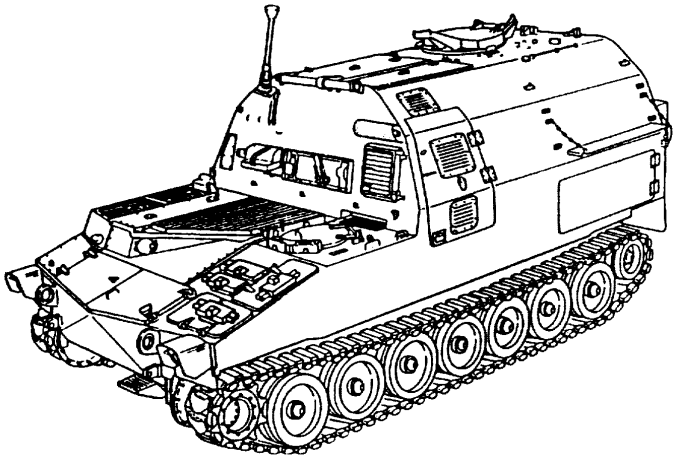
TECHNICAL MANUAL



DIRECT SUPPORT AND GENERAL
SUPPORT MAINTENANCE
FOR

CARRIER, AMMUNITION
TRACKED
M992A1
(NSN 2350-01-352-3021)
EIC: AE6

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HEADQUARTERS, DEPARTMENT OF THE ARMY
OCTOBER 1993

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CHANGE
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., *6 June 1997*

TECHNICAL MANUAL

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE FOR CARRIER, AMMUNITION, TRACKED M992A1 (NSN 2350-01-352-3021) EIC: AE6

TM 9-2350-287-34, dated 22 October 1993, is changed as follows:
1. Remove old pages and insert new pages as indicated below.
2. New, changed, or deleted material is indicated by a vertical bar in the margin of the page or by a deletion notice.
3. Added pages or changed page numbers are indicated by a vertical bar by the page number.

Remove Pages	Insert Pages
i and ii	i and ii
1-3 through 1-10	1-3 through 1-10
1-13 through 1-18	1-13 through 1- 18
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A-1 and A-2	A-1 and A-2
B-1 through B-4 (blank)	B-1 through B-4 (blank)
D-1 through D-4 (blank)	D-1 through D-4 (blank)
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H-1 through H-4	H-1 through H-4
Index 1 through Index 4	Index 1 through Index 4
Front Cover	Front Cover

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General, United States Army
Chief of Staff

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JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
03589

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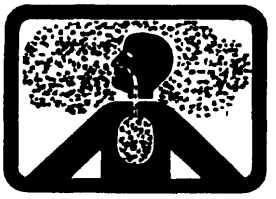
WARNING

CARBON MONOXIDE HAZARD



CARBON MONOXIDE (EXHAUST GAS) CAN KILL YOU

- Carbon monoxide is a colorless, odorless, DEADLY POISONOUS gas and when breathed deprives the body of oxygen and causes SUFFOCATION. Breathing air with carbon monoxide produces headache, dizziness, loss of muscular control, a sleepy feeling, and coma. Permanent BRAIN DAMAGE or DEATH can result from serious exposure.

- The following precautions MUST be followed to ensure personnel are safe whenever personnel heater, main engine, or auxiliary engine is operated for any purpose.

  – DO NOT operate personnel heater or engine of vehicle in enclosed area without adequate ventilation.

  – DO NOT idle engine for long periods without ventilator blower operating. If tactical situation permits, open hatches.

  – DO NOT drive any vehicle with inspection plates, cover plates, or engine compartment doors removed unless necessary for maintenance purposes.

  – NEVER sleep in a vehicle when the heater is operating or the engine is idling.

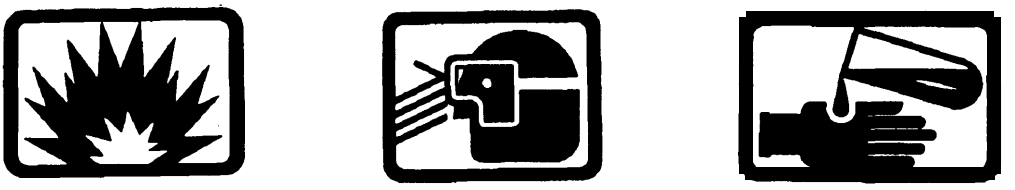
  – BE ALERT at all times during vehicle operation for exhaust odors and exposure symptoms. If either are present, IMMEDIATELY EVACUATE AND VENTILATE the area. Affected personnel treatment shall be: expose to fresh air; keep warm; DO NOT PERMIT PHYSICAL EXERCISE; if necessary, give artificial respiration as described in FM 21-11 and get medical attention.

  – BE AWARE: neither the gas particulate filter unit nor field protection mask for nuclear-biological-chemical protection will protect you from carbon monoxide poisoning.

THE BEST DEFENSE AGAINST CARBON MONOXIDE POISONING IS GOOD VENTILATION

WARNING

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 spaced.

- 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

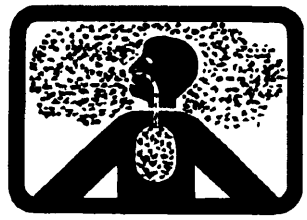
- Remove or disconnect batteries or turn off master battery disconnect switch prior to performing maintenance in immediate battery area or working on electrical system. Such disconnections prevent electrical shock to personnel or equipment.

- 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 rings, identification tags, bracelets, etc. 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

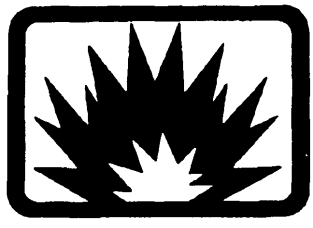
CHEMICAL AGENT RESISTANT COATING (CARC) HAZARD



Unusable chemical agent resistant coating (CARC) mixtures are onsidered hazardous waste and will require disposal in accordance with Federal, state, DOD, DA, and local installation hazardous waste regulations. Consult the installation environmental office for proper disposal guidance. Mixed CARC is extremely flammable. Use only in well-ventilated areas. Keep away from open flames, sparks, and other ignition sources.

WARNING

FUEL HANDLING HAZARDS



l Fuel is very flammable and can explode easily. To avoid serious injury or death:

Keep fuel away from open flame or any spark (ignition source).

Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.

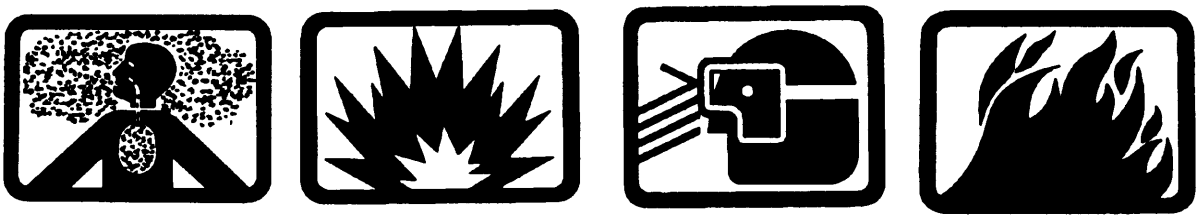
– Do not work on fuel system when engine is hot; fuel can be ignited by a hot engine.

– Clean fuel tank to purge any flammable liquid or vapors before welding, grinding, or using any heat-producing device near the fuel tank.

– Post signs that read “NO SMOKING WITHIN 50 FEET” when working with open fuel, fuel lines, or fuel tanks.

WARNING

SOLVENT P-D-680 HAZARDS



- Drycleaning solvent (P-D480) is TOXIC and flammable. Wear protective goggles and gloves; use only in 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 solvent; the flash point for type I drycleaning solvent is 100°F (38°C) and for type II it is 138°F (50°C). Failure to do so may result in injury or death to personnel.

- If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush eyes with water and get immediate medical attention.

WARNING

NUCLEAR, BIOLOGICAL, OR CHEMICAL (NBC) EXPOSURE AND VEHICLE AIR FILTERS 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 (FM 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 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 filters 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 (DRMO).

NUCLEAR, BIOLOGICAL, OR CHEMICAL (NBC) EXPOSURE AND VEHICLE AIR FILTERS HAZARDS (continued)

- Filters are completely safe to handle and use if they are not damaged in such away 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 self-sealing plastic bag; turn into Hazardous Waste Management Office or DRMO.

- Disposal of hazardous waste is restricted by law. Violation is subject to criminal penalties.

WARNING

AUTOMATIC FIRE EXTINGUISHING SYSTEM (AFES) HAZARDS

Any automatic fire extinguishing system (AFES) component in need of maintenance or repair is prone to accidental discharge. Accidental discharge can lead to frostbite or other injury. Small parts or tools become dangerous projectiles when propelled by HaIon at 750 psi (5171 kPa).

WARNING

HEAVY PARTS HAZARDS

- Many parts of the M992A1, such as doors, conveyor sections, and seats, are heavy and require more than one person to lift safely. Have one or two assistants help lift heavy components. Failure to do this can result is severe injury to personnel.

- Personnel must stand clear during lifting operations. A swinging or shifting load can cause injury or death.

WARNING

HOT PARTS HAZARD

Do not work on exhaust system, cooling system, powerpack, suspension, or hydraulic system until components are cool to the touch. The powerpack and the cooling and hydraulic systems contain fluids that can cause severe burns.

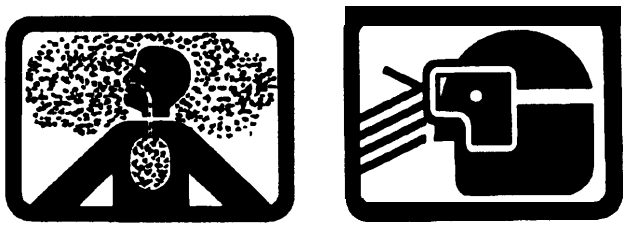
WARNING

HYDRAULIC PRESSURE HAZARD

High-pressure hydraulics (oil under 1500 psi [10,342 kPa] pressure) operate this equipment. Refer to vehicle operator and maintenance manuals for hydraulic oil pressure. Never disconnect any hydraulic line or fitting without first dropping pressure to zero. A high-pressure oil stream can pierce body and cause severe injury to personnel.

WARNING

ADHESIVE HAZARD



Adhesive causes immediate bonding on contact with eyes, skin, or clothing and also gives off harmful vapors. Wear protective goggles and use in well-ventilated area. If adhesive gets in eyes, try to keep eyes open; flush eyes with water for 15 minutes and get immediate medical attention.

TECHNICAL MANUAL

NO. 9-2350-287-34

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 22 October 1993

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL FOR CARRIER, AMMUNITION, TRACKED M992A1 (NSN 2350-01-352-3021)

EIC: AE6

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or 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 Commercial (810) 574-6323
* TACOM's e-mail address is tacom-tech-pubs@cc.tacom.army.mil

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HOW TO USE THIS MANUAL

SCOPE.

This technical manual contains Direct Support and General Support maintenance procedures for the M992A1 Carrier, Ammunition, Tracked. Chapter 1 contains general information; Chapter 2 provides general instructions and guidance for performing required maintenance functions and describes requirements for common tools and equipment, special tools and support equipment, and repair park; and Chapters 3 through 15 describe and illustrate maintenance procedures for various systems and components. Appendixes, a subject index, and electrical system and hydraulic system schematics are also contained in the manual.

INDEXING.

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

- Cover index. Lists chapter titles 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.
- Chapter indexes. Each chapter starts with a numerical listing of all procedure paragraphs in that chapter.
- Index. The alphabetically arranged subject index starts on page Index 1.

MAINTENANCE TEXT AND ILLUSTRATIONS (CHAPTERS 3 THROUGH 15).

Each chapter begins with a “General” paragraph that describes the system(s) to be covered.

Each procedures 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 D.
- 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 may be found in Appendix B. Mandatory replacement parts are listed in Appendix H.
- If more than one person is required to perform the procedure, the number is specified under the heading “Personnel Required.”
- 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 may be required to perform the procedure is listed under the heading “References.”

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

TEXT AND ILLUSTRATIONS.

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

Illustrations are numbered clockwise, beginning at the II o'clock position. Because an illustration is keyed to the text, parts that are removed sequentially may not have sequential numbers. For example:

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

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 two sample problems illustrate ways to use the manual efficiently.

1. How do 1 replace the radiator fan shroud?

   - Look in the subject index for "radiator fan shroud replacement" and turn to the appropriate page.

2. An equipment condition for engine mount repair (para 3-5) is "Lower fuel tank removed (para 4-4)." How do I find out what page paragraph 4-4 begins on?

   Look in the chapter index for Chapter 4 until you find paragraph 4-4, Lower Fuel Tank Replacement; then turn to the appropriate page.

IMPORTANT.

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

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

Notes may precede or follow the steps to which they pertain, depending on what makes the most sense. Notes give information meant to make performing the procedure easier.

REPAIR PARTS AND SPECIAL TOOLS.

For repair parts and special tools used on this vehicle, refer to TM 9-2350-287-24P.

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 DOD property. Portions of this summary may be 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 which may require using chemicals, solvents, paints, or other commercially availabie material that may pose a health or safety hazard. Refer to the “Materiais/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 these 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 PRECAUTIONS

- Always use the same fastener part number (or equivalent) when replacing fasteners. Do not risk using a fastener of less quality; do not mix metric and inch (customary) fasteners. Mismatched or incorrect fasteners can resuit 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 personnel will be used, 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 NICP/commodity command.

GENERAL SAFETY PRECAUTIONS (continued)

- Hearing protection is required for all personnel working in 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 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 cause 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 to exposed rotating parts. Tools, clothing, or hands can get caught and cause serious injury to personnel.

HAZARDOUS MATERIALS WARNINGS

- 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 with water for 15 minutes and get immediate medical attention.
- Adhesive sealant MIL-S-46163 (Loctite) can damage your eyes. Wear safety goggles/glasses when using; avoid contact with eyes. If sealant contacts eyes, flush eyes with water and get immediate medical attention.

HAZARDOUS MATERIALS WARNINGS (continued)

- Chemical agent resistant coating (CARC) paint contains isocyanyte (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 sensation 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 high-efficiency air purifying respirators in use.

  - 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 the solvent; the flashpoint for type 1 is 100°F (38°C) and for type II it is 138°F (50°C). Failure to do so may result in injury or death to personnel.

- If personnel become dizzy while using cleaning solvent, immediately get fresh air and medical help. If solvent contacts skin or clothes, flush with cold water. If solvent contacts eyes, immediately flush with water and get immediate medical attention.

CHAPTER 1
INTRODUCTION

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1-1. SCOPE.

a. Type of manual: Direct and General maintenance.
b. Model number and equipment name: M992A1 Carrier, Ammunition, Tracked.
c. Purpose of equipment: Provide overland transport of 155-millimeter projectiles and propelling charges from ammunition supply points to self-propelled howitzers in the field.

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, The Army Maintenance Management System; DA Pam 738-751, Functional Users Manual for the Army Maintenance for the Army Maintenance Management System-Aviation (TAMMS-A); or AR 700-138, Army Logistics Readiness and Sustainability.

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

Refer to TM 750-244-6 for procedures on destruction of military vehicles. Destruction of munitions is covered in TM 750-244-5-1 (conventional ammunition) and TM 43-0002-33 (improved conventional munitions).

1-4. PREPARATION FOR STORAGE OR SHIPMENT.

Refer to TM 9-2350-287-20-1 for procedures on preparation of the M992A1 for storage or shipment.

1-5. QUALITY ASSURANCE.

No specific quality assurance manual pertains to the M992A1.

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 Quality Deficiency Data. Mail your completed form directly to:

Commander
U.S. Army Tank-Automotive Command
ATTN: AMSTA-QRT
Warren, MI 48397-5000

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

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 M992A1.

A few tools and hull 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	Official Nomenclature
Adapter	Straight pipe adapter
Bracket	Rotating eye bracket
Front hull slope plate	Armor plate
Hook	Strap fastener loop
Hose or hose assembly	Hose assembly, nonmetallic
Lockwire	Nonelectrical wire
Master relay	Relay and housing assembly
Side hull slope plate	Door support plate
Spring	Adjustable door spring
Tube	Metallic bent tube
Wiring harness	Branched wiring harness

1-7. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRs).

If your M992A1 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 M992A1 is 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).

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

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. Use of key words such as "corrosion," "rust," "deterioration," and "cracking" will ensure that the information is identified as a CPC problem.

The form should be submitted to the address specified in DA Pam 738-750.

Section II. EQUIPMENT DESCRIPTION AND DATA

Paragraph Number	Paragraph Title	Page Number
1-11	Equipment Characteristics, Capabilities, and Features	1-4
1-12	Location and Description of Major Components	1-5
1-13	Differences Between Models	1-11
1-14	Equipment Data	1-13
1-15	Equipment Configuration	1-16

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

Purpose

The M992A1 is a field artillery ammunition support vehicle comparable in speed, mobility, and survivability to current field artillery weapons (M1 09A6 self-propelled howitzer class).

Capabilities

This full-tracked, self-propelled, diesel-powered vehicle is highly mobile and maneuverable. It is capable of long-range, high-speed operation on improved roads and is well suited to rough terrain, muddy or marshy ground, sand, snow, or ice. The M992A1 can also ford waterways where maximum depth is 42 inches.

Features

- Ammunition handling equipment that includes a hydraulically operated conveyor assembly, two projectile rack assemblies, canister stowage compartments, and related components.
- Remote start diesel-powered auxiliary power unit (APU) for continuous operation of electrical and hydraulic systems without use of the main engine.

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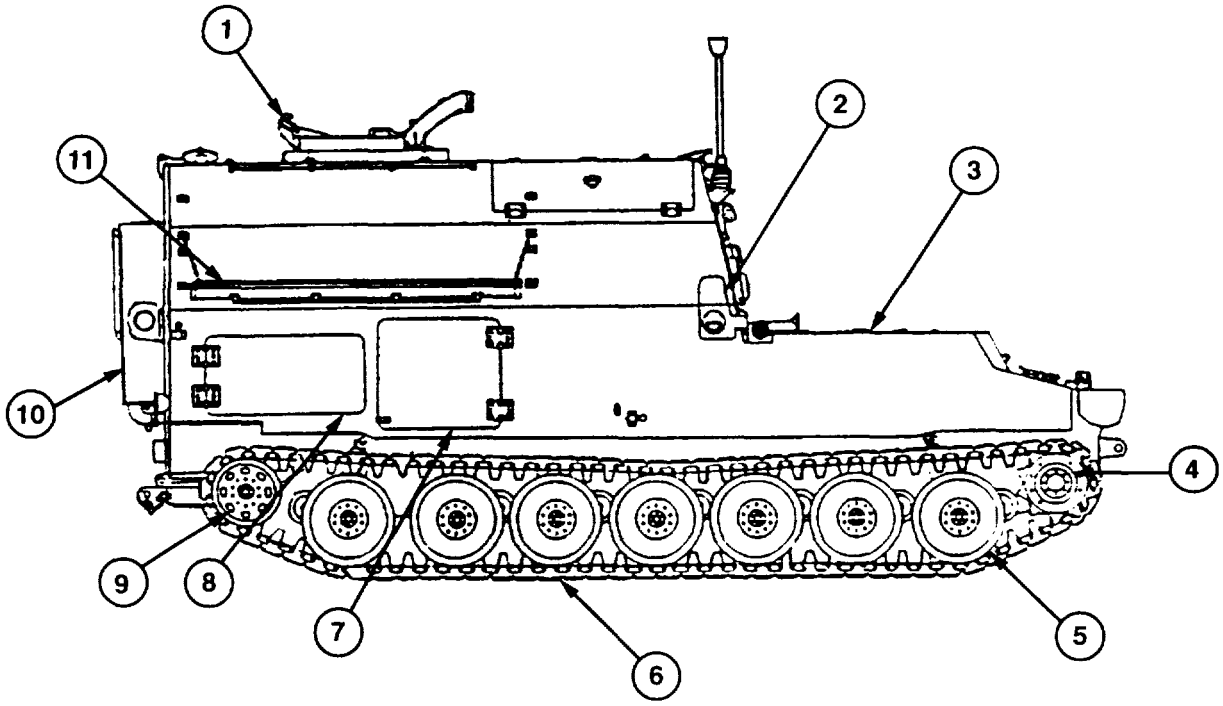
- Upper rear door that, when opened, provides overhead ballistic protection between M992A1 and supported howitzer. Two small doors in upper rear door allow operation of conveyor with upper rear door closed.
- Side doors, on both sides of vehicle, that provide access for personnel and for the loading of propellant-charge canisters and copperhead projectiles into canister compartments.
- On-board nuclear, biological, and chemical (NBC) agent detection and protection system.
- Crew seating for three, plus driver's seat and commander's seat.
- Simplified test equipment for the internal combustion engine (STE/ICE).

1-12. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

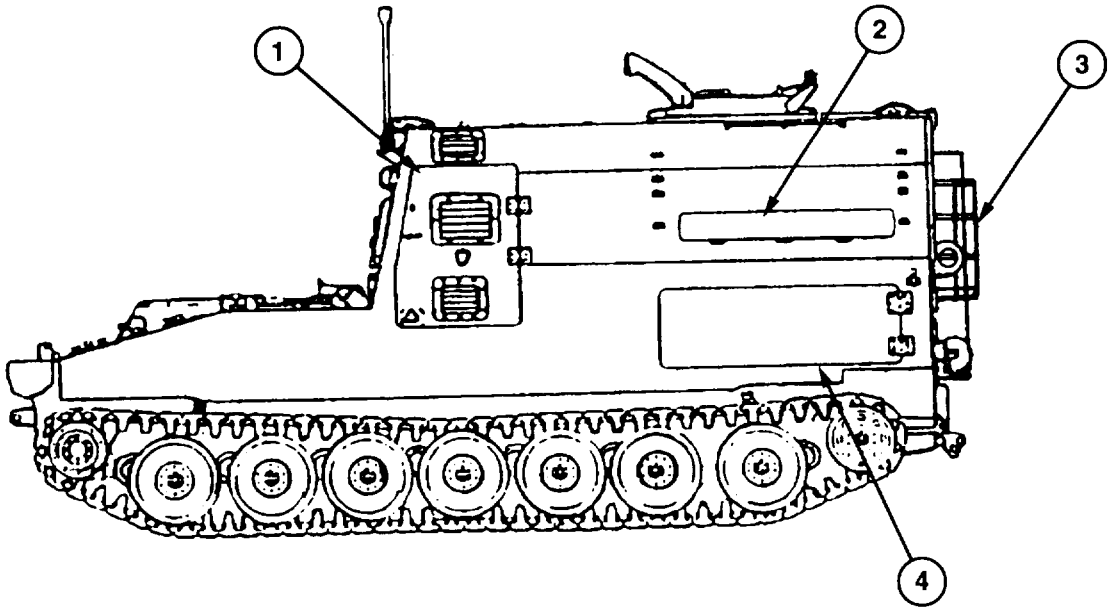
1. Commander's cupola
2. Fuel fill access door
3. Hull
4. Drive sprocket (one on each side)
5. Roadwheel (seven sets of two on each side)
6. Track (one on each side)
7. Personnel side door
8. Canister side door
9. Idler wheel (one set of two on each side)
10. Crew automatic fire extinguishing system (AFES) fire extinguisher box assembly
11. Duffle bag stowage rack



RIGHT-SIDE VIEW

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

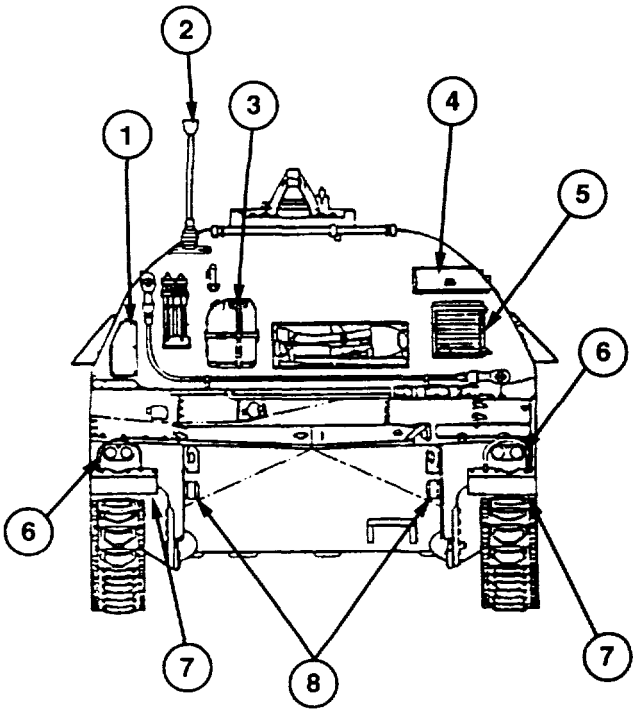
1. APU door
2. Duffle bag stowage rack
3. Stowage rack
4. Canister door/copperhead projectiles



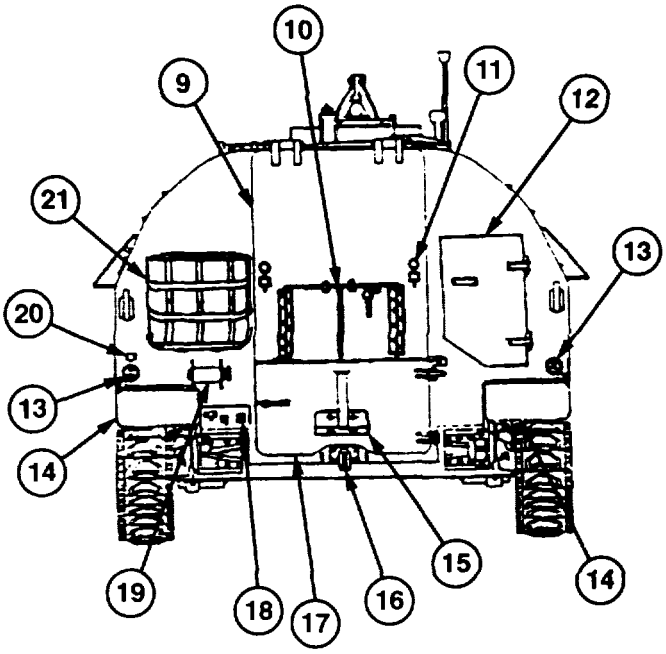
LEFT-SIDE VIEW

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

1. Fuel fill filter access plate
2. Global positioning system (GPS) antenna assembly
3. Water can stowage
4. APU muffler
5. APU air inlet door
6. Headlights
7. Fenders
8. Towing lugs
9. Upper rear door
10. Upper rear door small doors
11. Small door latches
12. Crew AFES fire extinguisher box assembly
13. Taillights
14. Fenders
15. M13 decontamination apparatus
16. Tow pintle
17. Lower rear door
18. NBC terminals, NATO intervehicle slave connector, and trailer receptacle
19. Telephone handreel
20. Telephone terminals
21. Stowage rack



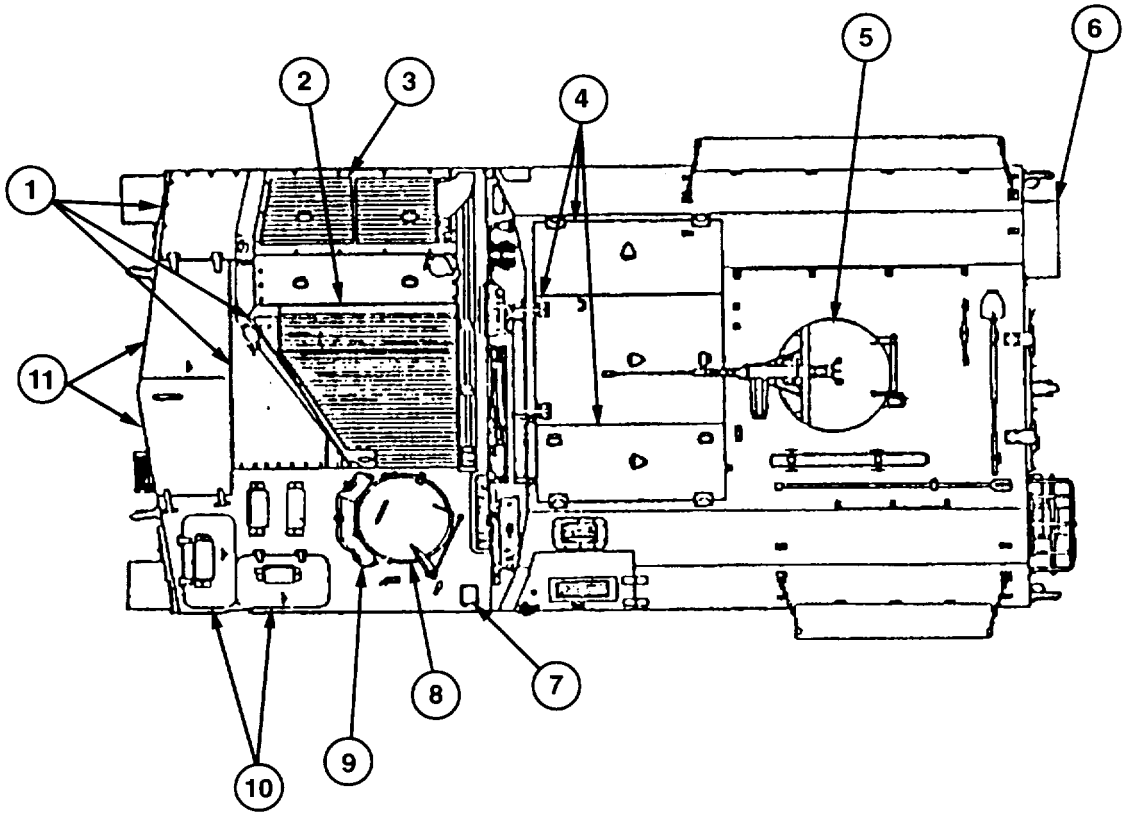
FRONT VIEW



REAR VIEW

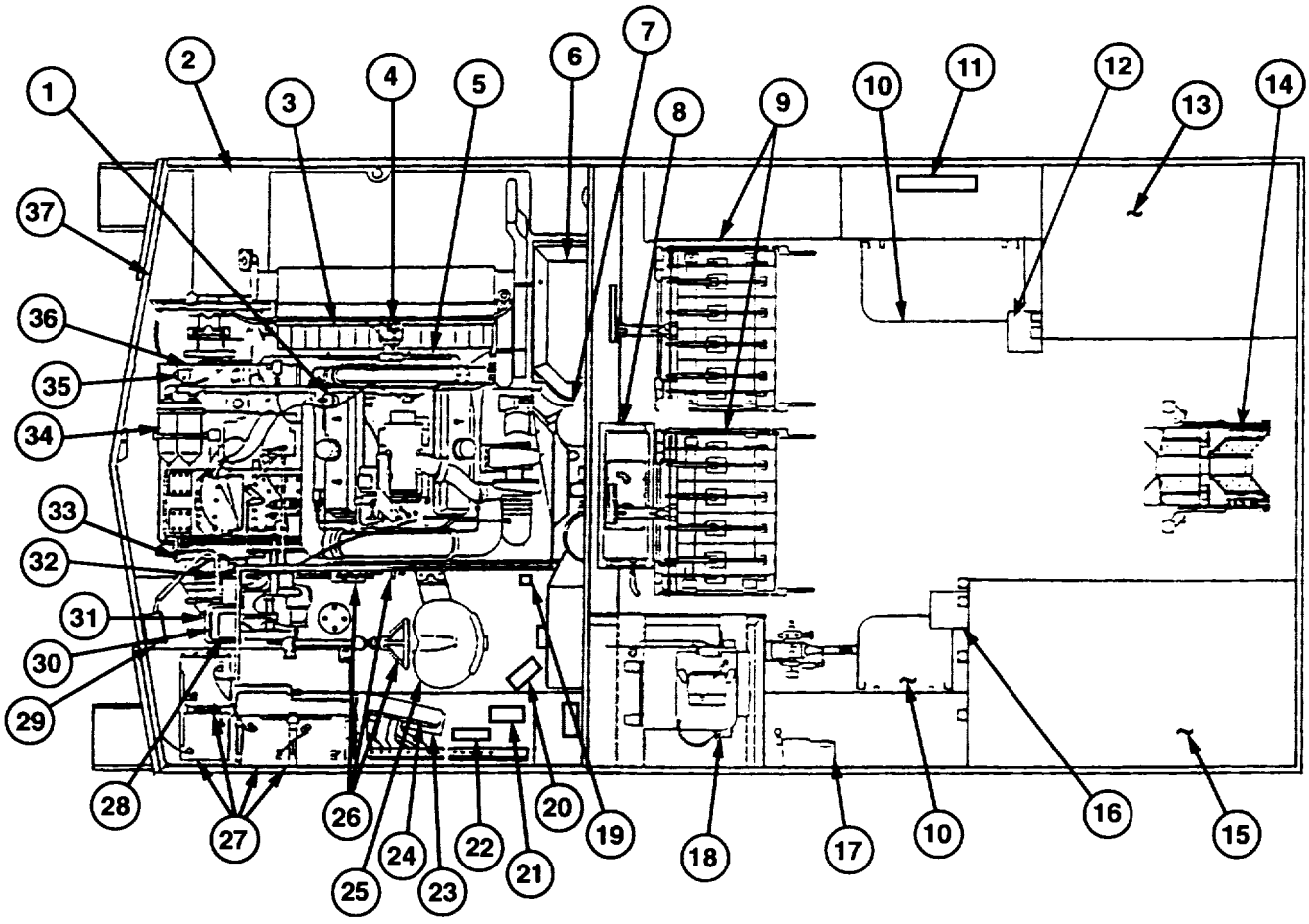
1-12. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (continued).

1. Engine deck access plates
2. Engine access cover
3. Air intake grille
4. Top doors
5. Commander's cupola
6. Crew AFES fire extinguisher box assembly
7. AFES manual discharge system (AFES/MDS) lanyard cable pull handle
8. Driver's hatch
9. Driver's periscope assembly
10. Battery access covers
11. Transmission access covers



TOP VIEW

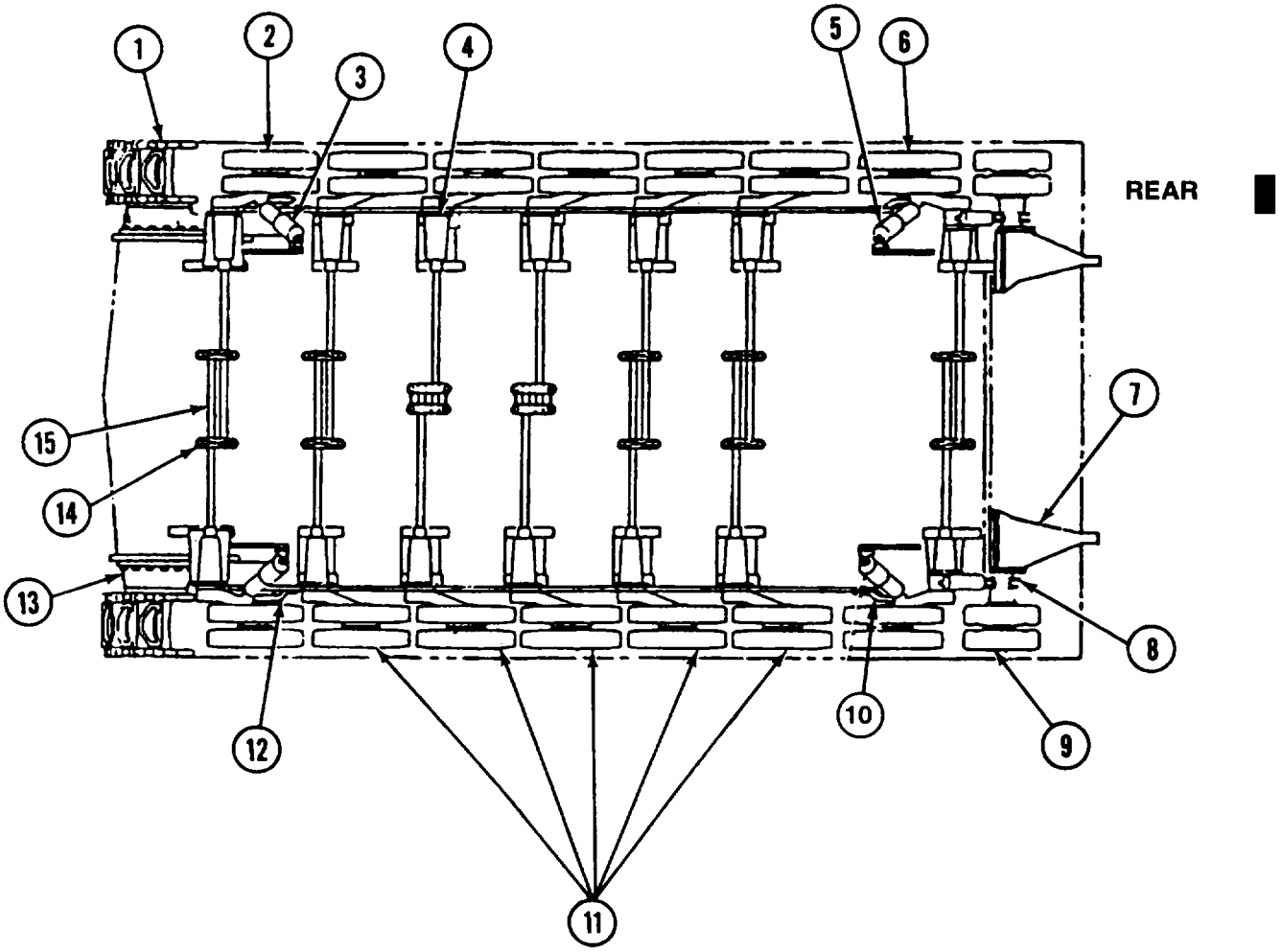
1-12. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (continued).



1. Engine
2. Fuel tanks and pumps
3. Radiator
4. Generator (alternator)
5. Fan assembly
6. Air cleaner
7. Personnel heater
8. Hydraulic fluid reservoir
9. Projectile rack assemblies
10. Crew seats
11. Crew AFES test and alarm (T/A) panel
12. Precision lightweight global positioning system (GPS) receiver (PLGR)
13. Right canister compartment shelf assembly
14. Conveyor assembly
15. Left canister compartment shelf assembly
16. Mounted water ration heater (MWRH)
17. Hydraulic control panel
18. APU
19. Air cleaner restriction indicator
20. Personnel heater control box
21. AFES/MDS actuator assembly
22. Engine AFES T/A panel
23. Driver's compartment NATO slave receptacle
24. Main and portable instrument panels
25. Driver's seat
26. Driver's controls
27. Batteries
28. Voltage regulator
29. Bilge pump relay
30. Rectifier
31. Starter relay
32. Master relay
33. Secondary fuel filter
34. Engine oil filters
35. Primary fuel filter
36. Transmission
37. Coolant surge tank

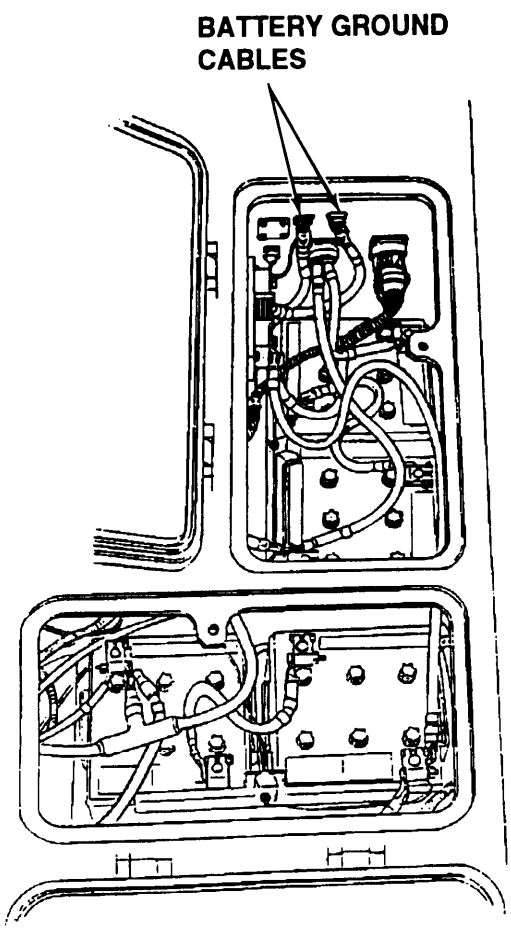
1-12. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS (continued).

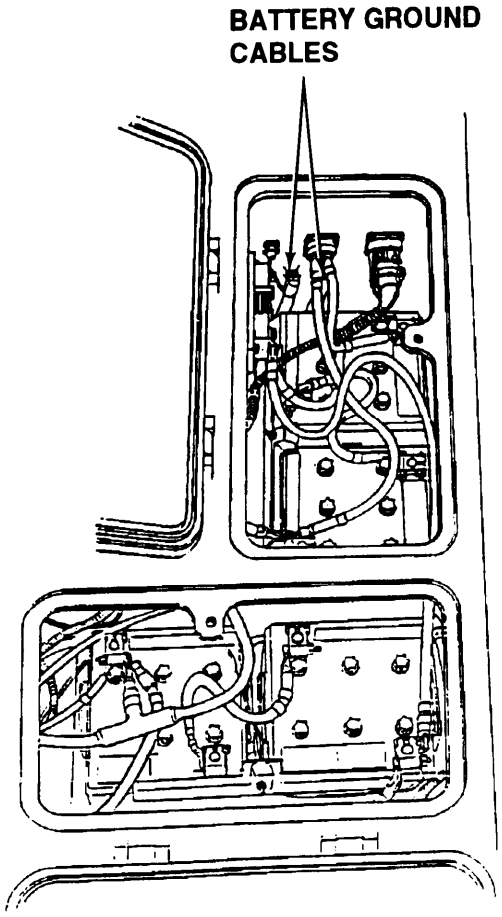
1. Drive sprockets (one set of two on each side)
2. No. 1 roadwheels (one set of two on each side)
3. Front shock absorbers (one on each side)
4. Roadwheel arms and hubs (seven on each side)
5. Rear shock absorbers (one on each side)
6. No. 7 roadwheels (one set of two on each side)
7. Idler wheel housings (one on each side)
8. Idler arms and hubs (one on each side)
9. Idler wheels (one set of two on each side)
10. Bump stop brackets (rear)
11. Intermediate roadwheels (five sets of two on each side)
12. Bump stop brackets (front)
13. Final drive housings (one on each side)
14. Torsion bar anchors (seven on each side)
15. Torsion bars (seven on each side)



1-13. DIFFERENCES BETWEEN MODELS.

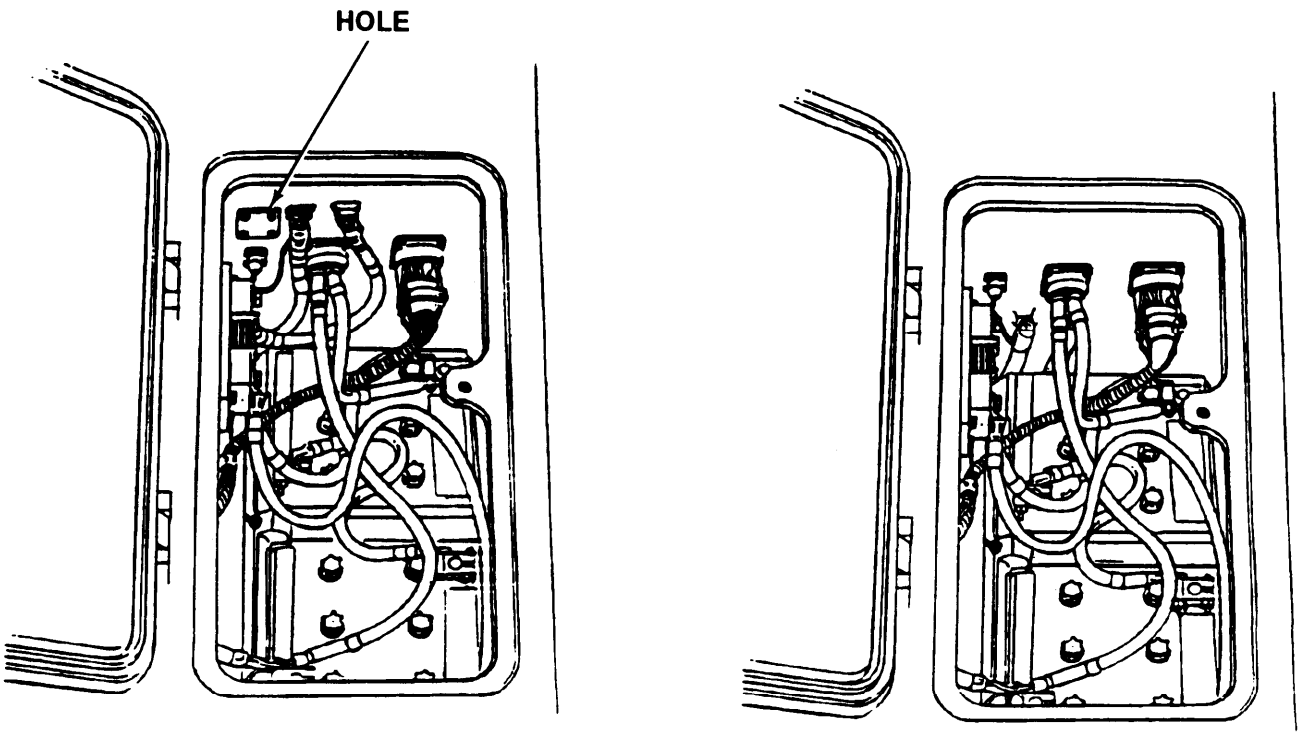
There is only one model of the M992A1, but there are differences between vehicles. Connection of the battery ground cables to the vehicle differ in location. The two locations are illustrated below.





1-13. DIFFERENCES BETWEEN MODELS (continued).

In addition, some vehicles do not have holes cut in the battery box bulkhead. The two configurations are shown below.



Because these are production deviations, serial number effectivities are not available. Be aware of the differences and the impact on performing certain maintenance procedures.

1-14. EQUIPMENT DATA.

GENERAL

Crew	3
Other personnel	2 max.
W eight (combat loaded)	57,500 lb (26,105 kg)
Length (overall)	260 in. (660.40 cm)
Width (overall)	124 in. (314.96 cm)
Height (overall, combat loaded to top of GPS antenna assembly)	143 in. (363.22 cm)
Ground clearance	15 in. (38.10 cm)
Armament	50-cal. M2, HB flex machine gun; 5.56 mm, M16A2 rifle

PERFORMANCE

High speed (max.)	35 mph (56 kph)
Reverse speed (max.)	7 mph (11 kph)
Maximum grade	60 percent
Maximum trench (width)	72 in. (183 cm)
Maximum vertical wall	21 in. (53 cm)
Turning radius (min.)	1 vehiclelength
Fording depth	42 in. (107 cm)
Cruising range	220 mi (354 cm)

ENGINE

Type/model	Detroit Diesel 8V71T, liquid-cooled, two-cycle
Manufacturer	Detroit Diesel Corporation
Cylinders	8
Brake horsepower (max.)	405 at 2300 rpm
Brake horsepower (continuous)	345 at 2300 rpm
Engine horsepower (full load)	440 at 2300 rpm
Displacement	567.4 cu in (34 cc)
Bore	4.25 in. (10.8 cm)
Stroke 5 in.(12.7	cm)
Compression	ratio 17:1
Torque (max. gross)	895 ft-lb (1214 N m) at 1600 rpm
Ignition	Compression

NOTE

Under emergency conditions and in military operations involving jet transportation, JP-5 aircraft turbine engine fuel may be used instead of diesel fuel specified by FED SPEC VV-F-800D.

Fuel (FED SPEC W -F-800D)	Diesel
Regular grade (DF-2)(NATO F-54)	+20° to 115° F (-7° to 46°C)
Winter grade (DF-1)	-20° to +20°F (-29° to -7°C)
Arctic grade (DF-A)	–65° to -25°F (-54° to-32°C)
Fuel capacity	135 gal. (511 L)
Fuel acceptance (safe max.)	50 gpm (189 lpm)

1-14. EQUIPMENT DATA (continued).

Lubrication oil system capacity (refill) ..... 27 qt (approx.) (25 L)
Cooling system capacity (refill)..... 14.5 gal. (55 L)
Cooling system capacity (dry) ..... 20.20 gal. (77 L)

TRANSMISSION

Model XTG411-4
Manufacturer .....Detroit Diesel Corporation, Allison Division
Usable ranges:
- First (low range) 5.69:1
- Second (low intermediate) 3.17:1
- Third (low intermediate) 1.58:1
- Fourth (high range) 0.79:1
- Low reverse (R 1)..... 5.60:1
- High reverse (R2) 3.79:1
- Steer 1.475:1

Oil capacity (refill) .....56 qt (53 L)
Steer control (first and second) ..... Clutch brake

ELECTRICAL SYSTEM

Voltage (nominal) ..... 24 V dc
Batteries ..... 4, 12 V dc each, series parallel
Generator type.....180 amps
Manufacturer ..... Prestolite Electric Inc.
Model ..... A001 -5520AC
Amperage..... 180
RPM ..... 8000 (m ax.)
Voltage..... 28 V dc

COMMUNICATIONS

Intercommunications set ..... AN/VIC 1
Outlets 3
External jack.....1
External extension (model) C-998/U

SUSPENSION

Type ..... Independent torsion bar
Roadwheel ..... 7 pairs per side
Size .....24 in. (61 cm)
Loadings:
- 1, 2, and 7 positions .....4000 lb (approx.) (1816 kg)
- Intermediate positions .....2600 lb (approx.) (1180 kg)

Track:
- Type.....T-154 double pin
- Adjustment at idler w heel.....Track adjuster
- Shoes per track 80

1-14. EQUIPMENT DATA (continued).

AUTOMATIC FIRE EXTINGUISHING SYSTEM (AFES)

Manufacturer ..... HTL Systems
Extinguishing agent ..... Halon 1301
Systems:
- Quantity 3
- Type ..... Engine AFES, crew AFES, AFES manual discharge

Bottles (fixed):
- Number ..... Engine AFES-2, crew AFES-6
- Capacity (each) ..... Engine AFES-two 10 lb (4.5 kg), Halon 1301 Crew AFES-six 7 lb (3 kg), Halon 1301
- Pressure ..... 750 psig (5171 kPa) at 70°F (21°C), nitrogen

Detection systems:
- Engine AFES ..... Engine compartment thermal wire
- Crew AFES ..... 4 optical fire sensing assemblies
- AFES manual discharge ..... Switch on T/A panels and 2 pull handles

Portable extinguishers:

[Text Deleted]

- Number 2
- Extinguishing agent ..... CO_2
- Discharge system ..... Manual

HYDRAULIC SYSTEM

Reservoir capacity ..... 13 gal. (49 L)
System pressure ..... 1550 psi (10, 687 kPa)
Oil MIL-H-6083
Filter ..... 10-micron element
Pump:
- Manufacturer ..... Rexroth Corp.
- Model ..... P2-3AH2-1 L
- Flow rate ..... 6.9 gpm (26.1 lpm) at 2000 rpm
- Type ..... Gear

[Text Deleted]

CONVEYOR

Hydraulic motor:
- Manufacturer ..... H.P.I Nicols
- Model 110-3-450

1-14. EQUIPMENT DATA (continued).

CONVEYOR (continued)

Type ..... Gear
Chain length ..... 19 ft (5.8 m)

AUXILIARY POWER UNIT

Height ..... 25.75 in. (65.4 cm)
Weight ..... 310 lb (140.7 kg) (approx.)
Length ..... 23.875 in. (60.64 cm)
Width ..... 18.375 in. (46.67 cm)
Number of cylinders 2
Displacement ..... 70 cu in (4.2 cc)
Horsepower at 2000 ..... rpm 11.5 HP
Governor setting ..... 2000 rpm +/- 100
Bore ..... 3.50 in. (8.89 cm) diameter
Stroke ..... 3.625 in. (9.208 cm)
Compression ..... ratio 19:1
Oil capacity ..... 3.5 qt (3.31 L)
Fuel (FED SPEC VV-F-800D) ..... Diesel
Cooling air at 2000 rpm ..... 650 cu ft/min (18 cu m/min)
Combustion air at 2000 rpm ..... 34.0 cu ft/min (1 cu m/min)
Electrical system:
- Generator/starter ..... 300 am p
- Battery voltage ..... 24 V dc
- Glow plug 2
- Manifold heater, series connected 2

1-15. EQUIPMENT CONFIGURATION.

There is only one configuration of the M992A1.

Section III. PRINCIPLES OF OPERATION

1-16. EQUIPMENT OPERATION.

The M992A1 requires the integrated performance of several systems to successfully complete its mission. The electrical supply and track and suspension systems are powered by the powerpack. The auxiliary power unit provides power to the hydraulic system.

POWERPACK

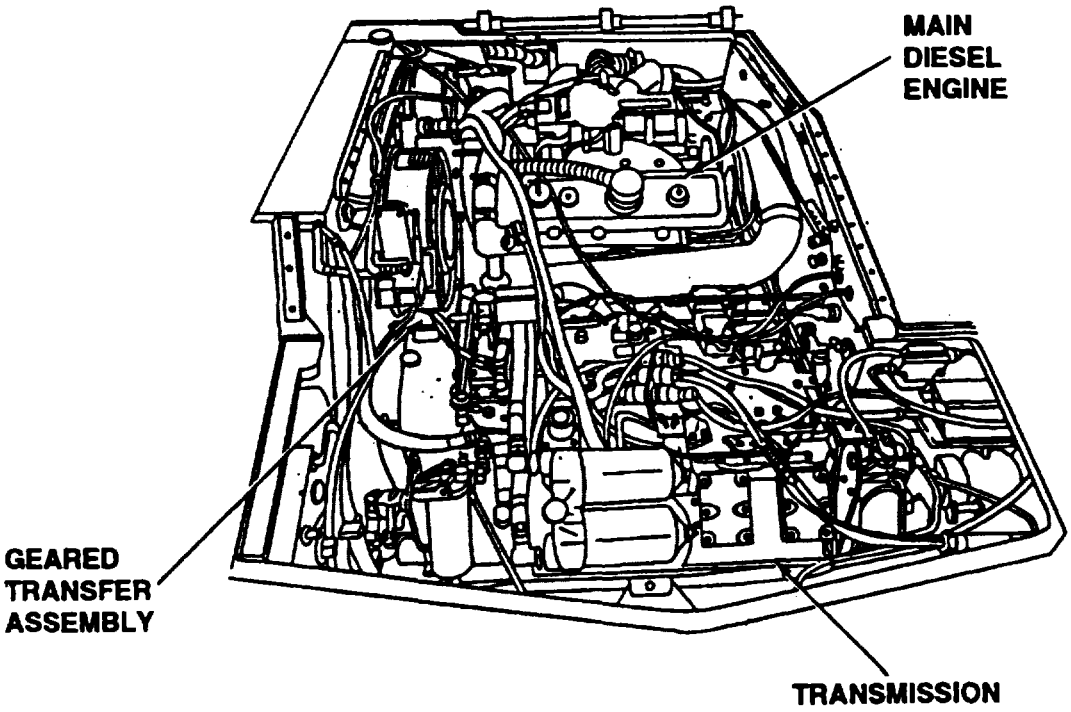
The powerpack includes the main diesel engine and the unitized transmission and transfer assembly.

The geared transfer assembly transfers engine power to the transmission. The transmission transfers power through the left and right final drives to the drive sprockets.

The powerpack is removed and installed as a single unit. It must be removed from the vehicle before the engine and transmission unit can be separated.

The engine is a Detroit Diesel turbocharged eight-cylinder, V-type, two-cycle diesel.

The Allison model XTG411-4 cross-drive transmission combines transmission, steering, and braking. The driver's compartment steering wheel is connected through linkages to hydraulic controls in the transmission. Braking is controlled by the service brake pedal through linkages to disks in the transmission.



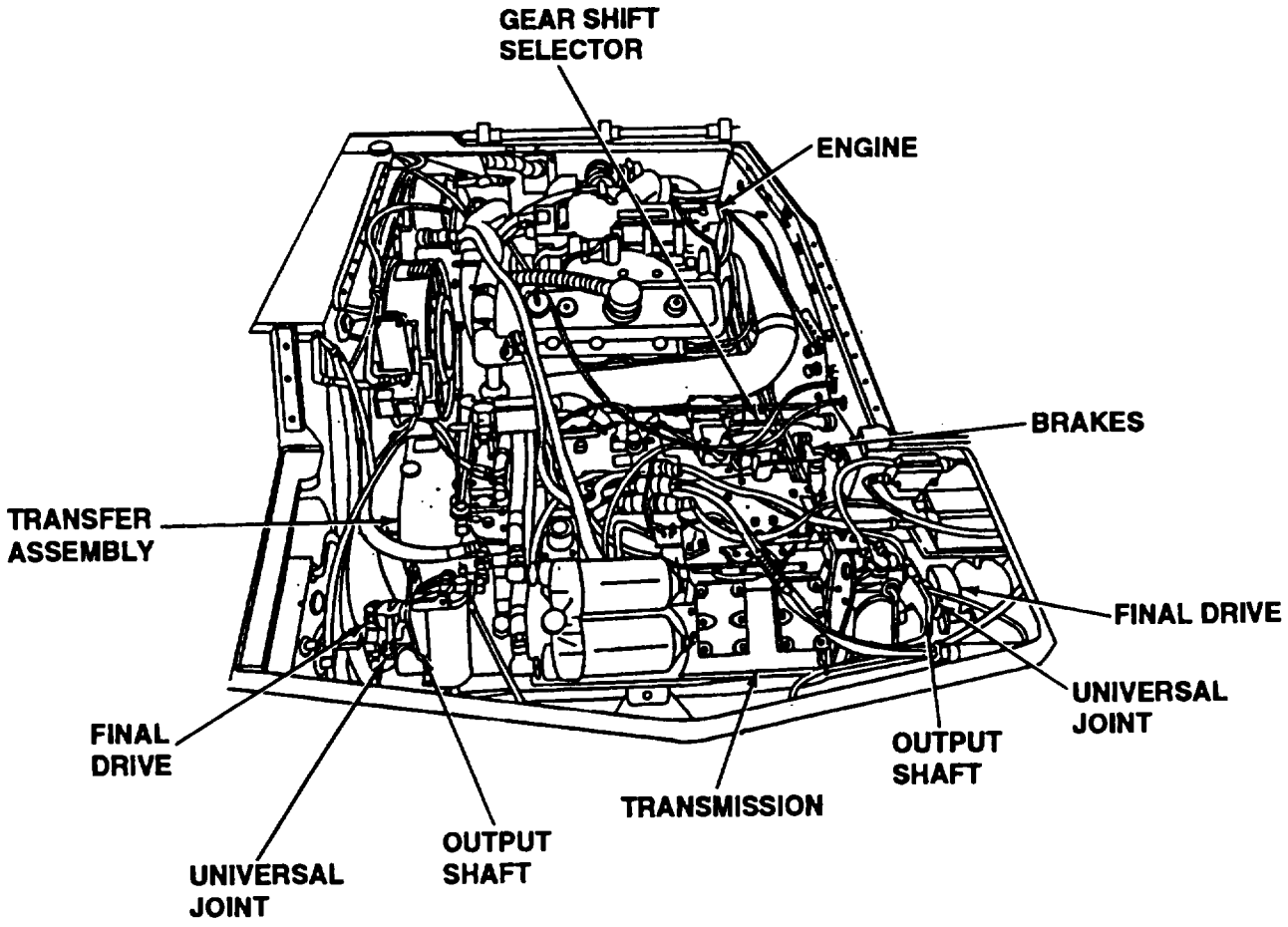
1-16. EQUIPMENT OPERATION (continued).

TRANSMISSION AND DRIVE CONTROL ASSEMBLIES

The transmission is mechanically and hydraulically operated. It receives power from the engine through a transfer assembly. The transmission has four forward, two reverse, and one neutral setting. Power is delivered to the left and right final drives through output shafts linked to the transmission by universal joints.

Transmission mechanically linked drive control assemblies include the following:

- Brakes, which provide internal mechanical braking for right and left transmission drive assemblies. Used to stop or slow vehicle by depressing brake pedal in driver's compartment.
- Gear shift selector, which selects speed for the transmission.



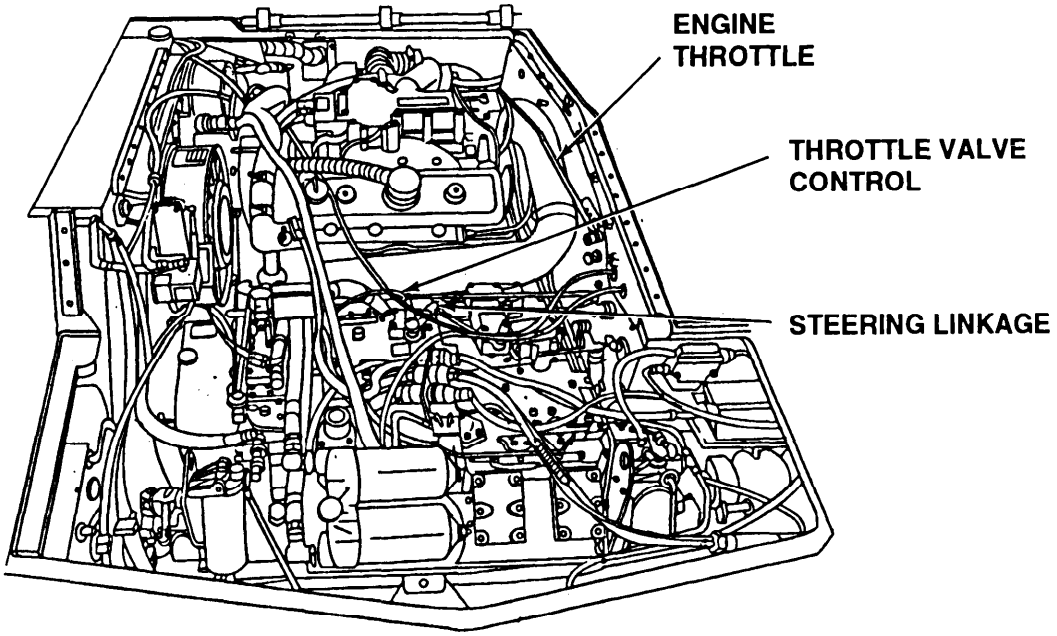
1-16. EQUIPMENT OPERATION (continued).

NOTE

The throttle valve control does not govern the speed of the vehicle. Speed and rpm are determined by engine rpm and the shift control position.

- Throttle valve control, which interconnects with the engine throttle and gear shift selector. With engine operating and shift control in neutral position, the transmission throttle valve is 'locked out." When gear shift selector is in a forward or reverse gear, the transmission throttle valve is "locked in," allowing transfer of power from the transfer assembly into the transmission.

- Steering linkage, which is connected to the steering wheel in driver's compartment. Turning the steering wheel applies brakes to track on inside of turn. For example, during a left turn the brake is applied to the left drive output. During a right turn the brake is applied to the right drive output.



1-16. EQUIPMENT OPERATION (continued).

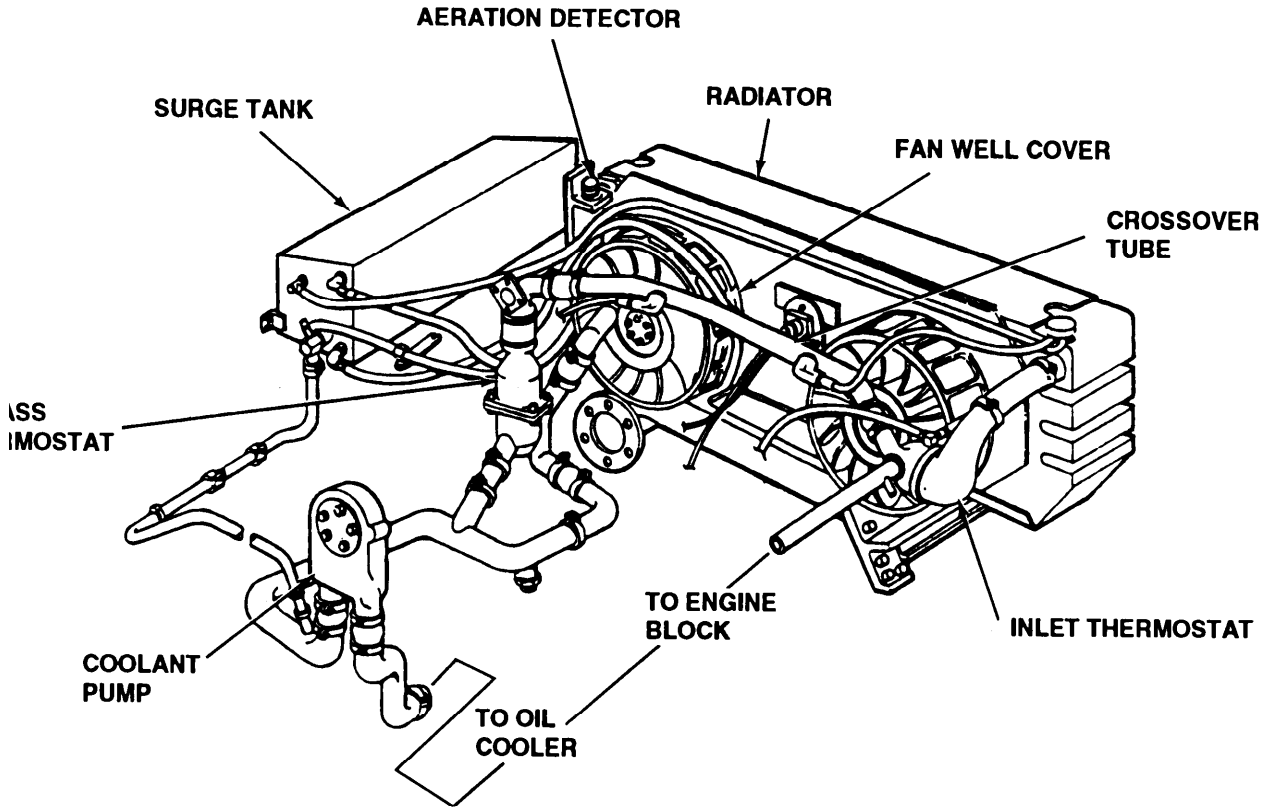
ENGINE COOLING SYSTEM

Cooling air is drawn through the fan well cover and is forced through the radiator by two cooling fans. Airflows around the engine and is exhausted through grilles on the vehicle deck.

Engine coolant flows from the coolant pump into a two-section oil cooler that cools the engine and transmission oil. From the oil cooler cores, coolant flows into engine water jackets for engine block cooling. At normal operating temperatures, the bypass thermostat is closed and the inlet thermostat is open, allowing coolant to circulate through the radiator. Below normal operating temperatures, the inlet thermostat closes and the bypass thermostat opens, allowing coolant to flow through the crossover tube and bypass the radiator.

The surge tank stores excess coolant, allowing coolant to flow back into the system as required to maintain the system at full level. Air trapped in the system is bled off through the pressure relief valve, which is connected to the surge tank.

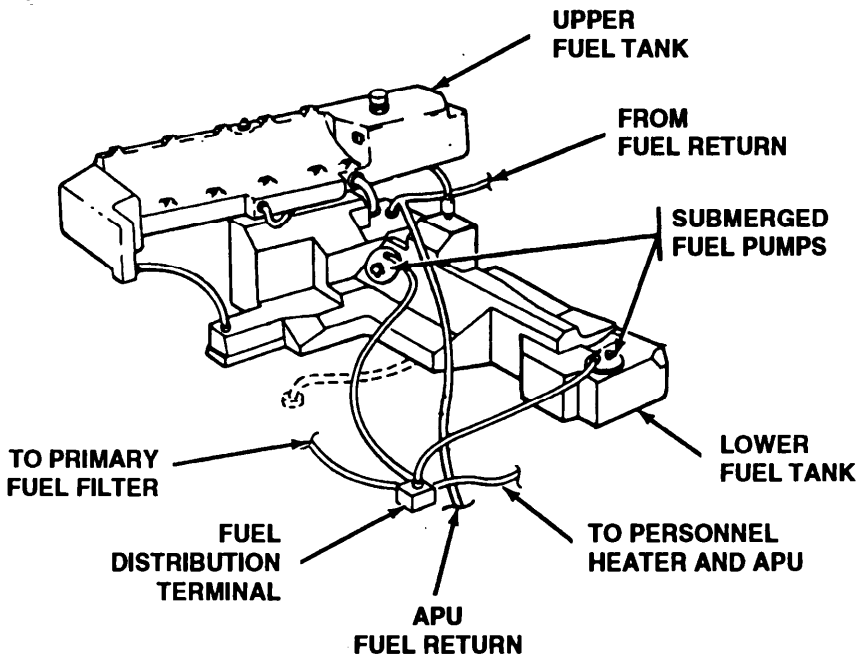
The aeration detector senses low coolant level and activates a warning indicator light on the driver's instrument panel.



1-16. EQUIPMENT OPERATIONS (continued).

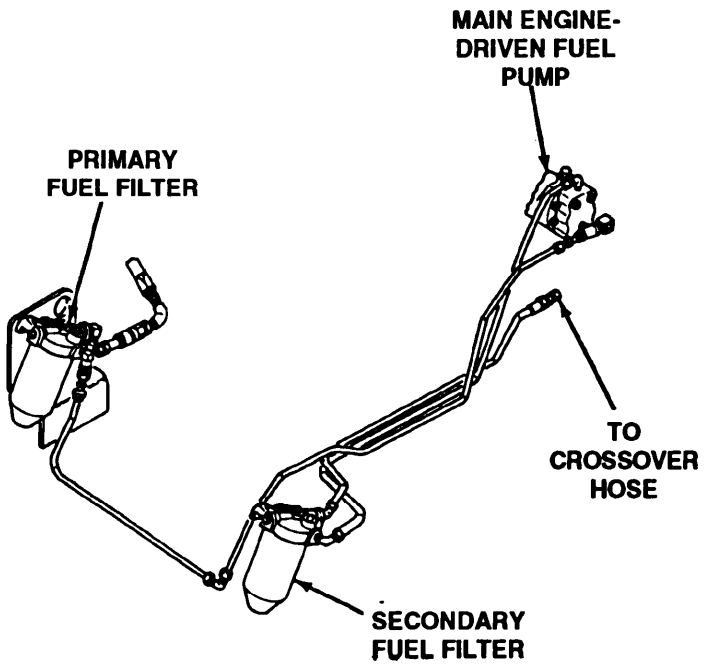
FUEL SYSTEM

The upper and lower fuel tanks have a combined capacity of 135 gallons. Fuel is pumped from the tanks by two submerged electrically driven fuel pumps to a fuel distribution terminal, where it is routed to the personnel heater, APU fuel pump and filters, or primary fuel filter or is returned to the tanks.



The primary fuel filter receives fuel from the fuel tanks. The main engine-driven fuel pump pulls fuel from the primary fuel filter and channels it to the secondary fuel filter.

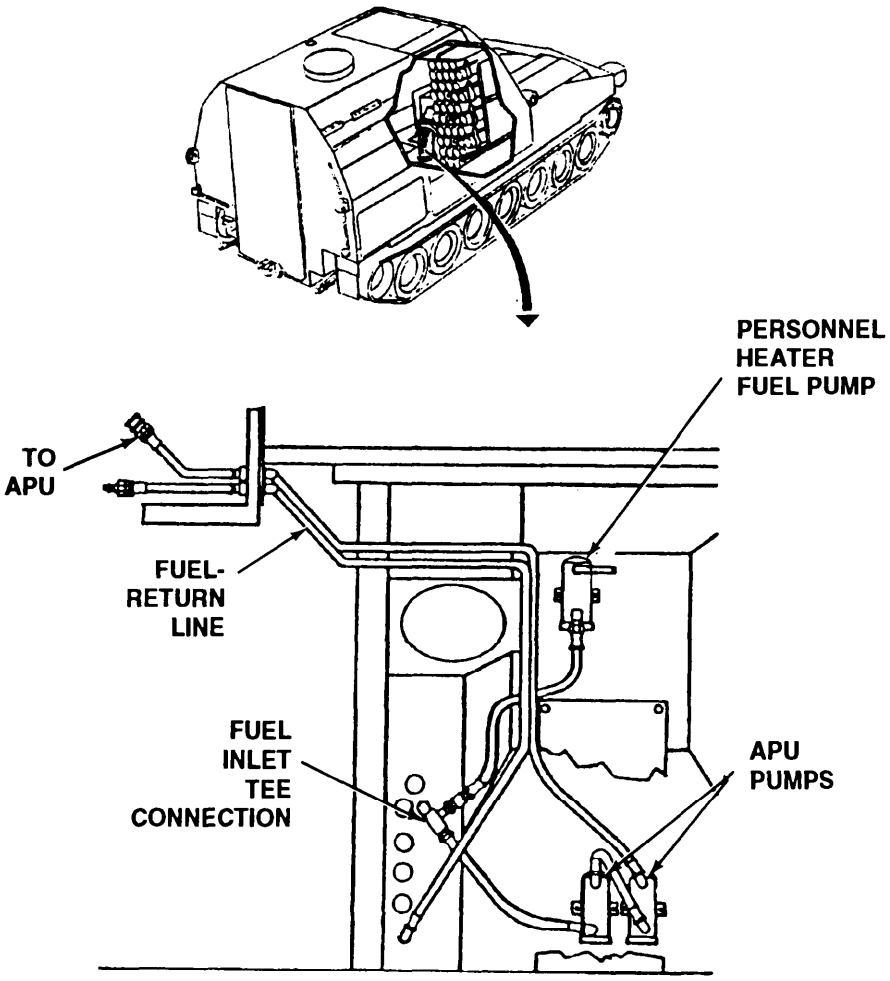
Fuel is delivered from the secondary fuel filter to the engine. The fuel-return crossover hose carries fuel from the right to the left cylinder head. Unused fuel from the engine is routed through the fuel-return hose to the fuel tanks.



1-16. EQUIPMENT OPERATION (continued).

The APU and personnel heater receive fuel through the fuel inlet tee connection from the fuel distribution terminal. APU pumps become operational when the MASTER switch located on the APU control panel is turned to ON. Fuel is routed through the APU compartment wall-mounted filters to the APU. Excess fuel is routed through the fuel-return line to the fuel tanks.

The personnel heater fuel pump becomes operational when the personnel heater MASTER switch is turned to ON. Fuel is routed to the personnel heater filter and onto the personnel heater.



ELECTRICAL SUPPLY SYSTEMS AND COMPONENTS

Four 12-volt batteries, connected in series and parallel, deliver 24 Vdc to the master relay. The MASTER switch, when turned to ON, draws 24 Vdc from the batteries and allows operation of vehicle electrical systems without the main engine running. The engine-driven alternator supplies 24 Vdc to the rectifier when the engine is operating. The rectifier converts the alternating current output to direct current voltage, which is supplied to the voltage regulator.

The voltage regulator controls the supply of 24 Vdc to vehicle electrical systems through the master relay. It also acts as a charger for the batteries when the engine is operating, keeping the batteries fully charged. The APU electrical generator supplies 24 Vdc through the APU voltage regulator to operate vehicle electrical systems and to recharge batteries when the main engine is not in operation.

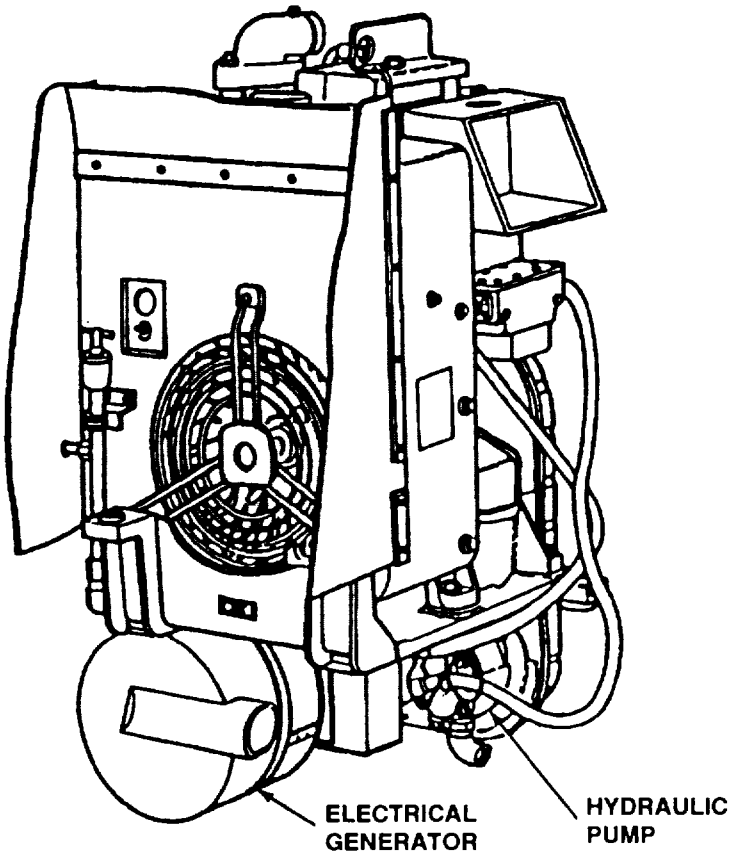
1-16. EQUIPMENT OPERATION (continued).

APU

The APU is an 11.5-horsepower, overhead valve, two-cylinder, four-cycle, air-cooled diesel engine used to drive an electrical generator and the hydraulic pump.

The chain-driven generator is used to recharge the batteries and provide electrical power for the operation of M992A1 components and a supported howitzer.

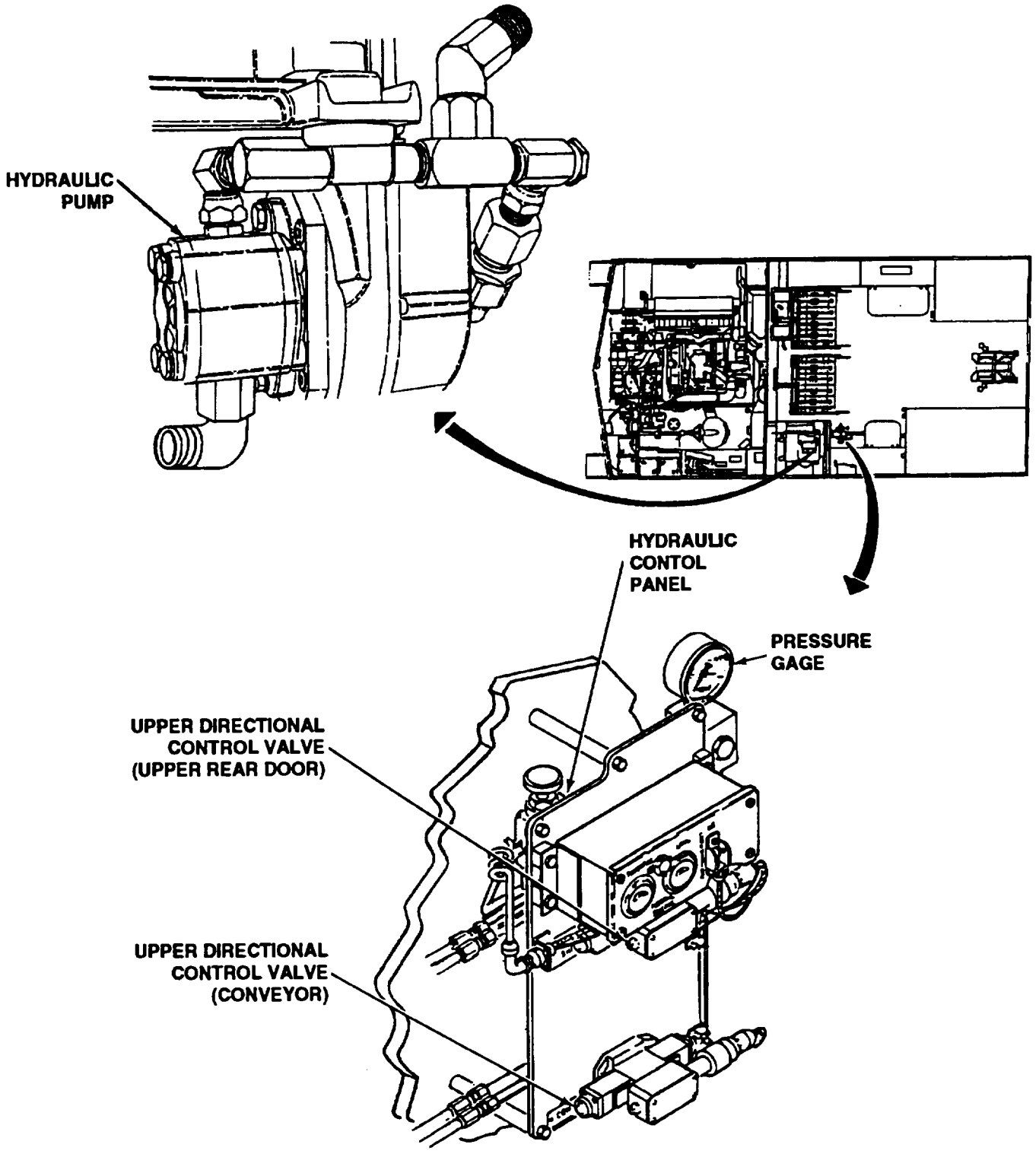
The hydraulic pump powers hydraulic system components.



HYDRAULIC SYSTEM OPERATION

The hydraulic system operates the upper rear door and conveyor assembly. The APU drives the hydraulic pump, which is capable of delivering 4.5 gallons per minute of flow at a system pressure of 1550 psi. Hydraulic fluid is pumped from the 13-gallon-capacity hydraulic reservoir to the hydraulic control panel. The hydraulic control panel contains two electromechanically activated directional control valves. The upper directional control valve controls the upper rear door actuator, extending or retracting the actuator to open or close the upper rear door. The lower directional control valve controls the conveyor motor for forward or reverse travel of the conveyor chain. The hydraulic control panel also incorporates a pressure gage that indicates system pressure. The conveyor control switch actuates the conveyor solenoid at the conveyor control valve.

1-16. EQUIPMENT OPERATION (continued).



The rear door switches are located at the upper and lower left areas of the rear door opening.

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1-16. EQUIPMENT OPERATION (continued).

CONVEYOR SYSTEM

The conveyor assembly is hydraulically powered and can be operated in either forward or reverse. Two stationary dead-end sections, one at each end, are used as staging areas for ammunition transfer. The powered parts of the conveyor assembly are the drive-end section, center section, and takeup-end section. A three-position switch, located on the hydraulic control panel, actuates the conveyor directional control valve that operates the conveyor hydraulic motor. A drive sprocket coupled to the motor shaft moves the conveyor chain.

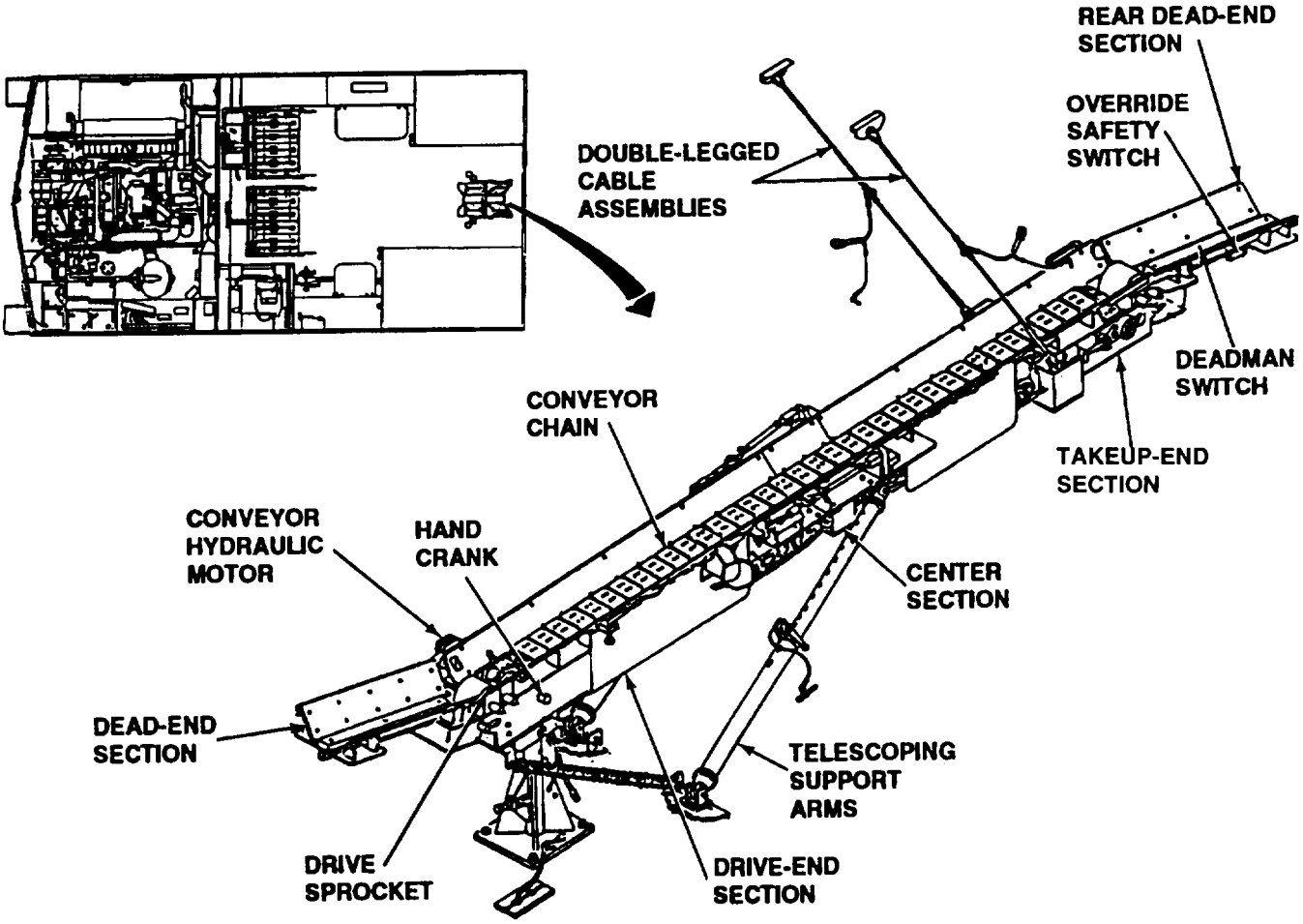
An override safety switch at the rear dead-end section provides an outside shutoff capability. A deadman switch is installed in the rear dead-end section to shut off the conveyor when a projectile is present, to prevent a pile-up of projectiles and charges when the conveyor assembly is in operation.

The conveyor chain runs taut across the top of the conveyor assembly, loose across the bottom. A chain adjustment device allows chain tension to be adjusted by moving the idler sprocket forward or backward.

Telescoping support arms adjust to lock the conveyor in several operating positions. Two double-legged cable assemblies support the conveyor assembly during deployment. They are stowed when the conveyor assembly is in operation.

A hand crank for manual operation is provided in case of a hydraulic system malfunction.

The conveyor assembly can be folded and stowed inside the vehicle when not in use.



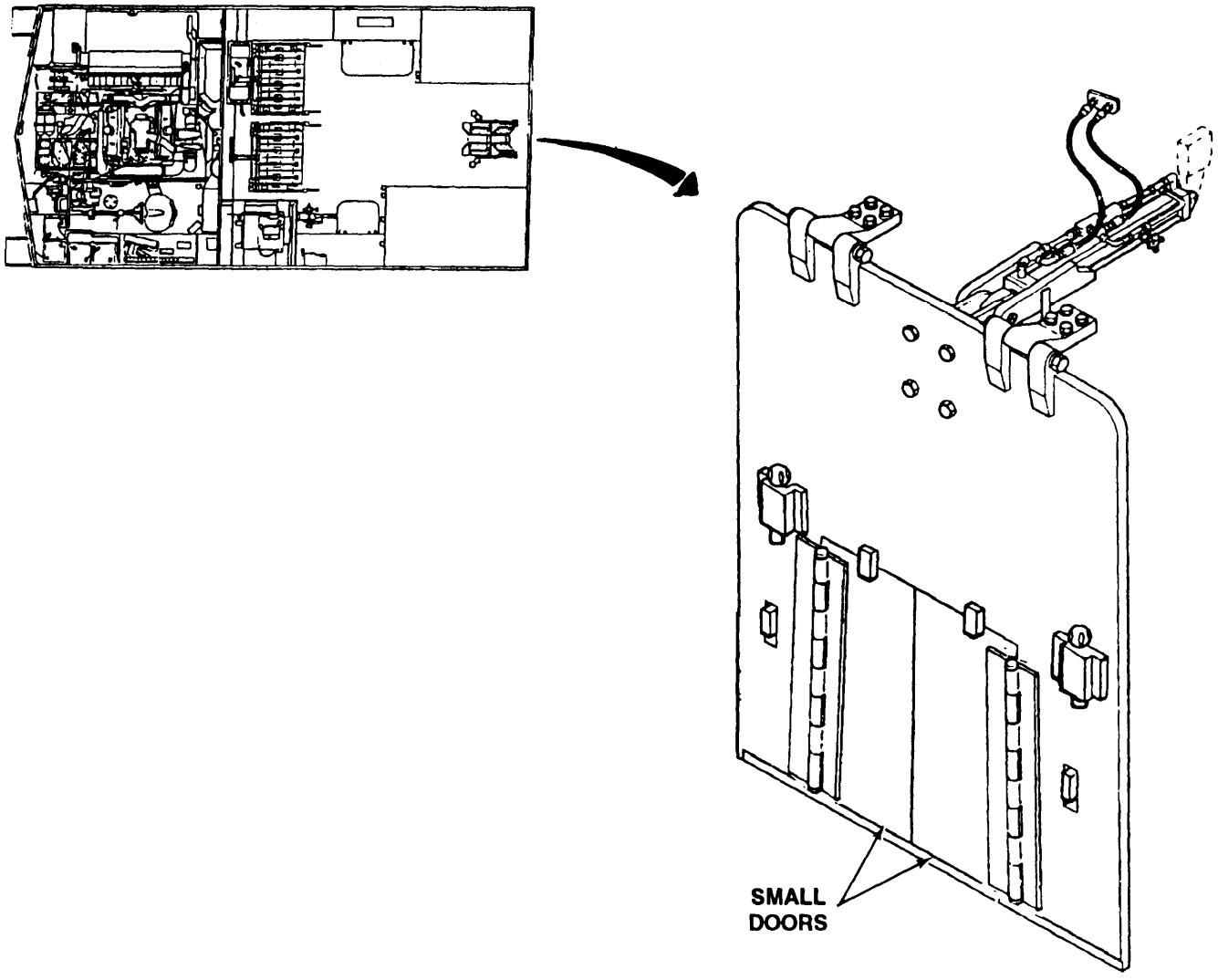
1-16. EQUIPMENT OPERATION (continued).

UPPER REAR DOOR

The upper rear door is hydraulically actuated by the ballistic shield directional control valve on the hydraulic control panel. When raised, the upper rear door provides ballistic protection between the M992A1 and a supported howitzer. The door also helps deploy and position the conveyor assembly. From the closed position, it can be raised to any position by a hydraulic actuator up to 120 degrees. The upper rear door directional control valve can be actuated by two three-position switches mounted inside the rear door opening on the left side. For inside and outside access, one is mounted high and the other is mounted low.

In the event of hydraulic system failure, the door is prevented from closing by a pilot check valve that stops hydraulic fluid backflow within the door hydraulic system. In addition, a mechanical lock engages the vehicle hull in the 45- and 90-degree (from closed) positions.

In the upper rear door, there are two small doors that allow the conveyor to be operated while the upper rear door is closed. This feature is for use with the M109A6 howitzer.

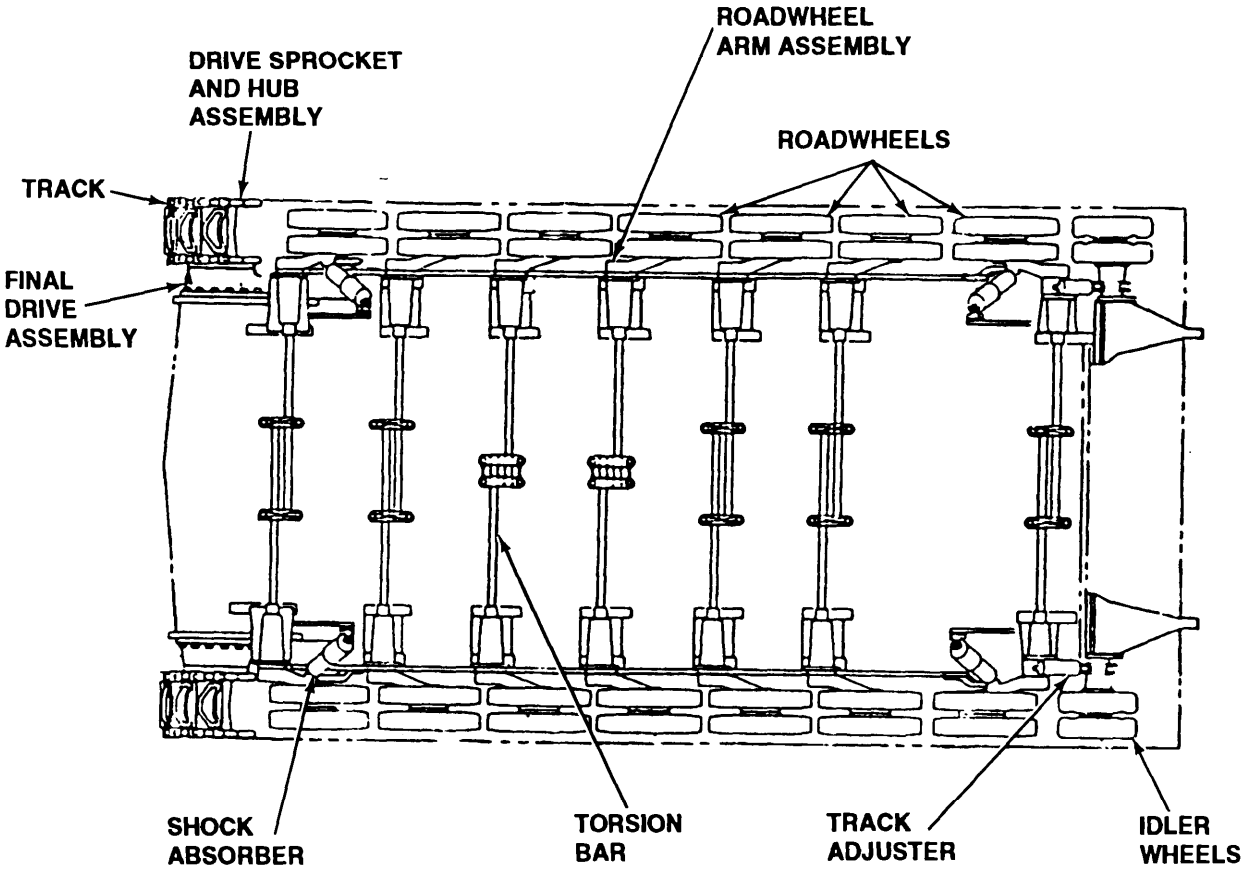


1-16. EQUIPMENT OPERATION (continued).

SUSPENSION SYSTEM

Two final drive assemblies transfer power from the powerpack to the track through two drive sprocket and hub assemblies. Seven pairs of roadwheels on each side of the vehicle help center the tracks on the drive sprocket and hub assemblies. Track tension is maintained by two idler wheels, which are connected to grease actuated track adjusters.

Each pair of roadwheels is supported by a roadwheel arm assembly. Each roadwheel arm assembly is connected to a torsion bar, which is anchored to the hull, to help maintain contact between the roadwheels and track. Four shock absorbers, connected to the two pairs of front and rear roadwheels, help smooth the ride of the vehicle.



1-16. EQUIPMENT OPERATION (continued).

NBC VENTILATED FACE PIECE SYSTEM

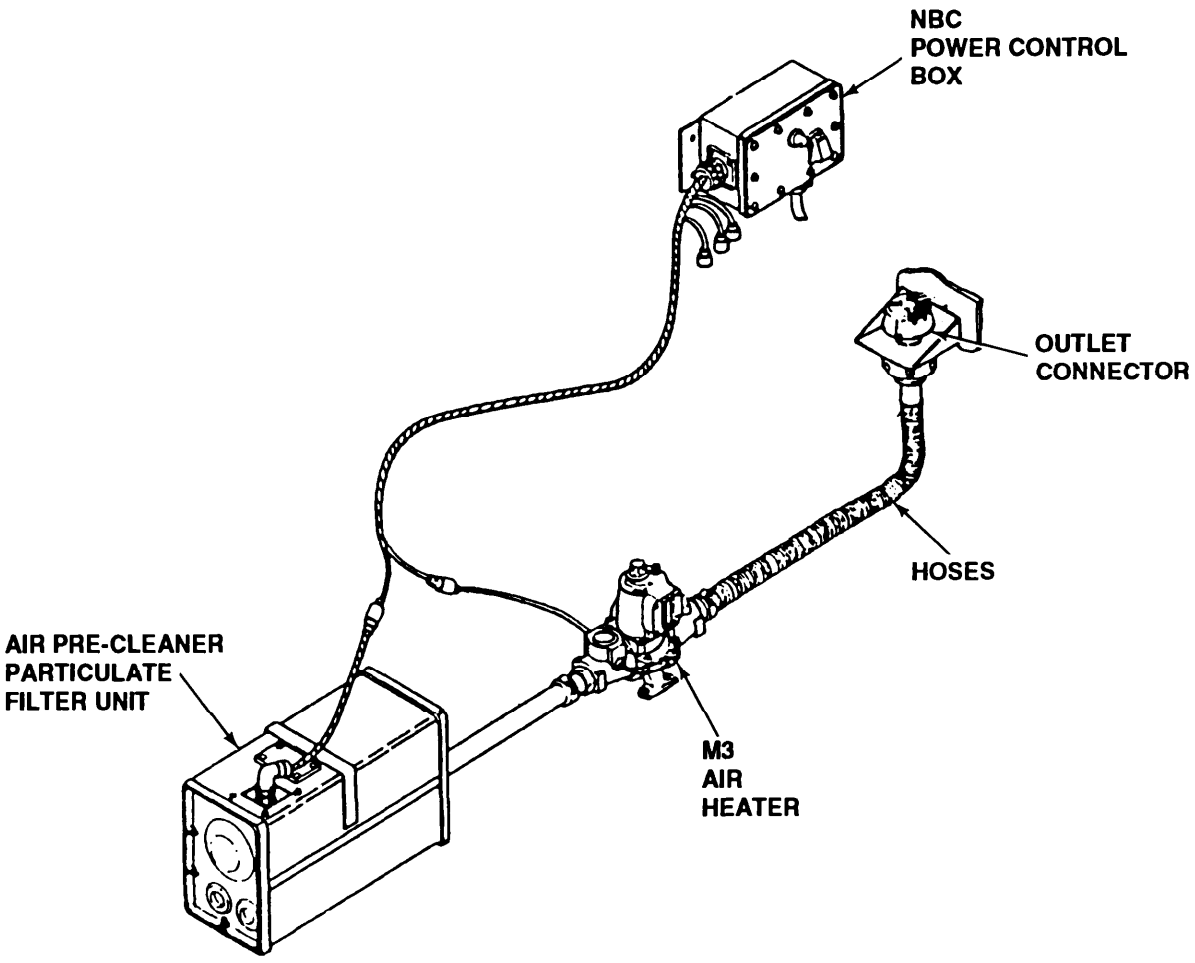
The ventilated face piece system (VFPS) provides clean, filtered air for the crew and personnel under NBC situations.

The system includes one air precleaned/particulate filter unit with four filtered air outlets, four M3 air heater, four outlet connectors, and one NBC power control box.

The air precleaned/particulate filter is located in the lower left rear of the crew compartment. Three air heaters are mounted forward from the precleaned. One air heater is located in the driver's compartment. The NBC control box is located on the left side of the crew compartment ceiling and is controlled by the user.

When not in use, hoses are connected to outlet connectors that function as one-way valves, allowing system air to escape and preventing backflow. When in use, the hoses are disconnected from outlet connectors and are connected to canister packs on face masks used with the system.

Each filtered air outled has an M3 air heater connected in-line to allow air temperature to be individually controlled by the user.



1-16. EQUIPMENT OPERATION (continued).

DRIVER'S INSTRUMENT PANELS

The driver's portable and main instrument panels are located to the left and in front of the driver's seat. The portable instrument panel can be separated from the main instrument panel and be placed on the hull outside the vehicle, for hatch-open operations.

The portable instrument panel (7) contains the following indicators and gages:

Coolant indicator (1), which indicates low coolant level;

Transmission oil temperature gage (2);

Engine coolant temperature gage (3);

MASTER warning light (4), which indicates critical powerpack operating conditions for Iow transmission oil pressure, high transmission oil temperature, high engine coolant temperature, and low engine oil temperature;

Transmission oil pressure gage (5);

Engine oil pressure gage (6);

Battery-generator gage (8);

Fuel level gage (9); and

MASTER switch (10), which actuates the electrical system.

The main instrument panel (12) contains the following indicators and gages:

Parking brake engaged indicator (11);

Light switch unit (13);

High-beam indicator (14);

Bilge pump switch (15);

Fuel level gage transmitter switch (16);

Glow plug switch (1 7);

Fuel prime switch (18);

Starter switch (19);

Glow plug indicator lamp (20);

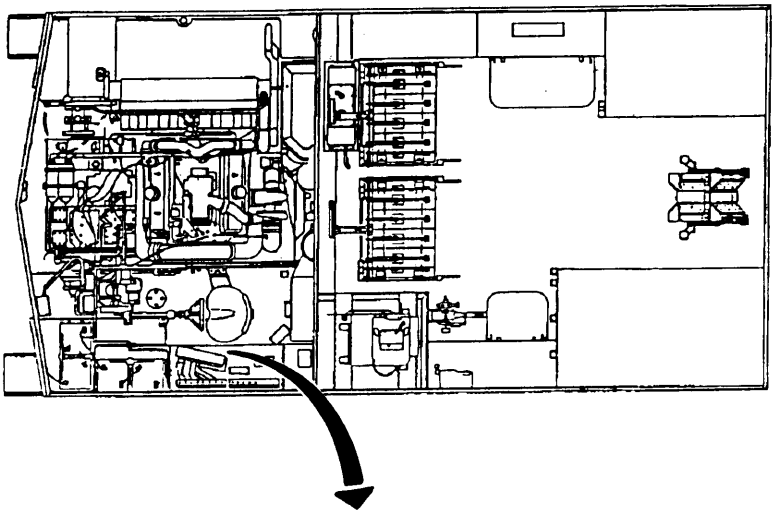
Speedometer/odometer (21);

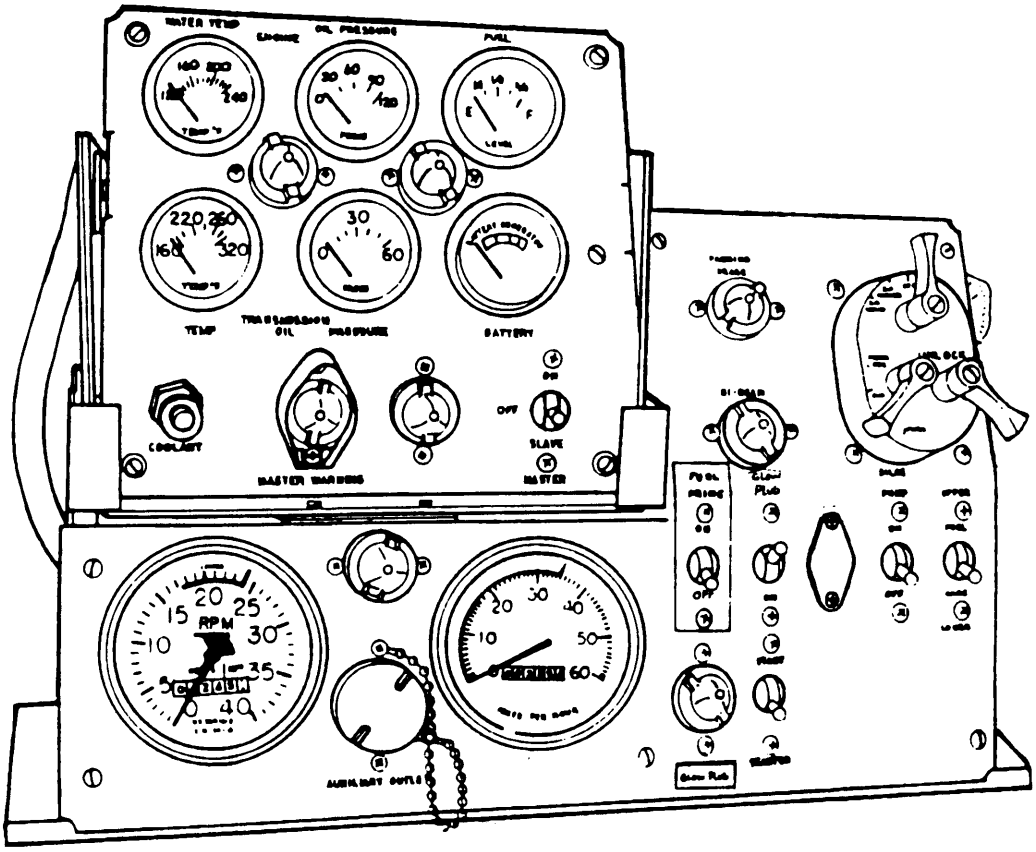
Auxiliary outlet (22); and

Tachometer/hour meter (23).

1-16. EQUIPMENT OPERATION (continued).

DRIVER'S INSTRUMENT PANELS (continued)





CHAPTER 2
DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE

This chapter provides general instructions and basic guidance for performing required maintenance functions and describes requirements for common tools and equipment, special tools and support equipment, and repair parts needed to support the M992A1.

Paragraph Number	Paragraph Title	Page Number
2-1	General	2-1
2-2	Common Tools and Equipment	2-1
2-3	Spares and Repair Parts	2-1
2-4	Special Tools, TMDE, and Support Equipment	2-2
2-5	Fabricated Tools	2-2
2-6	Troubleshooting Procedures	2-2
2-7	Repair Methods	2-2
2-8	Torque Values	2-3
2-9	Cleaning Instructions	2-3
2-10	Lubrication Instructions	2-4
2-11	Welding Instructions	2-4
2-12	Painting Instructions	2-5
2-13	Thread Insert Repair and Replacement	2-5
2-14	Splined Nut Replacement	2-6
2-15	Towing Eye Replacement	2-7

2-1. GENERAL.

References are provided for maintenance-related procedures not within the scope of this technical manual (e.g., welding). The troubleshooting procedures paragraph (para 2-6) is the master reference guide for locating troubleshooting information. This chapter also describes and illustrates or otherwise addresses repair methods, torque values, cleaning, lubrication, welding, painting, and screw thread insert, splined nut, and towing eye replacement.

2-2. COMMON TOOLS AND EQUIPMENT.

Standard and commonly used tools and equipment having general application to hull items are authorized by Tables of Allowances and Tables of Organization and Equipment.

2-3. SPARES AND REPAIR PARTS.

Repair parts are illustrated and listed in TM 9-2350-287-24P. That technical manual is the authority for requisitioning repair parts.

2-4. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

The special tools and support equipment listed and illustrated in TM 9-2350-287-24P are the only special tools and equipment necessary to perform maintenance operations described in this technical manual. TM 9-2350-287-24P is the authority for requisitioning special tools and support equipment.

2-5. FABRICATED TOOLS.

NOTE

Fabricated tools are not available for issue.

The fabricated tools listed in Appendix E of this technical manual are of particular value to shops engaged in repairing a number of identical components. The tools are listed in this manual to allow supporting maintenance shops to fabricate them locally.

2-6. TROUBLESHOOTING PROCEDURES.

For APU troubleshooting procedures, refer to TM 9-2815-221-34&P.
For ENGINE troubleshooting procedures, refer to TM 9-2815-202-34.
For TRANSMISSION troubleshooting procedures, refer to TM 9-2520-234-35.

2-7. REPAIR METHODS.

Complete disassembly is not always necessary to make a repair. Exercise good judgment to keep disassembly and assembly to a minimum.

CAUTION

Never scribe marks on bearing surfaces. Damage to the bearing will result.

To be certain of correct positioning at assembly, mark gears on mating teeth with scribe marks, dye, indelible ink, or paint. Avoid the use of chalk and crayon because they smudge and are easily wiped off.

During assembly, subassemblies should be assembled first, combined into major components if possible, and then installed to form a complete component.

Records to provide repair and replacement data and statistics should be carefully prepared and maintained according to DA Pam 738-750.

Replacement of Parts

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 or reconditioned will be salvaged, and new parts will be used to replace them.

When assembling components and assemblies, replace damaged keys with new ones. If screws, washers, or nuts are damaged, they must be replaced.

2-7. REPAIR METHODS (continued).

Gaskets, nonmetallic packings, preformed packings, seals, Iockwashers, self-locking nuts, self-locking screws, cotter pins, and spring pins must be replaced. Bushings must be replaced if removed.

Springs must be replaced if broken, kinked, stretched, or cracked.

If a required 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.

Ball and Roller Bearings

Refer to TM 9-214 for the cleaning, inspection, and Iubrication of bearings and for instructions for evaluating bearing life.

Removal of Burrs, Scratches, and Raised Metal

Remove burrs, scratches, or raised metal with a file or stone. Remove them from close-fitting surfaces by lapping the surfaces with abrasive-grade compound.

Shafts, Gears, and Bearings

Gears, bearings, sleeves, and other components may be installed on shafts as tight fits. The use of an arbor press, gear pullers, or other appropriate tools for removal and installation maybe required.

2-8. TORQUE VALUES.

Torque values given in these procedures apply to unlubricated threads. Follow torque values given throughout this technical manual. When no torque value is given, refer to Appendix C, Torque Values for Threaded Fasteners, to prevent damaging parts.

2-9. CLEANING INSTRUCTIONS.

All parts should be cleaned before inspection, after repair, and before assembly.

WARNING

Drycleaning solvent P-D-880 is toxic and flammable. Always wear protective goggles and gloves, and use only in a wlli-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 metal parts except bearings with drycleaning solvent. Metal or fiber brushes maybe used to apply dry cleaning solvent and to remove softened or dissolved material. Short lengths of wire maybe used to clear lubrication holes of debris or deposit residue. Hand scraping with metal scrapers maybe used to remove softened coatings or deposits.

Soak very oily or greasy metal parts in a tank containing drycleaning solvent. Soaking time varies with the type and amount of material to be removed.

2-9. CLEANING INSTRUCTIONS (continued).

Hands should be kept free of grease, which can collect dust and dirt,

WARNING

Compressed air used for cleaning purposes shall not exceed 30 psi (207 kPa). Use only with effective chip-guarding and personal protective equipment (e.g., goggles/ shield, gloves).

Blow-dry metal parts with compressed air or wipe pads dry with clean rags.

Rubber parts should be washed with a soap solution and dried with clean rags.

CAUTION

Do not steam-clean electrical components. Moisture and condensation in electrical wiring can cause short circuits and other damage.

Wipe electrical harnesses completely dry with clean rags.

Remove corrosion or rust by sandblasting or vapor-blast cleaning, or with crocus cloth. Use the method that will not damage the surface being cleaned. Crocus cloth should be used to remove corrosion and rust from polished surfaces only. Make sure critical dimensions are not changed when using crocus cloth.

Inspect screw thread inserts for damaged or missing keys, damaged threads, or looseness. Replace any damaged screw thread insert.

Inspect threaded holes for damaged or knurled threads. Repair damaged threads with thread restorer file by chasing on a lathe or using tap and die.

Always measure a component when tolerances are given to make sure the component is still serviceable.

2-10. LUBRICATION INSTRUCTIONS.

Unless otherwise directed, apply a light coat of lubricating oil to all metal parts after cleaning and inspection. This prevents rusting and aids assembly. To ease connection, silicone compound maybe used on connectors of electrical wires.

Lubricate parts during and after assembly in accordance with lubrication instructions and intervals given in TM 9-2350-287-10 and TM 9-2350-287-20-2.

2-11. WELDING INSTRUCTIONS.

Refer to TM 9-237 for welding instructions, materials, and tool sets.

2-12. PAINTING INSTRUCTIONS.

Refer to TM 43-0139 and TB 43-0209 for information on painting.

2-13. THREAD INSERT REPAIR AND REPLACEMENT.

When determined feasible by inspection, damaged screw thread inserts should be repaired by rethreading using a thread restorer, tap and die, or by chasing on a lathe.

If a screw thread insert is unserviceable, remove the insert by drilling out the material between the locking keys. Bend the keys inward, and remove damaged insert using an easy-out or other extractor tool.

Use a thread chaser on the tapped hole.

Install the new screw thread insert between 0.010 and 0.030 inch (0.254 and 0.762 mm) below top of tapped hole. Lock screw thread insert in place by driving locking keys down between the tapped hole and screw thread insert, flush with mounting surface.

If threads in the tapped hole are unserviceable, fill-weld the old tapped hole in accordance with TM 9-237. Then drill and tap new threaded hole to its original size using the information in Table 2-1

Use of oversized inserts is not recommended.

Table 2-1. Thread Inserts: Drill Size and Depth

THREAD INSERT		TAP DRILL Diameter	COUNTERSINK Diameter	REMOVAL DRILL	
Internal Thread	External Thread			Diameter	Drilling Depth
10-24 10-32	3/8-16	Q (0.332)	25/64	9/32	1/4
1/4-20 1/4-28	7/16-14	X (0.397)	29/64	11/32	1/4
5/16-18 5/16-24	1/2-13	29/64	33/64	13/32	1/4
3/8-16 3/8-24	9/16-12	33/64	37/64	15/32	1/4
7/16-14 7/16-20	5/8-11	37/64	41/64	17/32	1/4
1/2-13 1/2-20	11/16-11	41/64	45/64	19/32	1/4

2-14. SPLINED NUT REPLACEMENT.

This paragraph describes the removal and installation of splined nuts. Two persons are required for this task.

a. REMOVAL

1. Remove powerpack (refer to TM 9-2350-287-20-1). Remove splined nut attaching driver's seat and splined nut attached to heating duct (refer to TM 9-2350-287-20-2). Remove driver's compartment bulkhead shield and insulation (para 9-3).

2. From driver's compartment, use suitable hammer and punch to drive either insert from bulkhead into engine compartment.

b. INSTALLATION

1. Position new nut against engine side of hole. Position large steel washer against nut. Have assistant position large steel washer and screw from driver's side of bulkhead.

NOTE

Screw and nut for driver's seat splined nut must be 3/8-20. Screw and nut for driver's heating duct splined nut must be 3/16-28.

2. Install nut on screw. Have assistant hold screw. Tighten nut to drive nut into fully nested position. Remove nut, screw, and washers from bulkhead. Make sure splined nut is fully seated.

3. Screw in appropriate screw and remove it. Operation should be smooth.

4. Install driver's compartment bulkhead shield and insulation (para 9-3). Install driver's seat and driver's heating duct (refer to TM 9-2350-287-20-2).

5. Install powerpack (refer to TM 9-2350-287-20-1).

2-15. TOWING EYE REPLACEMENT.

This Task Covers:

a. Removal

b. Installation

Initial Setup:

Tools/Test Equipment:
- Electric disc sander (Item 13, Appendix D)
- General mechanic's tool kit (Item 19,
- Appendix D)
- Torch outfit, welding (Item 41.1, Appendix D)

Equipment Conditions:
- Vehicle parked on level ground (refer to TM 9-2350-287-10).
- Towing eye bushing removed (refer to TM 9-2350-287-20-2).

References:
- TC 9-237

a. REMOVAL

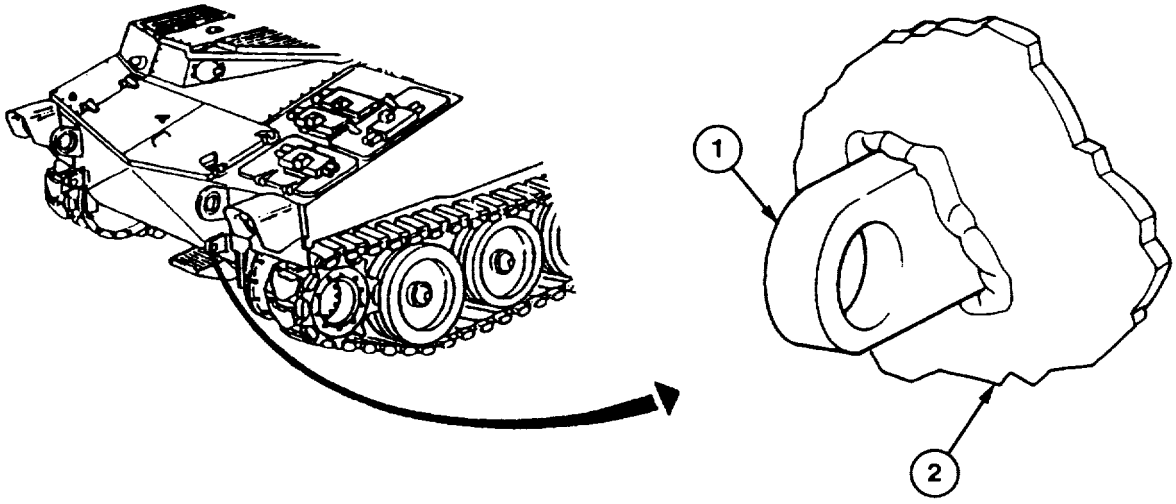
WARNING

Wear chip-guarding and personal protective equipment (goggles/shield, gloves, etc.) when using grinder. Failure to heed this warning may result in severe injury to personnel.

NOTE

There are two towing eyes; they are replaced the same way.

Grind weld loose to remove towing eye (1) from front surface of vehicle (2).



2-15. TOWING EYE REPLACEMENT (continued).

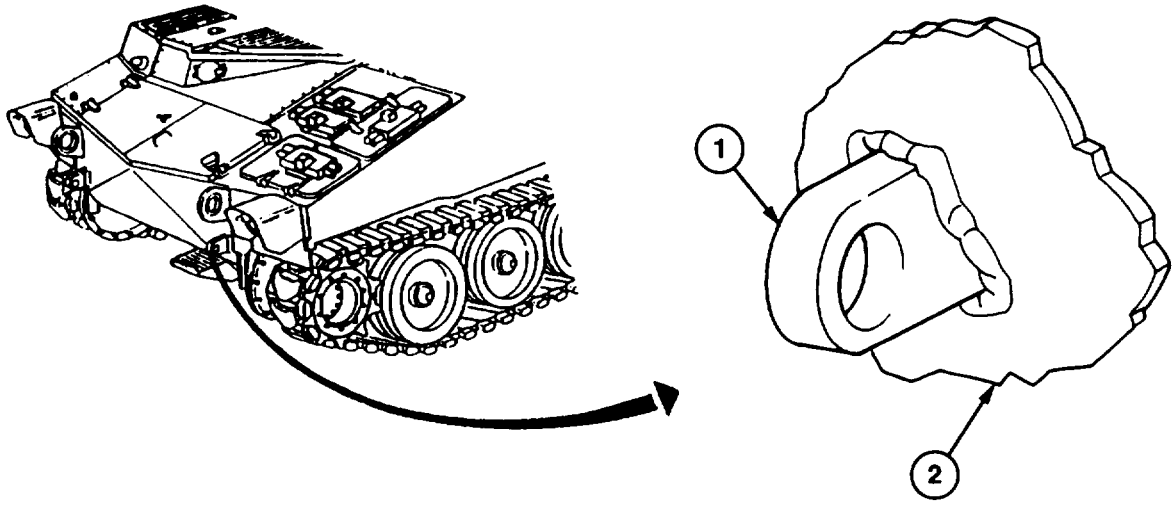
b. INSTALLATION

1. Position towing eye (1) into recess on front surface of vehicle (2).

WARNING

Unsafe welding practices can cause serious injury from fire, explosions, or harmful agents. Allow only authorized personnel to weld metals, and follow the precautions in TC 9-237. Protective clothing and goggles must be worn; adequate protective equipment must be used; a suitable fire extinguisher must be kept nearby; and the requirements of TC 9-237 must be strictly followed.

2. Weld towing eye (1) to front surface of vehicle (2) with aluminum armor weld type A, per MIL-STD-1946. Weld should be 3/4 inch and go completely around towing eye (1).



FOLLOW-ON MAINTENANCE:

- Install towing eye bushing (refer to TM 9-2350-287-20-2).

CHAPTER 3
ENGINE ASSEMBLY MAINTENANCE

Paragraph Number	Paragraph Title	Page Number
3-1	General	3-1
3-2	Engine Assembly Replacement	3-1
3-3	Mass Ring and Flexible Coupling Replacement	3-6
3-4	Vibration Damper Replacement	3-7
3-5	Engine Mount Repair	3-10

3-1. GENERAL

This chapter illustrates and describes maintenance instructions for the engine assembly and accessories. For engine assembly maintenance instructions not covered in this technical manual, refer to TM 9-2815-202-34.

3-2. ENGINE ASSEMBLY REPLACEMENT.

This Task Covers:

a. Removal

b. Installation

Initial Setup:

Tools/Test Equipment:
- General mechanic's tool kit (Item 19, Appendix D)
- Torque wrench, 0-175 ft-lb (Item 44, Appendix D)

Materials/Parts:
- Adhesive (Item 2, Appendix B)
- Silicone lubricant (Item 23, Appendix B)
- Gasket (Item 32, Appendix H)
- LockWasher (14) (Item 60, Appendix H)
- LockWasher (6) (Item 61, Appendix H)
- LockWasher (6) (Item 62, Appendix H)
- Preformed packing (Item 85, Appendix H)

Personnel Required: Two

Equipment Conditions:
- PowerPack placed on blocks.
- Vibration damper removed (para 3-4).

a. REMOVAL

WARNING

Never crawl under equipment when performing maintenance unless equipment is securely blocked. Keep clear of equipment when it is being raised or lowered. Do not allow heavy components to swing while suspended by lifting device. Exercise extreme caution when working near a cable under tension. Failure to comply with this warning can result in injury to personnel or damage to equipment.

3-2. ENGINE ASSEMBLY REPLACEMENT (continued).

CAUTION

Use care to avoid damage to powerpack components during replacement. Nicks, scratches, and dents resulting from careless handling can cause oil leakage or improper functioning. This could result in equipment failure. Handling of heavy components with slings and hooks, and blocking for support in various positions, are important for damage prevention.

NOTE

Refer to TM 9-2815-202-34 and TM 9-2520-234-35 regarding procedures for the removal and installation of engine, to or from shipping and storage containers.

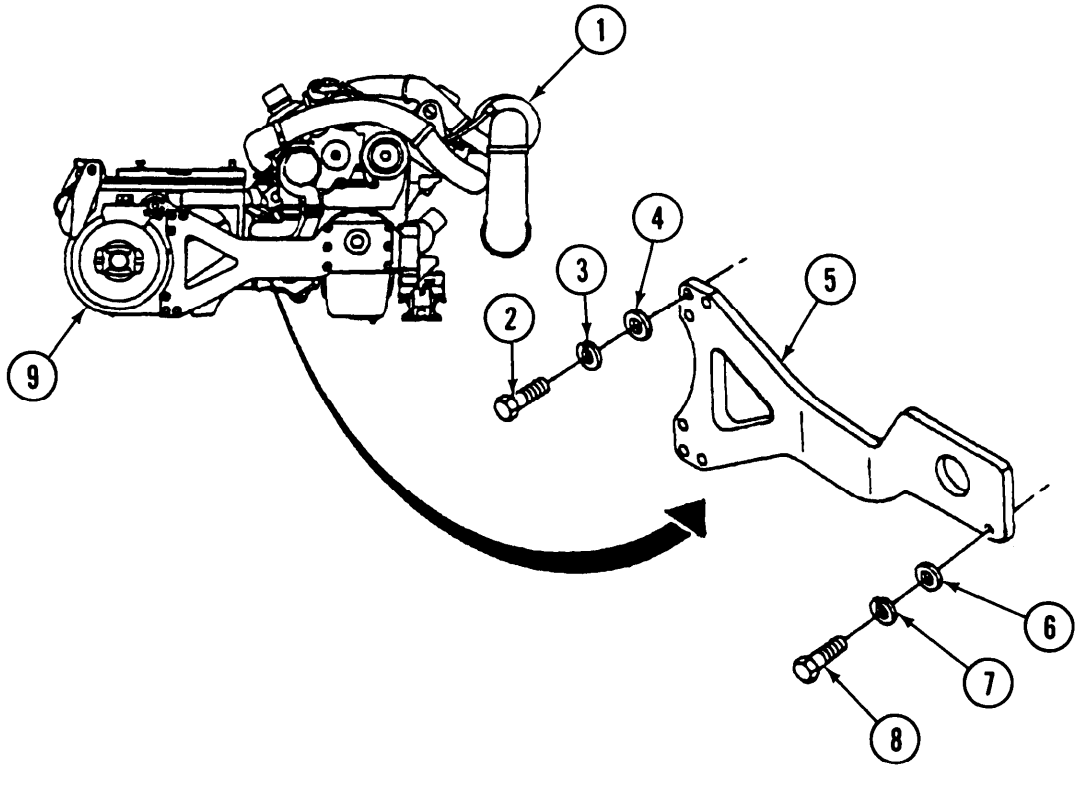
1. Attach sling to suitable lifting device and four engine lifting eyes.

WARNING

The transmission, transfer assembly, and engine assembly are heavy. To prevent injury to personnel or damage to equipment, make sure they are supported and blocked to prevent transmission from rolling.

2. Remove six screws (2), lockwashers (3), and washers (4) from tie bar (5) at transmission (9). Discard lockwashers.

3. With the aid of an assistant, remove six screws (8), lockwashers (7), and washers (6) and tie bar (5) from engine (1). Discard lockwashers.

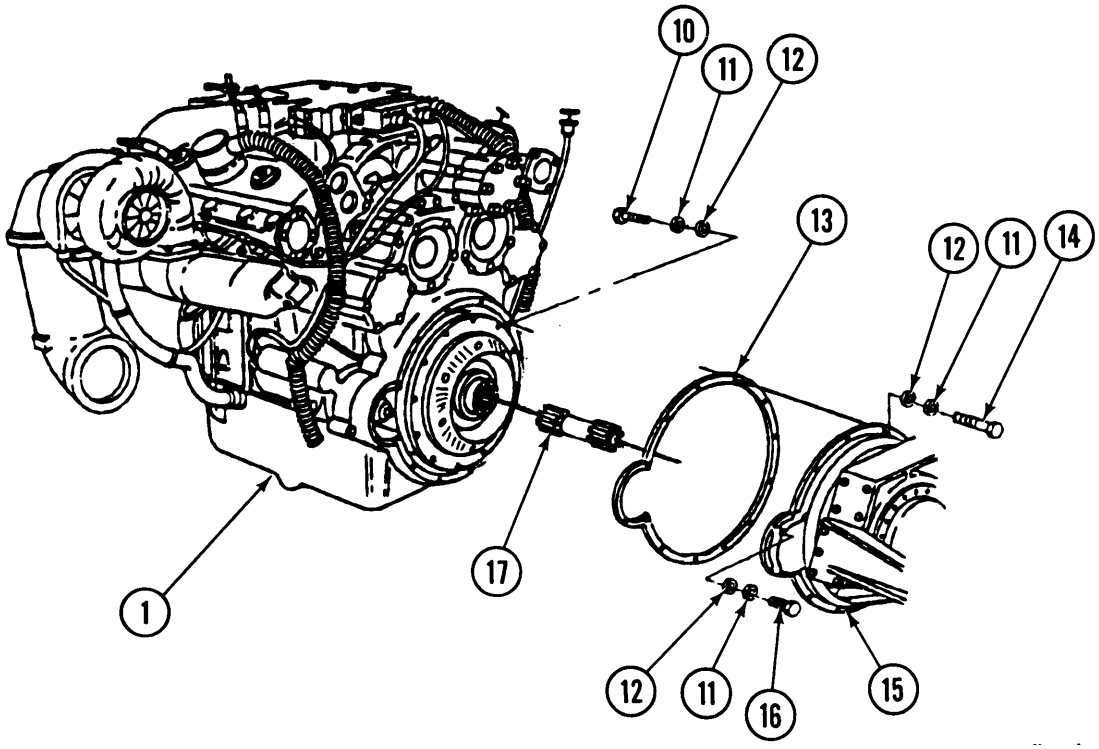


3-2. ENGINE ASSEMBLY REPLACEMENT (continued).

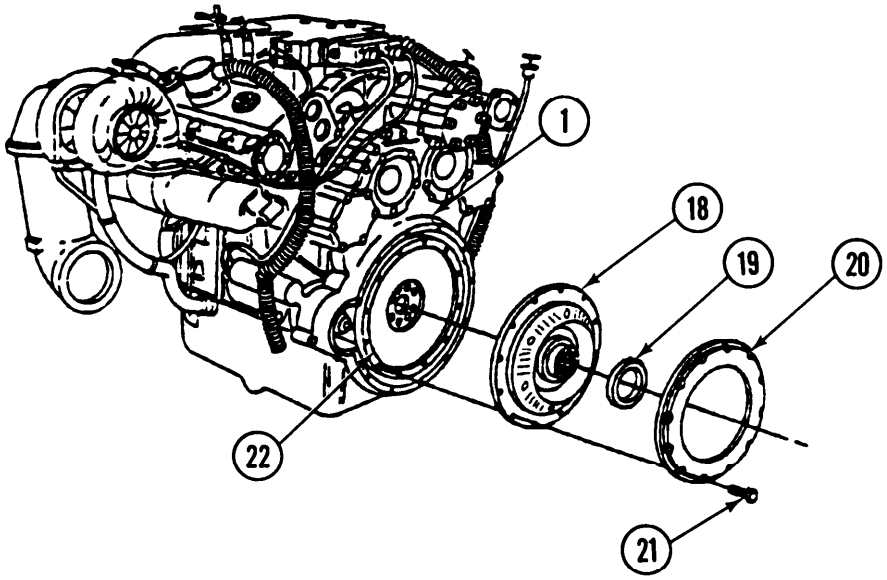
4. Remove two screws (10), nine screws (14), three screws (16), and 14 lockwashers(11) and washers (12) from transfer assembly (15). Discard lockwashers.

5. With the aid of an assistant, raise lifting device and remove engine (1) from transfer assembly (15).

6. Remove gasket (13) and shouldered shaft (17) from engine (1) or transfer assembly (15). Discard gasket.



7. Remove 12 screws (21), mass ring (20), flexible coupling (18), and preformed packing(19) from flywheel (22). Discard preformed packing.



3-2. ENGINE ASSEMBLY REPLACEMENT (continued).

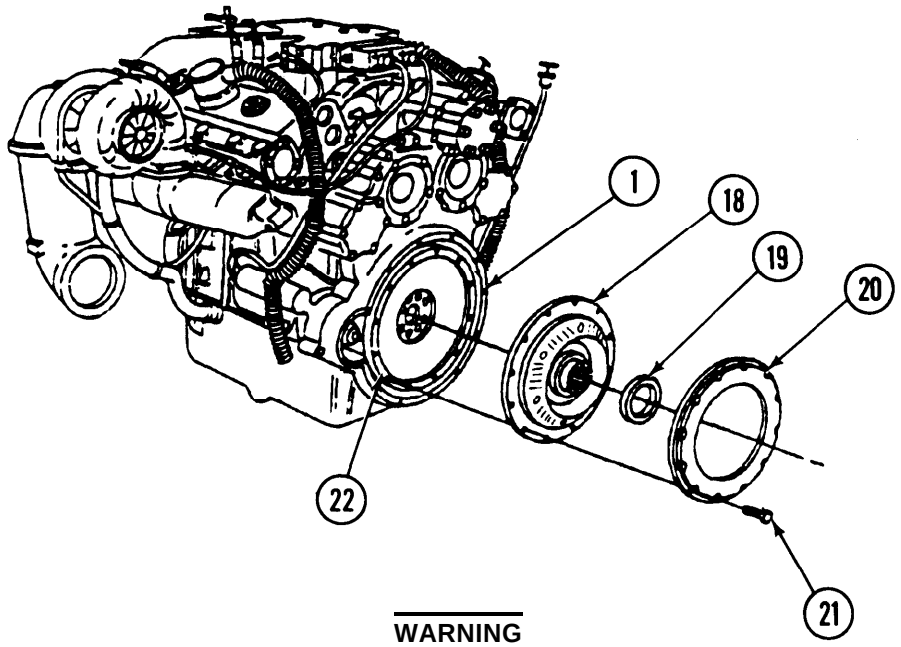
NOTE

Each assembly returned to an overhaul depot must include the component engine parts and accessories as part of the engine assembly when received in container prior to issuance of a serviceable replacement. Refer to TM 9-2350-287-24P for report and requisitioning information and data.

b. INSTALLATION

1. Apply silicone lubricant to new preformed packing(19) and groove of flexible coupling (18).

2. Install preformed packing (19) on flexible coupling (18).



WARNING

Adhesive causes immediate bonding on contact with eyes, skin, or clothing and also gives off harmful vapors. Wear protective goggles and use in well-ventilated area. If adhesive gets in eyes, try to keep eyes open; flush eyes with water for 15 minutes and get immediate medical attention.

3. Apply adhesive to spline of flexible coupling (18).

4. Install flexible coupling (18) and mass ring (20) on flywheel (22).

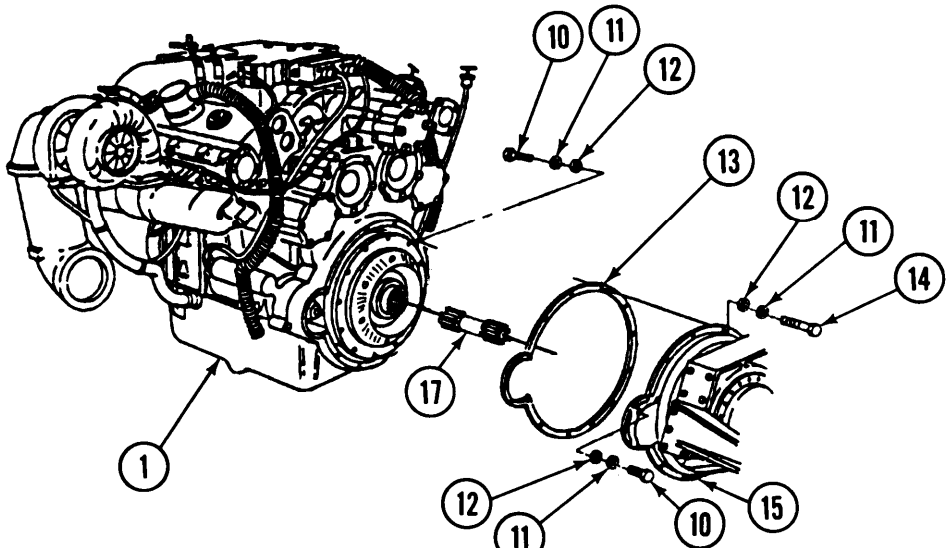
5. Check for clearance of 0.010 to 0.015 inch between mass ring (20) and flywheel (22). If clearance exceeds 0.015 inch, adjust high points by striking mass ring (20) until seated on flywheel (22).

6. Secure mass ring (20) and flexible coupling (18) to flywheel (22) with 12 screws (21). Torque screws (21) between 40 and 50 ft-lb (54 and 68 N•m).

3-2. ENGINE ASSEMBLY REPLACEMENT (continued).

7. Install shouldered shaft (17) in transfer assembly (15) so both internal and external splines mesh.

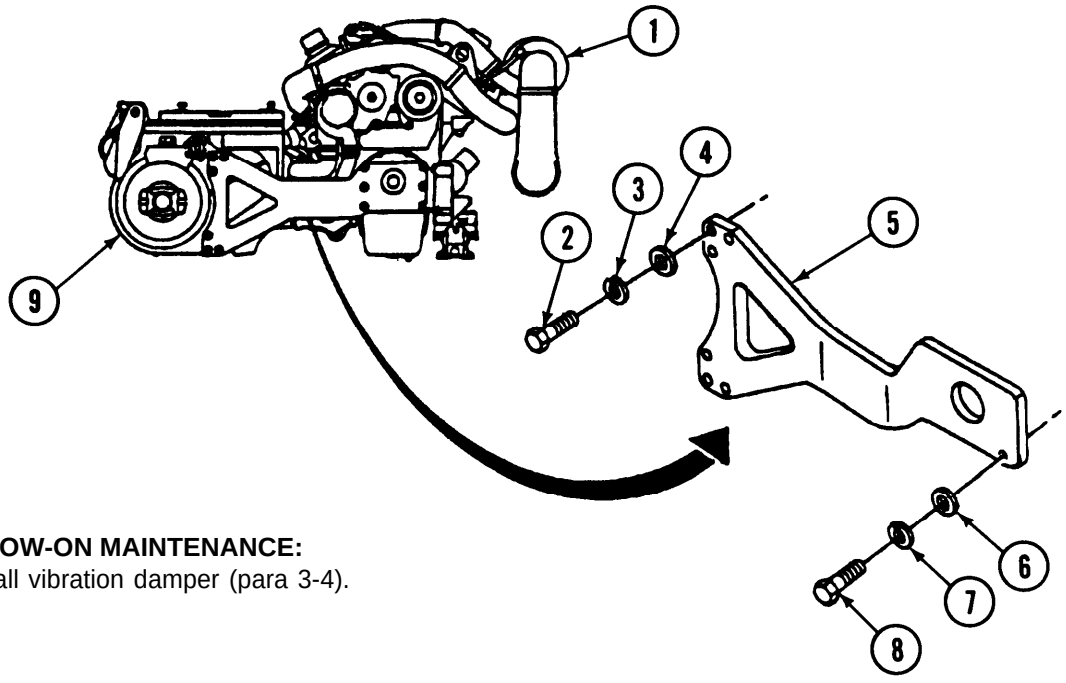
8. Install new gasket (13) on engine (1). With the aid of an assistant, raise lifting device and connect engine (1) to transfer assembly (15) with 14 washers (12) and new lockwashers (11), nine screws (14), three screws (16), and two screws (10). Torque screws (10, 14, and 16) between 60 and 70 ft-lb (81 and 95 N•m).



9. With the aid of an assistant, install tie bar (5) on engine (1) with six washers (6), new lockwashers (7), and screws (8). Torque screws between 90 and 100 ft-lb (122 and 135 N•m).

10. Install tie bar (5) on transmission(9) with six washers (4), new lockwashers (3), and screws (2). Torque screws between 140 and 150 ft-lb(190 and 203 N•m).

11. Block engine (1) and remove sling. Detach lifting device from sling.



FOLLOW-ON MAINTENANCE:
- Install vibration damper (para 3-4).

3-3. MASS RING AND FLEXIBLE COUPLING REPLACEMENT.

This Task Covers:

a. Removal
c. Installation
b. Inspection

Initial Setup:

Tool/Test Equipment:
- General mechanic's tool kit (Item 19, Appendix D)
- Torque wrench, 0-150 ft-lb (Item 43, Appendix D)

Materials/Parts:
- Adhesive (Item 2, Appendix B)
- Silicone lubricant (Item 23, Appendix B)
- Preformed packing (Item 88, Appendix H)

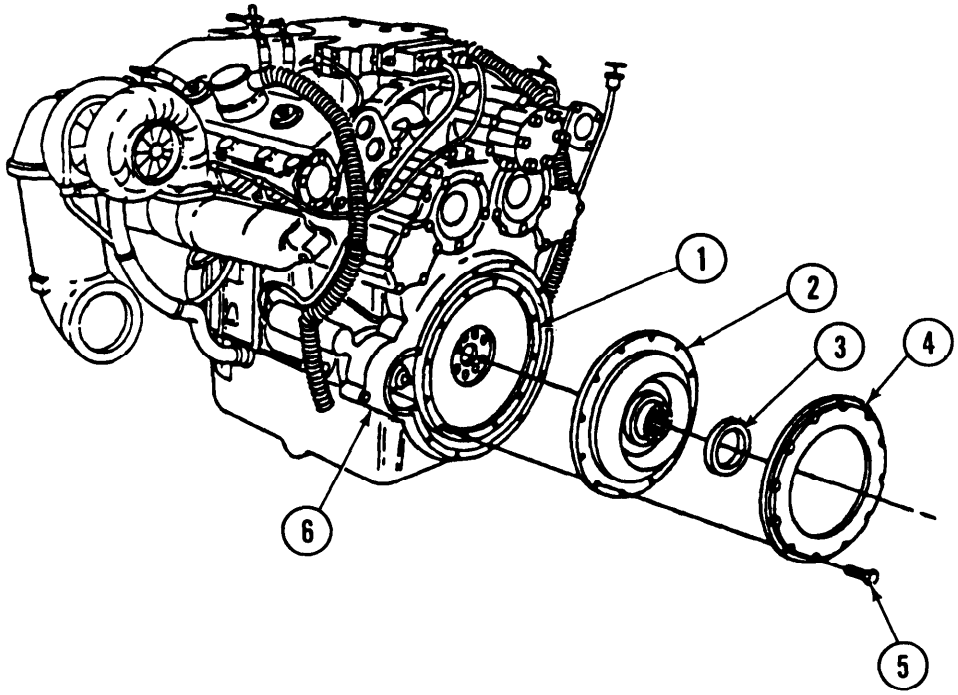
Equipment Conditions:
- Engine assembly removed (para 3-2).

a. REMOVAL

Remove 12 screws (5), mass ring (4), flexible coupling (2), and preformed packing (3) from flywheel (1). Discard preformed packing.

b. INSPECTION

If rear surface of flexible coupling (2) is oil-soaked, if springs or washers are broken, or if flexible coupling (2) is distorted, replace flexible coupling.



3-3. MASS RING AND FLEXIBLE COUPLING REPLACEMENT (continued)

c. INSTALLATION

1. Apply silicone lubricant to new preformed packing (3) and groove of flexible coupling (2).

2. Install preformed packing (3) on flexible coupling (2).

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 with water for 15 minutes and get immediate medical attention.

3. Apply adhesive to splines of flexible coupling (2).

4. Install flexible coupling (2) and mass ring (4) on flywheel (1).

5. Check for clearance of 0.010 to 0.015 inch between mass ring (4) and engine (6). If clearance exceeds 0.015 inch, adjust high points as necessary.

6. Secure mass ring (4) and flexible coupling (2) to flywheel(1) with 12 screws (5). Torque screws between 40 and 50 ft-lb (54 and 68 N•m).

FOLLOW-ON MAINTENANCE:
- Install engine assembly (para 3-2).

3-4. VIBRATION DAMPER REPLACEMENT.

This Task Covers:

a. Removal

b. Installation

Initial Setup:

Tools/Test Equipment:
- Deadblow hammer (Item 9, Appendix D)
- General mechanic's tool kit (Item 19, Appendix D)
- Socket wrench set, 1-inch drive, 2 9/16 inch (Item 38, Appendix D)
- Socket, 3/4-inch drive, 1 1/2 inch (Item 39, Appendix D)
- Torque wrench, 0-600 ft-lb (Item 45, Appendix D)

Materials/Parts:
- LockWasher (6) (Item 56, Appendix H)
- Vibration damper cone (Item 133, Appendix H)

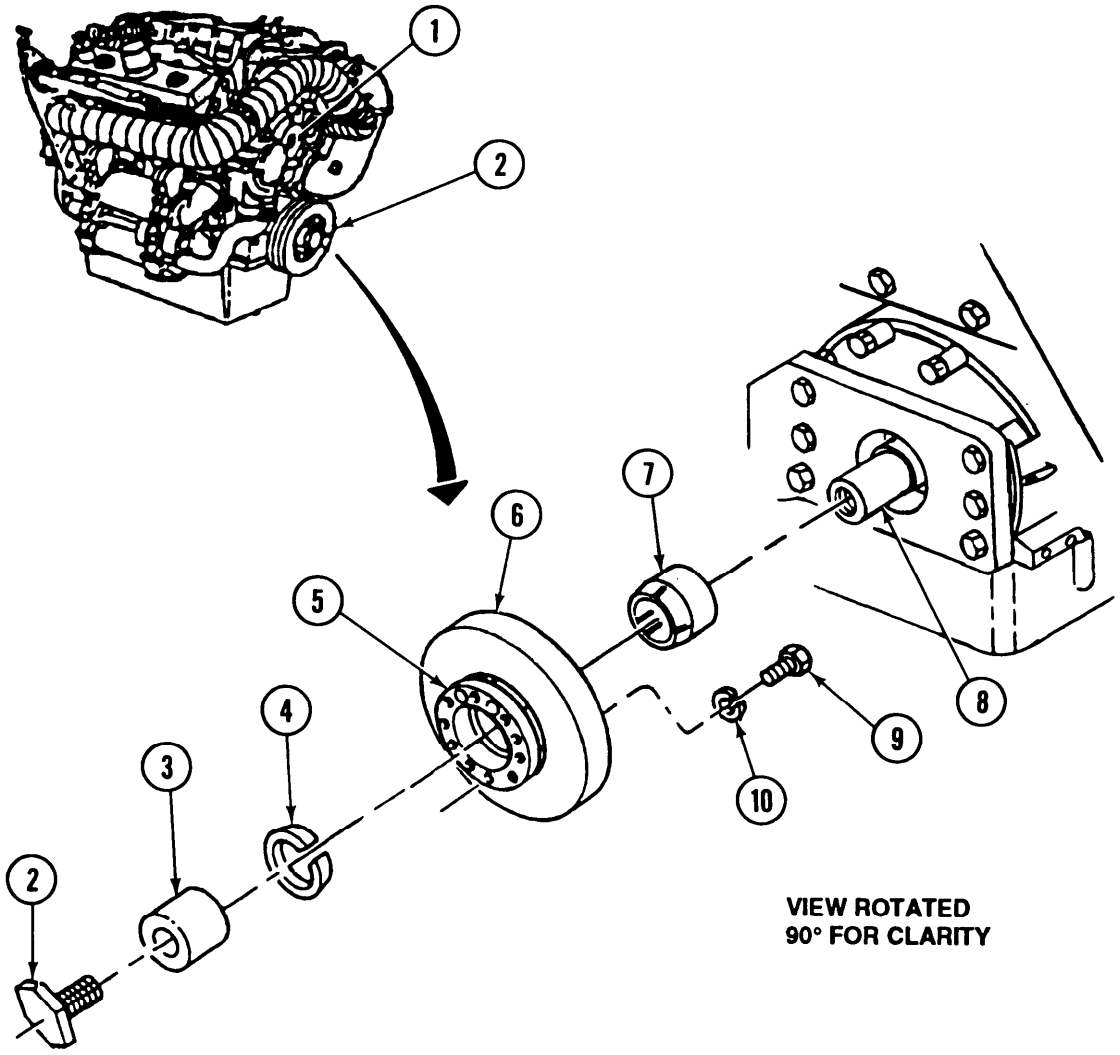
Personnel Required: Two

Equipment Conditions:
- PowerPack placed on blocks.

3-4. VIBRATION DAMPER REPLACEMENT (continued).

a. REMOVAL

1. Hold nut (1) to prevent engine from turning, and loosen bolt (2) approximately 1/8 inch.
2. Strike bolt (2) and vibration damper (6) to loosen vibration damper cone (7) and ring (4).
3. Pry vibration damper (6) and hub (5) loose from engine crankshaft (8).



3-4. VIBRATION DAMPER REPLACEMENT (continued).

4. Remove bolt (2), sleeve bushing (3), cone (7), vibration damper (6), hub (5), and ring (4) from engine crankshaft (8).

NOTE

Perform step 5 only if hub or vibration damper is damaged.

5. Remove six screws (9) and lockwashers (10) from hub (5) and vibration damper (6). Discard lockwashers.

b. INSTALLATION

NOTE

Perform steps 1 and 2 only if hub or vibration damper was damaged.

1. Install hub (5) in vibration damper (6) and aline holes. Install six screws (9) and new lockwashers (10). Torque screws (9) between 60 and 70 ft-lb (81 and 95 N•m).

2. Install ring (4), hub (5), vibration damper (6), cone (7), sleeve bushing (3), and bolt (2) on engine crankshaft (8).

3. Hold nut (1) and torque bolt (2) to 180 ft-lb (244 N•m).

4. Strike bolt (2) to seat cone (7) in hub (5).

5. Hold nut (1) and torque bolt (2) to 300 ft-lb (407 NŽm).

6. Strike bolt (2) again. Torque bolt (2) between 300 and 330 ft-lb (407 and 447 NŽm).

FOLLOW-ON MAINTENANCE:

- None

3-5. ENGINE MOUNT 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 19, Appendix D)

Materials/Parts:
- Cotter pin (2) (Item 11, Appendix H)
- Cotter pin (4) (Item *9,* Appendix H)
- Lockwasher (4) (Item *62,* Appendix H)

Equipment Conditions:
- Vehicle parked on level ground (refer to TM 9-2350-287-10).
- Engine compartment access cover removed (refer to TM 9-2350-287-20-2).
- PowerPack removed (refer to TM 9-2350-287-20-1).
- Lower fuel tank removed (para *4-4).*

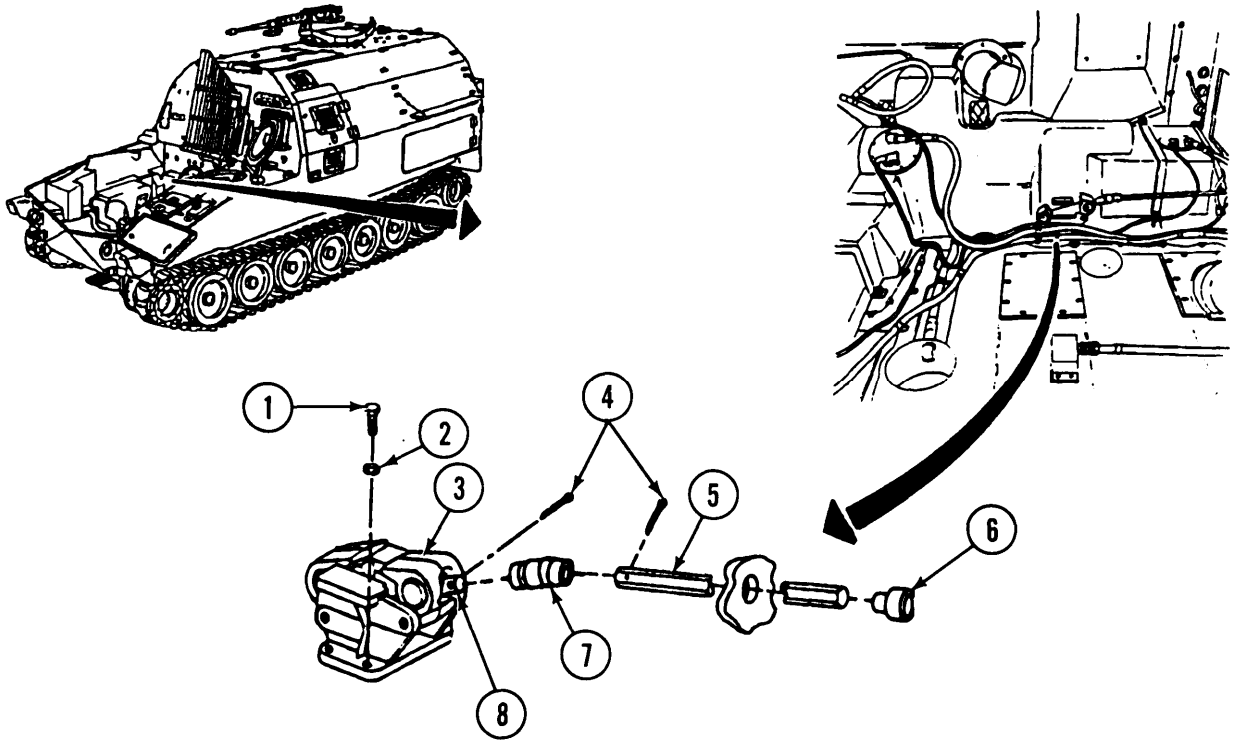
a. REMOVAL

1. Remove two cotter pins *(4)* from tensioning tie rod (8) and engine mounting bar (5). Discard cotter pins.

2. Remove mounting bar (5) from universal joint (7), and pull mounting bar *(5)* and bushing (6) into driver's compartment.

3. Remove universl joint *(7)* from tie rod (8).

4. Remove four screws (1) and iockwashers (2) and engine mounting base assembly *(3)* from bulkhead. Discard Iockwashers.



3-5. ENGINE MOUNT REPAIR (continued).

b. DISASSEMBLY

1. Remove four cotter pins (13) and two pins (12) from engine mount base (14). Discard cotter pins.
2. Remove jaw assembly (9) from mount base (14).
3. Turn engine mounting jaw (15) counterclockwise to remove from tie rod (8).
4. Turn engine mounting jaw (10) clockwise to remove from tie rod (8).
5. Slide two jaw nuts (11 and 16) out of two jaws (10 and 15).

c. INSPECTION

Inspect mount base, jaws, bolt, and jaw nuts for cracks and damaged threads.

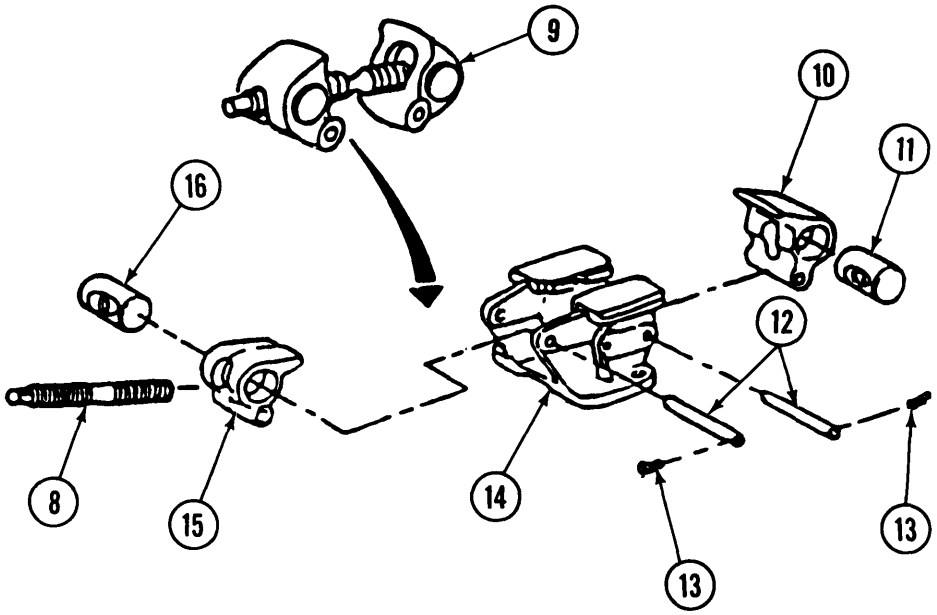
d. ASSEMBLY

1. Slide two jaw nuts (11 and 16) into two jaws (10 and 15).

NOTE

Make sure jaws are evenly spaced on bolt during installation.

2. Install jaw (10) on tie rod (8) by turning counterclockwise.
3. Install jaw (15) on tie rod (8) by turning clockwise.
4. Install jaw assembly (9) on mount base (14),
5. Install two pins (12) and four new cotter pins (13) on mount base (14)



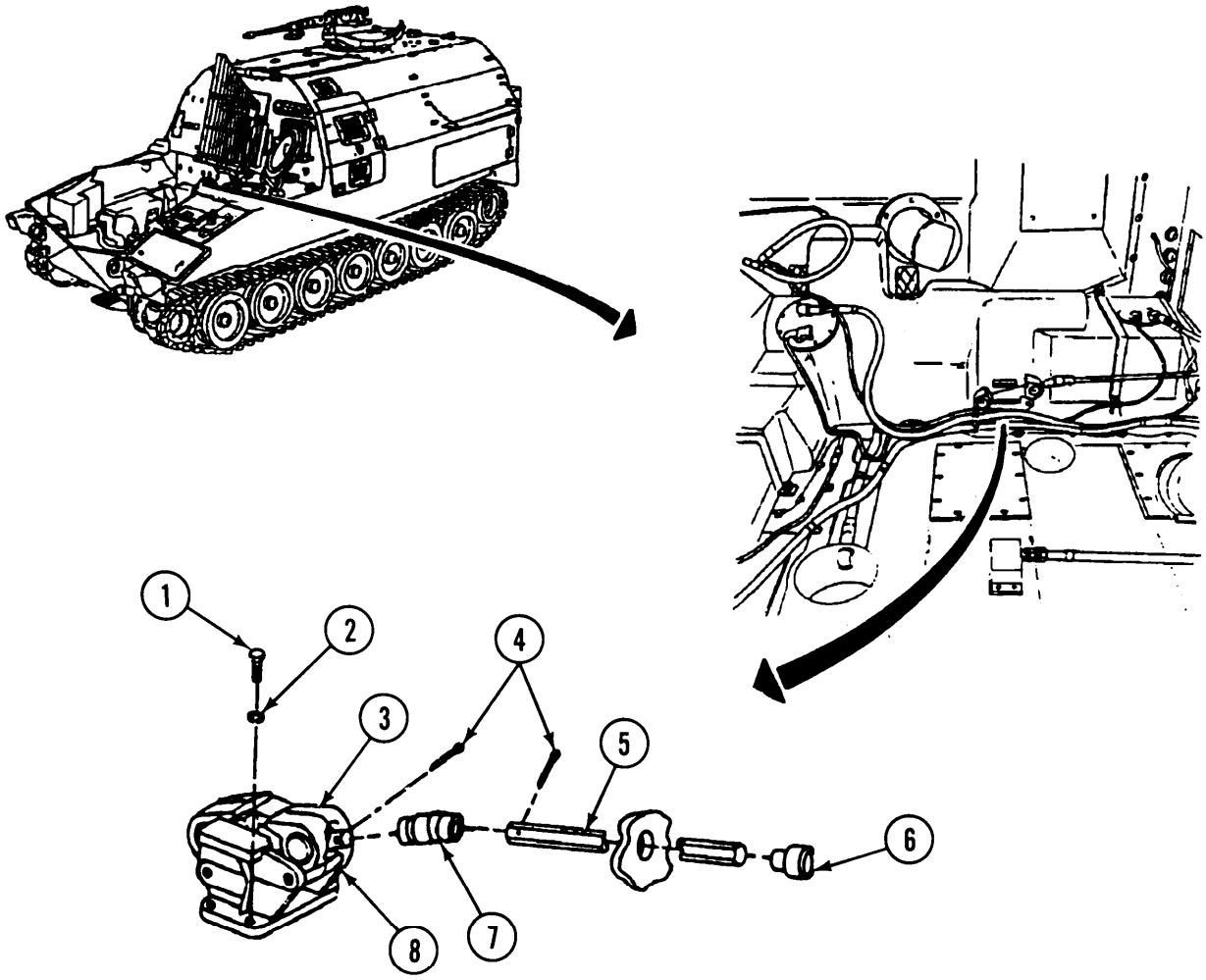
3-5. ENGINE MOUNT REPAIR (continued).

e. INSTALLATION

1. Install mounting base assembly (3) on bulkhead with four screws (1) and new lockwashers (2).

2. Install universal joint (7) on tie rod (8) with new cotter pin (4).

3. Insert bushing (6) and mounting bar (5) through driver's compartment, and install mounting bar (5) on universal joint (7) with new cotter pin (4).



FOLLOW-ON MAINTENANCE:

- Install lower fuel tank (para 4-4).
- Install powerpack (refer to TM 9-2350-287-20-1).
- Install engine compartment access cover (refer to TM 9-2350-287-20-2).

CHAPTER 4
FUEL, AIR INTAKE, AND EXHAUST SYSTEMS

Paragraph Number	Paragraph Title	Page Number
4-1	General	4-1
	[Paragraph 4-2 Deleted]	
4-3	Upper Fuel Tank Replacement	4-7
4-4	Lower Fuel Tank Replacement	4-9
4-5	Fuel Tank Repair	4-12
4-6	Fuel Tank Pad Replacement	4-18
4-7	Fuel Tank Retaining Strap and Channel Group Replacement	4-20
4-8	Air Cleaner Fan Assembly Repair	4-24
4-9	Engine-Driven Fuel Pump Repair	4-29

4-1. GENERAL.

This chapter illustrates and describes maintenance procedures for the upper and lower fuel tanks, fuel tank pads, fuel tank retaining straps and channel groups, air cleaner fan assembly, and engine-driven fuel pump. Refer to TM 9-2815-202-34 for all exhaust-related components.

[Paragraph 4-2 Deleted]

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4-3. UPPER FUEL TANK REPLACEMENT.

This Task Covers:

a. Removal

b. Installation

Initial Setup:

Tool/Test Equipment:
- Combination wrench, 1 1/4 inch (Item 8, Appendix D)
- General mechanic's tool kit (Item 19, Appendix D)

Personnel Required: Three

Equipment Conditions:
- Fuel system drained (refer to TM 9-2350-287-10).
- Powerpack removed (refer to TM 9-2350-287-20-1).
- Heat shield removed (refer to TM 9-2350-287-20-1).
- Fuel level transmitters removed (refer to TM 9-2350-287-20-1).
- Fuel hoses, tubes, and fittings disconnected (refer to TM 9-2350-287-20-1).

a. REMOVAL

WARNING

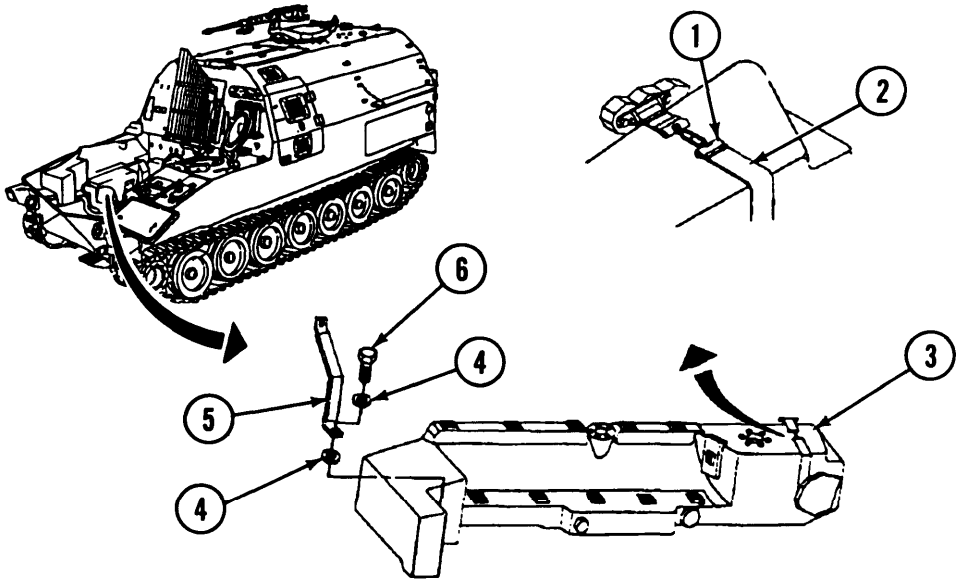
Do not smoke or use open flame when working on fuel systems. Fuel is highly combustible and an explosion may occur, resulting in severe injury or death.

1. Loosen turnbuckle (1) on retaining strap (2).

NOTE

For correct installation, note number of washers removed at each strap location.

2. Remove two screws (6), four washers (4), and retaining strap (5) from upper fuel tank (3).



4-3. UPPER FUEL TANK REPLACEMENT (continued).

3. With the aid of two assistants, pull fuel tank (3) toward front of vehicle, then lift tank (3) from vehicle.

b. INSTALLATION

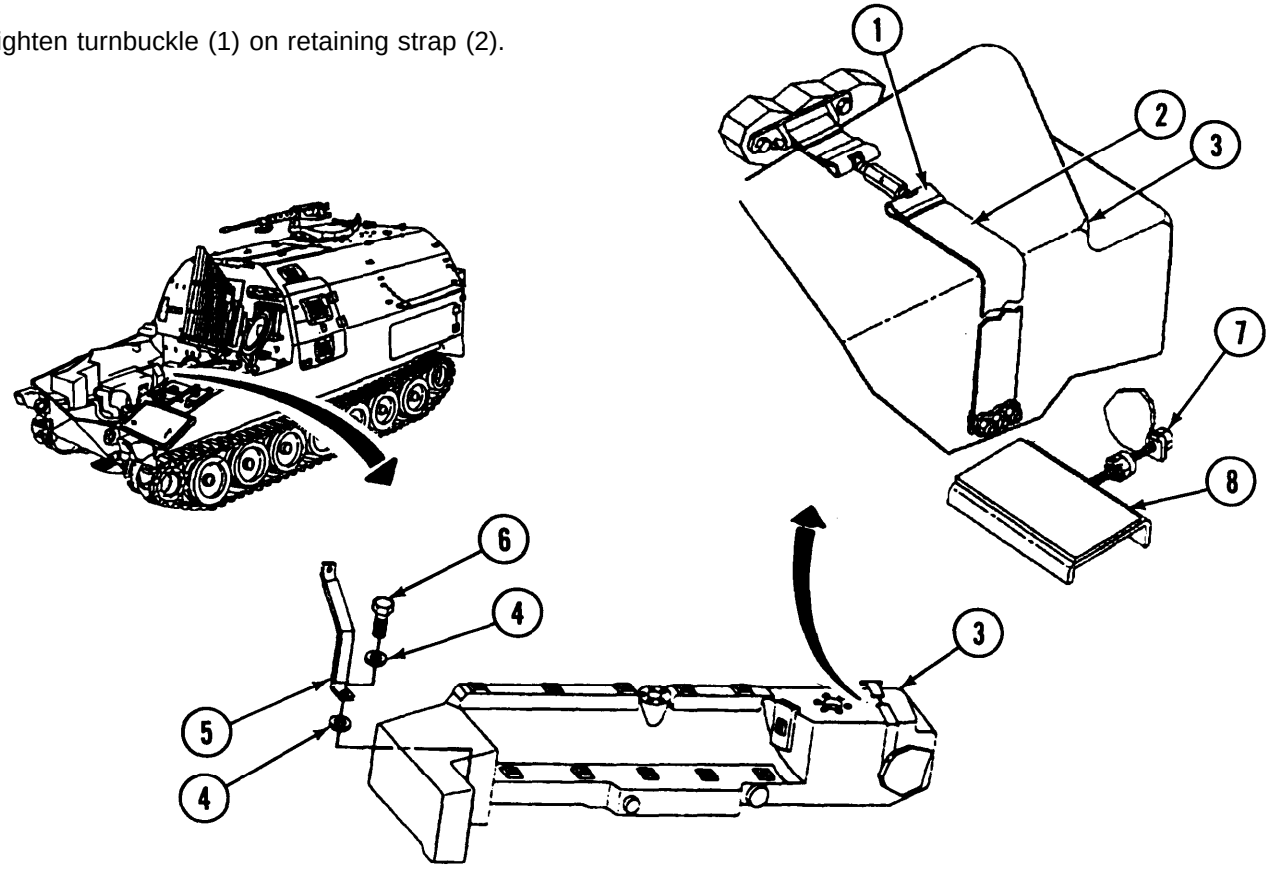
1. With the aid of two assistants, lift fuel tank (3) into vehicle.

2. From inside crew compartment, loosen nut (7) to retract plate (8).

3. Push fuel tank (3) into hull recess, over plate (8). Make sure to correctly position fuel tank (3) with crossover tube and filler assembly, and tighten nut (7).

4. Install retaining strap (5) on fuel tank (3) with two screews (6) and washers (4).

5. Tighten turnbuckle (1) on retaining strap (2).



FOLLOW-ON MAINTENANCE:

Connect fuel hoses, tubes, and fittings (refer to TM 9-2350-287-20-1).

- Install fuel level transmitters (refer to TM 9-2350-287-20-1).
- Install heat shield (refer to TM 9-2350-287-20-1).
- Install powerpack (refer to TM 9-2350-287-20-1).
- Fill fuel tanks (refer to TM 9-2350-287-10).

4-4. LOWER FUEL TANK REPLACEMENT.

This Task Covers:

a. Removal

b. Installation

Initial Setup:

Tools/Test Equipment:
- Combination wrench, 1 1/4 inch (Item 8, Appendix D)
- General mechanic's tool kit (Item 19, Appendix D)

Materials/Parts:
- Sealing compound (Item 21, Appendix B)

Personnel Required: Three

Equipment Conditions:
- Powerpack removed (refer to TM 9-2350-287-20-1).
- Fuel tanks drained (refer to TM 9-2350-287-10).
- Exhaust duct and pipe removed (refer to TM 9-2350287-20-1).
- Air cleaner duct and elbow removed (refer to TM 9-2350-287-20-1).
- Fuel level transmitter removed (refer to TM 9-2350-287-20-1).
- Fuel pumps removed (refer to TM 9-2350-287-20-1).
- Hoses, tubes, and fittings disconnected (refer to TM 9-2350-287-20-1).

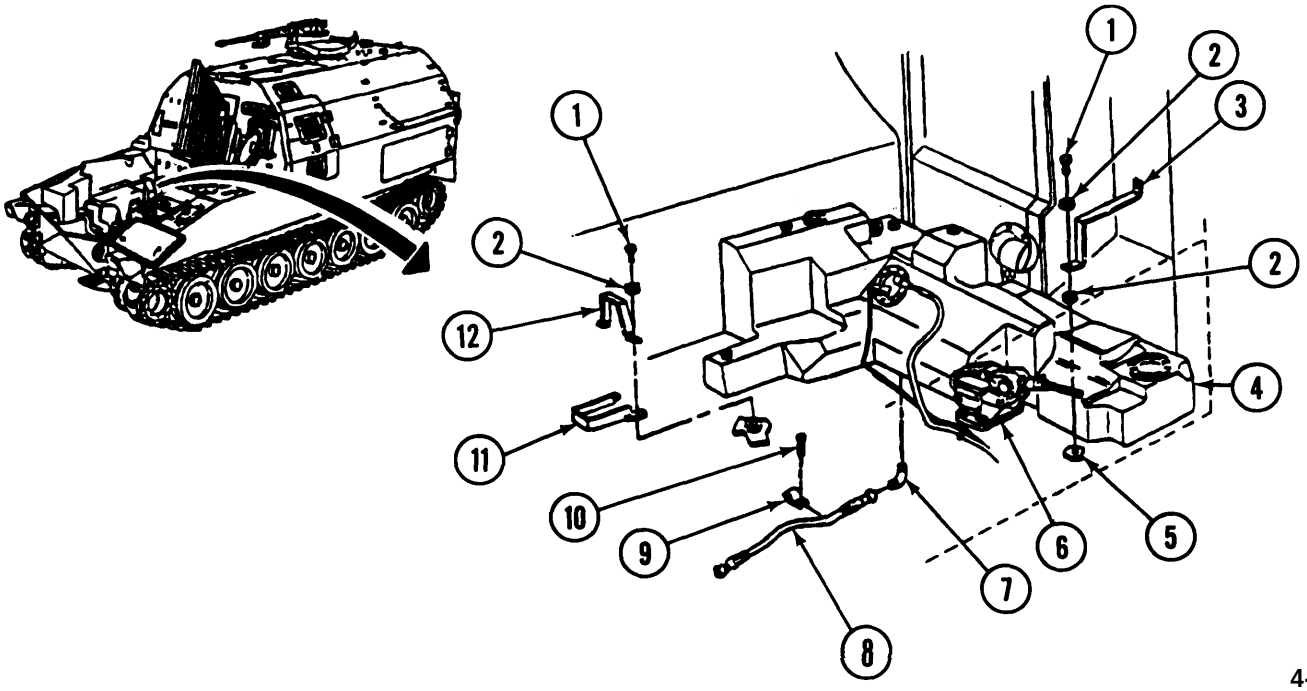
a. REMOVAL

1. Remove screw (10) and clamp (9) securing hose (8) to hull (5).

NOTE

For correct installation, record the number of washers and lengths of screws used on each strap.

2. Remove four screws (1) and washers (2) and three retaining straps (3, 11, and 12) from lower fuel tank (4).



4-4. LOWER FUEL TANK REPLACEMENT (continued).

3. With the aid of two assistants, lift fuel tank (4) over engine mount assembly (6) and out of vehicle.

4. Remove hose (8) from elbow (7).

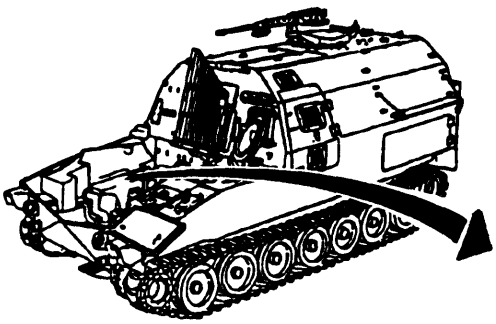
5. Remove elbow (7) from fuel tank (4).

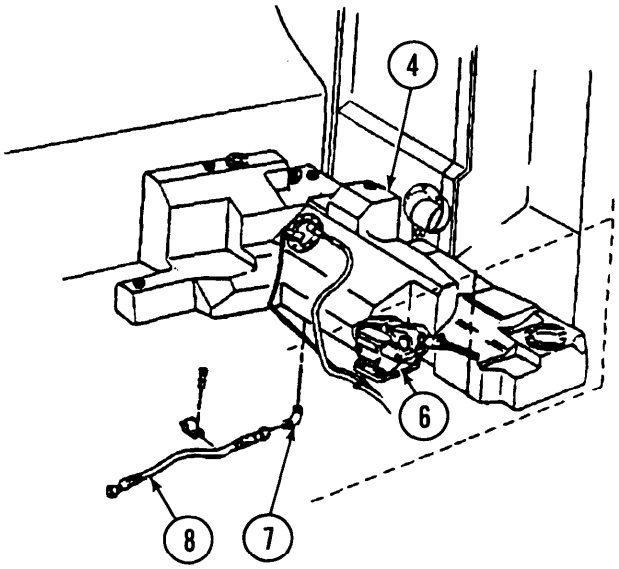
b. INSTALLATION

1. Install elbow (7) on fuel tank (4).

2. Install hose (8) on elbow (7).

3. With the aid of two assistants, lift fuel tank (4) into vehicle and position behind engine mount assembly (6).





WARNING

Sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in a well-ventilated area. If sealing compound gets on skin or clothing, wash immediately with soap and water.

4. Apply sealing compound to threads of four screws(1).

NOTE

Use enough washers to obtain metal-to-metal contact between retaining strap and hull. Retaining strap must be snug without squeezing fuel tank.

5. Install two retaining straps (11 and 12) in engine compartment with two screws (1) and necessary number of washers (2).

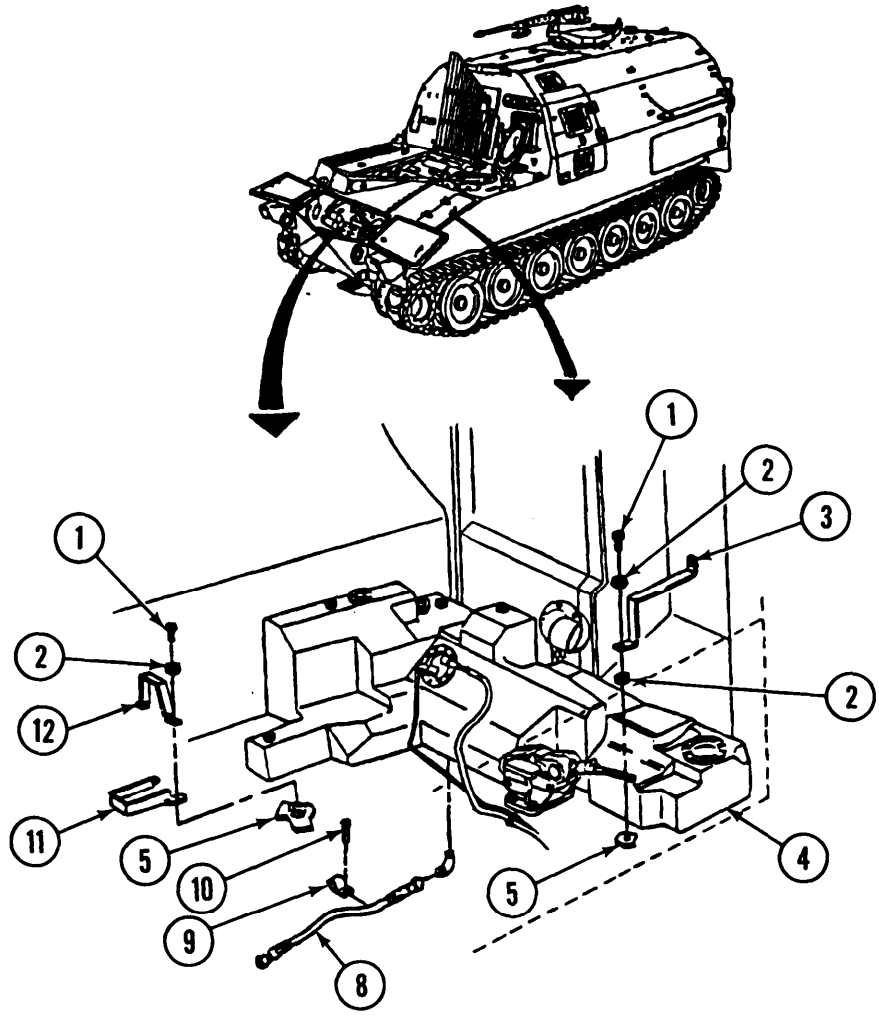
4-4. LOWER FUEL TANK REPLACEMENT (continued).

6. Position retaining strap (3) in place on top of fuel tank (4). Measure gap between retaining strap (3) and top of fuel tank (4). If gap is greater than 3/16 inch, remove two screws (1), washers (2), and retaining straps (11 and 12).

7. Position mounting end of retaining strap(11) under mounting end of retaining strap(12) and secure to hull with two screws (1) and washers (2).

8. Install retaining strap (3) on fuel tank (4) with two screws (1) and washers (2).

9. Secure hose (8) to hull (5) with clamp (9) and screw (10).



FOLLOW-ON MAINTENANCE

- Connect hoses, tubes, and fittings (refer to TM 9-2350-287 -20-1).
- Install fuel pumps (refer to TM 9-2350-287-20-1).
- Install fuel level transmitter (refer to TM 9-2350-287-20-1).
- Install air cleaner duct and elbow (refer to TM 9-2350-287-20-1).
- Install exhaust duct and pipe (refer to TM 9-2350-287-20-1).
- Fill fuel tanks (refer to TM 9-2350-287-10).
- Install powerpack (refer to TM 9-2350-287-20-1).

4-5. FUEL TANK REPAIR.

This Task Covers:

Repair

Initial Setup:

Tools/Test Equipment:
- General mechanic's tool kit (Item 19, Appendix D)
- Protective clothing (Item 28, Appendix D)
- Protective gloves (Item 29, Appendix D)
- Respirator (Item 30, Appendix D)
- Safety goggles (Item 31, Appendix D)

Materials/Parts:
- Drycleaning solvent (Item 9, Appendix **B)**
- Epoxy cement (Item 5, Appendix B)
- Fiberglass repair kit (Item 19, Appendix B)
- Fiberglass repair kit (Item 20, Appendix B)
- Fire-retardant paint (Item 15, Appendix B)
- Paper cup (Item 8, Appendix B)
- Wiping rag (Item 18, Appendix B)

Equipment Conditions:
- Upper fuel tank removed (para 4-3).
- Lower fuel tank removed (para 4-4).

REPAIR

WARNING

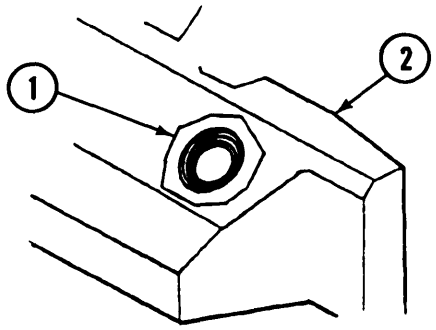
Wear respirator and rubberized protective clothing when working on fiberglass. Fiberglass dust inhalation can cause severe respiratory problems. Fiberglass particles embedded in the skin will cause irritation and possible infection. Particles in the skin are extremely difficult to remove. Failure to follow this warning can result in serious illness or death.

NOTE

- The following repair procedures apply to both the upper and the lower fuel tank.
- To repair holes larger than 1/2 inch in diameter, follow steps 1-17. To repair cracks or punctures less than 1/2 inch in diameter, follow steps 18-26.

1. Cut away damaged area. Make smooth-edged circular opening.

2. Taper hole (1) on fuel tank (2) so tapered lip is no less than 1/4 inch wide and no more than 1/2 inch wide.



4-5. FUEL TANK REPAIR (continued).

WARNING

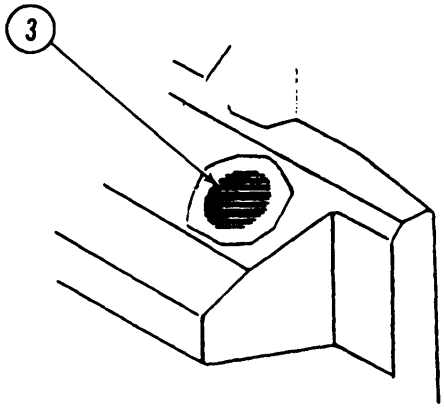
Drycleaning solvent P-D-680 is toxic and flammable. Always wear protective goggles and gloves, and use in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breath vapors. DO NOT use near open flame or excessive heat. If you become dizzy while using drycleaning solvent, Immediately get fresh air and medical help. If solvent contacts your eyes, wash them immediately and get medical help. Failure to follow this warning can result in injury or death.

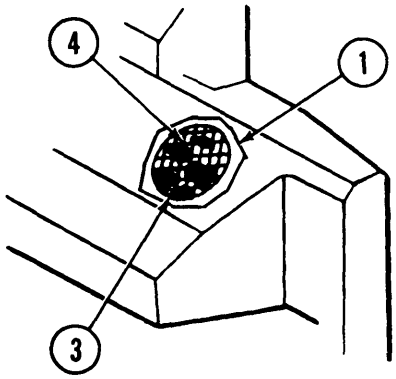
3. Remove dust and oil from repair area and clean with dry cleaning solvent and lint-free rag.

NOTE

- If damaged area is near an opening in tank, apply a backing plate with masking tape and release film, rather than wire cloth.
- If opening is less than one inch across at greatest point, wire screen is not required.

4. Cut and trim a piece of wire screen (3) 1/2 inch larger than opening.





5. Cut glass cloth patches (4) to size and shape. Cut first glass cloth patch (4) 1/2 inch larger than screen (3), and cut each succeeding patch (4) 1/2 inch larger until sufficient glass cloth has been built up to make patched area level with surrounding tank wall.

NOTE

Hardening will occur in the cup within one hour. Do not mix more than one cupful at one time.

6. Cut top from resin envelope and hardener envelope. Squeeze contents into paper cup and mix thoroughly.

7. Using hardwood depressor, thoroughly saturate hole (1) area and screen (3) with epoxy cement, and apply screen (3) over hole (1).

8. Remove 1/5 of cement from paper cup and place this into new paper cup. Add small amount of regenerated silica to obtain puttylike consistency. Use the mixture to apply first two layers of glass cloth (4).

4-5. FUEL TANK REPAIR (continued).

9. Using hardwood depressor, thoroughly saturate the smallest glass cloth (4) with puttylike regenerated silica-cement mix and-place it over screen (3).

10. Place piece of release film on glass cloth patch (4) and, with hardwood depressor, work out air pockets. Work from center of patch (4) outward.

11. Remove release film.

12. Repeat steps 5 through 11 for second glass cloth patch (4) application.

13. Saturate remaining glass cloth patches with epoxy cement without silica and apply to hole (1).

14. Repeat steps 10 and 11 to remove air pockets for any remaining patches.

CAUTION

During the first hour of curing, temperature should not exceed 100°F (38°C) or glass cloth may not adhere.

NOTE

Curing time will increase in temperatures below 70°F (21°C).

15. Allow completed glass cloth patch (4) to cure undisturbed for 16 to 24 hours.

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 flames or excessive heat. If you become dizzy while using drycleanlng solvent Immediately get fresh air and medical help. If solvent contacts your eyes, wash them immediately and get medical help. Failure to follow this warning can result in injury or death.**

- **Dry/cure freshly painted materials only in well-ventilated or unoccupied areas for a minimum of 30 minutes to allow solvents to flash off. All personnel who work in or near a spray-painting booth must wear a NIOSH approved respirator as well as personnel protective equipment when spiny-painting operations are unerway. There will be no open flame or spark-producing equipment (e.g., electric sander) within a 20-foot radius of any spray-painting area. There will be "NO SMOKING" signs posted in and around a 50-foot radius of spray-painting activities and paint storage areas.**

- **Immediately after working with fiberglass and resin, thoroughly wash any exposed skin surfaces. Fiberglass particles in the skin are extremely difficult to remove and can cause irritation and infection. If fiber particles are embedded in the skin, DO NOT SCRUB. RINSE IN WARM SOAPY WATER AND SEEK MEDICAL ASSISTANCE. Failure to follow this waming can result in serious illness or death.**

4-5. FUEL TANK REPAIR (continued).

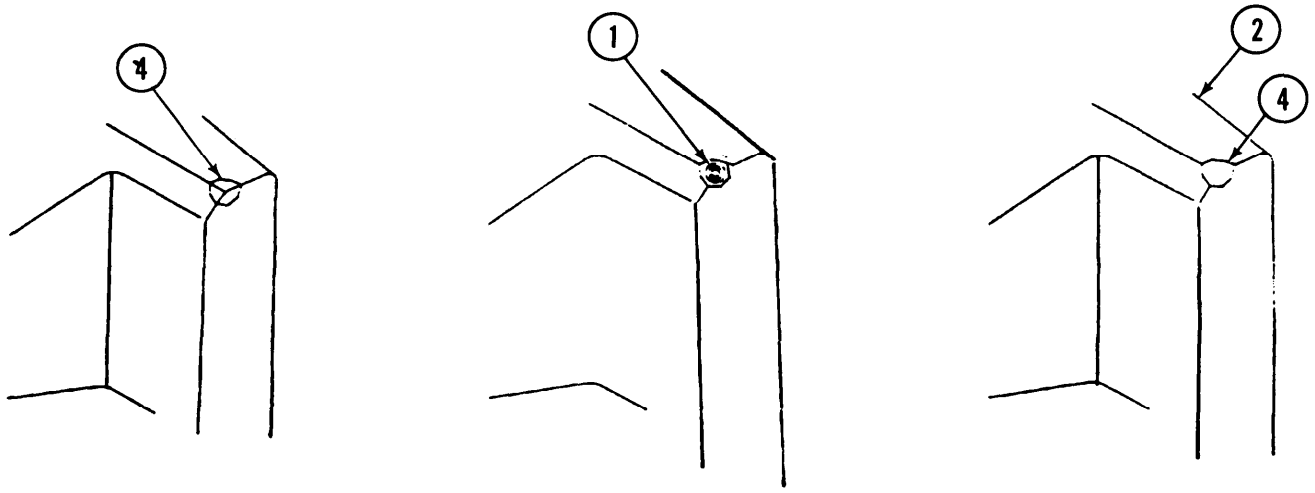
16. When cure incomplete, sand glass cloth patch(4) flush with surrounding surface of fuel tank (2). Clean surface of fuel tank (2) with drycleaning solvent and paint with fire-retardant paint.

WARNING

- **Wear protective goggles or face shield when using compressed air. Particles blown by compressed air are hazardous and can cause injury.**
- **Compressed air used for cleaning or drying purposes, or for clearing restrictions, should never exceed 30 psi (207 kpa). To avoid injury to personnel, wear protective clothing (e.g., goggles/shield, gloves) and exercise caution.**

17. Thoroughly flush fuel tank (2) with water and dry with low-pressure compressed air.

18. Taper hole (1) on fuel tank (2) so tapered lip is no less than 1/4 inch wide and no more than 1/2 inch wide.



WARNING

Drycleanlng 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 flames or excessive heat. If you become dizzy while using drycleaning solvent, immediately get fresh air and medical help. If solvent contacts your eyes, wash them immediately and get medical help. Failure to follow this warning can result in injury or death.

19. Remove dust and oil from repair area and clean with drycleaning solvent and lint-free wiping rag.

CAUTION

During the first hour of curing, temperature should not exceed 100°F (38°C) or glass cloth may not adhere.

4-5. FUEL TANK REPAIR (continued).

NOTE

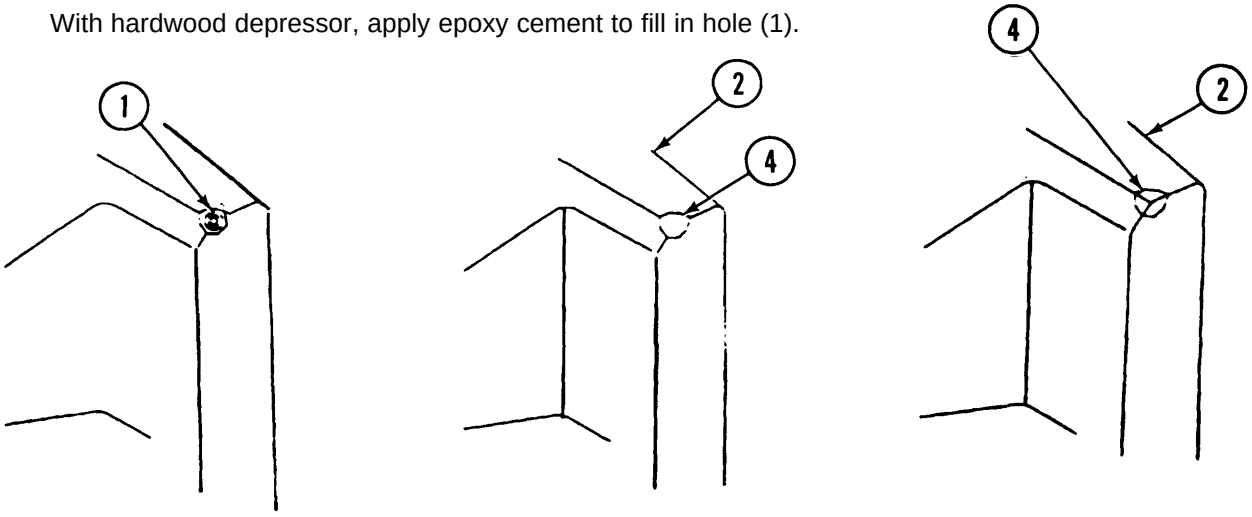
- Hardening will occur in the cup within one hour. Do not mix more than one cupful at one time.
- Curing time will increase in temperatures below 70°F (21 °C).

20. Cut top from resin envelope and hardener envelope. Squeeze contents into paper cup and mix thoroughly.

21. Thoroughly saturate hole (1) area with epoxy cement.

22. Remove 1/5 of cement from paper cup and place in new paper cup. Add small amount of regenerated silica to obtain puttylike consistency.

23. With hardwood depressor, apply epoxy cement to fill in hole (1).



24. Allow glass cloth patch (4) to cure undisturbed for 16 to 24 hours.

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 flames or excessive heat. if you become dizzy while using drycleaning solvent, immediately get fresh air and medical help. If solvent contacts your eyes, wash them immediately and get medical help. Failure to follow this warning can result in injury or death.

Dry/cure freshiy painted materials only in weli-ventilated or unoccupied areas for a minimum of 30 minutes to allow solvents to flash off. All personnel who work in or near a spray-painting booth must wear a NIOSH approved respirator as well as personnel protective equipment when spray-painting operations are unerway. Then will be no open flame or spark-producing equipment (e.g., electric sander) within a 20-foot radius of any spray-painting area. There will be "NO SMOKING" signs posted in and around a 50-foot radius of spray-painting activities and paint storage areas.

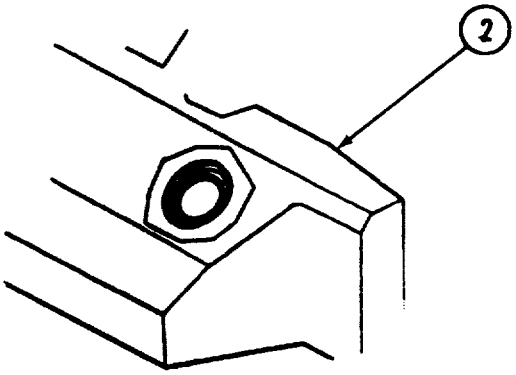
4-5. FUEL TANK REPAIR (continued).

25. When cure is complete, sand glass cloth patch (4) flush with surrounding surface. Clean surface with dry-cleaning solvent and paint with fire-retardant paint.

WARNING

- **Wear protective goggles or face shield when using compressed air. Particles blown by compressed air are hazardous and can cause injury.**
- **Compressed air used for cleaning or drying purposes, or for clearing restrictions, should never exceed 30 psi (207 kPa). To avoid injury to personnel, wear protective clothing (e.g., goggles/shield, gloves), and exercise caution.**

26. Thoroughly flush fuel tank (2) with water and dry with low-pressure compressed air.



WARNING

Immediately after working with fiberglass and resin, thoroughly wash any exposed skin surfaces. Fiberglass particles in the skin are extremely difficult to remove and can cause irritation and infection. If fiber particles are embedded in the skin, DO NOT SCRUB. RINSE IN WARM SOAPY WATER AND SEEK MEDICAL ASSISTANCE. Failure to follow this warning can result in serious illness or death.

FOLLOW-ON MAINTENANCE:
- Install lower fuel tank (para 4-4).
- Install upper fuel tank (para 4-3).

4-6. FUEL TANK PAD REPLACEMENT.

This Task Covers:

a. Removal

b. Installation

Initial Setup:

Tools/Test Equipment:
- General mechanic's tool kit (Item 19, Appendix D)

Materials/Parts:
[Item Deleted]
- Adhesive (Item 2, Appendix B)
- Dry-cleaning solvent (Item 9, Appendix B)

Equipment Conditions:
- Powerpack removed (refer to TM 9-2350-287-20-1).
- Upper fuel tank removed (para 4-3).
- Lower fuel tank removed (para 4-4).

a. REMOVAL

CAUTION

Fuel tanks are constructed of fiberglass. To avoid damaging fuel tanks, use extreme care when removing fuel tank pads.

NOTE

- **Remove only pads that are defective.**
- **All pads are removed and installed the same way.**
- **Record size and location of pads prior to removal.**

Remove damaged pad (1) from hull and upper or lower fuel tank (2 or 3). Discard pad.

b. INSTALLATION

[Text Deleted]

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 breathe vapors. DO NOT use near open flame or excessive heat.

1. Clean mounting surfaces of hull and any new pad (1) with dry-cleaning solvent to remove adhesive residue and dirt.

[Step 2 Deleted]

4-6. FUEL TANK PAD REPLACEMENT (continued).

3. Clean mounting surfaces of upper fuel tank or lower fuel tank (2 or 3) with drycleaning solvent to remove dirt and adhesive residue.

WARNING

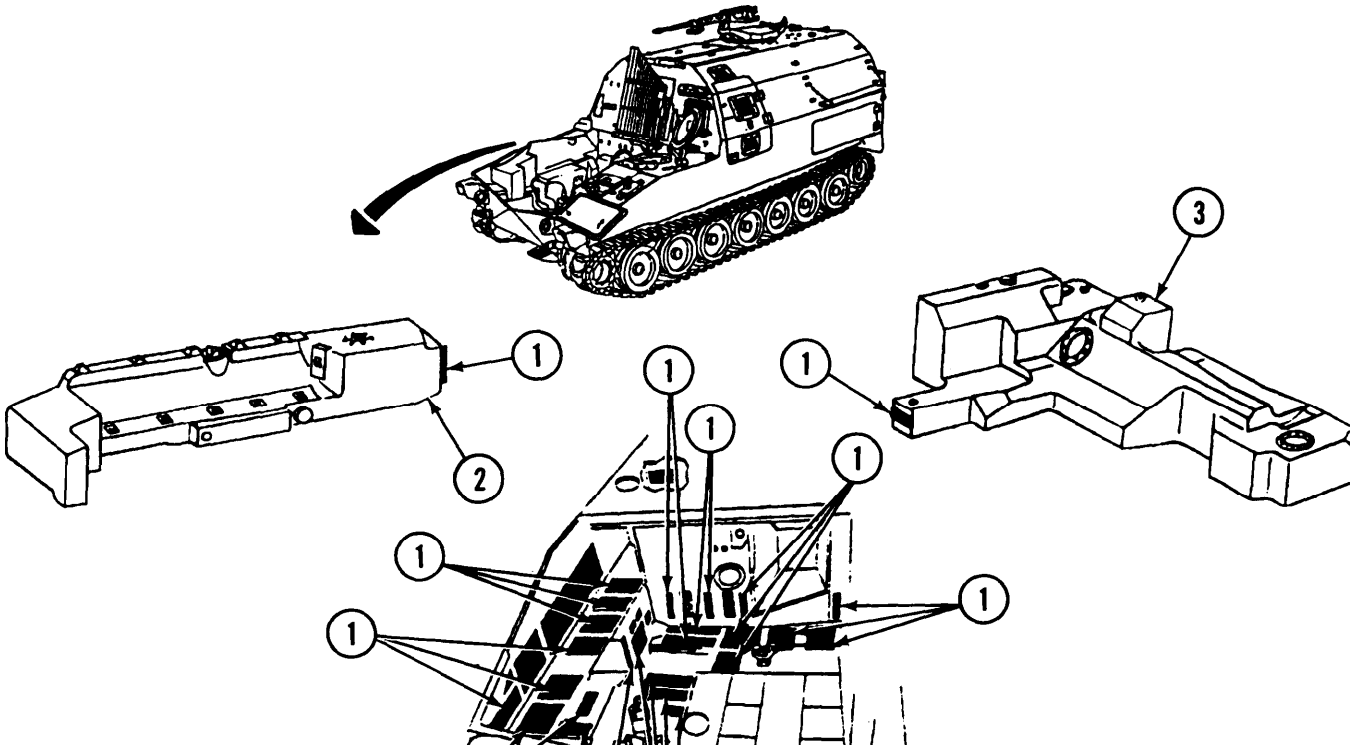
Adhesive can bum easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep adhesive away from open fire and use in a well-ventilated area.

NOTE

Use any combination of pads required to attain same size pad as noted prior to removal to aline and immobilize fuel tanks. Any movement of fuel tanks in vehicle is not acceptable.

4. Apply adhesive to new pads (1) and mounting surfaces of hull and upper fuel tank or lower fuel tank (2 or 3). Allow adhesive to dry 30 minutes before installation.

5. Install new pad (1) on hull and upper fuel tank or lower fuel tank (2 or 3).



FOLLOW-ON MAINTENANCE:

- Install lower fuel tank (para 4-4).
- Install upper fuel tank (para 4-3).
- Install powerpack (refer to TM 9-2350-287-20-1).

4-7. FUEL TANK RETAINING STRAP AND CHANNEL GROUP REPLACEMENT.

This Task Covers:

a. Removal

b. Installation

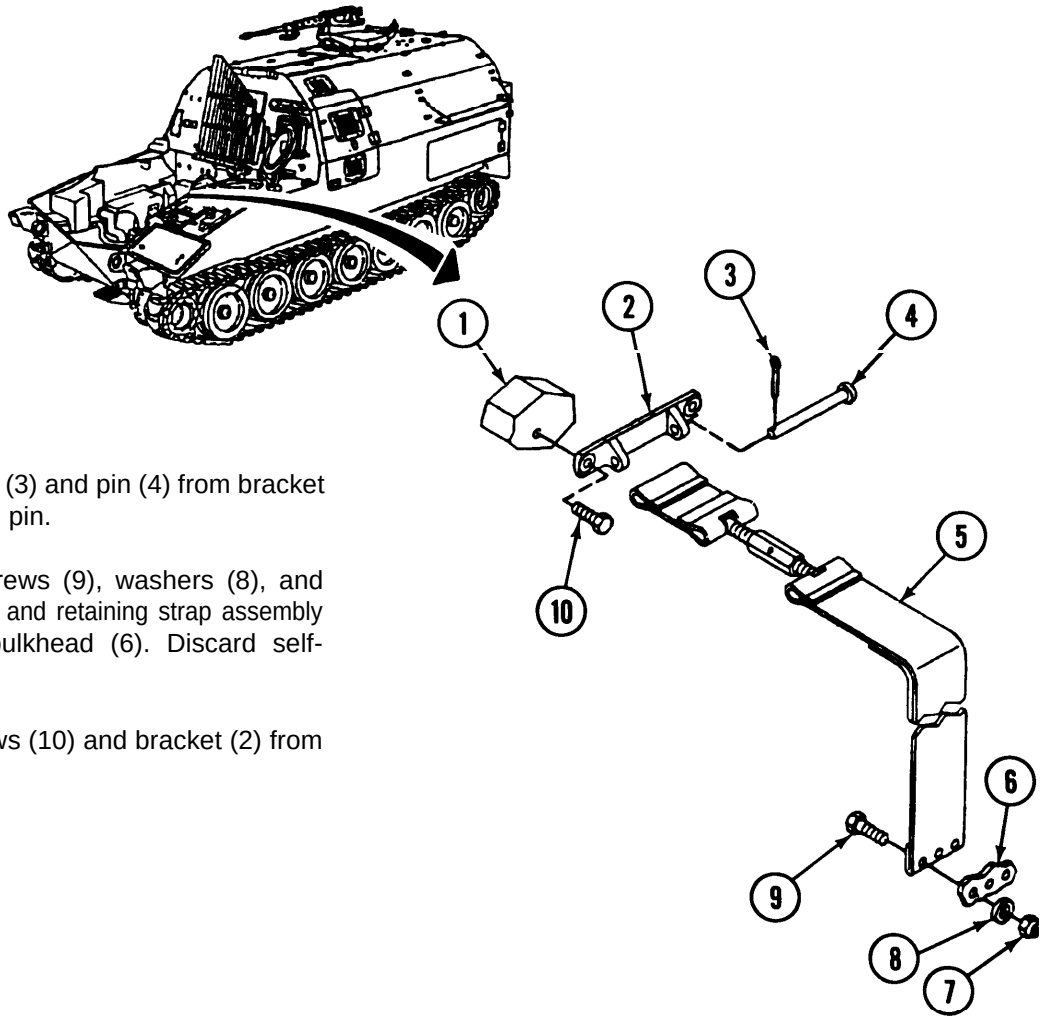
Initial Setup:

Tools/Test Equipment:
- General mechanic's tool kit (Item 19, Appendix D)

Materials/Parts:
- Adhesive (Item 2, Appendix B)
- Drycleaning solvent (Item 9, Appendix B)
- Gasket material (Item 10, Appendix B)
- Sealing compound (Item 21, Appendix B)
- Cotter pin (Item 5, Appendix H)
- Cushion pad (Item 13, Appendix H)
- Self-locking nut (3) (Item 122, Appendix H)
- Spring pin (Item 128, Appendix H)

Personnel Required: Two

Equipment Conditions:
- Powerpaok removed (refer to TM 9-2350-287-20-1).
- Upper fuel tank removed (para 4-3).
- Right projectile rack assembly moved to rear of vehicle (refer to TM 9-2350-287-10).



a. REMOVAL

1. Remove cotter pin (3) and pin (4) from bracket (2). Discard cotter pin.
2. Remove three screws (9), washers (8), and self-locking nuts (7) and retaining strap assembly (5) from inside bulkhead (6). Discard self-locking nuts.
3. Remove two screws (10) and bracket (2) from hull (1).

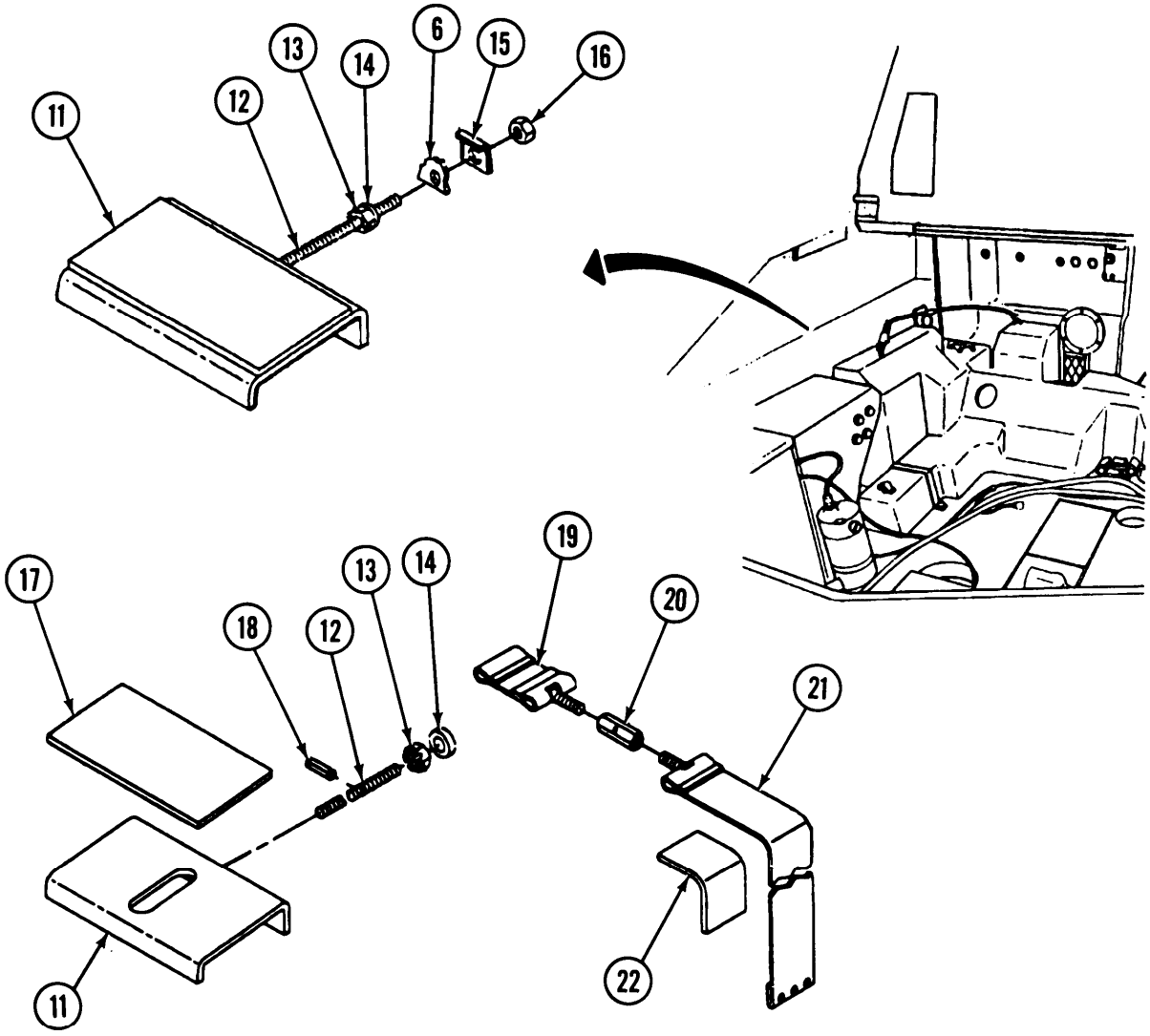
4-7. FUELTANKRETAINING STRAP AND CHANNEL GROUP REPLACEMENT (continued).

NOTE

Nut and end of stud are located inside hull crew compartment at forward bulkhead.

4. Remove nut (16) and retainer (15) from stud (12) from inside bulkhead (6).

5. Remove mounting plate (11), stud (12), nut (13), and washer (14) from hull recess in engine compartment.



6. Unscrew turnbuckle (20) to separate top retaining strap(19) from side retaining strap (21).

7. Remove side retaining strap pad (22) from side retaining strap (21). Discard pad.

8. Remove stud (12) from plate (11). Remove nut (13), washer (14), and spring pin(18) from stud (12). Discard spring pin.

9. Remove gasket (17) from plate (11). Discard gasket.

4-7. FUEL TANK RETAINING STRAP AND CHANNEL GROUP REPLACEMENT(continued).

b. INSTALLATION

1. Screw stud (12) into plate (11).

2. Install new spring pin (18), nut (13), and washer (14) on stud (12).

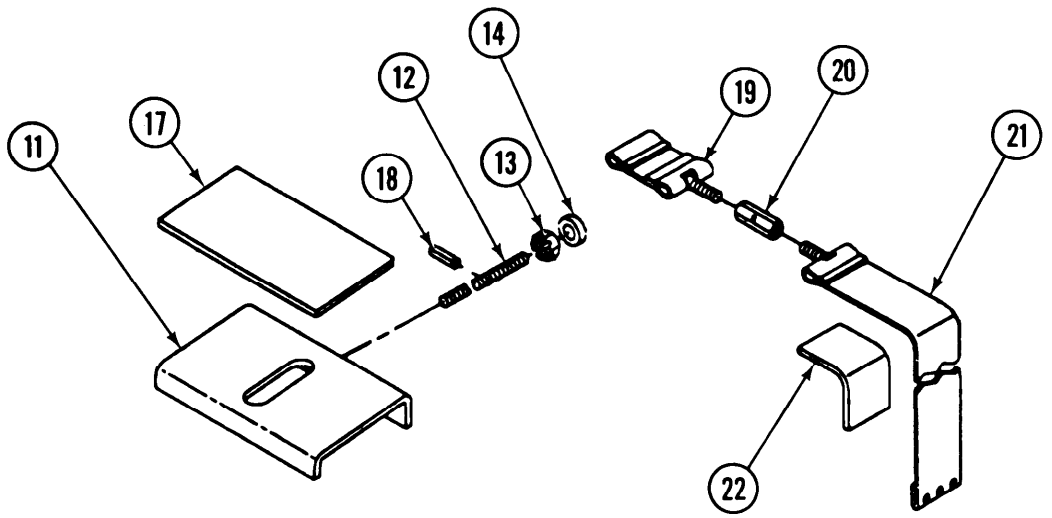
3. Join side retaining strap (21) and top retaining strap(19) using turnbuckle (20).

WARNING

Adhesive can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep adhesive away from open fire and use in a well-ventilated area.

4. Apply adhesive to new side retaining strap pad (22) and install on side retaining strap (21).

5. Cut new gasket from gasket material, apply adhesive to gasket (17), and install gasket (17) on plate (11).

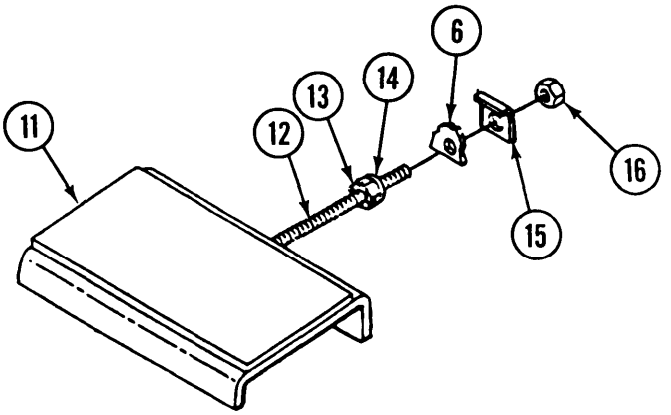


6. Install plate (11) with stud (12), nut (13), and washer (14) in hull recess in engine compartment.

NOTE

- Prior to fuel tank installation, retract mounting plate. After fuel tank installation, extend mounting plate.
- End of stud is located inside hull crew compartment at forward bulkhead.

4-7. FUELTANKRETAINING STRAPANDCHANNEL GROUP REPLACEMENT (continued).



7. Install retainer (15) and nut (16) on end of stud (12) and bulkhead (6). Torque nut to 10 ft-lb (13.5 N•m).

WARNING

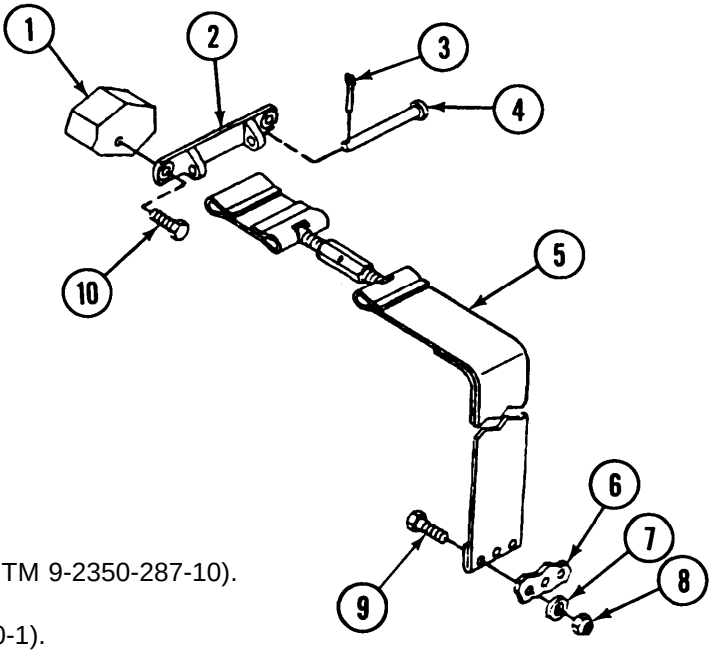
Sealing compound can bum easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep sealing compound away from open fire and use in a well-ventilated area.

8. Apply sealing compound to two screws (10).

9. Install bracket (2) on hull (1) with two screws (10).

10. Install retaining strap assembly (5) in bracket (2) with pin (4) and cotter pin (3).

11. Secure retaining strap assembly (5) to bulkhead (6) with three new self-locking nuts (7), washers (8), and screws (9).



FOLLOW-ON MAINTENANCE:
Install right projectile rack assembly (refer to TM 9-2350-287-10).
Install upper fuel tank (para 4-3).
Install powerpack (refer to TM 9-2350-287-20-1).

4-8. AIR CLEANER FAN ASSEMBLY REPAIR.

This Task Covers:

a. Disassembly
b. Inspection
c. Assembly

Initial Setup:

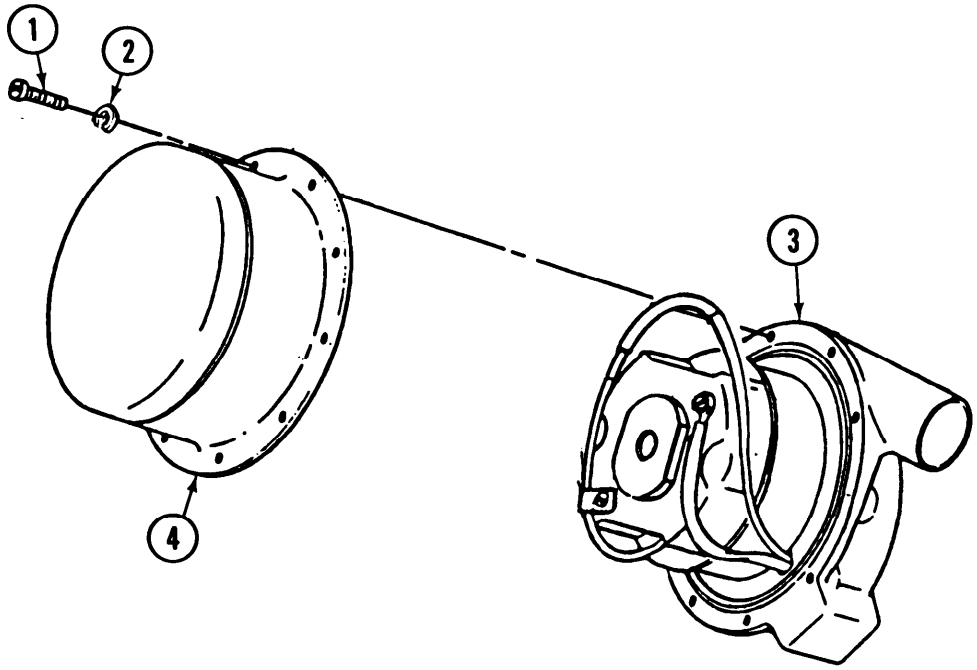
Tools/Test Equipment:
General mechanic's tool kit (Item 19, Appendix D)
Multimeter (Item 23, Appendix D)

Materials/Parts:
- LockWasher (14) (item 43, Appendix H)
- Lockwasher (Item 45, Appendix H)
- Preformed packing (Item 86, Appendix H)
- Preformed packing (item 92, Appendix H)
- Self-locking nut (item 118, Appendix H)
- Spacer (Item 126, Appendix H)
- Spring pin (Item 127, Appendix H)

Equipment Conditions:
- Air cleaner fan assembly placed on clean work surface.

a. DISASSEMBLY

1. Remove 10 screws (1) and lockwashers (2) and air cleaner fan cover (4) from impeller housing (3). Discard lockwashers.



2. Remove screw (15), lockwasher (14), and clip (13) from motor housing (12). Discard lockwasher.

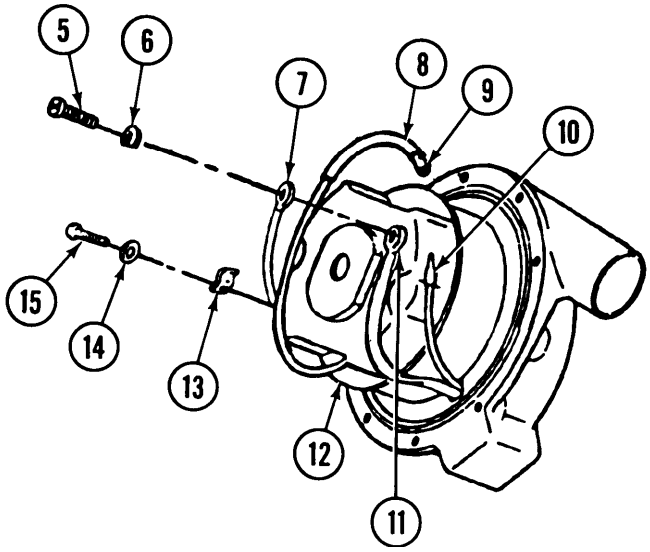
3. Slide insulation sleeve (8) away from electrical lead (9) and motor lead (10) connection.

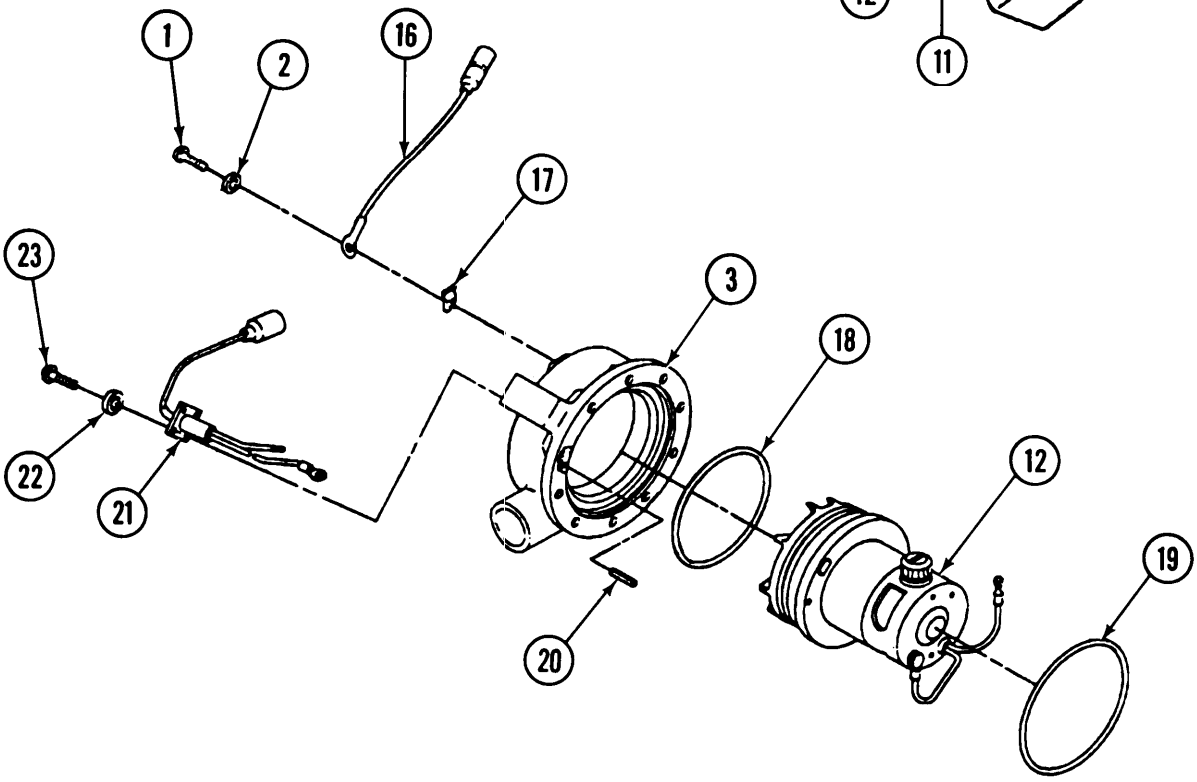
4-8. AIR CLEANER FAN ASSEMBLY REPAIR (continued).

4. Disconnect electrical lead (9) from motor lead (10), and remove sleeve (8) from electrical lead (9).

5. Remove screw (5), lockwasher (6), capacitor ground lead (11), and motor ground lead (7) from motor housing (12). Discard lockwasher.

6. Reinstall screw (5) into motor housing (12) with motor ground lead (7).





7. Remove motor housing (12) and two preformed packings (18 and 19) from impeller housing (3). Discard packings.

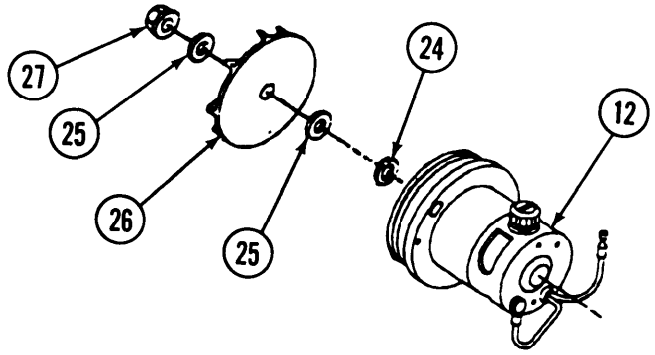
8. Remove screw (1), lockwasher (2), ground lead (1 6), and clip(17) from impeller housing (3). Reinstall screw (1) and clip(17) in impeller housing (3). Discard lockwasher.

9. Remove four screws (23) and lockwashers (22) and capacitor lead assembly (21) from impeller housing (3). Discard lockwashers.

10. Remove spring pin (20) from impeller housing (3). Discard spring pin.

4-8. AIR CLEANER FAN ASSEMBLY REPAIR (continued).

11. Remove self-locking nut (27), impeller (26), two washers (25), and spacer (24) from motor housing (12). Discard self-locking nut and spacer.

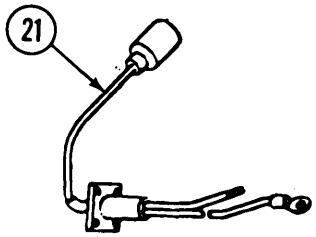


b. INSPECTION

1. Using a multimeter, test motor housing(12) for continuity. Replace if motor housing (1 2) has open or shorted field winding.

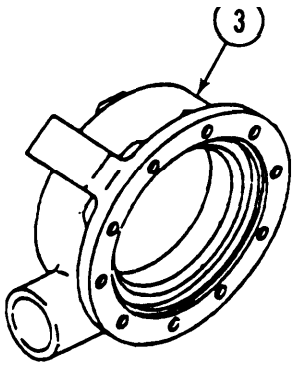
2. Inspect impeller (26) for cracked or broken fins. Replace if necessary.

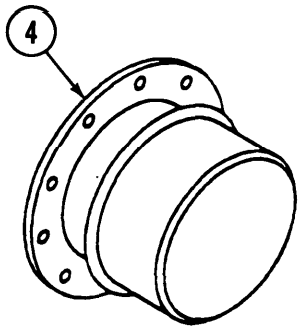
3. Inspect impeller (26). Replace if impeller (26) is out of balance.



4. Using a multimeter, test capacitor lead assembly (21) for continuity. If multimeter measures any resistance, replace capacitor lead assembly (21).

5. Inspect impeller housing (3) and air cleaner fan cover (4) for cracks or breaks. Replace damaged parts as necessary.

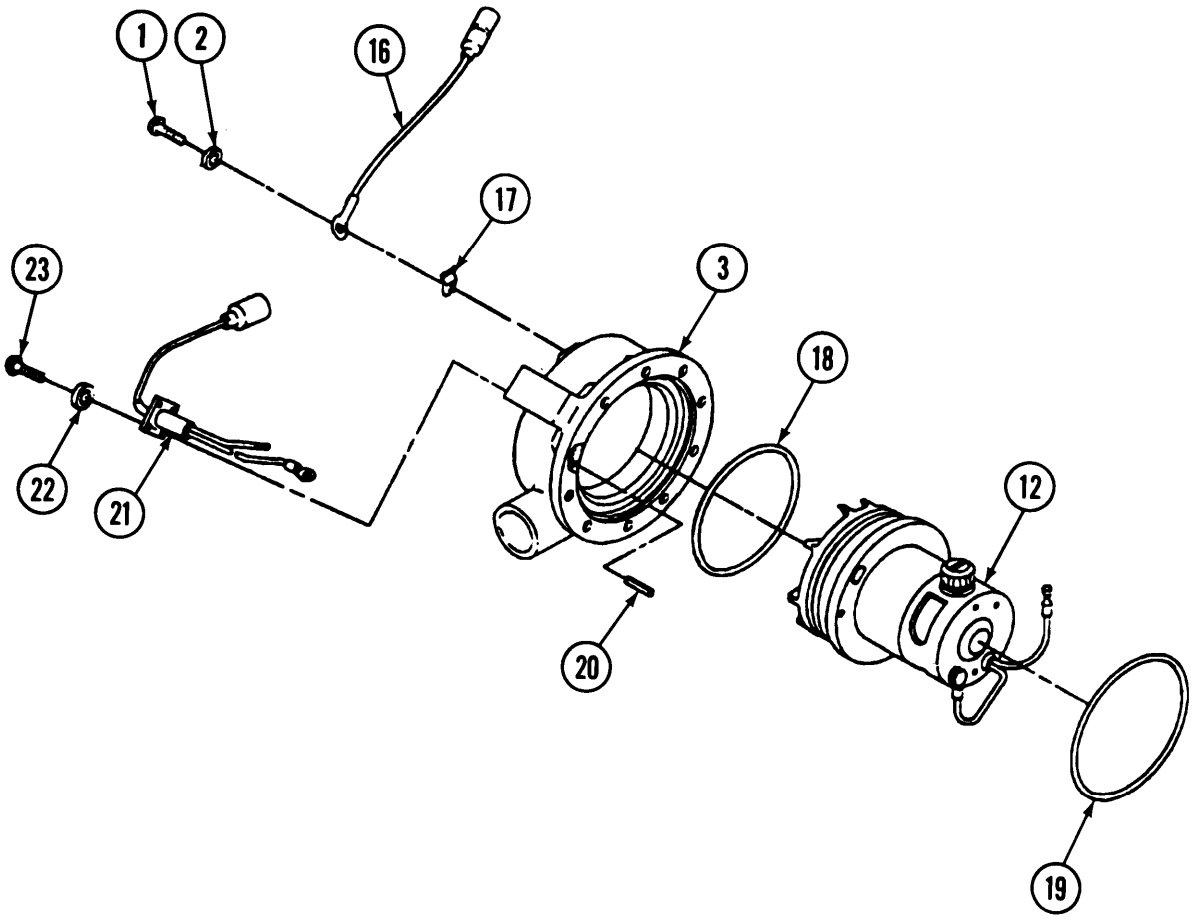




4-8. AIR CLEANER FAN ASSEMBLY REPAIR (continued).

c. ASSEMBLY

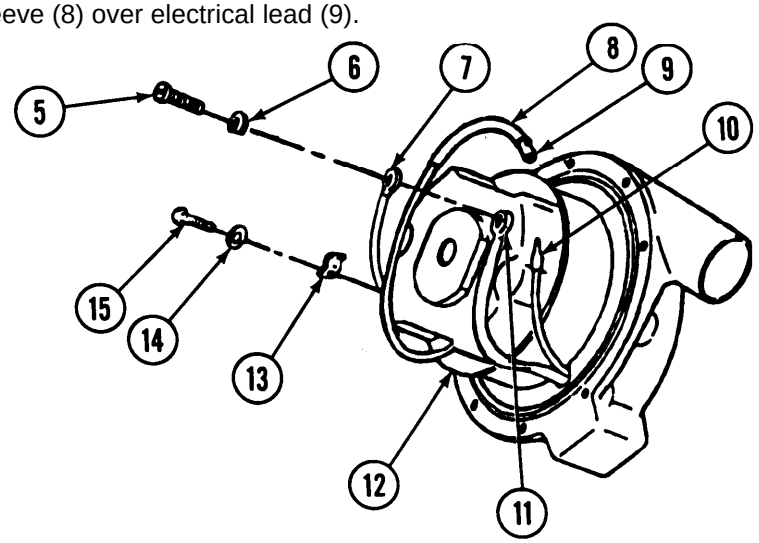
1. Install new spacer (24), two washers (25), and impeller (26) on motor housing (12).
2. Secure impeller (26) to motor housing(12) shaft with new self-locking nut (27).
3. Install new spring pin (20) in impeller housing (3).
4. Install capacitor lead assembly (21) in impeller housing (3) and secure with four screws (23) and new lockwashers (22).
5. Install ground lead (16) and clip (17) on impeller housing (3) with screw (1) and new lockwasher (2).
6. Install motor housing (12) in impeller housing (3) with two new preformed packings (18 and 19).



4-8. AIR CLEANER FAN ASSEMBLY REPAIR (continued).

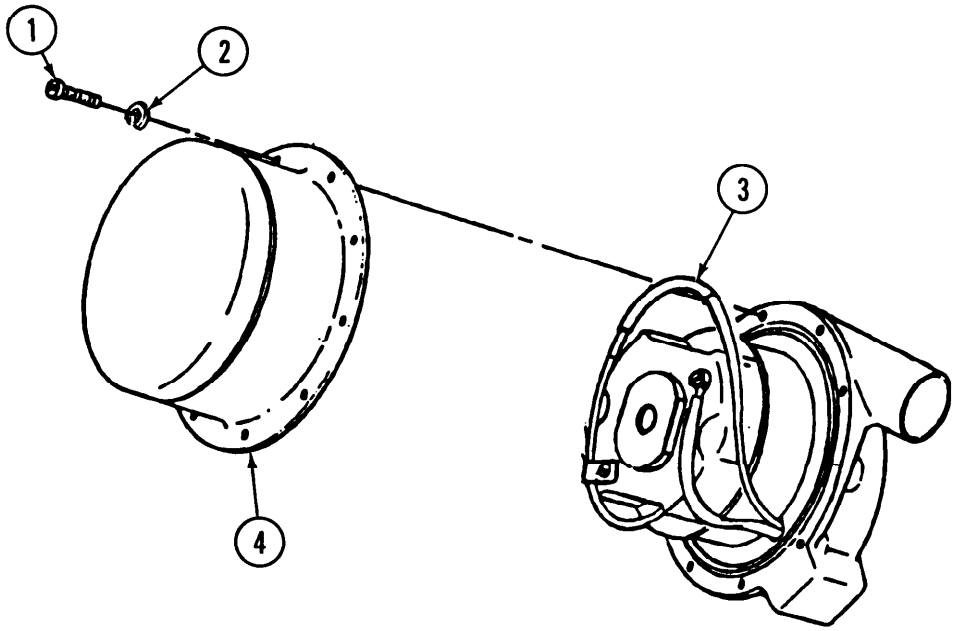
7. Secure capacitor ground lead (11) and motor ground lead (7) on motor housing(12) with new lockwasher (6) and screw (5).

8. Install sleeve (8) over electrical lead (9).



9. Connect electrical lead (9) and motor lead (10) together, and slide sleeve (8) over connection.

10. Install clip (13) over sleeve (8) and secure to motor housing (12) with new lockwasher (14) and screw (15).



11. Install air cleaner fan cover (4) on impeller housing (3) and secure with 10 new lockwashers (2) and 10 screws (1).

FOLLOWING MAINTENANCE:

- Install air cleaner bracket and fan assembly (refer to TM 9-2350-287-20-1).

4-9. ENGINE-DRIVEN FUEL PUMP REPAIR.

This Task Covers:

Repair

Initial Setup:

Equipment Conditions:
- Engine-driven fuel pump placed on clean work surface.

REPAIR

Refer to TM 9-2815-202-34 for procedures for repairing the engine-driven fuel pump.

FOLLOW-ON MAINTENANCE:
- None

CHAPTER 5
COOLING SYSTEM MAINTENANCE

Paragraph Number	Paragraph Title	Page Number
5-1	General	5-1
5-2	Cooling Fan Drive Assembly Repair	5-1
5-3	Coolant Pump Replacement	5-12
5-4	Radiator Fan Shroud Replacement	5-12
5-5	Cooling Vane Axial Fan Repair	5-13
5-6	Radiator Mounts Replacement	5-16

5-1. GENERAL

This chapter provides maintenance instructions for the cooling fan drive assembly, coolant pump, radiator fan shroud, cooling vane axial fan, and radiator mounts.

5-2. COOLING FAN DRIVE ASSEMBLY REPAIR.

This Task Covers:

a. Removal
b. Disassembly
c. Cleaning and Inspection
d. Assembly
e. Installation

Initial Setup:

Tools/Test Equipment:
- Arbor press (Item 4, Appendix D)
- Depth micrometer (Item 10, Appendix D)
- Dial indicator (Item 11, Appendix D)
- Drain pan (Item 12, Appendix D)
- Fan drive gearbox bracket (Appendix E)
- General mechanic's tool kit (Item 19, Appendix D)
- Torque wrench (Item 44, Appendix D)
- Wire-twisting pliers (Item 48, Appendix D)
- Wood block (Appendix E)

Materials/Parts:
- Dry-cleaning solvent (Item 9, Appendix B)
- Rag (Item 17, Appendix B)
- Gasket (2) (Item 26, Appendix H)
- Gasket (Item 28, Appendix H)
- Key washer (Item 39, Appendix H)
- Lockwasher (12) (Item 59, Appendix H)
- Lockwire (Item 69, Appendix H)
- Preformed packing (Item 80, Appendix H)
- Preformed packing (Item 82, Appendix H)
- Preformed packing (Item 84, Appendix H)
- Preformed packing (Item 85, Appendix H)
- Retaining ring (Item 98, Appendix H)
- Seal (Item 109, Appendix H)
- Shim (as required) (Item 123, Appendix H)
- Shim (2) (Item 124, Appendix H)

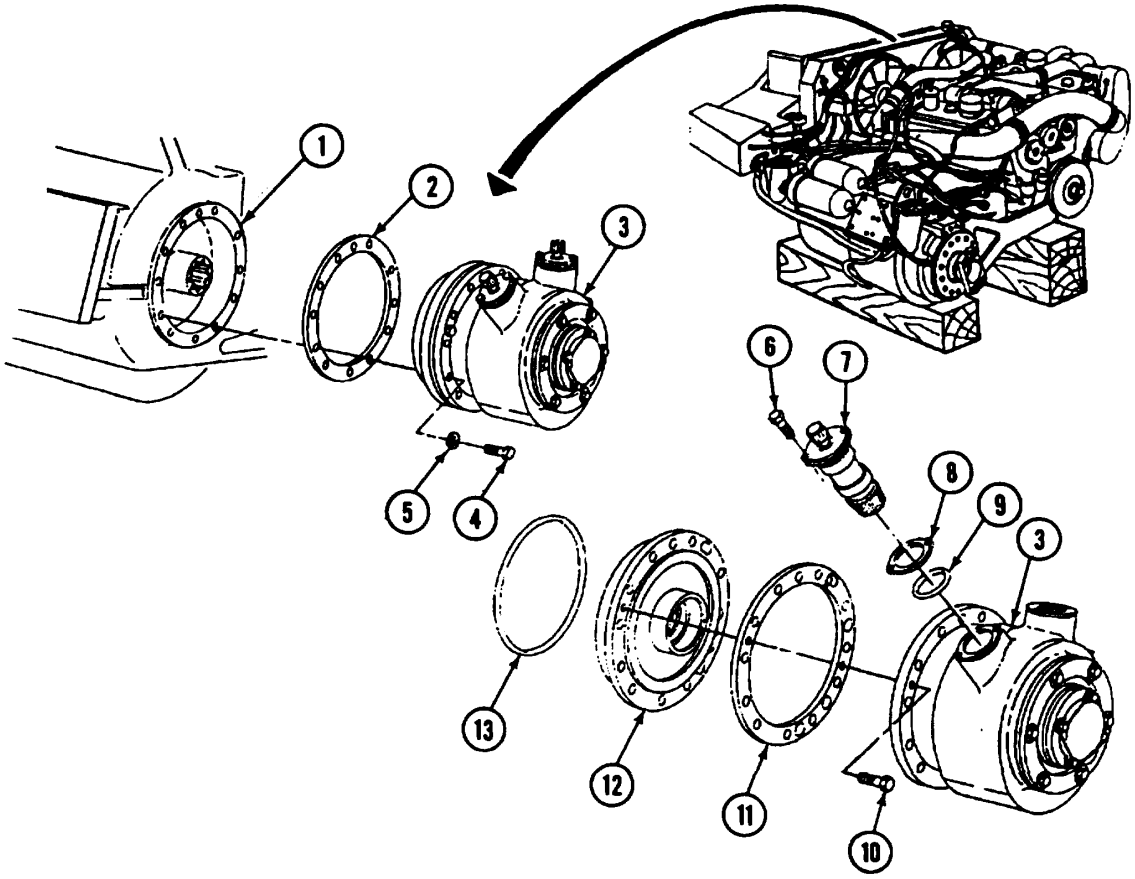
Equipment Conditions:
- Powerpack placed on blocks (refer to TM 9-2350-287-20-1).

5-2. COOLING FAN DRIVE ASSEMBLY REPAIR (continued).

a. REMOVAL

1. Place drain pan undercooling fan drive assembly (3). Remove 12 screws (4) and lockwashers (5) from cooling fan drive assembly (3), and drain oil from transfer assembly (1). Discard lockwashers.

2. Remove fan drive assembly (3) and gasket (2) from transfer assembly (1). Discard gasket.



b. DISASSEMBLY

1. Remove two screws (10), gasket (11), and inner housing cover (12) from fan drive assembly (3). Discard gasket.

2. Remove preformed packing (13) from inner housing cover (12). Discard preformed packing.

NOTE

Both bevel gearcase assemblies are removed and disassembled in the same manner.

3. Remove two screws (6), bevel gearcase assembly (7), shims (8), and preformed packing (9) from fan drive assembly (3). Discard preformed packing.

592. COOLING FAN DRIVE ASSEMBLY REPAIR (continued).

4. Remove retainer (14) and gear shaft (17) from sleeve (18).

5. Remove preformed packing (23) and seal (22) from retainer (14). Discard preformed packing and seal.

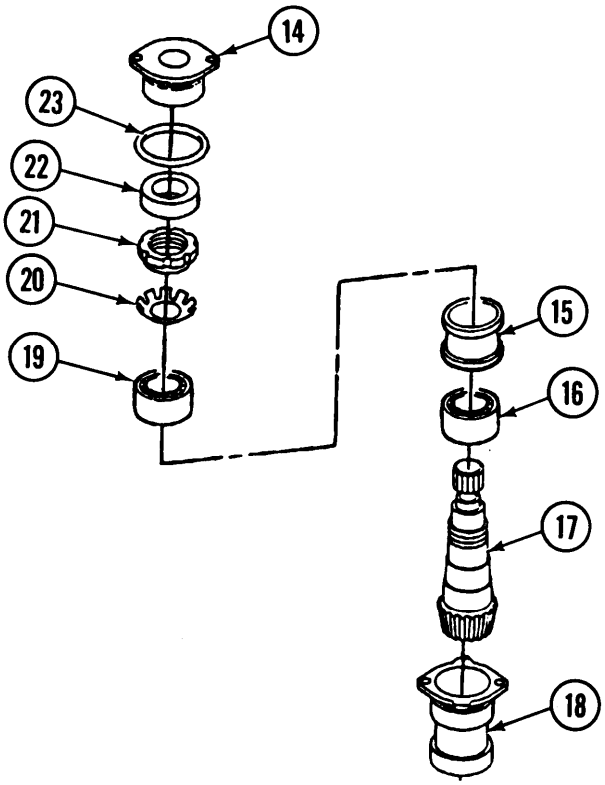
6. Straighten locking tabs on key washer (20), and remove nut (21) and key washer (20) from gear shaft (17). Discard key washer.

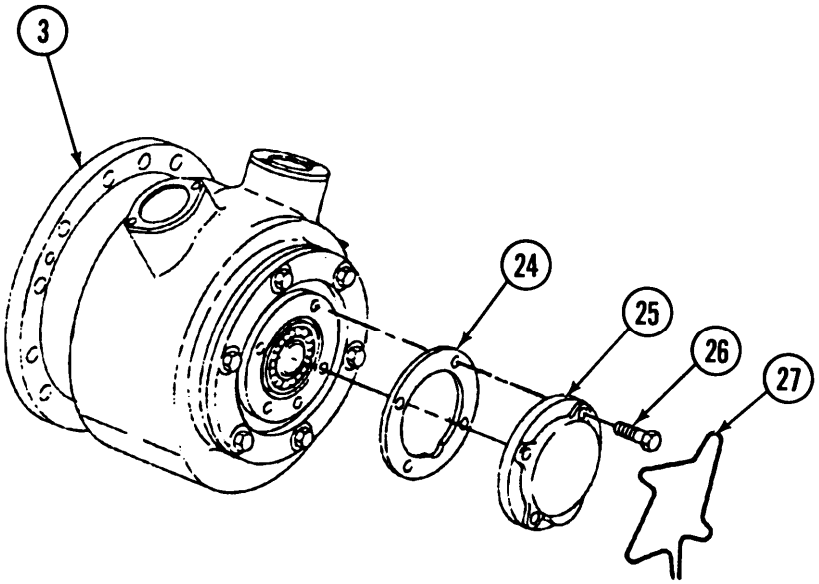
NOTE

Perform step 7 only if spacer or bearings fail inspection.

7. Remove bearing (19), spacer (15), and bearing (16) from gear shaft (17).

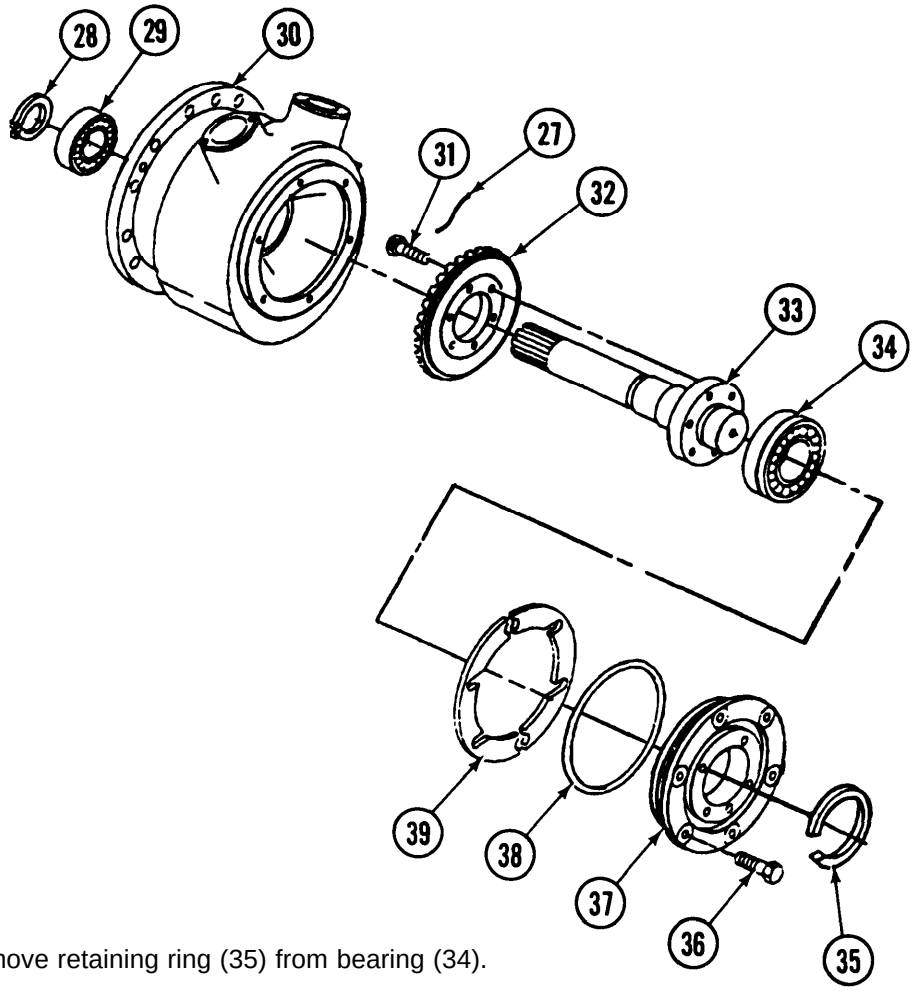
8. Repeat steps 3 through 7 for remaining bevel gearcase assembly.





9. Remove lockwire (27), four screws (26), cover (25), and gasket (24) from fan drive assembly (3). Discard gasket and lockwire.

5-2. COOLING FAN DRIVE ASSEMBLY REPAIR (continued).



10. Remove retaining ring (35) from bearing (34).

11. Remove six screws (36), housing cover (37), preformed packing (38), and shims (39) from fan drive housing (30). Measure thickness of shim pack before discarding shims. Discard shims and preformed packing.

WARNING

Use care when removing retaining rings. They are under spring tension and can act as projectiles when relessed. Wear safety goggles when removing retaining rings. Failure to heed this warning can result in serious injury to personnel.

12. Remove retaining ring (28) and drive shaft (33) from fan drive housing (30). Discard retaining ring.

13. Remove bearing (29) from fan drive housing (30).

NOTE

Perform step 14 only if bearing fails inspection.

14. Remove bearing (34) from drive shaft (33).

15. Remove lockwire (27), six screws (31), and gear (32) from drive shaft (33). Discard lockwire.

5-2. COOLING FAN DRIVE ASSEMBLY REPAIR (continued).

c. CLEANING AND INSPECTION

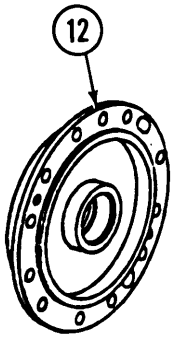
WARNING

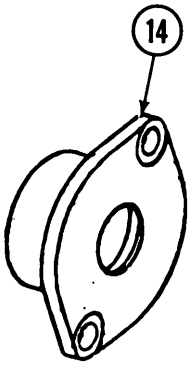
Drycleaning solvent P-D-680 is toxic and flammable. Always wear protective goggles and gloves, and use only in a weli-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breathe vapors. DO NOT use near open flames or excessive heat.

1. Clean all parts with drycleaning solvent.

2. Inspect inner housing cover (12) for wear, cracks, or distortion. Replace if necessary.

3. Inspect two retainers (14) for burrs, cracks, or chips. Replace if necessary.

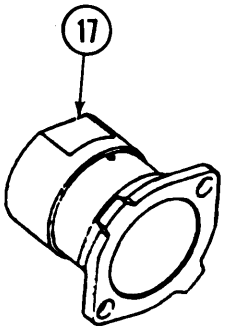


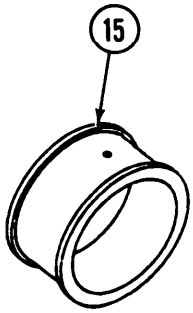


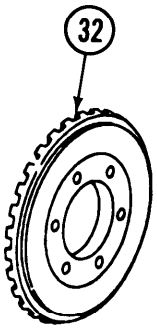
4. Inspect two sleeves (17) for burrs, cracks, or other damage. Replace is necessary.

5. Inspect two spacers (15) for burrs, sharp edges, cracks, or other damage. Replace if necessary.

6. Inspect two gears (32) for burrs and for cracked, worn, or broken splines. Replace if necessary.







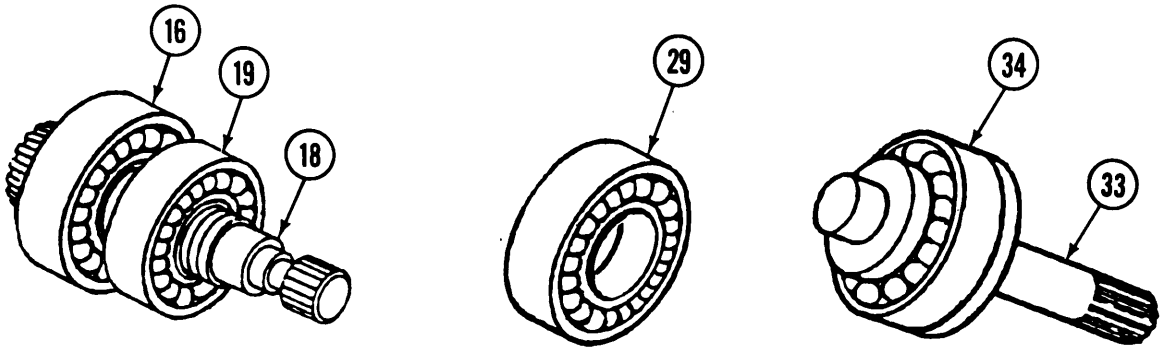
5-2. COOLING FAN DRIVE ASSEMBLY REPAIR (continued).

7. Inspect two gear shafts (18) for wear, burrs, and chipped, worn, or broken splines. Replace if necessary.

8. Inspect two bearings (16) and bearings (19) for nicks, burrs, or signs of discoloration. Replace if necessary.

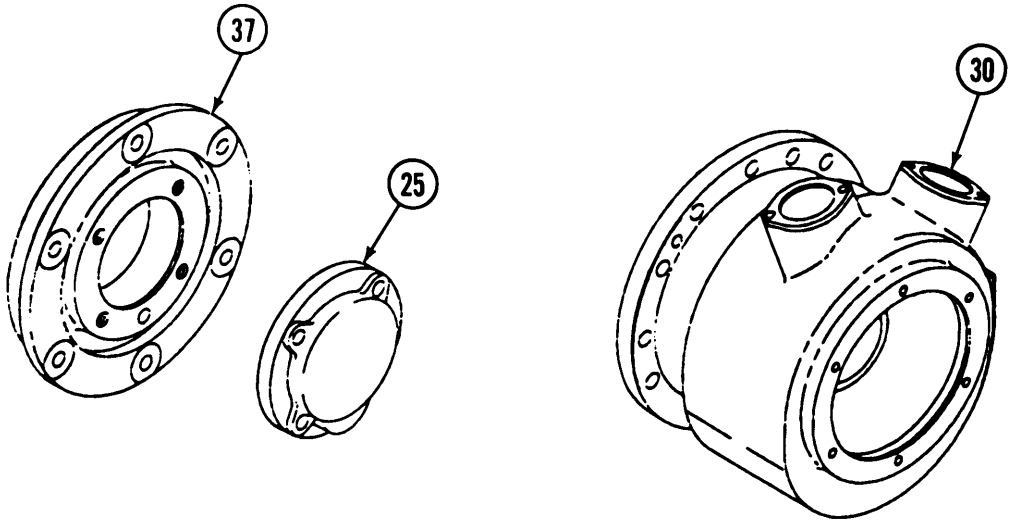
9. Inspect drive shaft (33) for wear, burrs, and worn or broken splines. Replace if necessary.

10. Inspect bearing (29) and bearing (34) for nicks, burrs, or discoloration. Replace if necessary.



11. Inspect cover (25) and housing cover (37) for burrs, cracks, or other damage. Replace if cracked. Remove burrs if necessary.

12. Inspect fan drive housing (30) for nicks, scratches, wear, or other damage. Replace if necessary.



d. ASSEMBLY

1. Install gear (32) on drive shaft (33) with six screws (31). Torque screws to 32 ft-lb (43 N•m). Secure six screws (31) with new lockwire (27).

5-2. COOLING FAN DRIVE ASSEMBLY REPAIR (continued).

NOTE

Preform step 2 only if bearing (34) is new.

2. Using arbor press, install bearing (34) on drive shaft (33).

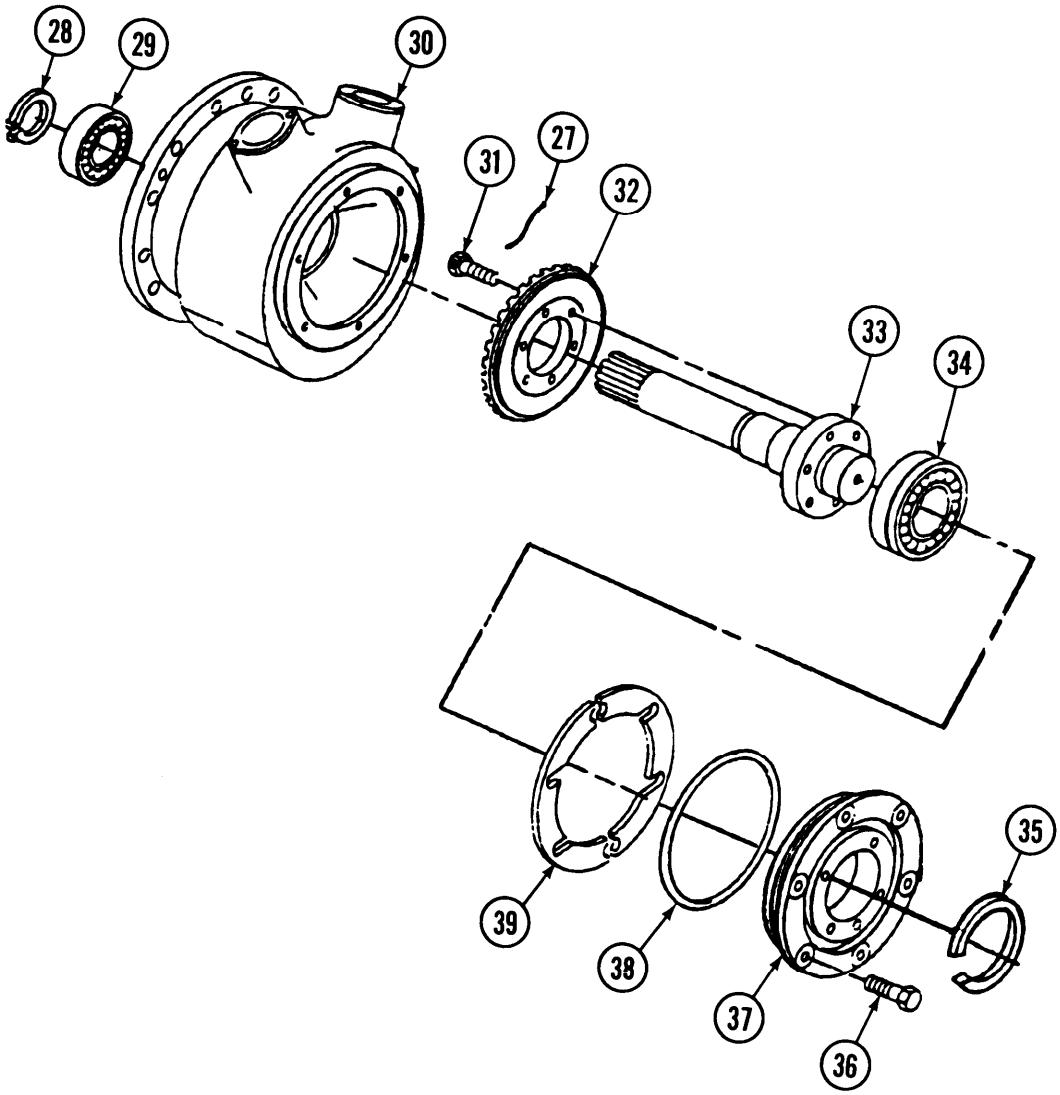
3. Install drive shaft (33) in fan drive housing (30).

WARNING

Use care when installing retaining rings. They are under spring tension and can act as projectiles when released. Wear safety goggles when installing retaining rings. Failure to heed this warning can result in serious injury to personnel.

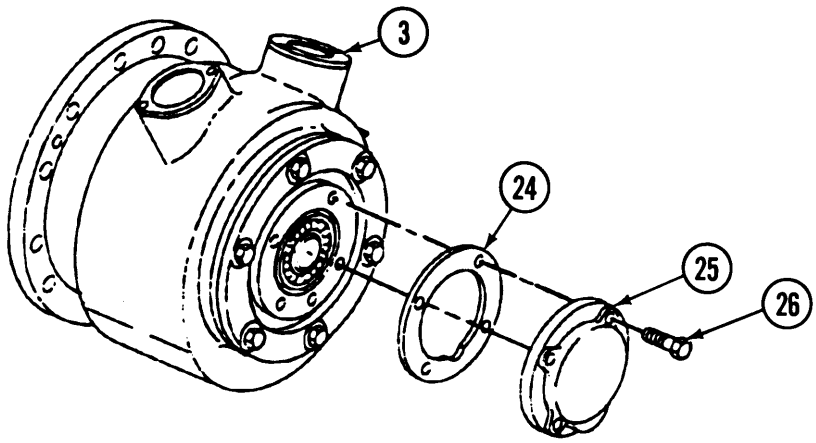
4. Using arbor press, install bearing (29) and new retaining ring (28) on drive shaft (33).

5. install new shims (39), new preformed packing (38), and housing cover (37) on fan drive housing (30) with six screws (36). Install new retaining ring (35) on bearing (34).



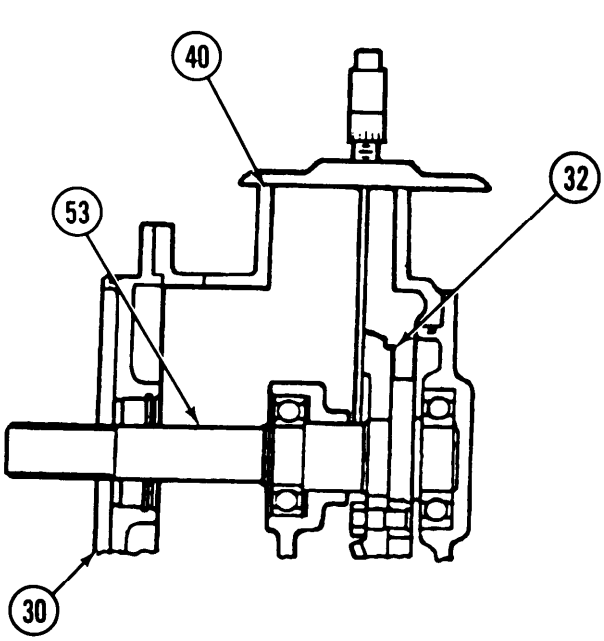
5-2. COOLING FAN DRIVE ASSEMBLY REPAIR (continued).

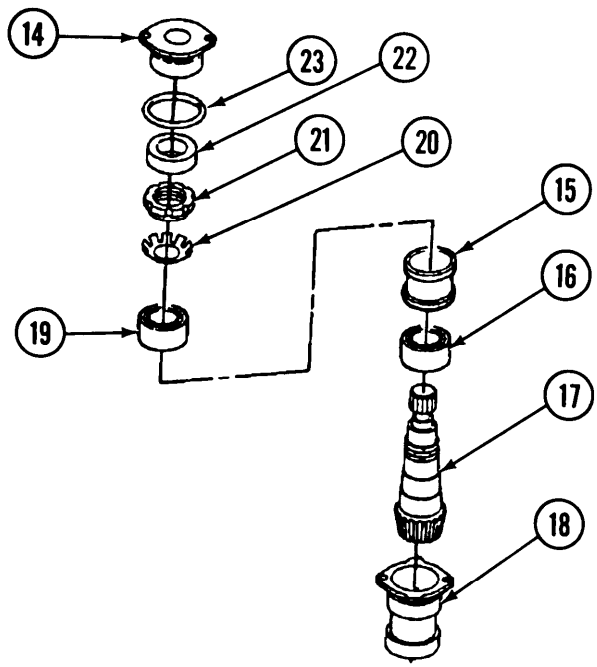
6. Install new gasket (24) and cover (25) on fan drive assembly (3) and secure with four screws (26).



7. Using depth micrometer, measure the distance between retainer boss (40) and top of drive shaft (53) at a point between fan drive housing (30) and gear (32).

8. Add 0.671 inch (17.04 mm) to distance measured in step 7 and record total.





NOTE

Both bevel gearcase assemblies are assembled and installed in the same manner.

9. Install bearing (16), bearing (19), and spacer (15) on gear shaft (17).

10. Install new key washer (20) and nut (21) on gear shaft (17).

11. Install new seal (22) and new preformed packing (23) in retainer (1 4). Install retainer (14) and gear shaft (17) on sleeve (1 8).

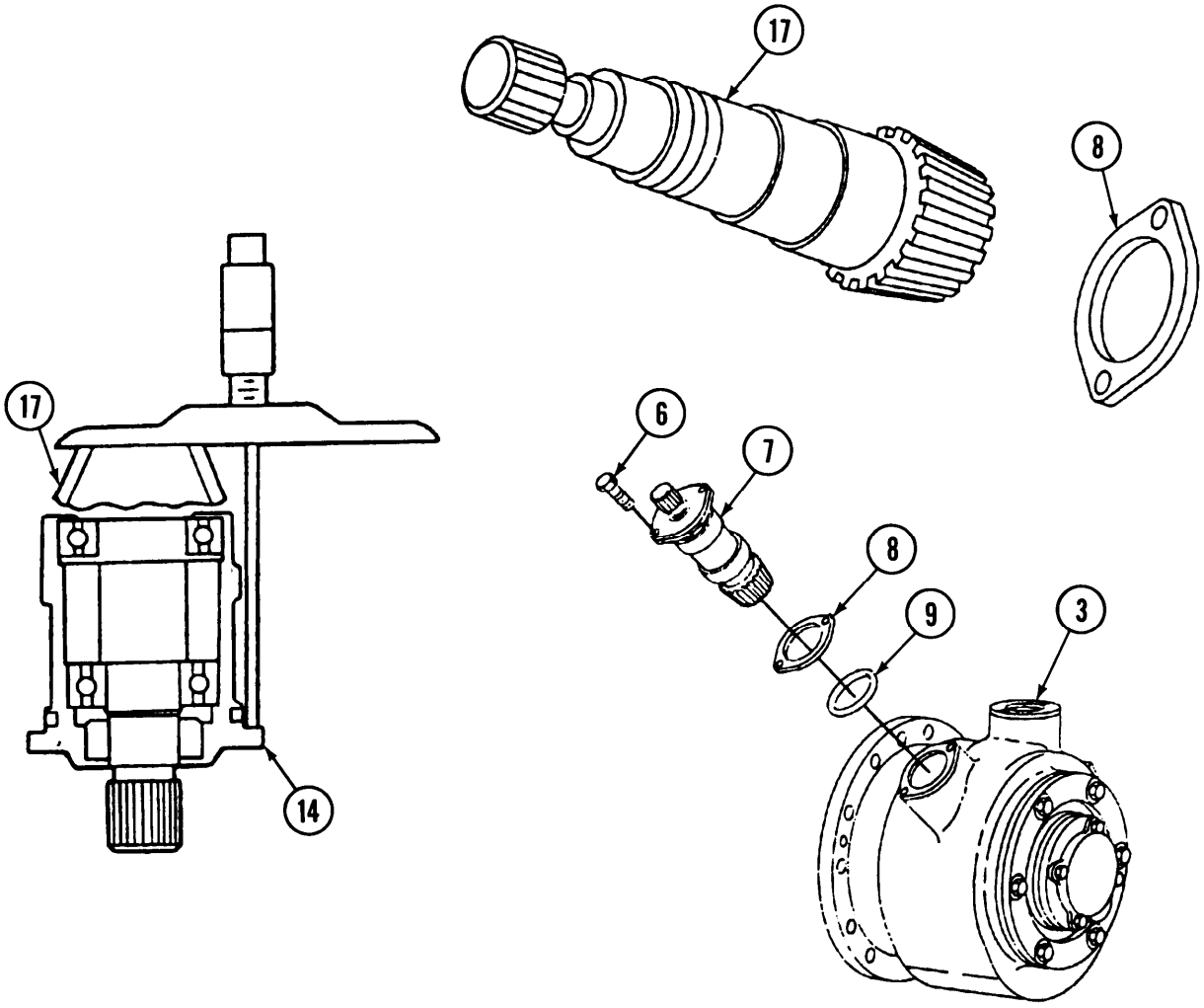
5-2. COOLING FAN DRIVE ASSEMBLY REPAIR (continued).

12. Using depth micrometer, measure the distance from end of gearshaft (17) to flange on retainer (14) and record dimension.

13. Subtract dimension recorded in step 12 from dimension recorded in step 8. Record dimension.

14. Record dimension etched on bottom of gear shaft (18).

15. Subtract dimension recorded instep 13 from dimension recorded in step 14, and record the result as the shim (8) thickness required.



16. Using shim (8) thickness determined in step 17, install new preformed packing (9), new shim (8), and bevel gearcase assembly (7) in fan drive assembly (3).

17. Secure bevel gearcase assembly (7) with two screws (6). Torque screws (6) between 19 and 21 ft-lb (25 and 28 N•m).

18. Repeat steps 9 through 17 for remaining bevel gearcase assembly (7).

5-2. COOLING FAN DRIVE ASSEMBLY REPAIR (continued).

19. Set fan drive assembly (3) on wood blocks on a flat, level surface.

20. Aline fan drive gearcase bracket with holes in fan drive assembly (3) and secure with two screws (42) and nuts (43).

21. Install dial indicator on fan drive gearcase bracket with plunger positioned on teeth of gear (32).

22. Hold drive shaft (33) secure to prevent any movement, and rotate gear shaft (17) fully counterclockwise (DO NOT FORCE). Record backlash measurement.

NOTE

- **Backlash measurement between gear shaft and drive shaft must be between 0.002 and 0.004 inch.**
- **If backlash measurement is less than 0.002 inch or greater than 0.004 inch, do steps 23 through 27 to obtain required backlash.**
- **If backlash measurement is OK, go to step 27.**

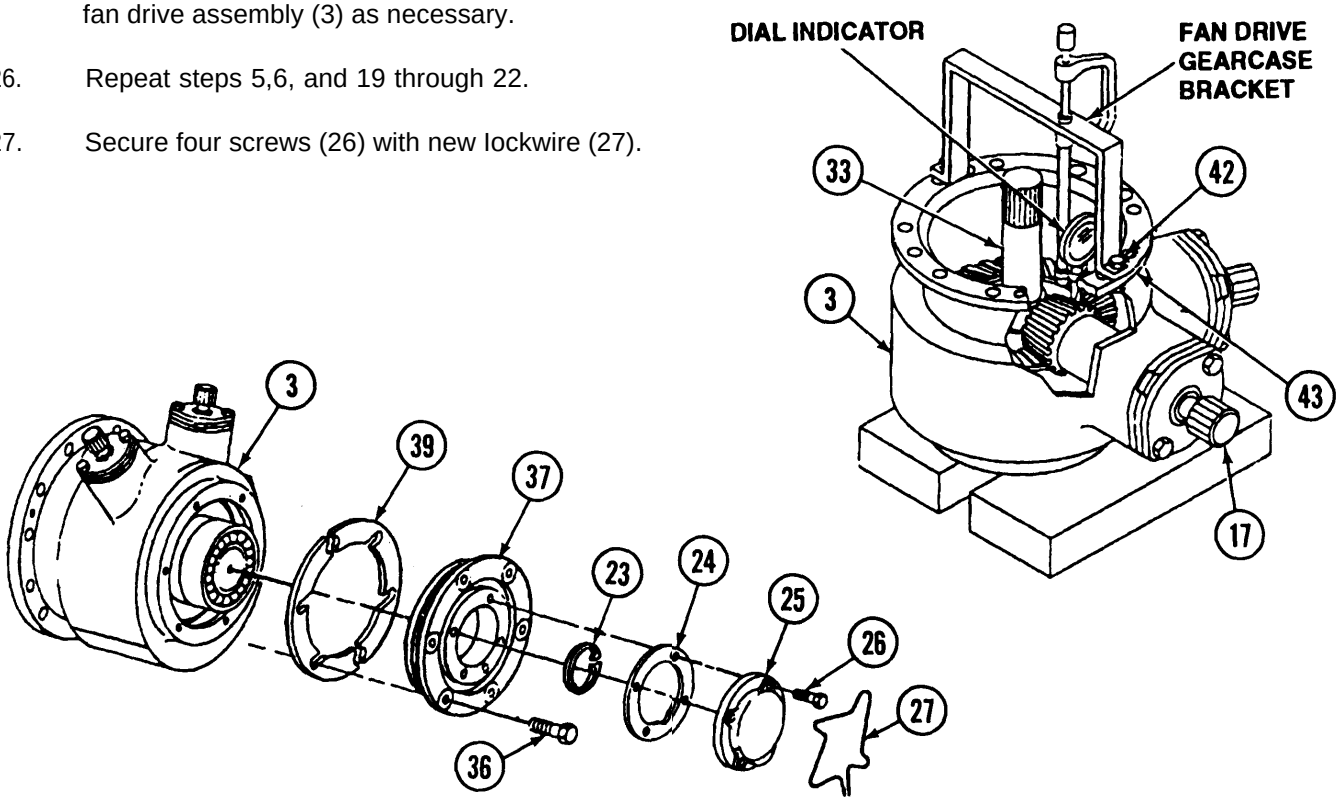
23. Remove four screws (26), cover (25), and gasket (24) from fan drive assembly (3).

24. Remove retaining ring (35) from bearing (34).

25. Remove six screws (36) and housing cover (37) from fan drive assembly (3). Remove or add shims (39) from fan drive assembly (3) as necessary.

26. Repeat steps 5,6, and 19 through 22.

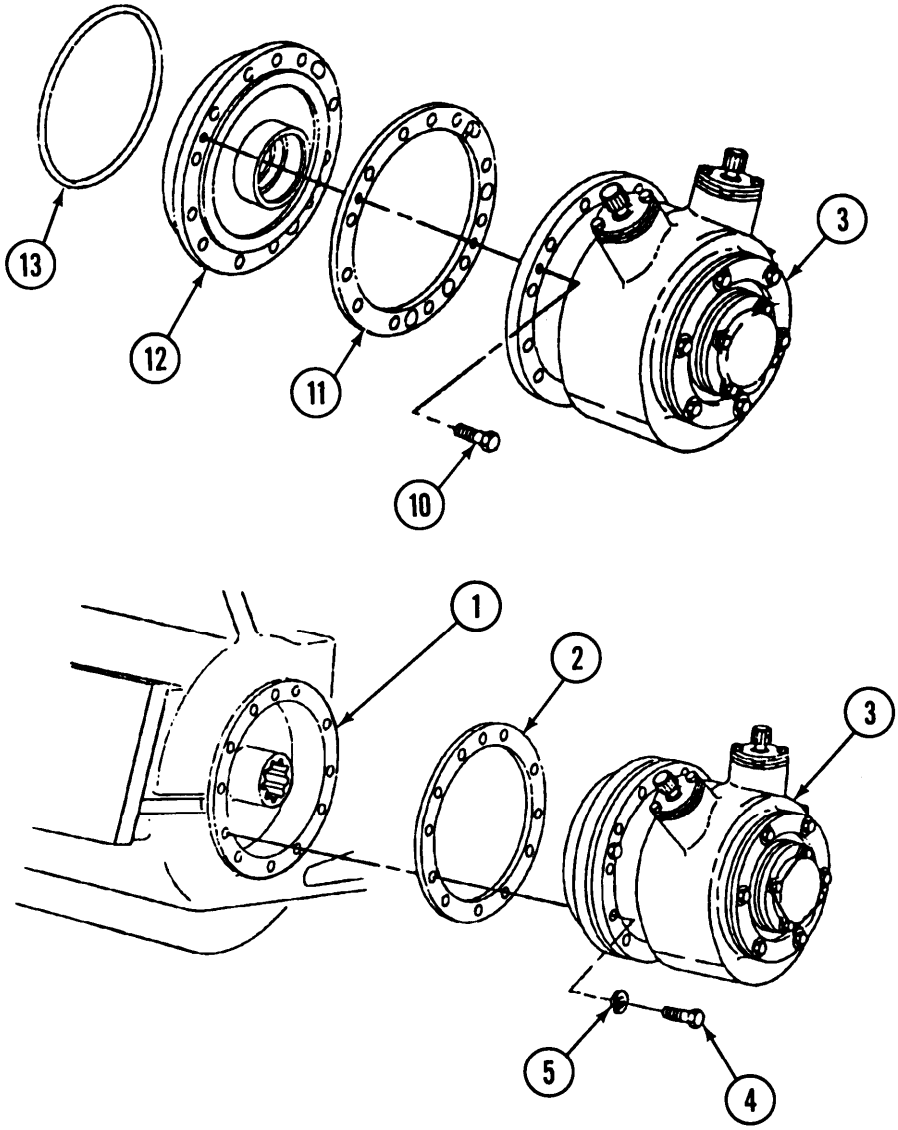
27. Secure four screws (26) with new lockwire (27).



5-2. COOLING FAN DRIVE ASSEMBLY REPAIR (continued).

28. Install new gasket (11) and inner housing cover (12) on fan drive assembly (3) with two screws (10).

29. Install new preformed packing (13) on inner housing cover (12).



e. INSTALLATION

1. Install new gasket (2) on fan drive assembly (3).

2. Install fan drive assemby (3) on transfer assembly (1) with 12 new lockwashers (5) and 12 screws (4).

FOLLOW-ON MAINTENANCE:
- None

5-3. COOLANT PUMP REPLACEMENT.

To replace the engine coolant pump, refer to TM 9-2815-202-34.

5-4. RADIATOR FAN SHROUD REPLACEMENT.

This Task Covers:

a. Disassembly

b. Assembly

Initial Setup:

Tools/Test Equipment:
- Blind hand riveter (item 6, Appendix D)
- Electric drill (Item 14, Appendix D)
- General mechanic's tool kit (item 19, Appendix D)
- Safety goggles (Item 31, Appendix D)
- Twist drill set (Item 46, Appendix D)

Materials/Parts:
- Retainer (4) (Item 94, Appendix H)
- Retainer (2) (item 95, Appendix H)
- Retainer (2) (Item 96, Appendix H)
- Rivet (36) (Item 100, Appendix H)
- Seal (2) (Item 105, Appendix H)
- Seal (2) (Item 108, Appendix H)

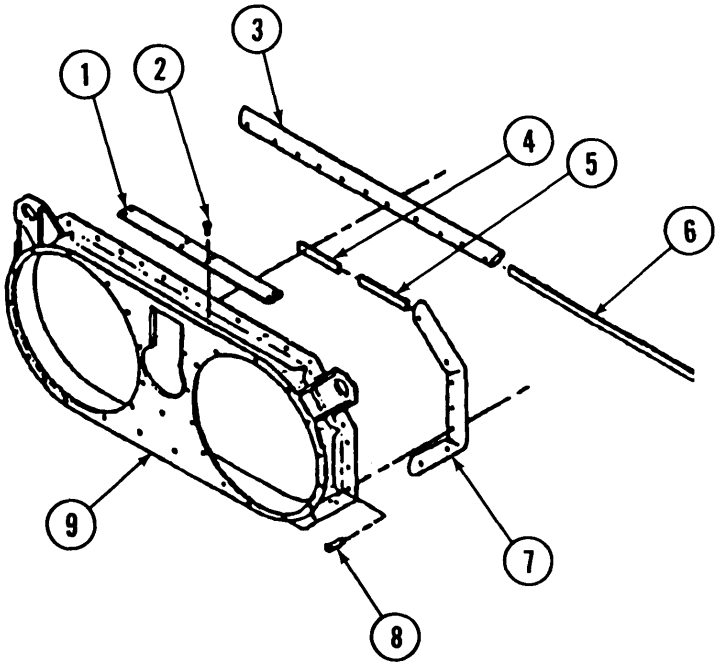
Equipment Conditions:
- Radiator fan shroud placed on clean work surface.

a. DISASSEMBLY

1. Remove eight screws (2) and cover (1) from radiator shroud (9).
2. Remove 36 rivets (8), two seals (3) and seals (7), four retainers (4), and two retainers (5) and retainers (6) from radiator fan shroud (9). Discard rivets, seals, and retainers.

b. ASSEMBLY

1. Install two new seals (3) and new seals (7), four new retainers (4), two new retainers (5) and new retainers (6), and 36 new rivets (8) on radiator shroud (9).
2. Install cover (1) and eight screws (2) on radiator fan shroud (9).



FOLLOW-ON MAINTENANCE:
- None

5-5. COOLING VANE AXIAL FAN REPAIR.

This Task Covers:

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

Initial Setup:

Tools/Test Equipment:
- General mechanic's tool kit (Item 19, Appendix D)
- Socket (Item 35.1, Appendix D)

Materials/Parts:
- Gasket (item 31.1, Appendix H)
- Key washer (Item 40, Appendix H)
- Lockwasher (12) (Item 59, Appendix H)
- Seal (Item 110.1, Appendix H)
- Seal (Item 110.2, Appendix H)

Equipment Conditions:
- Cooling vane axial fan placed on clean work surface.

a. REMOVAL

1. Remove four screws (1), lockwashers (2), and washers (3) from fan (4). Discard lockwashers.
2. Remove fan (4) from mount (13).
3. Remove four screws (11), lockwashers (10), and washers (9) from fan (8). Discard lockwashers.
4. Remove fan (8) from mount (13).
5. Remove four screws (5), lockwashers (6), and washers (7) and mount (13) from transfer housing (12). Discard lockwashers.

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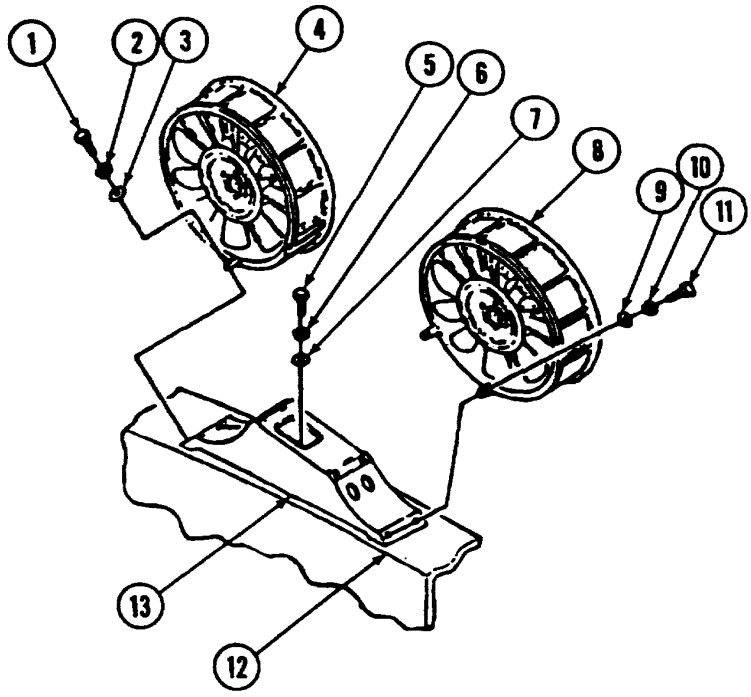


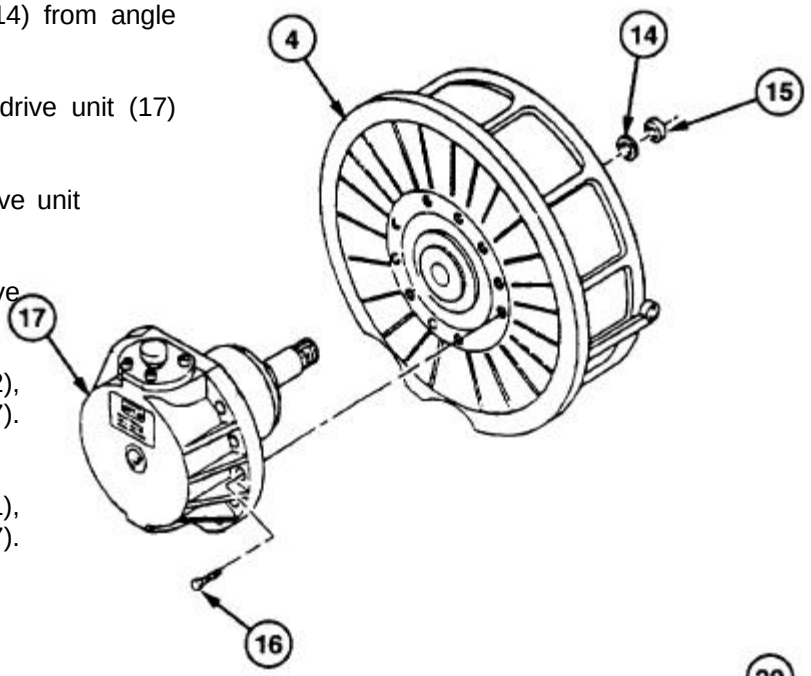
5-5. COOLING VANE AXIAL FAN REPAIR (continued).

b. DISASSEMBLY

NOTE

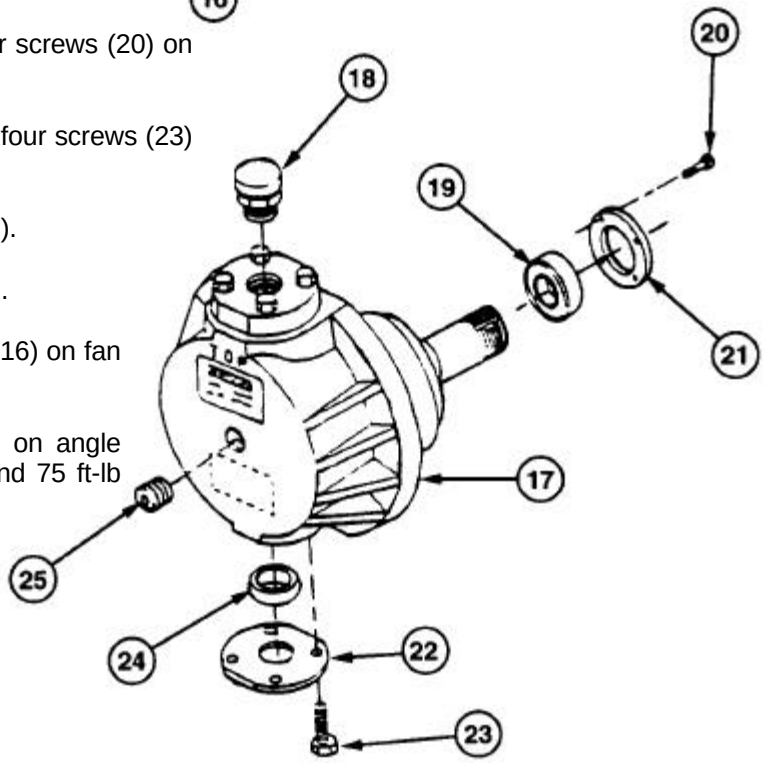
There are two cooling vane axial fans. Disassembly and assembly of the fans is the same; one fan is shown.

1. Remove nut (15) and key washer (14) from angle drive unit (17). Discard key washer.
2. Remove 10 screws (16) and angle drive unit (17) from fan (4).
3. Remove breather (18) from angle drive unit (17).
4. Remove pipe plug (25) from angle drive unit (17).
5. Remove four screws (23), gasket (22), and seal (24) from angle drive unit (17). Discard gasket and seal.
6. Remove fourscrews(20), retainer (21), and seal (19) from angle drive unit (17). Discard seal.



c. ASSEMBLY

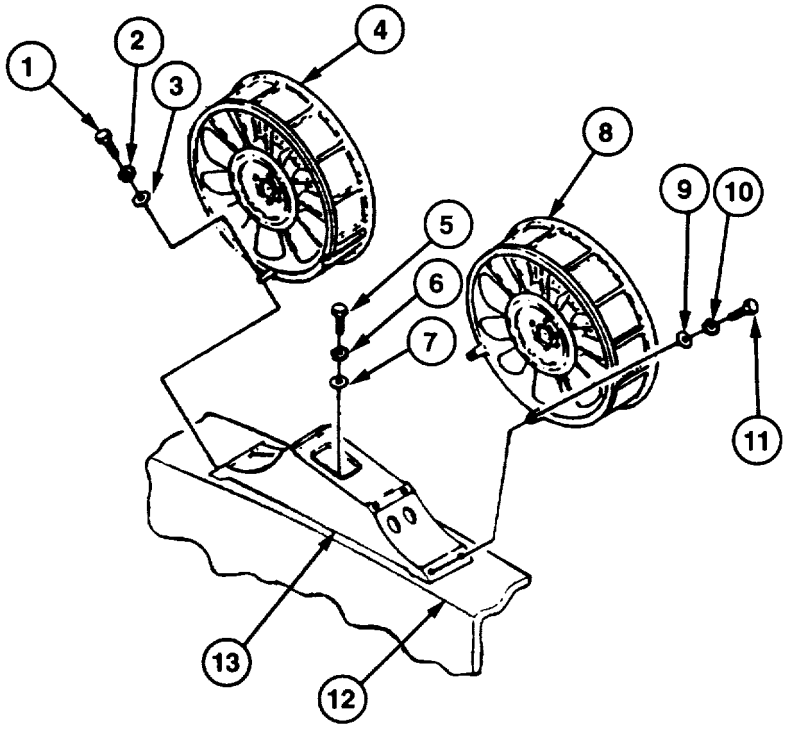
1. Install new seal (19), retainer (21), and four screws (20) on angle drive unit (17).
2. Install new seal (24), new gasket (22), and four screws (23) on angle drive unit (17).
3. Install pipe plug (25) on angle drive unit (17).
4. Install breather (18) on angle drive unit (17).
5. Install angle drive unit (17) and 10 screws (16) on fan (4).
6. Install new key washer (14) and nut (15) on angle drive unit (17). Torque nut between 65 and 75 ft-lb (88 and 102 N•m).



5-5. COOLING VANE AXIAL FAN REPAIR (continued).

d. INSTALLATION

1. Install mount (13) and four washers (7), new lockwashers (6), and screws (5) on transfer housing (12).
2. Place fan (8) on mount (13) and install four washers (9), new lockwashers (10), and screws (11) on transfer housing (12).
3. Place fan (4) on mount (13) and install four washers (3), new lockwashers (2), and screws (1) on transfer housing (12).



FOLLOW-ON MAINTENANCE:

- None

5-6. RADIATOR MOUNTS REPLACEMENT.

This Task Covers:

a. Removal

b. Installation

Initial Setup:

Tools/Test Equipment:
- General mechanic's tool kit (Item 19, Appendix D)

Equipment Conditions:
- Vehicle parked on level ground (refer to TM 9-2350-287-10).
- Powerpack removed (refer to TM 9-2350-287-20-1).
- Radiator removed (refer to TM 9-2350-287-20-1).

Materials/Parts:
- Gasket (Item 35.1, Appendix H)
- Lockwasher (17) (Item 60, Appendix H)

---

a. REMOVAL

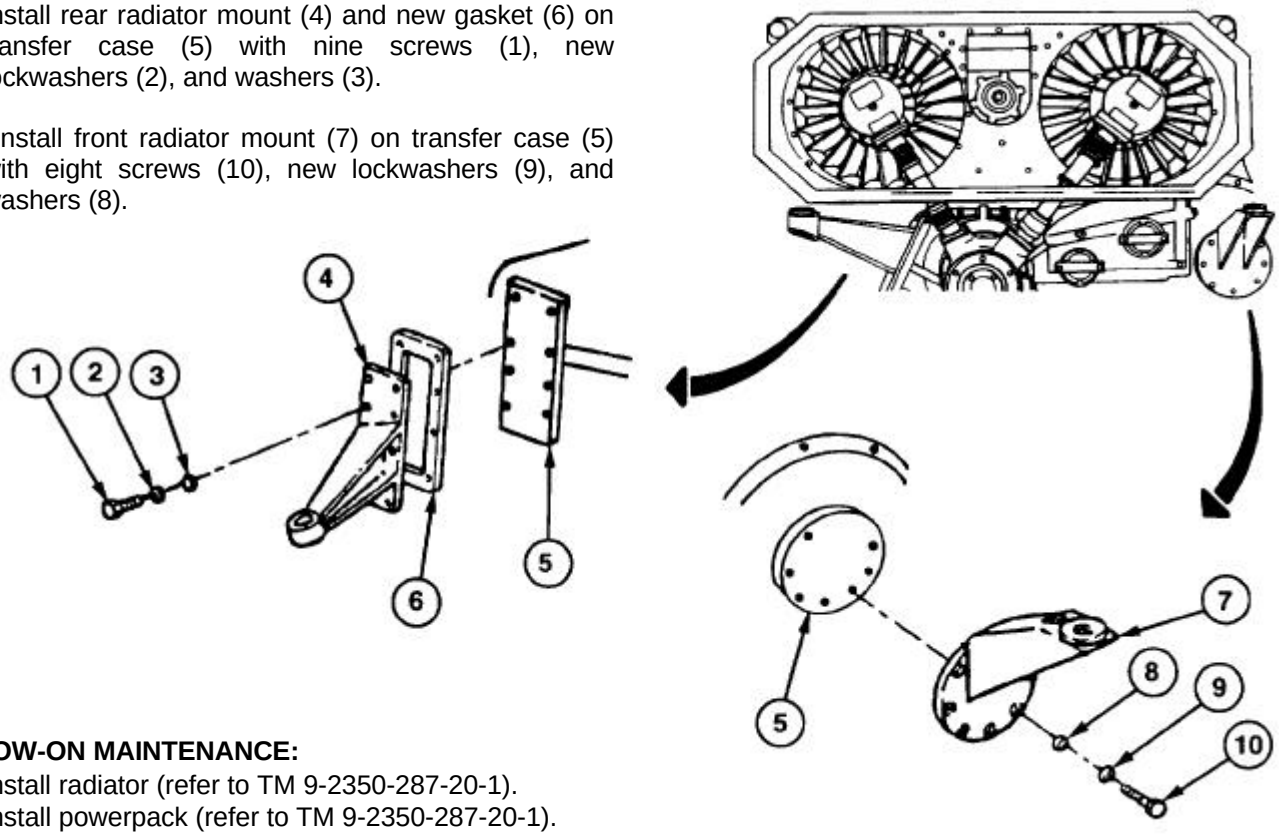
1. Remove eight screws (10), lockwashers (9), and washers (8) and front radiator mount (7) from transfer case (5). Discard lockwashers.

2. Remove nine screws (1), lockwashers (2), and washers (3), rear radiator mount (4), and gasket (6) from transfer case (5). Discard lockwashers and gasket.

b. INSTALLATION

1. Install rear radiator mount (4) and new gasket (6) on transfer case (5) with nine screws (1), new lockwashers (2), and washers (3).

2. Install front radiator mount (7) on transfer case (5) with eight screws (10), new lockwashers (9), and washers (8).



FOLLOW-ON MAINTENANCE:
- Install radiator (refer to TM 9-2350-287-20-1).
- Install powerpack (refer to TM 9-2350-287-20-1).

CHAPTER 6
ELECTRICAL SYSTEMS/CIRCUIT MAINTENANCE

Paragraph Number	Paragraph Title	Page Number
		6-1
6-1	General	6-1
6-2	Rectifier Repair	6-12
6-3	STE/ICE Resistor Box Repair	6-14
6-4	Cargo Compartment Wiring Harness (12330252) Replacement	

6-1. GENERAL.

This chapter describes and illustrates maintenance procedures for the rectifier and the simplified test equipment internal combustion engine (STE/ICE) resistor box.

6-2. RECTIFIER REPAIR.

This Task Covers:

a. Disassemby
b. Cleaning and Inspection
c. Assembly

Initial Setup:

Tools/Test Equipment:
- Automotive electrical repair tool kit (Item 5, Appendix D)
- General mechanic's tool kit (Item 19, Appendix D)
- Multimeter (Item 23, Appendix D)

Materials/Parts:
- Pressure-sensitive tape (Item 26, Appendix B)
- Rag (Item 17, Appendix B)
- Sealing compound (Item 21, Appendix B)
- Silicone lubricant (Item 23, Appendix B)
- Technical acetone (Item 1, Appendix B)
- Gasket (Item 17, Appendix H)
- Gasket (Item 18, Appendix H)
- Lockwasher (5) (Item 48, Appendix H)
- Lockwasher (15) (Item 49, Appendix H)
- Preformed packing (Item 87, Appendix H)

Equipment Conditions:
- Rectifier placed on clean work surface.

6-2. RECTIFIER REPAIR (continued).

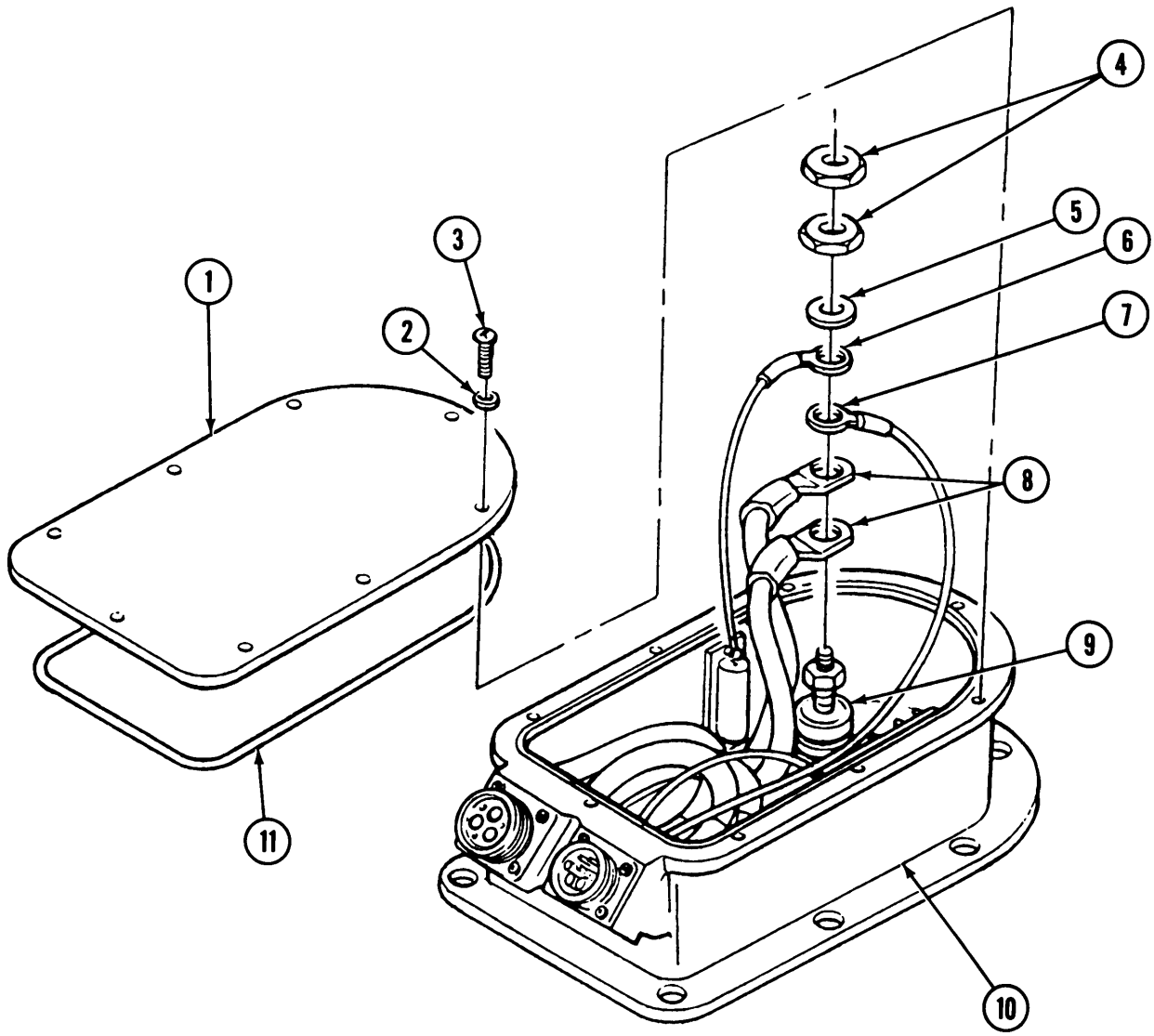
a. DISASSEMBLY

1. Remove eight screws (3) and washers (2), cover (1), and preformed packing (11) from housing (10). Discard preformed packing,

NOTE

When removing more than one wire from a multiple-wire receptacle, tag wires for later identification.

2. Remove two nuts (4), washer (5), two electrical leads (6 and 7), and two electrical leads (8) from rectifier diode (9).



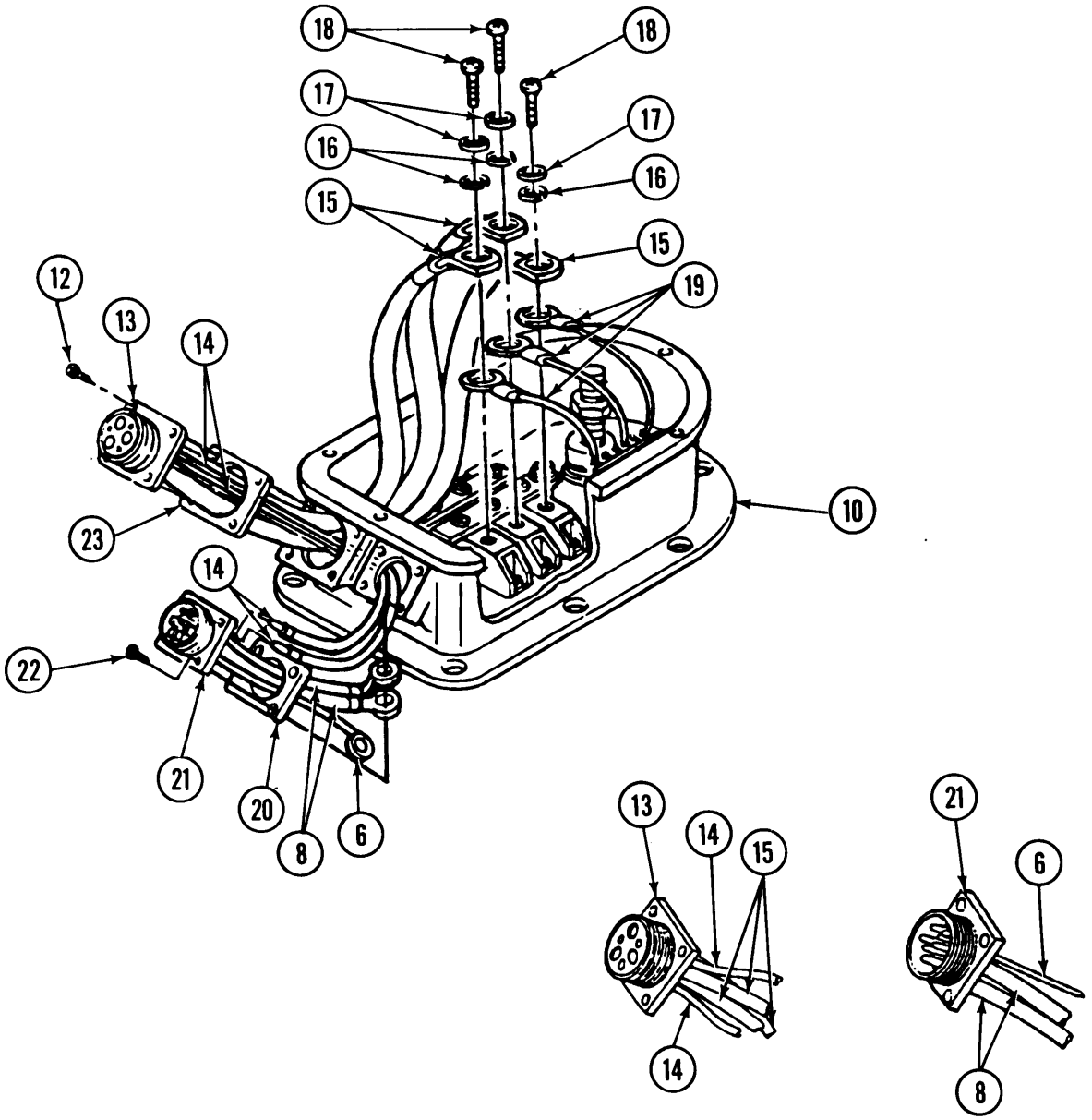
6-2. RECTIFIER REPAIR (continued).

3. Remove four screws (22) and connector (21) from housing (10).

4. Remove two electrical leads (14) from connector (21). Remove connector (21), gasket (20), electrical lead (6), and two electrical leads (8) from housing (10). Discard gasket.

5. Remove three screws (1 8), washers (17), Iockwashers (16), electrical leads (15) and electrical leads (19) from housing (10). Discard Iockwashers, and reinstall washers and screws.

6. Remove four screws (12), gasket (23), and connector (13) from housing (1 O). Discard gasket.



7. Remove three electrical leads (15) and two electrical leads (14) from connector (13). Remove electrical lead (6) and two electrical leads (8) from connector (21).

6-2. RECTIFIER MAINTENANCE (continued).

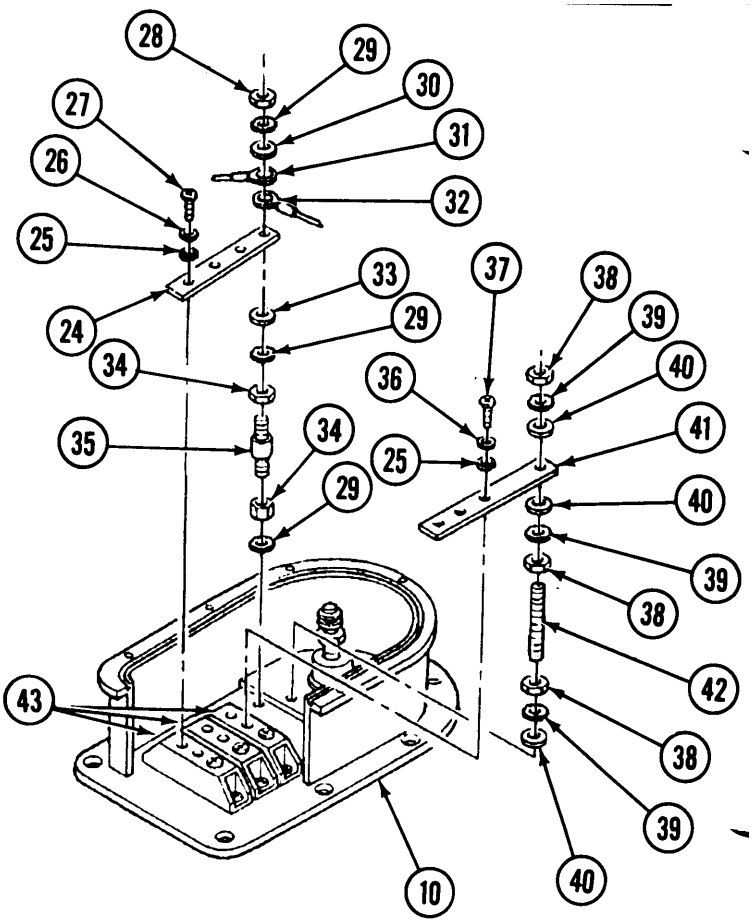
8. Remove nut (28), lockwasher (29), washer (30), and two electrical leads (31 and 32) from ground terminal (35). Discard lockwasher.

9. Remove three screws (27), washers (26), and lockwashers (25) from negative bus bar (24). Remove negative bus bar (24) from three diode assemblies (43). Discard lockwashers and reinstall washers and screws.

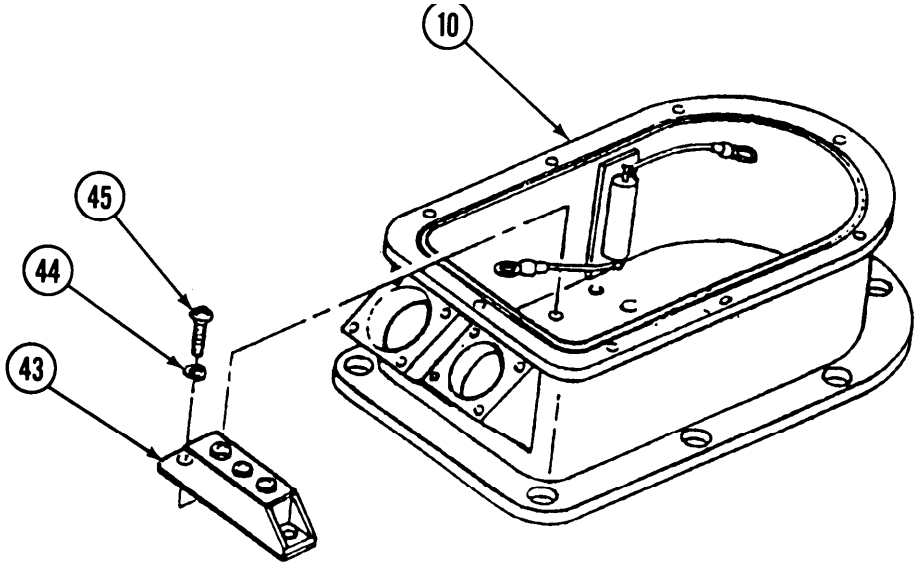
10. Remove washer (33), two lockwashers (29) and nuts (34), and ground terminal (35) from housing (10). Discard lockwashers.

11. Remove three screws (37), washers (36), and lockwashers (25) from positive bus bar (41). Discard lockwashers.

12. Remove nut (38), lockwasher (39), washer (40), and positive bus bar (41) from terminal stud (42). Remove two washers (40), lockwashers (39), and nuts (38) and terminal stud (42) from housing (10). Discard lockwashers.



13. Remove six screws (45) and lockwashers (44) and three diode assemblies (43) from housing (10). Discard lockwashers.



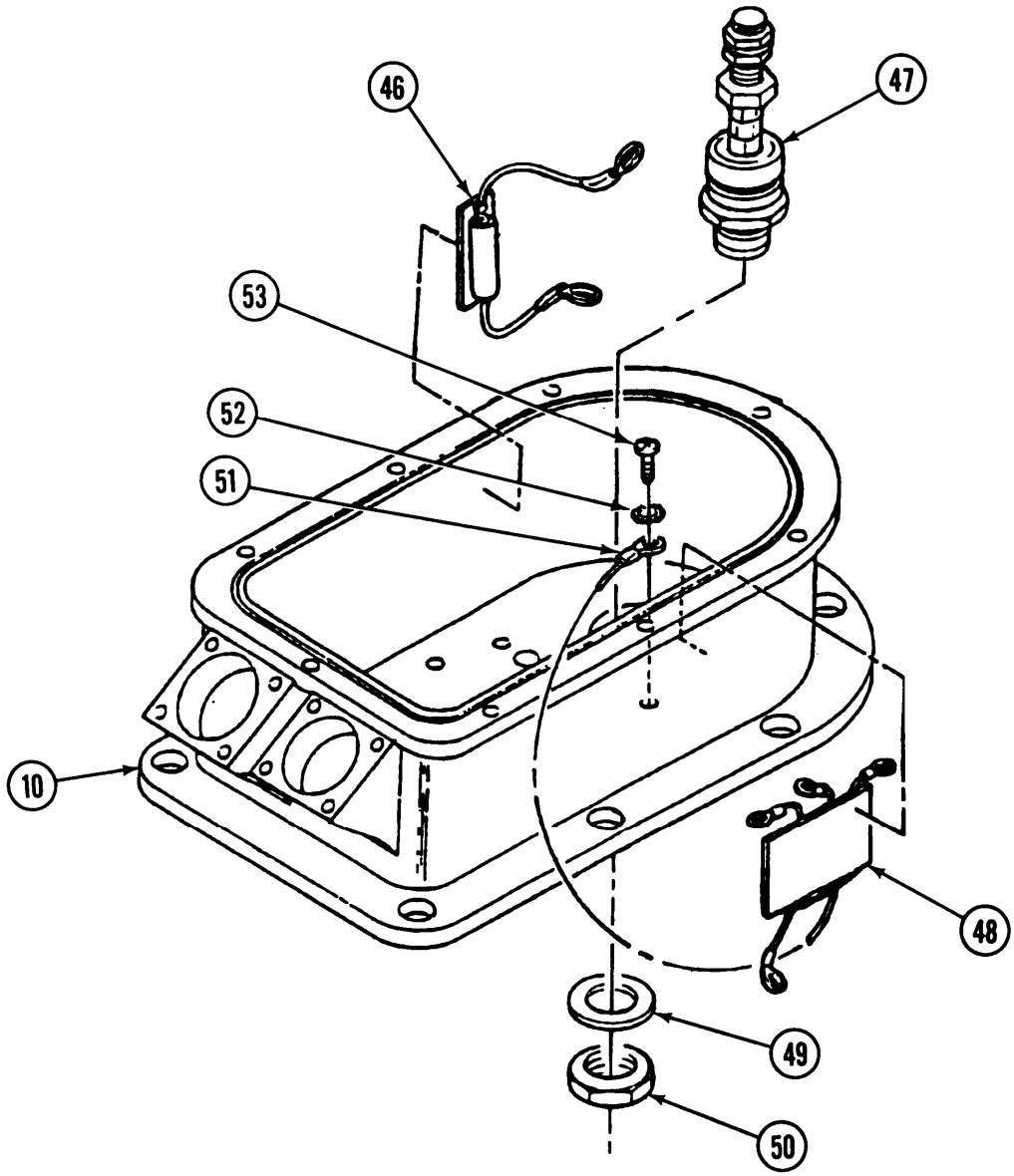
6-2. RECTIFIER MAINTENANCE (continued).

NOTE

Capacitor board assemblies are held to housing with pressure-sensitive tape. Remove from housing only if damaged.

14. Remove capacitor board assembly (46) from housing (10). Remove screw (53), lockwasher (52), and electrical lead (51) from housing (10). Remove capaciter board assembly (48) from housing (10).

15. Remove nut (50), insulator (49), and diode (47) from housing (10).



6-2. RECTIFIER MAINTENANCE (continued).

b. CLEANING AND INSPECTION

WARNING

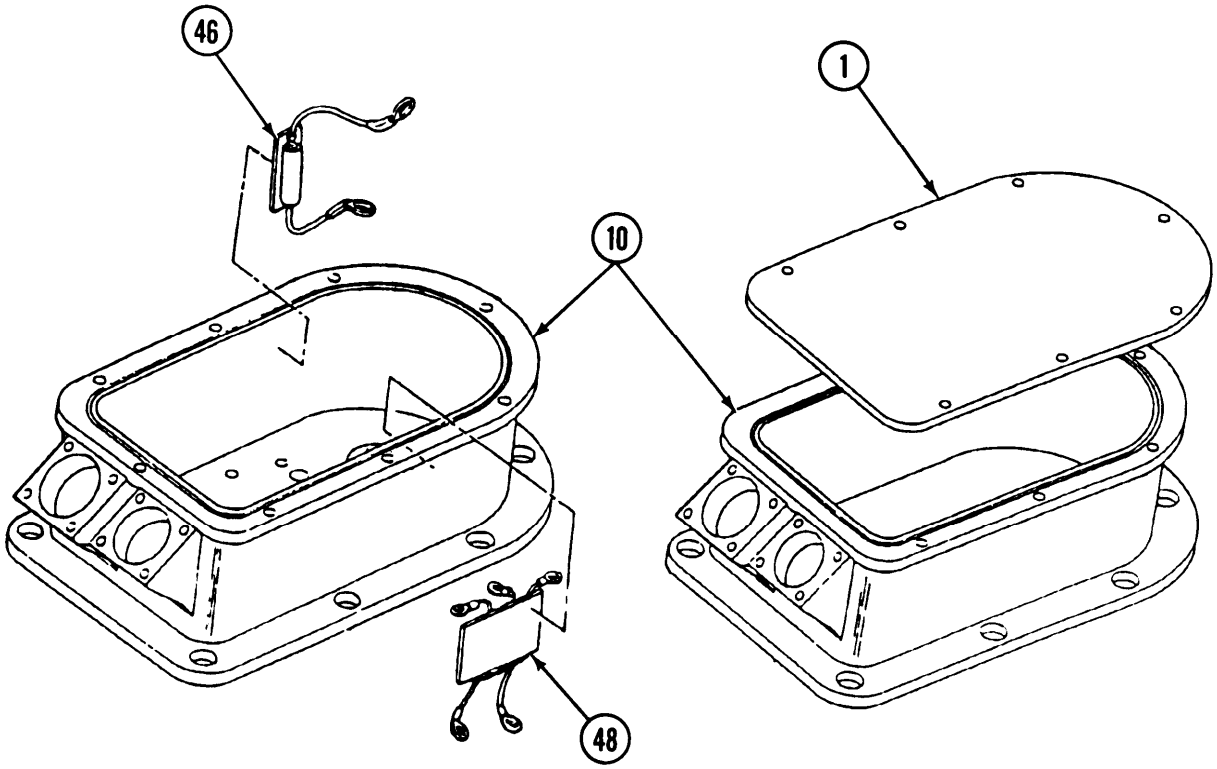
Acetone solvent is toxic and flammable. Use only in a well-ventilated area. Do not breathe vapors. Do not use near open flame or excessive heat. Failure to heed this warning can result in injury or death.

NOTE

Perform step 1 only if capacitor assembly was removed.

1. Clean off remains of pressure-sensitive tape and wipe down back of capacitor assembly board (46 or 48) with technical acetone.

2. Inspect cover (1) and housing (10) for cracks or distortion. Replace if damaged.



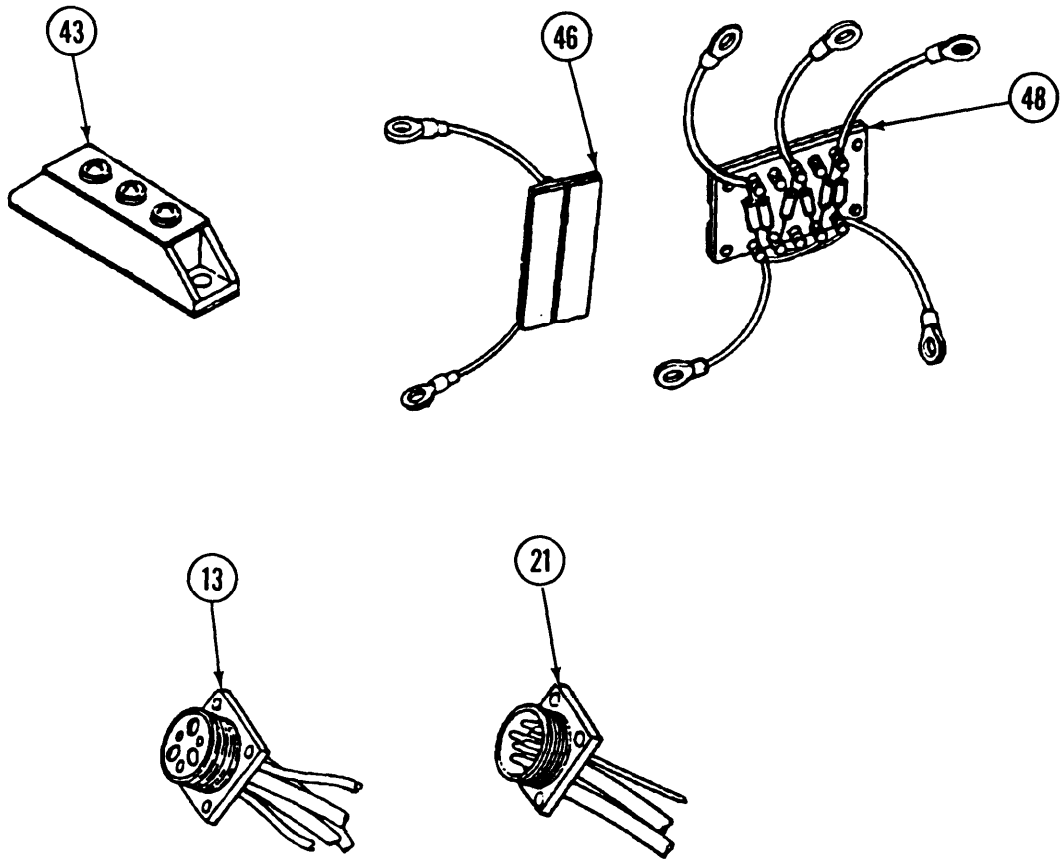
6-2. RECTIFIER MAINTENANCE (continued).

3. Test three diode assemblies (43) for continuity. Replace if defective.

4. Inspect two connectors (13 and 21) for broken pins, and solder leads for breaks. Replace if damaged.

5. Inspect capacitor board assembly (46 or 48) for cracks and loose or missing terminals. Replace assembly if damaged.

6. Test capacitor board assemblies (46 and 48) with red lead of multimeter on one capacitor terminal and black lead on the other capacitor terminal. Multimeter should show continuity, then infinity (∞). If only continuity is shown, replace capacitor board assembly (46 or 48).



7. Reverse multimeter leads and repeat step 6.

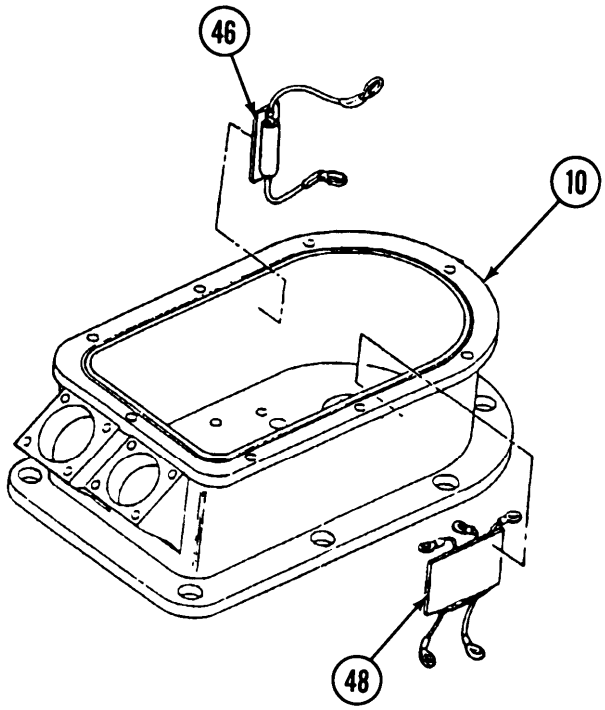
6-2. RECTIFIER MAINTENANCE (continued).

c. ASSEMBLY

NOTE

Perform step 1 only if capacitor board assembly was removed.

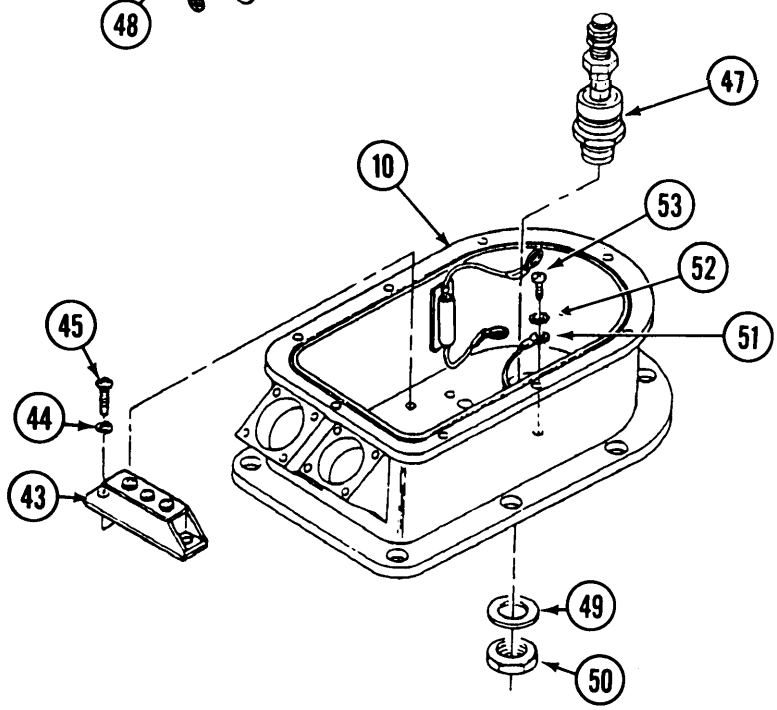
1. Apply two pieces of pressure-sensitive tape to back of capacitor board assembly (46 or 48). Peel protective coating from tape, and install capacitor board assembly (46 or 48) on housing (10).



2. Install electrical lead (51) in housing (10) with screw (53) and new lockwasher (52).

3. Coat mating surfaces with silicone lubricant, and install six screws (45) and new lockwashers (44) and three diode assemblies (43) on housing (10).

4. Install diode (47) in housing (10) and secure with insulator (49) and nut (50).



6-2. RECTIFIER MAINTENANCE (continued).

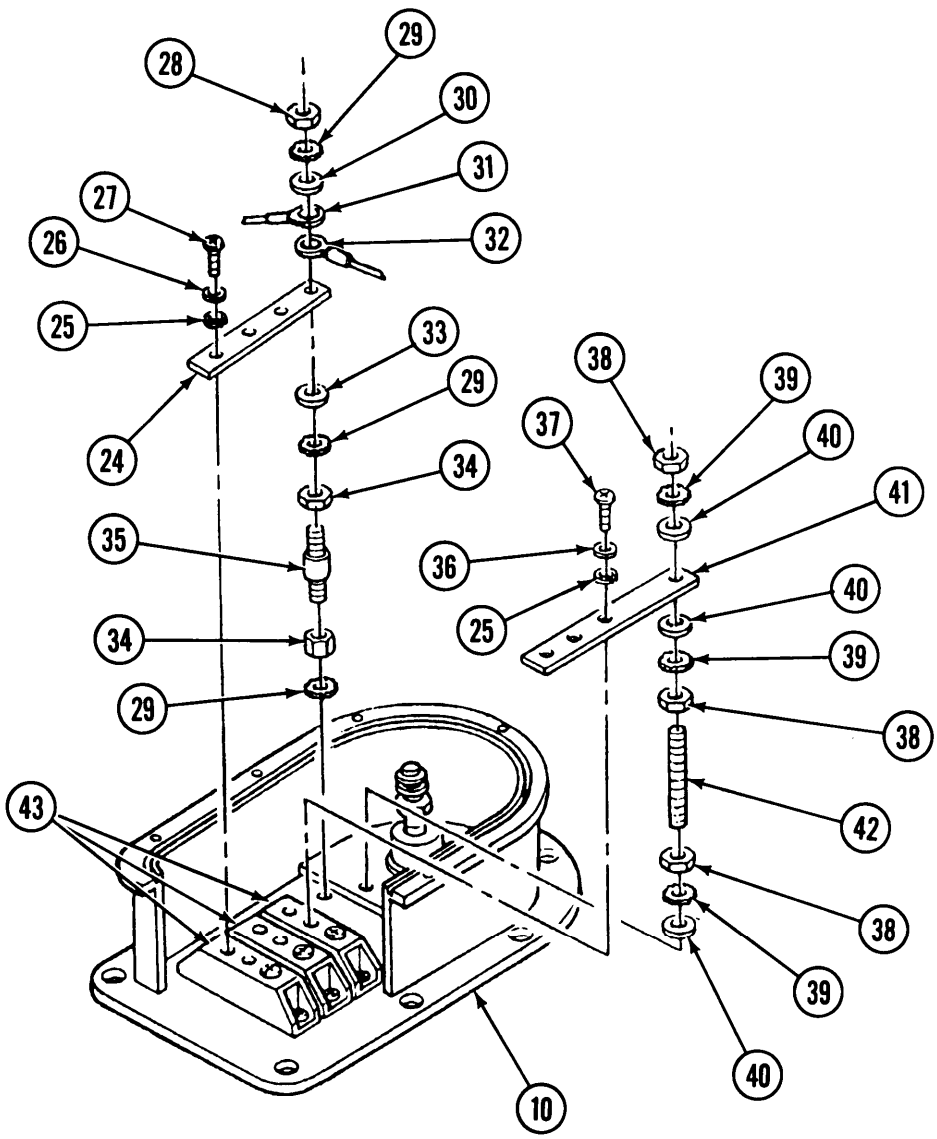
5. Install terminal stud (42) and two new lockwashers (39), washers (40), and nuts (38) in housing (10). Install positive bus bar (41) on terminal stud (42) with nut (38), new lockwasher (39), and washer (40).

6. Remove hardware for positive bus bar (41). Install positive bus bar (41) on three diode assemblies (43) with three screws (37), washers (36), and new lockwashers (25).

7. Install ground terminal (35) on housing (10) with washer (33) and two new lockwashers (29) and nuts (34).

8. Remove hardware for negative bus bar (24). Install negative bus bar (24) on three diode assemblies (43) with three screws (27), washers (26), and new lockwashers (25).

9. Install two electrical leads (31 and 32), washer (30), new lockwasher (29), and nut (28) on ground terminal (35).



6-2. RECTIFIER MAINTENANCE (continued).

10. Install three electrical leads (15) and two electrical leads (14) on connector (13). Install electrical lead (6) and two electrical leads (8) on connector (21).

11. Thread two electrical leads (14) through housing (10), and connect two electrical leads (14) to connector (21).

WARNING

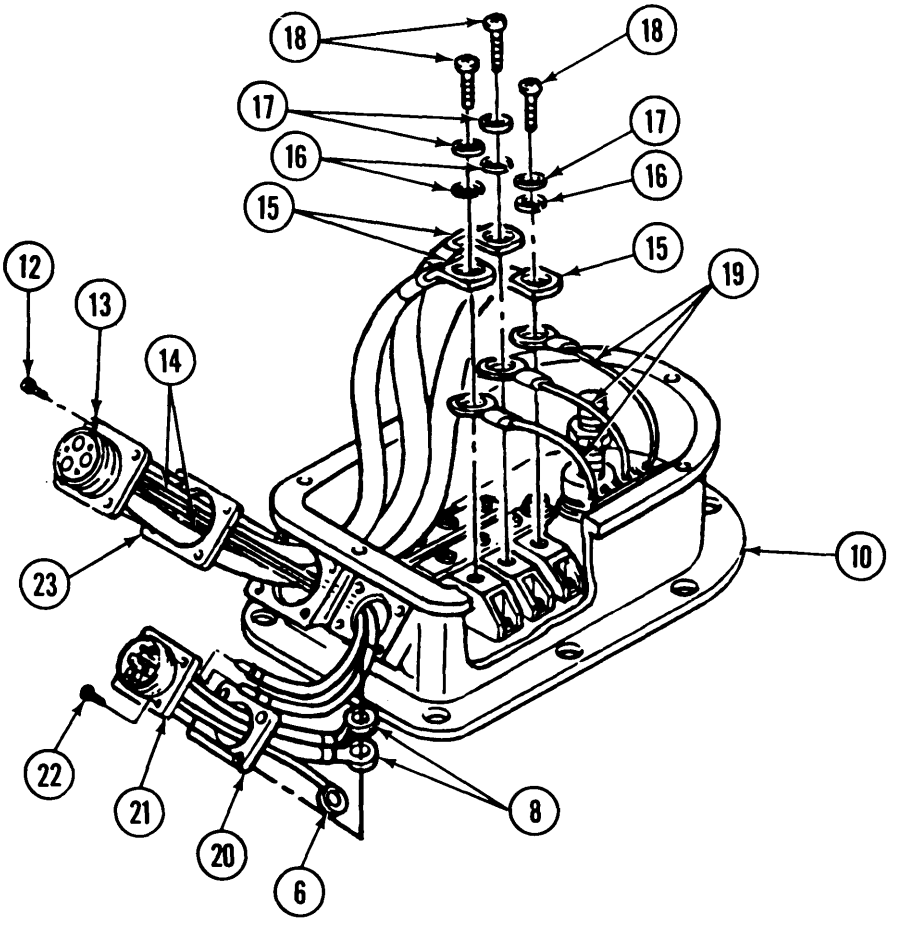
Sealing compound can bum easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep sealing compound away from open fire and use it in a well-ventilated area. if sealing compound gets on skin or clothing, wash immediately with soap and water.

12. Apply sealing compound to threads of four screws (1 2). Install connector (1 3) and new gasket (23) on housing (10) with four screws (12).

13. Apply sealing compound to threads of four screws (22). Install connector (21) and new gasket (20) on housing (10) with four screws (22).

14. Bend top three electrical leads (15) to 90 degrees.

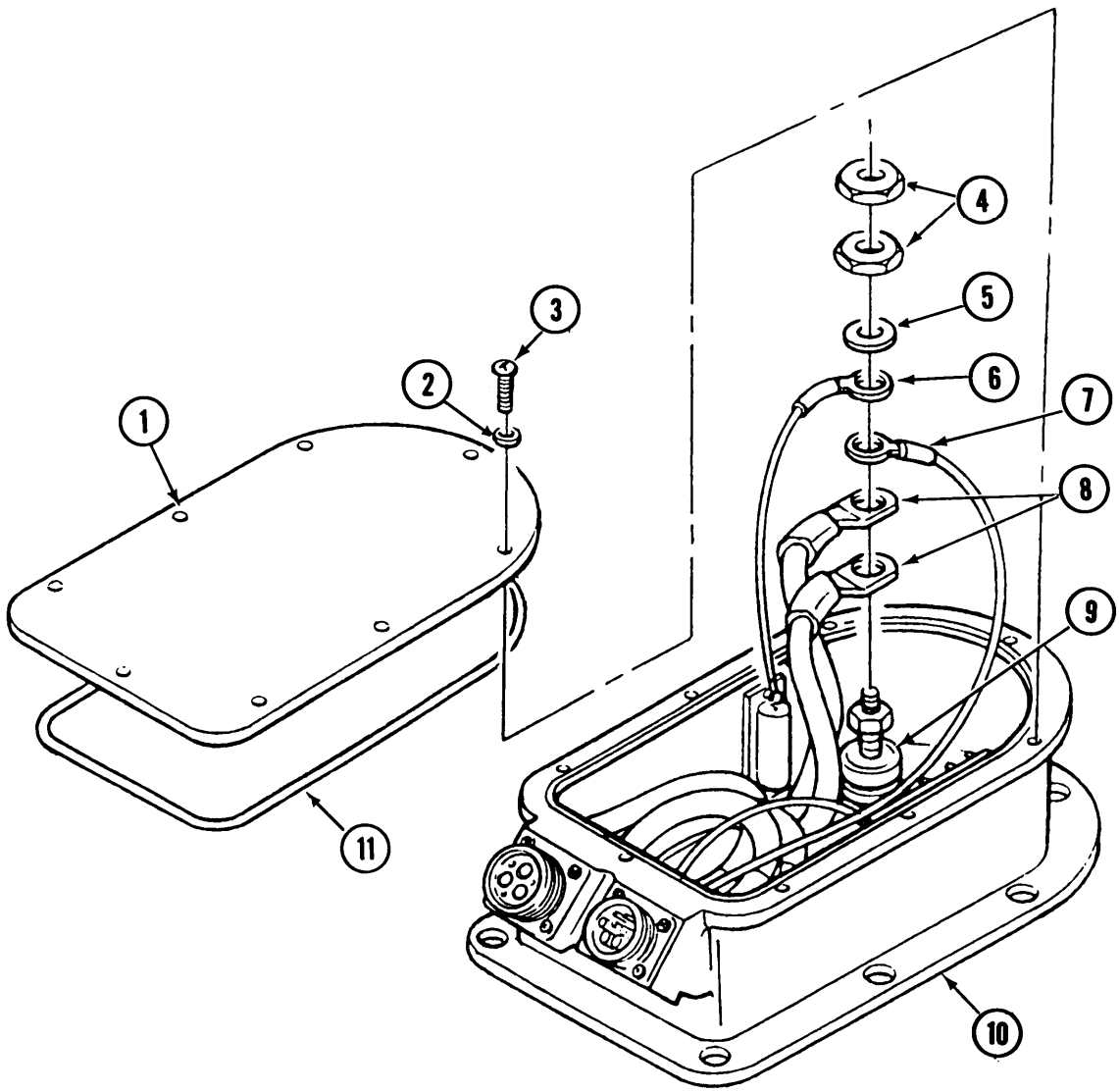
15. Remove three lockwashers (1 6), washers (1 7), and screws (18) from housing (10). Install three lockwashers (16), washers (17), electrical leads (15), electrical leads (19), and screws (18) on housing (10).



6-2. RECTIFIER MAINTENANCE (continued).

16. Install washer (5) and two electrical leads (6 and 7), electrical leads (8), and nuts (4) on rectifier diode (9).

17. Install new preformed packing (11) and cover (1) on housing (10) with eight washers (2) and screws (3).



FOLLOW-ON MAINTENANCE:
• None

6-3. STE/ICE RESISTOR BOX REPAIR.

This Task Covers:

a. Disassembly
b. Inspection
c. Assembly

Initial Setup:

Tools/Test Equipment:
- General mechanic's tool kit (Item 19, Appendix D)

Materials/Parts:
- Gasket (Item 19, Appendix H)
- Lockwasher (4) (Item 51, Appendix H)
- Lockwasher (4) (Item 52, Appendix H)
- Lockwasher (4) (Item 54, Appendix H)

Equipment Conditions:
- STE/ICE resistor box placed on clean work surface.

a. DISASSEMBLY

1. Remove four screws (3) from four retainers (2), and unhook four retainers (2) securing cover (4) to box housing (1).
2. Remove cover (4) from box housing (1).
3. Tag 12 terminal leads (13). Remove eight terminal screws (10) and 12 terminal leads (13) from terminal board (15).
4. Remove four screws (17), washers (22), Iockwashers (23), and nuts (24) from STE/ICE resistor box wiring harness (16). Remove gasket (18) and STE/ICE resistor box wiring harness (16) from box housing (1). Discard lockwashers and gasket.
5. Remove eight terminal screws (10), three bus connectors (11), five terminal lugs (1 2), and three fixed resistors (9) from terminal board (15).
6. Remove four screws (7) and Iockwashers (6) securing panel (5) to box housing (1). Discard Iockwashers. Remove panel (5), with terminal board (15), from box housing (1).
7. Remove four screws (14), washers (19), Iockwashers (20), and nuts (21) from terminal board (15). Remove terminal board (15) and marker strip (8) from panel (5). Discard Iockwashers.

b. INSPECTION

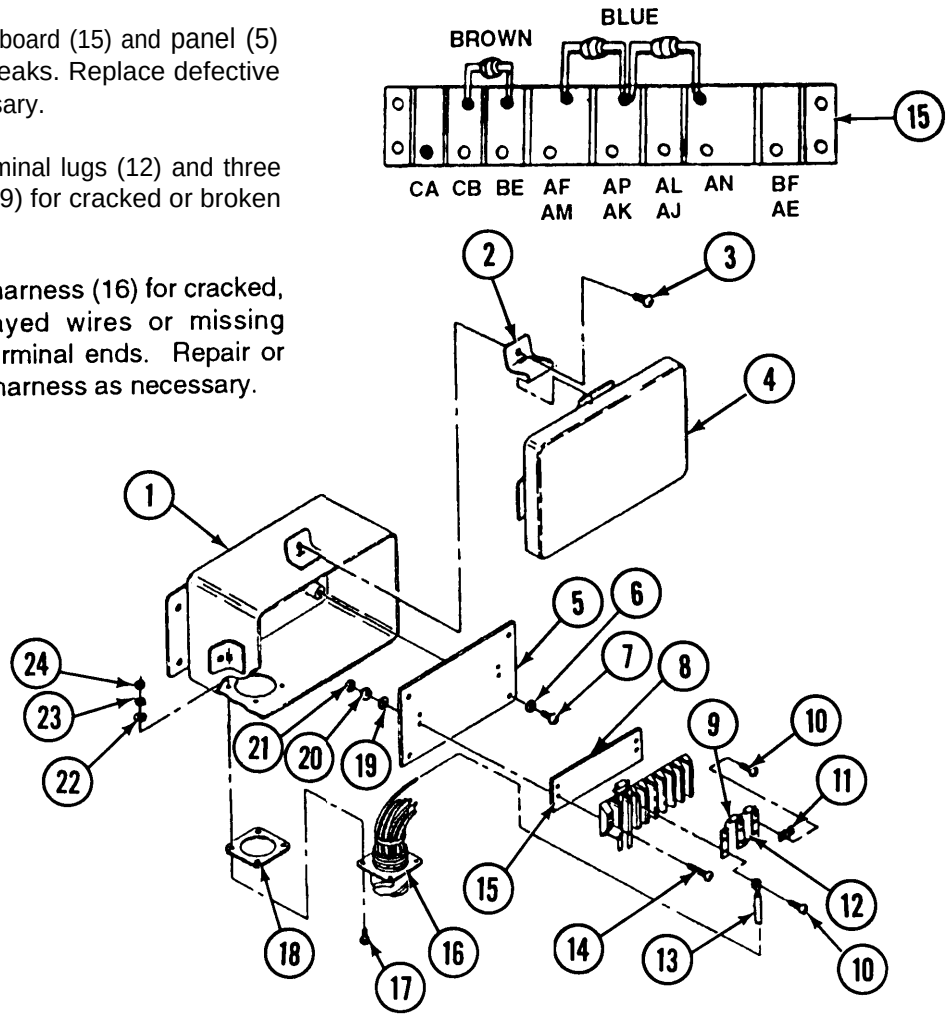
1. Inspect cover (4) and box housing (1) for cracks, bends, breaks, or missing seal. Replace cover and box housing if either is defective.

6-3. STE/ICE RESISTOR BOX REPAIR (continued).

2. Inspect terminal board (15) and panel (5) for cracks or breaks. Replace defective parts as necessary.

3. Inspect five terminal lugs (12) and three fixed resistors (9) for cracked or broken lugs.

4. Inspect wiring harness (16) for cracked, broken, or frayed wires or missing insulation or terminal ends. Repair or replace wiring harness as necessary.



c. ASSEMBLY

1. Secure terminal board (15) and marker strip (8) to panel (5) with four screws (14), washers (19), new lockwashers (20), and nuts (21).

2. Install panel (5), with terminal board (15), in box housing (1) with four screws (7) and new lockwashers (6).

3. Install five terminal lugs (12) and three fixed resistors (9) and bus connectors (11) on terminal board (15) with eight terminal screws (10).

4. Install 12 terminal leads (13) on terminal board (15) with eight terminal screws (10).

5. Install new gasket (18) and wiring harness (16) in box housing (1) with four screws (17), washers (22), new lockwashers (23), and nuts (24).

6. Install cover (4) on box housing (1) and hook four retainers (2) to secure

7. Install four screws (3) in four retainers (2).

FOLLOW-ON MAINTENANCE:
- None

6-4. CARGO COMPARTMENT WIRING HARNESS (12330252) REPLACEMENT.

This Task Covers:

a. Removal

b. Installation

initial Setup:

Tools/Test Equipment:
- General mechanic's tool kit (Item 19, Appendix D)

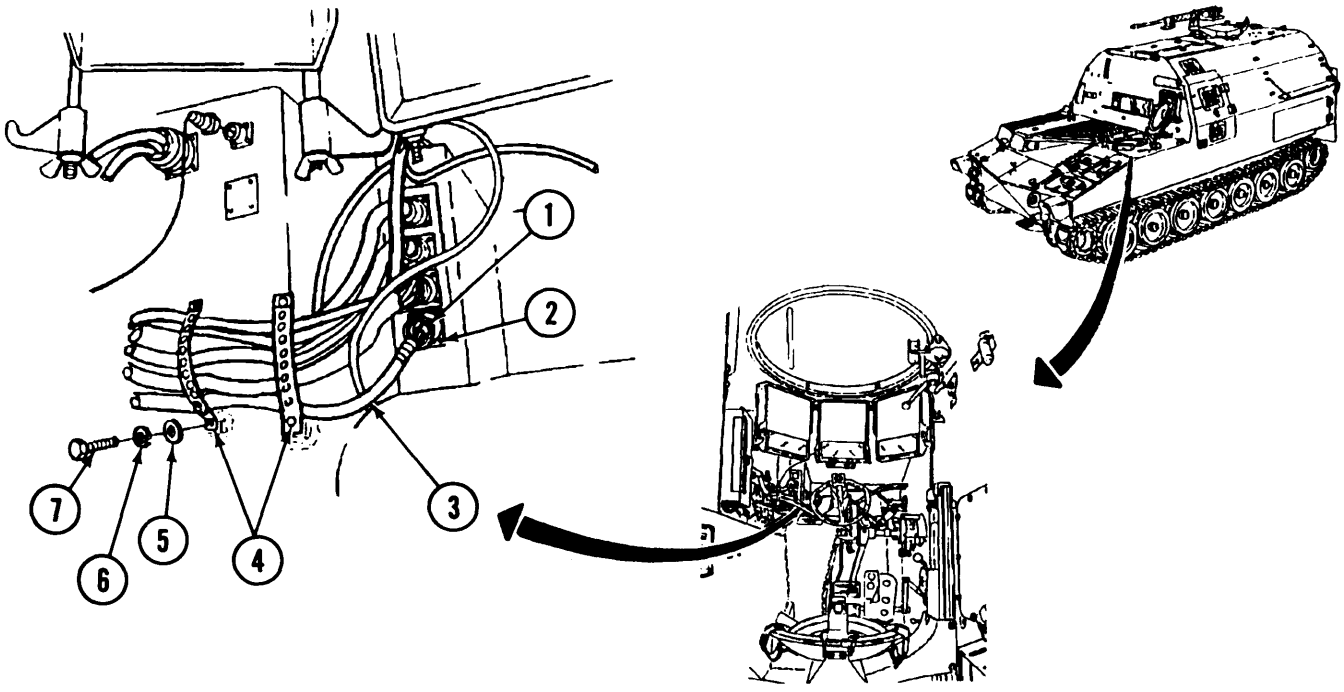
Materials/Parts:
- Lockwasher (2) (Item 46, Appendix H)
- Lockwasher (77) (item 58, Appendix H)
- Lockwasher (8) (Item 67, Appendix H)

Equipment Conditions:
- Vehicle parked on level ground (refer to TM 9-2350-287-10).
- Battery ground cables disconnected (refer to TM 9-2350-287-20-1).
- Driver's instrument panel removed (refer to TM 9-2350-287-20-1).
- Driver's station M3 air electric heater removed (refer to TM 9-2350-287-20-2).
- Engine AFES cylinder brackets removed (refer to TM 9-2350-287-20-2).
- Right side canister restraint bars removed (refer to To TM 9-2350-287-20-2).
- Right side stowage net removed (refer to TM 9-2350-287-20-2).
- Left front canister restraints removed (refer to TM 9-2350-287-20-2).
- APU control box removed (refer to TM 9-2350-287-20-1).

a. REMOVAL

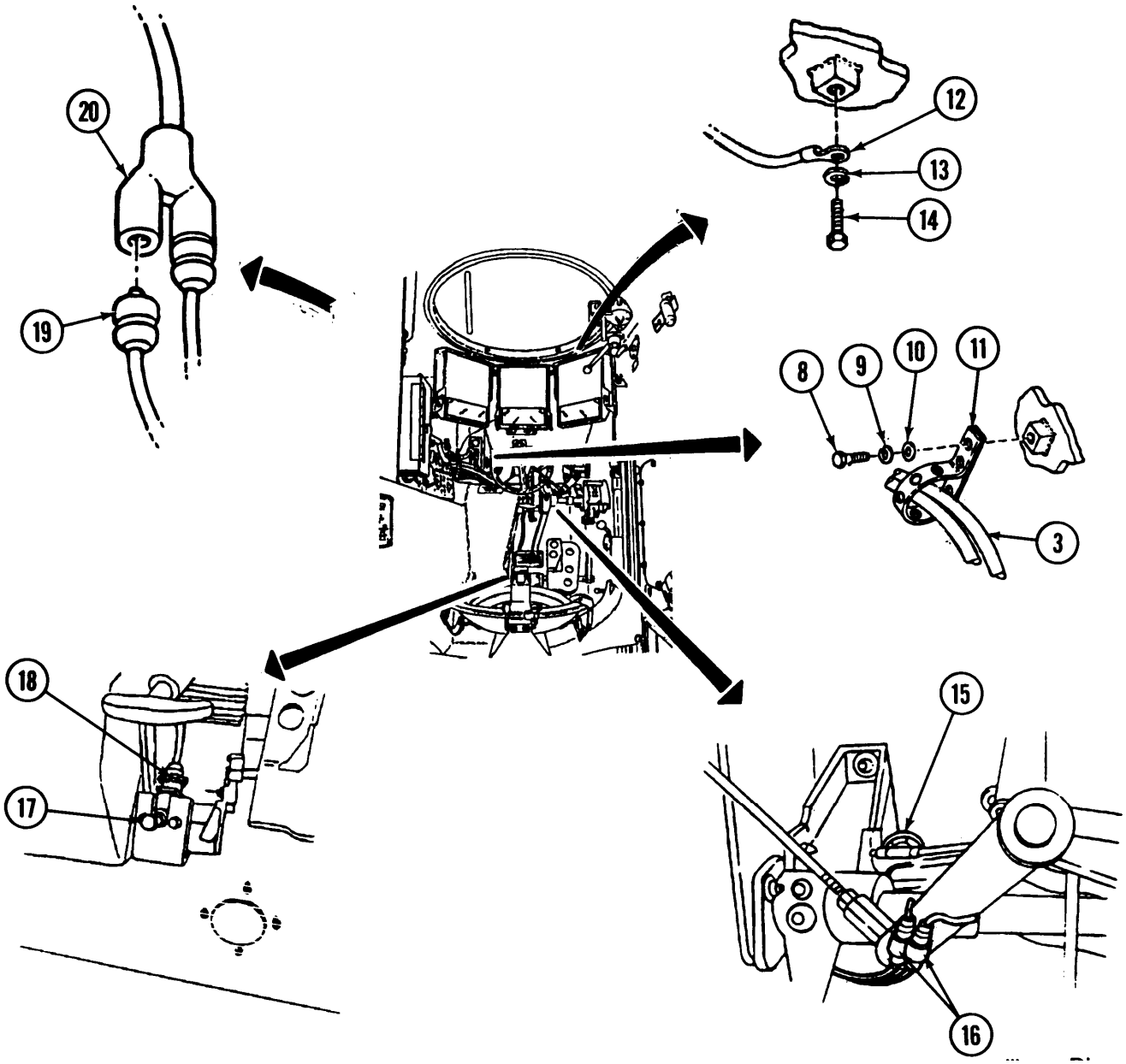
1. Remove two screws (7), lockwashers (6), and washers (5) securing bottom of two straps (4) and wiring harness 12330252 (3) to wall of driver's compartment. Discard lockwashers.

2. Disconnect wiring harness 12330252 electrical connector (1) from bottom terminal (2) on driver's compartment wall.



6-4. CARGO COMPARTMENT WIRING HARNESS (12330252) REPLACEMENT (continued).

3. Remove two screws (8), lockwashers (9), washers (10), and straps (11) securing wiring harness 12330252 (3) to ceiling and wall of driver's compartment. Discard lockwashers.



4. Remove screw (14), lockwasher (13), and ground wire (12) from driver's compartment ceiling. Discard lockwasher.

5. Disconnect electrical connector (18) from dimmer switch (17).

6. Disconnect two leads No. 75 (16) from stoplight switch (15).

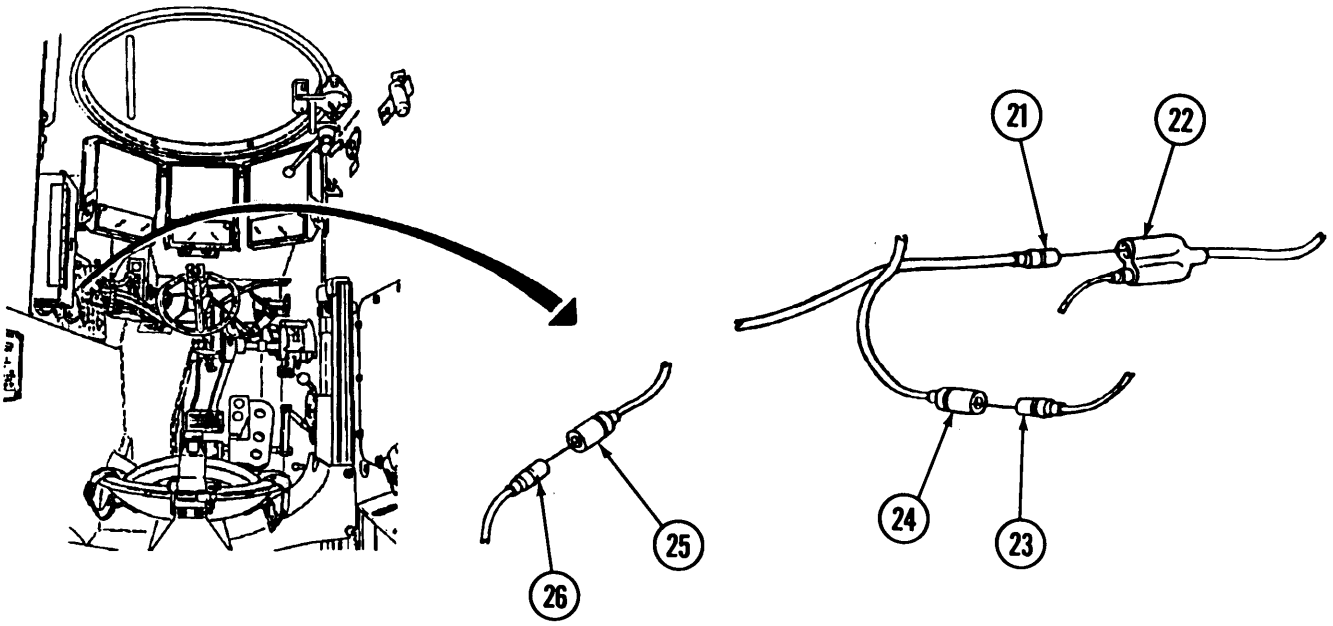
7. Disconnect lead No. 36 (19) from driver's compartment dome light Y-connector (20).

6-4. CARGO COMPARTMENT WIRING HARNESS (12330252) REPLACEMENT (continued).

8. Disconnect lead No. 459 (24) from wiring harness 12260287 lead No. 459 (23).

9. Disconnect lead No. 15 (26) from wiring harness 12376405 lead No. 10L (25).

10. Disconnect lead No. 40 (21) from Y-connector (22).



11. Refer to Table 1 to disconnect electrical connectors from circuit breakers.

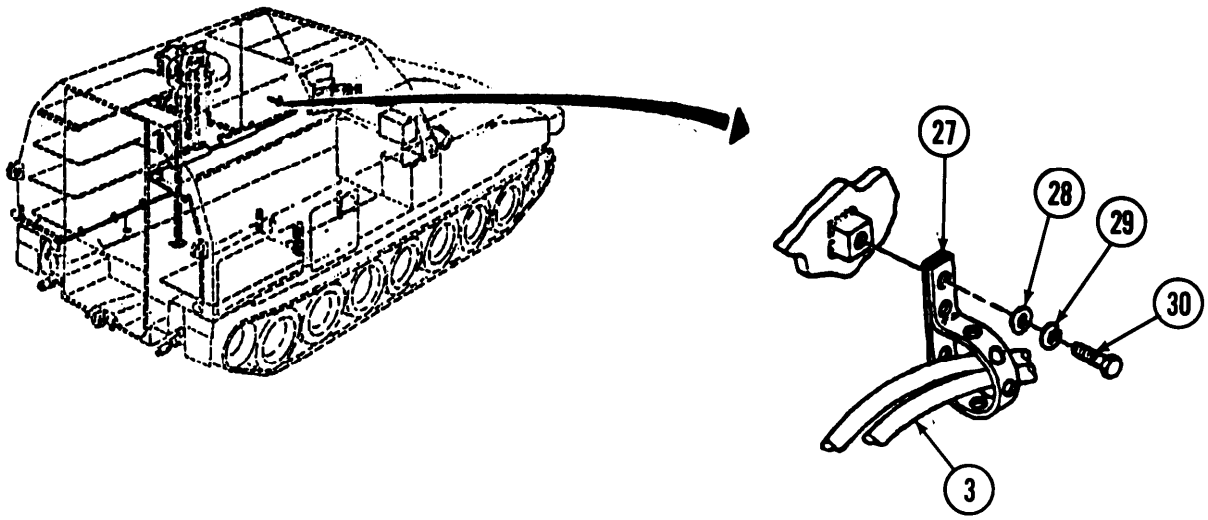
Table 1. Circuit Breaker Panel Disconnections

Circuit Number	Circuit Breaker Panel	Circuit Breaker Number
10	2	4
27,38,40	2	5
419	1	8
76	1	5
37, 38	1	1

12. Pull wiring harness 12330252 (3) through bulkhead opening.

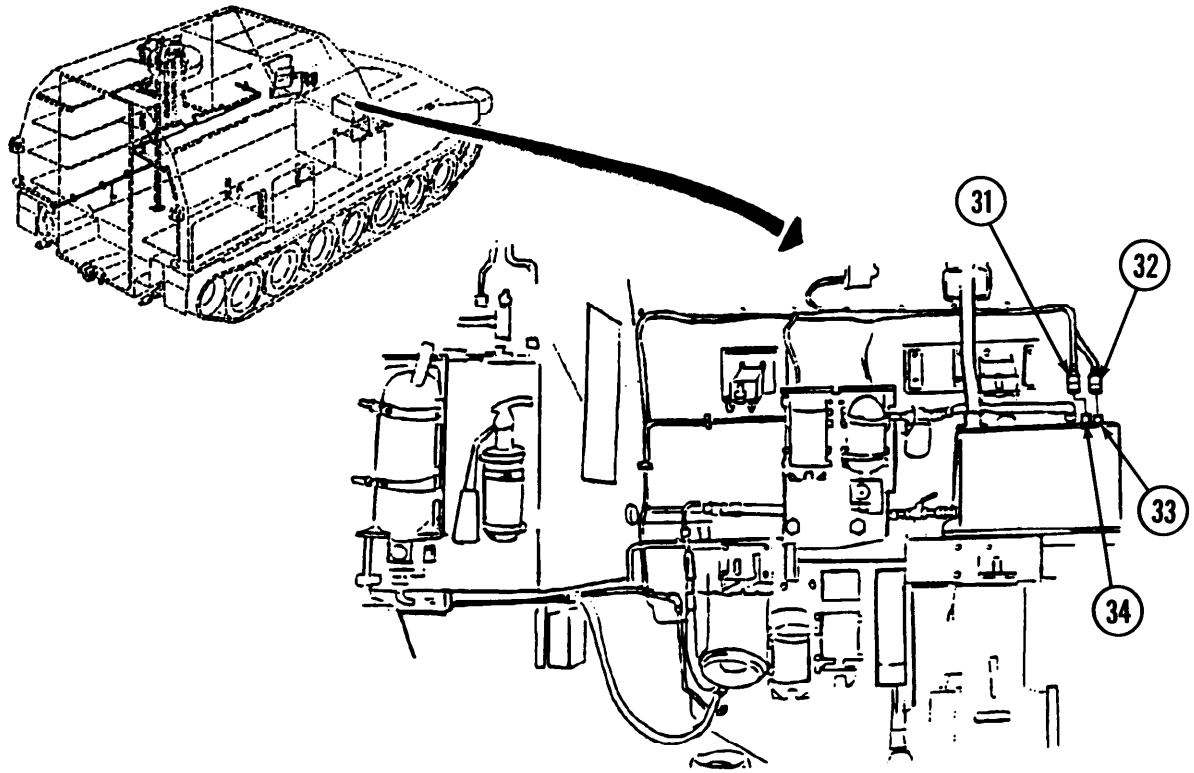
6-4. CARGO COMPARTMENT WIRING HARNESS (12330252) REPLACEMENT (continued).

13. Remove 15 screws (30), lockwashers (29), washers (28), and straps (27) securing wiring harness 12330252 (3) to bulkhead and crew compartment wall. Discard lockwashers.



14. Disconnect lead No. 864 (31) from hydraulic fluid temperature transmitter (34).

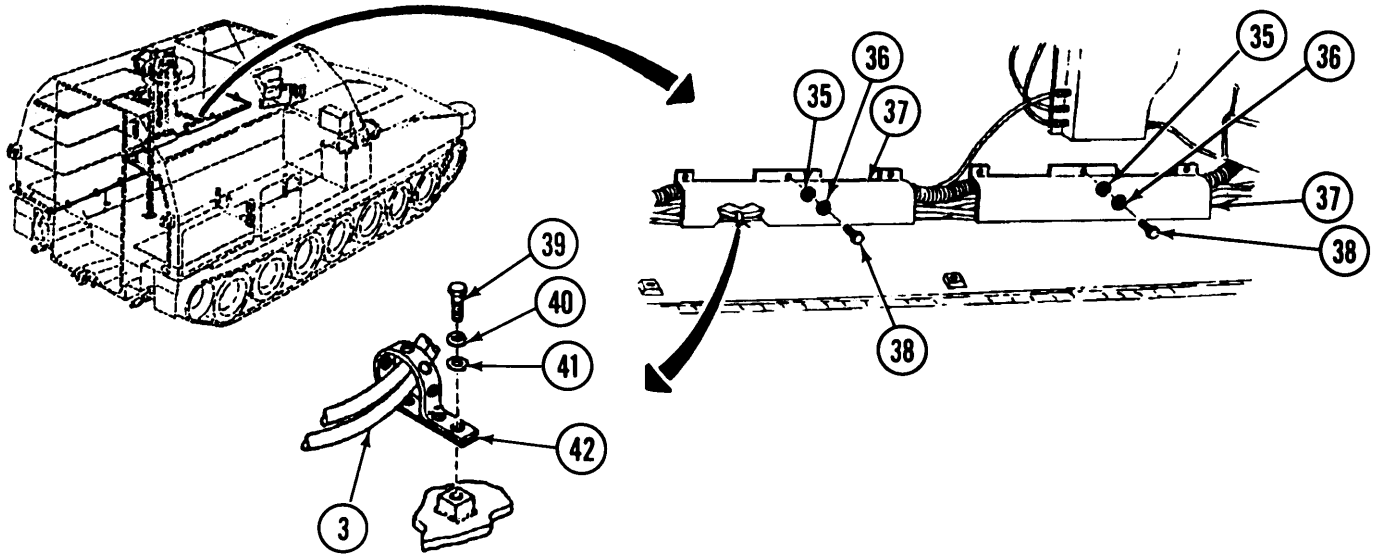
15. Disconnect lead CD (32) from hydraulic fluid level sending unit (33).



6-4. CARGO COMPARTMENT WIRING HARNESS (12330252) REPLACEMENT (continued).

16. Remove seven screws (38), lockwashers (36), and washers (35) and two wiring harness guards (37) from sponson. Discard lockwashers.

17. Remove five screws (39), lockwashers (40), washers (41), and straps (42) securing wiring harness 12330252 (3) to sponson. Discard lockwashers.

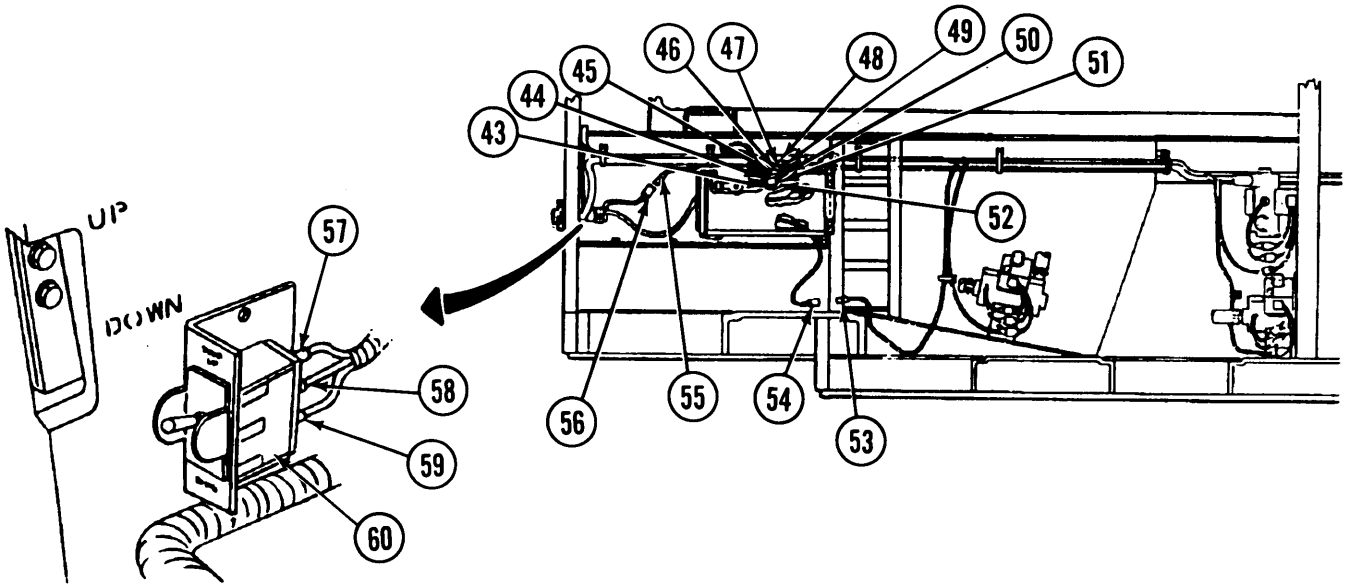


18. Disconnect wiring harness 12330252 lead GND (53) from wiring harness 12376544 lead GND (54).

19. Disconnect wiring harness 12330252 lead 419 (55) from wiring harness 12330248 lead 419 (56).

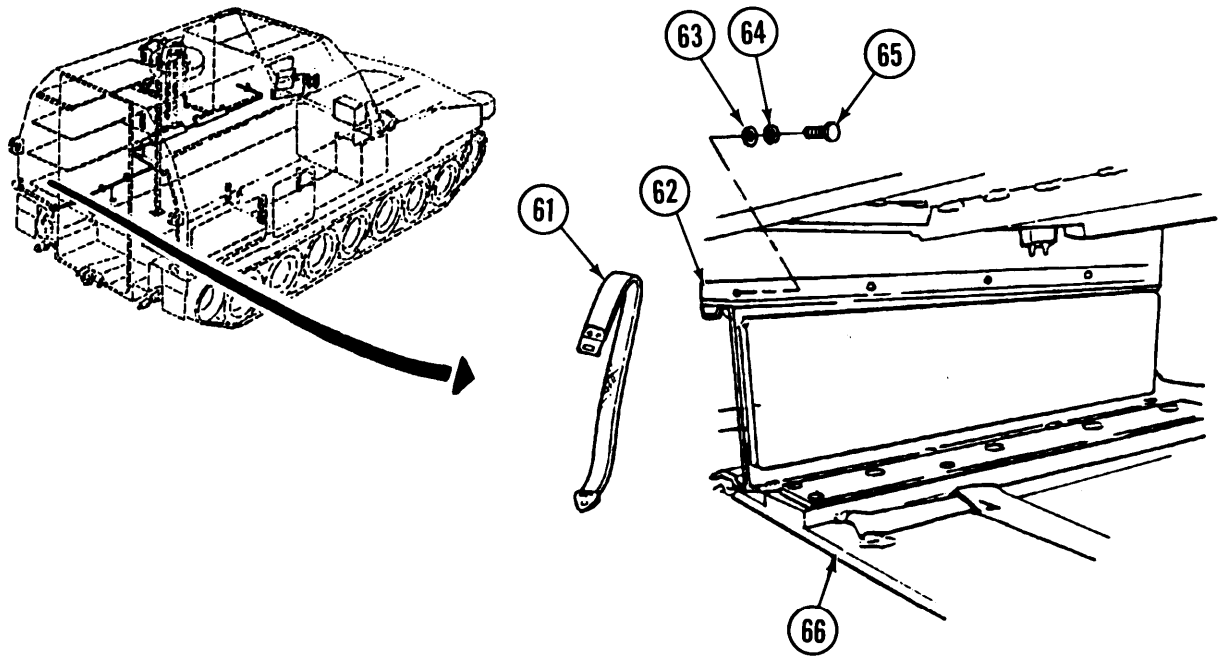
20. Disconnect leads AAF, 10, and AAG (57, 58, and 59) from lower rear door switch (60).

21. Disconnect leads Nos. 37A, 23,22,21, and 24 (48, 49,50,51, and 52) from wiring harness 12330246 leads Nos. 37A, 23,22,21, and 24 (43, 44,45,46, and 47).



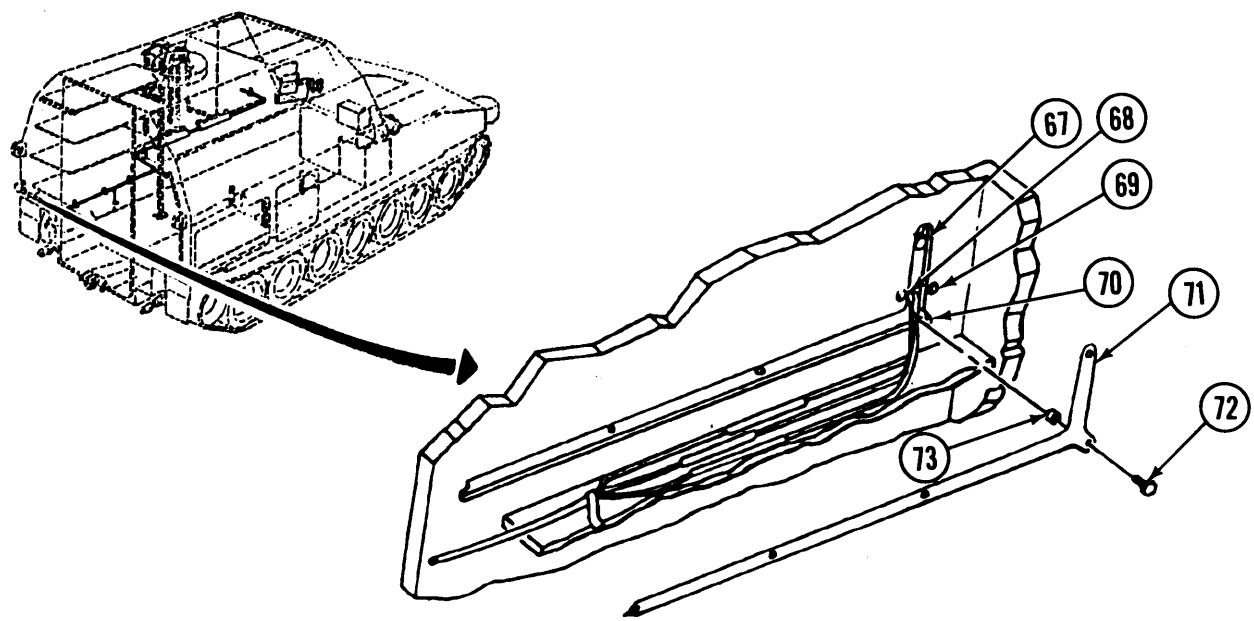
6-4. CARGO COMPARTMENT WIRING HARNESS (12330252) REPLACEMENT (continued).

22. Remove eight screws (65), lockwashers (64), and washers (63), strap (61), and angle bracket (62) from left rear canister shelf (66) and rear compartment wall.



23. Remove six screws (72) and spacers (73) and access cover (71) from rear crew compartment wall.

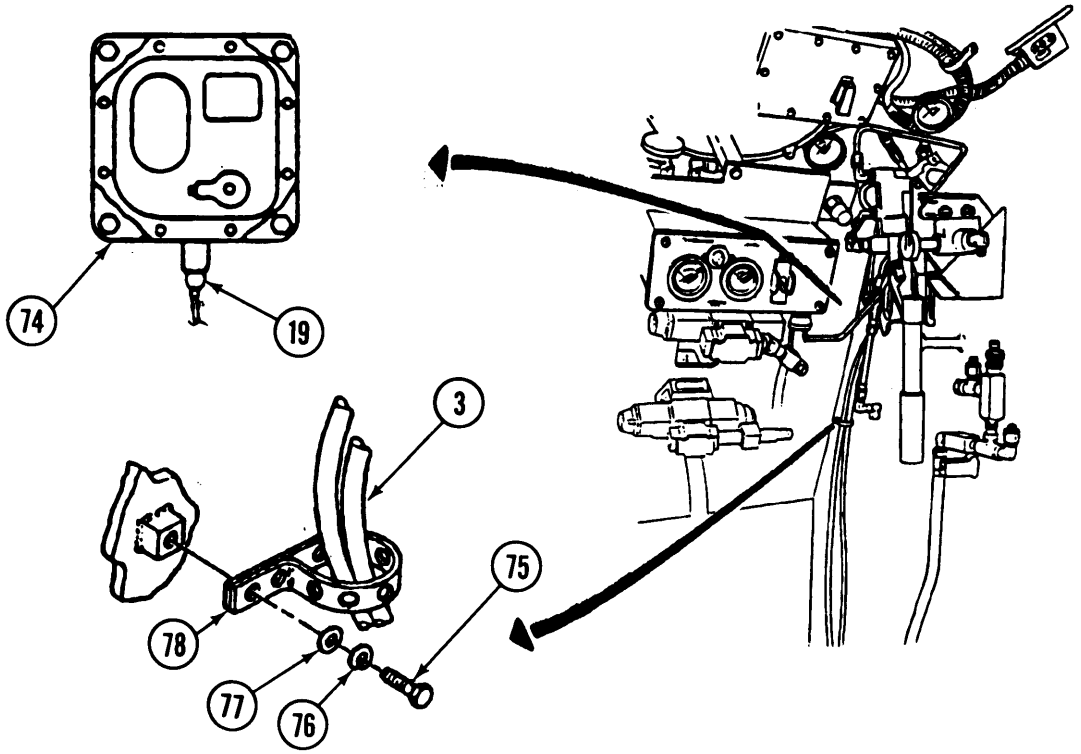
24. Disconnect three leads Nos. 22,24, and 21 (68, 69, and 70) from left taillight assembly (67).



6-4. CARGO COMPARTMENT WIRING HARNESS (12330252) REPLACEMENT(continued).

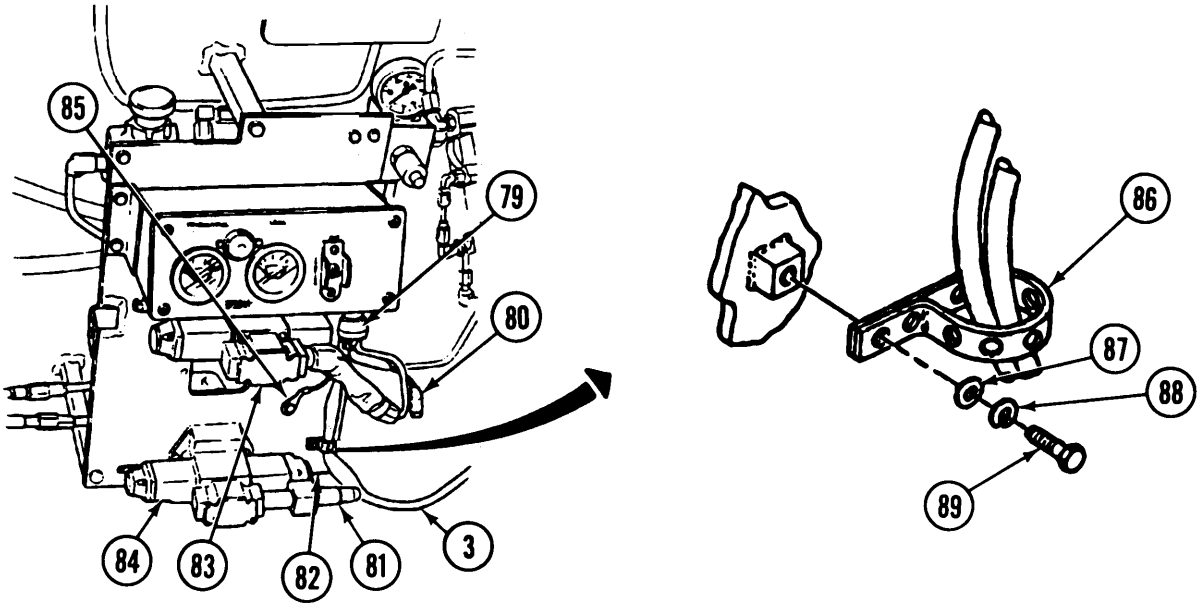
25. Remove eight screws (75), lockwashers (76), washers (77), and straps (78) securing wiring harness 12330252 (3) to APU compartment. Discard lockwashers.

26. Disconnect lead No. 38(19) from APU compartment wall dome light (74).



27. Disconnect three connectors (79, 80, and 81) from hydraulic gage panel (82), upper rear door solenoid (83), and conveyor solenoid (84).

Remove three screws (89), lockwashers (88), and washers (87), ground lead (85), and two straps (86) from hydraulic gage panel (82). Discard lockwashers.



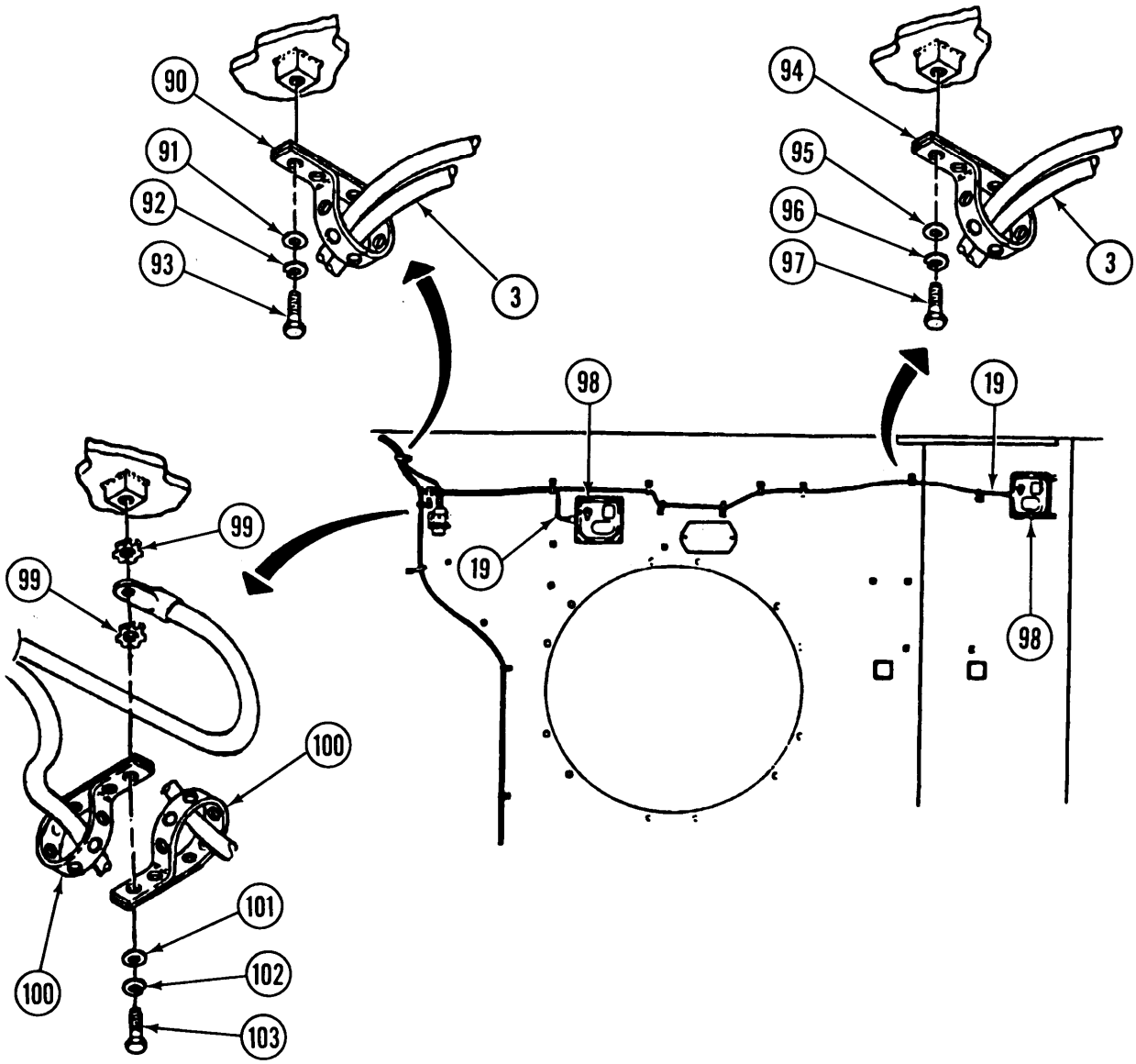
6-4. CARGO COMPARTMENT WIRING HARNESS (12330252) REPLACEMENT (continued).

29. Remove six screws (93), Iockwashers (92), washers (91), and straps (90) securing wiring harness 12330252 (3) to APU compartment wall and crew compartment ceiling.

30. Remove screw (103), Iockwasher (102), washer (101), and two straps (1 00) and Iockwashers (99) from crew compartment ceiling. Discard Iockwashers.

31. Disconnect two leads No. 38(19) from two forward crew compartment dome lights (98).

32. Remove six screws (97), bckwashers (96), washers (95), and straps (94) securing wiring harness 12330252 (3) to crew compartment ceiling. Discard Iockwashers.



6-4. CARGO COMPARTMENT WIRING HARNESS (12330252) REPLACEMENT (continued).

33. Disconnect lead No. 38(19) from left rear crew compartment dome light (104).

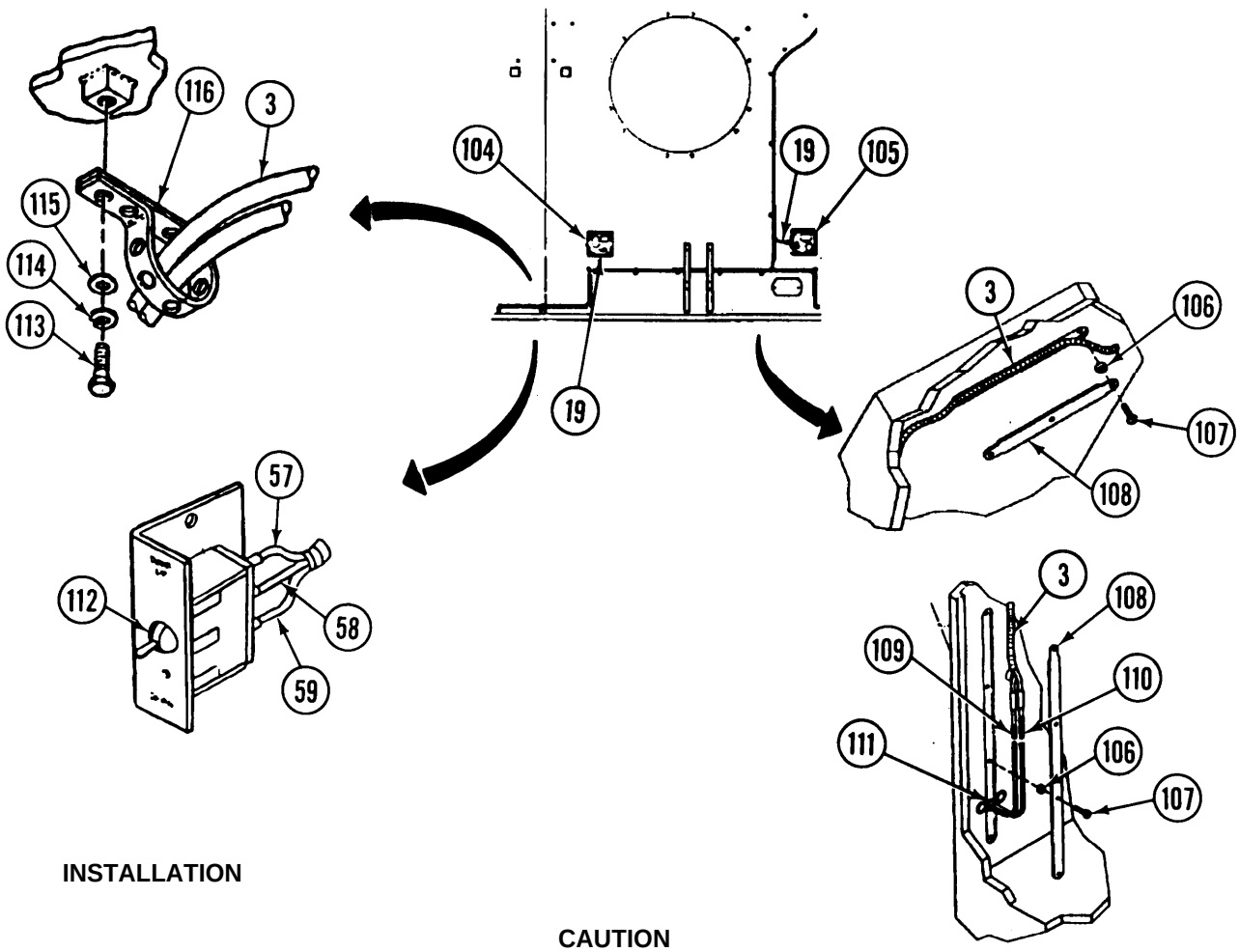
34. Disconnect leads AAF, 10, and AAG (57, 58, and 59) from upper rear door switch (112).

35. Disconnect lead No. 38(19) from right rear crew compartment dome light (105).

36. Remove seven screws (107) and spacers (106) and two access covers (108) from right rear crew compartment wall.

37, Disconnect leads Nos. 23 and 24 (109 and 110) from right taillight assembly (111).

38. Remove 15 screws (113), lockwashers (114), washers (115), and straps (116) securing wiring harness 12330252 (3) to crew compartment ceiling. Discard lockwashers.



b. INSTALLATION

CAUTION

Route wiring harness between top plate and door stop guide. Failure to do this can result in damage to wiring harness.

1. Mall wiring harness 12330252 (3) on crew compartment ceiling with 15 straps (116), washers (115), new lockwashers (114), and screws (113).

6-4. CARGO COMPARTMENT WIRING HARNESS (12330252) REPLACEMENT (continued).

2. Connect leads Nos. 23 and 24 (109 and 110) to right taillight assemby (111).

3. Install two access covers (108) over wiring harness 12330252 (3) with seven spacers (106) and screws (107).

4. Connect lead No. 38(19) to right rear crew compartment dome light (105).

5. Connect leads AAF, 10, and AAG (57, 58, and 59) to upper rear door switch (112).

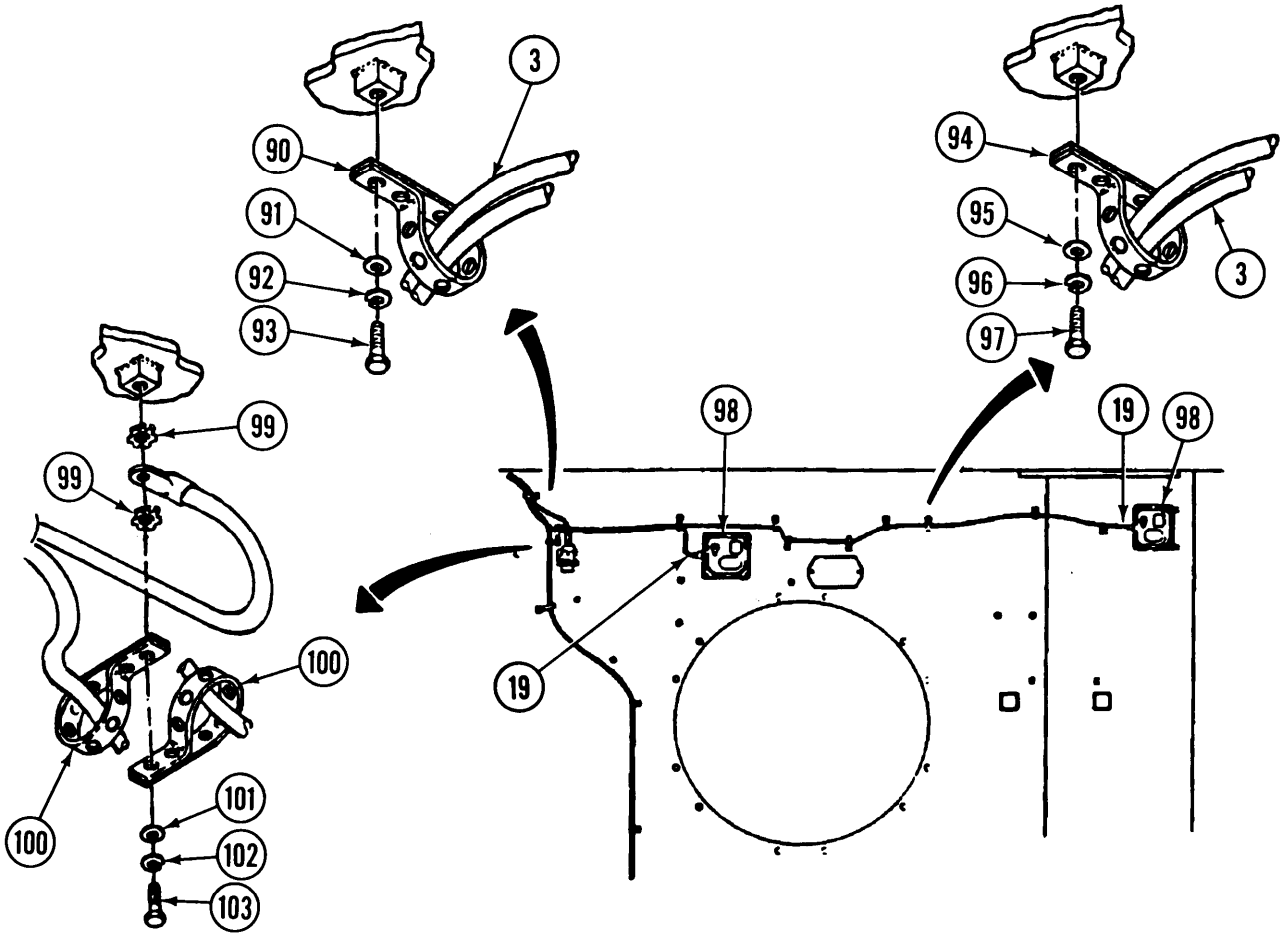
6. Connect lead No. 38(19) to left rear crew compartment dome light (104).

7. Secure wiring harness 12330252 (3) to crew compartment ceiling with six straps (94), washers (95), new lockwashers (96), and screws (97).

8. Connect two leads No. 38(1 9) to two forward crew compartment dome lights (98).

9. Install two straps (100) and new lockwashers (99) to crew compartment ceiling with washer (101), new lockwasher (102), and screw (103).

10. Secure wiring harness 12330252 (3) to crew compartment ceiling and APU compartment wall with six straps (90), washers (91), new lockwashers (92), and screws (93).



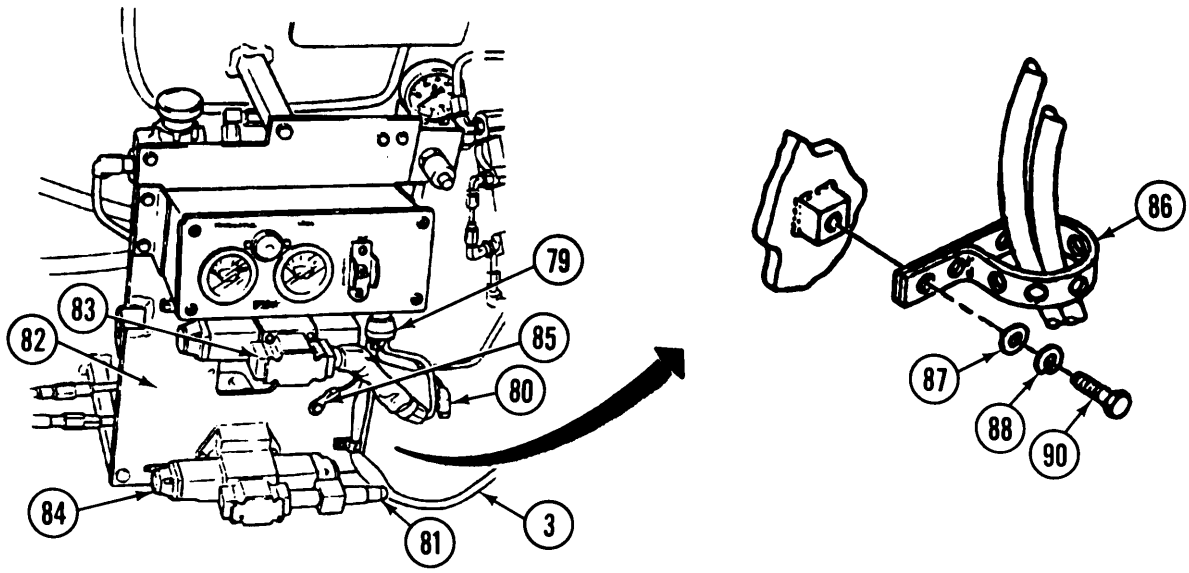
6-4. CARGO COMPARTMENT WIRING HARNESS (12330252) REPLACEMENT (continued).

11. Install two straps (86) and ground lead (85) on hydraulic gage panel (82) with three washers (87), new lockwashers (88), and screws (90).

12. Connect connector (79) to hydraulic gage panel (82).

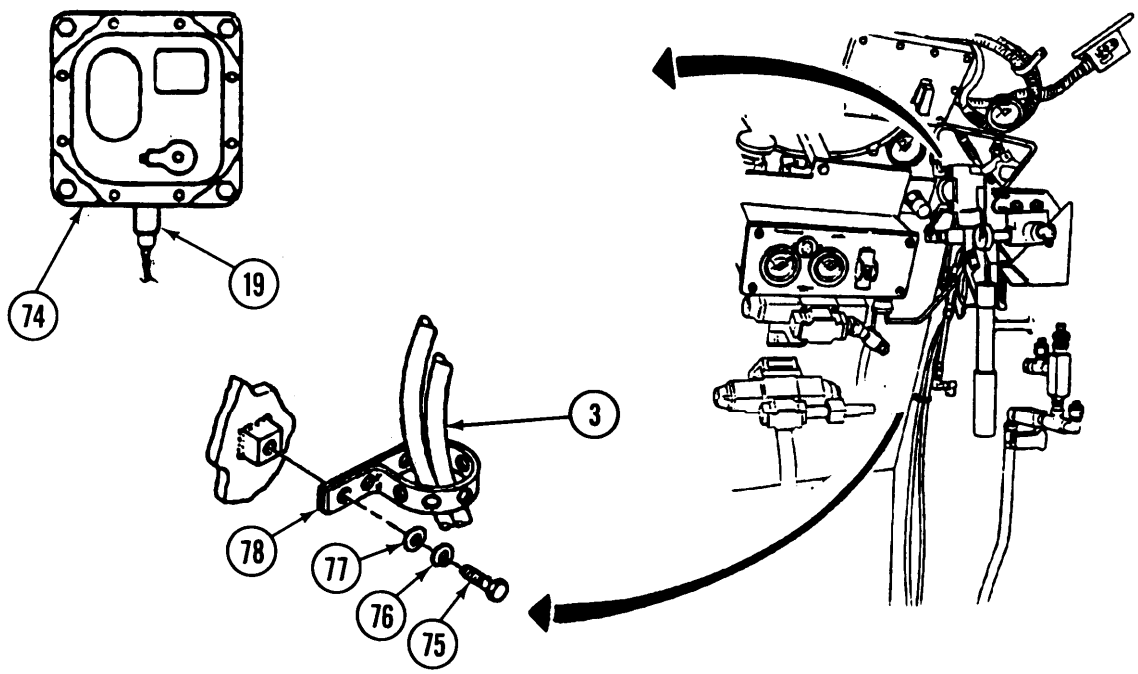
13. Connect connector (80) to upper rear door solenoid (83).

14. Connect connector (81) to conveyor solenoid (84).



15. Connect lead No. 38(19) to APU compartment wall dome light (74).

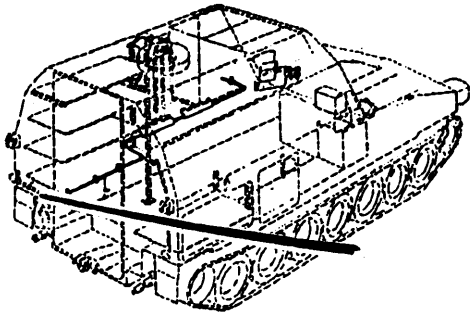
16. Secure wiring harness 12330252 (3) to APU compartment with five straps (78), washers (77), new lockwashers (76), and screws (75).

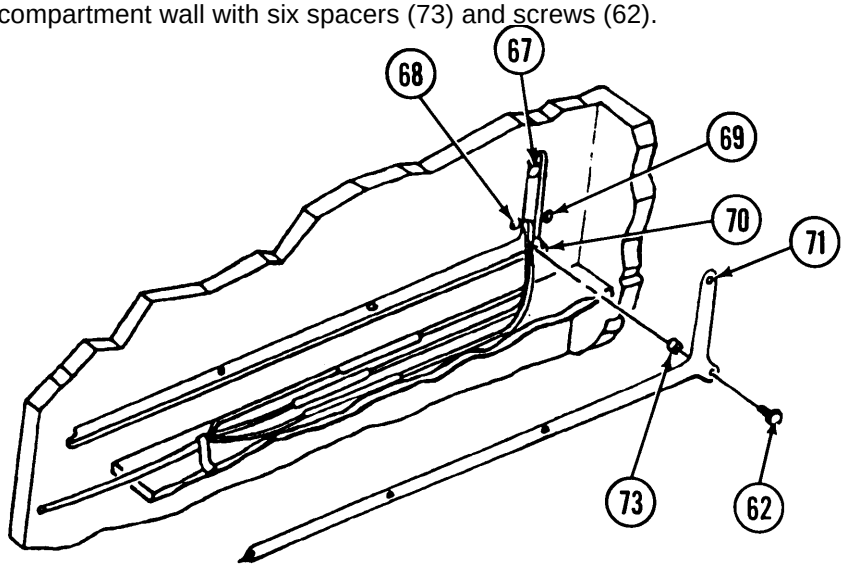


6-4. CARGO COMPARTMENT WIRING HARNESS (12330252) REPLACEMENT (continued).

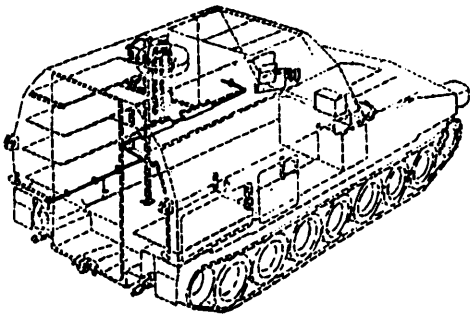
17. Connect leads 22,24, and 21 (68, 69, and 70) to left taillight assemby (67).

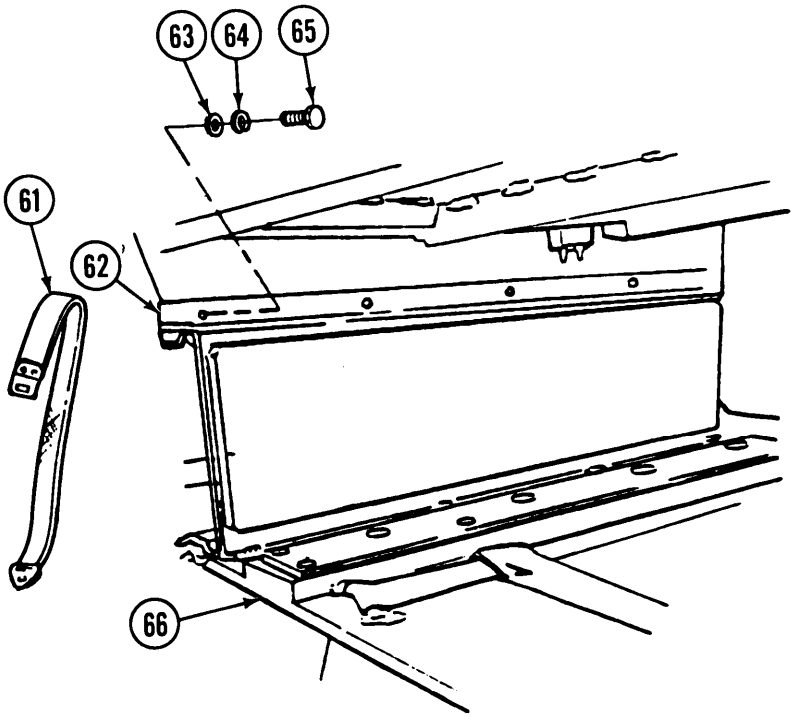
18. Install access cover (71) on crew compartment wall with six spacers (73) and screws (62).





19. Install angle bracket (62) and strap (61) on left rear canister shelf (66) with eight washers (63), new lockwashers (64), and screws (65).





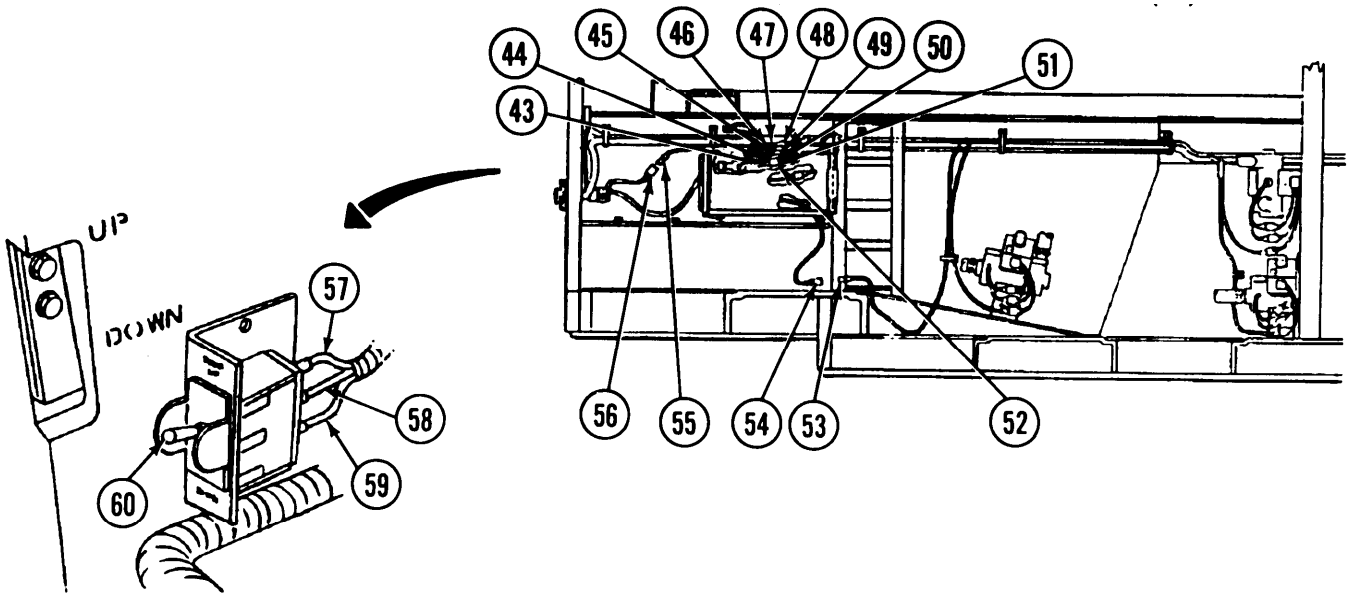
6-4. CARGO COMPARTMENT WIRING HARNESS (12330252) REPLACEMENT (continued).

20. Connect leads Nos. 37A, 23,22,21, and 24 (48, 49,50,51, and 52) to wiring harness 12330246 37A, 23, 22,21, and 24 (43, 44,45,46, and 47).

21. Connect leads AAF, 10, and AAG (57, 58, and 59) to lower rear door switch (60).

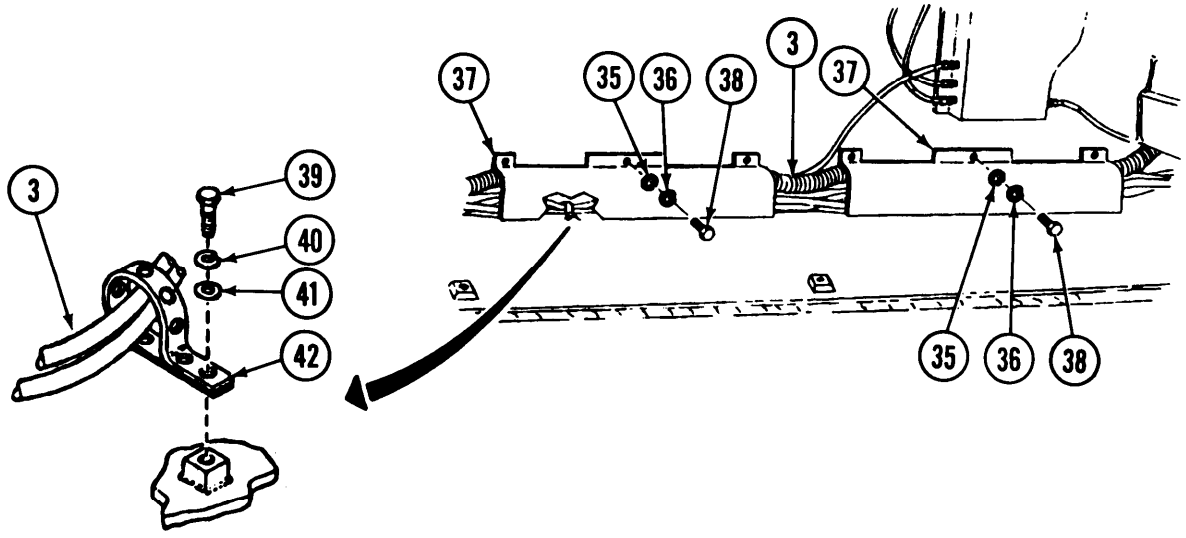
22. Connect wiring harness 12330252 lead No. 419 (55) to wiring harness 12330248 lead No.419 (56).

23. Connect wiring harness 12330252 lead GND (53) to wiring harness 12376544 lead GND (54).



24. Secure wiring harness 12330252 (3) to sponson with five straps (42), washers (41), new lockwashers (40), and screws (39).

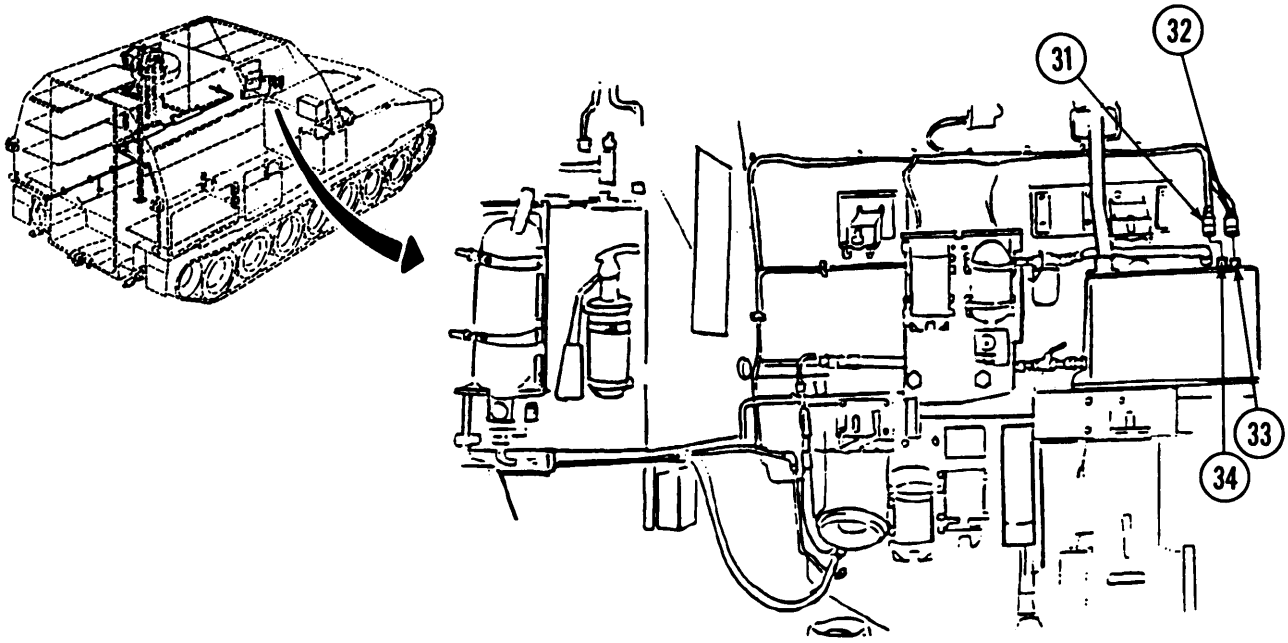
25. Position wiring harness 12330252 (3) against sponson, and install two wiring harness guards (37) with seven washers (35), new lockwashers (36), and screws (38).



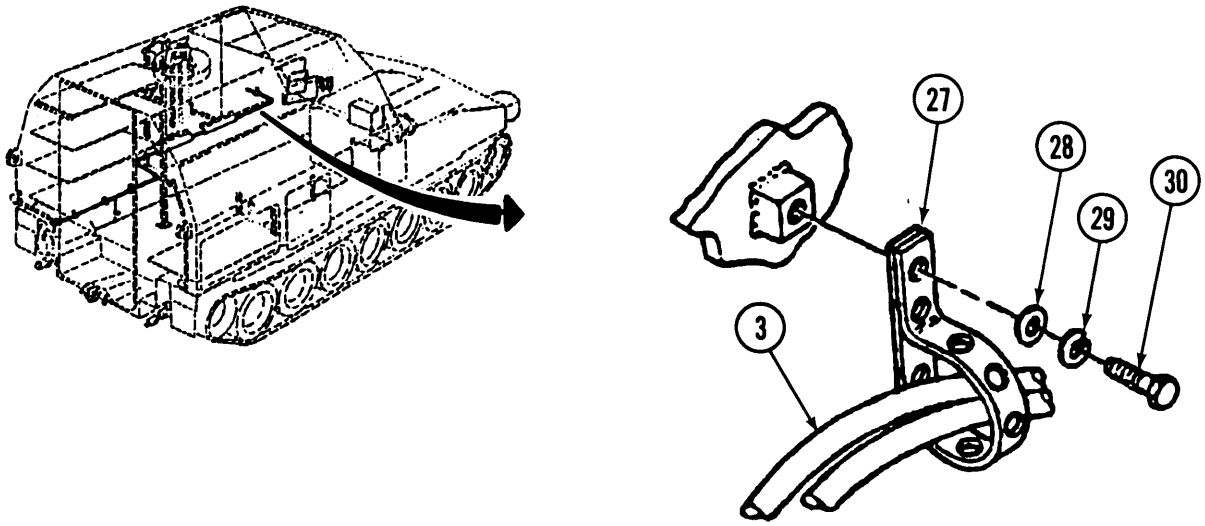
6-4. CARGO COMPARTMENT WIRING HARNESS (12330252) REPLACEMENT (continued).

26. Connect lead CD (32) to hydraulic fluid level sending unit (33).

27. Connect lead No. 664 (31) to hydraulic fluid temperature transmitter (34).



28. Secure wiring harness 12330252 (3) to crew compartment wall and bulkhead with 15 straps (27), washers (28), new lockwashers (29), and screws (30).



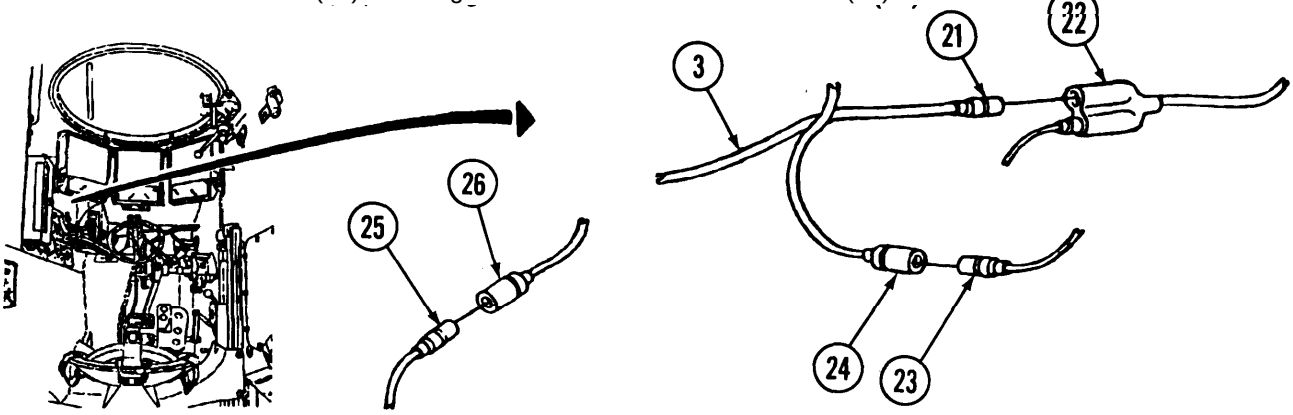
6-4. CARGO COMPARTMENT WIRING HARNESS (12330252) REPLACEMENT (continued).

29. Route wiring harness 12330252 (3) through bulkhead opening.

30. Connect lead No. 40 (21) to Y-connector (22).

31. Connect lead No. 15 (26) to wiring harness 12376405 lead No. 10L (25).

32. Connect lead No. 459 (24) to wiring harness 12260287 lead No. 459 (23).

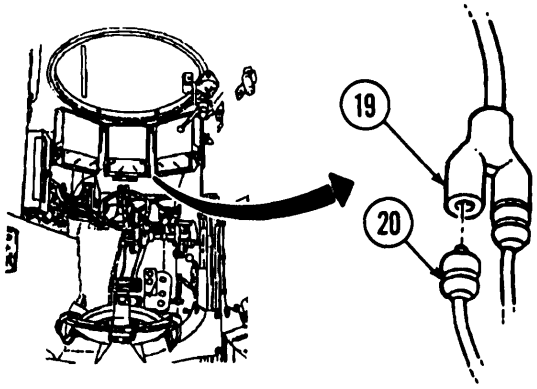


33. Refer to Table 2 to connect electrical connectors to circuit breakers.

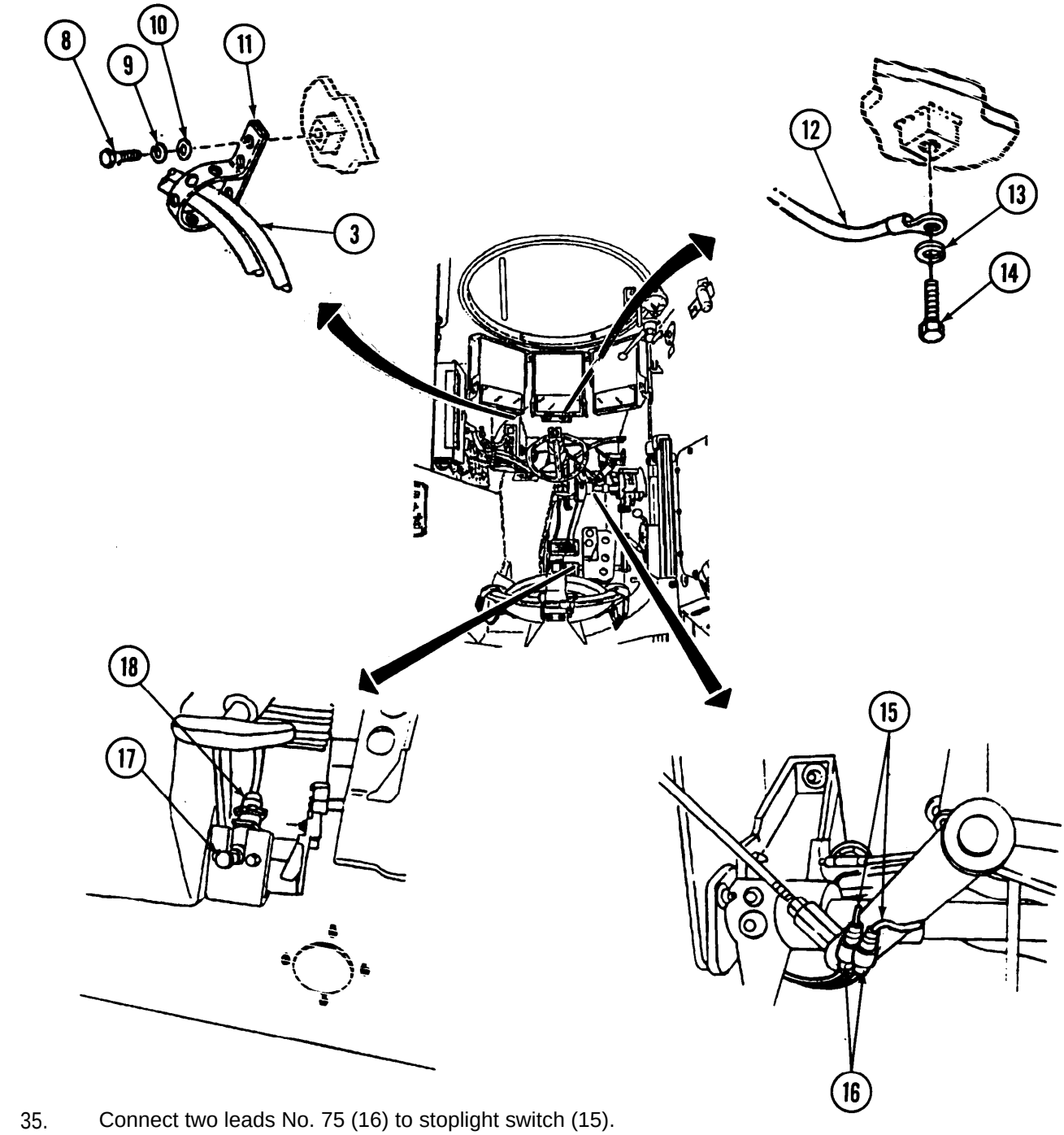
Table 2. Circuit Breaker Panel Disconnections

Circuit Number	Circuit Breaker Panel	Circuit Breaker Number
10	2	4
27,38,40	2	5
419	1	8
76	1	5
37,38	1	1

34. Connect lead No. 38 (19) to driver's compartment dome light Y-connector (20).



6-4. CARGO COMPARTMENT WIRING HARNESS (12330252) REPLACEMENT (continued).



35. Connect two leads No. 75 (16) to stoplight switch (15).

36. Connect electrical connector (18) to dimmer switch (17).

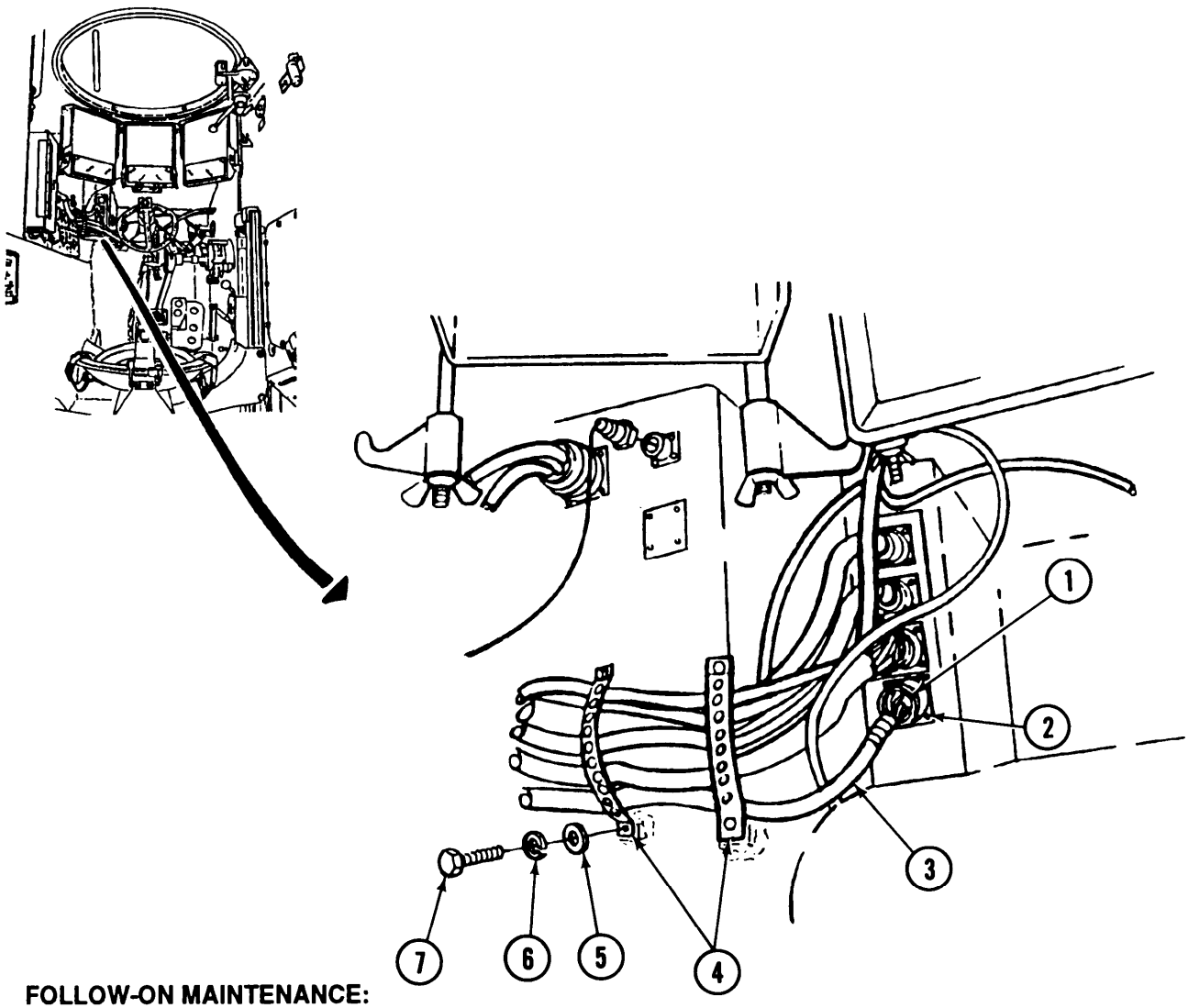
37. Install ground wire (12) on driver's compartment ceiling with new lockwasher (13) and screw (14).

38. Secure wiring harness 12330252 (3) to ceiling and wall of driver's Compartment with two straps (11), washers (10), new lockwashers (9), and screws (8).

6-4. CARGO COMPARTMENT WIRING HARNESS (12330252) REPLACEMENT (continued).

39. Connect wiring harness 12330252 electrical connector (1)to bottom terminal (2) on driver's compartment wall.

40. Secure wiring harness 12330252 (3) behind two straps (4) with two washers (5), new lockwashers (6), and screws (7).



FOLLOW-ON MAINTENANCE:

- Install APU control box (refer to TM 9-2350-287-20-1).
- Install left front canister shelves and restraints (refer to TM 9-2350-287-20-2).
- Install right side stowage net (refer to TM 9-2350-287-20-2).
- Install right side canister restraint bars (refer to TM 9-2350-287-20-2).
- Install engine AFES cylinder brackets (refer to TM 9-2350-287-20-2).
- Install driver's station NBC air heater (refer to TM 9-2350-287-20-2).
- Install driver's instrument panel (refer to TM 9-2350-287-20-1).
- Connect battery ground cables (refer to TM 9-2350-287-20-1).
- Install left front canister restraints (refer to TM 9-2350-287-10).

CHAPTER 7
TRANSFER, FINAL DRIVE, PLANETARY, AND DROP GEARBOX MAINTENANCE

Paragraph Number	Paragraph Title	Page Number
7-1	General	7-1
7-2	Final Drive Assembly Repair	7-1

7-1. GENERAL.

This chapter provides general instructions and guidance for performing required maintenance functions for the final drive. The procedures in paragraph 7-2 are Direct Support maintenance functions.

7-2. FINAL DRIVE ASSEMBLY REPAIR.

This Task Covers:

a. Disassemby
b. Inspection
c. Assembly

Initial Setup:

Tools/Test Equipment:
- Arbor press (Item 4, Appendix D)
- Final drive workstand (Appendix E) (fabricated)
- General mechanic's tool kit (Item 19, Appendix D)
- Torque wrench, 0 to 175 ft-lb (Item 44, Appendix D)
- Torque wrench, 0 to 600 ft-lb (Item 45, Appendix D)

Materials/Parts:
- Drycleaning solvent (Item 9, Appendix B)
- Sealing compound (Item 22, Appendix B)
- Cotter pin (Item 12, Appendix H)
- Gasket (Item 21, Appendix H)
- Gasket (Item 22, Appendix H)
- Gasket (Item 23, Appendix H)
- Gasket (Item 35, Appendix H)
- Lockwasher (24) (Item 59, Appendix H)
- Lockwasher (7) (Item 61, Appendix H)
- Seal (Item 104, Appendix H)
- Seal (Item 117, Appendix H)

Personnel Required: Two

References:
- TM 9-214

Equipment Conditions:
- Final drive placed on clean work surface.

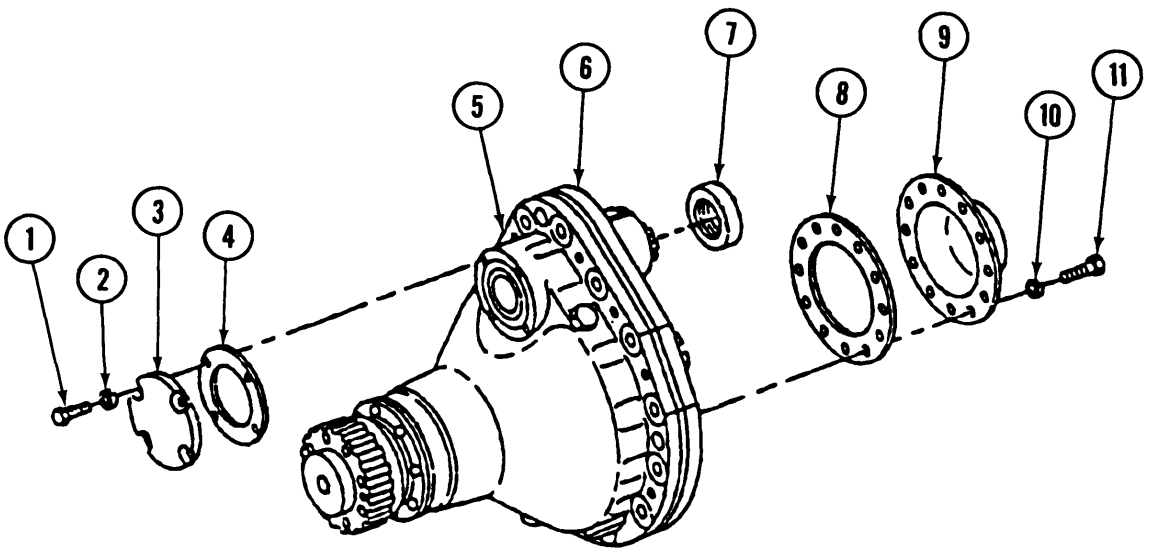
7-2. FINAL DRIVE ASSEMBLY REPAIR (continued).

a. DISASSEMBLY

1. Remove four screws (1) and lockwashers (2), access cover (3), and gasket (4) from final drive assembly housing (5). Discard gasket and lockwashers.

2. Remove seal (7) from housing cover (6). Discard seal.

3. Remove 12 screws (11) and lockwashers (10), access cover (9), and gasket (8) from housing cover (6). Discard lockwashers and gasket.



4. Remove seven screws (16) and lockwashers (17), housing cover (6), and gasket (14) from housing (5). Discard lockwashers and gasket.

5. Remove two plugs (15) from housing cover (6).

6. Remove input splined gearshaft (13) from housing (5).

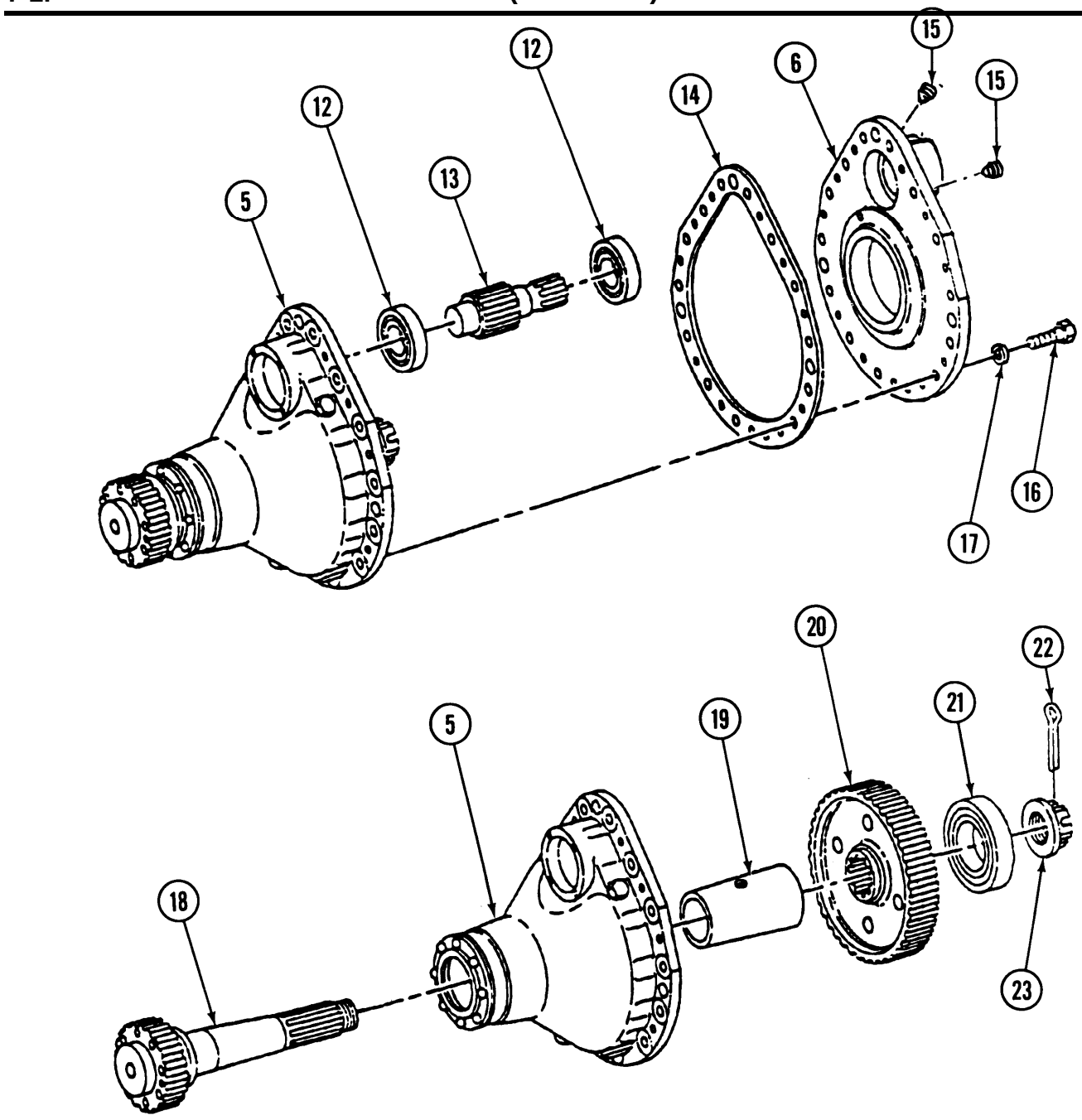
7. Using arbor press, remove two bearings (12) from input splined gearshaft (13).

8. Remove cotter pin (22) and nut (23) from output shaft (18). Discard cotter pin.

9. Remove ring gear (20), spacer (19), and output shaft (18) from housing (5).

10. Remove bearing (21) from ring gear (20).

7-2. FINAL DRIVE ASSEMBLY REPAIR (continued).



7-2. FINAL DRIVE ASSEMBLY REPAIR (continued).

11. Remove eight screws (24) and lockwashers (25), shaft seal (32), cap (26), gasket (27), and bearing (31) from housing (5). Discard lockwashers and gasket.

12. Remove bearing (31), cap (26), and shaft seal (32) from output shaft (18). Discard seal.

13. Remove two plugs (30) and screws (29) from housing (5).

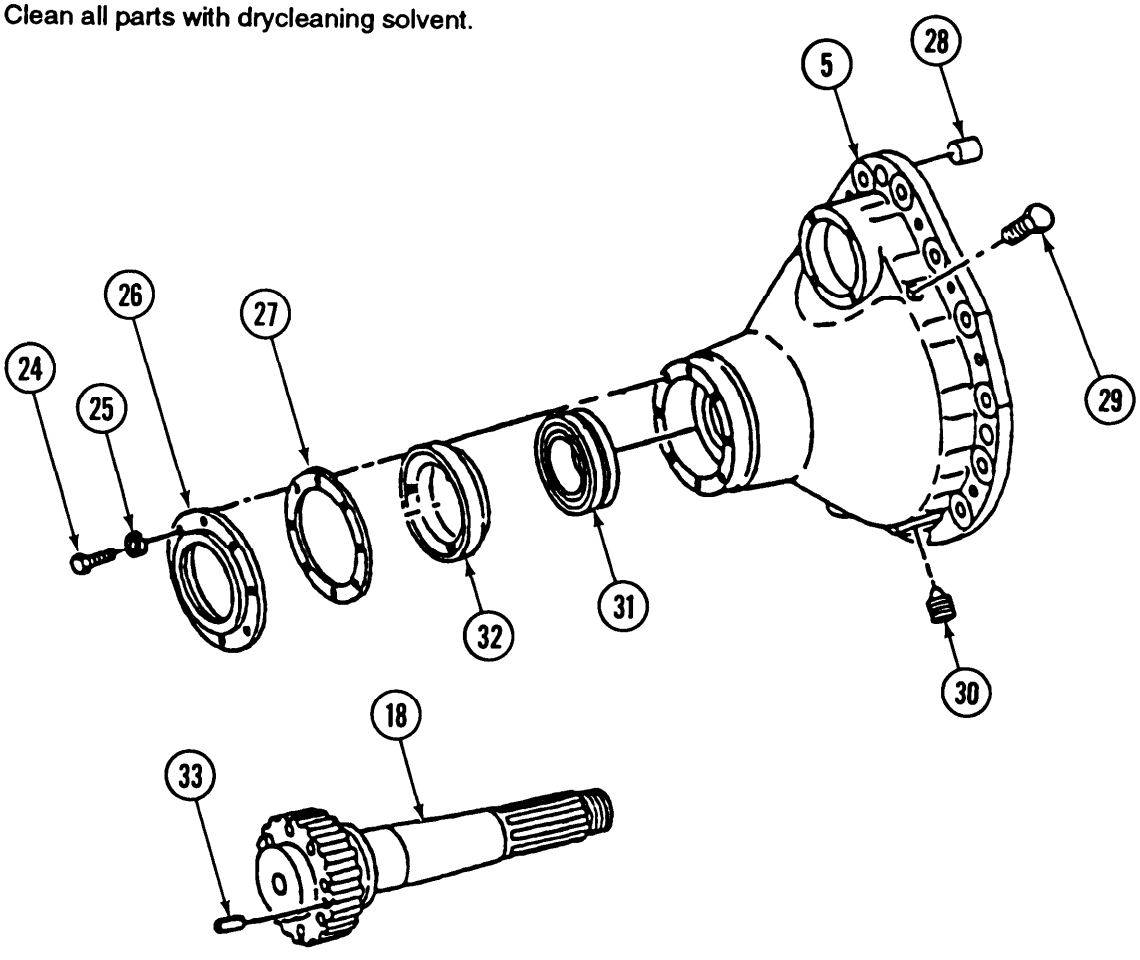
14. Remove three pins (28) from housing (5).

15. Remove pin (33) from output shaft (18).

WARNING

Drycleaning solvent P-MO 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 flames or excessive heat.

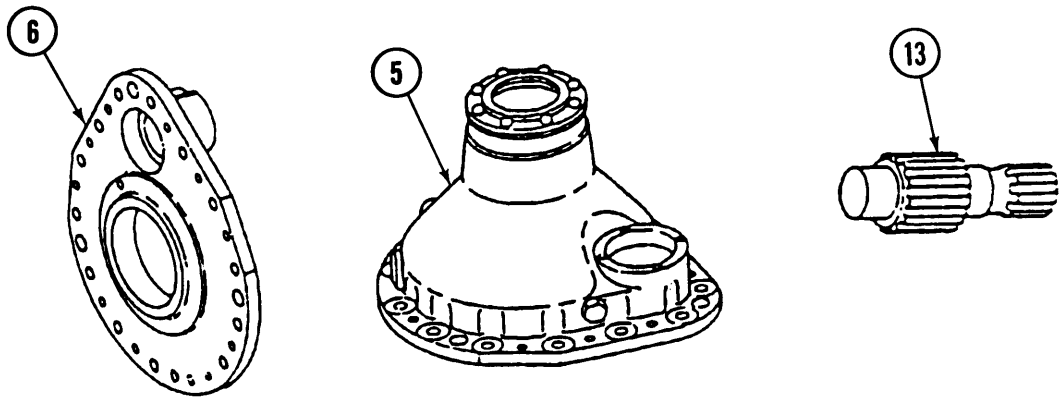
16. Clean all parts with drycleaning solvent.



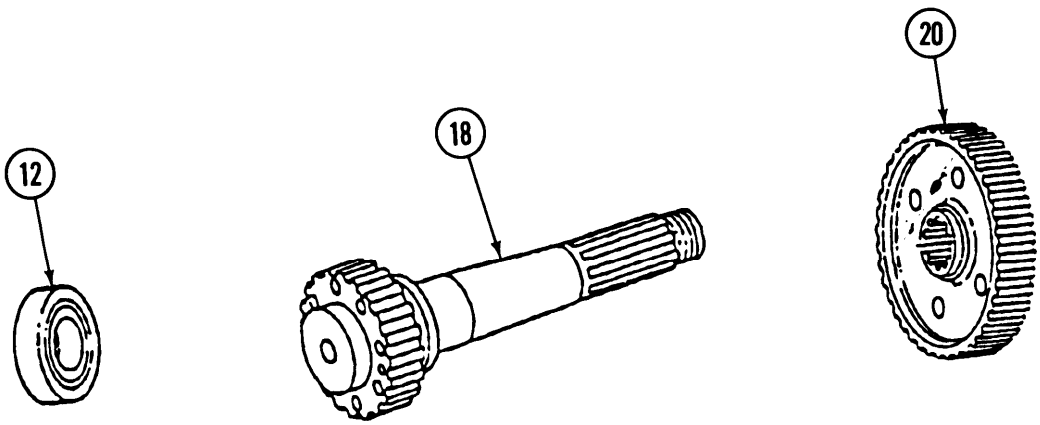
7-2. FINAL DRIVE ASSEMBLY REPAIR (continued).

b. INSPECTION

1. Inspect housing cover (6) for cracks or other damage. Replace if defective.
2. Inspect housing cover (6) for stripped threads. Repair if stripped.
3. Inspect housing (5) for cracks or other damage. Replace if defective.
4. Inspect housing (5) for stripped threads. Repair if stripped.
5. Inspect input splined gearshaft(13) for cracks or other damage and for broken splines or gear teeth. Replace if defective.



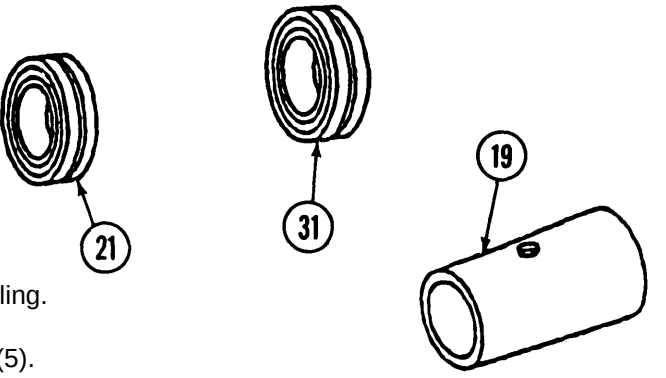
6. Inspect two bearings (12) (refer to TM 9-214). Replace if defective.
7. Inspect output shaft (18) for damage and for broken or missing splines on ends of shaft. Replace if defective.
8. Inspect ring gear (20) for broken or missing teeth. Replace if necessary.



7-2. FINAL DRIVE ASSEMBLY REPAIR (continued).

9. Inspect bearing (21) and bearing (31) (refer to TM 9-214). Replace if defective.

10. Inspect spacer (19) for cracks or distortion. Replace if cracked or if ends are not smooth.



c. ASSEMBLY

1. Apply lubricating oil to all threads prior to assembling.

2. Install two plugs (30) and screws (29) in housing (5).

CAUTION

Make sure all bearings are free from dirt and foreign material. Failure to do so may cause damage to equipment.

3. Apply lubricating oil to all bearings.

WARNING

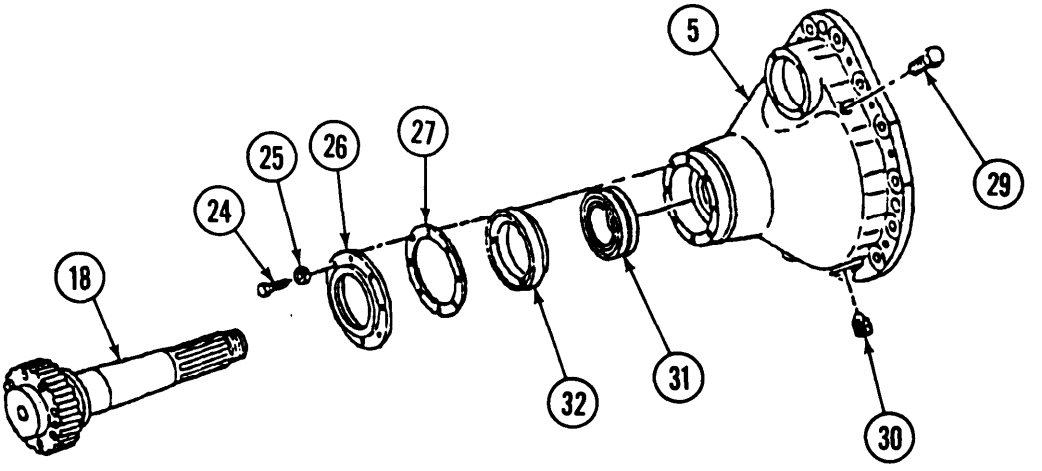
Sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep sealing compound away from open fire and use it in a weil-ventilated area. if sealing compound gets on skin or clothing, wash immediately with soap and water.

4. Apply sealing compound to outside diameter of new shaft seal (32).

5. install bearing (31), shaft seal (32), cap (26), and new gasket (27) on output shaft (18).

6. Using arbor press, install output shaft (18) in housing (5).

7. install cap (26) on housing (5) and secure with eight new lockwashers (25) and eight screws (24). Torque screws between 35 and 40 ft-lb (47 and 54 N•m).



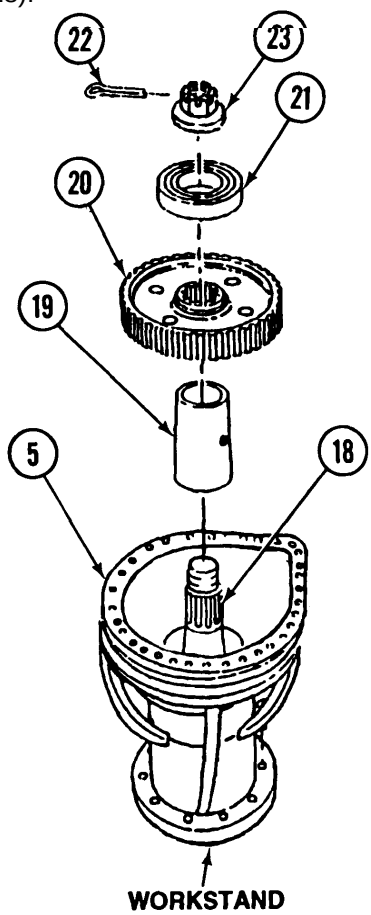
7-2. FINAL DRIVE ASSEMBLY REPAIR (continued).

8. Install bearing (21) on ring gear (20).

9. With the aid of an assistant, place housing (5) in final drive workstand.

10. Install spacer (19) and ring gear (20) on output shaft (18).

11. Install nut (23) on output shaft (18).



CAUTION

To prevent nut from backing off output shaft and causing severe damage to equipment, the following torquing procedure must be followed.

12. a. Torque nut (23) between 450 and 475 ft-lb.(610 and 643 N•m).

b. If slot in nut (23) is alined with cotter-pin hole in output shaft (1 8), go to step 13.

c. If slot in nut (23) is not alined with cotter-pin hole in output shaft (1 8), continue to torque nut (23) (maximum 30 ft-lb., or 41 N•M until next slot is alined, then go to step 13.

13. Install new cotter pin (22) in nut (23).

7-2. FINAL DRIVE ASSEMBLY REPAIR (continued).

14. Using arbor press, install two bearings (12) on input splined gearshaft (13).

15. Install input splined gearshaft (13) in housing (5).

16. Install three pins (28) in housing (5).

CAUTION

Make sure input splined gearshaft and bearings are centered when installing cover. Failure to do so may result [n damage to assembly.

17. Install new gasket (14) and housing cover (6) on housing (5) with seven new Iockwashers (17) and seven screws (16). Torque screws between 75 and 80 ft-lb (101 and 108 N•m).

18. Install two plugs (15) in housing cover (6).

19. Install new gasket (8) and access cover (9) on housing cover (6) with 12 new Iockwashers (10) and screws (11). Torque screws between 35 and 40 ft-lb (47 and 54 N•m).

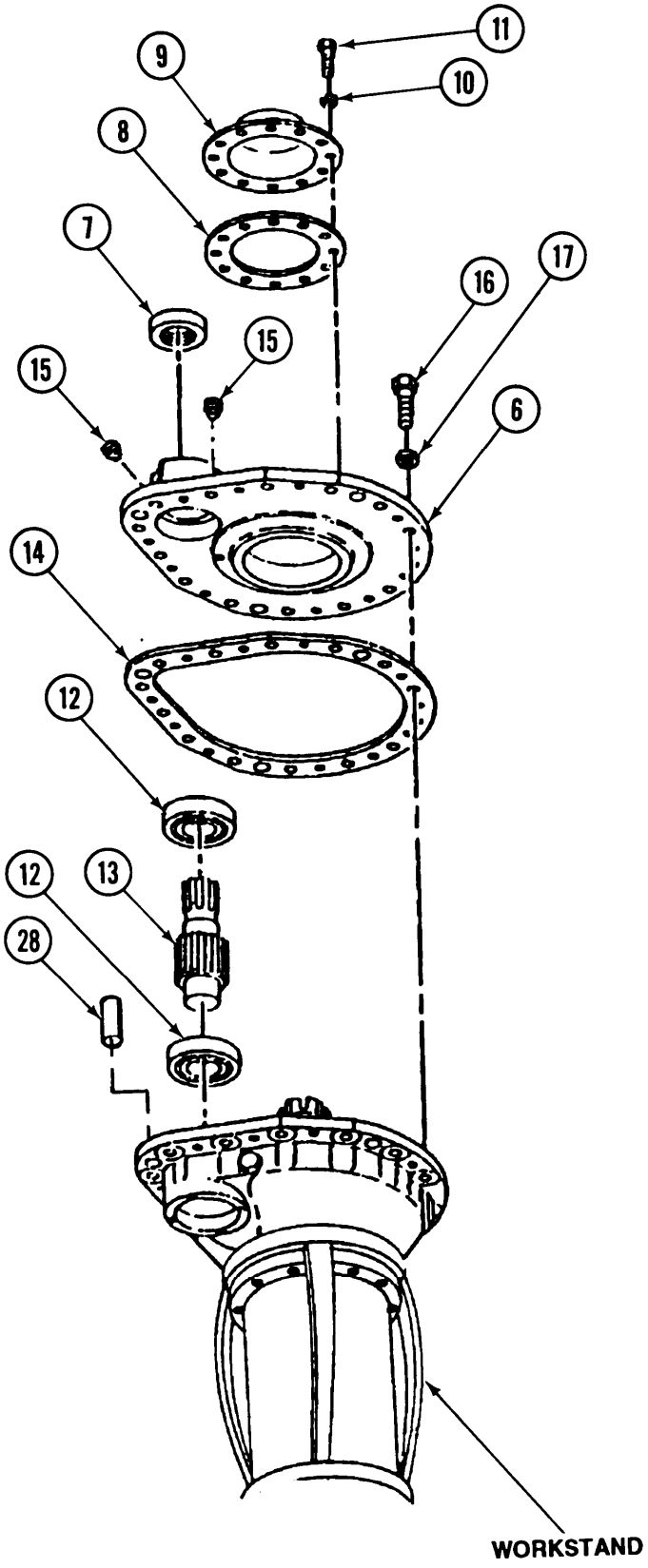
WARNING

Sealing compounds can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open flame and use in a weil-ventilated area. If sealing compound gets on skin or clothing, wash immediately with soap and water.

20. Coat outside diameter of seal (7) with sealing compound, and install seal (7) in housing cover (6).

21. With the aid of an assistant, remove housing (5) from final drive workstand.

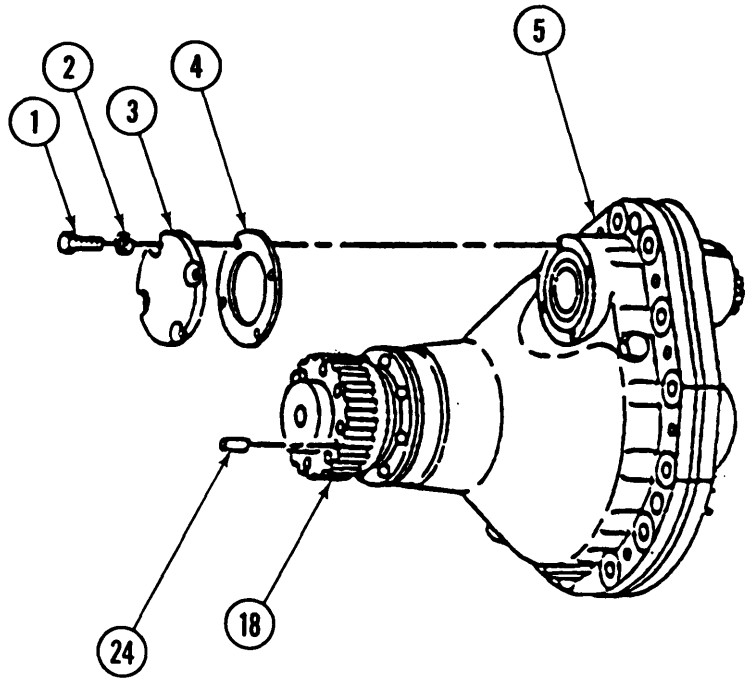
7-2. FINAL DRIVE ASSEMBLY REPAIR (continued).



7-2. FINAL DRIVE ASSEMBLY REPAIR (continued).

22. Install new gasket (4) and access cover (3) on housing (5) with four new lockwashers (2) and four screws (1). Torque screws between 35 and 40 ft-lb (47 and 54 N•m).

23. Install pin (24) in output shaft (18).



FOLLOW-ON MAINTENANCE:

- None

CHAPTER 8
WHEELS AND TRACKS MAINTENANCE

Paragraph Number	Paragraph Title	Page Number
8-1	General	8-1
8-2	Roadwheel Arm Assembly Repair	8-1
8-3	Idler Arm Assembly Repair	8-5
8-4	No. 3 Roadwheel Arm Torsion Bar Anchors Replacement	8-8
8-5	Track Adjuster Repair	8-10

8-1. GENERAL.

This chapter provides general instructions and guidance for performing required maintenance functions for the track and suspension components. The procedures in paragraphs 8-2 and 8-3 are Direct Support maintenance functions; the procedures in paragraphs 8-4 and 8-5 are General Support maintenance functions.

8-2. ROADWHEEL ARM ASSEMBLY REPAIR.

This Task Covers:

a. Disassembly
b. Inspection
c. Assembly

Initial Setup

Tool/Test Equipment:
Ž Depth micrometer (Item 10, Appendix D)
• General mechanic's tool kit (Item 19, Appendix D)
• Seal replacer (Item 35, Appendix D)
• Socket wrench (Item 38, Appendix D)
• Socket wrench set, 3/4-inch (Item 37, Appendix D)

Materials/Parts:
• Keywasher (Item 40, Appendix H)
• Preformed packing (Item 81, Appendix H)
• Seal (Item 102, Appendix H)
• Seal (Item 108, Appendix H)

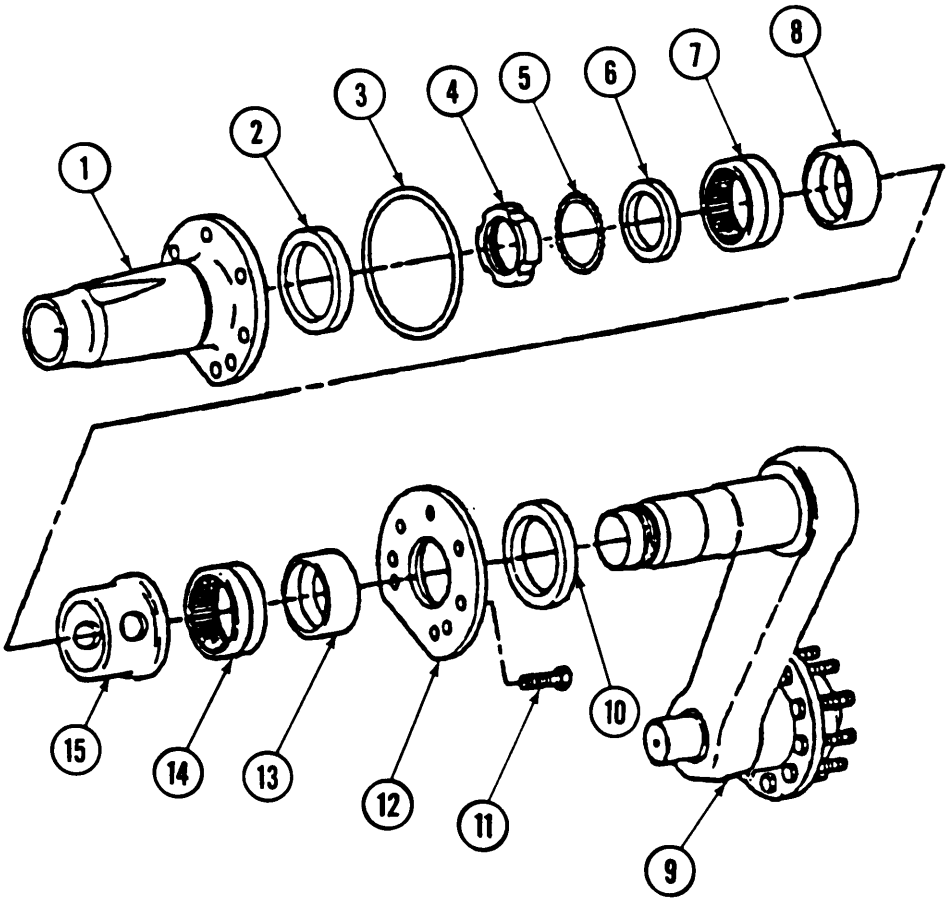
References: TM 9-214

Equipment Conditions:
• Roadwheel arm placed on clean work surface.

8-2. ROADWHEEL ARM ASSEMBLY REPAIR (continued).

a. DISASSEMBLY

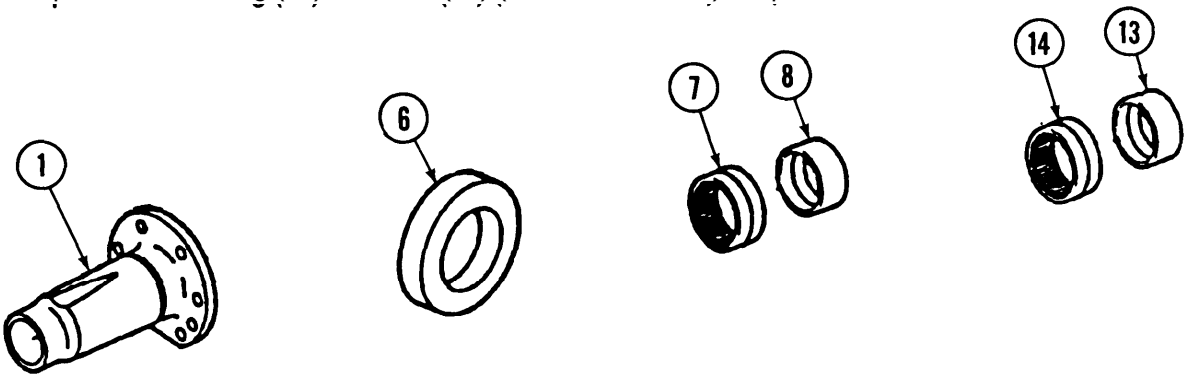
1. Remove two screws (11) and housing (1) from upper spindle (9).
2. Remove preformed packing (3) and seal (2) from housing (1). Discard preformed packing and seal.
3. Straighten tangs on keywasher (5).
4. Using socket wrench, remove self-locking nut (4) from spindle (9).
5. Remove keywasher (5), hub spacer(6), inner bearing (7), and race (8) from spindle (9). Discard keywasher.
6. Remove bearing spacer (15), outer bearing (14), race (13), and retainer (12) from spindle (9).
7. Remove seal (10) from spindle (9). Discard seal.



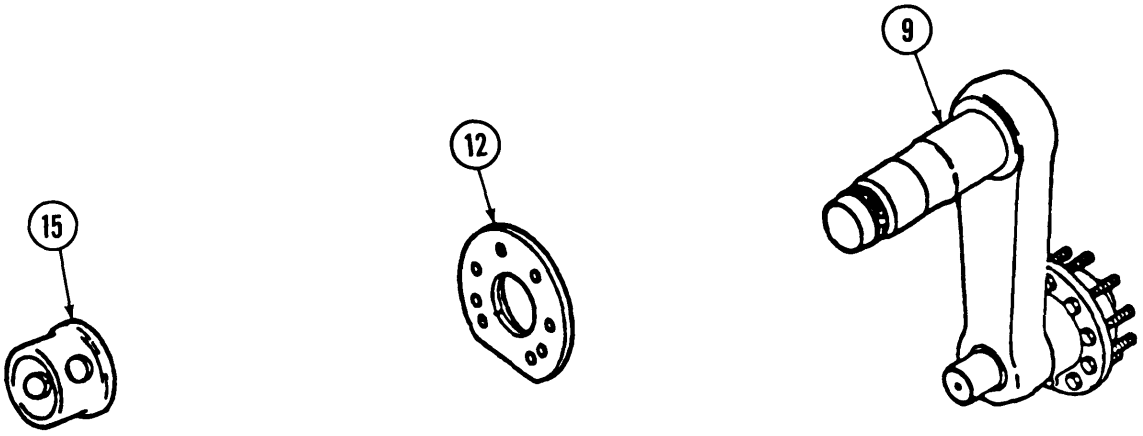
8-2. ROADWHEEL ARM ASSEMBLY REPAIR (continued).

b. INSPECTION

1. Inspect housing (1) for cracks, damage, or defects. Replace if necessary.
2. Inspect thrust spacer (6) for surface flatness and smoothness. Replace if not flat and smooth.
3. Inspect inner bearing (7) and race (8) (refer to TM 9-214). Replace if defective.
4. Inspect outer bearing (14) and race (13) (refer to TM 9-214). Replace if defective.



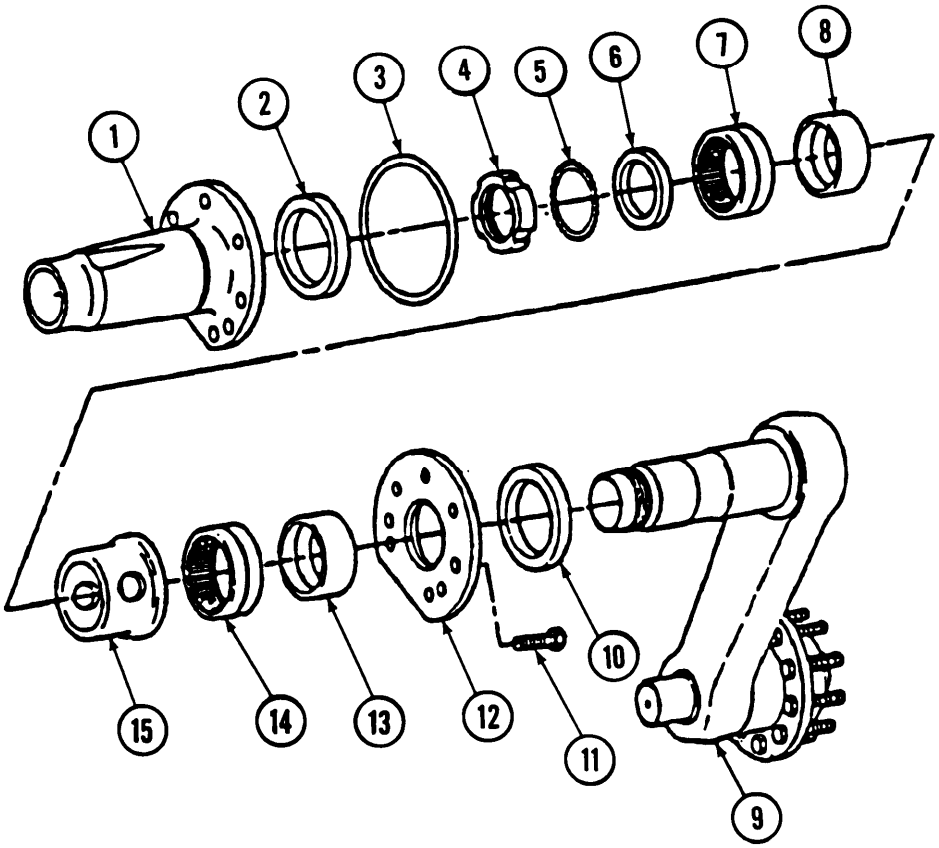
5. Using micrometer, inspect bearing spacer (15) for damage or distortion. Replace if defective or if ends are
6. Inspect retainer (12) for cracks or other damage. Replace if defective.
7. Inspect spindle (9) for cracks or other damage. Replace if defective.
8. Inspect lubrication fittings and relief valves for cracks or other damage. Replace if defective.



8-2. ROADWHEEL ARM ASSEMBLY REPAIR (continued).

c. ASSEMBLY

1. Using seal replacer, install new seal (10) on spindle (9).
2. Install retainer (12), outer bearing (14), race (13), and bearing spacer (15) on spindle (9).
3. Install inner bearing (7), race (8), hub spacer (6), and new keywasher (5) on spindle (9).
4. Using socket wrench, install self-locking nut (4) on spindle (9). Bend all keywasher (5) tangs into self-locking nut (4) recesses.
5. Install new preformed packing (3) and new seal (2) on housing (1).
6. Install housing (1) on spindle (9) and secure with two screws (11).



FOLLOW-ON MAINTENANCE:
- None

8-3. IDLER ARM ASSEMBLY REPAIR.

This Task Covers:

a. Disassembly
b. Inspection
c. Assembly

Initial Setup:

Tools/Test Equipment:
- Arbor press (Item 4, Appendix D)
- General mechanic's tool kit (Item 19, Appendix D)

Materials/Parts:
- Grease (Item 11, Appendix B)
- Preformed packing (Item 77, Appendix H)
- Preformed packing (Item 83, Appendix H)
- Seal (Item 107, Appendix H)
- Spring pin (Item 138, Appendix H)

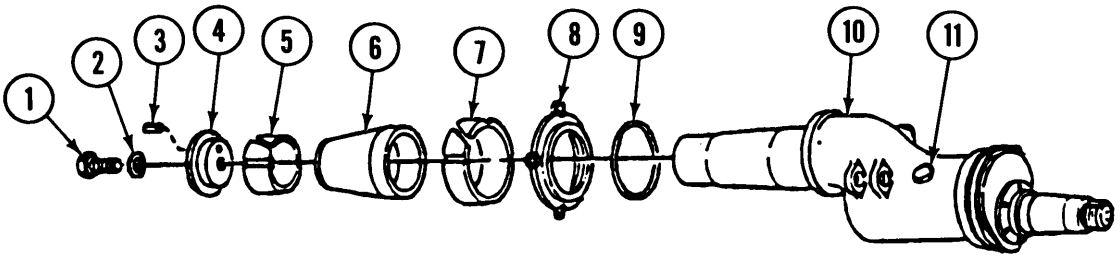
References: TM 9-214

Equipment Conditions:
- Idler arm assembly placed on clean work surface.

a. DISASSEMBLY

1. Remove screw (1), washer (2), idler arm cap (4), and plug (11) from idler arm (10). Remove spring pin (3) from cap (4). Discard spring pin.

2. Remove inner sleeve bearing (5), bearing spacer (6), outer sleeve bearing (7), idler arm retainer (8), and preformed packing (9) from idler arm (10). Discard preformed packing.



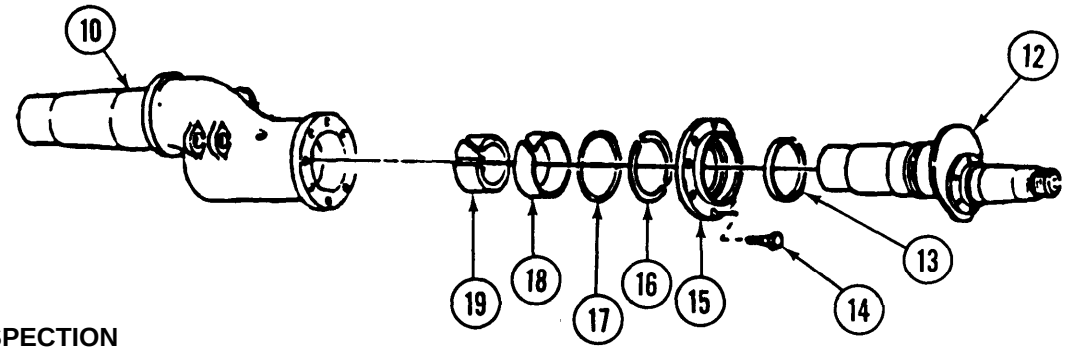
8-3. IDLER ARM ASSEMBLY REPAIR (continued).

3. Remove eight screws (14) and spindle (12) from idler arm (10).

4. Remove inner sleeve bearing (19), outer sleeve bearing (1 8), and preformed packing (17) from idler arm (10). Discard seal and performed packing.

5. Using arbor press, compress retainer (15) and spindle (12) together. Remove ring (16) from retainer (15) and spindle (12).

6. Remove spindle (12) from arbor press. Remove retainer (15) and seal (13) from spindle (12).



b. INSPECTION

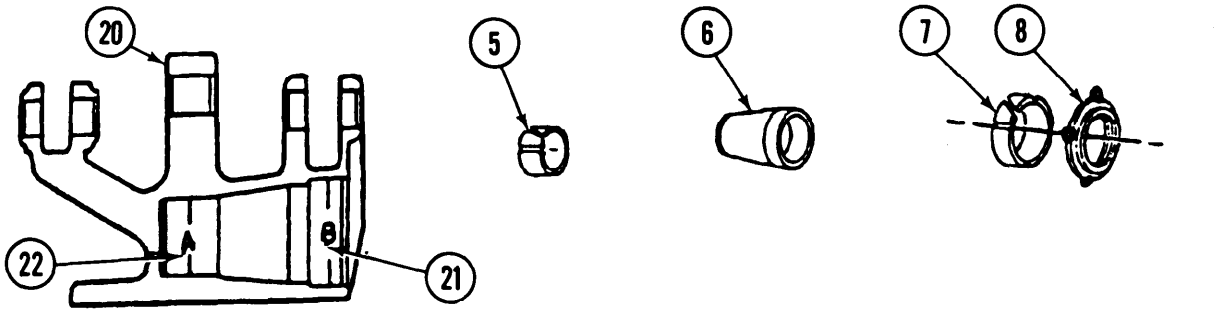
1. Inspect housing (20) for cracks, breaks, or scoring in bearing surfaces (21 and 22). Replace if defective.

2. Inspect inner sleeve bearing (5) (refer to TM 9-214).

3. Inspect bearing spacer (6) for smooth, flat, parallel ends and for cracks or other damage. Replace if ends are not smooth, flat, and parallel or if defective.

4. Inspect idler arm retainer (8) for cracks or breaks. Replace if defective.

5. Inspect outer sleeve bearing (7) (refer to TM 9-214).



6. Inspect idler arm (10) for cracks, bends, breaks, or scoring. Replace if defective.

7. Inspect inner sleeve bearing (19) (refer to TM 9-214).

8. Inspect outer sleeve bearing (18) (refer to TM 9-214).

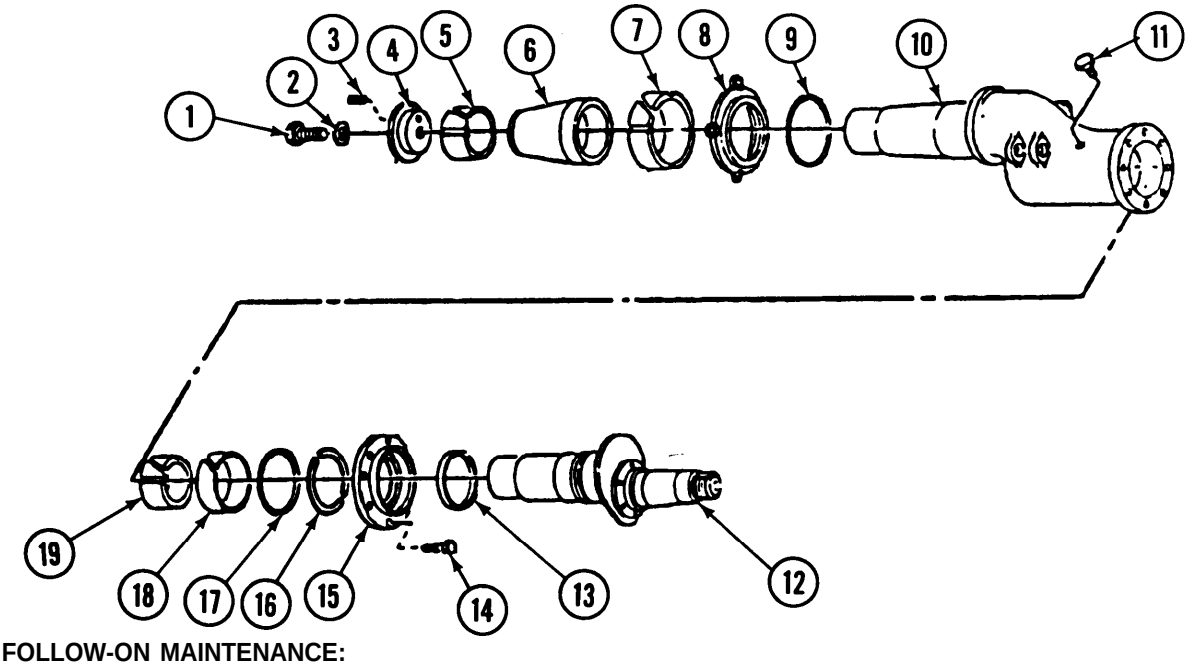
9. Inspect ring (16) and retainer (15) for cracks, bends, or breaks. Replace if defective.

8-3. IDLER ARM ASSEMBLY REPAIR (continued).

10. Inspect spindle (12) for cracks, bends, breaks, scoring, or damaged threads. Replace if defective.

c. ASSEMBLY

1. Install new seal (13) in retainer (15).
2. Install retainer (15) on spindle (12). Using arbor press, compress retainer (15) and spindle (12) together.
3. Install ring (16) in retainer (15) and spindle (12). Remove spindle (12) from arbor press.
4. Pack idler arm (10) with grease, and install plug (11) in idler arm (10).
5. Install new preformed packing (17), outer sleeve bearing (18), and inner sleeve bearing (19) on spindle (12).
6. Install spindle (12) in idler arm (10) and secure with eight screws (14). Torque screws (14) to 35 ft-lb (47 N•m).
7. Install new preformed packing (9), idler arm retainer (8), outer sleeve bearing (7) with tapered end facing out, bearing spacer (6), and inner sleeve bearing (5) on idler arm (10).
8. Install cap (4) on idler arm (10), and install new spring pin (3) in cap (4). Secure cap (4) with screw (1) and washer (2).



FOLLOW-ON MAINTENANCE:

. None

8-4. NO. 3 ROADWHEEL ARM TORSION BAR ANCHORS REPLACEMENT.

This Task Covers:

a. Removal

b. Installation

Initial Setup:

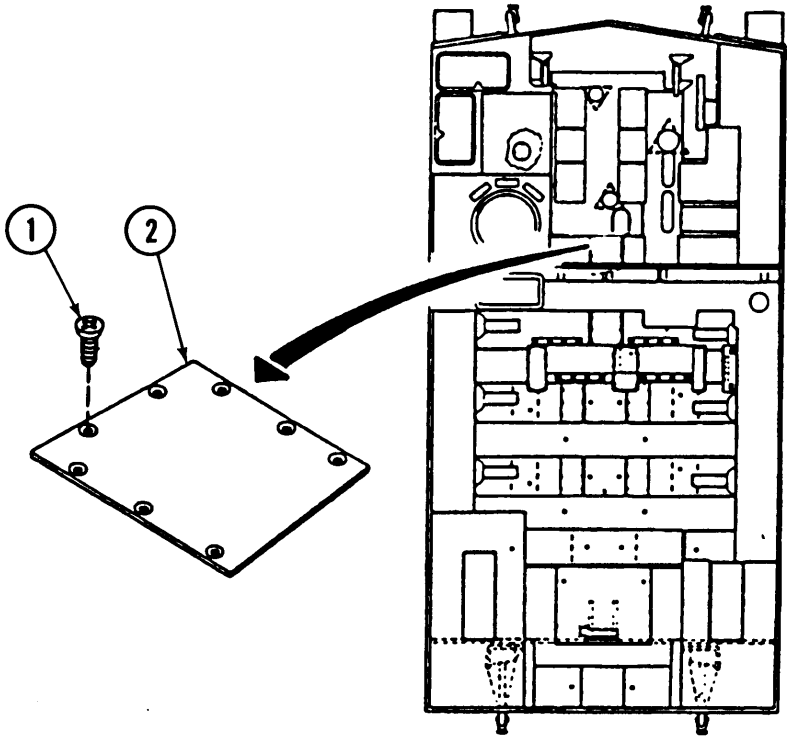
Tools/Test Equipment:
- General mechanic's tool kit (Item 19, Appendix D)
- Screwdriver adapter (Item 32, Appendix D)
- Screwdriver bit holder (Item 33, Appendix D)
- Socket wrench set, 3/4-inch drive (Item 37, Appendix D)
- Torque wrench, 0-600 ft-lb (Item 46, Appendix D)

Materials/Parts:
- Nonelectrical wire (Item 27, Appendix B)
- Sealing compound (Item 21, Appendix B)

Equipment Conditions:
- Torsion bars removed (refer to TM 9-2350-287-20-2).
- Lower fuel tank removed (para 4-4).

a. REMOVAL

1. Remove eight screws (1) securing cover plate (2) to floor of hull at crew compartment bulkhead.
2. Remove lockwire (6) from two screws (4). Discard lockwire.
3. Remove two screws (4) and washers (5) from each of two no. 3 roadwheel arm torsion bar anchors (3).
4. Remove two torsion bar anchors (3) from floor of hull.



8-4. NO. 3 ROADWHEEL ARM TORSION BAR ANCHORS REPLACEMENT.

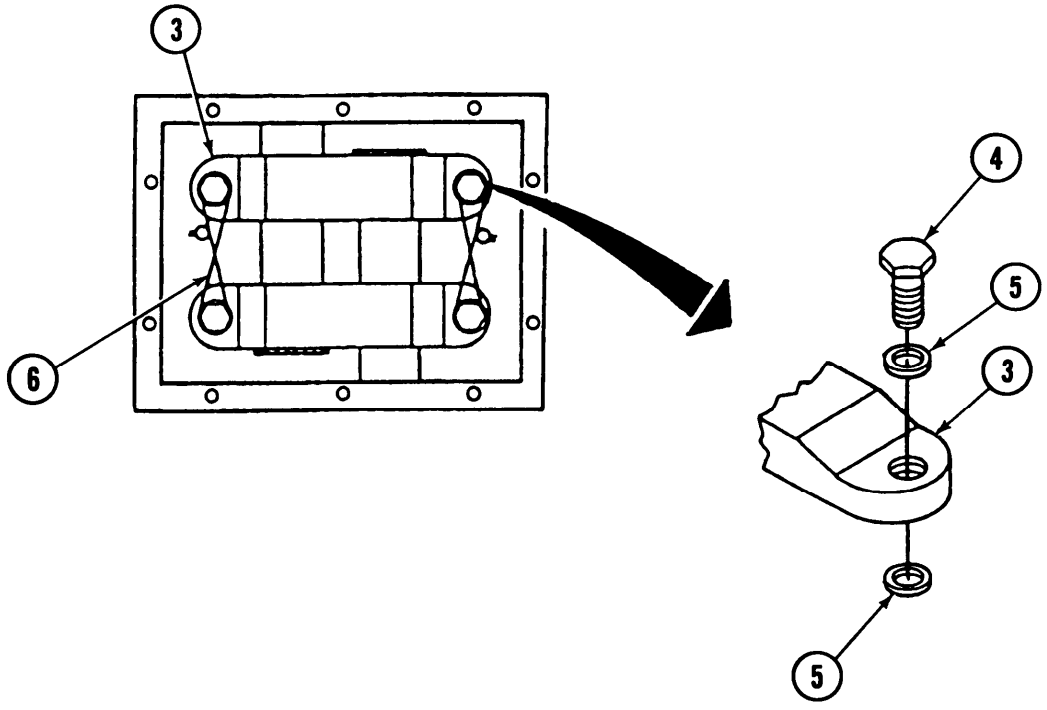
b. INSTALLATION

1. Install two torsion bar anchors (3) on floor of hull.
2. Install two washers (5) and screws (4) on each of two torsion bar anchors (3).
3. Torque two screws (4) to 245 ft-lb (332 N•m) and install new Iockwire (6) on screws (4).

WARNING

Sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep sealing compound away from open fire and use in a weii-ventilated area. if sealing compound gets on skin or clothing, wash immediately with soap and water.

4. Apply sealing compound around entire edge of cover plate (2).
5. Position cover plate (2) on floor of hull at crew compartment bulkhead and secure with eight screws (1)



FOLLOW-ON MAINTENANCE:
- Install lower fuel tank (para 4-4).
- Install torsion bars (refer to TM 9-2350-287-20-2).

8-5. TRACK ADJUSTER REPAIR.

This Task Covers:

a. Disassembly
b. Cleaning and Inspection
c. Assembly

Initial Setup:

Tools/Test Equipment:
- Arbor press (Item 4, Appendix D)
- General mechanic's tool kit (Item 19, Appendix D)
- Machinist's vise (Item 21, Appendix D)
- Spanner wrench, (Item 40, Appendix D)
- Vise jaw caps (Item 47, Appendix D)

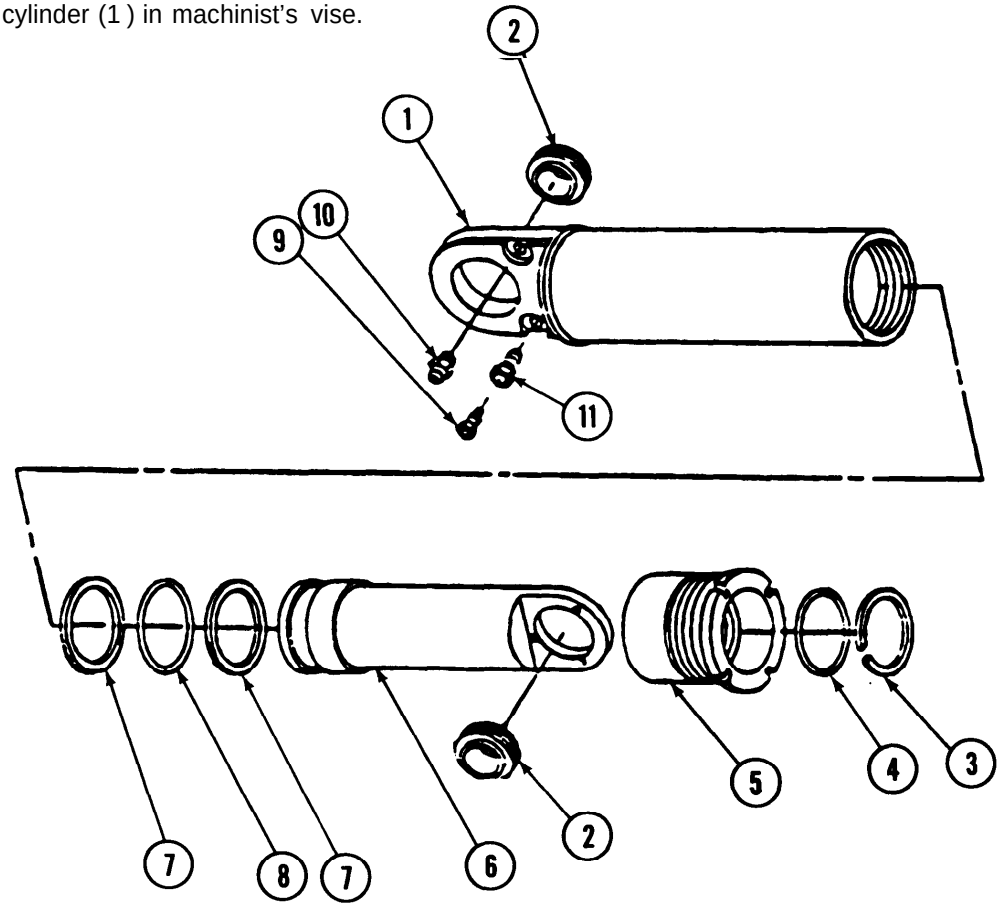
Materials/Parts:
- Automotive grease (Item 12, Appendix B)
- Drycleaning solvent (Item 9, Appendix B)
- Bearing (2) (Item 1, Appendix H)
- Preformed packing (item 90, Appendix H)
- preformed packing (item 91, Appendix H)
- Retainer (2) (Item 93, Appendix H)
- scraper (Item 139, Appendix H)

References: TM 9-214

Equipment Conditions:
- Track adjuster placed on clean work surface.

a. DISASSEMBLY

1. Place cylinder (1) in machinist's vise.



8-5. TRACK ADJUSTER REPAIR (continued).

2. Remove bleeder plug (9) and bleeder body (11) from cylinder (1).

3. Remove nut (5) and piston (6) from cylinder (1).

4. Remove two retainers (7) and preformed packing (8) from piston (6). Discard retainers and preformed packing.

5. Remove scraper (3) and preformed packing (4) from nut (5). Discard scraper and preformed packing.

6. Remove lubrication fitting (10) from cylinder (1).

7. Remove cylinder (1) from vise.

NOTE

Perform step 8 only if bearings fail inspection.

8. Using arbor press, remove two bearings (2) from end of cylinder (1) and/or piston (6). Discard bearings.

b. CLEANING AND INSPECTION

1. Inspect two bearings (2) (refer to TM 9-214).

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.

2. Clean all parts using drycleaning solvent.

c. ASSEMBLY

NOTE

Perform step 1 only if bearings were removed.

1. Use arbor press to install two new bearings (2) in cylinder (1) and/or piston (6).

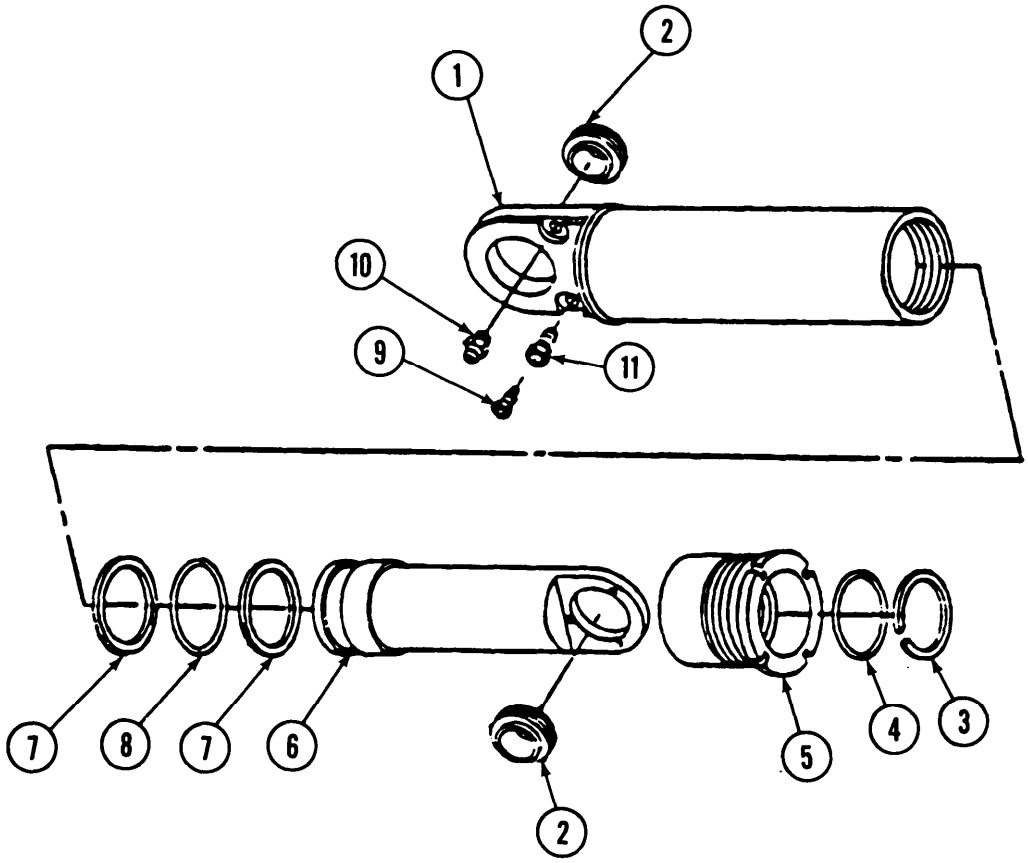
2. Coat inside of cylinder (1) with grease.

3. Place cylinder (1) in vise.

4. Install lubrication fitting (10) in cylinder (1).

8-5. TRACK ADJUSTER REPAIR (continued).

5. Install new preformed packing (4) and new scraper (3) in nut (5).
6. Install new preformed packing (8) and two new retainers (7) on piston (6).
7. Coat surface of piston (6) with grease, and slide piston (6) into cylinder (1).
8. Install nut (5) over end of piston (6), and screw in and tighten nut (5) in end of cylinder (1).
9. Install bleeder body (11) and bleeder plug (9) in cylinder (1).
10. Remove cylinder (1) from vise.



FOLLOW-ON MAINTENANCE:
• None

CHAPTER 9
BODY, CAB, HOOD, AND HULL MAINTENANCE

Paragraph Number	Paragraph Title	Page Number
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9-3	Engine Compartment Bulkhead Insulation and Shields Replacement	9-8
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9-1. GENERAL.

This chapter describes and illustrates maintenance procedures for body, cab, hood, and hull components, which consist of upper rear door small doors and hinges, engine compartment bulkhead insulation and shields, and projectile rack sections.

9-2. UPPER REAR DOOR SMALL DOORS AND HINGE REPLACEMENT.

This Task Covers:

a. Removal

b. Installation

Initial Setup:

Tools/Test Equipment:
- Electric disc sander (Item 13, Appendix D)
- Electric drill (Item 14, Appendix D)
- General mechanics tool kit (Item 19, Appendix D)
- Screw extractor set (Item 34, Appendix D)
- Thread cutting die and tap set (Item 41, Appendix D)
- Torch set (Item 42, Appendix D)
- Twist drill set (Item 46, Appendix D)

Materials/Parts:
- Adhesive (Item 2, Appendix B)
- Dry-cleaning solvent (Item 9, Appendix B)
- Cotter pin (2) (Item 6.1, Appendix H)
- Lockwasher (4) (Item 57, Appendix H)
- Seal (Item 112, Appendix H)
- Seal (Item 113, Appendix H)
- Seal (left door) (Item 114, Appendix H)
- Seal (right door) (Item 115, Appendix H)
- Thread insert (4) (Item 132, Appendix H)

References:
TC 9-237

Equipment Conditions:
- Upper rear door removed (refer to TM 9-2350-287-20-2).

9-2. UPPER REAR DOOR SMALL DOORS AND HINGE REPLACEMENT (continued).

a. REMOVAL

NOTE

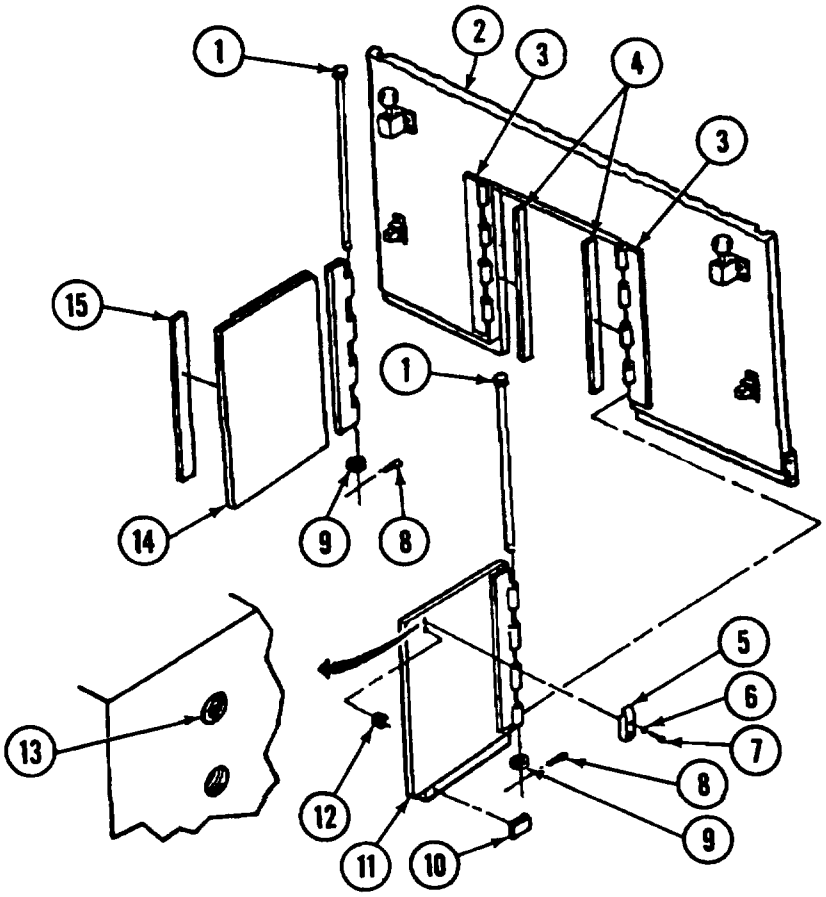
Perform steps 1 through 4 only if replacing threaded inserts.

1. Remove two screws (7) and lockwashers (6) and strike (5) from each door (11 and 14). Discard lockwashers.
2. Using electric drill and 19/32-inch twist drill, drill out material between threaded insert locking keys (13).
3. Bend in and remove four threaded insert locking keys (13).
4. Using screw extractor, remove threaded insert (12). Discard threaded insert.

NOTE

Perform steps 5 and 6 only if replacing hinge pins.

5. Remove two cotter pins (8) and washers (9) from two hinge pins (1). Discard cotter pins.
6. Remove two hinge pins (1) and small doors (11 and 14), with two hinge halves (3) attached, from upper rear door (2).
7. Remove two seals (4) and two seals (10 and 15) from upper rear door small doors (11 and 14).



9-2. UPPER REAR DOOR SMALL DOORS AND HINGE REPLACEMENT (continued).

WARNING

Wear chip-guarding and personal protective equipment (goggles/shield, gloves, etc.) when using grinder. Failure to heed this warning may result in severe injury to personnel.

CAUTION

Be careful not to damage upper rear door when grinding loose hinge.

NOTE

Perform step 8 only if hinge halves are damaged.

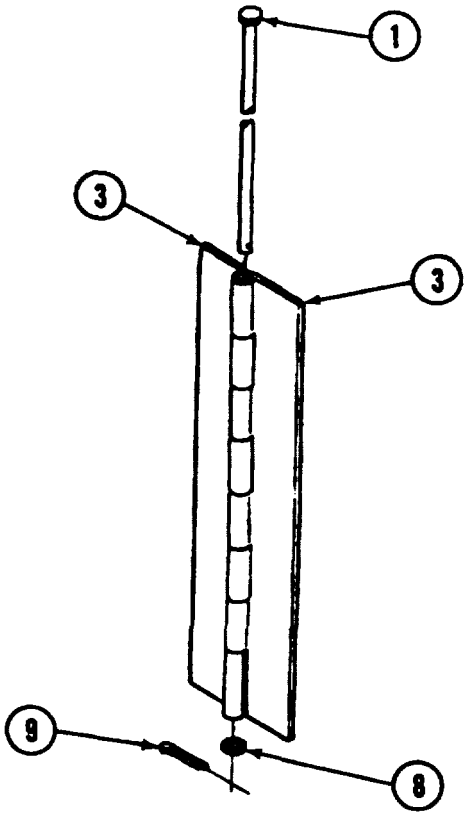
8. Grind weld loose to remove four hinge halves (3) from upper rear door (2) and each of two upper rear door small doors (11 and 14).

b. INSTALLATION

NOTE

Perform steps 1 through 5 only if hinge halves were removed.

1. Assemble four hinge halves (3) with two hinge pins (1), washers (8), and new cotter pins (9).



9-2. UPPER REAR DOOR SMALL DOORS AND HINGE REPLACEMENT (continued).

2. Position upper rear door (2) on level surface capable of supporting the weight.

3. Position two upper rear door small doors (11 and 14) as shown.

4. Position two assembled hinge halves (3) on upper rear door (2) and two upper rear door small doors (11 and 14) as shown.

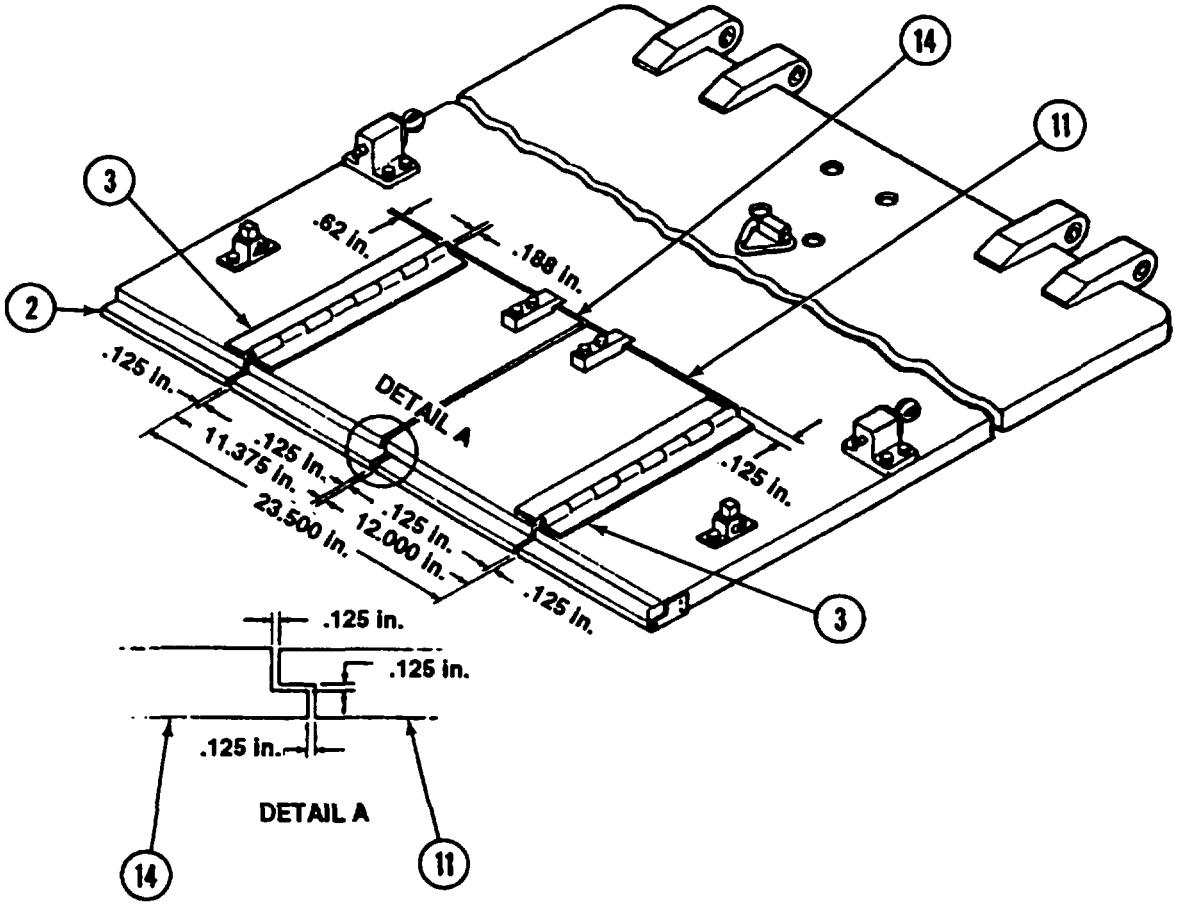
WARNING

Unsafe welding practices can cause serious injury from fire, explosions, or harmful agents. Allow only authorized personnel to weld metals, and follow precautions in TC 9-237. Protective clothing and goggles must be worn, adequate protective equipment used, a suitable fire extinguisher kept nearby, and requirements of TC 9-237 strictly followed.

CAUTION

Be careful when welding near the edges of upper rear door and upper rear door small doors. Do not weld into gaps between upper rear door and upper rear door small doors. Failure to heed this caution can result in damage to upper rear door and upper rear door small doors.

5. Weld new assembled hinge halves (3) to upper rear door (2) and each of two upper rear door small doors (11 and 14) with 1/8 inch of weld.



9-2. UPPER REAR DOOR SMALL DOORS AND HINGE REPLACEMENT (continued).

WARNING

- Do not use dry-cleaning solvent near upper rear door and upper rear door small doors until doors are cool to the touch. Failure to follow this warning may result in severe injury or death to personnel.

- **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 use near open flame or excessive heat.**

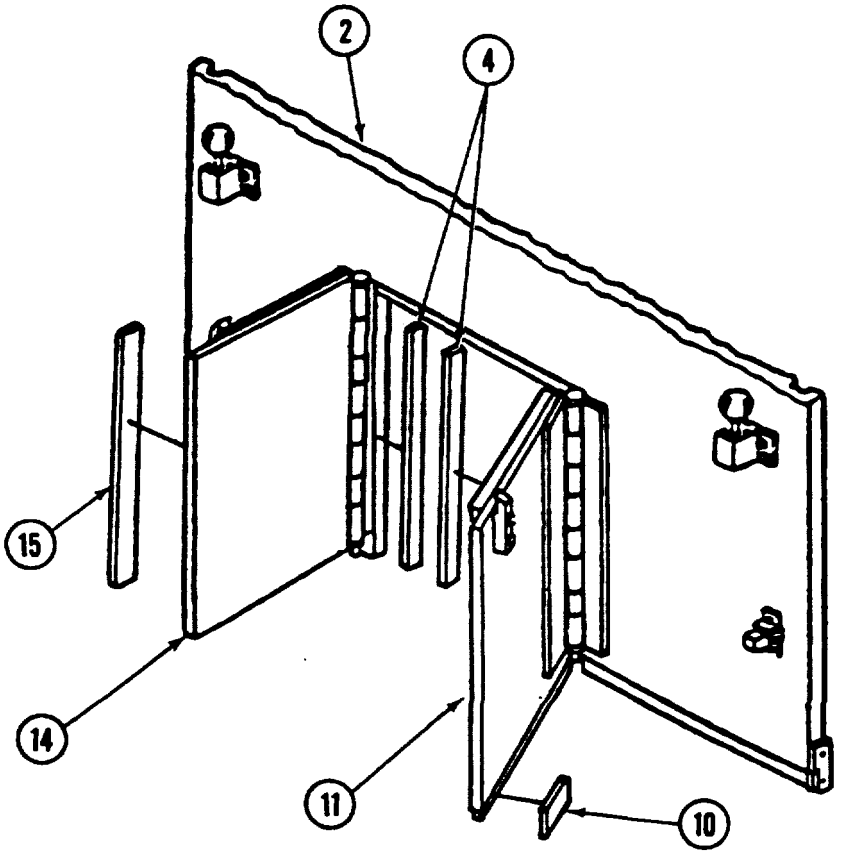
6. Clean mounting surfaces of upper rear door (2) and upper rear door mounting doors (11 and 14) with dry-cleaning solvent to remove all old adhesive and seal residue.

WARNING

Adhesives can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep away from open fire and use in a well-ventilated area. If adhesive gets on skin or clothing, wash immediately with soap and water.

7. Apply adhesive to two new seals (10 and 15), and install seals (10 and 15) on upper rear door small doors (11 and 14).

8. Apply adhesive to two new seals (4), and install two seals (4) on upper rear door (2).



9-2. UPPER REAR DOOR SMALL DOORS AND HINGE REPLACEMENT (continued).

NOTE

Perform steps 9 through 13 only if threaded inserts were removed.

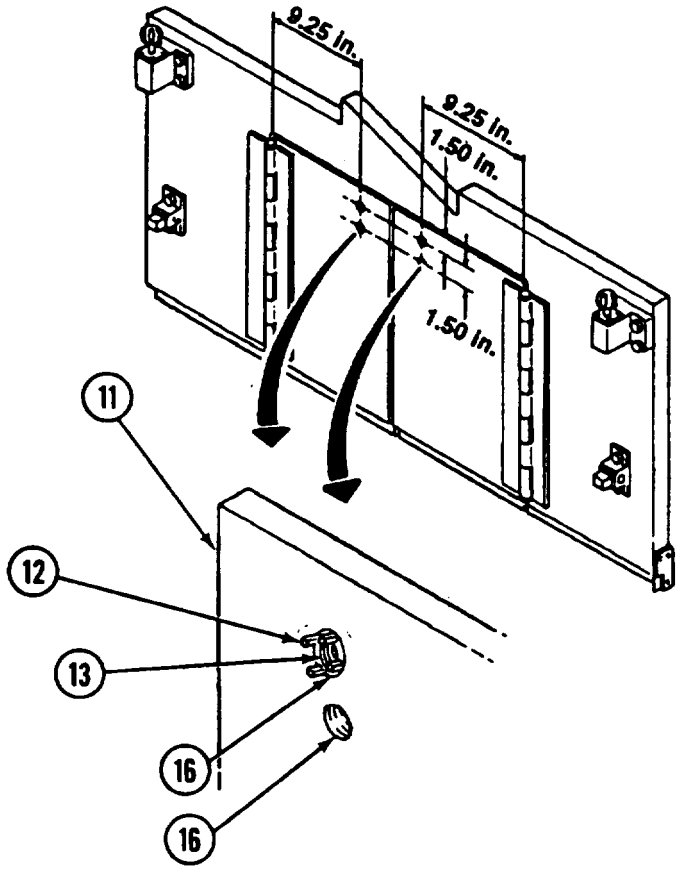
WARNING

- Unsafe welding practices can cause serious injury from fire, explosions, or harmful agents. Allow only authorized personnel to weld metals, and follow precautions in TC 9-237. Protective clothing and goggles must be worn, adequate protective equipment used, a suitable fire extinguisher kept nearby, and requirements of TC 9237 strictly followed.

- **Wear chip-guarding and personal protective equipment (goggles/shield, gloves, etc.) when using grinder. Failure to follow this warning may result in severe injury to personnel.**

9. Inspect two threaded holes (16) in upper rear door small door (11 or 14). If threads in holes (16) are undamaged, go to step 12. If threads in holes (16) are damaged, go to step 10.

10. Chip and fill-weld threaded holes (16). Grind weld until flush with surface of upper rear door small door (11 or 14).



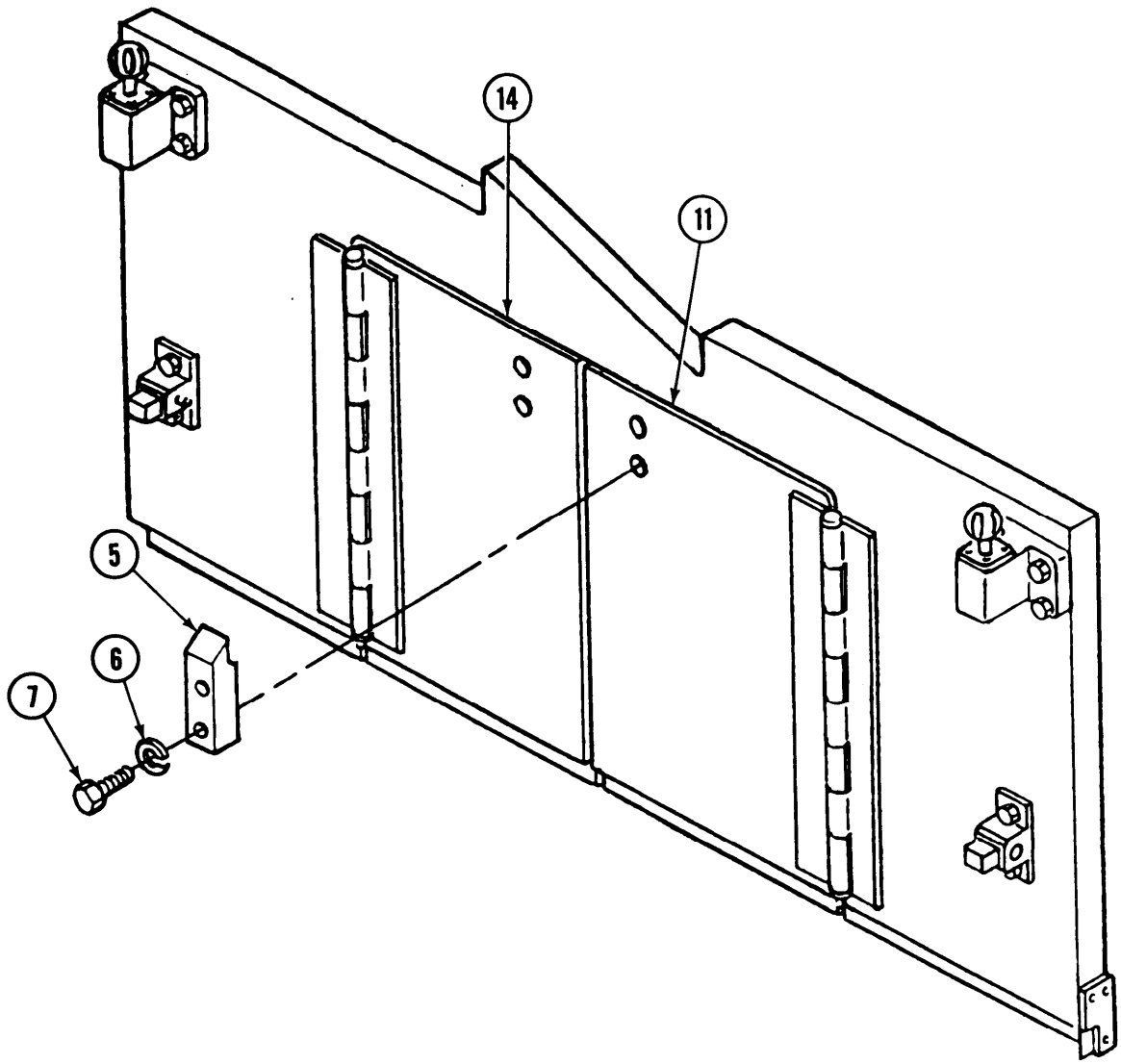
9-2. UPPER REAR DOOR SMALL DOORS AND HINGE REPLACEMENT (continued).

11. Using electric drill and 23/32-inch twist drill, and thread-cutting tap, drill and tap a 11/1 6 inch-11 UNS hole.

12. Install new threaded insert (12) in threaded hole (16) until top of insert (12) is flush with surface of upper rear door small doors (11 or 14).

13. Drive four keys (13) of insert (12) into threaded hole (16).

14. Install strike (5) on each of upper rear door small doors (11 and 14) with two new lockwashers (6) and screws (7).



FOLLOW-ON MAINTENANCE:
Ž Install upper rear door (refer to TM 9-2350-287-20-2).

9-3. ENGINE COMPARTMENT BULKHEAD INSULATION AND SHIELDS REPLACEMENT.

This Task Covers:

a. Removal

b. Installation

Initial Setup:

Tool/Test Equipment:
- General mechanic's tool kit (Item 19, Appendix D)

Materials/Parts:
- Adhesive (Item 2, Appendix B)
- Drycleaning solvent (Item 9, Appendix B)
- Rag (Item 17, Appendix B)
- Sealing compound (Item 21, Appendix B)

Personnel Required: Three

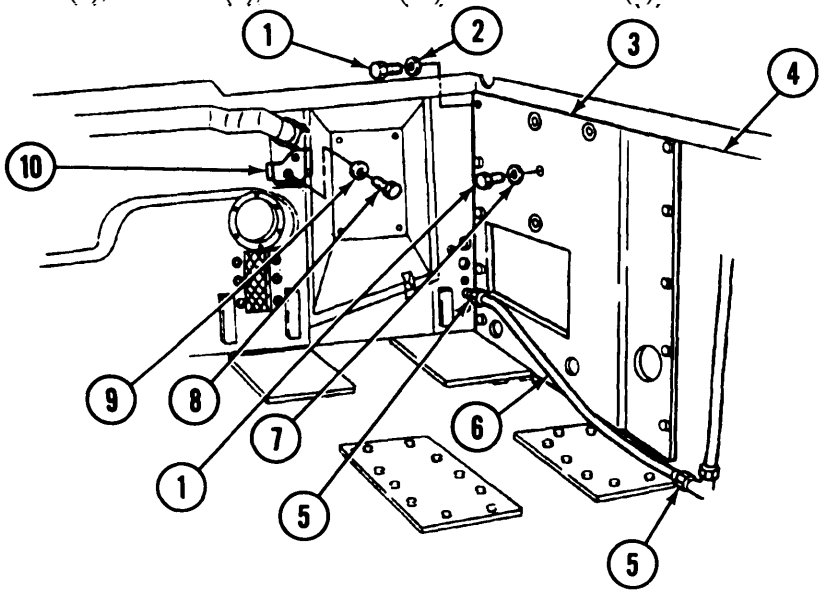
Equipment Conditions:
- Powerpack removed (refer to TM 9-2350-287-20-1).
- Lower fuel tank removed (para 4-4).
- Engine mount release bar removed (para 3-5).
- Engine air cleaner ducts and hoses removed (refer to TM 9-2350-287-20-1).

a. REMOVAL

NOTE

- To remove shield (3), perform steps 1 through 3.
- To remove shield (23), perform step 5.
- To remove shields (19, 20, and 27), perform steps 1 through 12.

1. Unscrew two nuts (5) and remove tube (6).
2. Remove 13 screws (1), eight washers (7) and five washers (2) from shield (3) and bulkhead (4).
3. Remove shield (3) from bulkhead (4).
4. Remove two screws (8), washers (9), and shield (10) from bulkhead (4).



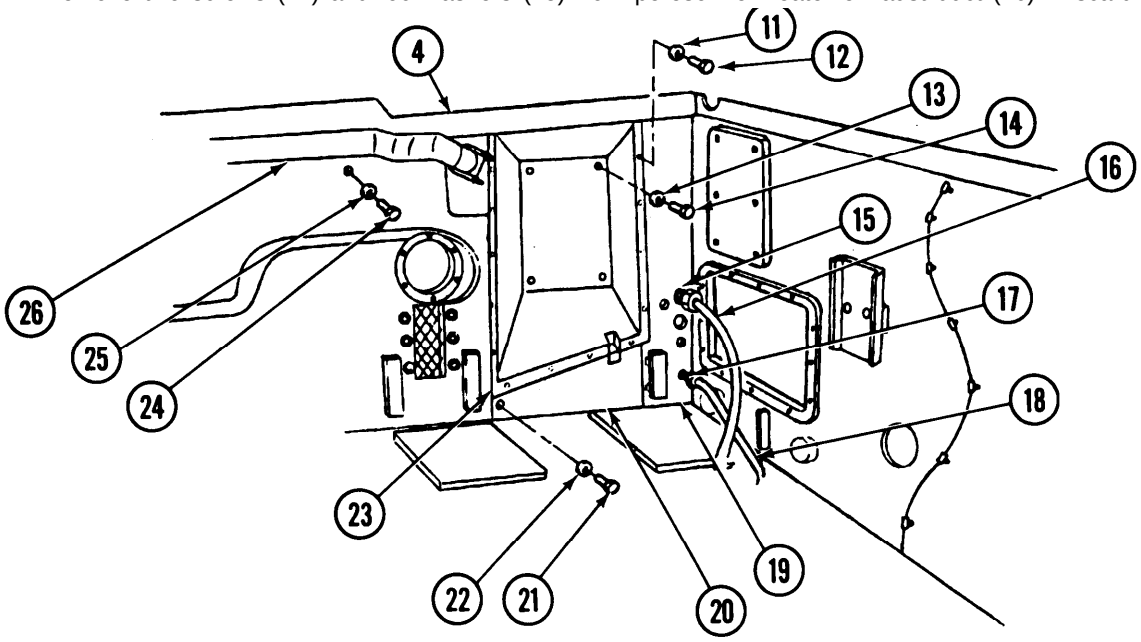
9-3. ENGINE COMPARTMENT BULKHEAD INSULATION AND SHIELDS REPLACEMENT (continued).

5. Remove 16 screws (12) and washers (11) from shield (23) and bulkhead (4). Remove four screws (14), washers (13), and shield (23) from bulkhead (4).

6. Remove three screws (21), washer (22), and shield (20) from bulkhead (4).

7. Disconnect fuel hose (16 and 18) from fittings(15 and 17). Remove shield (19) from bulkhead (4).

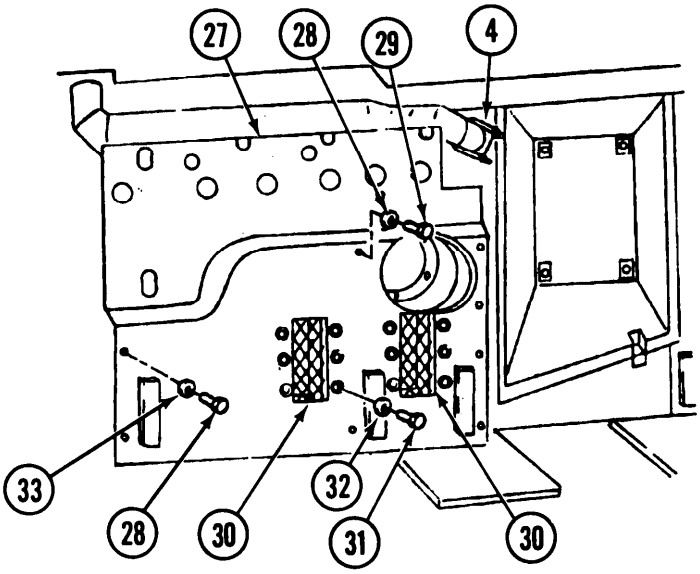
8. Remove two screws (24) and lockwashers (25) from peresonnel heater exhaust duct (26). Discard lockwasher.



9. Remove six screws (29), four washers (28), two washers (33), and shield (27) from bulkhead

10. Remove 12 screws (31), washers (32), and two grilles (30) from shield (27).

11. Inspect shields (3, 10, 19,20,23, 27) for cracks, bends, or breaks. Replace if necessary.

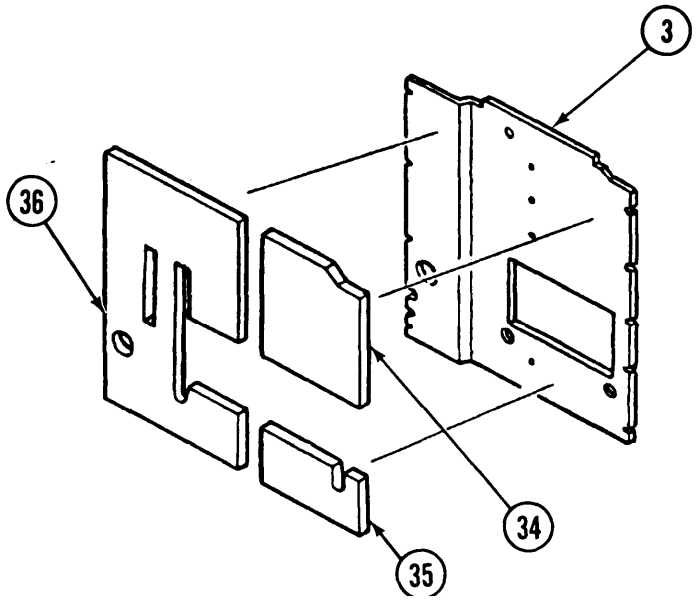


9-3. ENGINE COMPARTMENT BULKHEAD INSULATION AND SHIELDS REPLACEMENT (continued).

N O T E

Perform step 12 only if insulation is torn, ripped, or missing. Shield (3) and insulation (34, 35, and 36) are shown.

12. Pry off and discard damaged insulation (34, 35, and 36).



b. INSTALLATION

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 breath, vapors. DO NOT use near open flame or excessive heat.

NOTE

Perform steps 1 through 3 only if insulation or shield is new.

1. Using dry cleaning solvent, clean and dry seal channel and insulation mounting surfaces, Make sure to remove all seal and insulation particles.

WARNING

Adhesive causes Immediate bonding on contact with eyes, skin, or clothing and also gives off harmful vapors. To avoid Injury or death, wear protective goggles, keep away from open fire, and use in a well-ventilated area. If adhesive gets in your eyes, try to keep them open, flush with water for 15 minutes, and get medical attention.

2. Apply adhesive to new insulation (34, 35, and 36).

3. Install insulation (34, 35, and 36) on shield (3).

9-3. ENGINE COMPARTMENT BULKHEAD INSULATION AND SHIELDS REPLACEMENT (continued).

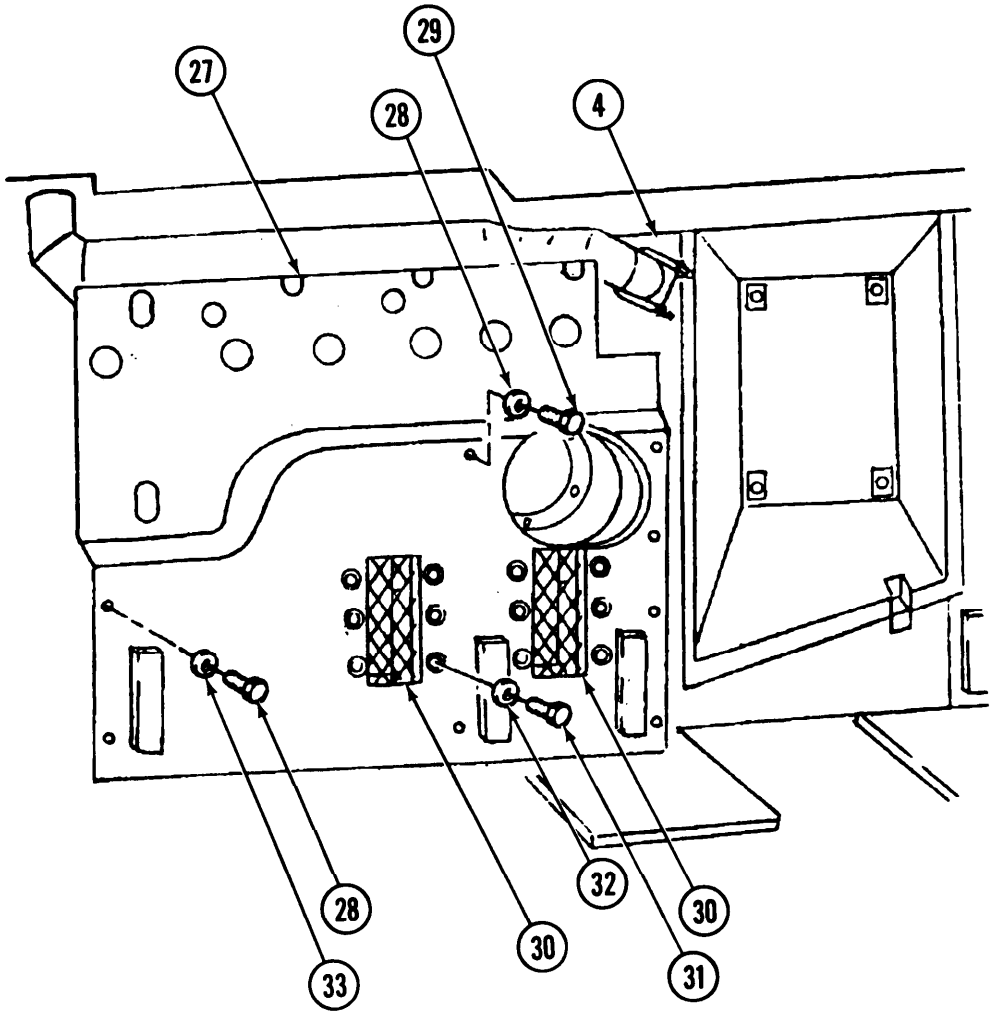
WARNING

Sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep sealing compound away from open fire and use in a well-ventilated area. If sealing compound gets on skin or clothing, wash immediately with soap and water.

4. Apply sealing compound to threads of screws (1,8, 12, 14, 21, 29, and 31).

5. Install two grilles (30) on shield (27) with 12 screws (31) and washers (32).

6. Position shield (27) in place on bulkhead (4) and secure with six screws (29), four washers (28), and two washers (33).

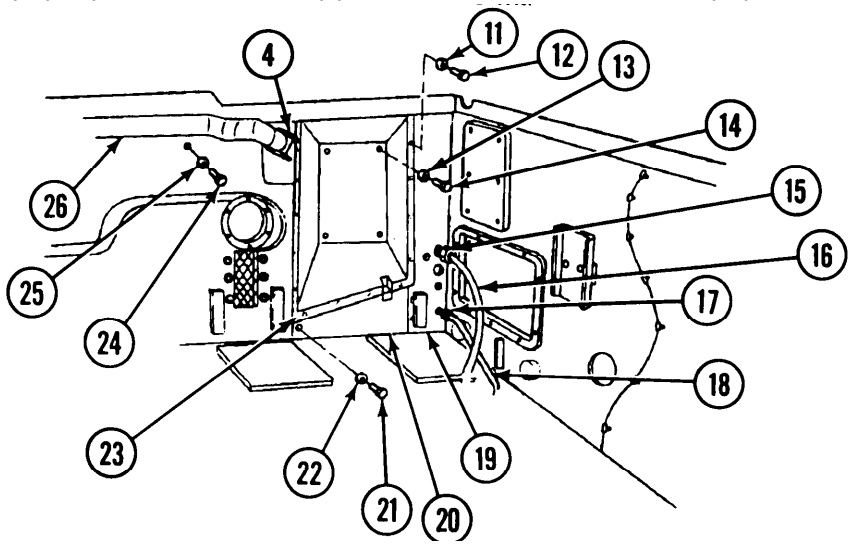


9-3. ENGINE COMPARTMENT BULKHEAD INSULATION AND SHIELDS REPLACEMENT (continued).

7. Install two screws (24) and new lockwashers (25) in personnel heater exhaust duct (26).

8. Position shield (19) in place on bulkhead (4) and connect fuel lines (16 and 18) to fittings (15 and 17).

9. Position shield (20) in place on bulkhead (4) and secure with three screws (21) and washers (22).

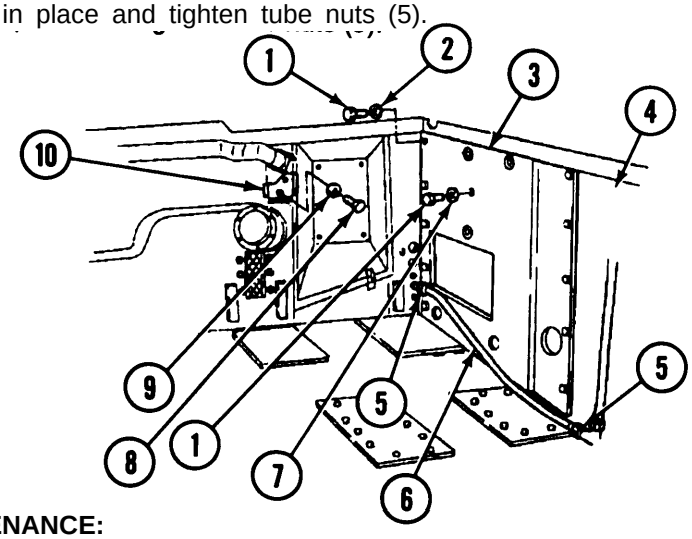


10. Position shield (23) in place on bulkhead (4) and secure with four screws (14) and washers (13). Install screws (12) and washers (11) in shield (23) and bulkhead (4).

11. Position shield (10) in place on bulkhead (4) and secure with two screws (8) and washers (9).

12. Position shield (3) in place on bulkhead (4) and secure with 13 screws (1), eight washers (7), and five washers (2).

13. Install tube (6) in place and tighten tube nuts (5).



FOLLOW-ON MAINTENANCE:

- Install engine air cleaner ducts and hoses (refer to TM 9-2350-287-20-1).
- Install engine mount release bar (para 3-5).
- Install lower fuel tank (para 4-4).
- Install powerpack (refer to TM 9-2350-287-20-1).

9-4. PROJECTILE RACK SECTION REPAIR.

This Task Covers:

a. Disassembly
b. Cleaning and Inspection
b. Assembly
c. Test

Initial Setup:

Tools/Test Equipment:
- Force gage (Item 18, Appendix D)
- General mechanic's tool kiti (Item 19, Appendix D)
- Projectile rack section test stand (Appendix E) (fabricated)
- Projectile with inert fuse (Item 27, Appendix D)
- Wire twisting pliers (Item 48, Appendix D)

Material/Parts:
- Cotter pin (9) (Item 4, Appendix H)
- Lockwasher (2) (Item 67, Appendix H)
- Lockwasher (2) (Item 56, Appendix H)
- Lockwire (4) (Item 71, Appendix H)
- Mounting rod (2) (Item 72, Appendix H)
- Self-locking nut (2) (Item 121, Appendix H)

Personnel Required: Two

Equipment Conditions:
- Projectile rack assembly on clean work surface (refer to TM 9-2350-287-20-2).

a. DISASSEMBLY

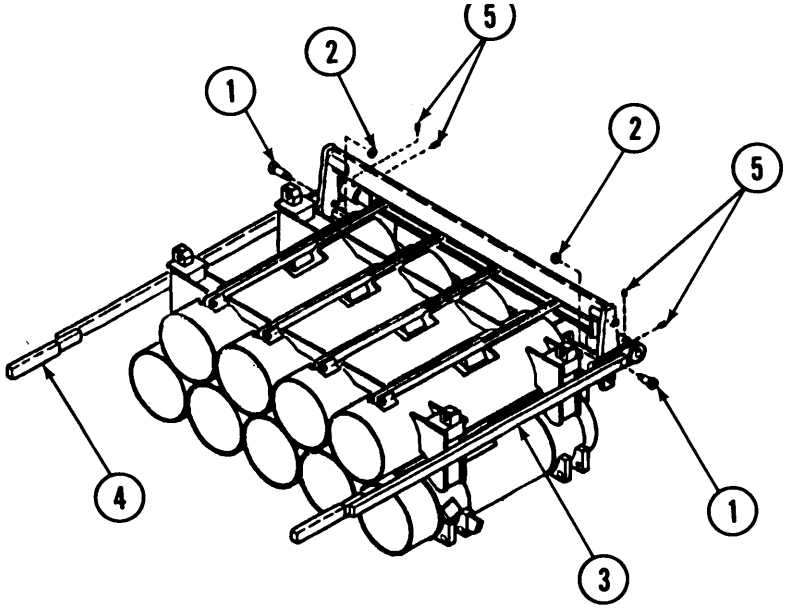
NOTE

Handles must be in release position before starling disassembly.

1. Remove screw (1) and self-locking nut (2) from right locking handle (3) and left locking handle (4). Discard self-locking nuts (2).

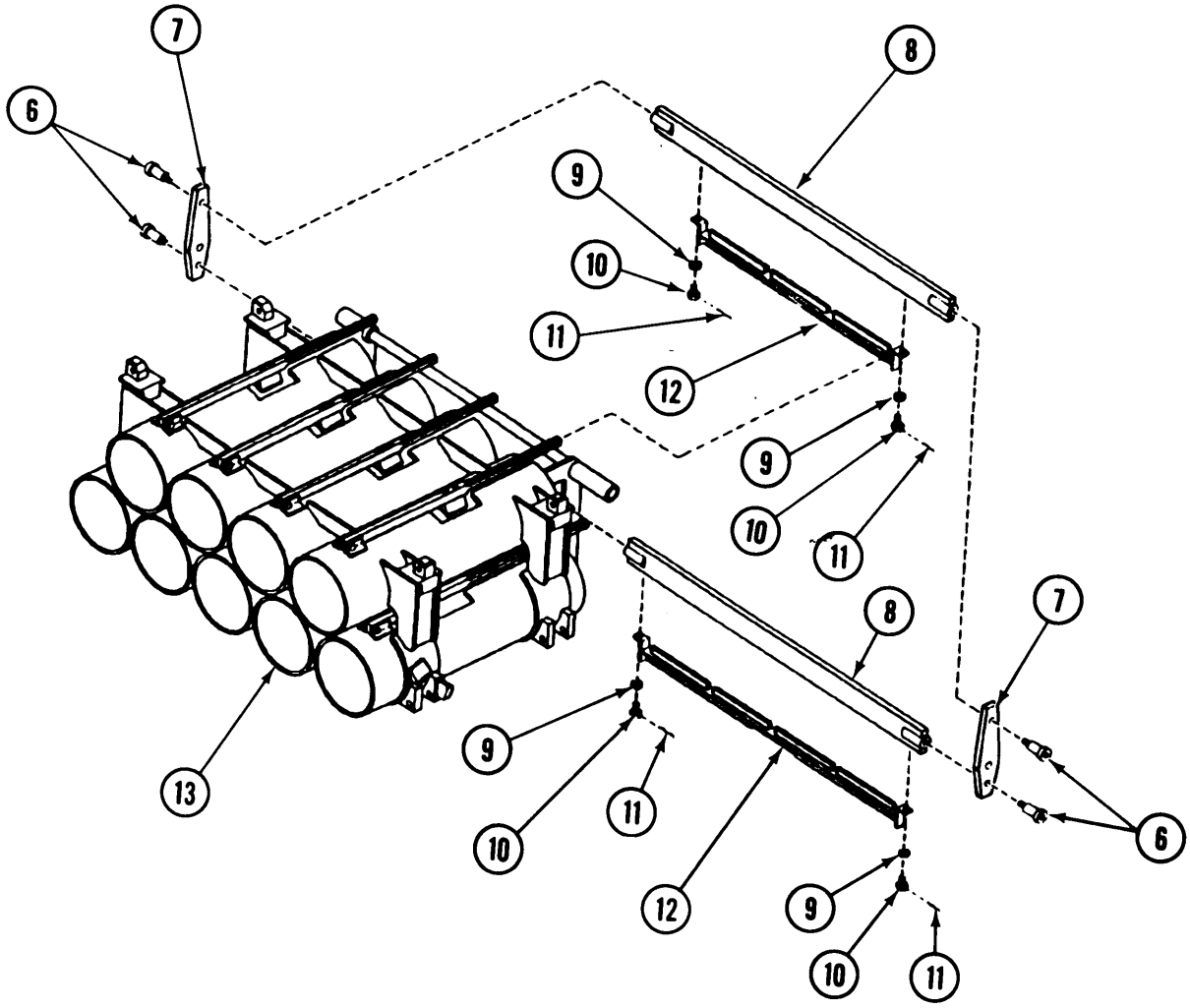
2. Loosen two setscrews (5) on right locking handle (3) and left locking handle (4).

3. Remove right locking handle (3) and left locking handle (4).



9-4. PROJECTILE RACK SECTION REPAIR (continued).

4. Remove four shoulder screws (6) from pivot plates (7).
5. Remove two pivot plates (7) from projectile rack section (13).
6. Remove upper locking plate (8) with support (12) attached, from projectile rack section (13).
7. Remove two lockwires (11) from upper support bar (12). Discard lockwires.
8. Remove two screws (10) and washers (9) from upper support bar (12).
9. Remove upper support bar (12) from upper locking plate (8).
10. Remove two lockwires (11) from lower support bar (12). Discard lockwires (11).
11. Remove two screws (10) and washers (9) from lower support bar (12).
12. Remove lower support bar (12) from lower locking plate (8).

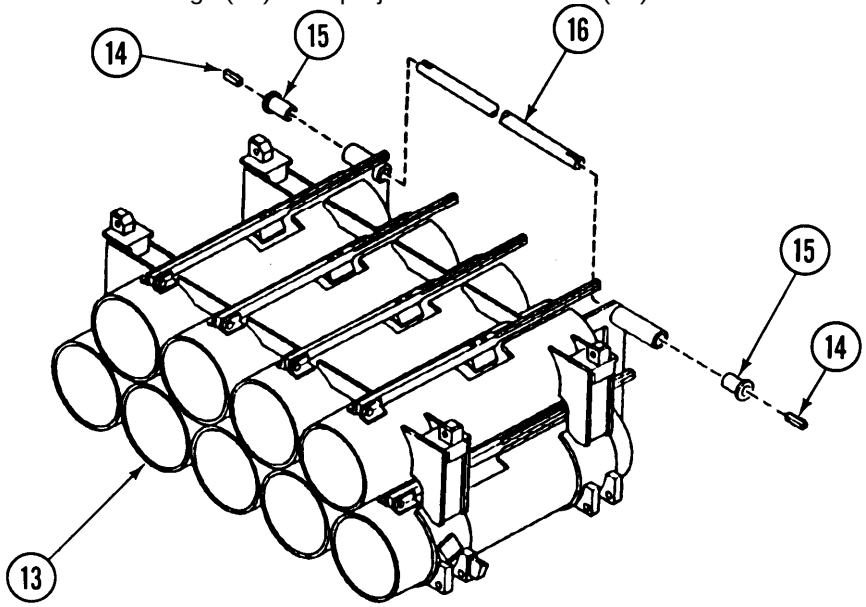


9-4. PROJECTILE RACK SECTION REPAIR (continued).

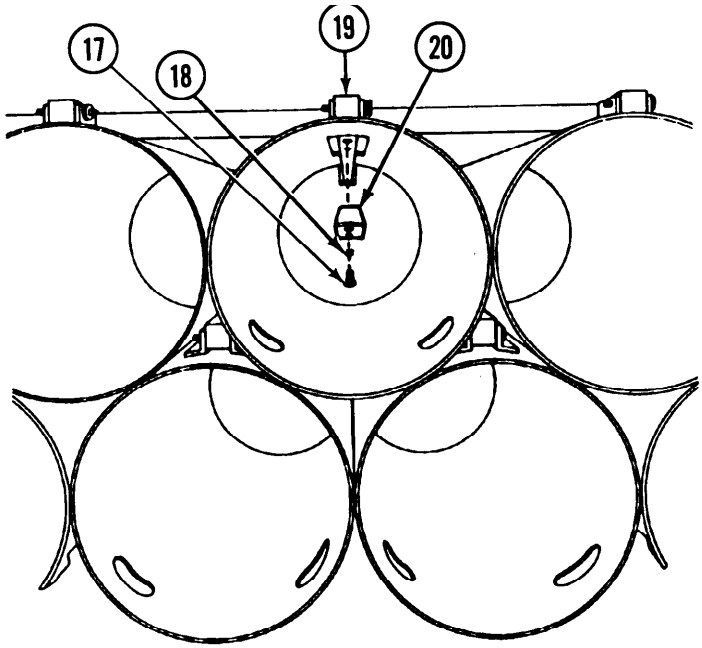
13. Remove two keys (14) from shaft (15).

14. Remove shaft (16) from projectile rack section (13).

15. Remove two sleeve bearings (15) from projectile rack section (13).



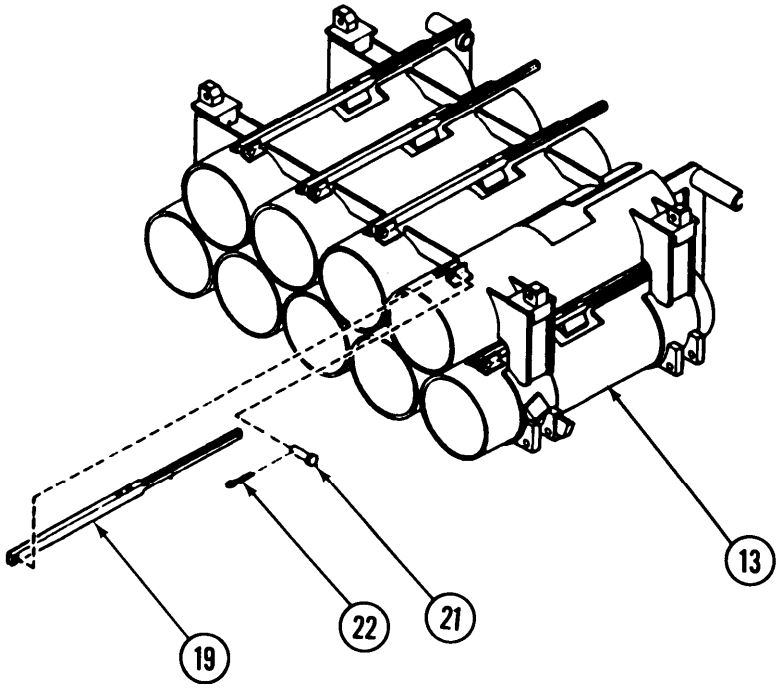
16. Remove two screws (17), two lockwashers (18) and locking shoe (20) from each locking bar (19). Discard lockwashers (18).



9-4. PROJECTILE RACK SECTION REPAIR (continued).

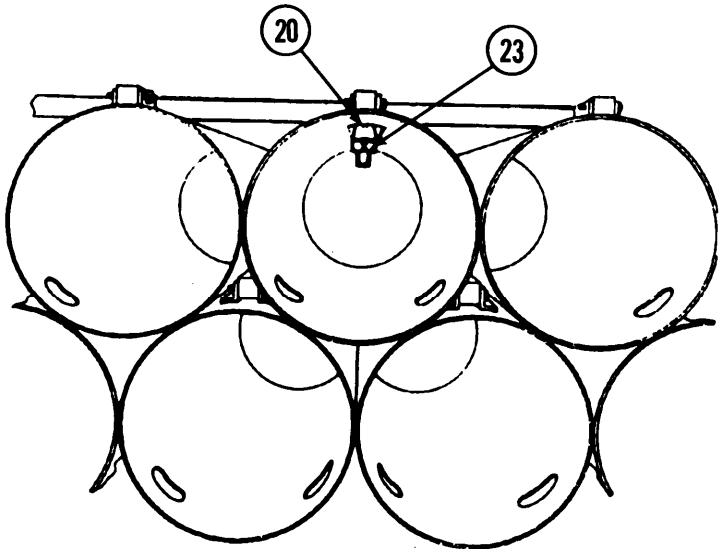
17. Remove nine cotter pins (22) and nine cam pins (21). Discard cotter pins.

18. Remove nine locking bars (19) from projectile rack section (13).



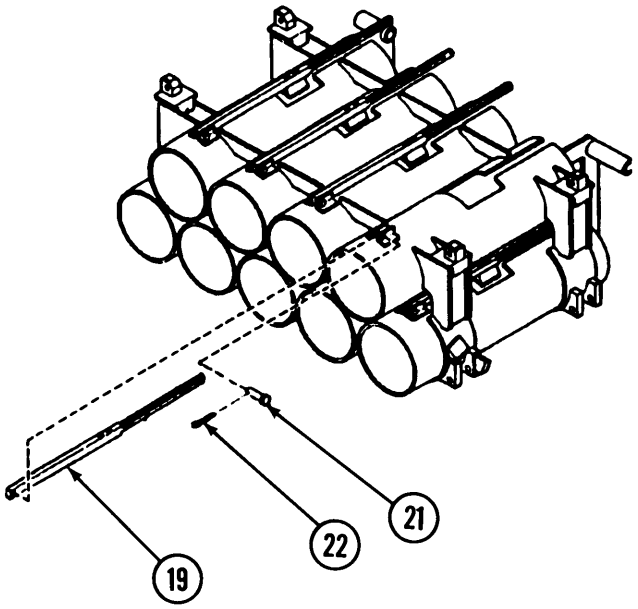
b. CLEANING AND INSPECTION

1. Inspect locking shoe (20) for separation of plastisol coating (23). Replace if necessary.



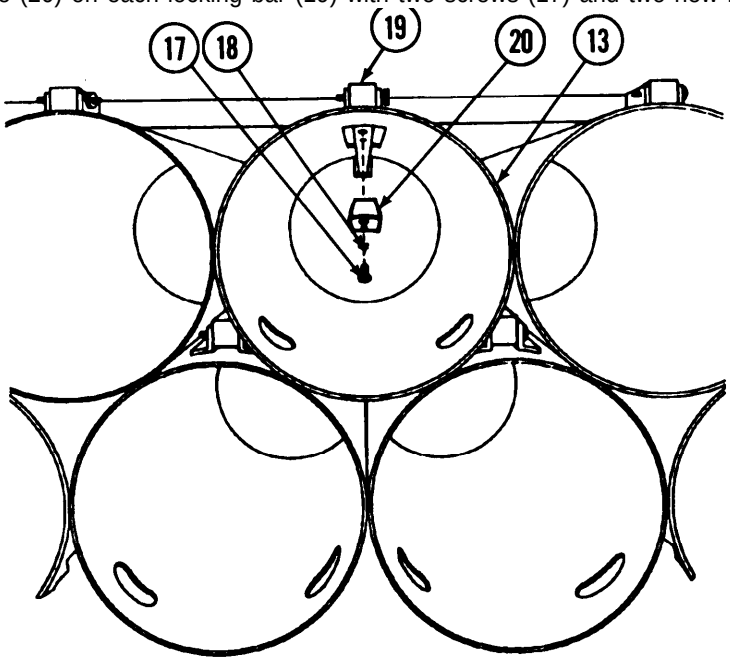
9-4. PROJECTILE RACK SECTION REPAIR (continued).

2. Inspect locking bar (19) and cam pin (21) for bends or looseness. Replace if necessary.



c. ASSEMBLY

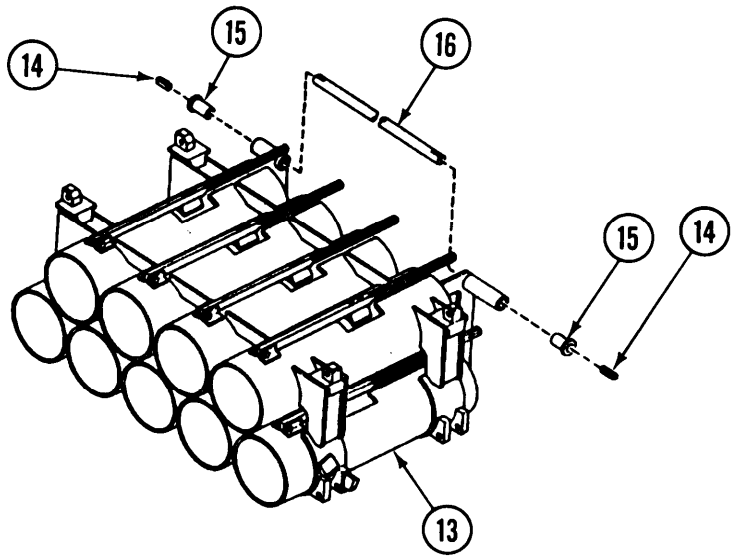
1. Install locking shoe (20) on each locking bar (19) with two screws (17) and two new lockwashers (18).



2. Install nine locking bars (19) on projectile rack section (13) with nine pins (21) and nine new cotter pins (22).

9-4. PROJECTILE RACK SECTION REPAIR (continued).

3. Install two sleeve bearings (15), shaft (16), and two keys (14) on projectile rack section (13).



4. Install lower support bar (12) on lower locking plate (8) with two screws (10) and washers (9).

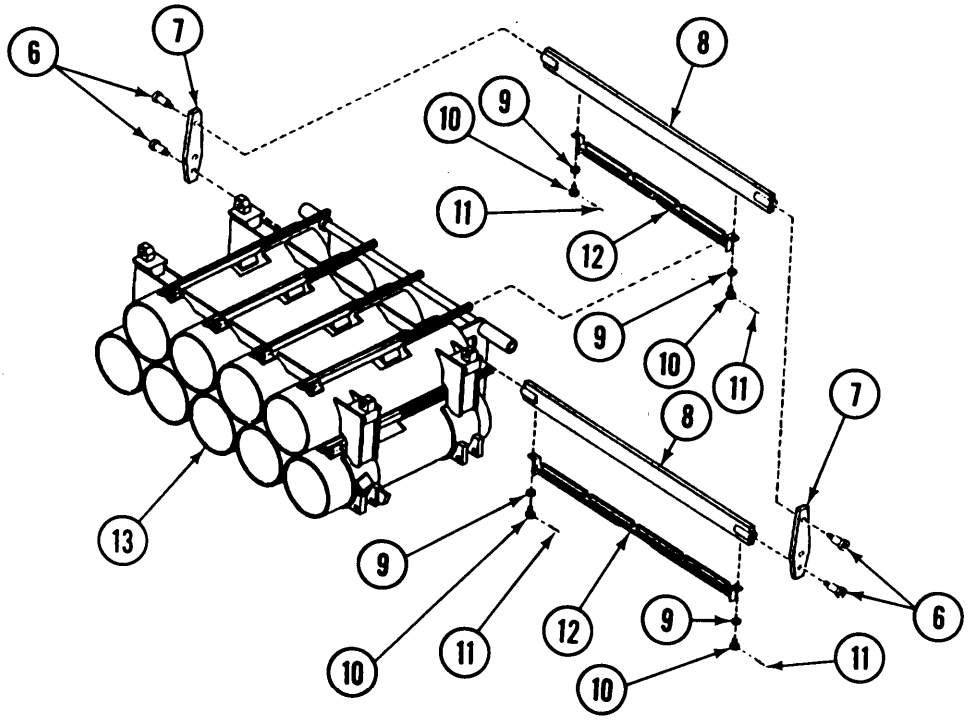
5. Install two new lockwires (11) on lower support bar (12).

6. Install upper support bar (12) on upper locking plate (8) with two screws (10) and washers (9).

7. Install two new lockwires (11) on upper support bar (12).

8. Install upper and lower locking plate (8) from projectile rack section (13).

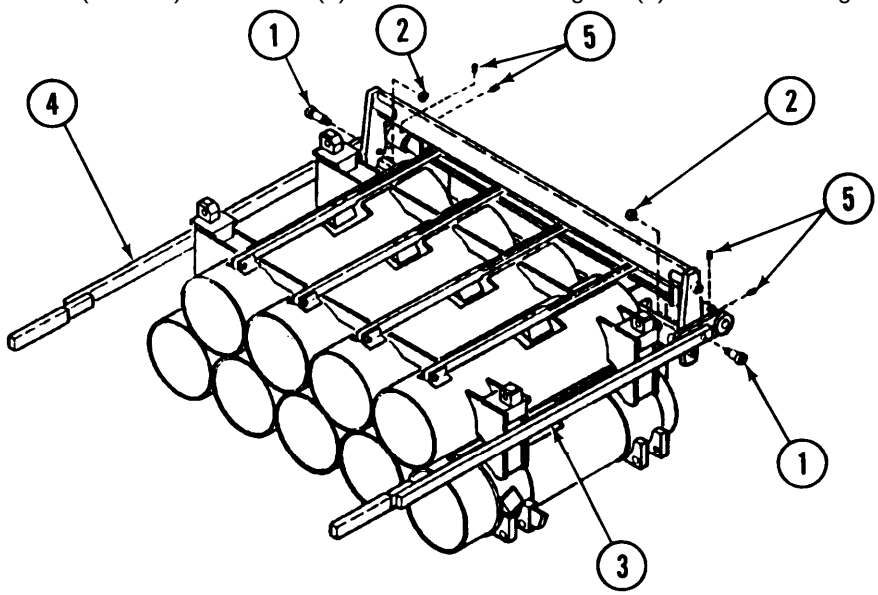
9. Install two pivot plates (7) from projectile rack section (13) with four shoulder screws (6).



9-4. PROJECTILE RACK SECTION REPAIR (continued).

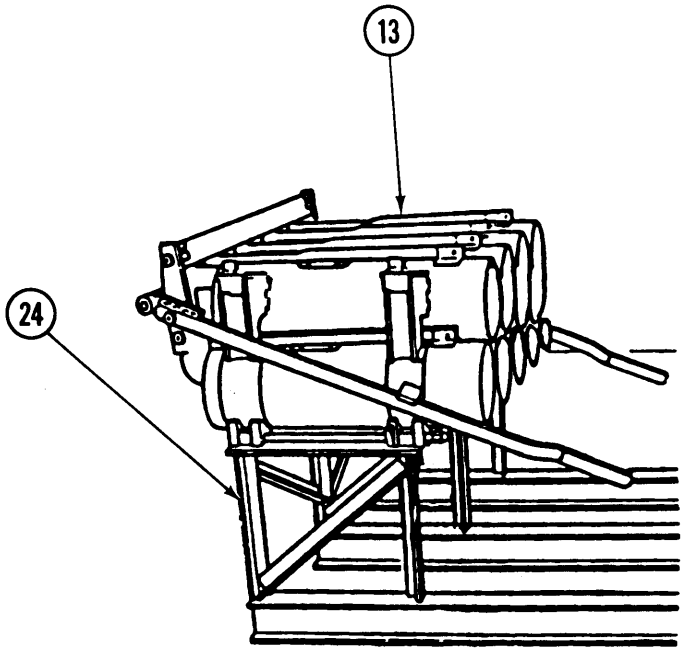
10. Install right locking handle (3) and left locking handle (4) and tighten two setscrews (5) on each locking handle (3 and 4).

11. Secure locking handles (3 and 4) with screw (1) and new self-locking nut (2) for each locking handle (3 and 4).



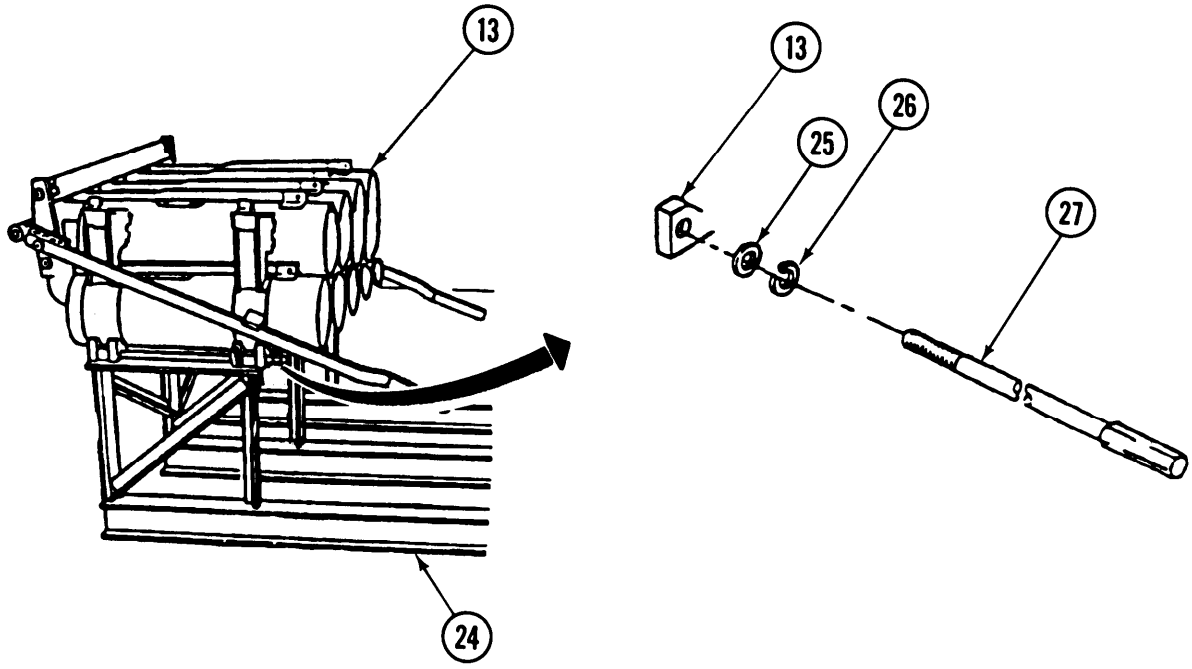
d. TEST

1. With the aid of an assistant, install projectile rack section (13) on test stand (24).



9-4. PROJECTILE RACK SECTION REPAIR (continued).

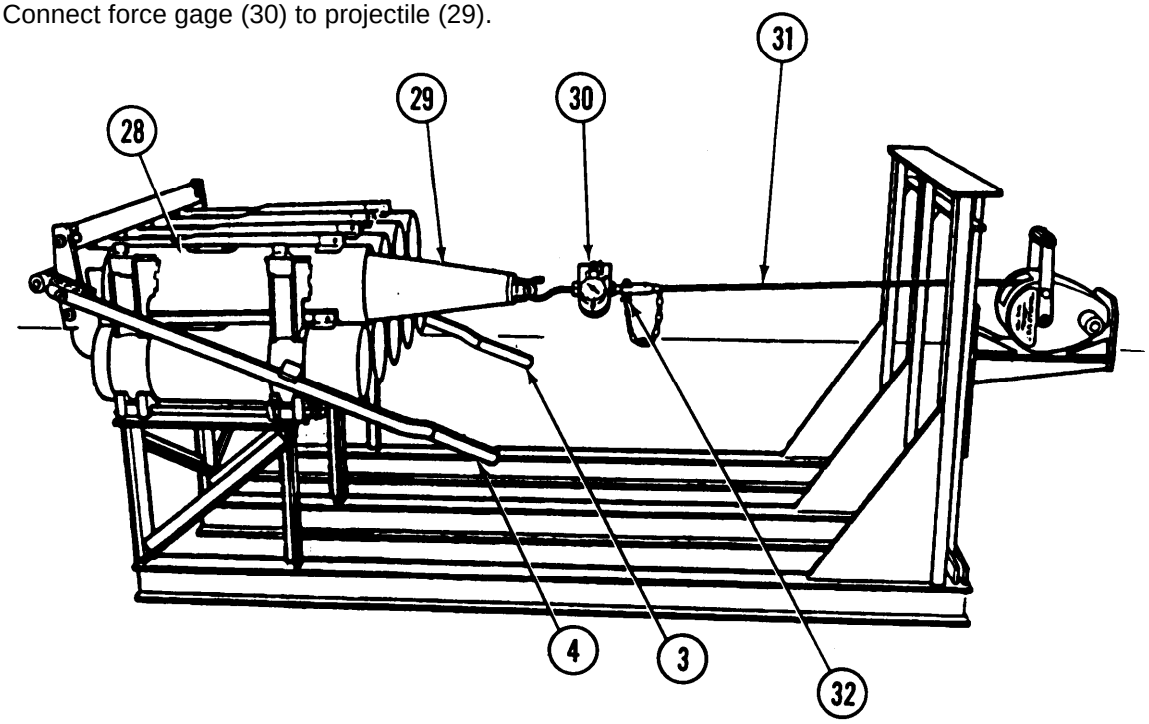
2. Secure projectile rack section (13) to test stand (24) with two mounting rods (27), lockwashers (26), and washers (25).



3. Install projectile (29) in tube (28), and depress right locking handle (3) and left locking handle (4).

4. Connect force gage (30) to cable (31) using quick release pin (32).

5. Connect force gage (30) to projectile (29).



9-4. PROJECTILE RACK SECTION REPAIR (continued).

WARNING

Projectile, cable, and connecting hardware under tension may snap out of position. Monitor force gage from a safe distance. SAFETY GOGGLES must be worn during test. Failure to heed this warning can result in Injury or death.

NOTE

Slippage may occur before full load is applied and will stop when rotating band contacts locking shoe.

6. Turn winch (33) and applied tension to projectile (29)

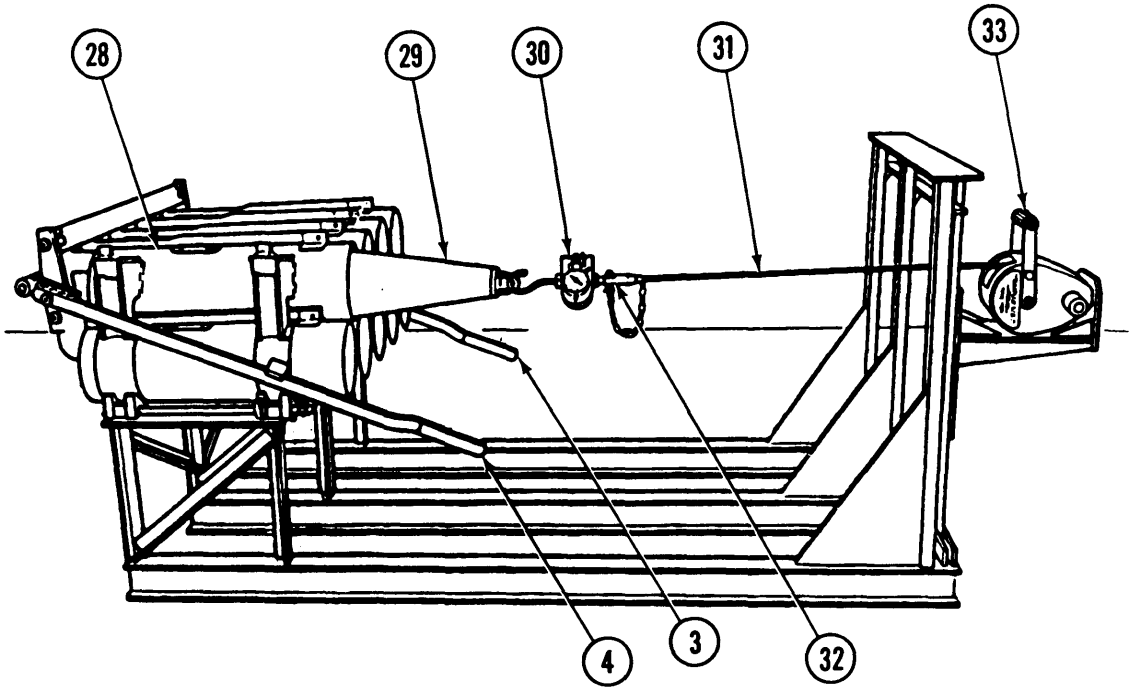
NOTE

- Projectile rack passes test if 400 lbs. of tension can be applied and rotating band does not pass under locking shoe.
- If it does not pass test, repair projectile rack assembly.

7. Remove force gage (30) from projectile (29).

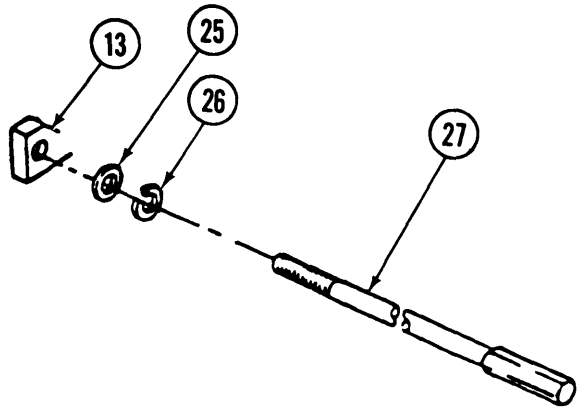
8. Remove quick release pin (32) and force gage (30) from cable.

9. Raise both locking handles (3 and 4) and remove projectile (29) from tube (28).

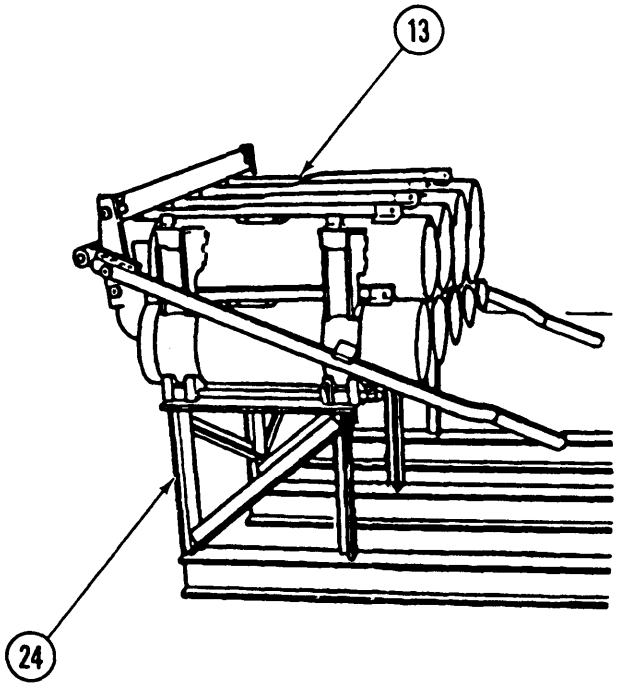


9-4. PROJECTILE RACK SECTION REPAIR (continued).

10. Remove two mounting rods (27), lockwashers (26), and washers (25) from projectile rack section (13).



11. With the aid of an assistant, remove projectile rack section (13) from test stand (24).



FOLLOW-ON MAINTENANCE:

- None

9-5. CARGO TIE DOWNS AND NET ASSEMBLIES REPAIR.

Refer to FM 10-16 to repair the cargo tie downs and net assemblies.

9-6. CANISTER COMPARTMENT RESTRAINT BAR ASSEMBLIES REPAIR.

Canister compartment restraint bar assernblies can be repaired by replacing damgedt hreaded inserts, or by welding, For general welding procedures, refer to TM 9-237. For threaded insert replacement, refer to para 2-13.

CHAPTER 10
ACCESSORY ITEMS MAINTENANCE

Paragraph Number	Paragraph Title	Page Number
10-1	General	10-1
10-2	Bilge Pump Repair	10-1
10-3	Personnel Air Duct Ventilating Fan Repair	10-8
10-4	Personnel Heater Support Assemblies and Resilient Mounts Replacement	10-16
10-5	APU Compartment Front and Side Door Access Cover Fastener Installation	10-18
10-6	Shroud Assembly Repair	10-20

10-1. GENERAL.

This chapter provides instructions for the disassembly, cleaning, inspection, repair, and assembly of the bilge pump, personnel ventilating fan, personnel heater support assemblies and mounts, and the auxiliary power unit front and side door access cover fasteners. These procedures are at the Direct Support level of maintenance.

10-2. BILGE PUMP REPAIR.

This Task Covers:

a. Disassembly
b. Cleaning and Inspection
c. Assembly

Initial Setup:

Tools/Test Equipment:
- Face wrench socket (Item 16, Appendix D)
- General mechanic's tool kit (Item 19, Appendix D)
- Multimeter (Item 23, Appendix D)

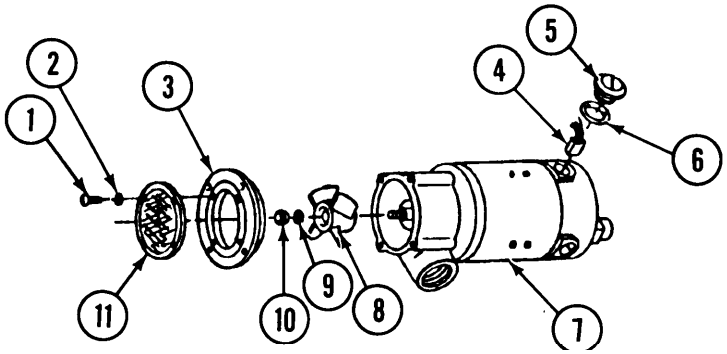
Materials/Parts:
- Rag (Item 17, Appendix B)
- Bilge pump parts kit (Item 2, Appendix H)
- Bilge pump parts kit (Item 3, Appendix H)
- Gasket (Item 24, Appendix H)
- Gasket (4) (Item 25, Appendix H)
- Lockwasher (16) (Item 67, Appendix H)
- Lockwasher (2) (Item 55, Appendix H)

Equipment Conditions:
- Bilge pump placed on clean work surface.

10-2. BILGE PUMP REPAIR (continued).

a. DISASSEMBLY

1. Match markimpeller cover (3) and impeller housing (19) to bilge pump (7).

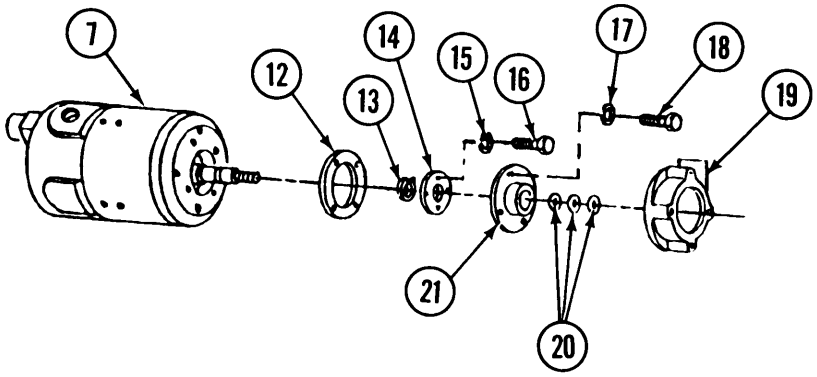


2. Match mark impeller housing (19) to bilge pump (7).

3. Remove four brush caps (5), preformed packings (6), and brushes (4) from bilge pump (7). Discard preformed packings and brushes.

4. Remove four screws (1) and lockwashers (2), inlet screen (11), and impeller cover (3) from bilge pump (7). Discard lockwashers.

5. Remove nut (10), lockwasher (9), and impeller (8) from bilge pump (7). Discard lockwasher.



6. Pull impeller housing (19) from bilge pump (7).

7. Remove four screws (18) and lockwashers (17), seal cover (21), and gasket (12) from bilge pump (7). Discard lockwashers and gasket.

8. Remove three shaft seals (20) from seal cover (21). Discard shaft seals.

WARNING

Snaprings are under spring tension and will snap out of position when removed. To avoid injury to personnel, use care during removal.

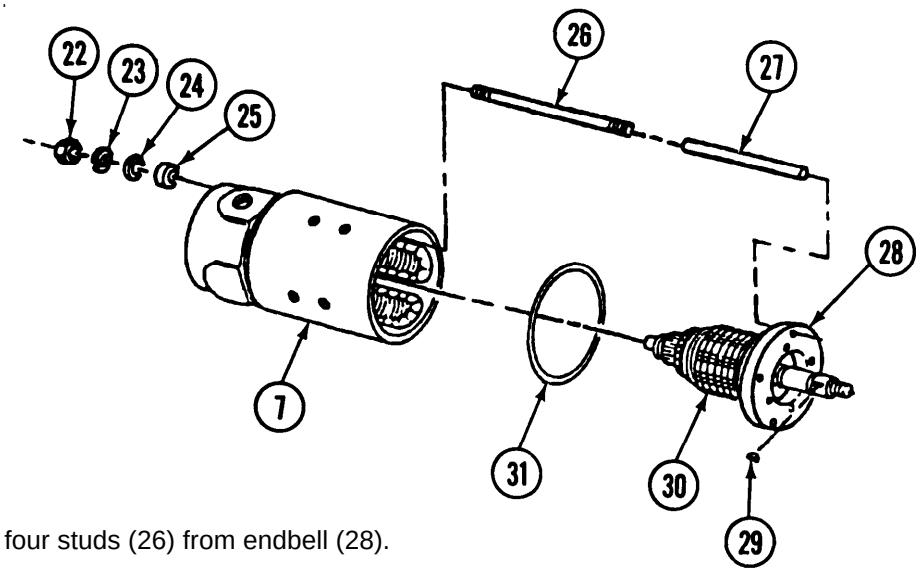
9. Remove four screws (16) and lockwashers (15), plate (14), and snapring (13) from bilge pump (7). Discard lockwashers and snapring.

10-2. BILGE PUMP REPAIR (continued).

10. Match mark endbell (28) with bilge pump (7).

11. Remove four nuts (22), lockwashers (23), washers (24), and gaskets (25) from four studs (26). Discard lockwashers and gaskets.

12. Remove endbell (28), motor armature (30), gasket (31), and four glass sleeves (27) and studs (26) from bilge pump (7).



13. Remove four studs (26) from endbell (28).

14. Remove armature (30) from endbell (28).

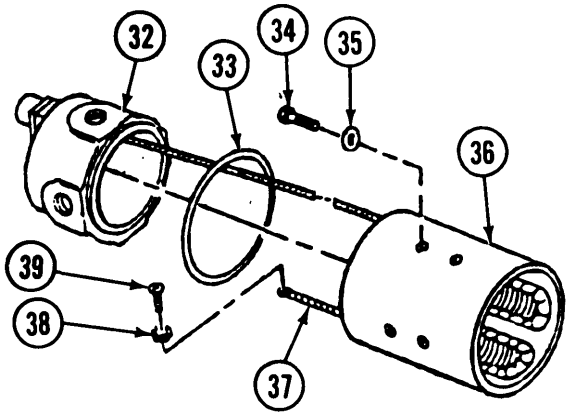
15. Remove key (29) from armature (30).

16. Match mark endbell (32) with motor stator (36).

17. Remove eight screws (34) and washers (35) from motor stator (36).

18. Remove screw (39) and lockwasher (38) to release wire (37) from motor stator (36) to inside of endbell (32). Discard lockwasher.

19. Remove motor stator (36) and gasket (33) from endbell (32).

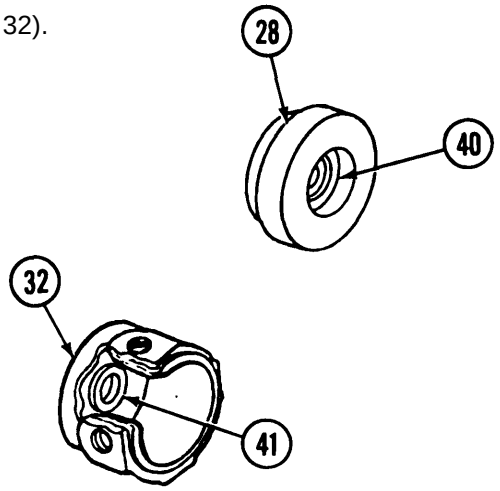


10-2. BILGE PUMP REPAIR (continued).

NOTE

Perform step 19 only if bearings are defective.

20. Remove bearing (40 or 41) from endbell (28 or 32).



b. CLEANING AND INSPECTION

WARNING

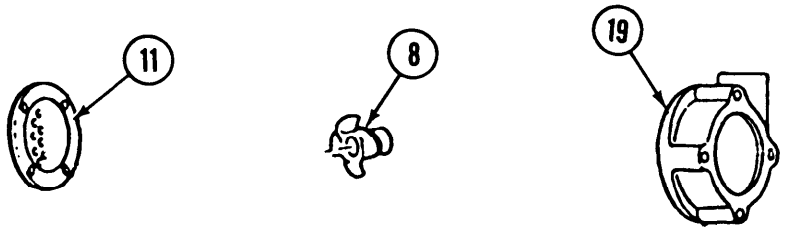
- **Drycleaning solvent P-D-680 is toxic and flammable. Always wear protective goggles and gloves, and use in a well-ventilated area. Avoid contact with skin, eyes, and clothes, and DO NOT breathe vapors. DO NOT use near open flames or excessive heat.**

- **Compressed air used for cleaning o rdrying purposes, or for clearing out restrictions, should never exceed 30 psi (207 kPa). To avoid injury, wear protective clothing (e.g., goggles/shield, gloves) and exercise caution.**

1. Clean and inspect inlet screen (11). Blowout mesh with compressed air. Replace inlet screen (11) if torn or damaged.

2. Inspect impeller (8) for cracks, nicks, burrs. Smooth out nicks and burrs. Replace if defective.

3. Inspect impeller housing (19) for cracks, warped mating surface, or other damage. Replace if defective.

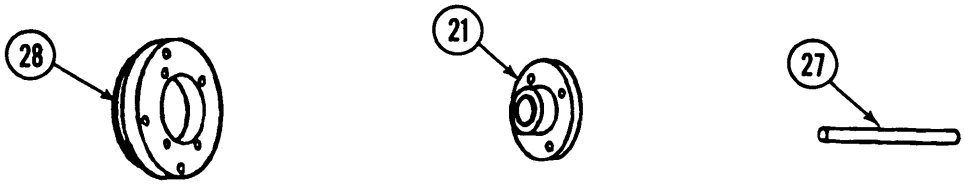


10-2. BILGE PUMP REPAIR (continued).

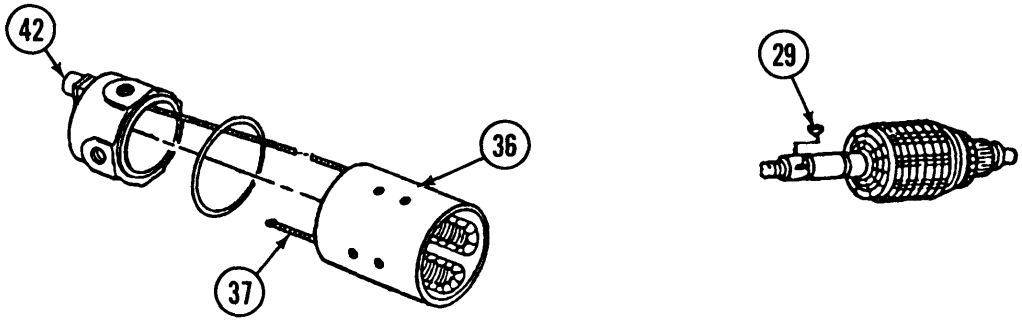
4. Inspect endbell (28) for cracks and warped mating surfaces. Replace if defective.

5. Inspect seal cover (21) for cracks, warped mating surface, or other damage. Replace if defective.

6. Inspect four glass sleeves (27) for chips or breaks. Replace if defective.



7. Connect red lead of multimeter to wire (37) and black lead to pin in connector (42) and check motor stator (36) for continuity. If defective, replace bilge pump.



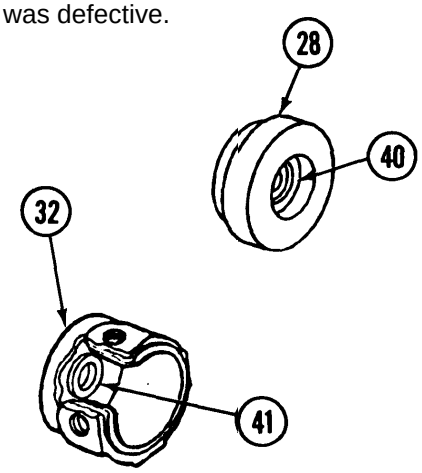
8. Inspect key (29) for damage. Replace if defective.

c. ASSEMBLY

NOTE

Perform step 1 only if bearing was defective.

1. Install new bearing (40 or 41) in endbell (28 or 32).

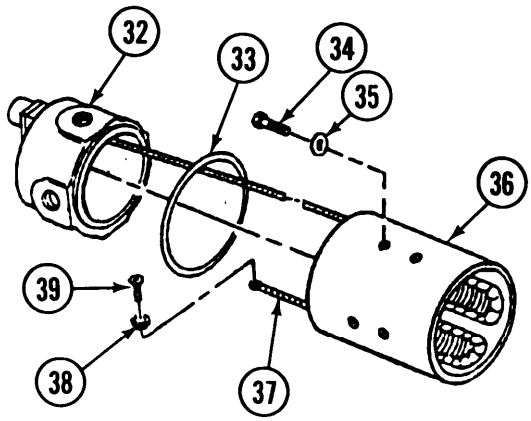


10-2. BILGE PUMP REPAIR (continued).

2. Secure wire (37) from motor stator (36) to endbell (32) with new lockwasher (38) and screw (39).

3. Install eight screws (34) and washers (35) in motor stator (36).

4. Install endbell (32) and gasket (33) on motor stator (36).



5. Install key (29) on armature (30).

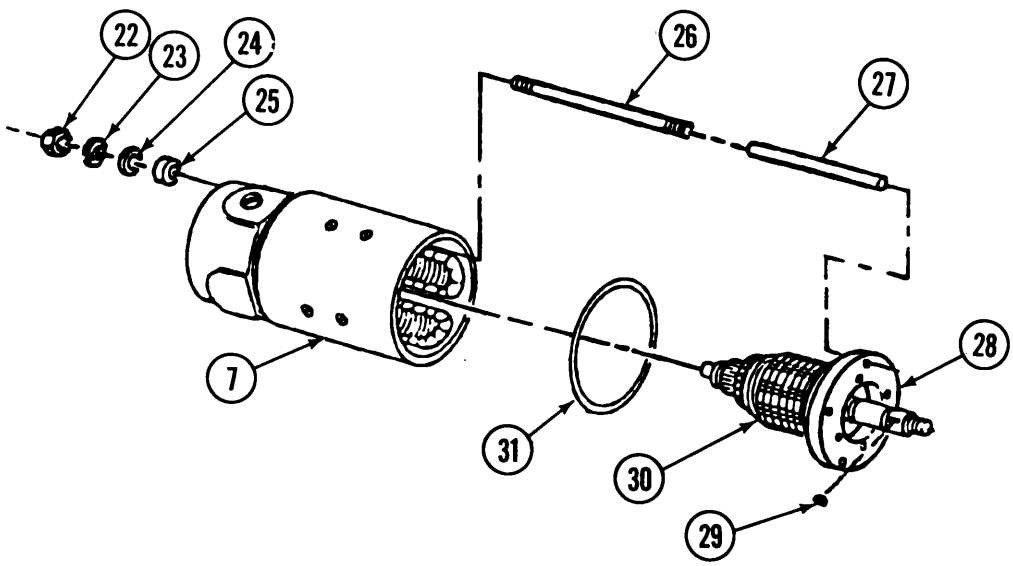
6. Install armature (30) in endbell (28).

7. Install four studs (26) on endbell (28).

8. Install four glass sleeves (27) on four studs (26).

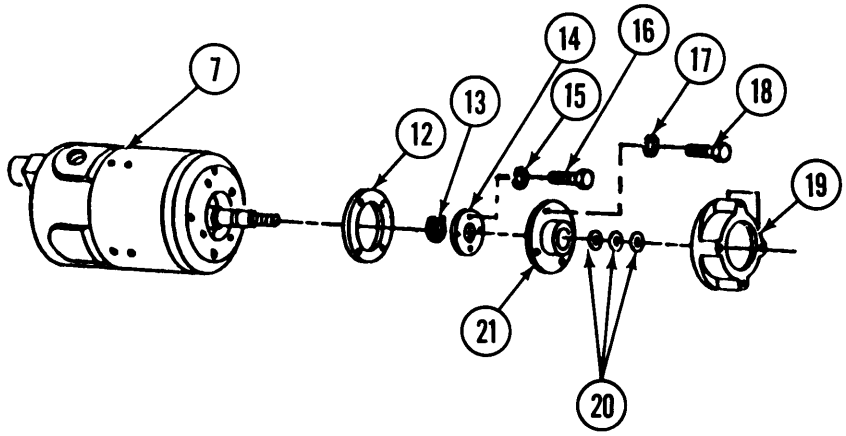
9. Install endbell (28), four studs (26) and glass sleeves (27), armature (30), and new gasket (31) in bilge pump (7) as an assembly.

10. Install four new gaskets (25) and four washers (24), new lockwashers (23), and nuts (22) on ends of four studs (26).



10-2. BILGE PUMP REPAIR (continued).

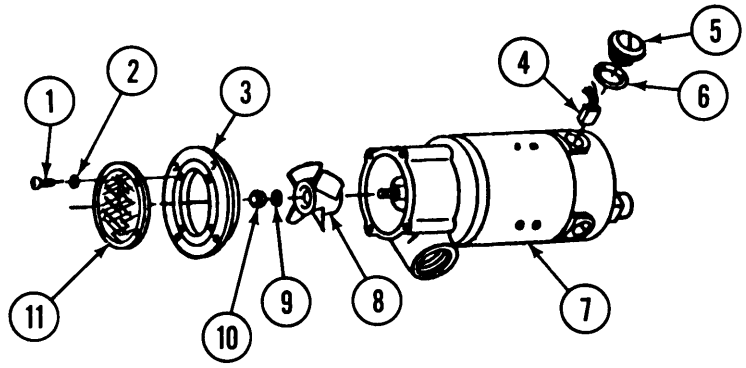
11. Install new snapring (13) and plate (14) on bilge pump (7). Secure plate (14) with four new lockwasher (15) and four screws (16).



12. Install three new shaft seals (20) in seal cover (21). Install new gasket (12) on seal cover (21), and install seal cover (21) on bilge pump (7).

13. Secure seal cover (21) with four new lockwashers (17) and four screws (18).

14. Install impeller housing (19) on bilge pump (7).



15. Install impeller (8) on bilge pump (7). Using face wrench socket, secure impeller (8) with nut (10) and new lockwasher (9).

16. Install impeller cover (3) and inlet screen (11) on bilge pump (7) and secure with four new lockwashers (2) and four screws (1).

17. Install four new brushes (4), new preformed packings (6), and brush caps (5) on bilge pump (7).

FOLLOW-ON MAINTENANCE:

- Install bilge pump (refer to TM 9-2350-287-20-2).

10-3. PERSONNEL AIR DUCT VENTILATING FAN REPAIR.

This Task Covers:

a. Disassembly
b. Inspection and Repair
c. Assembly
d. Test

Initial Setup:

Tool/Test Equipment:
- Arbor press (Item 4, Appendix D)
- General mechanic's tool kit (Item 19, Appendix D)
- Growler (Item 20, Appendix D)
- Multimeter (Item 23, Appendix D)
- Power supply (Item 26, Appendix D)
- Wire twisting pliers (Item 48, Appendix D)

Materials/Parts:
- Nonelectrical wire (Item 27, Appendix B)
- Drive screw (2) (Item 14, Appendix H)
- l Grommet (Item 36, Appendix H)
- Lockwasher (2) (Item 50, Appendix H)
- Lockwasher (4) (Item 140, Appendix H)
- Retaining ring (2) (Item 99, Appendix H)
- Self-locking nut (Item 120, Appendix H)
- Spring tension washer (Item 130, Appendix H)

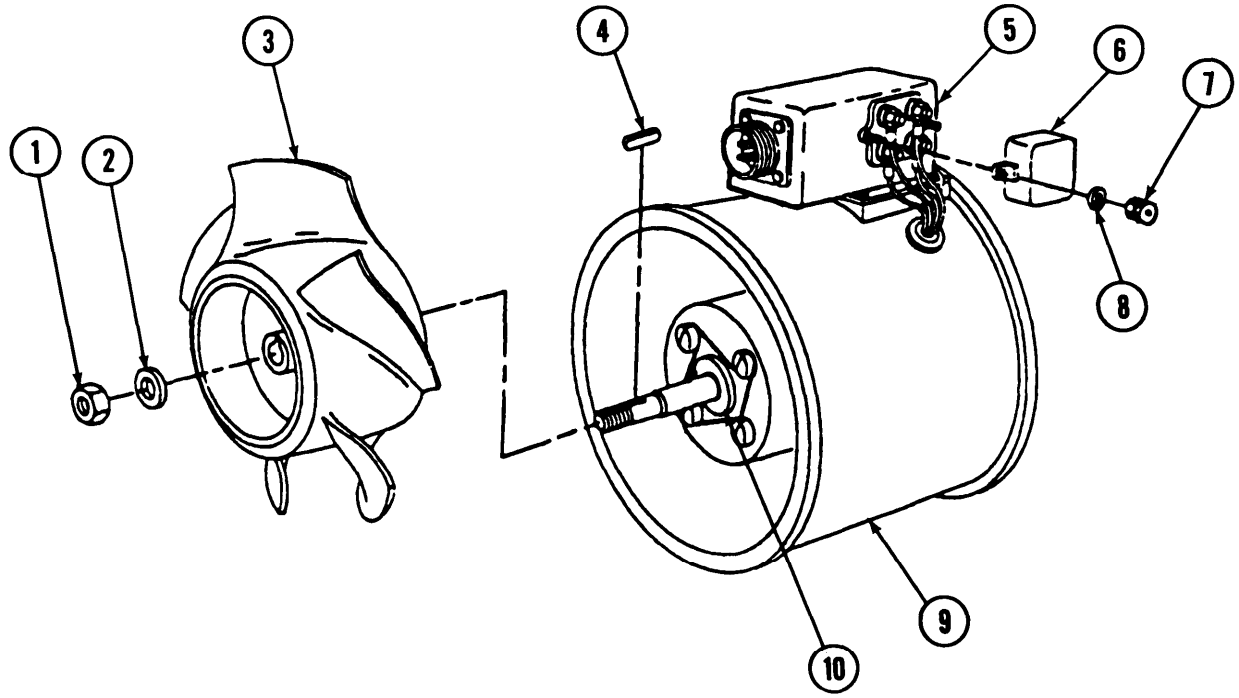
References:
- TM 9-214

Equipment Conditions:
- Personnel ventilating air duct fan placed on clean work surface.

a. DISASSEMBLY

1. Remove self-locking nut (1), washer (2), impeller (3), shaft key (4), and two washers (10) from fan assembly housing (9). Discard self-locking nut.

2. Remove two nuts (7) and lockwashers (8) and cover (6) from noise filter (5). Discard lockwashers.



10-3. PERSONNEL AIR DUCT VENTILATING FAN REPAIR (continued).

NOTE

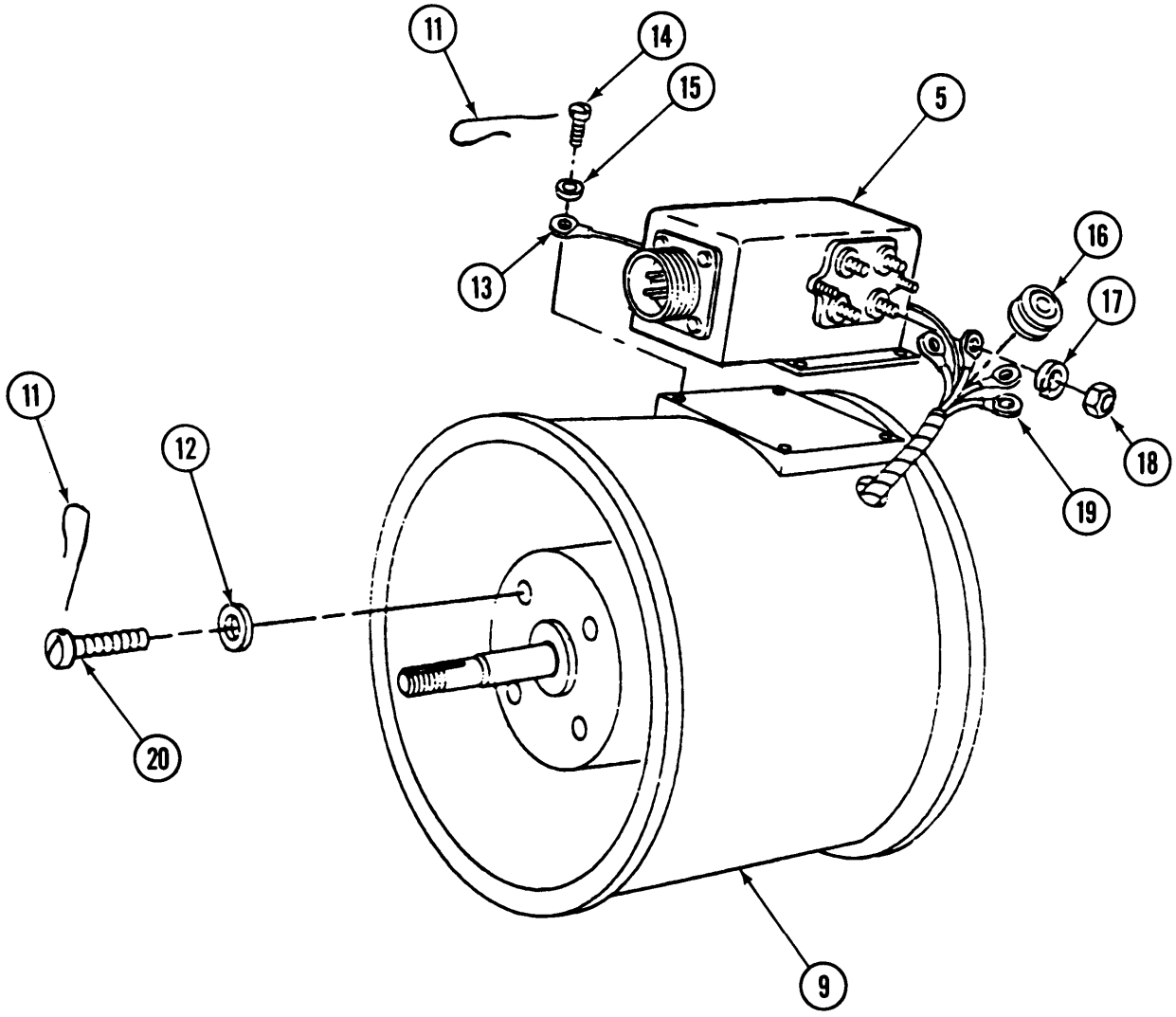
To ensure proper installation, make sure electrical leads are tagged.

3. Remove four nuts (18), lockwashers (17), and electrical leads (19) from noise filter (5). Discard lockwashers.

4. Remove nonelectrical wire (11), four screws (14) and washers (15), ground wire lead (13), and noise filter (5) from fan assembly housing (9). Discard nonelectrical wire.

5. Remove nonelectrical wire (11) and four screws (20) and washers (12) from front of fan assembly housing (9). Discard nonelectrical wire.

6. Remove grommet (16) from fan assembly housing (9). Feed four electrical leads (19) and ground wire lead (13) through grommet (16). Discard grommet.

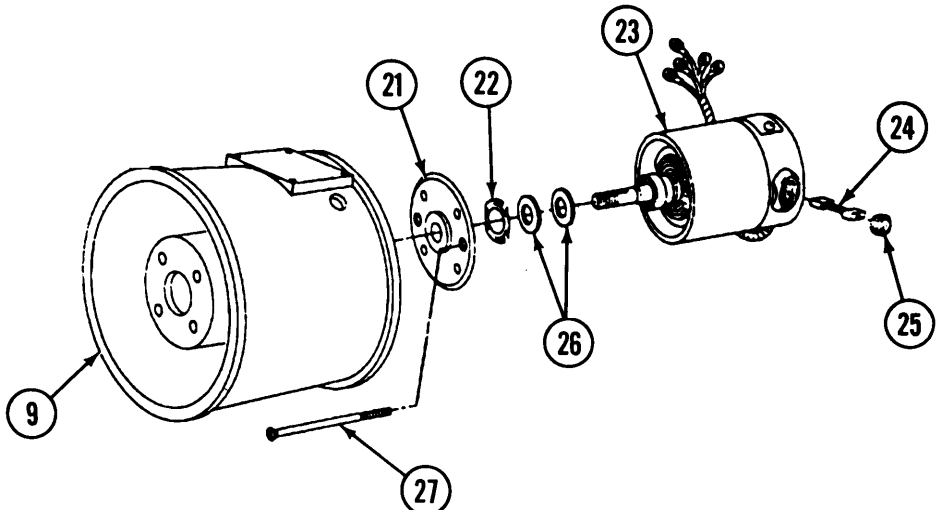


10-3. PERSONNEL AIR DUCT VENTILATING FAN REPAIR (continued).

7. Remove motor assembly (23) from fan assembly housing (9).

8. Remove two screws (27), end cover (21), spring tension washer (22), and two washers (26) from motor assembly (23).

9. Remove two brush caps (25) and electrical brushes (24) from motor assembly (23).



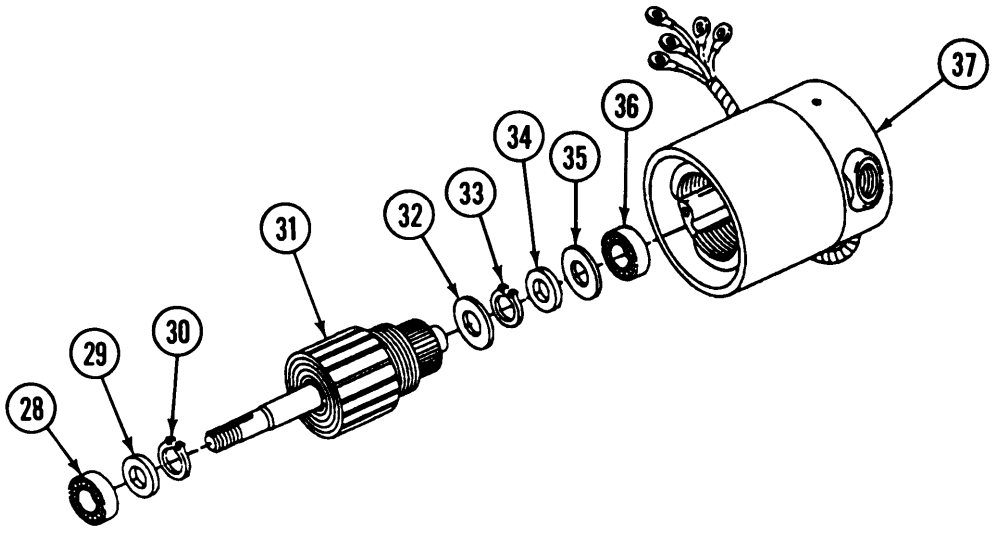
10. Remove armature (31) from motor housing (37).

WARNING

Safety goggles should be worn when removing retaining rings. Retaining rings are under spring tension and can act as projectiles when released. Failure to follow this warning can result in severe eye injury.

11. Remove bearing (36), washer (35), retaining ring (30), insulator (34), and washer (32) from armature (31).

12. Remove bearing (28), washer (29), and retaining ring (33) from armature (31).



10-3. PERSONNEL AIR DUCT VENTILATING FAN REPAIR (continued).

b. INSPECTION AND REPAIR

1. Inspect impeller (3) for nicks and cracks. Replace if necessary.

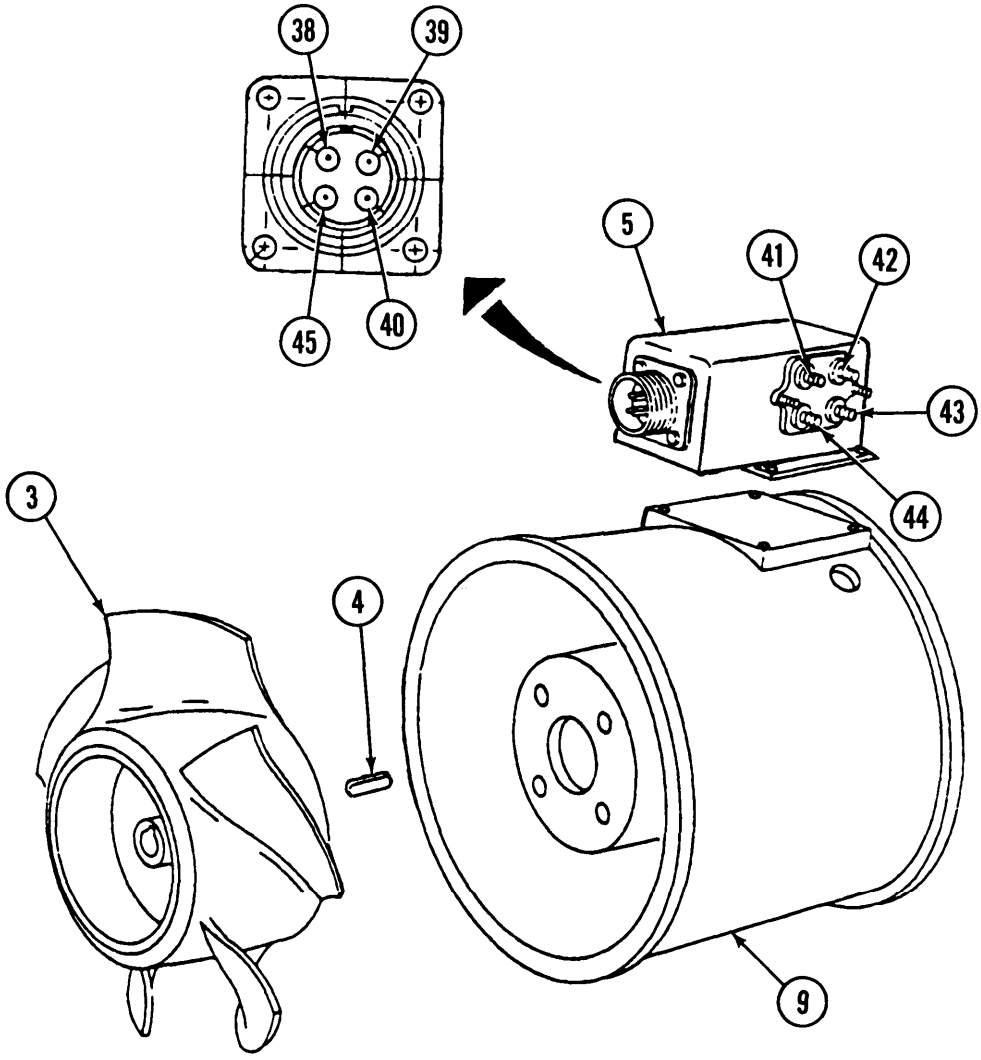
2. Using a multimeter, check noise filter (5) for continuity. If continuity does not exist between pins C (45) and D (38) and between pins A (39) and B (40), replace noise filter (5).

3. Using a multimeter, check noise filter (5) for continuity. If continuity does not exist between pin A (39) and terminal (41), between pin B (40) and terminal (42), between pin C (45) and terminal (43), and between pin D (40) and terminal (44), replace noise filter (5).

4. Inspect fan assembly housing (9) for cracks. Replace if necessary.

5. Inspect fan assembly housing (9) for cracks, bends, or signs of damage. Replace fan assembly housing (9) if necessary.

6. Inspect shaft key (4). Replace if damaged.



10-3. PERSONNEL AIR DUCT VENTILATING FAN REPAIR (continued).

7. Measure length of two brushes (24). Replace brushes (24) if measurement is less than 1/4 inch.

8. Inspect two brush caps (25). Replace if threads are damaged.

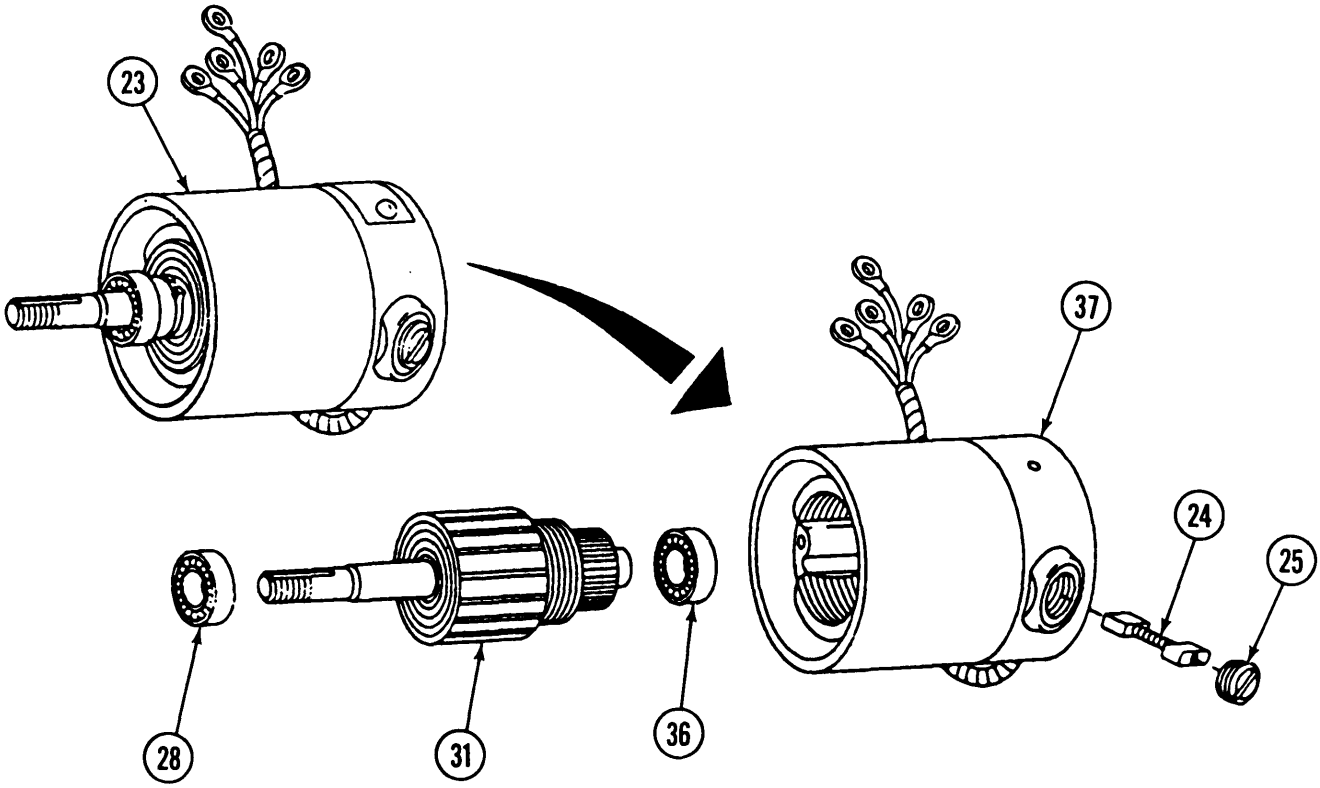
NOTE

If armature or motor assembly is damaged or defective, or if armature shaft is worn beyond the limits for proper bearing fit, replace motor assembly as a unit.

9. Test armature (31) on growler. If defective, replace motor assembly (23).

10. Using a multimeter, test motor housing (37) for shorts or open field windings. Replace if defective.

11. Inspect two bearings (28 and 36) (refer to TM 9-214). Replace if defective.



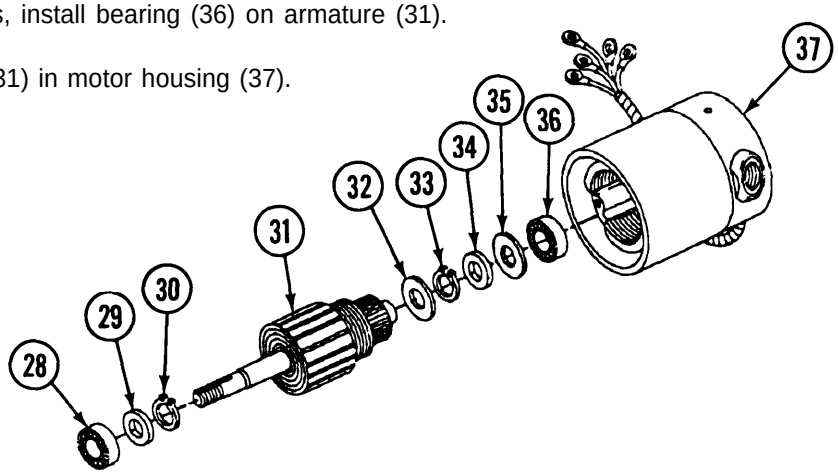
10-3. PERSONNEL AIR DUCT VENTILATING FAN REPAIR (continued).

c. ASSEMBLY

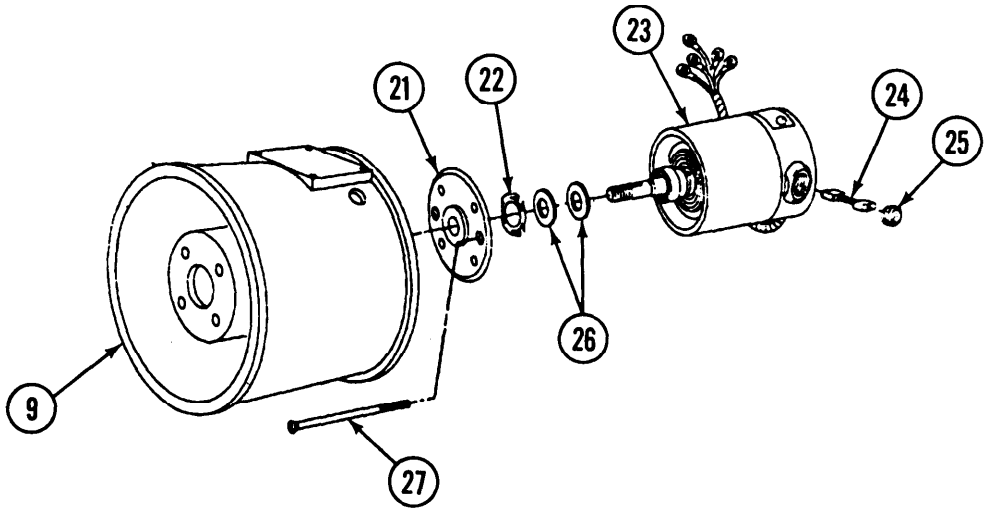
WARNING

Safety goggles should be worn when installing retaining rings. Retaining rings are under spring tension and can act as projectiles when released. Failure to follow this warning can result in severe eye injury.

1. Install retaining ring (30) and washer (29) on armature (31).
2. Using arbor press, install bearing (28) on armature (31).
3. Install washer (32), insulator (34), retaining ring (33), and washer (35) on armature (31).
4. Using arbor press, install bearing (36) on armature (31).
5. Install armature (31) in motor housing (37).

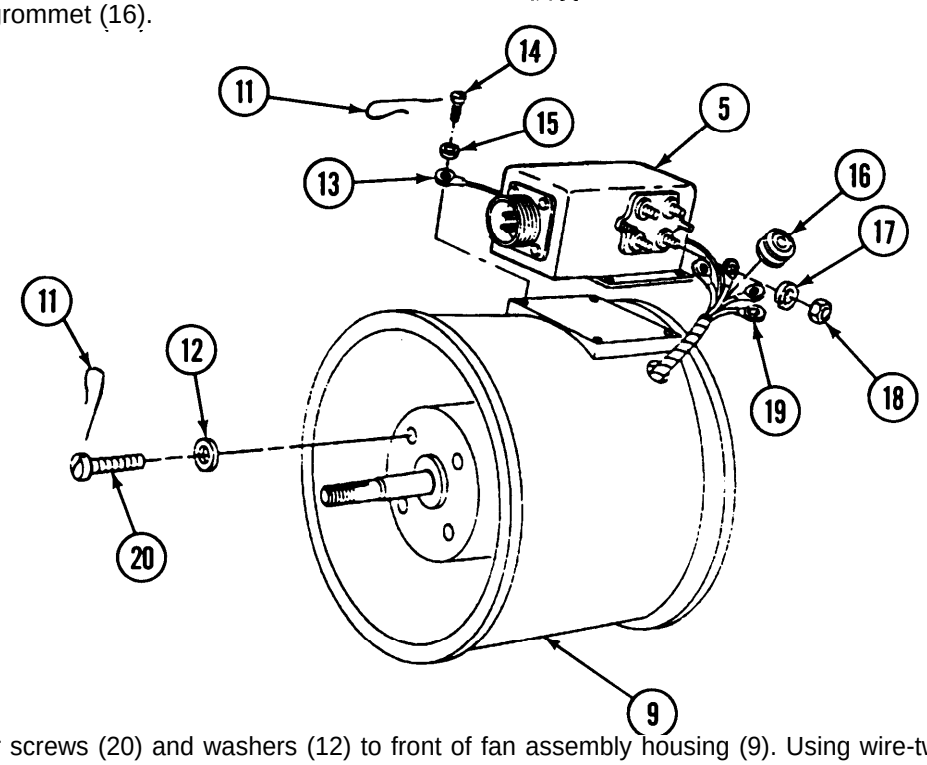


6. Install two brushes (24) and brush caps (25) in motor assembly (23).
7. Install two washers (26), new spring tension washer (22), and end cover (21) on motor assembly (23) and secure with two screws (27).
8. Install motor assembly (23) in fan assembly housing (9).



10-3. PERSONNEL AIR DUCT VENTILATING FAN REPAIR (continued).

9. Install grommet (16) in fan assembly housing (9). Feed four electrical leads (19) and ground wire lead (13) through grommet (16).



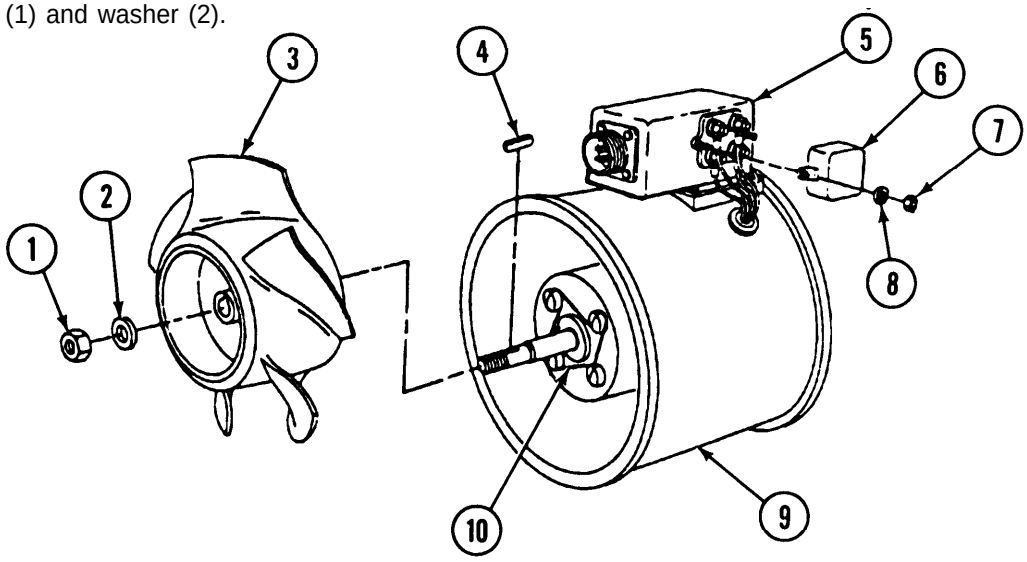
10. Install four screws (20) and washers (12) to front of fan assembly housing (9). Using wire-twist pliers, secure four screws (20) with new nonelectrical wire (11).

11. Install noise fitter (5) on fan assembly housing (9) ground wire lead (13), and secure with four screws (14) and washers (15). Using wire-twist pliers, secure four screws (14) with new nonelectrical wire (11).

12. Install four electrical leads (19) to noise fitter (5) with four nuts (18) and new lockwashers (17).

13. Install cover (6) on noise filter (5) and secure with two nuts (7) and new lockwashers (8).

14. Install two washers (10), shaft key (4), and impeller (3) on front of fan assembly housing (9) and secure with nut (1) and washer (2).



10-3. PERSONNEL AIR DUCT VENTILATING FAN REPAIR (continued).

d. TEST

WARNING

- **Use extreme care when working with live circuits. Remove all jewelry prior to testing. Failure to follow this warning can result in electrical shock and severe injury or death.**
- **When testing fan rotation, keep hands away from impeller blade. Failure to follow this warning can result in severe injury.**

NOTE

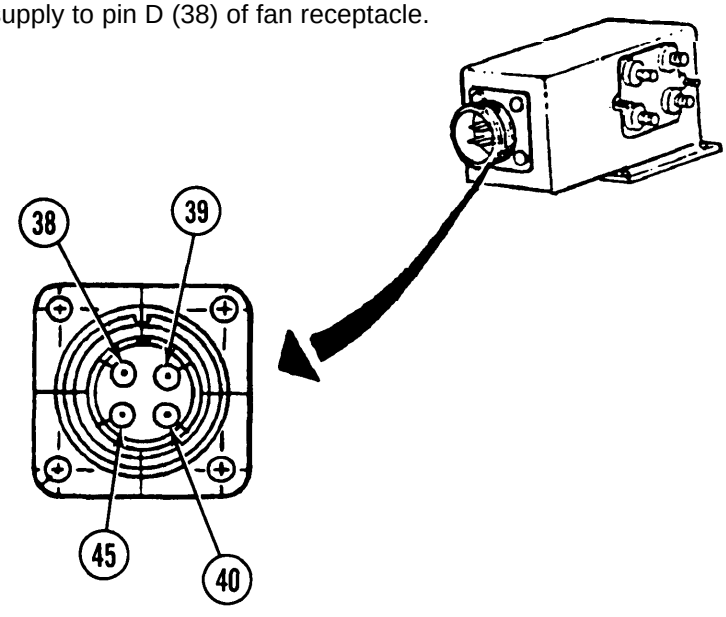
The following steps test clockwise rotation of ventilating fan.

1. Connect positive lead of 24-vdc power supply to pin B (40) of fan receptacle.
2. Connect jumper wire from pin A (39) to pin C (45) on fan receptacle.
3. Connect negative lead of power supply to pin D (38) of fan receptacle.

NOTE

The following steps test counterclockwise rotation of ventilating fan.

4. Connect positive lead of power supply to pin A (39) of fan receptacle.
5. Connect jumper wire from pin B (40) to pin C (45) on fan receptacle.
6. Connect negative lead of power supply to pin D (38) of fan receptacle.



FOLLOW-ON TASKS:
• Install personnel ventilating air duct fan (refer to TM 9-2350-287-20-2).

10-4. PERSONNEL HEATER SUPPORT ASSEMBLIES AND RESILIENT MOUNTS REPLACEMENT.

This Task Covers:

a. Removal

b. Installation

Initial Setup:

Tools/Test Equipment:
- General mechanic's tool kit (Item 19, Appendix D)

Materials/Parts:
- Self-locking nut (4) (Item 119, Appendix H)

Personnel Required: Two

Equipment Conditions:
- Left and right projectile rack assemblies moved to rear of vehicle (refer to TM 9-2350-287-10).
- Numbers 1 and 2 engine AFES cylinder bottles removed (refer to TM 9-2350-287-20-2).
- Numbers 1 and 2 engine AFES cylinder bottle bracket straps, brackets, and mounts removed (refer to TM 9-2350-287-20-2).
- Personnel heater removed (refer to TM 9-2350-287-20-2).
- Personnel heater mounting clamps and brackets removed (refer to TM 9-2350-287-20-2).
- PowerPack removed (refer to TM 9-2350-287-20-1).
- Engine compartment bulkhead insulation and shields removed (para 9-3).

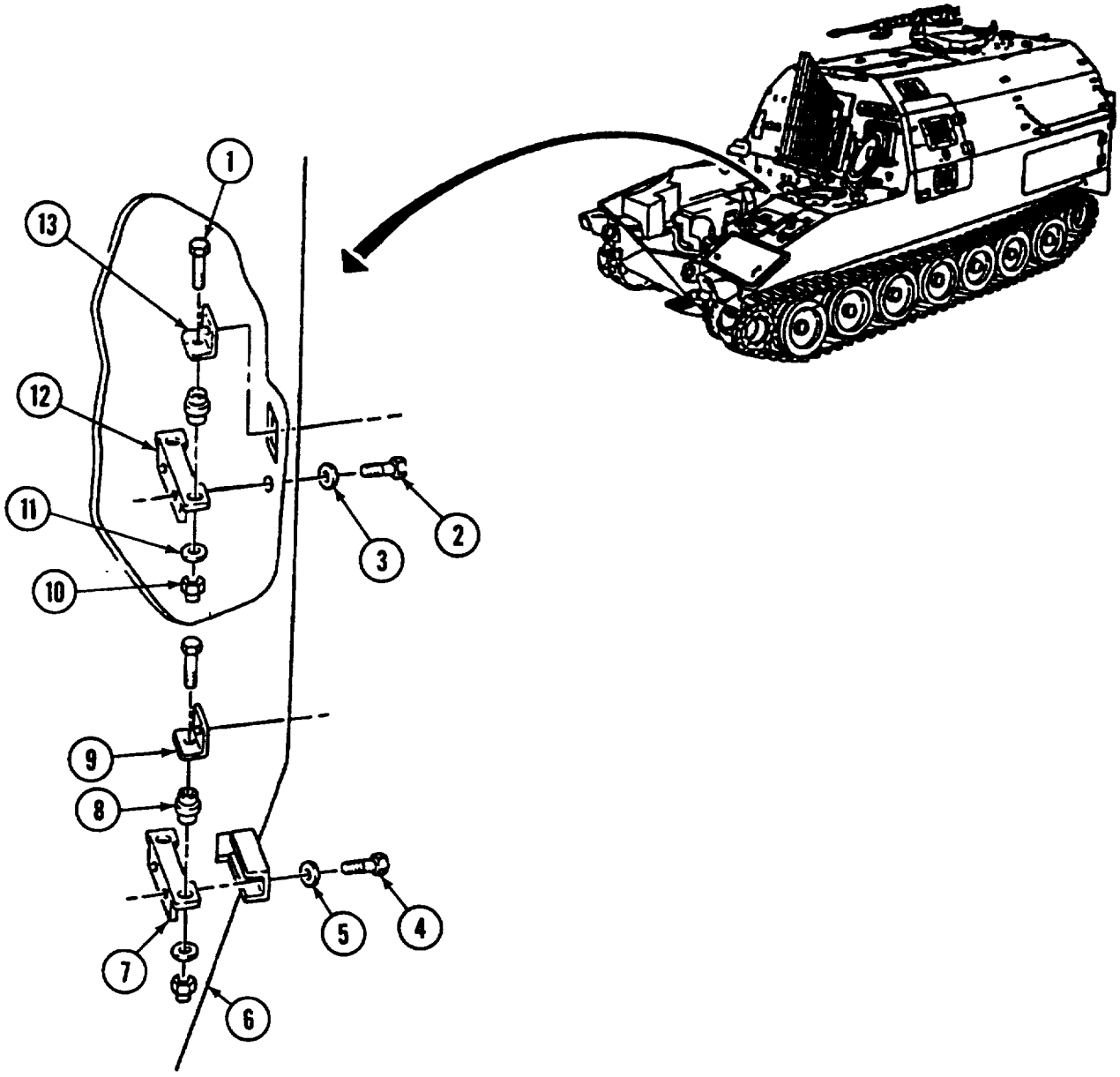
a. REMOVAL

1. Remove two screws (2) and washers (3) and upper supporl assembly (12) from forward bulkhead (6).
2. Remove two screws (4) and washers (5) and lower support assembly (7) from forward bulkhead (6).
3. Remove four screws (1), washers (11), and self-locking nuts (10), two angles (13), and two angles (9) from upper and lower support assemblies (12 and 7).
4. Remove four resilient mounts (8) from upper and lower support assemblies (12 and 7).

b. INSTALLATION

1. Insert four resilient mounts (8) in upper and lower support assemblies (12 and 7).
2. Install two angles (9) and two angles (13) on upper and lower support assemblies (12 and 7) with four screws (1), washers (11), and self-locking nuts (10).
3. Install lower support assembly (7) on forward bulkhead (6) with two screws (4) and washers (5), finger-tight.
4. Install upper support assembly (12) on forward bulkhead (6) with two screws (2) and washers (3), finger-tight.

10-4. PERSONNEL HEATER SUPPORT ASSEMBLIES AND RESILIENT MOUNTS REPLACEMENT (continued).



FOLLOW-ON MAINTENANCE:

- Install engine compartment bulkhead insulation and shields (para 9-3).
- Install powerpack (refer to TM 9-2350-287-20-1).
- Install personnel heater mounting clamps and brackets (refer to TM 9-2350-287-20-2).
- Install personnel heater (refer to TM 9-2350-287-20-2).
- Install numbers 1 and 2 engine AFES cylinder bottle bracket straps, brackets, and mounts (refer to TM 9-2350-287-20-2).
- Install numbers 1 and 2 engine AFES cylinder bottles (refer to TM 9-2350-287-20-2).
- Move left and right projectile rack assemblies to front of vehicle (refer to TM 9-2350-287-10).

10-5. APU COMPARTMENT FRONT AND SIDE DOOR ACCESS COVER FASTENER INSTALLATION.

This Task Covers:

Installation

Initial Setup:

Tools/Test Equipment:
- Electric drill (Item 14, Appendix D)
- General mechanic's tool kit (Item 19, Appendix D)
- Thread cutting die and tap set (Item 41, Appendix D)
- Torch set (Item 42, Appendix D)
- Twist drill set (Item 46, Appendix D)

Materials/Parts:
- Fastener (2) (Item 15, Appendix H)
- Fastener (Item 16, Appendix H)
- Strap fastener (11) (Item 131, Appendix H)

Personnel Required:
- Metal worker

References:
- TC 9-237

Equipment Conditions:
- Vehicle parked on level ground (refer to TM 9-2350-287-10)

INSTALLATION

WARNING

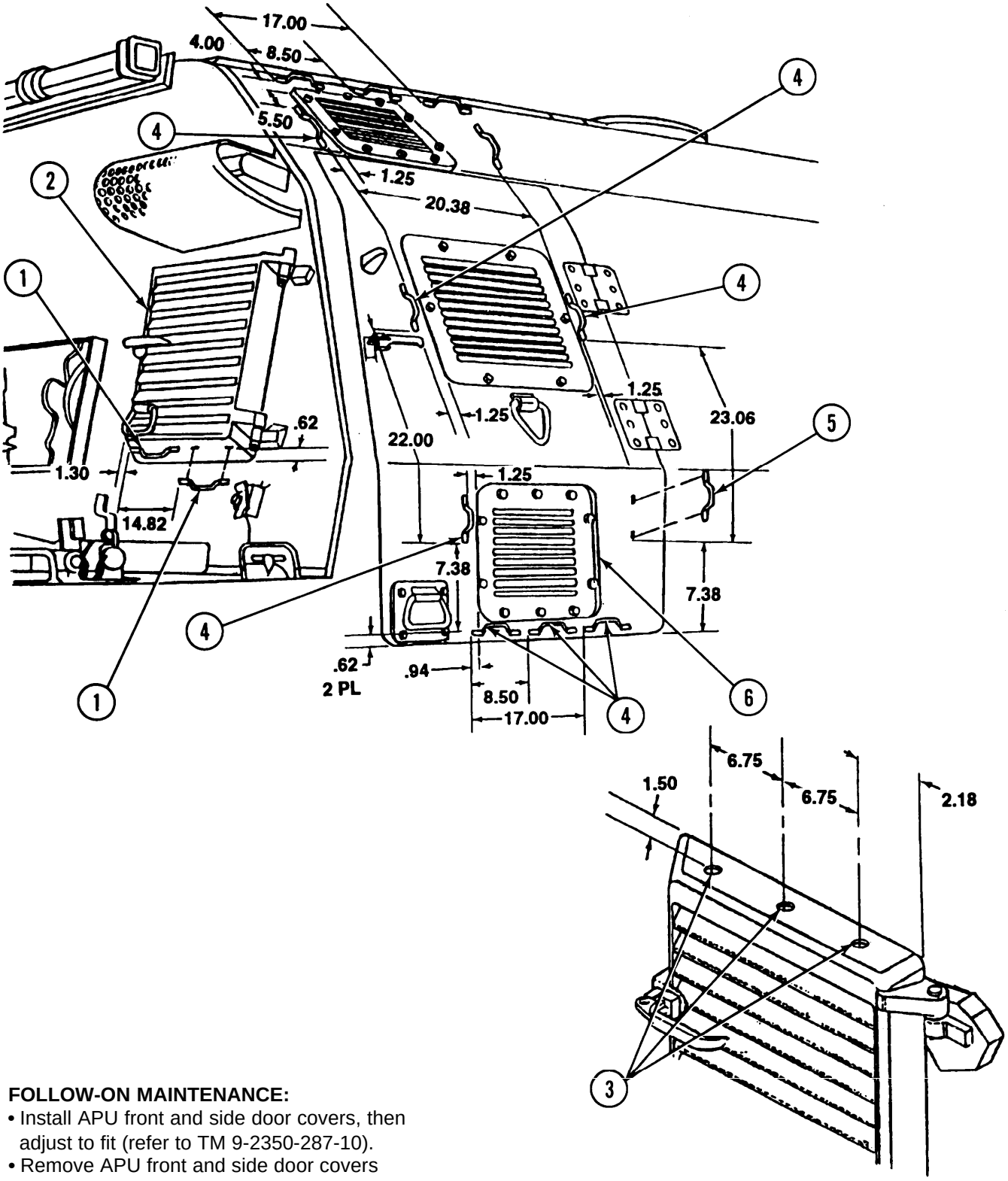
Unsafe welding practices can cause serious injury from fire, explosions, or harmful agents. Allow only authorized personnel to weld or cut metals, and follow safety precautions in TC 9-237. Protective clothing and goggles must be worn, adequate protective equipment used, a suitable fire extinguisher kept nearby, and requirements of TC 9-237 strictly followed.

NOTE

- **All fasteners are installed the same.**
- **Perform steps 1 through 4 for APU compartment front door fasteners.**
- **Perform steps 5 and 6 for APU compartment side door fasteners.**

1. Measure and mark locations of two fasteners (1) to be installed on the bottom exterior of APU front door (2).
2. Weld two fasteners (1) in place.
3. Measure and mark locations of three holes (3) to be drilled on top surface of APU front door (2).
4. Drill three 0.204-inch holes (3) in marked locations and tap 0.250-20 UNC-2B through APU front door (2).
5. Measure and mark locations of 11 fasteners (4) and fastener (5) to be installed on exterior of APU side door (6) and vehicle hull.
6. Weld 11 fasteners (4) and fastener (5) in place.

10-5. APU COMPARTMENT FRONT AND SIDE DOOR ACCESS COVER FASTENER INSTALLATION (continued).



FOLLOW-ON MAINTENANCE:

- Install APU front and side door covers, then adjust to fit (refer to TM 9-2350-287-10).
- Remove APU front and side door covers (refer to TM 9-2350-287-10).

10-6. SHROUD ASSEMBLY REPAIR.

Refer to FM 10-16 to repair the shroud assembly.

CHAPTER 11
HYDRAULIC ACTUATOR CYLINDER ASSEMBLY

Paragraph Number	Paragraph Title	Page Number
11-1	General	11-1
	[Paragraphs 11-2 and 11-3 Deleted]	
11-4	Hydraulic Actuator Repair	11-12

11-1. GENERAL.

This chapter describes and illustrates the following procedures for the hydraulic actuator cylinder assembly: disassembly; cleaning, inspection, and repair; and assembly. This is a Direct Support level task.

[Paragraphs 11-2 and 11-3 Deleted]

11-4. HYDRAULIC ACTUATOR REPAIR.

This Task Covers:

a. Disassembly
b. Cleaning, Inspection, and Repair
c. Assembly

Initial Setup:

Tools/Test Equipment:
- Combination wrench set (Item 7, Appendix D)
- Drain pan (Item 12, Appendix D)
- General mechanic's tool kit (Item 19, Appendix D)

Materials/Parts:
- Cap and plug set (Item 4, Appendix B)
- Corrosion preventive (Item 7, Appendix B)
- Dry-cleaning solvent (Item 9, Appendix B)
- Grease (Item 11, Appendix B)
- Hydraulic fluid (Item 13, Appendix B)
- Rag (Item 17, Appendix B) (as required)
- Overhaul kit (Item 73, Appendix H)

Personnel Required: Two

Equipment Conditions:
Hydraulic actuator removed (refer to TM 9-2350-287-20-2).

a. DISASSEMBLY

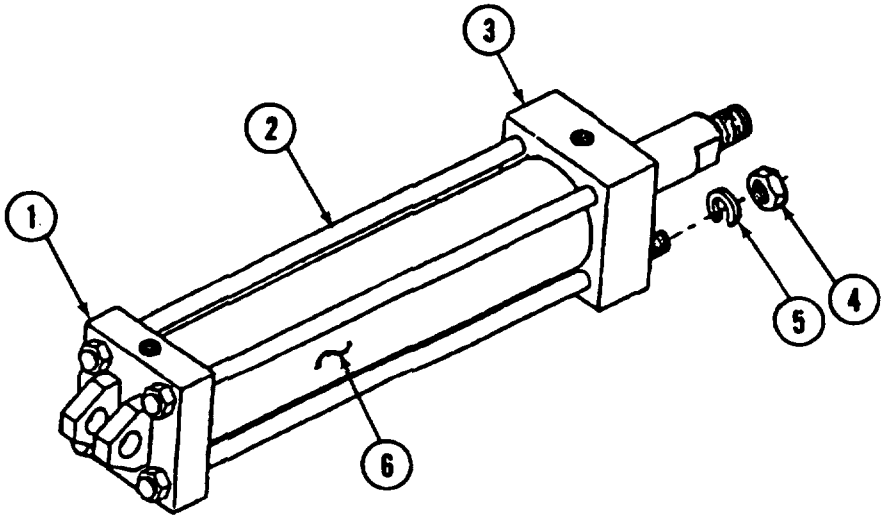
WARNING

Hydraulic fluid can cause skin rash. Wear gloves when handling hydraulic fluid. If it gets on skin or clothing, wash with soap and water.

1. Place drain pan under hydraulic actuator (6), and remove end cap (1) from actuator (6). Drain hydraulic fluid into drain pan.

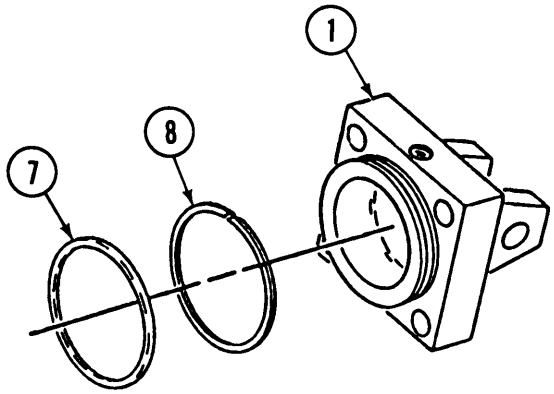
2. Remove four nuts (4) and lockwashers (5) from end cap (1) and gland (3). Discard lockwashers.

3. Remove four tie rods (2) from gland (3).



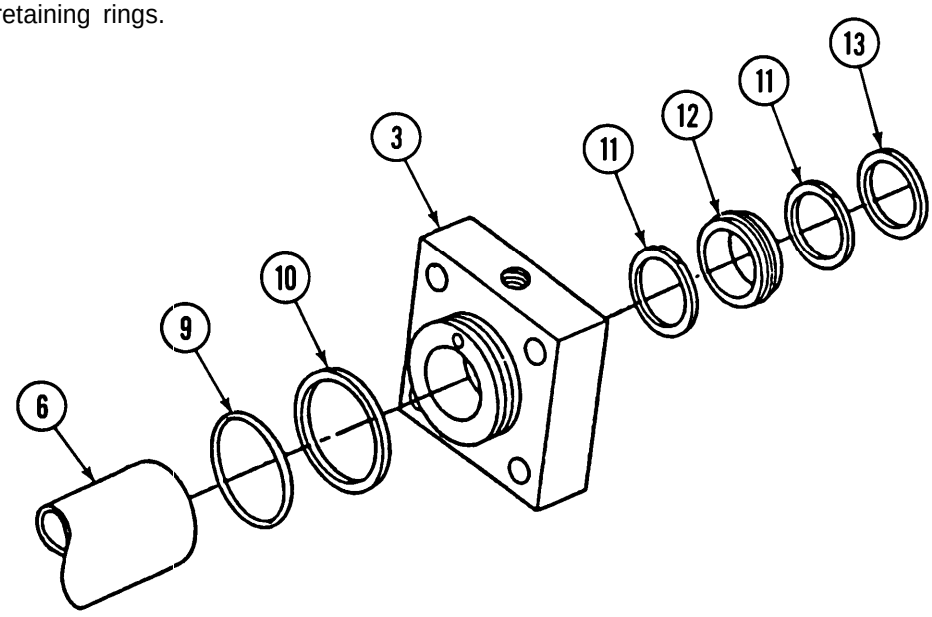
11-4. HYDRAULIC ACTUATOR REPAIR (continued).

4. Remove retainer (8) and packing (7) from end cap (1). Discard retainer and packing.



5. Remove gland (3) from actuator (6), and remove retainer (10) and packing (9) from gland (3). Discard retainer and packing.

6. Remove ring (13), retaining ring (11), T-seal (12), and retaining ring (11) from opposite side of gland (3). Discard retaining rings.

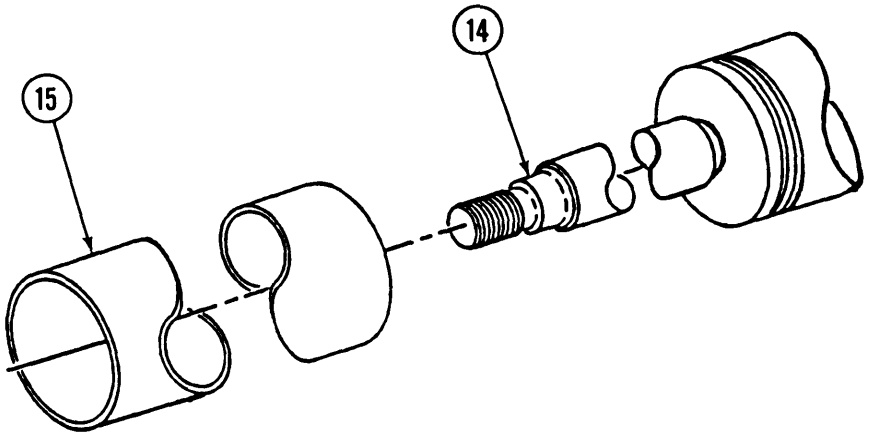


11-4. HYDRAULIC ACTUATOR REPAIR (continued).

CAUTION

Make sure threaded ends of piston rod are protected. Damage to piston rod can result if threaded ends are not protected.

7. Remove piston rod (14) from actuator housing (15).

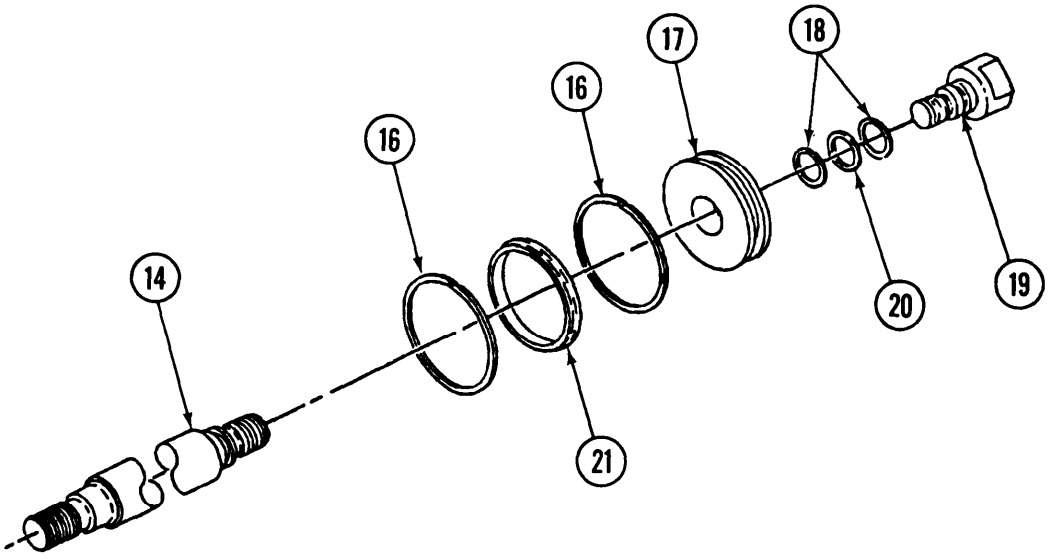


8. With assistant securing piston rod (14) from turning, remove piston retainer (19) from piston head (17).

9. Remove two retainers (18) and packing (20) from piston retainer (19). Discard retainers and packing.

10. Remove piston head (17) from piston rod (14).

11. Remove two retainers (16) and T-seal (21) from piston head (17). Discard retainers and T-seal.



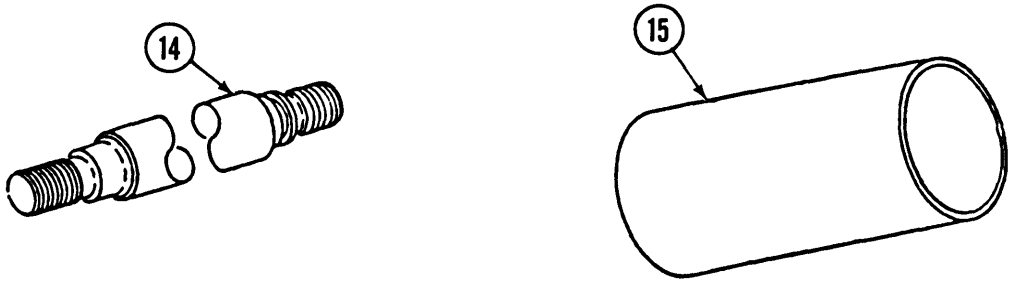
11-4. HYDRAULIC ACTUATOR REPAIR (continued).

b. CLEANING, INSPECTION, AND REPAIR

WARNING

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

1. Clean all parts with dry cleaning solvent.
2. inspect parts for nicks, burrs, or other damage. Replace if necessary.
3. Inspect piston rod (14) and housing (15) for nicks, burrs, scratches, or other damage. Repair if necessary.



c. ASSEMBLY

1. Install two new retainers (16) and new T-seal (21) on piston head (17).

WARNING

Hydraulic fluid can cause skin rash. Wear gloves when handling hydraulic fluid. if it gets on skin or clothing, wash with soap and water.

2. Lightly lubricate T-seal (21) and two retainers (16) with hydraulic fluid, and install piston head (17) on piston rod (14).
3. Install two new retainers (18) and new packing (20) on piston retainer (19).
4. Coat threads of piston retainer (19) with grease.

CAUTION

Make sure piston rod threaded ends are protected. Damage to piston rod can result if threaded ends are not protected.

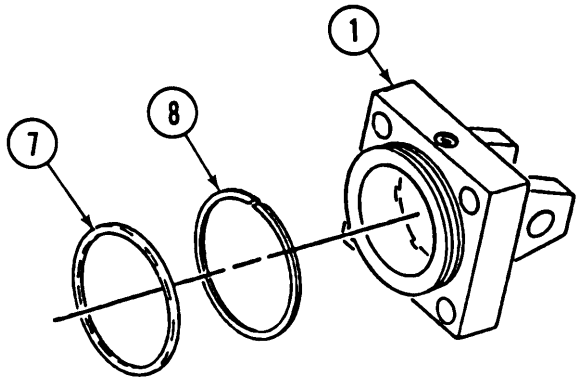
5. install piston retainer (19) in opposite end of rod (14). Torque between 250 and 280 ft-lb (339 and 380 N·m).
6. Lightly lubricate piston rod (14) with hydraulic fluid, and install piston rod (14) in housing (21).

11-4 HYDRAULIC ACTUATOR REPAIR (continued).

WARNING

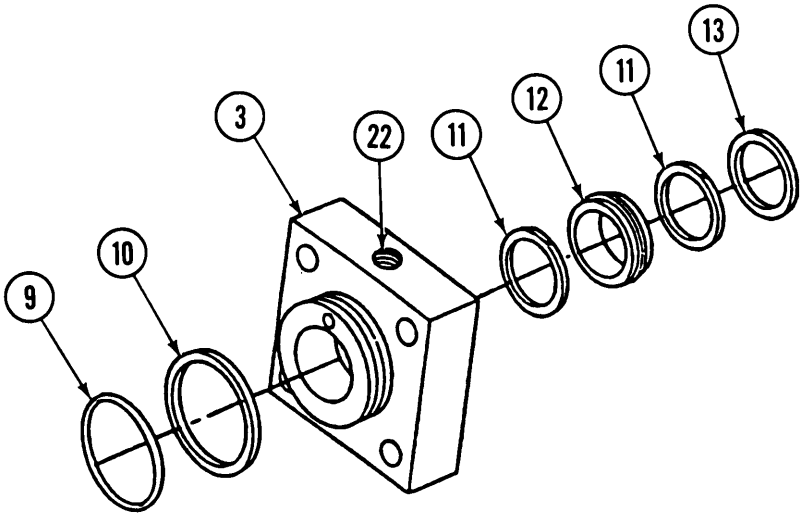
Hydraulic fluid can cause skin rash. Wear gloves when handling hydraulic fluid. If it gets on skin or clothing, wash with soap and water.

7. Install new packing (7) and new retainer (8) on end cap (1). Lubricate packing (7) and retainer (8) with hydraulic fluid.



8. Install two new retaining rings (11), T-seal (12), and ring (13) in gland (3).

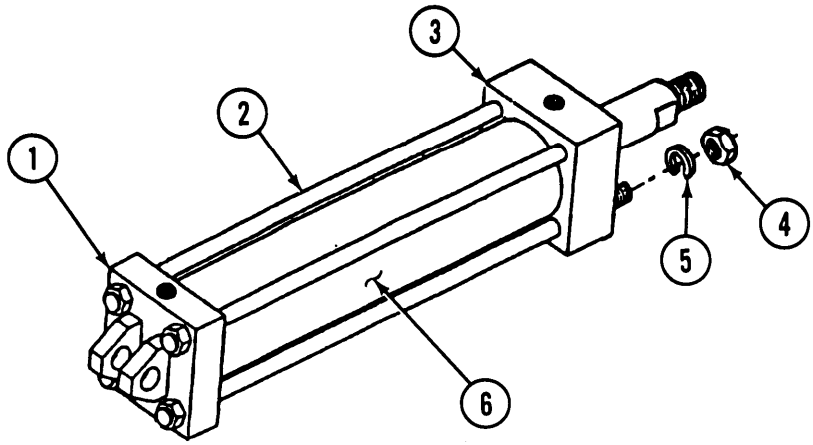
9. Install new retainer (10) and new packing (9) on gland (3). Lubricate retainer (10) and packing (9) with hydraulic fluid.



10. Install end cap (1) and gland (3) on actuator (6) with port holes (22) facing in the same direction.

11. Install four tie rods (2) through end cap (1) and gland (3).

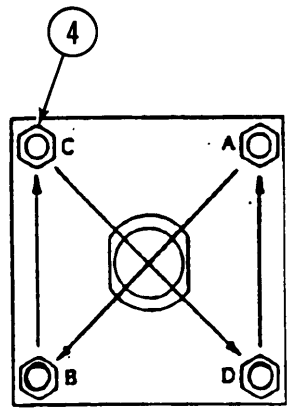
114. HYDRAULIC ACTUATOR REPAIR (continued).



12. Install four nuts (4) and new lockwashers (5) on four tie rods (2) at end cap (1).

13. Install four nuts (4) and lockwashers (5) on four tie rods (2) at gland (3).

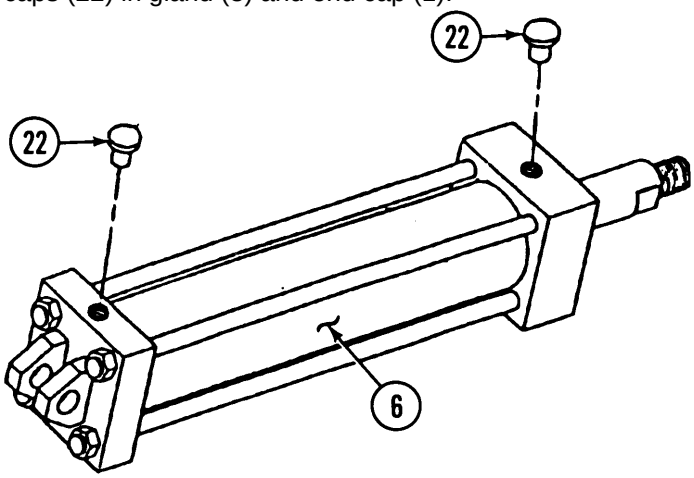
14. Torque eight nuts (4) evenly in cross-pattern style as follows:



- Tighten nut A to 5 ft-lb (7 N·m) on first Cycle.
- Tighten nut B to 20 ft-lb (27 N·m) on second cycle.
- Tighten nut C to 40 ft-lb (54 N·m) on third cycle.
- Tighten nut D to 65 ft-lb (86 N·m) on fourth cycle.

15. Coat nonpainted areas of actuator (6) with corrosion preventive.

16. Install two protective caps (22) in gland (3) and end cap (1).



FOLLOW-ON MAINTENANCE:
- Install hydraulic actuator (refer to TM 9-2350-287-20-2).

CHAPTER 12
AUXILIARY POWER UNIT

Paragraph Number	Paragraph Title	Page Number
12-1	General	12-1
12-2	APU Chain Cover Repair	12-1
12-3	APU Gearcase Repair	12-4
12-4	APU Generator Brushes Repair	12-17

12-1. GENERAL

This chapter provides maintenance instructions to repair the auxiliary power unit (APU) chain cover and APU gearcase. APU engine maintenance is covered in TM 9-2815-221-34&P, and APU generator maintenance is covered in TM 9-2920-224-34&P.

12-2. APU CHAIN COVER REPAIR.

This Task Covers:

a. Removal
b. Cleaning and Inspection
c. Installation

Initial Setup:

Tools/Test Equipment:
- Drain pan (Item 12, Appendix D)
- General mechanic's tool kit (Item 19, Appendix D)

Materials/Parts:
- Drycleaning solvent (Item 9, Appendix B)
- Sealant adhesive (Item *3,* Appendix B)
- Sealing compound (Item 22, Appendix B)
- Gasket (Item 20, Appendix H)
- Gasket (Item 31, Appendix H)
- Lockwasher (17) (Item 44, Appendix H)

Equipment Conditions:
- APU on crew work surface.

a. REMOVAL

1. Position drain pan under drain plug (7). Remove plug (7) and gasket (8) from chain cover (2) and drain. Discard gasket.

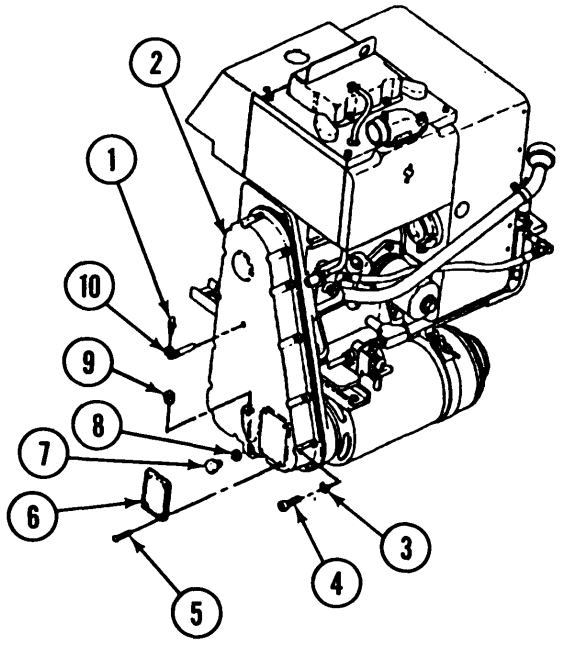
NOTE

Perform steps 2 and 3 only if replacing cover.

2. Remove four screws (5) and data plate (6) from cover (2).

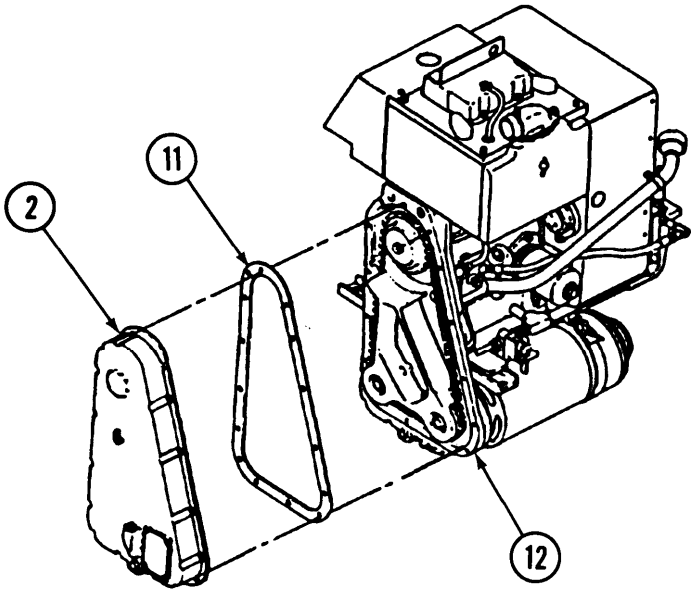
3. Remove breather(1), breather elbow (10), and fill plug (9) from cover (2).

4. Remove 15 screws (4) and lockwashers (3) from cover (2). Discard lockwashers.



12-2. APU CHAIN COVER REPAIR (continued).

5. Remove cover (2) and gasket (11) from APU chain housing (12). Discard gasket.

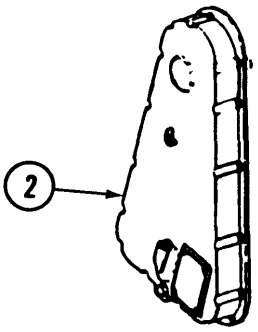


b. CLEANING AND INSPECTION

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 use near open frames or excessive heat.

1. Clean all parts with drycleaning solvent.
2. Inspect for stripped or crossed threads.
3. Inspect cover (2) for cracks or damage to mating surfaces.
4. Replace parts as necessary.



c. INSTALLATION

WARNING

Sealant adhesive can bum easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep sealant adhesive away from open fire and use in a well-ventilated area. If sealant adhesive gets on skin or clothing, wash immediately with soap and water.

12-2. APU CHAIN COVER REPAIR (continued).

WARNING

Adhesives can burn easily, can give off harmful vapors, and are harmful to skin and clothing. To avoid injury or death, keep adhesive away from open fire and use in a well-ventilated area. If adhesive gets on skin or clothing, wash immediately with soap and water.

1. Coat new gasket (11), cover (2) mating surface, APU chain housing (12) mating surface, and 15 screw (4) threads with sealant adhesive.

2. install cover (2) and gasket (11) on APU chain housing (12) and secure with 15 screws (4) and new lockwashers (3).

NOTE

Perform steps 3 and 4 only if replacing cover.

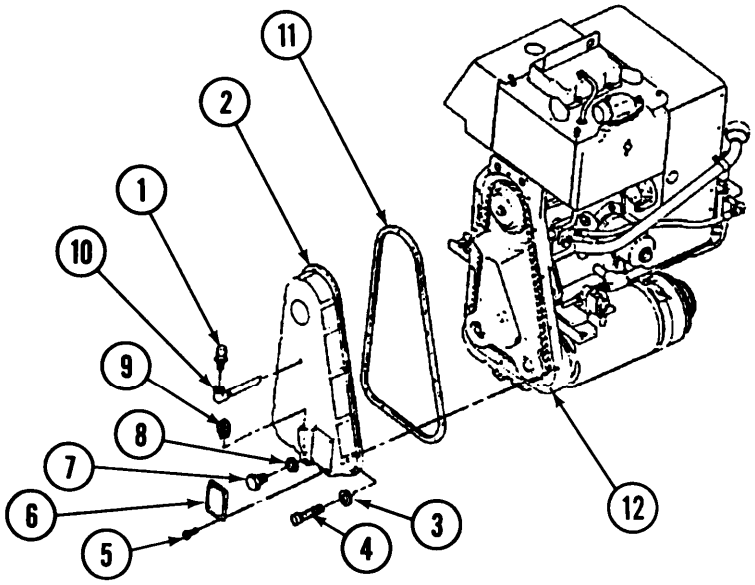
3. install data plate (6) on cover (2) with four screws (5).

WARNING

Sealing compound can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep sealing compound away from open fire and use in a well-ventilated area. if sealing compound gets on skin or clothing, wash immediately with soap and water.

4. Apply sealing compound to threads on plug (7), breather elbow (10), and breather (1).

5. install plug (7), new gasket (8), breather elbow (10), and breather (1) on cover (2).



FOLLOW-ON MAINTENANCE:
• Fill gearcase with oil (refer to TM 9-2350-287-10).

12-3. APU GEARCASE REPAIR.

This Task Covers:

a. Disassembly
c. Assembly
b. Cleaning, Inspection, and Repair

Initial Setup:

Tools/Test Equiprnent:
- Alinement gage (Item 3, Appendix D)
- . General mechanic's tool kit (Item 19, Appendix D)
- Mechanical puller (Item 22, Appendix D)

Materials/Parts:
- Drycleaning solvent (Item 9, Appendix B)
- Grease (Item 12, Appendix B)
- Sealant adhesive (Item 3, Appendix B)
- Gasket (Item 29, Appendix H)
- Gasket (2) (Item 30, Appendix H)
- Lockwasher (4) Item 47, Appendix H)
- Lockwasher (4) (Item 141, Appendix H)
- Lockwasher (2) (Item 53, Appendix H)
- Lockwasher (2) (Item 55, Appendix H)
- Lockwasher (Item 56, Appendix H)
- Seal (2) (Item 110, Appendix H)

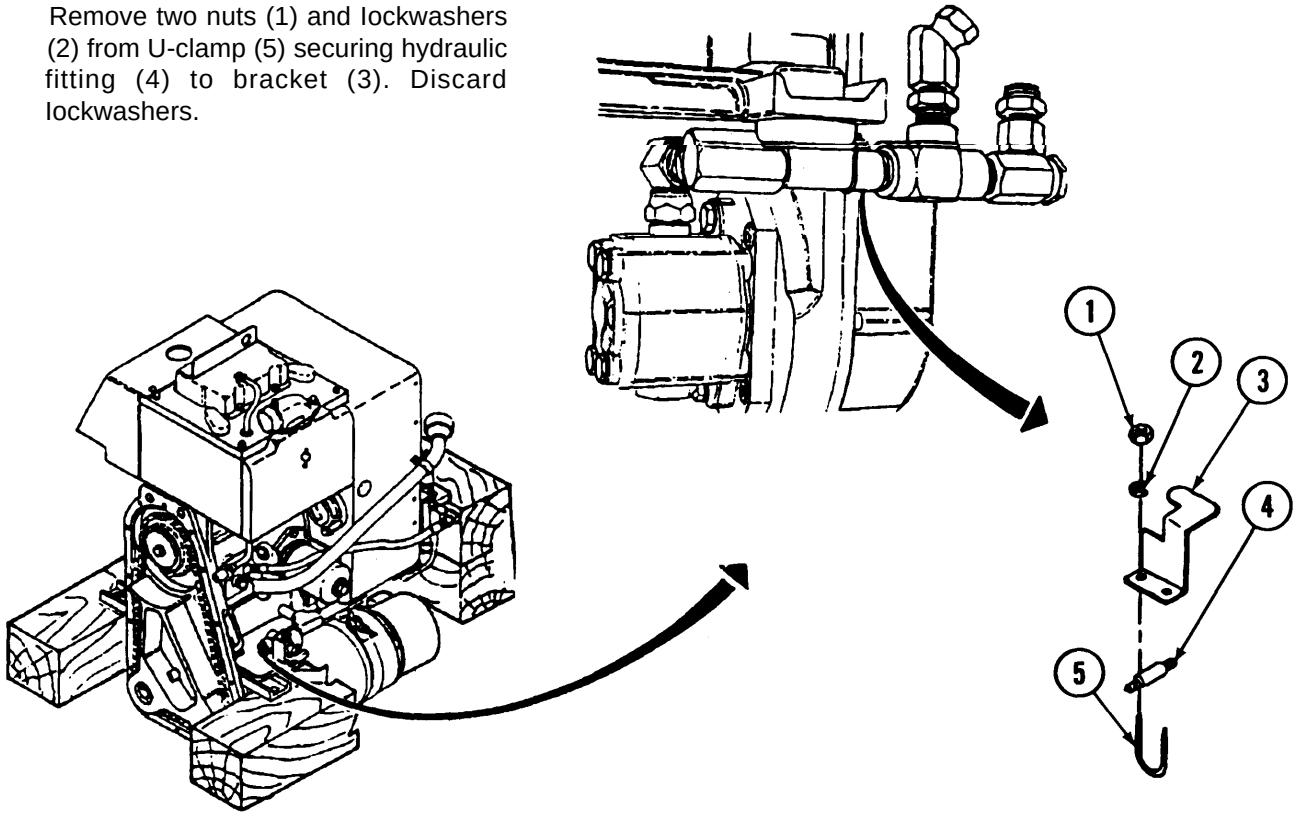
Personnel Required: Two

References:
- TM 9-214
- TM 9-2815-221-34&P

Equipment Conditions:
- APU chain cover removed (para 12-1).

a. DISASSEMBLY

1. Remove two nuts (1) and Iockwashers (2) from U-clamp (5) securing hydraulic fitting (4) to bracket (3). Discard Iockwashers.

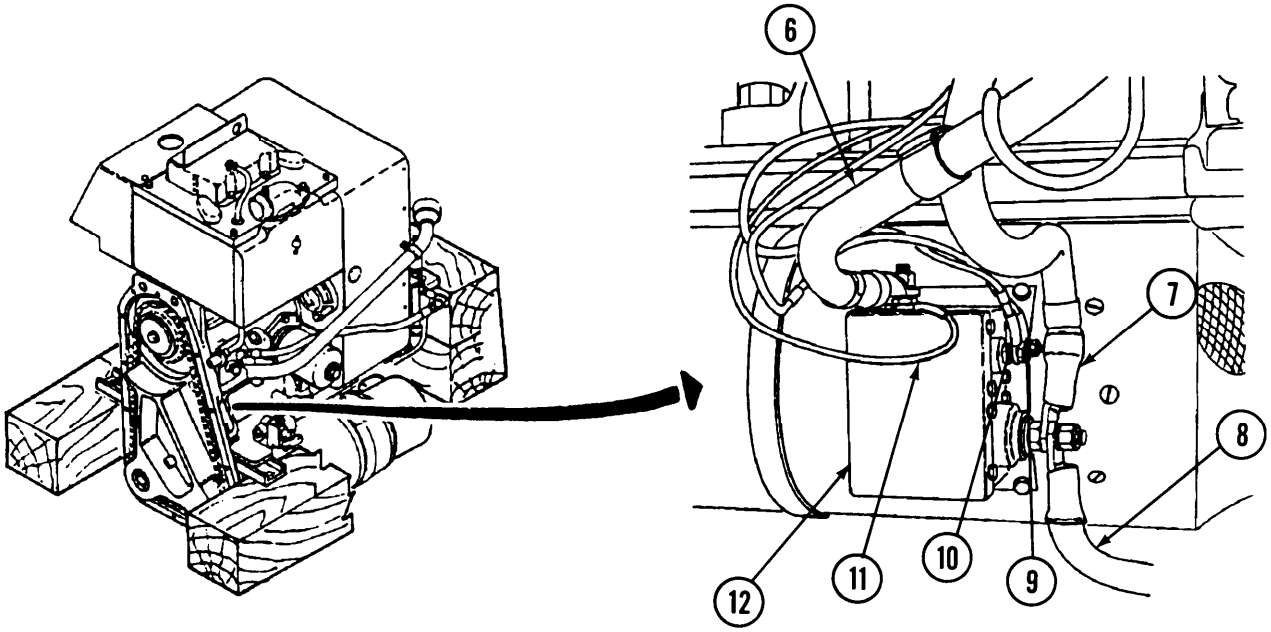


12-3. APU GEARCASE REPAIR (continued).

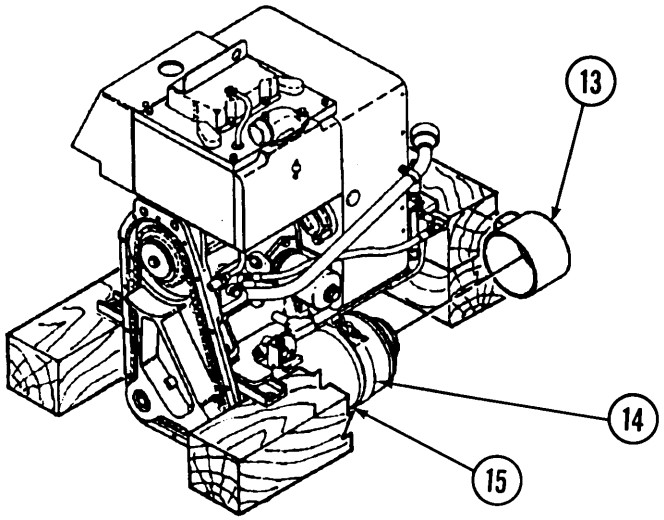
NOTE

To ensure proper installation, make sure cable leads are tagged before disconnecting from terminal box.

2. Remove cables GND, 66, and 62 (6, 7, and 8) and leads 61, 478A, and GND (9, 10, and 11) from generator terminal box (12).

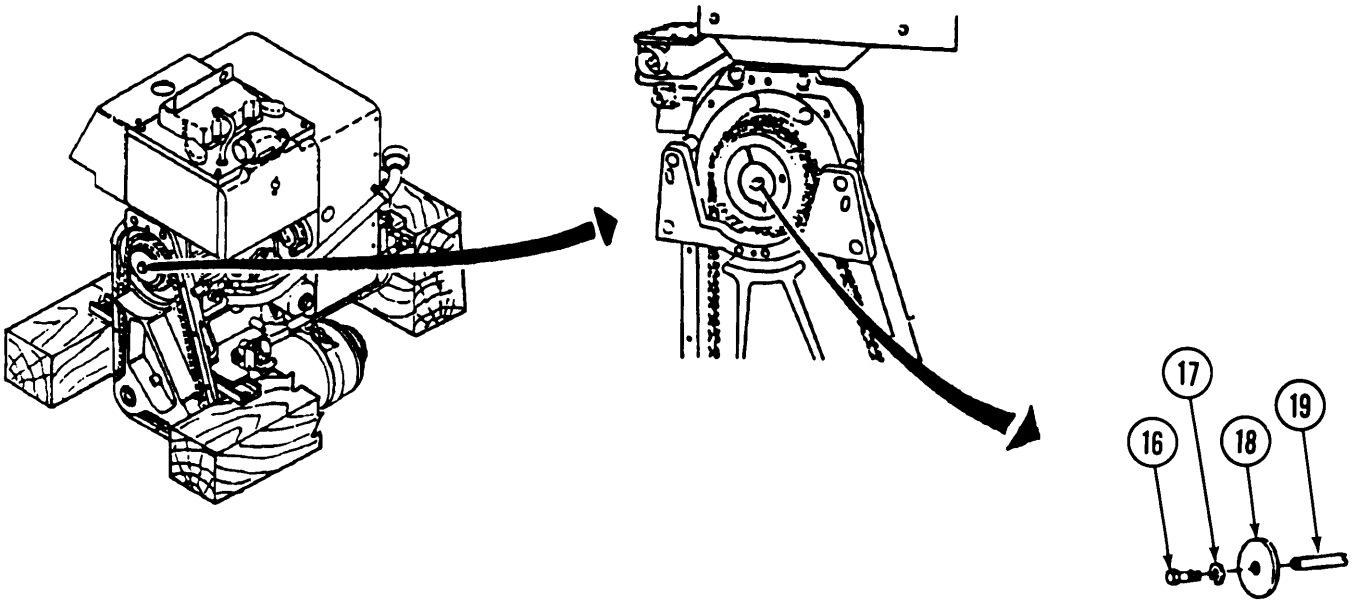


3. Release strap (14) and remove air duct (13) from generator (15).



12-3. APU GEARCASE REPAIR (continued).

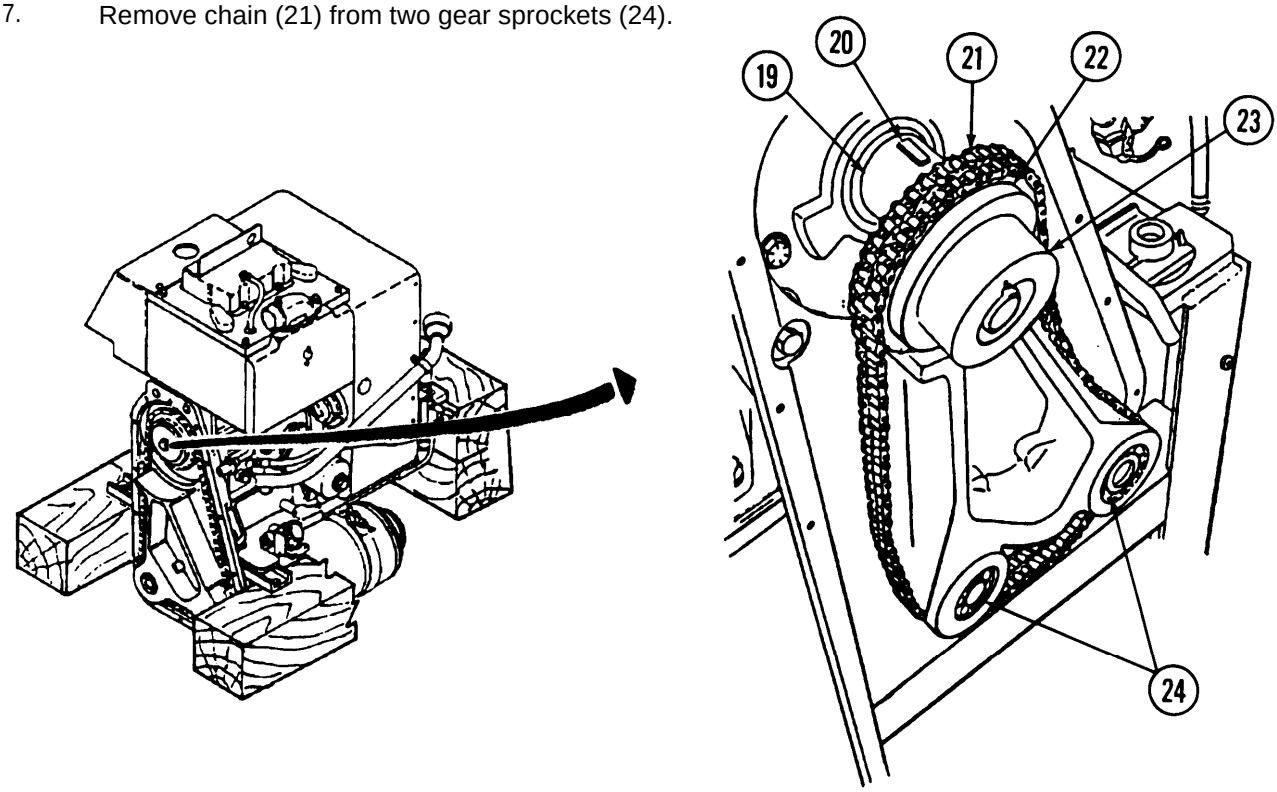
4. Remove screw (16), lockwasher (17), and spacer plate (18) from shaft (19). Discard lockwasher.



5. Using mechanical puller, remove bushing (23) from shaft (19).

6. Remove drive sprocket (22), chain (21), and key (20) from shaft (19).

7. Remove chain (21) from two gear sprockets (24).



12-3. APU GEARCASE REPAIR (continued).

WARNING

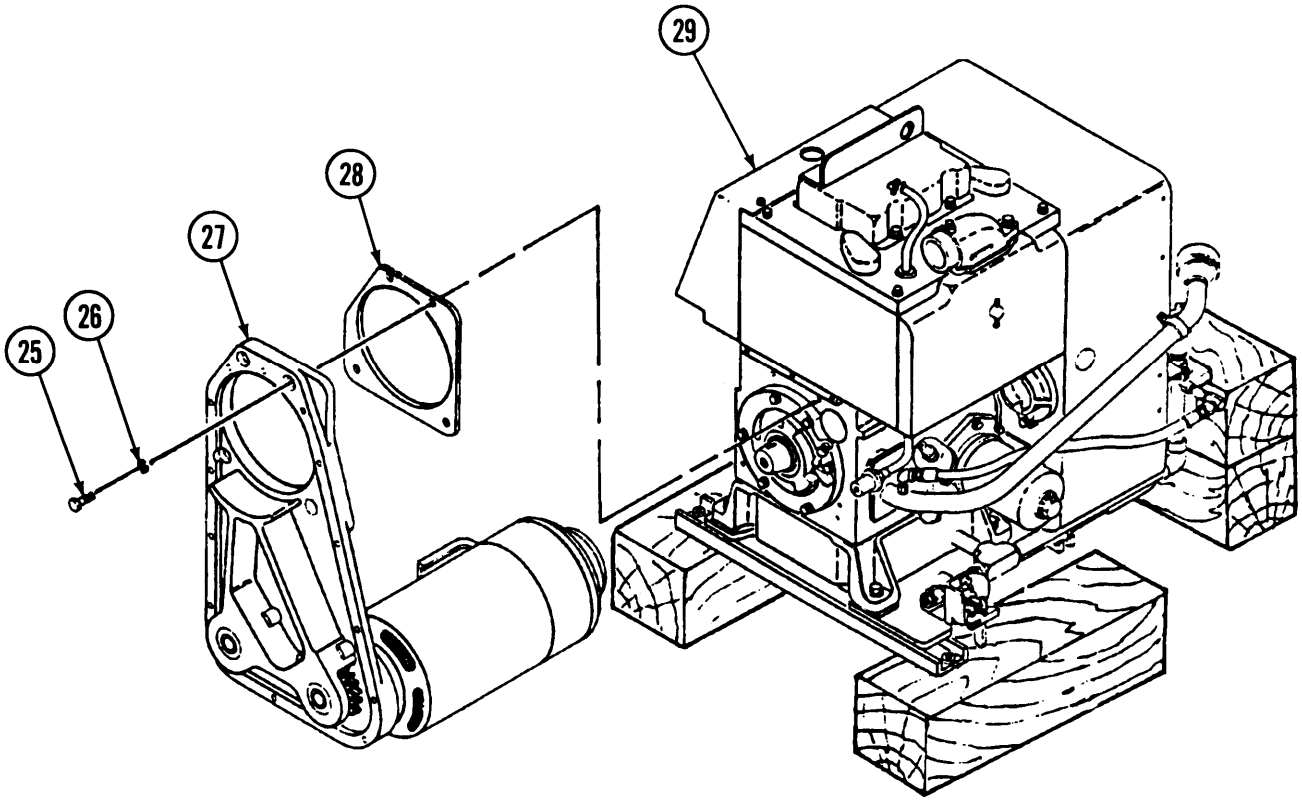
Make sure generator, pump, and chain housing are supported before removing bolts. If they fall, heavy parts can crush you. Assistance is required to remove chain housing. Failure to heed this warning can result in injury or death.

CAUTION

Chain housing is heavy, and damage to generator and pump can occur if assembly is dropped.

8. Remove four screws (25) and lockwashers (26) from chain housing (27). Discard lockwashers.

9. Remove housing (27) and gasket (28) from APU (29). Discard gasket.



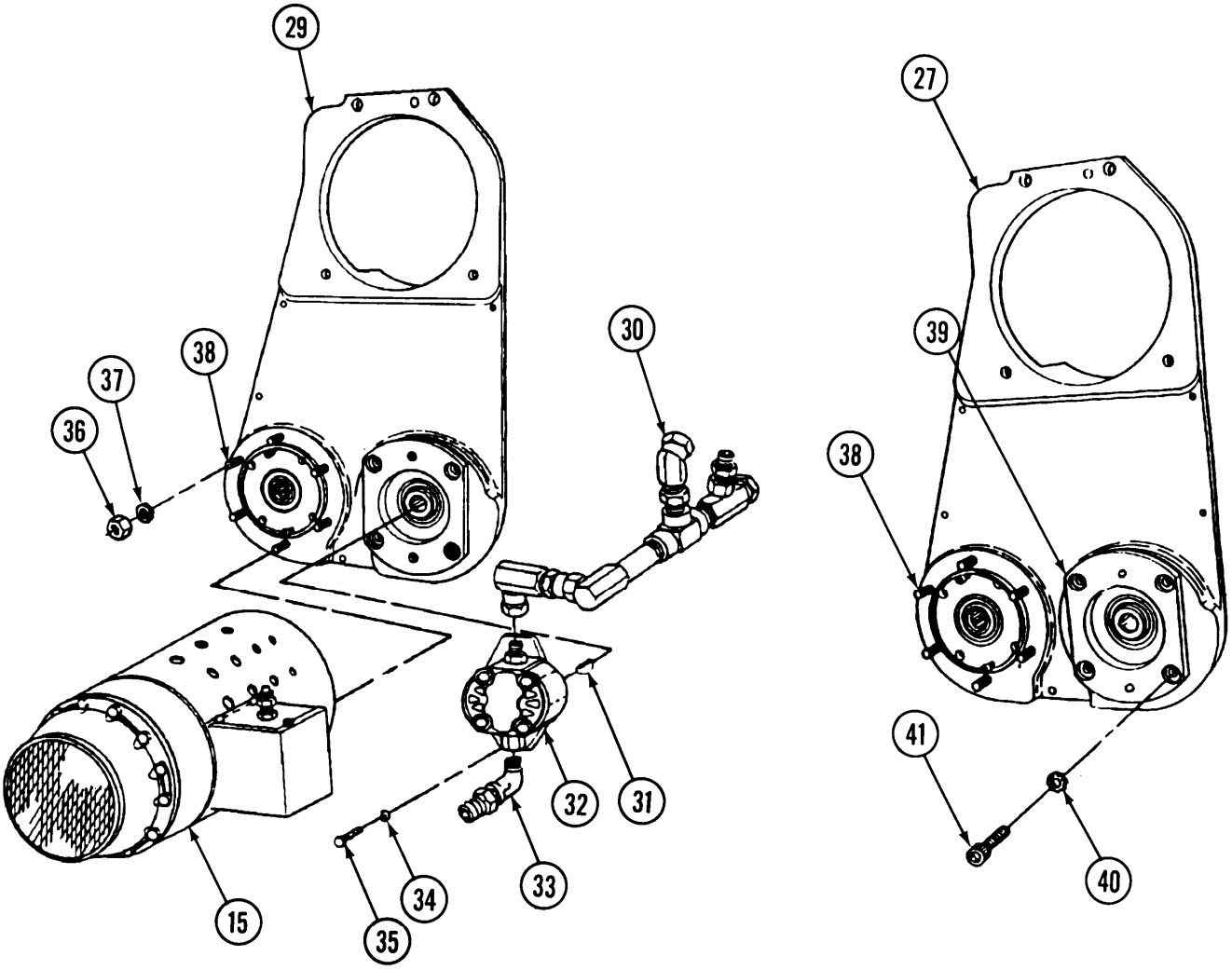
12-3. APU GEARCASE REPAIR (continued).

10. Loosen six nuts (36) and washers (37), then turn and remove generator (15) from housing (27). Remove six nuts (36) and washers (37). Discard nuts.

11. Remove fitting assembly (30) and elbow (33) from hydraulic pump (32).

12. Remove two screws (35) and lockwashers (34) and pump (32) from housing (27). Discard lockwashers.

13. Remove key (31) from pump (32) shaft.



14. Remove four screws (41) and lockwashers (40) from adapter (39). Discard lockwashers.

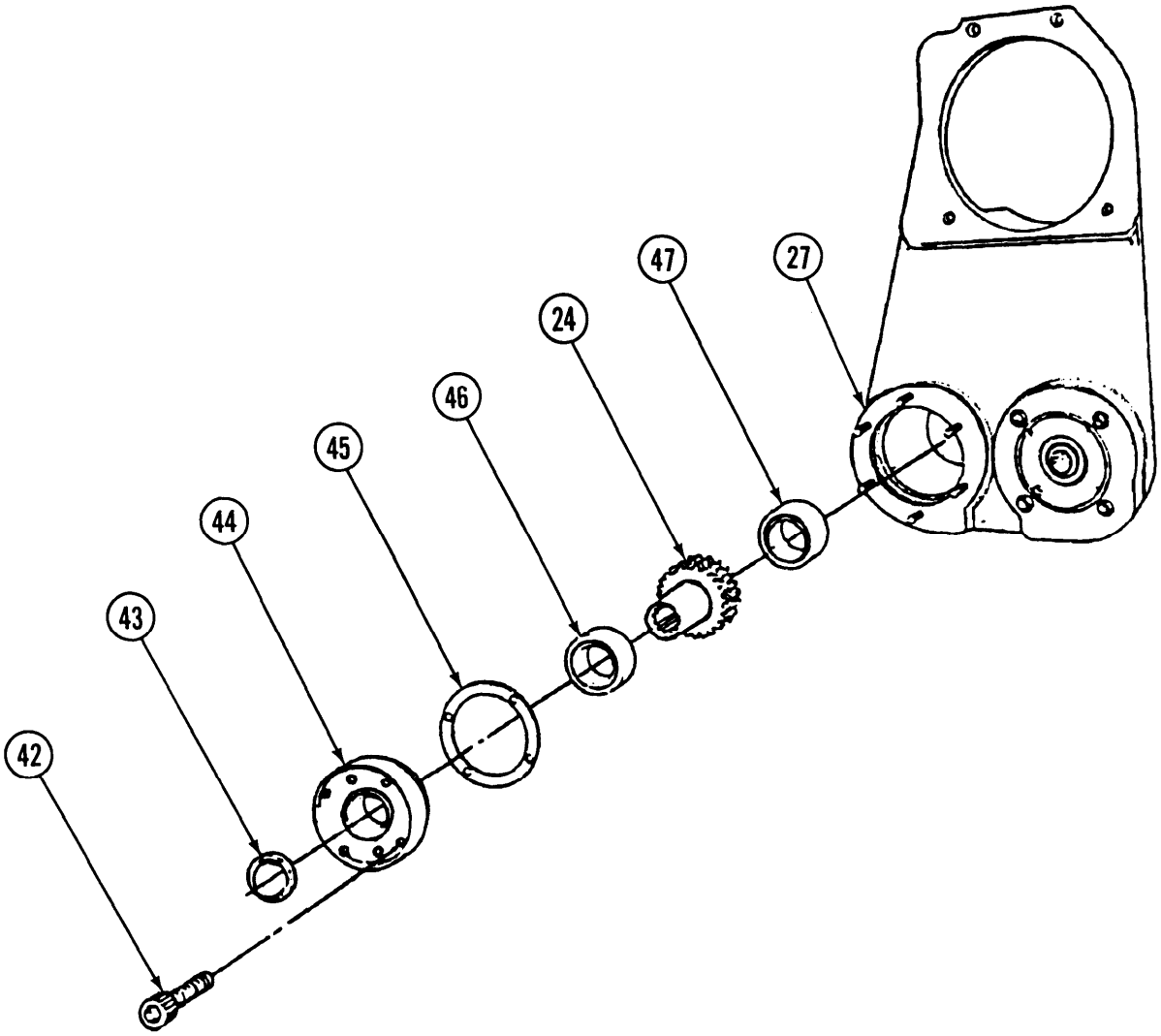
15. Install two 3/8-16 screws in holes in adapter (39), and alternately tighten screws until adapter (39) is removed from housing (27).

NOTE

Perform step 16 only if studs are damaged.

16. Remove any damaged studs (38) from housing (27).

12-3. APU GEARCASE REPAIR (continued).



17. Remove four screws (42) from bearing retainer (44).

18. Install two 1/4-20 screws in bearing retainer (44), and alternately tighten screws until bearing retainer (44) is removed from housing (27).

19. Remove gasket (45) from housing (27). Discard gasket.

20. Remove drive seal (43) and gear sprocket (24) from bearing retainer (44). Discard seal.

21. Remove bearing (46) from gear sprocket (24).

22. Remove bearing (47) from housing (27) bore.

23. Repeat steps 17-22 for opposite side of housing (27).

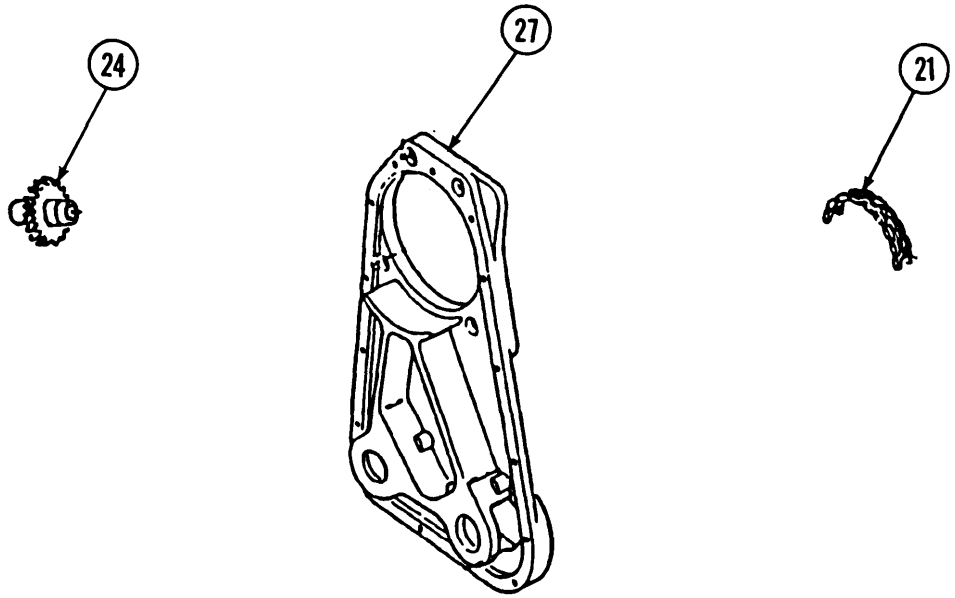
12-3. APU GEARCASE REPAIR (continued).

b. CLEANING, INSPECTION, AND REPAIR

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 use near open flames or excessive heat.

1. Clean all parts with drycleaning solvent.
2. Inspect two gear sprockets (24) for worn, chipped, or cracked teeth. Replace if necessary.
3. Inspect bearings (refer to TM 9-214). Replace if necessary.
4. Inspect housing (27) for cracks or other damage. Repair or replace if necessary.
5. Inspect chain (21) for wear or other damage. Repair or replace if necessary.



12-3. APU GEARCASE REPAIR (continued).

c. ASSEMBLY

1. Install bearing (47) in housing (27) bore.

2. Install bearing (46), gear sprocket (24), and new seal (43) in bearing retainer (44).

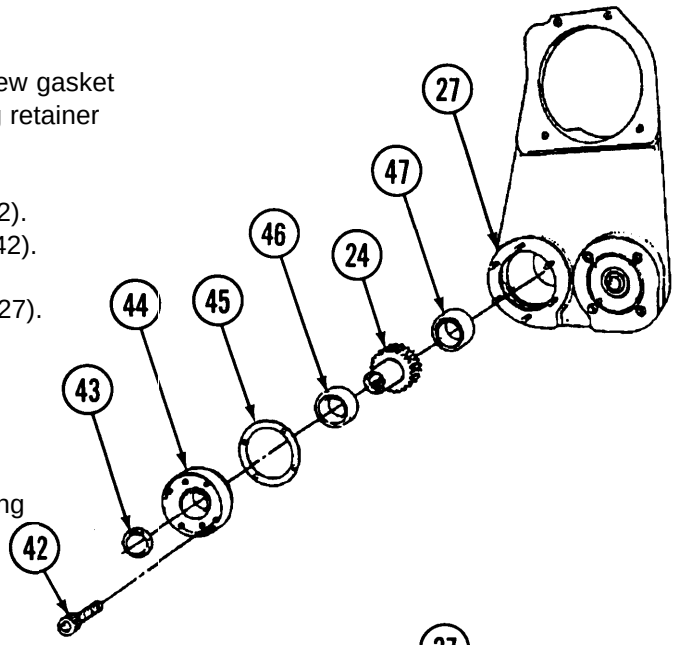
WARNING

Sealant adhesive can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep adhesive away from open fire and use in a weii-ventilated area. if adhesive gets on skin or clothing, wash immediately with soap and water.

3. Apply sealant adhesive to gasket (45). Install new gasket (45) on bearing retainer (44), and install bearing retainer (44) in housing (27).

4. Apply sealant adhesive to threads of screws (42). Secure bearing retainer (44) with four screws (42).

5. Repeat steps 1-4 for opposite side of housing (27).



NOTE

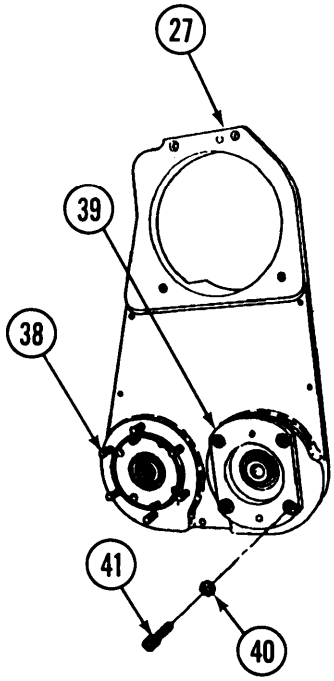
Perform step 6 only if stud was removed.

6. Install previously removed studs (38) in housing (27).

WARNING

Sealant adhesive can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep adhesive away from open fire and use in a weil-ventilated area. if adhesive gets on skin or clothing, wash immediately with soap and water.

7. Apply sealant adhesive to threads of screws (41). Install adapter (39) in housing (27) and secure with four screws (41) and new lockwashers (40).



12-3. APU GEARCASE REPAIR (continued).

8. Install key (31) in pump (32) shaft.

WARNING

Sealant adhesive can bum easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep adhesive away from open fire and use in a well-ventilated area. If adhesive gets on skin or clothing, wash immediately with soap and water.

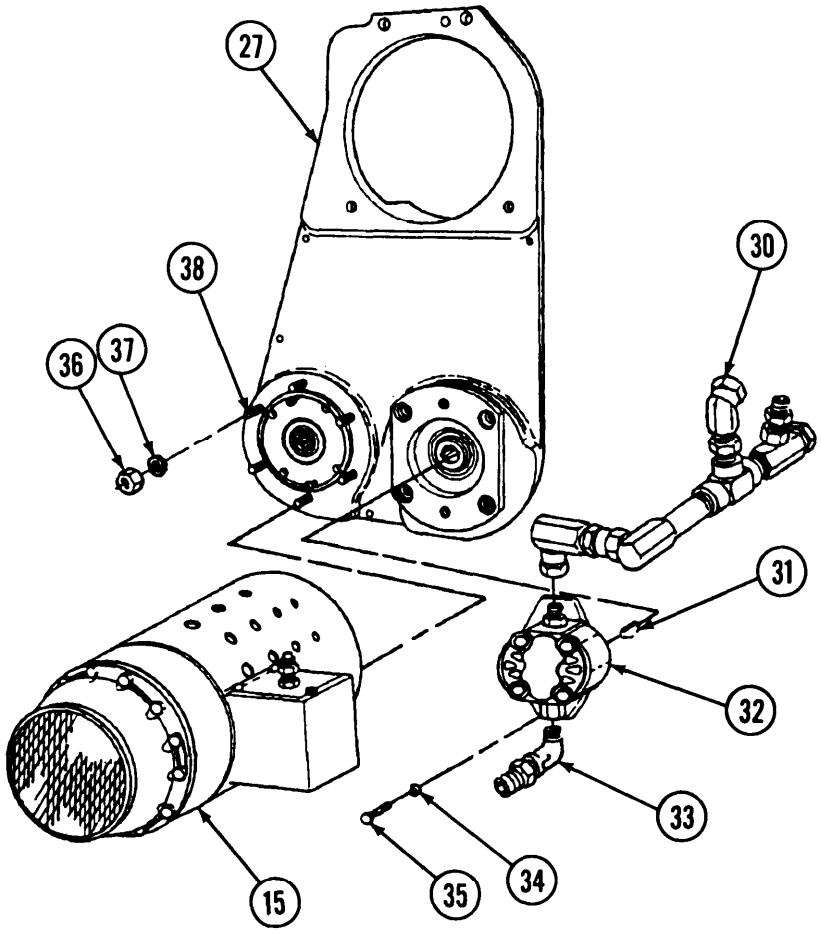
9. Apply sealant adhesive to threads of screws (35). Install pump (32) in housing (27) and secure with two screws (35) and new lock-washers (34).

10. Install six new nuts (36) and washers (37) on studs (38).

11. Install generator (15) over six nuts (36) and washers (37), and rotate generator (15) clockwise.

12. Tighten six nuts (36) to secure generator (15).

13. Install elbow (33) and fitting assembly (30) on pump (32).



12-3. APU GEARCASE REPAIR (continued).

WARNING

Sealant adhesive can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep adhesive away from open fire and use in a well-ventilated area. If adhesive gets on skin or clothing, wash immediately with soap and water.

14. Apply sealant adhesive to new gasket (28). Install gasket (28) on housing (27).

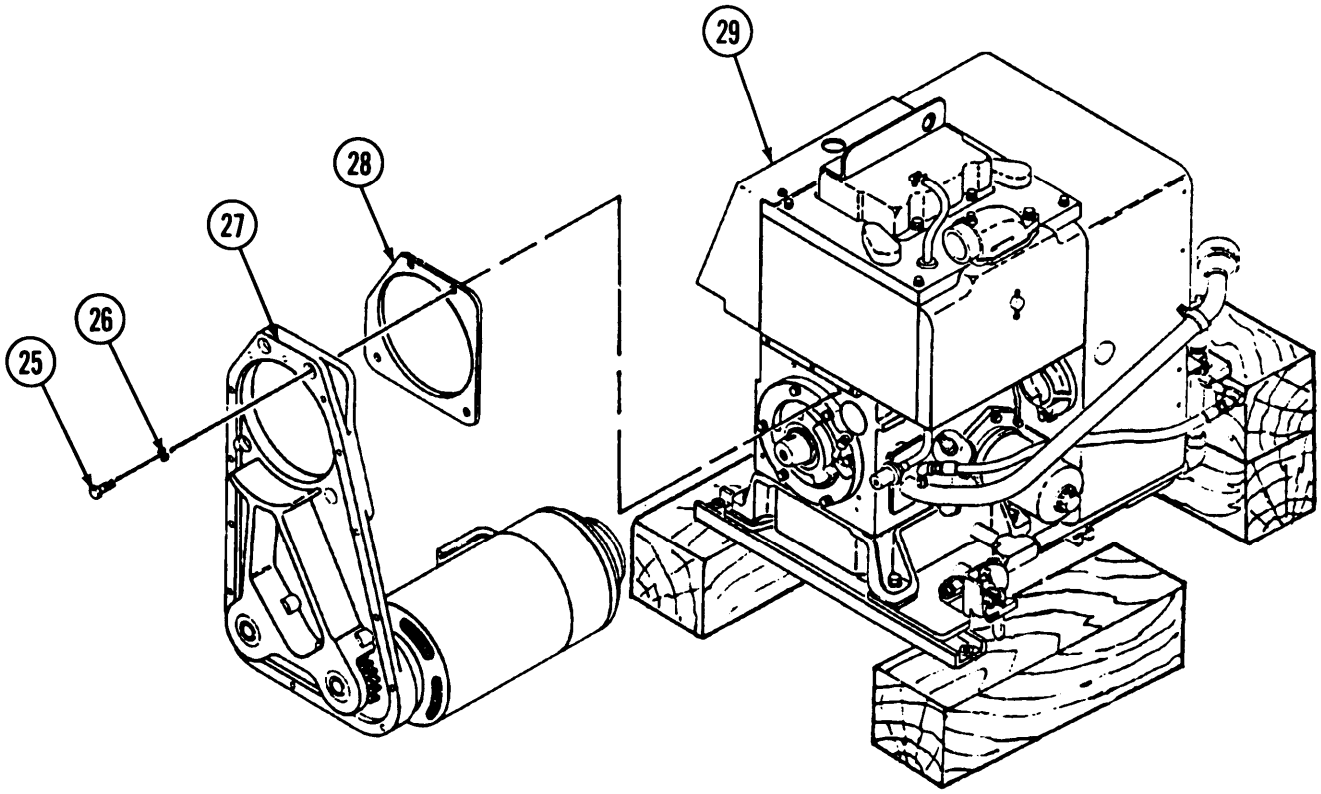
WARNING

Make sure chain housing is supported before installing bolts. If they fall, heavy parts can crush you. Assistance is required to install housing. Failure to heed this warning can result in injury or death.

CAUTION

Chain housing is heavy, and damage to generator and pump can occur if assembly is dropped.

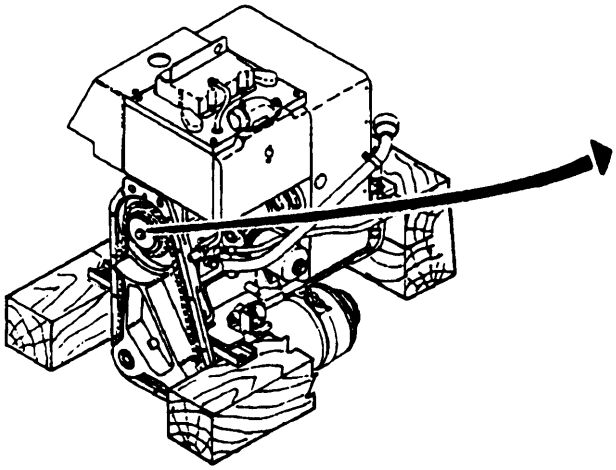
15. Apply sealant adhesive to threads of screws (25). Install housing (27) on APU (29) and secure with four screws (25) and new lockwashers (26).

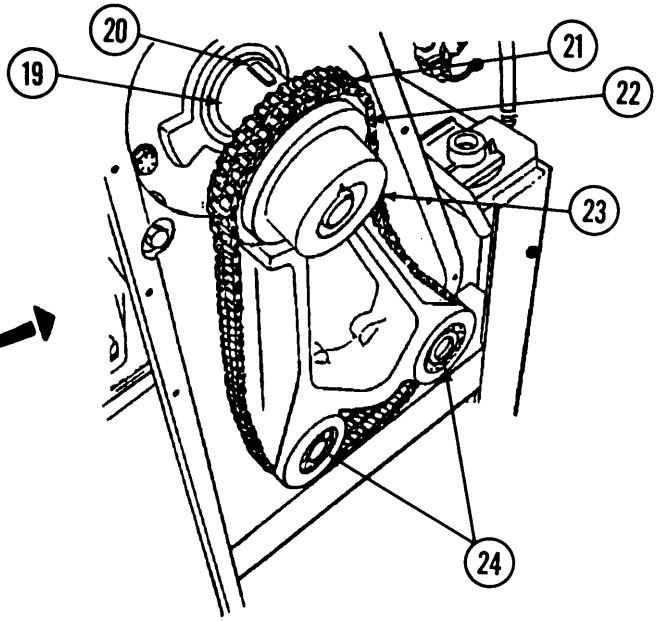


12-3. APU GEARCASE REPAIR (continued).

16. Install key (20) on shaft (19).

17. Install drive sprocket (22) on shaft (19) over key (20).

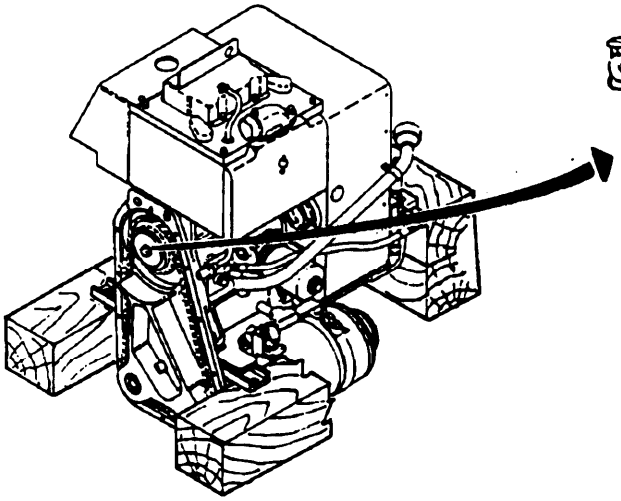


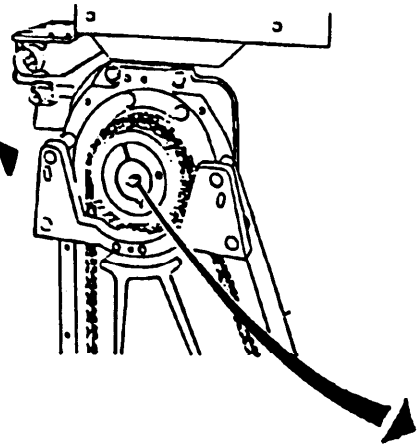


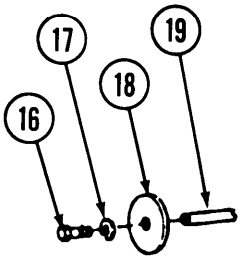
18. Install chain (21) around two gear sprockets (24) and drive sprocket (22). Install bushing (23) on shaft (19).

19. Lightly apply grease to chain (21).

20. Install spacer plate (18) on shaft (19) and secure with screw (16) and new lockwasher (17). Torque screw (16) between 50 and 55 ft-lb (68 and 75 N·m).







21. Remove screw (16), lockwasher (17), and spacer plate (18) from shaft (19).

12-3. APU GEARCASE REPAIR (continued).

22. Pry out or tap in on drive sprocket (22) until alinement gage can be installed against machined surface of housing (27).

23. Position alinement gage plate between two rows of drive sprocket (22) teeth, just touching rear drive sprocket (22).

WARNING

Sealant adhesive can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep adhesive away from open fire and use in a well-ventilated area. If adhesive gets on skin or clothing, wash immediately with soap and water.

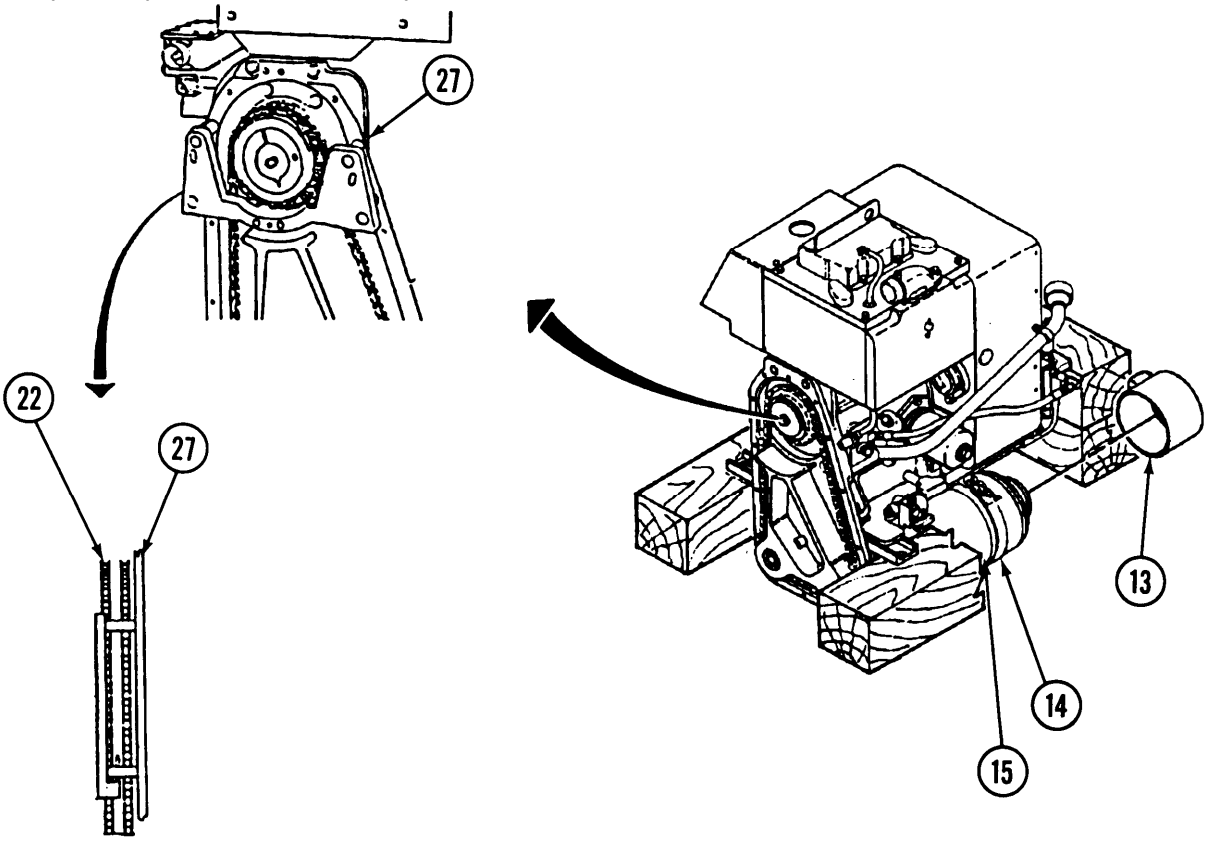
24. Apply sealant adhesive to threads of screw (16). Install screw (16), lockwasher (17), and plate (18) on shaft (19). Torque screw (16) between 50 and 55 ft-lb (68 and 75 N·m) with alinement gage held in position.

NOTE

Make sure alinement gage plate is not touching either row of teeth at this point. If alinement of drive sprocket shifts perform steps 25 and 26.

25. Pry drive sprocket away from housing (27).

26. Repeat steps 23 and 24 if drive sprocket (21) alinement shifts.



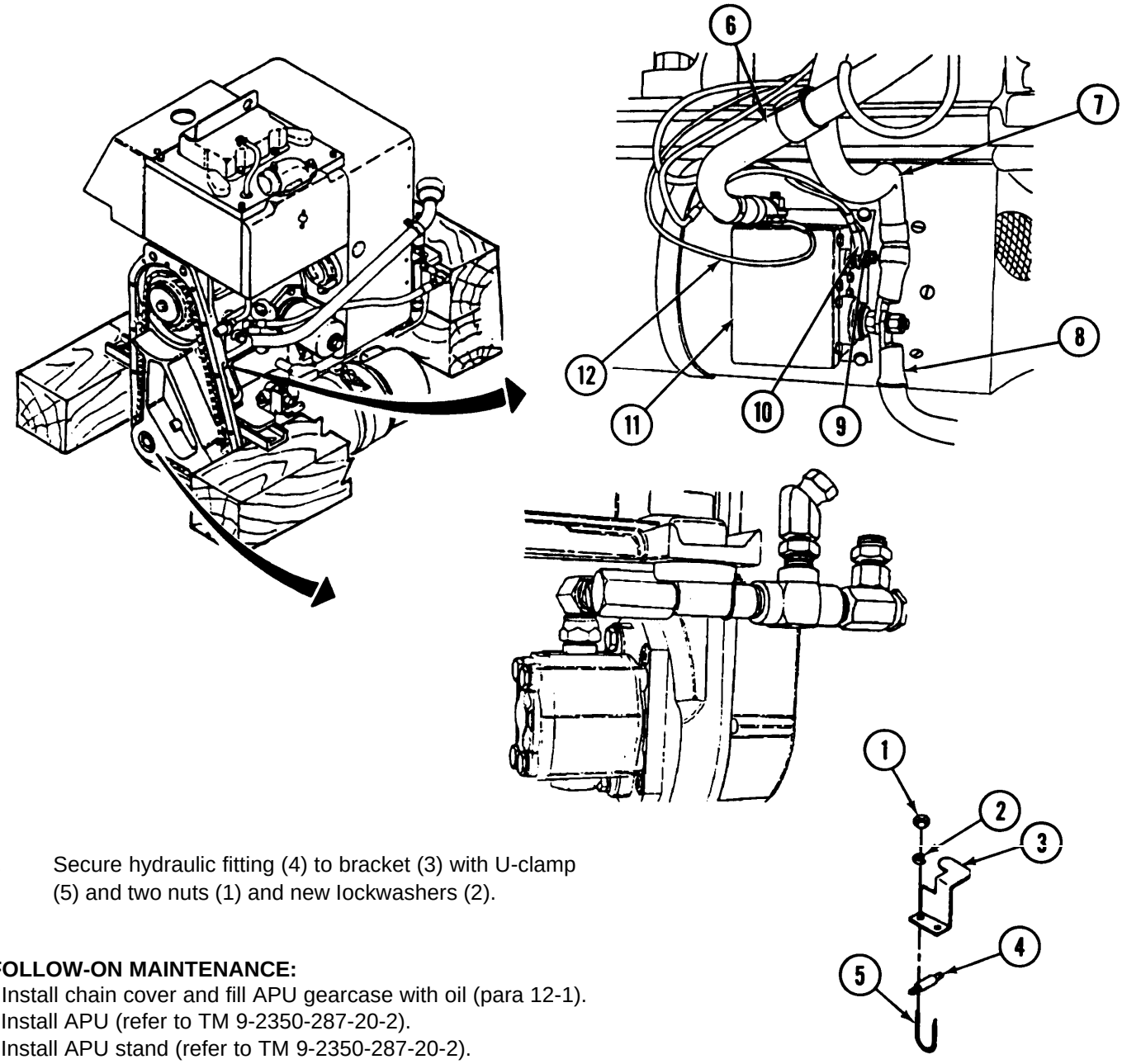
27. Install air duct (13) on generator (15) and secure with strap (14).

12-3. APU GEARCASE REPAIR (continued).

WARNING

Sealant adhesive can burn easily, can give off harmful vapors, and is harmful to skin and clothing. To avoid injury or death, keep adhesive away from open fire and use in a weii-ventilated area. if adhesive gets on skin or clothing, wash immediately with soap and water.

28. Connect leads 61, 478A, and GND (9, 10, and 11) and cables GND, 66, and 62 (6, 7, and 8) to generator terminal box (12). Coat generator terminals, cables, and leads with sealant adhesive.



29. Secure hydraulic fitting (4) to bracket (3) with U-clamp (5) and two nuts (1) and new Iockwashers (2).

FOLLOW-ON MAINTENANCE:

- Install chain cover and fill APU gearcase with oil (para 12-1).
- Install APU (refer to TM 9-2350-287-20-2).
- Install APU stand (refer to TM 9-2350-287-20-2).
- Test APU (refer to TM 9-2815-221-34&P).

12-4. APU GENERATOR BRUSHES REPAIR.

For repair of the APU generator brushes, refer to TM 9-2920-224-34&P.

CHAPTER 14
AFES CYLINDERS RECHARGING

14-1. AFES CYLINDERS RECHARGING.

The procedure for recharging AFES cylinders is contained in TM 5-4210-218-13&P.

CHAPTER 15
CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL (CBR) EQUIPMENT MAINTENANCE

15-1. GENERAL

Direct Support maintenance procedures for the M2A2 air purifier and the M1A1 precleaned and particulate filter for the nuclear, biological, and chemical (NBC) system are contained in TM 3-4240-276-30&P.

APPENDIX A
REFERENCES

Paragraph Number	Paragraph Title	Page Number
A-1	General	A-1
A-2	Regulations	A-1
A-3	Manuals	A-1
A-4	Pamphlets, Bulletins	A-3
A-5	Forms	A-4

A-1. GENERAL.

The following is a list of publications applicable to material covered in this technical manual. Appropriate indexes should be consulted frequently for the latest revisions and additions.

A-2. REGULATIONS.

Defense Traffic Management Regulation ..... AR 55-355
Malfunctions Involving Ammunition and Explosives ..... AR 75-1
Dictionary of United States Army Terms ..... AR 310-25
Authorized Abbreviations and Brevity Codes ..... AR 310-50
Accident Reporting and Records ..... AR 385-40
Prevention of Motor Vehicle Accidents ..... AR 385-55
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 746-1

A-3. MANUALS.

NBC Protection ..... FM 3-4
NBC Decontamination ..... FM 3-5
Explosives and Demolition ..... FM 5-25
General Fabric Repair ..... FM 10-16
First Aid for Soldiers ..... FM 21-11
Operator's Circular Welding Theory and Application ..... TC 9-237
Storage, Shipment, Handling, and Disposal of Chemical Agents and Hazardous Chemicals ..... TM 3-250
Direct Support Maintenance Manual (Including Repair Parts and Special Tools List): Purifier, Air: M2A1 (NSN 4240-00-307-7805); Purifier, Air: M2A2 (NSN 4240-00-868-7906) and Precleaner and Particulate Filter Assembly: Ml A1 -19 (4240-01-026-3112) ..... TM 3-4240-276-30&P
Operator's and Organizational Maintenance Manual: For Alarm, Chemical Agent, Automatic: Portable, Manpack, M8 (NSN 6665-00-935-6955) Fixed Emplacement, M10 (6665-00-169-1446) for Trucks, Utility: 1/4-Ton, M11 (6665-00-169-1447); for Truck: 3/4-Ton, M12 (6665-00-169-1448); for Truck: 2 1/2-Ton, M13 (6665-00-169-1449); for Full-Tracked, Armored Personnel Carriers and Recovery Vehicles, M14 (6665-00-169-1450); for Carrier, Command and Reconnaissance, Armored, M15 (6665-00-169-1451)

A-3. MANUALS (continued).

with Power Supply for Truck, Utility: 1/4-Ton, M16 (6665-00-169-1452); with Power Supply for Truck: 3/4-Ton, M17 (6665-00-169-1453) and with Power Supply for Truck: 2 1/2-Ton, Ml 18 (6665-00-169-1454) ..... TM 3-6665-225-12

Operator's, Organizational, and Direct Support Maintenance Manual Including Repair Parts and Special Tools List for Recharger, Fire Extinguisher, Monobromotrifluoromethane, Skid Mounted, Electric Motor Driven Model RHA-101-M, Part Number 350501-001 S/N 3505-1 to 3505-368 (NSN 4210-01-176-3511) ..... TM 5-4210-218-13&P

Inspection, Care and Maintenance of Antifriction Bearings ..... TM 9-214

[Item Deleted]

Materials Used for Cleaning, Preserving, Abrading and Cementing Ordnance Materiel and Related Materials Including Chemicals ..... TM 9-247

Operator, Organizational, Direct Support and General Support Maintenance Manual Including Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools), Various Machine Gun Mounts and Combinations Used on Tactical and Armored Vehicles Mounts ..... TM 9-1005-245-14

Operator's Manual: Carrier, Ammunition, Tracked M992A1 (NSN 2350-01-352-3021) TM-9-2350-287-10

Unit Maintenance Manual for Carrier, Ammunition, Tracked M992A1 (NSN 2350-01-352-3021); Volume 1 of 2 ..... TM 9-2350-287-20-1

Unit Maintenance Manual for Carrier, Ammunition, Tracked M992A1 (NSN 2350-01-352-3021); Volume 2 of 2 ..... TM 9-2350-287-20-2

Unit, Direct Support, and General Support Maintenance Repair Parts and Special Tools List for Carrier, Ammunition, Tracked: M992A1 ..... TM 9-2350-287-24P

Unit, Direct Support and General Support Maintenance Manual Standards for Inspection and Classification of Tracks, Track Components and Solid-Rubber Tires (FSC 2530) ..... TM 9-2530-200-24

Organizational, Direct Support and General Support Maintenance Manual (Including Repair Parts and Special Tools) for Heaters, Vehicular Compartment ..... TM 9-2540-205-24&P

Direct Support and General Support Maintenance Repair Parts and Special Tools Lists (Including Depot Maintenance Repair Parts and Special Tools Lists) for 8V71T Diesel Engines Model 7083-7395 (NSN 2815-01-043-7092) and (2815-01-260-0211) Model 7083-7396 (2815-01-040-3120) and (2815-01-260-0212) Model 7083-7398 (2815-00-936-7659) Model 7083-7399 (2815-00-134-4845) ..... TM 9-2815-202-24P

Direct Support and General Support Maintenance for Engine, Diesel with Container Model 7083-7395 (NSN 2815-01-043-7092) (2815-01-260-0211) Engine, Diesel with Container Model 7093-7396 (2815-01-040-3120) (2815-01-260-0212) Engine, Diesel with Container Model 7083-7398 (2815-00-936-7659) Engine, Diesel with Container Model 7083-7399 (2815-00-134-4845) ..... TM 9-2815-202-34

Direct Support and General Support Maintenance (Including Repair Parts and Special Tools List) for Engine, Diesel, Industrial Type Model DJEAM and DJBMA (NSN 2815-01-175-7342) and (2815-00-615-8740) ..... TM 9-2815-221-34&P

Direct Support and General Support Maintenance Manual Including Repair Parts and Special Tools List for Generator Assembly, Engine (300 AMP) 8717421 (NSN 2920-00-795-6627), 10889713 (2920-00-830-6660), and 11642898 (2920-00-169-5715) ..... TM 9-2920-224-34&P

A-3. MANUALS (continued).

Direct Support, General Support, and Depot Maintenance Manual (Including Repair Parts) for Starter, Engine, Electrical, Assembly (NSN 2920-00-226-6545) (DELCO-REMY Model 11 13943) (Military Part No. 10911018-1): Starter, Engine Electrical, Assembly (2920-00-91 1-5637) (DELCO-REMY Model 11 13904) (Military Part Number 10911018) Starter, Engine Electrical, Assembly (2920-00-912-9510) (DELCO-REMY Model 11 13944) . . . . . TM 9-2920-242-35

Direct Support and General Support Maintenance Manual (Including Repair Parts and Special Tools List) for Starter, Engine, Electrical (Leece-Neville Model M0017072MB) (NSN 2920-00-267-9987) . . . . . TM 9-2920-243-34

Organizational and Direct Support Maintenance Manual Including Repair Parts and Special Tools List for Heater, Engine Coolant, Diesel or Gasoline-Fueled (NSN 2990-00-997-1532) ..... TM 9-2990-207-23&P

Operator's and Organizational Maintenance Manual Including Repair Parts and Special Tools List for Simplified Test Equipment for Internal Combustion Engines ..... TM 9-491O-571-12&P

Operator's, Unit, Intermediate Direct Support and Intermediate General Support Maintenance Manual for Lead-Acid Storage Batteries ..... TM 9-6140-200-14

Chemical, Toxicological and Missile Fuel Handlers Protective Clothing ..... TM 10-277

Operator's and Unit Organizational Maintenance Manual for inter-communication Set, AN/VIC-1(V) (NSN 5830-00-856-3273); and Control, Intercommunication Set, C-I0456/VRC (NSN 5830-01-082-0804) . . . . . TM 11-5830-340-12

Operator's, Unit, Direct Support and General Support Maintenance Manual for Digital Multimeter AN/PSM-45 (NSN 6625-01-139-251 2) ..... TM 11-6625-3052-14

Packaging of Materiel: Preservation (VOI 1) ..... TM 38-230-1

Packaging of Materiel: Packing (VOl 11) ..... TM 38-230-2

Procedures for Destruction of Improved Conventional Munitions (lCM) to Prevent Enemy Use ..... TM 43-0002-33

Painting Instructions for Army Materiel ..... TM 43-0139

Transportability Guidance: Carrier, Cargo, Full-Tracked: 7-Ton, Ammunition, M992A1 Field Artillery Ammunition Support Vehicle (FAASV) ..... TM 55-2350-287-14

General Procedures for Purging and Charging of Fire Control Instruments . . . . . TM 750-116

Procedures for Destruction of Equipment to Prevent Enemy Use (Mobility Equipment Command) ..... TM 750-244-3

Destruction of Conventional Ammunition and Improved Conventional Munitions to Prevent Enemy Use (Excluding Toxic and Incapacitating Chemical Agents) (For Combat Units) ..... TM 750-244-5-1

Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use ..... TM 750-244-6

A-4. PAMPHLETS, BULLETINS.

Expendable/Durable Items (Except Medical, Class V, Repair Parts and Heraldic Items) ..... CTA 50-970

Army Medical Department Expendable/Durable Items ..... CTA 8-100

Consolidated Index of Army Publications and Blank Forms ..... DA Pam 25-30

The Army Maintenance Management System (TAMMS) ..... DA Pam 738-750

Functional Users Manual for The Army Maintenance Management System-Aviation (TAMMS-A) ..... DA Pam 738-751

A-4. PAMPHLETS, BULLETINS (continued).

Storage Serviceability Standard: Tracked Vehicles, Wheeled Vehicles, and Component Pads ..... SB 740-98-1
Solder and Soldering ..... TB SIG 222
Color, Marking and Camouflage Painting of Military Vehicles, Construction Equipment and Materials Handling Equipment ..... TB 43-0209
Nonaeronautical Equipment Army Oil Analysis Program (AOAP) ..... TB 43-0210
Use of Antifreeze Solutions, Antifreeze Extender, Cleaning Compcunds and Test Kit in Engine Cooling Systems ..... TB 750-651

A-5. FORMS.

U.S. Army Accident Investigation Report ..... DA Form 285
Product Quality Deficiency Report ..... SF Form 368

APPENDIX B
EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

B-1. GENERAL.

This appendix lists expendable supplies and materials needed to operate and maintain the M992A1. These items are authorized to you by CTA 50-970 or CTA 8-100.

B-2. EXPLANATION OF COLUMNS.

Column 1 - Item Number. This number is assigned to the entry in the listing and is referenced in narrative instructions to identify the material needed (e.g., Cleaning solvent, Item 6, Appendix B).

Column 2 - Level. This column identifies the lowest level of maintenance that requires the listed item:

C - Operator/Crew
O - Unit Maintenance
F - Direct Support Maintenance
H - General Support Maintenance

Column 3 - National Stock Number. This is the national stock number (NSN) assigned to the item; use the NSN to request or requisition the item.

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.

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: BD (bundle), BT (bottle), BX (box), CN (carton), EA (each), GL (gallon), HD (hundred), KT (kit), LB (pound), OZ (ounce), PT (pint), QT (quart), RL (roll), SH (sheet), and TU (tube). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue necessary to satisfy your requirements.

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCCRIPTION (CAGEC)	(5) U/M
1	F	6810-00-184-4796	ACETONE, TECHNICAL, 5-GAL. CAN OA-51 (81348)	CN
2	F	8040-00-221-3811	ADHESIVE MMM-A-1617 (81348)	BT
2.1	O	8040-00-809-8252	ADHESIVE MIL-A-1 154 (81349)	BT
3	O	8040-00-148-7207	ADHESIVE, SEALANT, SILICON RTV MIL-A-46106 (81349)	OZ
4	O	5340-00-450-5718	CAP AND PLUG SET (19207)10935405	EA
5	F	8040-00-738-6429	CEMENT, EPOXY AV100/HV100 (07566)	KT
6	F	6850-00-281-3061	CLEANING SOLVENT, 5-OZ CAN	OZ
7	F	8030-00-244-1297	CORROSION PREVENTIVE MIL-C-16173 GRADE 2 (80244)	EA
8	F	7350-00-965-1662	CUP, PAPER UU-C-806TY5STACL2 (80244)	BX
9	O	6850-00-281-1985	DRYCLEANING SOLVENT (81348) P-D-680	GL
10	F	5330-00-223-2659	GASKET MATERIAL P2246-A PER MIL-G-12803	SH
11	F	9150-00-181-7724	GREASE, AIRCRAFT MIL-G-81322 (81349)	OZ
12	O	9150-00-935-1017	GREASE, AUTOMOTIVE MIL-G-10924 (81349)	CN

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST (continued)

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCCRIPTION (CAGEC)	(5) U/M
13	O	9150-00-935-9807	HYDRAULIC FLUID, PET, OHT, MIL-H-6083 (98308) BRAYCO783C	QT
14	O	9150-00-189-6727	LUBRICATING OIL (81349) MIL-L-2104B	QT
15	F	8020-00-655-9228	PAINT, FIRE-RETARDANT (78520)	GL
16	F	5350-00-598-5537	PAPER, ABRASIVE (80244) A-A1202 TY152	HD
17	O	7920-00-205-1711	RAG, WIPING DD-R-30 (81348)	LB
18	F	7920-00-140-0869	RAG, WIPING, LINT-FREE 8722-0088 (03950)	BX
19	F	8040-01-108-6660	REPAIR KIT, FIBERGLASS 900M-1 95 (73168)	KT
20	F	2910-00-078-4065	REPAIR KIT, FIBERGLASS (19207) 10941900	EA
21	O	8030-00-159-8176	SEALING COMPOUND (81349) MIL-S-45180	TU
22	F	8030-00-530-6608	SEALING COMPOUND, TYPE III (81349) MIL-S-11030	RL
23	F	9150-00-834-5608	SILICONE LUBRICANT (06186)	PT
24	O	3439-00-555-4629	SOLDER, TIN ALLOY QQ-S-571 (81348)	LB
25	F	9905-00-537-8954	TAG, MARKER (81 349) MIL-T-12755	BD
26	F	7510-00-198-5831	TAPE, PRESSURE-SENSITIVE (58536) A-A-194	RL
27	F	9505-00-293-4206	WIRE, NONELECTRICAL (96906) MS20995C32	RL

APPENDIX C
TORQUE VALUES FOR THREADED FASTENERS

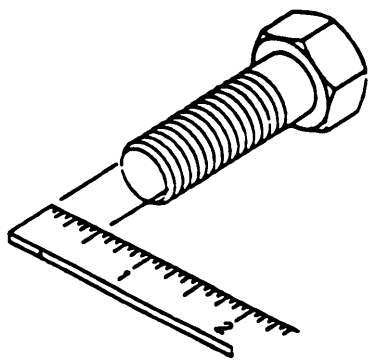
C-1. GENERAL

This section provides general torque limits for screws used on the M992A1 vehicle. Special torque limits are indicated in the maintenance procedures for applicable components. The general torque limits given in this appendix will 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.

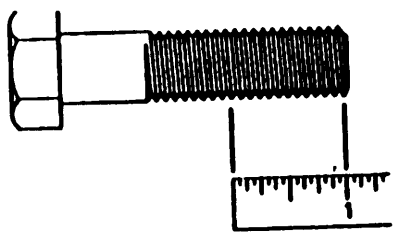
C-2. TORQUE LIMITS.

Table C-1 (p. C-2) lists dry torque limits. Dry torque limits are used on screws that do not have lubricants applied to threads. Table C-2 (p. C-3) lists wet torque limits. Wet torque limits are used on screws that have high-pressure lubricants applied to threads.

C-3. HOW TO USE TORQUE TABLE.



1. Measure the diameter of the screw to be installed.



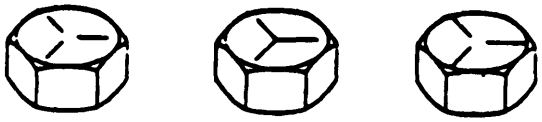
2. Count the number of threads per inch or use a pitch gage.

3. Under the heading SIZE, look down the left-hand column until the diameter of 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.

C-3. HOW TO USE TORQUE TABLE (continued).

CAPSCREW HEAD MARKINGS
Manufacturer's marks may vary.
These are all SAE Grade 5 (three- line).

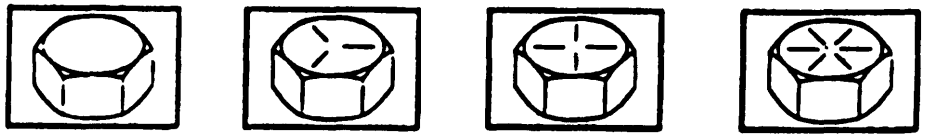


5. To find the grade of the screw that is to be installed, match the markings on the head to the correct picture of CAPSCREW HEAD MARKINGS on the table.

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 C-1. Torque Limits for Dry Fasteners

SAE CAPSCREW HEAD MARKINGS

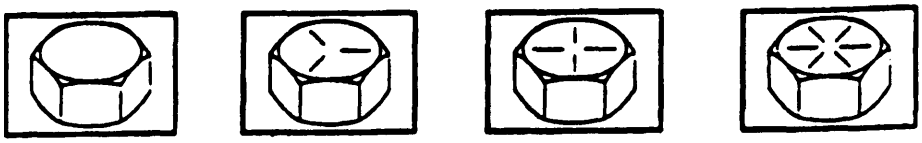


SIZE			TORQUE							
			SAE GRADE No. 1 or 2		SAE GRADE No. 5		SAE GRADE No. 6 or 7		SAE GRADE No. 8	
I N .	THREADS PER INCH	MM	FOOT-POUNDS	N•m	FOOT-POUNDS	N•m	FOOT-POUNDS	N•m	FOOT-POUNDS	N•m
1/4	20	6.35	5	6.78	8.00	10.85	10	13.56	12.00	16.27
1/4	28	6.35	6	8.14	10.00	13.56			14.00	18.98
5/16	18	7.94	11	14.92	17.00	23.05	19	25.76	24.00	32.52
5/1 6	24	7.94	13	17.63	19.00	25.76			27.00	36.61
3/8	16	9.53	18	24.41	31.00	42.04	34	46.10	44.00	59.66
3/8	24	9.53	20	27.12	35.00	47.46			49.00	66.44
7/16	14	11.11	28	37.97	49.00	66.44	55	74.58	70.00	94.92
7/16	20		30	40.68	55.00	74.58			78.00	105.77
1/2	13	12.70	39	52.88	75.00	101.70	85	115.26	105.00	142.38
1/2	20		41	55.60	85.00	115.26			120.00	162.78
9/1 6	12	14.29	51	69.16	110.00	149.16	120	162.72	155.00	210.18
9/16	18		55	74.58	120.00	162.72			170.00	230.52
5/8	11	15.88	63	85.43	150.00	203.40	167	226.45	210.00	284.76
5/8	18		95	128.82	170.00	230.52			240.00	325.44
3/4	10	19.05	105	142.38	270.00	366.12	280	379.68	375.00	508.50
3/4	16		115	155.94	295.00	400.02			420.00	596.52
7/8	9	22.23	160	216.96	305.00	535.62	440	596.64	605.00	820.38
718	14		175	237.30	435.00	589.86			675.00	915.30
1	8	25.40	235	318.66	590.00	800.04	660	894.96	910.00	1233.96
1	14		260	339.00	660.00	894.96			990.00	1342.44
1118		25.58			800.00	1064.80			1280.00	1735.70
					880.00	1193.30			1440.00	1952.80
1114		31.75							1820.00	2467.90
									2000.00	2712.00
13/8		34.93			1460.00	1979.80			2380.00	2337.30
					1680.00	2278.10			2720.00	3688.30
1 1/2		38.10			1940.00	2630.60	.	.	3160.00	4285.00
					2200.00	2983.20			3560.00	4827.40

C-3. HOW TO USE TORQUE TABLE (continued).

Table C-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. 6 or 7		SAE GRADE No. 8	
DIA IN.	THREADS PER INCH	MM	FOOT-POUNDS	NŽm	FOOT-POUNDS	NŽm	FOOT-POUNDS	N•m	FOOT-POUNDS	N•m
1/4	20	6.35	4.90	6.10	7.20	9.76	9.00	12.20	10.80	14.64
1/4	28	6.35	5.40	7.33	9.00	12.20	-		12.60	17.08
5/16	18	7.94	9.90	13.34	15.30	22.54	17.10	23.18	21.60	29.27
5/16	24	7.94	11.70	15.87	17.10	23.18	-		24.30	32.95
3/8	16	9.53	16.20	21.97	27.90	37.84	30.60	41.49	39.60	53.69
3/8	24	9.53	18.00	24.41	31.50	42.71	-		44.10	59.80
7/16	14	11.11	25.20	34.17	44.10	59.80	49.50	67.12	63.00	85.42
7/16	20	-	27.00	36.61	49.50	67.12	-		70.20	95.19
1/2	13	12.70	35.10	47.59	67.50	91.53	76.50	103.73	94.50	128.14
1/2	20	-	36.90	50.04	76.50	103.73	-		108.00	146.50
9/1 6	12	14.29	45.90	62.24	99.00	134.24	108.00	146.45	139.50	189.16
9/16	18	-	49.50	67.12	108.00	146.45	-		153.00	207.47
5/8	11	15.88	56.70	76.89	135.00	183.06	150.30	203.80	189.00	256,28
5/8	18	-	85.50	1115.49	153.00	207.47	-		216.00	296.90
3/4	10	19.05	94.50	128.14	243.00	329.51	252.00	341.71	337.50	457.65
314	16	-	103.50	140.35	265.50	360.20	-		378.00	536.87
718	9	22.23	144.00	195.26	355.50	482.06	396.00	536.98	544.50	738.34
7/8	14	-	157.50	213.57	391.50	530.87	-		607.50	823.77
1	8	25.40	211.50	286.79	531.00	720.04	594.00	805.46	819.00	1110.56
1	14	-	225.00	305.10	594.00	805.46	-	–	891.00	1208.20
1 1/8	-	25.58	–	–	720.00	976.32	-	–	1152.00	1562.13
					792.00	1073.97			1296.00	1757.52
1114	-	31.75	-	–				–		2221.11
										2440.80
1318	-	34.93	-	–	1314.00	1781.82	-	–	2142.00	2904.57
					1512.00	2050.29			2446.00	3319.47
1 1/2	-	38.10	-	–	1746.00	2367.54	-	–	2844.00	3856.50
					1980.00	2684.88			3204.00	4344.66

C-4. TIGHTENING METAL FASTENERS.

When torquing a fastener, select a torque wrench whose range (Table C-3, p. C-4) 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 O to 100 will be most accurate from 25 to 75 foot-pounds. The accuracy of readings will decrease as you approach O foot-pounds or 100 foot-pounds. The ranges in Table C-3 are based on this principle.

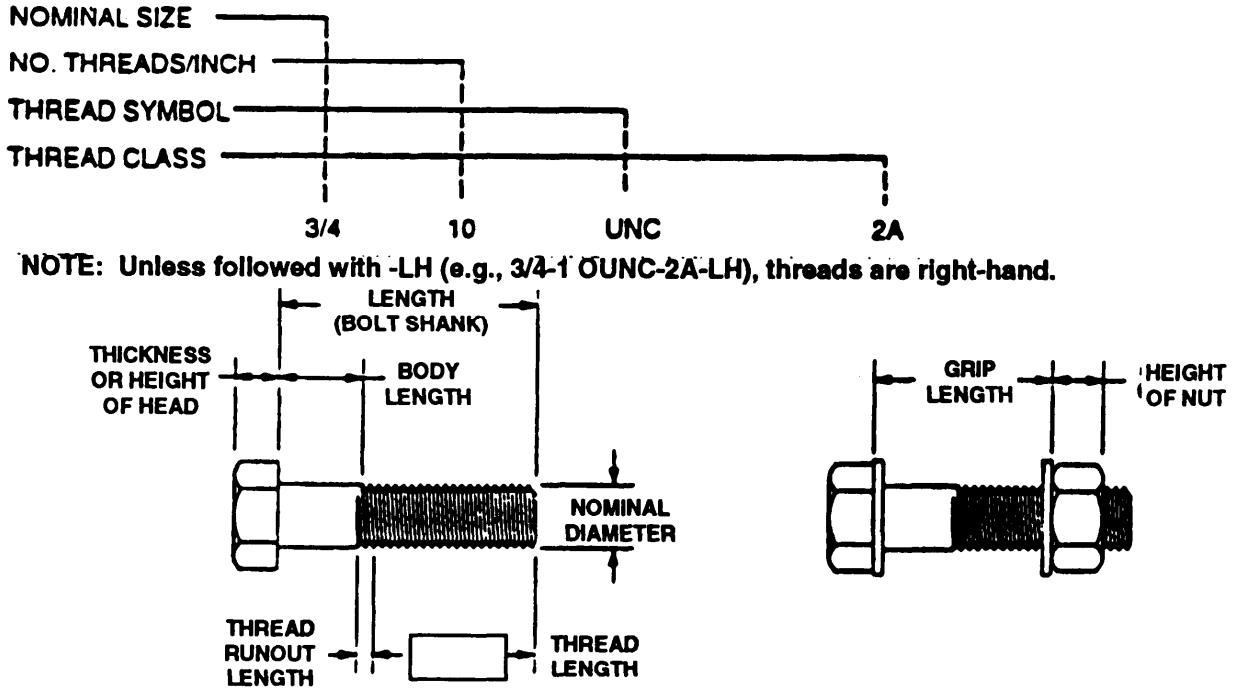
C-4. TIGHTENING METAL FASTENERS (continued).

Table C-3. Torque Ranges	
STATED RANGE	MOST EFFECTIVE RANGE
0- 200 in-lb	4 - 13 ft-lb
0- 600 ft-lb	50 - 450 ft-lb
0 - 170 ft-lb	44 - 131 ft-lb
15 - 75 ft-lb	30 - 60 ft-lb

C-5. 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 C-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 C-4. Thread Classes and Description		
EXTERNAL	INTERNAL	INTERNAL
1A	1B	LOOSE FIT
2A	2B	MEDIUM FIT
3A	3B	CLOSE FIT



C-6. 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 C-5).

Table C-5. SAE Screw and Bolt Markings

SCREWS	BOLTS
SAE GRADE 6 4 RADIAL DASHES 90° APART	SAE GRADE 2 NO MARKINGS
SAE GRADE 7 5 RADIAL DASHES 72° APART	SAE GRADE 3 2 RADIAL DASHES 180° APART
SAE GRADE 8 6 RADIAL DASHES 60° APART	SAE GRADE 5 3 RADIAL DASHES 120° APART

Markings on Hex Locknuts

GRADE A -No Marks
GRADE B -3 Marks
GRADE C -6 Marks

GRADE A - No Mark
GRADE B - Letter B
GRADE C- Letter C

GRADE A- No Notches
GRADE B - One Notch
GRADE C - Two Notxhee

APPENDIX D
COMMON AND SPECIAL TOOL REQUIREMENTS

D-1. GENERAL.

This appendix lists all common and special tools required to maintain the M992A1. This appendix is for reference only. To requisition special tools, use TM 9-2350-287-24P.

D-2. EXPLANATION OF COLUMNS.

Column (1) - Item Number. This number is assigned to the entry in the listing and is referenced in the Initial Setup in each maintenance procedure to identify the item (e.g. General mechanic's tool kit, Item 19, Appendix D).

Column (2) - Item Name. This column lists the item by nomenclature and other descriptive features, such as measurement.

Column (3) - National Stock Number. This is the national stock number assigned to the item; use it to requisition or request the item.

Column (4) - Part Number. This indicates the primary number used by the manufacturer who controls the design and characteristics of the item by means of engineering drawings, specifications, standards, and inspection requirements.

Column (5) - Reference. This column identifies the authorizing supply catalog (SC) or repair parts and special tools list (RPSTL) for items listed in this appendix.

Section II. COMMON TOOLS SUPPLEMENTS, AND SPECIAL TOOLS/FIXTURES LIST

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
1	AFES repair tool kit	4210-01-269-8368	5705554	TM 9-2350-287-24P
2	Air blow gun	4940-00-333-5541	DGA 520	SC-4910-95-CL-A02
3	Alignment gage	5120-00-613-6779	11671961	TM 9-2350-287-24P
4	Arbor press	3444-00-449-7295	A-A-51194	SC-4910-95-CL-A31
5	Automotive electrical repair tool kit	5180-00-422-8594	1711	SC-4910-95-CL-A31
6	Blind hand riveter	5120-00-017-2849	98	SC-4910-95-CL-A02
7	Combination wrench set	5120-00-895-9566	GGG-W-00645	SC-4910-95-CL-A02
8	Combination wrench, 1-1/4 inch	5120-00-184-8677	GGG-W-645	SC-4910-95-CL-A02
9	Deadblow hammer	5120-01-065-2211	57-534	SC-4910-95-CL-A02
10	Depth micrometer	5210-00-221-1921	GGG-C-105	SC-4910-95-CL-A31
11	Dial indicator	5210-00-277-8840	196A	SC-4910-95-CL-A02
12	Drain pan	4910-00-387-9592	450	SC-4910-95-CL-A31
13	Electric disc sander	5130-00-596-9728	6112-90	SC-4910-95-CL-A31
14	Electric drill	5130-00-889-9004	WD00661	SC-4910-95-CL-A31
15	Endless sling	3940-00-675-5003	PD-10196	TM 9-2350-287-24P
16	Face wrench socket	5120-00-034-8443	8390124	TM 9-2350-287-24P
17	Five-ton hoist			TO&E
18	Force gage			TM 9-2350-287-24P
19	General mechanic's tool kit	5180-00-177-7033		SC-5180-90-CL-N26
20	Growler	6625-00-363-3846	AY4013	SC-4910-95-CL-A02
21	Machinist's vise	5120-00-293-1439	GGG-V-410	SC-4910-95-CL-A31
22	Mechanical puller	5120-00-613-6775	11671732	TM 9-2350-287-24P
23	Multimeter	6625-01-139-2512	T00377	SC-4910-95-CL-A31
24	Multiple leg sling	3940-00-097-7398	10930560	TM 9-2350-287-24P
25	Outside micrometer caliper set	5210-00-554-7134	GGG-C-105	SC-4910-95-CL-A02
26	Power supply	6115-00-465-1044	564-0932	SC-4910-95-CL-A02
27	Projectile with inert fuse	1320-00-D00-7974	M 483	TM 9-2350-287-24P
28	Protective clothing	8415-00-082-6108	MIL-A-41829	SC-4910-95-CL-A02
29	Protective gloves	8415-00-268-7859	AA50022	SC-4910-95-CL-A31
30	Respirator	4240-00-022-2524	GGG-M-1 25/6	SC-4910-95-CL-A31
31	Safety goggles	4240-00-269-7912	AA1814	SC-4910-95-CL-A02
32	Screwdriver adapter	5130-00-240-5250	SPB083-5	SC-4910-95-CL-A31
33	Screwdriver bit holder	5130-00-449-7698	SJ409-2/#2DP	SC-4910-95-CL-A31
34	Screw extractor set	5210-00-540-1416	35585	SC-4910-95-CL-A02
35	Seal replacer	5210-00-034-0878	10914185	TM 9-2350-287-24P
35.1	Socket	5120-01-255-8232	12268253	TM 9-2350-287-24P
36	Socket wrench set, 1 inch	5120-00-081-2309	A-A 1392	SC-4910-95-CL-A31
37	Socket wrench set, 3/4-inch	5120-00-204-1999	FEDSTD353	SC-4910-95-CL-A02
38	Socket wrench socket, 2-9/16 inch, 1-inch drive	5120-00-261-2846	B107.1CL1STA	SC-4910-95-CL-A31
39	Socket wrench socket, 1-1/2 inch, 3/4 drive	5120-00-293-0094	A-A 1394	SC-4910-95-CL-A31
40	Spanner wrench	5120-00-277-9076	GGG-W-665	SC-4910-95-CL-A31
41	Thread cutting die and tap set	5136-00-357-7494	GGG-T-330	SC-3470-95-CL-A02
41.1	Torch outfit, welding	3431-00-691-1415	MIL-W-52161	TO&E
42	Torch set	3433-00-357-6311		SC-3433-90-CL-N01

Section II. COMMON TOOLS SUPPLEMENTS, AND SPECIAL TOOLS/FIXTURES LIST (continued)

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
43	Torque wrench, 0-150 ft-lb	5120-00-247-2540	J-1313-B	SC-4910-95-CL-A31
44	Torque wrench, 0-175 ft-lb	5120-00-640-6364	1753LDF	SC-4910-95-CL-A31
45	Torque wrench, 0-600 ft-lb	5210-00-221-7983	SW130-301	SC-4910-95-CL-A31
46	Twist drill set	5133-00-293-0983	DB129B	SC-3470-95-CL-A31
47	Vise jaw caps	5210-00-221-1506	GGG-C-137	SC-4910-95-CL-A31
48	Wire twisting pliers	5120-00-542-4171	M84-12	TM 9-2350-287-24P

APPENDIX E
ILLUSTRATED LIST OF MANUFACTURED ITEMS

Paragraph Number	Paragraph Title	Page Number
E-1	General	E-1
E-2	Heat Shield Reinforcement	E-2
E-3	Final Drive Work Stand	E-3
E-4	Fuel Tank Heat Shield Pad	E-4
E-5	Fan Drive Gearbox Bracket	E-5
E-6	Wood Blocks	E-6
E-7	Projectile Rack Section Test Stand	E-7

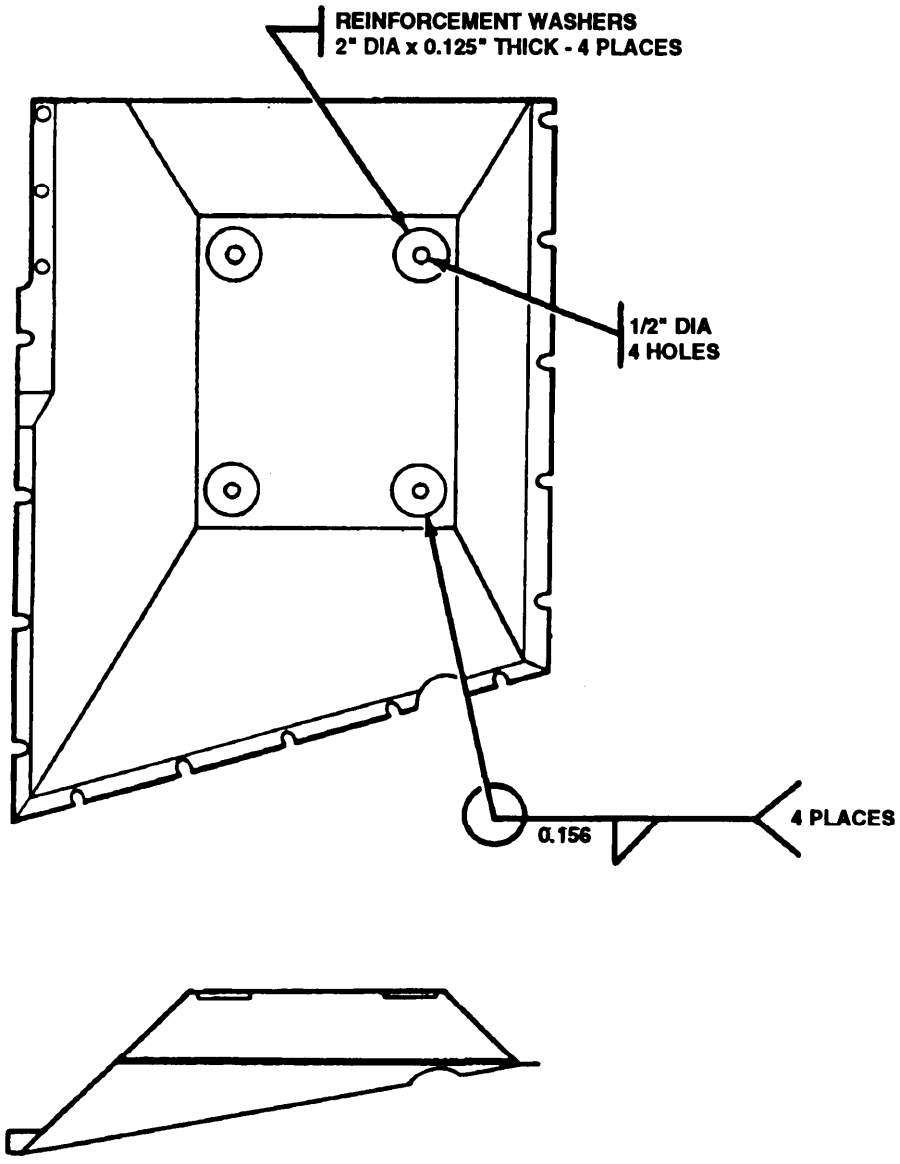
E-1. GENERAL

This appendix includes instructions for making the heat shield reinforcement, final drive work stand, fuel tank heat shield pad, fan drive gearbox bracket, wood blocks, and projectile rack section test stand.

E-2. HEAT SHIELD REINFORCEMENT.

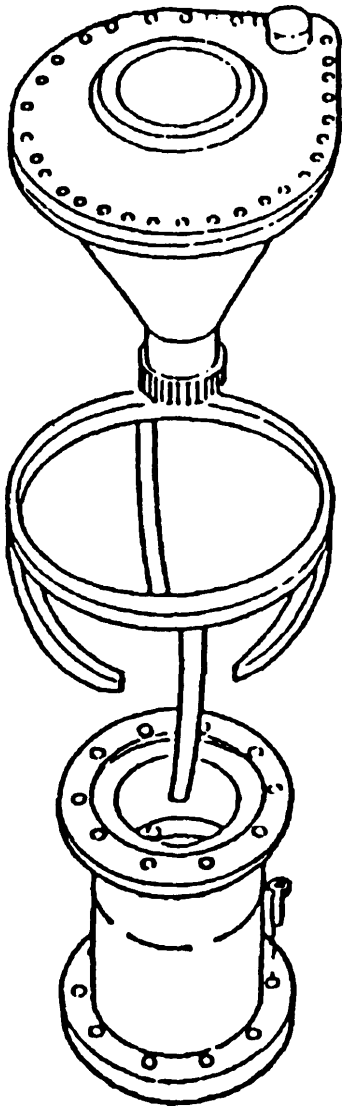
1. Drill or punch l/2-inch hole through center of stainless steel washers.

2. Weld washers to heat shield in four places (refer to TM 9-237).



E-3. FINAL DRIVE WORK STAND.

1. Construct from an old sprocket hub, PN (19207) 10936277, NSN 2520-00-066-0239.
2. Using l/8-inch flat steel, make a rack to support the weight of the final drive.
3. Make certain the final drive fits comfortably in the rack. Bolt rack to upper ring or weld rack to hub.
4. Before using the stand, bolt it securely to the floor through the lower ring.



E-4. FUEL TANK HEAT SHIELD PAD.

WARNING

A protective mask must be worn while working with asbestos cloth. Failure to do so can result in injury or death.

1. Fabricate pad in accordance with diagram.

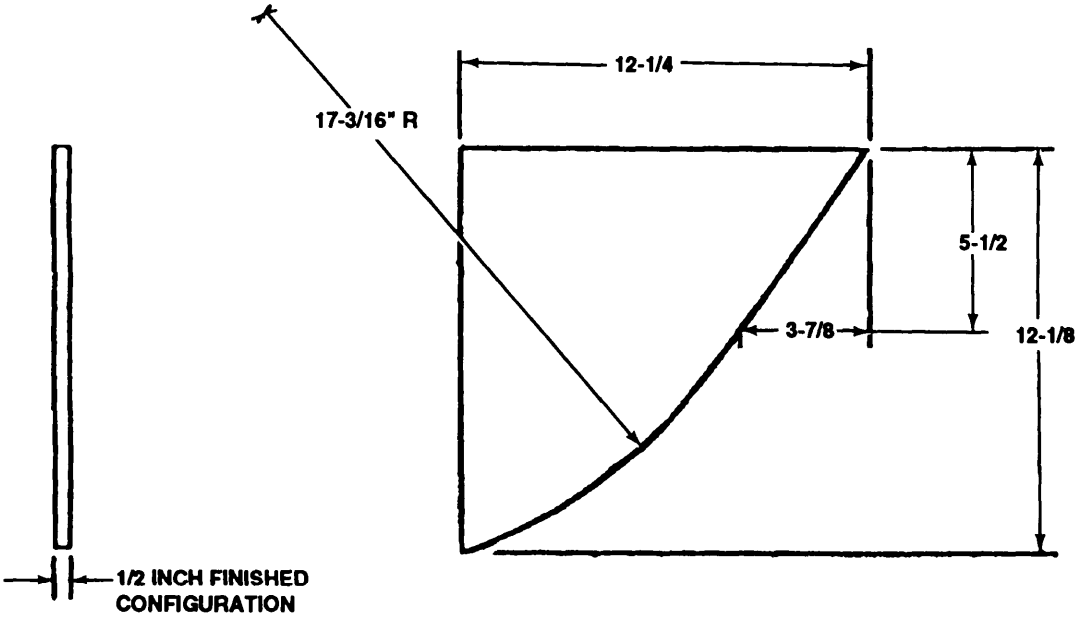
2. Dimensions are shown in inches.

3. Cover filler material (outer side only) with rubber-coated asbestos cloth. Stitch as required to maintain shape with fibrous glass cord, type SR-4.5, specification MIL-I-3158.

FILLER MATERIAL: two thicknesses of 1 oz/sq ft unbended B-fiber batting.

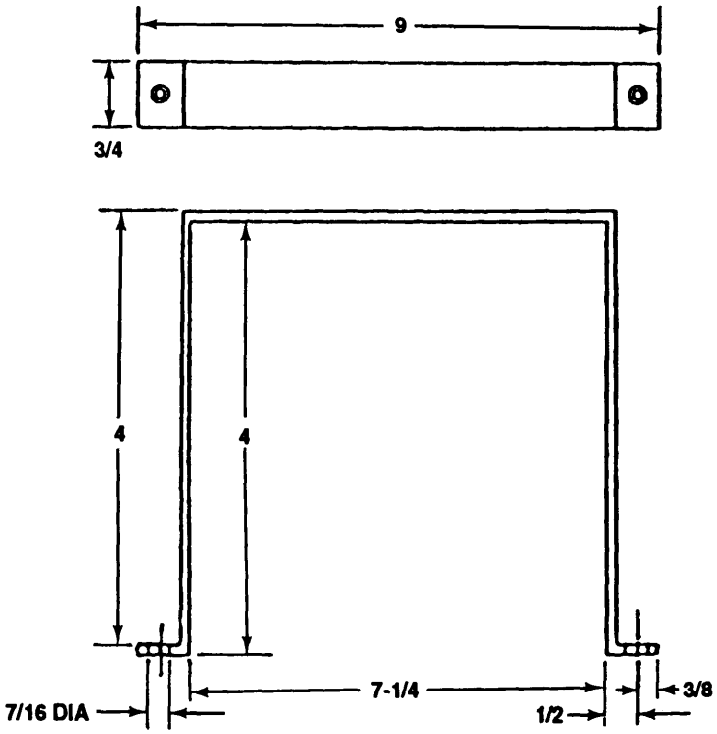
COVER MATERIAL: asbestos cloth, grade UG, class 1, 2,25 lb/sq yd, 0.083 inches thick, specification MIL-C-10316.

COATING MATERIAL: rubber, grade SC 615 F2J, specification MIL-R-3065.



E-5. FAN DRIVE GEARBOX BRACKET.

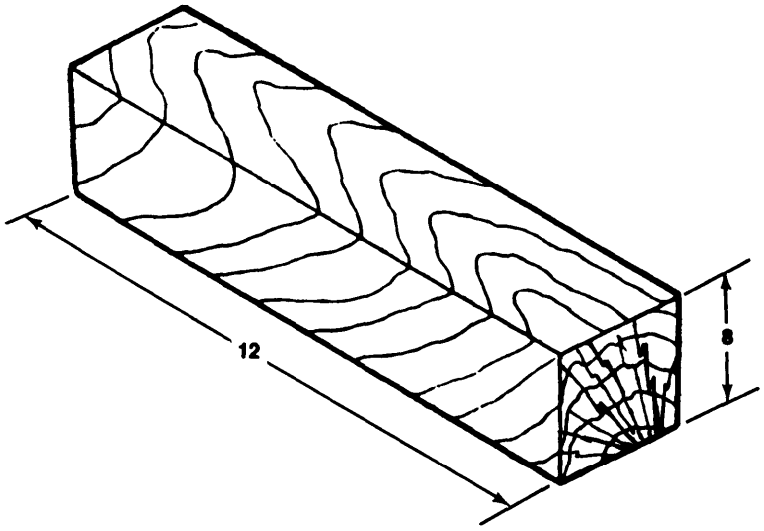
Manufacture from 3/4-inch x 0.080-inch thick steel according to specifications given on the illustration.



NOTE: DIMENSIONS ARE IN INCHES.

E-6. WOOD BLOCKS.

Cut two 8-inch by 8-inch wood blocks 12 inches long to use as a stand for the cooling fan drive assembly during repair.



E-7. PROJECTILE RACK SECTION TEST STAND.

Directions for making the projectile rack section test stand are on the following pages.

E-7. PROJECTILE RACK SECTION TEST STAND (continued).

PARTS LIST

ITEM NO	QTY	NAME	PN/SPEC
		MANUFACTURED ITEMS	
1	1	PLATE	ASTMA575 OR A576
2	1	PLATE	ASTMA575 OR A576
3	4	GUSSET	ASTMA575 OR A576
4	2	GUSSET	ASTM A575 OR A576
5	1	PLATE	ASTM A575 OR A576
6	1	BRACKET	
7	6	GUSSET	ASTM A575 OR A576
8	1	PLATE	ASTM A575 OR A576
9	3	GUSSET	ASTM A575 OR A576
10	1	RAIL	ASTM 4575 OR A576
11	1	CHANNEL	ASTM A36
12	2	CHANNEL	ASTM A36
13	2	PLATE	ASTM A575 OR A576
14	3	BEAM	ASTM A36
15	1	PLATE	ASTM A575 OR A576
16	1	ANGLE	ASTM A36
17	1	ANGLE	ASTM A36
18	6	ANGLE	ASTM A36
19	1	ADAPTER	ASTM Al 08
20	1	HOOK	ASTM A108
21	1	PLATE	ASTM A575 OR A576
22	1	TEST FIXTURE	
23	1	SUPPORT STAND	
24	6	BLOCK	ASTM A36
25	3	ANGLE	ASTM A36
26	2	ANGLE	ASTM A36
27	2	PLATE	ASTM A575 OR A576
		PROCURED ITEMS	
28	1	FORCE GAGE	BML 64840
29	4	NUT	MS 51968-14
30	2	LOCKWASHER	MS 35338-48
31	4	FLAT WASHER	MS 27183-18
32	2	CAM FOLLOWER	12332904
33	1	WINCH	12333546
34	2	SCREW	MS 90728-60
35	10	FLAT WASHER	MS 27183-14
36	6	LOCKWASHER	MS 35338-46
37	4	NUT	MS 51967-8
38	1	PIN	MS 17990-510
39	2	CHAIN 12351791-9	42C15120-205
40	2	HOOK	MS 87006-3
41	4	SCREW	MS 90728-63
42	1	SCREW	MS 90725-4
43	1	LOCKWASHER	MS 35336-44
44	1	PIN	MS 17990-507
45	1	CLEVIS	12333545

BILL OF MATERIAL

QTY	DESCRIPTION	SPEC
20 FT	STEEL ANGLE 1.25 X 1.25X .187	ASTM A36
2 SQ FT	STEEL, CARBON M101O-M1O25 ,375 THK	ASTM A575 OR A576
15 SQ FT	STEEL, CARBON M 101 O-M 1025.250 THK	ASTM A575 OR A576
1 FT	STEEL, CARBON M101O-M1O25 ,500 DIA	ASTM A108
20 FT	STEEL '1' BEAM I 3 X 7,5	ASTM A36
10 FT	STEEL CHANNEL 2.00 X 1.00 X .187	ASTM A36
1 FT	STEEL, CARBON 1.00 X 1.25	ASTM A36

E-7. PROJECTILE RACK SECTION TEST STAND (continued).

NOTES:
1. Weld per spec MIL-STD-l 261 Class 1.
2. All weld sizes are minimum.

TOLERANCES ON:		
FRACT.	DECIMALS	ANGLES
±	± .03	± 2°
	.010	

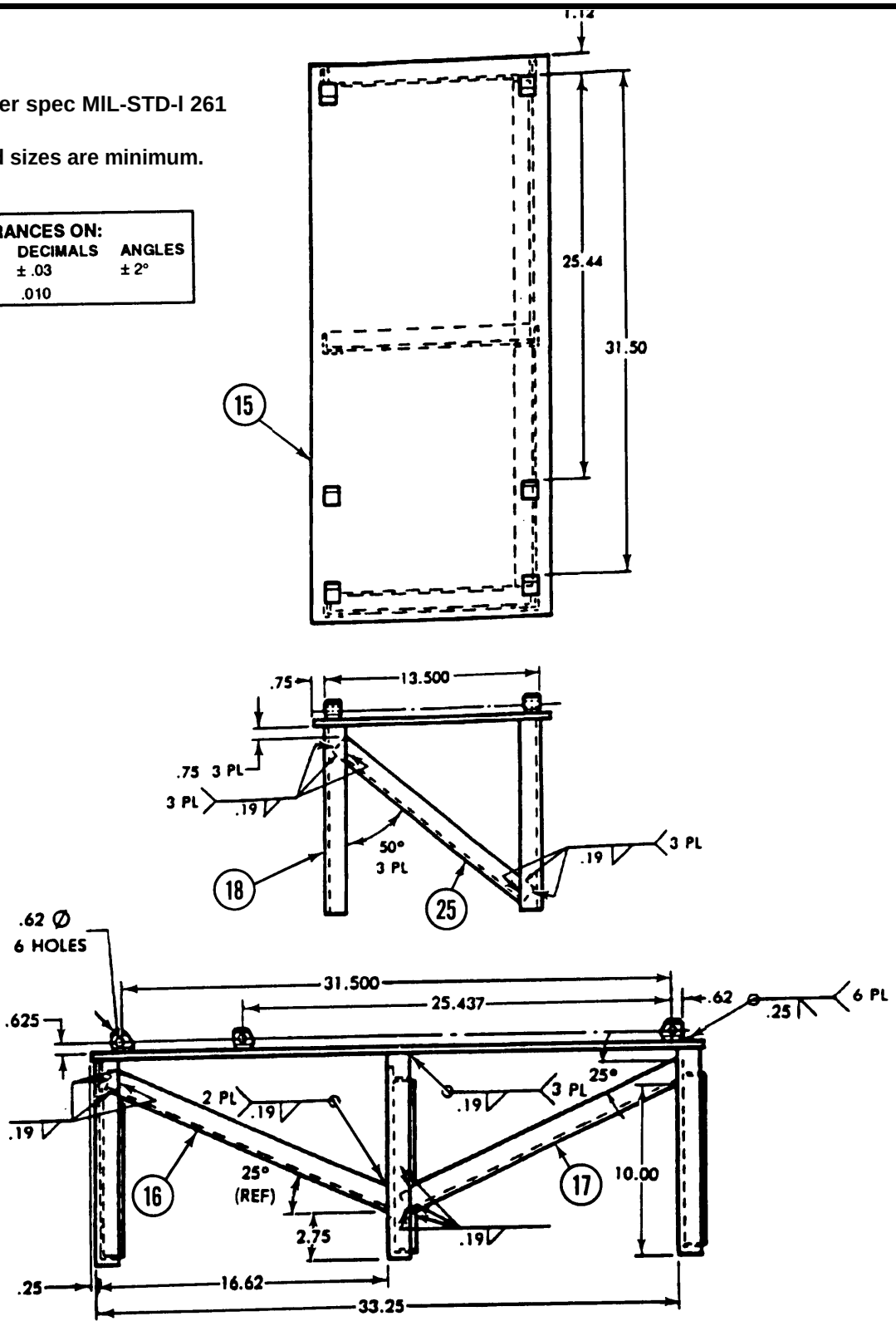


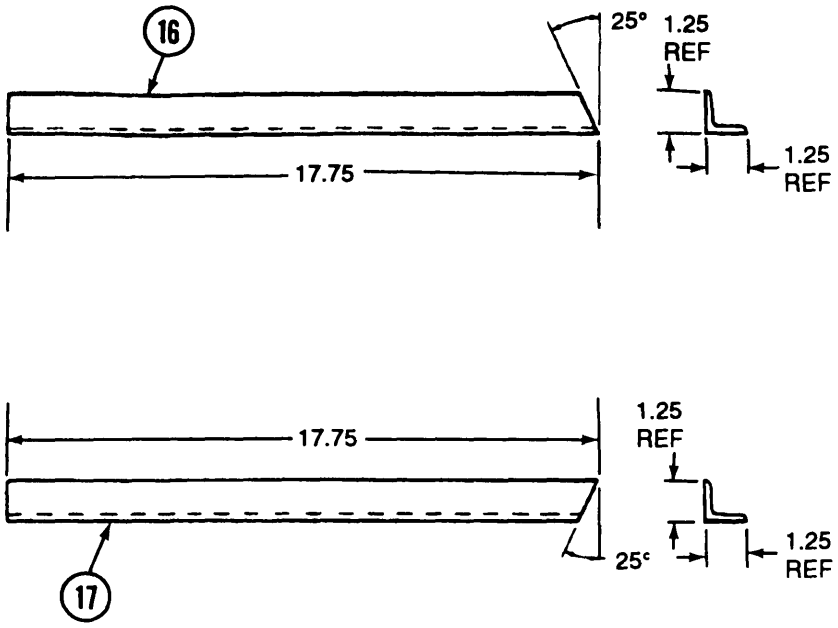
Figure 1. Projectile Rack Section Test Stand-Support Stand

E-7. PROJECTILE RACK SECTION TEST STAND (continued).

NOTES:

1. Steel, carbon
   Ml 01 O-Ml 025
   Spec ASTM A575 or A576
   .250 thick
2. Steel angle
   Per ASTM A36
   1.25x1.25x.187
3. Remove all burrs and sharp edges.

TOLERANCES ON:
FRACT, DECIMALS ANGLES
± * .03 * 2°



ITEM NUMBER	A
18	12.12
25	15.50
26	34.00

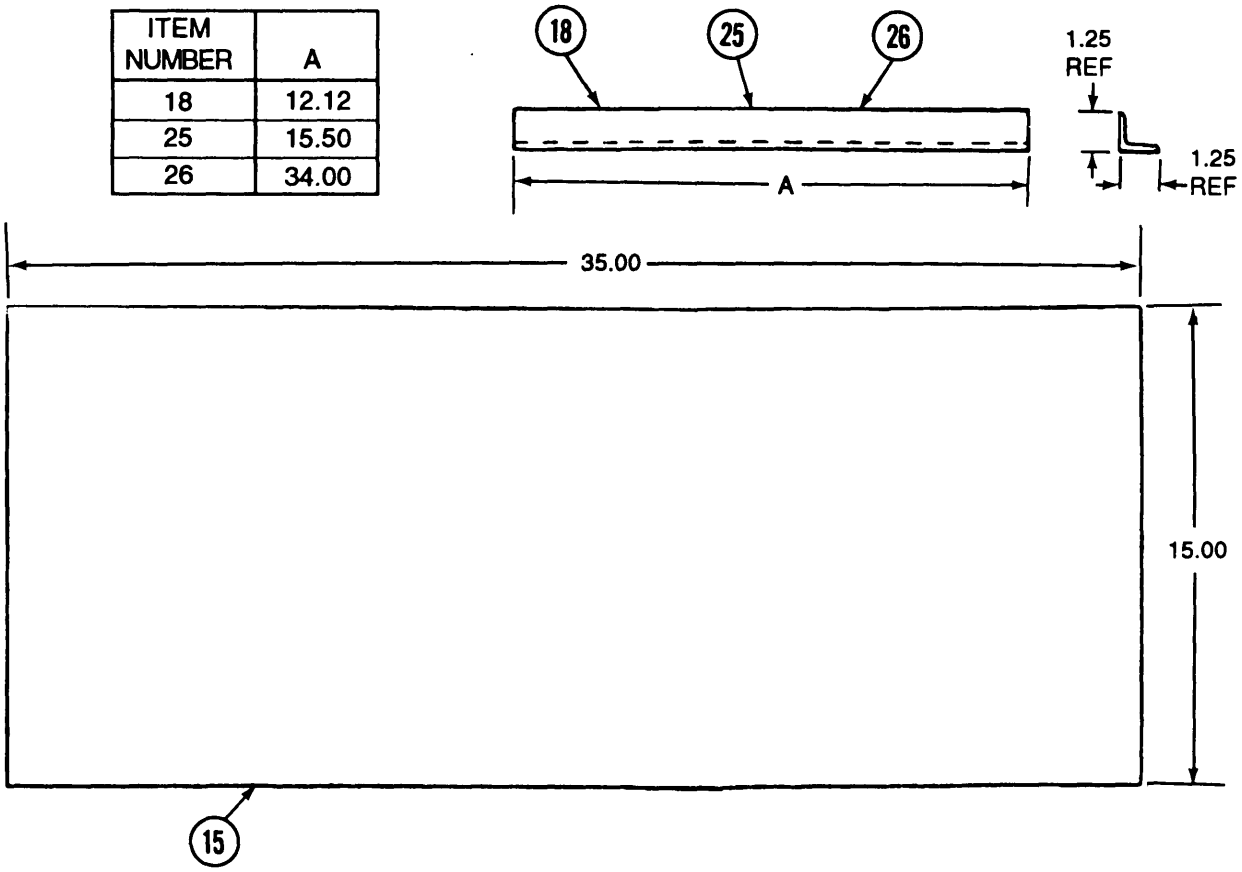


Figure 2. Projectile Rack Section Test Stand

E-7. PROJECTILE RACK SECTION TEST STAND (continued).

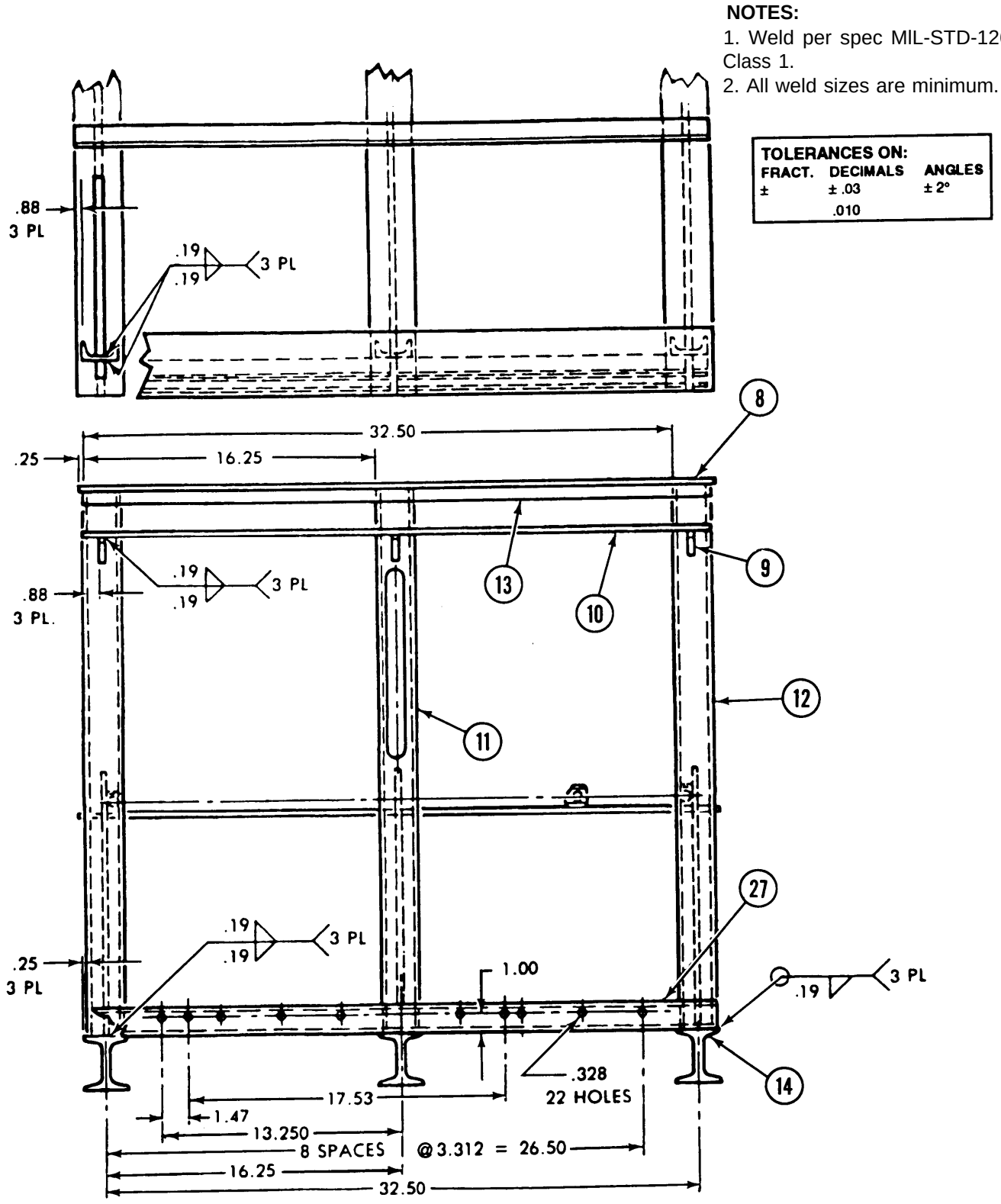


Figure 3. Projectile Rack Section Test Stand-Test Fixture Weldment (1 of 2)

E-7. PROJECTILE RACK SECTION TEST STAND (continued).

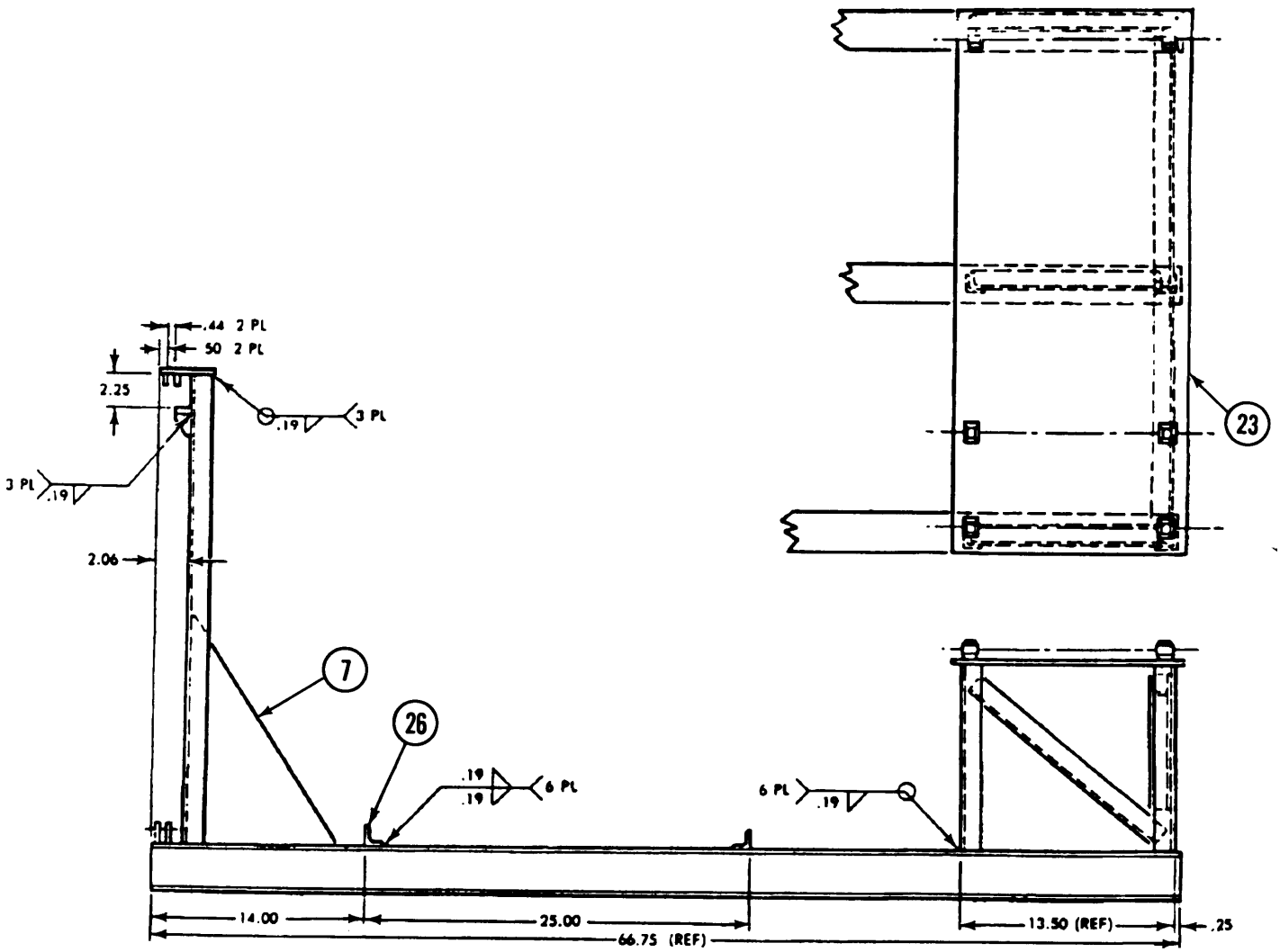


Figure 3. Projectile Rack Section Test Stand-Test Fixture Weldment (2 of 2)

E-7. PROJECTILE RACK SECTION TEST STAND (continued).

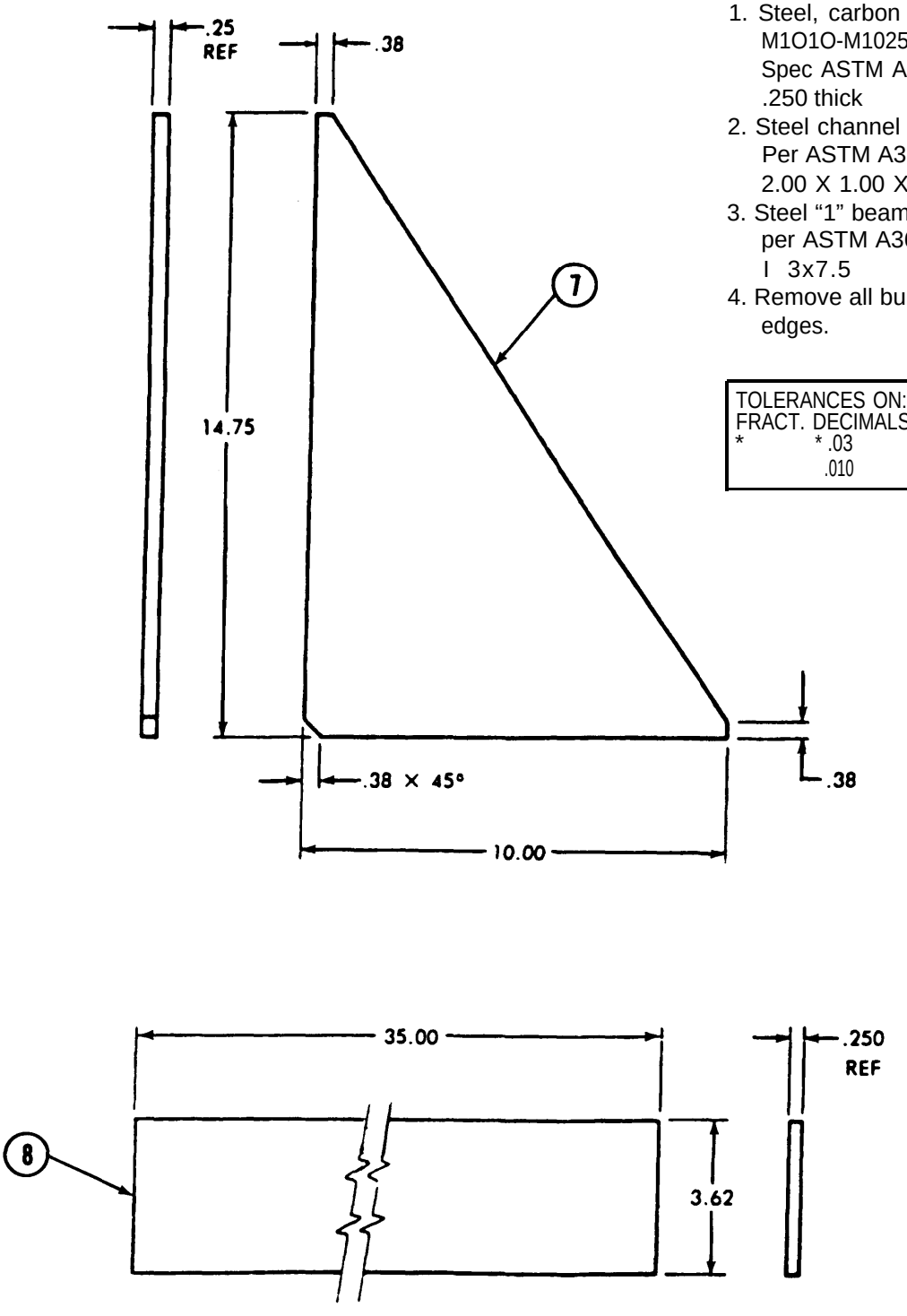


Figure 4. Projectile Rack Section Test Stand (1 of 3)

E-7. PROJECTILE RACK SECTION TEST STAND (continued).

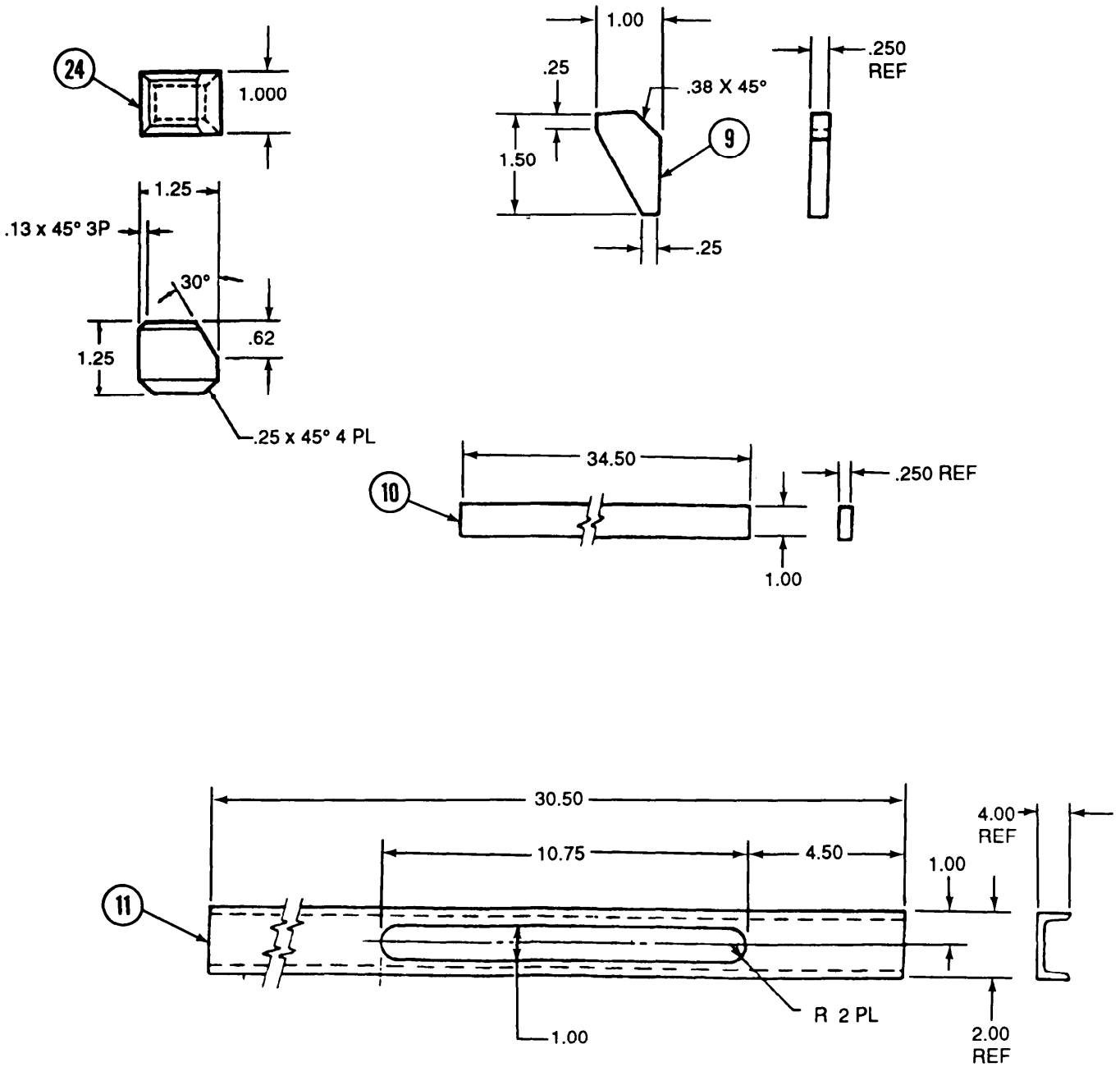
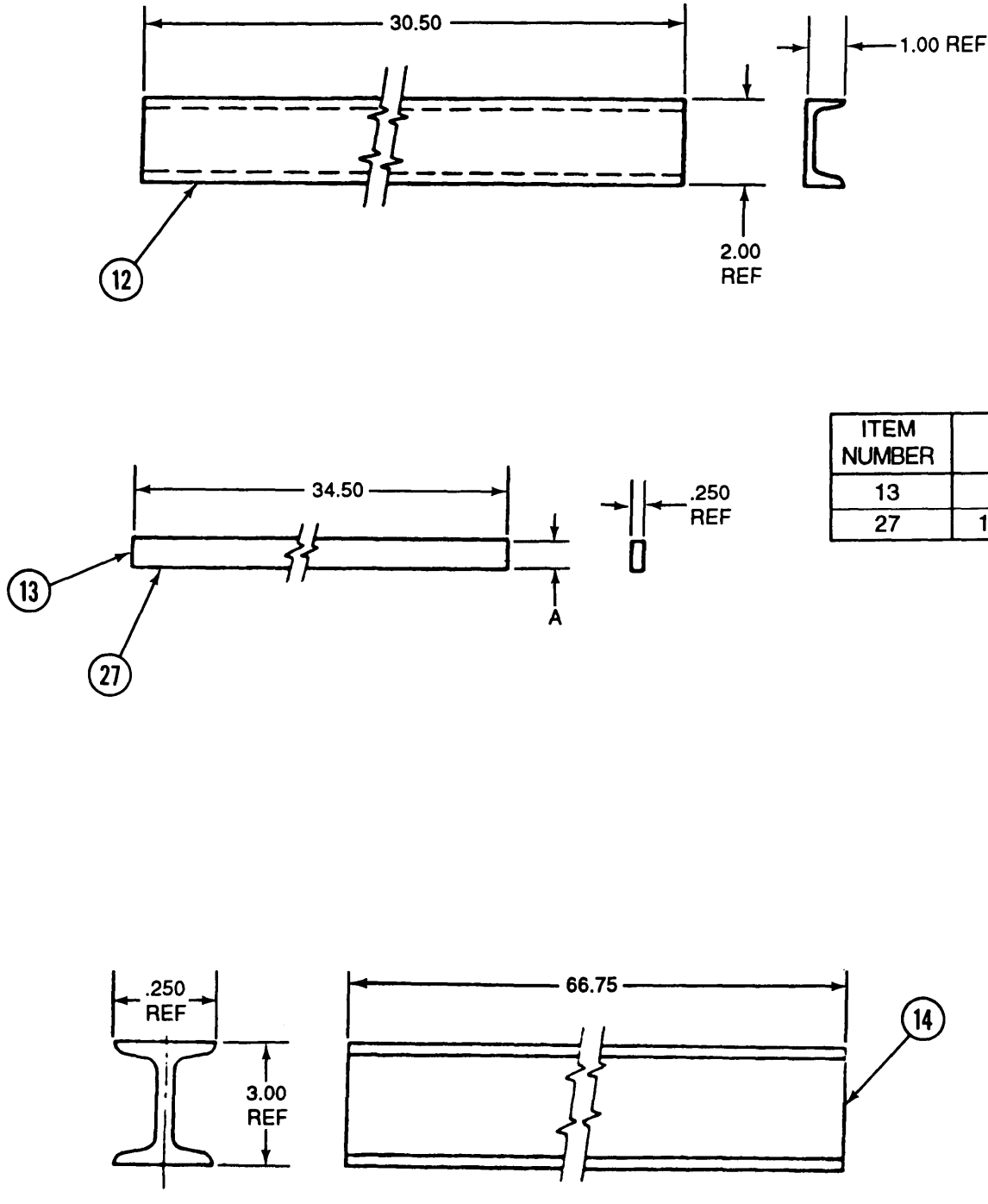


Figure 4. Projectile Rack Section Test Stand (2 of 3)

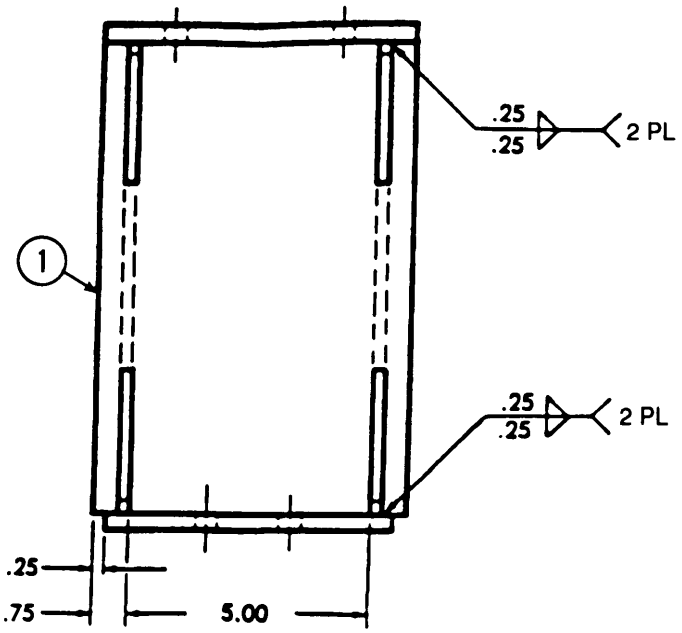
E-Z PROJECTILE RACK SECTION TEST STAND (continued).



ITEM NUMBER	A
13	.75
27	1.50

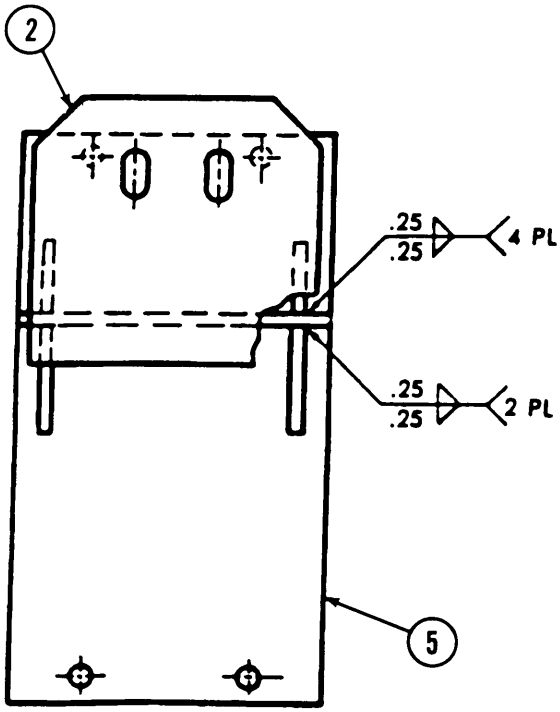
Figure 4. Projectile Rack Section Test Stand (3 of 3)

E-7. Projectile RACK SECTION TEST STAND (continued).



NOTES:
1. Weld per Spec MIL-STD-1261 Class 1.
2. All weld sizes are minimum.

TOLERANCES ON:		
FRACT.	DECIMALS	ANGLES
±	±.03	±



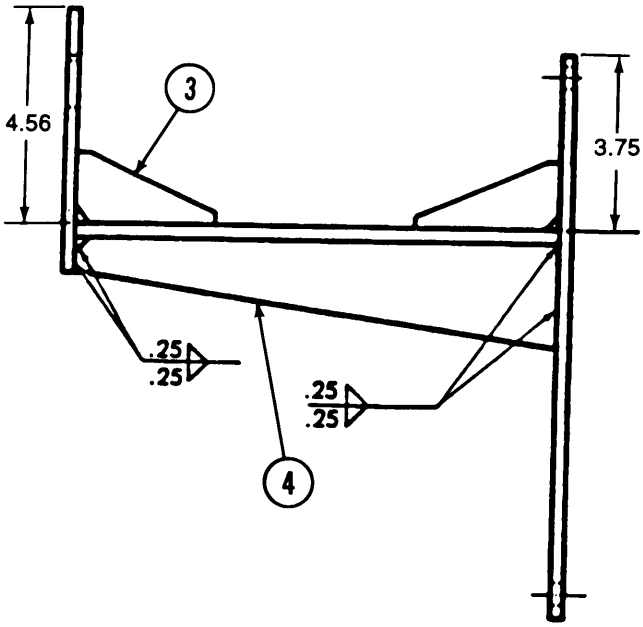


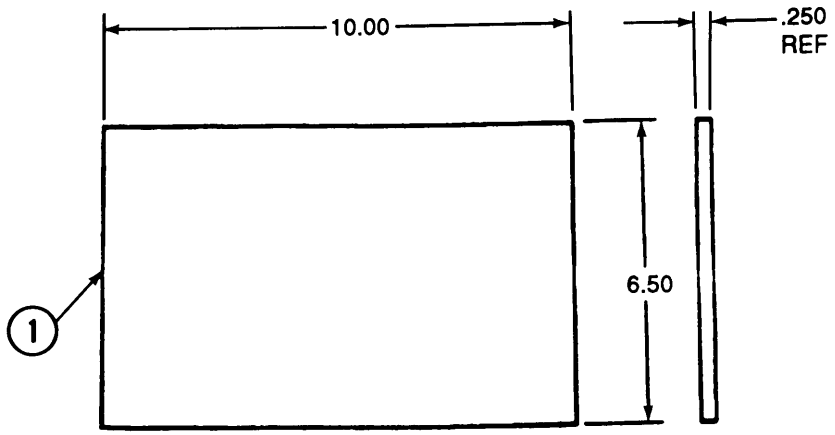
Figure 5. Projectile Rack Section Test Stand-Bracket Weldment

E-7. PROJECTILE RACK SECTION TEST STAND (continued).

NOTES:

1. Steel, carbon
   M1010-M1025
   Spec ASTM A575 Or A576
   .250 thick
2. Remove all burrs and sharp edges.

TOLERANCES ON:		
FRACT.	DECIMALS	ANGLES
±	± .03	± 2°



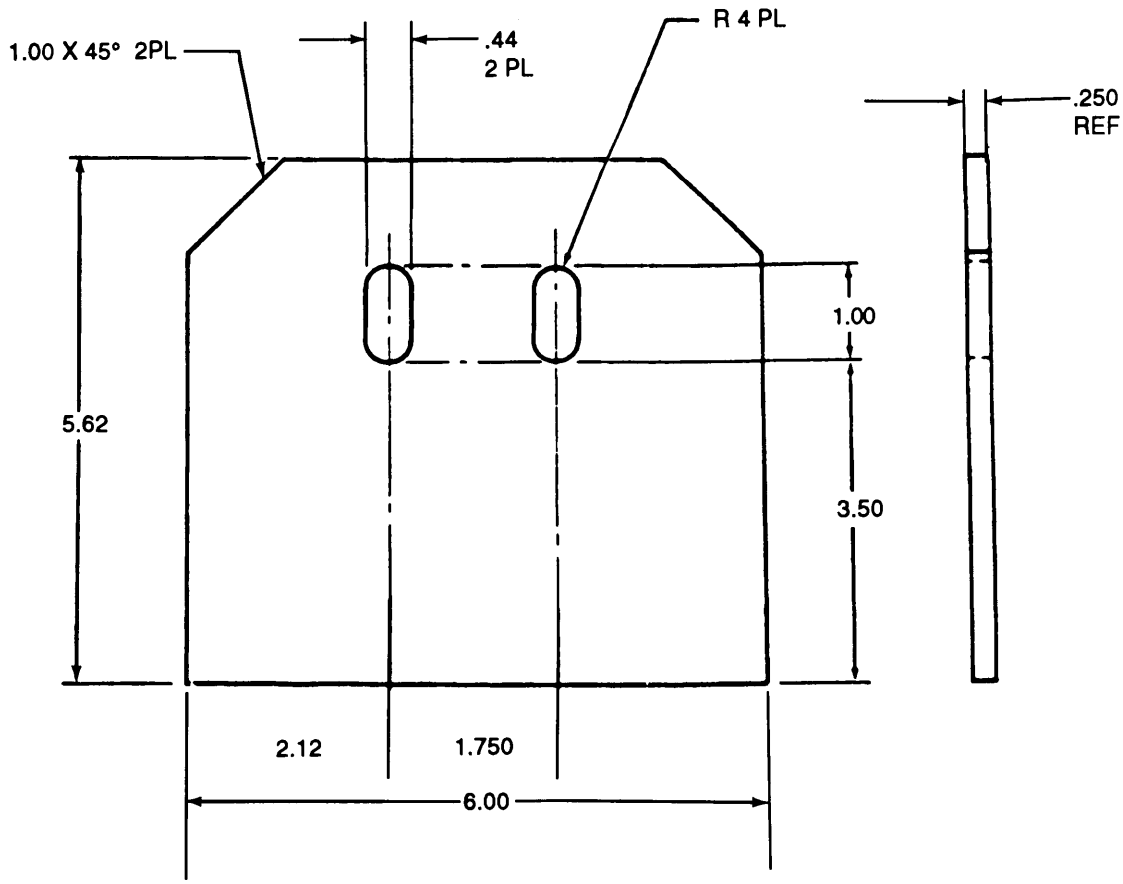


Figure 6. Projectile Rack Section Test Stand (1 of 3)

E-7. PROJECTILE RACK SECTION TEST STAND (continued).

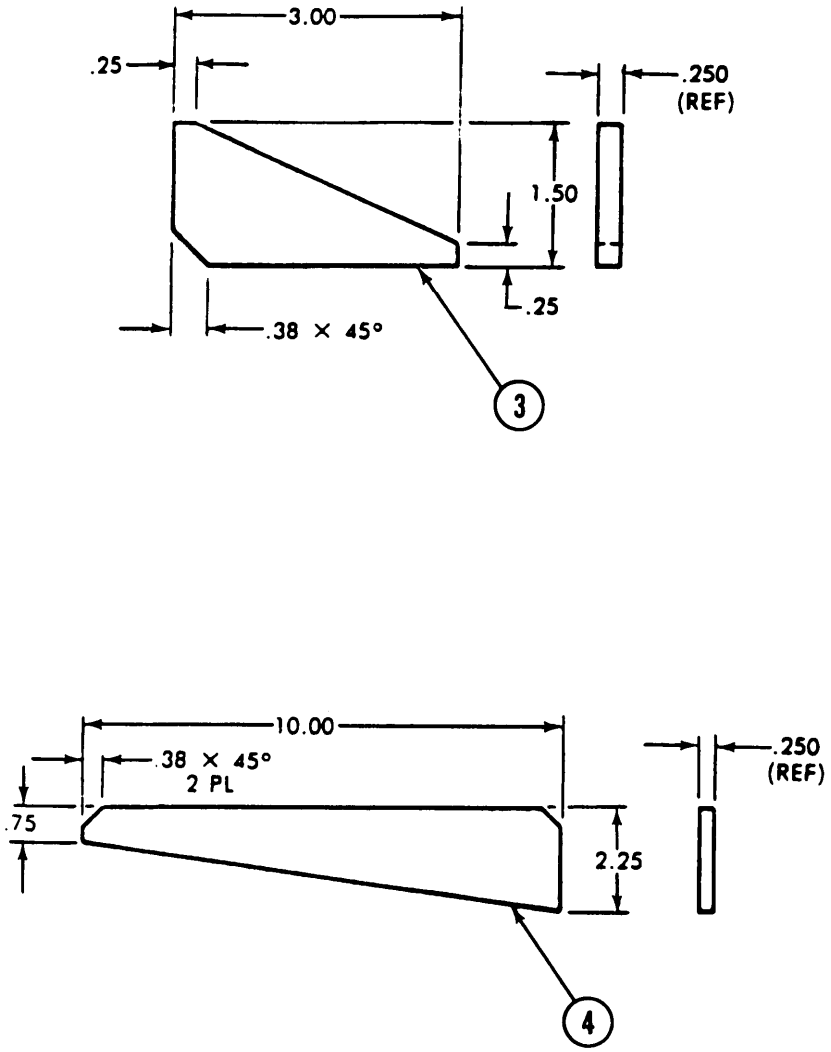


Figure 6. Projectile Rack Section Test Stand (2 of 3)

E-7. PROJECTILE RACK SECTION TEST STAND (continued).

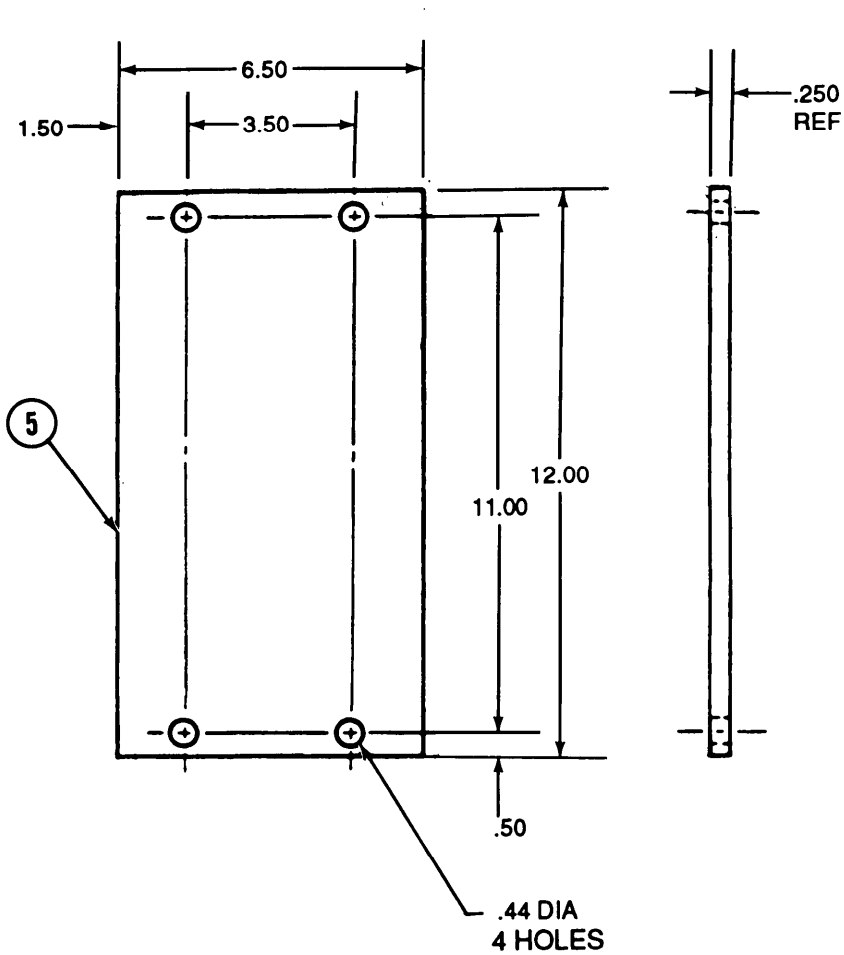


Figure 6. Projectile Rack Section Test Stand (3 of 3)

E-7. PROJECTILE RACK SECTION TEST STAND (continued).

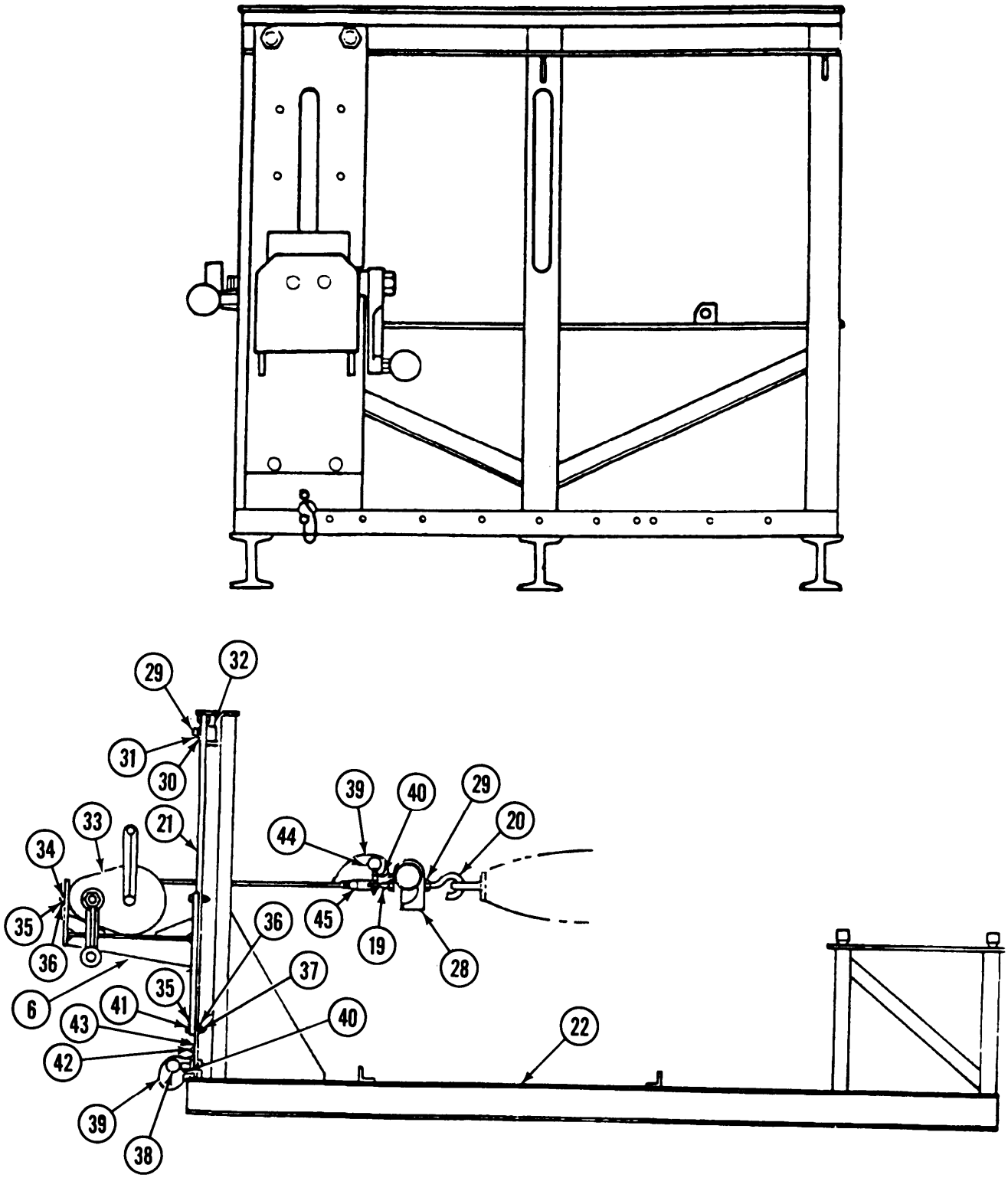


Figure 7. Projectile Rack Section Test Stand-Ammo Rack Pull Test Fixture

E-7. PROJECTILE RACK SECTION TEST STAND (continued).

NOTES:

1. Steel, carbon
   M1O1O-M1025
   Spec ASTM Al 08
   .500 dia
2. Steel, carbon
   M1O1O-M1 025
   Spec ASTM A575 Or A576
   .375 thick
3. Remove all burrs and sharp edges.

TOLERANCES ON:		
FRACT.	DECIMALS	ANGLES
±	± .03	± 2°

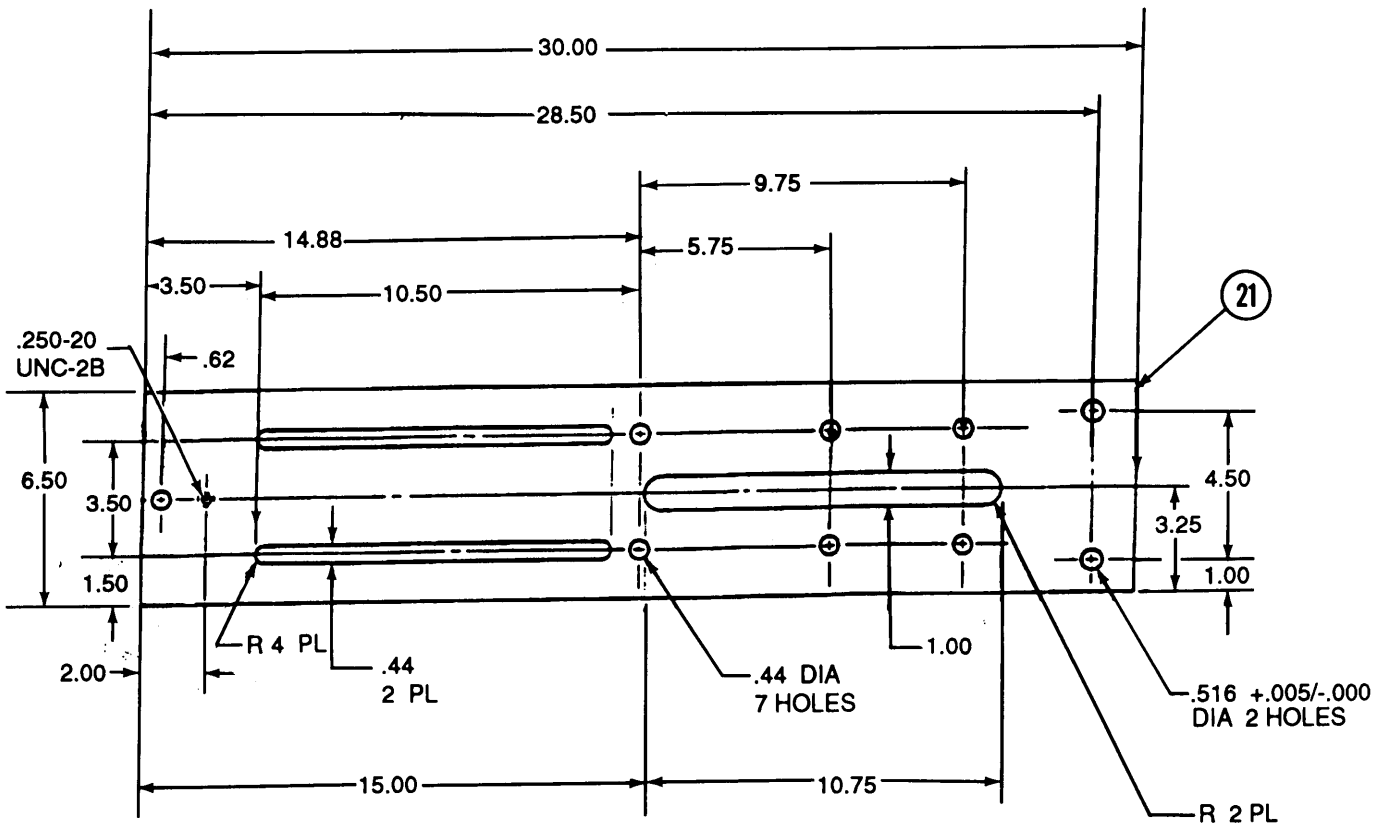


Figure 8. Projectile Rack Section Test Stand (1 of 2)

E-7. PROJECTILE RACK SECTION TEST STAND (continued).

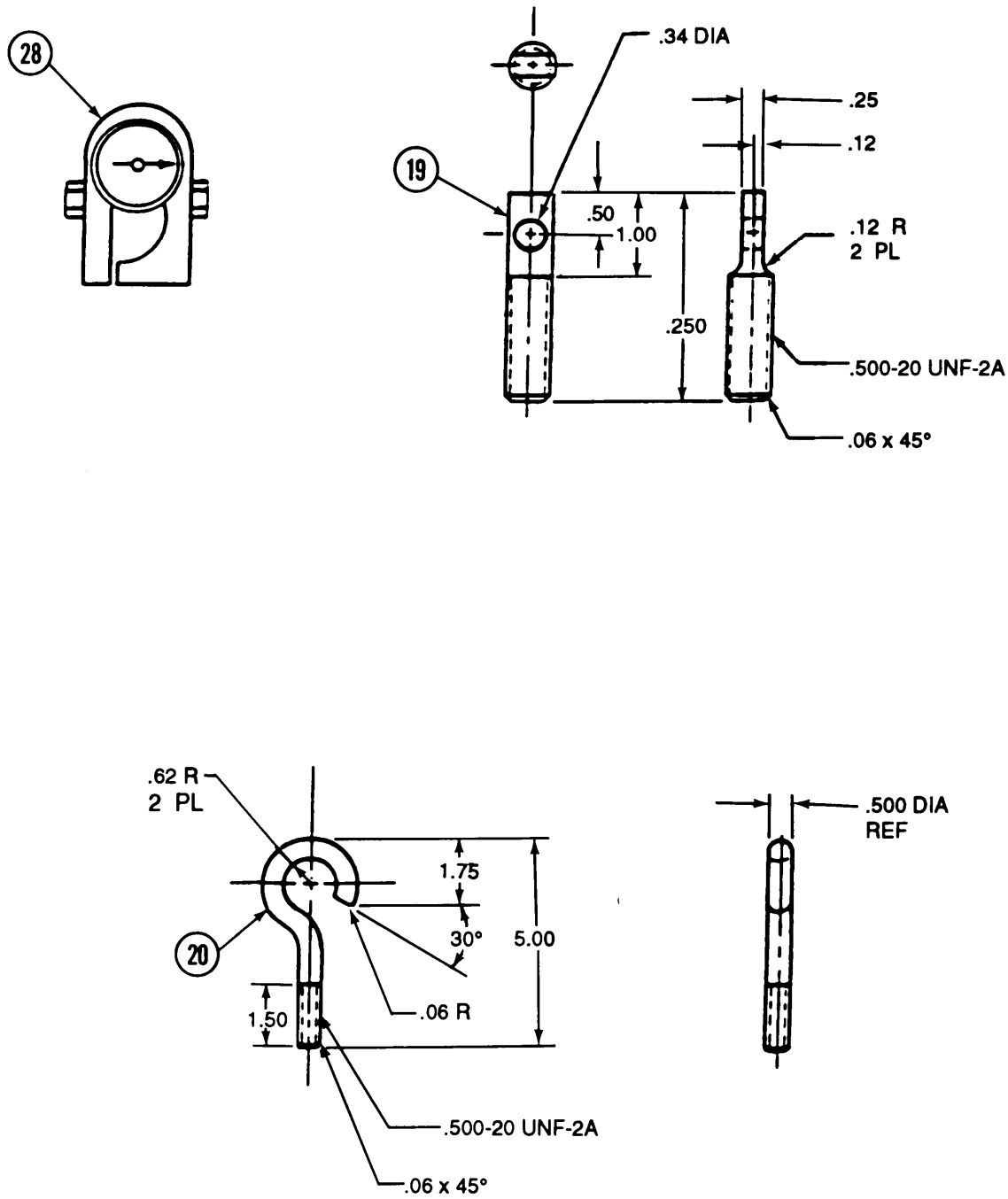


Figure 8. Projectile Rack Section Test Stand (2 of 2)

APPENDIX F
ELECTRICAL SYSTEM SCHEMATICS

F-1 . GENERAL

This appendix contains schematic drawings of repairable wiring harnesses. Schematics for each wiring harness are identified by part number. Refer to the wiring harness schematic when disassembling a wiring harness.

F-2. ELECTRICAL SYSTEM SCHEMATICS.

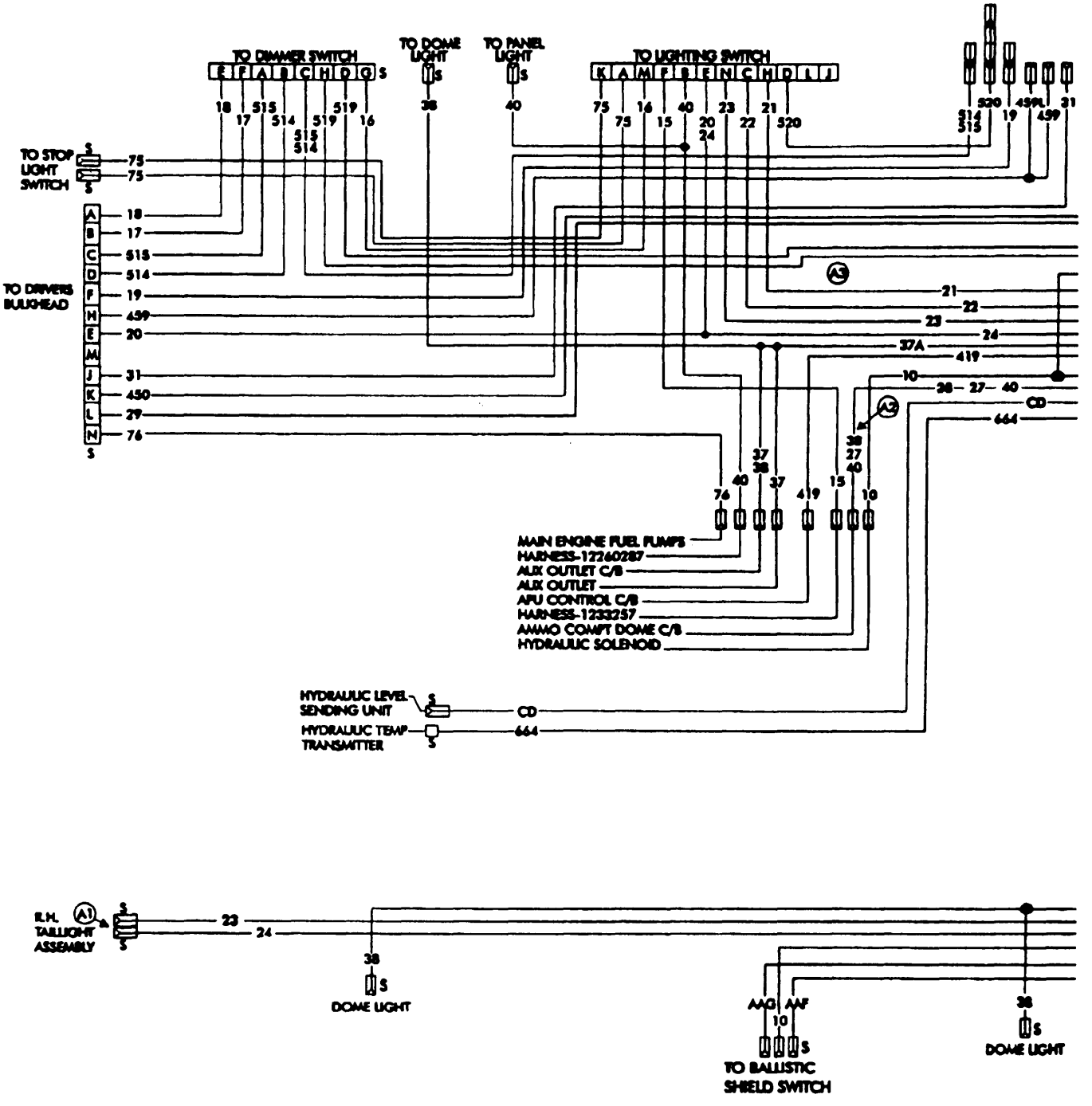


Figure F-1. Cargo Compartment Wing Harness (12330252) (one of two)

F-2. ELECTRICAL SYSTEM SCHEMATICS (continued).

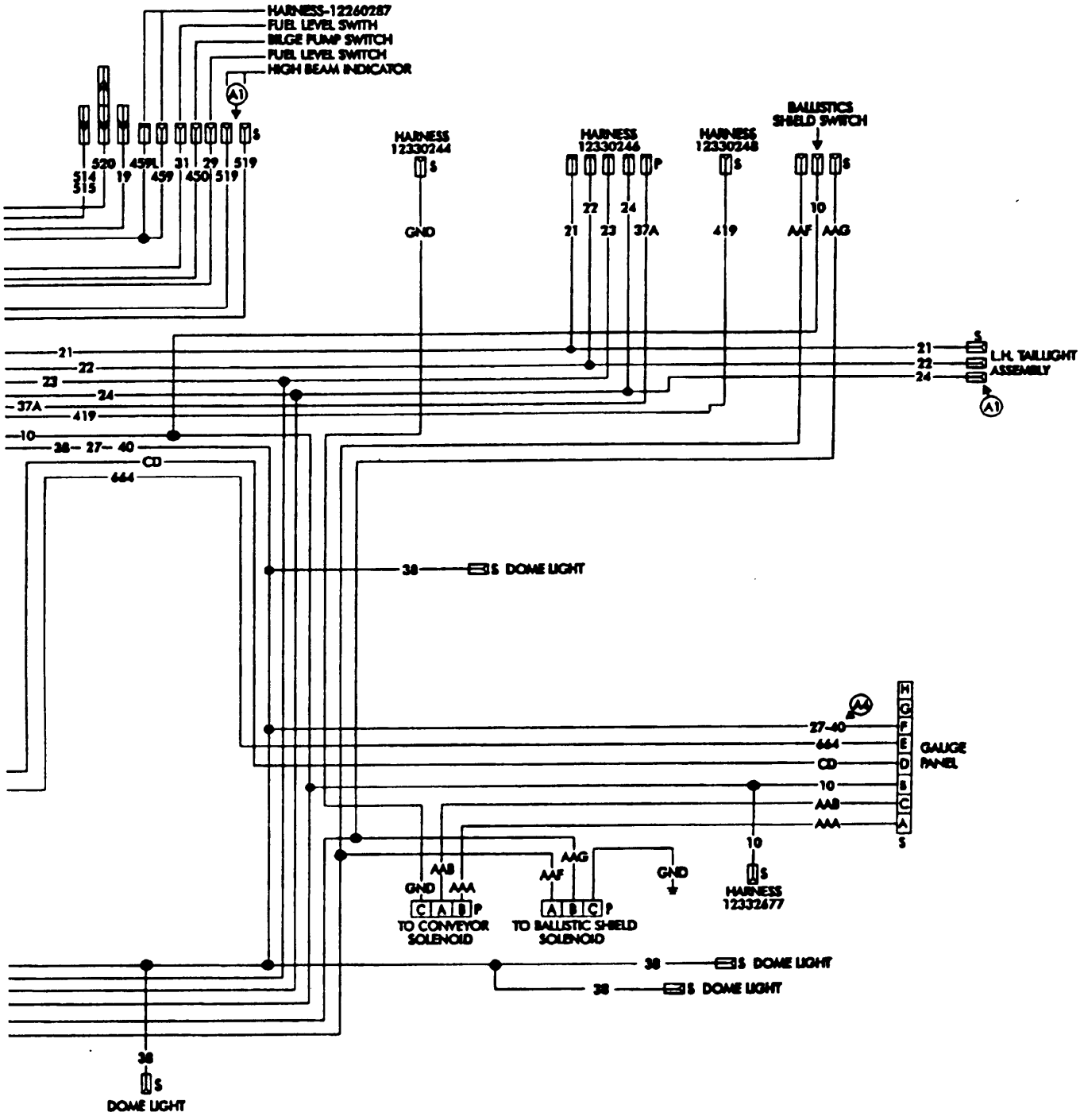


Figure F-2. Cargo Compartment Wing Harness (12330252) (two of two)

F-2. ELECTRICAL SYSTEM SCHEMATICS (continued).

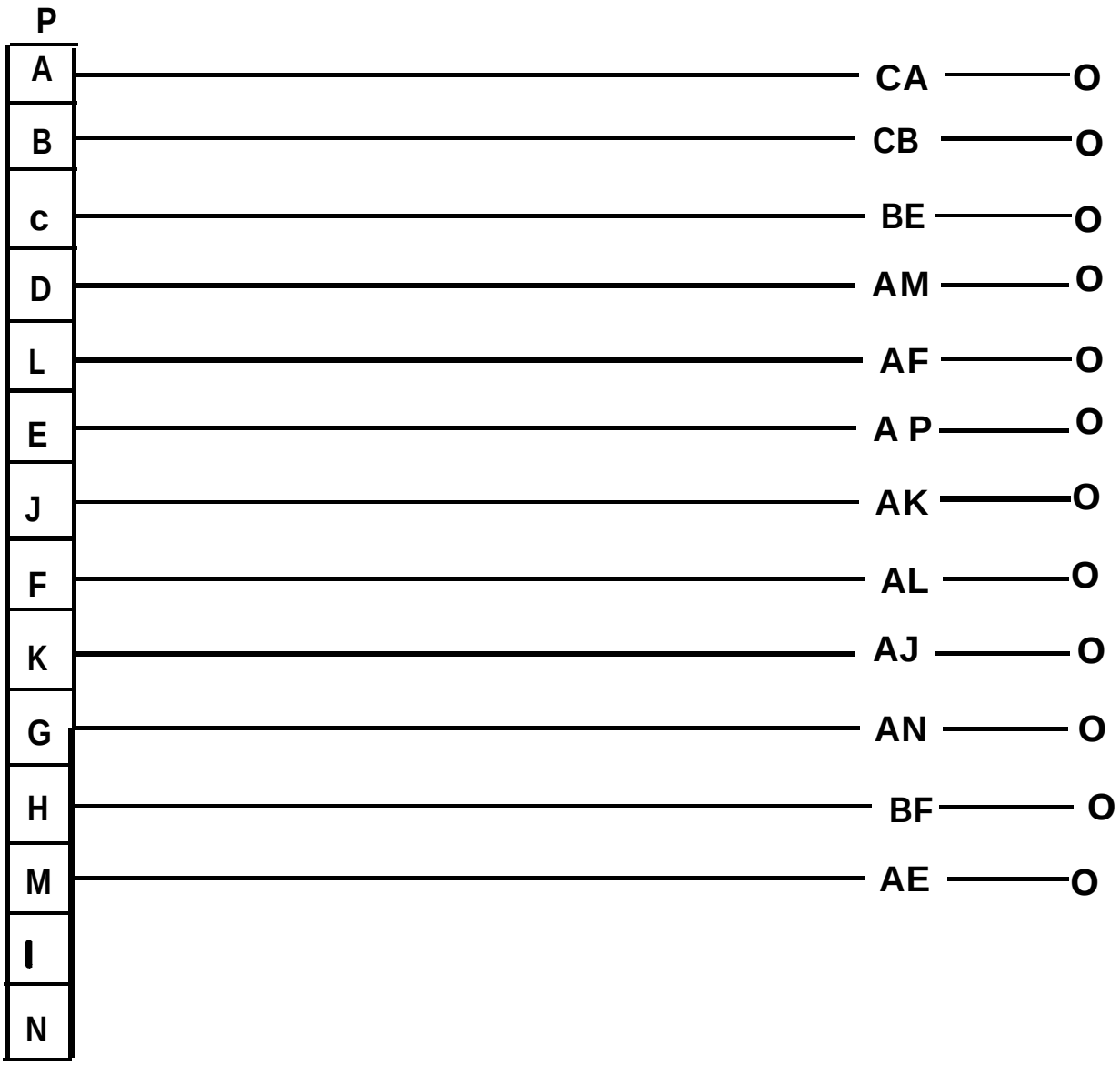


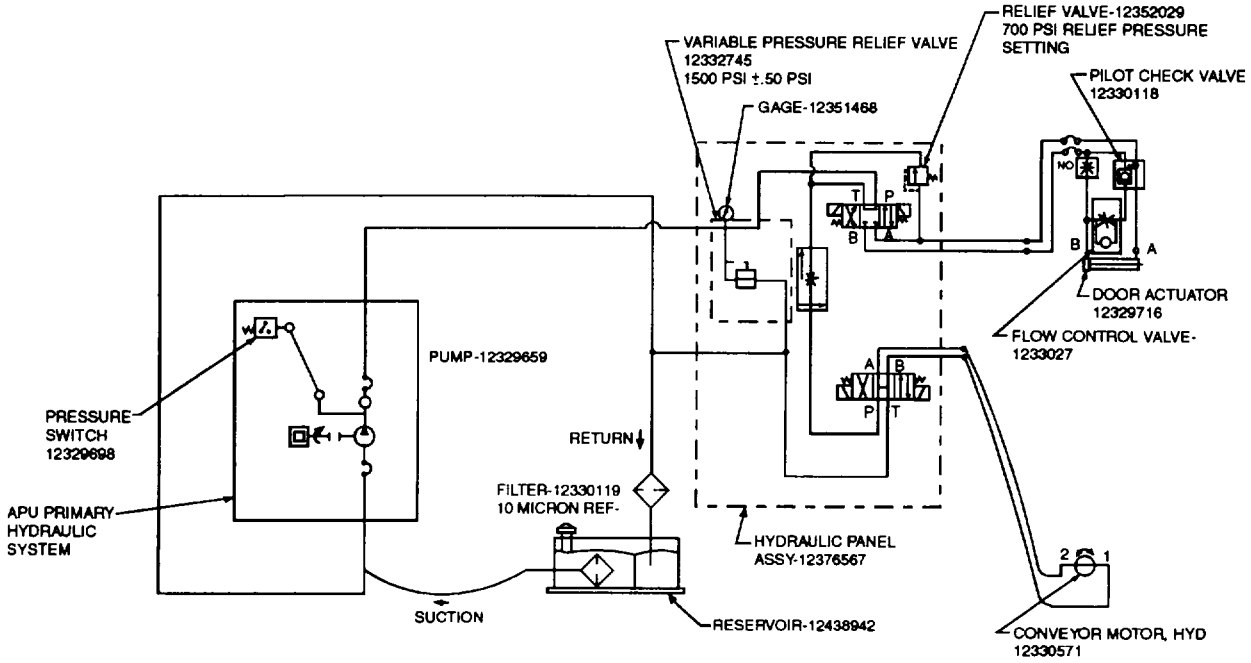
Figure F-2. STE/ICE Control Box Wing Harness (12351547)

APPENDIX G
HYDRAULIC SYSTEM SCHEMATIC

G-1. GENERAL.

This appendix contains a schematic of the vehicle hydraulic system. Refer to this schematic when performing troubleshooting for hydraulic problems.

G-2. HYDRAULIC SYSTEM SCHEMATIC.



Change 1 G-2/(G-3 and G-4 deleted)

APPENDIX H
MANDATORY REPLACEMENT PARTS

Paragraph Number	Paragraph Title	Page Number
H-1	General	H-1
H-2	Explanation of Columns	H-1

H-1. GENERAL.

This appendix is a cross-reference of item numbers to part numbers and is included for that purpose only.

H-2. EXPLANATION OF COLUMNS.

a. Column (1) - Item Number. This number is assigned to the entry in Table H-1 for cross-referencing to the part number. The item number appears in the Materials/Parts listing of the 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 number.

d. Column (4) - Part Number. This is the primary number used by the manufacturer that 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 H-1. MANDATORY REPLACEMENT PARTS LIST

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
1	Bearing	3120-00-930-4073	10947993	TM 9-2350-287-24P
2	Bilge pump parts kit	4320-00-967-6271	5703511	TM 9-2350-287-24P
3	Bilge pump parts kit	2590-00-967-6272	5703512	TM 9-2350-287-24P
4	Cotter pin	5315-00-839-2325	MS24665-132	TM 9-2350-287-24P
5	Cotter pin	5315-00-239-8023	MS24665-229	TM 9-2350-287-24P
6	Cotter pin	5315-00-477-0115	MS24665-259	TM 9-2350-287-24P
6.1	Cotter pin	5315-00-842-3044	MS24665-283	TM 9-2350-287-24P
7	Cotter pin	5315-00-234-1862	MS24665-299	TM 9-2350-287-24P
8	Cotter pin	5315-00-619-3047	MS24665-300	TM 9-2350-287-24P
9	Cotter pin	5315-00-839-5822	MS24665-353	TM 9-2350-287-24P
10	Cotter pin	5315-00-298-1481	MS24665-357	TM 9-2350-287-24P
11	Cotter pin	5315-00-013-7258	MS24665-497	TM 9-2350-287-24P
12	Cotter pin	5315-00-234-1848	MS24665-629	TM 9-2350-287-24P
13	Cushion pad	2590-00-133-7963	10952572-10	TM 9-2350-287-24P
14	Drive screw	5305-00-253-5625	MS21318-46	TM 9-2350-287-24P
15	Fastener	5340-00-764-2334	MS51939-1	TM 9-2350-287-24P
16	Fastener		12351835	TM 9-2350-287-24P
17	Gasket	5330-00-828-3628	MS51007-10	TM 9-2350-287-24P
18	Gasket	5330-00-838-6935	MS51007-13	TM 9-2350-287-24P
19	Gasket	5330-00-968-1753	MS52000-7	TM 9-2350-287-24P
20	Gasket	5330-00-682-4609	10867301	TM 9-2350-287-24P
21	Gasket	5330-00-879-7160	10898034	TM 9-2350-287-24P
22	Gasket	5330-00-885-3455	10898036	TM 9-2350-287-24P
23	Gasket	5330-00-878-4190	10898038	TM 9-2350-287-24P
24	Gasket	5330-00-450-3509	10900571	TM 9-2350-287-24P
25	Gasket	5330-01-020-9719	10900572	TM 9-2350-287-24P
26	Gasket	5330-00-345-8043	10920615	TM 9-2350-287-24P
27	Gasket	5330-00-080-1023	10922277	TM 9-2350-287-24P
28	Gasket	5330-00-933-7838	11605391	TM 9-2350-287-24P
29	Gasket	5330-00-613-6855	11671375	TM 9-2350-287-24P
30	Gasket	5330-00-622-7395	11671389	TM 9-2350-287-24P
31	Gasket	5330-00-614-9128	11671392	TM 9-2350-287-24P
31.1	Gasket	5330-01-292-5385	12268244	TM 9-2350-287-24P
32	Gasket	5330-01-167-8094	12289974	TM 9-2350-287-24P
33	Gasket	5330-00-917-2738	126400	TM 9-2350-287-24P
34	Gasket	5330-01-020-9719	50A-032	TM 9-2350-287-24P
35	Gasket	5330-00-771-8488	7718488	TM 9-2350-287-24P
35.1	Gasket	5330-00-733-4749	8351752	TM 9-2350-287-24P
36	Grommet	5325-00-185-0003	MS35489-42S	TM 9-2350-287-24P
37	Hydraulic parts kit	2530-01-202-8234	PK813	TM 9-2350-287-24P
38	Hydraulic parts kit	2530-01-202-8235	PK815	TM 9-2350-287-24P
39	Key washer	5310-00-905-2500	MS172280	TM 9-2350-287-24P
40	Key washer	5310-00-045-3812	MS19070-052	TM 9-2350-287-24P
41	Lockwasher	5310-00-293-9624	MS19070-152	TM 9-2350-287-24P
42	Lockwasher	5310-00-579-0079	MS35333-37	TM 9-2350-287-24P
43	Lockwasher	5310-00-559-0070	MS35333-38	TM 9-2350-287-24P
44	Lockwasher	5310-00-550-1130	MS35333-40	TM 9-2350-287-24P
45	Lockwasher	5310-00-596-7693	MS35335-31	TM 9-2350-287-24P
46	Lockwasher	5310-00-209-0786	MS35335-33	TM 9-2350-287-24P
47	Lockwasher	5310-00-627-6128	MS35335-35	TM 9-2350-287-24P
48	Lockwasher	5310-00-913-9776	MS35335-91	TM 9-2350-287-24P
49	Lockwasher	5310-00-933-8120	MS35338-138	TM 9-2350-287-24P
50	Lockwasher	5310-00-045-0591	MS35338-22	TM 9-2350-287-24P

Table H-1. MANDATORY REPLACEMENT PARTS LIST (continued)

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
51	Lockwasher	5310-00-543-2410	MS35338-40	TM 9-2350-287-24P
52	Lockwasher	5310-00-045-4007	MS35338-41	TM 9-2350-287-24P
53	Lockwasher	5310-00-045-3296	MS35338-43	TM 9-2350-287-24P
54	Lockwasher	5310-00-582-5965	MS35338-44	TM 9-2350-287-24P
55	Lockwasher	5310-00-637-9541	MS35338-46	TM 9-2350-287-24P
56	Lockwasher	5310-00-209-0965	MS35338-47	TM 9-2350-287-24P
57	Lockwasher	5310-00-584-5272	MS35338-48	TM 9-2350-287-24P
58	Lockwasher	5310-00-274-8710	MS35338-63	TM 9-2350-287-24P
59	Lockwasher	5310-00-011-5093	MS35338-65	TM 9-2350-287-24P
60	Lockwasher	5310-00-011-5314	MS35338-66	TM 9-2350-267-24P
61	Lockwasher	5310-00-011-6121	MS35338-67	TM 9-2350-287-24P
62	Lockwasher	5310-00-011-6123	MS35338-69	TM 9-2350-287-24P
63	Lockwasher	5310-00-185-9716	11594003	TM 9-2350-287-24P
64	Lockwasher	5310-00-165-8404	20-13-5	TM 9-2350-287-24P
65	Lockwasher	5310-00-140-2135	21-2-5	TM 9-2350-287-24P
66	Lockwasher	5310-00-274-8710	43W6335-40	TM 9-2350-287-24P
67	Lockwasher	5310-00-582-5965	6220-21	TM 9-2350-287-24P
68	Lockwire	9505-00-331-3275	ASTM A580	TM 9-2350-287-24P
69	Lockwire	9505-00-331-3275	MS20995C41	TM 9-2350-287-24P
70	Lockwire	9505-01-236-9343	MS20995C91	TM 9-2350-287-24P
71	Lockwire	9505-00-684-4843	MS20995F41	TM 9-2350-287-24P
72	Mounting rod	5306-01-179-9045	12332894	TM 9-2350-287-24P
73	Overhaul kit	2590-01-268-1766	5705543	TM 9-2350-287-24P
74	Parts kit	5330-01-202-8154	PK879	TM 9-2350-287-24P
75	Parts kit		12438828	TM 9-2350-287-24P
76	Parts kit	5330-01-344-4428	5705544	TM 9-2350-287-24P
77	Preformed packing	5330-00-285-9775	AN124012	TM 9-2350-287-24P
78	Preformed packing	5330-00-248-3847	MS29513-115	TM 9-2350-287-24P
79	Preformed packing	5330-00-231-7716	MS29513-154	TM 9-2350-287-24P
80	Preformed packing	5330-00-599-3071	MS29513-251	TM 9-2350-287-24P
81	Preformed packing	5330-00-252-6041	MS29513-260	TM 9-2350-287-24P
82	Preformed packing	5330-00-291-3275	MS29513-261	TM 9-2350-287-24P
83	Preformed packing	5330-00-297-5337	MS29513-427	TM 9-2350-287-24P
84	Preformed packing	5330-00-802-1360	MS9021-034	TM 9-2350-287-24P
85	Preformed packing	5330-00-855-3076	MS9021-037	TM 9-2350-287-24P
86	Preformed packing	5330-00-585-7864	MS9021-154	TM 9-2350-287-24P
87	Preformed packing	5330-00-826-6373	MS9021-263	TM 9-2350-287-24P
88	Preformed packing	5330-00-165-1953	M83248/1-235	TM 9-2350-287-24P
89	Preformed packing	5330-00-001-6681	M83248/2-153	TM 9-2350-287-24P
90	Preformed packing	5330-01-185-2574	M83461/1-230	TM 9-2350-287-24P
91	Preformed packing	5330-01-178-8606	M83461/1-334	TM 9-2350-287-24P
92	Preformed packing	5330-00-058-5855	10934405	TM 9-2350-287-24P
93	Retainer		10955887	TM 9-2350-287-24P
94	Retainer	9515-01-084-5999	11594121-1	TM 9-2350-287-24P
95	Retainer	9515-01-084-6000	11594121-2	TM 9-2350-287-24P
96	Retainer	9515-01-084-6001	11594121-3	TM 9-2350-287-24P
97	Retaining ring	5365-00-754-1619	MS16624-1059	TM 9-2350-287-24P
98	Retaining ring	5365-00-800-9928	MS16624-1118	TM 9-2350-287-24P
99	Retaining ring	5365-00-806-1686	MS16624-59	TM 9-2350-287-24P
100	Rivet	5320-00-930-7865	MS24662-234	TM 9-2350-287-24P
101	Rubber mount	3930-00-111-3226	218592	TM 9-2350-287-24P
102	Seal	5330-00-823-5607	B60-8023-3	TM 9-2350-287-24P
103	Seal	5330-00-796-2191	CF-SP-79244	TM 9-2350-287-24P

Table H-1. MANDATORY REPLACEMENT PARTS LIST (continued)

(1) ITEM NUMBER	(2) ITEM NAME	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) REFERENCE
104	Seal	5330-00-291-2858	MS51915-36-1	TM 9-2350-287-24P
105	Seal	5330-00-899-5220	10903183	TM 9-2350-287-24P
106	Seal	5330-00-133-9443	10921767	TM 9-2350-287-24P
107	Seal	5330-00-453-9353	11604901	TM 9-2350-287-24P
108	Seal	5330-00-102-9927	11619289	TM 9-2350-287-24P
109	Seal	5330-01-130-2460	11669687	TM 9-2350-287-24P
110	Seal	5330-00-613-6854	11671660	TM 9-2350-287-24P
110.1	Seal	5330-01-292-5375	12268242	TM 9-2350-287-24P
110.2	Seal	5330-01-292-5373	12268248	TM 9-2350-287-24P
111	Seal	5330-01-257-1066	12351746-3	TM 9-2350-287-24P
112	Seal	5330-01-397-3398	12351746-4	TM 9-2350-287-24P
113	Seal		12351746-5	TM 9-2350-287-24P
114	Seal	5330-01-416-7234	12351746-6	TM 9-2350-287-24P
115	Seal	5330-01-232-6756	12351753	TM 9-2350-287-24P
116	Seal	5330-01-088-6596	5103544	TM 9-2350-287-24P
117	Seal	5330-00-796-2191	7962191	TM 9-2350-287-24P
118	Self-locking nut	5310-00-807-1469	MS21042-5	TM 9-2350-287-24P
119	Self-locking nut	5310-00-877-5786	MS21044N4	TM 9-2350-287-24P
120	Self-locking nut	5310-00-807-1469	MS21083N8	TM 9-2350-287-24P
121	Self-locking nut	5310-00-807-1469	MS51922-17	TM 9-2350-287-24P
122	Self-locking nut	5310-00-840-6220	8712289-1	TM 9-2350-287-24P
123	Shim	5365-00-862-2659	10903767	TM 9-2350-287-24P
124	Shim	5365-00-862-2661	10909670	TM 9-2350-287-24P
125	Sleeve	4730-00-278-8767	S260	TM 9-2350-287-24P
126	Spacer	5365-00-145-2077	11621149	TM 9-2350-287-24P
127	Spring pin	5315-00-882-1438	MS16526-193	TM 9-2350-287-24P
128	Spring pin	5315-00-814-3530	MS16526-35	TM 9-2350-287-24P
129	Spring pin	5315-00-597-4222	NAS561 P8-12	TM 9-2350-287-24P
130	Spring tension washer	5310-01-094-9036	7759648-1	TM 9-2350-287-24P
131	Strap fastener	5340-00-179-2894	10930388	TM 9-2350-287-24P
132	Thread insert	5340-00-241-6672	MS51831-206	TM 9-2350-287-24P
133	Vibration damper cone	2815-00-215-7985	5134917	TM 9-2350-287-24P
134	Seal	5330-01-130-3460	471571	TM 9-2350-287-24P
135	Seal	9515-01-084-6001	11594121-3	TM 9-2350-287-24P
136	Seal	9515-01-084-5999	11594121-1	TM 9-2350-287-24P
137	Self-locking nut	5310-00-959-7600	MS51922-5	TM 9-2350-287-24P
138	Spring pin	5315-00-844-3662	MS16562-62	TM 9-2350-287-24P
139	Parts kit	2530-00-999-8586	5702941	TM 9-2350-287-24P
140	Lockwasher	5310-00-274-8710	MS35338-62	TM 9-2350-287-24P
141	Lockwasher	2310-00-167-0721	MS35333-41	TM 9-2350-287-24P

APPENDIX I
GLOSSARY

Section I. ABBREVIATIONS

amp	ampere
cap	capacitor
cfm	cubic foot (feet) per minute
cr	crystal rectifier
°C	degrees Celsius
°F	degrees Fahrenheit
ft-lb	foot-pound
gph	gallons per hour
id	inside diameter
in.	inch
lb	pound
lb/min	pounds per minute
mfd	microfarad
N•m	newton-meter
od	outside diameter
psi	pound-force per square inch
psig	pound-force per square inch gage
rpm	revolutions per minute
tir	total indicator reading
vdc	volts, direct current

Section II. Definitions OF UNUSUAL TERMS

adjacent	near or next to
armature	revolving coil in an electric motor
backlash	play between adjacent movable gears
concentricity	having a common center or axis
continuity	uninterrupted connection, complete circuit
counterbore	enlargement of the mouth of a cylindrical bore
fabricate	make, construct
growler	device used for finding short-circuited coils
perpendicular	at right angles to a given plane or line
splines	a series of projections on a shaft that fit into slots on a corresponding shaft, enabling both to rotate together
stator	the stationery part of a motor in or about which a rotor turns
torsion	twisting or being twisted
trueness	brought or restored to a desired mechanical accuracy or form

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109		51		Item 3. The NSN and P/N are not listed on the AMDF nor the MCRL. Request correct NSN and P/N be furnished.
2-8			2-1	Preventive Maintenance Checks and Services. Item 7 under "Items to be inspected" should be changed to read as follows: Firing linkage and firing mechanism pawl.
12	1-6a			Since there are both 20- and 30- round magazines for this rifle, data on both should be listed.

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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

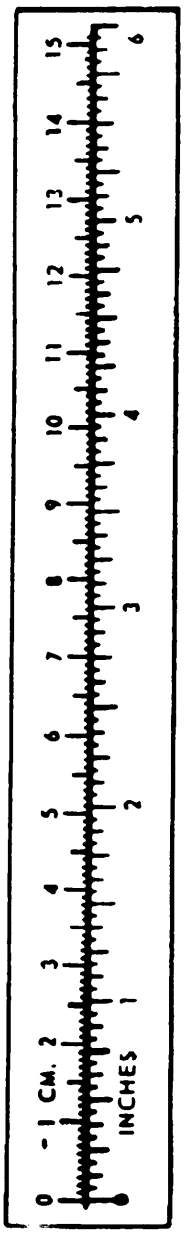
TEMPERATURE

$\frac{5}{9}(°F - 32) = °C$
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
$\frac{9}{5}(°C + 32) = °F$

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
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

TO CHANGE	TO	MULTIPLY BY
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



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