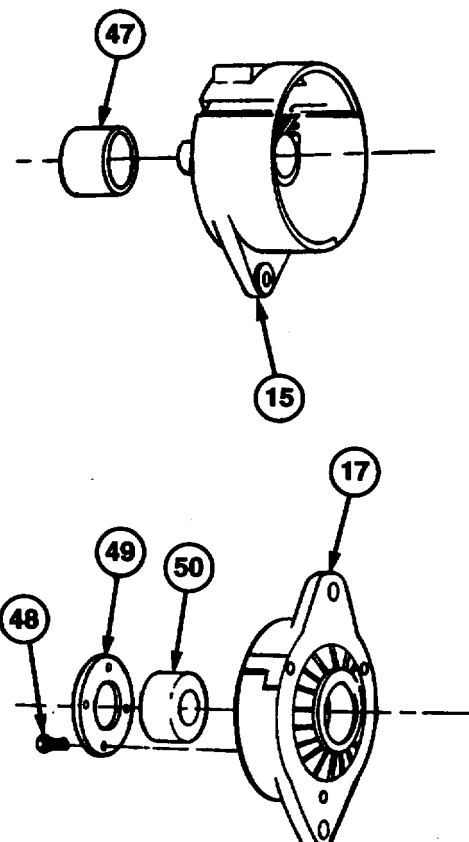
Particles blown by compressed air can be dangerous. Be sure to direct air stream away from the user and other personnel in the area. Failure to do so may result in injury to personnel.

1. Clean all parts with compressed air.
2. Inspect bearing (47) in slip ring end housing (15). If bearing (47) is damaged, remove bearing (47) from slip ring end housing (15).
3. Inspect bearing (48) in drive end housing (17). If bearing (49) is damaged, remove four screws (50), bearing retainer (48), and bearing (49) from drive end housing (17).
4. Inspect all parts for wear, cracks, or other defects. Replace damaged parts.

**c. ASSEMBLY****NOTE**

Perform steps 1 and 2 only if bearing and bearing retainer were removed from drive end housing.

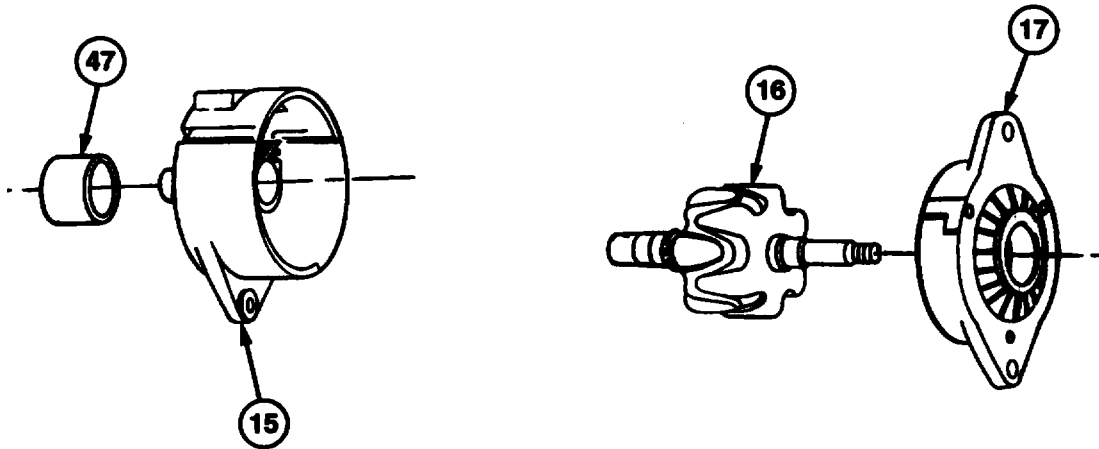
1. Install bearing (49) in drive end housing (17).
2. Install bearing retainer (48) in drive end housing (17) with four screws (50).



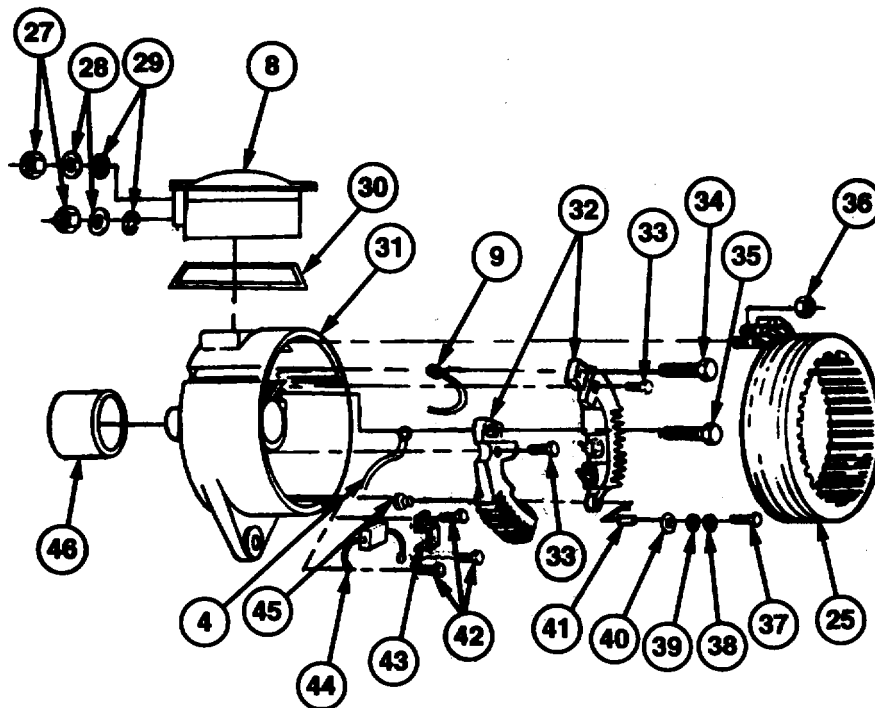
**3-27. ALTERNATOR REPAIR (continued).****NOTE**

- Perform step 3 only if bearing was removed from slip ring end housing.
- When bearing is properly installed, part number on bearing will face to the outside of slip ring end housing.

3. Install bearing (47) in slip ring end housing (15).



4. Install rotor (16) in drive end housing (17).
5. Install flanged dust cap (46) in slip ring end housing (15).
6. Install four terminal stud insulating bushings (45) in slip ring end housing (15).



**3-27. ALTERNATOR REPAIR (continued).**

7. Install insulating bushing (41) in each of two rectifier assemblies (32).
8. Install two rectifier assemblies (32) in slip ring end housing (15) with two insulating washers (40), guard washers (39), washers (38), and screws (37). Tighten screws (37) only enough to hold rectifier assemblies (32) in place.
9. Install red lead (4) and black lead (9) on two rectifier assemblies (32) with two screws (33). Route red lead (4) and black lead (9) through opening in slip ring end housing (15).
10. Install capacitor (44) and clamp (43) in slip ring end housing (15) with three screws (42).

**NOTE**

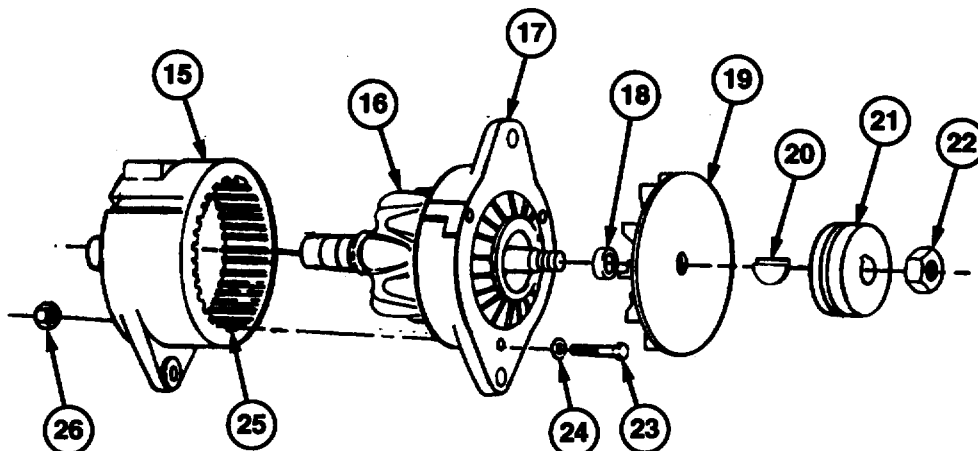
Red lead and black lead run through opening between slip ring end housing and regulator housing.

11. Install new gasket (30), regulator housing (8), and positive and negative output terminal bolts (35 and 34) on slip ring housing (15).
12. Install two nuts (27), washers (28), and nuts (29), on positive and negative output terminal bolts (35 and 34).
13. Using tags as a guide, install six electrical leads of rectifier assemblies (32) and three electrical leads of stator (25) to slip ring end housing (15) with three nuts (36).

**NOTE**

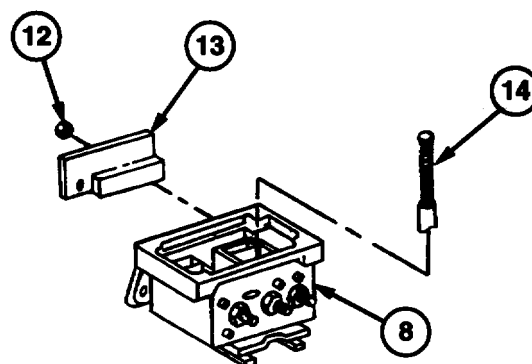
Make sure all electrical leads are not pinched between rectifier assemblies and slip ring end housing before tightening screws.

14. Tighten two screws (37) on two rectifier assemblies (32).
15. Install drive end housing (17) and rotor (16) on stator (25) and slip ring end housing (25) with three screws (23), washers (24), and nuts (26).
16. Install spacer (18) and Woodruff key (20) on shaft of rotor (16).
17. Install fan holder assembly (19) and groove pulley (21) on shaft of rotor (16) with nut (22).



**3-27. ALTERNATOR REPAIR (continued).**

18. Install diode trio (13) on regulator housing (8) with three nuts (12).
19. Install brush and spring assembly (14) in regulator housing (8).

**NOTE**

Steps 20 through 24 cover installation of voltage regulator.

20. Install new gasket (3) over red lead (4), diode trio electrical lead (6), and black lead (9).
21. Install diode electrical lead (6) on regulator housing (8) with two nuts (7).
22. Install black lead (9) to left (negative) terminal of regulator (2) with screw (8).
23. Install red lead (4) to right (positive) terminal of regulator (2) with screw (5).

**NOTE**

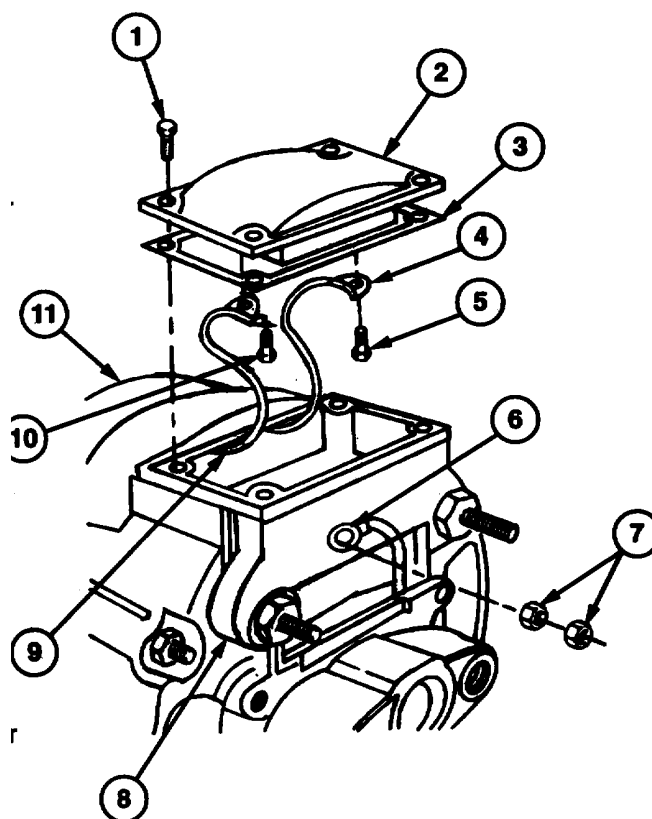
Perform step 24 only if voltage regulator does not require adjustment.

24. Secure regulator (2) to alternator (11) with four screws (1).

**d. ADJUSTMENT****NOTE**

- Adjustment may be required during prolonged operation in extremely low or high temperatures to make sure batteries are properly charged.
- Be careful with gasket on regulator. If it is damaged, regulator will have to be removed to replace it.

1. If necessary, remove four screws (1), regulator (2), and gasket (3) from alternator (11).



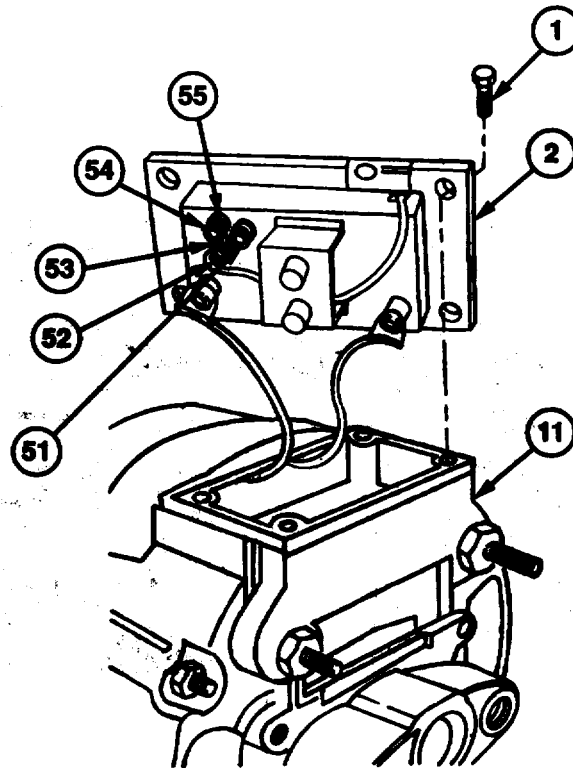
**3-27. ALTERNATOR REPAIR (continued).****CAUTION**

Do not overtighten screws on voltage adjustment strap. Voltage regulator will be damaged.

**NOTE**

Changing position of voltage adjustment strap will change output by 0.4 V dc.

2. Remove two screws (54) and voltage adjustment strap (53) from voltage adjustment posts A, B, or C, (52, 51 or 55) of regulator (2).
3. For output voltage of 14.4 V dc (HIGH setting), install voltage adjustment strap (53) on adjustment posts B and C (51 and 55) of regulator (2) with two screws (54).
4. For output voltage of 14.0 V dc (MED setting), install voltage adjustment strap (53) on adjustment posts A and C (52 and 55) of regulator (2) with two screws (54).
5. For output voltage of 13.6 V dc (LOW setting), install voltage adjustment strap (53) on adjustment posts B and A (51 and 52) of regulator (2) with two screws (54).
6. Install regulator (2) and gasket (3) on alternator (11) with four screws (1).

**FOLLOW-ON MAINTENANCE:**

- Install alternator (para 2-100).

**3-28. ENGINE HIGH-TEMP THERMOSTAT CONTROL SWITCH REPLACEMENT.**

*This Task Covers:*

a. Removal

b. Installation

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

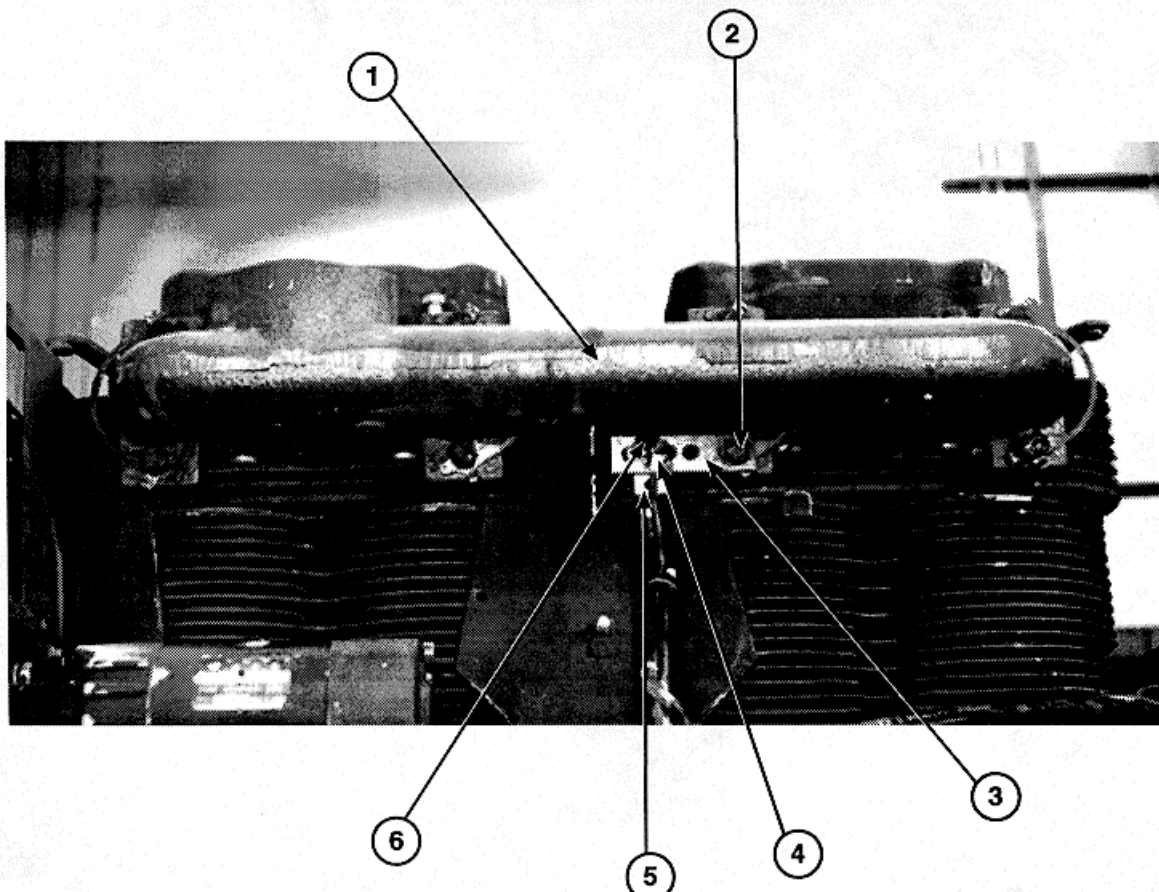
- Lockwasher (Item 117, Appendix F)

**Equipment Conditions:**

- Semi-trailer uncoupled (refer to TM 9-2330-398-10).
- Semi-trailer bonded and grounded (refer to TM 92330-39-10).
- Air shutter assembly removed (para 3-26).

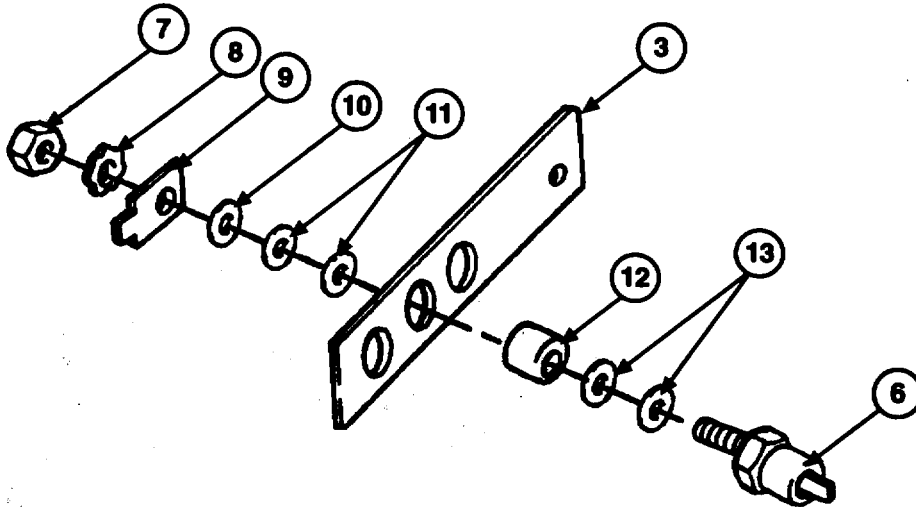
**a REMOVAL**

1. Disconnect two leads (4 and 5) from engine high-temp thermostat control switch (6).
2. Remove screw (2) and switch bracket (3) from exhaust manifold (1).



**3-28. ENGINE HIGH-TEMP THERMOSTAT CONTROL SWITCH REPLACEMENT.**

3. Remove nut (7), lockwasher (8), terminal (9), washer (10), two insulated washers (11), insulated sleeve (12), two insulated washers (13), and switch (6) from switch bracket (3). Discard lockwasher.

**b. INSTALLATION**

1. Install switch (6) on switch bracket (3) with nut (7), new lockwasher (8), terminal (9), washer (10), two insulated washers (11), insulated sleeve (12), and two insulated washers (13).
2. Install switch bracket (3) on exhaust manifold (1) with screw (2).
3. Connect two leads (4 and 5) to switch (6).

**FOLLOW-ON MAINTENANCE:**

- Install air shutter assembly (para 3-26).
- Disconnect ground (refer to TM 9-2330-398-10).



**3-29. ENGINE FUEL STOP SOLENOID REPAIR.***This Task Covers:*

- |                            |                |
|----------------------------|----------------|
| a. Removal                 | b. Disassembly |
| c. Cleaning and Inspection | d. Assembly    |
| e. Installation            | f. Adjustment  |

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Material/Parts:**

- Rag (Item 25, Appendix C)
- Lockwasher (2)

**Equipment Conditions:**

- Semi-trailer uncoupled (refer to TM 9-2330-398-10).
- Semi-trailer bonded and grounded (refer to TM 9-2330-398-10).

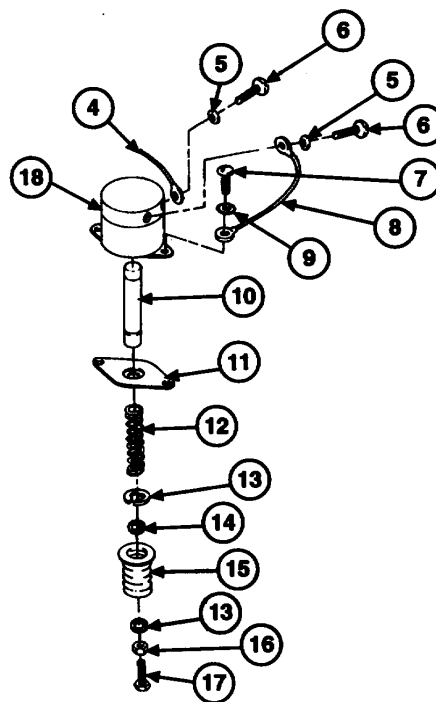
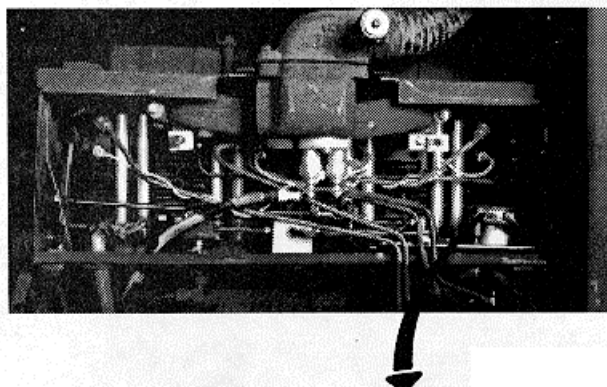
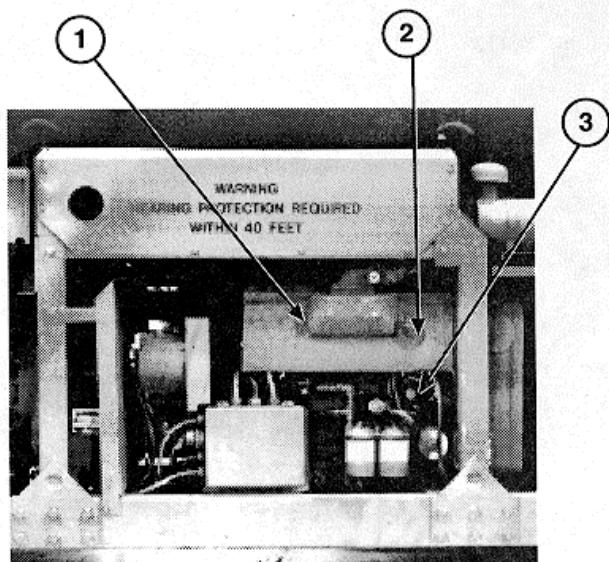
**a. REMOVAL**

1. Loosen two retaining screws (1) and remove engine door panel (2) from engine assembly (3).

**NOTE**

Lockwashers provisioned with solenoid.

2. Remove two screws (6), lockwashers (5), and leads (4 and 8) from engine fuel stop solenoid. Retain lockwashers.



---

**3-29. ENGINE FUEL STOP SOLENOID REPAIR (continued).**

---

3. Remove two screws (7) and lockwashers (9) and solenoid (18) from bottom cylinder pan. Discard lockwashers.

**b. DISSASSEMBLY**

Remove adjusting screw (17), jamnut (16), two retaining rings (14), rubber boot (15), spring (12), retaining ring (13), retaining plate (11), and solenoid plunger (10) from solenoid (18).

**c. CLEANING AND INSPECTION**

1. Wipe all components with clean rag and inspect for damage. Replace if damaged parts are found.
2. Inspect cover of solenoid plunger for deterioration, cracks, and small holes. Replace if defective.
3. Inspect leads for damage due to sharp bends, kinks, or excessive wear. Replace if defective.

**d. ASSEMBLY**

Install solenoid plunger (10), retaining plate (11), spring (12), rubber boot (15), retaining ring (14), jamnut (16), and adjusting screw (17) on solenoid (18).

**e. INSTALLATION**

1. Install solenoid (18) on bottom cylinder pan with two screws (7) and new lockwashers (9).
2. Install leads (4 and 8) to solenoid (18) with screws (6) and lockwashers (5).
3. Install engine door panel (2) with two retaining screws (1).

**f. ADJUSTMENT****NOTE**

Solenoid plunger should be adjusted to fully stop injection when in de-energized position.

If solenoid plunger sticks, remove engine fuel stop solenoid and clean plunger and plunger recess.

To adjust length of solenoid plunger (10) turn adjusting screw (17) and jamnut (16) clockwise to move solenoid plunger (10) out, counterclockwise to move solenoid plunger (10) in.

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

## Section VII. FILTERS, SEPARATORS, AND PURIFIERS MAINTENANCE

Paragraph Number	Paragraph Title	Page Number
3-30	General.....	3-96
3-31	Filter Separator Replacement .....	3-96
3-32	Drain Valve Assembly and Tubing Replacement.....	3-100

**3-30. GENERAL**

This section describes and illustrates removal and installation procedures for the filter separator and drain valve assembly and tubing.

**3-31. FILTER SEPARATOR REPLACEMENT.**

*This Task Covers:*

## a. Removal

## b. Installation

Initial Setup:

**Tools/Test Equipment:**

- Common no. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)
- Forklift (Item 5, Appendix B)

Materials/Parts:

- Petrolatum (Item 24, Appendix C)
- Tape, anti-sieze (Item 30, Appendix C)

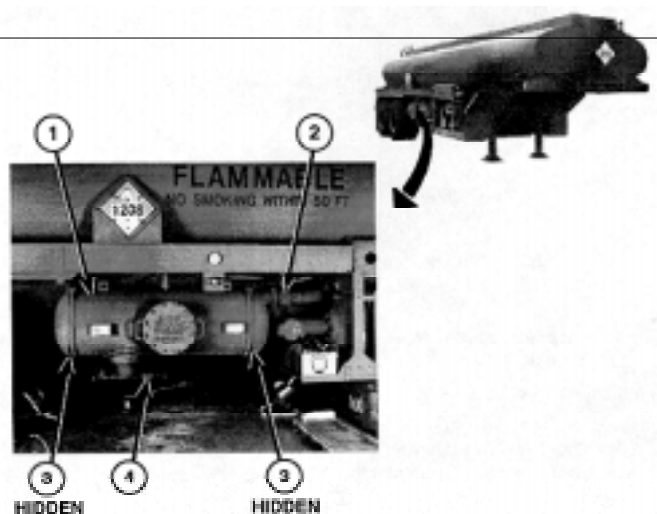
- Seal (2) (Item 151, Appendix F)
- Self-locking nut (2) (Item 176, Appendix F)

**Equipment Conditions:**

- Semi-trailer uncoupled (refer to TM 9-2330-398-10).
- Semi-trailer bonded and grounded (refer to TM 92330-398-10).
- Semi-trailer drained and purged (refer to TM 9-2330-398-10).

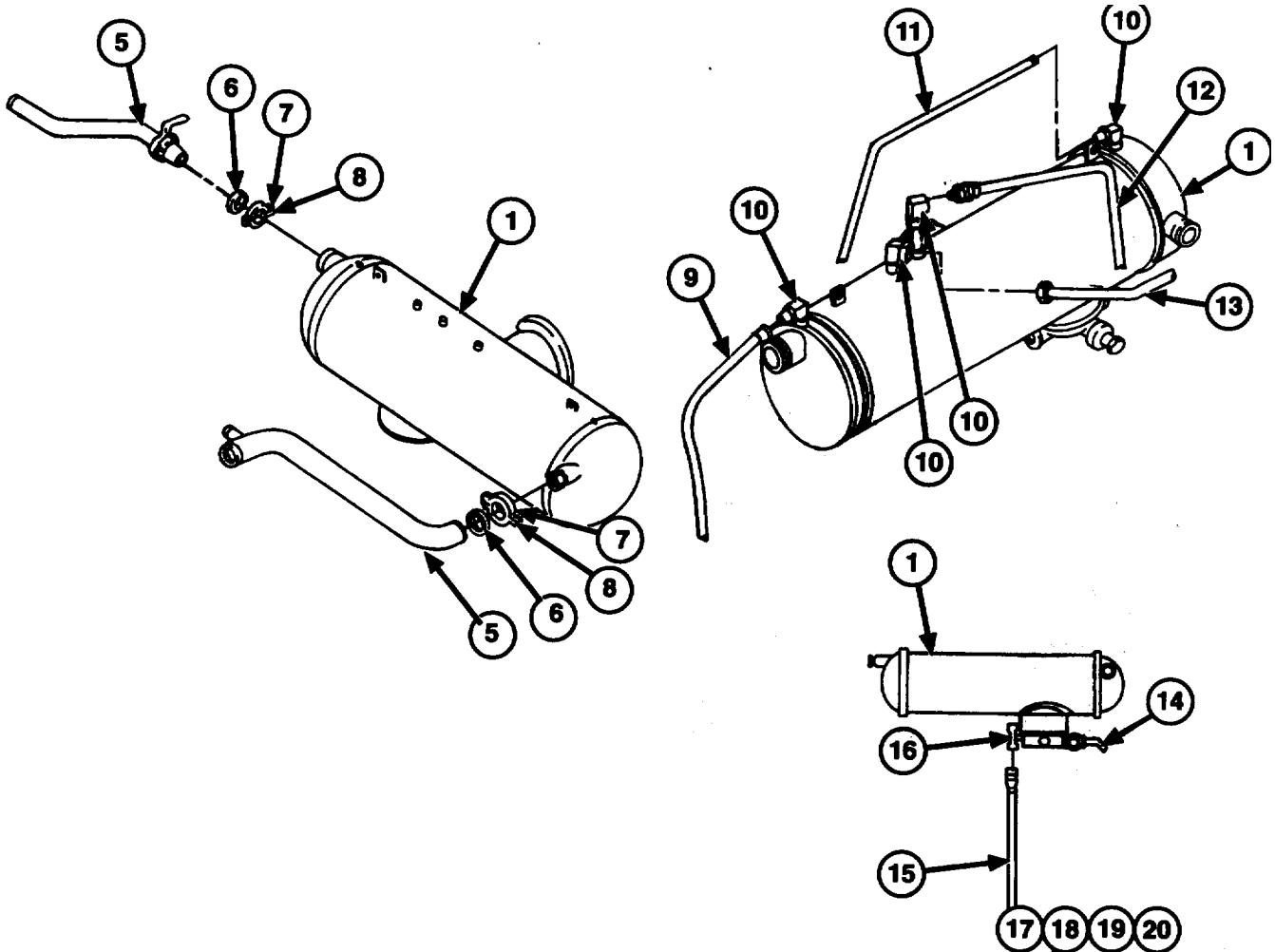
**a. REMOVAL**

1. Close valve M (2) on curb side of semi-trailer.
2. Position suitable container under filter separator (1). Open manual drain valve N (4), and remove drain plugs (3) to remove any fluid from filter separator (1).



**3-31. FILTER SEPARATOR REPLACEMENT (continued).**

3. Remove four screws (7) and two couplings (8) and two seals (6) from inlet and outlet lines (5) at filter separator (1).

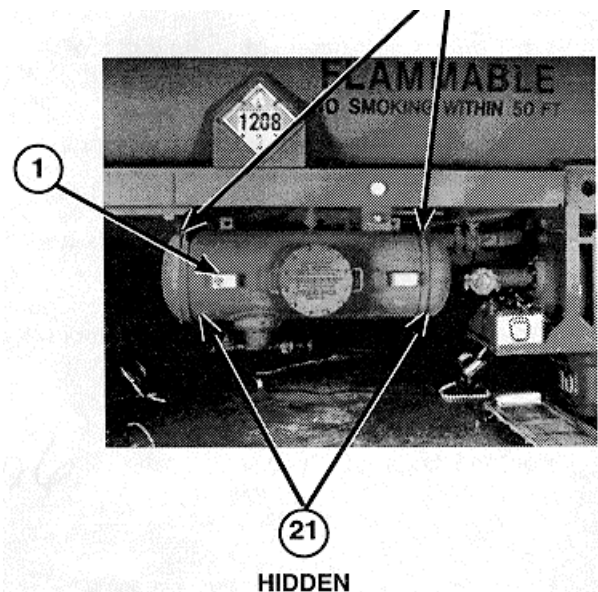


4. Disconnect hoses (9, 11, 12, and 13) from fittings (10) on top of filter separator (1), and remove fittings (10) from filter separator (1).
5. Disconnect hose (15) from tee fitting (16) at drain valve (14), and remove tee fitting (16) from drain valve (14).

**NOTE**

Position forklift under filter separator to support weight.

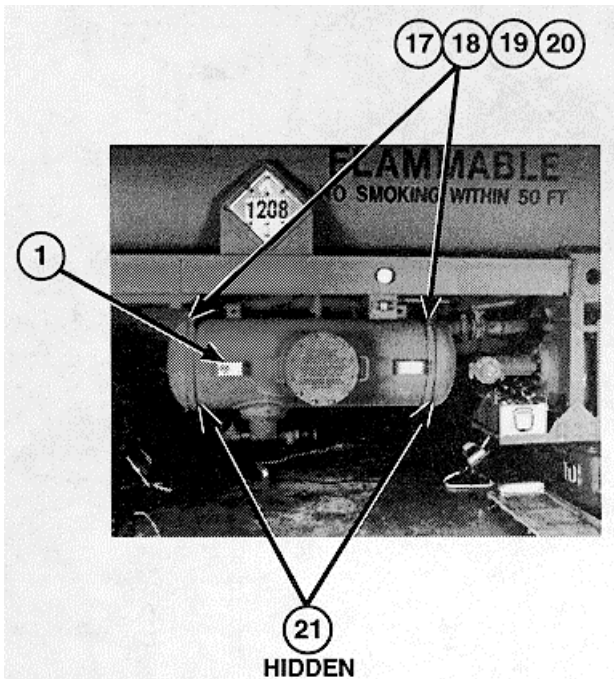
6. Remove two self-locking nuts (17), two nuts (18), and self-locking washers (19), mounting strap (20), and webbing (21) from filter separator (1), and remove filter separator (1) from semi-trailer. Discard self-locking nuts.



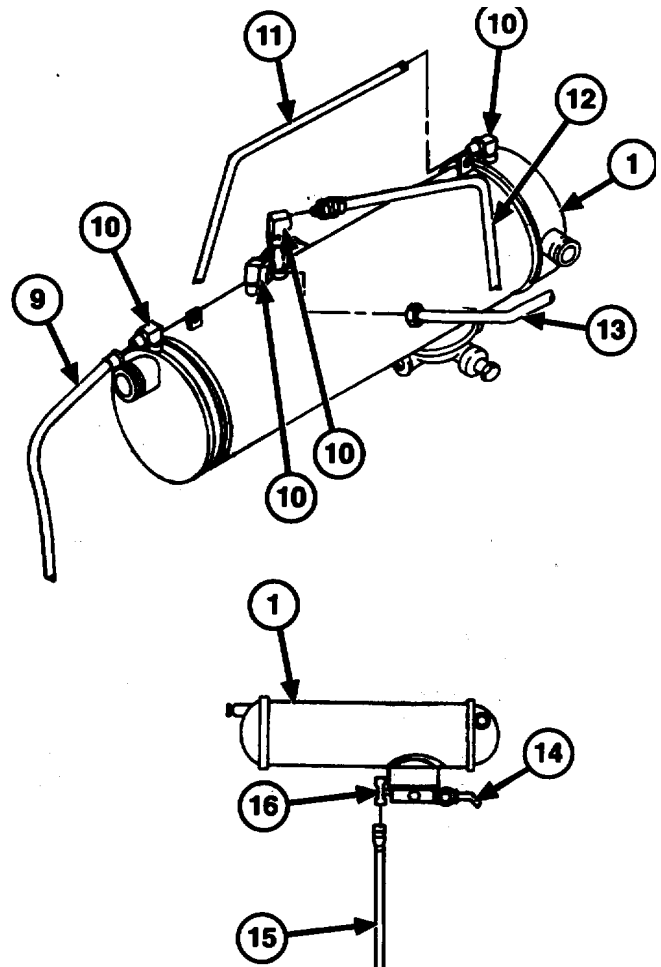
**3-31. FILTER SEPARATOR REPLACEMENT (continued).****b. INSTALLATION****NOTE**

Filter separator should be centered on mounting straps, with drain valve at the bottom and outlet line opening facing rear.

1. Install filter separator (1) and webbing (21) on semi-trailer with two mounting straps (20), washers (19), nuts (18), and new self-locking nuts (17). Tighten nuts (17 and 18) between 142 and 158 lb.-ft (192 and 214 N•m).

**NOTE**

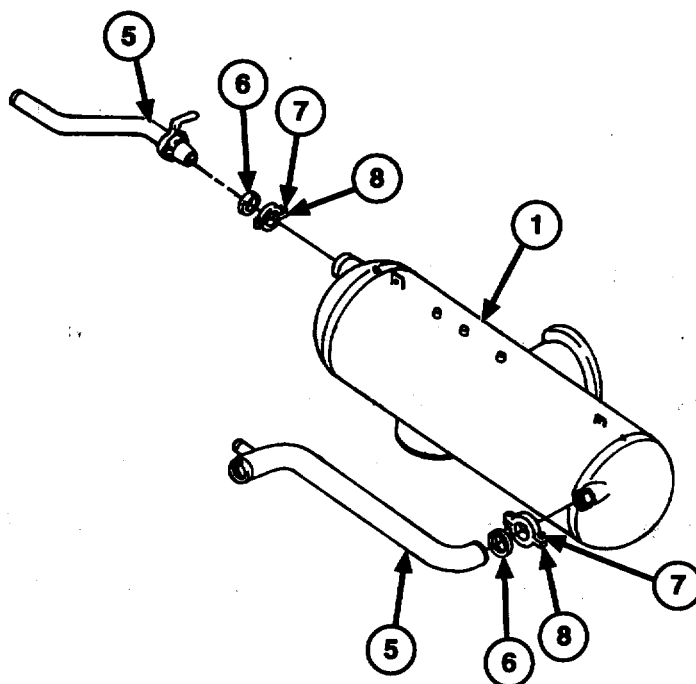
- Tighten all fittings after hoses are connected.
  - Coat male threads of fittings with anti-seize tape.
2. Install tee fitting (16) on drain valve (14), and connect hose (15) to tee fitting (16).
  3. Install fitting (10) on top of filter separator (1), and connect hoses (9, 11, 12, and 13) to fittings (10).
  4. Tighten fittings (10).



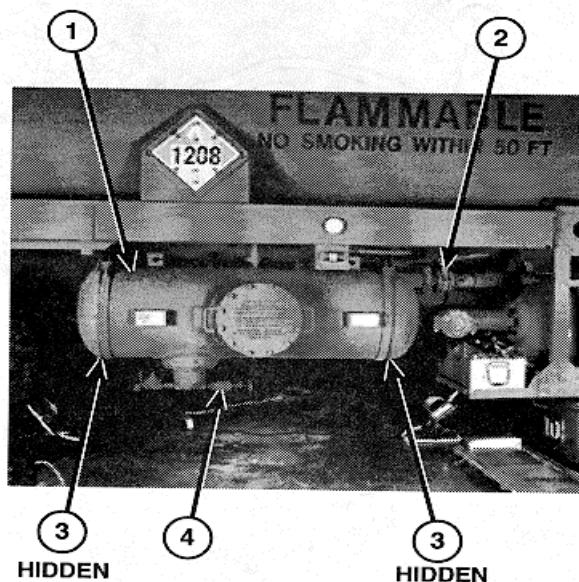
**3-31. FILTER SEPARATOR REPLACEMENT (continued).****NOTE**

**When installing coupling, lubricate gasket with petrolatum.**

5. Install two couplings (8) and new seals (6) on inlet and outlet lines (5) at filter separator (1) with two screws (7). Tighten screws (7) between 95 and 105 lb-ft (129 and 142 N.m).



6. Install two drain plugs (3) in filter separator (1),
7. Close manual drain valve N (4), and open valve M (2).

**FOLLOW-ON MAINTENANCE:**

Disconnect ground (refer to TM 9-2330-398-10).

**3-32. DRAIN VALVE ASSEMBLY AND TUBING REPLACEMENT.***This Task Covers:*

a. Removal

b. Installation

*Initial Setup:***Tools/ Test Equipment**

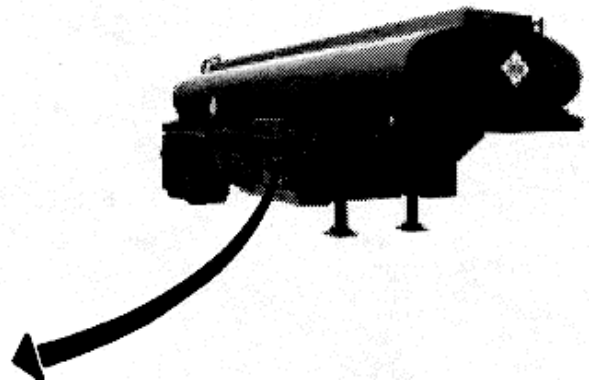
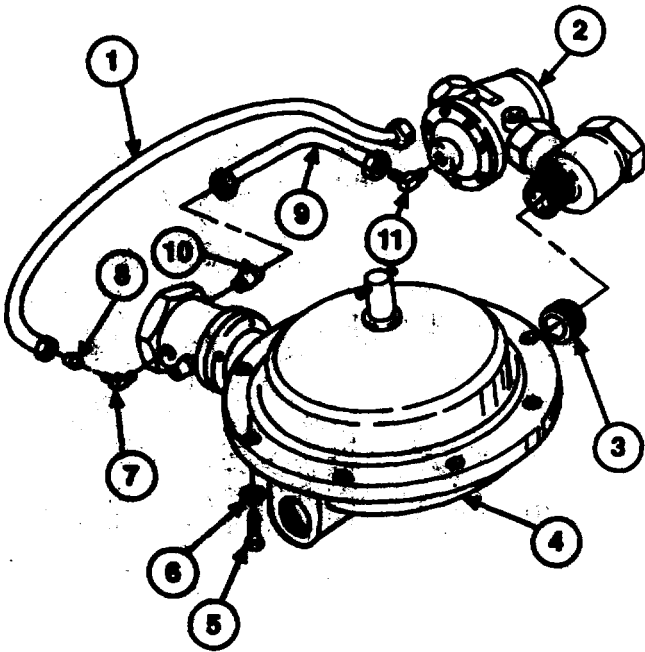
- General mechanics tool kit  
(Item 4, Appendix B)

**Equipment Conditions**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Float valve removed (para 3-40).

**a. REMOVAL**

1. Remove tube (1) from diaphragm valve assembly (2).
2. Remove tube (1), insert (8), and elbow (7) from drain valve assembly (4).
3. Remove tube (9) and elbow (11) from diaphragm valve (4).
4. Remove tube (9) and straight adapter (10) from drain valve assembly (4).
5. Remove diaphragm assembly (2) and nipple (3) from drain valve assembly (4).
6. Remove eight screws (5), washers (6), and drain valve assembly (4) from semitrailer.



---

**3-32. DRAIN VALVE ASSEMBLY AND TUBING REPLACEMENT.**

---

**b. INSTALLATION**

1. Install drain valve assembly (4) on semitrailer with eight screws (5) and washers (6).
2. Install diaphragm assembly (2) and nipple (3) on drain valve assembly (4).
3. Install tube (9) and straight adapter (10) to drain valve assembly (4).
4. Install tube (9) and elbow (11) on diaphragm valve (4).
5. Install tube (1), insert (8), and elbow (7) on drain valve assembly (4).
6. Install tube (1) on diaphragm valve assembly (2).

**FOLLOW-ON MAINTENANCE:**

- Install float valve (para 3-40).
- Disconnect ground (refer to TM 9-2330-398-10).



**Section VIII. DISPENSING AND SERVICES EQUIPMENT COMPONENTS**

<b>Paragraph Number</b>	<b>Paragraph Title</b>	<b>Paper Number</b>
3-33	General	3-102
3-34	Four-Inch Pump Repair	3-102
3-35	Piping Frame Assembly Replacement	3-110
3-36	Emergency Valve and Float Piping Replacement	3-112
3-37	Globe Valve Repair	3-114
3-38	Discharge Manifold Replacement	3-116
3-39	Hose Reel Piping Assembly Replacement	3-117
3-40	Float Valve Replacement	3-118
3-41	Emergency Valve Repair	3-120
3-42	F, B, and C Valve Assemblies Repair	3-124
3-43	Check Valve Assembly Repair	3-126
3-44	R, P, M, and G Valve Assemblies Repair	3-128

**3-33. GENERAL.**

This section describes and illustrates removal and installation procedures for the piping frame assembly, emergency valve and float piping, discharge manifold, hose reel piping assembly, and float valve. This section also includes repair procedures for the four-inch pump; emergency valve; F, B, and C valve assemblies; check valve assembly; and R, P, M, and G valve assemblies.

**3-34. 4-INCH PUMP ASSEMBLY REPAIR.**

*This Task Covers:*

- |                            |                |
|----------------------------|----------------|
| a. Removal                 | b. Disassembly |
| c. Cleaning and Inspection | d. Assembly    |
| e. Installation            |                |

*Initial Setup:*

Initial setup:

**Tools/Test Equipment:**

- Common No. 1 tool set (Item 1, Appendix B)
- General mechanic's tool kit (Item 4, Appendix B)
- Lifting device (Item 6, Appendix B)
- Self-locking nuts (Item 176, Appendix F)

- Seal, (Item 154, Appendix F)

- Seal, (Item 155, Appendix F)

- Self-locking nuts (Item 163, Appendix F)

- Self-locking nuts (Item 171, Appendix F)

**Materials/Parts**

- Gasket, 4156-GA (Item 68, Appendix F)
- Gasket (Item 69, Appendix F)
- Gasket, (Item 67, Appendix F)
- Gasket (Item 78, Appendix F)
- Lockwasher (12), -S3533846 (Item 97, Appendix F)
- Lockwasher (12), J-08 (item 85, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-39-10).
- Engine and pump cabinet frame removed (para 3-21).
- Alternator removed (para 2-107).
- Fuel lines from engine fuel pumps removed (para 2-99).

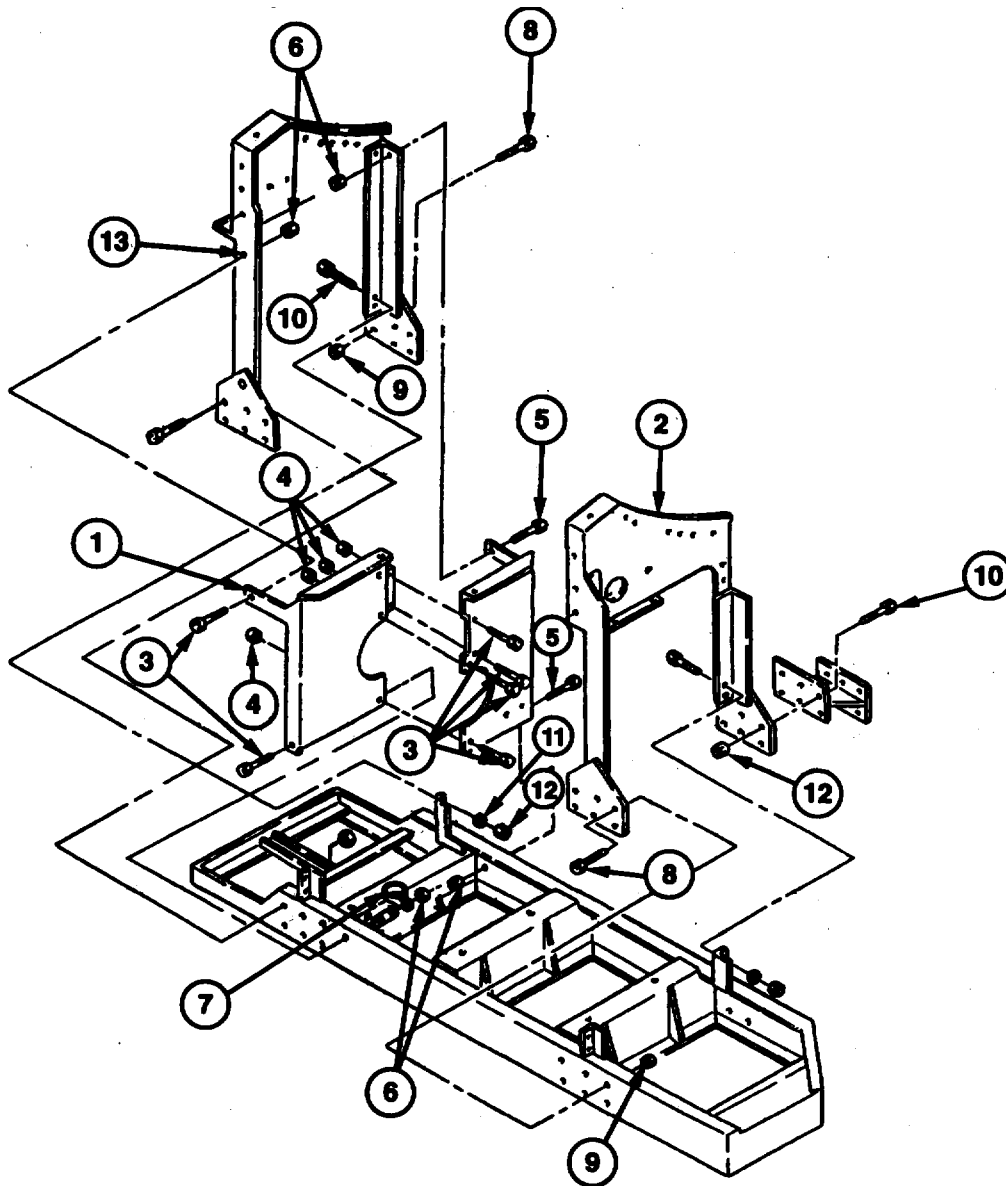
**3-34. 4-NCH PUMP ASSEMBLY REPAIR (continued).****a. REMOVAL**

1. Remove four screws (3), self-locking nuts (4), from firewall sections (1). Discard self-locking nuts.

**NOTE**

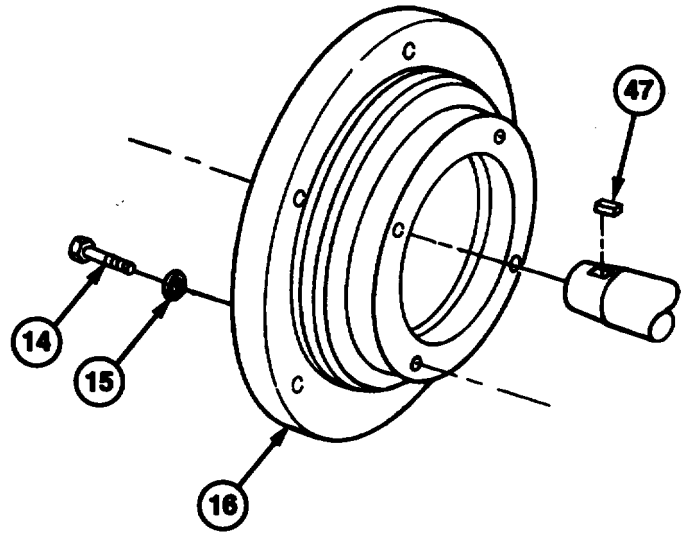
**Remove alternator ground wire from bottom center of firewall.**

2. Remove four screws (5), self-locking nuts (6), two clamps (7) and one spacer from engine cabinet assembly (2). Discard self-locking nuts.
3. Remove eight screws (8), and self-locking nuts (9), from engine frame (1). Discard self-locking nuts.
4. Remove four screws (10), washers (11), and self-locking nuts (12) from engine frame (1). Remove engine support (13). Discard self-locking nuts.



**3-34. 4-INCH PUMP ASSEMBLY REPAIR ((continued)).**

5. Remove six screws (14), lockwashers (15) from pump coupling (16). Discard lockwashers.

**NOTE**

Number of shims may vary.

**NOTE**

**If Installing same pump, use same shims, mark the location and number of the shims used in the mounting of the pump.**

6. Remove two screws (17), washers (18), and shims (19).

**WARNING**

**To avoid personnel injury, use a hoist or get assistance when lifting components that weigh more than 50 lb.**

7. Remove pump assembly (20).

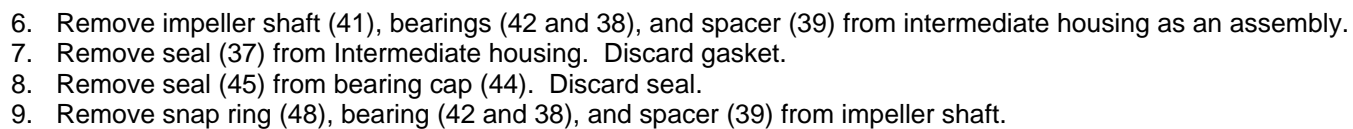
**b. DISASSEMBLY**

1. Remove eight nuts (21), lockwashers (22), Intermediate housing (35), seal plate (34), impeller (29) and gasket (30) from volute (26) as an assembly. Discard gasket.

**WARNING**

**The spring load on the mechanical seal may cause the impeller to fly off the shaft it is being removed, causing serious injury to personnel**

2. Unscrew Impeller (29) from Impeller shaft (41). Unscrew the impeller in the same direction as the pump turns.
3. Remove seal plate (34), mechanical seal (33), spring seat (32), and shims (31) from impeller shaft.
4. Remove four screws (46), lockwashers (22), bearing cap (44), and gasket (43). Discard gasket.
5. Remove pump coupling (16) and key (47) from impeller shaft.



---

**3-34. 4-INCH PUMP ASSEMBLY REPAIR (continued).**

---

**NOTE**

**Remove wear plate only if excessive wear is evident.**

9. Remove two nuts (21) and lockwashers (22) and wear plate (28) from volute. Discard lockwashers.
10. Remove eight studs (27) from volute (26).
11. Remove pipe plug (23) from volute (26).

**c. CLEANING AND INSPECTION**

1. Inspect clearance between wear plate and Impeller. If clearance exceeds 0.035 inch, add shims until rubbing just starts to occur when impeller and wear plate are installed. Remove enough shims to move the impeller away from the wear plate to a distance of 0.015 inch.
2. Rotate pump by hand to make sure Impeller is not binding or scraping.
3. Remove minor nicks on edges of impeller vanes with a fine finishing stone.
5. After replacement of impeller, wear plate, or impeller shaft, check for clearance between the back of the impeller and the seal plate. If the impeller scrapes when the seal plate is installed, add another gasket of sufficient thickness between the seal plate and pump casting.
6. Inspect the mating surfaces of the seals for wear, scoring, grooves, or other damage that can cause leakage. If any of the seal parts are worn, replace seal. Never mix old and new parts of seals.
7. Inspect the impeller shaft for nicks, scratches, scoring, or other damage. Replace the shaft if damaged.
8. Rotate bearings by hand and check for binding or wear. Replace bearings if wear is found. If the shaft is worn so the bearings slip on and off easily, the shaft must be replaced. Replace the housing if the bearings do not fit snugly into the bearing bore.

**d. ASSEMBLY**

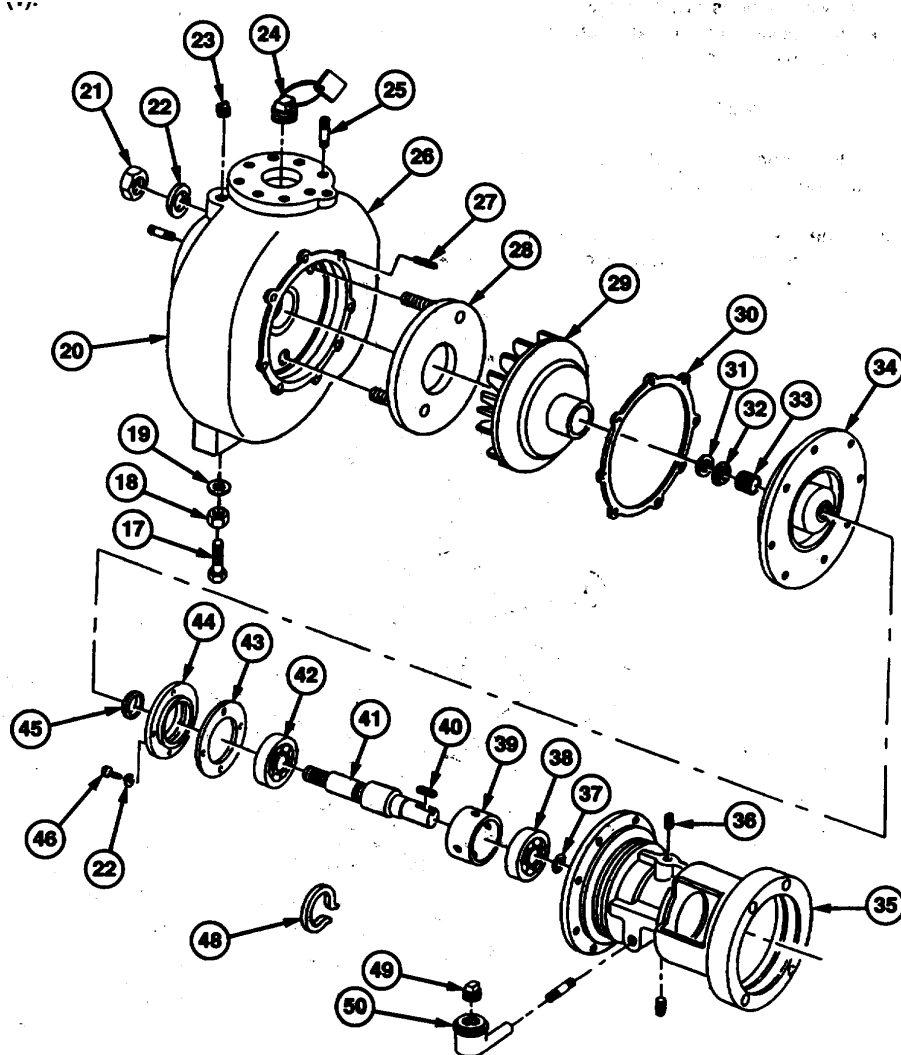
1. Install pipe plug (23) in volute (26).
2. Install eight studs (27) in volute (26).
3. Install wear plate (28) to volute (26) with two new lockwashers (22) and nuts (21).
4. Install spacer (39), bearings (38 and 42), and snap ring (48) to impeller shaft (41).
5. Install new seal (45) in bearing cup (44).
6. Install new seal (37) in intermediate housing (35).
7. Install spacer (39), bearings (38 and 42), and impeller shaft (41) in intermediate housing (35) as an assembly.
8. Install pump coupling (16) and key (47) to impeller shaft (41).
9. Install new gasket (43), bearing cap (44), new lockwasher (22), and four screws (46) to intermediate housing (35).

**3-34. 4-INCH PUMP ASSEMBLY REPAIR (continued)**

10. Install shims (31), spring seat (32), new mechanical seal (33), and seal plate (34) to impeller shaft (41).
11. Install new gasket (30), impeller shaft (41), seal plate (34), intermediate housing (35), eight new lockwasher (22), and nuts (21) to volute (26) as an assembly.

**e. INSTALLATION**

1. Install pump assembly (20), nine shims (19), two new self-locking nuts (18), and screws (17) to engine frame

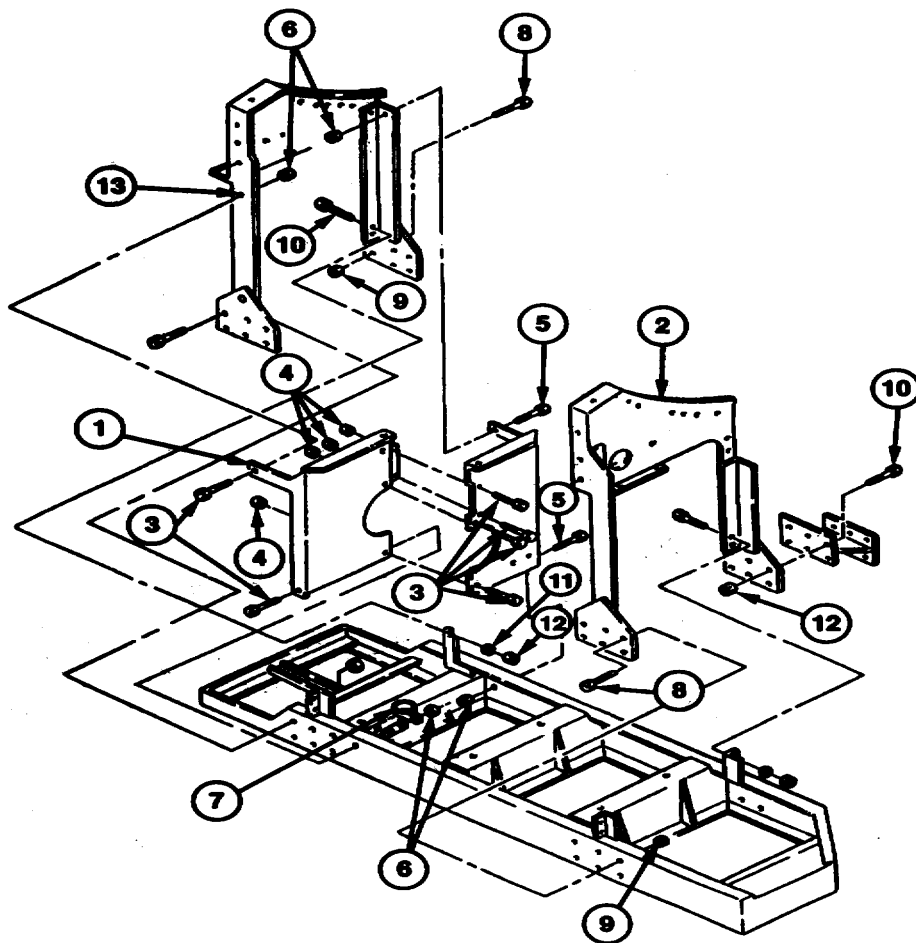
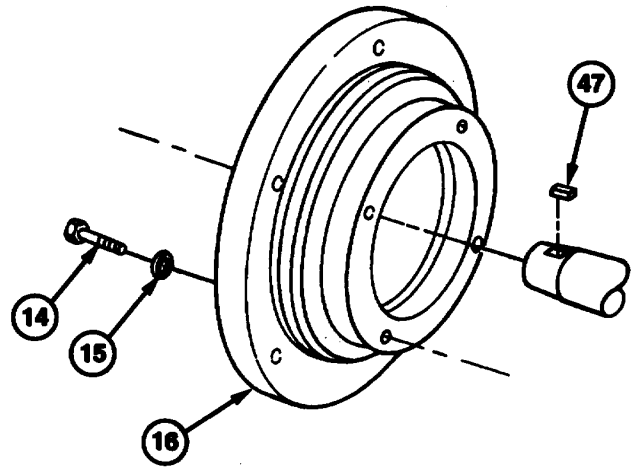


**3-34. 4-INCH PUMP A SEMBLY REPAIR (continued).**

2. Install six new lockwashers (15) and screws (14) to pump coupling (16).
3. Install engine support (13), four new self locking nuts (12), washers (11), and screws (10) to engine frame (1).
4. Install eight new self-locking nuts (9) and screws (8) to engine frame (1).
5. Install firewall sections (1), two camps (7), four new self-locking nuts (6), and screws (5) to engine cabinet assembly (2).
6. Install four new self-locking nut (4) and or (3) to firewall section (1) and en cabinet assembly (2).

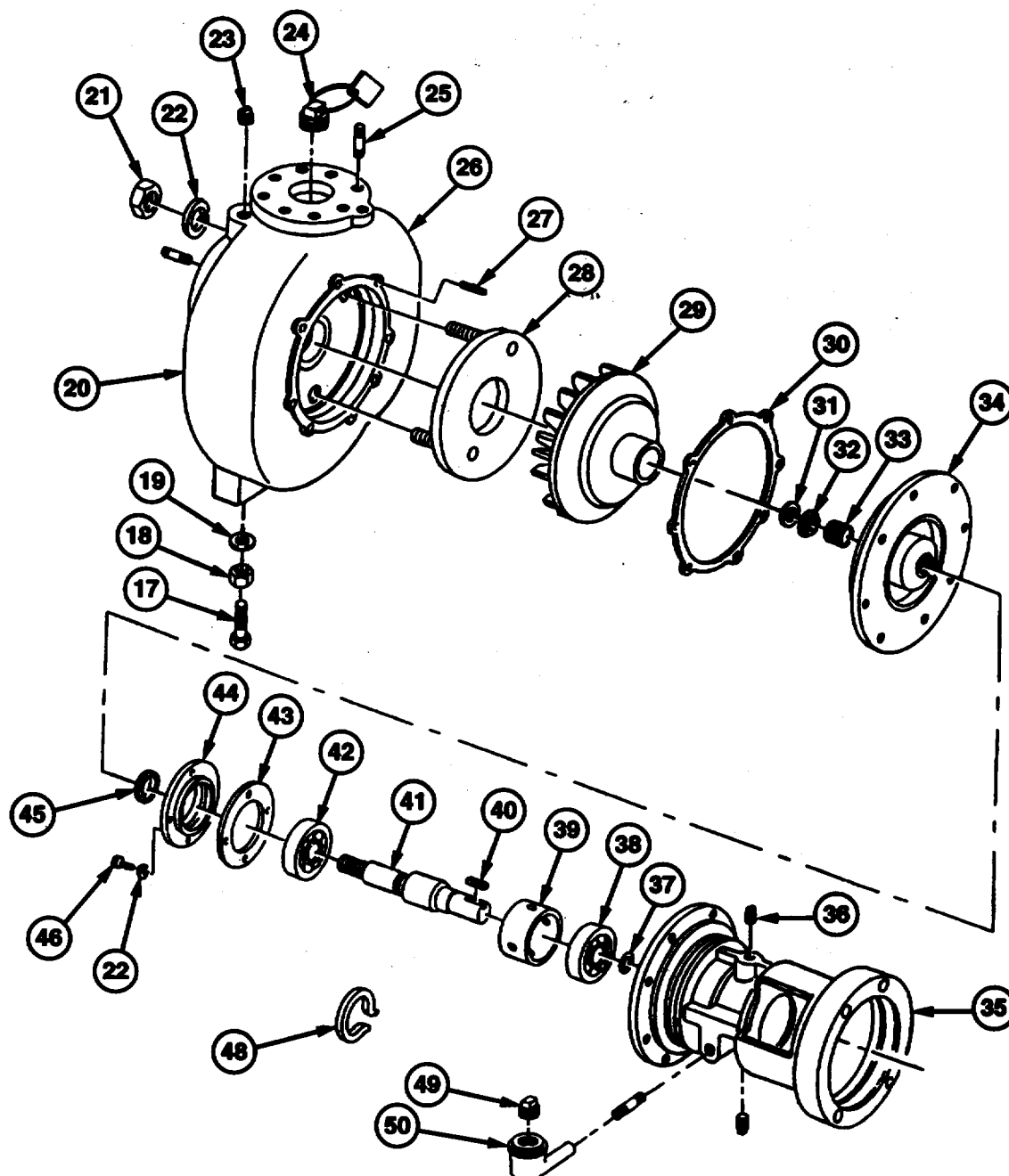
**NOTE**

Install alternator  
ground wire to bottom  
center of firewall.



**3-34. 4-INCH PUMP ASSEMBLY REPAIR (continued).**

7. Install engine and pump cabinet frame on semi-trailer (para 3-21).
8. Remove plug (23) from volute (26) of intermediate housing (35).
9. Using funnel and 5-gallon container of the same type of fuel or product to be filled or dispensed from the semi-trailer, pour approximately 5 gallons into the volute (26).
10. Install plug (23) in volute (26).





---

**3-35. PIPING FRAME ASSEMBLY REPLACEMENT.**

---

*This Task Covers:*

a. Removal

b. Installation

---

*Initial Setup:*

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)
- Emergency valve A control lever removed (para 2-135).

- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

**Materials/Parts:**

- Self-locking nut (4) (Item 172, Appendix F)
- Self-locking nut (18) (Item 176, Appendix F)

- Static reel removed (para 2-77).
- Control panel assembly removed (para 2-112).

**Personnel Required:** Two

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- 

**a. REMOVAL**

1. Remove four screws (1) and self-locking nuts (4) and panel (2) from piping frame assembly (6). Discard self-locking nuts.

**WARNING**

**Piping frame assembly is heavy and can cause injury to personnel if it should fall.  
An assistant is required to remove piping frame assembly from semi-trailer**

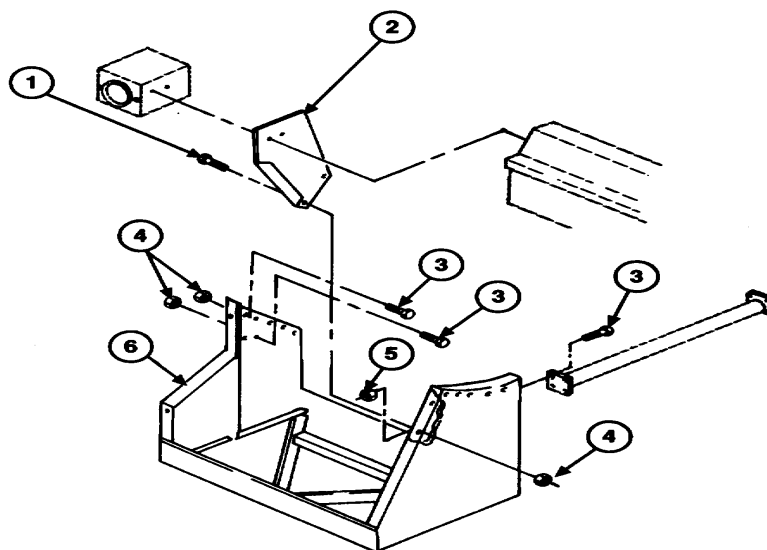
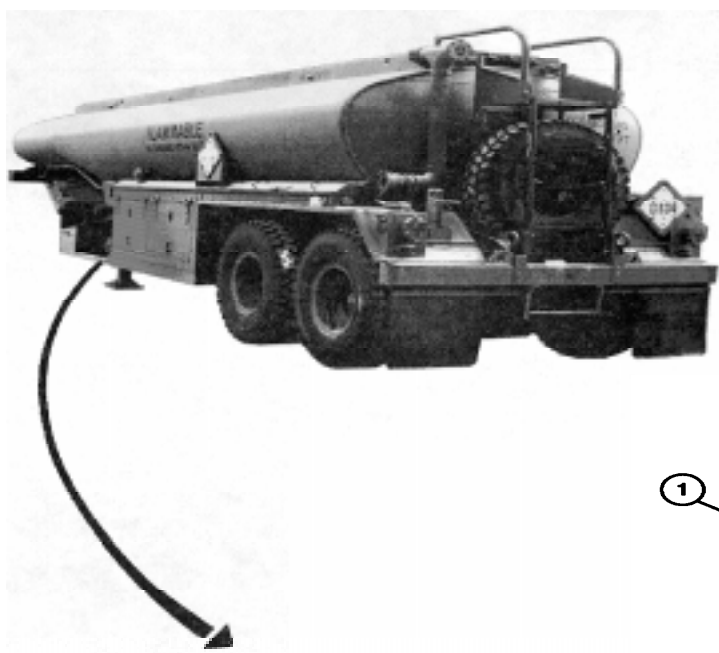
2. Remove 18 screws (3), four self-locking nuts (5), and 14 self-locking nuts (4), and, with the aid of an assistant, remove piping frame assembly (6) from semitrailer. Discard self-locking nuts.

**b. INSTALLATION**

**WARNING**

**Piping frame assembly is heavy and can cause injury to personnel if it should fall. An assistant is required to install piping frame assembly on semi-trailer.**

1. With the aid of an assistant, install piping frame assembly (6) on semi-trailer with 18 screws (3), four new self-locking nuts (5), and 14 self-locking nuts (4).
2. Install panel (2) on piping frame assembly (6) with four screws (1) and new self-locking nuts (4).

**3-35. PIPING FRAME ASSEMBLY REPLACEMENT (continued).****FOLLOW-ON MAINTENANCE:**

- Install control panel assembly (para 2-112).
- Install static reel (para 2-77).
- Install emergency valve A control lever (para 2-135).
- Disconnect ground (refer to TM 9-2330-398-10).

**3-36. EMERGENCY VALVE AND FLOAT PIPING REPLACEMENT.***This Task Covers:*

a. Removal

b. Installation

*Initial Setup:***Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)
- Semi-trailer bonded and grounded (refer to

**Materials/Parts:**

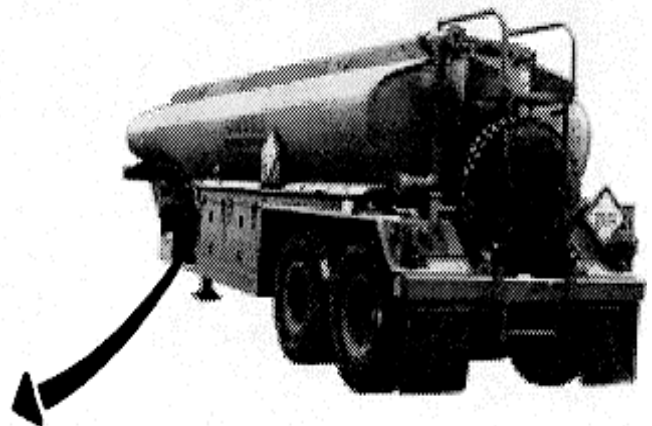
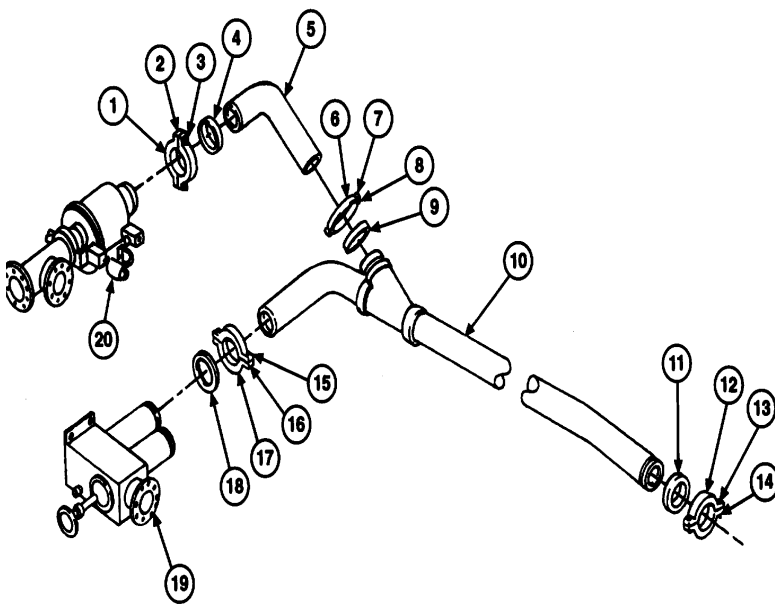
- Seal (4) (Item 153, Appendix F)

**Equipment Conditions:**

- Semi-trailer uncoupled (refer to TM 9-2330-398-10).
- TM 9-2330-398-10).
- Fuel drained from piping (refer to TM 9-2330-398-10).

**NOTE****Do not lose screws and nuts as they are an integral part of couplings.****a. REMOVAL**

1. Remove two screws (3) and nuts (2), coupling (1), seal (4), and float piping (5) from control valve assembly (20). Discard seal.
2. Remove two screws (7) and nuts (8), coupling (6), seal (9), and float piping (5) from pipe (10). Discard seal.



---

**3-36. EMERGENCY VALVE AND FLOAT PIPING REPLACEMENT (continued).**

---

3. Remove two screws (13) and nuts (14), coupling (12), seal (11), and pipe (10) from semitrailer. Discard seal.
4. Remove two screws (15) and nuts (16), coupling (17), seal (18), and pipe (10) from manifold assembly (19). Discard seal.

**NOTE**

Do not loose screws and nuts as they are an integral part of couplings.

**b. INSTALLATION**

1. Install pipe (10) on manifold assembly (19) with two screws (15) and nuts (16), new seal (18), and coupling (17).
2. Install pipe (10) on semitrailer with two screws (13) and nuts (14), new seal (11), and coupling (12).
3. Install float piping (5) on pipe (10) with two screws (7) and nuts (8), new seal (9), and coupling (6).
4. Install float piping (5) on control valve assembly (20) with two screws (3) and nuts (2), new seal (4), and coupling (1).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

### 3-37. GLOBE VALVE REPAIR.

#### *This Task Covers:*

- |                            |                |
|----------------------------|----------------|
| a. Removal                 | b. Disassembly |
| c. Cleaning and Inspection | d. Assembly    |
| e. Installation            |                |

#### *Initial Setup:*

#### **Tools/Test Equipments.:**

- General mechanic's tool kit (Item 4, Appendix B)

#### **Materials /Parts:**

- Drycleaning solvent (item 12, Appendix C)
- Rag (Item 25, Appendix C)
- Packing (Item 125, Appendix F)

#### **Equipments Condition:**

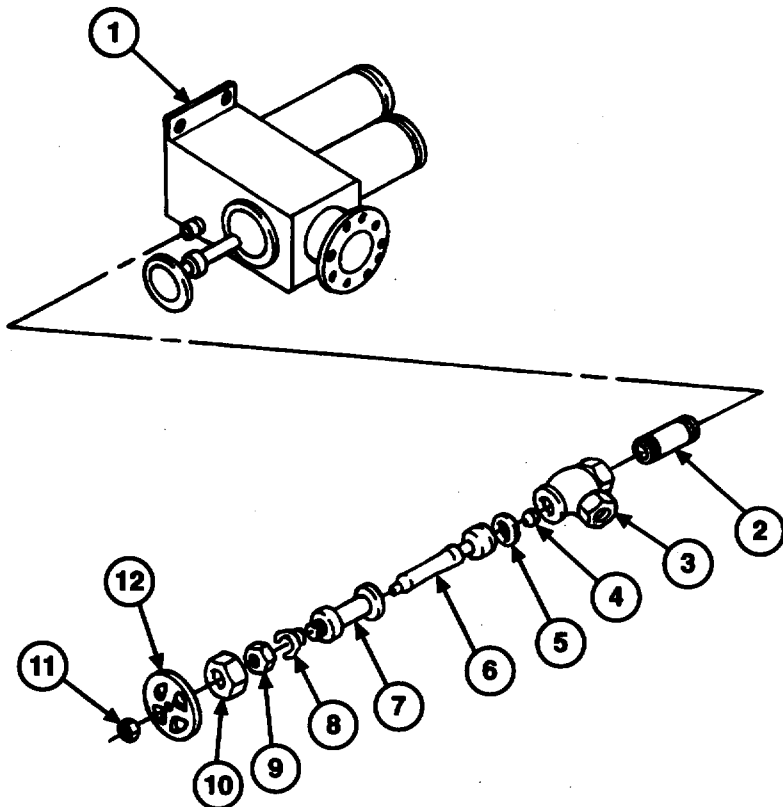
- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

#### **a. REMOVAL**

Turn globe valve (3) counterclockwise, and remove globe valve (3) and pipe nipple (2) from manifold (1).

#### **b. DISASSEMBLY**

Loosen packing nut (11) and turn handwheel (12) counterclockwise. Remove nut (11), handwheel (12), nut (10), nipple (9), sleeve (8), insert (7), stem (6), packing (5), and seat (4) from globe valve (3). Discard packing.



**3-37. GLOBE VALVE REPAIR (continued).****c. CLEANING AND INSPECTION****WARNING**

Drycleaning solvent P-D-680 is toxic and flammable. Always wear protective goggles and gloves, and use in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Do not use near open flame or excessive heat.

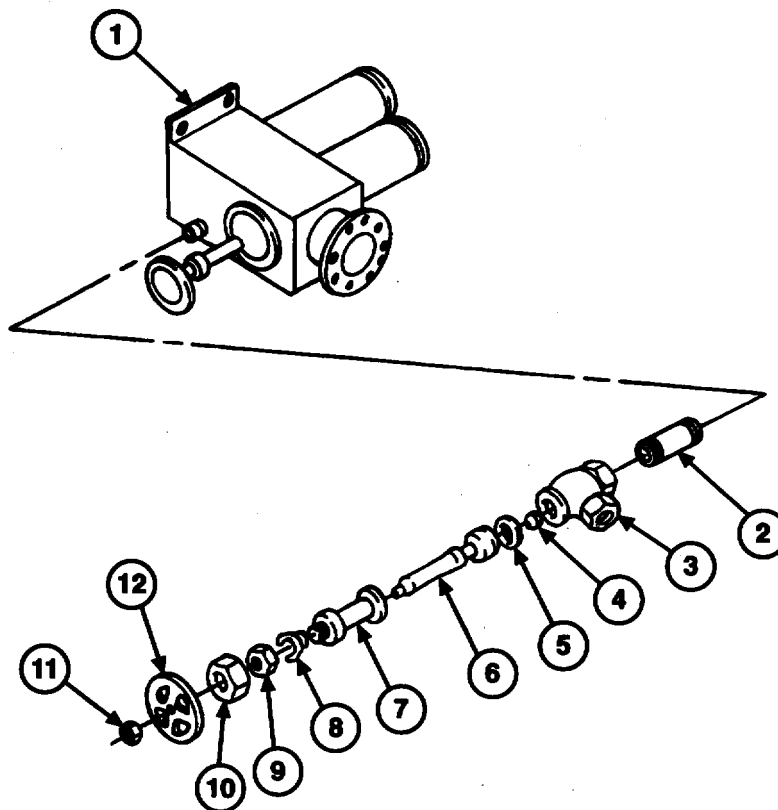
1. Clean all metal parts with drycleaning solvent and rags.
2. Inspect metal parts for cracks, scoring, and pitting. Replace any damaged parts.

**d. ASSEMBLY**

Install seat (4) new packing (5), stem (6), insert (7), sleeve (8), nipple (9), nut (10), handwheel (12), and packing nut (11) in globe valve (3). Tighten packing nut (11) and turn handwheel (12) clockwise.

**e. INSTALLATION**

Install pipe nipple (2) and globe valve (3) on manifold (1). Turn globe valve (3) clockwise to tighten.

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

### 3-38. DISCHARGE MANIFOLD REPLACEMENT.

*This Task Covers:*

a. Removal

b. Installation

*Initial Setup:*

#### Tools/Test Equipment:

- General mechanic's tool kit (Item 4, Appendix B)

#### Materials /Parts:

- Gasket (Item 39, Appendix F)
- Self-locking nuts (13) (Item 172, Appendix F)

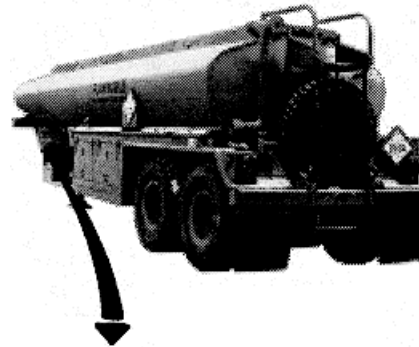
#### Equipment Conditions:

- Semitrailer uncoupled (refer to TM 9-2330-398-10).

- F and B valves removed (para 3-41).
- Piping and control assembly angle valve removed (para 2-126).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

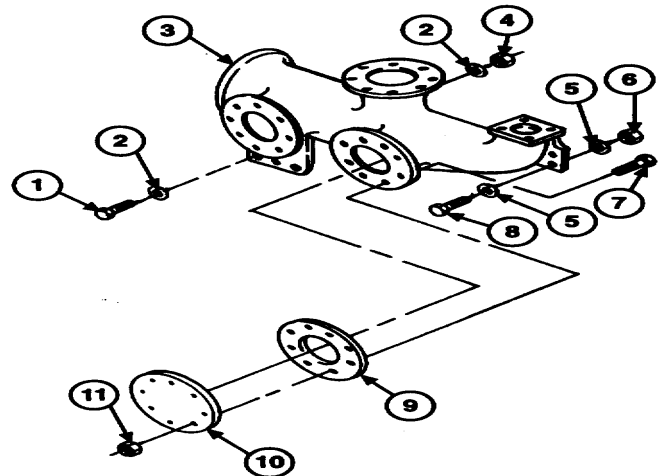
#### a. REMOVAL

1. Remove three screws (1), six washers (2), and three self-locking nuts (4) from discharge manifold (3). Discard self-locking nuts.
2. Remove two screws (8), four washers (5), and two self-locking nuts (6) from discharge manifold (3). Discard self-locking nuts.
3. Remove eight screws (7) and self-locking nuts (11), access cover (10), and gasket (9) from discharge manifold (3). Discard self-locking nuts and gasket.



#### b. INSTALLATION

1. Install access cover (10) and new gasket (9) on discharge manifold (3) with eight screws (7) and new self-locking nuts (11).
2. Install two screws (8), four washers (5), and two new self-locking nuts (6) on discharge manifold (3).
3. Install three screws (1), six washers (2), and three new self-locking nuts (4) on discharge manifold (3).



#### FOLLOW-ON MAINTENANCE:

\* Disconnect ground (refer to TM 9-2330-398-10).

**3-39. HOSE REEL PIPING ASSEMBLY REPLACEMENT.**

This Task Covers:

a. Removal

b. Installation

Initial Setup:

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts**

- Gasket (Item 54, Appendix F)
- Seal (Item 149, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Fuel drained from piping (refer to TM 9-2330-9-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

**NOTE**

Use this task to replace left-side and right-side hose reel piping assembly. Right side is shown.

**a. REMOVAL**

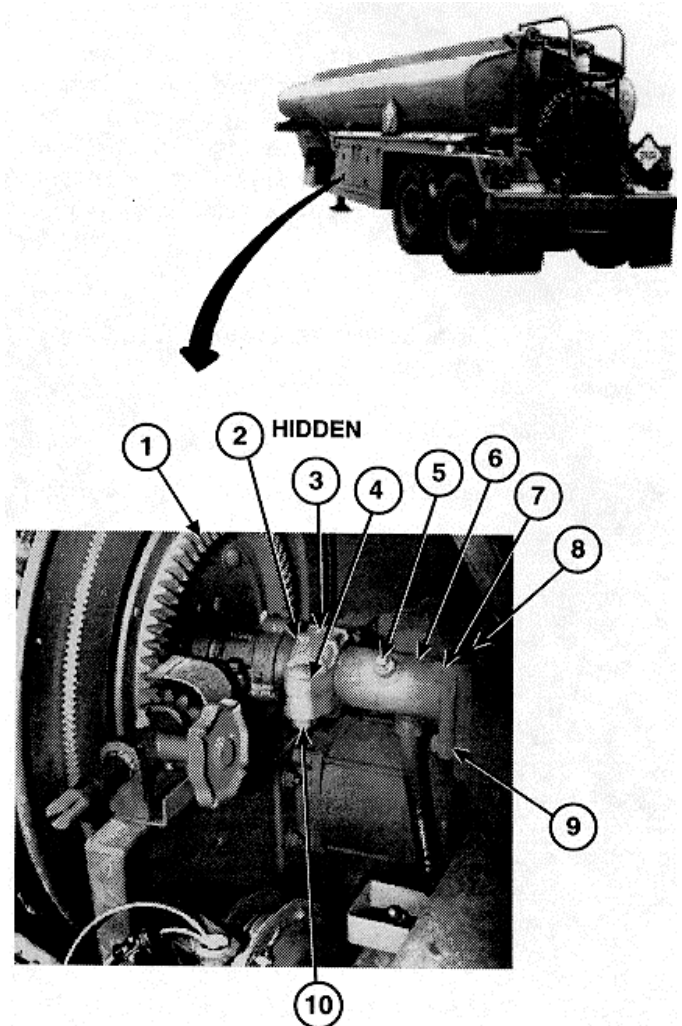
1. Remove pipe plug (5) from hose reel piping assembly (6), if necessary.
2. Remove two screws (4) and nuts (10), pipe coupling (3), and seal (2) from piping assembly (6). Discard seal.
3. Remove four nuts (7), piping assembly (6), and gasket (9) from volumetric meter (8). Discard gasket.

**b. INSTALLATION**

1. Install new gasket (9) and piping assembly (6) on volumetric meter (8) with four nuts (7).
2. Install pipe coupling (3) and new seal (2) on piping assembly (6). Install piping assembly (6) on hose reel (1) with two screws (4) and nuts (10).
3. Install pipe plug (5) in piping assembly (6), if necessary.

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).





---

**3-40. FLOAT VALVE REPLACEMENT.**


---



---

This Task Covers:

- |            |                 |
|------------|-----------------|
| a. Removal | b. Installation |
|------------|-----------------|
- 

Initial Setup:

**Tools/Test Equipment:**

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• General mechanic's tool kit (Item 4, Appendix B)</li> </ul> | <ul style="list-style-type: none"> <li>• Semitrailer bonded and grounded (refer to TM 9-2330-398-10).</li> <li>• Semitrailer drained and purged (refer to TM 9-2330-398-10).</li> </ul> |
|--|---|

**Materials/Parts:**

- Lockwasher (4) (Item 96, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- 

**WARNING**

**Do not climb into tank unless Interior of tank has been drained and purged and an explosive meter check indicates it is safe to do so. Adequate forced-air ventilation or self-contained breathing apparatus must be used. The person entering tank must have an attached life line. An observer must be stationed at manhole opening so assistance may be summoned in the event of an emergency. Failure to follow this warning may result In serious Injury or death to personnel.**

**NOTE**

**Float valve is located inside semitrailer tank. It can only be removed from inside the tank only.**

**a. REMOVAL**

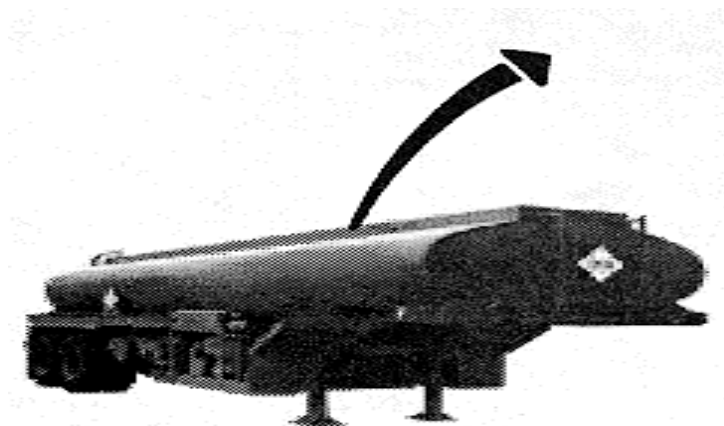
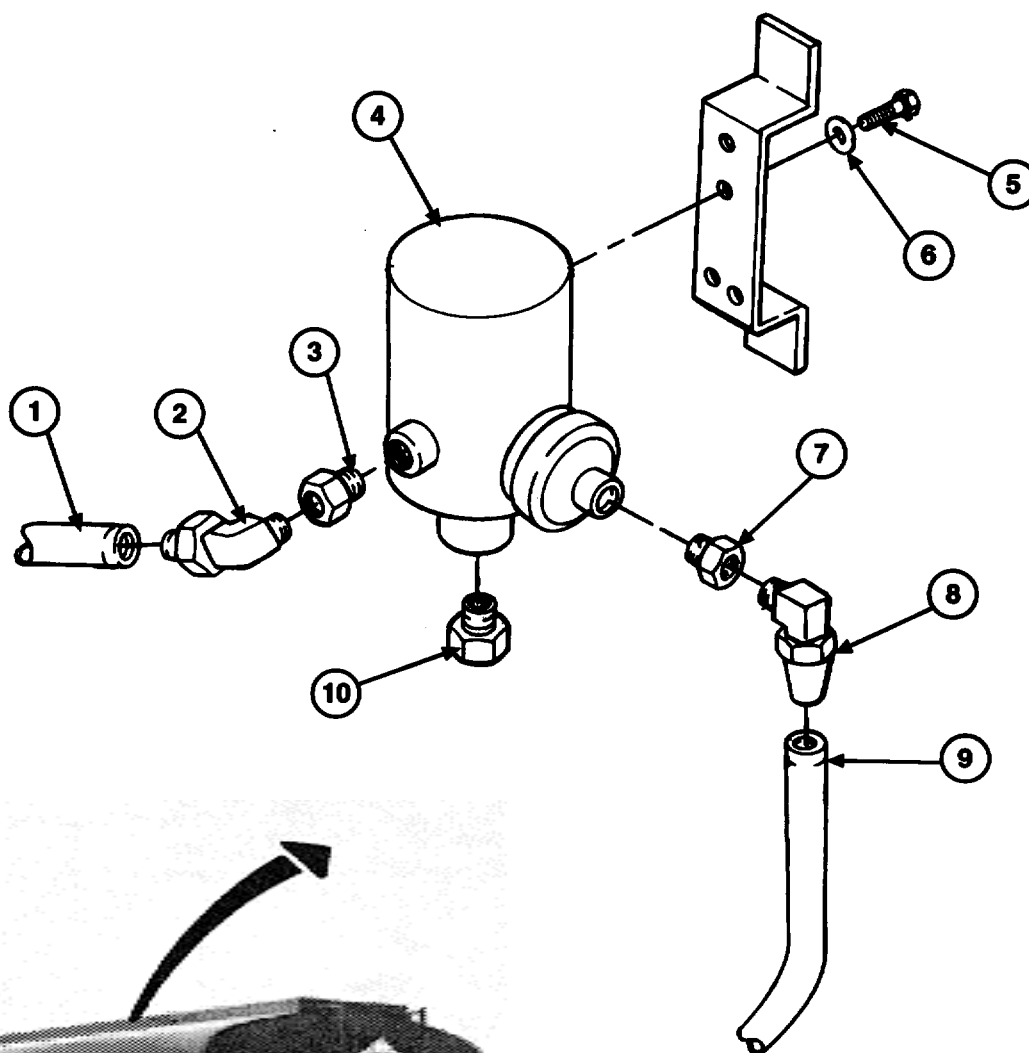
1. Disconnect tube (1), with elbow (2) and bushing (3), from float valve (4).
2. Disconnect tube (9), with elbow (8) and bushing (7), from float valve (4).
3. Remove bushing (10) from float valve (4).
4. Remove four bolts (5) and lockwashers (6) and float valve (4) from semitrailer. Discard lockwashers.

**b. INSTALLATION**

1. Install float valve(4) on semitrailer With four bolts (5) and new lockwashers (6).
2. Install bushing (10) on float valve (4).

**3-40. FLOAT VALVE REPLACEMENT (continued).**

3. Install tube (9), with elbow (8) and bushing (7), on float valve (4).
4. Install tube (1), with elbow (2) and bushing (3), on float valve (4).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

**3-41. EMERGENCY VALVE REPAIR.**

This Task Covers:

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>a. Removal</li> <li>c. Cleaning and Inspection</li> <li>e. Installation</li> </ul> | <ul style="list-style-type: none"> <li>b. Disassembly</li> <li>d. Assembly</li> </ul> |
|---|---|

Initial Setup:

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/parts:**

- Drycleaning solvent (Item 12, Appendix C)
- Rag (Item 25, Appendix C)
- O-ring (Item 123, Appendix F)
- Preformed packing (2) (Item 137, Appendix F)

- Seal (Item 153, Appendix F)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).
- Semitrailer tank drained and purged (refer to TM 9-2330-398-10).

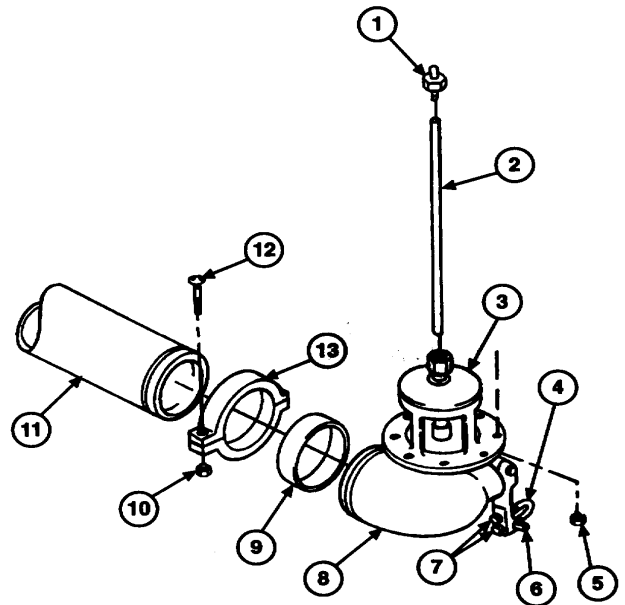
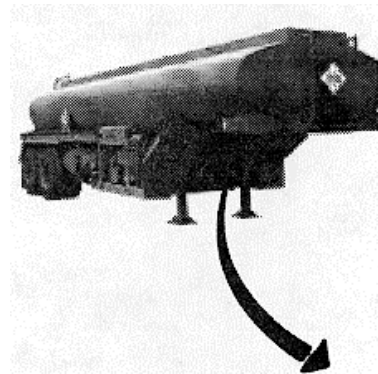
**a. REMOVAL**

1. Loosen two nuts (7) on emergency valve lever U-bolt (4), and disconnect emergency valve cable (6) from emergency valve (3).

**CAUTION**

**To avoid equipment damage, support large outlet tube with jack stands or blocks before removal.**

2. Remove two bolts (12) and nuts (10), seal (9), and coupling (13) from emergency valve (3) and outlet pipe (11). Discard seal.
3. Remove eight nuts (5), emergency valve (3), pipe (2), and adapter (1) from tank sump (8).



1. Loosen nut (24) and screw (22), and remove lever (23) from stem (28).
2. Remove stuffing box nut (26), O-ring (25), and two preformed packings (27) from operating stem (28). Discard O-ring and preformed packings.
3. Remove stem (28) and cam (29) from body (20).
4. Loosen setscrew (15) and remove adapter (14) from bonnet (33).
5. Loosen three setscrews (21) and remove bonnet (33) from body (20).
6. Remove spring (31) and stem (32) from bonnet (33).
7. Remove nut (30), washer (19), retaining plate (18), plunger disc (17), and disc holder (16) from stem (32).



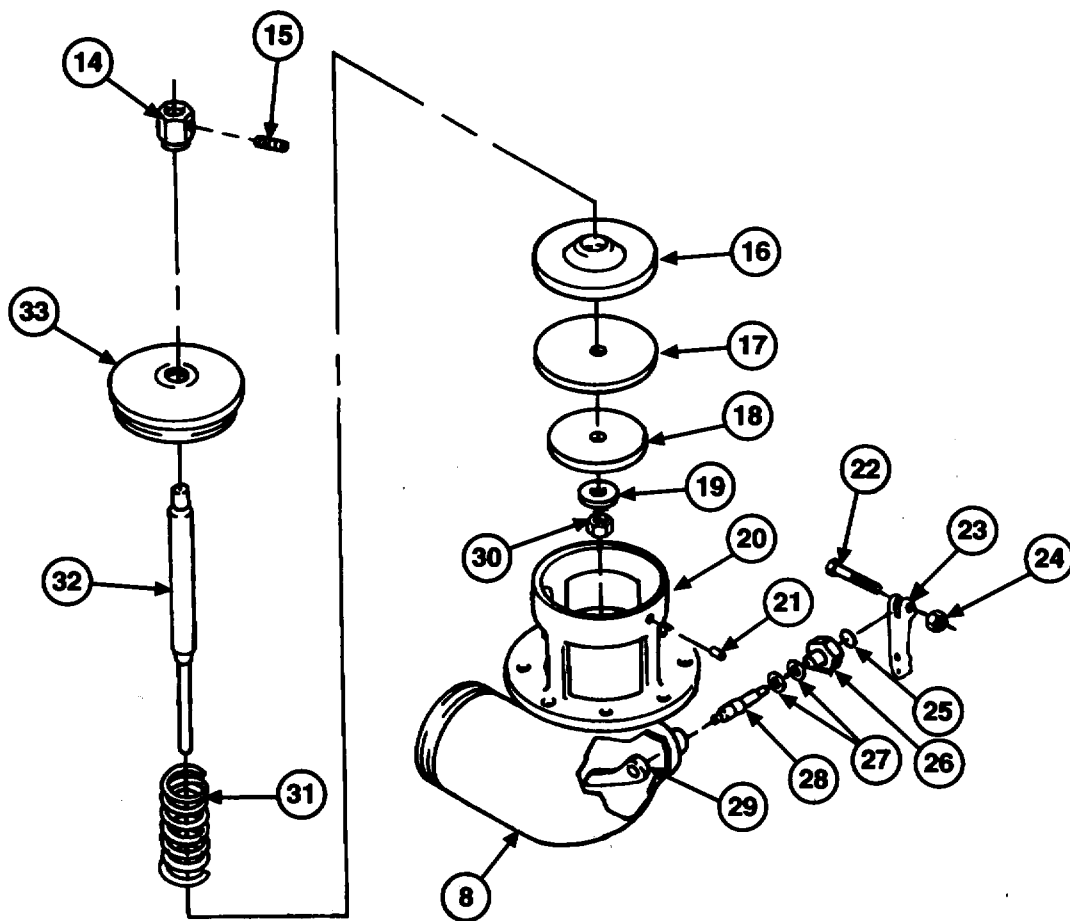
**3-41. EMERGENCY VALVE REPAIR (continued).****c. CLEANING AND INSPECTION****WARNING**

Drycleaning solvent P-D-80 is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Do not use near flame or excessive heat

1. Clean emergency valve and all metal parts with drycleaning solvent and rag. Dry thoroughly.
2. Inspect emergency valve for damage and wear. Replace emergency valve if damaged.

**d. ASSEMBLY**

1. Install cam (29) and stem (28) in body (20).
2. Install new O-ring (25), two new preformed packings (27), and stuffing box nut (26) on stem (28).
3. Install lever (23) on stem (28), and tighten screw (22) and nut (24).

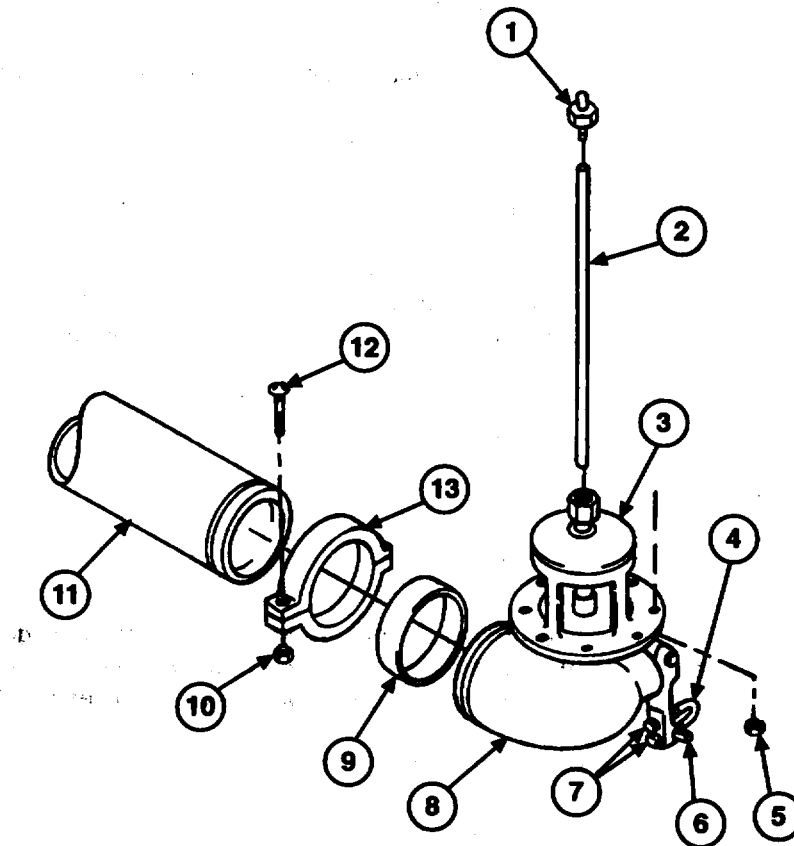


**3-4. EMERGENCY VALVE REPAIR (continued).**

4. Install disc holder (16), plunger disc (17), retaining plate (18), washer (19), and nut (30) on stem (32).
5. Install spring (31) on stem (32).
6. Install bonnet (33) on body (20) with three screws (21).
7. Install adapter (14) on bonnet (33), and tighten setscrew (15).

**e. INSTALLATION**

1. Install emergency valve (3), pipe (2), and adapter (1) on tank sump (8) with eight nuts (5).
2. Install new gasket (9) and coupling (13) on emergency valve (3) and outlet pipe (11) with two bolts (12) and nuts (10).
3. Install emergency valve cable (6) on emergency valve (3), and tighten two nuts (7) on emergency valve lever U-bolt (4).

**FOLLOW-ON MAINTENANCE:**

- Disconnect ground (refer to TM 9-2330-398-10).

---

**3-42. F, B, AND C VALVE ASSEMBLIES REPAIR,**


---

This Task Covers:

- |                |                            |
|----------------|----------------------------|
| a. Disassembly | b. Cleaning and Inspection |
| c. Assembly    |                            |

---

Initial Setup:

**Tools/ Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Materials/Parts:**

- Drycleaning solvent (Item 12, Appendix C)
- Rag (Item 25, Appendix C)
- Gasket (Item 72, Appendix F)
- Lockwasher (8) (Item 109, Appendix F)
- Packing (Item 126, Appendix F)

**Equipment Condition:**

- Semitrailer uncoupled (refer to TM 9-230-398-10).
- F, B, and/or C valve assembly removed (para 2-129).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

---

**NOTE**

**Use this task to repair the F, B, or C valve assembly. The F valve assembly is shown.**

**a. DISASSEMBLY**

1. Remove eight screws (8), lockwashers (14), and nuts (15), gasket (12), and bonnet (7) from valve body (13). Discard lockwashers and gasket.
2. Loosen packing nut (3) and turn handwheel (2) counterclockwise. Remove nut (1), handwheel (2), packing nut (3), spring (4), packing retainer (5), and packing (6) from bonnet (7). Discard packing.
3. Remove stem (9), pull nut (10), and disc assembly (11) from valve body (13).

**b. CLEANING AND INSPECTION**

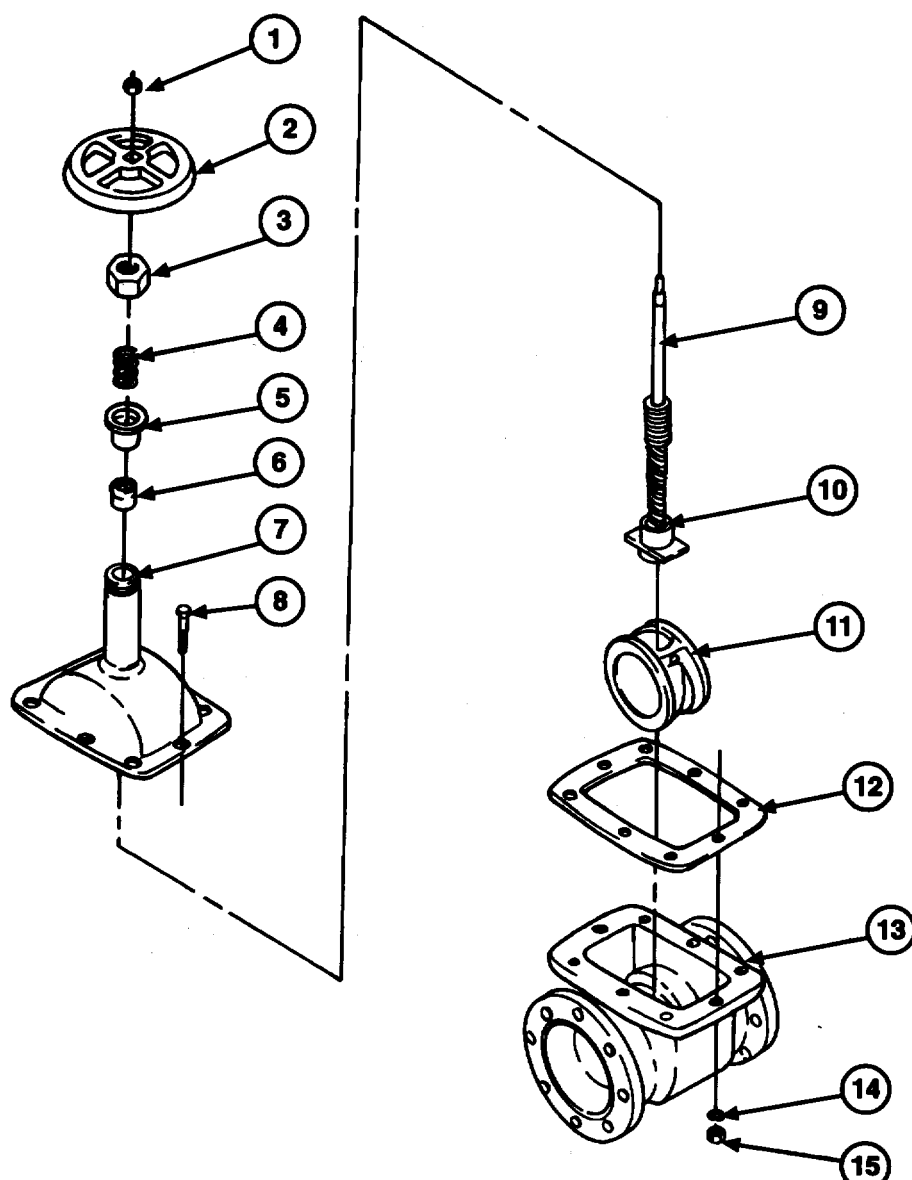
**WARNING**

**Drycleaning solvent P-D680 is toxic and flammable. Always wear protective goggles and gloves, and use in a well-ventilated air. Avoid contact with skin, eyes, and do not breathe; vapors. Do not use near open flame or excessive heat**

1. Clean all metal parts with drycleaning solvent and rags.
2. Inspect metal parts for cracks, scoring, and pitting. Replace any damaged parts.
3. If disc assembly or disc assembly mating surfaces are pitted or scored, replace entire valve assembly.

**3-42. F, B, AND C VALVE ASSEMBLIES REPAIR (continued).****c. ASSEMBLY**

1. Install stem (9), pull nut (10), and disc assembly (11) in valve body (13).
2. Install nut (1), handwheel (2), packing nut (3), spring (4), packing retainer (5), and packing (6) on bonnet (7). Tighten packing nut (3) and turn handwheel (2) clockwise.
3. Install eight screws (8), new lockwashers (14), and nuts (15), new gasket (12), and bonnet (7) on valve body (13).

**FOLLOW-ON MAINTENANCE:**

- Install F, B, and/or C valve assembly (para 2-129).
- Disconnect ground (refer to TM 9-2330-398-10).



---

**3-43. CHECK VALVE ASSEMBLY REPAIR.**

---

---

**This Task Covers:**

- a. Disassembly
  - b. Cleaning and Inspection
  - c. Assembly
- 

**Initial Setup:****Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Check valve assembly removed (para 2-132).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

**Materials/Parts:**

- Drycleaning solvent (Item 12, Appendix C)
  - Rag (Item 25, Appendix C)
  - Preformed packing (Item 142, Appendix F)
- 

**a. DISASSEMBLY**

1. Remove retaining ring (1), cap (2), and O-ring (3) from check valve (7).
2. Remove two plugs (6), lever bushing (1 1), pin (12), disc (4), and preformed packing (5) from check valve (7). Discard preformed packing.
3. Remove lever (8), washer (9), and retaining ring (10) from disc (4).

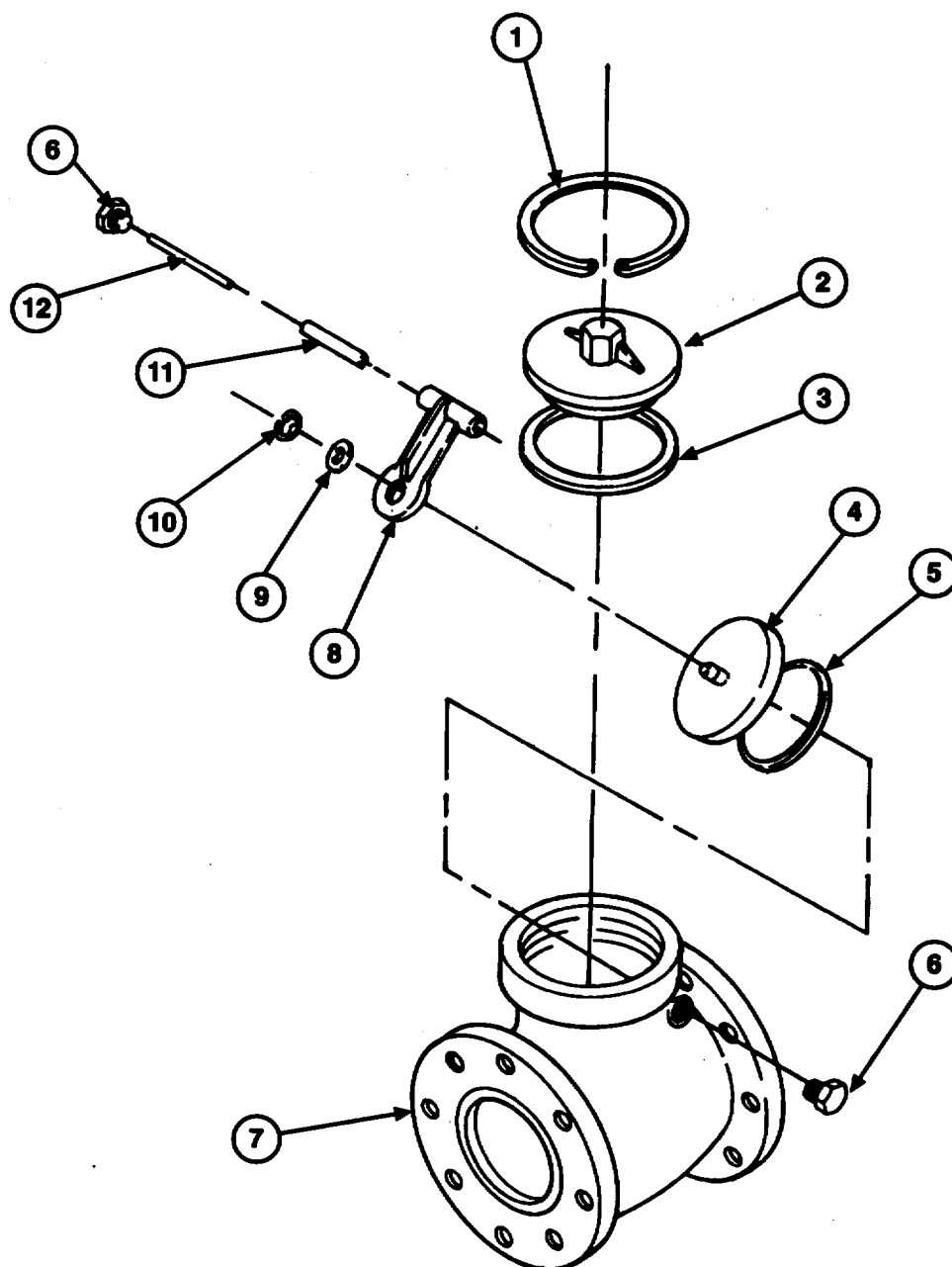
**b. CLEANING AND INSPECTION****WARNING**

**Drycleaning solvent P-D-80 is toxic and flammable. Always wear protective goggles and gloves, and use in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Do not use near open flame or excessive heat.**

1. Clean all metal parts with drycleaning solvent and rags.
2. Wipe O-ring clean with rags.
3. Inspect metal parts for cracks, scoring, and pitting. Replace any damaged parts.
4. Inspect O-ring and retainer for damage. If they are damaged, check valve assembly must be replaced.

**c. ASSEMBLY**

1. Install lever (8), washer (9), and retaining ring (10) on disc (4). /
2. Install two plugs (6), lever bushing (1 1), pin (12), disc (4), and new preformed packing (5) on check valve (7).
3. Install retaining ring (1), cap (2), and O-ring (3) on check valve (7).

**3-43. CHECK VALVE ASSEMBLY REPAIR (continued).****FOLLOW-ON MAINTENANCE:**

- Install check valve assembly (para 2-132).
- Disconnect ground (refer to TM 9-2330-398-10).

**3-44. R, P, M, AND G VALVE ASSEMBLIES REPAIR.**


---

This Task Covers:

- a. Disassembly
  - b. Cleaning and Inspection
  - c. Assembly
- 

Initial Setup:

**Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)

**Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- R, P, M, and/or G valve assembly removed (para 2-135).
- Semitrailer bonded and grounded (refer to TM 9-2330-398-10).

**Materials/Parts:**

- Drycleaning solvent (Item 12, Appendix C)
  - Rag (Item 25, Appendix C)
  - Parts kit (Item 4, Appendix F)
  - Preformed packing (3) (Item 143, Appendix F)
  - Top seal (Item 189, Appendix F)
- 

**NOTE**

**This task can be used for repair of the R, P, M, and G valve assemblies. The R valve assembly is shown.**

**a. DISASSEMBLY**

1. Remove cotter pin (2) top pin (3), handle (1), and clip (4) from valve stem (7). Discard cotter pin.
2. Remove two screws (19) and stop plate (5) from valve body (12).
3. Remove valve seal (8) split bearing (10), two preformed packings (9 and 11), and top seal (6) from valve body (12). Discard valve seal, top seal, and preformed packings.
4. Remove spring pin (15) bottom stem (16), and preformed packing (17) from valve body (12). Discard spring pin and preformed packing.
5. Remove and discard bearing (18) from bottom stem (16).
6. Remove disc (14) and sleeve (13) from valve body (12).

**b. CLEANING AND INSPECTION****WARNING**

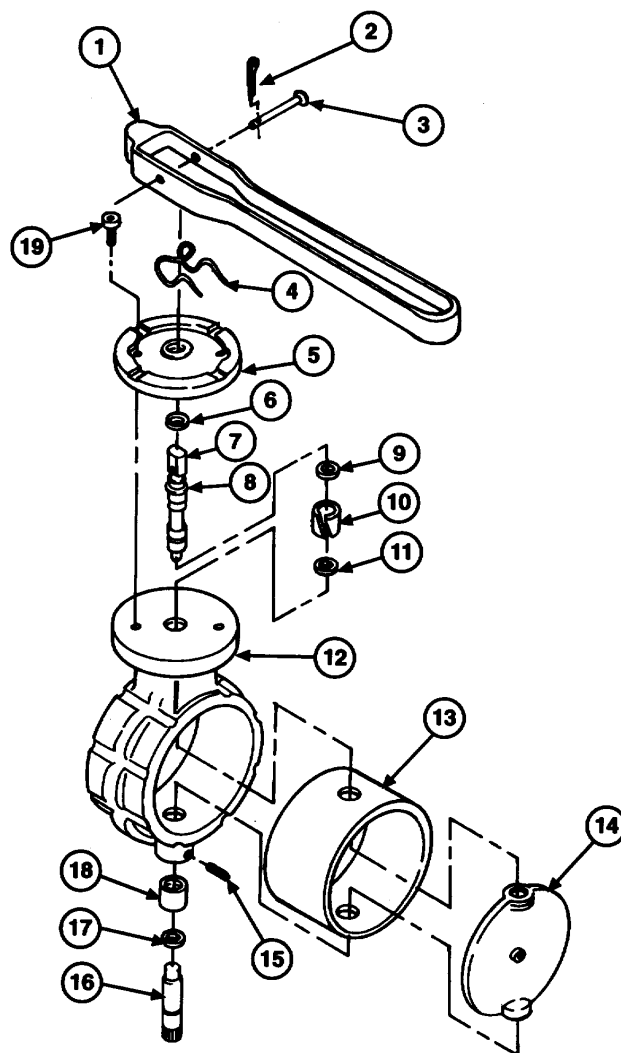
**Drycleaning solvent P-D-680 toxic and flammable. Always wear protective goggles and gloves, and use in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Do not use near open flame or excessive heat.**

1. Clean all metal parts with drycleaning solvent and rags.
2. Inspect metal parts for cracks, scoring, and pitting. Replace any damaged parts.

**3-44. R, P, M, AND G VALVE ASSEMBLIES REPAIR (continued).****c. ASSEMBLY****NOTE**

The only difference in the four valves is different size disc and sleeves.  
When assembling disc and sleeves, verify that size is correct.

1. Install disc (14) and sleeve (13) in valve body (12).
2. Install new bearing (18) on bottom stem (16).
3. Install bottom stem (16) and new preformed packing (17) in valve body (12) with new spring pin (15).
4. Install split bearing (10), two new preformed packings (9 and 11), valve seal (8), and top seal (6) on valve stem (7). Install valve stem (7) in valve body (12).
5. Install stop plate (5) on valve body (12) with two screws (19).
6. Install new cotter pin (2), top pin (3), handle (1), and dip (4) on valve body (12).

**FOLLOW-ON MAINTENANCE:**

- Install R, P, M, and/or G valve assemblies (para 2-135).
- Disconnect ground (refer to TM 9-2330-398-10).

## CHAPTER 4 GENERAL SUPPORT MAINTENANCE

### 4-1. ENGINE ASSEMBLY REPAIR.

#### *This Task Covers:*

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>a. Removal</li> <li>c. Cleaning and Inspection</li> <li>e. Installation</li> </ul> | <ul style="list-style-type: none"> <li>b. Disassembly</li> <li>d. Assembly</li> </ul> |
|---|---|

#### *Initial Setup:*

#### **Tools/Test Equipment:**

- General mechanic's tool kit (Item 4, Appendix B)
- Common No. 1 tool set (Item 1, Appendix B)
- Basic field maintenance shop equipment
- (Item 3, Appendix B)
- Lifting device (item 6, Appendix B)

- Seal (Item 152, Appendix F)
- Seal (Item 156, Appendix F)
- Seal (Item 157, Appendix F)
- Seal (Item 158, Appendix F)
- Self-locking bolt (6) (Item 161, Appendix F)
- Self-locking nut (4) (Item 163, Appendix F)

#### **Materials/Part:**

- Crocus cloth (Item 6, Appendix C)
- Diesel fuel oil (item 15, Appendix C)
- Drycleaning solvent (Item 12, Appendix C)
- Grease (Item 18, Appendix C)
- Hydraulic fluid (Item 19, Appendix C)
- Lubricating oil (Item 22, Appendix C)
- Wiping rag (Item 25, Appendix C)
- Gasket (Item 28, Appendix F)
- Gasket (Item 29, Appendix F)
- Gasket (Item 30, Appendix F)
- Gasket (Item 31, Appendix F)
- Gasket (2) (Item 34, Appendix F)
- Gasket (2) (Item 35, Appendix F)
- Gasket (Item 52, Appendix F)
- Gasket (Item 64, Appendix F)
- Lockwasher (9) (Item 96, Appendix F)
- Lockwasher (10) (Item 98, Appendix F)
- Lockwasher (9) (Item 113, Appendix F)
- Lockwasher (2) (Item 114, Appendix F)
- Lockwasher (Item 115, Appendix F)
- Preformed packing (16) (Item 139, Appendix F)

#### **Equipment Conditions:**

- Semitrailer uncoupled (refer to TM 9-2330-398-10).
- Alternator and mounting bracket removed (para 2-100).<sup>1</sup>
- Engine oil filter removed (para 2-106).
- Glow plugs removed (para 2-107).
- Intake manifold removed (para 2-108).
- Fuel filter head and hose assembly removed (para 2-110).
- Engine starter removed (para 2-111).
- Engine oil filter head removed (para 3-17).
- Fuel metering pump removed (para 3-19).
- Fuel injection nozzles removed (para 3-21).
- Engine throttle and choke linkage removed (para 3-22).
- Governor assembly removed (para 3-23).
- Engine exhaust manifold removed (para 3-24).
- Engine shrouding removed (para 3-25).
- Engine high-temp thermostatic control switch removed (para 3-27).
- Four-inch pump assembly removed (para 3-32).

**Personnel Required:** Two

## 4-1. ENGINE ASSEMBLY REPAIR (continued).

### a. REMOVAL

#### WARNING

**Engine Is heavy and can cause serious injury to personnel if it should fall. Use care when removing engine from semitrailer.**

1. Remove four self-locking nuts (4) and screws (3) from engine frame (2). Position lifting device under engine frame (2) to take up weight of engine (1), and remove engine from engine and pump cabinet (5). Discard self-locking nuts.

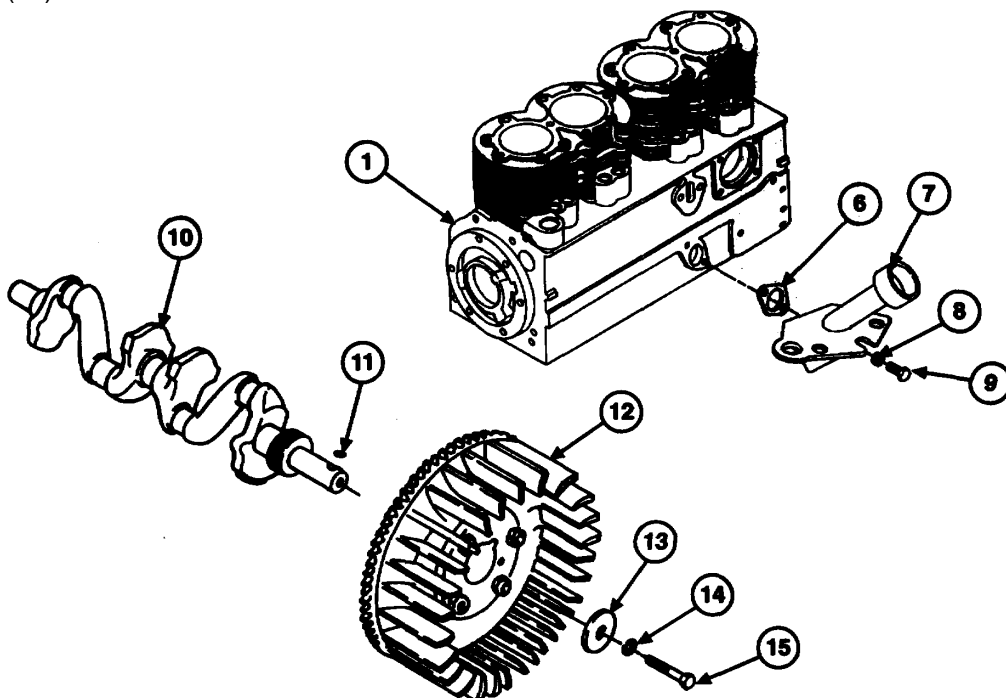
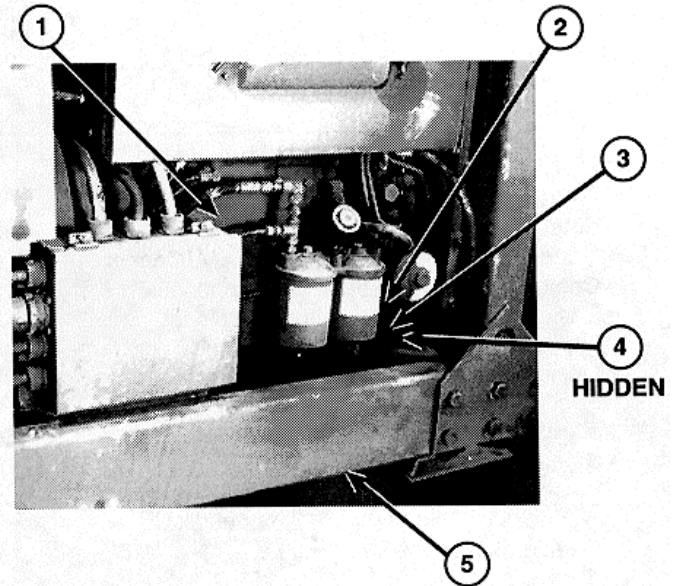
#### NOTE

When using some maintenance stands, baffles may have to be removed before attaching engine.

2. Install engine (1) on maintenance stand.

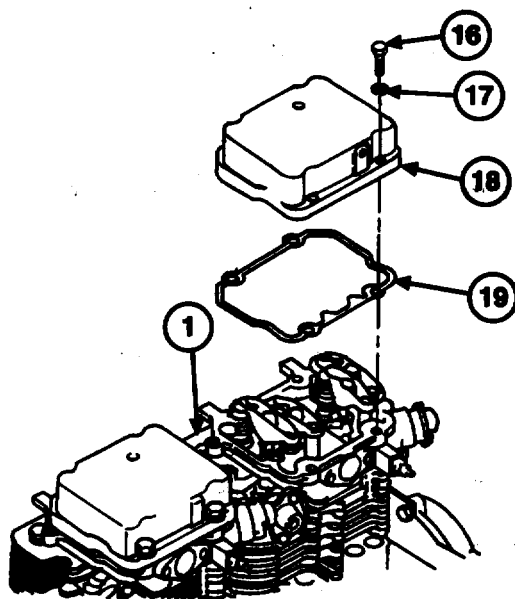
### b. DISASSEMBLY

1. Remove two screws (9) and lockwashers (8), oil fillertube (7), and gasket (6) from engine (1). Discard lockwashers and gasket.
2. Remove screw (15), lockwasher (14), and washer (13) from flywheel (12). Using puller set, remove flywheel (12) and key (11) from crankshaft (10). Discard lockwasher.

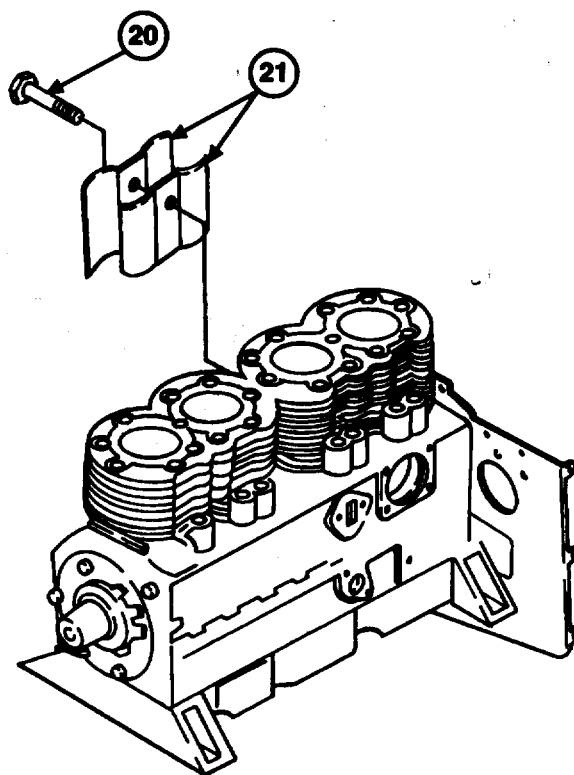


**4-1. ENGINE ASSEMBLY REPAIR (continued)**

3. Remove eight screws (16) and lockwashers (17), two rocker arm covers (18), and gaskets (19) from engine (1). Discard lockwashers and gaskets.



4. Remove screw (20) and two baffles (21) from engine (1).



**4-1. ENGINE ASSEMBLY REPAIR (continued).**

5. Remove four standpipe vents (27) from two cylinder heads (28).
6. Remove eight nuts (24), rocker arm balls (23), and rocker arms (22) from two cylinder heads (28).

**CAUTION**

To prevent damage to cylinder heads do not use a prybar or strike cooling fins.

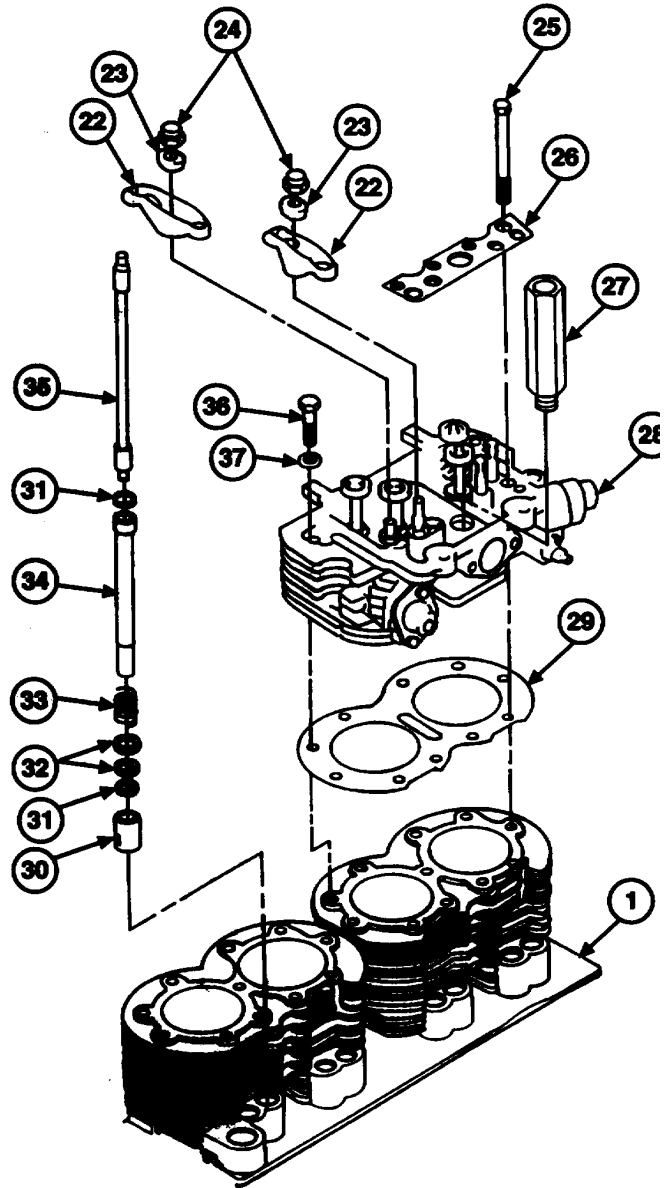
**NOTE**

If cylinder heads stick, tap them gently with soft hammer.

7. Remove 10 screws (25), two push rod guide plates (26), 12 screws (36) and washers (37), eight push rods (35), and two cylinder heads (28) from engine (1).
8. Remove eight push rod shields (34), 16 packings (31), eight springs (33), 16 washers (31), eight tappets (30), and two cylinder head gaskets (29) from engine (1). Discard packings and gaskets.

**CAUTION**

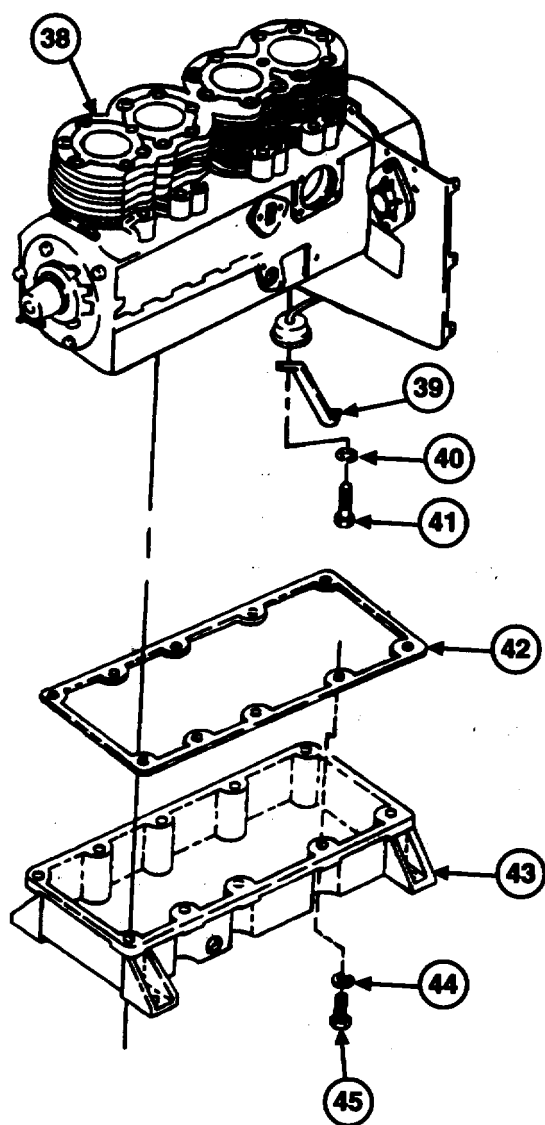
Do not attempt to pry oil base free of cylinder block. If necessary, use soft mallet to separate oil base.





**4-1. ENGINE ASSEMBLY REPAIR (continued).**

9. Remove 10 screws (45) and lockwashers (44), oil base (43), and gasket (42) from cylinder block (37). Discard lockwashers and gasket.
10. Remove screw (41), lockwasher (40), and bracket (39), from cylinder block (38). Discard lockwasher.
11. Remove ridge from cylinder bore in cylinder block (38).



**4-1. ENGINE ASSEMBLY REPAIR (continued).****NOTE**

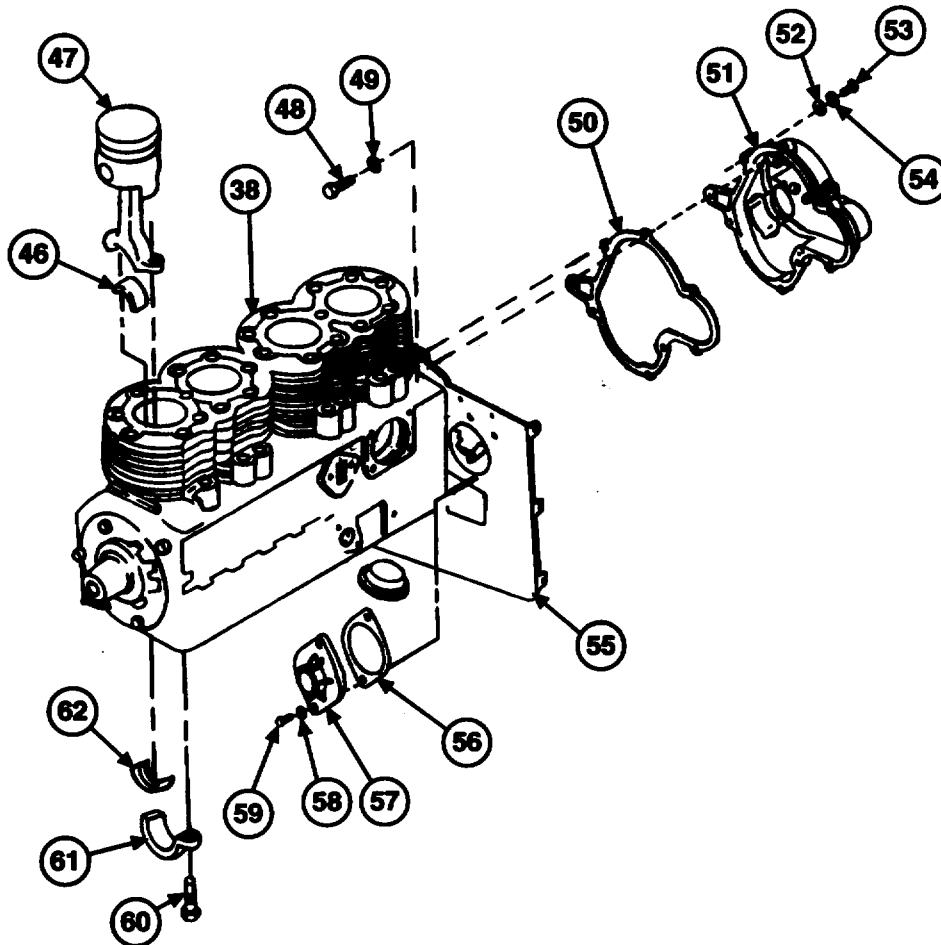
- If piston assembly cannot be removed, turn crankshaft to align connecting rod with crankshaft.
- Do not set cylinder block assembly upright until after removal of oil pump pick-up cup assembly, camshaft, and valve tappets.

12. Remove two bolts (60), cap (61), and two half bearings (46 and 62) from each of four piston assemblies (47). Push piston assemblies (47) upward through top of cylinder bore in cylinder block (38). Loosely install cap (61) and half bearings (46 and 62) on corresponding removed piston assemblies (47) to maintain proper grouping.
13. Remove two screws (59) and lockwashers (58), cover (57), and gasket (56) from backplate (55). Discard lockwashers and gasket.
14. Remove screw (48) and lockwasher (49) from backplate (55). Discard lockwasher.

**NOTE**

Tap crankcase gear cover with hammer to loosen gear cover for easy removal.

15. Remove four screws (54), lockwashers (53), and washers (51) from crankcase gear cover (50). Remove gear cover (51) and gasket (50) from backplate (55). Discard lockwashers and gasket.



**4-1. ENGINE ASSEMBLY REPAIR (continued).**

16. Remove retaining ring (68) from center pin of camshaft (66).
17. Remove governor cup (67) and five flyballs (69) from camshaft (66).

**CAUTION**

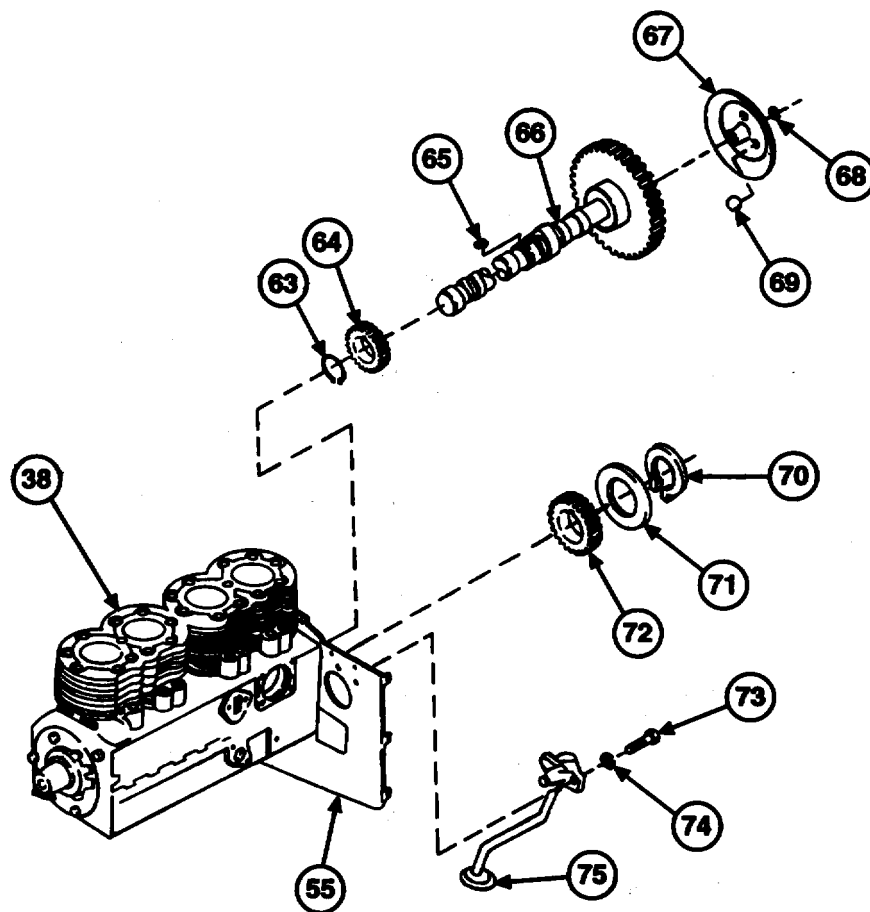
**When removing camshaft assembly, be careful not to damage bearings.**

18. Remove camshaft (66) from cylinder block (38) as a group. Remove retaining ring (63) and press gear (64) from camshaft (66).
19. Remove key (65) from camshaft (66).

**CAUTION**

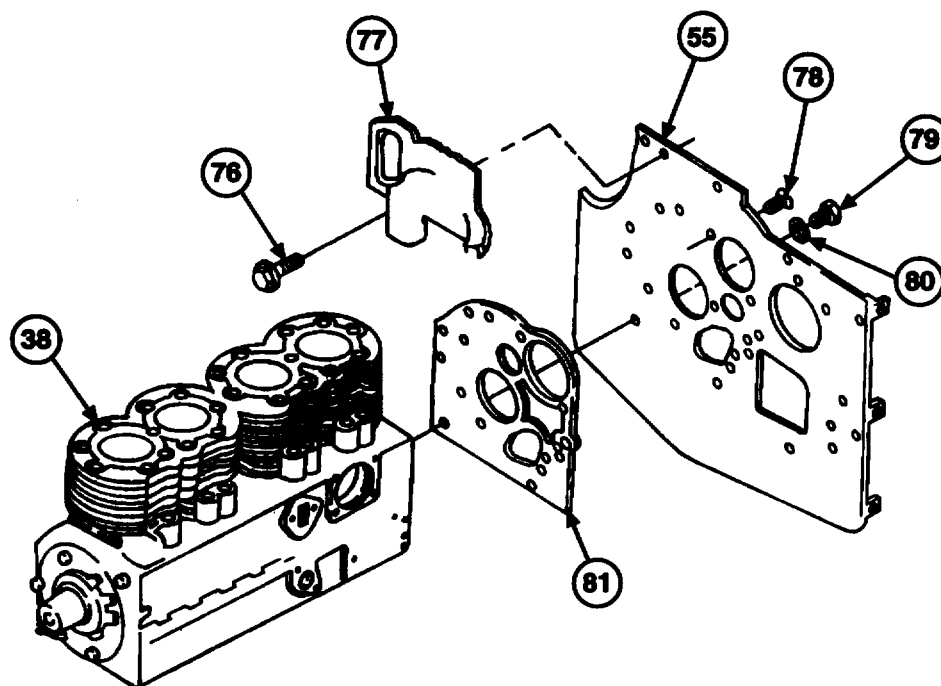
**Use care not to damage gear teeth N crankshaft gear is to be reused.**

20. Remove crankshaft gear lock ring (70), retaining washer (71), and crankshaft gear (72) from backplate (55).
21. Remove two screws (73) and lockwashers (74) and oil pump (75) from backplate (55). Discard lockwashers.



**4-1. ENGINE ASSEMBLY REPAIR (continued).**

22. Remove screw (76) and front air baffle (77) from backplate (55).
23. Remove screw (79), lockwasher (80), two flat head screws (78), backplate (55), and gasket (81) from cylinder block (38). Discard lockwasher and gasket.



24. Remove screw (82) and washer (83) from end of crankshaft (10). Remove pump coupling (84) and woodruff key (91) from crankshaft (10).

**NOTE**

Number of shims may vary.

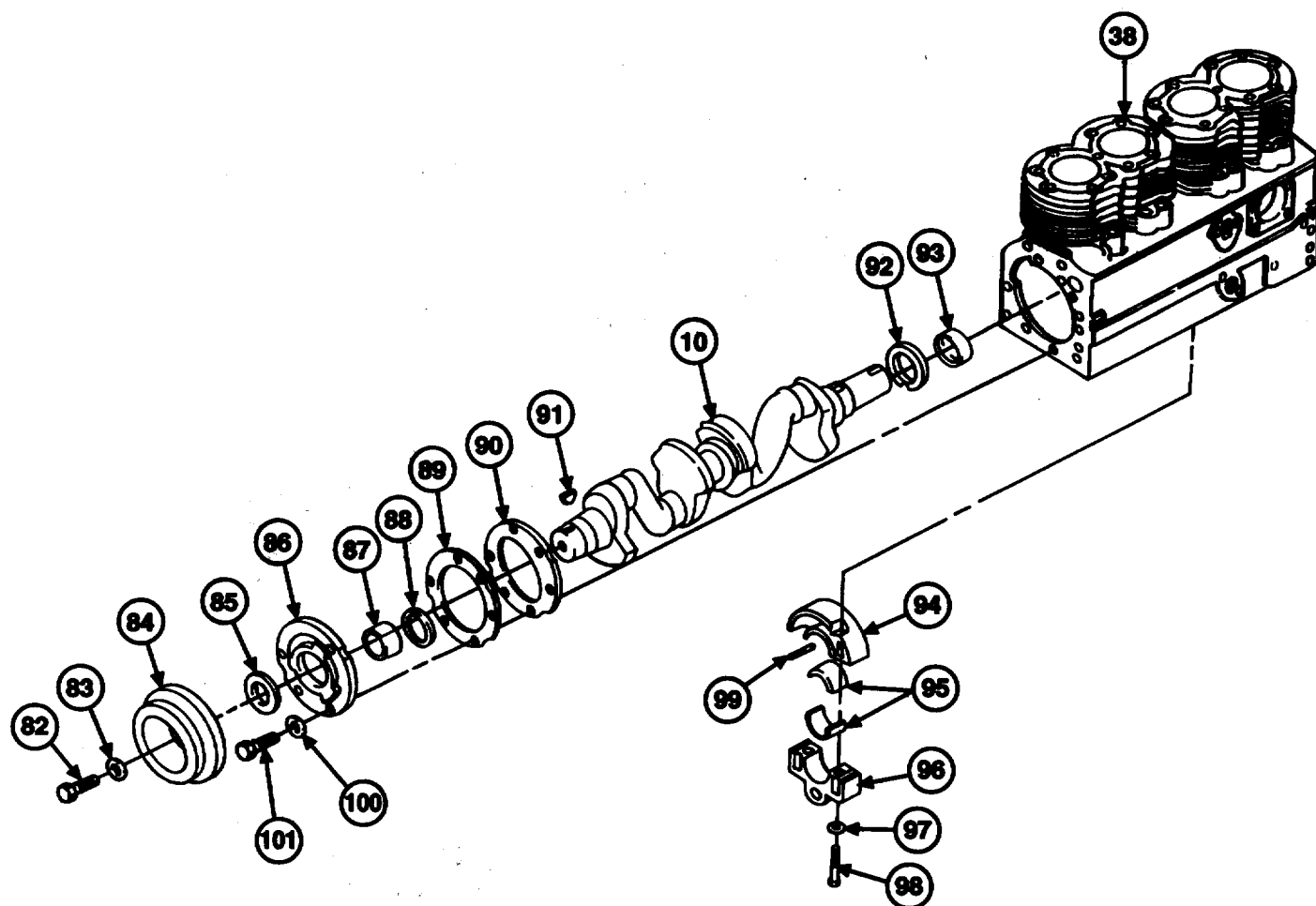
25. Remove six self-locking bolts (101), washers (100), rear bearing plate (86), two gaskets (89), and shims (90) from cylinder block (38). Discard self-locking bolts and gaskets.
26. Remove two bolts (98) and washers (97), bottom center main bearing housing (96), and lower half bearing (95) from cylinder block (38). Rotate crankshaft (10) and remove upper center bearing housing (94), upper half of center bearing (95) and two pins (99) from cylinder block (38). Remove crankshaft (10) through rear opening in cylinder block (38).

**NOTE**

Do not remove pressed-in components, such as bearings, seals, and plugs, unless there is evidence of damage, excessive wear, or looseness.

27. Remove seal (85) and rear main bearing (87) from rear bearing plate (86). Discard seal.
28. Remove front main bearing (93) from cylinder block (38).
29. Remove two thrust washers (88 and 92) from crankshaft (10).

## 4-1. ENGINE ASSEMBLY REPAIR (continued).



**4-1. ENGINE ASSEMBLY REPAIR (continued).****NOTE**

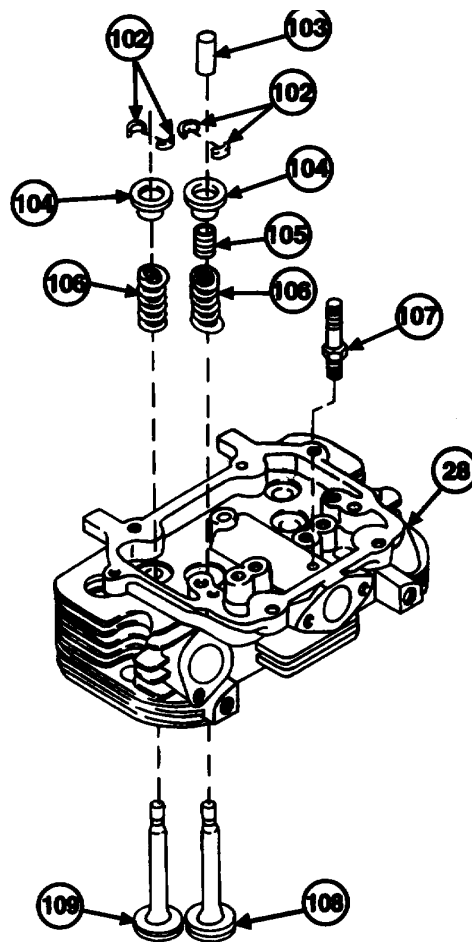
Disassembly is the same for both cylinder heads. One is shown.

30. Remove valve stem cap (103) from each of two intake valves (108) and two exhaust valves (109).
31. Using valve spring compressor, compress valve spring (106), and remove both halves of valve stem lock (102) from stem of valve (108 or 109).
32. Release valve spring compressor and remove spring retainer (104), valve spring (106), and valve (108 or 109) from cylinder head (28).
33. Repeat steps 31 and 32 for remaining three valves (108 and 109).

**NOTE**

Seals are installed on intake valves only.

34. Remove seal (105) from each of two valves (108). Discard seals.
35. Remove four rocker arm studs (107) from cylinder head (28).

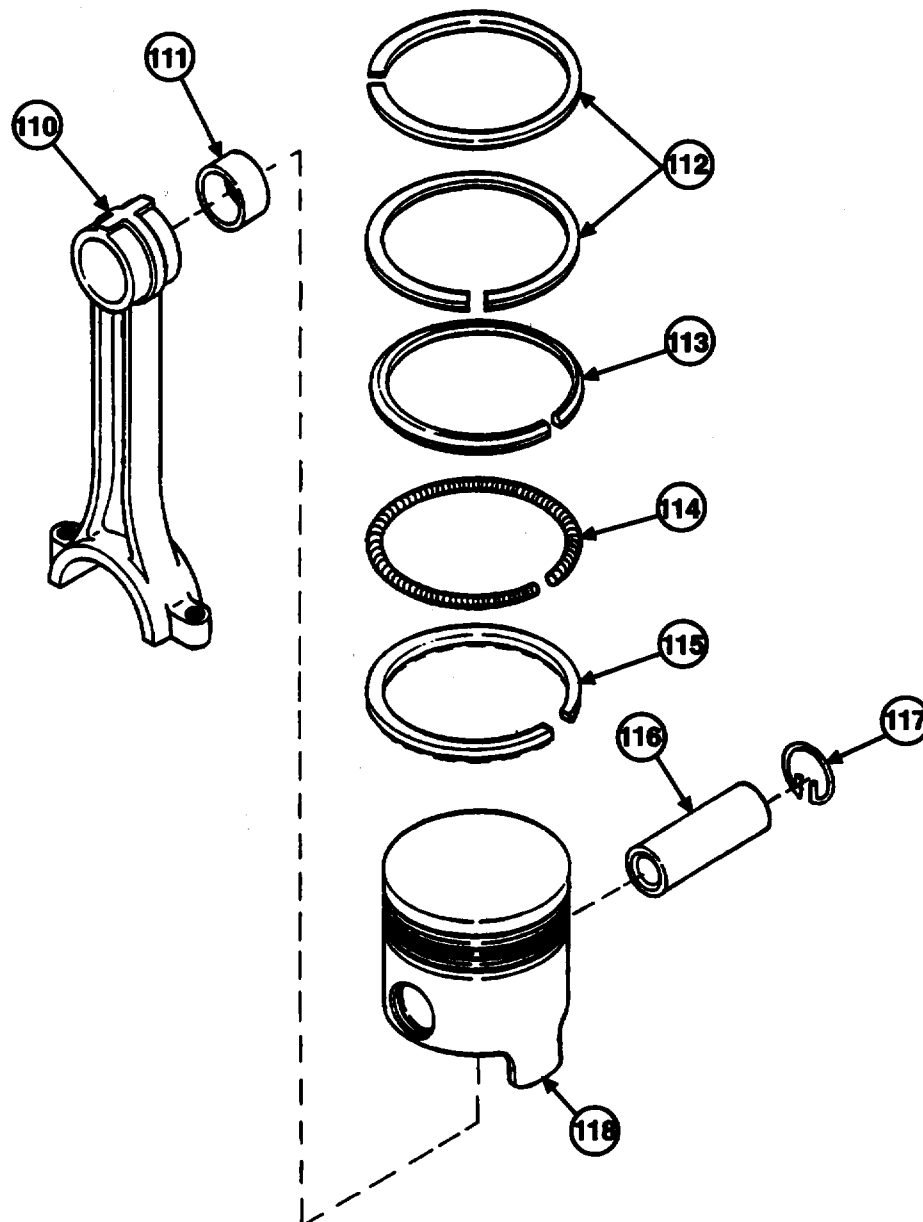


**4-1. ENGINE ASSEMBLY REPAIR (continued).**

36. Using ring expander, remove four piston rings (112, 113, and 115) and oil ring expander (114) from each of four pistons (117).
37. Remove two retaining rings (117) from piston pin (116), and remove piston pin (116), bushing (111), and connecting rod (110) from each of four pistons (118).

**WARNING**

Use care when unscrewing recessed plug in rear bearing plate. Tension on bypass spring may cause it to fly out, causing injury to personnel.

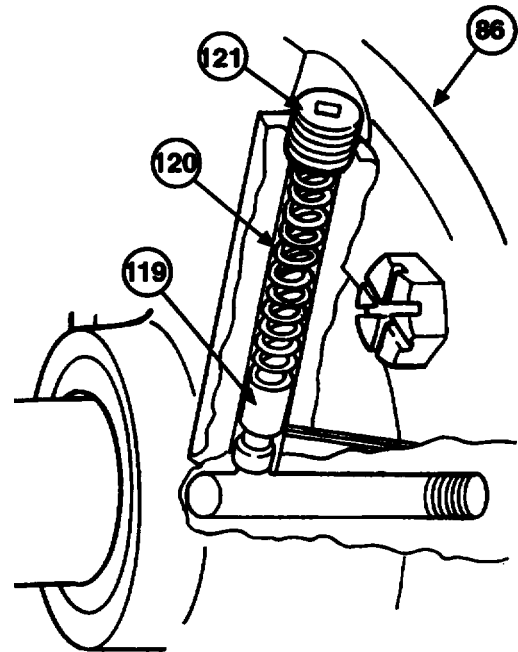


**4-1. ENGINE ASSEMBLY REPAIR (continued).**

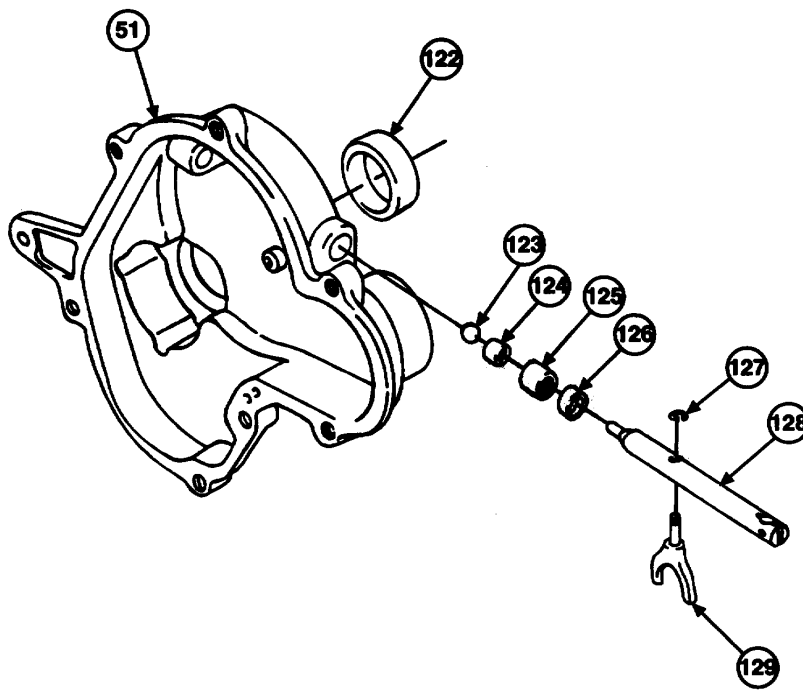
38. Remove recessed plug (121) from rear bearing plate (86).
39. Remove bypass spring (120) and valve plunger (119) from rear bearing plate (86).
40. Remove external retaining ring (127) securing governor yoke (129) to governor shaft (128), and remove governor yoke (129) from governor shaft (128).
41. Remove governor shaft (128) from gear cover (51).

**NOTE**

Do not remove pressed-in components, such as bearings, seals, and plugs, unless there is evidence of damage, excessive wear, or looseness.



42. Place gear cover (51) on wooden supports and drive out seal (121). Discard seal.
43. Using valve guide driver tool, driveout needle bearing (124) and seal (126) from gear cover (51). Discard seal.
44. Remove thrust bearing (124) and ball (123) from gear cover (51).





---

**4-1. ENGINE ASSEMBLY REPAIR (continued).**

---

**c. CLEANING AND INSPECTION****NOTE**

- If cylinder block is cracked, engine cannot be overhauled. Be certain to save all salvageable components if engine cannot be overhauled.
  - Use only clean, lint-free cloth for wiping engine parts. Oil and diesel fuel used during the reassembly process must be clean. Handle all parts carefully, especially bearings and machined surfaces.
1. Use Magnaflux or dye-penetrating technique to detect cracks in cylinder block.
  2. Inspect all milled surfaces for pitting, burrs, and carbon or dirt buildup. Remove all burrs from bolt holes on machined or milled surfaces.
  3. Inspect all mating surfaces. Be certain they are clean and smooth, to ensure proper gasket sealing.

**WARNING**

**Drycleaning solvent P-D-680 is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Do not use near open flames or excessive heat.**

4. Clean rocker arm cover gasket mating surface using drycleaning solvent and rags. Make sure mating surface is cleaned and free of all excess gasket material. Wipe dry using rags.
5. Flush rocker arm cover oil line with diesel fuel and clean out four drain holes.

**WARNING**

**Particles blown by compressed air can be dangerous. Be certain to direct air stream away from user and other personnel in the area.**

6. Dry oil inlet using clean, filtered, compressed air under pressure of approximately 15 psi (103 kPa).
7. Visually inspect rocker arm cover for nicks or dents on gasket mating surface. Inspect cover for cracks, particularly around the area of lifting bracket bolt hole. Inspect bolt holes for damaged or excessively worn threads. Replace rocker arm cover if damaged.
8. Inspect oil line for deep nicks or dents that may obstruct oil flow. Inspect line for cracks or punctures. Replace oil line if defective.

---

**4-1. ENGINE ASSEMBLY REPAIR (continued).**

---

**WARNING**

**Drycleaning solvent P-D680 is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Do not use near open flames or excessive heat.**

9. Thoroughly clean all components of the cylinder head assembly using drycleaning solvent and a stiff brush.
10. Inspect oil inlet port using cleaning wire, and flush clean with drycleaning solvent.

**WARNING**

**Particles blown by compressed air can be dangerous. Be certain to direct air stream away from user and other personnel in the area.**

11. Dry all tapped holes and oil ports using compressed air.
12. Inspect cylinder head casting using Magnaflux or dye-penetrating technique to detect cracks.
14. Inspect all finished surfaces for nicks, scratches, pitting, or excessive wear.
15. Inspect all tapped holes for worn or damaged threads.
16. Repair minor damage to the cylinder head castings using crocus cloth dipped in drycleaning solvent. Repair minor damage to threads using a proper size tap. Do not enlarge threaded hole. If minor damage cannot be repaired, replace cylinder head casting and valve seats. Salvage all other usable components.
17. Inspect studs for stripped or worn threads or bent or loose connections. Replace studs if damaged.
18. Check for valve-stem-to-valve-guide allowable clearance by measuring inside diameter of valve guide (133 and 134) and outside diameter of valve stem. Refer to Table 4-1 for correct dimensions.

**NOTE**

If valve stem is worn below minimum tolerances, replace valve. If new valve fails to correct stem-to-valve clearance, replace valve guide.

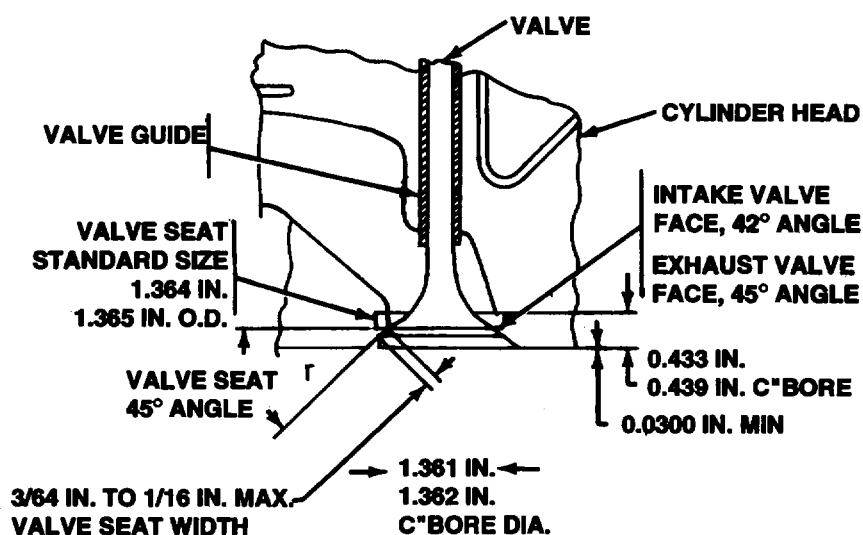
19. Remove valve guide and install new valve guide through top of cylinder head using valve guide driver/installer tool set. Allow valve guide to remain at 0.3437 inch (0.8730 cm) from top of cylinder head. Ream the replacement valve guide, if necessary, to obtain proper valve-stem-to-valve-guide clearance.
20. Inspect valves for warped stems, pitting, evidence of burning, and excessive wear. Replace valves if badly damaged or if valve stem is worn beyond tolerances shown in Table 4-1.

**CAUTION**

**If grinding on valve face produces valve with thin edge, replace valve.**

**4-1. ENGINE ASSEMBLY REPAIR (continued).**

21. Repair valves that can be refaced by grinding to the requirements shown in Table 4-1.
22. Inspect valve seats. Reface valve seats if seat face is slightly pitted, burned, or worn and can be refaced to the requirements in Table 4-1. If valve seats are loose, they must be replaced.
23. Inspect valve spring for evidence of damage. Replace spring if cracked, pitted, or if ends are out of square.
24. Check valve spring for 1.875 inches (4.76 cm) free length.
25. Inspect valve spring under load conditions using a compression scale as follows:
  - a. Compress spring to 1.528 inches (3.88 cm) (valve closed), and check scale for 45 to 49 pounds (20 to 22 kg) compression.
  - b. Compress spring to 1.182 inches (3.00 cm) (valve open), and check scale for 87 to 97 pounds (39 to 44 kg) compression.
  - c. Discard any spring that fails to meet the above requirements.



**4-1. ENGINE ASSEMBLY REPAIR (continued).**

*Table 4-1. Repair and Replacement Standards (continued)*  
*(All values are in inches unless otherwise specified.)*

Component	Manufacture's Dimensions and Tolerance		Maximum Allowable Wear Limit
	Minimum	Maximum	
PISTON PIN:			
Length	2.753	2.758	N/A
Diameter	0.9899	0.9901	0.001
Piston clearance	Thumb push fit		
Connecting rod bushing clearance	0.0002	0.0007	0.0008
PISTON RING:			
Clearance in groove - top	0.0035	0.0075	0.0100
Clearance in groove - 2nd and 3rd - compression	0.0030	0.0050	0.0080
Clearance in groove - 4th - oil control	0.0020	0.0030	0.0050
Gap	0.0100	0.0200	0.0400
VALVE INTAKE:			
Stem diameter	0.3415	0.3410	N/A
Stem guide clearance	0.0025	0.0028	N/A
Stem to rocker arm clearance	Cold 0.009		0.0005
Seat diameter in head	1.361	1.362	N/A
Top of valve recessed below cylinder head deck	0.433	0.439	0.500
Seat width	0.0468	0.0625	N/A
Valve seat angle	45°	N/A	N/A
Valve face angle	42°	N/A	N/A
VALVE EXHAUST:			
Stem diameter	0.3415	0.3410	N/A
Stem guide clearance	0.0045	0.005	N/A
Stem to rocker arm clearance	0.007		0.0005
Seat diameter in head	1.361	1.362	N/A
Top of valve recessed below cylinder head deck	0.433	0.439	0.500
Seat width	0.0468	0.0625	N/A
Valve seat angle	45°	N/A	N/A
Valve face angle	45°	N/A	N/A
VALVE GUIDE:			
Length	1.7812		
Outside diameter	0.4690	0.4695	0.4695
Bore diameter - intake - reamed	0.3425	0.3435	0.003
Bore diameter - exhaust - reamed	0.3445	0.3455	0.003
VALVE LIFTER:			
Body diameter	0.8725	0.8730	0.003
Overall length	1.510	1.550	1.500
Lifter bore	0.8755	0.8765	0.008
VALVE SPRINGS - INTAKE AND EXHAUST:			
Free length	1.875		N/A
Total coils	5.75		N/A
Length, valve dosed	1.528		N/A
Length, valve open	1.214		N/A
Load, valve closed	45 lb	49 lb	40 lb
Load, valve open	83 lb	93 lb	N/A

\* Replacement bearing only.

† Ship controlled

**4-1. ENGINE ASSEMBLY REPAIR (continued).**

*Table 4-1. Repair and Replacement Standards (continued)*  
*(All values are in inches unless otherwise specified.)*

Component	Manufacturer's Dimensions and Tolerances		Maximum Allowable Wear Limit
	Minimum	Maximum	
CYLINDER HEAD:			
Warpage (longitudinally)		0.001	0.0015
Warpage (laterally)		0.001	0.0015
CAMSHAFT:			
Bearing journal diameter - front	2.500	2.505	0.002
Bearing journal diameter - rear	1.1875	1.1880	0.002
Bearing clearance limit	0.0012	0.0037	0.0057
Camshaft end play	0.007	0.039	0.045
Cam tappet hole diameter	0.7505	0.7515	N/A
Cam tappet diameter	0.7475	0.7480	N/A
CONNECTING RODS:			
Large bearing bore	2.1871	2.1876	2.1886
Small bushing bore	1.044	1.045	1.0455
Length-center to center	5.998	6.002	6.002
Bearing-to-crankshaft clearance	0.0010	0.0033	0.0040
CRANKSHAFT:			
Main bearing journal diameter*	2.2430*	2.2435	0.001
Crankshaft main bearing clearance	0.0024	0.0049	N/A
Connecting rod journal diameter	2.0600	2.0605	N/A
End play, crankshaft	0.010	0.015	0.015
CYLINDER BLOCK:			
Cylinder bore	3.2495	3.2505	0.005
PISTON;			
Clearance in cylinder bore	0.0050	0.0070	0.005
Bore, piston pin	0.9900	0.9903	0.9903
Ring groove width - top	0.0970	0.0980	0.005
Ring groove width - 2nd and 3rd - compression	0.0965	0.0975	0.005
Ring groove width - 4th oil control	0.1880	0.1895	0.005

\* Replacement bearing only.

† Ship controlled

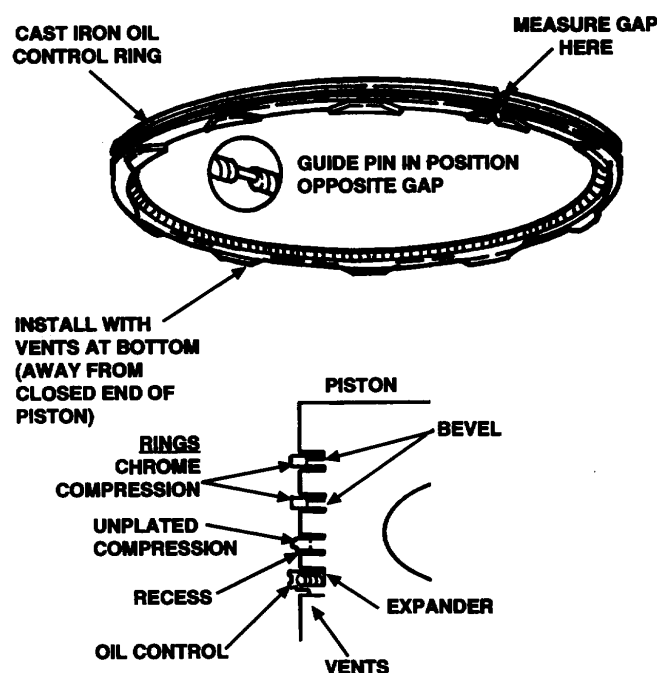
**4-1. ENGINE ASSEMBLY REPAIR (continued).**

26. Thoroughly clean and inspect each piston. Clean carbon from ring grooves and make sure that any oil holes are open. If any piston is badly scored or buffed, loose in cylinders, has badly worn ring grooves, or otherwise is not in good condition, replace it. Check piston clearance in cylinder 90 degrees from axis of piston pin and below oil control ring. Clearance should be 0.0055 to 0.0075 inch (0.014 to 0.019 cm). If not, replace piston and check cylinder wall for possible reconditioning.

**NOTE**

Piston and pin are matched set and are not procured separately.

27. Each piston pin should be a thumb push fit into its piston at room temperature. If pin is excessively loose, piston.
28. Place each piston ring into its cylinder bore and, using a feeler gage, measure gap where indicated in illustration. Gap is shown in Table 4-1. If gap is under 0.010 inch (0.025 cm), file as follows:
- Place file in vise and grasp piston ring in both hands.
  - Insert file into ring gap and move ring down entire length of file. Be sure to apply equal pressure on ring.
29. Clean connecting rods and check each rod for defects. Check connecting rod bushings for proper clearance with piston pin. Clearance is given in Table 4-1. If bushings are excessively worn, press them out and install one new bushing from each side of bushing bore. Press new bushings only until flush with sides of rod to leave 0.0625 to 0.1094 inch (0.159 to 0.278cm) oil groove in center. Ream bushing inside diameter to obtain proper clearance. Check bore in connecting rod. Bore must be open. Check connecting rod alignment on a standard alignment fixture.
30. Inspect connecting rod bearings for burrs, breaks, pits, and wear. Measure clearance between bearings and crankshaft journal (Table 4-1). If necessary, replace with new standard or undersize bearings.



---

**4-1. ENGINE ASSEMBLY REPAIR (continued).**

---

**WARNING**

**Drycleaning solvent P-D680 is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Do not use near open flames or excessive heat.**

31. Clean oil bypass valve, spring, and plug using drycleaning solvent and rag.

**WARNING**

**Particles blown by compressed air can be dangerous. Be certain to direct air stream away from user and other personnel in the area.**

32. Flush oil port clean using clean diesel fuel. Air-dry oil bypass valve port with compressed air.
33. Soak all metal parts of oil bypass valve in clean container containing hydraulic fluid. Wipe dry using clean, lint-free cloth and compressed air. Coat all components with oil prior to assembly.
34. Measure diameter of bypass valve. If measurement shows less than 0.3365 inch (0.855 cm) minimum diameter, replace valve. Maximum diameter should not exceed 0.3380 inch (0.858 cm).
35. Measure free length of valve spring. If free length is less than  $2.3125 + 0.0625$  inch (5.874 + 0.159 cm), replace valve spring.
36. Inspect valve spring tension under load conditions. Using a compression scale, compress valve spring to 1.1875 inches (3.016 cm) and check the scale for  $2.225 + 0.110$  pounds ( $1.010 \pm 0.050$  kg) compression.
37. Inspect plug for evidence of worn or damaged threads. Replace plug if defective.

**WARNING**

**Drycleaning solvent P-D680 is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and do not breathe vapors. Do not use near open flames or excessive heat.**

38. Clean gearcase gasket mating surface using drycleaning solvent. Make sure mating surface is cleaned free of all excess gasket material. Wipe dry using clean, lint-free cloth.

**WARNING**

**Particles blown by compressed air can be dangerous. Be certain to direct air stream away from user and other personnel in the area.**

39. Flush gearcase clean with diesel fuel oil and dean out oil passages. Dry oil passages with compressed air.
40. Visually inspect gearcase for nicks or dents on gasket mating surface. Inspect for cracks. Inspect bolt holes for damaged or excessively worn threads. Replace gearcase if damaged.
41. Inspect all components for evidence of excessive wear, scratches, and nicks. Replace defective components.
42. Measure distance from end of roll pin to mounting face of gearcase. Distance should be 0.781 inch (1.984 cm). If necessary to replace pin, pin should be positioned with open end facing crankshaft seal.

**4-1. ENGINE ASSEMBLY REPAIR (continued).**

43. Replace any flyballs that have flat spots or grooves.
44. Replace cup if race surface is grooved or rough. Governor cup must be a free spinning fit on camshaft center pin, but should be replaced if excessively loose or wobbly.
45. Check distance to center pin that extends from camshaft gear. This distance must be 0.781 inch (1.984 cm) to give proper travel distance for cup. If it is less, engine may race; if more, cup will not hold the balls properly. If distance is too great, drive or press in center pin. If it is too small, replace pin; it cannot be removed without damaging the surface.
46. If aluminum ball spacer openings are badly worn, replace complete camshaft gear, which includes a new spacer and thrust plate. Camshaft gear must be removed from camshaft.
47. Clean out crankshaft and clear out all oil passages. Check journals for out-of-round, taper, grooving, or ridges. Pay particular attention to ridges or grooves on either side of oil hole areas. Unusual conditions here often point to previous neglect of oil changes. If journal dimensions are not within limits or journals are scored, metallize and regrind crankshaft to standards listed in Table 4-1.
48. Replace crankshaft bearings if clearances are greater than limits (Table 4-1) or if bearings are worn, grooved, or broken.
49. Inspect camshaft bearings. Bearings should be replaced if clearance to camshaft is greater than specified in Table 4-1, or if bearings show cracks, breaks, burrs, excessive wear, or other defects. Camshaft-to-bearing clearance should be 0.00i2 to 0.0037 inch.

**d. ASSEMBLY****CAUTION**

- **During assembly of engine, work area should be as clean as possible to reduce engine contamination which can cause engine failure.**
- **Make sure all components are coated with the proper grade of oil as they are assembled. Failure to properly coat with oil may cause damage to engine components.**

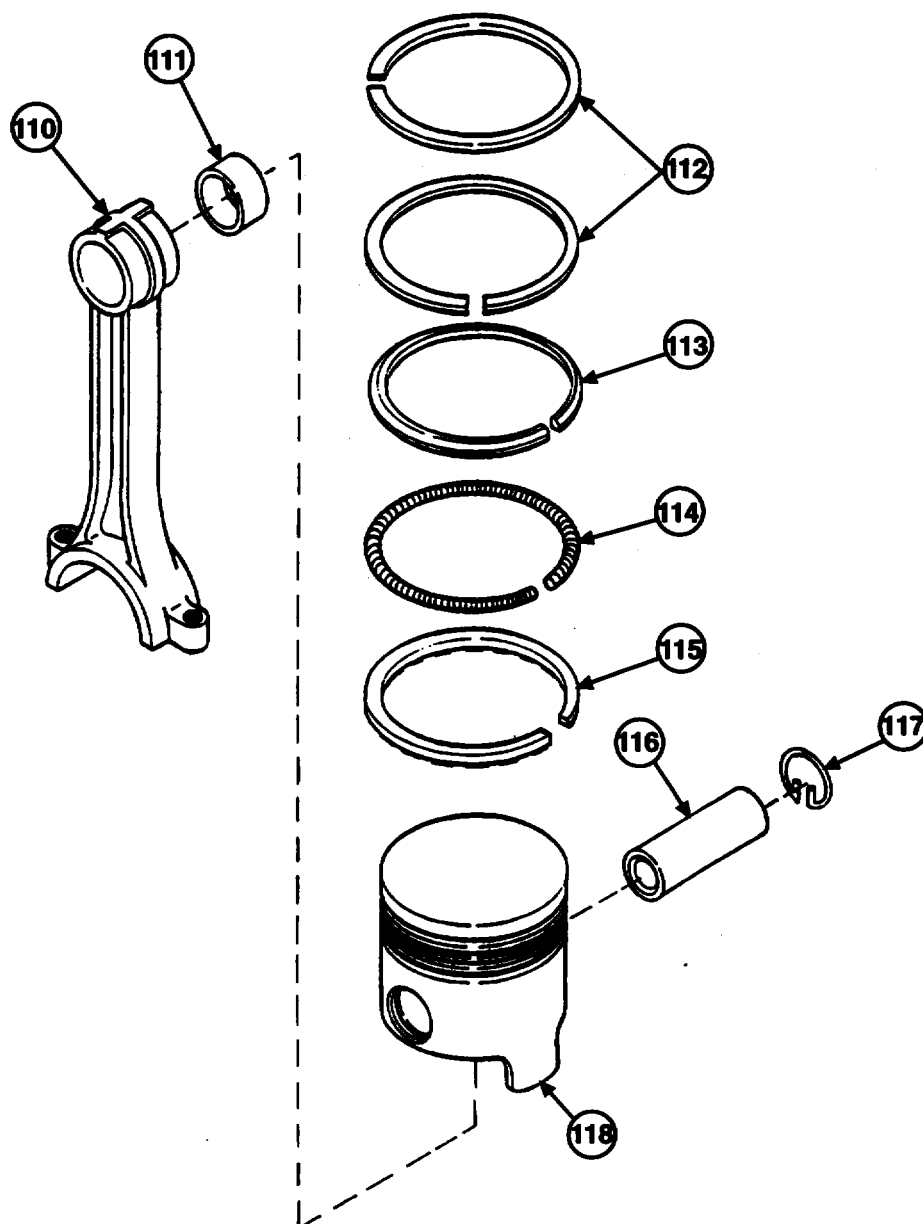
**NOTE**

- Use clean, rags for wiping engine parts. Oil and diesel fuel used during assembly procedures must be clean. Handle all parts carefully, especially bearings and machined surfaces.
- During assembly of internal engine components, coat all components heavily with oil of same grade to be used in crankcase. During the first few moments of operation, engine will depend of this lubrication.
- After each assembly step involving crankshaft, check crankshaft to be sure it is not frozen in place.



**4-1. ENGINE ASSEMBLY REPAIR (continued).**

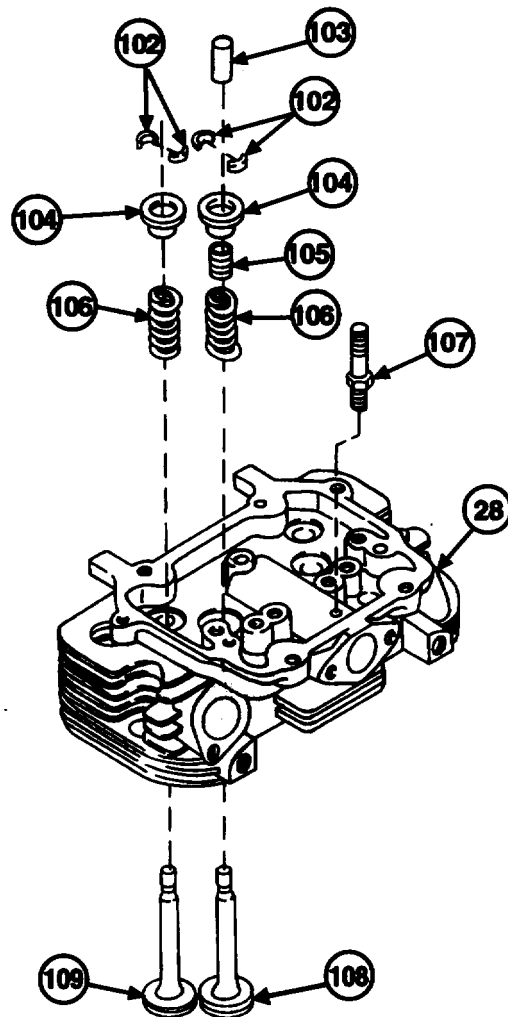
1. Install piston pin (116), bushing (111), and connecting rod (110) on each of four pistons (118).
2. Install two retaining rings (117) on piston pin (116) on each of four pistons (118).
3. Using piston ring expander, install three piston rings (112, 113, and 115) and oil ring expander (114) on each of four pistons.



**4-1. ENGINE ASSEMBLY REPAIR (continued).****NOTE**

Assembly procedures for both cylinder heads are the same. One is shown.

4. Install four rocker arm studs (107) in cylinder head (28).
5. Install new seal (105) on each of two intake valves (108).
6. Install two intake valves (108) and exhaust valves (109), four valve springs (106), and four spring retainers (104) in cylinder head (28).
7. Using valve spring compressor, compress each of four valve springs (106), and install both halves of valve stem lock (102) on stem of each of four valves (108 and 109).
8. Install valve stem cap (103) on each of four valves (108 and 109).

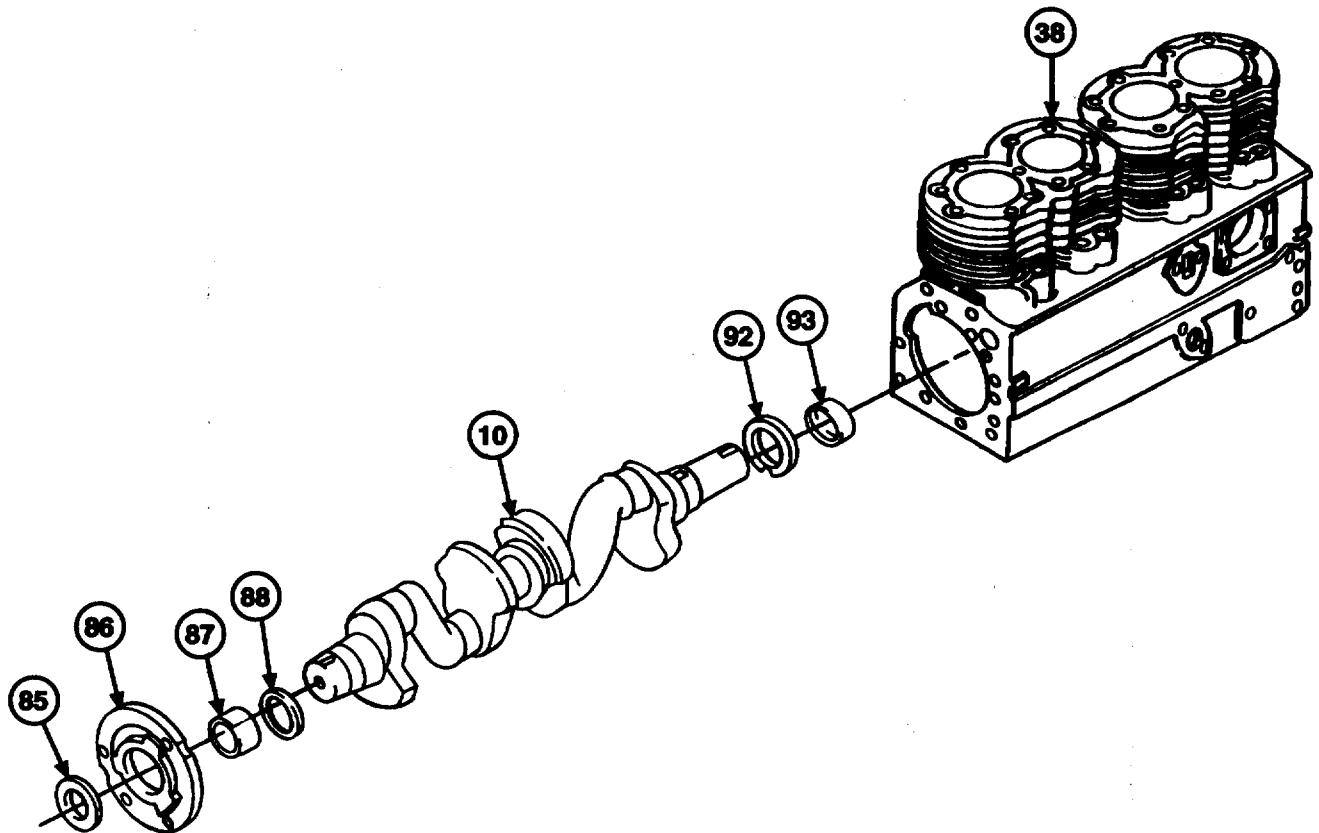


**4-1. ENGINE ASSEMBLY REPAIR (continued).**

9. Heat cylinder block (38) and bearing plate (86) in a 325°F (163°C) oven for 30 minutes. Press front main bearing (93) into place in cylinder block (38), aligning bearing housing oil holes.
10. Align oil holes in rear main bearing (87) and rear bearing plate (86), and press rear main bearing (87) into rear bearing plate (86).
11. Install new seal (85) in rear bearing plate (86).
12. Install thrust washers (88 and 92) over end of crankshaft (10).
13. Oil bearing surfaces and install crankshaft (10) in cylinder block (38) from rear of crankcase through rear bearing plate hole. Align slots in front thrust washer with locating pins.

**NOTE**

Install upper center bearing housing with side marked FRONT towards front main bearing.



**4-1. ENGINE ASSEMBLY REPAIR (continued).**

14. Install lower half of center bearing (95) in lower center main bearing housing (96). Install Upper half of center bearing (95) in upper center main bearing housing (94). Set upper center main housing (94) on crankshaft (10) and rotate it into place. Install two pins (99) and lower center main bearing housing (96) on cylinder block (38) with two bolts (98) and washers (97). Tighten bolts (98) to specifications in Table 4-2.
15. Install one new gasket (89) on each side of shim (90) and place on rear bearing plate (86).

**NOTE**

- Before tightening screws, make sure that thrust washers are in position over locating pins.
- Before installing bearing plate, tape keyway and sharp edges on crankshaft to protect oil seal during installation.

16. Install rear bearing plate (86), two gaskets (89), and shim (90) on cylinder block (38) with six new self-locking bolts (101) and new lockwashers (100).

**NOTE**

- If more than 0.010 inch total thickness is required, use steel shim of proper thickness and 0.005-inch thick gasket on each side of shim. This avoids excessive gasket compression and maintains bolt torque.

17. Check end play of crankshaft (10). Use enough shims (90) to provide 0.010 to 0.015 inch end play.

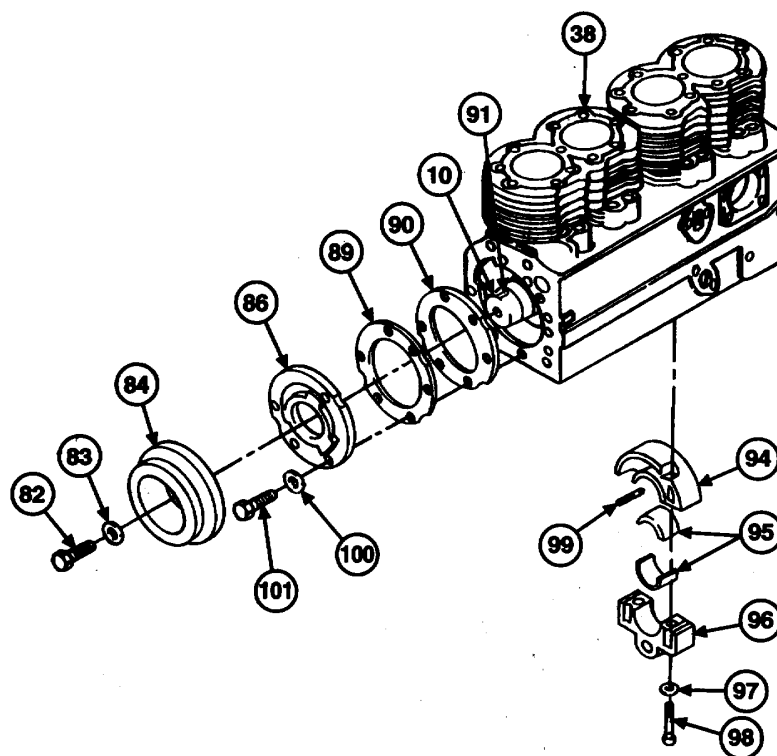
*Table 4-2. Torque Values*

Item	Torque Range (Lb.-Ft.)	
	Minimum	Maximum
Center main bolt	97	102
Connecting rod bolt	27	29
Rocker-box cover	8	10
Cylinder head bolt	44	46
Exhaust manifold nuts	13	15
Flywheel mounting screw	65	70
Hub to flywheel screws	17	21
Fuel pump mounting screws	15	20
Gearcase cover	15	20
Glow plug	10	15
Injection nozzle mounting screws	20	21
Injection pump mounting screws	15	16
Intake manifold	13	15
Oil base mounting screws	45	50
Oil pump mounting screws	15	20
Rear bearing plate	40	45
Rocker arm nut	4	lot
Rocker arm stud	35	40

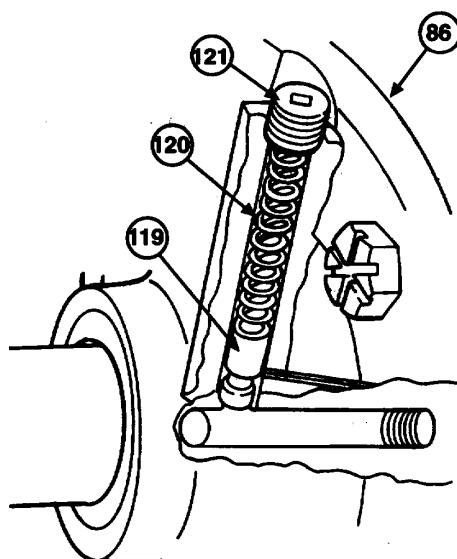
\* Exhaust manifold nuts must be tightened evenly.

† This torque is due to friction between the threads only and locks the nuts in place. Use rocker arm nut to adjust valve lash.

## 4-1. ENGINE ASSEMBLY REPAIR (continued).



18. Install woodruff key (91) and pump coupling (84) on crankshaft (10) with washer (83) and screw (82).
19. Install valve plunger (119) and bypass spring (120) in rear bearing plate (86).
20. Install recessed plug (121) in rear bearing plate (86).

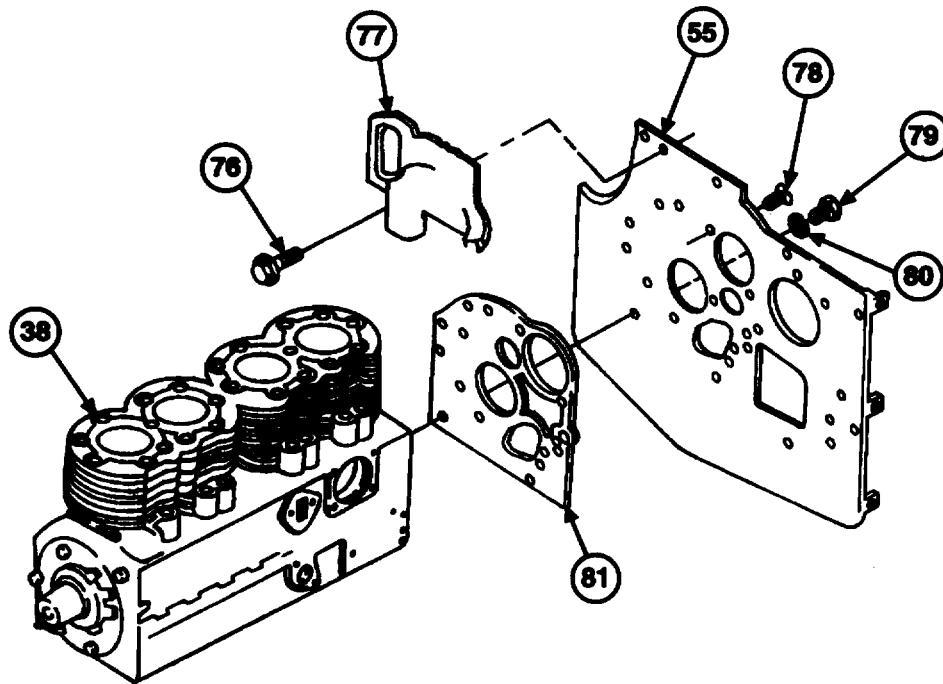


**4-1. ENGINE ASSEMBLY REPAIR (continued).**

21. Install new gasket (81) and backplate (55) on cylinder block (38) with screw (79), new lockwasher (80), and two flat head screws (78).
22. Install front air baffle (77) on backplate (55) with screw (76).

**NOTE**

Do not Install crankshaft washer or retaining ring if camshaft has to be installed in crankcase. Camshaft gear will not clear retaining washer.



23. Install crankshaft gear (72), retaining washer (71), and crankshaft gear locking ring (70) on backplate (55).
24. Fill Intake of oil pump (75) lubricating oil to ensure it is primed.

**CAUTION**

**Failure to allow adequate pump drive gear to crankshaft gear clearance. can damage oil pump.**

**NOTE**

Allow adequate pump drive gear to crankshaft gear clearance. Clearance must be 0.005-inch backlash.

25. Install oil pump (75) on backplate (55) with two screws (73) and new lockwashers (74).

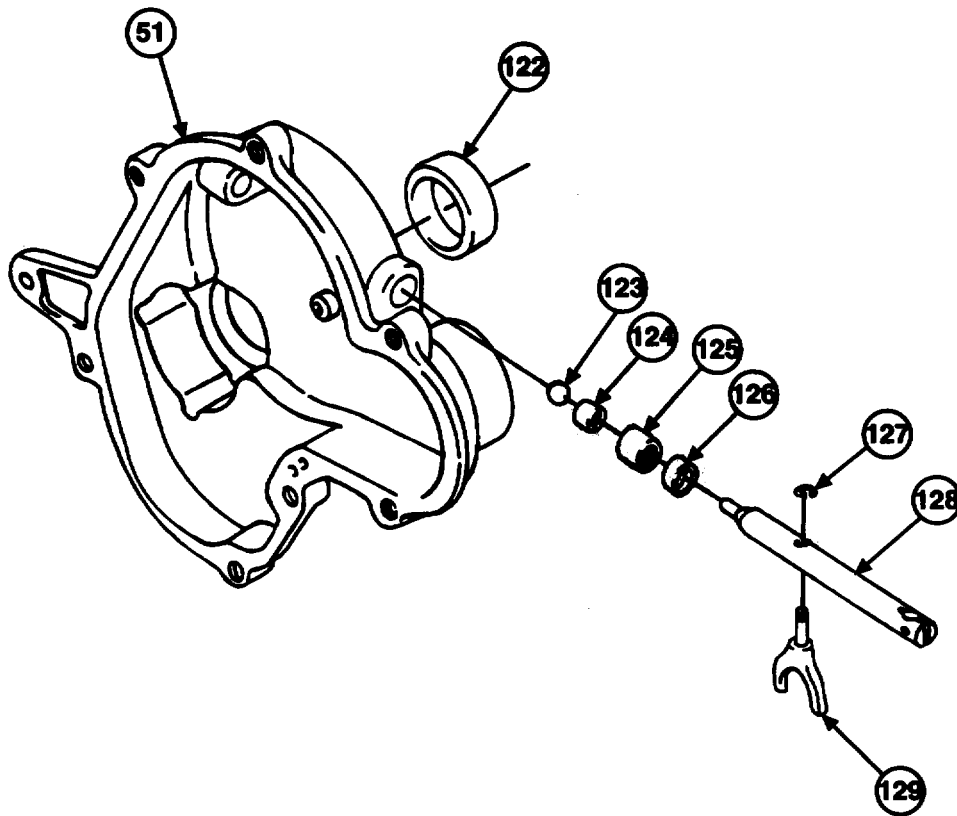
- 
- This diagram shows an exploded view of a 12-cylinder engine. The main engine block is labeled 38. The cylinder head assembly is labeled 55. The timing gear train is shown in an exploded view, including the timing gear (63), timing gear cover (64), timing gear (65), timing gear cover (66), timing gear (67), timing gear cover (68), and timing gear (69). The timing gear (63) is shown in an exploded view with the timing gear cover (64). The timing gear (65) is shown in an exploded view with the timing gear cover (66). The timing gear (67) is shown in an exploded view with the timing gear cover (68). The timing gear (69) is shown in an exploded view with the timing gear cover (67). The timing gear (63) is shown in an exploded view with the timing gear cover (64). The timing gear (65) is shown in an exploded view with the timing gear cover (66). The timing gear (67) is shown in an exploded view with the timing gear cover (68). The timing gear (69) is shown in an exploded view with the timing gear cover (67).

**4-1. ENGINE ASSEMBLY REPAIR (continued).**

30. Install ball (123) and thrust bearing (124) in gear cover (51).
31. Install new oil seal (126) and needle bearing (125) in gear cover (51).
32. Install new seal (122) in gear cover (51).
33. Install governor shaft (128) in gear cover (51).
34. Install governor yoke (129) on governor shaft (128) with smooth face of yoke facing away from gearcover (51), and secure with retaining ring (127).
35. Pack cavity of seal (122) with grease.

**NOTE**

- Tape keyway and sharp edges on crankshaft to protect the seal during installation.
- Before tightening screws, make sure stop pin is in governor cup.





**4-1. ENGINE ASSEMBLY REPAIR (continued).****NOTE**

Maneuver governor yoke over governor cup when positioning gear cover on back plate.

36. Install gear cover (51) on back plate (55) with new gasket (50), four screws (53), new lockwashers (54), and washers (52). Tighten mounting screws to specified torque (Table 4-2).
37. Install screw (48) and new lockwasher (49) on backplate (55).
38. Install cover (57) and gasket (56) on backplate (55) with two screws (59) and new lockwashers (58).

**NOTE**

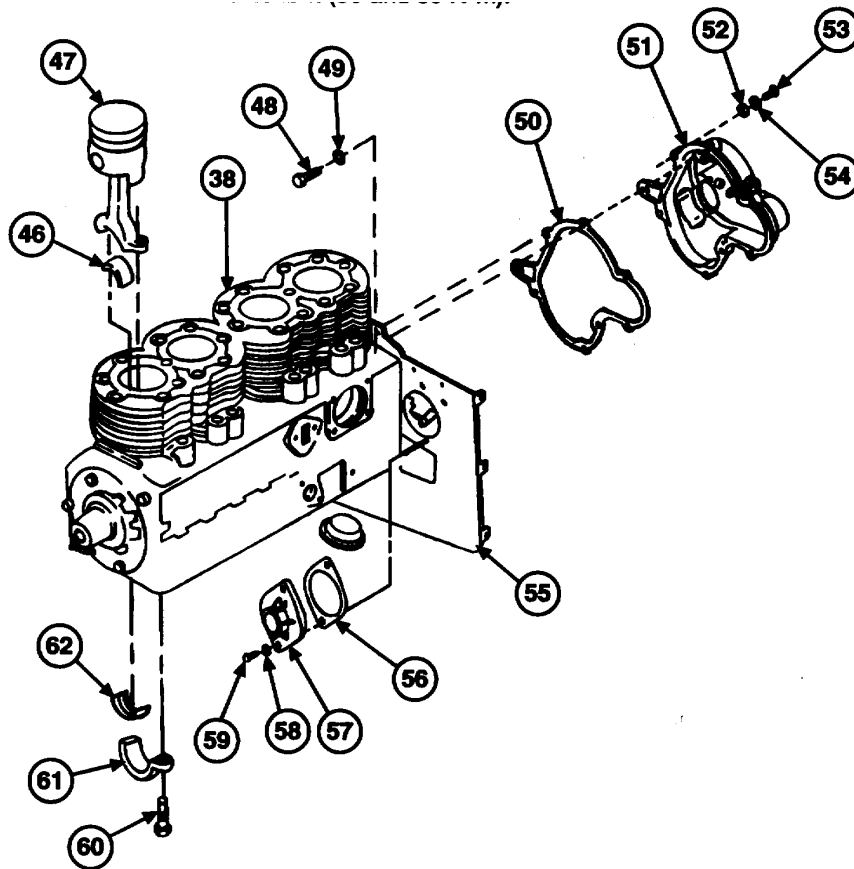
It may be necessary to rotate crankshaft to install piston assemblies.

39. Using piston ring compressor, install four piston assemblies (47) in cylinder block (38).

**NOTE**

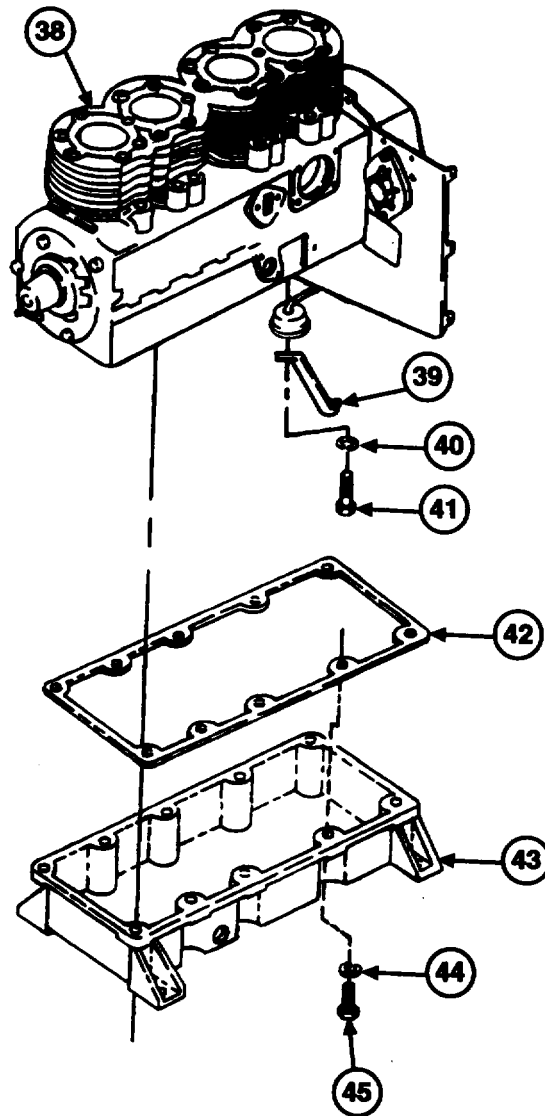
When installing rod cap, position it so raised witness mark on forging matches mark on piston assembly. Piston assembly witness mark should face toward gear cover.

40. Install bearing halves (46 and 62), cap (61), and two screws (60) on each of four piston assemblies (47). Tighten screws between 27 and 29 lb-ft (36 and 39 Nom).



**4-1. ENGINE ASSEMBLY REPAIR (continued).**

41. Install bracket (39) on cylinder block (38) with new lockwasher (40) and screw (41).
42. Install new gasket (42) and oil base (43) with 10 screws (45), and new lockwashers (44). Tighten screws between 45 and 50 lb-ft (61 and 68 Nom).

**NOTE**

Make sure tappets are riding on cams of camshaft before continuing with assembly.

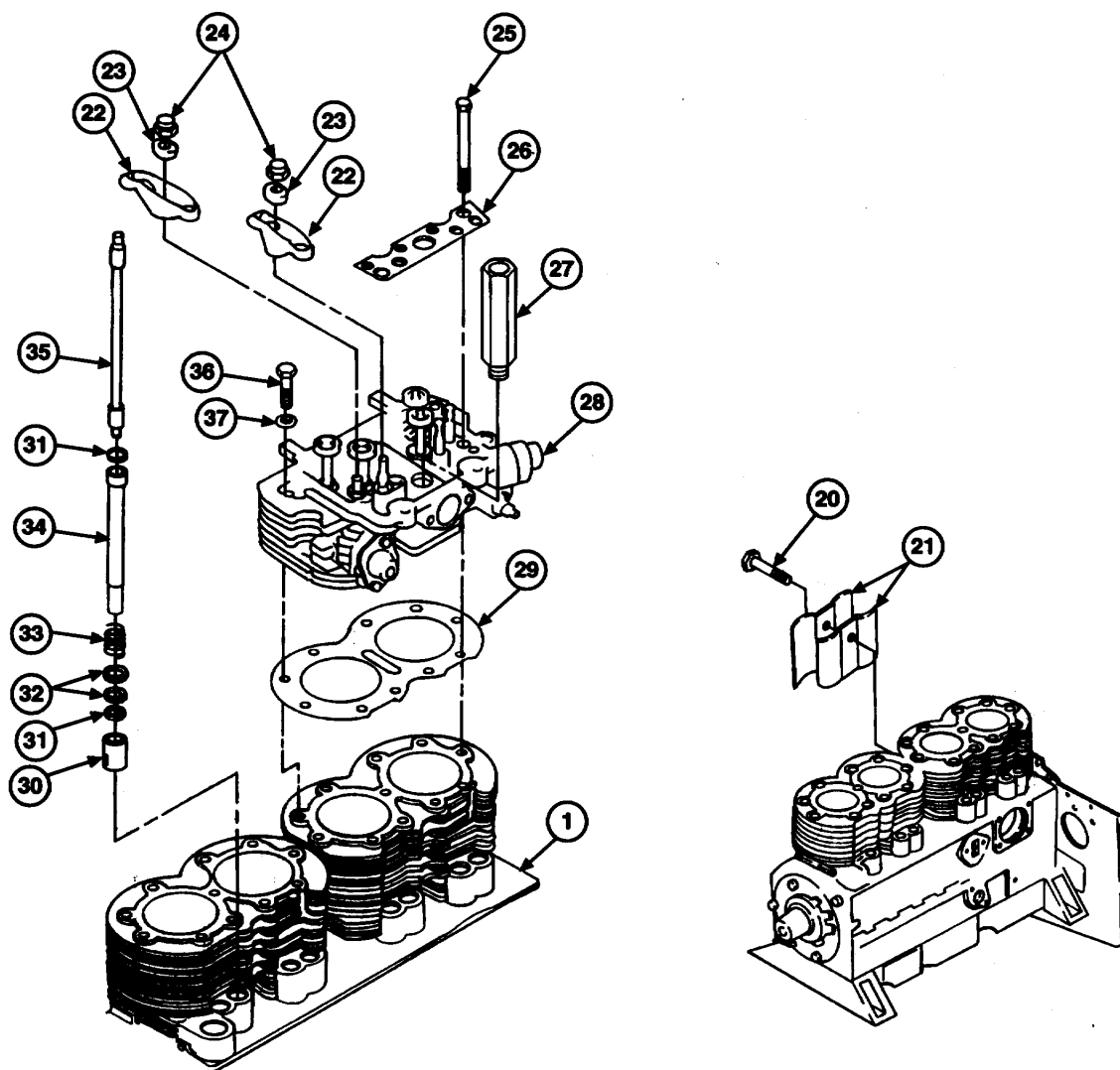
43. Install two new cylinder head gaskets (29) and eight tappets (30) in cylinder block (38).
44. Install 16 packings (31) and washers (32), and eight springs (33) and push rod shields (34) in cylinder block (38).
45. Install two cylinder heads (28) on cylinder block (38) with 12 screws (36) and washers (37). Tighten screws (35) hand-tight.

## 4-1. ENGINE ASSEMBLY REPAIR (continued).

## NOTE

Install exhaust manifold will help align exhaust ports in manifold and cylinder heads before cylinder head screws are tightened.

46. Install engine exhaust manifold (para 3-24).
47. After exhaust manifold nuts have been tightened between 13 and 15 lb-ft (17 to 20 N-m), tighten cylinder head screws (36) between 25 and 30 lb-ft (34 and 41 N.m).
48. Tighten cylinder head screws (36) to 44 to 46 lb-ft (60 and 62 Nom); wait one minute, and check to see screws have retained torque.
49. Install eight push rods (35) in cylinder block (38).



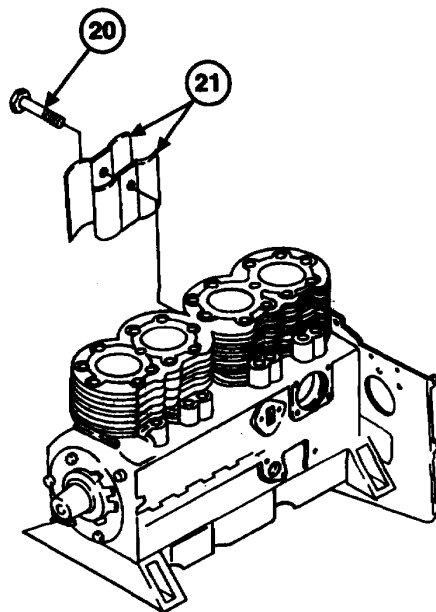
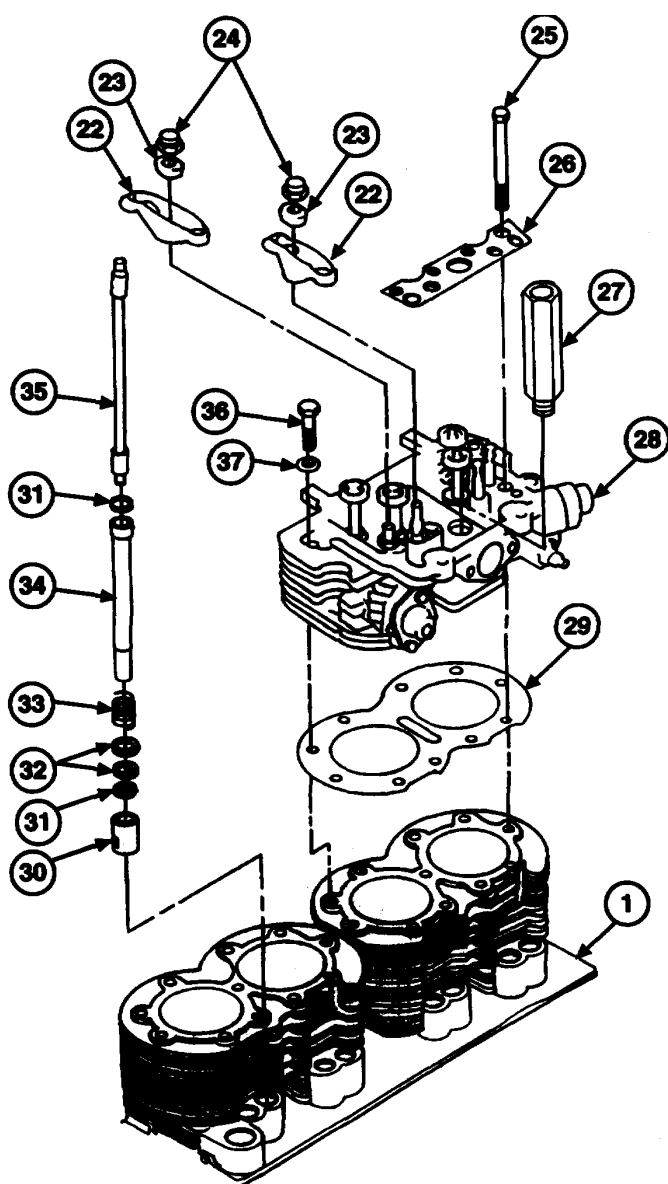
## 4-1. ENGINE ASSEMBLY REPAIR (continued).

50. Install two push rod guides (26) over eight push rods (35), and secure to two cylinder heads (28) with 10 screws (25).
51. Install eight rocker arms (22) and rocker arm balls (23) on two cylinder head (27) with eight nuts (24). Tighten nuts (23) between 4 and 10 lb-ft (5.2 to 13 N•m).
52. Install four standpipe vents (27) in two cylinder heads (28).

## NOTE

When using some maintenance stands, baffles may not be installed until after engine is removed from stand.

53. Install two baffles (21) on engine (1) with screw (20).

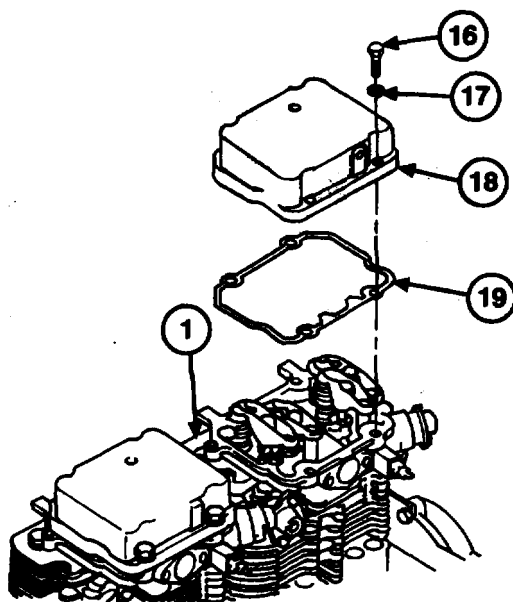


---

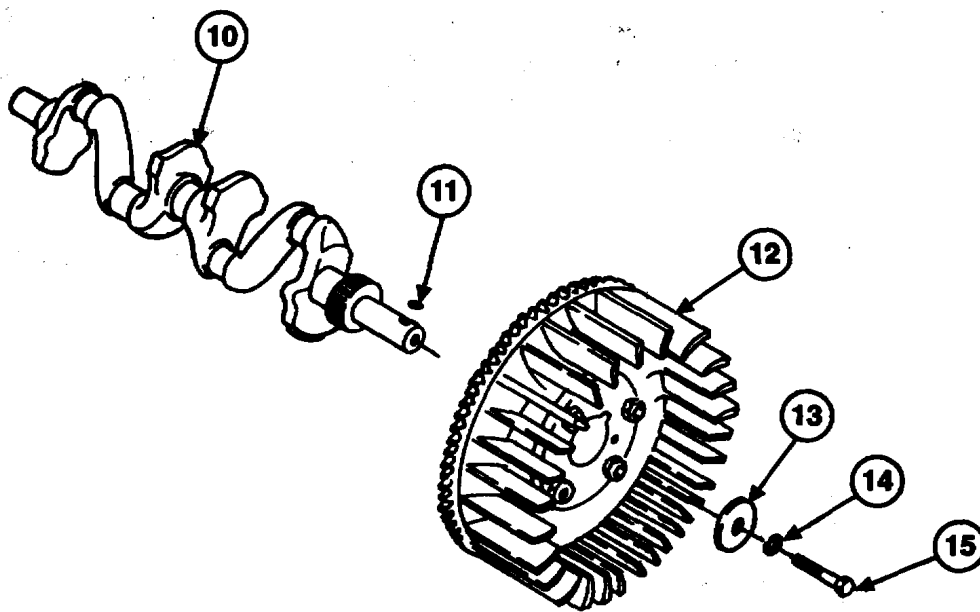
**4-1. ENGINE ASSEMBLY REPAIR (continued).**

---

54. Install two new gaskets (19) and rocker arm covers (18) on engine (1) with eight screws (16) and new lockwashers (17). Tighten screws (16) between 8 and 10 lb-ft (9 and 13 N-m).

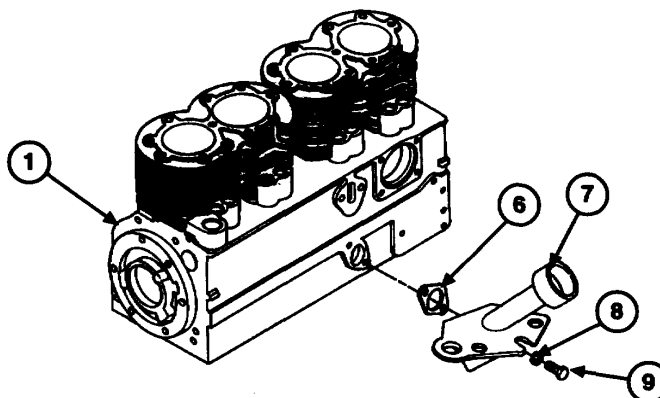


55. Install key (11) and flywheel (12) on crankshaft (10) with washer (13), new lockwasher (14), and screw (15). Tighten screw (15) between 65 and 70 lb-ft (88 and 95 Nm).



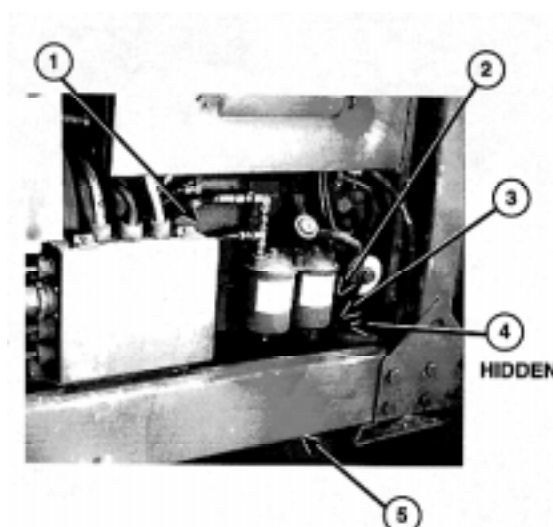
**4-1. ENGINE ASSEMBLY REPAIR (continued).**

56. Install new gasket (6) and oil filler tube (7) on engine (1) with two screws (9) and new lockwashers (8).

**e. INSTALLATION****WARNING**

Engine is heavy and can cause serious injury to personnel if it falls. Use care when installing engine on semitrailer.

1. Remove engine from engine maintenance stand.
2. Position lifting device under engine frame (2) to take up weight of engine (1). Slowly position engine (1) on engine frame (2). Install engine (1) on engine and pump cabinet (5) with four new self-locking nuts (4) and screws (3).

**FOLLOW-ON MAINTENANCE:**

- Install four-inch pump (para 3-32).
- Install engine high-temp thermostatic control switch (para 3-27).
- Install engine shrouding (para 3-25).
- Install governor assembly (para 3-23).
- Install engine throttle and choke linkage (para 3-22).
- Install fuel injection nozzles (para 3-21).
- Install fuel metering pump (para 3-19).
- Install engine oil filter head (para 3-17).
- Install engine starter (para 2-111).
- Install engine fuel filter head and hose assembly (para 2-110).
- Install intake manifold (para 2-108).
- Install glow plugs (para 2-107).
- Install engine oil filter (para 2-106).
- Install alternator and mounting bracket (para 2-100).

## APPENDIX A REFERENCES

Paragraph Number	Title	Page Number
A-1	General .....	A-1
A-2	Forms .....	A-1
A-3	Regulations .....	A-1
A-4	Field Manuals .....	A-2
A-5	Technical Manuals .....	A-2
A-6	Pamphlets and Bulletins .....	A-3
A-7	Miscellaneous Publications .....	A-3

### A-1. GENERAL.

The following is a list of forms and publications applicable to the operation of and to the Unit, Direct Support, and General Support maintenance of the M969A2 semitrailers. DA Pam 25-30, Consolidated Index of Army Publications and Blank Forms, should be consulted frequently for the latest changes and revisions and for new publications relevant to material covered in this technical material.

### A-2. FORMS.

Recommended Changes to Publications and Blank .....	DA Form 2028
Recommended Changes to Equipment Technical Publications .....	DA Form 2028-2
Organizational Control Record for Equipment .....	DA Form 2401
Equipment Inspection and Maintenance Worksheet .....	DA Form 2404
Maintenance Request .....	DA Form 2407
Equipment Log Assembly (Records) .....	DA Form 2408
Preventive Maintenance Schedule and Record.....	DD Form 314
Processing and Deprocessing Record for Shipment, Storage and Issue of Vehicles and Spare Engines .....	DD Form 1397
Report of Discrepancy (ROD).....	SF Form 364
Product Quality Deficiency Report.....	SF Form 368

### A-3. REGULATIONS.

Defense Traffic Management Regulation.....	AR 55-355
The Army Physical Security Program .....	AR 190-13
Security of Army Property at Unit and Installation Level .....	AR 190-51
Environmental Protection and Enhancement .....	AR 200-1
Dictionary of United States Army Terms .....	AR 310-25
Authorized Abbreviations, Brevity Codes, and Acronyms.....	AR 310-50
Accident Reporting and Records.....	AR 385-40
Prevention of Motor Vehicle Accidents .....	AR 385-55

**A-3. REGULATIONS (continued).**

Army Logistics Readiness and Sustainability .....	AR 700-138
Reporting of Product Quality Deficiencies Across Component Lines .....	AR 702-7
Packaging of Army Materiel for Shipment and Storage.....	AR 74&1
Army Materiel Maintenance Policy and Retail Maintenance Operations .....	AR 755-1

**A-4. FIELD MANUALS.**

NBC Contamination Avoidance .....	FM 3-3
NBC Protection .....	FM 3-4
NBC Decontamination .....	FM 3-5
Route Reconnaissance and Classification .....	FM 5-36
Ammunition Handbook .....	FM 9-13
Operation and Maintenance of Ordnance Materiel in Cold Weather (0 Degrees F to Minus 65 Degrees F) .....	FM 9-207
General Fabric Repair .....	FM 10-16
Organizational Maintenance of Military Petroleum Pipelines, Tanks and Related Equipment .....	FM 10-20
Aircraft Refueling .....	FM 10-48
Petroleum Supply Point Equipment and Operations .....	FM 10-69
Petroleum Tank Vehicle Operations .....	FM 10-71
Vehicle Recovery Operations .....	FM 20-22
First Aid for Soldiers .....	FM 21-11
Manual for the Wheeled Vehicle Driver .....	FM 21-305
Training in Units.....	FM 25-3
Basic Cold Weather Manual .....	FM 31-70
Northern Operations .....	FM 31-71
Railway Operating and Safety Rules .....	FM 55-21
Army Motor Transport Units and Operations .....	FM 55-30
Camouflage .....	FM 5-20
Desert Operations (How to Fight) .....	FM 90-3
Field Behavior of NBC Agents (Including Smoke and Incendiaries) .....	FM 3-6
Mountain Operations .....	FM 90-6
Operational Terms and Symbols .....	FM 101-5-1

**A-5. TECHNICAL MANUALS.**

Operator and Organizational Maintenance Manual (Including Repair Parts and Special Tools List) for Nozzle Assembly, Closed Circuit Refueling W/Strainer Assembly .....	TM 5-4930-226-12&P
Inspection, Care and Maintenance of Antifriction Bearings .....	TM 9-214
Operator's Manual for Welding Theory and Application .....	TM 9-237
Deepwater Fording of Ordnance Materiel .....	TM 9-238
Materials Used for Cleaning, Preserving, Abrading and Cementing Ordnance Materiel and Related Materials Including Chemicals.....	TM 9-247
Operator's Manual for Semitrailer, Tank, 5000-Gallon, Fuel Dispensing, Automotive; M969A2 (NSN 2330-01-377-9337) .....	TM 9-2330-398-10



**A-5. TECHNICAL MANUALS (continued).**

Hand Receipt Covering Content of Components of End Item (COEI), Basic Issue Items (B11), and Additional Authorization List for Semitrailer, Tank, 5000-Gallon, Fuel Dispensing, Automotive; M969A2 (NSN 2330-01-377-9337) .....	TM 9-2330-398-10-HR
Unit, Direct Support, and General Support Maintenance Repair Parts and Special Tools List for Semitrailer, Tank, 5000-Gallon, M969A2 (NSN 2330-01-377-9337) .....	TM 9-2330-398-24P
Operator's, Unit, Direct Support and General Support, Maintenance Manual for Care, Maintenance Repair and Inspection of Pneumatic Tires and Inner Tubes .....	TM 9-2610-200-14
Operator's, Unit, Intermediate Direct Support and Intermediate General Support Maintenance Manual for Lead-Acid Storage Batteries .....	TM 9-6140-200-14
Painting Instructions for Army Materiel .....	TM 43-0139
Railcar Loading Procedures .....	TM 55-601
Storage and Materials Handling .....	TM 743-200-1
Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use .....	TM 750-244-6
Direct Support and General Support for Quality Control Inspector's Inspection Criteria.....	TM 750-245-4

**A-6. PAMPHLETS AND BULLETINS.**

The Army Maintenance Management System (TAMMS) .....	DA Pam 738-750
TITLE TK .....	MTMCTEA Pam 55-19
Storage Serviceability Standard: Tracked Vehicles, Wheeled Vehicles, and Component Parts .....	SB 740-98-1
Description, Use, Bonding Techniques and Properties of Adhesives .....	TB ORD 1032
Hand Portable Fire Extinguishers Approved for Army Users .....	TB 5-4200-200-100
Tactical Wheeled Vehicles: Repair of Frames .....	TB 9-2300-247-40
Equipment Improvement Report and Maintenance Digest (U.S. Army Tank-automotive and Armaments Command) Tank and Automotive Equipment .....	TB 43-0001-39 Series
Maintenance Expenditure Limits for Tactical Wheeled Vehicles. FSC Group 23, FSC Classes 2320 and 2330 .....	TB 43-0002-81
Color, Marking, and Camouflage Painting of Military Vehicles, Construction Equipment and Materials Handling Equipment .....	TB 43-0209
Purging, Cleaning and Coating Interior Ferrous and Terne Sheet Vehicle Fuel Tanks .....	TB 43-0212
Corrosion Prevention and Control Including Rustproofing Procedures for Tactical Vehicles and Trailers .....	TB 43-0213
Maintenance in the Desert.....	TB 43-0239

**A-7. MISCELLANEOUS PUBLICATIONS.**

Army Medical Department Expendable/Durable Items.....	CTA 8-100
Expendable/Durable Items (Except Medical, Class V, Repair Parts and Heraldic Items) .....	CTA 50-970

## APPENDIX B

### MAINTENANCE ALLOCATION CHART

Paragraph Number	Title	Page Number
B-1	General .....	B-1
B-2	Maintenance Functions .....	B-1
B-3	Explanation of Columns in Section II, Maintenance Allocation Chart for Semitrailer, Tank, M969A2 .....	B-2
B-4	Explanation of Columns in Section III, Tool and Test Equipment Requirements .....	B-3

#### B-1. GENERAL.

Appendix B consists of three sections:

- a. Section I provides a general explanation of all maintenance and repair functions authorized at the various maintenance levels.
- b. Section II, the maintenance allocation chart (MAC), designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. 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.
- 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.

#### B-2. MAINTENANCE FUNCTIONS.

Maintenance functions are limited to and defined as follows:

- a. **Inspect.** To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (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.** To keep an item in proper operating condition by periodically cleaning (including decontaminating, when required), preserving, draining, painting, or replenishing fuel, lubricants, chemical fluids, or gases.
- d. **Adjust.** To maintain or regulate, within prescribed limits, by bringing into proper or exact position or by setting the operating characteristics to specified parameters.
- e. **Align.** To adjust specified variable elements of an item to bring about optimum or desired performance.
- f. **Calibrate.** To determine the accuracy of and cause corrections or adjustments to be made on instruments or test, measuring, and diagnostic equipment (TMDE) used in precision measurement. Calibration consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

---

**B-2. MAINTENANCE FUNCTIONS (continued).**


---

- 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 is shown as the third position of the source, maintenance, and recoverability (SMR) code.
- i. **Repair.** To apply maintenance services-including fault location/troubleshooting, removal/installation, and disassembly/assembly procedures-and maintenance actions to identify troubles and restore serviceability to an item by correcting any specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.
- j. **Overhaul.** To perform that maintenance effort (service/action) required to restore an item to a completely serviceable/operational condition as required by maintenance standards in an appropriate technical publication (e.g., depot maintenance work requirement). 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.** To perform those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours/miles, etc.) considered in classifying Army equipment/components.

---

**B-3. EXPLANATION OF COLUMNS IN SECTION II, MAINTENANCE ALLOCATION CHART FOR SEMITRAILER, TANK, M969A2.**


---

- a. **(1) Group Number.** Column 1 lists functional group code numbers, whose purpose is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly. The end item group number is "00."
- b. **(2) Component/Assembly.** Column 2 contains the names of components, assemblies, subassemblies, and modules for which maintenance is authorized.
- c. **(3) Maintenance Function.** Column 3 lists the functions to be performed on the item listed in Column 2. (For a detailed explanation of these functions, refer to para B-2.)
- d. **(4) Maintenance Level.** Column 4 specifies, by the listing of a work-time figure in the appropriate subcolumn(s), the level of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance levels, appropriate work-time figures will be shown for each level. The work-time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance/ quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. The symbol designations for the various maintenance levels are as follows:

---

**B-3. EXPLANATION OF COLUMNS IN SECTION II, MAINTENANCE ALLOCATION CHART FOR SEMITRAILER, TANK, M969A2.**


---

C .....Operator/Crew  
 O .....Unit  
 F .....Direct Support  
 H .....General Support  
 D .....Depot

- e. **(5) Tools and Equipment Reference Code.** Column 5 specifies, by code, those common tool sets (not individual tools), common TMDE, special tools, special TMDE, and special support equipment required to perform the designated maintenance function. Codes are keyed to tools and test equipment listed in Section III.
  - f. **(6) Remarks.** When applicable, this column contains a letter code, in alphabetical order, which is keyed to remarks contained in Section IV. If there is nothing in the Remarks column, there is no Section IV.
- 

**B-4. EXPLANATION OF COLUMNS IN SECTION III, TOOL AND TEST EQUIPMENT REQUIREMENTS.**


---

- a. **Column 1, Tool or Test Equipment Reference Code.** This code correlates with the code used in Section II, Column 5.
- b. **Column 2, Maintenance Level..** The symbol designation shown indicates the lowest level of maintenance authorized to use the tool or test equipment.
- c. **Column 3, Nomenclature.** This is the name or Identification of the tool or test equipment.
- d. **Column 4, National Stock Number.** This is the national stock number of the tool or test equipment.
- e. **Column 5, Tool Number.** This is the manufacturer's part number.

**Section II. MAINTENANCE ALLOCATION CHART  
FOR SEMITRAILER, TANK: 5000 GALLON, M969A2**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
06	ELECTICAL SYSTEM								
0609	Light, Dome	Remove/ Replace Repair		0.27 0.25				4	
	Light, Marker, Clearance	Remove/ Replace Repair		0.35 0.52				4 4	
	Light, Marker, Clearance	Remove/ Replace Repair Fault Location		0.35 0.52 2.18				4 4 1	
	Taillight, Vehicular	Remove/ Replace Repair		0.43 1.20				4 1,4	
	Wiring Harness	Inspect Remove/ Replace Repair	0.01	0.02 0.60	1.0			4 1,4	
	Battery, Storage	Inspect Remove/ Replace Fault Location	0.08	0.08 0.33 0.70				1,4 4 4	
	Terminal, Lug	Remove/ Replace		0.33				4	
	Terminal, Lug	Remove/ Replace		0.33				4	
	Cover, Access	Remove/ Replace		0.05				4	
	Wiring Harness	Inspect Remove/ Replace Repair	0.01	0.02 0.85	1.0			4 1,4	
		<b>B-4</b>							

**Section II. MAINTENANCE ALLOCATION CHART  
FOR SEMITRAILER, TANK: 5000 GALLON, M969A2 (continued)**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
0612	Lead, Electrical	Inspect Remove/ Replace Repair	0.01	0.02 1.02 1.0				4 1	
	Lead, Electrical	Remove/ Replace Repair		0.68 1.0				4 1,4	
	Lead, Electrical	Inspect Remove/ Replace Repair	0.01	0.27 0.50				4 1,4	
	Lead, Electrical	Inspect Remove/ Replace Repair	0.01	0.02 1.35	1.0			4 1, 4	
	Lead, Electrical	Inspect Remove/ Replace Repair	0.01	0.27 0.50				4 1,4	
0613	Bend, Electrical	Remove/ Replace		4.52				1,4	
	Bend, Electrical	Remove/ Replace		4.52				1,4	
	Bend, Electrical	Remove/ Replace		2.85				1, 4	
	Tube	Remove/ Replace		5.18				1,4	
	Bend, Electrical	Remove/ Replace		5.18				1,4	
	Tube, Bent, Metallic	Remove/ Replace		2.85				1,4	

**Section II. MAINTENANCE ALLOCATION CHART  
FOR SEMITRAILER, TANK: 5000 GALLON, M969A2 (continued)**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
0613	Bend, Electrical	Remove/ Replace		5.18				1, 4	
	Tube	Remove/ Replace		2.85				1, 4	
	Cover, Electrical	Remove/ Replace		0.23				1, 4	
	Tubing	Remove/ Replace		5.10				1, 4	
	Lead, Assembly, Electrical	Remove/ Replace		0.95				1, 4	
		Repair		1.95				1, 4	
	Wiring Harness	Remove/ Replace		1.85				1, 4	
		Repair		2.33				1, 4	
	Lead, Assembly	Remove/ Replace		1.60				1, 4	
		Repair		1.83				1, 4	
	Lead, Assembly	Remove/ Replace		1.85				1, 4	
		Repair		3.33				1, 4	
	Lead, Assembly	Remove/ Replace		1.52				1, 4	
		Repair		3.33				1, 4	
	Lead, Assembly	Remove/ Replace		1.52				1, 4	
		Repair		3.33				1, 4	
	Trailer, Harness	Remove/ Replace		3.52				1, 4	
		Repair		5.25				1, 4	
	Lead, Electrical	Remove/ Replace		1.85				1, 4	
		Repair		2.0				1, 4	

~~B-7~~



**B-8**

**Section II. MAINTENANCE ALLOCATION CHART  
FOR SEMITRAILER, TANK: 5000 GALLON, M969A2 (continued)**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
1311	Hub, Wheel, Vehicular	Inspect		1.0				1, 4	
	Brake Drum	Remove							
		Replace		2.75				1, 4	
		Repair			2.94				
	Cone and Rollers	Lubricate		2.5				1, 4	
15	FRAME, TOWING ATTACHMENTS, DRAWBARS, AND ARTICULATION SYSTEM								
1503	Coupler Assembly	Inspect	0.3	0.8				1, 4	
		Removal							
		Replace		.85				1, 4	
		Lubricate	0.30						
1507	Stay, Sliding	Remove/ Replace		0.17				1, 4	
	Leg, Semitrailer	Inspect	0.7	0.08					
		Remove/ Replace		3.18				1, 4	
		Repair		3.43				1, 4	
		Fault Location	0.08	0.58				1, 4	
	Shaft, Straight	Remove/ Replace		0.50				1, 4	
	Crank, Hand	Lubricate	0.08					1, 4	
	Shoe, Jack Support	Lubricate	0.08					1, 4	
		Remove/ Replace		0.33				4	
16	SPRING AND SHOCK ABSORBERS								
1601	Spring Assembly, Leaf	Inspect	0.01	0.01					
		Remove/ Replace			10.40			1, 4	

**Section II. MAINTENANCE ALLOCATION CHART  
FOR SEMITRAILER, TANK: 5000 GALLON, M969A2 (continued)**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
18	BODY, CAB, HOOD, AND HULL								
1801	Mudflap Assembly	Inspect Remove/ Replace	0.03	0.67				4	
1808	Static Reel Assembly	Inspect Remove/ Replace	0.01	0.33				1, 4	
	Cabinet (Weldment)	Remove/ Replace			3.39			1, 4, 6	
	Reel Assembly, Hose	Inspect Remove/ Replace Repair	0.03		3.27 4.0			1, 4	
1808	Swing Joint, Pipe	Lubricate	0.10						
	Brake Assembly, Pin	Lubricate	0.05						
	Door, Access	Remove/ Replace Repair Lubricate	0.7		2.60 2.69			1, 4	
	Frame (Weldment)	Remove/ Replace			1.95			1, 4, 6	
	Door, Vehicular	Remove/ Replace			2.62			4	
	Tool Box Assembly	Remove/ Replace Repair		0.50 2.0				1, 4 1, 4	
	Winch Assembly	Inspect Remove/ Replace Lubricate	0.2 0.10	1.09				1, 4	
	Bracket (Weldment)	Remove/ Replace		0.22				1, 4	

**Section II. MAINTENANCE ALLOCATION CHART  
FOR SEMITRAILER, TANK: 5000 GALLON, M969A2 (continued)**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
1808	Rod, Ground Spring, Flat	Inspect Remove/ Replace	0.01		1.95			1, 4	
	Cabinet (Weldment)	Remove/ Replace		1.77				1, 4, 6	
	Frame, Door	Inspect Remove/ Replace Lubricate	0.03		1.95			1, 4	
			0.7						
	Door, Access	Remove/ Replace Repair		2.62 2.69				1, 4	
	Cable	Remove/ Replace			1.79			1, 4	
	Bar, Trip	Remove/ Replace			2.62			1, 4	
1811	Terminal, Quick Disconnect	Remove/ Replace		0.50				1, 4	
	Cap	Remove/ Replace		0.42				4	
	Tank, Complete	Inspect Lubricate	0.02 0.10	0.08					
	Lifting Device and Drain Ladder	Inspect Remove/ Replace	0.01		2.38			1, 4	
	Cover, Manhole	Inspect Fault Location Lubricate	0.02 0.08	1.08				4	
		Adjust		0.50					
		Remove/ Replace Repair		1.00 0.50					

**Section II. MAINTENANCE ALLOCATION CHART  
FOR SEMITRAILER, TANK: 5000 GALLON, M969A2 (continued)**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
22	BODY, CHASSIS, AND HULL ACCESSORY ITEMS								
2210	Reflector, Indicating	Remove/ Replace		0.42				4	
	Plate, Instruction	Remove/ Replace		0.42				4	
	Plate, Instruction	Remove/ Replace		0.42				4	
	Plate, Identification	Remove/ Replace		0.42				4	
29	AUXILIARY GENERATOR AND ENGINE AND CONTROLS								
2910	Engine, Assembly	Inspect	0.3	0.08					
		Remove/ Replace			0.78			3, 4, 5	
		Fault Location	0.73	8.98					
		Lubricate		0.50				1	
	Switch, Pressure	Remove/ Replace		0.55				3, 4	
		Fault Location		0.55				3, 4	
2911	Filler Neck	Remove/ Replace			2.35			3, 4	
	Head Assembly	Test			2.50			3, 4	
		Remove/ Replace			3.95			3, 4	
		Repair			4.95			3, 4	
2912	Crankshaft	Remove/ Replace				5.77		3, 4	
		Repair				5.77		3, 4	

**Section II. MAINTENANCE ALLOCATION CHART  
FOR SEMITRAILER, TANK: 5000 GALLON, M969A2 (continued)**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
2913	Flywheel Assembly	Remove/ Replace			3.52			3, 4	
2914	Piston Assembly	Remove/ Replace Repair				2.78 3.45		3,4	
2915	Valve Train Assembly	Remove/ Replace Repair			2.37 2.53			3,4	
	Rocker Arm, Engine	Adjust				0.50			
	Camshaft, Engine	Remove/ Replace				5.78		3, 4	
	Cup, Governor	Remove/ Replace Repair				2.52 2.85		3, 4	
	Cover, Gear	Remove/ Replace Repair				2.37 2.45		3, 4	
	Parts Kit, Glow Plug	Remove/ Replace Fault Location		0.55 0.55				1, 4 1, 4	
2916	Tube Assembly, Metal	Remove/ Replace			2.18			1, 4	
	Oil Pump Assembly	Remove/ Replace				2.45		3, 4	
	Head, Fluid Filter	Remove/ Replace Repair			2.93 2.93			1, 4 1, 4	
	Cooler, Fluid, Oil	Remove/ Replace Repair			5.68 5.68			1, 4 1, 4	

**Section II. MAINTENANCE ALLOCATION CHART  
FOR SEMITRAILER, TANK: 5000 GALLON, M969A2 (continued)**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
2916	Filter Element, Fluid	Inspect Remove/ Replace	0.08	0.17 0.67					
2918	Intake Manifold and Heater Group	Remove/ Replace Fault Location		.55 .55				0021 0021	
2932	Tube Assembly, Metal	Remove/ Replace			2.35			1, 4	
	Pump, Fuel Metering	Test Remove/ Replace Repair			2.0 2.85 3.18			1, 4 1, 4 1, 4	
	Nozzle, Fuel Injection	Test Adjust Remove/ Replace Repair			2.0 2.0 2.68 3.02			1, 4 1, 4 1, 4 1, 4	
2933	Air Cleaner, Intake	Inspect Service	0.02 0.50						
2939	Linkage Assembly, Governor	Remove/ Replace Repair			2.02 2.02			1, 4 1, 4	
2941	Manifold, Exhaust	Remove/ Replace			2.85			1, 4	
2952	Duct Assembly, Air Outlet	Test Adjust Remove/ Replace Repair			2.25 2.50 6.13 6.13			1, 4 1, 4	
	Cover, Access	Remove/ Replace			5.93			1, 4	
	Cover, Air Housing	Remove/ Replace			5.52			1, 4	

**Section II. MAINTENANCE ALLOCATION CHART  
FOR SEMITRAILER, TANK: 5000 GALLON, M969A2 (continued)**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
2952	Housing, Mechanical	Inspect	0.02						
		Remove/ Replace				5.68		1,4	
	Engine Shrouding	Remove/ Replace			6.43			1,4	
2961	Alternator	Test		0.33				1,4	
		Adjust		0.17				1,4	
		Remove/ Replace		0.68				1, 3,4	
		Repair			1.02			3, 4	
2963	Wiring Harness, Branched Coupling, Tube	Remove/ Replace		0.68				4	
		Remove/ Replace		0.77				4	
	Circuit Breaker	Remove/ Replace		0.43				4	
	Solenoid, Electrical	Remove/ Replace		0.35				4	
	Box, Electrical	Remove/ Replace			1.17			1, 4	
	Starter, Engine	Test			2.33			4	
		Remove/ Replace			2.02			4	
		Repair			2.35			4	
	Switch, Thermostatic	Test			1.83				
		Remove/ Replace			2.02			4	
		Fault Location		0.55				4	
	Solenoid, Electrical	Test			08			1	
		Adjust			1.83				
		Remove/ Replace			2.25			4	
		Repair			2.42			4	



**Section II. MAINTENANCE ALLOCATION CHART  
FOR SEMITRAILER, TANK: 5000 GALLON, M969A2 (continued)**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
2963	Tubing	Remove/ Replace		0.63				1, 4	
	Box, Electrical	Remove/ Replace		0.93				4	
		Repair		0.83				4	
2967	Control Panel Assembly	Inspect	0.08						
		Remove/ Replace			1.10			1,4	
		Repair		1.25					
		Lubricate	0.08						
	Meter, Time, Totalizi	Remove/ Replace		0.33				4	
	Tachometer, Electronic	Adjust		1.67					
		Remove/ Replace		0.33				4	
	Voltmeter	Remove/ Replace		0.33				4	
	Switch, Rotary	Remove/ Replace		0.25				4	
	Switch, Rotary	Remove/ Replace		0.25				4	
	Control Panel Assembly	Remove/ Replace, Repair		3.62 2.68				1,4	
		Lubricate	0.08						
33	SPECIAL PURPOSE KITS								
3307	Vapor Recovery Kit	Inspect	0.08						
		Remove/ Replace		0.67					
		Repair		0.50					

[illegible]

**Section II. MAINTENANCE ALLOCATION CHART  
FOR SEMITRAILER, TANK: 5000 GALLON, M969A2 (continued)**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
7202	Pump, Centrifugal	Inspect	0.17						
		Remove/ Replace			1.52			3, 4,5	
		Repair			0.50			3, 4	
		Fault Location		0.33				1	
		Lubricate		0.50				1	
7203	Coupling, Pump	Test			0.17			1, 4	
		Remove/ Replace			5.35			1,4	
		Repair			11.03			1,4	
	Valve, Butterfly	Remove/ Replace		1.0				1, 4	
		Repair			1.50			4	
	Tube Assembly, Metal	Inspect	0.07						
		Remove/ Replace		10.17				1,4	
	Tube	Remove/ Replace		9.27				1, 4	
		Remove/ Replace		9.27				1, 4	
	Filter Element, Fluid	Remove/ Replace		9.27				1, 4	
		Remove/ Replace		9.27				1, 4	
	Valve, Globe	Remove/ Replace		.50				4	
		Repair			1.0			4	
	Frame	Remove/ Replace			3.62			1, 4	
		Repair			4.20				
	Valve, Check	Remove/ Replace		1.0				1, 4	
		Repair			1.50			1, 4	
	Tube, Bent, Metallic	Remove/ Replace		9.27				1, 4	

**Section II. MAINTENANCE ALLOCATION CHART  
FOR SEMITRAILER, TANK: 5000 GALLON, M969A2 (continued)**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
7203	Tube, Bent, Metallic	Remove/ Replace		9.27				1, 4	
	Valve, Butterfly	Remove/ Replace Repair		1.0	1.50			1, 4 4	
	Coupling, Pipe Clamp	Remove/ Replace		0.70				1, 4	
	Nozzle, Fuel and Oil	Remove/ Replace Repair		0.33	0.50			4 4	
	Strainer Element	Inspect	0.02						
	Pipe, Bent, Metallic	Remove/ Replace		8.80				1, 4	
	Adapter, Straight	Remove/ Replace		0.67				1, 4	
	Coupling, Clamp, Pipe	Remove/ Replace		0.63				1, 4	
	Valve, Ball	Inspect	0.01						
	Valve, Emergency	Inspect Remove/ Replace Repair	0.01	0.50	1.0			4 4	
	Vent Assembly	Adjust			0.08			4	
		Remove/ Replace			0.67			1, 4	
		Repair			1.0				
	Valve, Float	Remove/ Replace Repair			0.17	1.0		4	
	Valve, Butterfly	Remove/ Replace Repair		0.5	1.0			1, 4 4	

**Section II. MAINTENANCE ALLOCATION CHART  
FOR SEMITRAILER, TANK: 5000 GALLON, M969A2 (continued)**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
7203	Filter Element, Fluid Valve, Gate	Inspect Remove/ Replace Repair		0.17 0.33	0.17			1, 4 4	
	Nozzle, Fuel and Oil	Remove/ Replace Repair		0.17	0.67			4	
	Valve, Gate	Remove/ Replace Repair		0.50		1.50		1, 4	
	Valve, Gate	Remove/ Replace Repair		0.50	1.50			1, 4	
	Coupling Half, Quick Disconnect	Remove/ Replace Repair		0.17	0.33			1, 4	
	Valve Assembly, Manifold Remove/	Replace Repair		0.50	1.0			1, 4 1, 4	
	Nozzle, Fuel and Oil	Remove/ Replace Repair		0.33	0.50			4 4	
	Valve, Globe	Remove/ Replace Repair		0.50	1.0			4 4	
	Lever Assembly, Valve	Remove/ Replace		.28				1, 4	
	Cable	Remove/ Replace		3.18				1, 4	
7204	Cable	Remove/ Replace		3.18				1, 4	
	Bracket	Remove/ Replace			0.70				

**Section II. MAINTENANCE ALLOCATION CHART  
FOR SEMITRAILER, TANK: 5000 GALLON, M969A2 (continued)**

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT	(6) REMARKS
			C	O	F	H	D		
76	FIRE FIGHTING EQUIPMENT COMPONENTS								
7638	Support Assembly	Remove/ Replace		0.48				1, 4	
	Bracket, Fire	Remove/ Replace		0.32				1, 4	
7638	Bracket Assembly	Remove/ Replace		0.37				1, 4	
	Extinguisher, Fire	Inspect	0.07	0.07					
91	CHEMICAL, BIO- LOGICAL, AND RADIOLOGICAL (CBR) EQUIPMENT								
9120	Bracket Assembly	Remove/ Replace		0.20				1,4	

## Section II. TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	ITEM NAME	NATIONAL STOCK NUMBER	TOOL NUMBER
1.	O	Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance, Common No. 1	4910-00-754-0654	SC 4910-95-CL-A74
2.	O	Shop Equipment, Automotive Maintenance and Repair: Organizational Maintenance, Common No. 2	4910-00-754-0653	SC 4910-95-CL-A72
3.	F, H	Shop Equipment, Automotive Maintenance and Repair: Field Maintenance, Basic, Less Power	4910-00-348-7696	SC 4910-95-CL-A31
4.	O, F	Tool Kit, General Mechanic's Automotive	5180-00-177-7033	SC 5180-90-CL-N26
5.		Forklift	MTO&E	
6.	O, F	Lifting Device	MTO&E	
		B-22		

**APPENDIX C**  
**EXPENDABLE AND DURABLE ITEMS LIST**  
**Section I. INTRODUCTION**

Paragraph Number	Title	Page Number
C-1	Scope .....	C-1
C-2	Explanation of Columns .....	C-1

---

### **C-1. SCOPE.**

---

This appendix lists expendable/durable supplies and materials you will need to operate and maintain the M969A2. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V, Repair Parts and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

---

### **C-2. EXPLANATION OF COLUMNS.**

---

- a. **Column (1) Item Number.** This number is assigned to the entry in the listing and is referenced in the Initial Setups of maintenance paragraphs or narrative instructions to identify the material needed (e.g., Drycleaning solvent, Item 12, Appendix C).
- b. **Column (2) - Level.** This column identifies the lowest level of maintenance that requires the listed item.
  - C - Operator/Crew
  - O - Unit
  - F - Direct Support
  - H - General Support
- 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 (CAGEC).** 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 followed by the part number, if applicable.
- e. **Column (5) U/M [Unit of Measure].** Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation: EA (each), FT (foot), GL (gallon), IN. (inch), LB (pound), ML (milliliter), OZ (ounce), PT (pint), and QT (quart). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.



## Section II. TOOL AND TEST EQUIPMENT REQUIREMENTS

(1)	(2)	(3)	(4)	(5)
ITEM NUMBER	LEVEL	NATIONAL STOCK NUMBER	DESCRIPTION (CAGE C)	U/M
1	O	8040-00-262-9025	ADHESIVE: General Purpose, 4-Ounce Tube (81348) MMM-A-1617	OZ
2	O	8040-00-225-4548	ADHESIVE: Sealant, 2-Ounce Tube (81349) MIL-A-46106	OZ
3	O	5340-00-450-5718	CAP AND PLUG SET (19207) 10935404	EA
4	O		CLOTH: Abrasive (58536) A-A-1048	
		5350-00-192-5047	80 Grit - 50 Sheets	EA
		5350-00-192-5049	120 Grit - 50 Sheets	EA
		5350-00-192-5051	180 Grit - 50 Sheets	EA
5	O	5350-00-221-0872	CLOTH: Abrasive, Crocus, 50 Sheets (81348) P-C-458	EA
6	O	8030-00-753-4953	COMPOUND: Antiseize (81349) MIL-A-13881	LB
7	O	8030-01-044-5034	COMPOUND: Antiseize (81349) MIL-T-5544	LB
8	O	5610-00-782-5555	COMPOUND: Flight Deck (81349) MIL-D-23003	QT
9	O		COMPOUND: Lapping and Grinding (58536) A-A-1203	
		5350-00-193-1340	150 Grit - 1-Pound Can	LB
		5350-00-193-1341	220 Grit - 1-Pound Can	LB
		5350-00-193-1348	400 Grit - 1-Pound Can	LB
		5350-00-193-1349	500 Grit - 1-Pound Can	LB
10	O		CORROSION PREVENTIVE: Fingerprint Remover (81349) MIL-C-15074	
		8030-00-664 4017	1-Quart Can	QT
		8030-00-281-2338	1-Gallon Can	GL
		8030-00-252-8300	5-Gallon Can	GL
		8030-00-252-8301	65-Gallon Drum	GL
11	F	8030-00-244-1296	CORROSION PREVENTIVE COMPOUND: Grade 3, 1 -Gallon Can (81349) MILC-16173	GL
C-2				

## Section II. EXPENDABLE AND DURABLE ITEMS LIST (continued)

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
12	O	6850-00-110 4408 6850-00-274-5421 8850-00-285-8011	DRYCLEANING SOLVENT: Type II (81348) P-D-680 1-Pint Can 5-Gallon Can 55-Gallon Drum	PT GL GL
13	F	8010-00-889-9745	DYE: Prussian Blue, 1-Ounce Tube (81349) MIL-P-30501	OZ
14	O	9140-00-286-5282 9140-00-286-5284	FUEL OIL, DIESEL: Arctic, DF-A (81348) W-F-800 5-Gallon Can 55-Gallon Drum	GL GL
15	O	9140-00-286-5295 9140-00-286-5296	FUEL OIL, DIESEL: Regular, DF-2 (81348) W-F-800 6-Gallon Can GL 55-Gallon Drum	
16	O	9140-00-286-5287	FUEL OIL, DIESEL: Winter, DF-1 (81348) W-F-800 5-Gallon Can 55-Gallon Drum	GL GL
17	F	9150-00-985-7247	GREASE: Aircraft, 6-1/2 Pound Can (81349) MIL-G-23827	LB
18	O	9150-01-197-7688 9150-01-197-7689 9150-01-197-7690 9150-01-197-7692 9150-01-197-7693	GREASE: Automotive and Artillery (81349) MIL-G-10924 2-1/4 Ounce Tube 6-1/2 Pound Can 1-3/4 Pound Can 35-Pound Can 14 Ounce Cartridge	OZ LB LB LB OZ
19	F	9150-00-935-9807	HYDRAULIC FLUID: Petroleum, 1-Quart Can (81349) MIL-H-6083	QT
20	O	9150-00-889-3523	LUBRICATING OIL (81349) MIL-P-46002	OZ

## Section II. EXPENDABLE AND DURABLE ITEMS LIST (continued)

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
21	O	9150-00-4024478 9150-00-402-2372 9150-00491-7197	LUBRICATING OIL: Internal Combustion Engine, Arctic, OEA (81349) MIL-L-46167 1-Quart Can 5-Gallon Can 55-Gallon Drum	QT GL GL
22	O	9150-00-189-6727 9150-00-186-6668 9150-00-191-2772	LUBRICATING OIL: OEIHDO 10W (81349) MIL-L-2104 1 -Quart Can 5-Gallon Can 55-Gallon Drum	QT GL GL
23	O	9150-00-1866681 9150-00-188-9858 9150-00-189-6729	LUBRICATING OIL: OE/HDO 30W (81349) MIL-L-2104 1-Quart Can 5-Gallon Can 55-Gallon Drum	QT GL GL
24	O	6505-0-133-8060	PETROLATUM: White	OZ
25	O	7920-00-205-1711	RAG: Wiping, Cotton and Cotton Synthetic, 50-Pound Bale (58536) A-A-531	LB
26	O	8030-01-159-4844	SEALANT: Silicone, RTV, 81/2 Ounce Tube (11862) 1052734	OZ
27	O	8030-01-054-0740	SEALING COMPOUND: Pipe, Anaerobic, with Teflon, 50 Milliliter Tube (05972) 592-31	ML
28	O	8520-00-228-0598	SOAP: Toilet, Liquid (81348) P-S-624 Type 1	GL
29	O	9905-00-537-8954	TAG: Marker, 50 Each (81349) MIL-T-12755	EA
30	O	8030-00-889-3535	TAPE: Antisieze, 1/2-Inch Width, 260-Inch Roll (81349) MIL-T-27730A	IN.
31	O	5970-00-644-3167	TAPE: Insulation, Electrical, 85-Foot Roll (81348) HH-1-510	FT

## APPENDIX D ILLUSTRATED LIST OF MANUFACTURED ITEMS

### Section I. INTRODUCTION

Paragraph Number	Paragraph Title	Page Number
D-1	General.....	D-1
Table 1	Manufactured Items Part Number Cross Reference Index .....	D-1

#### **D-1. GENERAL.**

- a. This appendix includes complete instructions for making items authorized to be manufactured or fabricated at the Unit, Direct Support, and General Support maintenance levels. Refer to TM 9-2330-398-24P for all bulk materials/items of manufactured items.
- b. A part number index in alphanumeric order is provided in Table D-1 for cross-referencing the part number of the item to be manufactured to the figure that covers the fabrication criteria.
- c. All bulk materials needed for the manufacture of an item are listed by part number or specification number in the manufacturing instructions in Section II.
- d. When manufacturing items, make sure the appropriate tools are used to cut and shape materials. Bend tubes to the configuration shown and be careful not to kink tubing. Reuse old connectors and fittings whenever possible. Make sure tuning is clean before installing after fabrication.
- e. All dimensions given in Section II, Manufacturing Instructions, are in standard units.

*Table D-1. Manufactured Items Part Number Cross-Reference Index*

Part Number	Figure Number	Figure Title
116860333-1	D-1	Air Duct Hose 11686033-1
12356108	D-2	Bracket Assembly 12356108
11670920-1	D-3	Cable
11670920-2	D-3	Cable
11685930-1	D-4	Conduit
11685930-2	D-4	Conduit
11685930-3	D-4	Conduit
11685927	D-5	Electrical Lead
12275212-1	D-5	Electrical Lead
12275213-1	D-5	Electrical Lead
12275217-2	D-5	Electrical Lead
12275229	D-5	Electrical Lead
12275247	D-5	Electrical Lead
12356112-1	D-5	Electrical Lead
12356112-2	D-5	Electrical Lead
12356113-1	D-5	Electrical Lead
12356113-2	D-5	Electrical Lead
12356113-3	D-5	Electrical Lead

Table D-1. *Manufactured Items Part Number Cross-Reference Index (continued)*

Part Number	Figure Number	Figure Title
12275404	D-6	Electrical Lead 12275404
12275540	D-7	Electrical Lead 12275540
12380153	D-8	Gasket 12380153
12275524-1	D-9	Tube
12275524-2	D-9	Tube
12275524-3	D-9	Tube
12275524-4	D-9	Tube
11670918-1	D-10	Tubing
12275560-1	D-10	Tubing
12275562-5	D-11	Webbing Strap 12275562-5
12267081	D-12	Wiring Harness 12267081

Section II. MANUFACTURING INSTRUCTIONS

Paragraph Number	Paragraph Title	Page Number
Figure D-1	Air Duct Hose 11686033-1 .....	D-2
Figure D-2	Bracket Assembly 12356108.....	D-2
Table D-2	Cable Length .....	D-
Figure D-3	Cable .....	D-
Table D-4	Conduit Length .....	D-
Figure D-4	Conduit .....	D-
Figure D-5	Electrical Lead.....	D-
Table D-5	Electrical Lead Common Hardware .....	D-
Table D-6	Electrical Lead Length.....	D-6
Table D-7	Electrical Lead 12275404.....	D-
Figure D-6	Electrical Lead 12275404.....	D-
Table D-8	Electrical Lead 12275540.....	D-
Figure D-7	Electrical Lead 12275540.....	D-
Table D-9	Gasket 12380153 .....	D-
Figure D-8	Gasket 12380153 .....	D-
Table D-10	Tube Length .....	D-
Figure D-9	Tube .....	D-
Figure D-10	Tubing .....	D-
Table D-1 1	Tubing Common Hardware .....	D-
Table D-12	Tubing Length .....	D-
Table D-13	Webbing Strap 12275562-5 .....	D-
Figure D-11	Webbing Strap 12275562-5 .....	D-
Figure D-12	Wiring Harness 12267081.....	D-
Table D-14	Wiring Harness 12267081 Common Hardware .....	D-
Table D-15	Wiring Harness 12267081 Length.....	D-

Using knife, cut hose (1) to required length.

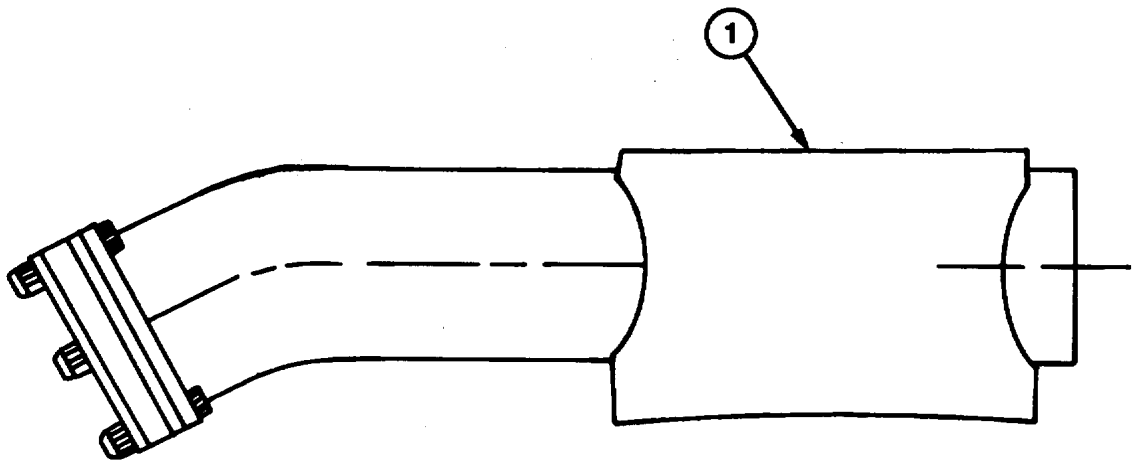


Figure D-1. Air Duct Hose 11686033-1

Locate and mark location for four mounting holes on bracket 11668080 as shown in figure D-2.

Using drill and 0.375 inch drill bit, drill four holes through bracket 11668080.

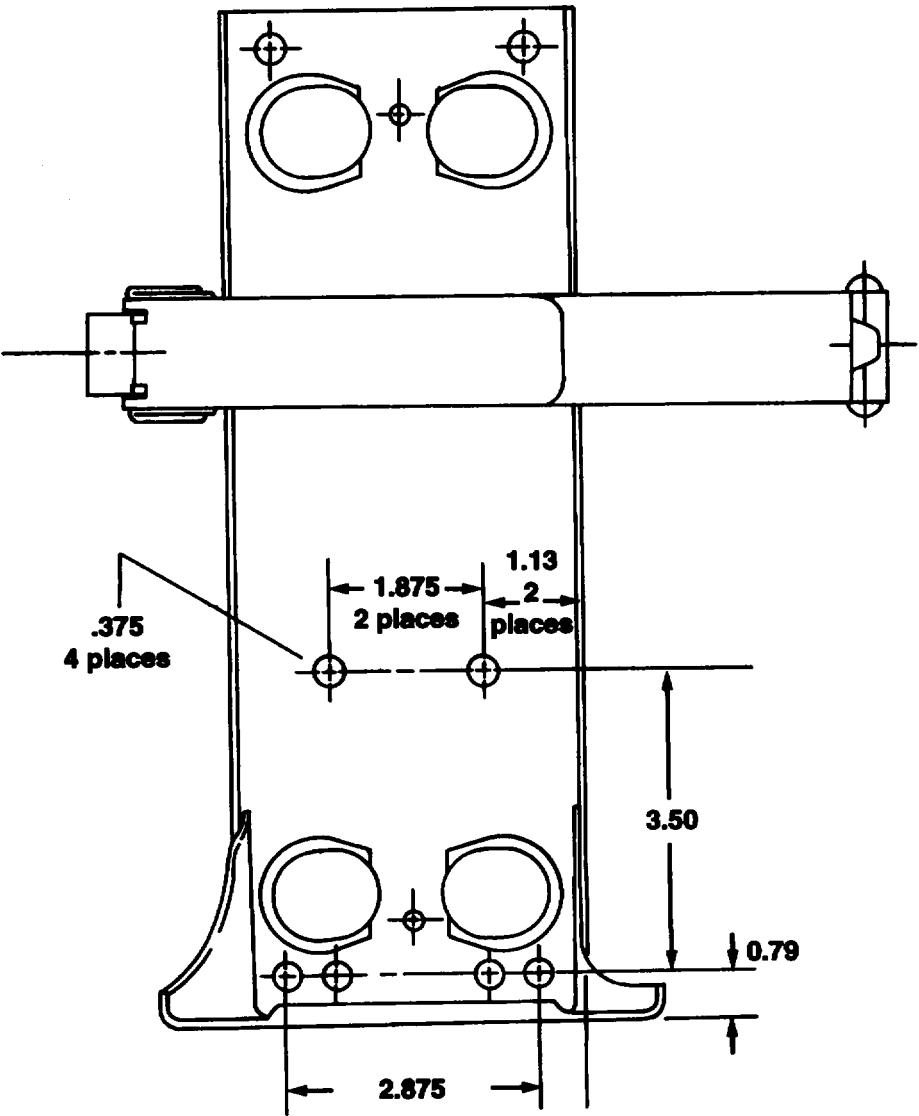


Figure D-2. Bracket Assembly 12356108

Table D-2. Cable Length

Part Number	Length	Make From: NSN
11670920-1	168 inches (426.7 cm)	Cable M83420/1-006 (NSN 4010-01-205-9337)
11670920-2	120 inches (304.8 cm)	Cable M83420/1-006 (NSN 4010-01-205-9337)

- 1.Using wire cutters and Table D-2, cut cable (1) to required length.
- 2.Using torch, carefully heat ends of cable (1) to form a ball of softened cable.



Figure D-3. Cable

Table D-4. Conduit Length

Part Number	Length	Make From: NSN
11685930-1	10 in (24 cm)	Conduit 12275547-25975-01406-5304
11685930-2	12 in. (29 cm)	Conduit 12275547-25975-01406-5304
11685930-3	48 in. (122 cm)	Conduit 12275547-25975-01-406-5304

Using knife or wire cutters and Table D-3, cut conduit (1) to required length.

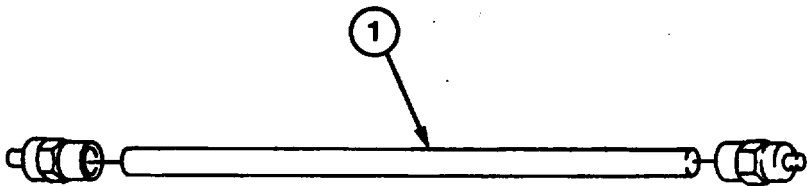


Figure D-4. Conduit.



1. Using wire cutter and Table D-5, cut electrical lead to required length.
2. Using Table D-6, determine type of connector (1) required for electrical lead to be manufactured.
3. Install connector (1) on both ends of electrical lead (2).

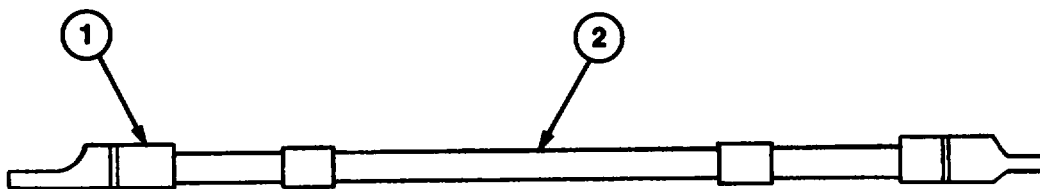


Figure D-5. Electrical Lead

Table D-5. Electrical Lead Common Hardware

Part Number	Connector Requirements		
	Qty	Part Number/CAGEC	Nomenclature/NSN
11685927	1	MS25036-116 (96906)	Terminal, Lug 5940-00-114-1305
	1	MS25036-118 (96906)	Terminal, Lug 5940-00-557-4345
12275212-1	1	MS25036-124 (96906)	Terminal, Lug 5940-00-114-1311
	1	MS25036-125 (96906)	Terminal, Lug 5940-00-557-4338
12275213-1	1	MS25036-112 (96906)	Terminal, Lug 5940-00-143-4794
	1	MS25036-113 (96906)	Terminal, Lug 5940-00-113-8183
12275217	2	MS25036-118 (96906)	Terminal, Lug 5940-00-557-4345
12275229	1	MS25036-112 (96906)	Terminal, Lug 5940-00-143-4794
	1	MS25036-156 (96906)	Terminal, Lug 5940-00-143-4775
12275247	1	MS25036-117 (96906)	Terminal, Lug 5940-00-114-1306
		MS25036-118 (96906)	Terminal, Lug
12275366-8	2	MS20659-104 (96906)	Terminal, Lug 5940-00-107-1481
12275540-6	2	MS25036-108 (96906)	Terminal, Lug 5940-00-143-4780
12356112-1	2	RM9731 (59730)	Terminal, Lug 5940-00-114-1320
12356112-2	2	RM9731 (59730)	Terminal, Lug 5940-00-114-1320
12356113-1	2	MS25036-124 (96906)	Terminal, Lug 5940-00-114-1311
12356113-2	2	MS25036-124 (96906)	Terminal, Lug 5940-00-114-1311
12356113-3	2	MS25036-125 (96906)	Terminal, Lug 5940-00-557-4338

Table D-. Electrical Lead Length

Part Number	(2) Electrical Lead Requirements	
	Length	Bulk Material
11685927	As required	Wire, Electrical 11685927-1
12275212-1	As required	Wire, Electrical 12275212-1-1
12275213-1	As required	Wire, Electrical 12275213-1-1
12275217-2	53 in. (132 cm)	Wire, Electrical 12275217-2-53
12275229	As required	Wire, Electrical 12275229-1
12275247	As required	Wire, Electrical 12275247-1
12275365-8	8 in. (20.3 cm)	Wire, Electrical M13486/1-5 6145-00-152-6499
12275540-6	6 in. (15.1 cm)	Wire, Electrical M13486/1-5 6145-00-152-6499
12356112-1	52 in. (132 cm)	Wire, Electrical M13486/1-17
12356112-2	50 in. (127 cm)	Wire, Electrical M13486/1-17
12356113-1	43 in. (109.2 cm)	Wire, Electrical M13486/1-11 6145-00-538-8219
12356113-2	40 in. (101.6 cm)	Wire, Electrical M13486/1-11 6145-00-538-8219
12356113-3	37 in. (93.9 cm)	Wire, Electrical M13486/1-11 6145-00-538-8219

Table D7. Electrical Lead 12275404

Item Number	Nomenclature	Part Number (CAGEC)	NSN
1	Electrical Wire	M13486/1-5 (81349)	6145-00-152-6499
2	Band Marker	M43436/1-1 (81349)	9905-00-752-4649
3	Terminal, Lug	MS25036-108(96906)	5940-00-143-4780
4	Contact, Electrical	572929(19207)	5999-00-057-2929
5	Washer, Slotted	8338567 (19207)	5310-01-096-5300
6	Shell, Electrical Connector	8338566 (19207)	5935-00-572-9180

1. Using wire cutters, cut electrical wire (1) to required length.
2. Using electrical repair kit, install terminal lug (3) on electrical wire (1).
3. Slide band marker (2), and electrical connector shell (6) on electrical wire (1).
4. Using electrical repair kit, install electrical contact (4) on electrical wire (1).
5. Install slotted washer (5) on electrical contact (4), and push electrical connector shell (6) over electrical contact (4).

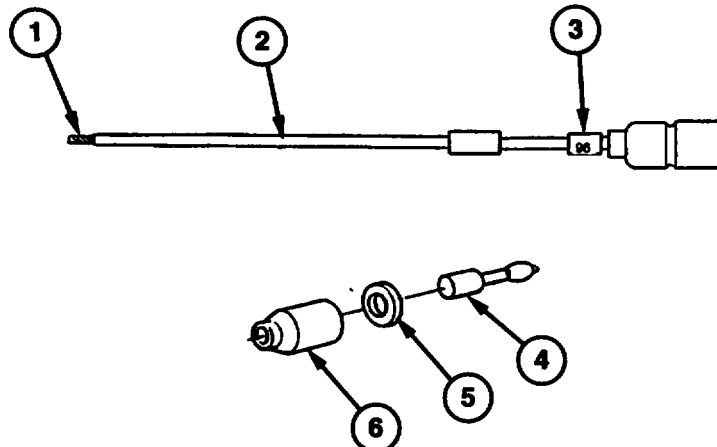


Figure D-6. Electrical Lead 12275404

Table D-8. Electrical Lead 12275540

Item Number	Nomenclature	Part Number (CAGEC)	NSN
1	Terminal, Quick-Disconnect	11669555 (19207)	5940-01-092-6502
2	Electrical Wire	M13486/1-5	(81349)6145-00-152-6499
3	Band Marker	M43436/1-1 (81349)	9905-00-752-4649
4	Contact, Electrical	572929 (19207)	5999-00-057-2929
5	Washer, Slotted	8338567 (19207)	5310-01-096-5300
6	Shell, Electrical Connector	8338566 (19207)	5935-00-572-9180

- 1. Using wire cutters, cut electrical wire (2) to required length.
- 2. Using electrical repair kit, install quick-disconnect terminal (1) on electrical wire (2).
- 3. Slide band marker (3) and electrical connector shell (6) on electrical wire (2).
- 4. Using electrical repair kit, install electrical contact (4) on electrical wire (2).
- 5. Install slotted washer (5) on electrical contact (4), and slide electrical connector shell (6) over electrical contact (4).

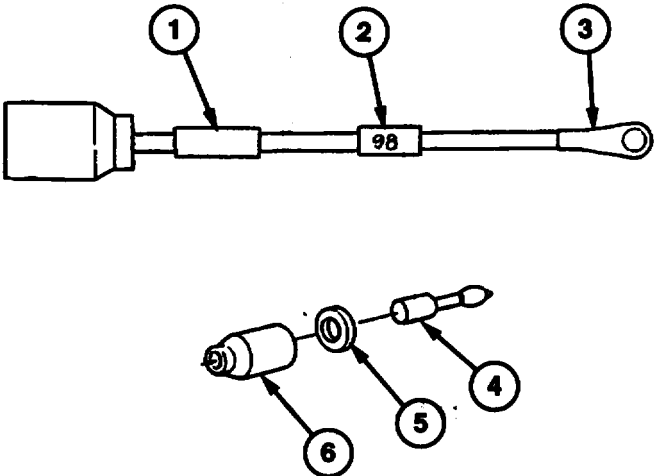


Figure D-7. Electrical Lead 12275540

NOTE

Gasket material comes in 9 sq ft (0.8 sq m) sheets. Check to see if unused gasket material is available to avoid ordering excess amounts.

Table D-9. Gasket 12380153

Part Number		Length
HH-P-96	3.88 in. (8.85 cm)	NSN 5330-00-634-8264

1. Using gasket-making kit, cut gasket to 3.88 in. (8.85 cm) square.
2. Using dies from gasket-making kit, locate, mark and punch four 7/16in. (1.10 cm) holes in gasket.
3. Using die from gasket-making kit, locate, mark, and punch 2.25 in. (5.68 cm) in center of gasket.

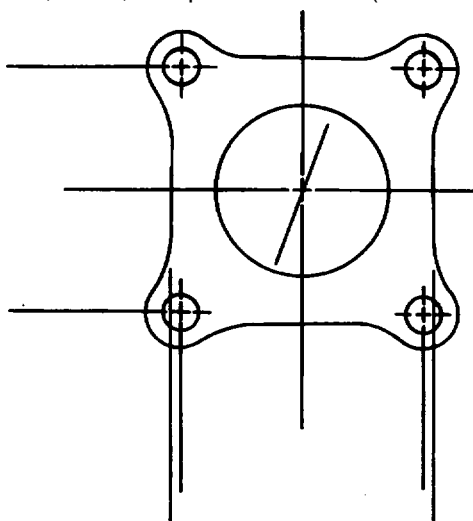


Figure A4. Gasket 12380154

**NOTE**

**Tubes may be reused only if sufficient length remains to prevent kinking after assembly. If not, replace them.**

Table D-10. Tube Length

Part Number	Length	Bulk Material
12275524-1	120 in. (304.8 cm)	Rigid Metal Conduit WW-563 5975-00-178-1220
12275524-2	79.5 in. (201.9 cm)	Flexible Metal Conduit 12275527-2 5975-01-904-5304
12275524-3	10 in. (25.4 cm)	Flexible Metal Conduit 12275527-2 5975-01-904-5304
12275524-4	16 in. (40.6 cm)	Flexible Metal Conduit 12275527-2 5975-01-904-5304

Using hacksaw and Table D-10, cut tube to correct length.

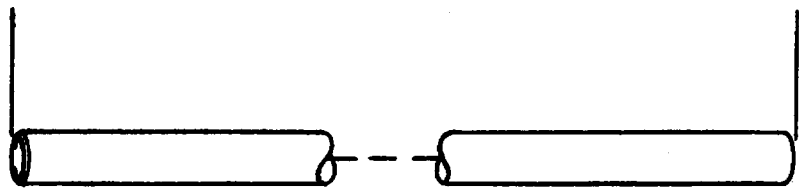


Figure D9. Tube

**NOTE**

**Tubing can be reused only if sufficient length remains to prevent kinking after assembly. If not, replace them.**

1. Using hose cutter and Table D-1 1, cut tubing for either new or replacement lengths.

**NOTE**

**Nut is part of fitting to which tubing assembly connected. Order the fitting in the quantity listed in Table D-11 to obtain the nut.**

2. Install nut (3) on tubing (4).
3. Install compression sleeve (2), if required, and insert (1) in tubing (4).

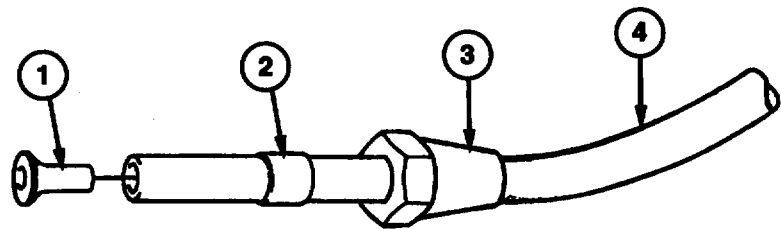


Figure D-10. Tubing

Table D-11. Tubing Common Hardware

Part Number	Item Number		
	1	2	3
11670918-1	2 Insert, Tube Fitting AC2511 (16662) (4730-00-293-7108)	2 Sleeve, Compression CPR-102321-1 (19207) (4730-079-8821)	1 Part of Elbow, Pipe to Tube 6-6 120202BA (81343) (4730-00-289-0155)
12275560-1	2 Insert, Tube Fitting HO-159-4 (79146) (4730-00-132-4588)	1 Part of Adapter, Straight, Pipe 8-6 1020102BA (81343) (4730-00-289-0051)	2 Part of Elbow, Pipe to Tube VS269AB4-2 (93061) (4730-00-921-3240)

Table D-12. Tubing Length

Part Number	(4) Tubing Requirements	
	Length	Bulk Material
11670918-1	As required	Hose, Nonmetallic CPR104420-2 (19207) (4730-01-014-4915)
12275560-1	As required	Hose, Nonmetallic CPR104420-1 (19207) (4720-01-058-7213)

Table D-13. Webbing Strap 12275562-5

Part Number	Length
12275562-5	62 in. (157 cm) (NSN 5340-01-098-2039)

**NOTE**

Webbing strap is ordered in 1 -foot (30 cm) lengths. Because the strap is 62 in. (157 cm), there will be about 10 in (25 cm) left over.

1. Using knife, cut webbing strap to 62 in. (157) length.
2. Carefully melt cut ends to prevent unraveling of webbing strap.



Figure D-11. Webbing Strap 12275562-5

1. Using wire cutters and Table D-14, cut eight lengths of electrical wire (6) and four lengths of electrical wire (15) to required lengths.
2. Thread coupling nut (5), grommet (3), and nut (2) over ends of wires (6 and 15).
3. Using electrical repair kit, install 12 pins (4) on ends of wires (6 and 15).
4. Using electrical repair kit and schematic, Install wires (6 and 15) in electrical connector plug (1).
5. Install nut (2), grommet (3), and packing nut (4) on connector plug (1).
6. Starting 2 inches from coupling nut (5), wrap electrical wires (6 and 15) with electrical tape (Item 31, Appendix C).
7. Pull electrical lead (6) free of wrapping 5 inches from coupling nut (5).
8. Pull electrical lead (6) free of wrapping 24 inches from coupling nut (5).
9. Continue wrapping electrical leads (6 and 15) until only 12 inches of leads (6 and 15) are uncovered.
10. Using schematic as a guide, install 12 marker bands (18) on electrical wires (6 and 15).
11. Using electrical repair kit, install four terminal lugs (10 and 11) on electrical wires (6 and 15).
12. Thread eight electrical connector shells (7, 12 and 16) on wires (6 and 15).
13. Thread seven insulator bushings (8 and 17) on electrical wires (6 and 15).
14. Using electrical repair kit, install eight terminal assemblies (9 and 14) on wires (6 and 15).
15. Install slotted washer (13) and electrical connector shell (12) over terminal assembly (14).
16. Push seven insulator bushings (8 and 17) and electrical connector shells (6 and 15) over terminal assemblies (9).

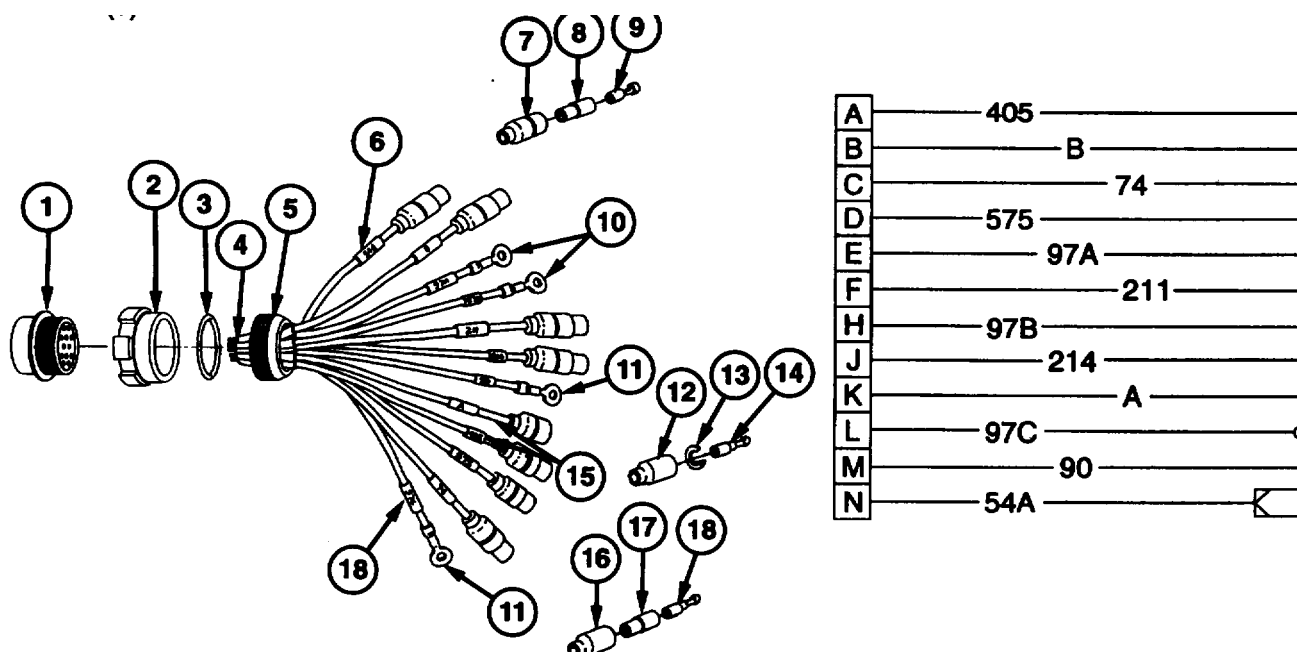


Figure D-12. Wiring Harness 12267081



Table D-14. Wiring Harness 12267081 Common Hardware

Item Number	Nomenclature	Part Number (CAGEC)	NSN
1	Electrical plug connector	8724257 (19207)	5935-00-754-9083
2	Nut	7723309 (19207)	5310-00-393-6685
3	Grommet	(02252)	
4	Pin	Part of Item 1	
5	Coupling nut	7716634 (19207)	5875-00-771-6634
7	Electrical connector shell	8338561 (19207)	5935-00-833-8561
8	Insulator bushing	8338562 (19207)	5970-00-833-8562
9	Electrical contact	8338564 (19207)	5940-00-399-6676
10	Terminal lug	MS25036-108 (96906)	5940-00-143-4774
11	Terminal lug	MS20659-104 (96906)	5940-00-107-1481
12	Electrical connector shell	8338572 (19207)	5935-00-695-9077
13	Slotted washer	8338573 (19207)	5310-00-595-7044
14	Electrical contact	MS27148-1 (96906)	5999-00-925-6495
16	Electrical connector shell	8338569 (19207)	2590-00-695-9076
17	Insulator bushing	8335970 (19207)	5310-00-754-9083
18	Marker band	M43436/1-1 (81349)	9905-00-752-4649

Table D-15. Wiring Harness 12267081 Length.

Item Number	Quantity/Length	Part Number (CAGEC)	NSN
6	1 22 in.(55cm)	M13486/1-5 (81349)	6145-00-152-6499
	1 39 in. (99 cm)	M13486/1-5 (81349)	6145-00-152-6499
	6 120 in. (304 cm)	M13486/1-5 (81349)	6145-00-152-6499
15	4 120 in. (304 cm)	M1348611-7 (81349)	6145-00-705-6678

## APPENDIX E

### TORQUE VALUES FOR THREADED FASTENERS

Paragraph Number	Paragraph Title	Page Number
E-1	General.....	E-1
E-2	Torque Limits .....	E-1
E-3	How To Use Torque Table .....	E-1
E-4	Tightening Metal Fasteners.....	E-3
E-5	Fastener Size and Thread Pattern .....	E-4
E-6	Fastener Grade .....	E-5

#### E-1. GENERAL.

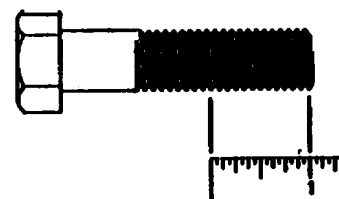
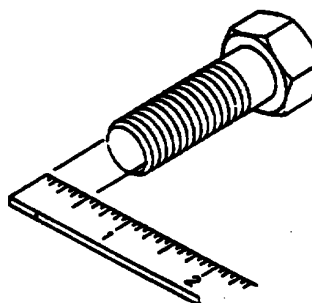
This section provides general torque limits for screws used on the semitrailer. Special torque limits are indicated in the maintenance procedures for applicable components. The general torque limits given in this appendix shall be used when specific torque limits are not indicated in the maintenance procedure. These general torque limits cannot be applied to screws that retain rubber components. The rubber components will be damaged before the correct torque limit is reached. If a special torque limit is not given in the maintenance instructions, tighten the screw or nut until it touches the metal bracket, then tighten it one more turn.

#### E-2. TORQUE LIMITS.

Table E-1 lists dry torque limits, which are used on screws that do not have lubricants applied to threads. Table E-2 lists wet torque limits, which are used on screws that have high-pressure lubricants applied to threads.

#### E-3. HOW TO USE TORQUE TABLE.

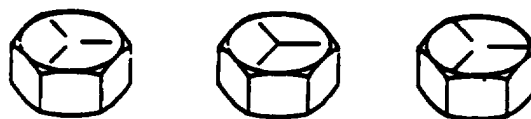
1. Measure the diameter of the screw to be installed.
2. Count the number of threads per inch or use a pitch gage.
3. Under the heading SIZE in Table E-1, look down the first column until the diameter of the screw to be installed is found (there will usually be two lines beginning with the same size).
4. In the second column under SIZE, find the number of threads per inch that matches the number of threads counted in step 2.



**E-3. HOW TO USE TORQUE TABLE (continued).**

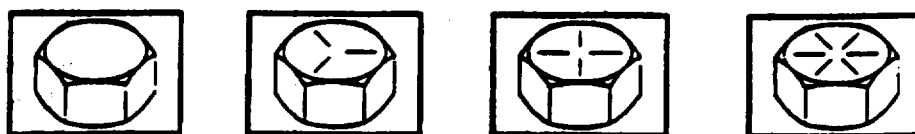
5. To find the grade of the screw that is to be installed, match the markings on the head to the correct picture of CAPSCREW HEAD MARKINGS on the table.

Manufacturers marks may vary.  
These are all SAE Grade 5 (3 lines).

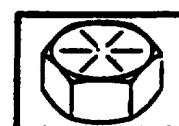
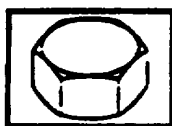
**CAPSCREW HEAD MARKINGS**

6. Look down the column under the picture found in step 5 until the torque limit in foot-pounds for the diameter and threads per inch of the screw being installed is found.

*Table E-1. Torque Limits for Dry Fasteners*

**SAE CAPSCREW HEAD MARKINGS**

SIZE			TORQUE							
			SAE GRADE No. 1 or 2		SAE GRADE No. 5		SAE GRADE No. 8		SAE GRADE No. 10	
DIA. IN.	THREADS PER INCH	MMs	FOOT- POUNDS	N•M	FOOT- POUNDS	N•M	FOOT- POUNDS	N•M	FOOT- POUNDS	N•M
1/4	20	6.35	5	6.78	8.0	10.85	10	13.56	12.0	16.27
1/4	28	6.35	6	8.14	10.0	13.56	-	-	14.0	18.98
5/16	18	7.94	11	14.92	17.0	23.05	19	25.76	24.0	32.52
5/16	24	7.94	13	17.63	190	25.76	-	-	27.0	36.61
3/8	16	9.53	18	24.41	31.0	42.04	34	46.10	44.0	59.66
3/8	24	9.53	20	27.12	35.0	47.46	-	-	49.0	66.44
7/16	14	11.11	28	37.97	49.0	66.44	55	74.58	70.0	94.92
7/16	20	-	30	40.68	55.0	74.58	-	-	78.0	105.77
1/2	13	12.70	39	52.88	75.0	101.70	85	115.26	105.0	142.38
1/2	20	-	41	55.60	85.0	115.26	-	-	120.0	162.78
9/16	12	14.28	51	69.16	110.0	149.16	120	162.72	1550	210.18
9/16	18	-	55	74.58	120.0	162.72	-	-	170.0	230.52
5/8	11	15.88	63	85.43	150.0	203.40	167	226.45	210.0	284.76
5/8	18	-	95	12.82	170.0	230.52	-	-	240.0	325.44
3/4	10	19.05	105	142.38	270.0	356.12	280	379.68	375.0	506.50
3/4	16	-	115	155.94	295.0	400.02	-	-	420.0	596.52
7/8	9	22.23	160	216.96	375.0	536.2	440	596.64	605.0	820.38
7/8	14	-	175	237.30	435.0	599.85	-	-	675.0	915.30
1	8	25.40	235	318.66	590.0	800.04	660	694.96	910.0	1233.96
1	14	-	250	338.00	660.0	894.96	-	-	990.0	1342.44
1-1/8	-	25.58	-	-	800.0	1064.8	-	-	1280.0	1735.7
					880.0	1193.3			1444.0	1952.8
1-1/4		31.75	-	-	-	-	-	-	1820.0	2467.9
									2000.0	2712.0
1-3/8	-	34.93	-	-	1460.0	1979.8	-	-	2300.0	3227.3
					1680.0	2278.1	-	-	2720.0	3688.3
1-1/2	-	38.10	-	-	940.0	2630.6	-	-	3160.0	4285.0
					2200.	2963.2			3580.0	4827.4

**E4. HOW TO USE TORQUE TABLE (continued).***Table E-2 Torque Limits for Wet Fasteners***SAE CAPSCREW HEAD MARKINGS**

SIZE			TORQUE							
			SAE GRADE No. 1 or 2		SAE GRADE No. 5		SAE GRADE No. 5		SAE GRADE No. 8	
DIA. IN.	THREADS PER INCH	MMs	FOOT- POUNDS	N•M	FOOT- POUNDS	N•M	FOOT- POUNDS	N•M	FOOT- POUNDS	N•M
1/4	20	6.35	4.9	6.10	72	9.76	9.0	12.0	10.8	14.64
1/4	28	6.35	5.4	7.33	9.0	1220	-	-	12.6	17.01
5/16	18	7.94	9.9	13.34	15.3	22.54	17.1	23.18	21.6	29.27
5/16	24	7.94	11.7	15.87	17.1	23.18	-	-	24.3	32.95
3/8	16	9.53	16.2	21.97	27.9	37.84	30.6	41.49	39.6	53.69
3/8	24	9.53	18.0	24.41	31.	42.71	-	-	44.1	59.80
7/16	14	11.11	25.2	34.17	44.1	59.80	49.5	67.12	63.0	85.42
7/16	20	-	27.0	36.61	49.5	67.12	-	-	70.2	95.19
1/2	13	12.70	35.1	47.58	67.5	91.53	76.5	103.73	94.5	128.14
1/2	20	-	36.9	50.04	71.5	10373	--	-	106.0	146.50
9/16	12	14.29	46.9	62.24	99.0	13424	108.0	14645	139.5	189.16
9/16	18	-	4.5	67.12	106.0	146.45	-	-	153.0	207.47
5/8	11	15.88	56.7	76.89	1350	183.06	150.3	203.80	189.0	256.28
5/8	1	-	85.5	115.94	153.0	207.47	-	-	216.0	296.90
3/4	10	19.05	94.5	128.14	243.0	329.51	252.0	341.71	337.5	457.65
3/4	16	-	103.5	140.35	265.5	360.2	-	-	378.0	536.87
7/8	9	22.23	144.0	195.26	355.5	482.06	396.0	536.98	544.5	738.34
7/8	14	-	157.5	213.57	391.5	530.87	-	-	607.5	823.77
1	8	25.40	211.5	286.79	531.0	720.04	594.0	805.46	819.0	1110.56
1	14	-	225.0	305.10	594.0	805.46	-	-	891.0	1208.12
1-1/8	-	25.58	-	-	720.0	976.32	-	-	1152.0	1582.13
					792.0	1073.97			1296.0	1757.52
1-1/4	-	31.75	-	-	-	-	-	-	16380	2221.11
									1800.0	2440.80
13/8	-	34.93	-	-	1314.0	1781.82	-	-	2142.0	2904.57
					1512.0	2050.29			2448.0	3319.47
1-1/2	-	38.10	-	-	1746.0	2367.54	-	-	2844.0	3856.50
					1980.0	2684.38			3204.0	4344.66

**E-4. TIGHTENING METAL FASTENERS.**

When torquing a fastener, select a torque wrench whose range (Table E-3) fits the required torque value. A torque wrench is most accurate from 25 percent to 75 percent of its stated range. A torque wrench with a stated range of 0 to 100 will be most accurate from 25 to 75 foot-pounds. The accuracy of readings will decrease as you approach 0 foot-pounds or 100 foot-pounds. The ranges in Table E-3 are based on this principle.

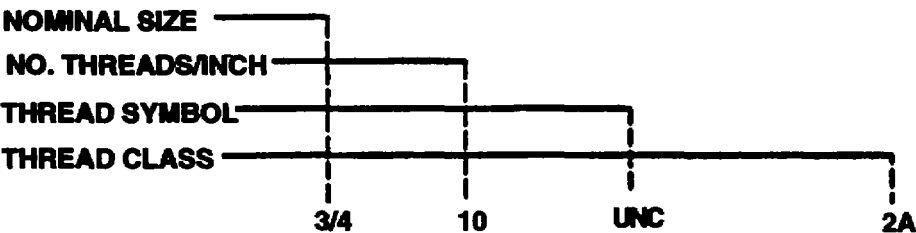
E-4. TIGHTENING METAL FASTENERS (continued).

Table E-4. Torque Ranges	
STATED RANGE	MOST EFFECTIVE RANGE
0-600 ft-lb 0-170 ft-lb 15-75 ft-lb	150-450 ft-lb 44-131 ft-lb 30-60 ft-lb

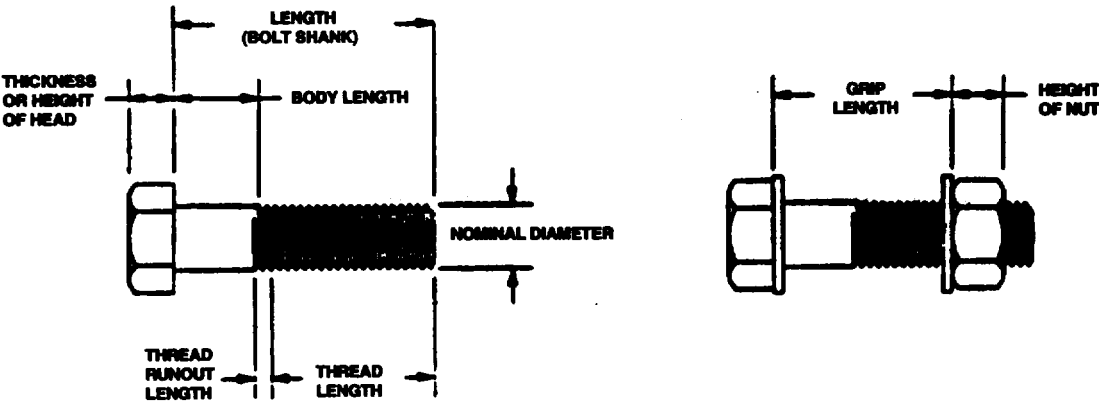
E4. FASTENER SIZE AND THREAD PATTERN.

Threaded fasteners are categorized according to diameter of the fastener shank. Thread styles are divided into broad groups, the two most common being coarse (Unified Coarse-UNC) and fine (Unified Fine-UNF). These groups are defined by the number of threads per inch on the bolt shanks. In addition, threads are categorized by thread class (Table E-4), which is a measure of the degree between threads of bolt or screw (external threads) and threads of the attaching nut or tapped hole (internal threads of the attaching nut or tapped hole) (internal threads). The most common thread class for bolts and screws is Class 2.

Table E-4. Thread Classes and Description		
EXTERNAL	INTERNAL	INTERNAL
1A 2A 3A	1B 2B 3B	LOOSE FIT MEDIUM FIT CLOSE FIT



NOTE: Unless followed with -LH (e.g., 3/4-10 UNC-2A-LH), threads are right-hand.



**E4. FASTENER GRADE.**

In addition to being classified by thread type, thread fasteners are also classified by material. The most familiar fastener classification system is the SAE grading system (Table E-5).

<i>Table E-5. SAE Screw and Bolt Markings</i>	
<b>SCREWS</b>	<b>BOLTS</b>
SAE GRADE 2 NO MARKING	SAE GRADE 6 4 RADIAL DASHES 90° APART
SAE GRADE 3 2 RADIAL DASHES 180° APART	SAE GRADE 7 5 RADIAL DASHES 72° APART
SAE GRADE 5 3 RADIAL DASHES 120° APART	SAE GRADE 8 6 RADIAL DASHES 60° APART

**Markings on Hex Locknut**

GRADE A - No Marks  
GRADE B - 3 Marks  
GRADE C - 6 Marks

GRADE A - No Marks  
GRADE B - Letter B  
GRADE C - Letter C

GRADE A - No Notches  
GRADE B - One Notch  
GRADE C - Two Notches

**E-5/(E-6 blank)**

## APPENDIX F

### MANDATORY REPLACEMENT PARTS

Paragraph Number	Paragraph Title	Page Number
F-1	General.....	F-1
F-2	Explanation of Columns .....	F-1
	Table F-1. Mandatory Replacement Parts List.....	F-2

---

#### **F-1. GENERAL.**

---

- a. This appendix is a cross-reference of item numbers to part numbers and is included for that purpose only.

---

#### **F-2. EXPLANATION OF COLUMNS.**

---

- a. Column (1)--Item Number. This number is assigned to the entry in Table F-1 for cross-referencing to the part number. The item number appears in the Materials/Parts listing of each maintenance procedure.
- b. Column (2)--Item Name. This is the name given each item in the Materials/Parts listing of the maintenance procedure.
- c. Column (3)--National Stock Number. When available, the national stock number is listed for each part.
- d. Column (4)--Part Number. This is the primary number used by the manufacturer, which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements, to identify an item or range of items.
- e. Column (5)--Reference. This is the number of the repair parts and special tools list (RPSTL) in which the referenced replacement part can be found. The RPSTL is the authorization for requisitioning replacement parts.

Table F-1. MANDATORY REPLACEMENT PARTS LIST

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
1	Antipilferage seal	5340-00-491-7632	MS51938-5	TM 9-2330-398-24P
2	Brakeshoe return spring	5360-01-241-6961	M1IWJ100	TM 9-2330-398-24P
3	Butterfly valve repair kit	4820-01-090-0874	8621J	TM 9-2330-398-24P
4	Butterfly valve repair kit	4820-01-090-0877	8621-N	TM 9-2330-398-24P
5	Cotter pin	5315-00-839-2325	MS24665-132	TM 9-2330-398-24P
6	Cotter pin	5315-00-839-2326	MS24665-281	TM 9-2330-398-24P
7	Cotter pin	5315-00-842-3044	MS24665-283	TM 9-2330-398-24P
8	Cotter pin	5315-00-234-1863	MS24665-300	TM 9-2330-398-24P
9	Cotter pin	5315-00-234-1864	MS24665-302	TM 9-2330-398-24P
10	Cotter pin	5315-00-839-5822	MS24665-353	TM 9-2330-398-24P
11	Cotter pin	5315-00-187-9538	137946	TM 9-2330-398-24P
12	Electrical locknut	5975-01-091-7849	10959767	TM 9-2330-398-24P
13	Electrical locknut		12267007-1	TM 9-2330-398-24P
14	Electrical tiedown strap	5975-00-984-6582	MS3367-1 -0	TM 9-2330-398-24P
15	Electrical tiedown strap	5975-00-985-6630	MS3367-3-0	TM 9-2330-398-24P
16	Electrical tiedown strap	5975-01-048-2922	MS3367-0	TM 9-2330-398-24P
17	Fluid filter element	4330-01-062-3836	G-3327	TM 9-2330-398-24P
18	Fluid filter element	4330-00-872-1779	M81380	TM 9-2330-398-24P
19	Fluid filter element	4330-01-393-5280	200025	TM 9-2330-398-24P
20	Gasket	5330-00-899-4509	MS27030-9	TM 9-2330-398-24P
21	Gasket	5330-00-948-0704	MS52000-10	TM 9-2330-398-24P
22	Gasket	5330-01-280-5827	M1OHG115	TM 9-2330-398-24P
23	Gasket	5330-00-778-7248	055019	TM 9-2330-398-24P
24	Gasket	5330-00-477-2563	055021	TM 9-2330-398-24P
25	Gasket	5330-00-778-7229	055285	TM 9-2330-398-24P
26	Gasket		100396	TM 9-2330-398-24P
27	Gasket		100397	TM 9-2330-398-24P
28	Gasket	5330-01-051-8129	101-0336	TM 9-2330-398-24P
29	Gasket	5330-01-064-3868	102-0475	TM 9-2330-398-24P
30	Gasket	5330-00-871-6093	103-0218	TM 9-2330-398-24P
31	Gasket	5330-00-145-2430	103-0251	TM 9-2330-398-24P
32	Gasket	5330-00-764-6291	10936675	TM 9-2330-398-24P
33	Gasket	5330-00-626-3966	110-0419	TM 9-2330-398-24P
34	Gasket	5330-01-052-9008	110-3738	TM 9-2330-398-24P
35	Gasket	5330-00-871-9486	115-0130	TM 9-2330-398-24P
36	Gasket	5330-01-005 8850	11597619	TM 9-2330-398-24P
37	Gasket	5330-01-168-2180	11611929	TM 9-2330-398-24P
38	Gasket	5330-01-065-8849	11621224-2	TM 9-2330-396-24P
39	Gasket	5330-01-081-5070	11670914	TM 9-2330-398-24P
40	Gasket	5330-01-060-5070	11670915	TM 9-2330-398-24P
41	Gasket	5330-01-083-6517	11670952	TM 9-2330-398-24P
42	Gasket	5330-01-070-4850	11685919	TM 9-2330-398-24P
43	Gasket	5330-01-066-2492	11685920	TM 9-2330-398-24P
44	Gasket	5330-01-064-6382	11685921	TM 9-2330-398-24P
45	Gasket	5330-01-065-6381	11685962	TM 9-2330-398-24P
46	Gasket	5330-01-067-7066	11685964	TM 9-2330-398-24P
		<b>F-2</b>		



Table F-1. MANDATORY REPLACEMENT PARTS LIST

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
47	Gasket	5330-01-010-2240	122-0243	TM 9-2330-398-24P
48	Gasket	5330-01-010-2239	122-0246	TM 9-2330-398-24P
49	Gasket	5330-01-096-1874	12275380	TM 9-2330-398-24P
50	Gasket	5330-01-098-2028	12275382	TM 9-2330-398-24P
51	Gasket	5330-01-178-7248	12275389	TM 9-2330-398-24P
52	Gasket	5330-00-932-1853	123-0667	TM 9-2330-398-24P
53	Gasket	5330-00-641-7571	123-1470	TM 9-2330-398-24P
54	Gasket		12380153	Appendix D
55	Gasket	5330-00-971-5752	140-0584	TM 9-2330-398-24P
56	Gasket	5330-00-725-2452	140-0706	TM 9-2330-398-24P
57	Gasket	5330-00-626-3966	147-0043	TM 9-2330-398-24P
58	Gasket	5330-00-571-9696	147-0243	TM 9-2330-398-24P
59	Gasket	5330-01-051-9995	147-0295	TM 9-2330-398-24P
60	Gasket	5330-00-971-5750	149-0792	TM 9-2330-398-24P
61	Gasket	5330-001-078-2827	154-0733	TM 9-2330-398-24P
62	Gasket	5330-01-061-7463	154-2799	TM 9-2330-398-24P
63	Gasket	5330-00-871-6097	154-2805	TM 9-2330-398-24P
64	Gasket	5330-00-145-2429	160-0721	TM 9-2330-398-24P
65	Gasket	5330-00-392-2691	25014	TM 9-2330-398-24P
66	Gasket	5330-01-024-2311	3119-BN	TM 9-2330-398-24P
67	Gasket	5330-01-060-9614	38683-207	TM 9-2370-398-24P
68	Gasket	5330-01-061-0749	4156-GA	TM 9-2330-398-24P
69	Gasket	5330-00-063-2437	4635GA	TM 9-2330-398-24P
70	Gasket	5330-00-763-9322	479136	TM 9-2330-398-24P
71	Gasket		54206005	TM 9-2330-398-24P
72	Gasket	5330-00-346-2732	6686-N	TM 9-2330-398-24P
73	Gasket	5330-00-353-0959	7526509	TM 9-2330-398-24P
74	Gasket	5330-01-078-2825	79031	TM 9-2330-398-24P
75	Gasket	5330-00-784-0749	8681826	TM 9-2330-398-24P
76	Gasket	5330-01-078-2826	97706	TM 9-2330-398-24P
77	Gasket set	5330-01-014-6015	120-0580	TM 9-2330-398-24P
78	Gasket set	5330-01-060-7266	2474-GA	TM 9-2330-398-24P
79	Globe valve repair kit		W460385-022	TM 9-2330-398-24P
80	Insulator sleeve	2940-01-008-3007	508-0103	TM 9-2330-398-24P
81	Locking washer		418123	TM 9-2330-398-24P
82	Lockwasher	5310-01-050-1309	C0853001600	TM 9-2330-398-24P
83	Lockwasher		J00004	TM 9-2330-398-24P
84	Lockwasher		J00005	TM 9-2330-398-24P
85	Lockwasher	5310-00-470-5974	J08	TM 9-2330-398-24P
86	Lockwasher	5310-00-576-5752	MS35333-39	TM 9-2330-398-24P
87	Lockwasher	5310-00-550-1130	MS35333-40	TM 9-2330-398-24P
88	Lockwasher	5310-00-595-7237	MS35333-42	TM 9-2330-398-24P
89	Lockwasher	5310-00-543-4385	MS35333-46	TM 9-2330-398-24P
90	Lockwasher	5310-00-627-6128	MS35335-35	TM 9-2330-398-24P
91	Lockwasher	5310-00-933-8121	MS35338-139	TM 9-2330-298-24P
92	Lockwasher	5310-00-543-2705	MS35338-27	TM 9-2330-398-24P
		<b>F-3</b>		

Table F-1. MANDATORY REPLACEMENT PARTS LIST (continued)

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
93	Lockwasher	5310-00-045-3299	MS35338-42	TM 9-2330-398-24P
94	Lockwasher	5310-00-045-3296	MS3533843	TM 9-2330-398-24P
95	Lockwasher	5310-00-582-5985	MS35338-44	TM 9-2330-398-24P
96	Lockwasher	5310-00-407-9566	MS35338-45	TM 9-2330-398-24P
97	Lockwasher	5310-00-637-9541	MS3533-46	TM 9-2330-398-24P
98	Lockwasher	5310-00-209-0965	MS35338-47	TM 9-2330-398-24P
99	Lockwasher	5310-00-061-1258	MS45904-76	TM 9-2330-398-24P
100	Lockwasher	5310-00-953-8628	MS45904-77	TM 9-2330-398-24P
101	Lockwasher		102-P-50	TM 9-2330-398-24P
102	Lockwasher	5310-00-761-6882	13-50641	TM 9-2330-398-24P
103	Lockwasher	5310-01-062-1013	14-50641	TM 9-2330-398-24P
104	Lockwasher	5310-01-004-7933	15-50641	TM 9-2330-398-24P
105	Lockwasher		200084	TM 9-2330-398-24P
106	Lockwasher		200273	TM 9-2330-398-24P
107	Lockwasher	5310-00-820-6653	23E10	TM 9-2330-398-24P
108	Lockwasher	5310-01-076-3052	27-50761	TM 9-2330-398-24P
109	Lockwasher	5310-01-077-9647	38084-C	TM 9-2330-398-24P
110	Lockwasher	5310-01-053-0641	500361-8	TM 9-2330-398-24P
111	Lockwasher	5310-00-624-0442	850-0025	TM 9-2330-398-24P
112	Lockwasher	5310-01-009-6570	850-0040	TM 9-2330-398-24P
113	Lockwasher	5310-01-063-9847	850-0045	TM 9-2330-398-24P
114	Lockwasher	5310-01-060-9104	850-0050	TM 9-2330-398-24P
115	Lockwasher	5310-01-051-6861	850-0055	TM 9-2330-398-24P
116	Lockwasher	5310-01-077-9650	853-0013	TM 9-2330-398-24P
117	Lockwasher	5310-01-060-7182	856-0006	TM 9-2330-398-24P
118	Lockwasher	5310-01-009 6568	856-0010	TM 9-2330-398-24P
119	Lockwasher	5310-01-061-0716	9010154-K7	TM 9-2330-398-24P
120	Nut	5310-01-010-2141	870-0137	TM 9-2330-398-24P
121	Oil filter	2940-00-926-4117	PH16	TM 9-2330-398-24P
122	Oil seal	5330-01-076-9864	25217-363	TM 9-2330-398-24P
123	O-ring		404942	TM 9-2330-398-24P
124	Packing		WV15265-CB	TM 9-2330-398-24P
125	Packing	5330-01-074-6882	65103-A-992	TM 9-2330-398-24P
126	Packing	5330-00-400-3513	651071	TM 9-2330-398-24P
127	Packing ring	5330-00-090-2128	213630	TM 9-2330-398-24P
128	Packing set		WV15227-AS	TM 9-2330-398-24P
129	Pipe clamp coupling	4730-00-855-4919	10871852-3	TM 9-2330-398-24P
130	Pop rivet		C00950114	TM 9-2330-398-24P
131	Piofor.4ed packing	5330-00-641-3407	MS28775-224	TM 9-2330-398-24P
132	Preformed pacing	5330-01-190-4634	M10HH100	TM 9-2330-398-24P
133	Preformed packing	5330-00-846-0182	STG75	TM 9-2330-398-24P
134	Preformed packing	5330-00-168-2180	11611929	TM 9-2330-398-24P
135	Preformed packing	5330-00-462-0907	11635919-2	TM 9-2330-398-24P
138	Preformed packing	5330-01-024-2311	3119-BN	TM 9-2330-398-24P
137	Preformed packing	5330-01-084-5969	407804	TM 9-2330-398-24P
138	Preformed packing	5330-01-038-8585	509-0035	TM 9-2330-398-24P
		<b>F-4</b>		

Table F-1. MANDATORY REPLACEMENT PARTS LIST (continued)

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
139	Preformed packing	5330-00-932-1837	509-0084	TM 9-2330-398-24P
140	Preformed packing	5330-00-973-8598	509-0094	TM 9-2330-398-24P
141	Preformed packing	5330-00-897-5859	52	TM 9-2330-398-24P
142	Preformed packing	5330-01-074-1997	6581-243-925	TM 9-2330-398-24P
143	Preformed packing	5330-01-076-9342	6596-B	TM 9-2330-398-24P
144	Primary fuel filter	2910-00-125-5601	122-0326	TM 9-2330-398-24P
145	Retaining ring	5365-01-062-1009	31624	TM 9-2330-398-24P
146	Retaining ring	5365-01-061-0710	38038	TM 9-2330-398-24P
147	Ring seal	5330-01-076-9863	6880-69	TM 9-2330-398-24P
148	Seal	5330-00-933-4198	MIOHH124-X	TM 9-2330-398-24P
149	Seal	5330-00-978-9575	T75-2	TM 9-2330-398-24P
150	Seal	5330-00-988-9575	10871869	TM 9-2330-398-24P
151	Seal	5330-00-930-5953	10871869-1	TM 9-2330-398-24P
152	Seal		110-3604	TM 9-2830-398-24P
153	Seal	5330-00-168-2195	11611883	TM 9-2330-398-24P
154	Seal	5330-01-060-9610	25227-689	TM 9-2330-398-24P
155	Seal	5330-01-078-2005	25271-207	TM 9-2330-398-24P
156	Seal	5330-00-950-8407	509-0086	TM 9-2330-398-24P
157	Seal	2815-00-978-8788	509-0087	TM 9-2330-398-24P
158	Seal	5330-00-424-3386	509-0088	TM 9-2330-398-24P
159	Seal	3110-00-100-0332	632	TM 9-2330-398-24P
160	Secondary fuel filter	2910-00-125-5600	122-0325	TM 9-2330-398-24P
161	Seal-locking bolt	5306-01-052-2402	MS35764-1297	TM 9-2330-398-24P
162	Self-locking nut	5310-00-877-5796	MS21044N4	TM 9-2330-398-24P
163	Self-locking nut	5310-00-877-5795	MS21044N8	TM 9-2330-398-24P
164	Self-locking nut	5310-00-905-8451	MS21083N06	TM 9-2330-398-24P
165	Seal-locking nut	5310-00-941-6019	MS21083N08	TM 9-2330-398-24P
166	Self-locking nut	5310-00-902-6676	MS21083N3	TM 9-2330-398-24P
167	Self-locking nut	5310-00-903-8282	MS21083N4	TM 9-2330-398-24P
168	Self-locking nut	5310-00-926-1852	MS21083N6	TM 9-2330-398-24P
169	Self-locking nut	5310-00-088-1251	MS51922-1	TM 9-2330-398-24P
170	Self-locking nut	5310-00-984-3807	MS51922-13	TM 9-2330-398-24P
171	Self-locking nut	5310-00-087-4652	MS51922-17	TM 9-2330-398-24P
172	Self-locking nut	5310-00-959-1488	MS51922-21	TM 9-2330-398-24P
173	Self-locking nut	5310-00-225-6993	MS51922-33	TM 9-2330-398-24P
174	Self-locking nut	5310-00-269-4040	MS51922-49	TM 9-2330-398-24P
175	Self-locking nut	5310-00-959-7600	MS51922-5	TM 9-2330-398-24P
176	Self-locking nut	5310-00-225-6408	MS51922-53	TM 9-2330-398-24P
177	Self-locking nut	5310-40-984-3806	MS51922-9	TM 9-2330-398-24P
178	Self-locking nut	5310-00-994-1670	115-0150	TM 9-2330-398-24P
179	Self-locking nut	5310-01-099-6539	37-03	TM 9-2330-398-24P
180	Self-locking nut	5310-01-060-7259	723001	TM 9-2330-398-24P
181	Self-locking nut	5310-01-098-7827	841-00	TM 9-2330-398-24P
182	Self-locking nut	5310-01-061-4478	870-0218	TM 9-2330-398-24P
183	Self-locking screw	5305-01-050-3733	821-0010	TM 9-2330-398-24P
184	Self-locking screw	5310-01-050-1106	821-0014	TM 9-2330-398-24P

Table F-1. MANDATORY REPLACEMENT PARTS LIST (continued)

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
185	Separator assembly		E1121	TM 9-2330-398-24P
186	Spring pin	5315-00-903-4322	MS16562-82	TM 9-2330-398-24P
187	Spring pin	5310-00-172-9994	1453-A40	TM 9-2330-389-24P
188	Strainer element	4730-00-893-6402	479729	TM 9-2330-398-24P
189	Top seal		6595-N	TM 9-2330-398-24P
190	Tubular rivet	5320-01-020-0703	M10HM160	TM 9-2330-398-24P
191	Valve packing	5330-00-909-5702	65107F	TM 9-2330-398-24P
192	Washer	5310-01-090-0758	154-1665	TM 9-2330-398-24P
193	Wheel stud (LH wheel)	5306-01-337-7973	M10OHM103	TM 9-2330-398-24P
194	Wheel stud (RH wheel)	5306-01-337-6972	M10HM102	TM 9-2330-398-24P

## APPENDIX G LUBRICATION INSTRUCTIONS

Paragraph Number	Paragraph Title	Page Number
G-1	General .....	G-1
G-2	Specific Lubrication Instructions.....	G-1

### G-1. GENERAL.

#### NOTE

**These instructions are MANDATORY.**

- a. The M969A2 semitrailer must receive lubrication with approved lubricants at recommended intervals in order to be mission-ready at all times.
- b. The KEY lists lubricants to be used in all temperature ranges and shows the intervals.
- c. The Lubrication Chart shows lubrication points, items to be lubricated, required lubricant, and recommended intervals for lubrication. Any special lubricating instructions required for specific components are contained in the NOTE section of the chart.
- d. Recommended intervals are based on normal conditions of operation; under extreme conditions, lubricants should always be changed more frequently. When in doubt, notify your supervisor.

### G-2. SPECIFIC LUBRICATION INSTRUCTIONS.

- a. Keep all lubricants in a closed container and store in a clean, dry place away from extreme heat. Keep container covers clean and do not allow dust, dirt, and other foreign material to mix with lubricants. Keep all lubrication equipment clean and ready to use.
- b. Maintain a record of lubrication performed and report any problems noted during lubrication. Refer to DA Pam 738-750 for maintenance forms and procedures to record and report any findings.

#### **WARNING**

**Wipe excess lubricant from the area of brakeshoe linings to prevent grease from soaking the linings. If brakeshoe linings become soaked, have Unit maintenance replace them. Failure to follow this warning may cause brakes to malfunction, resulting in serious injury or death to personnel.**

- c. Keep all external parts not requiring lubrication free of lubricants. After lubrication, wipe off excess oil or grease to prevent accumulation of foreign matter.
- d. Refer to FM 9-207 for lubrication instructions in cold weather.
- e. After operation in mud, sandy, or dusty conditions, clean and inspect all points of lubrication for fouled lubricants. Change lubricants as required.

---

**G-2. SPECIFIC LUBRICATION INSTRUCTIONS.**

---

Intervals (on-condition or hard time) and related man-hour times are based on normal operation. The man-hour time specified is the time you need to do all services prescribed for a particular interval. Decrease the interval if your lubricants are contaminated or if you are operating in equipment under adverse conditions., including longer-than usual operating hours. The intervals may be extended during periods of low activity. If extended, adequate preservation precautions must be taken.

Dotted leader lines indicate that lubrication is required on both sides of the semitrailer.

**WARNING**

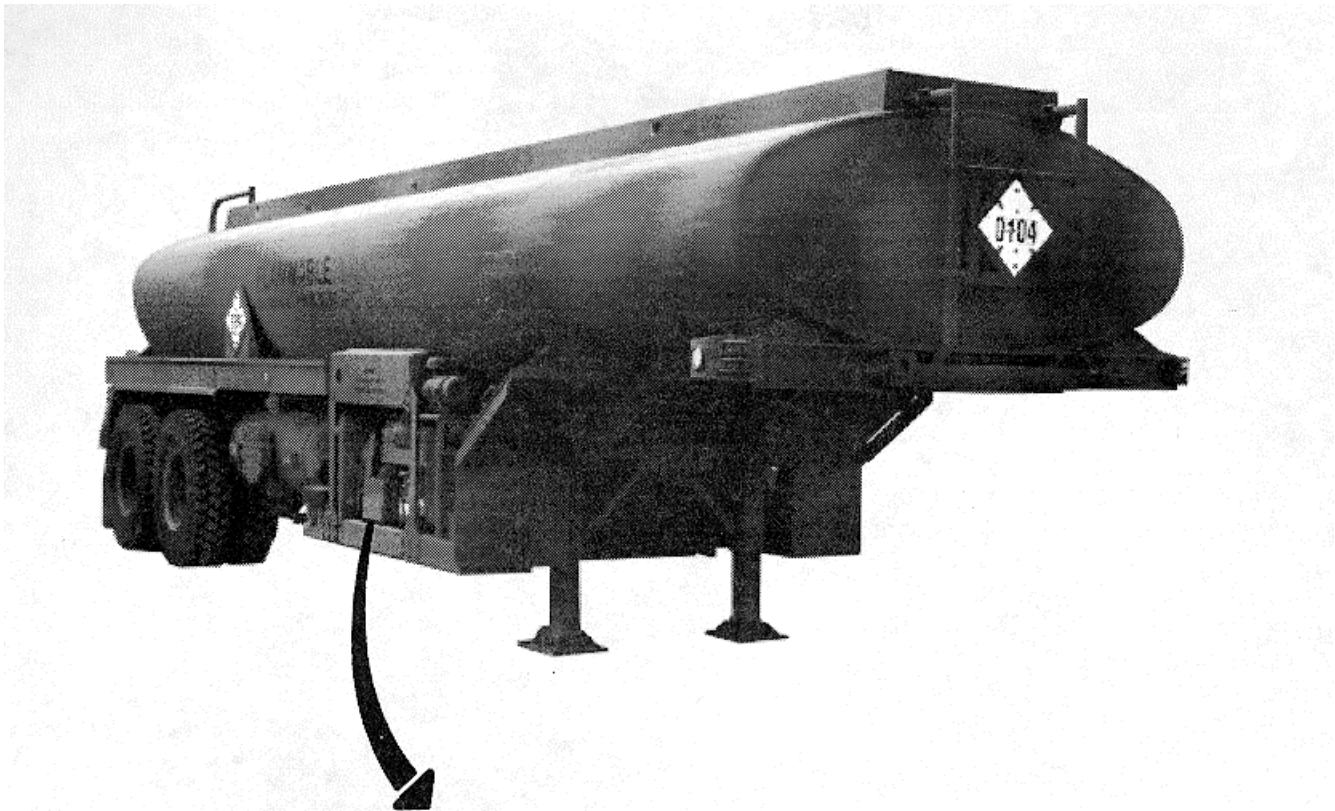
**Dry-cleaning solvent P-D-680 is toxic and flammable. Always wear protective goggles and gloves, and use only in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breathe vapors. DO NOT use near open flame or excessive heat.**

Clean all fittings and all areas around lubrication points with dry-cleaning solvent (Item 12, Appendix C) or equivalent, before lubricating equipment. After lubrications, wipe off excess oil or grease to prevent accumulation of foreign matter.

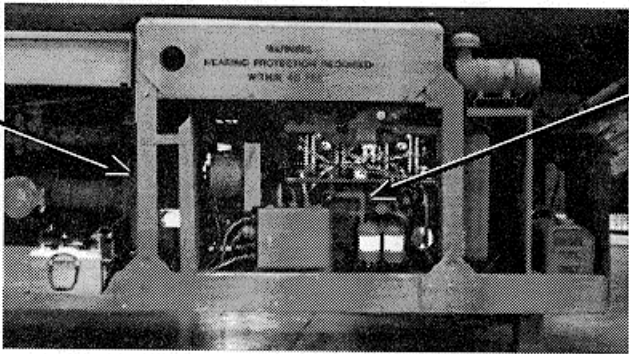
The lowest level of maintenance authorized to lubricate a point is indicated in parentheses by use of the following: (0) Unit maintenance.

LUBRICANT INTERVAL

INTERVAL LUBRICANT



OE/HDO • M  
Centrifugal Pump (O)  
(See Note 3)



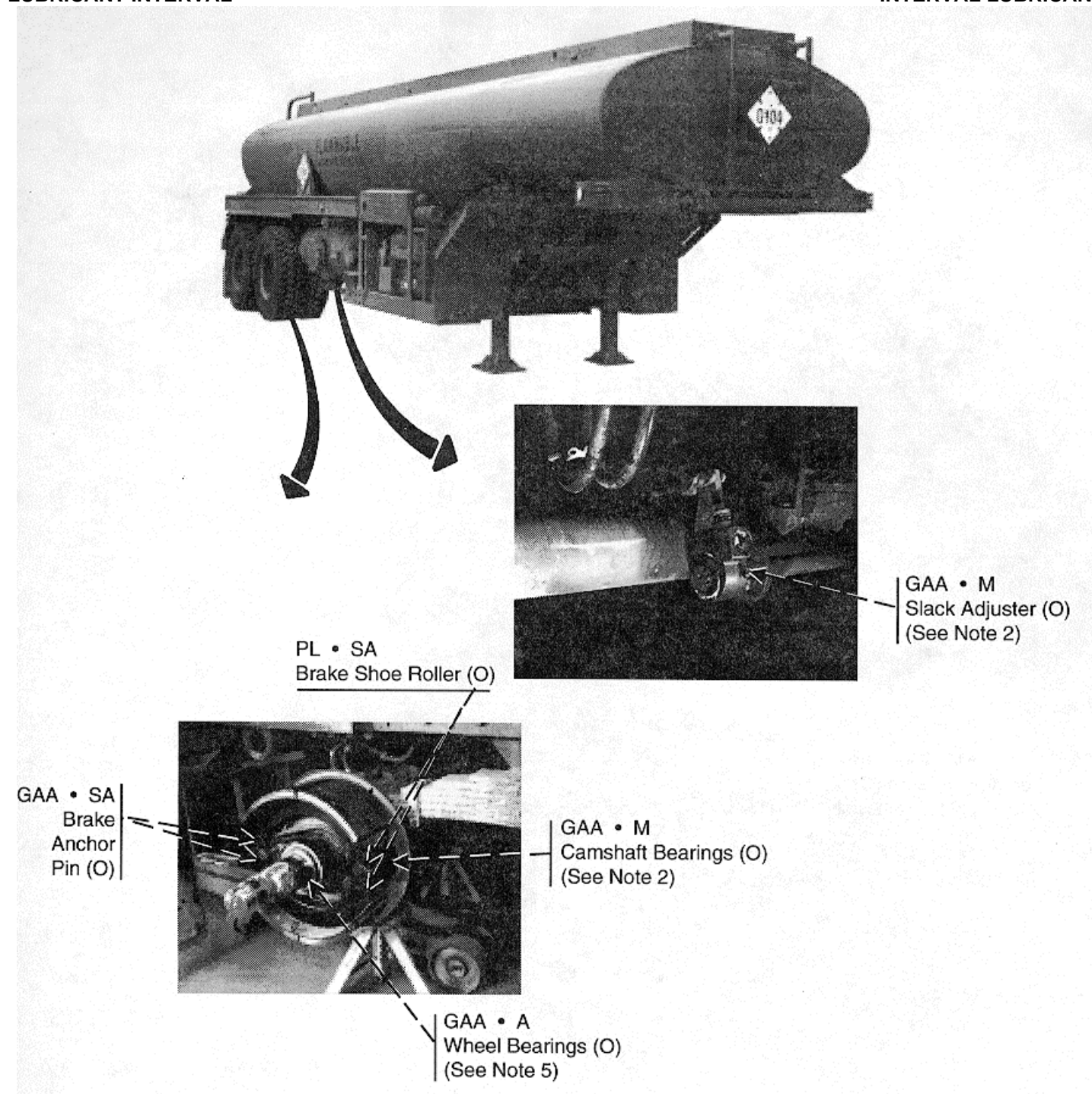
OE/HDO • H-100  
Engine Oil Drain (O)  
(See Note 4)

INTERVAL	MAN-HOURS*
M	0.4
H-100	0.4

\*The man-hour time specified is the time you need to do all the services prescribed for a particular interval.

## LUBRICANT INTERVAL

## INTERVAL LUBRICANT



INTERVAL	MAN-HOURS*
M	0.4
SA	0.6
A	1.0

\*The man-hour time specified is the time you need to do all the services prescribed for a particular interval.



TM 9-2330-398-2

LUBRICANT	EXPECTED TEMPERATURE*			INTERVALS
	Above +32°F (Above 0°C)	+40°F to -10°F (+4°C to -23°C)	0°F to -65°F (-18°C to -54°C)	
OE/HDO (MIL-L-2104D)  Lubricating-Oil, Internal Combustion Engine, Tactical Service	OE/HDO 15W40	OE/HDO 15W40	OEA (See Note 1)	M - Monthly  H100 - 100 Hours of operation  SA - Semiannual
PL (PL-S-W-L-800 or PL-M-MIL-L-3150)  Preservative Oil	PL-Medium	PL-Special	PL-Special	A - Annual
OEA (MIL-L-46167)  Lubricating Oil, Internal Combustion, Arctic  GAA (MIL-G-23827) Grease, Automotive and Artillery	All Temperatures			
All Temperatures				
* For Arctic operations, refer to FM 9-207.				

## NOTES:

- For operation of equipment in extreme cold temperatures below -10°F ( -23°C), remove lubricants prescribed in the key for temperatures above -1 0°F (-230C). Relubricate with lubricants specified in the key for temperatures below 0°F, (-180C). If OEA lubricant is required to meet the temperature changes prescribed in the key, OEA lubricant is to be used in place of OE/HDO-10 lubricant for all temperature ranges where OE/ HDO-10 lubricant is specified in the key.
- Grease lubrication fittings until grease appears. Slack adjusters and camshaft bearings are located on both sides of front and rear axles.
- Remove pipe plug from housing. Fill with oil to bottom of pipe plug hole. Wipe pipe plug clean with drycleaning solvent (Item 12, Appendix C) and dry with a rag (Item 25, Appendix C), and install pipe plug in housing.
- Remove drain plug from crankcase. Clean pipe plug with drycleaning solvent (Item 12, Appendix C) and wipe with clean rag (Item 25, Appendix C). Install pipe plug in crankcase. Refill capacity is 6 quarts (5.7 L). Add 1 pint (0.4 L) more engine oil filter has been replaced.
- Remove wheel bearings (para 2-64). Clean and repack bearings with GAA until all spaces between rollers are filled with grease and no air bubbles are present. Install wheel bearings (para 2-64).

APPENDIX H  
ELECTRICAL SYSTEM SCHEMATICS

Paragraph Number	Paragraph Title	Page Number
H-1	General .....	H-1
H-2	Electrical System Schematics.....	H-2

H-1. GENERAL

This appendix contains electrical schematic drawings of the semitrailers electrical systems and repairable wiring harnesses. Schematics for each wiring harness, cable assembly, or lead assembly are identified by part number. Figure H-1 is the chassis wiring diagram; Figure H-2 is the engine wiring schematic; Figure H-3 is the instrument panel wiring schematic; and Figure H-4 is the hose reel wiring diagram.

H-1

H-2. ELECTRICAL SYSTEM SCHEMATICS (continued).

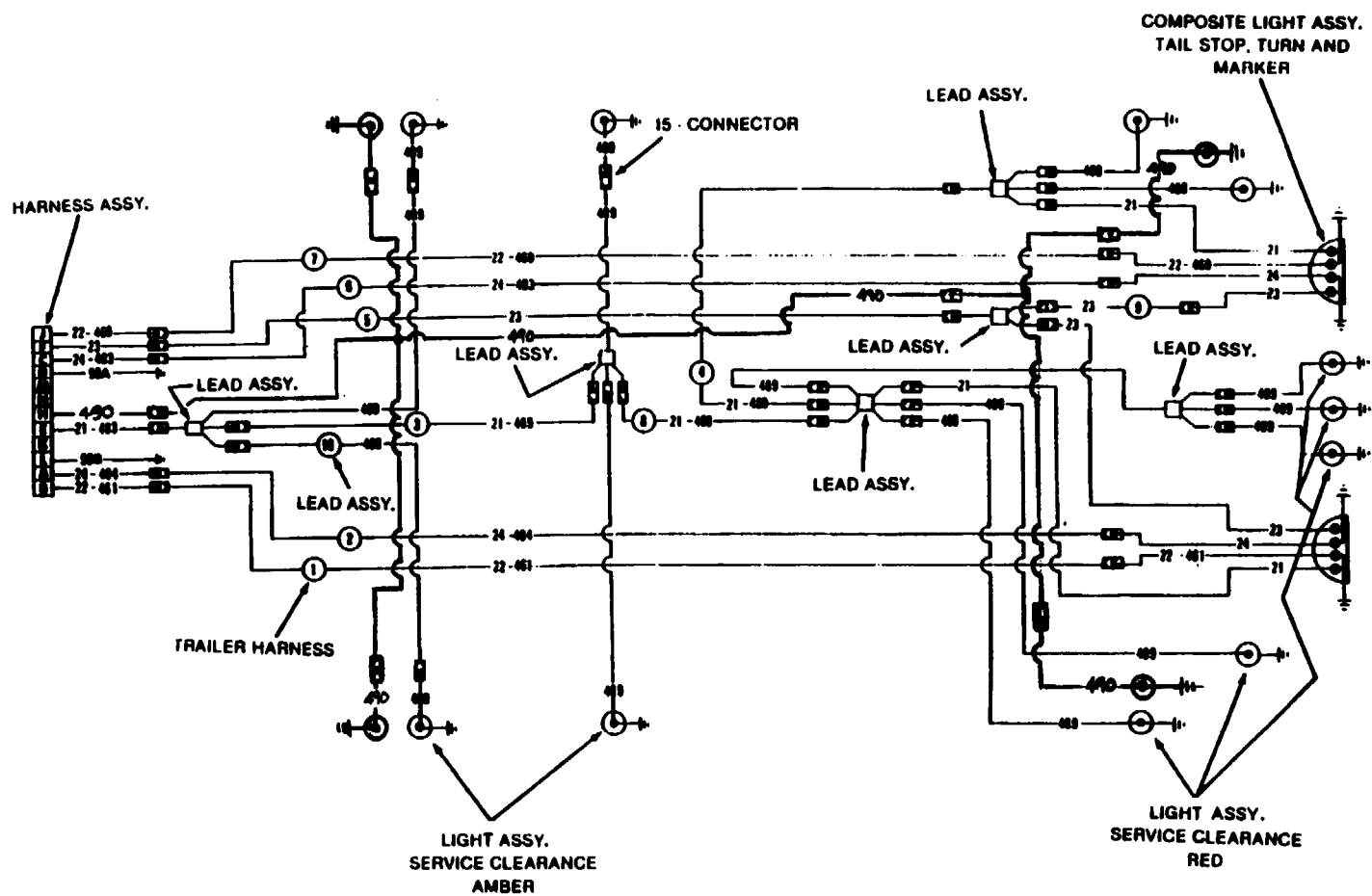


Figure H-1. CHASSIS WIRING DIAGRAM

H-2. ELECTRICAL SYSTEM SCHEMATICS (continued).

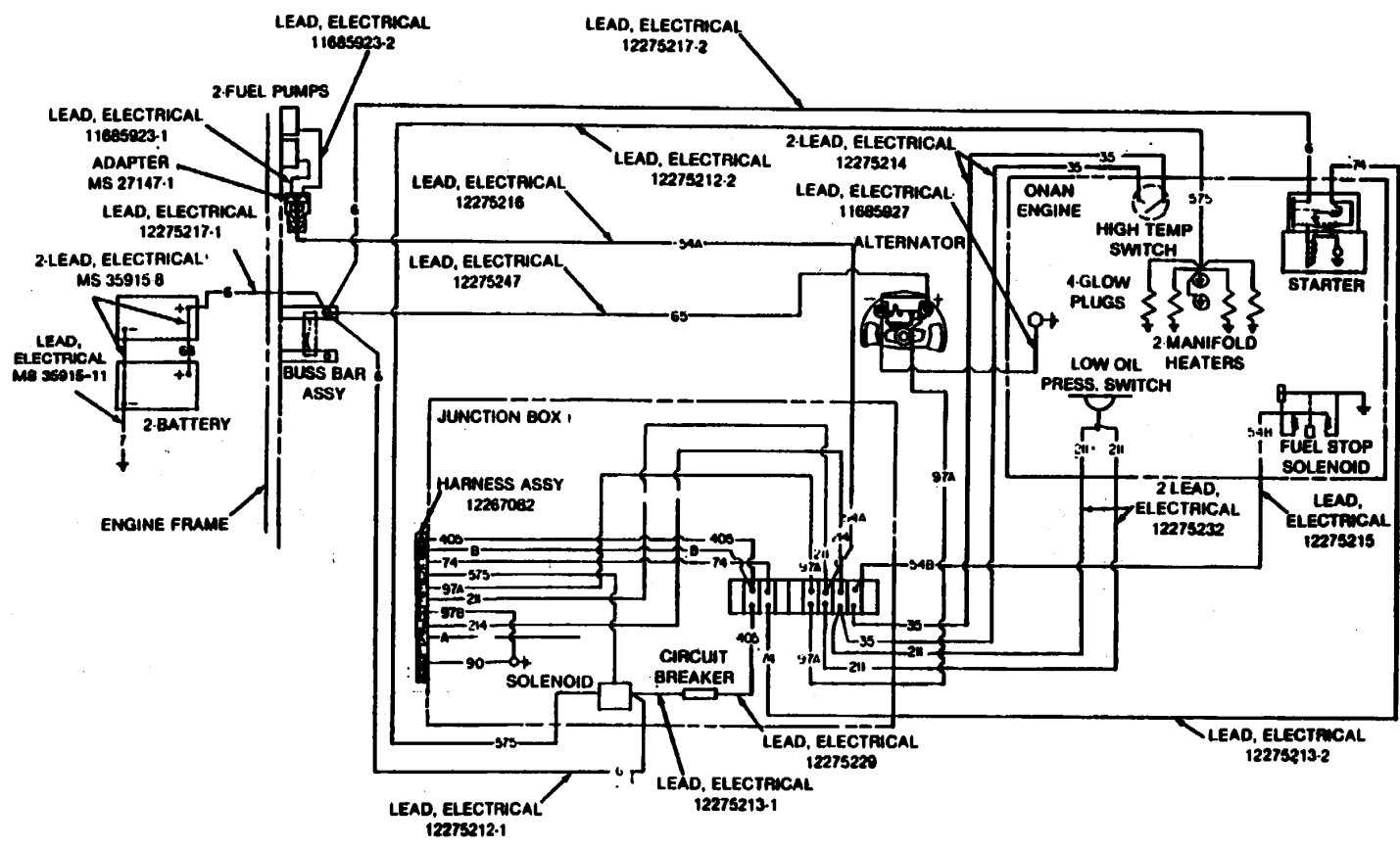


Figure H-2. ENGINE WIRING SCHEMATIC

## H-2. ELECTRICAL SYSTEM SCHEMATICS (continued).

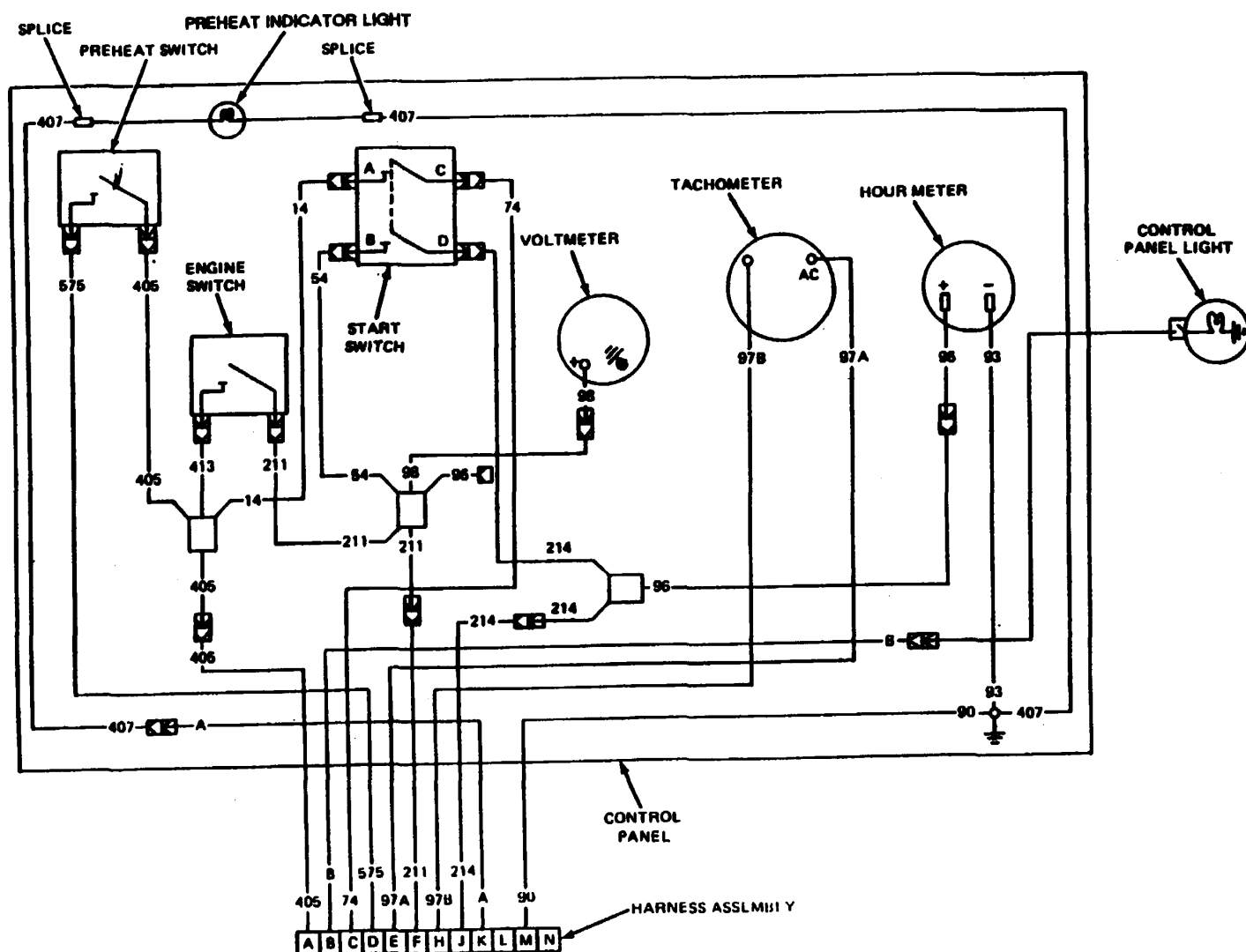


Figure H-3. INSTRUMENT PANEL WIRING SCHEMATIC



**H-5/(H-6 blank)**

## INDEX

Subject	Page
<b>A</b>	
Administrative Storage	
Care of Equipment in .....	2-301
Definition .....	2-299
Preparation for .....	2-300
Removal of Equipment from .....	2-302
Air Cleaner Restriction Indicator Replacement .....	2-199
Air Duct Hose and Pipe Coupling Replacement .....	2-200
Air Line Tubing and Fittings Replacement .....	2-142
Air Reservoir Replacement .....	2-136
Alternator, Mounting Bracket, and V-Belt Adjustment and Replacement .....	2-209
Alternator Repair .....	3-84
Automatic Drain Valve .....	1-12
Axle Replacement .....	3-30
<b>B</b>	
Battery Cable Replacement .....	2-80
Battery Replacement .....	2-78
Bogie Assembly Replacement .....	3-32
Brake-Actuating Camshaft Replacement .....	2-120
Brake Air Chamber Replacement and Test .....	2-131
Brake Air Hose Replacement .....	2-146
Brakeshoe Replacement .....	2-124
Brake System	
Air Line Tubing and Fittings Replacement .....	2-142
Air Reservoir Replacement .....	2-136
Emergency Relay Valve Replacement .....	2-135
Fail-Safe Chamber Brakes, Release of .....	2-148
Full Function Valve and Direct Linear Valve Replacement .....	2-146
Parking Brake Control Valve Replacement .....	2-140
Safety Relief Valve Replacement .....	2-138
Service and Emergency Couplings, Air Lines, and Fittings Replacement .....	2-133
Slack Adjuster Replacement .....	2-128
Branch Wiring Harness Replacement .....	2-220
Bulletins .....	A-3
<b>C</b>	
Cabinet Piping Assembly Replacement .....	2-279
Cable Assemblies, Hose Reel Cabinet .....	2-251
Camshaft, Brake-Actuating, Replacement of .....	2-121
Check Valve Assembly	
Repair .....	3-116
Replacement .....	2-289

Subject	Page
<b>C (continued)</b>	
Chemical, Biological, and Radiological (CBR) Equipment Maintenance.....	2-296
Cleaning Instructions.....	2-65
Common Tools and Equipment.....	2-1
Components, Major, Location and Description .....	1-6
Composite Stoplight, Taillight, and Blackout Light Repair.....	2-73
Control Cables Replacement .....	2-290
Control Panel Light Assembly Repair.....	2-76
Corrosion Prevention and Control .....	1-6
<b>D</b>	
Decal Replacement.....	2-69
Destruction of Army Materiel To Prevent Enemy Use.....	1-3
Direct Linear Valve Replacement.....	2-146
Discharge Manifold Replacement .....	3-106
Drain Valve	
Assembly and Tubing Replacement .....	3-100
Automatic.....	1-12
Manual .....	1-12
<b>E</b>	
Electrical Jumper from Intervehicular Cable to Road-Side Blackout Marker Light	
Lead Replacement.....	2-104
Electrical Lead Assemblies	
Electrical Intervehicular Wiring Harness Lead Assembly Replacement .....	2-108
Front Marker Lights Lead Assembly Replacement.....	2-96
Lead Assembly 12267081 Replacement .....	2-214
Lead Assembly 12275202 Replacement .....	2-94
Lead Assembly 12275204 Replacement .....	2-99
Lead Assembly 12275205 Replacement .....	2-114
Lead Assembly 12275206 Replacement .....	2-101
Lead Assembly 12275208 Replacement .....	2-106
Repair of .....	2-118
Electrical Leads	
Electrical Jumper from Intervehicular Cable to Road-Side Blackout Marker	
Light Lead Replacement .....	2-104
For Hose Reel Cabinet, Repair of.....	2-251
Electrical System Schematics .....	H-1
Electrical Troubleshooting .....	2-14
Emergency Relay Valve Replacement.....	2-135
Emergency Valve A Control Handle Repair .....	2-294
Emergency Valve and Float Piping Replacement .....	3-112
Emergency Valve Repair.....	3-120
Engine .....	1-11
Air Filter Element Replacement .....	2-197
Control Panel Repair.....	2-236
Electrical Box Repair.....	2-216



Subject	Page
<b>E (continued)</b>	
Electrical Conduit Replacement.....	2-221
Electrical Wiring Repair .....	2-213
Exhaust Manifold Replacement .....	3-77
Fuel Lines and Fittings Replacement.....	2-204
Fuel Pump Assembly Repair .....	2-194
Fuel Stop Solenoid Repair.....	3-94
Fuel Tank Replacement.....	2-201
High-Temp Thermostatic Control Switch Replacement.....	3-92
Intake Air Cleaner Replacement.....	2-196
Oil Cooler, Lines, and Fittings Replacement.....	3-56
Oil Filter Head Replacement.....	3-54
Oil Filter Replacement .....	2-222
Pump Cabinet Frame and, Replacement of .....	3-48
Shrouding Replacement .....	3-78
Splash Guard Replacement.....	2-185
Starter and Solenoid Replacement.....	2-232
Throttle and Choke Linkage Replacement .....	3-69
Engine Assembly Repair .....	4-1
Equipment	
Care of, in Administrative Storage .....	2-301
Characteristics, Capabilities, and Features .....	1-5
Common Tools and .....	2-1
Data .....	1-8
Operation .....	1-12
Preparation of, for Shipment.....	2-302
Removal of, from Administrative Storage .....	2-302
Test, Measurement, and Diagnostic .....	2-1
Equipment Improvement Recommendations .....	1-3
Exhaust Pipe Replacement .....	2-206
Expendable and Durable Items List .....	C-2

## F

Fall-Safe Chamber Brakes, Release of.....	2-148
F, B, and C Valve Assemblies	
Handwheel Replacement.....	2-286
Repair .....	3-124
Replacement.....	2-285
Field Manuals .....	A-2
Fill Gage Storage Tube Cap Replacement .....	2-168
Filter/Separator	
Description of .....	1-12
Filter Elements Replacement (M & E Industries Model) .....	2-258
Replacement.....	3-96
Fire Extinguisher Bracket Replacement .....	2-297
Float Valve Replacement .....	3-118
Flow Control Valve and Flange Assembly Replacement.....	2-266
Fluid Regulating (Relief) Valve Replacement.....	2-256
Forms .....	A-1

Subject	Page
---------	------

## F (continued)

Forms, Maintenance.....	1-2
Four-Inch Pump Repair .....	3-102
Front Blackout Marker Lights Wiring Harness Replacement . .....	2-82
Front Marker Lights Lead Assembly Replacement .....	2-96
Fuel Filter Head and Hose Assembly Replacement.....	2-230
Fuel Filters (Primary and Secondary) Replacement .....	2-228
Fuel Injection Lines and Fittings Replacement.....	3-62
Fuel Injection Nozzle Repair .....	3-64
Fuel Metering Pump Replacement.....	3-58
Full Function Valve and Direct Linear Valve Replacement .....	2-146

## G

Gage Assembly, In-Tank Liquid Level.....	2-255
Globe Valve Repair .....	3-114
Glow Plugs Replacement .....	2-224
Governor Linkage Assembly Repair.....	3-74
Grounding Rod Storage Tube Retaining Pin Replacement.....	2-169
Grounding Stud Replacement .....	2-184
G, R, P, and M Valve Assemblies Replacement .....	2-296

## H

Hazardous Materials Placard and Bracket Replacement.....	2-191
Hose Reel	
Cabinet Access Door Repair.....	3-46
Cabinet Door Bumper Replacement.....	2-175
Cabinet Door Cylinder Assembly Replacement.....	2-174
Cabinet Door Lock-Release Lever Replacement .....	2-173
Cabinet Electrical Leads and Cable Assemblies Repair.....	2-251
Cabinet Replacement .....	3-42
Conduit Assembly Replacement.....	2-253
Piping Assembly Replacement .....	3-117
1 1/4-Inch Hose Reel Assembly Replacement .....	3-38
Hoses, Tagging .....	2-67
Hose Trough Access Cover Replacement .....	2-170
How To Use This Manual .....	v
Hub and Brakedrum Assembly Replacement .....	2-152

## I

Identification and Instruction Plate Replacement .....	2-190
Illustrated List of Manufactured Items .....	D-1
Inspection Instructions.....	2-2, 2-66
Intake Manifold Replacement.....	2-226
In-Tank Liquid Level Gage Assembly Replacement .....	2-255

## Index-4

Subject	Page
<b>K</b>	
Kingpin Coupler Replacement.....	2-158
K Valve Replacement.....	2-287
<b>L</b>	
Landing Gear	
Ground Board Replacement .....	2-160
Handcrank and Drive Unit Replacement .....	2-163
Leg Replacement.....	2-161
Leaf Spring Assembly Replacement .....	3-35
Lights	
Composite Stoplight, Taillight, and Blackout Light Repair .....	2-73
Control Panel Light Assembly Repair .....	2-76
Marker Light LED and Lens Replacement.....	2-71
Marker Light Replacement.....	2-72
Lubrication Instructions .....	2-69, G-1
<b>M</b>	
Maintenance Allocation Chart.....	B-4
Maintenance Forms, Records, and Reports .....	1-2
Maintenance Instructions, General.....	2-64
Maintenance Procedures, Direct Support	
Alternator Repair.....	3-84
Axle Replacement.....	3-30
Bogie Assembly Replacement.....	3-32
Check Valve Assembly Repair.....	3-126
Discharge Manifold Replacement.....	3-116
Drain Valve Assembly and Tubing Replacement.....	3-100
Emergency Valve and Float Piping Replacement.....	3-112
Emergency Valve Repair .....	3-120
Engine and Pump Cabinet Frame Replacement .....	3-48
Engine Exhaust Manifold Replacement.....	3-77
Engine Fuel Stop Solenoid Repair.....	3-94
Engine High-Temp Thermostatic Control Switch Replacement .....	3-92
Engine Oil Cooler, Lines, and Fittings Replacement .....	3-56
Engine Oil Filter Head Replacement.....	3-54
Engine Shrouding Replacement .....	3-78
Engine Throttle and Choke Linkage Replacement .....	3-69
F, B, and C Valve Assemblies Repair.....	3-124
Filter/Separator Replacement.....	3-96
Float Valve Replacement.....	3-118
Four-Inch Pump Repair .....	3-102
Fuel Injection Lines and Fittings Replacement.....	3-62
Fuel Injection Nozzle Repair .....	3-64
Fuel Metering Pump Replacement .....	3-58
Globe Valve Repair.....	3-114

Subject	Page
<b>M (continued)</b>	
Governor Linkage Assembly Repair .....	3-74
Hose Reel Cabinet Access Door Repair.....	3-46
Hose Reel Cabinet Replacement.....	3-42
Hose Reel Piping Assembly Replacement . ....	3-117
Leaf Spring Assembly Replacement.....	3-35
Piping Frame Assembly Replacement.....	3-110
Quick Guide to Troubleshooting .....	3-2
R, P, M, and G Valve Assemblies Repair .....	3-128
Troubleshooting Chart .....	3-3
Troubleshooting Procedures .....	3-1
1 1/4-Inch Hose Reel Assembly Replacement .....	3-38
Maintenance Procedures, General .....	3-25
Maintenance Procedures, General Support.....	4-1
Maintenance Procedures, Specific.....	3-27
Maintenance Procedures, Unit	
Air Cleaner Restriction Indicator Replacement .....	2-199
Air Duct Hose and Pipe Coupling Replacement .....	2-200
Alternator, Mounting Bracket, and V-Belt Adjustment and Replacement .....	2-209
Brake System.....	2-120
Branch Wiring Harness Replacement . ....	2-220
Cabinet Piping Assembly Replacement.....	2-279
Check Valve Assembly Replacement.....	2-289
Control Cables Replacement.....	2-290
Decontamination Apparatus Bracket Replacement.....	2-298
Electrical Lead Assembly 12267081 Replacement.....	2-214
Electrical System .....	2-70
Emergency Valve A Control Handle Repair.....	2-294
Engine Air Filter Element Replacement.....	2-197
Engine Control Panel Repair .....	2-236
Engine Electrical Box Repair .....	2-216
Engine Electrical Conduit Replacement.....	2-221
Engine Electrical Wiring Repair .....	2-213
Engine Fuel Lines and Fittings Replacement .....	2-204
Engine Fuel Pump Assembly Repair .....	2-194
Engine Fuel Tank Replacement . ....	2-101
Engine Intake Air Cleaner Replacement.....	2-196
Engine Oil Filter Replacement .....	2-222
Engine Splash Guard Replacement.....	2-185
Engine Starter and Solenoid Replacement.....	2-232
F, B, and C Valve Assemblies Handwheel Replacement . ....	2-286
Fill Gage Storage Tube Cap Replacement.....	2-168
Filter Separator Filter Elements Replacement.....	2-258
Fire Extinguisher Bracket Replacement . ....	2-297
Flow Control Valve and Flange Assembly Replacement.....	2-266
Fluid Regulating (Relief) Valve Replacement .....	2-256
Fuel Filter Head and Hose Assembly Replacement .....	2-230
Fuel Filters (Primary and Secondary) Replacement .....	2-228
Glow Plugs Replacement.....	2-224
Grounding Rod Storage Tube Retaining Pin Replacement . ....	2-169
Grounding Stud Replacement.....	2-184

**Subject****Page****M (continued)**

Hazardous Materials Placard and Bracket Replacement .....	2-191
Hose Reel Cabinet Door Bumper Replacement .....	2-175
Hose Reel Cabinet Door Cylinder Assembly Replacement .....	2-174
Km Hose Reel Cabinet Door Lock-Release Lever Replacement .....	2-173
Hose Reel Cabinet Electrical Leads and Cable Assemblies Repair .....	2-251
Hose Reel Conduit Assembly Replacement .....	2-253
Hose Trough Access Cover Replacement .....	2-170
Hub and Brakedrum Assembly Replacement .....	2-152
Identification and Instruction Plate Replacement .....	2-190
Intake Manifold Replacement .....	2-226
In-Tank Liquid Level Gage Assembly Replacement .....	2-255
Kingpin Coupler Replacement .....	2-158
Landing Gear Ground Board Replacement .....	2-160
Landing Gear Handcrank and Drive Unit Replacement .....	2-163
Landing Gear Leg Replacement .....	2-161
Manhole Cover Assembly Repair .....	2-178
Manifold Valve Assembly Repair .....	2-274
Mudflap Assembly Replacement .....	2-167
Muffler and Exhaust Pipe Replacement .....	2-206
Piping Control Assembly Replacement .....	2-278
Precheck Control Tubing Assembly Replacement .....	2-282
Pump Tubing Assembly Replacement .....	2-271
Reflector Replacement .....	2-188
Spare Tire Lifting Device and Drain Pipe Replacement .....	2-180
K-m-j > Spare Tire Lifting Device Replacement .....	2-166
Static Reel and Electrical Clip Replacement .....	2-172
Tire and Tube Repair .....	2-157
Tire and Wheel Assembly Replacement .....	2-150
Tool Box Assembly Repair .....	2-176
Valve and Valve Assemblies Replacement .....	2-285, 2-287, 2-296
Vapor Recovery System Replacement .....	2-247
Vent Cap Replacement .....	2-186
Volumetric Meter Assembly Replacement .....	2-264
Wheel Studs Replacement .....	2-156
1 1/4-Inch Hose Reel Assembly Replacement .....	3-38
Main Trailer Wiring Harness Replacement .....	2-87
Major Components, Location and Description .....	1-6
Mandatory Replacement Parts List .....	F-2
Manhole Cover Assembly Repair .....	2-178
Manifold Valve Assembly Repair .....	2-274
Manual Drain Valve .....	1-12
Manual, This	
How To Use .....	v
Scope .....	1-1
Marker Light LED and Lens Replacement .....	2-71
m Marker Light Replacement .....	2-72
Materiel, Destruction of .....	1-3
Monitor Fuses .....	1-12
Mudflap Assembly Replacement .....	2-167
Muffler Replacement .....	2-206

Subject	Page
<b>N</b>	
Nomenclature Cross-Reference .....	1-3
Nomenclature, Official .....	1-3
<b>O</b>	
Operation, Principles of .....	1-11
<b>P</b>	
Painting and Stenciling .....	2-67
Pamphlets and Bulletins .....	A-3
Parking Brake Control Valve Replacement .....	2-140
Piping Control Assembly Replacement .....	2-278
Piping Frame Assembly Replacement .....	3-110
Pneumatic Leakage Test .....	3-29
Precheck Control Tubing Assembly Replacement .....	2-282
Preventive Maintenance Checks and Services (PMCS)	
Unit .....	2-4
Unit, General Procedures .....	2-4
Unit, PMCS Table .....	2-6
Unit, Specific Procedures .....	2-5
Publications .....	A-3
Pump .....	1-11
Pump, Four-Inch .....	3-102
Pump Tubing Assembly Replacement .....	2-271
<b>Q</b>	
Quality Assurance .....	1-3
Quick Guide to Troubleshooting	
Direct Support .....	3-1
Unit 2-16	
<b>R</b>	
Records, Maintenance .....	1-2
References .....	A-1
Reflector Replacement .....	2-188
Regulations .....	A-1
Repair Instructions .....	2-67
Repair Parts .....	2-1
Repairs, Reporting of .....	2-4
Reporting Repairs .....	2-4
Reports, Maintenance .....	1-2
R, P, M, and G Valve Assemblies Repair .....	3-128

Subject	Page
<b>S</b>	
Safety, Care, and Handling .....	1-4
Safety Relief Valve Replacement.....	2-138
Safety Summary .....	viii
Safety, Work.....	2-65
Schematics .....	H-1
Service and Emergency Couplings, Air Lines, and Fittings Replacement .....	2-133
Service Intervals .....	2-4
Service upon Receipt . .....	2-2
Servicing Instructions .....	2-2
Shipment, Preparation for .....	1-3
Shipment, Preparation of Equipment for .....	2-302
Slack Adjuster Replacement .....	2-128
Spare Tire Lifting Device and Drain Pipe Replacement .....	2-180
Spare Tire Lifting Device Replacement.....	2-166
Special Tools .....	2-1
Static Reel and Electrical Clip Replacement .....	2-172
Stenciling and Painting .....	2-67
Storage	
Administrative, Care of Equipment in .....	2-299
Administrative, Definition of .....	2-299
Administrative, Preparation for.....	2-300
Administrative, Removal of Equipment from .....	2-302
Preparation for . .....	1-3
Support Equipment.....	2-1
<b>T</b>	
Tagging Hoses and Tubes . .....	2-67
Technical Manuals .....	A-2
Test, Measurement, and Diagnostic Equipment .....	2-1
Threaded Fasteners, Torque Values for .....	E-1
Tire and Tube Repair .....	2-157
Tire and Wheel Assembly Replacement .....	2-150
Tool Box Assembly Repair . .....	2-176
Tools	
Common .....	2-1
Special .....	2-1
Tool and Test Equipment Requirements.....	B-22
Torque Values .....	2-69, E-1
Troubleshooting Procedures	
Direct Support . .....	3-1
Direct Support, Chart . .....	3-3
Direct Support, Quick Guide to . .....	3-2
Electrical .....	2-14
Unit, Chart.....	2-18
Unit, Quick Guide to.....	2-16
Tubes, Tagging .....	2-67

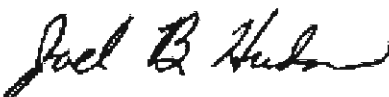
Subject	Page
<b>V</b>	
Valves	
Check Valve Assembly Replacement .....	2-289
Emergency Valve A Control Handle Repair .....	2-294
Emergency Valve Repair .....	3-120
F, B, and C Valve Assemblies Handwheel Replacement .....	2-286
F, B, and C Valve Assemblies Replacement .....	2-285
Float Valve Replacement .....	3-118
Fluid Regulating (Relief), Replacement of .....	2-256
Full Function Valve and Direct Linear Valve Replacement .....	2-146
G, R, P, and M Valve Assemblies Replacement .....	2-296
K Valve Replacement .....	2-287
R, P, M, and G Valve Assemblies Repair .....	3-128
Vapor Recovery System	
Description .....	1-13
Replacement .....	2-247
Vent Cap Replacement .....	2-186
Volumetric Meter Assembly Replacement .....	2-264

## W

Warning Summary .....	a
Warranty Information .....	1-4
Wheel Studs Replacement .....	2-156
Wiring Harness and Lead Assembly Repair .....	2-118
Wiring Harness Components Replacement .....	2-116
Wiring Harnesses	
Branch, Replacement of .....	2-220
Components Replacement .....	2-116
Front Blackout Marker Lights Wiring Harness Replacement .....	2-82
Main Trailer Wiring Harness Replacement .....	2-87
Repair of .....	2-118
Wiring Harness 12356095 Replacement .....	2-112
Work Safety .....	2-65



By Order of the Secretary of the Army:

Official: 

**JOEL B. HUDSON**

*Administrative Assistant to the  
Secretary of the Army  
07407*

**DENNIS J. REIMER**  
*General, United States Army  
Chief of Staff*

Distribution:

To be distribution in accordance with DA Form 12-39-E, Block 1021 requirements for TM 9-2330-398-24.

☆U.S. GOVERNMENT PRINTING OFFICE: 1996 - 746-014/4469

# RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS



## SOMETHING WRONG WITH THIS PUBLICATION?

THEN... JOT DOWN THE DOPE ABOUT IT ON THIS FORM, CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER

PUBLICATION DATE

PUBLICATION TITLE

BE EXACT... PIN-POINT WHERE IT IS

PAGE  
NO.

PARA-  
GRAPH

FIGURE  
NO.

TABLE  
NO.

IN THIS SPACE TELL WHAT IS WRONG  
AND WHAT SHOULD BE DONE ABOUT IT:

TEAR ALONG PERFORATED LINE

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

SIGN HERE:

DA FORM 2028-2  
1 JUL 79

PREVIOUS EDITIONS  
ARE OBSOLETE.

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 = 0.01 Meters = 0.3937 Inches  
 1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches  
 1 Kilometer = 1000 Meters = 0.621 Miles

### WEIGHTS

1 Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces  
 1 Kilogram = 1000 Grams = 2.2 Lb  
 1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

### LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces  
 1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

### SQUARE MEASURE

1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches  
 1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet  
 1 Sq Kilometer = 1,000,000 Sq Meters = 0.386 Sq Miles

### CUBIC MEASURE

1 Cu Centimeter = 1000 Cu Millimeters = 0.06 Cu Inches  
 1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

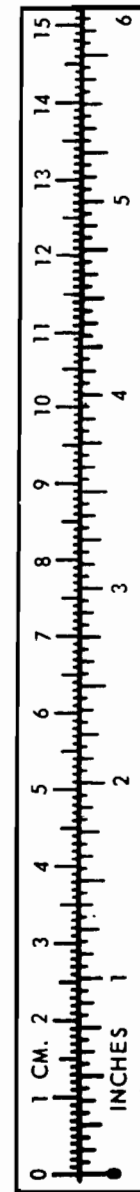
### TEMPERATURE

$5.9^{\circ}\text{F} - 32 = ^{\circ}\text{C}$   
 $212^{\circ}\text{Fahrenheit}$  is equivalent to  $100^{\circ}\text{Celsius}$   
 $90^{\circ}\text{Fahrenheit}$  is equivalent to  $32.2^{\circ}\text{Celsius}$   
 $32^{\circ}\text{Fahrenheit}$  is equivalent to  $0^{\circ}\text{Celsius}$   
 $9.5^{\circ}\text{C} + 32 = ^{\circ}\text{F}$

### APPROXIMATE CONVERSION FACTORS

<u>TO CHANGE</u>	<u>TO</u>	<u>MULTIPLY BY</u>
Inches . . . . .	Centimeters . . . . .	2.540
Feet . . . . .	Meters . . . . .	0.305
Yards . . . . .	Meters . . . . .	0.914
Miles . . . . .	Kilometers . . . . .	1.609
Square Inches . . . . .	Square Centimeters . . . . .	6.451
Square Feet . . . . .	Square Meters . . . . .	0.093
Square Yards . . . . .	Square Meters . . . . .	0.836
Square Miles . . . . .	Square Kilometers . . . . .	2.590
Acres . . . . .	Square Hectometers . . . . .	0.405
Cubic Feet . . . . .	Cubic Meters . . . . .	0.028
Cubic Yards . . . . .	Cubic Meters . . . . .	0.765
Fluid Ounces . . . . .	Milliliters . . . . .	29.573
Pints . . . . .	Liters . . . . .	0.473
Quarts . . . . .	Liters . . . . .	0.946
Gallons . . . . .	Liters . . . . .	3.785
Ounces . . . . .	Grams . . . . .	28.349
Pounds . . . . .	Kilograms . . . . .	0.454
Short Tons . . . . .	Metric Tons . . . . .	0.907
Pound-Feet . . . . .	Newton-Meters . . . . .	1.356
Pounds per Square Inch . . . . .	Kilopascals . . . . .	6.895
Miles per Gallon . . . . .	Kilometers per Liter . . . . .	0.425
Miles per Hour . . . . .	Kilometers per Hour . . . . .	1.609

<u>TO CHANGE</u>	<u>TO</u>	<u>MULTIPLY BY</u>
Centimeters . . . . .	Inches . . . . .	0.394
Meters . . . . .	Feet . . . . .	3.280
Meters . . . . .	Yards . . . . .	1.094
Kilometers . . . . .	Miles . . . . .	0.621
Square Centimeters . . . . .	Square Inches . . . . .	0.155
Square Meters . . . . .	Square Feet . . . . .	10.764
Square Meters . . . . .	Square Yards . . . . .	1.196
Square Kilometers . . . . .	Square Miles . . . . .	0.386
Square Hectometers . . . . .	Acres . . . . .	2.471
Cubic Meters . . . . .	Cubic Feet . . . . .	35.315
Cubic Meters . . . . .	Cubic Yards . . . . .	1.308
Milliliters . . . . .	Fluid Ounces . . . . .	0.034
Liters . . . . .	Pints . . . . .	2.113
Liters . . . . .	Quarts . . . . .	1.057
Liters . . . . .	Gallons . . . . .	0.264
Grams . . . . .	Ounces . . . . .	0.035
Kilograms . . . . .	Pounds . . . . .	2.205
Metric Tons . . . . .	Short Tons . . . . .	1.102
Newton-Meters . . . . .	Pound-Feet . . . . .	0.738
Kilopascals . . . . .	Pounds per Square Inch . . . . .	0.145
Kilometers per Liter . . . . .	Miles per Gallon . . . . .	2.354
Kilometers per Hour . . . . .	Miles per Hour . . . . .	0.621



TA089991

**PIN: 074731-000**